NUMERICAL STUDY OF NATURAL CONVECTION IN A SQUARE CAVITY WITH MAGNETIC FIELD AND SEMI CIRCULAR HEAT SOURCE OF DIFFERENT ORIENTATIONS

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INTRODUCTION

Free convection in cavity has received considerable attention from researchers. Most of the cavities commonly used in industries are circular, square, rectangular, trapezoidal and triangular etc. Square cavities have received a considerable attention for its application in various fields. Taghikhani and Chavoshi [1] numerically investigated two dimensional magneto hydrodynamics (MHD) free convection with internal heating in a square cavity. They observed that the effect of the magnetic field is to reduce the convective heat transfer inside the cavity. Bakhshan and Ashoori [2] investigated numerically analysis of a fluid behavior in a rectangular enclosure under the effect of magnetic field. They observed that Nusselt number rises with increasing Grashof and Prandtl numbers and decreasing Hartmann and orientation of magnetic field. Öztop and Al-Salem [3] numerically investigated effects of joule heating on MHD natural convection in non-isothermally heated enclosure. They observed that positive stream functions are decreased with increasing of Hartmann number and thermal boundary layer becomes larger. Parvin and Nasrin [4] investigated numerically analysis of the flow and heat transfer characteristics for MHD free convection in an enclosure with a heated obstacle. They found that buoyancy-induced vortex in the streamlines is increased and thermal layer near the heated surface becomes thick with increasing Rayleigh number. Natural convection in a square cavity localized heating from below was investigated by Santosh et al. [5]. They observed that heat transfer increases when the heater source is placed towards the cold wall. In the light of the above literatures, the present study addresses the effects of MHD free convection on heat flow within a square cavity. Free convection flow in the presence of magnetic field in a square cavity with semi circular heat source was

studied in this chapter. The lower wall of cavity was heated from below and upper wall of cavity was cold whereas side walls of the cavity were thermally insulated.

In the current study, Finite Element Method has been used to convert the non-linear coupled partial differential equations for flow and temperature field into a matrix form of equations, which can be solved iteratively with the help of a computer code. The Galerkin Finite Element Method of three nodded triangular elements is used to divide the physical domain into smaller segments, which is a pre-requisite for finite element method. Numerical results are presented in terms of stream functions, isotherms, temperature profiles and Nusselt numbers.

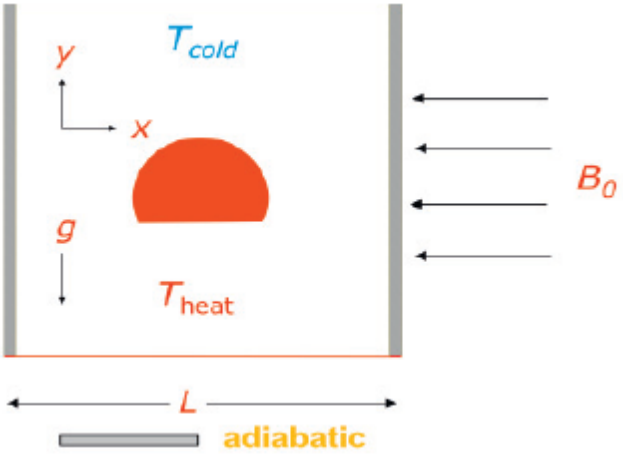


Fig.1: Schematic diagram of the physical system.

MATHEMATICAL FORMULATION:

A schematic diagram of the system considered in present study is shown in Fig. 1. The system consists of a square cavity with sides of length L and a semi-circular solid block is located at the centre of the enclosure. The left and right walls are considered to be adiabatic. The top wall is kept at a constant temperature Tc .The bottom wall and semi-circular obstacle are assumed to be uniform temperature be Th. Here Tc is less than Th. The uniform magnetic field B0 is also applied to the fluid in the direction parallel to y. Based on the model, two dimensional, laminar, incompressible steady equations are written by considering a uniform applied magnetic field. The gravitational force (g) acts in the vertically downward direction. We assumed that Boussinesq approximation is valid and radiation mode of the heat transfer and Joule heating are neglected. Thus, using the

coordinate system shown in Fig. 1, the governing equations can be written in dimensional form

$$\frac{\partial u}{\partial x}+\frac{\partial v}{\partial y}=0 \tag{1}$$

$$\rho\left(u\frac{\partial v}{\partial x}+v\frac{\partial v}{\partial y}\right)=-\frac{1}{\rho}\frac{\partial p}{\partial y}+\vartheta\left(\frac{\partial^2 v}{\partial x^2}+\frac{\partial^2 v}{\partial y^2}\right)+g\beta(T-T_c)-B_0^2 v \tag{2}$$

$$u\frac{\partial T}{\partial x}+v\frac{\partial T}{\partial y}=\alpha\left(\frac{\partial^2 T}{\partial x^2}+\frac{\partial^2 T}{\partial y^2}\right) \tag{3}$$

with boundary conditions

u (x , 0) = u(x, L) =u(0 , y) = u(L , y) = 0,

v (x , 0) = v(x, L) = v(0 , L) = v(L , y) = 0,

T (x, 0) = T_h,

$$\frac{\partial T}{\partial y}(x,L)=0,\quad T(0,y)=T_h-(T_h-T_c)\frac{y}{L},$$

The Continuity equation (3.1) can be satisfied automatically by introducing the stream function ‘ψ’ as

$$u=\frac{\partial \psi}{\partial y} \tag{4a}$$

$$v=-\frac{\partial \psi}{\partial x} \tag{4b}$$

where x and y are the distances measured along the horizontal and vertical directions respectively u and v are the velocity components in the x and y directions respectively T denotes the temperature ϑ and α are kinematic viscosity and thermal diffusivity respectively P is the pressure and ρ is the density T_h and T_c are the temperatures at hot bottom wall and cold vertical wall respectively L is the side of the square cavity.

Using the following non dimensional variables,

Width $X = \frac{x}{L}$

Height $Y = \frac{y}{L}$

Velocity components $\begin{cases} U = \frac{uL}{\alpha} \\ V = \frac{vL}{\alpha} \end{cases}$

Stream function $\overline{\psi} = \frac{\psi}{\alpha}$

Pressure $P = \frac{pL^2}{\rho\alpha^2}$

Prandtl Number $\mathrm{Pr} = \frac{\nu}{\alpha}$

Hartmann Number $Ha^2 = \frac{B_0^2 L^3}{\mu}$

Rayleigh number $Ra = \frac{g\beta(T_h - T_c)L^3 \mathrm{Pr}}{\nu^2}$

Temperature $\theta = \frac{T - T_c}{T_h - T_c}$

The governing equations (3.1)-(3.3) reduce to non-dimensional form as

$$\frac{\partial U}{\partial X} + \frac{\partial V}{\partial Y} = 0 \tag{5}$$

$$U\frac{\partial V}{\partial X} + V\frac{\partial V}{\partial Y} = -\frac{\partial P}{\partial Y} + \mathrm{Pr}\left(\frac{\partial^2 V}{\partial X^2} + \frac{\partial^2 V}{\partial Y^2}\right) + Ra\,\mathrm{Pr}\,\theta - Ha^2\,\mathrm{Pr}V \tag{6}$$

$$U\frac{\partial \theta}{\partial X} + V\frac{\partial \theta}{\partial Y} = \left(\frac{\partial^2 \theta}{\partial X^2} + \frac{\partial^2 \theta}{\partial Y^2}\right) \tag{7}$$

with the non dimensionless boundary conditions are

$$U(X, 0) = U(X, 1) = U(0, Y) = U(1, Y) = 0,$$

$$V(X, 0) = V(X, 1) = V(0, Y) = V(1, Y) = 0,$$

$$\theta(X, 0) = 1, \quad \frac{\partial \theta}{\partial Y}(X, 1) = 0,$$

where X and Y are dimensionless coordinates varying along horizontal and vertical directions respectively U and V are dimensionless velocity components in the X and Y directions respectively θ is the dimensionless temperature P is the dimensionless pressure Ra and Pr are Rayleigh Prandtl numbers respectively.

SOLUTION OF PROBLEM:

Thus far we have derived the partial differential equations, which describe the heat and fluid flow behavior in the vicinity of porous medium. The development of governing equations is one part but the second and important part is to solve these equations in order to predict the various parameters of interest in the porous medium. There are various numerical methods available to achieve the solution of these equations, but the most popular numerical methods are Finite difference method, Finite volume method and the Finite element method. The selection of these numerical methods is an important decision, which is influenced by variety of factors amongst which the geometry of domain plays a vital role. Other factors include the ease with which these partial differential equations can be transformed into simple forms, the computational time required and the

flexibility in development of computer code to solve these equations.In the present study, we have predominantly used Finite Element Method (FEM). The following sections enlighten the Finite element method and present its application to solve the above-mentioned equations.

The Finite Element Method is a deservingly popular method amongst scientific community. This method was originally developed to study the mechanical stresses in a complex airframe structure popularized by Zienkiewicz and Cheung (23) by applying it to continuum mechanics. Since then the application of Finite Element Method has been exploited to solve the numerous problems in various engineering disciplines. The great thing about finite element method is its ease with which it can be generalized to myriad engineering problems comprised of different materials.

Another admirable feature of the Finite Element Method (FEM) is that it can be applied wide range of geometries having irregular boundaries, which is highly difficult to achieve with other contemporary methods. FEM can be said to have comprised of roughly 5 steps to solve any particular problem. The steps can be summarized as

- **Descritizing the domain:** This step involves the division of whole physical domain into smaller segments known as elements, and then identifying the nodes, coordinates of each node and ensuring proper connectivity between the nodes.
- **Specifying the equation:** In this step, the governing equation is specified and an equation is written in terms of nodal values
- **Development of Global matrix:** The equations are arranged in a global matrix which takes into account the whole domain

- **Solution:** The equations are solved to get the desired variable at each table in the domain

The momentum and energy balance equations are solved using the Galerkin finite element method. Continuity equation will be used as a constraint due to mass conservation and this constraint may be used to obtain the pressure distribution. In order to solve equations, we use the finite element method where the pressure P is eliminated by a penalty parameter γ and the incompressibility criteria given by equation (3.5) which results in

$$P = -\gamma\left(\frac{\partial U}{\partial X}+\frac{\partial V}{\partial Y}\right) \tag{8}$$

The continuity equation (3.5) is automatically satisfied for large values of γ.

Using equation (3.8) and introducing stream function, the momentum equation (3.6) reduce to

$$\left[\frac{\partial\overline{\psi}}{\partial Y}\frac{\partial^2\overline{\psi}}{\partial X\partial Y}-\frac{\partial\overline{\psi}}{\partial X}\frac{\partial^2\overline{\psi}}{\partial Y^2}\right]=\gamma\left(\frac{\partial^2\overline{\psi}}{\partial Y^2}\frac{\partial\overline{\psi}}{\partial X}+\frac{\partial^2\overline{\psi}}{\partial Y^2}\right)+\Pr\left[\frac{\partial^2\overline{\psi}}{\partial X^2}+\frac{\partial^2\overline{\psi}}{\partial Y^2}\right]-Ra\Pr\theta+Ha^2\Pr\frac{\partial\overline{\psi}}{\partial Y} \tag{9}$$

Application of Galerkin method to equation (3.10) yields:

$$\{R^e\}=-\int_A N^T\begin{Bmatrix}\left[\frac{\partial\overline{\psi}}{\partial Y}\frac{\partial^2\overline{\psi}}{\partial X\partial Y}-\frac{\partial\overline{\psi}}{\partial X}\frac{\partial^2\overline{\psi}}{\partial Y^2}\right]-\gamma\left(\frac{\partial^2\overline{\psi}}{\partial Y^2}\frac{\partial\overline{\psi}}{\partial X}+\frac{\partial^2\overline{\psi}}{\partial Y^2}\right)\\-\Pr\left[\frac{\partial^2\overline{\psi}}{\partial X^2}+\frac{\partial^2\overline{\psi}}{\partial Y^2}\right]+Ra\Pr\theta-Ha^2\Pr\frac{\partial\overline{\psi}}{\partial Y}\end{Bmatrix}dXdY \tag{11}$$

where R^e is the residue.

Considering the terms individually

$$\int_A [N]^T \frac{\partial \overline{\psi}}{\partial Y}\frac{\partial^2 \overline{\psi}}{\partial X \partial Y} dA = \frac{1}{4A}\begin{Bmatrix} c_1\overline{\psi}_1 + c_2\overline{\psi}_2 + c_3\overline{\psi}_3 \\ c_1\overline{\psi}_1 + c_2\overline{\psi}_2 + c_3\overline{\psi}_3 \\ c_1\overline{\psi}_1 + c_2\overline{\psi}_2 + c_3\overline{\psi}_3 \end{Bmatrix} [b_1, b_2, b_3] \tag{12}$$

$$\int_A [N^T]\frac{\partial \overline{\psi}}{\partial X}\frac{\partial^2 \overline{\psi}}{\partial Y^2} dA = \frac{1}{12A}\begin{Bmatrix} b_1\overline{\psi}_1 + b_2\overline{\psi}_2 + b_3\overline{\psi}_3 \\ b_1\overline{\psi}_1 + b_2\overline{\psi}_2 + b_3\overline{\psi}_3 \\ b_1\overline{\psi}_1 + b_2\overline{\psi}_2 + b_3\overline{\psi}_3 \end{Bmatrix} [c_1, c_2, c_3] \tag{13}$$

$$\int_A [N^T]\gamma\frac{\partial^2 \overline{\psi}}{\partial Y^2}\frac{\partial \overline{\psi}}{\partial X} dA = \frac{\gamma}{12A}\begin{Bmatrix} b_1\overline{\psi}_1 + b_2\overline{\psi}_2 + b_3\overline{\psi}_3 \\ b_1\overline{\psi}_1 + b_2\overline{\psi}_2 + b_3\overline{\psi}_3 \\ b_1\overline{\psi}_1 + b_2\overline{\psi}_2 + b_3\overline{\psi}_3 \end{Bmatrix} [c_1, c_2, c_3] \tag{14}$$

$$\int_A [N^T]\gamma\frac{\partial^2 \overline{\psi}}{\partial Y^2} dA = -\frac{\gamma}{4A}\begin{bmatrix} b_1^2 & b_1b_2 & b_1b_3 \\ b_1b_2 & b_2^2 & b_2b_3 \\ b_1b_3 & b_2b_3 & b_3^2 \end{bmatrix}\begin{bmatrix} \theta_1 \\ \theta_2 \\ \theta_3 \end{bmatrix} \tag{15}$$

$$\int_A [N^T]\Pr\frac{\partial^2 \overline{\psi}}{\partial X^2} dA = -\frac{\Pr}{4A}\begin{bmatrix} c_1^2 & c_1c_2 & c_1c_3 \\ c_1c_2 & c_2^2 & c_2c_3 \\ c_1c_3 & c_2c_3 & c_3^2 \end{bmatrix}\begin{bmatrix} \theta_1 \\ \theta_2 \\ \theta_3 \end{bmatrix}$$

$$\int_A [N^T]\Pr\frac{\partial^2 \overline{\psi}}{\partial Y^2} dA = -\frac{\Pr}{4A}\begin{bmatrix} b_1^2 & b_1b_2 & b_1b_3 \\ b_1b_2 & b_2^2 & b_2b_3 \\ b_1b_3 & b_2b_3 & b_3^2 \end{bmatrix}\begin{bmatrix} \theta_1 \\ \theta_2 \\ \theta_3 \end{bmatrix} \tag{16}$$

$$\int_A [N]^T RaP\theta dA = \frac{RaP}{12A}\begin{bmatrix} \theta_1 \\ \theta_2 \\ \theta_3 \end{bmatrix} \tag{17}$$

$$\int_A [N^T]Ha^2\,\Pr\frac{\partial \overline{\psi}}{\partial Y} dA = \frac{Ha^2\,\Pr}{4A}\begin{bmatrix} b_1^2 & b_1b_2 & b_1b_3 \\ b_1b_2 & b_2^2 & b_2b_3 \\ b_1b_3 & b_2b_3 & b_3^2 \end{bmatrix}\begin{bmatrix} \theta_1 \\ \theta_2 \\ \theta_3 \end{bmatrix} \tag{17}$$

Thus the whole equation (3.10) can be written in matrix form as

$$\frac{1}{4A}\begin{Bmatrix} c_1\overline{\psi}_1+c_2\overline{\psi}_2+c_3\overline{\psi}_3 \\ c_1\overline{\psi}_1+c_2\overline{\psi}_2+c_3\overline{\psi}_3 \\ c_1\overline{\psi}_1+c_2\overline{\psi}_2+c_3\overline{\psi}_3 \end{Bmatrix}\begin{bmatrix} b_1,b_2,b_3 \end{bmatrix}-\frac{1}{12A}\begin{Bmatrix} b_1\overline{\psi}_1+b_2\overline{\psi}_2+b_3\overline{\psi}_3 \\ b_1\overline{\psi}_1+b_2\overline{\psi}_2+b_3\overline{\psi}_3 \\ b_1\overline{\psi}_1+b_2\overline{\psi}_2+b_3\overline{\psi}_3 \end{Bmatrix}\begin{bmatrix} c_1,c_2,c_3 \end{bmatrix}$$
$$+\frac{\gamma}{12A}\begin{Bmatrix} b_1\overline{\psi}_1+b_2\overline{\psi}_2+b_3\overline{\psi}_3 \\ b_1\overline{\psi}_1+b_2\overline{\psi}_2+b_3\overline{\psi}_3 \\ b_1\overline{\psi}_1+b_2\overline{\psi}_2+b_3\overline{\psi}_3 \end{Bmatrix}\begin{bmatrix} c_1,c_2,c_3 \end{bmatrix}+\frac{\gamma}{4A}\begin{bmatrix} b_1^2 & b_1b_2 & b_1b_3 \\ b_1b_2 & b_2^2 & b_2b_3 \\ b_1b_3 & b_2b_3 & b_3^2 \end{bmatrix}\begin{bmatrix} \theta_1 \\ \theta_2 \\ \theta_3 \end{bmatrix}$$
$$-\frac{\Pr}{4A}\begin{bmatrix} c_1^2 & c_1c_2 & c_1c_3 \\ c_1c_2 & c_2^2 & c_2c_3 \\ c_1c_3 & c_2c_3 & c_3^2 \end{bmatrix}\begin{bmatrix} \theta_1 \\ \theta_2 \\ \theta_3 \end{bmatrix}+-\frac{\Pr}{4A}\begin{bmatrix} b_1^2 & b_1b_2 & b_1b_3 \\ b_1b_2 & b_2^2 & b_2b_3 \\ b_1b_3 & b_2b_3 & b_3^2 \end{bmatrix}\begin{bmatrix} \theta_1 \\ \theta_2 \\ \theta_3 \end{bmatrix}$$
$$+\frac{RaP}{12A}\begin{bmatrix} \theta_1 \\ \theta_2 \\ \theta_3 \end{bmatrix}-\frac{Ha^2\Pr}{4A}\begin{bmatrix} b_1^2 & b_1b_2 & b_1b_3 \\ b_1b_2 & b_2^2 & b_2b_3 \\ b_1b_3 & b_2b_3 & b_3^2 \end{bmatrix}\begin{bmatrix} \theta_1 \\ \theta_2 \\ \theta_3 \end{bmatrix}=0 \qquad (3.18)$$

(18)

Introducing stream function, the energy equation (3.7) reduces as

$$\frac{\partial\overline{\psi}}{\partial Y}\frac{\partial\theta}{\partial X}+\frac{\partial\overline{\psi}}{\partial X}\frac{\partial\theta}{\partial Y}=\left(\frac{\partial^2\theta}{\partial X^2}+\frac{\partial^2\theta}{\partial Y^2}\right) \qquad (19)$$

FEM of Energy Equation is

$$\left\{R^e\right\}=-\int_A[N]^T\left(\frac{\partial\overline{\psi}}{\partial Y}\frac{\partial\theta}{\partial X}+\frac{\partial\overline{\psi}}{\partial X}\frac{\partial\theta}{\partial Y}-\frac{\partial^2\theta}{\partial X^2}-\frac{\partial^2\theta}{\partial Y^2}\right)dA \qquad (20)$$

Considering the terms individually

$$\int_A[N]^T\frac{\partial\overline{\psi}}{\partial Y}\frac{\partial\overline{\theta}}{\partial X}dA=\frac{1}{12A}\begin{Bmatrix} c_1\overline{\psi}_1+c_2\overline{\psi}_2+c_3\overline{\psi}_3 \\ c_1\overline{\psi}_1+c_2\overline{\psi}_2+c_3\overline{\psi}_3 \\ c_1\overline{\psi}_1+c_2\overline{\psi}_2+c_3\overline{\psi}_3 \end{Bmatrix}\begin{bmatrix} b_1,b_2,b_3 \end{bmatrix}\begin{bmatrix} \theta_1 \\ \theta_2 \\ \theta_3 \end{bmatrix} \qquad (21)$$

$$\int_A[N^T]\frac{\partial\overline{\psi}}{\partial X}\frac{\partial\theta}{\partial Y}dA=\frac{1}{12A}\begin{Bmatrix} b_1\overline{\psi}_1+b_2\overline{\psi}_2+b_3\overline{\psi}_3 \\ b_1\overline{\psi}_1+b_2\overline{\psi}_2+b_3\overline{\psi}_3 \\ b_1\overline{\psi}_1+b_2\overline{\psi}_2+b_3\overline{\psi}_3 \end{Bmatrix}\begin{bmatrix} c_1,c_2,c_3 \end{bmatrix}\begin{bmatrix} \theta_1 \\ \theta_2 \\ \theta_3 \end{bmatrix} \qquad (22)$$

$$\int_A [N^T]\frac{\partial^2\theta}{\partial X^2}dA = -\frac{1}{4A}\begin{bmatrix} b_1^2 & b_1b_2 & b_1b_3 \\ b_1b_2 & b_2^2 & b_2b_3 \\ b_1b_3 & b_2b_3 & b_3^2 \end{bmatrix} \begin{bmatrix} \theta_1 \\ \theta_2 \\ \theta_3 \end{bmatrix} \quad (23)$$

$$\int_A [N^T]\frac{\partial^2\theta}{\partial Y^2}dA = -\frac{1}{4A}\begin{bmatrix} c_1^2 & c_1c_2 & c_1c_3 \\ c_1c_2 & c_2^2 & c_2c_3 \\ c_1c_3 & c_2c_3 & c_3^2 \end{bmatrix} \begin{bmatrix} \theta_1 \\ \theta_2 \\ \theta_3 \end{bmatrix} \quad (24)$$

Thus the whole equation (3.19) can be written in matrix form as

$$\frac{1}{12A}\begin{Bmatrix} c_1\overline{\psi}_1 + c_2\overline{\psi}_2 + c_3\overline{\psi}_3 \\ c_1\overline{\psi}_1 + c_2\overline{\psi}_2 + c_3\overline{\psi}_3 \\ c_1\overline{\psi}_1 + c_2\overline{\psi}_2 + c_3\overline{\psi}_3 \end{Bmatrix} [b_1, b_2, b_3] \begin{bmatrix} \theta_1 \\ \theta_2 \\ \theta_3 \end{bmatrix} - \frac{1}{12A}\begin{Bmatrix} b_1\overline{\psi}_1 + b_2\overline{\psi}_2 + b_3\overline{\psi}_3 \\ b_1\overline{\psi}_1 + b_2\overline{\psi}_2 + b_3\overline{\psi}_3 \\ b_1\overline{\psi}_1 + b_2\overline{\psi}_2 + b_3\overline{\psi}_3 \end{Bmatrix} [c_1, c_2, c_3] \begin{bmatrix} \theta_1 \\ \theta_2 \\ \theta_3 \end{bmatrix}$$
$$-\frac{1}{4A}\begin{bmatrix} b_1^2 & b_1b_2 & b_1b_3 \\ b_1b_2 & b_2^2 & b_2b_3 \\ b_1b_3 & b_2b_3 & b_3^2 \end{bmatrix} \begin{bmatrix} \theta_1 \\ \theta_2 \\ \theta_3 \end{bmatrix} + \frac{1}{4A}\begin{bmatrix} c_1^2 & c_1c_2 & c_1c_3 \\ c_1c_2 & c_2^2 & c_2c_3 \\ c_1c_3 & c_2c_3 & c_3^2 \end{bmatrix} \begin{bmatrix} \theta_1 \\ \theta_2 \\ \theta_3 \end{bmatrix} = 0 \quad (25)$$

NUSSLET NUMBER:

The average dimensionless Nusselt Number ($\overline{Nu}$) can be evaluated using the formula

$$\overline{Nu} = -\frac{\partial\theta}{\partial n} \quad (26)$$

where n denotes the normal direction on a plane.

RESULTS AND DISCUSSION:

A numerical analysis has been performed in this work to investigate the effects of magnetic field in a square cavity with a semi circular heated obstacle of different orientation parameter (rot). The ranges rot and Ha for this investigation vary from 0^0 to 90^0 and 0 to 100 respectively whereas other parameters are fixed at Ra = 10^4 and Pr = 0.71. In this section the influence of the Hartmann number (Ha = 0, 50,100) on the flow and temperature fields for Ra=10^4 and three values of the

orientation parameter (rot=0^0, 60^0,90^0) are presented. Fig.4 illustrates the streamlines and isotherms for rot=0^0, where the buoyancy effects dominate the flow field in the cavity and the heat transfer is mainly due to natural convection. The results show that the buoyancy induced vortices in the cavity in the absence of the magnetic field (Ha = 0). Four vortices are evident inside of the cavity for Ha = 0. When the Hartmann number increases, both of them are vanished due to the effect of the magnetic field. The isotherms distribution is also affected by the effect of the magnetic field. Less bend of the isotherms lines is observed as the Hartmann number increases. Fig. 5 shows the streamlines and isotherms for rot=60^0. In the absence of the magnetic field, one vortex is appearing clearly right side of the heated body due to buoyancy force. As the Hartmann number increases size of the vortex larger and move to the top side and another vortex created on the left top corner. Bending of the isotherms lines are a lesser amount of with increasing Hartmann number. Fig. 6 shows the streamlines and isotherms for rot=90^0. In the absence of the magnetic field, elliptic size only one vortex is generated right side of the heated body due to buoyancy force. As the Hartmann number increases shape of the vortex seems to be almost circular and move to the top side and another vortex created on the left top corner. Effect of the magnetic field is also significant for isotherms lines. The average Nusselt number is plotted as a function of Hartmann number and Rayleigh number respectively as shown in Fig. 7 and Fig. 8 for five different orientation (rot = 0^0, 15^0, 30^0, 45^0, 90^0) while Pr=0.71.The maximum heat transfer rate is obtained for the lowest Ha. This is because the magnetic field retards the flow.

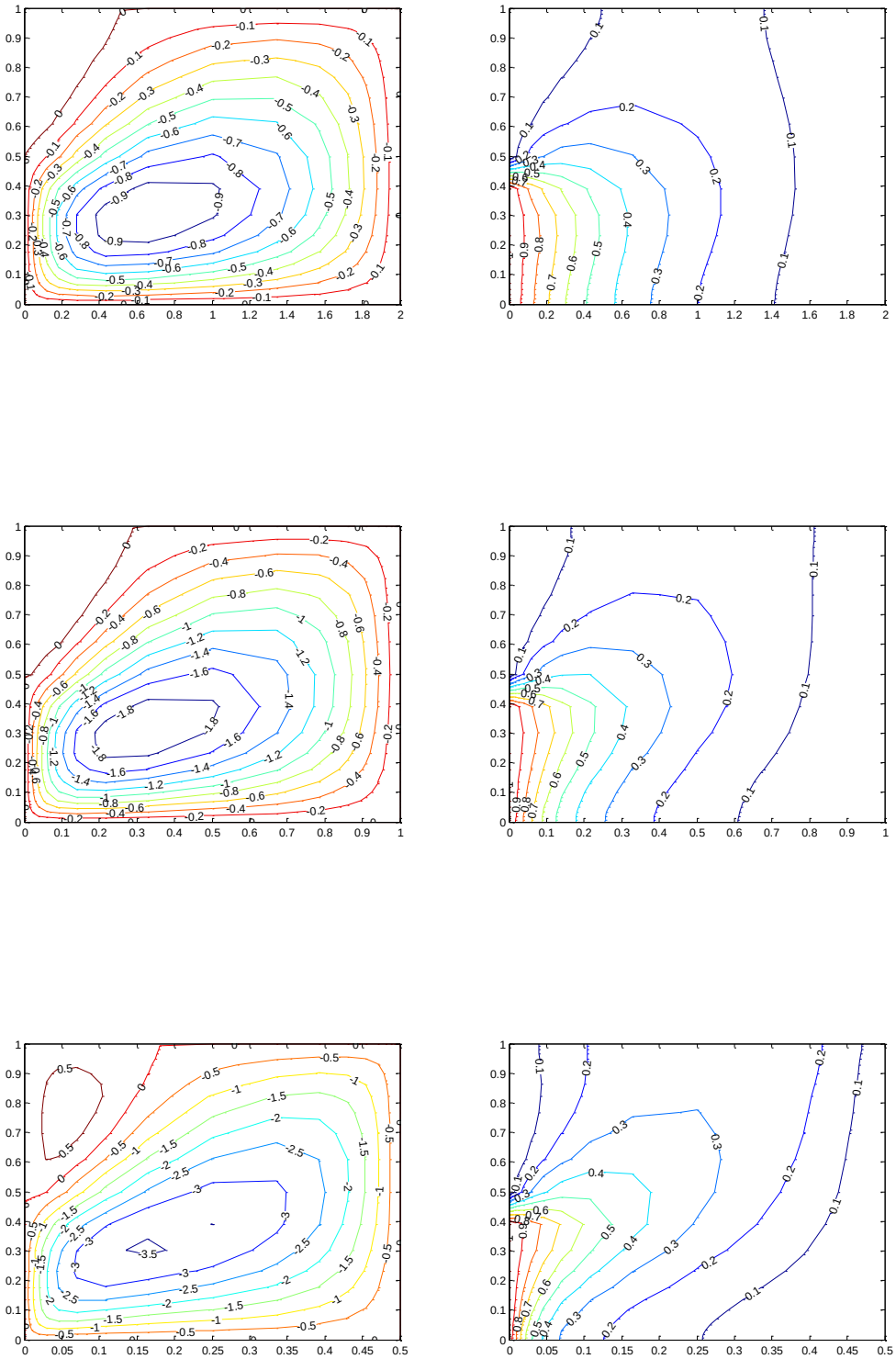


Fig. 4: Clockwise and anti-clockwise flows are shown via negative and positive signs of stream functions (Left) and Isotherms (Right) for rotation 0^0 with Pr=0.71 and Ra=10000.

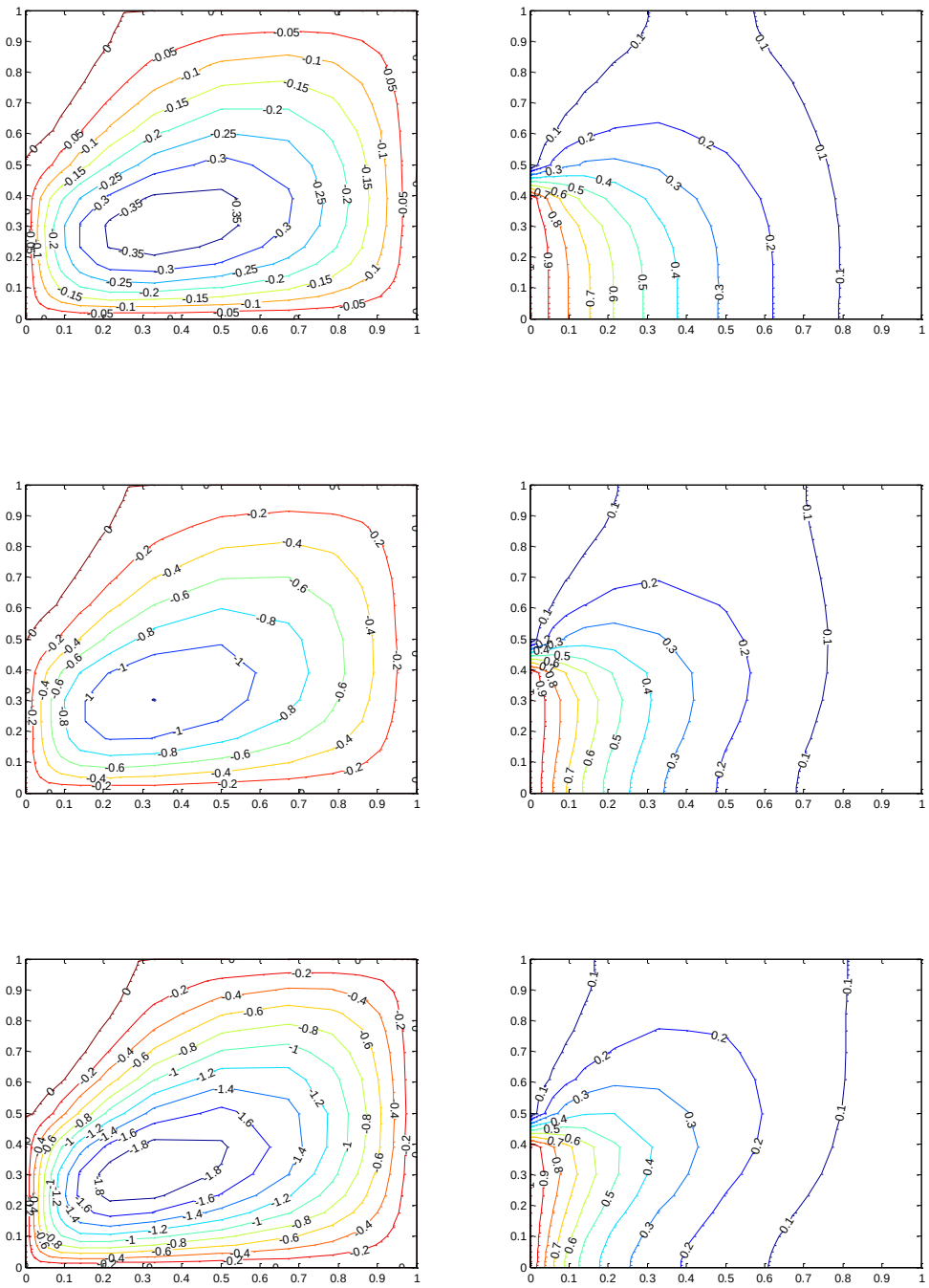


Fig.5: Clockwise and anti-clockwise flows are shown via negative and positive signs of stream functions (Left) and Isotherms (Right) for rotation 60^0 with Pr=0.71 and Ra=10000.

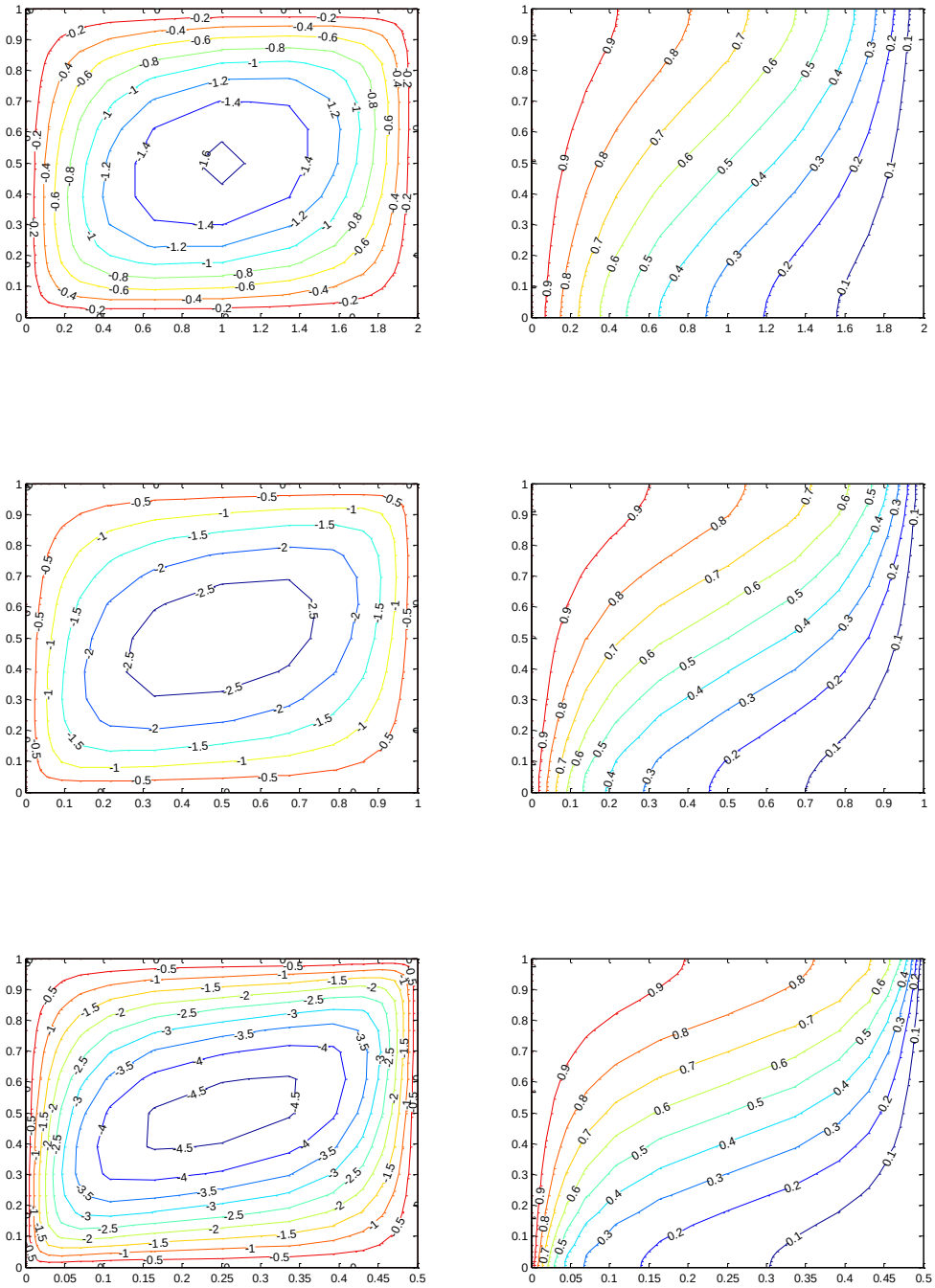


Fig.6:Clockwise and anti-clockwise flows are shown via negative and positive signs of stream functions (Left) and Isotherms (Right) for rotation 90^0 with Pr=0.71 and Ra=10000.

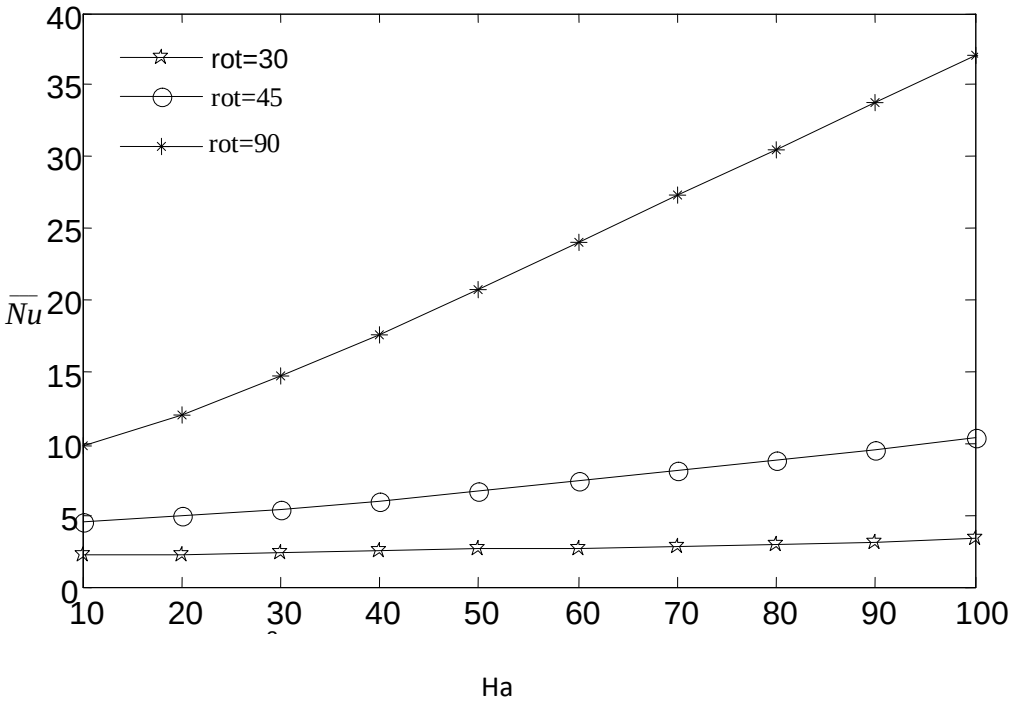


Fig. 7: Effect of Ha and rot on $\overline{Nu}$ while Pr=0.71 and Ra= 10^4

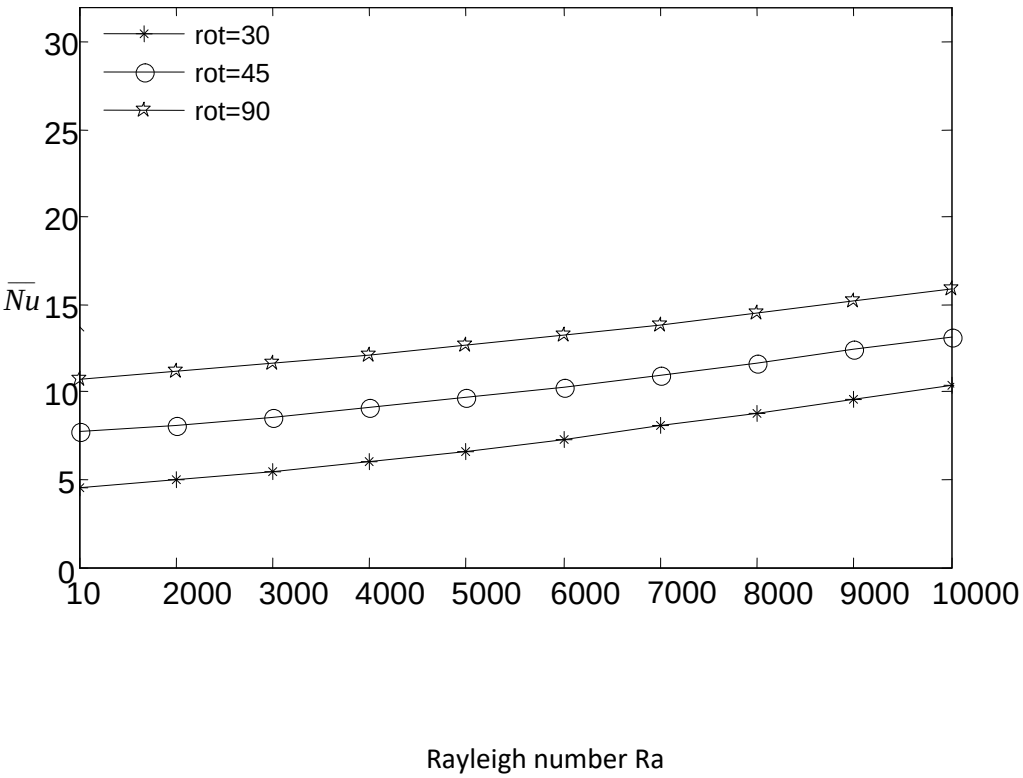


Fig.8: Effect of Ra and rot on $\overline{Nu}$ while Pr=0.71 and Ha= 0

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MULTIPLE VARIABLES EFFECT ON MHD TRANSIENT FLOW PAST A PLATE

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Abstract

This paper analyze the Magneto hydrodynamic, Radiation, chemical reaction, heat source and soret effects on unsteady flow, heat and mass transfer characteristics in a viscous, in compressible and electrically conduction fluid over a semi-infinite vertical porous plate through porous media. The porous plate is subjected to a transverse variable suction velocity. The transient, non-linear and coupled governing equations have been solved adopting a perturbative series expansion about a small parameter, ε. The effects of governing parameters on the flow variables are discussed graphically.

Keywords: Transient velocity, MHD, Thermal diffusion, Chemical reaction, Radiation, Rarefaction Parameter and Heat source parameter.

1. INTRODUCTION

The study of magneto hydrodynamics (MHD) plays an important role in agriculture, engineering and petroleum industries. MHD has won practical applications, for instance, it may be used to deal with problems such as cooling of nuclear reactors by liquid sodium and induction flow water which depends on the potential difference in the fluid direction perpendicular to the motion and goes to the magnetic field and also study of MHD of viscous conducting fluids is playing a significant role, owing to its practical interest and abundant applications, in astro-physical and geo-physical phenomenon. Astro-Physicists and geo-physicists realized the importance of MHD in stellar and planetary processes. The main impetus to the engineering approach to the electromagnetic fluid interaction studies has come from the concept of the magneto hydro dynamics, direct conversion generator, ion propulsion study of flow problems of electrically conducting fluid, particularly of ionized gases is currently receiving considerable interest. Such studies have made for years in convection with astro-physical and geo-physical problems such as Sun spot theory, motion of the interstellar gas etc. Recently, some engineering problems need the studies of the flow of an electrically conducting fluid, in ionized gas is called plasma. Many names have been used in referring to the study of plasma phenomena.

The MHD generation process is based on Faraday's electro-magnetic induction law. So Magneto-hydrodynamic generator generates thermal energy or kinetic energy of a moving conducting fluid into directly electrical energy. Examples of such kind of fluids are ionized gas, plasma, liquid metals, and seawater. It's a plasma technology. The gas is continuously seeded with potassium nitrate, making the gas electrically conductive at lower temperatures. The alkali metal ionizes easily at lower temperatures. MHD generators are different from conventional electric generators in that they can operate at high temperatures without moving parts.

Unsteady MHD convective flow of rivlin-ericksen fluid over an infinite vertical porous plate with absorption effect and variable suction was studied by Veera sankar et al. [1]. Anuradha Punithavalli [2] studied the MHD boundary layer flow of a steady micro polar fluid along a stretching sheet with binary chemical reaction . Rama Krishna Reddy et al. [3] have examined the MHD free convective flow past a porous plate. Karuna Dwivedi et al. [4] have investigated the MHD flow through a horizontal channel containing porous medium placed under an inclined magnetic field. Chandra Reddy et al.[5] studied the MHD natural convective heat generation/absorbing and radiating fluid past a vertical plate embedded in porous medium – an exact solution .

Chemical reaction engineering (reaction engineering or reactor engineering) is a specialty in chemical engineering or industrial chemistry dealing with chemical reactors. Frequently the term relates specifically to catalytic reaction systems where either a homogeneous or heterogeneous catalyst is present in the reactor. Sometimes a reactor per se is not present by itself, but rather is integrated into a process, for example in reactive separations vessels, retorts, certain fuel cells, and photocatalytic surfaces. The issue of solvent effects on reaction kinetics is also considered as an integral part. Reactor Design uses information, knowledge and experience from a variety of areas - thermodynamics, chemical kinetcs, fluid mechanics, heat and mass transfer and economics. Chemical Reaction Engineering is the synthesis of all these factors with the aim of properly designing a Chemical Reactor.

Raj Nandkeolyar et al. [6] studied the effect of chemical reaction and heat absorption on mhd nanoliquid flow past a stretching sheet in the presence of a transverse magnetic field. Mohapatra et al. [7] investigated the effect of chemical reaction on mhd micropolar fluid flow on a vertical surface through porous media with heat source. Recently researchers [8-10] shown interest in this area.

A heat sink transfers thermal energy from a higher temperature device to a lower temperature fluid medium. The fluid medium is frequently air, but can also be water, refrigerants or oil. If the fluid medium is water, the heat sink is frequently called a cold plate. In thermodynamics a heat sink is a heat reservoir that can absorb an arbitrary amount of heat without significantly changing temperature. Practical heat sinks for electronic devices must have a temperature higher than the surroundings to transfer heat by convection, radiation, and conduction. The power supplies of electronics are not 100% efficient, so extra heat is produced that may be detrimental to the function of the device.

Thommaandru Ranga Rao [11] investigates the heat source/sink effects of heat and mass transfer of magnetonanofluids over a nonlinear stretching sheet. Kuppala Sekhar [12] studied the effects of heat source/sink on mhd flow of casson fluid and heat transfer over an unsteady stretching sheet. DileepKumar [13] was studied the effects of heat source/sink and induced magnetic field on natural convective flow in vertical concentric annuli. Rathod and Sanjeev kumar [14] , Sravanthi and Gorla [15] are investigated in this area.

Thermal diffusion (or Soret effect), i.e., the appearance of a component flux as a consequence of a thermal gradient, is not completely dominated yet, at least for complex mixtures containing a high number of components with different sizes and polarities, like petroleum systems. Although gravity tends to segregate the heavies to the bottom of the reservoir and the lights to its top, thermal diffusion can both attenuate or enhance this effect, depending on the affinity of each component for the hot (bottom) or cold (top) side. Thermal

conductivity, thermal diffusivity and the specific heat are all properties of interest to scientists studying geopolymers. These characteristics can be determined by analysing data from hot plate or transient line experiments.

Chandra Sekhar Reddy et al. [16] investigated the thermal diffusion and radiation effect on unsteady magnetohydrodynamic free-convection flow past an impulsively moving plate with ramped wall temperature and ramped wall concentration. soret effect due to mixed convection on unsteady magnetohydrodynamic flow past a semi infinite vertical permeable moving plate in presence of thermal radiation, heat absorption and homogenous chemical reaction was studied by Raju et al. [17]. Recently researchers Chandra reddy et al. [18], Rama mohan reddy et al. [19], Venkateswara raju et al. [20], Sandeep et al. [21], Veeresh et al. [22] and Mohmmad Ibrahim et al. [23] are investigated in this area.

2. MATHEMATICAL FORMULATION

Consider the unsteady two dimensional MHD free convective flow of a viscous incompressible, electrically conducting and radiating fluid in an optically thin environment past an infinite heated vertical porous plate embedded in a porous medium in presence of thermal and concentration buoyancy effects . Let the x-axis be taken in vertically upward direction along the plate and y-axis is normal to the plate. It is assumed that there exist a homogeneous chemical reaction of first order with constant rate Kr between the diffusing species and the fluid .A uniform magnetic field is applied in the direction perpendicular to the plate. The viscous dissipation and the Joule heating effects are assumed to be negligible in the energy equation. The transverse applied magnetic field and magnetic Reynolds number are assumed to be very small, so that the induced magnetic field is negligible. Also it is assumed that there is no applied voltage, so that the electric field is absent. The concentration of the diffusing species in the binary mixture is assumed to be very small in comparison with the other chemical species, which are present, and hence the Soret and Dufour effects are negligible and the temperature in the fluid flowing is governed by the energy concentration equation involving radiative heat temperature. Under the above assumptions as well as Boussinesq's approximation, the equations of conservation of mass, momentum, energy and concentration governing the free convection boundary layer flow over a vertical porous plate in porous medium can be expressed as:

$$\frac{\partial v^*}{\partial y^*} = 0 \tag{1}$$

$$\frac{\partial u^*}{\partial t^*} + V^*\frac{\partial u^*}{\partial y^*} = \vartheta\frac{\partial^2 u^*}{\partial y^{*2}} + g\beta_T(T^* - T_\infty^*) + gB_C(C^* - C_\infty^*) - \frac{\sigma B_0^2}{\rho}u^* - \frac{\vartheta u^*}{K_p} \tag{2}$$

$$\frac{\partial T^*}{\partial t^*} + V^*\frac{\partial T^*}{\partial y^*} = \frac{K}{\rho C_p}\frac{\partial^2 T^*}{\partial y^{*2}} - \frac{1}{\rho C_p}\frac{\partial q_r^*}{\partial y^*} - \frac{Q_1}{\rho C_p}(T^* - T_\infty^*) \tag{3}$$

$$\frac{\partial C^*}{\partial t^*} + V^*\frac{\partial C^*}{\partial y^*} = D\frac{\partial^2 C^*}{\partial y^{*2}} - K_C(C^* - C_\infty^*) + D_1\frac{\partial^2 T^*}{\partial y^{*2}} \tag{4}$$

The relevant boundary conditions are given as follows

$$u^* = L^*(\frac{\partial u^*}{\partial y^*}),\quad T^* = T_w^* + (T_w^* - T_\infty^*)e^{i\omega^* t^*},\ C^* = C_w^* + (C_w^* - C_\infty^*)e^{i\omega^* t^*} \quad \text{at } y^* = 0 \tag{5}$$

$$u^* \to 0, \qquad T^* \to T_\infty^*, \qquad C^* \to C_\infty^* \qquad \text{as} \quad y^* \to \infty \tag{6}$$

Where T_w^* and T_∞^* is the temperature at the wall and infinity, C_w^* and C_∞^* is the species concentration at the wall and at infinity respectively. By using Rosseland approximation the radiative heat flux q_r^* is given by $q^*_r = \frac{-4}{3}\frac{\sigma_s}{k_e}\frac{\partial T_w^{*4}}{\partial y^*}$ where σ_s is the stefen Boltzmann constant and K_e is the main absorption coefficient.

By expanding T_w^{*4} in to the Taylor series T_∞^* which after neglecting higher order terms takes the form $T_w^{*4} = 4T^{*3}_\infty T_w^* - 3T^{*4}_\infty$.

From the equation of continuity (1), it is clear that the suction velocity at the plate is either a constant or a function of time only. Hence, the suction velocity normal to the plate is assumed to be in the form

$$V^* = -V_0(1+e^{i\omega t}) \tag{7}$$

On introducing the following non-dimensional quantities,

$$u = \frac{u^*}{v_0}, y = \frac{v_0 y^*}{\vartheta}, \theta = \frac{T^* - T_\infty^*}{T_w^* - T_\infty^*}, \phi = \frac{C^* - C_\infty^*}{C_w^* - C_\infty^*}, \Pr = \frac{\mu C_p}{K}, Sc = \frac{\vartheta}{D}, M = \frac{\sigma B_0^2 \vartheta}{\rho v_0^2},$$

$$Gr = \frac{\vartheta g \beta_T (T_w^* - T_\infty^*)}{v_0^3}, Gc = \frac{\vartheta g \beta_c^* (C_w^* - C_\infty^*)}{v_0^3}, \quad K = \frac{v_0^2 K_P}{\vartheta^2}, t = \frac{t^* v_0^2}{4\vartheta}, h = \frac{v_0 L^*}{\vartheta},$$

$$Kr = \frac{\vartheta K_C}{v_0^2}, F = \frac{4 I_1 \vartheta^2}{K v_0^2}, Q = \frac{Q_1 v^2}{K v_0^2}, S_0 = \frac{D_1 (T_w^* - T_\infty^*)}{\vartheta (C_w^* - C_\infty^*)}, R = \frac{K K_e}{4\sigma_s T_\infty^{*3}} \tag{8}$$

The governing equations (2) to (4) can be rewritten in the non-dimensional form as follows

$$\frac{1}{4}\frac{\partial u}{\partial t} - (1 + \varepsilon A e^{i\omega t})\frac{\partial u}{\partial y} = \frac{\partial^2 u}{\partial y^2} + Gr\theta + Gc\phi - M_1 u \tag{9}$$

$$\frac{\Pr}{4}\frac{\partial \theta}{\partial t} - \Pr(1 + \varepsilon A e^{i\omega t})\frac{\partial \theta}{\partial y} = \alpha \frac{\partial^2 \theta}{\partial y^2} - Q\theta \tag{10}$$

$$\frac{Sc}{4}\frac{\partial \phi}{\partial t} - Sc(1 + \varepsilon A e^{i\omega t})\frac{\partial \phi}{\partial y} = \frac{\partial^2 \phi}{\partial y^2} - ScKr\phi + So\frac{\partial^2 \theta}{\partial y^2} \tag{11}$$

The corresponding boundary conditions are given by

$$u = h(\frac{\partial u}{\partial y}),\ \theta = 1 + \varepsilon e^{i\omega t}, \phi = 1 + \varepsilon e^{i\omega t}, \quad at \quad y = 0$$

$$u \to 0, \quad \theta \to 0, \quad \phi \to 0 \quad as \quad y \to \infty \tag{12}$$

3. SOLUTION OF THE PROBLEM

The equations (9) to (11) are coupled, non-linear partial differential equations and these cannot be solved in closed form. However, these equations can be reduced to a set of ordinary differential equations, which can be solved analytically. So this can be done, when the amplitude of oscillations (ε <<1) is very small, we can assume the solutions of flow velocity u, temperature field θ and concentration ϕ in the neighborhood of the plate as:

$$u(y,t) = u_0(y) + \varepsilon e^{i\omega t} u_1(y)$$
$$\theta(y,t) = \theta_0(y) + \varepsilon e^{i\omega t} \theta_1(y) \quad (13)$$
$$\phi(y,t) = \phi_0(y) + \varepsilon e^{i\omega t} \phi_1(y)$$

Substituting equations (13) into equation (9)–(11) and equating the coefficients at the terms with the same powers of ε, and neglecting the terms of higher order, the following equations are obtained.

Zero order terms:

$$u_0'' + u_0' - \mathrm{M}_1 u_0 = -\mathrm{Gr}\,\theta_0 - \mathrm{Gc}\,\phi_0 \quad (14)$$
$$\alpha\theta_0'' + \mathrm{Pr}\,\theta_0' - \mathrm{Q}\,\theta_0 = 0 \quad (15)$$
$$\phi_0'' + Sc\,\phi_0' - \mathrm{ScK}r\,\phi_0 = -\mathrm{S}_0\,\mathrm{Sc}\,\theta_0'' \quad (16)$$

First order terms :

$$u_1'' + u_1' - (\mathrm{M}_1 + \frac{i\omega}{4})u_1 = -\mathrm{Gr}\,\theta_1 - \mathrm{Gc}\,\phi_1 - \mathrm{A}u_0' \quad (17)$$

$$\alpha\theta_1'' + \mathrm{Pr}\,\theta_1' - (\frac{\mathrm{Pr}(\mathrm{i}\,\omega)}{4} + \mathrm{Q})\,\theta_1 = -\mathrm{PrA}\,\theta_0' \quad (18)$$

$$\phi_1'' + Sc\,\phi_1' + Sc(Kr + \frac{i\omega}{4})\phi_1 = -S_0 Sc\,\theta_1'' - \mathrm{ScA}\,\phi_0' \quad (19)$$

The corresponding boundary conditions are

$$u_0 = h(\frac{\partial u_0}{\partial y}), u_1 = h(\frac{\partial u_1}{\partial y}),\ \theta_0 = 1, \theta_1 = 1, \phi_0 = 1, \phi_1 = 1 \quad at \quad y = 0$$
$$u_0 \to 0, u_1 \to 0, \theta_0 \to 0, \theta_1 \to 0, \phi_0 \to 0, \phi_1 \to 0 \quad as \quad y \to \infty \quad (20)$$

Solving equations (14) – (19) under the boundary conditions (20), the following solutions are obtained

$$\theta_0 = \exp(-m_1 y) \quad (21)$$
$$\theta_1 = b_1 \exp(-m_1 y) + b_2 \exp(-m_2 y) \quad (22)$$
$$\phi_0 = b_3 \exp(-m_1 y) + b_4 \exp(-m_3 y) \quad (23)$$
$$\phi_1 = b_5 \exp(-m_1 y) + b_6 \exp(-m_2 y) + b_7 \exp(-m_3 y) + b_8 \exp(-m_4 y) \quad (24)$$

$$u_0 = b_9 \exp(-m_1 y) + b_{10} \exp(-m_3 y) + b_{11} \exp(-m_5 y) \quad (25)$$

$$u_1 = b_{12} \exp(-m_1 y) + b_{13} \exp(-m_2 y) + b_{14} \exp(-m_3 y) + b_{15} \exp(-m_4 y) + b_{16} \exp(-m_5 y) + b_{17} \exp(-m_6 y) \quad (26)$$

Substituting equations(21)–(26) in equation (13) we obtain the velocity temperature and concentration field

$$u = b_9 \exp(-m_1 y) + b_{10} \exp(-m_3 y) + b_{11} \exp(-m_5 y) + \varepsilon(b_{12} \exp(-m_1 y) + b_{13} \exp(-m_2 y) + b_{14} \exp(-m_3 y) + b_{15} \exp(-m_4 y) + b_{16} \exp(-m_5 y) + b_{17} \exp(-m_6 y))e^{i\omega t} \quad (27)$$

$$\theta = \exp(-m_1 y) + \varepsilon(b_1 \exp(-m_1 y) + b_2 \exp(-m_2 y))e^{i\omega t} \quad (28)$$

$$\phi = b_3 \exp(-m_1 y) + b_4 \exp(-m_3 y) + \varepsilon(b_5 \exp(-m_1 y) + b_6 \exp(-m_2 y) + b_7 \exp(-m_3 y) + b_8 \exp(-m_4 y))e^{i\omega t} \quad (29)$$

Skin Friction:

The non-dimensional skin friction at the surface is given by

$$\tau = -\left(\frac{\partial u}{\partial y}\right)_{y=0}$$

$$\tau = (m_1 b_9 + m_3 b_{10} + m_5 b_{11}) + \varepsilon(m_1 b_{12} + m_2 b_{13} + m_3 b_{14} + m_4 b_{15} + m_5 b_{16} + m_6 b_{17})e^{i\omega t} \quad (30)$$

Nusselt Number :

The rate of heat transfer in terms of the Nusselt number is given by

$$Nu = -\left(\frac{\partial \theta}{\partial y}\right)_{y=0}$$

$$Nu = m_1 + \varepsilon(m_1 b_1 + m_2 b_2)e^{i\omega t} \quad (31)$$

Sherwood Number :

The rate of mass transfer on the wall in terms of Sherwood number is given by

$$Sh = -\left(\frac{\partial \phi}{\partial y}\right)_{y=0}$$

$$Sh = (m_1 b_3 + m_3 b_4) + \varepsilon(m_1 b_5 + m_2 b_6 + m_3 b_7 + m_4 b_8)e^{i\omega t} \quad (32)$$

4. RESULTS AND DISCUSSION

In order to get a physical insight into the problem numerical calculations are carried out for the Velocity, Temperature and concentration profiles and the following discussion is set out. Throughout the computations we employ, S_0 =1,Sc=0.22,Pr=0.71,Gr=5,Gc=5,K=0.1, Kr =0.5, M=1, Q=0.5,ε=0.01,ω=20,A=0.5,h=0.2,R=2,ωt=π/6,t=1.

Figures (1) and (2) shows the effect of Grashof number on velocity for Pr = 0.71 and Pr =7.Here Chemical reaction parameter (Kr=0.5), Magnetic field parameter (M=1),Radiation parameter (R=2),Suction parameter (A=0.5),Refraction parameter(h=0.2),Porosity parameter(K =0.1),Frequency parameter (ω =20),Mass Grash of number (Gc=5), Heat source parameter (Q=0.5) and Soret parameter (So=1) on the velocity profiles . We observe that the velocity gradient at the surface increase with the increase of Grashof number.

Figures (3) and (4) represents the effect of porosity parameter on transient velocity for Pr =0.71 and Pr =7 .Here Chemical reaction parameter (Kr=0.5), Magnetic field parameter (M=1), Radiation parameter (R=2), Suction parameter (A=0.5), Refraction parameter(h= 0.2), Frequency parameter(ω=20),Mass Grashof number (Gc=5),Thermal Grashof number (Gr=5) ,Heat source parameter (Q=0.5) and Soret parameter (So=1)on the velocity profiles . We observe that the velocity gradient at the surface increase with the increase of porosity Parameter.

Figures (5) and (6) represents the effect of Chemical reaction parameter on transient velocity for Pr = 0.71 and Pr =7. Thermal Grashof number(Gr=5), Magnetic field parameter (M=1),Radiationparameter(R=2),Suctionparameter(A=0.5),Refraction parameter(h=0.2),Porosity parameter(K =0.1),Frequency parameter (ω =20),Mass Grash of number (Gc=5), Heat source parameter (Q=0.5) and Soret parameter (So=1) on the velocity profiles . We observe that the velocity high at the surface with the decrease of Chemical reaction parameter.

Figures (7) and (8) shows the effect of Magnetic field parameter on transient velocity for Pr = 0.71 and Pr =7. Here Chemical reaction parameter (Kr=0.5), Porosity parameter(K =0.1), Radiation parameter (R=2), Suction parameter (A=0.5), Refraction parameter(h= 0.2), Frequency parameter(ω=20),Mass Grashof number (Gc=5),Thermal Grashof number (Gr=5) ,Heat source parameter (Q=0.5) and Soret parameter (So=1)on the velocity profiles . We observe that the velocity gradient at the surface increases with the decrease of Magnetic parameter.

Figures (9) and (10) shows the effect of rarefaction parameter on transient velocity for Pr = 0.71 and Pr =7. Here Chemical reaction parameter (Kr=0.5), Porosity parameter(K =0.1), Magnetic field parameter (M=1), Radiation parameter (R=2), Suction parameter (A=0.5), Frequency parameter(ω=20),Mass Grashof number (Gc=5),Thermal Grashof number (Gr=5) ,Heat source parameter (Q=0.5) and Soret parameter (So=1)on the velocity profiles. We observe that the velocity gradient at the surface increase with the increase of rarefaction parameter.

Figures (11) and (12) shows the effect of modified Grashof number on velocity for Pr = 0.71 and Pr =7.Here Chemical reaction parameter (Kr=0.5), Magnetic field parameter (M=1),Radiationparameter(R=2),Suctionparameter(A=0.5),Refraction parameter(h=0.2),Porosity parameter(K =0.1),Frequency parameter (ω =20),Grash of number (Gr=5), Heat source parameter (Q=0.5) and Soret parameter (So=1) on the velocity profiles . We observe that the velocity gradient at the surface increase with the increase of modified Grashof number.

Figures (13) and (14) shows the effect of Radiation parameter on transient velocity for Pr = 0.71 and Pr =7. We observe that the velocity gradient at the surface increase with the decrease of radiation parameter but it is reversed in case of water

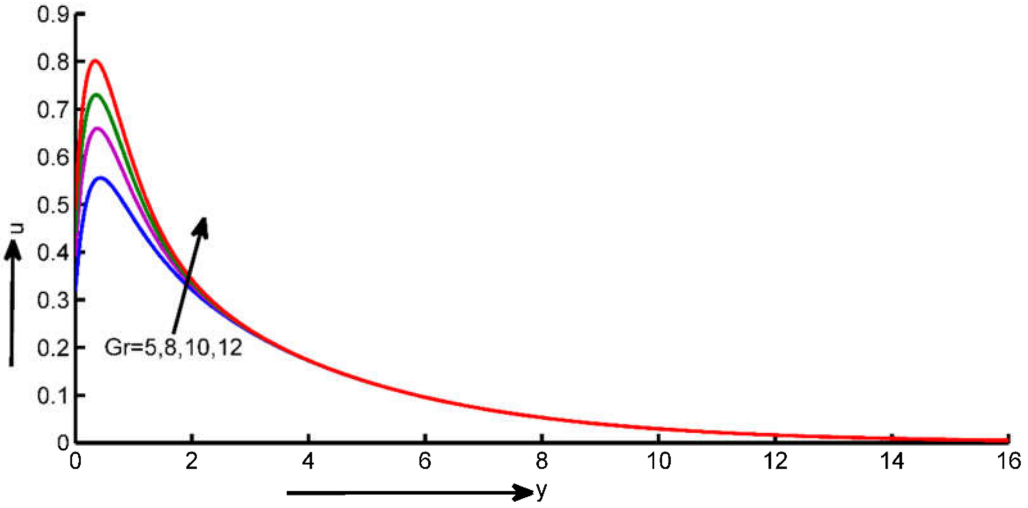


Figure 1: Effect of Grashof Number on Velocity for Pr=0.71

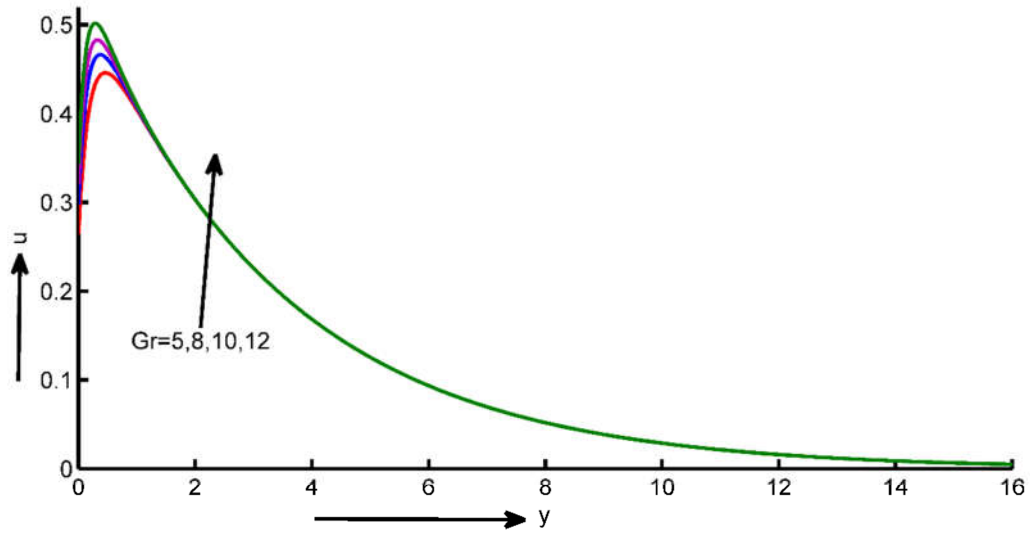


Figure 2: Effect of Grashof Number on Velocity for Pr=7

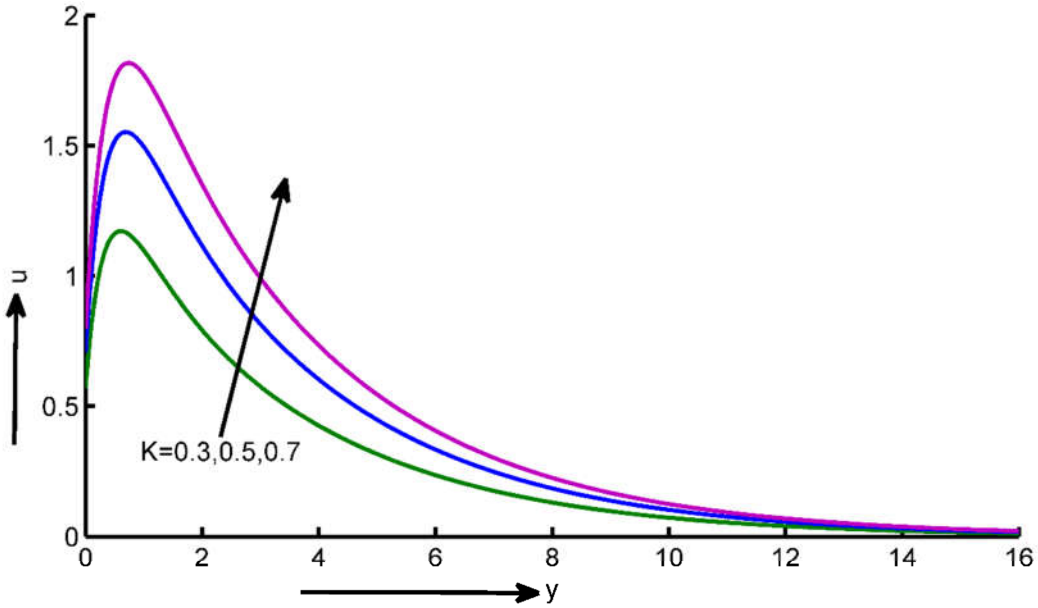


Figure 3: Effect of Porosity parameter on Velocity for Pr=0.71

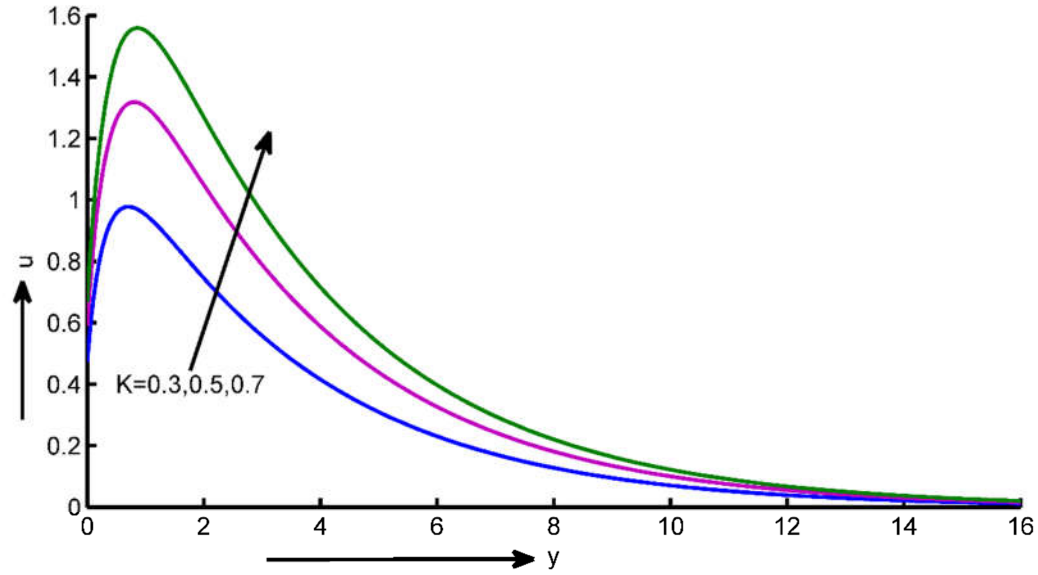


Figure 4: Effect of Porosity parameter on Velocity for Pr=7

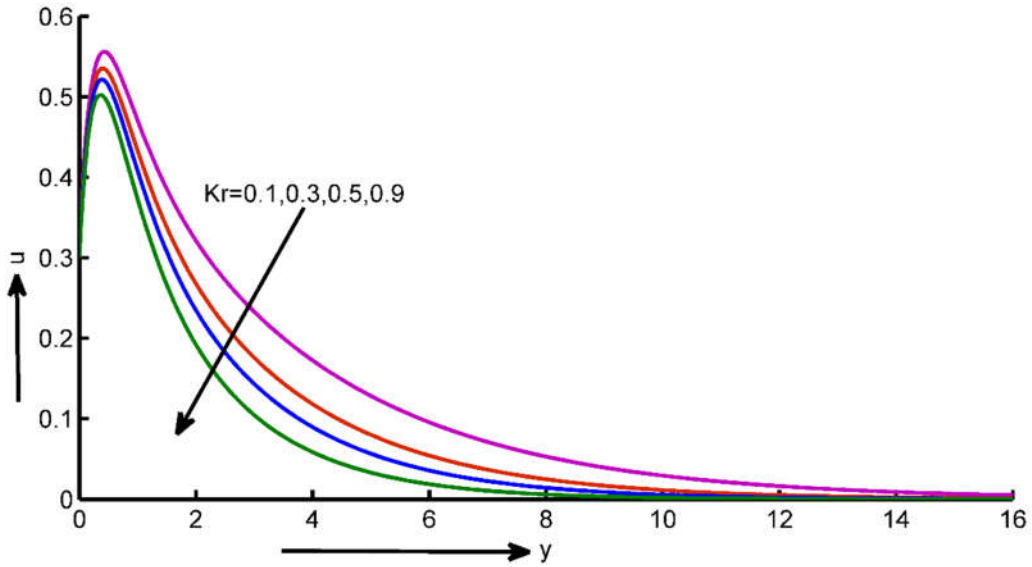


Figure 5: Effect of Chemical Reaction parameter on Velocity for Pr=0.71

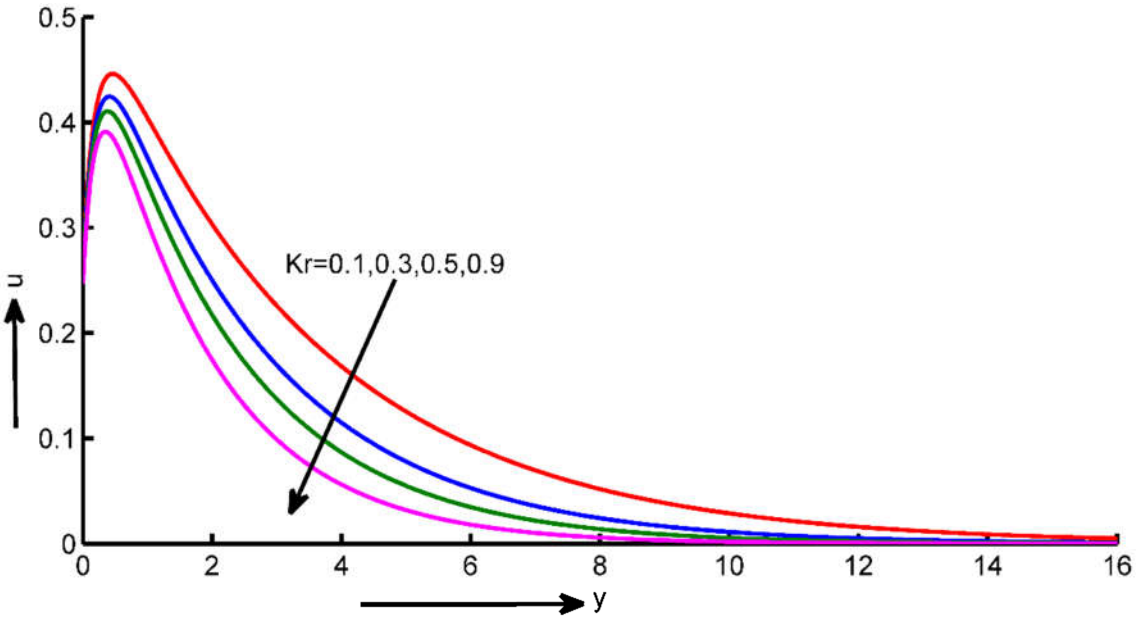


Figure 6: Effect of Chemical Reaction parameter on Velocity for Pr=7

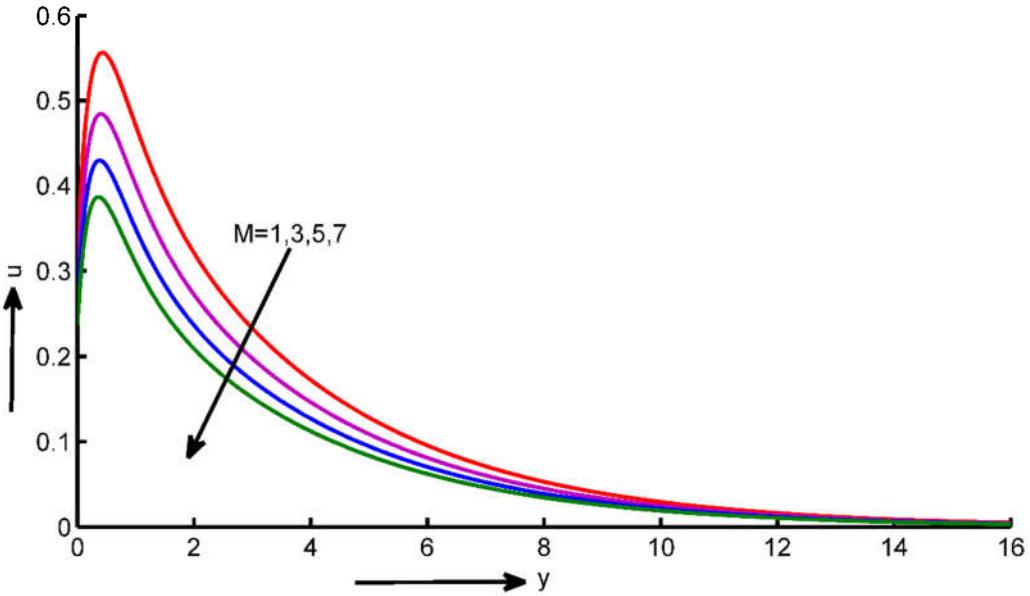


Figure 7: Effect of Magnetic parameter on Velocity for Pr=0.71

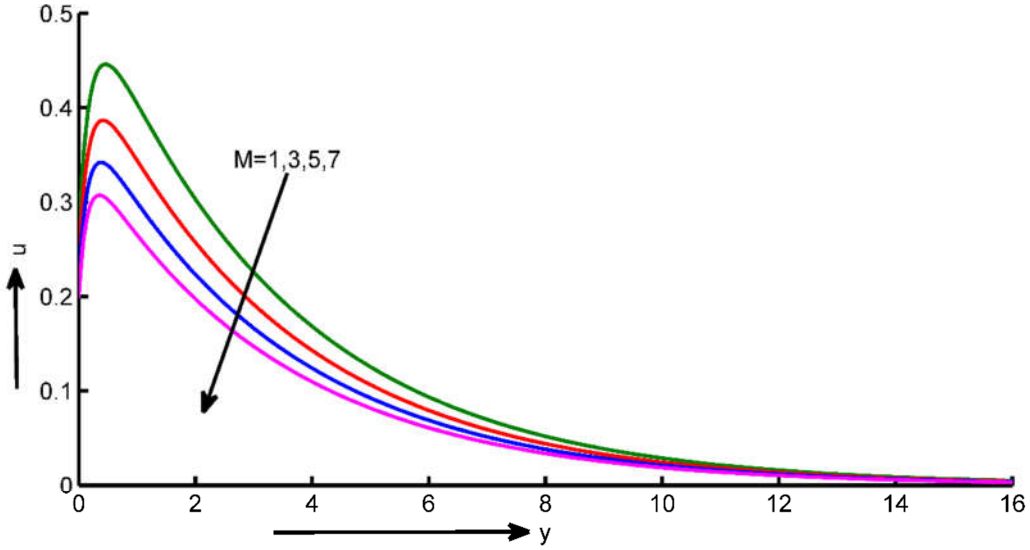


Figure 8: Effect of Magnetic parameter on Velocity for Pr=7

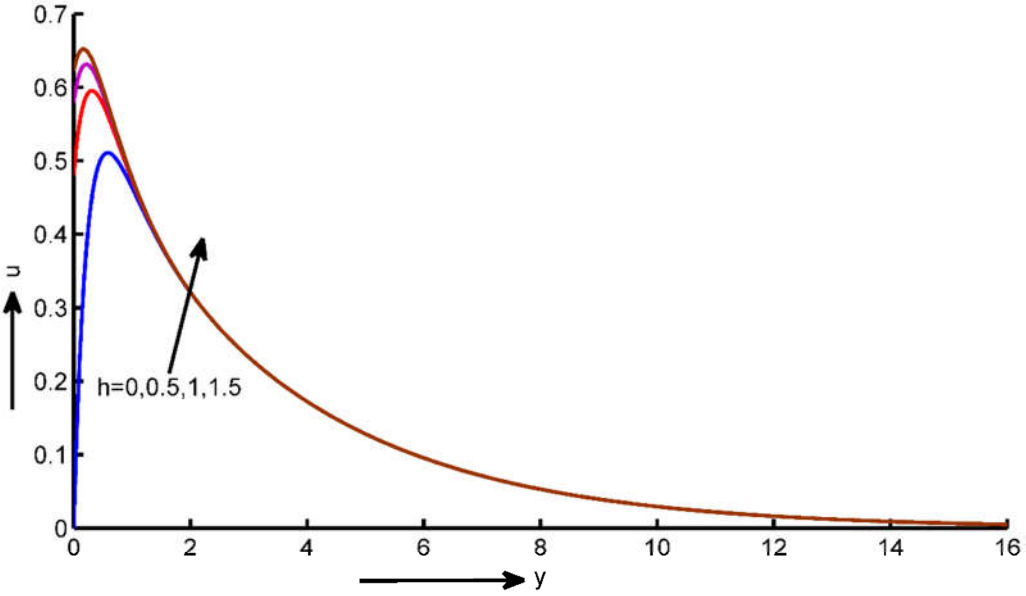


Figure 9: Effect of Rarefaction parameter on Velocity for Pr=0.71

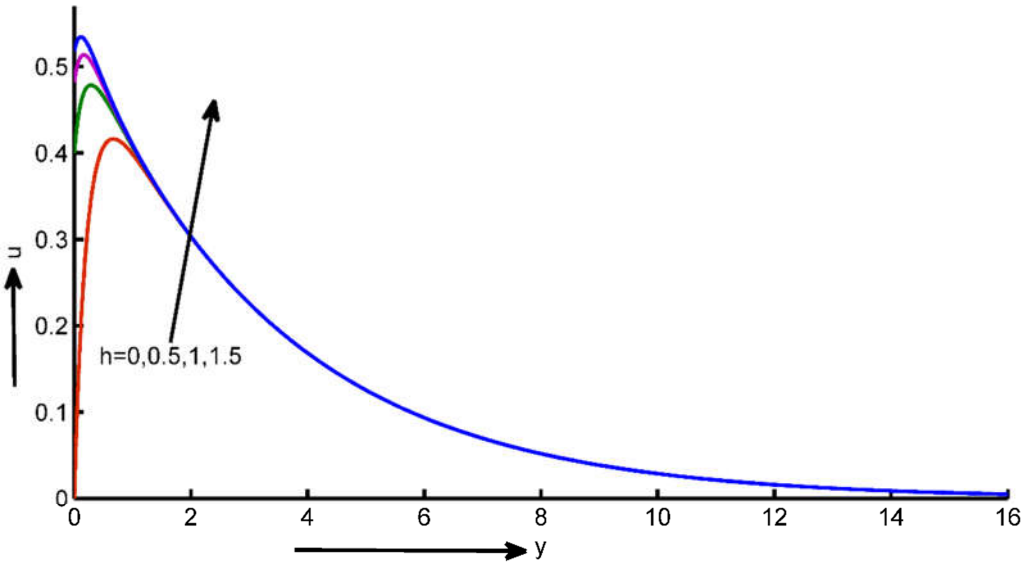


Figure 10: Effect of Rarefaction parameter on Velocity for Pr=7

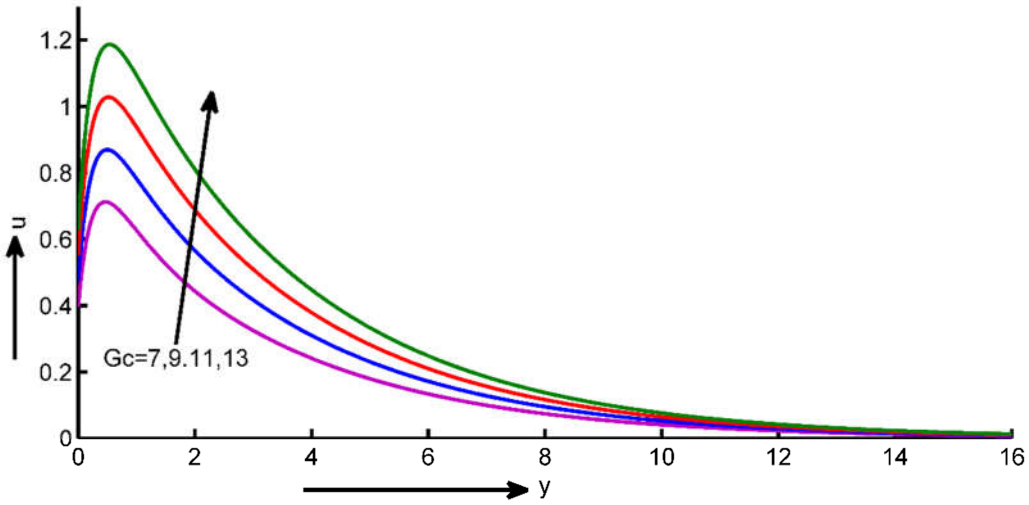


Figure 11: Effect of Modified Grashoff Number on Velocity for Pr=0.71

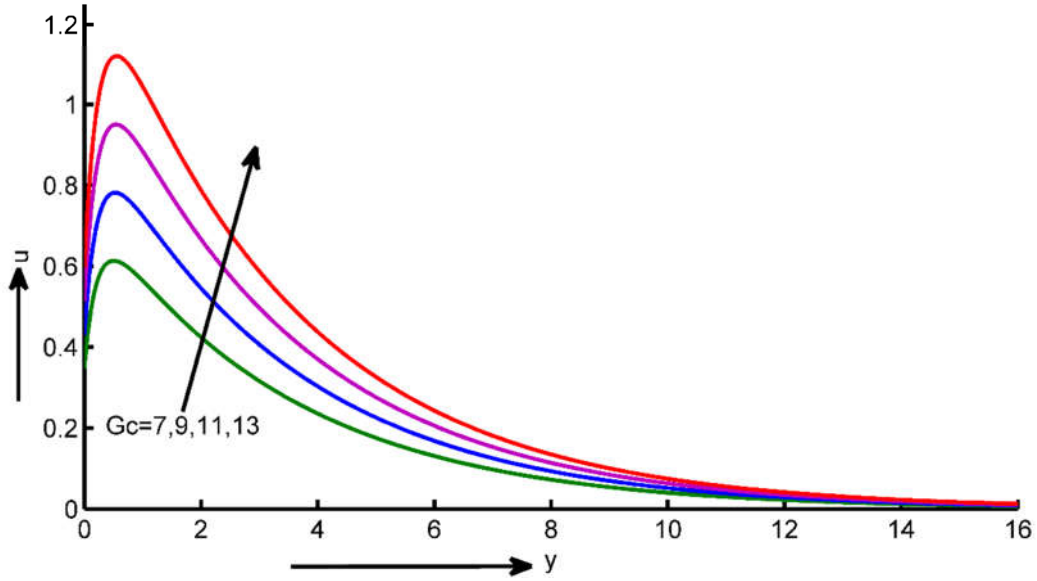


Figure 12: Effect of Modified Grashoff Number on Velocity for Pr=7

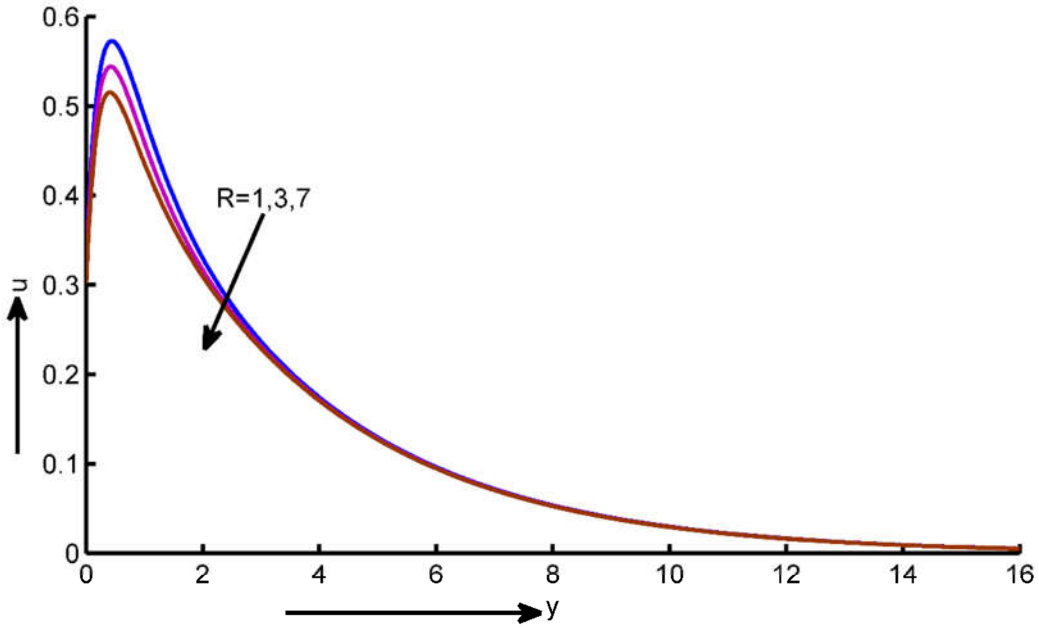


Figure 13: Effect of Radiation Parameter on Velocity for Pr=0.71

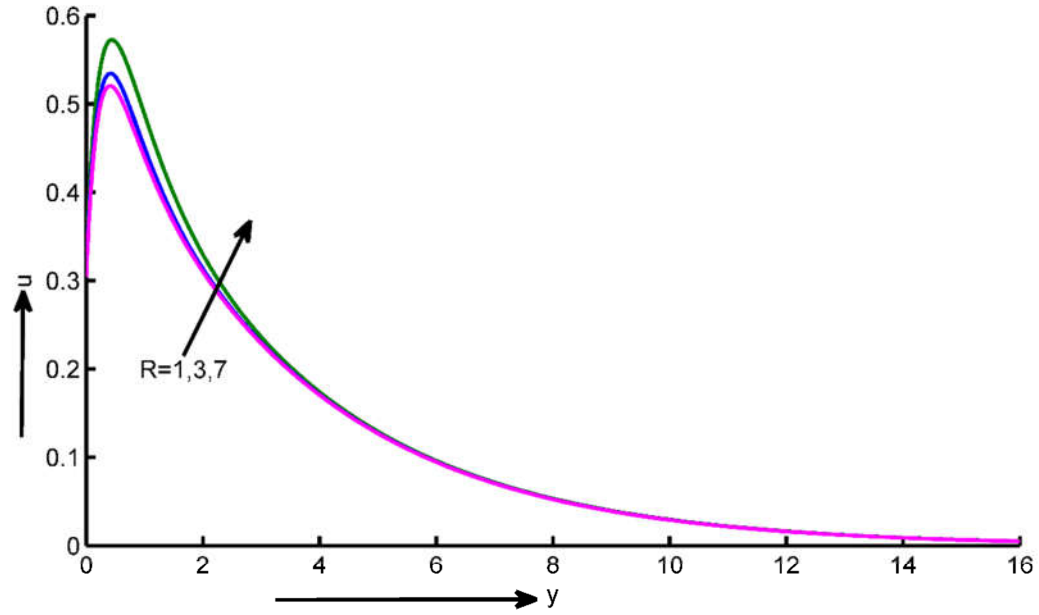


Figure 14: Effect of Radiation Parameter on Velocity for Pr=7

Figures 15– 17,shows the effect of Prandtl number, heat source parameter and Radiation parameter on the temperature profile. Here Chemical reaction parameter (Kr=0.5), Magnetic field parameter (M=1), Suction parameter (A=0.5), porosity parameter(K=0.1),Refraction parameter(h= 0.2), Frequency parameter(ω=20),Mass Grashof number (Gc=5),Thermal Grashof number (Gr=5) ,Heat source parameter (Q=0.5) and Soret parameter (So=1). From Fig15-17, it is clear that temperature decreases with the increase in Prandtal number (Pr),Heat source parameter(Q) and Radiation Parameter (R) .

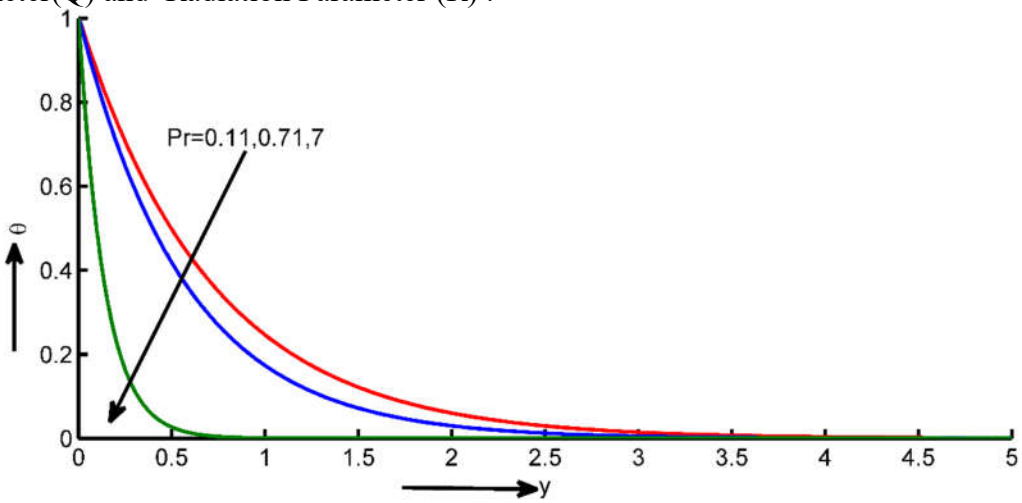


Figure 15: Effect of Prandtl Number on Temperature

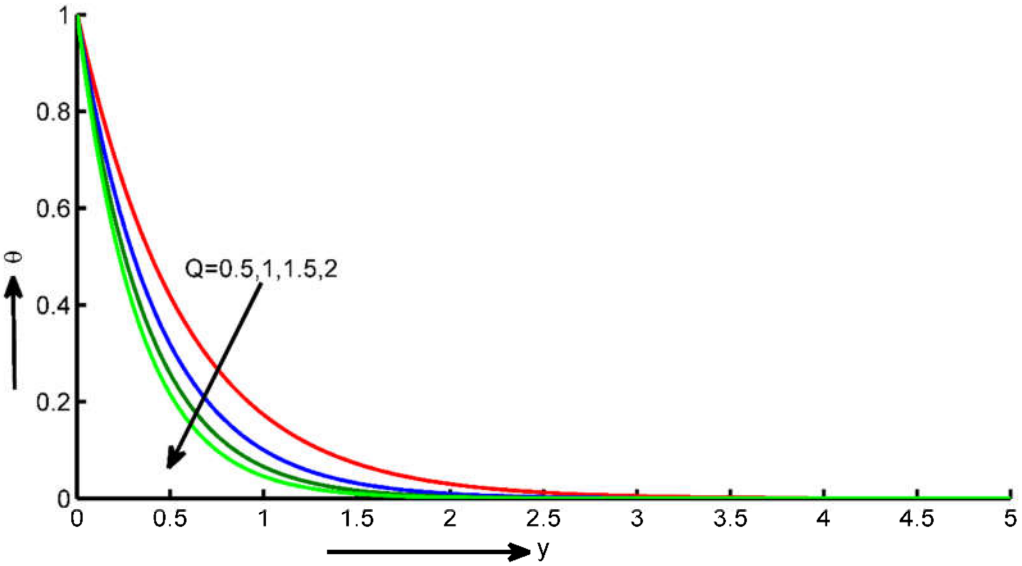


Figure 16: Effect of Heat source Parameter on Temperature

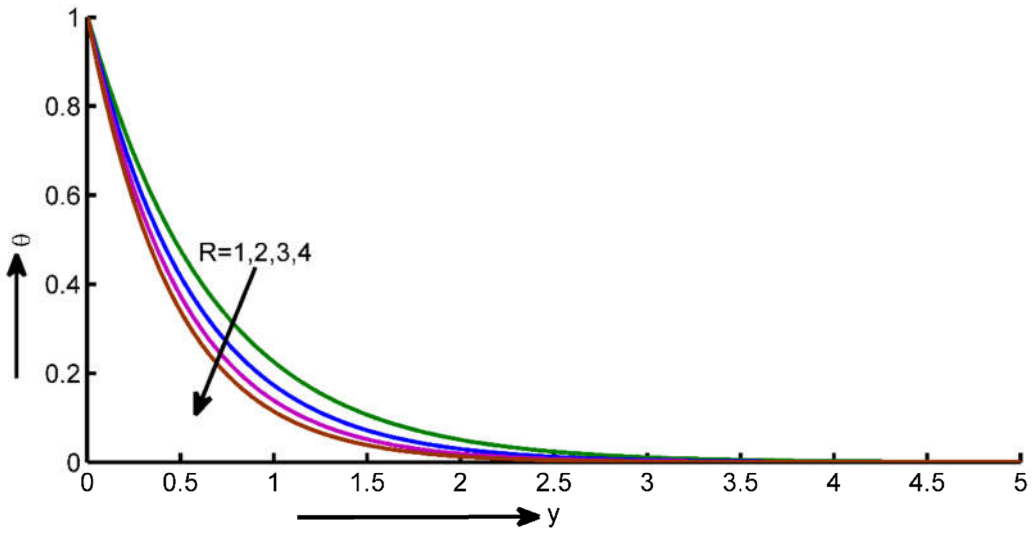


Figure 17: Effect of Radiation Parameter on Temperature

Figures (18)and(19) shows the effect of chemical reaction parameter(Kr) and Schmidt number(Sc) on concentration profile for pr=0.71. Hear Magnetic field parameter (M=1), Radiation parameter (R=2), Suction parameter (A=0.5), Refraction parameter(h=0.2), Frequency parameter(ω=20),Mass Grashof number (Gc=5),Thermal Grashof number (Gr=5) ,Heat source parameter (Q=0.5) and Soret parameter (So=1). From Fig18-19, it is clear that concentration decreases with the increase in chemical reaction parameter and Schmidt number. Fig.20 depicts the variations in Concentration profile for different values of Soret parameter (S_0). From this figure it is noticed that, Concentration increases when So increases.

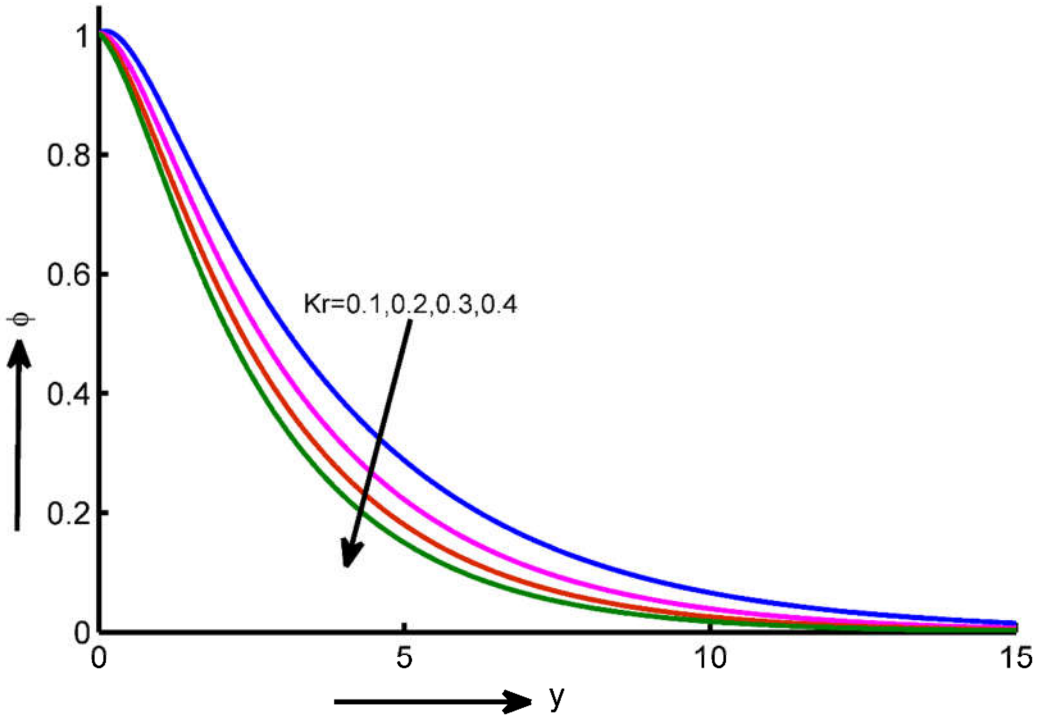


Figure 18: Effect of Chemical reaction Parameter on Concentration

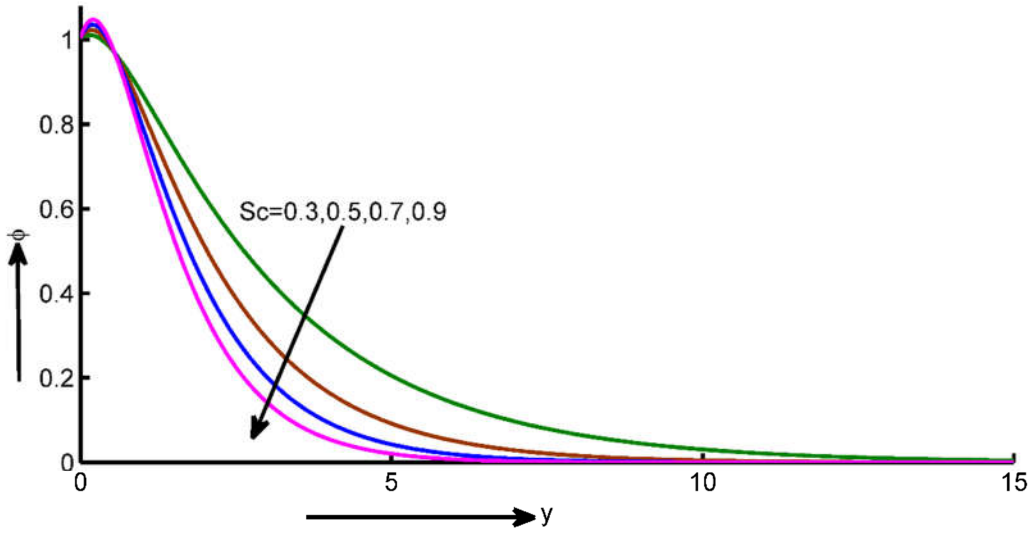


Figure 19: Effect of Schmidt Number on Concentration

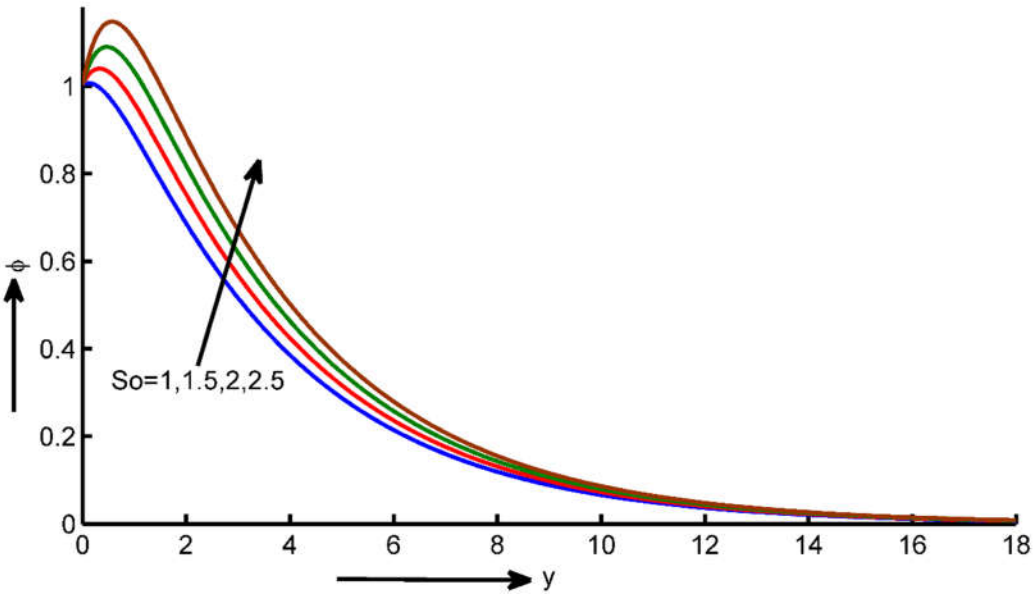


Figure 20: Effect of Soret Parameter on Concentration

Table – 1, shows numerical values of skin-friction for various of Grashof number (Gr), modified Grashof number (Gm), Magnetic parameter (M), Porosity parameter (K). From table 1, we observe that the skin-friction increases with an increase in Grashof number (Gr), modified Grashof number (Gm), Porosity parameter (K) where as it decreases under the influence of magnetic parameter.

Table-1:Variations in Skin Friction

Gr	Gc	M	K	τ
5				1.5886
7				1.8350
10				2.2046
12				2.4510
	6			1.7831
	8			2.1722
	15			3.5338
	20			4.5063
		2		1.4998
		3		1.4218
		5		1.2909
		7		1.1850
			0.5	3.5380
			1	4.4444
			1.5	4.9076
			2	5.1917

Table – 2 demonstrates the numerical values of Nusselt number (Nu) for different values of Prandtl number (Pr), Radiation parameter (R), Heat source parameter (Q). From table 2, we notice that the Nusselt number increases with an increase in Prandtl number, Radiation parameter and Heat source parameter.

Table-2:Variations in Nusselt Number

Pr	R	Q	Nu
0.4			1.5636
0.71			1.7472
7			7.2439
	1		1.4874
	3		1.9657
	5		2.3317
	7		2.6398
		0.2	1.2738
		0.4	1.6092
		0.6	1.8729
		0.8	2.0976

Table – 3 shows numerical values of Sherwood number (Sh) for the distinction values of Schmidt number (Sc), Chemical reaction parameter (Kr) and Soret number(So). It can be noticed from Table - 3 that the Sherwood number enhances with rising values of Schmidt number, and the Chemical reaction parameter where as it decrease under the influence of Soret number(S_0).

Table-3:Variations in Sherwood Number

Sc	Kr	So	Sh
0.2			0.0510
0.4			0.4290
0.6			0.7959
	0.4		0.0947
	0.8		0.2317
	1		0.2873
		1	-0.0621
		2	-0.4290
		3	-0.7959

5. CONCLUSIONS

In this problem, is studied the multiple variables effect on MHD transient flow past a plate. In the analysis of the flow the following conclusions are made:

1. Velocity increases with an increase in Grashof number and as well as modified Grashof number, porosity parameter and rarefaction parameter of the porous medium while, it decreases in the existence of magnetic parameter, radiation parameter and chemical reaction parameter.
2. Temperature decreases in the presence of Prandtl number, heat source parameter and radiation parameter.
3. Concentration decreases with an increase in Schmidt number and chemical reaction parameter while it increases in the presence of Soret parameter.
4. As significant increase in seen in skin friction for Grashof number, modified Grashof number and porosity parameter while a decrease is seen in the presence of magnetic parameter.
5. The rate of heat transfer increases with Prandtl number, heat source parameter and radiation parameter.
6. The rate of mass transfer increases with Schmidt number and Chemical reaction parameter while a decrease is seen in the presence of Soret parameter.

APPENDIX

$$M_1 = M + \frac{1}{K} \qquad \alpha = 1 + \frac{4}{3R} \qquad m_1 = \frac{\Pr + \sqrt{\Pr^2 + 4\alpha Q}}{2}$$

$$m_2 = \frac{\Pr + \sqrt{\Pr^2 + 4\alpha(\Pr i\omega/4 + Q)}}{2} \qquad m_3 = \frac{Sc + \sqrt{Sc^2 + 4Kr\ Sc}}{2}$$

$$m_4 = \frac{Sc + \sqrt{Sc^2 - 4Sc(Kr + i\omega/4)}}{2} \qquad m_5 = \frac{1 + \sqrt{1 + 4M_1}}{2} \qquad m_6 = \frac{1 + \sqrt{1 + 4(M_1 + i\omega/4)}}{2}$$

$$b_1 = \frac{A \Pr m_1}{\alpha m_1^2 - \Pr m_1 - (\Pr i\omega/4 + Q)} \qquad b_2 = 1 - b_1 \qquad b_3 = \frac{m_1^2 S_0 Sc}{m_1^2 - Scm_1 - KrSc} \qquad b_4 = 1 - b_3$$

$$b_5 = \frac{Sc\, m_1\,(Ab_3 - S_0 b_1 m_1)}{m_1^2 - Scm_1 + Sc(Kr + i\omega/4)} \qquad b_6 = \frac{-m_2^2 S_0 Scb_2}{m_2^2 - Scm_2 + Sc(Kr + i\omega/4)}$$

$$b_7 = \frac{Sc\, m_3 Ab_4}{m_3^2 - Scm_3 + Sc(Kr + i\omega/4)} \qquad b_8 = 1 - (b_5 + b_6 + b_7) \qquad b_9 = \frac{-(Gcb_3 + Gr)}{m_1^2 - m_1 - M_1}$$

$$b_{10} = \frac{-Gcb_4}{m_3^2 - m_3 - M_1} \qquad b_{11} = \frac{-b_9(1 + hm_1) - b_{10}(1 + hm_3)}{(1 + hm_5)} \qquad b_{12} = \frac{-Grb_1 - Gcb_5 + m_1 Ab_9}{m_1^2 - m_1 - (M_1 + i\omega/4)}$$

$$b_{13} = \frac{-Grb_2 - Gcb_6}{m_2^2 - m_2 - (M_1 + i\omega/4)} \qquad b_{14} = \frac{-Grb_7 + Am_3 b_{10}}{m_3^2 - m_3 - (M_1 + i\omega/4)} \qquad b_{15} = \frac{-Grb_8}{m_4^2 - m_4 - (M_1 + i\omega/4)}$$

$$b_{16} = \frac{Am_5 b_{11}}{m_5^2 - m_5 - (M_1 + i\omega/4)}$$

$$b_{17} = \frac{-b_{12}(1 + hm_1) - b_{13}(1 + hm_2) - b_{14}(1 + hm_3) - b_{15}(1 + hm_4) - b_{16}(1 + hm_5)}{(1 + hm_6)}$$

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MULTIVARIATE CONVECTIVE HEAT AND MASS TRANSFER PAST A VERTICAL PLATE THROUGH A POROUS MEDIUM IN CONDUCTING FIELD.

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ABSTRACT

In this manuscript, an attempt is made to study the Multivariate convective heat and mass transfer past a vertical plate through a porous medium in conducting field . The expressions for velocity, temperature and concentration distribution, skin-friction, rate of heat and mass transfer coefficients at the plate are obtained using perturbation technique. The effect of various physical parameters occurring into the problem on velocity, temperature and concentration fields are discussed with the help of graphs.

Key words: MHD, Chemical reaction, Radiation, Visco-elastic, Radiation absorption, Skin-friction.

1. INTRODUCTION

MHD is a fluid dynamics of a plasma which can carry an electric current. The interaction with this current and the magnetic field generated by the current, as well as externally imposed magnetic fields, give MHD its rich character which adds to underlying fluid dynamics. Although the plasma can carry a current, it remains electrically neutral throughout the course of its dynamics. The ideas of fluid dynamics in general are presented in heuristic detail, with emphasis on the conservation properties. At this point the electrons and positive ions which make up a completely ionized, neutral plasma are treated as separate, ideal (dissipation-free) fluids. Then, the conditions under which the plasma may be treated as a single, current-carrying fluid are listed, and the system of equations that make up ideal MHD is presented.

The important properties of ideal MHD are conservation of magnetic flux, the concept of a flux tube, essential dynamics of magnetic pressure and shear waves, or Alfv\'en waves. The relevant time and spatial scales are derived, and then the validity of MHD is addressed in terms of these parameters. One important parameter, the so-called "plasma beta", which is the ratio of fluid pressure to magnetic field pressure, is discussed at length. Finally, the effect of introducing electrical resistivity is addressed: resistivity is a dissipative momentum transfer between electrons and ions which acts as a magnetic diffusivity, relaxing the flux conservation property especially at very small scales.

Unsteady MHD Convective flow of Rivlin-Ericksen Fluid over an Infinite Vertical Porous Plate with Absorption Effect and Variable Suction was studied by Veera Sankar et al. [1]. Sharmilaa [2] Steadied Mhd Mixed Convective Flow in Presence of Inclined Magnetic Field and Thermal Radiation With Effects of Chemical Reaction and Soret Embedded in A Porous Medium . Unsteady MHD Mixed Convection Flow of Jeffrey Fluid Past a Radiating Inclined Permeable Moving Plate in the Presence of Thermophoresis Heat Generation and Chemical Reaction was discussed by Venkateswara raju et al. [3]. Unsteady MHD Free Convection Flow of a Viscoelastic Fluid Past a Vertical Porous Plate. International Journal of Dynamics of Fluids was studied by Gurivi Reddy [4]. Reddy [5] studied MHD boundary layer flow, heat and mass transfer analysis over a rotating disk through porous medium saturated by Cuwater and Ag-water nanofluid with chemical reaction. Magnetohydrodynamic (MHD) mixed convection flow of micropolar liquid due to nonlinear stretched sheet with convective condition was discussed by Waqas et al. [6]. Rashad et al, [7] studied by MHD mixed convection of localized heat source/sink in a nanofluid-filled lid-driven square cavity with partial slip.

Chemical reaction engineering (reaction engineering or reactor engineering) is a specialty in chemical engineering or industrial chemistry dealing with chemical reactors. Frequently the term relates specifically to catalytic reaction systems where either a homogeneous or heterogeneous catalyst is present in the reactor. Sometimes a reactor per se is not present by itself, but rather is integrated into a process, for example in reactive separations vessels, retorts, certain fuel cells, and photocatalytic surfaces. The issue of solvent effects on reaction kinetics is also considered as an integral part. Reactor Design uses information, knowledge and experience from a variety of areas - thermodynamics, chemical kinetcs, fluid mechanics, heat and mass transfer and economics. Chemical Reaction Engineering is the synthesis of all these factors with the aim of properly designing a Chemical Reactor.

Effects of Chemical Reaction on Unsteady MHD Casson Fluid flow past a moving Infinite Inclined Plate through Porous Medium was studied by Balakrishna et al. [8]. Rama Mohan et al. [9] Studied chemical reaction and thermal radiation effects on unsteady MHD free convection flow past an inclined moving plate with TGHS. Arifuzzaman et al. [10] was discussed chemically reactive and naturally convective high speed MHD fluid flow through an oscillatory

vertical porous plate with heat and radiation absorption effect. Chemical reaction effect on MHD boundary-layer flow of two-phase nanofluid model over an exponentially stretching sheet with a heat generation was discussed by Eid [11]. Muthuraj et al.[12] was studied influences of chemical reaction and wall properties on MHD Peristaltic transport of a Dusty fluid with Heat and Mass transfer. Chemical Reaction and radiation absorption effects on MHD convective heat and mass transfer flow of a viscoelastic fluid past an oscillation porous plate with heat generation/absorption studied by Ramaiah et al.[13].

Researchers use radioactive atoms to determine the age of materials that were once part of a living organism. The age of such materials can be estimated by measuring the amount of radioactive carbon they contain in a process called radiocarbon dating. Similarly, using other radioactive elements, the age of rocks and other geological features (even some man-made objects) can be determined; this is called Radiometric dating. Environmental scientists use radioactive atoms, known as tracer_atoms, to identify the pathways taken by pollutants through the environment. Radiation is used to determine the composition of materials in a process called neutron activation analysis. In this process, scientists bombard a sample of a substance with particles called neutrons. Some of the atoms in the sample absorb neutrons and become radioactive. The scientists can identify the elements in the sample by studying the emitted radiation.

Radiation and dufour effects on laminar flow of a rotating fluid past a porous plate in conducting field was studied by Ananda Reddy et al.[14]. Venkateswara raju et al.[15] studied thermal diffusion and radiation effects on magnetocasson fluid flow past a vertical porous plate. Hari Krishna et al.[16] discussed by the effects of Radiation and Chemical Reaction on MHD Flow Past an Oscillating Inclined Porous Plate with Variable Temperature and Mass Diffusion. Recently researchers [17-20] shown interest in this area.

The aim of the present investigation is to study the Multivariate convective heat and mass transfer past a vertical plate through a porous medium in conducting field. The dimensionless governing equations are solved using the perturbation technique.

2. Formulation of the Problem

Continuity equation:

$$\frac{\partial v^*}{\partial y^*} = 0 \tag{1}$$

Momentum equation:

$$\frac{\partial u^*}{\partial t^*} + V^* \frac{\partial u^*}{\partial y^*} = \vartheta \frac{\partial^2 u^*}{\partial y^{*2}} + g\beta\ (T^* - T_\infty) + gB^*(C^* - C_\infty) - K_1' \frac{\partial^3 u^*}{\partial y^{*2}\,\partial t^*} - \frac{\sigma B_0^2}{\rho} u^* - \frac{\vartheta}{K_0} u^* \tag{2}$$

Energy equation:

$$\frac{\partial T^*}{\partial t^*} + V^* \frac{\partial T^*}{\partial y^*} = \frac{K}{\rho C_p} \frac{\partial^2 T^*}{\partial y^{*2}} + \frac{1}{\rho C_p} \frac{\partial q_r}{\partial y^*} - \frac{S^*}{\rho C_p}(T^* - T_\infty) - \frac{R^*}{\rho C_p}(C^* - C_\infty) \tag{3}$$

Concentration equation

$$\frac{\partial C^*}{\partial t^*} + V^* \frac{\partial C^*}{\partial y^*} = D \frac{\partial^2 C^*}{\partial y^{*2}} - K^*(C^* - C_\infty) \tag{4}$$

The relevant boundary conditions are given as follows

$$u^* = U_0(1 + \varepsilon e^{i\omega^* t^*}), \quad T^* = T_w + \varepsilon(T_w - T_\infty)e^{i\omega^* t^*},$$
$$C^* = C_w + \varepsilon(C_w - C_\infty)e^{i\omega^* t^*}, \quad \text{at} \quad y^* = 0$$
$$u^* \to 0,\ T^* \to T_\infty, \quad C^* \to C_\infty \quad \text{as } y^* \to \infty \tag{5}$$

Where U_0 is the plate velocity, T_w and C_w are the wall dimensional temperature and concentration, respectively, T_∞ and C_∞ are the free stream dimensional temperature and concentration, respectively, ω -the constant.

Eq.(1) gives that V* = Constant = - V_0 (6) Where V_0 is the constant suction velocity normal to the plate

On introducing the following non-dimensional quantities,

$$u=\frac{u^*}{U_0}, w=\frac{\upsilon w^*}{U_0^2}, \lambda=\frac{U_0^2 K_1'}{\rho\upsilon^2}, \ y=\frac{U_0\ y^*}{\vartheta}, \ t=\frac{t^* U_0^{\ 2}}{\vartheta} \ \theta=\frac{T^*-T_\infty}{T_w-T_\infty}, \qquad \phi=\frac{C^*-C_\infty}{C_w-C_\infty},$$

$$\Pr=\frac{\mu C_p}{K}, \ Sc=\frac{\vartheta}{D}, \ M^2=\frac{\sigma_e B_0^2 \vartheta}{\rho U_0^{\ 2}}, Gr=\frac{\vartheta g\beta\ (T_W-T_\infty)}{U_0^3}, \quad Gm=\frac{\vartheta g\beta^*(C_w-C_\infty)}{U_0^3} \tag{7}$$

$$K_p=\frac{K_0 U_0^2}{\vartheta^2}, V_0=\frac{v_0}{U_0}, \ K_r=\frac{\vartheta K^*}{U_0^2}, R=\frac{4I^*\vartheta^2}{KU_0^2}, \ S=\frac{S^* v^2}{KU_0^2}, R_1=\frac{R^*\vartheta^2(C_w-C_\infty)}{KU_0^2(T_w-T_\infty)},$$

In view of the above non-dimensional quantities and the equation (6) the Equations(2) to (4) after dropping the asterisks reduce to the following dimensionless form.

$$\frac{\partial u}{\partial t}-V_0\frac{\partial u}{\partial y}=\frac{\partial^2 u}{\partial y^2}+Gr\theta+Gm\phi-M_1 u-\lambda_1\frac{\partial^3 u}{\partial y^2\partial t} \tag{8}$$

$$\Pr\frac{\partial\theta}{\partial t}-\Pr V_0\frac{\partial\theta}{\partial y}=\frac{\partial^2\theta}{\partial y^2}+\alpha\theta-R_1\phi \tag{9}$$

$$Sc\frac{\partial\phi}{\partial t}-ScV_0\frac{\partial\phi}{\partial y}=\frac{\partial^2\phi}{\partial y^2}-ScK_r\phi \tag{10}$$

Where $M_1=M^2+1/K_p$ α=R-S

The corresponding boundary conditions are :

$$u=1+\varepsilon e^{i\omega t}, \ \theta=1+\varepsilon e^{i\omega t}, \phi=1+\varepsilon e^{i\omega t} \quad at \quad y=0$$
$$u\to 0, \qquad \theta\to 0, \qquad \phi\to 0 \quad s \quad y\to\infty \tag{11}$$

3.Solution of the problem:

To solve the nonlinear equations (8) to (10) with the boundary conditions (11),

$$u(y,t)=u_0(y)+\varepsilon u_1(y)e^{i\omega t}$$
$$\theta(y,t)=\theta_0(y)+\varepsilon\theta_1(y)e^{i\omega t} \tag{12}$$
$$\phi(y,t)=\phi_0(y)+\varepsilon\phi_1(y)e^{i\omega t}$$

Substituting equation (12) into the equations (8), (9) and (10) and equating the harmonic and non-harmonic terms, neglecting the terms of $\in^2$, we get

Zero order terms:

$$u_0''+V_0u_0' = -\mathrm{Gr}\,\theta_0 - \mathrm{Gm}\,\phi_0 + \mathrm{M_1}u_0 \tag{13}$$
$$\theta_0''+\Pr V_0\theta_0'+\alpha\theta_0 = \mathrm{R_1}\,\phi_0 \tag{14}$$
$$\phi_0''+Sc\ V_0\phi_0'-\mathrm{ScK}_r\phi_0=0 \tag{15}$$

First order terms :

$$N_1u_1''+V_0u_1' = -\mathrm{Gr}\,\theta_1 - \mathrm{Gm}\,\phi_1 + N_2u_1 \tag{16}$$
$$\theta_1''+\Pr V_0\theta_1'+(\alpha-\Pr(i\omega)\,\theta_1=\mathrm{R_1}\,\phi_1 \tag{17}$$
$$\phi_1''+ScV_0\phi_1'-Sc(K_r+i\omega)\phi_1=0 \tag{18}$$

Where $N_1=1-\lambda_1(i\omega)$ $N_2=M_1+i\omega$

The corresponding boundary conditions are

$u_0=1, u_1=1, \quad \theta_0=1, \theta_1=1, \quad \phi_0=1, \phi_1=1$ at $y=0$

$u_0\to 0, u_1\to 0, \quad \theta_0\to 0, \theta_1\to 0, \quad \phi_0\to 0, \phi_1\to 0$ as $y\to\infty$ (19)

Solving equations (14) – (18) under the boundary conditions (19), the following solutions are obtained

$$u_0(y) = b_5 e^{-m_1 y} + b_6 e^{-m_3 y} + b_7 e^{-m_5 y} \quad (20)$$

$$u_1(y) = b_8 e^{-m_2 y} + b_9 e^{-m_4 y} + b_{10} e^{-m_6 y} \quad (21)$$

$$\theta_0(y) = b_1 e^{-m_1 y} + b_2 e^{-m_3 y} \quad (22)$$

$$\theta_1(y) = b_3 e^{-m_2 y} + b_4 e^{-m_4 y} \quad (23)$$

$$\phi_0(y) = e^{-m_1 y} \quad (24)$$

$$\phi_1(y) = e^{-m_3 y} \quad (25)$$

Substituting equations (20) – (25) in equation (12) we obtain the velocity temperature and concentration field

$$u(y,t) = (b_5 e^{-m_1 y} + b_6 e^{-m_3 y} + b_7 e^{-m_5 y}) + \varepsilon (b_8 e^{-m_2 y} + b_9 e^{-m_4 y} + b_{10} e^{-m_6 y}) e^{i\omega t} \quad (26)$$

$$\theta(y,t) = (b_1 e^{-m_1 y} + b_2 e^{-m_3 y}) + \varepsilon (b_3 e^{-m_2 y} + b_4 e^{-m_4 y}) e^{i\omega t} \quad (27)$$

$$\phi(y,t) = e^{-m_1 y} + \varepsilon e^{-m_2 y} e^{i\omega t} \quad (28)$$

Skin Friction:

The non-dimensional skin friction at the surface is given by

$$\tau = -\left(\frac{\partial u}{\partial y}\right)_{y=0}$$

$$\tau = [m_1 b_5 + m_3 b_6 + m_5 b_7] + \varepsilon [m_2 b_8 + m_4 b_9 + m_6 b_{10}] e^{i\omega t} \quad (29)$$

Nusselt Number :

The rate of heat transfer in terms of the Nusselt number is given by

$$Nu = -\left(\frac{\partial \theta}{\partial y}\right)_{y=0}$$

$$Nu = [m_1 b_1 + m_3 b_2] + \varepsilon [m_2 b_3 + m_4 b_4] e^{i\omega t} \quad (30)$$

Sherwood Number :

The rate of mass transfer on the wall in terms of Sherwood number is given by

$$Sh = -\left(\frac{\partial \phi}{\partial y}\right)_{y=0}$$

$$Sh = m_1 + \varepsilon m_2 e^{i\omega t} \quad (31)$$

4. RESULTS AND DISCUSSION

In order to get a physical insight into the problem numerical calculations are carried out for the Velocity, Temperature and concentration profiles and the following discussion is set out.

Throughout the computations we employ, V_0 =1,Sc=0.22,Pr=0.71,Gr=1,Gm=1,S=2,K_r=1, K_p =1,M=1, E=0.01, t=3,R=1,R_1=1, **ω=π/6, λ₁**=1.

In order to reveal the effects of various parameters on the dimensionless velocity fields, temperature field, concentration field, skin friction, Nusselt number and Sherwood number and the effect of the various physical parameters such as the Grashof number (Gr), the modified Grashof number (Gm),Magnetic parameter (M), Permeability parameter(K_p), Prandtl number (Pr), Heat absorption parameter(S), Radiation Parameter (R), Radiation absorption Parameter (R_1),Schmidt number(Sc) and Chemical reaction parameter(K_r) on velocity, temperature and concentration we draw a number of figures marked as figs. 1-19 and study these by choosing arbitrary values. The influence of these parameters on skin friction, Nusselt number and Sherwood number is also shown in Tables 1 – 3.

Figs. 1 – 10 demonstrate the variations of the fluid velocity under the effects of different parameters. In Fig.1, we represent the velocity profile for different values of Grashof number(Gr). From this figure it is noticed that, velocity increases with increases in Gr. In Fig.2 the effect of modified Grashof number (Gm) on velocity is presented. As Gm increases, velocity also increases. In Fig. 3, velocity profiles are displayed with the variation in magnetic parameter (M). From this figure it is noticed the velocity gets reduced by the increase of magnetic parameter (M). Fig.4, depicts the variations in velocity profiles for different values of permeability parameter (K_p). From where it is noticed that, velocity

increases as K_p increases. Fig.5, depicts the variations in velocity profiles for different values of Prandtl number (Pr) which shows that velocity decreases as Pr increases. In Fig.6 the effect of Radiation parameter(R) on velocity is presented. As R increases, velocity also decreases. In Fig.7 the effect of Heat absorption parameter(S) on velocity is presented. As S increases, velocity also increases. In Fig. 8, velocity profiles are displayed with the variation in Radiation absorption parameter (R_1). From this figure it is noticed the velocity gets reduced by the increase of Heat absorption parameter(S).In Fig. 9, velocity profiles are displayed with the variation in Schmidt number(Sc) From this figure it is noticed the velocity gets reduced by the increase of Schmidt number(Sc).A similar effects are noticed from fig.10, in the presence of chemical reaction parameter(K_r) which is also decreases the fluid velocity.

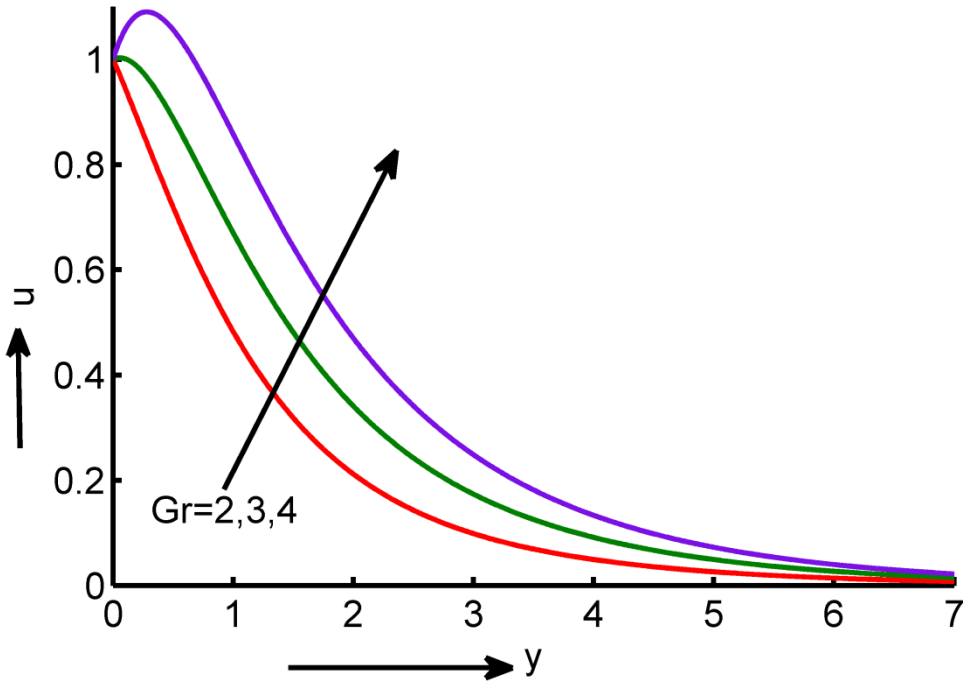


Figure 1: Effect of Thermal Grashof number on Velocity

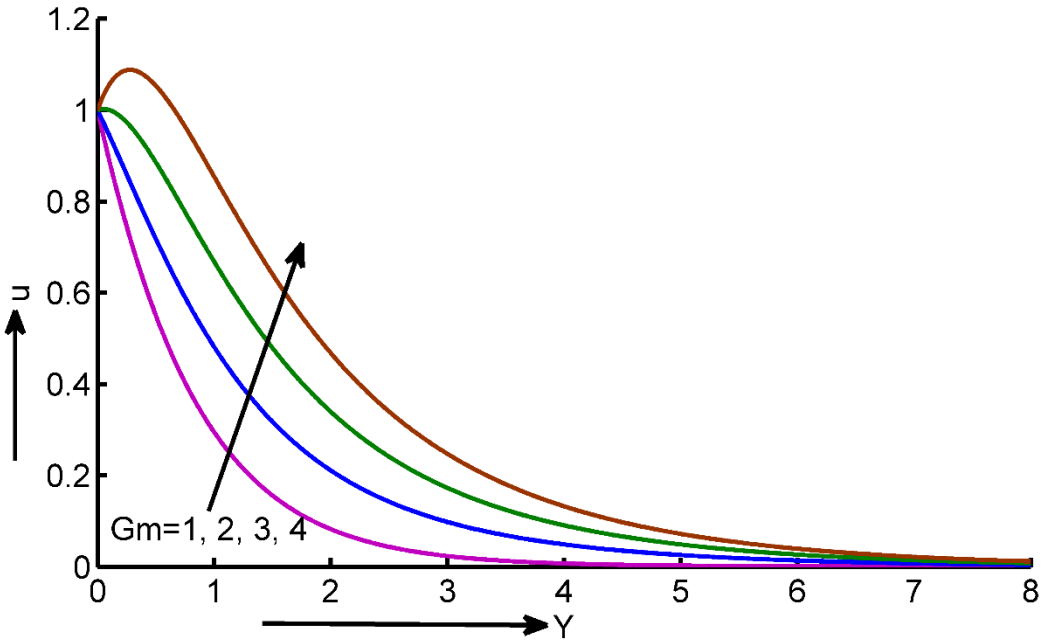


Figure 2: Effect of Modified Grashof number on Velocity

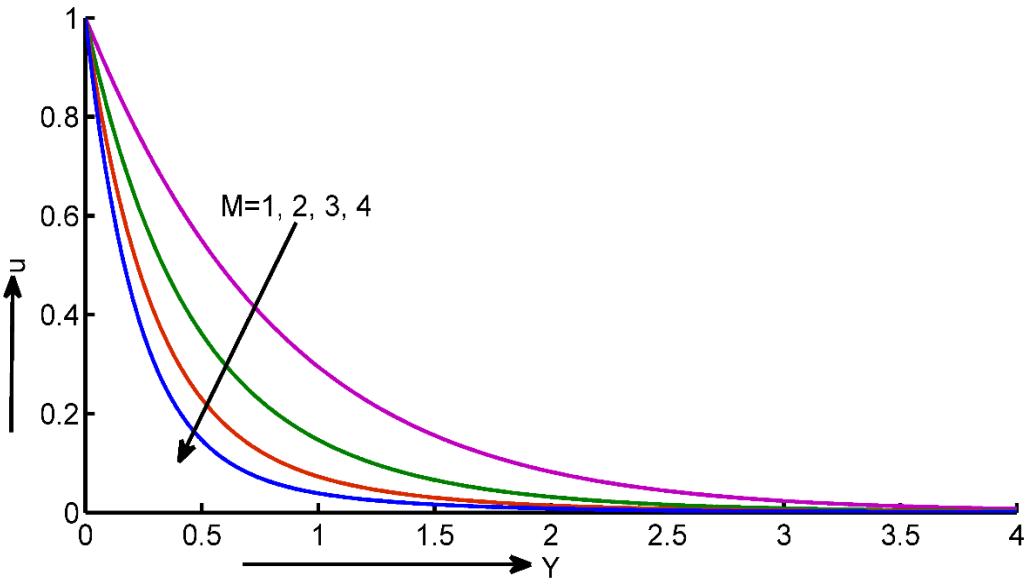


Figure 3: Effect of Magnetic parameter on Velocity

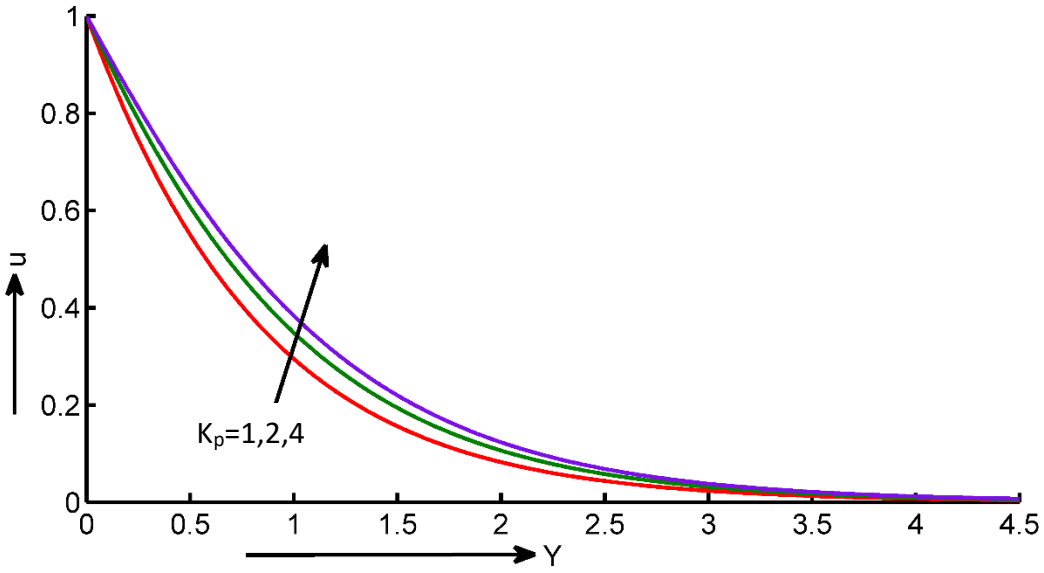


Figure 4: Effect of Permeability parameter on Velocity

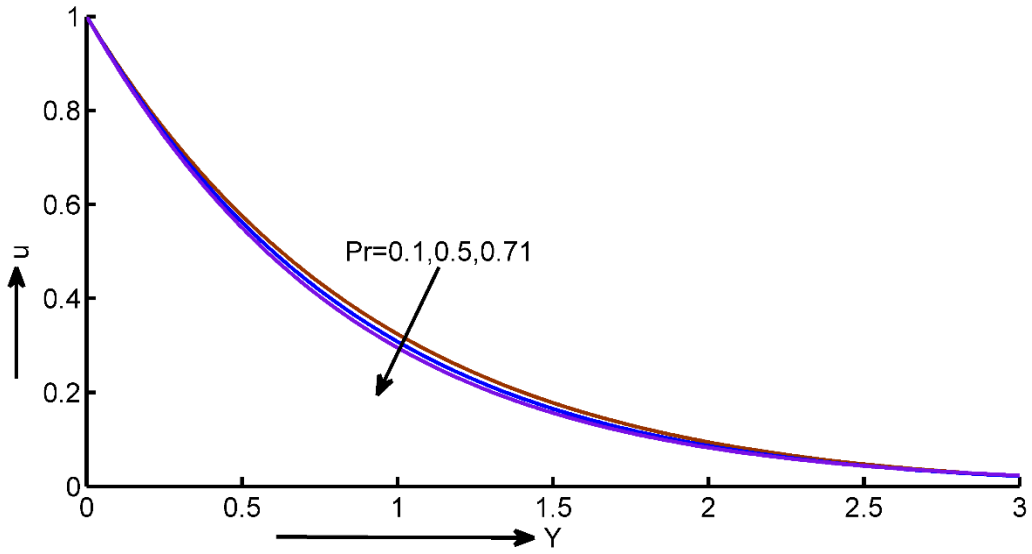


Figure 5: Effect of Prandtl number on Velocity

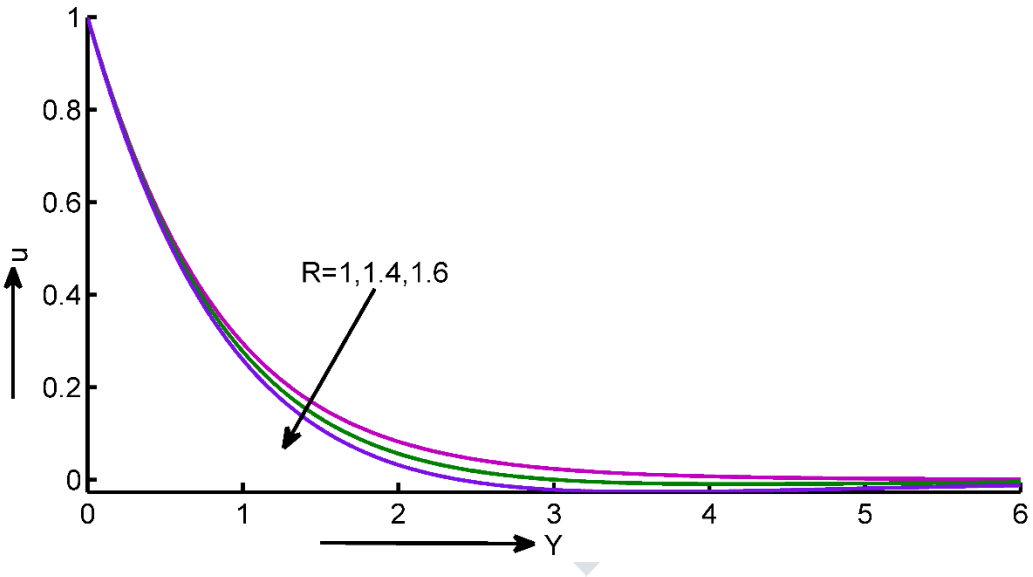


Figure 6: Effect of Radiation parameter on Velocity

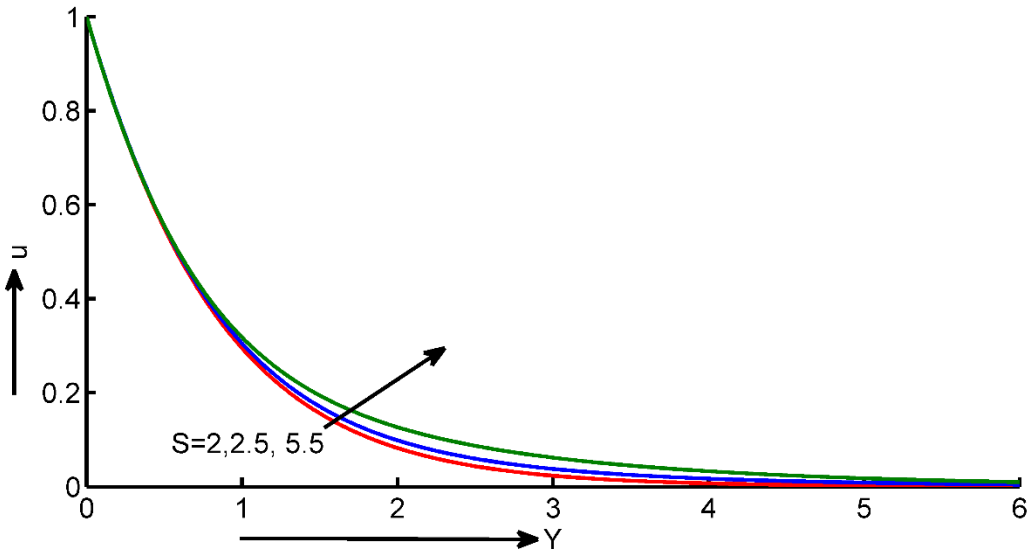


Figure 7: Effect of Heat absorption parameter on Velocity

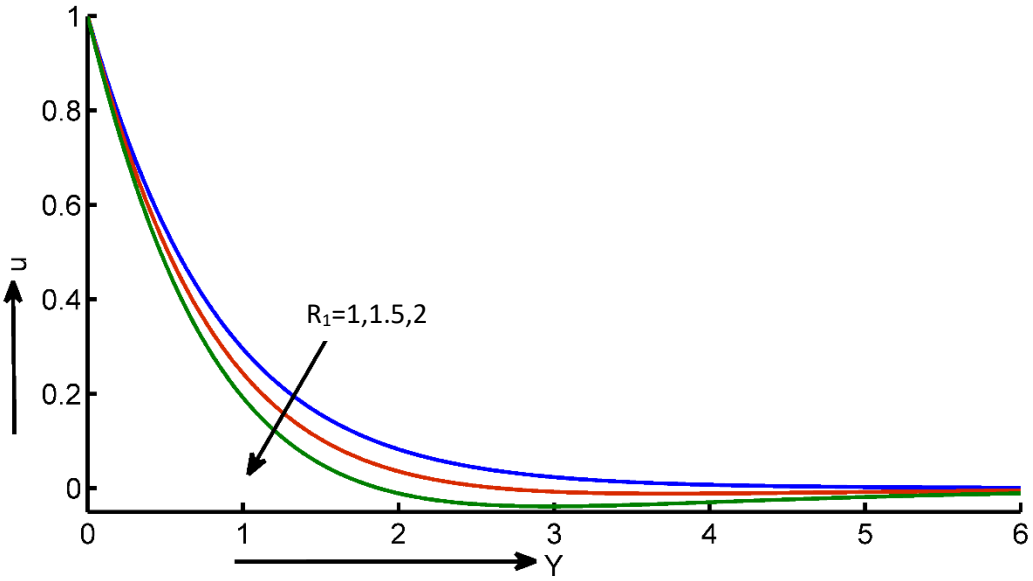


Figure 8: Effect of Radiation absorption parameter on Velocity

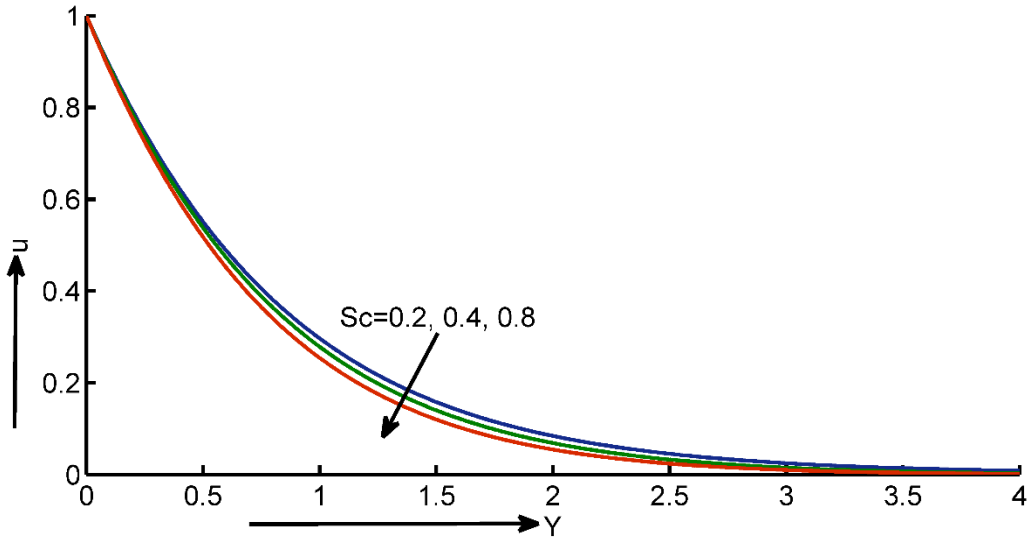


Figure 9: Effect of Schmidt number on Velocity

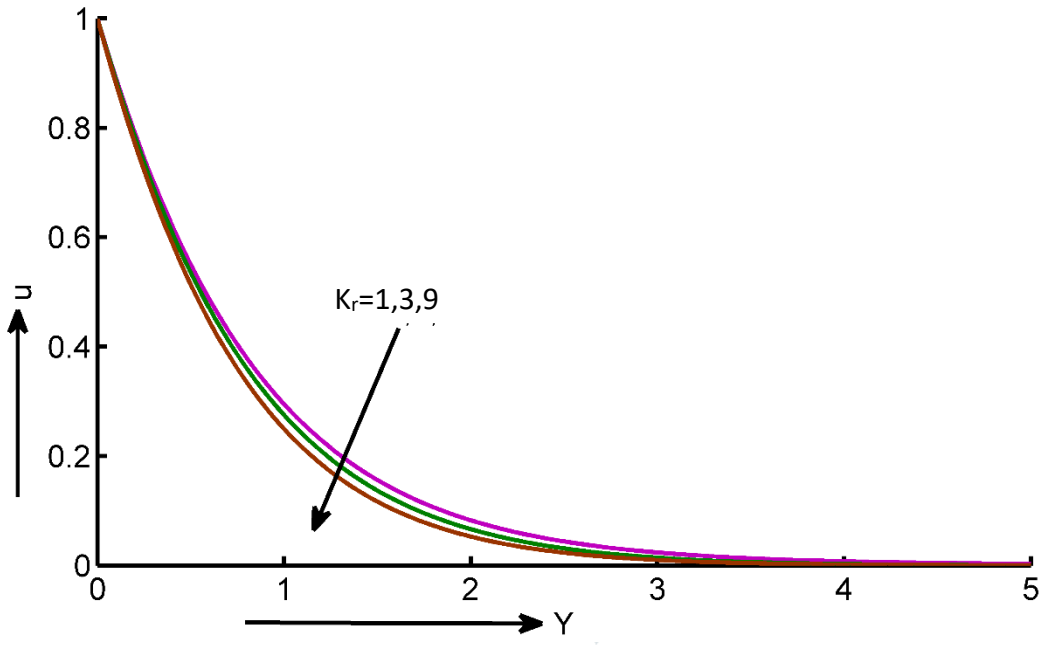


Figure 10: Effect of Chemical Reaction Parameter on Velocity

Figures 11– 17, display the variations of the fluid temperature under the effects of different parameters. From Fig11-14, it is clear that temperature decreases with the increase in Radiation absorption Parameter (R_1), Heat absorption parameter(S),Prandtal number (Pr) and Radiation Parameter (R), In Fig15-17, the effect of Chemical reaction parameter(K_r), Heat absorption parameter(S) and Schmidt number(Sc) are shown on the temperature profile. From these figures are observed that temperature increases with an increase values in K_r, S and Sc.

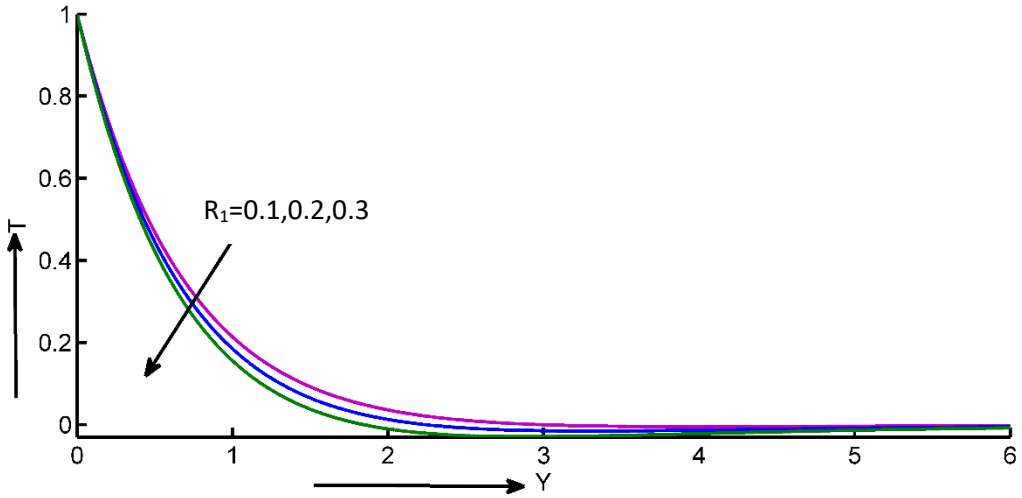


Figure 11: Effect of Radiation absorption parameter on Temperature

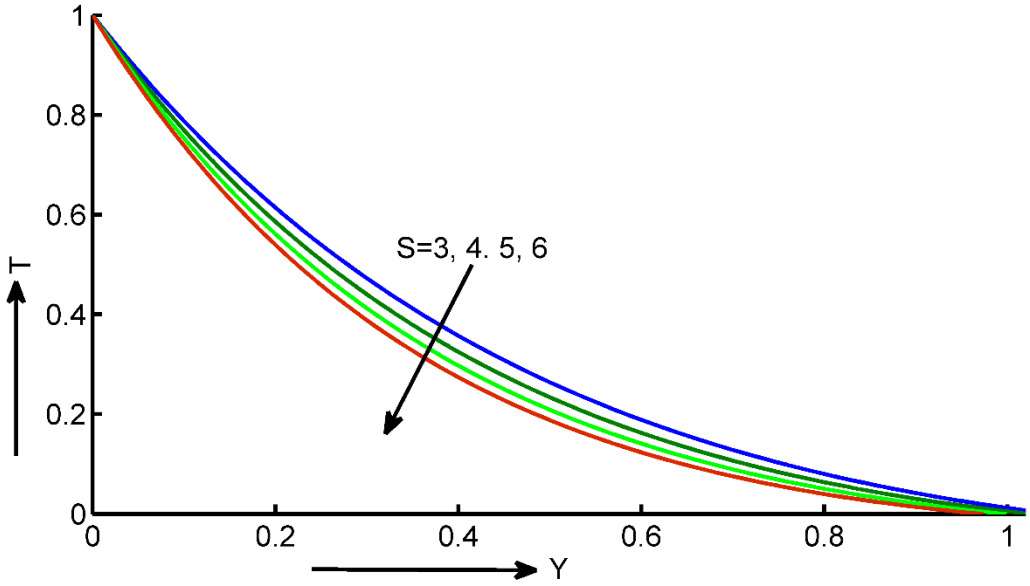


Figure 12: Effect of Heat absorption parameter on Temperature

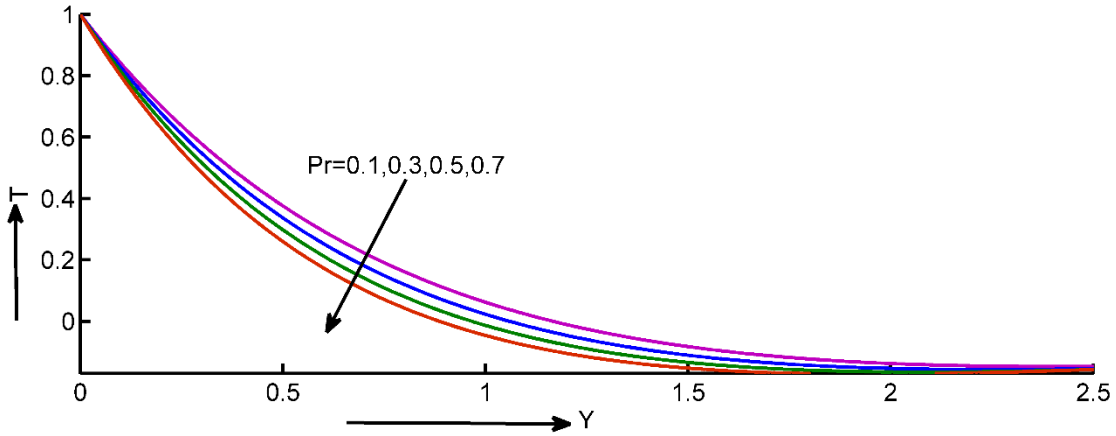


Figure 13: Effect of Prandtl number on Temperature

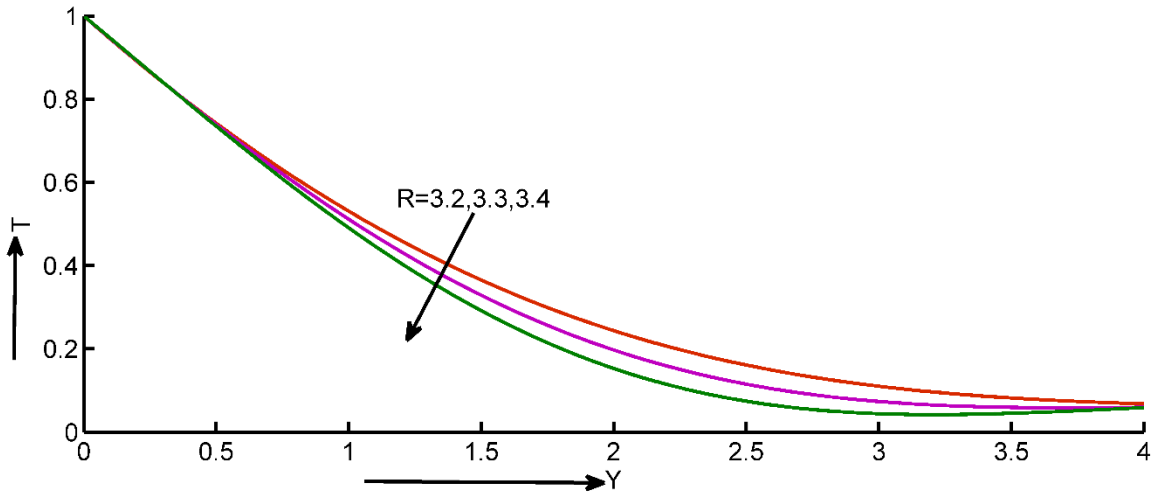


Figure 14: Effect of Radiation parameter on Temperature

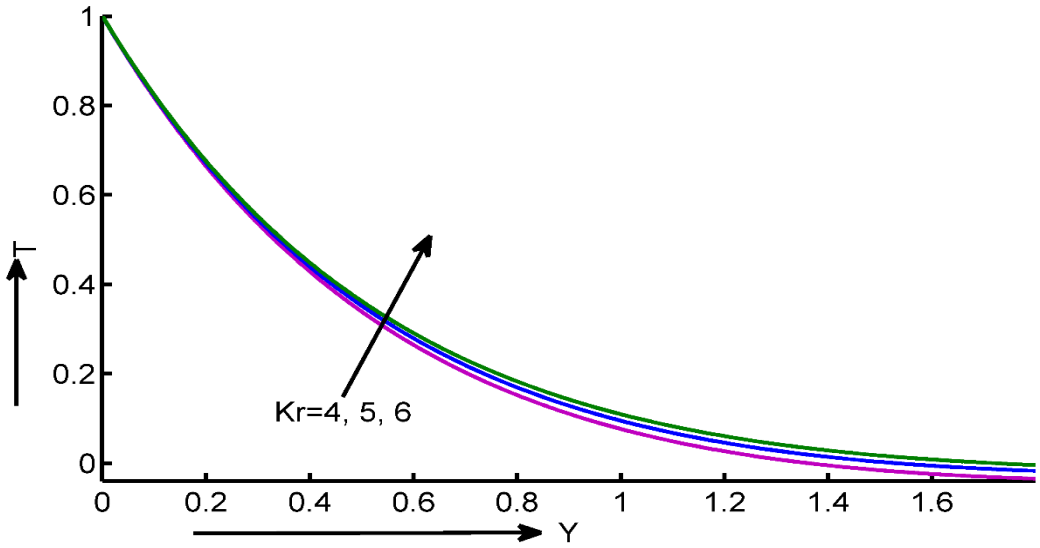


Figure 15: Effect of Chemical Reaction Parameter on Temperature

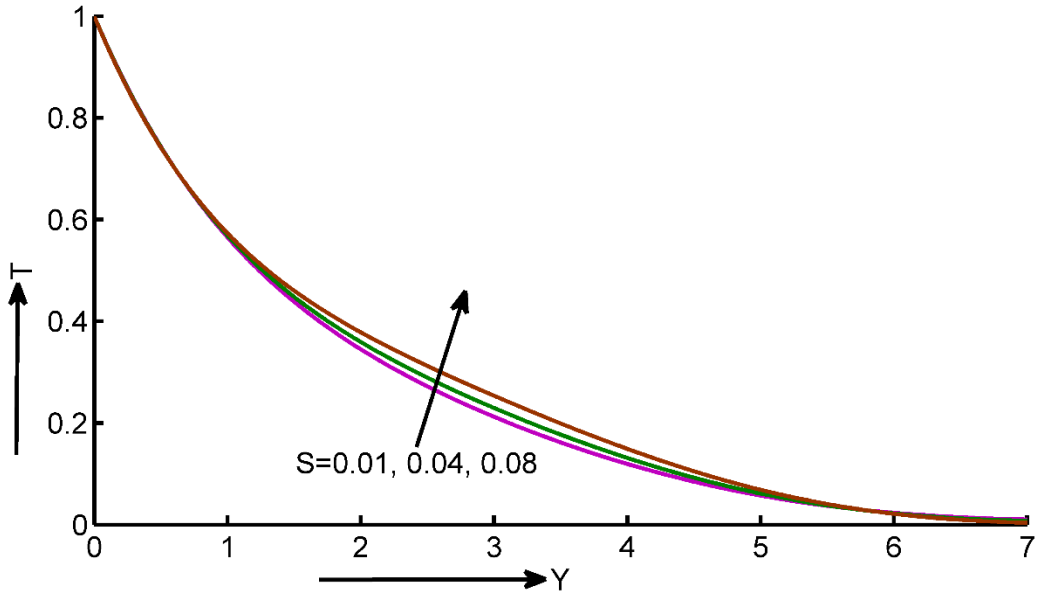


Figure 16: Effect of Heat absorption parameter on Temperature

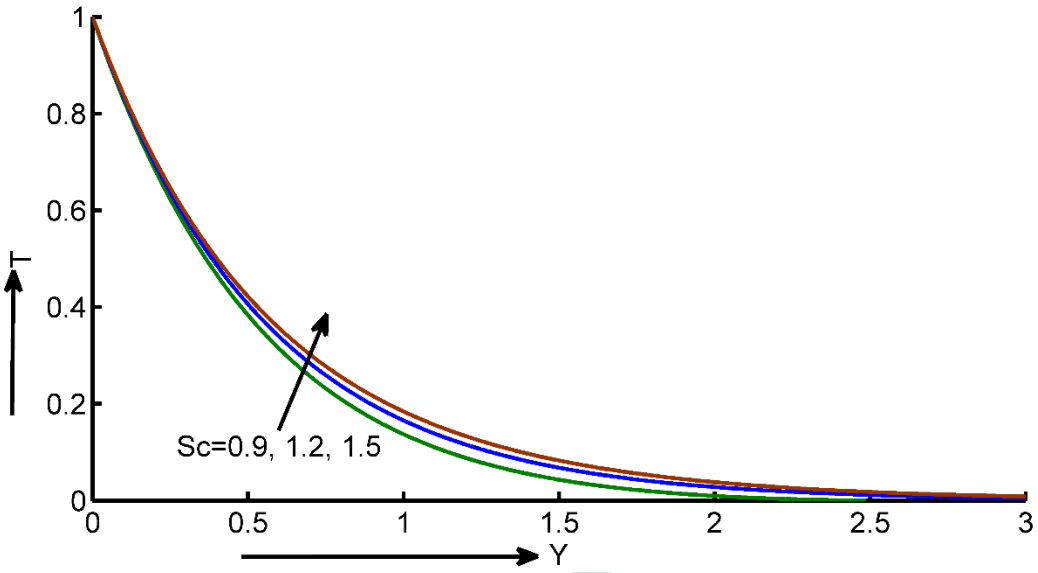


Figure 17: Effect of Schmidt number on Temperature

To analyze the effect of Schmidt parameter(Sc) on the concentration profile in Fig.18. The result shows that the concentration field decreases when increases Sc. Fig.19 depicts the variations in Concentration profile for different values of Chemical Reaction Parameter(K_r). From this figure it is noticed that, Concentration decreases when K_r increases.

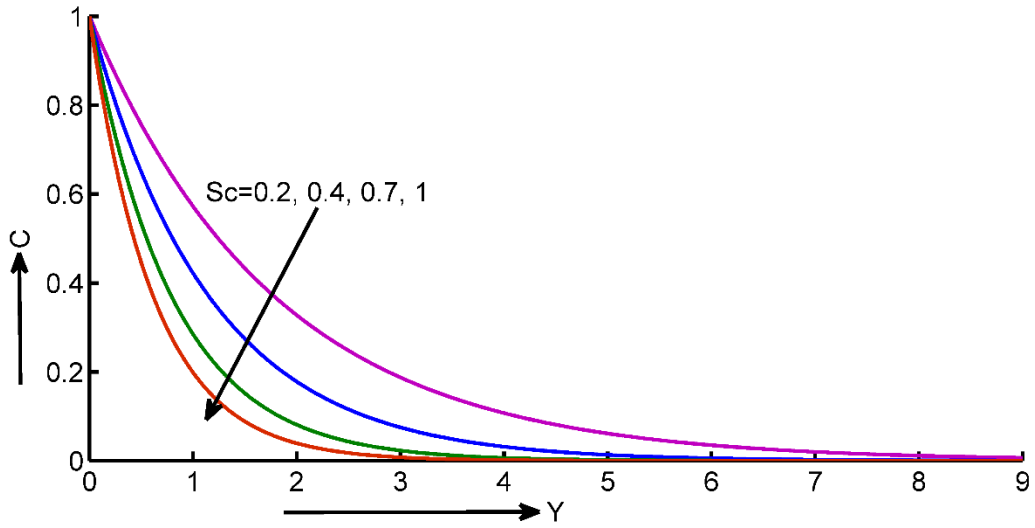


Figure 18: Effect of Schmidt number on Concentration

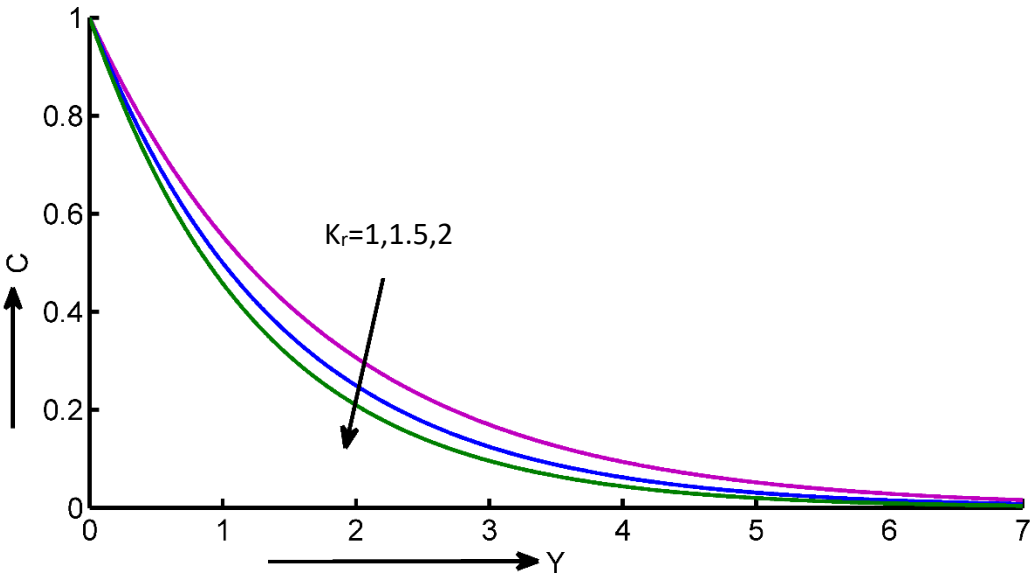


Figure 19: Effect of Chemical Reaction Parameter on Concentration

Table – 1, shows numerical values of skin-friction for various of Grashof number (Gr), modified Grashof number (Gm), Magnetic parameter (M), Permeability parameter (K_p) and Visco elastic parameter(λ) From table 1, we observe that the skin-friction decreases with an increase in Grashof number (Gr), modified Grashof number (Gm), Permeability parameter (K_p) where as it increases under the influence of magnetic parameter and visco elastic parameter.

Table-1:
Variations in Skin Friction

Gr	Gm	M	K_p	λ	τ
1.5	1	1	1	1	1.0513
2	1	1	1	1	0.9445
2.5	1	1	1	1	0.8376
3	1	1	1	1	0.7308
1	1	1	1	1	1.1582
1	1.2	1	1	1	1.0324
1	1.4	1	1	1	0.9067
1	2	1	1	1	0.5296
1	1	0.5	1	1	0.7715
1	1	1	1	1	1.1582
1	1	1.5	1	1	1.6434
1	1	2	1	1	2.1609
1	1	1	0.5	1	1.5568
1	1	1	1	1	1.1582
1	1	1	1.2	1	1.0808
1	1	1	1.6	1	0.9780
1	1	1	1	1	1.1582
1	1	1	1	2	1.1589
1	1	1	1	3	1.1595
1	1	1	1	4	1.1601

Table – 2 demonstrates the numerical values of Nusselt number (Nu) for different values of Prandtl number (Pr), Radiation parameter (R), Heat absorption parameter (S) and Radiation absorption parameter (R_1). From table 2, we notice that the Nusselt number increases with an increase in Prandtl number, Heat absorption parameter (S) and Radiation absorption parameter (R_1) where as it decreases under the influence of Radiation parameter (R).

Table-2:
Variations in Nusselt Number

Pr	R	S	R_1	Nu
0.11	1	2	1	1.7066
0.21	1	2	1	1.7806
0.31	1	2	1	1.8572
0.41	1	2	1	1.9362
0.71	1	2	1	2.1866
0.71	2	2	1	2.4001
0.71	3	2	1	0.6094
0.71	4	2	1	0.4769
0.71	5	2	1	0.4346
0.71	1	2.2	1	2.2268
0.71	1	2.4	1	2.2696
0.71	1	2.6	1	2.3137
0.71	1	2.8	1	2.3583
0.71	1	2	1	2.1866
0.71	1	2	2	2.9572
0.71	1	2	3	3.7278
0.71	1	2	4	4.4985

Table – 3 shows numerical values of Sherwood number (Sh) for the distinction values of Schmidt number (Sc), Chemical reaction parameter (K_r). It can be noticed from Table - 3 that the Sherwood number enhances with rising values of Schmidt number, and the Chemical reaction parameter.

Table-3:

Variations in Sherwood Number

Sc	Kr	Sh
0.1	1	0.3701
0.3	1	0.7178
0.5	1	0.9998
0.7	1	1.2567
0.22	1	0.5917
0.22	2	0.7823
0.22	3	0.9297
0.22	4	1.0544

5. CONCLUSIONS

In this problem, we have studied the multivariate convective heat and mass transfer past a vertical plate through a porous medium in conducting field. In the analysis of the flow the following conclusions are made:

1. Velocity increases with an increase in Grashof number and as well as modified Grashof number, Permeability parameter and Heat absorption parameter of the porous medium while, it decreases in the existence of magnetic parameter, Radiation parameter, Radiation absorption parameter, Schmidt number, Prandtl number and chemical reaction parameter.
2. Temperature increases in the presence of Schmidt number and Heat absorption parameter while it decreases in the presence of Radiation absorption parameter, Heat absorption parameter, Prandtl number, chemical reaction parameter and radiation parameter.
3. Concentration decreases with an increase in Schmidt number and chemical reaction parameter.
4. As significant decrease in seen in skin friction for Grashof number, modified Grashof number and permeability parameter while a increase is seen in the presence of magnetic parameter and visco elastic parameter.
5. The rate of heat transfer increases with Prandtl number, heat absorption parameter and Radiation absorption paremeter where as it decreases with an increase in radiation parameter.
6. The rate of mass transfer increases with Schmidt number and Chemical reaction parameter.

APPENDIX

$$M_1 = \mathrm{M}^2 + 1/\mathrm{Kp} \quad \alpha = \mathrm{R} - \mathrm{S} \quad \mathrm{N}_1 = 1 - \lambda_1 (\mathrm{i}\omega) \quad \mathrm{N}_2 = \mathrm{M}_1 + \mathrm{i}\omega$$

$$m_1 = \frac{ScV_0 + \sqrt{Sc^2V_0^2 + 4K_rSc}}{2} \qquad m_2 = \frac{ScV_0 + \sqrt{Sc^2V_0^2 + 4Sc(K_r + i\omega)}}{2}$$

$$m_3 = \frac{\mathrm{Pr}V_0 + \sqrt{\mathrm{Pr}^2 V_0^{\,2} + 4\alpha}}{2} \qquad m_4 = \frac{\mathrm{Pr}V_0 + \sqrt{\mathrm{Pr}^2 V_0^{\,2} - 4(\alpha - \mathrm{Pr}(i\omega)}}{2}$$

$$m_5 = \frac{V_0 + \sqrt{V^2{}_0 + 4M_1}}{2} \qquad m_6 = \frac{V_0 + \sqrt{V^2{}_0 + 4N_1N_2}}{2}$$

$$b_1 = \frac{R_1}{m_1^2 - \mathrm{Pr}V_0m_1 + \alpha} \qquad b_2 = 1 - b_1 \qquad b_3 = \frac{R_1}{m_2^2 - \mathrm{Pr}V_0m_2 + (\alpha - \mathrm{Pr}(i\omega))}$$

$$b_4 = 1 - b_{31} \qquad b_5 = \frac{-(b_1Gr + Gm)}{m_1^2 - V_0m_1 - M_1} \qquad b_6 = \frac{-b_2Gr}{m_3^2 - V_0m_3 - M_1} \qquad b_7 = 1 - (b_5 + b_6)$$

$$b_8 = \frac{-(b_3Gr + Gm)}{N_1m_2^2 - V_0m_2 - N_2} \qquad b_9 = \frac{-b_4Gr}{N_1m_4^2 - V_0m_4 - N_2} \qquad b_{10} = 1 - (b_8 + b_9)$$

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RESEARCH ARTICLE OPEN ACCESS

Radiation Absorption and Chemical Reaction Effects on MHD Radiative Heat Source/Sink Fluid Past a Vertical Porous Plate

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ABSTRACT
An analysis of radiation absorption and chemical reaction effects on unsteady MHD radiative heat source/sink fluid past a vertical porous plate have been discussed. The dimensionless governing equations are linear and coupled. These equations aresolved analytically by using perturbation technique. The expressions for velocity, temperature and concentration are obtained anddiscussed their variations under several parameters through graphs. The skin-friction, rate of heat transfer in the form of Nusseltnumber and the rate of mass transfer in the form of Sherwood number are also derived and discussed through tables.
Key words: Radiation absorption, Chemical reaction, MHD, Heat source/sink, Porous plate.

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I. INTRODUCTION

The study of magneto hydrodynamics (MHD) plays an important role in agriculture, engineering and petroleum industries. MHD has won practical applications, for instance, it may be used to deal with problems such as cooling of nuclear reactors by liquid sodium and induction flow water which depends on the potential difference in the fluid direction perpendicular to the motion and goes to the magnetic field and also study of MHD of viscous conducting fluids is playing a significant role, owing to its practical interest and abundant applications, in astro-physical and geo-physical phenomenon. Astro-Physicists and geo-physicists realized the importance of MHD in stellar and planetary processes. The main impetus to the engineering approach to the electromagnetic fluid interaction studies has come from the concept of the magneto hydro dynamics, direct conversion generator, ion propulsion study of flow problems of electrically conducting fluid, particularly of ionized gases is currently receiving considerable interest. Such studies have made for years in convection with astro-physical and geo-physical problems such as Sun spot theory, motion of the interstellar gas etc. Recently, some engineering problems need the studies of the flow of an electrically conducting fluid, in ionized gas is called plasma. Many names have been used in referring to the study of plasma phenomena.

The MHD generation process is based on Faraday's electro-magnetic induction law. So Magneto-hydrodynamic generator generates thermal energy or kinetic energy of a moving conducting fluid into directly electrical energy. Examples of such kind of fluids are ionized gas, plasma, liquid metals, and seawater. It's a plasma technology. The gas is continuously seeded with potassium nitrate, making the gas electrically conductive at lower temperatures. The alkali metal ionizes easily at lower temperatures. MHD generators are different from conventional electric generators in that they can operate at high temperatures without moving parts.

Unsteady MHD convective flow of rivlin-ericksen fluid over an infinite vertical porous plate with absorption effect and variable suction was studied by Veera sankar et al. [1]. Anuradha Punithavalli [2] studied the MHD boundary layer flow of a steady micro polar fluid along a stretching sheet with binary chemical reaction . Rama Krishna Reddy et al. [3] have examined the MHD free convective flow past a porous plate. Karuna Dwivedi et al. [4] have investigated the MHD flow through a horizontal channel containing porous medium placed under an inclined magnetic field. Chandra Reddy et al.[5] studied the MHD natural convective heat generation/absorbing and radiating fluid past a vertical plate embedded in porous medium – an exact solution .

Chemical reaction engineering (reaction engineering or reactor engineering) is a specialty in chemical engineering or industrial chemistry dealing with chemical reactors. Frequently the term relates specifically to catalytic reaction systems where either a homogeneous or heterogeneous catalyst is present in the reactor. Sometimes a reactor per se is not present by itself, but rather is integrated into a process, for example in reactive separations vessels, retorts, certain fuel cells, and photocatalytic surfaces. The issue of solvent effects on reaction kinetics is also considered as an integral part. Reactor Design uses information, knowledge and experience from a variety of areas - thermodynamics, chemical kinetcs, fluid mechanics, heat and mass transfer and economics. Chemical Reaction Engineering is the synthesis of all these factors with the aim of properly designing a Chemical Reactor.

Effects of Chemical Reaction on Unsteady MHD Casson Fluid flow past a moving Infinite Inclined Plate through Porous Medium was studied by Balakrishna et al. [6]. Rama Mohan et al. [7] Studied chemical reaction and thermal radiation effects on unsteady MHD free convection flow past an inclined moving plate with TGHS. Arifuzzaman et al. [8] was discussed chemically reactive and naturally convective high speed MHD fluid flow through an oscillatory vertical porous plate with heat and radiation absorption effect. Chemical reaction effect on MHD boundary-layer flow of two-phasenanofluid model over an exponentially stretching sheet with a heatgeneration was discussed by Eid [9]. Muthuraj et al.[10] was studied influences of chemical reaction and wallproperties on MHD Peristaltic transport of a Dusty fluid with Heat and Mass transfer. Chemical Reaction and radiation absorption effects on MHD convective heat and mass transfer flow of a viscoelastic fluid past an oscillation porous plate with heat generation/absorption studied by Ramaiah et al.[11].

The Study of heat generation or absorption effects in moving fluids is important in view of several physical problems such as fluids under-going exothermic or endothermic chemical reactions. The volumetric heat generation has been assumed to be constant or a function of space variable. For example, a hypothetical core-disruptive accident in a Liquid Metal Fast Breeder Reactor (LMFBR) could result in the setting of fragmented fuel debris on horizontal surfaces below the core. The porous debris could be saturated sodium coolant and heat generation will result from the radioactive decay of the fuel particulate.

Chemical reaction and radiation absorption effects on MHD convective heat and mass transfer flow of a visco-elastic fluid past an oscillating porous plate with heat generation / absorption was studied by Ramaiah et al. [12]. Recently researchers [13-21] showed interest in this area.

II. FORMULATION OF THE PROBLEM

Continuity equation:

$$\frac{\partial v^*}{\partial y^*} = 0 \tag{1}$$

Momentum equation:

$$\frac{\partial u^*}{\partial t^*} + V^* \frac{\partial u^*}{\partial y^*} = \vartheta \frac{\partial^2 u^*}{\partial y^{*2}} + g\beta\ (T^* - T_\infty) + gB^*(C^* - C_\infty) - \frac{\sigma B_0^2}{\rho} u^* - \frac{\vartheta}{K^*} u^* \tag{2}$$

Energy equation:

$$\frac{\partial T^*}{\partial t^*} + V^* \frac{\partial T^*}{\partial y^*} = \frac{K}{\rho C_p} \frac{\partial^2 T^*}{\partial y^{*2}} + \frac{1}{\rho C_p} \frac{\partial q_r}{\partial y^*} - \frac{Q_0}{\rho C_p}(T^* - T_\infty) - \frac{L_1}{\rho C_p}(C^* - C_\infty) \tag{3}$$

Concentration equation:

$$\frac{\partial C^*}{\partial t^*} + V^* \frac{\partial C^*}{\partial y^*} = D \frac{\partial^2 C^*}{\partial y^{*2}} - K^*(C^* - C_\infty) \tag{4}$$

The relevant boundary conditions are given as follows

$$u^* = L^*(\frac{\partial u^*}{\partial y^*}),\quad T^* = T_w^* + (T_w^* - T_\infty^*)e^{i\omega^* t^*},\ C^* = C_w^* + (C_w^* - C_\infty^*)e^{i\omega^* t^*} \text{ at } y^* = 0 \quad (5)$$

$$u^* \to 0, \qquad T^* \to T_\infty^*, \qquad C^* \to C_\infty^* \qquad \text{as} \quad y^* \to \infty$$

Where T_w^* and T_∞^* is the temperature at the wall and infinity, C_w^* and C_∞^* is the species

Eq.(1) gives that V* = Constant = - V_0 (6)

Where V_0 is the constant suction velocity normal to the plate.

On introducing the following non-dimensional quantities,

$$u = \frac{u^*}{v_0^*}, y = \frac{v_0^* y^*}{\vartheta}, \theta = \frac{T^* - T_\infty^*}{T_w^* - T_\infty^*}, C = \frac{C^* - C_\infty^*}{C_w^* - C_\infty^*}, \Pr = \frac{\mu C_p}{K}, Sc = \frac{\vartheta}{D}, M = \frac{\sigma B_0^2 \vartheta}{\rho v_0^{*2}},$$

$$Gr = \frac{\vartheta g \beta_T (T_w^* - T_\infty^*)}{v_0^{*3}}, Gc = \frac{\vartheta g \beta_c^* (C_w^* - C_\infty^*)}{v_0^{*3}}, \quad K = \frac{v_0^{*2} K}{\vartheta^2}, t = \frac{t^* v_0^{*2}}{4\vartheta}, h = \frac{v_0 L^*}{\vartheta},$$

$$\gamma = \frac{\vartheta K_1}{v_0^{*2}}, R = \frac{4I^* \vartheta}{\rho C_p v_0^{*2}}, F = \frac{Q_0 v}{\rho C_p v_0^{*2} v_0^2}, L = \frac{L_1 \upsilon\ (C_w^* - C_\infty^*)}{\rho C_p v_0^{*2} (C_w^* - C_\infty^*)}, \quad (7)$$

The governing equations (2) to (4) can be rewritten in the non-dimensional form as follows

$$\frac{1}{4}\frac{\partial u}{\partial t} - (1 + \varepsilon A e^{i\omega t})\frac{\partial u}{\partial y} = \frac{\partial^2 u}{\partial y^2} + Gr\theta + GcC - M_1 u \quad (8)$$

$$\frac{1}{4}\frac{\partial \theta}{\partial t} - (1 + \varepsilon A e^{i\omega t})\frac{\partial \theta}{\partial y} = \frac{1}{\Pr}\frac{\partial^2 \theta}{\partial y^2} + F_1\theta + LC \quad (9)$$

$$\frac{Sc}{4}\frac{\partial C}{\partial t} - Sc(1 + \varepsilon A e^{i\omega t})\frac{\partial C}{\partial y} = \frac{\partial^2 C}{\partial y^2} - Sc\gamma C \quad (10)$$

The corresponding boundary conditions are given by

$$u = h(\frac{\partial u}{\partial y}),\ \theta = 1 + \varepsilon e^{i\omega t}, C = 1 + \varepsilon e^{i\omega t}, \quad at \quad y = 0$$

$$u \to 0, \quad \theta \to 0, \quad C \to 0 \quad as \quad y \to \infty \quad (11)$$

III. SOLUTION OF THE PROBLEM

The equations (8) to (10) are coupled, non-linear partial differential equations and these cannot be solved inclosed form. However, these equations can be reduced to a set of ordinary differential equations, which canbe solved analytically. So this can be done, when the amplitude of oscillations (ε<<1) is very small, we canassume the solutions of flow velocity u, temperature field θ and concentration C in the neighborhood of theplate as:

$$u(y,t) = u_0(y) + \varepsilon e^{i\omega t} u_1(y)$$

$$\theta(y,t) = \theta_0(y) + \varepsilon e^{i\omega t}\theta_1(y) \quad (12)$$

$$C(y,t) = C_0(y) + \varepsilon e^{i\omega t} C_1(y)$$

Substituting equations (12) into equation (8)–(10) and equating the coefficients at the terms with the same powers of ε, and neglecting the terms of higher order, the following equations are obtained.

Zero order terms:

$$u_0'' + u_0' - M_1 u_0 = -Gr\ \theta_0 - Gc\ C_0 \quad (13)$$

$$\theta_0'' + \Pr\theta_0' + \Pr F_1 Q\ \theta_0 = -PrL\ C_0 \quad (14)$$

$$C_0'' + Sc\ C_0' - \mathrm{Sc}\gamma C_0 = 0 \tag{15}$$

First order terms :

$$u_1'' + u_1' - (\mathrm{M}_1 + \frac{i\omega}{4})\mathrm{u}_1 = -\mathrm{Gr}\,\theta_1 - \mathrm{Gc}\,C_1 - \mathrm{A}u_0' \tag{16}$$

$$\theta_1'' + \mathrm{Pr}\,\theta_1' + \mathrm{Pr}(\mathrm{F}_1 - \mathrm{i}\omega/4)\mathrm{Q})\,\theta_1 = -\mathrm{PrA}\,\theta_0' - \mathrm{PrLC}_1 \tag{17}$$

$$C_1'' + ScC_1' - Sc(\gamma + \frac{i\omega}{4})C_1 = -\mathrm{Sc}\mathrm{A}C_0' \tag{18}$$

The corresponding boundary conditions are

$$u_0 = h(\frac{\partial u_0}{\partial y}), u_1 = h(\frac{\partial u_1}{\partial y})\ , \theta_0 = 1, \theta_1 = 1, C_0 = 1, C_1 = 1 \quad at \quad y = 0$$
$$u_0 \to 0, u_1 \to 0, \theta_0 \to 0, \theta_1 \to 0, C_0 \to 0, C_1 \to 0 \qquad as \quad y \to \infty \tag{19}$$

Solving equations (13) – (18) under the boundary conditions (19), the following solutions are obtained

$$C_0 = \exp(-m_1 y) \tag{20}$$

$$\theta_0 = B_1 \exp(-m_1 y) + B_2 \exp(-m_2 y) \tag{21}$$

$$u_0 = B_3 \exp(-m_1 y) + B_4 \exp(-m_2 y) + B_5 \exp(-m_3 y) \tag{22}$$

$$C_1 = B_6 \exp(-m_1 y) + B_7 \exp(-m_4 y) \tag{23}$$

$$\theta_1 = B_8 \exp(-m_1 y) + B_9 \exp(-m_2 y) + B_{10} \exp(-m_4 y) + B_{11} \exp(-m_5 y) \tag{24}$$

$$u_1 = B_{12} \exp(-m_1 y) + B_{13} \exp(-m_2 y) + B_{14} \exp(-m_3 y) + B_{15} \exp(-m_4 y) + B_{16} \exp(-m_5 y) + B_{17} \exp(-m_6 y) \tag{25}$$

Substituting equations(20)–(25)inequation (12) we obtain the velocity temperature and concentration field:

$$u = B_3 \exp(-m_1 y) + B_4 \exp(-m_2 y) + B_5 \exp(-m_3 y) + \varepsilon(B_{12} \exp(-m_1 y) + B_{13} \exp(-m_2 y) + B_{14} \exp(-m_3 y) + B_{15} \exp(-m_4 y) + B_{16} \exp(-m_5 y) + B_{17} \exp(-m_6 y))e^{i\omega t} \tag{26}$$

$$\theta = B_1 \exp(-m_1 y) + B_2 \exp(-m_2 y) + \varepsilon(B_8 \exp(-m_1 y) + B_9 \exp(-m_2 y) + B_{10} \exp(-m_4 y) + B_{11} \exp(-m_5 y))e^{i\omega t} \tag{27}$$

$$C = \exp(-m_1 y) + \varepsilon(B_6 \exp(-m_1 y) + B_7 \exp(-m_4 y))e^{i\omega t} \tag{28}$$

Skin Friction:

The non-dimensional skin friction at the surface is given by

$$\tau = -\left(\frac{\partial u}{\partial y}\right)_{y=0}$$

$$\tau = (m_1 B_3 + m_2 B_4 + m_3 B_5) + \varepsilon(m_1 B_{12} + m_2 B_{13} + m_3 B_{14} + m_4 B_{15} + m_5 B_{16} + m_6 B_{17})e^{i\omega t} \tag{29}$$

NusseltNumber :

The rate of heat transfer in terms of the Nusselt number is given by

$$Nu = -\left(\frac{\partial \theta}{\partial y}\right)_{y=0}$$

$$Nu = m_1 B_1 + m_2 B_2 + \varepsilon(m_1 B_8 + m_2 B_9 + m_4 B_{10} + m_5 B_{11})e^{i\omega t} \tag{30}$$

Sherwood Number :

The rate of mass transfer on the wall in terms of Sherwood number is given by

$$Sh = -\left(\frac{\partial \phi}{\partial y}\right)_{y=0}$$

$$Sh = m_1 + \varepsilon(m_1 B_6 + m_4 B_7)e^{i\omega t} \qquad (31)$$

IV. RESULTS AND DISCUSSION

In order to get a physical insight into the problem numerical calculations are carried out for theVelocity, Temperature and concentration profiles and the following discussion is set out.Throughout the computations we employ, Sc=0.22,Pr=0.71,Gr=5,Gc=1,γ=2,K=3,F=**0.**1,M=3, E=0.01,t=1,R=0.1,**ω=π/3, L**=0.02. h=0.5,A=1.

In order to reveal the effects of various parameters on the dimensionless velocity fields, temperature field, concentration field, skin friction, Nusselt number and Sherwood number and the effect of the various physical parameters such as the Grashof number (Gr), the modified Grashof number (Gc),Magnetic parameter (M), Porosity parameter(K), Prandtl number (Pr), Heat absorption parameter(F), Radiation Parameter (R),Radiation absorption Parameter (L),Schmidt number(Sc) and Chemical reaction parameter(γ) on velocity, temperature and concentration we draw a number of figures marked as figs. 1-10 and study these by choosing arbitrary values. The influence of these parameters on skin friction, Nusselt number and Sherwood number is also shown in Tables 1 – 3.

Figs. 1 – 4 demonstrate the variations of the fluid velocity under the effects of different parameters. In Fig.1, we represent the velocity profile for different values of Grashof number(Gr). From this figure it is noticed that, velocity increases with increases in Gr. In Fig.2 the effect of modified Grashof number (Gc) on velocity is presented. As Gc increases, velocity also increases.Fig.3, depicts the variations in velocity profiles for different values of permeability parameter (K). From where it is noticed that, velocity increases as K increases. In Fig. 4, velocity profiles are displayed with the variation in magnetic parameter (M). From this figure it is noticed the velocity gets reduced by the increase of magnetic parameter (M).

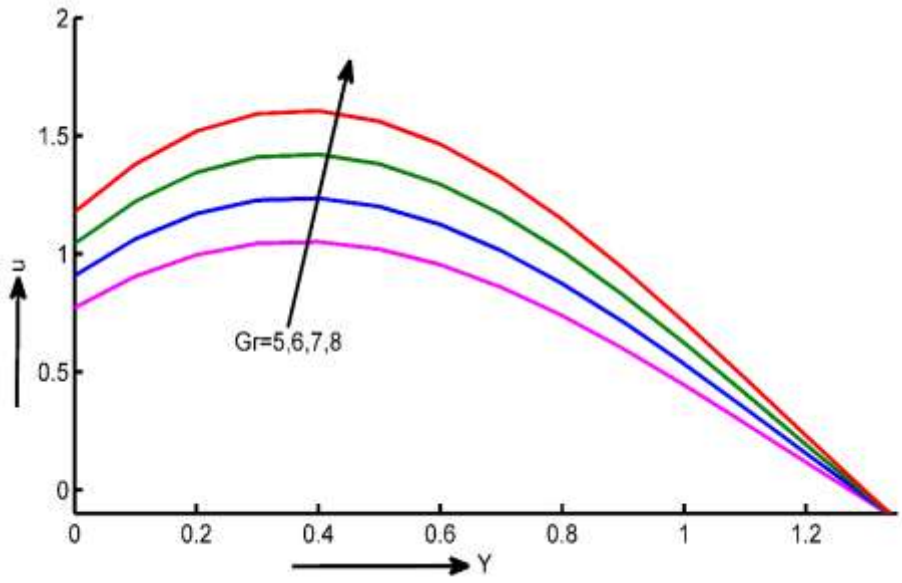


Figure 1: Effect of Thermal Grashof number on Velocity

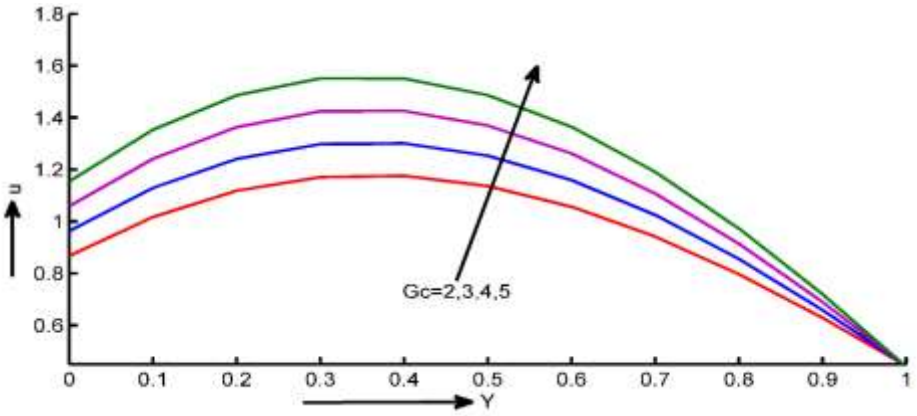


Figure 2: Effect of Modified Grashof number on Velocity

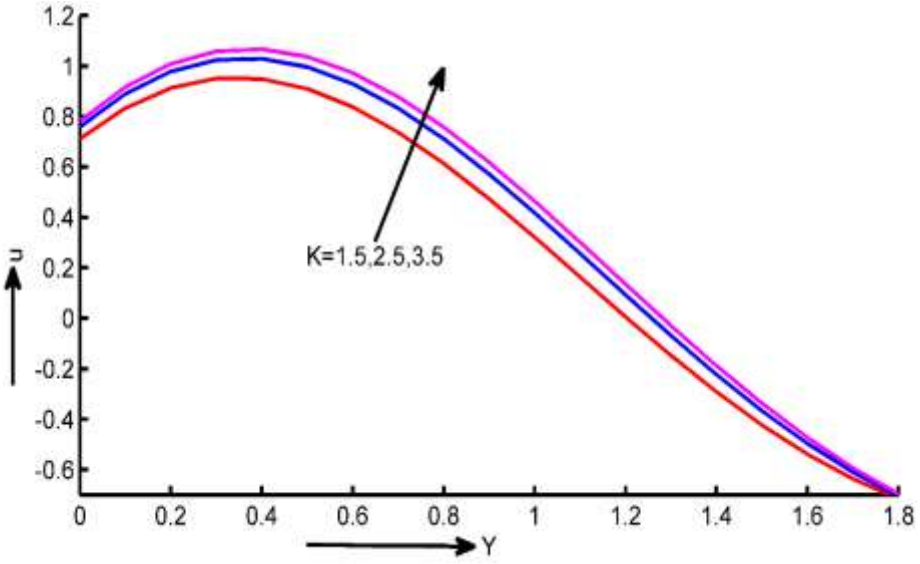


Figure 3: Effect of Porosity parameter on Velocity

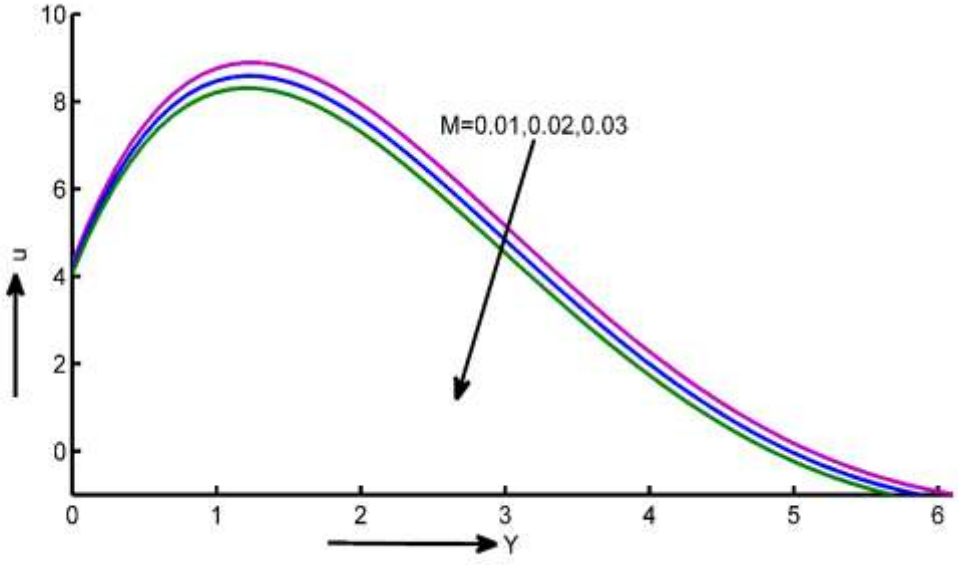


Figure 4: Effect of Magnetic parameter on Velocity

Figures 5– 8, display the variations of the fluid temperature under the effects of different parameters. From Fig5-7, it is clear that temperature decreases with the increase in Prandtal number (Pr),Radiation Parameter (R),Heat source parameter(F) .and In Fig 8, the effect of Radiation absorption Parameter (L), shown on the temperature profile. From these figure observed that temperature increases with an increase values in L.

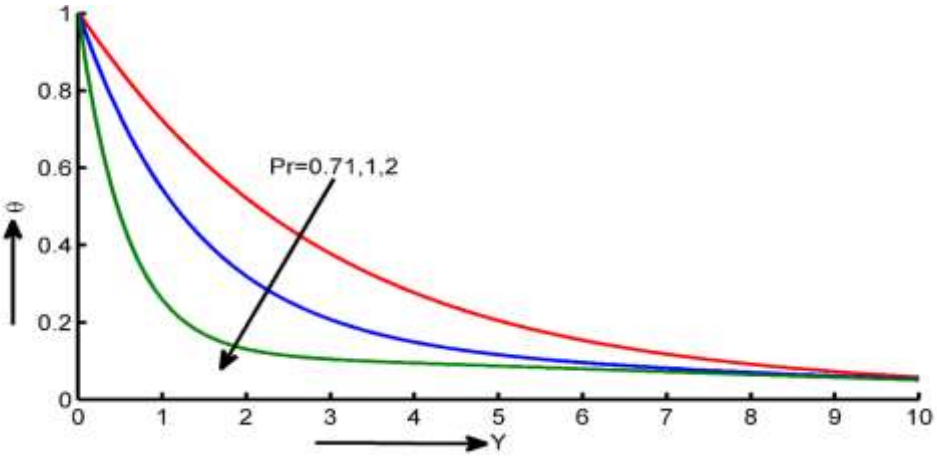


Figure 5: Effect of Prandtl number on Temperature

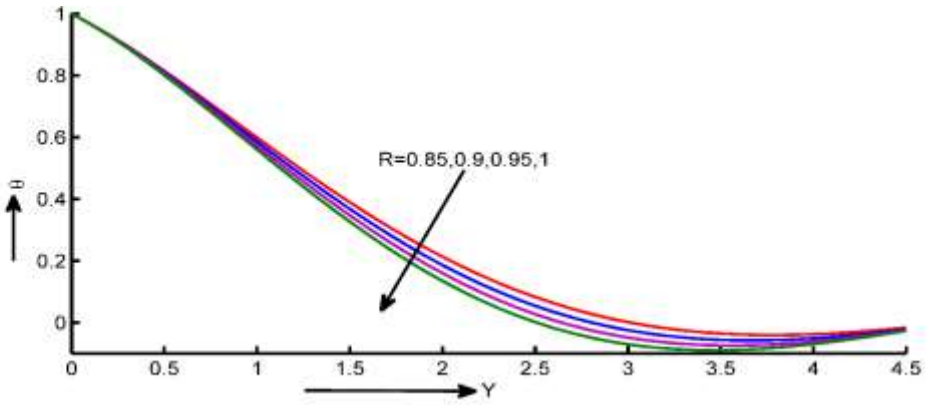


Figure 6: Effect of Radiation parameter on Temperature

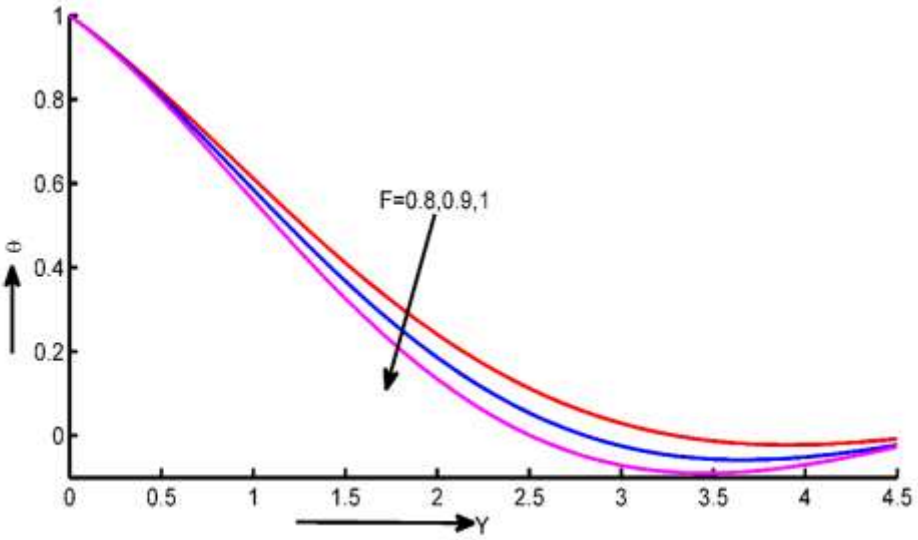


Figure 7: Effect of Heat source parameter on Temperature

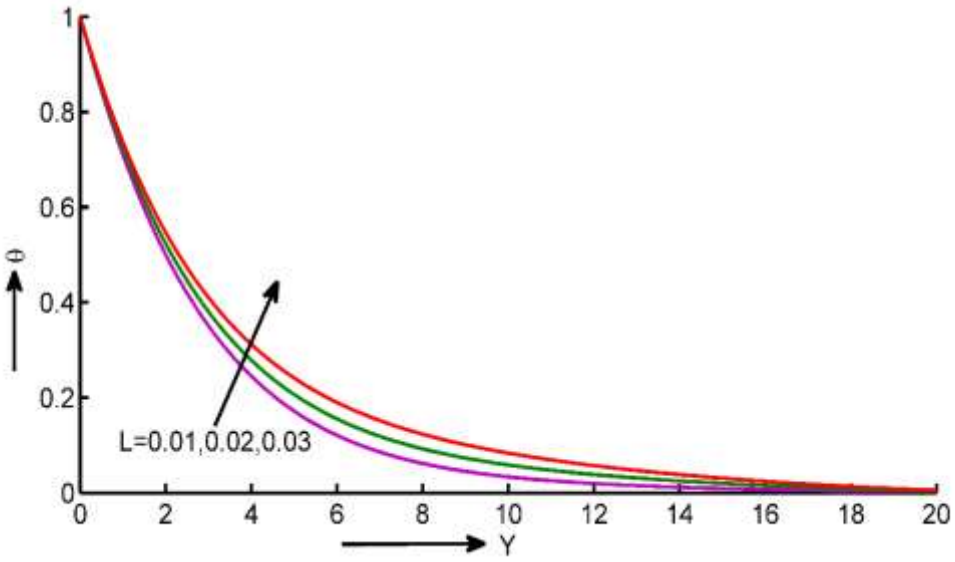


Figure 8: Effect of Radiation absorption on Temperature

To analyze the effect of Schmidt parameter(Sc) on the concentration profile in Fig.9. The result shows that the concentration field decreases when increases Sc. Fig.10 depicts the variations in Concentration profile for different values of Chemical Reaction Parameter(γ). From this figure it is noticed that, Concentration decreases when γ increases.

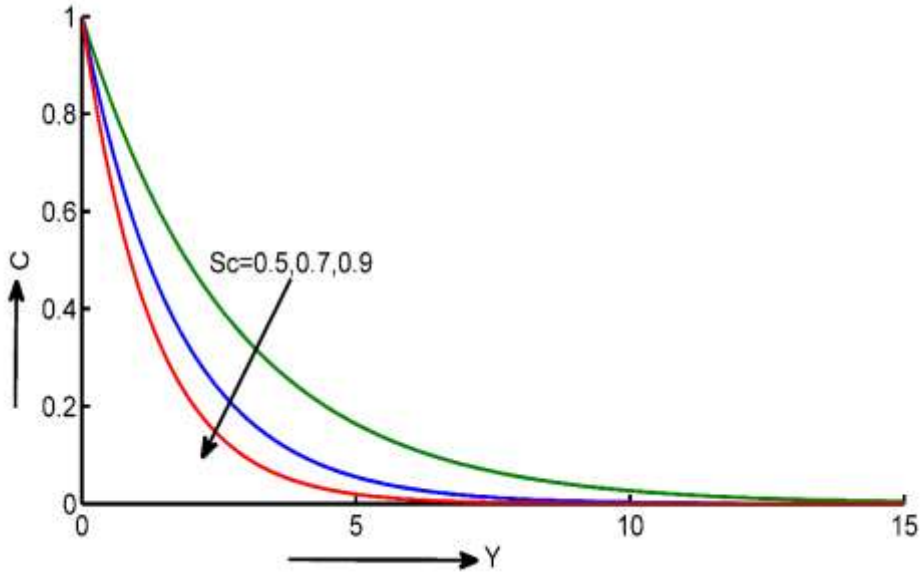


Figure 9: Effect of Schmidt number on Concentration

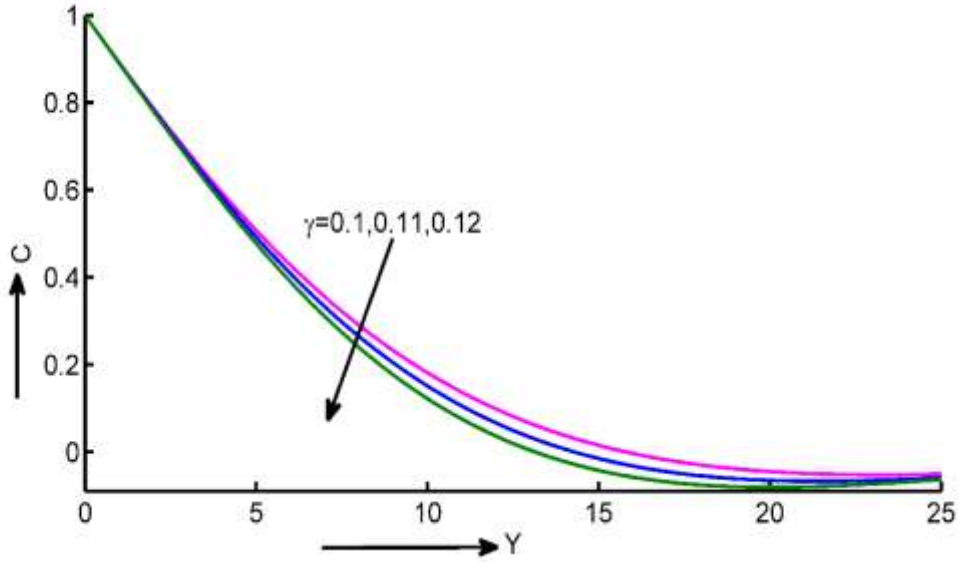


Figure 10: Effect of Chemical Reaction Parameter on Concentration

Table – 1, shows numerical values of skin-friction for various of Grashof number (Gr), modified Grashof number (Gc), Magnetic parameter (M), Porosity parameter (K) .From table 1, we observe that the skin-friction increases with an increase in Grashof number (Gr), modified Grashof number (Gm), Porosity parameter (K) where as it decreases under the influence of magnetic parameter .

Table-1:
Variations in Skin Friction

Gr	Gc	M	K	T
5				1.4843
6				1.7346
7				1.9820
8				2.2264
	2			1.6635
	3			1.8427
	5			2.2011
	7			2.5595
		0.1		5.6159
		0.2		4.9710
		0.3		4.5041
			0.5	1.0426
			0.6	1.1105
			0.7	1.1639

Table – 2 demonstrates the numerical values of Nusselt number (Nu) for different values of Prandtl number (Pr), Radiation parameter (R), Heat source parameter (F) and Radiation absorption parameter (L). From table 2, we notice that the Nusselt number increases with an increase in Prandtl number, Radiation parameter (R) ,Heat absorption parameter (F) and where as it decreases under the influence of Radiation absorption parameter (L).

Table-2:
Variations in Nusselt Number

Pr	R	F	L	Nu
0.3				0.1500
0.5				0.2500
0.71				0.3543
	0.1			0.1197
	0.5			0.5471

	0.7			0.6617
		0.4		0.4772
		0.6		0.6073
		0.8		0.7145
			0.1	0.0562
			0.2	-0.0231
			0.3	-0.1024
			0.4	-0.1818

Table – 3 shows numerical values of Sherwood number (Sh) for the distinction values of Schmidt number (Sc), Chemical reaction parameter (γ). It can be noticed from Table - 3 that the Sherwood number enhances with rising values of Schmidt number, and the Chemical reaction parameter.

Table-3:
Variations in Sherwood Number

Sc	Γ	Sh
0.2		0.6409
0.4		0.9088
0.6		1.1127
0.8		1.2823
	2	0.6725
	3	0.8319
	4	0.9672
	5	1.0873

V. CONCLUSIONS

In this problem, we have studied the radiation absorption and chemical reaction effects on unsteady MHD radiative heat source/sink fluid past a vertical porous plate. In the analysis of the flow the following conclusions are made:

1. Velocity increases with an increase in Grashof number and as well as modified Grashof number and Permeability parameter of the porous medium while, it decreases in the existence of magnetic parameter.
2. Temperature increases in the presence of Radiation absorption parameter while it decreases in the presence of Radiation parameter, Heat source parameter and Prandtl number.
3. Concentration decreases with an increase in Schmidt number and chemical reaction parameter.
4. As significant increase in seen in skin friction for Grashof number, modified Grashof number and permeability parameter while a decrease is seen in the presence of magnetic parameter.
5. The rate of heat transfer increases with Prandtl number, heat source parameter and Radiation paremeter where as it decreases with an increase in radiation absorption parameter.
6. The rate of mass transfer increases with Schmidt number and Chemical reaction parameter.

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Influence of an inclined magnetic field and radiation on unsteady free convective flow of a fluid through a porous medium in a channel with adiabatic

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Abstract:

In view of these, we studied the unsteady free convective flow of an incompressible viscous electrically conducting fluid through a porous medium under the action of an inclined magnetic field between two heated vertical plates by keeping one plate is adiabatic. The governing equations of velocity and temperature fields with appropriate boundary conditions are solved by using perturbation technique. The effects of various physical parameters on the velocity and temperature fields are discussed in detail with the help of graphs.

1. INTRODUCTION

The interaction between the magnetic field and the conducting fluid drastically modifies the flow, with effects on such significant flow properties as heat transfer, the fact character of which is strongly dependent on the orientation of the magnetic field. When fluid flows through a magnetic field, an electric field or consequently a current may be induced, and in turn the current interacts with the magnetic field to produce a body force on fluid. The production of this current has led to MHD power generators, MHD devices, nuclear engineering and the possibility of thermonuclear power has created a great practical need for understanding the dynamics of conducting. The influence of a magnetic field in viscous incompressible flow of electrically conducting fluid is of use in extrusion of plastics in the manufacture of rayon, nylon etc. The unsteady transient free convection flow of an incompressible dissipative viscous fluid past an infinite vertical plate on taking into account the viscous dissipative heat under the influence of a uniform transverse magnetic field was analyzed by Sreekant et al [1]. (2001). Gourla and Katoch [2] (1991) have studied the unsteady free convection MHD flow between two heated vertical plates. Recently, Bhaskar [3] (2013) have studied the unsteady free convection MHD flow of an incompressible viscous electrically conducting fluid under the action of transverse uniform magnetic field between two heated vertical plates by keeping one plate adiabatic. MHD Poiseuille flow between two infinite parallel porous plates in an inclined magnetic field was analyzed by Manyonge et al [4] (2012). The unsteady MHD poiseuille flow between two infinite parallel plates in an inclined magnetic field with heat transfer has been studied by Idowu et al [5] (2014). Simon [6] (2014) have investigated the effect of heat of transfer on unsteady MHD couette flow between two infinite parallel porous plates in an inclined magnetic field.

However, flow through a porous medium has been of significant interest in recent years particularly among geophysical fluid dynamicists. Examples of natural porous media are beach sand, stand stone, limestone, rye bread, wood, the human lung, bile duct, gall bladder with stones and in small blood vessels. Influence of MHD and radiation effects on oscillatory flow through a porous medium with constant suction velocity has been studied by El-Hakeem [7] (2000). Makinde and Mhone [8] (2005) have investigated the heat transfer and MHD effects on an oscillatory flow in a channel filled with porous medium.

Recently Raghunath and Siva Prasad [9] have investigated Heat and mass transfer on MHD flow of Non-Newtonian fluid over an infinite vertical

porous plate. Raghunath and Siva [10] Prasad Indigested Heat and mass transfer on Unsteady MHD flow of a second grade fluid through porous medium between two vertical plates.

2. MATHEMATICAL FORMULATION

We consider the free convective unsteady MHD flow of a viscous incompressible electrically conducting fluid between two heated vertical parallel plates filled with porous medium. Let x -axis be taken along the vertically upward direction through the central line of the channel and the y -axis is perpendicular to the x-axis. The plates of the channel are kept at $y=\pm h$ distance apart. A uniform magnetic field B_0 acts at an angle α $\left(0\le\alpha\le\frac{\pi}{2}\right)$, to the y-axis u is the velocity in the direction of flow of fluid, along the x -axis and v is the velocity along the y-axis. Consequently, u is a function of y and t, but v is independent of y . The fluid is assumed to be of low conductivity, such that the induced magnetic field is negligible. In order to derive the equations of the problem, we assume that the fluid is finitely conducting and the viscous dissipation the Joule heats are neglected. The polarization effect is also neglected.

At time $t>0$, the temperature of the plate at $y = h$ changes according to the temperature function: $T=T_0+(T_w-T_0)(1-e^{-n't'})$, where T_w and T_0 are the temperature at the plates $y=h$ and at $y=-h$ respectively, and $n(\ge 0)$ is a real number, denoting the decay factor. The equations governing the flow field are given by

$$\frac{\partial v}{\partial y}=0 \qquad (1)$$

$$\frac{\partial u}{\partial t}=\nu\frac{\partial^2 u}{\partial y^2}+g\beta(T-T_0)-\left(\frac{\nu}{k}+\frac{\sigma B_0^2}{\rho}\cos^2\alpha\right)u \qquad (2)$$

$$\frac{\partial T}{\partial t}=\frac{K}{\rho c_p}\frac{\partial^2 T}{\partial y^2}-\frac{1}{\rho c_p}\frac{\partial q}{\partial y} \qquad (3)$$

here ρ is the density of the fluid, B_0 is the magnetic field strength, σ is the electrical conductivity of the fluid, ν is the co-efficient of kinematic viscosity, k is the permeability of the porous medium. K is the thermal conductivity of the fluid, c_p is the specific heat at constant pressure, β is the co-efficient of thermal expansion, g is the acceleration due to gravity, T is the temperature of the fluid and q is the radiative heat flux. Following Cogley et al. (1968), it is assumed that the fluid is optically thin with a relatively low density and the radiative heat flux is given by

$$\frac{\partial q}{\partial y}=4\alpha_1^{\,2}\left(T_0-T\right) \qquad (4)$$

here α_1 is the mean radiation absorption coefficient.

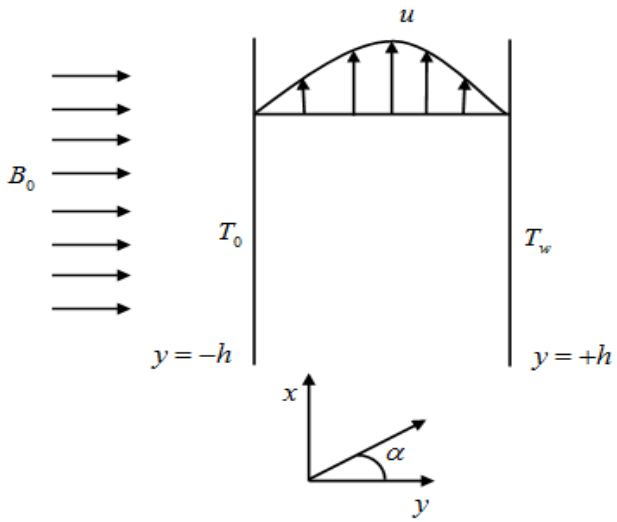


Fig. 2.1 The physical model

The initial and boundary conditions for the problem are

$$t=0:\quad u=0, T=T_0 \quad \text{for all } -h\le y\le h$$

$$t>0: u=0, T=T_0+(T_w-T_0)(1-e^{-nt}) \quad \text{for } y=h$$

$$u=0, \frac{\partial T}{\partial y}=0 \quad \text{for } y=-h \qquad (5)$$

The non-dimensional variables are

$$\bar{u}=\frac{\nu u}{\beta g h^2(T_w-T_0)}, \bar{y}=\frac{y}{h}, \bar{T}=\frac{T-T_0}{T_w-T_0},$$

$$\bar{t}=\frac{\nu t}{h^2}, P_r=\frac{\mu C_p}{K}, \bar{n}=\frac{h^2 n}{\nu}, M=B_0 h\sqrt{\frac{\sigma}{\mu}}$$

$$Da = \frac{k}{h^2},\ R^2 = \frac{4\alpha_1{}^2 h^2}{k} \tag{6}$$

in which $\Pr$ is the Prandtl number, Da is the Darcy number and M is the Hartmann number.

Using the non-dimensional variables (5) in to the equations (2) and (3), we obtain

$$\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial y^2} - N^2 u + T \tag{7}$$

$$\Pr \frac{\partial T}{\partial t} = \frac{\partial^2 T}{\partial y^2} + R^2 T \tag{8}$$

here $N = \sqrt{\frac{1}{Da} + M^2 \cos^2 \alpha}$.

Under the above non-dimensional quantities, the corresponding boundary conditions reduces to

$$\begin{aligned} &t = 0: \ u = 0, T = 0 && \text{for} && -1 \le y \le 1 \\ &t > 0: u = 0, T = (1 - e^{-nt}) && \text{for} && y = 1 \\ &u = 0, \frac{\partial T}{\partial y} = 0 && \text{for} && y = -1 \end{aligned} \tag{9}$$

3. SOLUTION OF THE PROBLEM

We look for a regular perturbation series solution to solve the Equations (7) and (8) of the form

$$u = u_o(y) + e^{-nt} u_1(y) \tag{10}$$

$$T = T_0(y) + e^{-nt} T_1(y) \tag{11}$$

Substituting Equations (10) and (11) into the Equations (6) – (8) and solving the resultant Equations, we obtain

$$\begin{aligned} u = &\left[\begin{array}{l} c_1 \cosh Ny + c_2 \sinh Ny \\ + \dfrac{\cos R(1+y)}{(R^2 + N^2)\cos 2R} \end{array} \right] \\ &+ \left(\begin{array}{l} c_3 \cosh m_2 y + c_4 \sinh m_2 y \\ - \left(\dfrac{1}{m_1^2 + m_2^2} \right) \dfrac{\cos m_1 (1+y)}{\cos 2m_1} \end{array} \right) e^{-nt} \end{aligned} \tag{12}$$

and

$$T = \frac{\cos R(1+y)}{\cos(2R)} - \frac{\cos m_1 (1+y)}{\cos(2m_1)} e^{-nt} \tag{13}$$

Here $m_1 = \sqrt{R^2 + n \Pr}$ and $m_2 = \sqrt{N^2 - n}$.

The rate of heat transfer coefficient in terms of Nusselt number Nu at the plate $y = 1$of the channel is given by

$$Nu = -\left. \frac{\partial \theta}{\partial y} \right|_{y=1} = R \tan 2R - \left(m_1 \tan(2m_1) \right) e^{-nt} \tag{14}$$

As $\alpha \to 0$ and $Da \to \infty$ our results coincides with the results of Bhaskar (2013).

4. RESULTS AND DISCUSSIONS

In order to see the effect of various physical parameters on the velocity and temperature, we plotted Figs. 2 – 6. The variation of velocity u with inclination angle α for $\Pr = 0.71$, $M = 1$, $Da = 0.1$, $n = 1$ and $t = 1$ is shown in **Fig. 2** It is found that, the velocity increases with an increase in α. **Fig. 3** depicts the variation of velocity u with Hartmann number M for $\Pr = 0.71$, $Da = 0.1$, $\alpha = \frac{\pi}{6}$, $n = 1$ and $t = 1$. It is noticed that, the velocity u decreases on increasing M . The variation of velocity u with Darcy number Da for $\Pr = 0.71$, $\alpha = \frac{\pi}{6}$, $n = 1$ and $t = 1$ is shown in **Fig. 4**. It is noticed that the velocity u increases with increasing Da . **Fig. 5** illustrates the variation of velocity u with decay parameter n for $\Pr = 0.71$, $Da = 0.01$, $\alpha = \frac{\pi}{6}$, $M = 2$ and $t = 1$. It is observed that, the velocity u decreases with an increase in n. The variation of velocity u with Prandtl number $\Pr$ for $n = 1$, $\alpha = \frac{\pi}{6}$, $Da = 0.01$, $M = 2$ and $t = 1$ is presented in **Fig. 6**. It is found that, the velocity u decreases with increasing $\Pr$. **Fig. 7** shows the variation of temperature T with decay parameter n for $\Pr = 0.71$ and $t = 1$. It is found that the temperature T decreases with increasing n . The variation of temperature T with Prandtl number $\Pr$ for $n = 1$ and $t = 1$ is shown in

Fig.8. It is observed that the temperature T decreases with increasing Prandtl number $\Pr$.

Table-1 shows the effects of $\Pr$ and n on Nusselt number Nu for $t=1$. It is found that, the Nu decreases with increasing $\Pr$ and n.

5. CONCLUSIONS

In this chapter, we studied the unsteady free convective flow of an incompressible viscous electrically conducting fluid through a porous medium under the action of an inclined magnetic field between two heated vertical plates by keeping one plate is adiabatic. The expressions for velocity and temperature are obtained by using regular perturbation technique. It is found that the velocity increases with increasing Darcy number Da and α, while it decreases with increasing $M, \Pr$ and n and the temperature decreases with increasing $\Pr$ and n. It is found that, the Nu decreases with increasing $\Pr$ and n.

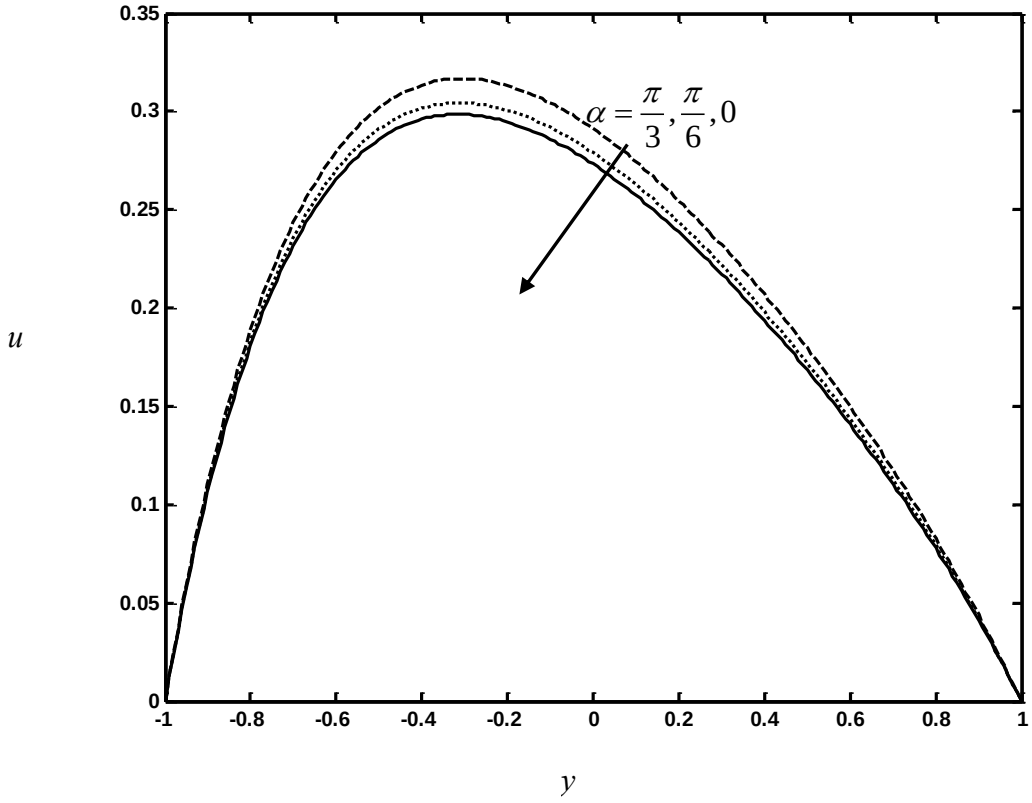


Fig. 2 The variation of velocity u with inclination angle α for $\Pr = 0.71$, $M = 1$, $Da = 0.1$, $n = 1$ and $t = 1$.

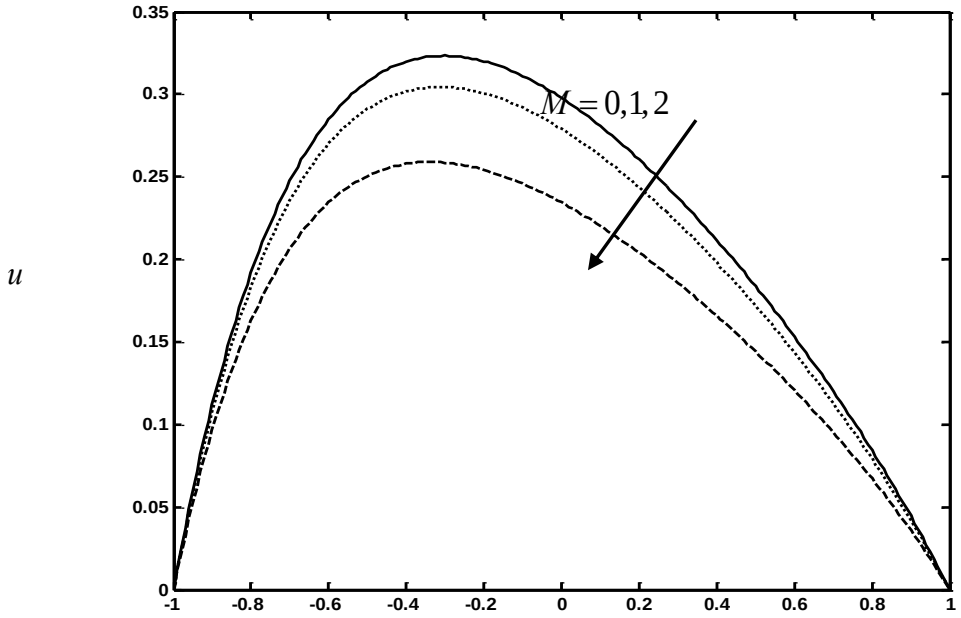


Fig. 3 The variation of velocity u with Hartmann number M for $\Pr = 0.71$, $Da = 0.1$, $\alpha = \frac{\pi}{6}$, $n = 1$ and $t = 1$.

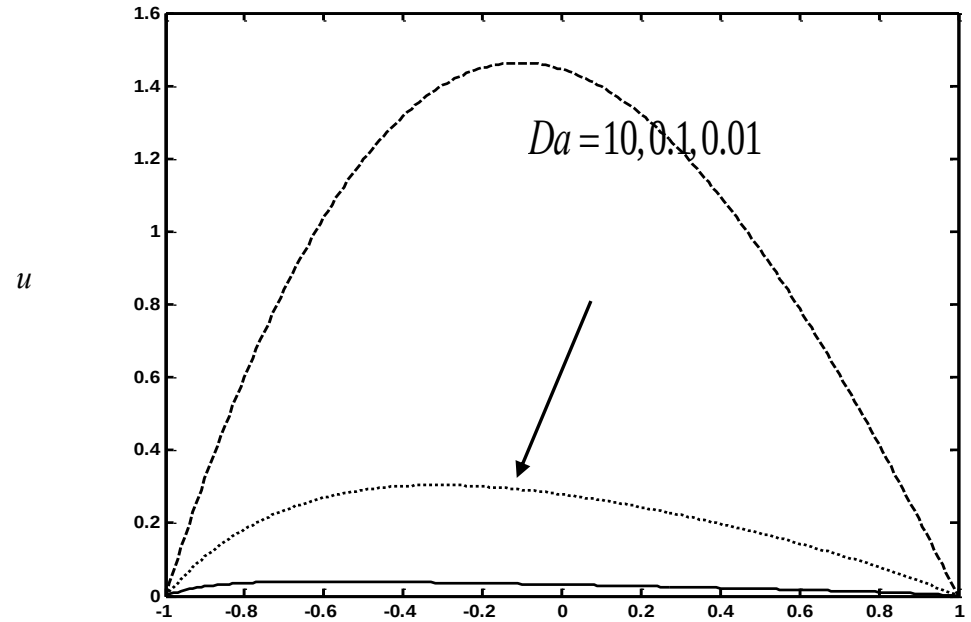


Fig. 4 The variation of velocity u with Darcy number Da for $\Pr = 0.71$, $\alpha = \frac{\pi}{6}$, $M = 1$, $n = 1$ and $t = 1$.

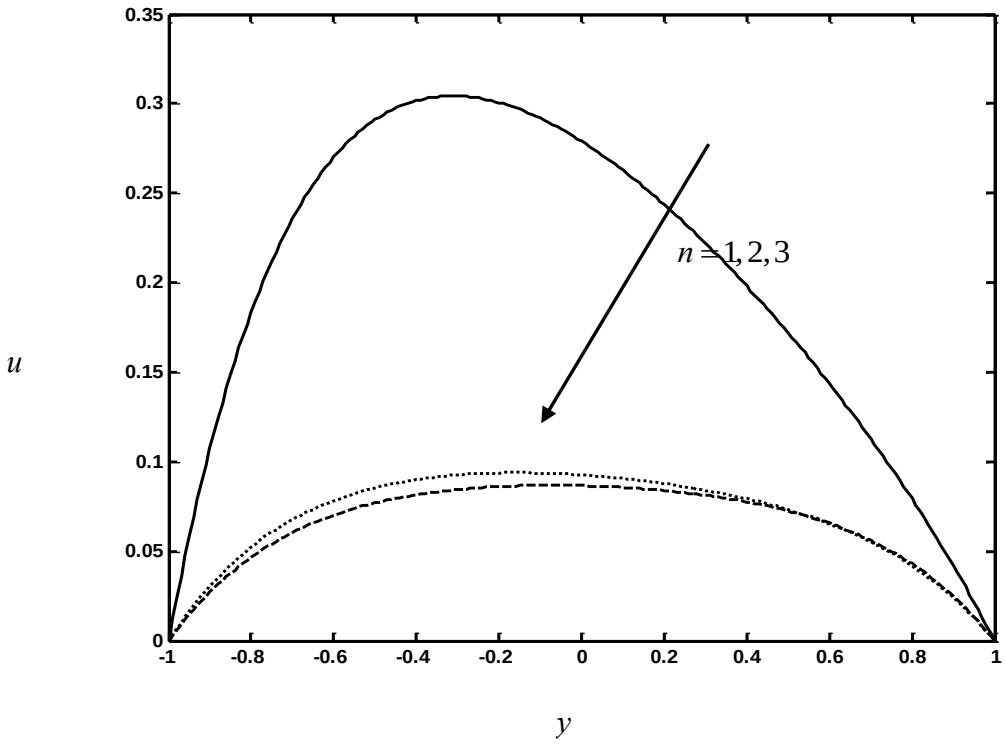


Fig. 5 The variation of velocity u with n for $\Pr = 0.71$, $\alpha = \frac{\pi}{6}$, $Da = 0.1$, $M = 1$ and $t = 1$.

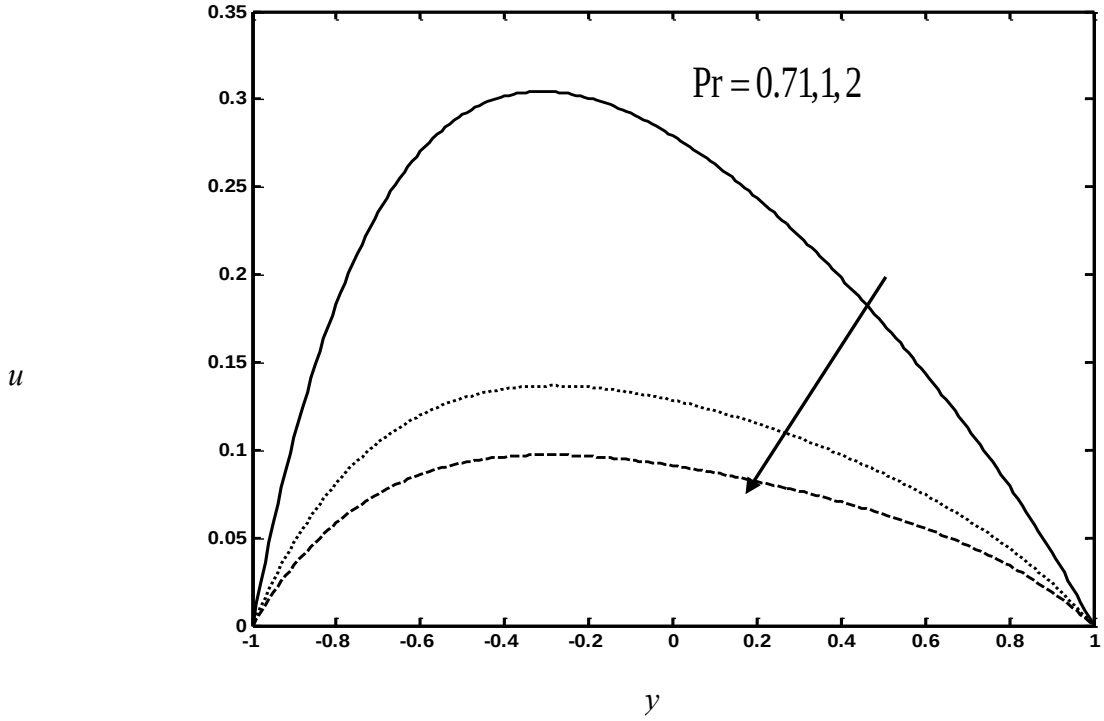


Fig. 6 The variation of velocity u with Prandtl number $\Pr$ for $M = 1$, $\alpha = \frac{\pi}{6}$, $Da = 0.1$, $n = 1$ and $t = 1$.

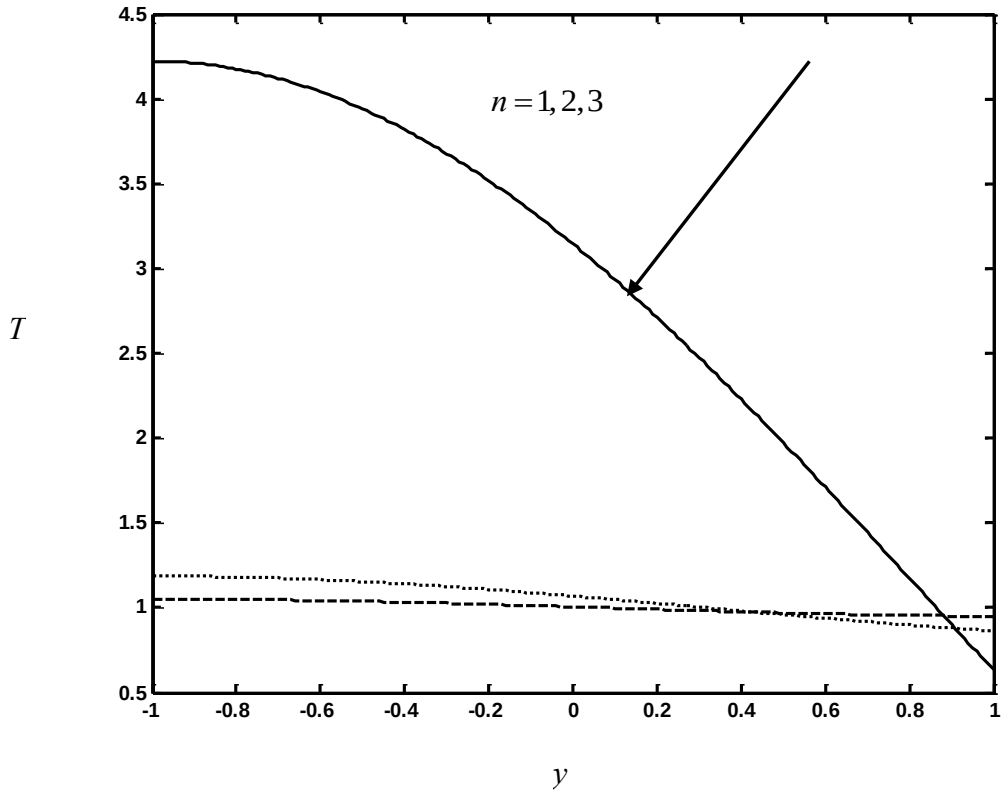


Fig..7 The variation of temperature T with n for $\Pr = 0.71$ and $t = 1$

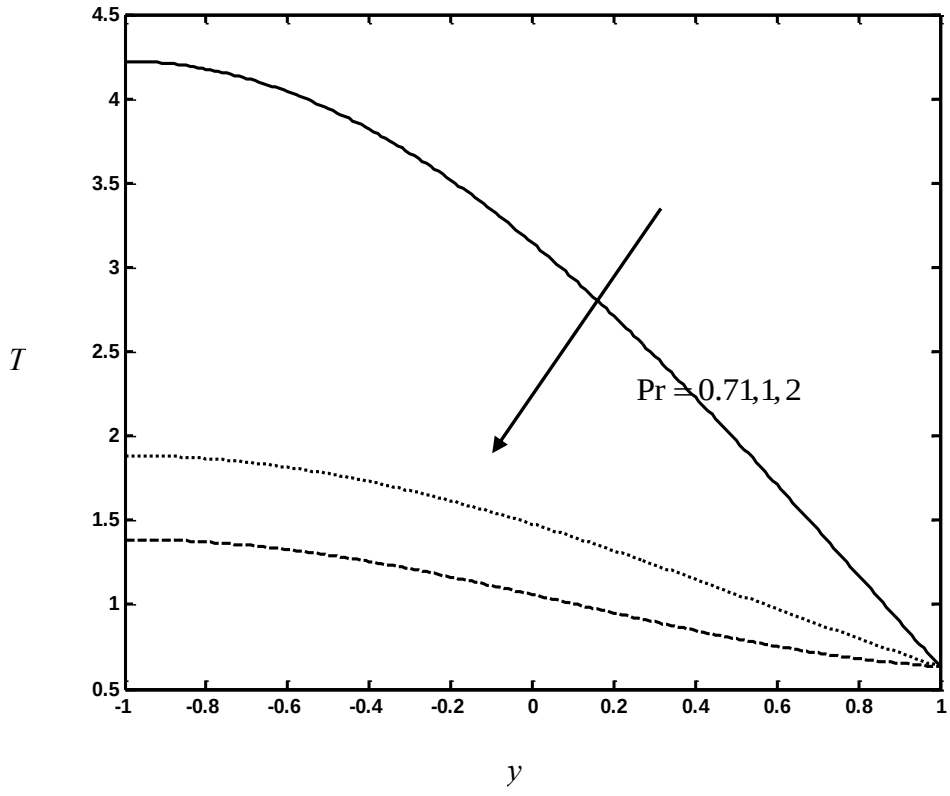


Fig. 8 The variation of temperature T with Prandtl number $\Pr$ for $n = 1$ and $t = 1$.

Table-2.1: Effects of Pr and n on Nusselt number Nu for $t = 1$.

Pr	n	Nu
0.71	**1**	**2.6970**
1	**1**	**0.8038**
0.71	**2**	**0.1528**

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SAVINGS BEHAVIOUR AND INVESTMENT PREFERENCES IN RURAL HOUSEHOLDS IN KURNOOL DISTRICT : AN EMPIRICAL STUDY

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ABSTRACT

The capital market is an important constituent of the financial system. It is the market both debt and equity for long term funds. Generally, it is mainly deals with financial assets, excluding currency. The financial assets comprises shares, mutual funds, bonds, pension funds, fixed deposits, insurance policies, provident fund and derivatives. The Indian Stock Exchanges are well regulated, functioning smoothly and it is the indication of healthy capital market. The financial markets and financial institutions are two mechanisms of channel from savings to investment. The financial market score over financial institutions in the allocation efficiency, as they allocate savings to those investments, which have potential to yield higher returns. This inevitably leads to higher returns to savers on their savings and higher productivity on investments to enterprises. Investment culture refers to the attitudes, perceptions, and willingness of the individuals and institutions in placing their savings in various financial assets, more popularly known as securities. A study on savings behavior and Investment preferences of individual investors which includes the investors' perceptions and preferences. It assumes a most significance in the formulation of policies for the development and regulation of security markets . This study only confines to Kurnool district in Andhra Pradesh and 300 samples were selected who are living in rural areas. In this context, the researcher has collected data on their behavior, awareness of saving and investment pattern in selected study area.

Key words: Capital market, Savings behavior, Investment

INTRODUCTION

The Indian securities market has made substantial progress during the post-independence period. The structure as well as the functioning of Indian securities market has been transformed beyond recognition since 1990s. The profile of the investing public, investment vehicles available, the investment environment and the nature of problems encountered by the small and household investors are substantially different today from what they were a decade ago. The Indian capital market has grown so sharply in the 1990's and that the decade itself has been christened as a decade of the capital market. However, the amount of capital raised in the form of equity, preference shares and debentures by the corporate sector has not been large over a number of years. It is extremely important for the policy makers and regulatory authorities to understand the investors' perceptions, preferences and their concerns about the financial markets and specifically on the stock market. An understanding of the small investor behaviour constitutes the focal point for evolving suitable and effective strategies for development of securities markets in any country. The investor behaviour needs to be studied and analyzed from the dimensions like – What motivates a small investor to make an investment? How frequently he prefers to make investment? In whose name the investor would like to hold the investment? What factors are likely to affect the size and timing of his investments? And finally, what investment strategies, the small investors would like to normally adopt? An analysis all these dimensions hopefully would formulate the dimensions to determine the behaviour of investors. A study on Investment behaviour of individual investors which includes the investors perceptions and preferences, thus, assumes a greater significance in the formulation of policies for the development and regulation of security markets in general and protection and promotion of small and house-hold investors in particular.

SIGNIFICANCE OF THE STUDY

It is clear that, not many studies have been undertaken exclusively to study the perceptions, preferences, and behaviour of the small and household investors, a very crucial area in the formulation of policies and procedures for the orderly growth and development of securities markets in any nation. Most of the studies reviewed above have mainly covered the aspects at macro level, like the ownership patterns in the capital market, occupation-wise break up of paid up value of share holdings of individuals, ownership pattern of shares/ debentures, geographical distribution of share ownership in India. There are only a few studies covering the issue of investor perceptions and behaviour at micro/regional level. Especially in the context of decline in the participation of small and household investors in the primary market operations, withdrawal of investors from the capital market, diversion of household savings into safer investment avenues like bank deposits, real estate, and unproductive assets like gold and silver, it becomes all the more important to study and analyze the investor awareness, perceptions and preferences of various investment avenues available to them in the securities markets. This may help the policy makers in evolving the suitable strategies to get small and household investors once again in large numbers into the capital market operations. Hence, the present investigation is an attempt in that direction. The issues investigated in the present study include awareness of investment avenues, investment pattern, the most preferred objectives of investors, and investment evaluation. Hence, the present study is an attempt to know the investment pattern of investors. The study is made to examine investor's awareness of investment avenues, investment objectives of investors and the evaluation of investment by the investors.

OBJECTIVES OF THE STUDY

1. To trace out the trends in capital market operations with special emphasis on protection of interest of small households investor.
2. To examine and study the causes for variations in savings.
3. To analyse the awareness, preferences and investment patterns of rural households.

METHODOLOGY OF THE STUDY

The present study is based on both primary and secondary data. The primary data have been collected from selected sample households through a structured interview schedule and by conducting personal interviews from Kurnool district of Andhra Pradesh. However, the secondary data were also be made use of wherever it is necessary. The relevant secondary data have been collected from the reports, books, journals, magazines, periodicals, dailies, and websites. The data and the information collected with the help of the schedule will be processed and analyzed by using SPSS software.

SAMPLE DESIGN

The Kurnool district is one of the drought prone and backward district in Andhra Pradesh. But when compared to other districts in Rayalaseema, Kurnool district is educationally and industrially developed. For the purpose of research study, the researcher divide the Kurnool District into three regions, based on level of development in terms of area of irrigation and rainfall. Hence the present study covers the areas, Nandyala, Dhone and Adoni. Nandyal region is agriculturally and industrially developed through sufficient water facility and rainfall. Dhone is the another region which is less developed because of there is no water facility, less rainfall and less industries. In case of Adoni region, which is medium developed in all dimensions. Hence, the researcher has identified and selected high, medium and low developed regions. In each region 100 samples were collected in five villages through Field Survey method in simple random technique. Altogether, 300 samples were collected in three regions for empirical analysis.

REVIEW OF LITERATURE

According to a study on "Indian Households Investors Survey"[1] by society for Capital Market Research and Development for Ministry of Company Affairs, "these problems get manifested in the erratic of discouraging or even driving away the genuine investors from the market. The study was based on a sample of 5900 investors spread over 90 cities and town in 24 states. The RBI[3] conducted three sample surveys in 1959, 1965 and 1978 to analyse the ownership pattern of shareholdings. A comparison of the findings of these three surveys indicated that during 1959 to 1978, the number and proportion of individual shareholders showed an increasing trend, but in terms of the paid-up value by individual shareholders, the percentage declined. It indicated that in spite of an increase in their number, the individual shareholders lost their share in corporate shareholdings in favour of institutional investors i.e., IDBI, IFCI, ICICI, UTI, LIC and GIC whose shares showed an increasing trend. The holding of joint stock companies slightly declined in 1965, but increased in 1978. The government and semi-government bodies showed a mixed trend and constituted a completely low proportion.

The RBI conducted a survey in 1978 which gives the data relating to occupation wise breakup of paid - up value of shareholdings of individuals in 336 companies. The finding of the survey indicates that professionals and self-employed persons with 8.48 lakh accounts held Rs.150.53 crores or about one-third (32.3 percent) of the total value of shareholdings

of individuals. Individuals with miscellaneous occupations, grouped under others, ranked second and held 24 percent of the share capital. Salaried persons held the largest number of accounts (29.9 percent amounting to 7.75 lakh accounts) but represented only 19.5 percent in value of the individual shareholdings. Persons engaged in household work accounted for 21.3 percent (5.6 percent accounts) and hold a little less than 20 percent of the value of individual holdings. The number of accounts and the value of shareholdings of farmers are rather insignificant. A sample survey conducted by Naresh Kumar[6] of the Management Development Institute, New Delhi, on behalf of the ICICI has thrown light on the geographical distribution of share ownership in India. The data pertains to 1983-84. The findings of the study show that the metropolitan cities have a dominant share in share ownership. Twelve major cities accounted for 20 per cent. The study also pointed out that the very meager share of small towns in the country's shareholding population is on account of lack of infrastructure facilities.

The Bombay Stock Exchange conducted a study on the present position of stock market in India. The study covered 1847 companies out of 2275 companies listed with Bombay Stock Exchange as at the end of March 1989. The survey found that out of the 1847 companies studied, only 26 companies have more than one lakh shareholders each. While another 45 companies have shareholders ranging from 50,000 to 1, 00,000 and in other cases it is much less.

INVESTMENT AWARENESS CONCEPTS

Awareness is a continuing process by which investors come to learn about the investment particulars. In certain cases they try to know about the modes clearly and eventually adopt it or reject it. Awareness is commonly described as the first step in the process of investment. When the investors are aware of the existence of numerous investment modes, his inquisitiveness stimulates him to seek more information about them. After becoming well versed of investment modes, the investors turns to evaluation of each channel by making comparison with each other. At last, the investor decides to make investment in an advantageous mode or modes. Thus awareness creates attitude in investor towards investment channels. This sense of awareness of investor towards investment is created, modified and shaped by various external sources of information such as dailies, weeklies, electronic media, friends and relatives, brokers advice etc. awareness in an abstract concept and, hence, it is not possible to measure precisely and directly in quantitative terms, but can be measured and assessed indirectly.

The concept of investor awareness refers to the stage wherein a prospective investors is conscious of and is having the knowledge of the existence of an investment product or avenue for his consideration to place the savings.

Table 1: Particulars of Awareness of investment avenues

S.No	Investment Avenues	Awareness			
		very well	well	some what	Don't know
1	Small saving scheme	130 (43.33)	105 (35.00)	35 (11.66)	30 (10.00)
2	Life insurance	150 (50.00)	105 (35.00)	30 (10.00)	15 (05.00)
3	Bank deposits	136 (45.33)	130 (43.33)	22 (7.33)	12 (4.00)
4	Company deposits	43 (14.33)	75 (25.00)	82 (27.33)	100 (33.33)
5	Bullion	135 (45.00)	87 (29.00)	67 (22.33)	11 (03.66)
6	Real estates	55 (18.33)	195 (65.00)	35 (11.66)	15 (05.00)
7	Mutual funds	45 (15.00)	38 (12.66)	95 (31.66)	122 (40.66)

Source: Field Survey N= 300

(Figures mentioned in parenthesis are percentages)

To study the awareness of investment avenues among the investors, 10 investment products are identified and placed before the sample –respondents to ascertain their level of awareness in 4 levels, namely, know very well, know well, know somewhat, and do not know. The responses of the sample investors are tabulated and presented in table 1.

An examination of the above table unveils the following facts:

a) Most of the respondents stated that they are highly aware (know very well) of investment avenues like Bank deposit (45.33 per cent), life insurance policies (50 per cent), bullion (45 per cent), and small saving schemes (43.33 per cent).
b) Many of the respondents also expressed that they are well aware (know well) of investment opportunities such as real estate (65 per cent); bank deposit schemes (43.33 per cent); small saving schemes (35 per cent); and life insurance policies (35 per cent); and
c) Majority of the sample investors expressed their unawareness (do not know) of investment avenues, which included mutual funds (40.66 per cent); company deposits (33.33 per cent).

Table 2: Opinion of participants of investment decisions

S. No	Participants	Number of Respondents	Percentage to total
1	No assistance- Own decision	72	24.00
2	Family members	126	42.00
3	Consultants	36	12.00
4	Friends	66	22.00
	Total	300	100

Source: Field survey

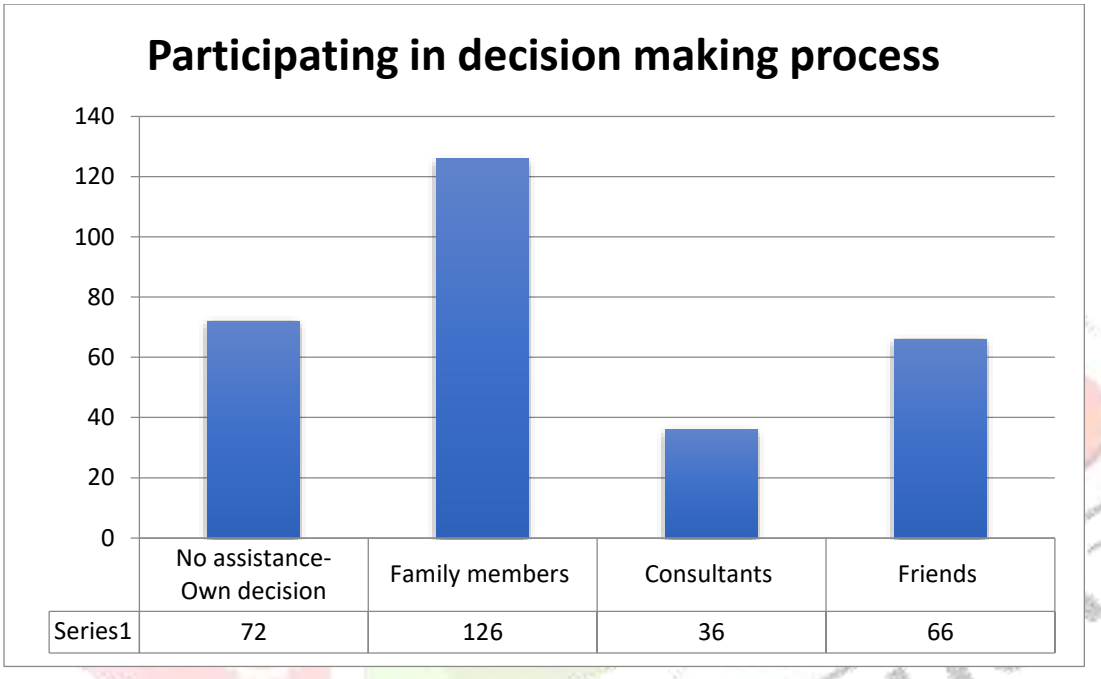


Figure1

It can be found that the table depicted that opinion of the sample respondents on taking investment decision by supporting someone in the study area is presented in table 2 It can be further found that out of 300 sample investors, 24 per cent of the sample respondents are taking decision by him/her self, 42 per cent of the sample investor respondents are taking suggestions from their family members, 12 per cent of them are consulting consultants before taking investment decision and rest of the sample respondents are taking suggestions from their friends and it is representing 22 per cent in the study area.

It can be concluded from the study that majority of the sample respondents have taken investment decision by their family members.

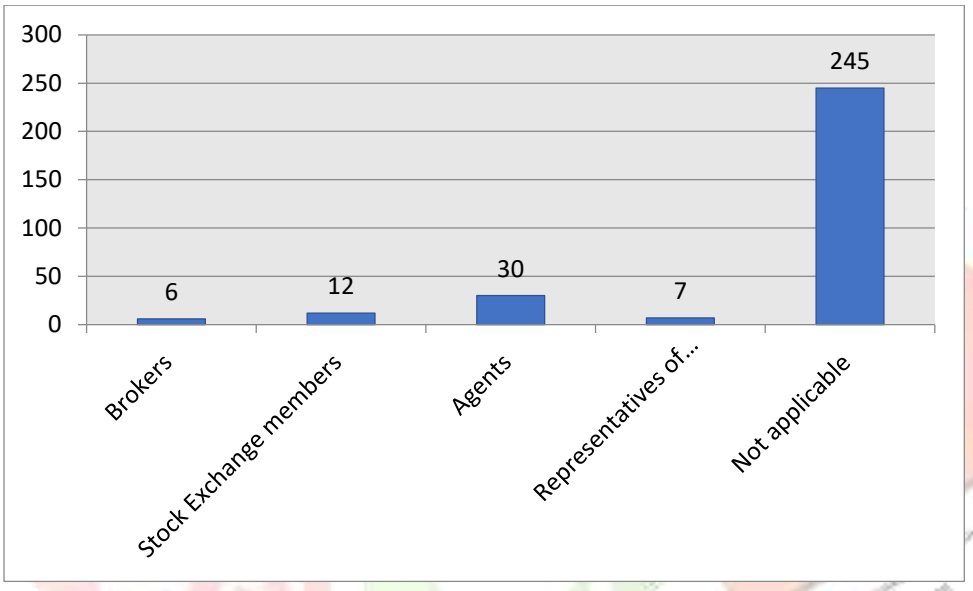
In capital market phenomena, every investor have been collected huge information from the various consultants, predicting, understanding and analysed. After analyzing or consult the consultant they were invested in various dimensions. To verify this commonly observed phenomenon, the sample investors are asked to indicate whether they took the advice of any investment consultant or a broker/an agent before the investments are made. Their response are recorded and presented in table 3.

Table 3: Role of consultants and external agents

S. No	Type of consultants	Number of Respondents	Percentage to total
1	Brokers	6	2.00
2	Stock Exchange members	12	4.00
3	Agents	30	10.00
4	Representatives of organizations	7	2.33
5	Not applicable	245	81.67
	Total	300	100

Source: Field survey

Figure 2



The above table reveals that the opinion of the respondents on the role of consultants and external agents in the process of the investment decision by the selected sample respondents in the study area like Kurnool district of Andhra Pradesh. It can be found that, out of 300 sample respondents, 245 sample investors did not taken any information or advice from the any one and rest of the sample respondents are depends upon various intermediaries like brokers, stock exchange members, agents and representative of organization etc.

It is further found that, few investor are depends on various consultants because of they don't have any idea about capital market and rest of investors are taken own decision or taken information from friends, relatives, family members while investing in other investment avenues like bank deposits, fixed deposits, Lie and Real estates etc.

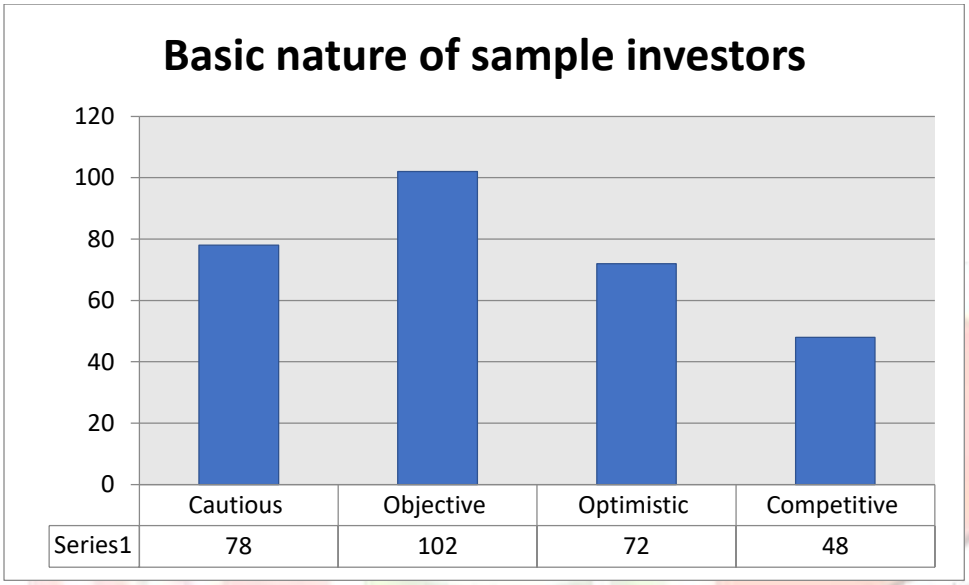
"The every basic nature of the investors is likely to determine the investor expectations about the future income and savings, likely changes in them, and the resultant behavior of the investors". The data concerning the basic nature of the investors selected as sample for the purpose of the present study is furnished in table 5.10

Table 4: Basic nature of sample investors

S. No	Nature	Number of Respondents	Percentage to total
1	Cautious	78	26.00
2	Objective	102	34.00
3	Optimistic	72	24.00
4	Competitive	48	16.00
	Total	300	100

Source: Field survey

Figure3



The data of table 4 reveals that 34 per cent of the sample investors identified their nature as objective, while nearly 26 per cent were stated to be cautious and 24 per cent are said to be optimistic. Therefore, the investors chosen for the purpose of the study may be identified as objective, cautious, and optimistic in their approach to the investments. This nature of the sample investors is bound to influence and shape the behavior of the investors as far as the expectations of future income and savings are concerned.

Table 5: Expected change in income in future

S. No	Extent of change	Number of Respondents	Percentage to total
1	A moderate increase	138	46.00
2	A substantial increase	102	34.00
3	A decrease	15	5.00
4	No change	42	15.00
	Total	300	100

Source: Field survey

Figure 4

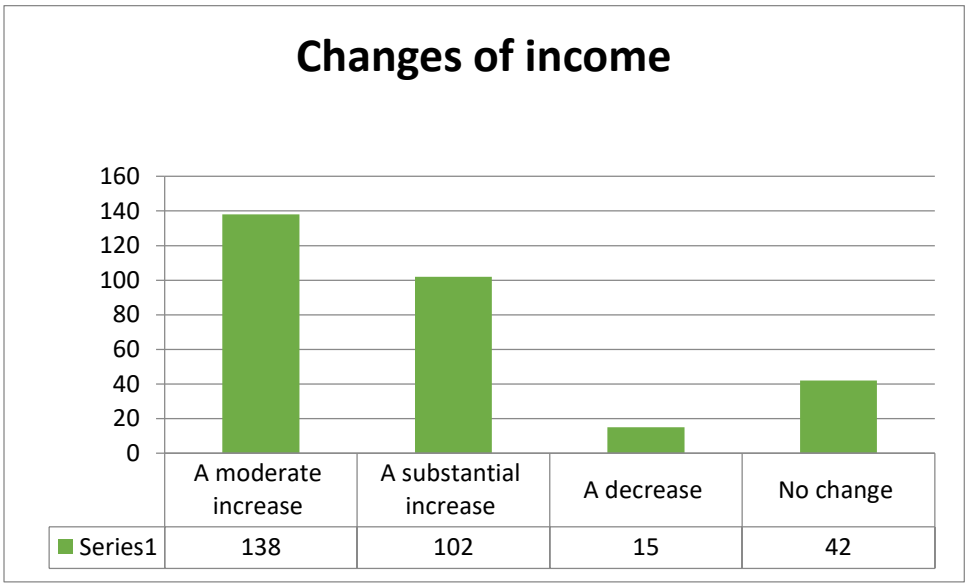


Table shows that the opinion of the sample respondents on their expected income levels after investment in the study area. In this direction, the researcher has put some questions to the respondents like your income has increased moderately, a substantial increased, decreased and no change.

Majority of the investors are having positive dimensions about increases of their income in future and it indicate 46 per cent, 34 of the sample respondents have said that a substantially increased income in next few years, 15 per cent of the respondents tender their opinion neutral (no change) and rest of the sample respondents have expressed their opinion that their income has decreased.

Table 6: Investment monitoring by the investors

S. No	Focus of attention	Number of Respondents	Percentage to total
1	The individual instruments that are doing poorly	150	50.00
2	The recent results of my overall portfolio of investment	36	12.00
3	The longer term progress of my investment portfolio	54	18.00
4	The individual instruments that are doing very well	60	20.00
	Total	300	100

Source: Field survey

The researcher has collected data from the investors relating to monitoring of their investment on time –to-time in the study area. The researcher has given the statements relating to monitoring like (a) Individual instruments that are doing poorly, (b) Recent results of my overall portfolio of investment, (c) Longer term progress of my investment portfolio and (d) Individual instruments that are doing very well. It is quite interesting that 50 per cent of the sample respondents has stated that individual instruments that are doing poorly, followed by 20 per cent of the sample

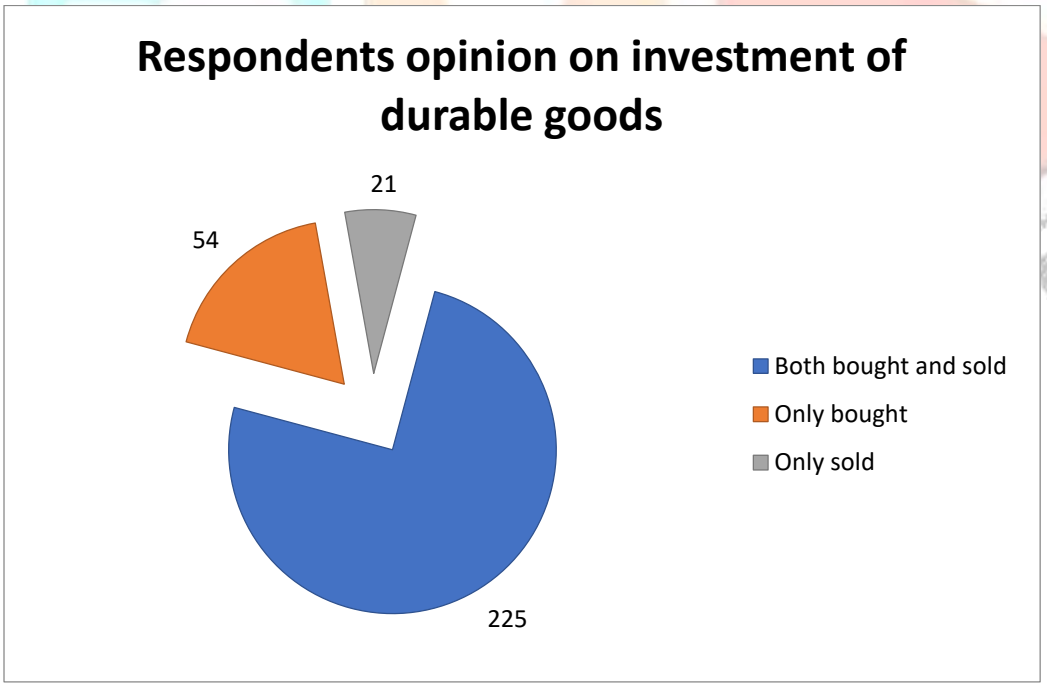
households stated that individual instruments that are doing very well and 18 per cent of the sample households has says that longer term progress of my investment portfolio and rest of them recent results of my overall portfolio of investment in the study area.

Table 7: Durable and assets-investment activity of the sample investors

S. No	Name of the activity	Number of Respondents	Percentage to total
1	Both bought and sold	225	75.00
2	Only bought	54	18.00
3	Only sold	21	07.00
4	No deal	--	--
	Total	300	100

Source: Field Survey

Figure 5



Any individual investors are going to be invested two types namely permanent investment like purchase house, purchase land (not for sale) Two wheelers, four wheelers and Gold, non permanent assets which is purchased for resale purpose. The researcher put a question to all rural investors on investment activities is for permanent purpose or resale purpose. After collection of information regarding said dimensions, researcher has tabulated, analysed and presented in table 5.13. This is evidence from the table that, 75 per cent of the sample households have invested for both purpose like bought and sold, 18 per cent of the selected respondents have said only for bought and rest of the sample respondents have said that only for sale purpose . It obtusely found that majority of the respondents have invested both for sold and bought where they are invested in real estate.

CONCLUSIONS

Every individual investor has his own mindset when they decide about investing in a particular investment avenue such as stocks, bonds, mutual funds, fixed deposit, real estate, bullion etc. In each life cycle stage, every individual desires his hard earned money to be invested in most secure and liquid avenue. However, the decision varies for every individual depending on their risk-taking ability and the purpose for which such investment is to be done. There is an explosion in the growth of middle class families due to double income group families and increase in number of working women, hence this group will play vital role in the investment market. Efforts should be made to attract the women investors by providing right information and knowledge about the investment market though advertisements.

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On Ideals and Multiplicative (Generalized) - (Φ, Φ) - Derivations

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Abstract: Let P be a prime ring, I is a nonzero ideal of P, Φ is an automorphism on P. A mapping $M : P \to P$ is called Multiplicative (generalized) -(Φ, Φ)-derivation if there exist a map $d : P \to P$ such that $M(a, b) = M(a)\Phi(b) + \Phi(a)d(b)$ holds for all $a, b \in P$. The objective of the present paper is to study the following identities (i). If $M(ab) - M(a)M(b) = 0$ for all $a, b \in I$ then $\Phi(I), M(a), M(b) = 0$ for all $a \in I$ (ii). Let M_1 and M_2 be two multiplicative (generalized)-(Φ, Φ) derivations on P associated with the maps d_1 and d_2 on P respectively. If $M_1(ab) - \Phi(b) \circ M_2(a)$ for all $a, b \in I$ then R is abelian or commutative or $\Phi(I)[\Phi(I), M_2(I)] = 0$ (iii). If $M_1(ab) = [\Phi(b), M_2(a)]$ for all $a, b \in I$ then either $\Phi(I)[\Phi(I), M_2(I)] = (0)$ or R is commutative.

MSC: 16W25, 16N80, 16U80.

Keywords: Primering, Ideal, Multiplicative (generalized) derivation, Multiplicative (generalized)-(Φ, Φ)-derivation.

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1. Introduction

A ring P is prime if for any $a, b \in P$, $aPb = (0)$ implies that either $a = 0$ or $b = 0$. $M(a, b) = M(a)\Phi(b) + \Phi(a)d(b)$ for all $a, b \in P$ is called Multiplicative (generalized) -(Φ, Φ)-derivation, where $M : P \to P$ is a mapping and P is a prime ring. In 2014 [1] Dhara proved few identities connected to Multiplicative (generalized) $-(\sigma, \sigma)$ derivations where σ is an epimorphism. Furthermore accurately they demonstrated succeeding outcomes. Let R be a semi prime ring, I a nonzero left ideal of R and σ any epimorphism of R Suppose that F is a Multiplicative (generalized) -(σ, σ) derivation associate with the map d. If $F(xy) - F(x)F(y) = 0$ holds for all $x, y \in I$ then $\sigma(I)d(I) = (0)$ and $\sigma(I)[F(x), \sigma(x)] = (0)$ for all $x \in I$. In 2020 [2] chirag Garg showed few results associated to Left ideals and Multiplicative (generalized) -(α, β)-derivations. Particularly, they proved the subsequent result. Let R be a prime ring and L be a non zero left ideal of R. Suppose that F is Multiplicative (generalized) -(α, β)-derivation on R associated with the map d on R. If $F(xy) + F(x)F(y) = 0$ for all $x, y \in L$ then either $\alpha(L)[F(x), \alpha(x)] = (0)$ or $\beta(L)[F(x), \beta(x)] = (0)$ for all $x \in L$. Considering exceeding results we initiate our theorems We will frequently use the basic commutator and Skew-commutator identities

(i). $[xy, z] = x[y, z] + [x, z]y$.

(ii). $[x, yz] = y[x, z] + [x, y]z$.

(iii). $x \circ yz = (x \circ y) - y[x, z] = y(xoz) + [x, y]z$.

(iv). $xy \circ z = x(yoz) - [x, z]y = (x \circ z)y + x[y, z]$ for all $x, y \in P$.

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2. Main Results

Theorem 2.1. *In a prime ring P and I is a nonzero ideal of P if $M(ab) + M(a)M(b) = 0$ for all $a, b \in I$, where M is a multiplicative (generalized) -(Φ, Φ) derivation on P related with the map d on P then $\Phi(I)[M(a), M(b)] = 0$ for all $a \in I$.*

Proof. From the hypothesis we have

(1). $M(ab) + M(a)M(b) = 0$ for all $a, b \in I$.
Restore bc in the place of b in (1).

(2). $M(abc) + M(a)M(bc) = 0$ for all $a, b, c \in I$.

(3). $M(ab)\Phi(c) + \Phi(ab)d(c) + M(a)\{M(b)\Phi(c) + \Phi(b)d(c)\} = 0$ for all $a, b, c \in I$.

(4). $M(ab)\Phi(c) + \Phi(ab)d(c) + M(a)M(b)\Phi(c) + M(a)\Phi(b)d(c) = 0$ for all $a, b, c \in I$.

(5). $\{M(ab) + M(a)M(b)\}\Phi(c) + \Phi(ab)d(c) + M(a)\Phi(b)d(c) = 0$ for all $a, b, c \in I$. Using (1) we have

(6). $\Phi(ab)d(c) + M(a)\Phi(b)d(c) = 0$ for all $a, b, c \in I$. Substitute au in the place of a in (6).

(7). $\Phi(aub)d(c) + M(au)\Phi(b)d(c) = 0$ for all $a, b, c, u \in I$.

(8). $\Phi(aub)d(c) + \{M(a)\Phi(u) + \Phi(a)d(u)\}\Phi(b)d(c) = 0$ for all $a, b, c, u \in I$.

(9). $\Phi(aub)d(c) + M(a)\Phi(u)\Phi(b)d(c) + \Phi(a)d(u)\Phi(b)d(c) = 0$ for all $a, b, c, u \in I$. Another time substitute ub in the place of b in (6)

(10). $\Phi(aub)d(c) + M(a)\Phi(ub)d(c) = 0$ for all $a, b, c, u \in I$.

(11). $\Phi(aub)d(c) + M(a)\Phi(u)\Phi(b)d(c) = 0$ for all $a, b, c, u \in I$. Subtract (9) from (11),

(12). $\Phi(aub)d(c) + M(a)\Phi(u)\Phi(b)d(c) + \Phi(a)d(u)\Phi(b)d(c) - \Phi(aub)d(c) - M(a)\Phi(u)\Phi(b)d(c) = 0$ for all $a, b, c, u \in I$.

(13). $M(a)\Phi(u)\Phi(b)d(c) + \Phi(a)d(u)\Phi(b)d(c) - M(a)\Phi(u)\Phi(b)d(c) = 0$ for all $a, b, c, u \in I$.

(14). $\{M(a)\Phi(u) + \Phi(a)d(u) - M(a)\Phi(u)\}\Phi(b)d(c) = 0$ for all $a, b, c, u \in I$.

(15). $\{M(au) - M(a)\Phi(u)\}\Phi(b)d(c) = 0$ for all $a, b, c, u \in I$. By the primness of P, we have,

(16). $M(au) - M(a)\Phi(u) = 0$ or

(17). $\Phi(b)d(c) = 0$.
Case 1: If $M(au) - M(a)\Phi(u) = 0$ for all $a, u \in I$. In particular, for all $a, b \in I$, we have $M(ab) - M(a)\Phi(b) = 0$.

(18). $M(ab) = M(a)\Phi(b)$ for all $a, b \in I$. From (1), we have $M(ab) = -M(a)M(b)$. Replace bc in the place of b,

(19). $M(abc) = -M(ab)M(c) = -M(a)M(bc)$ for all $a, b, c \in I$. Above equation can be written as $M(ab)M(c) = M(a)M(bc)$. Using (18),

(20). $M(a)\Phi(b)M(c) = M(a)M(b)\Phi(c)$.

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or

$$[\Phi(a), \Phi(u)] = 0. \tag{39}$$

Case 1: If $\Phi(b)d(c) = 0$, from (31), $\Phi(a)\Phi(b)d(c) = \Phi(b)[\Phi(c), M_2(a)]$.

(40). $\Phi(b)[\Phi(c), M_2(a)] = 0$. Therefore $\Phi(I)[\Phi(I), M_2(I)] = 0$ for all $a, b, c \in I$.

Case 2: If $[\Phi(a), \Phi(u)] = 0$ for all $a, u \in I$. In particular $[\Phi(a), \Phi(b)] = 0$ for all a,b $\in I$.

(41). $\Phi(a)\Phi(b) - \Phi(b)\Phi(a) = 0$. Substitute pb in the place of b in (41), where $p \in P$

(42). $\Phi(a)\Phi(pb) - \Phi(pb)\Phi(a) = 0$.

(43). $\Phi(a)\Phi(p)\Phi(b) - \Phi(p)\Phi(b)\Phi(a) = 0$. Left multiply (41) with $\Phi(p)$.

(44). $\Phi(p)\Phi(a)\Phi(b) - \Phi(p)\Phi(b)\Phi(a) = 0$. Subtract (43) from (44), we have $\Phi(a)\Phi(p)\Phi(b) - \Phi(p)\Phi(a)\Phi(b) = 0$.

(45). $[\Phi(a)\Phi(p)]\Phi(b) = 0$. Since I is nonzero and primness of R forces that

$$\Phi(a)\Phi(p) - \Phi(p)\Phi(a) = 0$$
$$[\Phi(a), p]_{\Phi,\Phi} = 0 \quad \text{for all } a \in I, p \in P$$

Applying Lemma 2 [12], let R be a prime ring, I be a left ideal of R. If $[x, r] = 0$ for all $x \in I$, $r \in R$, then R is commutative. Hence R is commutative. Therefore the proof of the theorem is completed. □

Theorem 2.3. *In a prime ring P, I a nonzero ideal of R. Let M_1, M_2 be two Multiplicative (generalized) -(Φ, Φ) derivations on R associated with the maps d_1 and d_2 on P (respectively). If $M_1(ab) = [\Phi(b), M_2(a)]$ for all $a, b \in I$, then either $\Phi(I)[\Phi(I), M_2(I)] = (0)$ or R is commutative.*

Proof. From the hypothesis

(46). $M_1(ab) = [\Phi(b), M_2(a)]$ for all $a, b \in I$. Substitute be in the place of b

(47). $M_1(abc) = [\Phi(bc), M_2(a)]$.

(48). $M_1(ab)\Phi(c) + \Phi(ab)d(c) = [\Phi(b)\Phi(c), M_2(a)]$.

(49). $M_1(ab)\Phi(c) + \Phi(ab)d(c) = \Phi(b)[\Phi(c), M_2(a)] + [\Phi(b), M_2(a)]\Phi(c)$. Using (46)

(50). $M_1(ab)\Phi(c) + \Phi(ab)d(c) = \Phi(b)[\Phi(c), M_2(a)] + M_1(ab)\Phi(c)$. We have

(51). $\Phi(ab)d(c) = \Phi(b)[\Phi(c), M_2(a)]$ for all $a, b, c \in I$

Equation (51) is same as (31) in Theorem 3.2 we go-ahead in the same way as in Theorem 3.2. And we obtain the required result. □

At present we windup this segment with an example, which exhibit that the primness of the ring in our results is essential.

Example 2.4. *Consider the ring* $P = \left\{ \begin{pmatrix} u & v \\ 0 & w \end{pmatrix} / u, v, w \in Z \right\}$, *where Z is the set of integers Let* $I = \left\{ \begin{pmatrix} u & v \\ 0 & 0 \end{pmatrix} / u, v \in Z \right\}$ *be a left ideal. Let* $\Phi : P \to P$ *defined as* $\Phi \begin{pmatrix} u & v \\ 0 & w \end{pmatrix} = \begin{pmatrix} u & -v \\ 0 & w \end{pmatrix}$ *be an autoorphism Define*

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a mapping $d_1 : P \to P$ *on* M_1 *as* $d_1 \begin{pmatrix} u & v \\ 0 & w \end{pmatrix} = \begin{pmatrix} 0 & v/2 \\ 0 & 0 \end{pmatrix}$ *and* $M_2 \begin{pmatrix} u & v \\ 0 & w \end{pmatrix} = \begin{pmatrix} u & -v/2 \\ 0 & 0 \end{pmatrix}$ *respectively. Again define mapping* d_2 *on* M_2 *as* $d_2 \begin{pmatrix} u & v \\ 0 & w \end{pmatrix} = \begin{pmatrix} 0 & v/2 \\ 0 & 0 \end{pmatrix}$ *and* $M_1 \begin{pmatrix} u & v \\ 0 & w \end{pmatrix} = \begin{pmatrix} u/2 & 0 \\ 0 & 0 \end{pmatrix}$. *We observe that* M_1, M_2 *are multiplicative (generalized)* $-(\Phi, \Phi)$ *-derivations on* P *related to the maps* d_1 *and* d_2 *on* P. *We can substantiate that* $M_1(ab) + M_1(a)M_1(b) = 0, M_1(ab) = \Phi(b) \circ M_2(a)$ *for all* $a, b \in I$. *We realize that* $\begin{pmatrix} 0 & 1 \\ 0 & 0 \end{pmatrix} P \begin{pmatrix} 1 & 0 \\ 0 & 0 \end{pmatrix} = (0)$ *but* $\begin{pmatrix} 0 & 1 \\ 0 & 0 \end{pmatrix}$ *and* $\begin{pmatrix} 1 & 0 \\ 0 & 0 \end{pmatrix}$ *are nonzero elements of* P. *It implies that* P *is not prime ring. In this illustration we also observe that* R *is not commutative.*

$$\Phi(I)[\Phi(I), M_2(I)] \neq (0)$$

$$\Phi(I)[M_1(a), \Phi(a)] \neq 0 \text{ for } a \in I$$

$$\Phi(I)[M_1(a), \Phi(a)] \neq 0 \text{ for some } a \in I$$

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Generalized Skew Reverse Derivations in Semi Prime Rings

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Abstract **:** The study of generalized skew reverse derivations in semiprime and prime rings. In section 1 we study different situations for a semi prime ring to be commutative by admitting generalized skew reverse derivations, several authors proved commutative property by admitting reverse derivations, generalized reverse derivations in semi prime rings and prime rings. In this line of investigation we extend the results of Ali et al [2] where they studied the results on lie ideals with multiplicative derivations in prime and semiprime rings to semi prime rings admitting generalized skew reverse derivations. In this paper, we extend the results of Chirag Garg and Sharma [9], where they studied on some identities by admitting generalized (α,β) derivations on a non zero square closed Lie Ideals of a prime ring to generalized skew reverse derivations on Ideals in prime rings.

Keywords : Prime rings, Generalized skew reverse derivations, semiprime rings, skew reverse derivations.

1. INTRODUCTION

Throughout, R denotes a ring with center $Z(R)$. We write $[x,y]$ for $xy - yx$. Recall that a ring R is called *prime* if $aRb = 0$ implies $a = 0$ or $b = 0$; and it is called *semiprime* if $aRa = 0$ implies $a = 0$. A prime ring is obviously semiprime. An additive mapping d from R into itself is called a *derivation* if $d(xy) = d(x)y + xd(y)$, for all $x, y \in R$. a mapping f from R into itself is *commuting* if $[f(x),x] = 0$, and *skew commuting* if $f(x)x + xf(x) = 0$, for all $x \in R$. A considerable amount of work has been done on derivations and related maps during the last decades (sec. eg., (Beidar et al[4], Bell and Martindale[5], Bresar[6]) and references therein). Bresar and Vukman [7]) have introduced the notion of a *reverse derivation* as an additive mapping d from a ring R into itself satisfying $d(xy) = d(y)x + yd(x)$. for all $x, y \in R$. Obviously, if R is commutative, then both derivation and reverse derivation are the same. In the present note, we explore more about reverse derivations. We will show that while the notions of derivation and reverse derivation do not coincide, the set of all derivations and the

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set of all reverse derivations on a ring R are not disjoint. Recall that a ring R is called *anticommutative* if $ab + ba = 0$ for all $a, b \in R$. We will provide some properties for reverse derivations on anticommutative rings. On the way of studying derivations and reverse derivations, we will show that if d is a skew commuting derivation on a non-commutative prime ring, then d must be trivial. One of our main aims is to show that for a semiprime ring R, any reverse derivation is in fact a derivation mapping R into its center. This, in turn, will force a prime ring with a non-trivial reverse derivation to be commutative. For example, we refer the readers (Ali and Dar[1], Ali [3], Chaung [8], Lee[10], Oukhtite and Mamouni[11], Rehman et al[12], Samman[13] and Tiwari et al[14]) have been analysed the generalized reverse derivation in semiprime rings and where further references can be found). For motivation and a close view on reverse derivations, we provide the following examples.

2. GENERALIZED SKEW REVERSE DERIVATIONS IN SEMIPRIME RINGS

All through the section R is a semiprime ring. A ring R is said to be semiprime if for any x in R, $xRx = 0$ implies $x = 0$. An additive map g: $R \to R$ is said to be skew reverse derivation if $g(xy) = g(y)x + \alpha(y)g(x)$, for all $x, y \in R$ associated with an automorphism α of R and an additive map $F : R \to R$ is said to be generalized skew reverse derivation if $G(xy) = G(y)x + \alpha(y)g(x)$, for all $x, y \in R$ associated with skew reverse derivation d and an automorphism α of R.

Lemma 1.1 : (Ali et al.[2], Lemma 2.1) : If R is a semiprime ring and I is an ideal of R, then I is a semiprime ring.

Theorem 1.1. : R is a semiprime ring, I is a nonzero ideal of R and (G, g) is a generalized skew reverse derivation associated with and automorphism α such that $G[u,v] = \pm(uv + vu)$, for all $u, v \in I$, then $[g(u), \alpha(u)] = 0$.

Proof: Firstly, we consider

$$G[u, v] = uv + vu, \text{ for all } u, v \in I. \tag{2.1}$$

Replacing v by uv in equation 2.1, then $g[u, uv] = uuv + uvu$, for all $u, v \in I$.

$$\begin{aligned} u^2 v + uvu &= g[u[umv]]. \\ &= G[u, v]u + \alpha[u, v]g(u). \\ &= (uv + vu)u + \alpha[u, v]g(u). \\ &= uvu + vu^2 + \alpha[u, v]g(u). \end{aligned}$$

Therefore, $$\alpha[u, v]g(u) + [v, u^2] = 0, \text{ for all } u, v \in I. \tag{2.2}$$

Replacing v by rv in equation 2.2.

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$$\alpha[u, vw]g(u) + [vw, u^2] = 0.$$

$$\alpha[u, vw]g(u) + [vw, u^2] = 0, \text{ for all } u, v \in I, r \in R.$$

$$\alpha(v)\alpha[u, v]g(u) + \alpha[u, v]\alpha(v)g(u) + v[v, u^2] + [v, u^2]v = 0. \tag{2.3}$$

Left multiplying equation 2.2 with $\alpha(v)$,

$$\alpha(v)\alpha[u, v]g(u) + \alpha(v)[v, u^2] = 0. \tag{2.4}$$

Subtracting equation 2.4 from equation 2.3,

$$\alpha[u, v]\alpha(v)g(u) + v[v, u^2]v = 0, \text{ for all } u, v \in I, r \in R. \tag{2.5}$$

In particular if $r \in R$, say $r = w \in I$, then

$$\alpha[u, w]\alpha(v)g(u) + [vw, u^2]v = 0, \text{ for all } u, v, w \in I. \tag{2.6}$$

By equation 2.2 for $u, w \in I$, we have

$$[w, u^2] = -\alpha[u, w]g(u), u, w \in I. \tag{2.7}$$

Using equation 2.7 in 2.6,

$$\alpha[u, w]\{\alpha(v)g(u) - g(u)v\} = 0, \text{ for all } u, v, w \in I.$$

Replacing v by $\alpha(v)$ in above equation, we obtain

$$\alpha[u, w][\alpha(v), g(u)] = 0, \text{ for all } u, v, w \in I. \tag{2.8}$$

Replacing w by $g(u)w$ in above equation,

$$\alpha(g(u))\alpha[u, w][\alpha(v), g(u)] + \alpha[u, g(u)]\alpha(w)[\alpha(v), g(u)] = 0.$$

Using equation 2.8 in above equation, we get

$$\alpha[u, g(u)]\alpha(w)[\alpha(v), g(u)] = 0.$$

Replacing $\alpha(g(u))$ by $g(u)$ and v by u in above equation,

$$[\alpha(u), g(u)]I[\alpha(u, g(u))] = 0, \text{ for all } u \in I.$$

In view of lemma 2.1, I is a semiprime ring, so that

$$[\alpha(u), g(u)] = 0, \text{ for all } u \in I, \text{ or } [g(u), \alpha(u)] = 0, \text{ for all } u \in I.$$

By using similar approach we can prove the same result for $G[u, v] = -(uv + vu)$, for all $u, v \in I$.

Theorem 1.2 : R is a semiprime ring, I is a nonzero ideal of R and (G, g) is a generalized skew reverse derivation associated with an automorphism α such that $G(u \circ v) = \pm (uv + vu)$, for all $u, v \in I$, then $[g(u), \alpha(u)] = 0$, for all $u \in I$.

Proof: Firstly, consider $G(u \circ v) = uv + vu$, for all $u, v \in I$, 2.9

Replacing v by uv in equation 2.9, then $G(u \circ uv) = uuv + uvu$, for all $u, v \in I$.

$$u^2v + uvu = G\{u(u \circ v)\},$$

$$= G(u \circ v)u + \alpha(u \circ v)g(u).$$

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$$= uvu + vu^2 + \alpha(u \circ v)g(u).$$

Therefore $\alpha(u \circ v)g(u) + [v, u^2] = 0$, for all $u, v \in I$. 2.10

Replacing v by rv in equation 2.10

$$\alpha(u \circ rv)g(u) + [rv, u^2] = 0, \text{ for all } u, v \in I, r \in R.$$

$$\alpha\{r(u \circ v) + [u, r]v\}g(u) + [rv, u^2] = 0.$$

$$\alpha(r)\alpha(u \circ v)g(u) + \alpha[u,r]\alpha(v)g(u) + r[v, u^2] + [r, u^2]v = 0. \quad 2.11$$

Left multiplying equation 2.10 with $\alpha(r)$.

$$\alpha(r)\alpha(u \circ v)g(u) + \alpha(r)[v, u^2] = 0. \quad 2.12$$

Subtracting equation 2.12 from equation 2.11,

$$\alpha[u, r]\alpha(v)g(u) + r[v, u^2] + [r, u^2]v - \alpha(r)[v, u^2] = 0.$$

Replacing $\alpha(r)$ by r in above equation.

$$\alpha[u, r]\alpha(v)g(u) + r[v, u^2]v = 0, \text{ for all } u, v \in I, r \in R. \quad 2.13$$

The equation 2.13 is same as equation 2.5 in theorem 2.1. Thus, by same argument as in theorem 2.1, we conclude the result. By using similar approach we can prove the same result for $G(u \circ v) = -(uv + vu)$ for all $u, v \in I$.

Theorem 1.3 : R is a semiprime ring. I is a nonzero ideal of R and (G, g) is a generalized skew reverse derivation associated with an automorphism α such that $G(uv) \pm (u \circ v) = 0$, for all $u, v \in I$, then R is commutative.

Proof: Firstly, consider $G(uv) - (u \circ v) = 0$, for all $u, v \in I$. 2.14

Replacing u by wu in equation 2.14, then

$$= G(uv)w + \alpha(uv)g(w) - (wuv + vwu) = 0, \text{ for all } u, v, w \in I.$$

Adding and subtracting $(u \circ v)w$ in right side of the above equation,

$$G(uv)w + \alpha(uv)g(w) - (wuv + vwu) + (u \circ v)w - (u \circ v)w = 0.$$

$$\{G(uv) - (u \circ v)\}w + \alpha(uv)g(w) - wuv - vwu + uvw + vuw = 0.$$

Using equation 2.14 in above equation,

$$\alpha(uv)g(w) + [uv, w] + v[u, w] = 0. \quad 2.15$$

Replacing v by uv in equation 2.15, then

$$\alpha(u^2v)g(w) + [u^2v, w] + uv[u, w] = 0. \quad 2.16$$

Left multiplying equation 2.15 by $\alpha(u)$, we get

$$\alpha(u^2v)g(w) + \alpha(u)[uv, w] + \alpha(u)v[u, w] = 0, \text{ for all } u, v, w \in I. \quad 2.17$$

Subtracting equation 2.17 from equation 2.16 and replacing $\alpha(u)$ by u, we get

$$0 = [u^2, v, w] - u[uv, w].$$

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$$= u^2vw - wu^2v - u^2vw + uwuv.$$

$$= [u, w]uv. \quad 2.18$$

Replacing w by wz, $z \in I$, in equation 2.18, then we get $[u, wz]uv = 0$.

$$w[u, z]uv + [u, w]zuv = 0. \quad 2.19$$

Using equation 2.18 by replacing w by zw,

$$[u, w]zuv = 0. \quad 2.20$$

Again replacing z by zw in equation 2.20

$$[u, w]zwuv = 0, \text{ for all } u, v, w, z \in I. \quad 2.21$$

Replacing v by wv in equation 2.20,

$$[u, w]zuwv = 0, \text{ for all } u, v, w, z \in I. \quad 2.22$$

Ubtracting equation 2.21 from equation 2.22,

$$[u, w]z[u,w]v = 0, \text{ for all } u, v, w, z \in I.$$

Replacing v by z in above eqution, we have $\{[u, w]z\}^2 = 0$.

By semiprimeness of R, we conclude that $[u, w] = 0$, for all $u, w, z \in I$. Thus R is commutative. By similar approach, we can prove the same conclusion for $G(uv) + (u \circ v) = 0$, for all $u, v \in I$.

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MULTIPLICATIVE (GENERALIZED (α, β) – DERIVATIONS ACTING AS HOMOMORPHISM AND ANTI-HOMORPHISM IN PRIME RINGS

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Abstract : *Let R be a prime ring. Suppose that α,β are automorphisms of R. A mapping $F : R \to R$ is called a multiplicative (generalized) (α,β) – derivation if there exists a map $d : R \to R$ such that $F(x,y) = F(x)\alpha(y) + \beta(x)\, d(y)$, for all $x, y \in R$. In this paper, we prove that every multiplicative (generalized) (α,β)-derivation on zero Jordan ideal of R. The main result of the present paper states that if F is a multiplicative (generalized) (α,β)-derivation on J which also acts as a homomorphism or as anti-homomorphism on J, they either $d = 0$ or $J \subseteq Z(R)$.*

Keywords : Prime rings, Jordan ideals, Multiplicative (generalized) (α,β)-derivations, homomorphism, Anti-Homomorphism.

1. INTRODUCTION

Throughout the present paper, R will denote an associative c ring with center $Z(R)$. For any $x, y \in R$, the symbol (x,y) stands for all commutator $xy - yx$, while the symbol xoy will stand for the anti-commutator $xy+yx$. R is 2-torsion free if whenever $2x = 0$, with $x \in R$ implies $x = 0$. A ring R is said to be prime if for any $x, y \in R$, $xRy = 0$ implies that either $x=0$ or $y = 0$. An additive subgroup J of R is said to be a Jordan ideal of R if $xor \in J$ for all $x \in R$ and $x \in J$. An additive mapping $d : R \to R$ is called a derivation if $d(xy) = d(x)y + xd(y)$, holds forallx, $y \in R$. The generalized derivation of R is an additive mapping $F : R \to R$ such that $F(xy) = F(x)y + xd(y)$ for all $x,y \in R$, where d is a derivation of R. If $d = 0$ then we have $F(xy)y$ for all $x,y \in R$, which is called a left multiplier mapping of R. thus generalized derivation generalizes both the concept of derivations as well as left multiplier mappings of R. Let S be a non empty subset of ring R. the mapping $F : R \to R$ is said to be a homomorphism (anti-homomorphism) acting on S if $F(xy) - F(x)\,F(y)$ holds for all $x, y \in S$ (respectively, $F(xy) = F(y)\,F(x)$ holds for all $x,y \in S$).

A multiplicative derivation of R is a mapping $d : R \to R$ which satisfied $d(xy) = d(x)\,y+xd(y)$ for all $x,y \in R$. Ofcourse these mapping are not additive. The concept of multiplicative derivations was introduced by Dai[4]. Further, the complete description of those maps was given by Goldmann and Semrl in[8]. The notion of multiplicative derivation was extended to multiplicative generalized derivation in[7]. A mapping $F : R \to R$ is called a derivation d such that $F(xy) = F(x)y + xd(y)$ for all $x,y \in R$. In this definition, if we consider d is any map on R(not necessarily additive) then it is called as a multiplicative (generalized)-derivation if $F(xy) = F(x)y + xd(y)$ for all $x,y \in R$, where d is any mapping on R (not necessarily a derivation not an additive map). Hence the concept of multiplicative (generalized) derivation covers the concept of multiplicative (generalized)-derivation with $d=0$ covers the concept of multiplicative centralizers (not necessarily zero). Obviously, every generalized derivation is multiplicative (generalized)-derivation on R. However, the converse is not true in general.

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A mapping $F : \rightarrow R$ (not necessarily additive) is said be multiplicative (generalized)-derivation if it satisfies $F(xy) = F(x)\ \alpha\ (y) + \beta(x)\ d(y)$ for all $x, y \in R$. where d is any map on R. In [1], Bell and Kappe proved that if d is a derivation of a prime ring R which acts as a homomorphism or as anti homomorphism on a nonzero ideal I of R, then $d = 0$ on R. This result was generalized by Rehman replacing derivation d with a generalized derivation F. Recently Gusic in [14] showed that the result of Rehman in complete form as follows: Let R be an associative prime ring, Let d be any function on R(not necessarily a derivation nor an additive function), Let F be any function on R(not necessarily additive function), Let F be any function on R(not necessarily additive) satisfying $F(x)y + xd(y)$ for all $x, y \in R$ and Let I be a non-zero ideal of R. (i) Assume that $F(xy) = F(x)\ F(y)$ for all $x, y \in I$. Then d = 0 and F=0 or $F(x) = x$ for all $x \in R$(in this case R should be commutative).

In [15] Ali and Huang studied the case when a generalized Jordan(α, β)-derivation F acts as homomorphism or anti-homomorphism on a square closed lie ideals Uin prime ring R. The above result of Ali et al for prime rings motivates us to study the multiplicative generalized (α, β)-derivations on a Jordan ideal of a prime ring.

2. PRELIMINARY RESULTS

We shall make use of the following basic commutator identities: $[x,yz] = [x,y]z + y[x,z]$ and $[xy, z] = [x,z]y + x[y,z]$.

We begin with the following lemmas which are essential in developing the proof of our Theorem.

3. MAIN RESULTS

Lemma 3.1. Let R be a prime ring and J be a non-zero Jordan ideal of R. If $a \in R$ and $aJ = (0)$ or $Ja = (0)$, then $a = 0$.

Lemma 3.2. Let R be 2-torsion free prime ring and J be a non-zero ideal of R. If $aJb = (0)$, then either $a = 0$ or $b = 0$.

Lemma 3.3. Let R be a 2-torsion free prime ring and J is a commutative Jordan ideal, then $J \subseteq Z(R)$.

Lemma 3.4. Let R be a 2-torsion free prime ring J be a non-zero Jordan ideal of R. Suppose θ, ϕ are automorphisms of R. If R admits a (θ, ϕ)-derivation d such that $d(J) = (0)$, then either $d = 0$ or $J \subseteq Z(R)$.

4. MAIN RESULTS

Theorem 4.1: Let R be a 2-torsion free prime ring and J be a non-zero Jordan ideal and a subring of R. Suppose α, β is an automorphism of R and F: $R \rightarrow R$ is a multiplicative (generalized) (α,β)-derivation on R associated with a mapped on R. (i) If F acts as a homormorphism on J, then either $d = 0$ on R (or) $J \subseteq Z(R)$. (ii) If F acts as a anti homomorphism on J, then either $d = 0$ on R o(or) $J \subseteq Z(R)$.

Proof : If $J \subseteq Z(R)$, then there is nothing to prove, so we assume that $J \subseteq Z(R)$.

(i) If F acts as a homomorphism on J, then we have

$$F(xy) = F(x)\ F(y) \text{ for all } x, y \in J. \tag{4.1}$$

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We put $y = yz$, in above relation and then obtain that

$$F(x(yz)) = F(x)\ F(yz) \text{ for all } x, y, z \in J. \tag{4.2}$$

Which gives

$$F(xy)\ \alpha(z) + \beta(xy)\ d(z) = F(x)\ F(y)\ \alpha(z) + F(x)\ \beta(y)\ d(z) \text{ for all } x,y \in J. \tag{4.3}$$

Using (4.1) then above relation reduces to

$$(F(x) - \beta(x))\ \beta(y)\ d(z) = 0 \text{ for all } x, y, z \in J. \tag{4.4}$$

That is

$$\beta^{-1}(F(x) - \beta(x)\beta^{-1}(d(z)) = 0 \text{ for all } x, y, z \in J. \tag{4.5}$$

and hence $\beta^{-1}(F(x) - \beta(x))\ J\ \beta^{-1}\ d(z) = 0$ for all $x, y, z \in J$. Application of *Lemma* (2) implies that either $\beta^{-1}(F(x)) = 0$ for all $x \in J$ (or) $\beta^{-1}(d(z)) = 0$, for all $x, z \in J$. This implies that $F(x) - \beta(x) = 0$ for all $x \in J$ (or) $d(z) = 0$ for all $z \in J$. Since $F \neq \beta$, so that the remaining possibility is $d(z) = 0$ for all $z \in J$. Thus by *Lemma* (4), we get the required result. (ii) If F acts as an anti-homomorphism on J, then we have

$$F(xy) = F(y)\ F(x) \text{ for all } x, y \in J. \tag{4.6}$$

Replacing x by xy in (1) and then obtain that

$$F(xy^2) = F(y)\ F(xy) \text{ for all } x, y \in J. \tag{4.7}$$

Since F is a multiplicative(generalized)(α,β)-derivation of R, we have

$$F(xy)\ \alpha(y) + \beta(xy)\ d(y) = F(y)\ F(x)\ \alpha(y) + \beta(x)\ d(y) \text{ for all } x, y \in J. \tag{4.8}$$

Which gives by using (4.6) that

$$\beta(x)\ \beta(y)\ d(y) = F(y)\ \beta(x)\ d(y) \text{ for all } x, y \in J. \tag{4.9}$$

Again by replacing x by zx in the above equation

$$\beta(z)\ \beta(x)\ \beta(y)\ d(y) = F(y)\ \beta(z)\ \beta(x)\ d(y) \text{ for all } x, y, z \in J. \tag{4.10}$$

In view of (4.9), the relation (4.10) yields that

$$[F(y), \beta(z)]\ \beta(x)\ d(y) = 0, \text{ for all } x, y, z \in J \tag{4.11}$$

This implies that $\beta^{-1}\ [F(y), \beta(z)]\ \beta(x)\ \beta^{-1}d(y) = 0$, for all $x, y, z \in J$. Using *Lemma* (2) either $[F(y), \beta(z)]$ for all $y, z \in J$ (or) $d(y) = 0$ for all $y \in J$. Then by *Lemma* (4), we get the required result. If $[F(x), \beta(z)] = 0$ for all $x, y \in J$. Replace z by $x(\beta^{-1}\ \alpha Z)$ in the above expression, we get

$$F(y), \beta(x\beta^{-1}(\alpha)Z) = 0 \tag{4.12}$$

This implies that

$$[F(y), \beta(x)\ \alpha(z)] = 0 \tag{4.13}$$

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Using $[F(y), \beta(z)] = 0$ in the above, we get

$$\beta(x)\,[F(y), \alpha(z)] = 0, \text{ for all } x, y, z \in J. \tag{4.14}$$

By primeness of R, we get $F[(y), \alpha(z)] = 0$ for all $y, z \in J$. Replacing y by xy in last expression, we get

$$F(x)\,[\alpha(y), \alpha(z)] + [\beta(x), \alpha(z)] = 0 \tag{4.15}$$

Replacing z by y in the above equation, we get

$$[\beta(z), \alpha(z)]\,\beta(x)\,d(y) = 0 \tag{4.16}$$

By primeness of R implies that either $[\beta(z), \alpha(z)] = 0$ or $d(y) = 0$. The later case have been discussed earlier. So, we have $[\beta(z), \alpha(y)] = 0$ for all $y, z \in J$. Which implies that R is commutative. There by the proof of the Theorem completed.

Corollary 4.2 : Let R be a 2-torsion free prime ring, J be a non-zero Jordan ideal and a subring of R is a multiplicative (generalized)-derivation on R associated with a map d on R. (i) If F acts as a homomorphism on J, then either $d = 0$ on R or $J \subseteq Z(R)$. (ii) If F acts as anti-homomorphism on J, then either $d = 0$ on R (or) $J \subseteq Z(R)$.

Proof: Replacing α and β by 1 in *Theorem* (1), where 1 is the identity map on R, we get the required result.

Example : Consider $R = \left\{ \begin{pmatrix} a & 0 \\ b & c \end{pmatrix} \middle/ a, b, c \in S \right\}$, $J = \left\{ \begin{pmatrix} 0 & 0 \\ c & 0 \end{pmatrix} \middle/ c \in S \right\}$, then it is to see that J is a Jordan ideal of R.

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ON GENERALIZED LEFT DERIVATIONS AS HOMOMORPHISONS AND ANTI - HOMOMORPHISMS

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Abstract

Let R be a 2-torsion free prime ring and $I \neq 0$ an ideal of R and F is a generalized left derivation of R. In this paper we study the following conditions such that either $F(xy) = F(x)F(y)$ or $F(xy) = F(y)F(x)$ for all , $xy \in I$, then R is commutative.

1. Introduction

Throughout the present paper R will denote an associative ring with center $Z(R)$. For any $x, y \in R$ the symbol $[x, y]$ stands for the commutator $xy - yx$ the symbol $(x \circ y)$ stands for the anti commutator $xy + yx$, thus the commutator identities.

(i) $[xy, z] = x[y, z] + [x, z]y$

(ii) $[x, yz] = y[x, z] + [x, y]z$ for all $x, y, z \in R$.

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Recall that a ring R is called prime if for any $a, b \in R$, $aRb = (0)$ implies that either $a = 0$ or $b = 0$ however, in case prime rings Bell and Kappe [1] established that if I is a non zero right ideal of a prime ring R and $d : R \to R$ is a derivation of R such that d acts as a homomorphism or an anti-homomorphism on I. Then $d = 0$ on R. In the year 1990, Bresar and vukman [2] introduced the notion of a left derivation as follows. An additive mapping $d : R \to R$ is said to be a left derivation if $d(xy) = xd(y) + yd(x)$ holds for all $x, y \in R$. In [3], Bresar was introduced the generalized derivation. An additive mapping $F : R \to R$ is said to be generalized left derivation on R if there exists a left derivation $d : R \to R$ such that $F(xy) = xF(y) + yd(x)$ holds for all $x, y \in R$. Nadeem-Ur-Rehman [4] proved that Let R be a 2-torsion free prime ring and I be a non zero ideal of R. Suppose $F : R \to R$ is a non zero generalized derivation with d.

(i) If F acts as a homomorphism on I and if $d \neq 0$, then R is commutative.

(ii) If F acts as anti-homomorphism on I and if $d \neq 0$, then R is commutative.

In the present paper our objective is to extend this result for generalized left derivation acting on ideals in prime ring.

2. Preliminaries

Lemma 2.1: [5,lemma 3] : Let R be a prime ring and I be a non zero right ideal of R. If d is a non zero derivation on R then d is non zero on I.

Lemma 2.2 [6, lemma 2] : If a prime ring R contains a non zero commutative righ ideal, then R is commutative.

3. Main Results

Theorem 3.1 : Let R be a 2-torsion free prime ring and I be a non zero Ideal of R. Suppose $F : R \to R$ is a non zero generalized left derivation with left derivation d where d commutes with I

(i)If $F(xy) = F(x)\ F(y)$ for all $x, y \in I$ and if $d \neq 0$ (That is if F acts as a homomorphism on I) and if $d \neq 0$ then R is commutative.

(ii) If $F(xy) = F(y)F(x)$ for all $x, y \in I$ and if $d \neq 0$ (That is if F acts as an anti homomorphism on I) and if $d \neq 0$ then R is commutative.

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Proof : (i) If F acts as a homomorphism on I then we have, for all $xy \in I$.

$$F(xy) = xF(y) + yd(x) = F(x)F(y) \tag{3.1}$$

Replace x by zx, Since F is a generalized left derivation

$$F(zxy) = zF(xy) + xyd(z) \text{ for all } x, y, z \in I \tag{3.2}$$

$$F(zxy) = F(zx)F(y) \text{ for all } x, y, z \in I \tag{3.3}$$

$$\begin{aligned} F(zxy) &= F(zx)F(y) \text{ for all } x, y, z \in I \\ &= \{zF(x) + xd(z)\}F(y) \text{ for all } x, y, z \in I \\ &= zF(x)F(y) + xd(z)F(y) \text{ for all } x, y, z \in I. \end{aligned}$$

Using (3.1)

$$F(zxy) = zF(xy) + xd(z)F(y) \text{ for all } x, y, z \in I \tag{3.4}$$

Comparing (3.2) and (3.4)

$$zF(xy) + xyd(z) = zF(xy) + xd(z)F(y) \text{ for all } x, y, z \in I.$$

We get $xyd(z) = xd(z)F(y)$ for all $x, y, z \in I$

$$xyd(z) + xd(z)y - xd(z)y = xd(z)F(y) \text{ for all } x, y, z \in I$$

$$xyd(z) - xd(z)y - xd(z)F(y) - xd(z)y \text{ for all } x, y, z \in I.$$

$$X[y, d(z)] = xd(z)(F(y) - y) \text{ for all } x, y, z \in I.$$

d commutes with I we get

$$xd(z)(F(y) - y) = 0 \text{ for all } x, yz \in I \tag{3.5}$$

$$d(z)x(F(y) - y) = 0 \text{ for all } x, y, z \in I.$$

Thus, primness of Rforces that Either $d(z) = 0$ or $(F(y) - y) = 0$ for all $x, y, z \in I$. If $d(z) = 0$, for all $z \in I$ then $d = 0$.
A contradiction.

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On the other hand if $F(y) - y = 0$

$$\Rightarrow F(y) = y \text{ for all } y \in I$$
$$\Rightarrow F(x) = x \text{ for all } x \in I.$$

Now

$$\begin{aligned} xy &= F(x)F(y) \quad (\text{since } F \text{ is homomorphism}) \\ &= F(xy) \quad (\text{since } F \text{ is generalized left derivation}) \end{aligned}$$

$$xy = xF(y) + yd(x) \text{ for all } x, y \in I$$
$$xy - xF(y) = yd(x) \text{ for all } x, y, z \in I$$
$$x(y - F(y)) = yd(x) \text{ for all } x, y, z \in I$$
$$(y - y) = yd(x) \text{ for all } x, y, z \in I$$

We get

$$yd(x) = 0 \text{ for all } x, y \in I \tag{3.6}$$
$$Id(x) = 0 \text{ for all } x \in I$$

Again since $i \neq 0$ and R is prime we get $d(x) = 0$ for all $x \in I$ and hence $d = 0$.
Again contradiction.
(ii) If F acts as an anti homomorphism on I and if $d \neq 0$ then R is commutative.
Proof : If F acts as an ant homomorphism on

$$I.F(xy) = F(y)F(x) \tag{3.7}$$

Since F is generalized left derivation

$$F(xy) = xF(y) + yd(x) = F(y)F(x) \tag{3.8}$$

Replace y by xy.

$$F(xy)F(x) = F(xxy) = xF(xy) + xyd(x) \tag{3.9}$$

Since F is an anti hommorphism

$$F(xxy) = F(xy)F(x) \tag{3.10}$$

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right multiplying (3.8) with $F(x)$

$$\begin{aligned}(xy)F(x) &= \{xF(y) + yd(x)\}F(x)\\ &= xF(y)F(x) + yd(x)F(x)\end{aligned}$$

$$F(xy)F(x) = xF(xy) + yd(x)F(x) \tag{3.11}$$

Equating (3.9) and (3.11)

$$xF(xy) + xyd(x) = xF(xy) + yd(x)F(x)$$

we get

$$xyd(x) = yd(x)F(x) \tag{3.12}$$

replace y by zy in (3.12)

$$xzyd(x) = zyd(x)F(x) \tag{3.13}$$

Left multiply (3.12) with z we get

$$zxyd(x) = zyd(x)F(x) \quad \text{for all } x, y, z \in I \tag{3.14}$$

Equating (3.13) and (3.14)

$$xzyd(x) = zxyd(x) \quad \text{for all } x, y, z \in I$$

$$[x, z]yd(x) = 0 \quad \text{for all } x, y, z \in I \tag{3.23}$$

$$\Rightarrow [x, z]Idx = 0 \quad \text{for all } x, y, z \in I.$$

Thus primness of R implies that for each $x, z \in I$ either $[x, z] = 0$ or $d(x) = 0$.
If $d(x) = 0$ then $d = 0$.

If $[x, z] = 0$ for all $x, y, z \in I$, by lemma 2.2 R is commutative.

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తెల్లవారిపై నాటకాలతో సాయుధ పోరాటం చేసిన అరుదైన తెలుగువీరుడు దామరాజు పుండరీకాక్షుడు

డా.డి.మల్లయ్య, తెలుగు అధ్యాపకులు, పి.యన్.సి & కె.వి.యస్.సి ప్రభుత్వ కళాశాల, నంద్యాల

"The instinct of freedom is perhaps, the noblest of all human instincts, because it inspires, enlarges and elevates as well as gives meanings and content of life" అన్నది జాకీర్ హుస్సేన్‌గారి మాట. (Songs of Freedom కి ముందుమాటలో) "జననీ జన్మభూమిశ్చ స్వర్గాదపీ గరీయసీ" అని రామాయణంలో చెప్పబడింది. ఇవన్నీ కూడా అక్షర సత్యమనీ చరిత్రవల్ల తెలుస్తుంది. మాతృభూమిని దాస్యశృంఖలాల నుండి విముక్తి చేయాలని ఎందరో తమతమ్మలాడినట్లు దేశం కోసం ఆత్మార్పణం గావించుకున్నట్లు చరిత్ర నిరూపిస్తున్నది. ఈ పవిత్రయజ్ఞంలో కవులు, రచయితలు కూడా తమవంతు పాత్రను నిర్వహించారు. కొందరు దేశభక్తిని విషయంగా చేసుకొని కావ్యాలు రాస్తే, కొందరు స్వాతంత్ర్యవీరులను, పాలకుల దుశ్చర్యలను పద్యాలు, పాటల ద్వారా గానం చేశారు. యూరపు దేశాలలో కొందరు కవులు సాక్షాత్తుగా యుద్ధంలో స్వయంగా పాల్గొన్నారు. అవసరం వచ్చినపుడు యుద్ధం చేస్తూ అవకాశం దొరికినపుడు కావ్యాలు రాశారు. తుదకు అక్కడే ప్రాణాలు కూడా వదిలారు. విల్‌ఫ్రెడ్ ఓవెన్ అనే కవి 1918 సం॥లో ఫ్రాన్సులో యుద్ధంలో పాల్గొంటూ వీరమరణం పొందాడు. అలాగే ఫ్రాన్స్‌జుమార్ము అనే జర్మన్ లలిత కళోపాసకుడు 1916 సం॥లో యుద్ధంచేస్తూ దేశంకోసం ప్రాణాలర్పించాడు.

మన తెలుగు కవులకు కూడా ఇలాంటి అనుభవాలు ఉన్నాయి. ఈ పవిత్రయజ్ఞంలో పాలుపంచుకున్నారు. తమ కలాల్ని తుపాకులుగా చేసుకొని ప్రబోధగేయాల్ని తూటాలుగా ఆంగ్లేయులపైకి వదిలారు. ఎందరో కవులు జాతీయోద్యమ కవితా రథసారథులయ్యారు. కొంతమంది కవుల కొన్ని గీతాలు మాత్రమే వెలుగులోకి వచ్చి ఎందరో కవులు అజ్ఞాతంలో ఉండిపోయారు. అలాంటి వారే దామరాజు పుండరీకాక్షుడు.తెల్లవారిపై నాటకాలతో సాయుధ పోరాటం చేసిన అరుదైన తెలుగువీరుడు దామరాజు పుండరీకాక్షుడు.

1898 జూలై 6న పూర్వ గుంటూరు (ప్రస్తుత పల్నాడు) జిల్లా సత్తెనపల్లి తాలూకా పాలిబండ్ల గ్రామంలో దామరాజు పుండరీకాక్షుడు జన్మించాడు. గుంటూరు, కృష్ణా, విశాఖపట్నం ప్రాంతాలలో ప్రాథమిక, ప్రాథమికోన్నత విద్యనభ్యసించి మద్రాసులో బి.ఏ., బి.ఎల్ (న్యాయశాస్త్రం) పూర్తిచేశారు. ఓ వైపు చదువుకుంటూనే ... మరోవైపు బ్రిటీష్ కర్కషపాలనను తులనాడుతూ జాతీయోద్యమం వైపు ప్రజలను జాగృతం చేస్తూ తన సాహిత్యానికి పదునుపెట్టారు.

బి.ఎల్ చదువుతున్న సమయంలోనే పుండరీకాక్షుడి రచనలను ఆ కళాశాల యూరోపియన్ అధ్యాపకులు గుర్తించారు. ప్రతీకారచర్యగా పరీక్షలో ఉద్దేశపూర్వకంగానే ఫెయిల్ చేశారు. ఆయన దీనిపై సత్యాగ్రహ పద్ధతిలో నిరసన తెలుపుతూ అధిపతులను నిలదీశారు. చివరకు తమ వర్ద సమాధానమేమి లేక అధికారులు పుండరీకాక్షుడు ఉత్తీర్ణత సాధించినట్లు ప్రకటించారు. విద్యార్థి దశలోనే తెల్లవారిపై విజయం సాధించిన ఈ సంఘటనతో ఆయన 1920-29 సంవత్సరాల మధ్య అనేక జాతీయ రచనలద్వారా దేశభక్తిని, త్యాగనిరతను పురిగొల్పాడు.

స్వాతంత్ర్యోద్యమం గాంధీ సారథ్యంలో మహోద్యమంగా జరుగుతున్న రోజుల్లో గాంధీ టోపీ పెట్టినా, గాంధీ మీద పాటపాడినా, గాంధీపై నినాదం చేసినా ఆంగ్లేయులు అగ్గిమీదగుగ్గిలం అయ్యేవారు. జాతీయోద్యమంలో గీతాలు రాయడాన్ని, వాటిని ప్రచరించడాన్ని రాజద్రోహ చర్యగా పరిగణించి చాలామంది కవులను, రచయితలను కారాగారాల్లో బంధించేవారు బ్రిటీష్ పాలకులు. ఆ బెదిరింపులను తాటాకుచప్పుళ్ళు కింద జమకట్టిన యోధుడు పుండరీకాక్షుడు. ఆ పరిస్థితుల్లోనూ గాంధీనే స్తుతిస్తూ, కీర్తిస్తూ .... ఉద్యమ అవశ్యకతను ప్రజలకు వివరిస్తూ నాటకాలు రాసి, ప్రదర్శిస్తుండేవారాయన.

'దైరాసుర..'

గుంటూరు గాంధీపేట (నేటి అరండల్‌పేట)లో పుండరీకాక్షుడు 'స్వరాజ్య సోపాననిలయం' ఏర్పాటు చేశారు. అక్కడి నుండి వెలువడిన దేశభక్తి గేయాలు, పాటలు, పద్యాలు, నాటకాలు, హరికథలు, బుర్రకథలు ఆంగ్లేయుల గుండెల్లో గుబులు పుట్టించాయి. జలియన్‌వాలాబాగ్ దురాగతాన్ని 'మహాభారతం' కథలో ఇమిడ్చి పుండరీకాక్షుడు రాసిన 'పాంచాల పరాభవం' నాటకం అప్పట్లో ఓ సంచలనం. ఈ నాటకంలో జనరల్ డయ్యర్‌ను 'దైరాసుర' గా సంబోధిస్తూ దుశ్శాసునిగా, భరతమాతను పాంచాలిగా, మహాత్మాగాంధీని కృష్ణుడిగా పోల్చారు. తెల్లవారిచేతుల్లో చిక్కి, వెక్కివెక్కి ఏడుస్తున్న

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భరతమాతను గాంధీ ఓదార్చుతూ .... సత్యాగ్రహ దీక్షతో ప్రజలను స్వరాజ్య సమరం వైపు మళ్ళించే ఇందులోని ఘట్టం సామాన్యులను కూడా ఆలోచింపజేసింది. దుశ్శాసునిడిగా చిత్రీకరిస్తూ డయ్యర్ దిష్టిబొమ్మను ఊరూరా తగలబెట్టడాన్ని శ్వేతజాతీయులు జీర్ణించుకోలేకపోయారు. ఈ నాటక ప్రదర్శన బ్రిటన్ పార్లమెంటులోను చర్చకు వచ్చింది. ఫలితంగా బ్రిటీష్ ప్రభుత్వం భారత్‌లో ఆ నాటకాన్ని నిషేధించింది. ఆ నాటిక ప్రతులను తగులబెట్టించి, చివరకు ... పుందరీకాక్షుడు రాసిన నాటకాలపై ఉక్కుపాదం మోపింది. వాటిని ప్రదర్శించేవారికి లాఠీదెబ్బులు, కారాగారం తప్పేది కాదు! ఉద్యమాలు, ఉద్యమ నాయకులమీద ప్రదర్శిస్తే.... దొరికి పోతామన్న ఉద్దేశంతో 'హరిశ్చంద్ర రాయభారం, చింతామణి' వంటి నాటకాల గురించి ముందుగా ప్రచారం చేసి సమయానికి ప్రదర్శించేది మాత్రం ... 'నవయుగ గాంధీవిజయం, రణభేరి, క్విట్ ఇండియా' లాంటి నాటకాలు!!

జాతీయోద్యమ నాటకాలతో ప్రజల్ని జాగృతం చేస్తున్న దామరాజుని తమ అదుపాజ్ఞలో పెట్టుకోవడానికి తెల్లదొరలు ఎన్నో ఎత్తులు వేశారు. చివరికి 'కనీసం నాటకాల్లో గాంధీజీ పాత్ర లేకుండా అయినా రాయండి' అంటూ ఓ రాయబారితో ఆంధ్ర ప్రభుత్వం రాయభారం నడిపింది. అలా చేస్తే నజరానాగా యాభైవేల రూపాయిలు ఇస్తామని కూడా ఆశజూపింది. అప్పట్లో రూ.50 వేలు అంటే మాటలు కాదు. కానీ దామరాజు ఆ ప్రలోభానికి లొంగలేదు. సరికదా... "గాంధీ లేనిది సాగదు నా కలమ్ము..." అంటూ ఓ పద్యాన్ని రాసి, ఆ రాయభారి ద్వారానే ఆంధ్ర పాలకులకు పంపించారాయన.

దామరాజు పుందరీకాక్షుడు రాసిన దేశభక్తి గేయాలు, పాటలు, ఒగ్గు కథలు, బుర్రకథలు .... ప్రముఖులు, పండితపామరుల మెప్పు పొందడమే కాదు, ఎంతటి పాషాణ హృదయాన్నైనా కరిగించాయి. వీరావేశంతో స్వాతంత్ర్యోద్యమంలో దూకేలా చేశాయి. సగటు భారతీయుల నోళ్ళలోనూ నానుతూ జాతీయ భావాలను పెంపొందించేవి. కాంగ్రెస్ సభల్లో 'ఎవ్వని శాంతిమూర్తియని ఎల్లరనారతమునన్...' శ్రీ గాంధీనామం మరువం మరువం... నిత్యం జైలుకు వెరువం వెరువం ...' అన్న దామరాజు గీతాలే వినిపించేవి. ఈయన రాసిన నాటకాలను ఆచార్య ఎన్జీ రంగా ఇంగ్లాండ్‌లో ప్రదర్శించి అరెస్టు అయ్యాడు. దీని ద్వారా ఆయన నాటిక రచనాపటిమను మనం అర్థం చేసుకోవచ్చు. దేశంలో జాతీయోద్యమ నాటకాల తొలి రచయితగా పేరును సుస్థిరం చేసుకున్న దామరాజు పుందరీకాక్షుడు 1975లో పరమపదించారు.

ఆధారగ్రంథాలు:-

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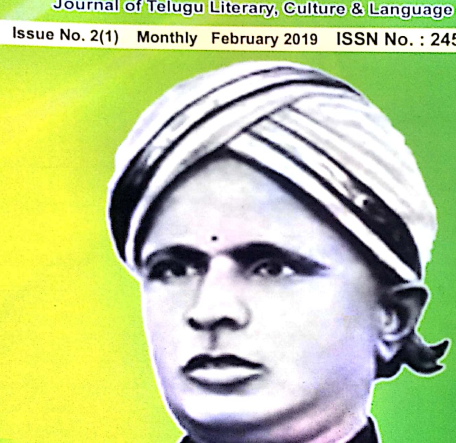
తెలుగు సాహిత్య సాంస్కృతిక భాషాధ్యయన పత్రిక

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మహబూబ్‌నగర్ కథలు - దళిత, గిరిజన, బహుజన జీవన చిత్రణ

- డా॥ డి. కుల్లయ్య తెలుగు అధ్యాపకులు, పి.యస్.సి & కె.వి.ఎస్.సి, ప్రభుత్వ డిగ్రీ కళాశాల, నంద్యాల, కర్నూలు జిల్లా.

1902 లో తెలుగు కథానిక పుట్టింది. 1910 లో తెలుగు కథానికా ప్రవాహం మొదలైంది. 1925 లో తెలుగు దళిత కథానిక వెలువడింది. తెలుగు నేలలో ఈ కథానిక పుట్టేనాటికి ఆంధ్రదేశంలో సంఘ సంస్కరణ జాతీయోద్యమాల బలంగా సాగడం, కుల సమానత వేదికమీదకు రావడం, అస్పృశ్యత ప్రధాన ప్రవంతి కావడం, దళితులు ఆలోచనాపరులు కావడం, తాము కోల్పోతున్న హక్కులను గుర్తించడం, హిందూవాదాన్ని ప్రశ్నించడం, అగ్రవర్ణ దౌర్జన్యాన్ని వ్యతిరేకించడం లాంటి అంశాలు మొదలయ్యాయి.

ఆ తర్వాతి కాలంలో దళితులు చైతన్యవంతం కావడం అస్పృశ్యతను వ్యతిరేకించే ఉద్యమాలలో భాగస్వాములు కావడం, బౌతిక వాదం మాటున ముందుకు సాగడం, తమ ఉనికిని మార్చుకొనే ప్రయత్నం చేయడం, దళిత ఉద్యమాలను బలోపేతం చేయడం, దళితులపై సాగే హింసను

అత్యాచారాలను ప్రతిఘటించడం, తమ హక్కులను కాపాడుకొనే ప్రయత్నం చేయడం, ఆ ప్రయత్నంలో సవర్ణుల నుండి దళితులు తీవ్ర హింసను ఎదుర్కొనడం, హత్యలకు గురికావడం, దళితుల ఆత్మగౌరవ పోరాటాలు సాగడం లాంటి అంశాలు గత శతాబ్దాన్ని బాగా కుదిపేశాయి. ఇలాంటి గత శతాబ్ది సంఘటనలన్నింటికీ తెలుగు కథానిక సాక్షీభూతంగా నిలిచింది. గ్రామీణ సమాజంలోని దళితులు, వారి జీవన స్థితి, గాయాలు, చేస్తున్న పోరాటాలు, పొందుతున్న లాభాలు, చేయాల్సిన పోరాటాలు.... ఇలా వీటన్నిటిని రచయితలు తమ కథానికల ద్వారా రికార్డు చేసే ప్రయత్నం చేశారు. తెలుగు కథానికలో భాగంగా వచ్చిన మహబూబ్‌నగర్ జిల్లా కథా సాహిత్యంలో కూడా ఇవన్నీ చిత్రీకరించబడ్డాయి.

మహబూబ్‌నగర్ నిజాము ఏలుబడిలో పుండడం వల్ల ప్రజాజీవనంలో కొన్ని ప్రత్యేక పరిస్థితులు కనిపిస్తాయి. ఉన్నత వర్గాల వారు జాగీర్దార్లకు దగ్గరగా ఉండేవారు. వారి ద్వారా నిజాము ప్రభుత్వానికి కూడా దగ్గర కాని దళిత, బహుజనులకు అటువంటి అండ లేనే లేదు. వాళ్ళు నిజాము పోలీసుల దోపిడీకి గురయ్యారు. ఈ దోపిడీని మహబూబ్‌నగర్ జిల్లా కథకులు తమ కథల ద్వారా వ్యంగ్యంగా శక్తివంతంగా చిత్రించారు.

మహబూబ్‌నగర్ జిల్లాలో వివిధ ప్రక్రియల్లో గొప్ప రచనలు రావడం వెనుక అక్కడి ఉద్యమాలు ప్రధానంగా దోహదం చేశాయి. ఈ ఉద్యమాల్లో దళిత, బహుజనులు సాహసోపేతంగా పాల్గొన్నారు. నిజాం వ్యతిరేక పోరాటంలో వారి సాహస కార్యాలను ముఖ్యంగా తొలి తరం కథా రచయితలు గొప్పగా చిత్రించారు. అనంతర తరానికి చెందిన రచయితలకు నక్సలైట్ ఉద్యమంలో భూమి కోసం భుక్తి కోసం సాగిన పోరాటం కథా వస్తువైంది. ఈ కథల్లోనూ దళితులు, బహుజనుల త్యాగాలు చిత్రించబడ్డాయి.

మహబూబ్‌నగర్ నుండి బొంబాయి ఆ పరిసర ప్రాంతాలకు వలస వెళ్ళిన పేదల బాధలపై అనేక కథలు వచ్చాయి. జీవనం గడవక పొట్టచేత బట్టుకొని వలస వెళ్ళక తప్పని పరిస్థితులలోకవైపు, తల్లితండ్రి, ఊరువాడా వదలి దూరదేశం వెళ్ళలేక మరోవైపు పడ్డ వేదనను చిత్రిస్తూ కథలు రాసిన వారిలో గొరుసు జగదీశ్వరరెడ్డి (వలస పక్షులు); జనజ్వాల (... ఎడమకాలు చెప్పు జారింది, పిచ్చి పిల్ల); కోట్లవంజాత (సముద్రం); డా॥ భీంపల్లి శ్రీకాంత్ (వలసజీవులు); ఉదయమిత్ర ('పేగు బంధం, అమ్మను జూడాలె....., పట్నం వచ్చిన ఎలుక) వంటి వారున్నారు.

పాలమూరు కథారచయిత గొరుసు జగదీశ్వర రెడ్డి రాసిన 'వలస పక్షులు' కథలో నగటు వలస కూలీలు వలస వెళ్ళాక అక్కడ కాంట్రాక్టర్‌ల దురాగతాలకు ఎలా బలైపోతారనేది ఈ కథలో ప్రధాన ఇతివృత్తం. పాలమూరు కరువు నేపథ్యంలో తన తండ్రిని పోగొట్టుకున్న

Scanned with CamScanner

ఒక పిల్లవాడు తల్లితో కలసి విశాఖపట్నం వలస వెళ్ళి అక్కడ ఆమెనీ పొగొట్టుకుని, అక్కడే పనిచేస్తున్న మరొక వ్యాపారి సాయంతో పెరిగి, పెద్దవాడై బాగా చదువుకొని విశాఖ స్టీల్ ప్లాంట్‌లో జూనియర్ మేనేజర్ అవుతాడు. ఆయన తన వృత్తిలో భాగంగా వున్నపుడు ఒక ప్రమాదం సంభవించి నూకాలమ్మ అనేకులీ గాయపడుతుంది. అతడామెకు సహాయం చేస్తాడు. ఆమెకు న్యాయం జరగాలని తన పై అధికారులతో, కాంట్రాక్టర్లతో వాదిస్తాడు. ఆ క్రమంలోనే తన వైయక్తిక జీవితం ఎలా ధ్వంసమైందో చెప్తాడు రచయిత. "గగనంలోని పక్షులు మరోచోటుకి వలస వెళ్ళినా స్వేచ్ఛగా తిరుగుతూ వాటి పిట్టలు నింపుకొని కొన్నాళ్ళకి తిరిగి సొంతగూటికి చేరుతుంటాయి. కానీ, పాలమూరి పక్షులు రెక్కలు ముక్కలు చేసుకొంటూ, దొక్కలు మాడ్చుకుంటూ, మేస్త్రీలను, కాంట్రాక్టర్‌లను మేపడానికి వలస వెళ్తుంటాయన్న యదార్థం ఎందరికి తెలుగు" అనడం పాలమూరు వలస కూలీల జీవితాన్ని వివరిస్తాయి. వలస బాధితుల దయనీయ స్థితిని గురించి కూడా జనజ్వాల తన 'పిచ్చిపిల్ల' అనే కథలో చిత్రించాడు. ఇందులో వలస వెళ్ళిన తల్లిదండ్రుల కోసం వారు చనిపోయారని తెలియక ఎదురుచూసి, తెలిశాక మానసిక అస్వస్థతకులోనయ్యే ఒక చిన్నారి జీవితం గురించిన ఇతివృత్తంతో సాగిన కథ. అవిద్యావంతులైన వలస కూలీలు కాంట్రాక్టర్ల దోపిడీకి ఎలా గురువుతున్నారో చిత్రించడం జరిగింది.

మహబూబ్‌నగర్ జిల్లాలో కనిపించే మరొక ముఖ్యమైన కోణం, ఈ ప్రాంతపు వెనుకబాటుతనం, ఈ వెనుకబాటుతనం కథల్లోకి కూడా ప్రవహించింది. ఇక్కడి నుంచే రచయితలు తయారై తమ వెతలకు అక్షరరూపం ఇవ్వడం, తమ బాధల గాథల్ని సహజంగా, శక్తివంతంగా చిత్రించడానికి ప్రయత్నించడం కనిపిస్తుంది. గ్రామాల్లో బడులు వచ్చాయి. అక్కడ పనిచేసే ఉపాధ్యాయులు పిల్లలకు అన్ని విషయాలు చెబుతుంటారు. ఇదే విషయం పాలమూరు కవి, రచయిత అయిన 'జనజ్వాల' రాసిన '..... ఎడమకాలు చెప్పు జారింది' అనే కథలో ఒక సాధారణ పేద కుటుంబీకుడు, నిమ్న కులస్థుడు, అయిన ఒక ఉపాధ్యాయుడు తన జీవితంలో చూసిన పాలమూర్ లేబర్‌కు సంబంధించిన విషయాన్ని చెప్పడమే ఇందులోని ప్రధాన ఇతివృత్తం. ఇందులో కథకుడు పాలమూర్ లేబర్ దయనీయ స్థితి గురించి, దళిత బహుజనుల జీవన స్థితిగతులను గురించి శక్తివంతంగా చిత్రించాడు. ఇదే విషయాన్ని ఇతివృత్తంగా తీసుకొని డా॥ బీంపల్లి శ్రీకాంత్ 'వలసజీవులు' కథలోనూ, ఉదయమిత్ర 'పేగుబంధం', 'అమ్మను జూడాలె', 'పట్నం వచ్చిన ఎలుక', కథల్లోనూ మహబూబ్‌నగర్ జిల్లా దళిత బహుజన, మైనారిటీ ప్రజల జీవన విధానాన్ని సహజంగా చిత్రించారు.

తెలంగాణలో బహుజనులకున్న అనేక సమస్యల్లో దొరల ఆగడాలు అతిపెద్ద సమస్య. ఇది మహబూబ్‌నగర్ జిల్లాలోనూ ఉంది. ఈ సమస్యను ఇతివృత్తంగా చేసుకొని ఎందరో ఈ జిల్లా కథారచయితలు ప్రజా జీవితాన్ని చిత్రించారు. ఈ సమస్యను ఉదయమిత్ర రాసిన 'బానిస రాజ్జె' కథలో మనం చూడవచ్చు. తక్కువ కులంలో పుట్టినప్పటికీ దొరలకు బాంచెలు కావొద్దని, విలువలతో మానవత్వంతో బతికే దళిత కుటుంబాన్ని ఓర్చుకోలేని, దొర ఎన్ని కుటిలాలోచనాలతో ఒక దళిత కుటుంబాన్ని లొంగదీసుకొని ఆ కుటుంబ జీవితాన్ని ఎలా విధ్వంసం చేసిందో కవి అటు దళిత చైతన్యాన్ని, ఇటు దొరల దౌర్జన్యాలను, ఆగడాలను, సామాజక స్థితిని శక్తివంతంగా చిత్రించాడు. ఈయనే ఇదే ఇతివృత్తంతో రాసిన 'సాచ్చీ' కథలో కూడా దొరలకు వ్యతిరేకంగా సత్య విషయాన్ని సాక్షిగా చెప్పిన దళితుడి మంచితనం, దళితుడి మానవతాగుణం, దళితుడి సాహసం దొరల దౌర్జన్యం ముందు ఏవిధంగా ఓడిపోయిందో, దొరల ఆగ్రహానికి ఎలా గురయ్యిందో రచయిత నిపుణతతో చిత్రించాడు. ఇదే రచయిత 'బిచ్చుగత్తె' కథలో పురుషాహంకారాన్ని చూపిస్తూ స్త్రీ తన దయనీయ స్థితిలో కూడా తన ఆస్తిత్వాన్ని చాటుకున్న పరిణామాన్ని చిత్రించాడు. తెలుగు సాహిత్యంలో చాలా వరకు స్త్రీ, పురుష సంబంధాలు విచ్ఛిన్నమౌతున్న వైనాన్ని చెప్పగలుగుతున్నారు. కాని ఇంటి గడపదాటిన స్త్రీని ఏం చేయాలో తెలియని అయోమయ స్థితి చాలావరకు కనిపిస్తుంది. కాని ఈ కథలో బిచ్చుగత్తె తాను ఒంటరిగానైనా

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గౌరవంగా జీవించగలననే ధీమా ఉంది. బహుశా స్త్రీ పురుష సమానత్వ సాధనలో ఈ తెగింపు ఒక భాగమే కావచ్చు. ఇది ఈయనే రాసిన గ్యాస్‌లైట్ కథలో కూడా కనిపిస్తుంది.

పిల్లల మనసులో మనసునూ, భాషలో భాషగా ఒదిగి పోయే విధంగా వెంకట్రాములు అద్భుతమైన కథలు రాస్తాడు. ఉపాధ్యాయుడుగా బడిలో ఎంతగా ఒదిగి పోయాడో బయట ఉపాధ్యాయ ఉద్యమానికి అంతగా నాయకత్వం అందించాడు. ఏడు కథలతో 'జంగిడి' కథా సంకలనాన్ని రాశాడు. ఈ కథలు దేనికవి వేర్వేరు విషయాలను మనతో సంభాషించినా అంతస్సూత్రం బడుగు, బలహీన వర్గాల జీవితం, పర్యావరణం. సమాజంలోని, జీవితంలోని కల్మశాన్ని కడిగిపారేయకుండా ఒక ఆటంకంగా, ఒక వ్యాపారంగా సామ్రాజ్యవాద విషకోరలు ఎట్లా చుట్టముట్టినాయో ఈ కథలు తెలుపుతాయి. మన కళ్ళముందరనే మన జనాలు, మన వనాలు మారవలిసిన నట్టు గుణాత్మకంగా కాకుండా ఒక వికృత రూప విక్రియ ఎట్లా జరుగుతున్నదో ఈ కథలు చూపెడతాయి. అనాగరికత నాగరికతగా, నాగరికత అనాగరికతగా, చలామణి అవుతుండటం లోయ కథలో మనం చూస్తాం. మన పల్లెలు 'జంగిడి' కబేళాలకు ఆహారంగా మారటం, జంగిడి జీవనాధారంగా బతికిన ఎల్లప్ప బతుకు జంగిడిలాగా దైన్యంలోకి దిగజారడం జంగిడి కథలో పెను విషాదం. మన బళ్ళల్లో పిల్లలు ఎట్లా ఉన్నారు. 'అందరికీ అక్షరాల పథకం ప్రభుత్వాలకు ఆదర్శం'. అది వెంకటేష్‌కు ఆదర్శమే. 'పాల' అట్లానే బడికి చేరింది. బడిలో ఉండగలిగిందా? చదువుకోగలిగిందా? పాలిని బడి తరిమేసిందా? అమ్ముకున్నది అవ్వేనా? సమాజం పాలి కోసం ఆలోచిస్తున్నదా? ప్రభుత్వాల ప్రయోజనాలు వేరు కదా? పాలి కథ మన పసిపిల్లలు పనిపిల్లలుగా ఎట్లా అమ్మకానికి పోతున్నారో, ఎటుపోతున్నారో తెలియని దుస్థితి చెప్తుంది. ఈ కథలో మన పిల్లలు, మనం, మన పరిసరాలు అన్నీ నరుకుగా వ్యాపారానికి బందీలుగా ఎట్లా మారిపోయాయో తెలుస్తుంది. 'ఏడు సంచుల దరిద్రం' కథ ట్రాక్టర్ కొనటం అనే గోదాలోకి దిగటంతో మొదలై ట్రాక్టర్‌ను వదిలించుకోవటంతో ముగుస్తుంది. కలలు కనలేని జీవన వ్యవసాయ సంక్షోభంలో ఉన్న మైబు, మైబమ్మ తదితర పాత్రలు మనని వెంటాడుతాయి. ఆపరేషన్ బర్త్‌డౌంట్ కథ వర్తమాన సమాజ చలనాన్ని దృశ్యమానం చేసి మనం ఎక్కడ ఉన్నామో..... ఎక్కడ ఉండాలో తేట తెల్లంచేస్తుంది.

'నేద్యం' కవితా సంకలనంతో కవిగా మనందరికీ తెలిసిన ఇక్బాల్ కథలూ రాశాడు. మూడున్నర దశాబ్దాలుగా ప్రజాస్వామిక తాత్వికధార తెగకుండా రాస్తున్నాడు. జీవితాన్ని ఏమేమి కొప్పేస్తున్నాయో ? తాను అర్థం చేసుకున్నదంతా మనకూ అర్థం చేయించే ప్రయత్నంలో నిరంతరం రాస్తూనే ఉన్నాడు. ఏడు కథలతో ఒక సంకలనం తెచ్చాడు. 'కాలువ మింగిన ఊరు' కథలో ఆలోచింపజేసే చర్చను అందించాడు. చేనేత కార్మికుల బతుకులలో పాదుకొన్న అసహజ మరణాల స్థితిని 'చెల్లని రాయ్యం కథలోను' డిఇఓ కార్యాలయ లంచగొండితనాన్ని నిలదీసిన సందర్భాన్ని 'అతడే' కథలోను చూపించాడు. పోలేపల్లి గ్రామాన్ని సమాధిచేసి దాని మీద పరుచుకున్న 'కఫన్' లాగా సెజ్ ఎట్లా పోలేపల్లి ప్రజల బతుకుల్ని సమాధిచేసిందో 'కఫన్' కథలో వివరించాడు. పాలమూరు వలసజీవుల బిడ్డడు 'బీజా' బాల్యాన్ని అనేక ఎతలు చుట్టుకున్నాయి. తమ పల్లెను, బతుకు వలసలను, బడిని, పంతుళ్ళను, కాలిన ఊరును అతడు అనుభవించాడు. బస్సుమీద పేరిన దుమ్ములో అతను రాసి పంపిన అవ్వ చావు వార్తను అమ్మ చూస్తుందా ? అతని చుట్టూ అతనికి అన్నీ సమస్యలే. బీజా ఈ సమస్యలను దాటే పనిలో బయల్దేరాడు. అతనిప్పుడు ఎక్కడున్నాడు? చిన్న వయసులోనే చెరువంత జీవితాన్ని అనుభవించిన బీజా మనందరి విముక్తికి దారులు వేస్తున్నాడా ..... ? ఇదే సంకలనంలోని మరో కథ 'ఎటు చూసినావాడే' ఇది పాఠకున్ని కదిలించి, ఆలోచింపజేసే కథ.ఈ కథలో అదృశ్యమైన పిల్లవాడు బడినుండి మాయమైన పిల్లవాడు. విద్య ప్రాథమిక హక్కుగా అంగీకరించారు. సందర్భంలో సమస్యల వలయంలో చిక్కుకుని ప్రపంచీకరణలో కొట్టుకొనిపోయిన వాడు. ఆకలి, కరువు, వలసలకు

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ఆహుతి అయినవాడు. ఇదంతా కూడా వందల సంవత్సరాలుగా ఒకరికి ఒకరము అనే సహకారం, సమిష్టి జీవనం కష్టనుఖాల్లో స్పందించే మనుషులను కోల్పోవడం మహా బూబ్‌నగర్ దళిత బహుజనుల జీవన బ్రతుకుకు నిదర్శనం.

ఈ పాలమూరు కథల రాజకీయ ఆర్థిక నేపథ్యం. ఈ దేశ పాలనలో సామ్రాజ్యవాద ప్రేరేపిత అభివృద్ధి నమూనాను అమలు చేస్తున్న సందర్భం. పాలమూరు రాజకీయ నాయకులు ఆంధ్ర పెట్టుబడిదారులకు ఊడిగం చేస్తూ వాళ్ళ సంపదకు దాసోహం అంటున్న సందర్భమిది. లేక పోతే కృష్ణానదిలో తమ జిల్లా న్యాయమైన వాటా కొరకు పోరాటం చేయకపోవడమేమిటి? ఆంధ్రా పెట్టుబడుదారులు, దేశ దళారీ నాయకులతో మిలాఖతై ప్రపంచీకరణ ఈ దేశానికి, ఈ దేశ ప్రజలకు, వ్యవసాయ జీవితానికి, గ్రామీణ వృత్తులకు పూర్తిగా వ్యతిరేకమైన ఒక నమూనాను ఈ దేశం మీద రుద్దారు. దాంతో కృష్ణానదిలో నీళ్ళ వాటా కోల్పోయి కరువుకు విలవిలలాడుతున్న పాలమూరు బడుగు, బలహీన వర్గాల మీద ఈ దుర్మార్గ అభివృద్ధి నమూనాను రుద్దడంతో గత రెండు దశాబ్దాలుగా ప్రజల జీవితం మరింత విధ్వంసానికి గురైంది. ఈ విధ్వంస చిత్రీకరణే ఈ కథలు.

1980 ల ఆదునికీకరణ పరిణామాలు, 1990 ల నూతన ఆర్థిక విధానాల పరిణామాలు దేశదేశాల సమాజాలను, మొత్తంగా ప్రపంచాన్ని అనేక కుదుపులకు ఆటుపోట్లకు గురిచేశాయి. ఈ ప్రభావం ఏ మనిషిని ఏ ఇంటినీ ఏ ప్రాంతాన్ని వదిలిపెట్టలేదు. చదల చీకటి కదల బారిందేమో కానీ, ఉరుములు మెరుపులతో కొత్త చీకట్లు కమ్ముకున్నాయి. ఈ వెలుగు నీడలన్నీ సాహిత్యంలో నమోదు కావాలి. ప్రయాణిస్తున్న వాహనం కుదుపులకు లోనయినపుడు తట్టుకోలేని దేహాల మనుషుల లాంటి పరిస్థితి పాలమూరు దళిత, బహుజనుల జీవితాలను కమ్మేసింది. ఈ దైన్యాన్ని నమోదు చేసి కదిలించవలసిన బాధ్యత పాలమూరు రచయితల మీద చాలానే ఉంది.

వేల సంవత్సరాల గత చరిత్రలోను, మనకు దగ్గరి ఈ నూరేండ్ల చరిత్రలోను మనం పట్టుకొని పది మందికీ చూపవలసిన ఆసక్తికరమైన ప్రత్యేకమైన అనేక సందర్భాలు పాలమూరులో ఉన్నాయి. ప్రజలు కాపాడుతూ వచ్చిన మౌఖిక కథలు, పాడుకున్న వీరగాధలు అభూత కల్పనలదాడికి, ఆధునిక మిడియా దాడికి గురవుతున్నాయి. మన పెద్ద మనుషుల నుంచి, జానపద గాయకుల నుంచి విని ఈ కథలన్నీ నమోదు చేయవలసి ఉంది. వాటిలో ఉన్నటువంటి ప్రజాజీవన చిత్రణ నేటి దళిత, బహుజన, గిరిజన వర్గాల, స్థానిక చరిత్ర అవగాహనకు, భవిష్యత్తు నిర్మాణానికి ఇవి ఎంతైనా తోడ్పడతాయి.

తృణీకరించబడ్డ వర్గాల పట్ల, అణచివేతకు దోపిడీకి, గురవుతున్న వర్గాల పట్ల రావల్సినంత సాహిత్యం మహా బూబ్‌నగర్ జిల్లా నుండి రావడం లేదు. సమాజంలో దళిత, మైనారిటీ, గిరిజన, బహుజనులు అధిక సంఖ్యాకులైనా, ఈ దేశ ఉత్పత్తులలో అగ్రభాగంలో ఉన్నా, ప్రభుత్వాలచేత, ఆర్థికంగా, రాజకీయంగా ఎదిగిన మిగిలిన సామాజిక వర్గాల చేత నిరాదరణకు గురువుతూనే ఉన్నారు. రచయితలు కూడా ఈ వర్గాల నుంచే ఈనాడు ఎక్కువగా వున్నారు. దేశం ఆర్థికంగా, సాంకేతికంగా అన్ని రంగాలలో ముందుకు వెళుతున్న ఈ సందర్భంలోనూ ఈ వర్గాల గురించి పట్టించుకునేవారు తక్కువే. ఈ విధానం మారాలి. నిరాదరణకు గురైన వారి గురించి రాయాల్సిన చారిత్రక అవసరాన్ని గుర్తించాలి. ఎందుకంటే మనకు చరిత్ర అంటే రాజులు, వారి పాలనా, కళాపోషణ, నాయకుల ఘన కార్యాలే కాదు. వాటితోబాటు సామాన్యులకు సంబంధించిన విషయాలు కూడా చరిత్రేతన్న సత్యాన్ని ప్రపంచం విస్మరించింది. రొటీన్ విషయాలతో గిడసబారిపోయివున్న చరిత్ర, మన ప్రాచీన సంస్కృతి మొదలైన విషయాలతో చరిత్రను పునర్మించుకోవాల్సిన అవసరం ఎంతయినా వుంది. అది జరగాలంటే Gross Roots అయిన దళిత, బహుజన, గిరిజన, మైనారిటీల చరిత్ర సంస్కృతి తెలియాలి. వారి జీవన విధానం తెలియాలి. అందుకోసమైనా దళిత బహుజన, గిరిజన, మైనారిటీల కథలు విస్తారంగా రావాలి. వారి జీవితాలు మెరుగుపడాలి.

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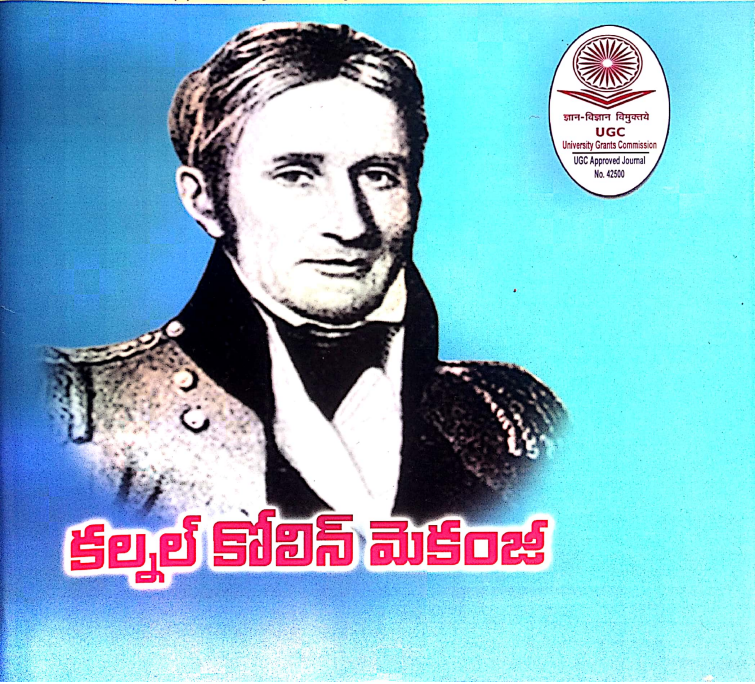
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తెలుగు సాహిత్య సాంస్కృతిక భాషాధ్యయన పత్రిక

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మహబూబ్‌నగర్ కథలు - ప్రపంచీకరణ అనుభవాలు

- డా॥ ఓ. కుల్లయ్య, తెలుగు అధ్యాపకులు, పి.యస్.సి & కె.వి.ఎస్.సి, ప్రభుత్వ డిగ్రీ కళాశాల, నంద్యాల, కర్నూలు జిల్లా.

ఒక దశాబ్దం కాలంనాటి మన చుట్టూ ఉన్న ప్రజా జీవన సరళికి, నేటి జీవన విధానానికి ఉన్న తేడాను పరిశీలించి చూసినపుడు రెండింటికీ మధ్య వ్యత్యాసం ఎంత వుందో స్పష్టంగా అర్థమవుతుంది. వేషభాషలు, ఆహారపు అలవాట్లు, విద్యావిధానం, మొదలైనవి తమ తమ స్వాభావిక రూపాల్ని మార్చుకుంటూ వింత నాగరికతవైపు దృష్టి పెట్టి సంపదలవైపు, సౌఖ్యాల వైపు మనిషిని ప్రేరేపిస్తున్న కొత్త ఆలోచనా విధానమే ప్రపంచీకరణ ప్రభావం. మానవతా విలువల్ని మంటగలుపుతూ, మనిషి వ్యక్తిత్వాన్ని వేటకొడవళ్ళతో నరుకుతూ తెలుగు సమాజాన్ని ఆక్రమిస్తున్న ఈ ప్రపంచీకరణ దుర్భర్యల్ని ఎదుర్కొనే శక్తిలేక మనకెందుకులే అంటూ మౌనంగా చూస్తున్నవారు కొందరైతే ఈ పాశ్చాత్య ప్రపంచీకరణ ఘాటుకు ఊపిరాడక నలుగుతున్న వారు కొందరు. ఈ విపరీత ధోరణులకు ఎదురుతిరిగి తుపాకీ తూటాలకు ప్రాణాలు విడుస్తున్న వారు మరికొందరు.

1990 నుండి ప్రపంచీకరణ భారతదేశ అస్తిత్వానికి పెద్ద సవాలుగా మారింది. దేశీయమైన జీవనంలో ప్రతి అంశాన్ని విదేశీయం చేయడానికి ప్రపంచీకరణవాదులు ప్రయత్నిస్తున్నారు. ప్రతి వస్తువును అమ్మకం సరుకుగా చేస్తూ మనుషుల మధ్య ఎత్తైన డబ్బు గోడలు కడుతూ మానవత్వపు విలువల్ని ప్రపంచీకరణ ధ్వంసం చేస్తుంది. తెలుగు కథానిక ఆవిర్భవించిన నాటి నుండి సమకాలీన పరిస్థితుల్ని, సంఘటనల్ని, నూతన పోకడల్ని విమర్శిస్తూ ముందుకు సాగింది. అదే క్రమంలో ప్రపంచీకరణ దుర్భర్యల్ని ఎండగట్టడానికి గురుజాడ వారసత్వాన్ని మహబూబ్ నగర్ కథాసాహిత్యంకొనసాగించింది. ఈ ప్రపంచీకరణ సృష్టిస్తున్న విధ్వంసాన్ని ప్రజలకు తెల్పడానికి మహబూబ్‌నగర్ కథానికా రచయితలు కొందరు స్వచ్ఛందంగా ముందుకొచ్చారు. అయితే అలాంటి కథలు రాస్తున్న రచయితలందరికీ ప్రపంచీకరణ గురించి, దానిలో ఇమిడి ఉన్న అంశాల గురించి, దాని ఫలితం గురించి స్పష్టంగా తెలియకపోయినా నేడు మార్కెట్‌లోకి వస్తున్న సరికొత్త వస్తువులు, రంగుల్ని ఒలకబోసే టి.వి.లు, వాటి ద్వారా ప్రజల్ని ఆకర్షిస్తున్న కొత్త జీవనశైలి, సరికొత్త మానవ సంబంధాలు మనిషిని మార్కెట్ శక్తిగా మలుస్తున్న తీరు కథా రచయితలకు ప్రపంచీకరణ అంటే ఏమిటో ఒక అవగాహన కల్పించాయి. తత్ఫలితంగా ఎన్నో కొత్తకథలు మహబూబ్‌నగర్ కథా ప్రపంచంలో అడుగుపెట్టాయి. చేతివృత్తులు నాశనమైపోయి వాటిని నమ్ముకున్న వాళ్ళు వీధిన పడడం, చేనేత కార్మికుల ఆత్మహత్యలు, వ్యవసాయ దారుని నడ్డి విరిచే ప్రయత్నాలు, అభివృద్ధి కార్యక్రమాల్లో, యంత్రాల్ని ఉపయోగించడం, చదువంటే కంప్యూటర్ విద్యనుకోవడం, కంప్యూటర్ ఉద్యోగాలు చేసే వారి జీవనశైలి తక్కిన ప్రపంచంనుండి వారు విడిపోయినట్టుండడం, ఇటీవల కాలంలో వచ్చిన సెజ్, ప్రాజెక్టుల వల్ల రోడ్డున పడ్డ ప్రజలు, విద్యారంగంలో ధనస్వామ్య లక్షణాల ప్రవేశం మొదలైన అంశాలపై మహబూబ్‌నగర్ జిల్లా నుండి ఎన్నో కథలు వచ్చాయి.

1. ప్రపంచీకరణ కథలు- చేతివృత్తుల విధ్వంసం:

స్వేచ్ఛా వాణిజ్యాన్ని ప్రోత్సహిస్తున్న ప్రపంచీకరణ విధానంలో తొలిదెబ్బ దేశీయమైన చేతివృత్తులపై, చిన్న చిన్న వ్యాపారులపై పడింది. చిన్న చిన్న వృత్తులలో బ్రతుకు బండిని నడిపిస్తున్న ప్రజల నడ్డి విరగ్గొట్టిన ప్రపంచీకరణ ప్రయత్నాలను మహబూబ్‌నగర్ కథా రచయితలు దుయ్యబట్టారు.

ఇటీవలి కాలంలో గ్రామాల్లో కరువు నివారణ కోసం ప్రభుత్వం ప్రవేశపెట్టిన 'ఉపాధి హామీ పథకం' కూడా గ్రామ పెత్తందార్లు, రాజకీయ నాయకుల చేతుల్లోపడి పేద ప్రజల శ్రమను ఎలా దోచుకుంటుందో దాసరి రాజేంద్ర కుమార్ రాసిన 'కోత' కథ తెల్పుతుంది.

Scanned with CamScanner

భూతంలా పల్లెలోకి వచ్చిన వరికోత మిషను కూలీల కడుపుకొట్టి తాను వెళ్ళిపోగా ప్రభుత్వ ఉపాధి పథకంతో కూలి దొరుకుతుందని గంతేసిన సుభద్రమ్మ వంటి వాళ్లకు కడుపుకోతే మిగిలింది. 100 రోజుల పనుల్ని తెలివిగా 50 రోజుల్లో పూర్తి చేయించుకొని చివరికి రోజుకు 80 రూపాయల చొప్పున కాకుండా కొలతల ప్రకారం 40 రూపాయలే వస్తుందని లెక్కకట్టి ఆ డబ్బుతో 5 ఎకరాల పొలం కొన్న డీలరు, వరికోత మిషను కొన్న గోపినాయుడు వంటి ప్రపంచీకరణ చుట్టాల్ని ఈ కథ బట్ట బయలు చేసింది.

రైతులు అప్పుల ఊబిలో కూరుకొనిపోతూ ఆత్మహత్యలు చేసుకొంటున్న నిజాన్ని ఉదయ మిత్ర పేగు బంధం కథలోను, పట్టణాలు ఆకర్షిస్తున్న నేపథ్యంలో మళ్లన్న పల్లె విడిచిపెట్టలేక, పల్లెలో చూసేవాళ్ళు లేక పడే తపనను ఇతనే రాసిన 'అమ్మమనుజాడాలె' కథలోను, పిల్లల్ని బాగా చదివించుకుంటే మంచి ఉద్యోగం వస్తుంది, హాయిగా పట్టణాల్లో వుండవచ్చు అనే ధోరణిలో తయారు చేయడం వల్ల వాళ్లు పల్లెలు విడిచి పట్టణాలకెళ్లడం, పల్లెల్లో, విత్తనాల్లో, ఎరువుల్లో, బ్యాంకుల్లో రైతులకు జరిగే మోసాల్ని ఎవరూ పట్టించుకోవడం లేని సిటీ 'ఒక పెద్ద బ్లాక్‌హోల్' అని, పల్లెలు అమాయకంగా అందులో దూకుతున్నాయని వివరించేదే ఉదయమిత్ర రాసిన 'క్లీన్ అండ్ గ్రీన్' కథ. అదే విధంగా గిరిజన ప్రాంతాల్లోని ప్రజల జీవన విధానాన్ని వారిని దోచుకుంటున్న తీరును ఇక్ష్వాల్ రాసిన కఫన్ కథ తెలుపుతుంది.

ప్రపంచీకరణ తెచ్చిన ప్రమాదాన్ని ముందుగా పసిగట్టలేక గ్రామీణ కులవృత్తులు ఎలా అన్యాయమై పోయామో కోట్ల వనజాత రాసిన 'సముద్రం' కథ వివరిస్తుంది. అందమైన వస్త్రాలు తయారుచేసే సమర్థతగల చేనేత కార్మికుడు పవర్‌బాయ్స్ వచ్చాక తాము నేస్తున్న బట్టలకు ప్రతిఫలం దొరక్క బతుకు దుర్భరమై వలస కూలీలుగా ఎలా మారుతున్నారో ఈ కథ వివరిస్తుంది. ఇది వారి సామాజిక వర్గం మిగతా ప్రజానీకం వలెనే ఎలా ధ్వంసమైపోయారన్నది మహబూబ్‌నగర్ చేతివృత్తుల వారి జీవన సారాంశం.

పట్టణాల్లో చిన్నచిన్న పనులు చేసుకుంటూ బ్రతికే బడుగు జీవితంలో కూడా ఈ ప్రపంచీకరణ అలజడిని రేపింది. ఒక్కో సంవత్సరం వస్తున్న మార్పులు ఒక్కొక్క కొత్త పనికోసం పరుగులు తీస్తున్న తీరును ఉదయమిత్ర రాసిన 'పట్నం వచ్చిన ఎలుక' కథ వివరిస్తున్నది. ప్రతికాత్మకంగా రాసిన ఈ కథలో ప్రపంచీకరణ తెచ్చిన నవీకరణలో తన వృత్తి జీవనం కష్టంగా మారిన వృత్తి కార్మికుడు పట్టణానికి వలసపోయి అక్కడ కూడా తన జీవనాన్ని కొనసాగించలేక పట్టణం కంటే పల్లెనే నయం అనుకొని తిరిగి పల్లెకు వెళ్తాడు. ఈ కథలో అమానవీయ పరిశ్రామికీకరణ స్పష్టంగా ఉంది. ఈ అభివృద్ధి వలన సామాన్యుల వృత్తి జీవనం ఎలా విచ్ఛిన్నమౌతున్నదో రచయిత చాలా ప్రతిభావంతంగా రాశాడు.

2. ప్రపంచీకరణ కథలు - వ్యవసాయరంగం :

ప్రపంచీకరణలో భాగంగా వచ్చిన యాంత్రీకరణ వ్యవసాయరంగాన్ని నమ్ముకున్న వారి జీవితాన్ని ఎలా అశాంతికి గురిచేసిందో వివరించే కథలు ఎన్నో వచ్చాయి. అరకొరగా విద్యుత్, ఎరువులపై సబ్సిడీల ఎత్తివేత, నకిలీ విత్తనాల బోధ్యం, ప్రత్యేక ఆర్థిక మండళ్ళు వంటివి నాలుగు మెతుకులు పెట్టే రైతు నడ్డి విరగదీశాయి.

దీనివల్ల వారసత్వ సంపదైన వ్యవసాయం, పశువులు, కోళ్ళు మొదలైనవి కళ్ళముందే కనబడకుండా పోయే స్థితి దాపురించింది. గ్రామీణ వ్యవసాయానికి వెన్నుముకైన రైతు జీవితం పతనమవుతున్నతీరును కోట్ల వనజాత 'సముద్రం' కథలో వివరించింది.

ప్రపంచీకరణ పరిస్థితులకు ఎదురొడ్డి జీవిస్తున్న రైతుల్ని ఏదో ఒకరూపంలో అది కంటిమీద కునుకు లేకుండా చేస్తోంది. ఇటీవల కాలంలో ప్రభుత్వం చేపడుతున్న సెజ్‌లు, ప్రాజెక్టుల వల్ల నిర్వాసితులవుతున్న ప్రజల జీవనాన్ని మన కళ్ళముందుంచేందుకు మహబూబ్‌నగర్ కథ ప్రయత్నించింది. ఈ సెజ్‌ల వల్ల వ్యవసాయం కోల్పోయి బానిసలుగా మారిన రైతుల జీవితాన్ని కోట్ల వనజాత 'సముద్రం' కథలో వివరించింది. మధ్య తరగతి ప్రజలు సెజ్‌ల వల్ల ఎలా బికార్లు అవుతున్నారో ఉదయ

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మిత్ర 'ఆఖరి కుందేలు' కథ తెల్పుతుంది. అందరి కడుపు నింపే కామధేనువులాంటి వ్యవసాయ భూములని, అడవులను సెజ్ పేరుతో ప్రభుత్వం సొంతం చేసుకుంటుంటే అడవిలో జీవించే అడవి జంతువుల జీవనం ఏవిధంగా కకావికలమైందో ఈ కథ వివరిస్తుంది.

సమాజంలోని, జీవితంలోని కల్మశాన్ని కడిగిపారేయకుండా ఒక ఆటంకంగా, ఒక వ్యాపారంగా సామ్రాజ్యవాద విష కోరలు ఎట్లా చుట్టుముట్టినాయో వెంకట్రాములు రాసిన 'లోయ' కథ వివరిస్తుంది. మన కళ్ళ ముందరనే మన జనాలు, మనవనాలు మారవలిసినట్టు గుణాత్మకంగా కాకుండా ఒక వికృత రూప విక్రియ ఎట్లా జరుగుతున్నదో ఈ కథ చూపెడుతుంది. అనగారికత నాగరికతగా, నాగరికత అనాగరికతగా, చలామణి అవుతుండటం ఈయనే రాసిన 'లోయ' కథలో మనం చూస్తాం. మన పల్లెల 'జంగిడి' కబేళాలకు ఆహారంగా మారటం, జంగిడి జీవనాధారంగా బతికిన ఎల్లప్ప బతుకు జంగిడిలాగా దైన్యంలోకి దిగజారడం జంగిడి కథలో సెన్సిటివిపాదం. మన బళ్ళల్లో పిల్లలు ఎట్లా ఉన్నారు. 'అందరికీ అక్షరాల పథకం ప్రభుత్వాలకు ఆదర్శం' అది వెంకటేష్‌కు ఆదర్శమే 'పోలి' అట్లానే బడికి చేరింది. బడిలో ఉండగలిగిందా? చదువుకోగలిగిందా ? పోలినిబడి తరిమేసిందా? అమ్ముకున్నది అవ్వేనా? సమాజం పోలి కోసం ఆలోచిస్తున్నదా? ప్రభుత్వాల ప్రయోజనాలు వేరు కదా? పోలి కథ మన పసిపిల్లలు పనిపిల్లలుగా ఎట్లా అమ్మకానికి పోతున్నారో, ఎటుపోతున్నారో తెలియని దుస్థితి చెప్తుంది. ఈ కథలో మన పిల్లలు, మనం, మన పరిసరాలు అన్నీ సరుకుగా వ్యాపారానికి బందీలుగా ఎట్లా మారిపోయాయో తెలుస్తుంది. 'ఏడు సంచుల దరిద్రం' కథ ట్రాక్టర్ కొనటం అనే గోదాలోకి దిగటంతో మొదలై ట్రాక్టర్‌ను వదిలించుకోవటంతో ముగుస్తుంది. కలలు కనలేని జీవన వ్యవసాయ సంక్షోభంలో ఉన్న మైబు, మైబమ్మ తదితర పాత్రలు మనని వెంటాడుతాయి. ఆపరేషన్ బర్డ్‌హంట్ కథ వర్తమాన సమాజ చలనాన్ని దృశ్యమానం చేసి మనం ఎక్కడ ఉన్నామో ..... ఎక్కడ ఉండాలో తేట తెల్లం చేస్తుంది.

'సేద్యం' కవితా సంకలనంతో కవిగా మనందరికీ తెలిసిన ఇక్బాల్ కథలూ రాశారు. మూడున్నర దశాబ్దాలుగా ప్రజాస్వామిక తాత్వికధార తెగకుండా రాస్తున్నాడు. జీవితాన్ని ఏమేమి కప్పేస్తున్నాయో ? తాను అర్థం చేసుకున్నదంతా మనకూ అర్థం చేయించే ప్రయత్నంలో నిరంతరం రాస్తూనే ఉన్నాడు. ఏడు కథలతో ఒక సంకలనం మన చేతిలో పెట్టాడు. 'కాలువ మింగిన ఊరు' కథలో ఆలూరును, ఎటుచూసినా కనిపిస్తున్నాడని' వాయిల్‌కుంట తాండ బడిపిల్లవాడిని, 'శివమ్మ' జీవన దైన్యాన్ని ఆమెను చూస్తూ ప్రతినిత్యం తను అనుభవించిన వేదనను కథలుగా మలిచాడు. ప్రజాజీవితం, కుటుంబాలు ఎట్లా సంక్షోభంలో కూరుకుపోయాయో కళ్ళకు కడుతూ ఆలోచింపజేసే చర్చను అందించాడు. చేనేత కార్మికుల బతుకులలో పాతుకొన్న అసహజ మరణాల స్థితిని 'చెల్లని రాజ్యం' కథలోను, డి.ఇ.ఓ కార్యాలయ లంచగొండితనాన్ని నిలదీసిన సందర్భాన్ని 'అతడే' కథలోను మనకు చూపించాడు. పోలేపల్లి గ్రామాన్ని సమాధి చేసి దాని మీద పరుచుకున్న 'కఫన్' లాగా సెజ్ ఎట్లా పోలేపల్లి ప్రజల బతుకులను సమాధిచేసిందో 'కఫన్' కథలో వివరించాడు. పాలమూరు వలసజీవుల బిడ్డడు 'బీజా' బాల్యాన్ని అనేక ఎతలు చుట్టుకున్నాయి. తమ పల్లెను, బతుకులవలసను, బడిని, పంతుళ్ళను, కాలిన ఊరును అతడు అనుభవించాడు. బస్సుమీద పేరిన దుమ్ములో అతను రాసి పంపిన అవ్వచావ్ల వార్తను అమ్మ చూస్తుందా? అతని చుట్టూ అతనికి అన్నీ సమస్యలే. బీజా ఈ సమస్యలను దాటే పనిలో బయలు దేరాడు. అతనిప్పుడు ఎక్కడున్నాడు? చిన్న వయసులోనే చెరువంత జీవితాన్ని అనుభవించిన బీజా మనందరి విముక్తికి దారులు వేస్తున్నాడా ....? ఇదంతా కూడా ప్రపంచీకరణ భూతం పచ్చని వ్యవసాయ పల్లెల్ని, పల్లె ప్రజల జీవనాన్ని ఎలా ధ్వంసం చేసిందో అనే సత్యానికి కథా రచయితలు ఇచ్చిన అక్షర రూపమే అని చెప్పాలి.

అయితే ప్రపంచీకరణ దుష్ప్రభావాల్ని తెలుగు కథకులు ఎన్నో రకాలుగా తమ కథల్లో తెలియజేసినా ప్రజల్లో

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ఆశించినంత చైతన్యాన్ని కల్గించలేక పోయారు అని ఖచ్చితంగా చెప్పొచ్చు. దీనికి కారణం ఎన్నో చిన్న విషయాల్ని పెద్దవిగా భూతద్దంలో చూపించే మీడియా ఇంత పెద్ద విషయాల్ని చిన్నదిగా చూపించడం ఒక కారణమైతే, కొందరు రాజకీయవాదులు తమ స్వార్థం కోసం దీన్ని బాహాటంగా సమర్థించడం మరోటి. మహాత్మాగాంధీ చెప్పినట్లు విదేశీ గాలి రావాల్సిందే కాని అది మన కిటికీలో నుండి రావాలే గాని మన ఇంటి పైకప్పును ఎగర గొట్టేంతగా కాదు. ఇప్పుడు ఇదే జరుగుతోంది. వాస్తవానికి అభివృద్ధి చెందిన సమాజంతో పోలిస్తే అభివృద్ధి చెందని సమాజమే ఎక్కువగా ఉంది. కానీ ఈ ప్రచార యుగంలో తక్కువది ఎక్కువగాను, ఎక్కువది తక్కువగాను చూపించడం జరుగుతోంది. మన సమాజంలో జరిగే సంక్లోభాల్ని సాహిత్యం, మీడియా మాత్రమే అందరికీ తెల్సాలి అయితే ఈ రెండింటిలో ప్రముఖ పాత్ర పోషించే కొందరు అవకాశ వాదులుగా మారిపోవడం వల్లే కొన్ని సమస్యలు ఉత్పన్నమవుతున్నాయి. కొందరు రచయితలు తమ సృజనాత్మక శక్తిని సమాజానికి పూర్తి స్థాయిలో ఉపయోగించడం లేదు. కాబట్టి అటువంటి వాళ్ళందరూ మన నేలను మనమే చదును చేసుకుందాం అనే సునిశిత సంకల్పంతో ముందుకు రావాలి. ప్రపంచీకరణ నైజంలో మనిషి అనేవాడు లేడు. అమ్మకందారుడు, కొనుగోలుదారుడు మాత్రమే ఉన్నారనే విషయాన్ని చేప్పే కథలు ఇంకా తెలుగులో రావాలి. అయితే నేడు వస్తున్న కథల్లో కొన్ని వార్తా పత్రికల్లో ప్రచురించే వార్తలకంటే భిన్నంగా ఉండడం లేదు. నాటితరం కథారచయితలైన చలం, గోపీచంద్, నవీన్, కొ.కు., చాసో, పాలగుమ్మి, శ్రీశ్రీల వంటి వారి కథాశిల్పంలాగా నూతన వస్తువుతో వచ్చే కథలను మలచి హృదయ తంత్రుల్ని మీటగలగాలి. అప్పుడే తెలుగు కథకు నూరేళ్ళ పండుగ చేసినవాళ్ళమవుతాం.

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శ్రీవర్ర చెన్నారెడ్డి ప్రభుత్వ డిగ్రీ కళాశాల

పలమనేరు, చిత్తూరు జిల్లా

భావవీణ ప్రత్యేక సంచిక

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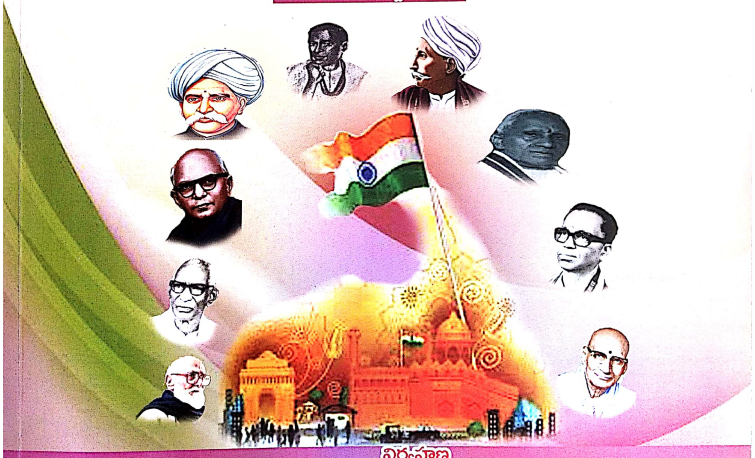
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డా.డి.మల్లయ్య, తెలుగు అధ్యాపకులు, పి.యన్.సి & కె.వి.యస్.సి ప్రభుత్వ కళాశాల, నంద్యాల

"The instinct of freedom is perhaps, the noblest of all human instincts, because it inspires, enlarges and elevates as well as gives meanings and content of life" అన్నది జాకీర్ హుస్సేన్‌గారి మాట. (Songs of Freedom కి ముందుమాటలో) "జననీ జన్మభూమిశ్చ స్వర్గాదపీ గరీయసీ" అని రామాయణంలో చెప్పబడింది. ఇవన్నీ కూడా అక్షర సత్యమనీ చరిత్రవల్ల తెలుస్తుంది. మాతృభూమిని దాస్యశృంఖలాల నుండి విముక్తి చేయాలని ఎందరో తమతమాలాడినట్లు దేశం కోసం ఆత్మార్పణం గావించుకున్నట్లు చరిత్ర నిరూపిస్తున్నది. ఈ పవిత్రయజ్ఞంలో కవులు, రచయితలు కూడా తమవంతు పాత్రను నిర్వహించారు. కొందరు దేశభక్తినే విషయంగా చేసుకొని కావ్యాలు రాస్తే, కొందరు స్వాతంత్ర్యవీరులను, పాలకుల దుశ్చర్యలను పద్యాలు, పాటల ద్వారా గానం చేశారు. యూరపు దేశాలలో కొందరు కవులు సాక్షాత్తుగా యుద్ధంలో స్వయంగా పాల్గొన్నారు. అనవరం వచ్చినపుడు యుద్ధం చేస్తూ అవకాశం దొరికినపుడు కావ్యాలు రాశారు. తుదకు అక్కడే ప్రాణాలు కూడా వదిలారు. విల్‌ఫ్రెడ్ ఓవెన్ అనే కవి 1918 సం॥లో ఫ్రాన్సులో యుద్ధంలో పాల్గొంటూ వీరమరణం పొందాడు. అలాగే ఫ్రాన్స్‌జుమార్మ్ అనే జర్మన్ లలిత కళోపాసకుడు 1916 సం॥లో యుద్ధంచేస్తూ దేశంకోసం ప్రాణాలర్పించాడు.

మన తెలుగు కవులకు కూడా ఇలాంటి అనుభవాలు ఉన్నాయి. ఈ పవిత్రయజ్ఞంలో పాలుపంచుకున్నారు. తమ కలాన్ని తుపాకులుగా చేసుకొని ప్రబోధగీతాల్ని తూటాలుగా ఆంగ్లేయులపైకి వదిలారు. ఎందరో కవులు జాతీయోద్యమ కవితా రథసారథులయ్యారు. కొంతమంది కవుల కొన్ని గీతాలు మాత్రమే వెలుగులోకి వచ్చి ఎందరో కవులు అజ్ఞాతంలో ఉండిపోయారు. అలాంటి వారే దామరాజు పుండరీకాక్షుడు.తెల్లవారిపై నాటకాలతో సాయుధ పోరాటం చేసిన అరుదైన తెలుగువీరుడు దామరాజు పుండరీకాక్షుడు.

1898 జూలై 6న పూర్వ గుంటూరు (ప్రస్తుత పల్నాడు) జిల్లా సత్తెనపల్లి తాలూకా పాటిబండ్ల గ్రామంలో దామరాజు పుండరీకాక్షుడు జన్మించాడు. గుంటూరు, కృష్ణా, విశాఖపట్నం ప్రాంతాలలో ప్రాథమిక, ప్రాథమికోన్నత విద్యనభ్యసించి మద్రాసులో బి.ఏ., బి.ఎల్ (న్యాయశాస్త్రం) పూర్తిచేశారు. ఓ వైపు చదువుకుంటూనే ... మరోవైపు బ్రిటీష్ కర్కశపాలనను తులనాడుతూ జాతీయోద్యమం వైపు ప్రజలను జాగృతం చేస్తూ తన సాహిత్యానికి పదునుపెట్టారు.

బి.ఎల్ చదువుతున్న సమయంలోనే పుండరీకాక్షుడి రచనలను ఆ కళాశాల యూరోపియన్ అధ్యాపకులు గుర్తించారు. ప్రతీకారచర్యగా పరీక్షలో ఉద్దేశపూర్వకంగానే ఫెయిల్ చేశారు. ఆయన దీనిపై సత్యాగ్రహ పద్ధతిలో నిరసన తెలుపుతూ అధిపతులను నిలదీశారు. చివరకు తమ వర్గ సమాధానమేమి లేక అధికారులు పుండరీకాక్షుడు ఉత్తీర్ణత సాధించినట్లు ప్రకటించారు. విద్వాద్ధి దశలోనే తెల్లవారిపై విజయం సాధించిన ఈ సంఘటనతో ఆయన 1920-29 సంవత్సరాల మధ్య అనేక జాతీయ రచనలద్వారా దేశభక్తినీ, త్యాగనిరతను పురిగొల్పాడు.

స్వాతంత్ర్యోద్యమం గాంధీ సారథ్యంలో మహోద్యమంగా జరుగుతున్న రోజుల్లో గాంధీ టోపీ పెట్టినా, గాంధీ మీద పాటపాడినా, గాంధీపై నినాదం చేసినా ఆంగ్లేయులు అగ్గిమీదగుగ్గిలం అయ్యేవారు. జాతీయోద్యమంలో గీతాలు రాయడాన్ని, వాటిని ప్రదర్శించడాన్ని రాజద్రోహ చర్యగా పరిగణించి చాలామంది కవులను, రచయితలను కారాగారాల్లో బంధించేవారు బ్రిటీష్ పాలకులు. ఆ బెదిరింపులను తాటాకుచప్పుళ్ళు కింద జమకట్టిన యోధుడు పుండరీకాక్షుడు. ఆ పరిస్థితుల్లోనూ గాంధీనే స్తుతిస్తూ, కీర్తిస్తూ .... ఉద్యమ ఆవశ్యకతను ప్రజలకు వివరిస్తూ నాటకాలు రాసి, ప్రదర్శిస్తుండేవారాయన.

'దైరాసుర..'

గుంటూరు గాంధీపేట (నేటి అరండల్‌పేట)లో పుండరీకాక్షుడు 'స్వరాజ్య సోపానాలియం' ఏర్పాటు చేశారు. అక్కడి నుండి వెలువడిన దేశభక్తి గేయాలు, పాటలు, పద్యాలు, నాటకాలు, హరికథలు, బుర్రకథలు ఆంగ్లేయుల గుండెల్లో గుబులు పుట్టించాయి. జలియన్‌వాలాబాగ్ దురాగతాన్ని 'మహాభారతం' కథలో ఇమిడ్చి పుండరీకాక్షుడు రాసిన 'పాంచాల పరాభవం' నాటకం అప్పట్లో ఓ సంచలనం. ఈ నాటకంలో జనరల్ డయ్యర్‌ను 'దైరాసుర' గా సంబోధిస్తూ దుశ్శాసునిగా, భరతమాతను పాంచాలిగా, మహాత్మాగాంధీని కృష్ణుడిగా పోల్చారు. తెల్లవారిచేతుల్లో చిక్కి, వెక్కివెక్కి ఏడుస్తున్న

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భరతమాతను గాంధీ ఓదార్చుతూ .... సత్యాగ్రహ దీక్షతో ప్రజలను స్వరాజ్య సమరం వైపు మళ్ళించే ఇందులోని ఘట్టం సామాన్యులను కూడా ఆలోచింపజేసింది. దుశ్శాసునిడిగా చిత్రీకరిస్తూ డయ్యర్ దిష్టిబొమ్మను ఊరూరా తగలబెట్టడాన్ని శ్వేతజాతీయులు జీర్ణించుకోలేకపోయారు. ఈ నాటక ప్రదర్శన బ్రిటన్ పార్లమెంటులోను చర్చకు వచ్చింది. ఫలితంగా బ్రిటీష్ ప్రభుత్వం భారత్‌లో ఆ నాటకాన్ని నిషేధించింది. ఆ నాటిక ప్రతులను తగులబెట్టించి, చివరకు ... పుండరీకాక్షుడు రాసిన నాటకాలపై ఉక్కుపాదం మోపింది. వాటిని ప్రదర్శించేవారికి లాఠీదెబ్బలు, కారాగారం తప్పేది కాదు! ఉద్యమాలు, ఉద్యమ నాయకులమీద ప్రదర్శిస్తే.... దొరికి పోతామన్న ఉద్దేశంతో హరిశ్చంద్ర రాయభారం, చింతామణి వంటి నాటకాల గురించి ముందుగా ప్రచారం చేసి సమయానికి ప్రదర్శించేది మాత్రం ... 'నవయుగ గాంధీవిజయం, రణభేరి, క్విట్ ఇండియా' లాంటి నాటకాలు!!

జాతీయోద్యమ నాటకాలతో ప్రజల్ని జాగృతం చేస్తున్న దామరాజుని తమ అదుపాజ్ఞలో పెట్టుకోవడానికి తెల్లదొరలు ఎన్నో ఎత్తులు వేశారు. చివరికి 'కనీసం నాటకాల్లో గాంధీజీ పాత్ర లేకుండా అయినా రాయిండి' అంటూ ఓ రాయబారితో ఆంగ్ల ప్రభుత్వం రాయభారం నడిపింది. అలా చేస్తే నజరానాగా యాభైవేల రూపాయిలు ఇస్తామని కూడా ఆశజూపింది. అప్పట్లో రూ.50 వేలు అంటే మాటలు కాదు. కానీ దామరాజు ఆ ప్రలోభానికి లొంగలేదు. సరికదా... "గాంధీ లేనిది సాగదు నా కలమ్ము..." అంటూ ఓ పద్యాన్ని రాసి, ఆ రాయభారి ద్వారానే ఆంగ్ల పాలకులకు పంపించారాయన.

దామరాజు పుండరీకాక్షుడు రాసిన దేశభక్తి గేయాలు, పాటలు, ఒగ్గు కథలు, బుర్రకథలు .... ప్రముఖులు, పండితపామరుల మెప్పు పొందడమే కాదు, ఎంతటి పాషాణ హృదయాన్నైనా కరిగించాయి. వీరావేశంతో స్వాతంత్ర్యోద్యమంలో దూకేలా చేశాయి. సగటు భారతీయుల నోళ్ళలోనూ నానుతూ జాతీయ భావాలను పెంపొందించేవి. కాంగ్రెస్ సభల్లో 'ఎవ్వని శాంతిమూర్తియని ఎల్లరనారదమునన్....' శ్రీ గాంధీనామం మరువం మరువం... నిత్యం జైలుకు వెరువం వెరువం ...' అన్న దామరాజు గీతాలే వినిపించేవి. ఈయన రాసిన నాటకాలను ఆచార్య ఎస్జీ రంగా ఇంగ్లాండ్‌లో ప్రదర్శించి అరిస్టు అయ్యాడు. దీని ద్వారా ఆయన నాటిక రచనాపటిమను మనం అర్థం చేసుకోవచ్చు. దేశంలో జాతీయోద్యమ నాటకాల తొలి రచయితగా పేరును సుస్థిరం చేసుకున్న దామరాజు పుండరీకాక్షుడు 1975లో పరమపదించారు.

ఆధారగ్రంథాలు:-

1. సవ్యాంధ్ర సాహిత్య వీథులు -కురుగంటి సీతారామయ్య
2. తెలుగు సాహిత్య సమీక్ష - ఆచార్య జి. నాగయ్య
3. తెలుగు సాహిత్య చరిత్ర - డాక్టర్ ద్వా.నా. శాస్త్రి
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డా॥ వి.ఆర్. రాసాని

సాహిత్య సమాలోచన



సంపాదకులు

ఆచార్య నాగోలు కృష్ణారెడ్డి

డా॥ పి.సి. వెంకటేశ్వర్లు

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డా॥ డి. మల్లయ్య

వి.ఆర్. రాసానిగారు అట్టడుగు జీవితాలు ఎలా ఉంటాయో గమనించినవారు, పేదరికంలోని కష్టాలను అనుభవించినవారు కావటంచేత బహుజన కుటుంబాల్లోని మానవ సంబంధాలను, మానవత్వాన్ని తన రచనల్లో పొందుపరచినారు. వీరు శతాధిక కథలు, కొన్ని నవలలు, నాటకాలను సృష్టించారు. ఈ పరిశోధనాపత్రం మాత్రం రాసాని కథల్లోని మానవ సంబంధాలను పరిశీలించడం వరకు పరిమితం చేయబడింది. వీరి కథల్లోని మానవ సంబంధాలను ముఖ్యంగా (1) ప్రజలు - రాజకీయ నాయకులు (2) ప్రజలు - భూస్వాములు (3) ప్రజలు - అధికారులు (4) ప్రజలు - కుటుంబ సంబంధాలు (5) వివిధ మతాల ప్రజల మధ్య సంబంధాలు అని 5 రకాలుగా విభజించుకొని పరిశీలించడం జరిగింది.

1. ప్రజలు - రాజకీయ నాయకుల మధ్య సంబంధాలు

ప్రశాంతంగా ఉండే పల్లెలు రాజకీయ పార్టీల పుణ్యమా అని పార్టీలుగా విడిపోయి తమ బ్రతుకులను ఏవిధంగా చిన్నాభిన్నం చేసుకున్నారో కొన్ని కథల్లో తెలుస్తుంది.

ఉదాహరణకు శనీస్పురుడు, మెరవణి, కొత్తజూదం కథలను తీసుకోవచ్చు.

1.1. శనీస్పురుడు : తరతరాల నుండి ప్రశాంతంగా, నిమ్మళంగా, ఏ రొంపులూ, రాగింతలూ లేకుండా ప్రజలందరూ ఒక తాటిపై నిలిచే పల్లె కత్తేపల్లె. ఆ ఊరికి అన్నీ తానై దేవుడువలె చూసుకుంటున్నాడు ఆ ఊరి ప్రెసిడెంట్‌గా పెద్దిరెడ్డి. దేశంలో గాంధీకి ఎంత పేరుందో - ఆ ఊరిలో పెద్దిరెడ్డికి అంతే పేరుంది. కొన్నాళ్ళకు పెద్దిరెడ్డి హఠాన్మరణంతో ఊరికి ఎలక్షన్లు వచ్చాయి. అప్పుడే రాష్ట్రంలో పుట్టిన రాజకీయ పార్టీ వారు కుళాయప్పను చేరదీసి పెద్దిరెడ్డి కుమారుడు బసిరెడ్డికి పోటీగా నిలబెట్టారు. కుళాయప్ప పార్టీవారు డబ్బు, దొంగసారాయితోపాటు కులరాజకీయాలను రెచ్చగొట్టి బసిరెడ్డిని ఓడించారు. అప్పటినుండి ఆ ఊరు రెండుగా చీలిపోయింది. రాష్ట్రంలో ఎక్కడ కక్షలు, కార్పణ్యాలు, ముఠాతగాదాలు వచ్చినా అవన్నీ కూడా కొంపలో పాముదూరినట్లు ఆ పల్లెలో దూరి ఆ పల్లెను చిన్నాభిన్నం చేశాయి. చిన్న చిన్న విషయాలకే పెద్ద గొడవలు జరిగి ఆ గొడవల్లో అటు పెద్దిరెడ్డి కుటుంబం, ఇటు కుళాయప్ప కుటుంబం సర్వనాశనం అయ్యాయి. ఊరు ఊరంతా చిన్నభిన్నమైంది. ఊరిలో 144వ సెక్షను విధించారు. భయభ్రాంతులకు గురైన పల్లెప్రజలు పట్టణాలకు వలసపోవడం జరిగింది.

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1.2. మెరవణి : ఈ కథలోనూ కక్షలు, కార్పణ్యాలు లేని ఆ పల్లెలో శ్రీరామ నవమిరోజు ప్రతి ఏడూ జరిపే పటం మెరవణి మూలంగా కక్షలు ప్రారంభమవుతాయి. పల్లె రెండు పార్టీలుగా విడిపోతుంది. ఊరేగింపులో రాశింటి రామచంద్రయ్య ఇంటి ముందర ఇరుపార్టీలకు జరిగిన దొమ్మిలో ఏ కులానీకీ చెందని చెంగమ్మ భర్త, పిల్లవాడు చనిపోతారు. ఈ సంఘటనతో పల్లెలో రాజకీయాల కారణంగా కక్షలు మొదలయ్యాయి.

1.3. కొత్త జూదం : ఈ కథలో ఎంపిటిసి ఎలెక్షన్స్‌లో ఆ ఊరికి బి.సి. మహిళా కేటగిరికి సంబంధించిన విషయంలో కాంగ్రెస్, తెలుగుదేశం పార్టీలు పోటీపడి దాయాదుల మధ్య ద్వేషాన్ని రేపుతాయి. వారిలో ఒక కుటుంబానికి ఒకపార్టీ బరోసా యిస్తే మరో కుటుంబానికి యింకో పార్టీ అండగా నిలుస్తుంది.

ఇలా ఒకప్పుడు ప్రేమ, ఆప్యాయతలకు మంచి మానవ సంబంధాలకు, ప్రశాంత వాతావరణానికి నిలయాలైన పల్లెలు రాజకీయ పార్టీల రొంపులో పడి వర్గాలు పార్టీలుగా విడిపోయి ముఠా తగాదాలతో కక్షలతో ఎలా ఛిద్రమయ్యాయో, ప్రజల మధ్య సంబంధాలు ఎలా విచ్ఛిన్నమయ్యాయో ఈ కథల్లో రచయిత చిత్రించిన తీరు పాఠకుల హృదయాలను ఆవేదనకు గురి చేస్తుంది.

2. ప్రజలు – భూస్వాముల మధ్య సంబంధాలు :

రాసాని భూసమస్యల నేపథ్యంతో రాసిన కథలు ఎన్‌కౌంటర్, అక్షింతలు, హోమం వంటి కథలు. వీటిలో సామాన్యులకు, భూస్వాములకు మధ్య వున్న మానవ సంబంధాలెలా వుంటాయో చెప్పడం జరిగింది.

2.1. ఎన్‌కౌంటర్ : ఆ ఊరు చివర నక్కలోళ్ళకు సంబంధించిన 10 గుడిసెల్లో వుంటారు. భూమిలేని వారికి భూమినిచ్చే పథకంలో భాగంగా నక్కలోళ్ళ కుటుంబాలకు కూడా 20 ఎకరాల భూమిని ఇస్తుంది ప్రభుత్వం. "తిండికి టికానా లేనివాళ్ళు, సంవత్సరం పొడవునా ఊర్లూ, అడవులు పట్టుకొని తిరిగే జనాలు, నా పొలం పక్కనే అదీ నేను డి.కె.టి. పట్టా తెచ్చుకొన్న భూమిలో నాకు ధీటుగా నిలబడి వ్యవసాయం చేస్తారా?" అని వారిపై కక్ష పెంచుకుంటాడు ఆ ఊరి భూస్వామి చౌదరిగారు. ఎన్నో కుటిలోపాయాలు పన్ని వాళ్ళకు మాయమాటలు చెప్పి వేలిముద్రలు వేయించుకుని వాళ్ళ భూమిని లాగేసుకుంటాడు. చౌదరిగారి చేతిలో మోసపోయామని తెలుసుకున్న నక్కలోళ్ళు గంగజ్జు నాయకత్వంలో పోరాటం చేస్తారు. కలెక్టర్ వచ్చి న్యాయం చేస్తానని హామీ ఇస్తాడు. ఎవ్వటికైనా వరిస్థితి ఎదురు తిరగవచ్చని భావించిన చౌదరి వాళ్ళను దెబ్బకొట్టాలనుకుంటాడు. వాళ్ళ నాయకుడైన గంగజ్జును అంతమొందించాలనుకుంటాడు.

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నక్కలోళ్ళకు వారసత్వపు ఆస్తిగా సంక్రమించే నాటు తుపాకిని అడ్డం పెట్టుకుని గంగమ్మని బైల్లో వేయిస్తాడు, చివరకు ఎన్‌కౌంటర్ చేయిస్తాడు.

స్వార్థపరులైన స్థానిక భూస్వాములు చట్టాలను అడ్డుపెట్టుకుని తమకు ఎదురు తిరిగిన వాళ్ళను మానవత్వం మరచి కుట్రలు, కుతంత్రాలతో బడుగు జీవులను ఎలా బలి తీసుకుంటున్నారో, రచయిత చిత్రించిన తీరు పాఠకుల హృదయాలను కలచివేస్తుంది. వున్న వాళ్ళకు, లేని వాళ్ళకు మధ్య నిరంతరం సంఘర్షణ జరుగుతూనే వుంటుందని, ఫలితంగా ఈ రెండు వర్గాల మధ్య మానవ సంబంధాలు ఎప్పుడూ దూరమవుతూనే వుంటాయని ఈ కథ మూలంగా చెప్పవచ్చు.

2.2. అక్షింతలు : దళితుల్లో ఉన్న నికృష్టమైన 'మాతమ్మ' ఆచారాన్ని చిత్రించిన కథ అక్షింతలు. చిన్నప్పుడే బాల బసివినిగా మార్చబడిన భాగ్యమ్మ ఆత్మఘోషే అక్షింతలు కథ. తనను ఏడెనిమిదేళ్ళ వయసులో పెండ్లి బాజాలతో బసివినిగా మార్చితే, తన మేనత్త కొడుకు తంగమణితో తన చిన్నాన్న కూతురు అలివేలుకు అదే పెండ్లి బాజాలమధ్య పెండ్లి జరుగుతుంటే తన భవిష్యత్తుని తలచుకొని తన చేతిలోని అక్షింతల్ని నేలకేసి కొడుతుంది భాగ్యమ్మ.

స్వార్థపూరితులైన భూస్వాములు, పూరిపెద్దలు మానవత్వాన్ని మరచి సభ్యసమాజం సిగ్గుపడేలా మాతమ్మ ఆచారాన్ని బలవంతంగా నిలబెట్టుకుంటూ వస్తూ, దళిత ఆడపిల్లల జీవితాలను అన్యాయంగా చిదిమేస్తున్న తీరును రచయిత చిత్రించిన విధానం పాఠకుల హృదయాలను పిండేస్తుంది.

2.3. హోమం : హోమం కథను చదువుతుంటే ఒళ్ళు గగుర్పొడవక మానదు. దళితుల కుల కళ అయిన డప్పులు, కొమ్ములు వంటి వాయిద్యాలు వాయించడంలో నేర్పరులు. 'కులాలను గుర్తింపజేసే ఈ విద్యలు వాయిద్యాలు మాకొద్దు' అంటూ దళితులు కొండ్రెడ్డి అనే భూస్వామి దాష్టీకానికి, దౌర్జన్యానికి భరించలేక తిరగబడి డప్పుల్ని మిగతా వాయిద్యాల్ని అగ్నికి ఆహుతి చేసిన తీరును రాసానిగారు ఉద్విగ్నంగా రచించి భూస్వాముల అమానవీయ ఆగడాలను కళ్ళకు కట్టారు.

3. ప్రజలు – కుటుంబ సంబంధాలు :

మానవ సంబంధాలన్నీ కుటుంబ సంబంధాలే. హైందవ కుటుంబ వ్యవస్థలో ఒకప్పుడు సమిష్టి కుటుంబాలు వుండేవి. ప్రస్తుతం అన్నీ వ్యష్టి కుటుంబాలే. సమిష్టి కుటుంబాలు అరుదై పోయాయి. ఏది ఏమైనా కుటుంబ సభ్యులందరి అవసరాలను, ఆలోచనలను గమనించి నడుచుకోవాల్సిన బాధ్యత కుటుంబ పెద్దది. కష్ట సుఖాల్లోనూ, అందరూ భాగం పంచుకుంటారు. ఇలాంటి కుటుంబ సభ్యుల సంబంధాలను రాసానిగారు

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నక్కలోళ్ళకు వారసత్వపు ఆస్తిగా సంక్రమించే నాటు తుపాకిని అడ్డం పెట్టుకుని గంగజ్జని జైల్లో వేయిస్తాడు, చివరకు ఎన్‌కౌంటర్ చేయిస్తాడు.

స్వార్థపరులైన స్థానిక భూస్వాములు చట్టాలను అడ్డుపెట్టుకుని తమకు ఎదురు తిరిగిన వాళ్ళను మానవత్వం మరచి కుట్రలు, కుతంత్రాలతో బడుగు జీవులను ఎలా బలి తీసుకుంటున్నారో, రచయిత చిత్రించిన తీరు పాఠకుల హృదయాలను కలచివేస్తుంది. వున్న వాళ్ళకు, లేని వాళ్ళకు మధ్య నిరంతరం సంఘర్షణ జరుగుతూనే వుంటుదని, ఫలితంగా ఈ రెండు వర్గాల మధ్య మానవ సంబంధాలు ఎప్పుడూ దూరమవుతూనే వుంటాయని ఈ కథ మూలంగా చెప్పవచ్చు.

2.2. అక్షింతలు : దళితుల్లో ఉన్న నికృష్టమైన 'మాతమ్మ' ఆచారాన్ని చిత్రించిన కథ అక్షింతలు. చిన్నప్పుడే బాల బసివినిగా మార్చబడిన భాగ్యమ్మ ఆత్మఘోషే అక్షింతలు కథ. తనను ఏడెనిమిదేళ్ళ వయసులో పెండ్లి బాజాలతో బసివినిగా మార్చితే, తన మేనత్త కొడుకు తంగమణితో తన చిన్నాన్న కూతురు అలివేలుకు అదే పెండ్లి బాజాలమధ్య పెండ్లి జరుగుతుంటే తన భవిష్యత్తుని తలచుకొని తన చేతిలోని అక్షింతల్ని నేలకేసి కొడుతుంది భాగ్యమ్మ.

స్వార్థపూరితులైన భూస్వాములు, ఊరిపెద్దలు మానవత్వాన్ని మరచి సభ్యసమాజం సిగ్గుపడేలా మాతమ్మ ఆచారాన్ని బలవంతంగా నిలబెట్టుకుంటూ వస్తూ, దళిత ఆడపిల్లల జీవితాలను అన్యాయంగా చిదిమేస్తున్న తీరును రచయిత చిత్రించిన విధానం పాఠకుల హృదయాలను పిండేస్తుంది.

2.3. హోమం : హోమం కథను చదువుతుంటే ఒళ్ళు గగుర్పొడవక మానదు. దళితుల కుల కళ అయిన డప్పులు, కొమ్ములు వంటి వాయిద్యాలు వాయించడంలో నేర్పరులు. 'కులాలను గుర్తింపజేసే ఈ విద్యలు వాయిద్యాలు మాకొద్దు' అంటూ దళితులు కొండ్రెడ్డి అనే భూస్వామి దాష్టీకానికి, దౌర్జన్యానికి భరించలేక తిరగబడి డప్పుల్ని మిగతా వాయిద్యాల్ని అగ్నికి ఆహుతి చేసిన తీరును రాసానిగారు ఉద్విగ్నంగా రచించి భూస్వాముల అమానవీయ ఆగడాలను కళ్ళకు కట్టారు.

3. ప్రజలు - కుటుంబ సంబంధాలు :

మానవ సంబంధాలన్నీ కుటుంబ సంబంధాలే. హైందవ కుటుంబ వ్యవస్థలో ఒకప్పుడు సమిష్టి కుటుంబాలు వుండేవి. ప్రస్తుతం అన్నీ వ్యష్టి కుటుంబాలే. సమిష్టి కుటుంబాలు అరుదై పోయాయి. ఏది ఏమైనా కుటుంబ సభ్యులందరి అవసరాలను, ఆలోచనలను గమనించి నడుచుకోవాల్సిన బాధ్యత కుటుంబ పెద్దది. కష్ట సుఖాల్లోనూ, అందరూ భాగం పంచుకుంటారు. ఇలాంటి కుటుంబ సభ్యుల సంబంధాలను రాసానిగారు

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రెక్కల గుర్రం, పగటితారలు, చీకటి, పాలగొడ్డు, శ్యామసుందరీయం మొదలైన కథల్లో చిత్రీకరించారు.

3.1. రెక్కలగుర్రం : ఓ ప్రైవేటు స్కూల్ వాచ్‌మన్ బీకయ్య. అతని భార్య ఓబులమ్మ వాళ్ళ గారాలపట్టి నీలమ్మ. ఒక్కగానొక్క కూతురు కాబట్టి చాలా ప్రేమగా పెంచుకుంటారు. చాలా నవ్యంగా సాగుతున్న కుటుంబంలో ఉన్నట్లుండి బీకయ్య మరణిస్తాడు. ఓబులమ్మ కష్టపడి కూతురు నీలమ్మను 9 వరకు చదివిస్తుంది. మంచి సంబంధం చూచి పెళ్ళి చేయాలని పెళ్ళి ప్రయత్నంలో ఉంటుంది ఓబులమ్మ. నీలమ్మ ఆ ఊరి స్కూల్ మాస్టరు అయిన సుందరం మోజులోపడి మోసపోయి చివరకు పెళ్ళి కాకుండా తల్లి అవుతుంది.

సుందరం మాస్టారుచే మోసపోయిన తన కూతుర్ని ఓదారుస్తూ, అండగా ఉంటుంది ఓబులమ్మ. తల్లీకూతుళ్ళ మధ్య ఉండే సంబంధాన్ని రచయిత చిత్రించిన విధం మానవత్వాన్ని పరిమళింపజేస్తుంది. సుందరం లాంటి మాయాప్రవరులను నేడు సమాజంలో మనం చూస్తూనే ఉన్నాము.

3.2. పగటి తారలు : ఈ కథలో అప్పులు చేసి కరువుకు వ్యవసాయం సాగక, పనులు లేక వలసలు వెళతారు వీధినాటక కళాకారులు. వారి గురువు మునస్వామి. వారు పైగడ్డ ప్రాంతంలో రోడ్డు పనులు చేస్తూ సంపాదించిన డబ్బుల్ని కుటుంబం ఇబ్బంది పడకూడదని ఎప్పటికప్పుడు ఇంటికి పంపిస్తుంటారు.

3.3. చీకటి : ఈ కథలో రోడ్డు పక్కనే ఒక బంకులో మత్తుమందుల్ని అమ్ముతున్న సుబ్బరాయుడు అనే అతను చిరు వ్యాపారి, అతని కొడుకు పొరబాటున మత్తుమందు ఎక్కువ తిని పడిపోతాడు. ఆ సమయంలో ఆ కుటుంబం తల్లడిల్లిపోతుంది.

3.4. పాలగొడ్డు : ఈ కథలో వెంకటమ్మకు ఇద్దరు కూతుళ్ళు. మంచి కుటుంబం. అయితే చేసిన అప్పులు తీర్చలేక ఆ యింటి యజమాని ఆత్మహత్య చేసుకుని చనిపోతాడు. ఆ తర్వాత కుటుంబ పోషణకోసం పాలివ్వని ఆవును కొని కుటుంబాన్ని పోషించలేక, అప్పులు తీర్చలేక అల్లాడిపోతుంది వెంకటమ్మ.

3.5. శ్యామసుందరీయం : ఈ కథలో కొత్తగా పెళ్ళయిన శ్యామల, సుందరం అనే నూతన దంపతుల సంసారంలో ఎదురయిన చిన్న చిన్న అంశాలు హాస్యంగా చిత్రించి వారి అన్యోన్యతను గొప్పగా చిత్రించడం జరిగింది.

4. ప్రజలు – అధికారుల మధ్య సంబంధాలు :

రాసాని రాసిన కొన్ని కథల్లో ప్రజలకు, అధికారులకు మధ్య వున్న సంబంధాలను కూడా చిత్రించడం జరిగింది. అలాంటి వాటిలో కొన్ని....

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రెక్కల గుర్రం, పగటితారలు, చీకటి, పాలగొడ్డు, శ్యామసుందరీయం మొదలైన కథల్లో చిత్రీకరించారు.

3.1. రెక్కలగుర్రం : ఓ ప్రైవేటు స్కూల్ వాచ్‌మన్ బీకయ్య. అతని భార్య ఓబులమ్మ వాళ్ళ గారాలపట్టి నీలమ్మ. ఒక్కగానొక్క కూతురు కాబట్టి చాలా ప్రేమగా పెంచుకుంటారు. చాలా సవ్యంగా సాగుతున్న కుటుంబంలో ఉన్నట్లుండి బీకయ్య మరణిస్తాడు. ఓబులమ్మ కష్టపడి కూతురు నీలమ్మను 9 వరకు చదివిస్తుంది. మంచి సంబంధం చూచి పెళ్ళి చేయాలని పెళ్ళి ప్రయత్నంలో ఉంటుంది ఓబులమ్మ. నీలమ్మ ఆ ఊరి స్కూల్ మాస్టరు అయిన సుందరం మోజులోపడి మోసపోయి చివరకు పెళ్ళి కాకుండా తల్లి అవుతుంది.

సుందరం మాస్టారుచే మోసపోయిన తన కూతుర్ని ఓదారుస్తూ, అండగా ఉంటుంది ఓబులమ్మ. తల్లీకూతుళ్ళ మధ్య ఉండే సంబంధాన్ని రచయిత చిత్రించిన విధం మానవత్వాన్ని పరిమళింపజేస్తుంది. సుందరం లాంటి మాయాప్రవరులను నేడు సమాజంలో మనం చూస్తూనే ఉన్నాము.

3.2. పగటి తారలు : ఈ కథలో అప్పులు చేసి కరువుకు వ్యవసాయం సాగక, పనులు లేక వలసలు వెళతారు వీధినాటక కళాకారులు. వారి గురువు మునస్వామి. వారు పైగడ్డ ప్రాంతంలో రోడ్డు పనులు చేస్తూ సంపాదించిన డబ్బుల్ని కుటుంబం ఇబ్బంది పడకూడదని ఎప్పటికప్పుడు ఇంటికి పంపిస్తుంటారు.

3.3. చీకటి : ఈ కథలో రోడ్డు పక్కనే ఒక బంకులో మత్తుమందుల్ని అమ్ముతున్న సుబ్బరాయుడు అనే అతను చిరు వ్యాపారి, అతని కొడుకు పొరబాటున మత్తుమందు ఎక్కువ తిని పడిపోతాడు. ఆ సమయంలో ఆ కుటుంబం తల్లడిల్లిపోతుంది.

3.4. పాలగొడ్డు : ఈ కథలో వెంకటమ్మకు ఇద్దరు కూతుళ్ళు. మంచి కుటుంబం. అయితే చేసిన అప్పులు తీర్చలేక ఆ యింటి యజమాని ఆత్మహత్య చేసుకుని చనిపోతాడు. ఆ తర్వాత కుటుంబ పోషణకోసం పాలివ్వని ఆవును కొని కుటుంబాన్ని పోషించలేక, అప్పులు తీర్చలేక అల్లాడిపోతుంది వెంకటమ్మ.

3.5. శ్యామసుందరీయం : ఈ కథలో కొత్తగా పెళ్ళయిన శ్యామల, సుందరం అనే నూతన దంపతుల సంసారంలో ఎదురయిన చిన్న చిన్న అంశాలు హాస్యంగా చిత్రించి వారి అన్యోన్యతను గొప్పగా చిత్రించడం జరిగింది.

4. ప్రజలు – అధికారుల మధ్య సంబంధాలు :

రాసాని రాసిన కొన్ని కథల్లో ప్రజలకు, అధికారులకు మధ్య వున్న సంబంధాలను కూడా చిత్రించడం జరిగింది. అలాంటి వాటిలో కొన్ని....

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4.1. వలసం : వాళ్ళు నక్కలోళ్ళు, అడవిలో ఎక్కడ నీళ్లుంటే అక్కడ గుడారాలేసుకుని అడవుల్లో జంతువుల్ని వేటాడి తింటూ, ఆ ప్రాంతంలో ఉన్న పల్లెల్లో పిన్నీసులు, తలపిన్నులు, పూసలు, దండలు అమ్మి, ఆ డబ్బుతో కాసిన్ని నూకలు తెచ్చుకుంటూ బతికే సంచార జీవులు. ఈ మధ్యనే దాదాపు పది కుటుంబాల జనం ఊట్లోనొంకలో గుడారాలు వేసుకున్నారు. ఒకరోజు ఉదయం అన్ని సద్దినీళ్ళు తాగి గేరిలో మనుషులందరూ చేరి మాట్లాడుకుంటున్న సందర్భంలో వాళ్ళ గుడారాల మీదపడి గుడారాలన్నింటిని కూలుస్తూ 'ఇంకా అడవుల్లో ఉంటే నక్సలైట్లని కాల్చిపారేస్తామ్' అని గుడారాలను పీకి సామాన్లు చిందర వందర చేసి వెళ్ళిపోతారు ఫారెస్టోళ్ళు. సామాన్లన్నీ సర్దుకొని నెత్తిన పెట్టుకొని పిల్లాజల్లల్తో గమ్యం తెలీని గేరి జనం నడక ముందుకు సాగిపోతూనే ఉంటుంది.

ఇక్కడ రచయిత – అడవిలో జంతువులు నాశనమైపోతున్నాయని తరిమేస్తున్నారేగాని, అడవులపైన బడి బతికే సంచార జీవుల బతుకులు ఏమైపోతాయోనన్న యోచన ఒకనికీ లేదు. అధికార్లు జంతువులకంటే మనుషులను హీనంగా చూస్తున్నారన్న విషయాన్ని రచయిత చిత్రించిన విధం పాఠకుల్లో మానవత్వాన్ని తట్టి లేపుతుంది.

4.2. వేట : వేట కథలో పుట్టలో లేచే ఉసుళ్ళవేట ఉంది. ఉసుళ్ళను వేటాడేవారిని ప్రపంచీకరణ అనే పెను రక్కసి, తన ఇనుప పాదాల కిందవేసి నేలమట్టం చేసిన వారి గుడిసెలున్నాయి. ఉసుళ్ళకోసం వాటి నివాసాలైన పుట్టల్ని ఇర్లోడు తవ్వటం జరుగుతుంది. అయితే అతను ఇంటికొచ్చేసరికి ఆ ఊరి గుడిసెల్ని రోడ్డు వెడల్పు చేయడం అనే నెపంతో ప్రభుత్వాధికారులు నేలమట్టం చేస్తారు. ఇలా వారి గుడిసెలు అదృశ్యం కావటం గుండెల్ని పిండేసే సన్నివేశం. ఇందులో ప్రభుత్వ అధికార్లు మరియు గిరిజన ప్రజల మధ్య సంబంధాలు ఎంత విరుద్ధంగా వుంటాయో రచయిత ఎంతో చక్కగా చిత్రీకరించారు. అంతేగాకుండా ఈ కథల్లో సామాన్య ప్రజలకు, ప్రభుత్వ అధికారులకు మధ్య ఎంతటి దారుణ సంబంధాలు కలిగి వుంటాయో చిత్రించడం జరిగింది. రాజ్యవ్యవస్థ ఎప్పుడూ ఉన్నవారి పక్షాన వుండి పేదవారిని కష్టాలకు గురిచేస్తున్న సత్యాన్ని ఈ కథల్లో రచయిత చిత్రించడం విశేషం.

5. వివిధ మత ప్రజల మధ్య సంబంధాలు

రాసానిగారు ముస్లిం సంస్కృతీ సంప్రదాయాల నేపథ్యంలో 'మహన్నభావుడు నామాల సాయిబు', 'బుసీఫెలస్ నువ్వు అనాథవు కావు సామితల్లి', 'అల్లాసామి' అనే కథలు రాశారు. వీటిలోని మానవ సంబంధాలెలాంటివో కూడా పరిశీలిద్దాం.

5.1. మహన్నభావుడు మా నామాల సాయిబు : రాయలసీమ జిల్లాల్లోను, కొన్ని తమిళ ప్రాంతాల్లోను, 'ఇల్దీర్థం' పేరుతో ముడుపులు కట్టి ఇంట్లోని కుటుంబ సభ్యులందరూ

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తిరుమల కొండకు బయలుదేరటం ఒక ఆచారంగా ఉంది. అలాగే చిత్తూరు జిల్లాలోని ముస్లింలు సైతం తమ ఆడపడుచు బీబీనాంచారిని పెళ్ళాడిన మామగా వెంకన్నను దర్శించుకోవటం తరతరాల నుంచి వస్తున్న సంప్రదాయం. ఈ నేపథ్యంలో సాగిందే 'మహన్నభావుడు మా నామాల సాయిబు' కథ. ఒక హిందువుల పిల్లవాడు 'ఇల్దీర్థం'లో తప్పిపోయి, రెండు మూడు రోజులు దిక్కూమొక్కూ లేకుండా తిరుపతి వీధుల్లో తిరుగుతాడు. అప్పుడు ఆ పిల్లవాడిని వాళ్ళు పక్క ఊరివాడైన నామాల సాయిబు గుర్తించి, ఆదరించి చేరదీసి వాళ్ళ పెద్దలకు అప్పజెప్పుతాడు. చక్కని మతసామరస్యాన్ని, మానవత్వాన్ని ప్రబోధించే ఈ సన్నివేశాన్ని రాసానిగారు ఈ కథలో వర్ణించిన తీరు హృదయానికి హత్తుకుంటుంది. అంతేగాక ఒకప్పుడు హిందూముస్లింల మధ్యవున్న చక్కటి మానవసంబంధాలను ఈ కథ తెలియజేస్తుంది.

5.2. బుసీఫెలస్ నీవు అనాథవు కావు : ప్రపంచీకరణ ప్రభావంతో నశించిపోతున్న మానవ సంబంధాలు, దూరమవుతున్న రక్తసంబంధాలు, కుటుంబానికి ఆధారంగా నిలిచిన పశువు ఉపయోగం తీరాక, ఇంటిని పోషించి, వృద్ధుడైన తండ్రి అవసరం తీరాక బిడ్డలు నిరాదరించే ఆధునిక మనస్తత్వాలు పాఠకుల్ని ఆవేదనకు, ఆలోచనకు గురిచేసేవిధంగా ఈ కథలో చిత్రీకరించారు రాసానిగారు. ఈవిధంగా రాసానిగారు తన కథలను మానవ సంబంధాలతో, మానవీయ విలువలతో పరిపుష్టం చేసుకున్నారు.

రాసానిగారు పుస్తకాలకంటే ప్రజల జీవితాల్ని బాగా చదివారు. అందుకే ఈయన కథల్లో కల్పనలుండవు. సమాజంలో జరుగుతున్న సంఘటనలుంటాయి. అంతకుమించి బడుగుజీవుల బాధలుంటాయి. ఆర్తుల ఆక్రందనలుంటాయి. ఆ ఆక్రందనల్లోను, బాధల్లోనూ మానవత్వం మాత్రం పరిమళిస్తూనే ఉంటుంది. అందుకే మునిపల్లె రాజుగారు 'మనిషిమీద గొప్ప కరుణ, అభిమానం రాసాని పాత్రల్లో ఉన్నాయి. ఇవే కాలప్రవాహంలో రచయితను మాయం చేయకుండా మళ్ళీ మళ్ళీ స్మృతికి తెచ్చేస్తుంటాయి. నినాదాల జోరే కథాలక్షణం అనుకునేవారి కోవలోనికి రాని కథలు వీరివి' అని చెప్పిన మాటలలో యథార్థం ఉంది. అందుకే రాసానిగారు మానవతావాదిగా తెలుగు సాహిత్యంలోనే ప్రత్యేకంగా కనిపిస్తారు.

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TO FIND THE COMPARISON OF DIAMETER AND DENSITY OF AN INTERVAL GRAPH TOWARDS DOMINATING SETS

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ABSTRACT:

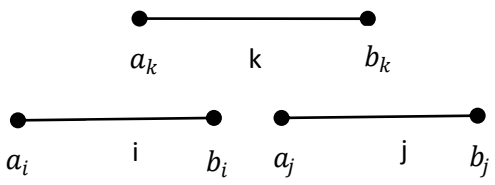
In this paper we investigate the problem of "the comparison of diameter and density of an interval graph towards dominating sets". In interval graphs have wide range of applications in the field of scheduling, computer networking, genetics etc. The diameter and density of a graph are fundamental topological parameters that have many practical applications in real world networks. For this purpose, certain classes of interval graphs are taken into consideration and their diameter, density towards dominating sets are obtained.

Key words: ***Interval family, Interval graph, Dominating set, Distance, Diameter and Density.***

INTRODUCTION

A finite number of intervals on a straight line, a graph associated with this set of intervals can be constructed in the following manner that is- each interval corresponds to a vertex of the graph and two vertices are connected by an edge if and only if the corresponding intervals overlap atleast partially.

Let $I = \{I_1, I_2, I_3, \ldots\ldots I_n\}$ be an interval family. Each interval I_i, in I is represented by $[a_i, b_i]$ for i = 1,2,3,….,n. Here a_i is called left end and b_i is called right end of the interval i . Without loss of generality, we may assume that there are 2n end points which are distinct. The intervals are labeled in the increasing of their right end points.



The above interval family is labeled as I = $[a_i, b_i]$, j= $[a_j, b_j]$ and k = $[a_k, b_k]$ whre I < j < k.

A graph G = (V, E) is an interval graph, if the vertex set V can be put into one to one correspondence with a set of intervals *I* on the real line R such that two vertices are adjacent in G if and only if their corresponding intervals have non-empty intersection. The set *I* is called an interval representation of G and G is referred to as the intersection graph *I*.

The research of the domination in graphs has been ever green of the graph theory. Its basic concepts are the dominating set and the domination number. The theory of domination in graphs was introduced by Ore [1] and Berge[2]. A survey on result and application of dominating set was presented by E.J.Cockayane and S.T.Hedetniemi [3]. In 1997 V.R.Kulliet. all introduced the concept non-split domination [4]. The diameter and radius are two of the most basic graph parameters. The diameter of a graph is the largest distance between its vertices. The distance orientation of graphs by V. Chvatal [5], the diameter of a graph G is the maximum eccentricity of all its vertices and is denoted by diam(G)- that is Diam(G) = Max$\{e(u): u \subset V(G)\}$, where the maximum distance from a vertex u to any vertex v of G is called eccentricity of the vertex u is denoted by e(u)- that is $e(u) =$ = Max$\{d(u,v): v \in V(G)\}$, where as the distance between two vertices u *and* v of a graph is the length of the shortest path between them and is denoted by $d_G(u,v)$ or $d(u,v)$.

The density of G is the ratio of edges in G to the maximum possible number of edges. Let G be a graph. A subset D of V is called a dominating set if, every vertex in V-D is adjacent to some vertex in D. The distance $d(u,v)$ from a vertex u to a vertex v in a graph G is the length of a shortest $u-v$ walk if one exist. Otherwise $d(u,v) = \infty$.

DENSITY AND AVERAGE DEGREE

The density of a graph G = (V,E) measures how many edges are in the set E compared to the maximum possible number of edges between vertices in the set of V. Density of a graph is calculated as follows:

. As undirected graph has no loops and can have at most $\frac{|V|\,(|V-1|)}{2}$ edges. So the density of an undirected graph is $\frac{2\,|E|}{|V|(|V-1|)}$.

. A directed graph has no loops and can have at most $|V|(|V-1|)$ edges. So the density of a directed graph is $\frac{|E|}{|V|(|V-1|)}$.

The average degree of a graph G is another measure of how many edges are in the set E compared to the number of vertices in the set V because, each edge is incident to two vertices and counts in the degree of both vertices. The average degree of an undirected graph is $\frac{2\,|E|}{|V|}$.

Density $d = \frac{\bar{d}}{|V|}$, where $\bar{d}$ = Average degree.

Theorem1: Let G be a contained interval graph corresponding to an interval family *I*, i ∈ D, j ≠ 1, then $|NSDS| \geq dia(G) > \frac{\bar{d}}{n-1}$ (or) $dia(G) \geq |NSDS| > \frac{\bar{d}}{n-1}$.

Proof:- Let d be a dominating set of the given interval graph G corresponding to a contained interval family *I*. If i and j are any two intervals in *I* such that , i ∈ DS, , j ≠ 1, and j is contained in i and if there is atleast one interval to the left of j that intersects j and atleast one interval k ≠ i, to the right of j that intersects j. Then we have to show that the non-split domination occurs in G.

Suppose there is at least one interval k ≠ i to the right of j that intersects j. Then it is obvious that j is adjacent to k in $\langle V - D \rangle$, so that there will not be any disconnection $\langle V - D \rangle$. Since there is at least one interval to the left of j that intersects j, there will not be any disconnection in$\langle V - D \rangle$, to its left. Thus, we get non-spilt domination in G, it is denoted by NSDS.

Again we have to prove that the diameter of G corresponding to an interval family I = $\{1,2,3 \ldots\ldots i, j, \ldots n\}$.

First we will discuss the distances of G. For any two vertices i, j in an interval graph G corresponding to an internal family I, the distance from i *to* j is denoted by d(i,j) and defined as the length of a shortest i–j in an interval graph. The term 'distance' is just defined by satisfying all four of the following properties.

i) $d(i,j) \geq 0, \ \forall \ i,j \in V(G)$

ii) $d(i,j) = 0 \quad iff \ \ i = j$

iii) $d(i,j) = d(j,i)$, $\forall \ i,j \in V(G)$

iv) $d(i,k) \leq d(i,j) + d(j,k)$, $\forall \ i,j,k \in V(G)$

Suppose an interval graph V(G) is not a connected graph and G_1 and G_2 are two graphs of G such that G = $G_1 \cup G_2$ and E(G_1) ∪ $E(G_2)$ = E(G) and $G_1 \cap G_2 = \emptyset$ that implies V(G_1) ∩ $V(G_2) = \emptyset$ and E(G_1) ∩ $E(G_2)$

= ∅. Then $d(i,j) = \infty$ for i∈ V(G_1) and j ∈ $V(G_2)$. This contradicts that i-j is shortest. Therefore G must be connected.

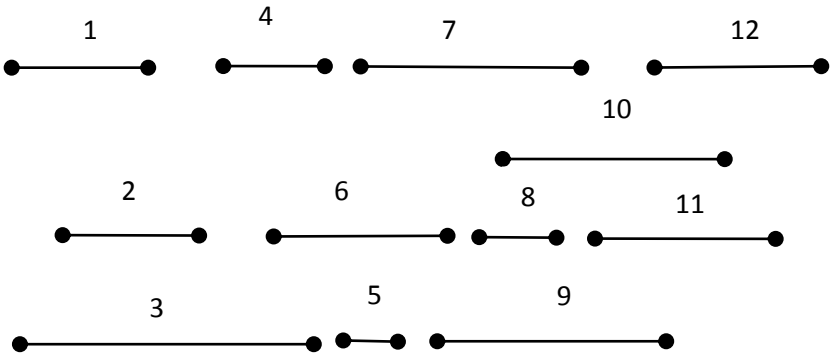
The diameter and radius are two of the most basic graph parameters. The diameter of a graph is the largest distance between the vertices. The distance orientations of graph by V.Chvatal[5], the diameter of a graph G is the maximum eccentricity of all its vertices and is denoted by dia(G), that is dia(G) = max$\{ecc(v) : v \in V(G)\}$, where the maximum distance from vertex v to any vertex of G is called 'eccentricity' of the vertex and is denoted by ecc(v), that is ecc(v) = max$\{d(v,u) : u \in V(G)\}$, where as the distance $d(v,u)$ between two vertices $v\ and\ u$ of a graph is the length of the shortest path between them and is denoted by $d(v,u)$.

Finally we will find a density d of G corresponding to an interval family $I = \{I_1, I_2, I_3, \ldots\ldots I_n\}$. We find the degree of vertices deg(1), deg(2) ... ..., deg(n) in G corresponding to I. that is we discuss $\frac{2E}{n(n-1)}$, where n = number of vertices and E = number of edges.

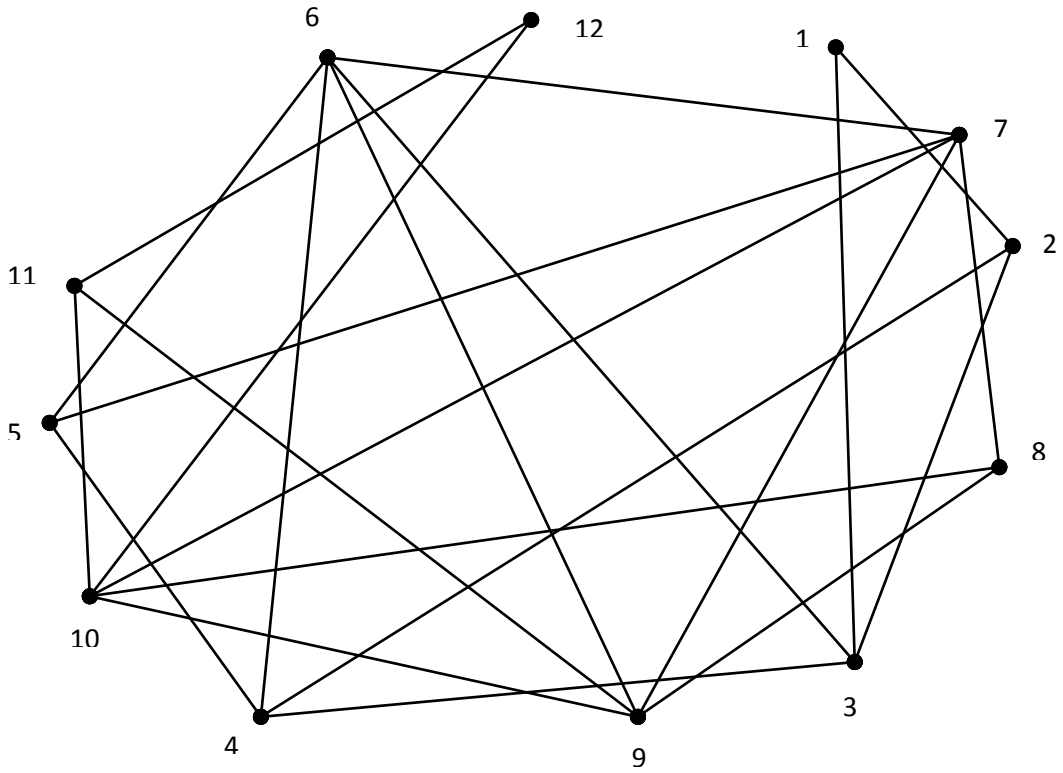
First we find the average degree of G. Suppose; an interval graph G has n vertices with degrees deg(1), deg(2) ... ... deg(n). Add together all vertices to get a new number D= 2E, where E= number of edges in G. In words, for any graph the sum of the degrees of the vertices equals to twice the number of edges. Therefore, we we find the average degree which can be denoted by $\bar{d} = \frac{\deg(1)+\deg(2)+\cdots..deg(n)}{n}$. Finally, we find the density of G corresponding to I. So that $d = \frac{\bar{d}}{n-1} = \frac{D}{n(n-1)} = \frac{2E}{n(n-1)}$.

From the above proof we can deduce the conditions which are $dia(G) \geq |NSDS| \geq \frac{\bar{d}}{n-1}$.
Hence the proof.

Illustration 1:



Interval Family (I.F.)



Interval Graph (I.G.)- G

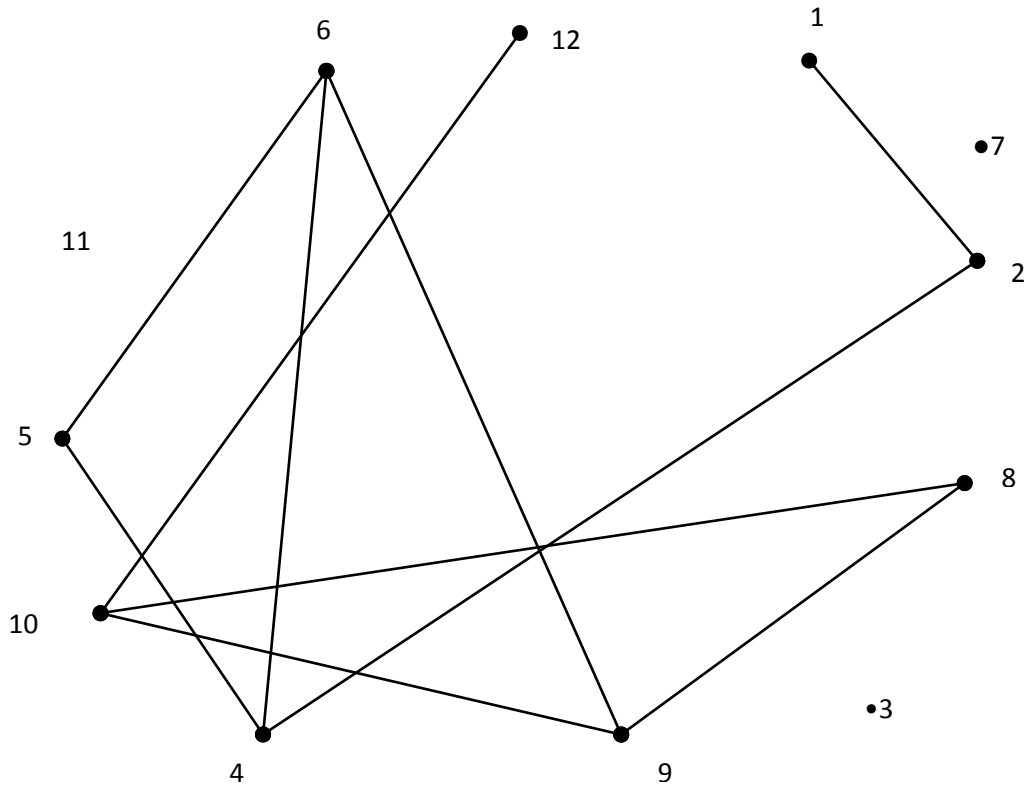
To find dominating set of G:

$I = \{1,2,3,4,5,6,7,8,9,10,11,12\}$,

Dominating set = $\{3,7,11\}$

$\therefore |DS| = 3$

$V - D = \{1,2,4,5,6,8,9,10,12\}$



Interval Graph (I.G.) – G'

From the picture above it is understood that the interval induced graph G' is connected. The nonsplit dominating set (NSDS) of G' is {1,4,10}. ∴ $|NSDS| = 3$.

To find the average degree of G for density:

deg(1)=2, deg(2)=3, deg(3)=4, deg(4)=4, deg(5)=3, deg(6)=5, deg(7)=5, deg(8)=3, deg(9)=5, deg(10)=5, deg(11)=3, deg(12)=2.

∴ The sum of the degrees of vertices $D = \sum_{i=1}^{12} deg(i)$ = 44.

Average degree $\overline{D} = \frac{\sum_{i=1}^{12} \deg(i)}{12} = \frac{44}{12} = 3.7$

∴ Density $d = \frac{2E}{n(n-1)} = \frac{44}{12X11} = \frac{4}{12} = 0.33$

To find the diameter of $G = max\{e(i) : i \in V(G)\}$

The diameter of vertices $d(i,j)$ are as follows, whwre $i,j \in V(G)$

$d(1,1) = 0$	$d(2,1) = 1$	$d(3,1) = 1$	$d(4,1) = 2$
$d(1,2) = 1$	$d(2,2) = 0$	$d(3,2) = 1$	$d(4,2) = 1$
$d(1,3) = 1$	$d(2,3) = 1$	$d(3,3) = 0$	$d(4,3) = 1$
$d(1,4) = 2$	$d(2,4) = 1$	$d(3,4) = 1$	$d(4,4) = 0$
$d(1,5) = 3$	$d(2,5) = 2$	$d(3,5) = 2$	$d(4,5) = 1$
$d(1,6) = 2$	$d(2,6) = 2$	$d(3,6) = 2$	$d(4,6) = 1$
$d(1,7) = 3$	$d(2,7) = 3$	$d(3,7) = 2$	$d(4,7) = 2$
$d(1,8) = 4$	$d(2,8) = 4$	$d(3,8) = 3$	$d(4,8) = 3$
$d(1,9) = 3$	$d(2,9) = 4$	$d(3,9) = 2$	$d(4,9) = 2$
$d(1,10) = 4$	$d(2,10) = 4$	$d(3,10) = 3$	$d(4,10) = 3$
$d(1,11) = 4$	$d(2,11) = 4$	$d(3,11) = 3$	$d(4,11) = 3$
$d(1,12) = 5$	$d(2,12) = 5$	$d(3,12) = 4$	$d(4,12) = 3$

$d(5,1) = 3$	$d(6,1) = 2$	$d(7,1) = 3$	$d(8,1) = 4$
$d(5,2) = 2$	$d(6,2) = 2$	$d(7,2) = 3$	$d(8,2) = 4$
$d(5,3) = 2$	$d(6,3) = 3$	$d(7,3) = 2$	$d(8,3) = 3$
$d(5,4) = 1$	$d(6,4) = 1$	$d(7,4) = 2$	$d(8,4) = 3$
$d(5,5) = 0$	$d(6,5) = 2$	$d(7,5) = 1$	$d(8,5) = 2$
$d(5,6) = 1$	$d(6,6) = 0$	$d(7,6) = 1$	$d(8,6) = 2$
$d(5,7) = 1$	$d(6,7) = 1$	$d(7,7) = 0$	$d(8,7) = 1$
$d(5,8) = 2$	$d(6,8) = 2$	$d(7,8) = 1$	$d(8,8) = 0$
$d(5,9) = 2$	$d(6,9) = 2$	$d(7,9) = 1$	$d(8,9) = 1$
$d(5,10) = 2$	$d(6,10) = 2$	$d(7,10) = 1$	$d(8,10) = 1$
$d(5,11) = 3$	$d(6,11) = 2$	$d(7,11) = 2$	$d(8,11) = 2$
$d(5,12) = 3$	$d(6,12) = 3$	$d(7,12) = 2$	$d(8,12) = 2$

$d(9,1) = 3$	$d(10,1) = 4$	$d(11,1) = 4$	$d(12,1) = 5$
$d(9,2) = 4$	$d(10,2) = 4$	$d(11,2) = 4$	$d(12,2) = 5$
$d(9,3) = 2$	$d(10,3) = 3$	$d(11,3) = 3$	$d(12,3) = 4$
$d(9,4) = 2$	$d(10,4) = 3$	$d(11,4) = 3$	$d(12,4) = 3$
$d(9,5) = 2$	$d(10,5) = 2$	$d(11,5) = 3$	$d(12,5) = 3$
$d(9,6) = 2$	$d(10,6) = 2$	$d(11,6) = 2$	$d(12,6) = 3$
$d(9,7) = 1$	$d(10,7) = 1$	$d(11,7) = 2$	$d(12,7) = 2$

$d(9,8)=1$	$d(10,8)=1$	$d(11,8)=2$	$d(12,8)=2$
$d(9,9)=0$	$d(10,9)=1$	$d(11,9)=1$	$d(12,9)=2$
$d(9,10)=1$	$d(10,10)=0$	$d(11,10)=1$	$d(12,10)=1$
$d(9,11)=1$	$d(10,11)=1$	$d(11,11)=0$	$d(12,11)=1$
$d(9,12)=2$	$d(10,12)=1$	$d(11,12)=1$	$d(12,12)=0$

The eccentricity of vertex i is $e(i)=max\{d(i,j):(i,j)\in V(G)\}$

$e(1)=max\{d(1,j):j\in V\}$

$=max\{0,1,1,2,3,2,3,4,3,4,4,5\}=5$

$e(2)=max\{d(2,j):j\in V\}$

$=max\{1,0,1,12,2,34,4,4,4,5\}=5$

$e(3)=max\{d(3,j):j\in V\}$

$=max\{1,1,0,1,2,2,2,3,2,3,3,4\}=4$

$e(4)=max\{d(4,j):j\in V\}$

$=max\{2,1,1,0,1,1,2,3,2,3,3,3\}=3$

$e(5)=max\{d(5,j):j\in V\}$

$=max\{3,2,2,1,0,1,1,2,2,2,3,3\}=3$

$e(6)=max\{d(6,j):j\in V\}$

$=max\{2,2,2,1,1,0,1,2,2,2,2,3\}=3$

$e(7)=max\{d(7,j):j\in V\}$

$=max\{3,3,2,2,1,1,0,1,1,1,2,2\}=3$

$e(8)=max\{d(8,j):j\in V\}$

$=max\{4,4,3,3,2,2,1,0,1,1,2,2\}=4$

$e(9) = max\{d(9,j): j \in V\}$

$= max\{3,4,2,2,2,2,1,0,1,1,2,2\} = 4$

$e(10) = max\{d(10,j): j \in V\}$

$= max\{4,4,3,3,2,2,1,1,1,0,1,1\} = 4$

$e(11) = max\{d(11,j): j \in V\}$

$= max\{4,4,3,3,3,2,2,2,1,1,0,1\} = 4$

$e(12) = max\{d(12,j): j \in V\}$

$= max\{5,5,4,3,3,3,2,2,2,1,1,0\} = 5$

Now the diameter(G) = $max\{e(i): i \in V(G)\}$

$= max\{5,5,4,3,3,3,3,4,4,4,4,5\}$ = 5

Therefore, $|NSDS| = 3$, $d = \frac{\ddot{D}}{n-1} = 0.33$ and $diam(G) = 5$

Thus, $diam(G) > |NSDS| > d$

Theorem 2: Let G be a contained connected interval graph corresponding to an interval family $I, i \in D, j = 1$. then $dia(G) \geq |NSDS| \geq \frac{\bar{d}}{n-1}$.

Proof: Let $I = \{1,2, \ldots \ldots \ldots n\}$ be an interval family and G be an interval graph corresponding to I. If i and j are two intervals in I such that $i \in D, j = 1$ and j

Is contained in i and if there is one or more intervals other than i that intersects j, then we will prove that $NSDS$ occurs in G.

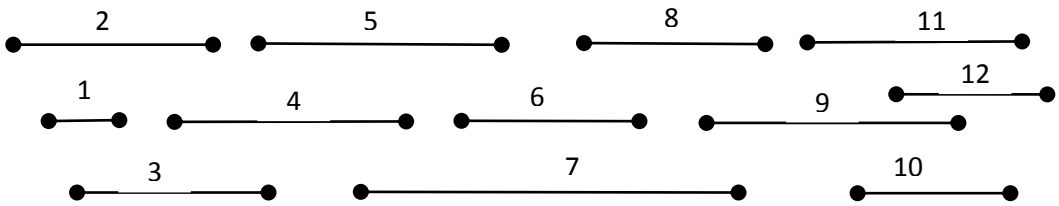
Let $j = 1$ be the interval contained in i, where $i \in D$. Suppose k is an interval , $k \neq i$and k intersects j. Since $i \in D$, $< V - D >$ does not contain i. For that, in $< V - D >$, the vertex j is adjacent to the vertex k. Hence there will not be any disconnection in $< V - D >$. Therefore we get $NSDS$ in G.

Again we will prove that the diameter of G. We have already proved it in theorem 1.

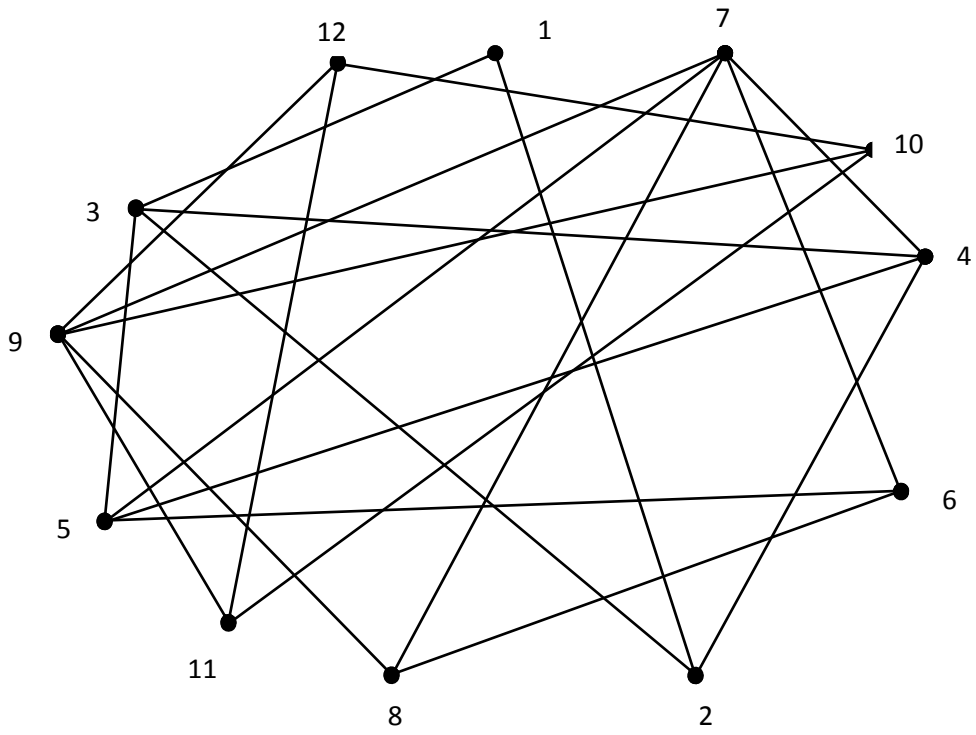
Next we will find the density of G corresponding to an interval family I. This is also proved in theorem1.

Hence $dia(G) \geq |NSDS| \geq \frac{\bar{D}}{n-1}$, at $i \in D, j = 1$.

Illustration 2:



Interval Family(I.F.)



Interval Graph (I.G.)-

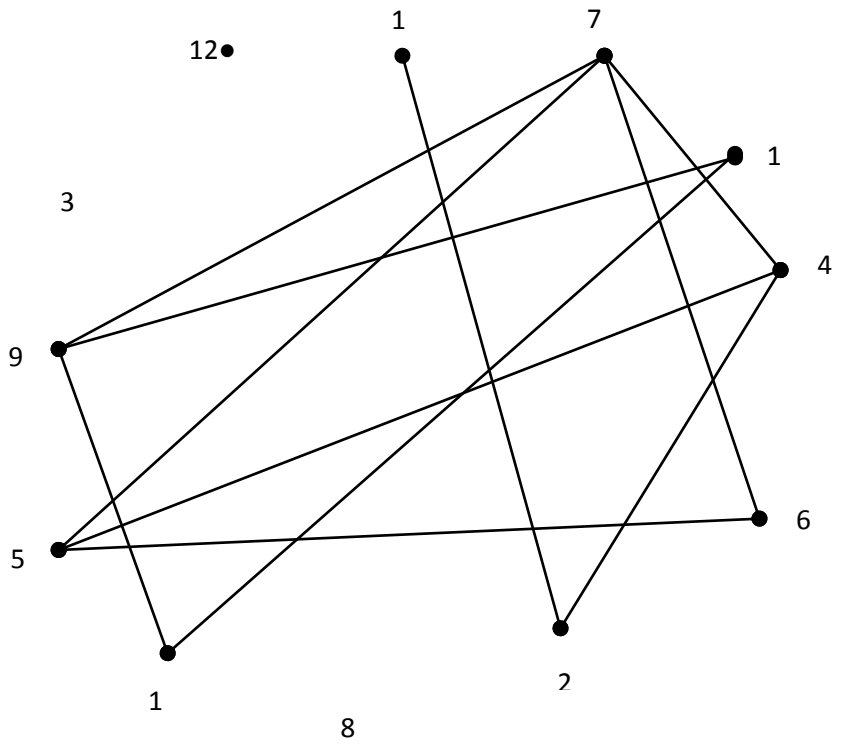
To find dominating set of G:

$I = \{1,2,3,4,5,6,7,8,9,10,11,12\}$,

Dominating set = $\{3,8,12\}$ $\therefore$ the cordinality of DS is $|DS| = 3$

$V - D = \{1,2,4,5,6,7,9,10,11\}$

Induced graph $< V - D >$ is



Interval Graph (I.G.) $- G'$

From the picture above it is understood that the interval inducede graph G' is connected. The nonsplit dominating set (NSDS) of G' is $\{2,5,9\}$. $\therefore$ $|NSDS| = 3$

To find the average degree of G for density :

deg(1)=1, deg(2)=3, deg(3)=4, deg(4)=4, deg(5)=4, deg(6)=3, deg(7)=5, deg(8)=3, deg(9)=5, deg(10)=3, deg(11)=3, deg(12)=3.

∴ The sum of the degrees of vertices $D = \sum_{i=1}^{12} deg(i) = 40$

Average degree $\overline{D} = \frac{\sum_{i=1}^{12} \deg(i)}{12} = \frac{40}{12} = 3.3$

∴ Density $d = \frac{2E}{n(n-1)} = \frac{\ddot{D}}{n-1} = \frac{40}{12X11} = 0.3$

To find the diameter of $G = max\{e(i) : i \in V(G)\}$

The diameter of vertices $d(i,j)$ are as follows, whwre $i,j \in V(G)$

$d(1,1) = 0$	$d(2,1) = 1$	$d(3,1) = 1$	$d(4,1) = 2$
$d(1,2) = 1$	$d(2,2) = 0$	$d(3,2) = 1$	$d(4,2) = 1$
$d(1,3) = 1$	$d(2,3) = 1$	$d(3,3) = 0$	$d(4,3) = 1$
$d(1,4) = 2$	$d(2,4) = 1$	$d(3,4) = 1$	$d(4,4) = 0$
$d(1,5) = 2$	$d(2,5) = 2$	$d(3,5) = 1$	$d(4,5) = 1$
$d(1,6) = 3$	$d(2,6) = 3$	$d(3,6) = 2$	$d(4,6) = 2$
$d(1,7) = 3$	$d(2,7) = 3$	$d(3,7) = 2$	$d(4,7) = 1$
$d(1,8) = 4$	$d(2,8) = 3$	$d(3,8) = 3$	$d(4,8) = 2$
$d(1,9) = 4$	$d(2,9) = 3$	$d(3,9) = 3$	$d(4,9) = 3$
$d(1,10) = 5$	$d(2,10) = 4$	$d(3,10) = 4$	$d(4,10) = 3$
$d(1,11) = 5$	$d(2,11) = 4$	$d(3,11) = 4$	$d(4,11) = 3$
$d(1,12) = 5$	$d(2,12) = 4$	$d(3,12) = 4$	$d(4,12) = 3$

$d(5,1) = 2$	$d(6,1) = 3$	$d(7,1) = 3$	$d(8,1) = 4$
$d(5,2) = 2$	$d(6,2) = 3$	$d(7,2) = 3$	$d(8,2) = 3$
$d(5,3) = 1$	$d(6,3) = 2$	$d(7,3) = 2$	$d(8,3) = 3$
$d(5,4) = 1$	$d(6,4) = 2$	$d(7,4) = 1$	$d(8,4) = 2$
$d(5,5) = 0$	$d(6,5) = 1$	$d(7,5) = 1$	$d(8,5) = 2$
$d(5,6) = 1$	$d(6,6) = 0$	$d(7,6) = 1$	$d(8,6) = 1$
$d(5,7) = 1$	$d(6,7) = 1$	$d(7,7) = 0$	$d(8,7) = 1$
$d(5,8) = 2$	$d(6,8) = 1$	$d(7,8) = 1$	$d(8,8) = 0$
$d(5,9) = 2$	$d(6,9) = 2$	$d(7,9) = 1$	$d(8,9) = 1$
$d(5,10) = 3$	$d(6,10) = 3$	$d(7,10) = 2$	$d(8,10) = 2$
$d(5,11) = 3$	$d(6,11) = 3$	$d(7,11) = 2$	$d(8,11) = 2$

$d(5,12) = 3$ $d(6,12) = 3$ $d(7,12) = 2$ $d(8,12) = 2$

$d(9,1) = 4$ $d(10,1) = 5$ $d(11,1) = 5$ $d(12,1) = 5$
$d(9,2) = 3$ $d(10,2) = 4$ $d(11,2) = 4$ $d(12,2) = 4$
$d(9,3) = 3$ $d(10,3) = 4$ $d(11,3) = 4$ $d(12,3) = 4$
$d(9,4) = 3$ $d(10,4) = 3$ $d(11,4) = 3$ $d(12,4) = 3$
$d(9,5) = 2$ $d(10,5) = 3$ $d(11,5) = 3$ $d(12,5) = 3$
$d(9,6) = 2$ $d(10,6) = 3$ $d(11,6) = 3$ $d(12,6) = 3$
$d(9,7) = 1$ $d(10,7) = 2$ $d(11,7) = 2$ $d(12,7) = 2$
$d(9,8) = 1$ $d(10,8) = 2$ $d(11,8) = 2$ $d(12,8) = 2$
$d(9,9) = 0$ $d(10,9) = 1$ $d(11,9) = 1$ $d(12,9) = 1$
$d(9,10) = 1$ $d(10,10) = 0$ $d(11,10) = 1$ $d(12,10) = 1$
$d(9,11) = 1$ $d(10,11) = 1$ $d(11,11) = 0$ $d(12,11) = 1$
$d(9,12) = 1$ $d(10,12) = 1$ $d(11,12) = 1$ $d(12,12) = 0$

The eccentricity of vertex i is $e(i) = max\{d(i,j): (i,j) \in V(G)\}$

$e(1) = max\{d(1,j): j \in V\}$

$= max\{0,1,1,2,2,3,3,4,4,5,5,5\} = 5$

$e(2) = max\{d(2,j): j \in V\}$

$= max\{1,0,1,1,2,3,3,3,3,4,4,4\} = 4$

$e(3) = max\{d(3,j): j \in V\}$

$= max\{1,1,0,1,1,2,2,3,3,4,4,4\} = 4$

$e(4) = max\{d(4,j): j \in V\}$

$= max\{2,1,1,0,1,2,1,2,3,3,3,3\} = 3$

$e(5) = max\{d(5,j): j \in V\}$

$= max\{2,2,1,1,0,1,1,2,2,3,3,3\} = 3$

$e(6) = max\{d(6,j): j \in V\}$

$= max\{3,3,2,2,1,0,1,1,2,3,3,3\} = 3$

$e(7) = max\{d(7,j): j \in V\}$

$= max\{3,3,2,1,1,1,0,1,1,2,2,2\} = 3$

$e(8) = max\{d(8,j): j \in V\}$

$= max\{4,3,3,2,2,1,1,0,1,2,2,2\} = 4$

$e(9) = max\{d(9,j): j \in V\}$

$= max\{4,3,3,3,2,2,1,1,0,1,1,1\} = 4$

$e(10) = max\{d(10,j): j \in V\}$

$= max\{5,4,4,3,3,3,2,2,0,1,1,1\} = 5$

$e(11) = max\{d(11,j): j \in V\}$

$= max\{5,4,4,3,3,3,2,2,1,1,0,1\} = 5$

$e(12) = max\{d(12,j): j \in V\}$

$= max\{5,4,4,3,3,3,2,2,1,1,1,0\} = 5$

Now the diameter$(G) = max\{e(i): i \in V(G)\}$

$= max\{5,4,4,3,3,3,3,4,4,5,5,5\} = 5$

Therefore, $|NSDS| = 3$, $d = \frac{\eth}{n-1} = 0.3$ and $\text{diam}(G) = 5$

Thus, $\text{diam}(G) > |NSDS| > d$

Theorem 3: Let $I = \{1,2,3, \ldots\ldots, n\}$ be an interval family and G is a connected interval graph. If i, j, k are three consecutive intervals such that $i < j < k$, and $j \in D. i \cap j, j \cap k$ and $k \cap i$. Then $\text{diam}(G) \geq |NSDS| \geq \frac{\bar{D}}{n-1}$.

Proof: We consider$G$ be an interval graph corresponding to an interval family I= $\{1,2,3, \ldots\ldots, n\}$. If i, j, k are three consecutive intervals such that i$< j < k$, and $j \in D$, $i \cap j, j \cap k$ and $k \cap i$, we have to show that G must be connected as well as G is a non-split dominating set which can be denoted by NSDS.

Let i, j, k be three consecutive intervals satisfying the hypothesis.

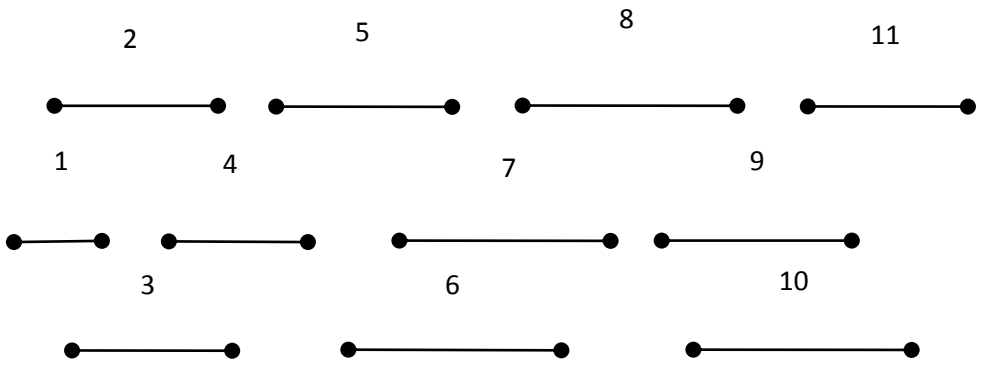
Now i, k intersects implies that i and k are adjacent in $< V - D >$ so that, there will not be any disconnection in $< V - D >$. Therefore G must be a connected graph corresponding to an internal family I.

Again we find the diameter of G corresponding to the consecutive interval family I. Already we have proved the diameter in G in theorem 1.

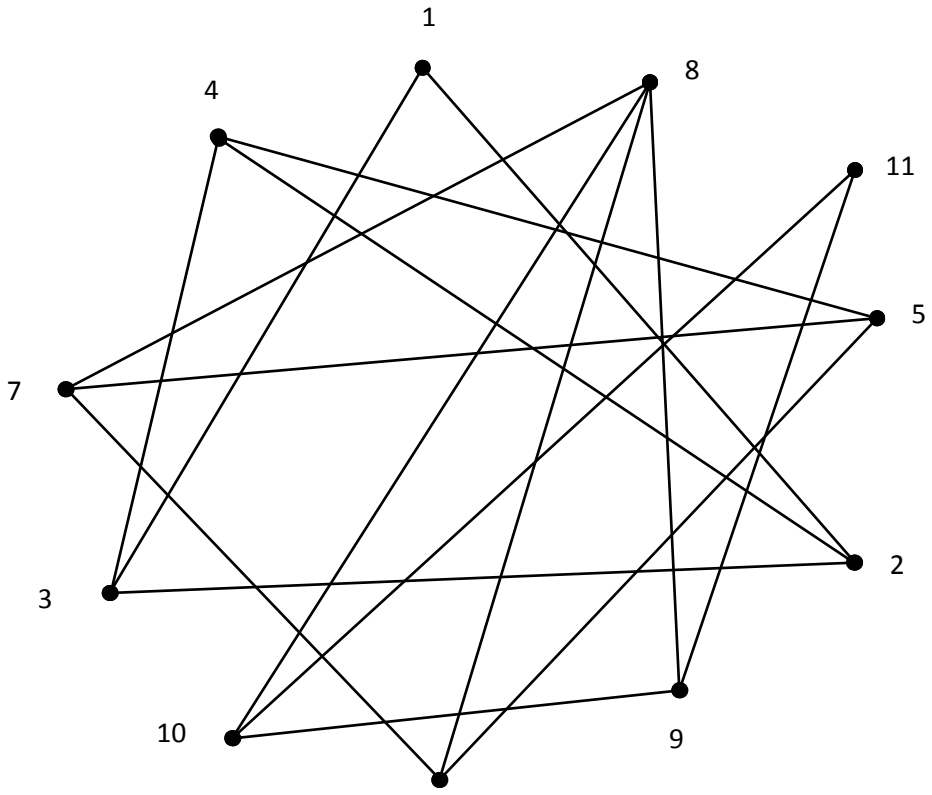
Next we have to prove the density d of G from a consecutive interval family I This proof is already proved in theorem1.

Therefore from the cases said above we get $\text{diam}(G) \geq |NSDS| \geq \frac{\bar{D}}{n-1}$.

Illustration 3:



Interval Family (I.F.)



Interva ıph (I.G.)-G'

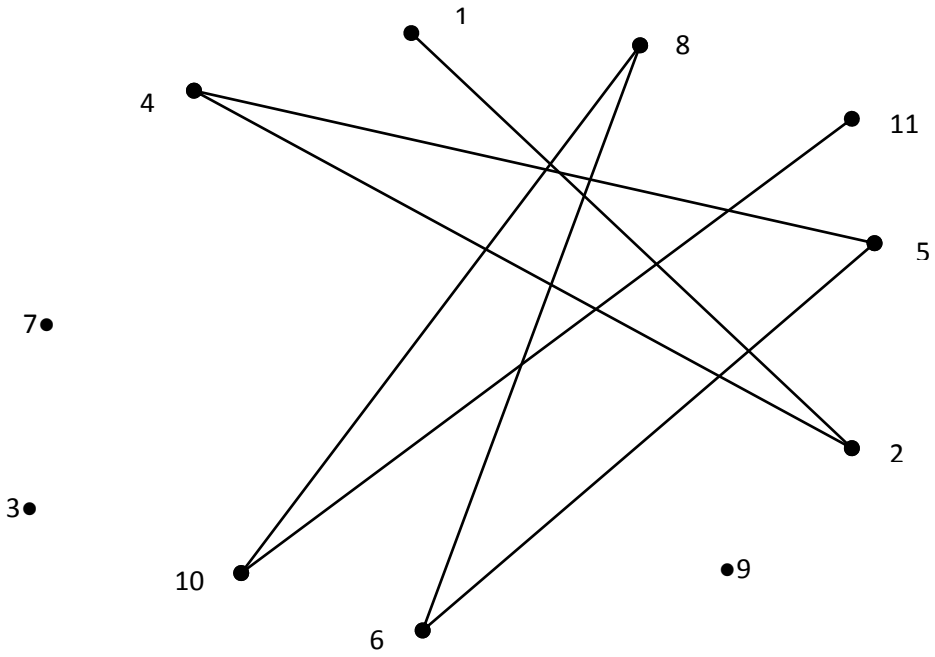
To find dominating set of G:

$I = \{1,2,3,4,5,6,7,8,9,10,11\}$,

Dominating set = $\{3,7,9\}$

$\therefore |DS| = 3$

$$< V - D >= \{1,2,4,5,6,8,10,11\}$$



Interval Graph (I.G.) – G'

The induced subgraph G' is also connected. Hence, it is Non-Split graph. The Non-Split Dominating set (NSDS) is $\{2,6,10\}$ $\therefore$ $|NSDS| = 3$

From the picture above it is understood that the interval graph is connected and G' is non-split dominating set of G.

To find the average degree of G for density:

deg(1)=2, deg(2)=3, deg(3)=3, deg(4)=3, deg(5)=3, deg(6)=3, deg(7)=3, deg(8)=4, deg(9)=3, deg(10)=3, deg(11)=2

$\therefore$ The sum of the degrees of vertices $D = \sum_{i=1}^{11} deg(i)$ = 32.

Average degree $\overline{D} = \frac{\sum_{i=1}^{11} \deg(i)}{11} = \frac{32}{11} = 2.9$

$\therefore$ Density $d = \frac{\ddot{D}}{n-1} = \frac{2E}{n(n-1)} = \frac{2X16}{11X10} = \frac{32}{110} = 0.29$

To find the diameter of $G = max\{e(i) : i \in V(G)\}$

The diameter of vertices $d(i,j)$ are as follows, where $i,j \in V(G)$

$d(1,1) = 0$	$d(2,1) = 1$	$d(3,1) = 1$	$d(4,1) = 2$
$d(1,2) = 1$	$d(2,2) = 0$	$d(3,2) = 1$	$d(4,2) = 1$
$d(1,3) = 1$	$d(2,3) = 1$	$d(3,3) = 0$	$d(4,3) = 1$
$d(1,4) = 2$	$d(2,4) = 1$	$d(3,4) = 1$	$d(4,4) = 0$
$d(1,5) = 3$	$d(2,5) = 2$	$d(3,5) = 2$	$d(4,5) = 1$
$d(1,6) = 3$	$d(2,6) = 3$	$d(3,6) = 2$	$d(4,6) = 2$
$d(1,7) = 4$	$d(2,7) = 3$	$d(3,7) = 3$	$d(4,7) = 2$
$d(1,8) = 5$	$d(2,8) = 4$	$d(3,8) = 4$	$d(4,8) = 3$
$d(1,9) = 6$	$d(2,9) = 5$	$d(3,9) = 5$	$d(4,9) = 4$
$d(1,10) = 6$	$d(2,10) = 5$	$d(3,10) = 5$	$d(4,10) = 4$
$d(1,11) = 7$	$d(2,11) = 6$	$d(3,11) = 6$	$d(4,11) = 5$

$d(5,1) = 3$	$d(6,1) = 3$	$d(7,1) = 4$	$d(8,1) = 5$
$d(5,2) = 2$	$d(6,2) = 3$	$d(7,2) = 3$	$d(8,2) = 4$
$d(5,3) = 2$	$d(6,3) = 2$	$d(7,3) = 3$	$d(8,3) = 4$
$d(5,4) = 1$	$d(6,4) = 2$	$d(7,4) = 2$	$d(8,4) = 3$
$d(5,5) = 0$	$d(6,5) = 1$	$d(7,5) = 1$	$d(8,5) = 2$
$d(5,6) = 1$	$d(6,6) = 0$	$d(7,6) = 1$	$d(8,6) = 1$
$d(5,7) = 1$	$d(6,7) = 1$	$d(7,7) = 0$	$d(8,7) = 1$
$d(5,8) = 2$	$d(6,8) = 1$	$d(7,8) = 1$	$d(8,8) = 0$
$d(5,9) = 3$	$d(6,9) = 2$	$d(7,9) = 2$	$d(8,9) = 1$
$d(5,10) = 3$	$d(6,10) = 2$	$d(7,10) = 2$	$d(8,10) = 1$
$d(5,11) = 4$	$d(6,11) = 3$	$d(7,11) = 3$	$d(8,11) = 2$

$d(9,1) = 6$	$d(10,1) = 6$	$d(11,1) = 7$
$d(9,2) = 5$	$d(10,2) = 5$	$d(11,2) = 6$
$d(9,3) = 5$	$d(10,3) = 5$	$d(11,3) = 6$
$d(9,4) = 4$	$d(10,4) = 4$	$d(11,4) = 5$
$d(9,5) = 3$	$d(10,5) = 3$	$d(11,5) = 4$
$d(9,6) = 2$	$d(10,6) = 2$	$d(11,6) = 3$
$d(9,7) = 2$	$d(10,7) = 2$	$d(11,7) = 3$

$d(9,8) = 1$ $d(10,8) = 1$ $d(11,8) = 2$
$d(9,9) = 0$ $d(10,9) = 1$ $d(11,9) = 1$
$d(9,10) = 1$ $d(10,10) = 0$ $d(11,10) = 1$
$d(9,11) = 1$ $d(10,11) = 1$ $d(11,11) = 0$

The eccentricity of vertex i is $e(i) = max\{d(i,j): (i,j) \in V(G)\}$

$e(1) = max\{d(1,j): j \in V\}$

$= max\{0,1,1,2,3,3,4,5,6,6,7\} = 7$

$e(2) = max\{d(2,j): j \in V\}$

$= max\{1,0,1,1,2,3,3,4,5,5,6\} = 6$

$e(3) = max\{d(3,j): j \in V\}$

$= max\{1,1,0,1,2,2,3,4,5,5,6\} = 6$

$e(4) = max\{d(4,j): j \in V\}$

$= max\{2,1,1,0,1,2,2,3,4,4,5\} = 5$

$e(5) = max\{d(5,j): j \in V\}$

$= max\{3,2,21,0,1,1,2,3,3,4\} = 4$

$e(6) = max\{d(6,j): j \in V\}$

$= max\{3,3,2,2,1,0,1,1,2,2,3\} = 3$

$e(7) = max\{d(7,j): j \in V\}$

$= max\{4,3,3,2,1,1,0,1,2,2,3\} = 4$

$e(8) = max\{d(8,j): j \in V\}$

$= max\{5,4,4,3,2,1,1,0,1,1,2\} = 5$

$e(9) = max\{d(9,j): j \in V\}$

$= max\{6,5,5,4,3,2,2,1,0,1,1\} = 6$

$e(10) = max\{d(10,j): j \in V\}$

$= max\{6,5,5,4,3,2,2,1,1,0,1\} = 6$

$e(11) = max\{d(11,j): j \in V\}$

$= max\{7,6,6,5,4,3,3,2,1,1,0\} = 7$

$\therefore$ The diameter$(G) = max\{e(i): i \in V(G)\}$

$= max\{7,6,6,5,4,3,4,5,6,6,7\} = 7$

Therefore, $|NSDS| = 3$, $d = \frac{\ddot{D}}{n-1} = 0.29$ and $diam(G) = 7$

Thus, $diam(G) > |NSDS| > d$

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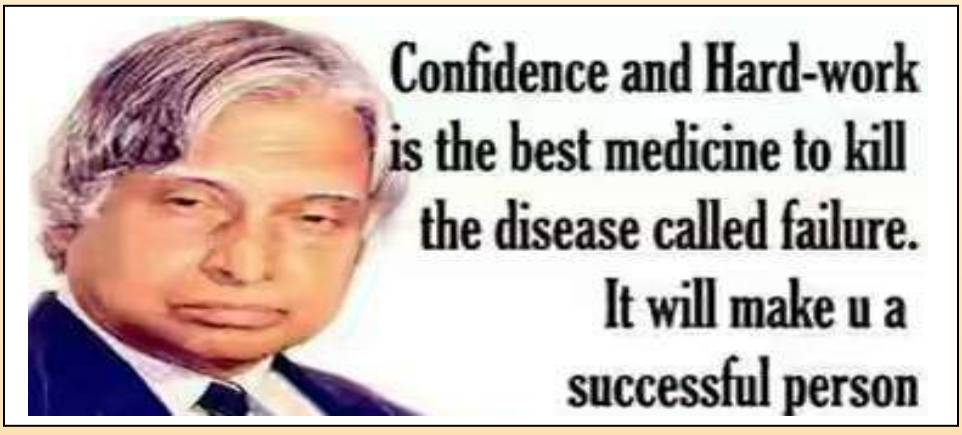
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SUM OF THE DEGREES OF AN INTERVAL GRAPH USING EUCLIDEAN DIVISION ALGORITHM

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Abstract: **A set $D \subseteq V$ is called dominating set, if every vertex in V\D is adjacent to some vertex in D. The domination number γ of G is the minimum cardinality of a dominating set and then D^C = V \ D is also a Dominating Set which is called Complementary Dominating set and γ^c be the complimentary domination number of G In this paper we tried to present the sum of the degrees of the elements in a Vertex Set of an Interval Graph corresponding to an Interval family I through its Dominating Set and Complementary Dominating set using an Euclidean division algorithm.**

Keywords: **Dominating set, Complement of a Dominating set, Interval family, Interval Graph, Euclidean division algorithm.**

I. INTRODUCTION

Dominating sets plays predominant role in theory of Graphs. In general the concept of dominating sets in the Graph theory finds wide application in different types of communication networks[2, 3, 5]. A serious study of domination graphs was first witnessed in the year1950 in the context of a problem in game of chess, where the placement of minimum number of queens on an n x n chess board in such a way as to cover or dominate each square. The researchers toiled for over a decade till 1960 to arrive at some serious comprehension and study of domination graphs[1, 6, 13]. Ore came out with the concepts of 'domination number' and 'dominating graph' for the first time in the year 1962. This study was further carried out by E.J.Cockayne and S.T.Hedetniemiin 1977, who have conducted a very broad survey on the resultant outcomes regarding the then existing concepts pertaining to the dominant graphs. The pair first applied the notation $\gamma(G)$ pertaining to the domination number of a graph, which was universally accepted ever since. This theory of domination in graphs as advocated by Ore and Berge is an un trodden ground for the researchers till very recently.

II. PRELIMINARIES

The number of edges incident with a vertex V is called degree of V and is denoted by d(v). Let G = (V, E) be a graph, a set $D \subseteq V$ is a dominating set of G if every vertex in V\D is adjacent to some vertex in D. The domination number $\gamma(G)$ of G is the minimum cardinality of a dominating set. A dominating set with minimum

cardinality among all the dominating sets of a graph G is said to be Minimum dominating set. If D is a Dominating set then D^c = V \ D = $\{x \in V / x \notin D\}$ is also a Dominating Set which is called Complementary Dominating set[10,11,13]. Let γ^C be the complementary domination number of D^C. According to the Euclidean division algorithm [7, 8 9] if we have two positive integers a and b, then there exists unique integers q and r which satisfies the condition a = bq + r where $0 \leq r < b$.

III. PREREQUISITE RESULTS

A. *Result*

Let I = $\{ I_1, I_2, I_3, I_4, \cdots\cdots\cdots, I_n \}$, $\forall n \geq 3$ be any finite interval family such that every interval I_i, i ≠ n intersect the next interval only and let G(V, E) be an interval graph corresponding to an interval family I. Suppose n = 3q + r, where r = 0, 1, 2 and q is any positive integer. If r = 0, then the Minimum dominating set $D = \{v_{3k-1} \ / \ 1 \leq k \leq q\}$ and the domination number $\gamma(G)$ = q, i.e., D = $\{v_2, v_5, v_8, \cdots\cdots\cdots, v_{n-4}, v_{n-1}\}$ and

$$\gamma(G) = \frac{n}{3}$$

B. *Result*

Let I = $\{ I_1, I_2, I_3, I_4, \cdots\cdots\cdots, I_n \}$, $\forall n \geq 3$ be any finite interval family such that every interval I_i, i ≠ n intersect the next interval only and let G(V, E) be an interval graph corresponding to an interval family I. Suppose n = 3q+r, where r = 0, 1, 2 and q is any positive integer. If r = 1, then the Minimum dominating set $D = \{v_{3k-1}, v_n / 1 \leq k \leq q\}$ and the domination number $\gamma(G)$ = q + 1, i.e., D = $\{v_2, v_5, v_8, \cdots\cdots\cdots, v_{n-2}, v_n\}$ and

$$\gamma(G) = \frac{n+2}{3}$$

C. *Result*

Let I = $\{ I_1, I_2, I_3, I_4, \cdots\cdots\cdots, I_n \}$, $\forall n \geq 3$ be any finite interval family such that every interval I_i, i ≠ n intersect the next interval only and let G(V, E) be an interval graph corresponding to an interval family I. Suppose n = 3q+r, where r = 0, 1, 2 and q is any positive integer. If r = 2, then the domination number $\gamma(G)$ = q+1 and it will arise two cases

Case(1): Minimum dominating set $D = \{v_{3k-1}, v_{n-1} / 1 \leq k \leq q\}$, i.e., D = $\{v_2, v_5, v_8, \ldots\ldots, v_{n-3}, v_{n-1}\}$ and

$$\gamma(G) = \frac{n+1}{3}$$

Case(2): Minimum dominating set $D=\{v_{3k-1}, v_n / 1\le k\le q\}$, i.e., D = $\{v_2, v_5, v_8, \ldots\ldots\ldots\ldots, v_{n-3}, v_n\}$ and $\gamma(G)=\frac{n+1}{3}$

D. Result

Let I = $\{I_1, I_2, I_3, I_4, \cdots\cdots\cdots, I_n\}$, $\forall n \ge 3$ be any finite interval family such that every interval I_i, i ≠ n intersect the next interval only and let G(V, E) be an interval graph corresponding to an interval family I if there is one-to-one correspondence between the vertex set V and interval family I where $V = \{v_1, v_2, v_3, \ldots\ldots\ldots, v_n\}$ then $d(v_1) = d(v_n) = 1$ and $d(v_2) = 2$ $d(v_3) = d(v_4) = d(v_5) =$ ××××××××= $d(v_{n-1}) = 2$.

E. Result

Let I = $\{I_1, I_2, I_3, I_4, \cdots\cdots\cdots, I_n\}$, $\forall n \ge 3$ be any finite interval family such that every interval I_i, i ≠ n intersect the next interval only and let G(V,E) be an interval graph corresponding to an interval family I. Suppose n = 3q+r, where r = 0, 1, 2 and q is any positive integer. If r = 0, then the Minimum dominating set $D=\{v_{3k-1} / 1\le k\le q\}$ and γ = q and then the following deductions are true. $(1)\sum_{v\in D} d(v) = 2q$ $(2)\sum_{v\in D} d(v) = 2\gamma$ $(3)\sum_{v\in D} d(v) = \frac{2n}{3}$ $(4)\sum_{v\in D^c} d(v) = 4q-2$ $(5)\sum_{v\in D^c} d(v) = 2\gamma^c - 2$ $(6)\sum_{v\in D^c} d(v) = \frac{4n-6}{3}$.

F. Result

Let I = $\{I_1, I_2, I_3, I_4, \cdots\cdots\cdots, I_n\}$, $\forall n \ge 3$ be any finite interval family such that every interval I_i, i ≠ n intersect the next interval only and let G(V,E) be an interval graph corresponding to an interval family I. Suppose n = 3q+r, where r = 0, 1, 2 and q is any positive integer. If r = 1, then the Minimum dominating set $D=\{v_{3k-1}, v_n / 1\le k\le q\}$ and γ = q + 1 and then the following deductions are true. $(1)\sum_{v\in D} d(v) = 2q+1$ $(2)\sum_{v\in D} d(v) = 2\gamma - 1$ $(3)\sum_{v\in D} d(v) = \frac{2n+1}{3}$ $(4)\sum_{v\in D^c} d(v) = 4q-1$ $(5)\sum_{v\in D^c} d(v) = 2\gamma^c - 1$ $(6)\sum_{v\in D^c} d(v) = \frac{4n-7}{3}$.

G. Result

Let I = $\{I_1, I_2, I_3, I_4, \cdots\cdots\cdots, I_n\}$, $\forall n \ge 3$ be any finite interval family such that every interval I_i, i ≠ n intersect the next interval only and let G(V,E) be an interval graph corresponding to an interval family I. Suppose n = 3q+r, where r = 0, 1, 2 and q is any positive integer. If r = 2 then two cases will arise.

Case (1): The Minimum dominating set $D=\{v_{3k-1}, v_{n-1} / 1 \le k \le q\}$ and γ = q + 1 and then the following deductions are true $(1)\sum_{v\in D} d(v)=2q+2$ $(2)\sum_{v\in D} d(v)=2\gamma-1$ $(3)\sum_{v\in D} d(v)=\frac{2n-1}{3}$ $(4)\sum_{v\in D^c} d(v)=4q$ $(5)\sum_{v\in D^c} d(v)=2\gamma^c-2$ $(6)\sum_{v\in D^c} d(v)=\frac{4n-8}{3}$.

Case (2): The Minimum dominating set $D=\{v_{3k-1}, v_n / 1 \le k \le q\}$ and γ = q + 1 and then the following deductions are true $(1)\sum_{v\in D} d(v)=2q+1$ $(2)\sum_{v\in D} d(v)=2\gamma-1$ $(3)\sum_{v\in D} d(v)=\frac{2n-1}{3}$ $(4)\sum_{v\in D^c} d(v)=4q+1$ $(5)\sum_{v\in D^c} d(v)=2\gamma^c-1$ $(6)\sum_{v\in D^c} d(v)=\frac{4n-5}{3}$.

IV. MAIN THEOREMS AND PRACTICAL PROBLEMS

A. *Theorem*

Let I = $\{ I_1, I_2, I_3, I_4, \cdots\cdots\cdots, I_n\}$, $\forall n \ge 3$ be any finite interval family such that every interval I_i, i ≠ n intersect the next interval only and let G(V, E) be an interval graph corresponding to an interval family I. Suppose n = 3q+r, where r = 0, 1, 2 and q is any positive integer. If r = 0, then the Minimum dominating set $D=\{v_{3k-1} / 1 \le k \le q\}$ and γ = q and then $\sum_{v\in V} d(v)=2n-2$

Proof:

Let I = $\{ I_1, I_2, I_3, I_4, \cdots\cdots\cdots, I_n\}$, $\forall n \ge 3$ be any finite interval family such that every interval I_i, i ≠ n intersect the next interval only and let G(V, E) be an interval graph corresponding to an interval family I if there is one-to-one correspondence between the vertex set V and interval family I where $V = \{v_1, v_2, v_3, \ldots\ldots\ldots, v_n\}$

By Euclidean division algorithm, n = 3q + r, where r = 0, 1, 2 and q is any positive integer where n is a number of vertices of an interval graph G(V,E).

Suppose r = 0 then we have $n = 3q + 0$

$$\Rightarrow n = 3q$$
$$\Rightarrow q = \frac{n}{3}$$

and the Minimum Dominating set $D=\{v_{3k-1} / 1 \le k \le q\}$ *and* $\gamma = q$

i.e., $D = \{v_2, v_5, v_8, ..., v_{3q-4}, v_{3q-1}\}$ *and* $\gamma = q$

i.e., $D = \{v_2, v_5, v_8, ..., v_{n-4}, v_{n-1}\}$ *and* $\gamma = q$

and then $D^c = \{v_1, v_3, v_4, v_6, ..., v_{n-2}, v_n\}$ *and* $\gamma^c = 2q$

Case (1): *The theorem will be prove through the quotient q of divisor 3*

We have $\sum_{v \in D} d(v) = 2q$ *and* $\sum_{v \in D^c} d(v) = 4q - 2$

Now $\sum_{v \in V} d(v) = \sum_{v \in D} d(v) + \sum_{v \in D^c} d(v) = 2q + 4q - 2 = 6q - 2 = 2(3q) - 2 = 2n - 2$

$\therefore \sum_{v \in V} d(v) = 2n - 2$

Case (2): *The theorem will be prove through the domination number*

We have $\sum_{v \in D} d(v) = 2\gamma$ *and* $\sum_{v \in D^c} d(v) = 2\gamma^c - 2$

Now (i) $\sum_{v \in V} d(v) = \sum_{v \in D} d(v) + \sum_{v \in D^c} d(v) = 2\gamma + 2\gamma^c - 2 = 2(\gamma + \gamma^c) - 2 = 2n - 2$

$\therefore \sum_{v \in V} d(v) = 2n - 2 \quad (\because \gamma + \gamma^c = n)$

Case (3): *The theorem will be prove through the number of vertices*

We have $\sum_{v \in D} d(v) = \frac{2n}{3}$ *and* $\sum_{v \in D^c} d(v) = \frac{4n-6}{3}$

Now (i) $\sum_{v \in V} d(v) = \sum_{v \in D} d(v) + \sum_{v \in D^c} d(v) = \frac{2n}{3} + \frac{4n-6}{3} = \frac{2n+4n-6}{3} = \frac{6n-6}{3} = 2n - 2$

$\therefore \sum_{v \in V} d(v) = 2n - 2$

Practical problem

Let I = $\{I_1, I_2, I_3, I_4, I_5, I_6\}$ be an interval family and let G(V, E) be an interval graph corresponding to an interval family I is as follows:

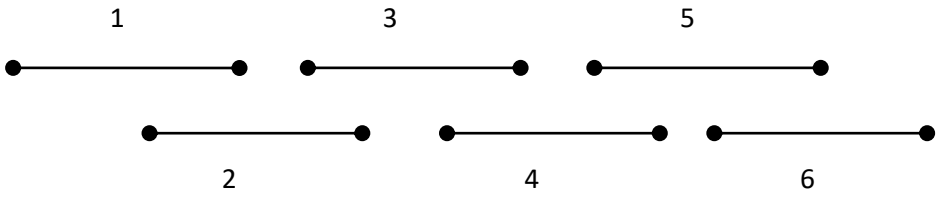


Fig.1 Interval Family

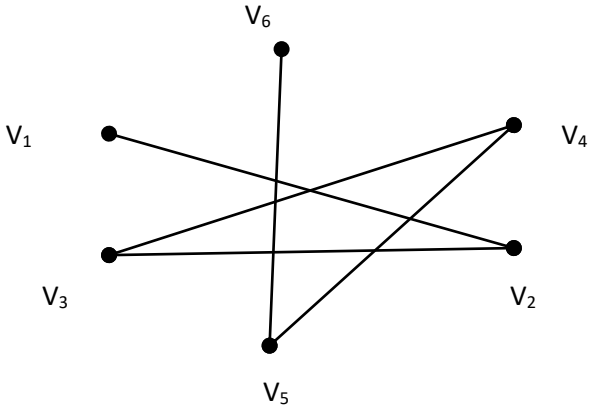


Fig.2 Interval Graph

Here $V=\{v_1,v_2,v_3,v_4,v_5,v_6\}$ *and* $n=|V|=6$

$d(v_1) = 1$, $d(v_2) = 2$, $d(v_3) = 2$, $d(v_4) = 2$, $d(v_5) = 2$, $d(v_6) = 1$

Now $\sum_{v\in V} d(v) = d(v_1)+d(v_2)+d(v_3)+d(v_4)+d(v_5)+d(v_6)=1+2+2+2+2+1=10$

$\therefore \sum_{v\in V} d(v)=10$ ……(1)

Here n = 6= 3 × 2 + 0

This is of the form n = 3q + r, where q = 2 and r = 0.

If r = 0, then Minimum dominating set $D=\{v_{3k-1}/1\le k\le q\}$ and $\gamma=q=2$.

$$D=\{v_{3k-1}/1\le k\le 2\}=\{v_2,v_5\} \text{ and } \gamma=2$$

$$D^c=\{v_1,v_3,v_4,v_6\} \text{ and } \gamma^c=4$$

Case (1): *The theorem will be proved through the quotient q of divisor 3*

We have $\sum_{v\in D} d(v) = 2q = 2(2) = 4$ *and* $\sum_{v\in D^c} d(v) = 4q-2 = 4(2)-2 = 8-2 = 6$

Now $\sum_{v\in V} d(v) = \sum_{v\in D} d(v) + \sum_{v\in D^c} d(v) = 4+6 = 10 \cdots\cdots\cdots\cdots (2)$

and $\sum_{v\in V} d(v) = 2n-2 = 2(6)-2 = 12-2 = 10 \cdots\cdots\cdots\cdots (3)$

From Equations (1), (2) and (3), $\sum_{v\in V} d(v) = 2n-2$

Hence the theorem is verified.

Case (2): *The theorem will be proved through the domination number*

We have $\sum_{v\in D} d(v) = 2\gamma = 2(2) = 4$ *and* $\sum_{v\in D^c} d(v) = 2\gamma^c - 2 = 2(4)-2 = 8-2 = 6$

Now $\sum_{v\in V} d(v) = \sum_{v\in D} d(v) + \sum_{v\in D^c} d(v) = 4+6 = 10 \cdots\cdots\cdots\cdots (4)$

From Equations (1), (3) and (4), $\sum_{v\in V} d(v) = 2n-2$

Hence the theorem is verified.

Case (3): *The theorem will be proved through the number of vertices*

We have $\sum_{v\in D} d(v) = \frac{2n}{3} = \frac{2\times 6}{3} = \frac{12}{3} = 4$

and $\sum_{v\in D^c} d(v) = \frac{4n-6}{3} = \frac{4\times 6-6}{3} = \frac{24-6}{3} = \frac{18}{3} = 6$

Now $\sum_{v\in V} d(v) = \sum_{v\in D} d(v) + \sum_{v\in D^c} d(v) = 4+6 = 10 \cdots\cdots\cdots\cdots (5)$

From Equations (1), (3) and (5), $\sum_{v\in V} d(v) = 2n-2$

Hence the theorem is verified.

B. Theorem

Let $I = \{ I_1, I_2, I_3, I_4, \cdots\cdots\cdots, I_n \}$, $\forall n \geq 3$ be any finite interval family such that every interval I_i, $i \neq n$ intersect the next interval only and let G(V,E) be an interval graph corresponding to an interval family I. Suppose n = 3q+r, where r = 0, 1, 2 and q is any positive integer. If r = 1, then the Minimum dominating set $D = \{V_{3k-1}, V_n / 1 \leq k \leq q\}$ and γ = q + 1 and then $\sum_{v\in V} d(v) = 2n-2$.

Proof:

Let I = $\{ I_1, I_2, I_3, I_4, \cdots\cdots\cdots, I_n \}$, $\forall n \geq 3$ be any finite interval family such that every interval I_i, i ≠ n intersect the next interval only and let G(V, E) be an interval graph corresponding to an interval family I if there is one-to-one correspondence between the vertex set V and interval family I where $V = \{v_1, v_2, v_3, \ldots\ldots\ldots, v_n\}$

By Euclidean division algorithm, n = 3q + r, where r = 0, 1, 2 and q is any positive integer where n is a number of vertices of an interval graph G(V,E).

Suppose r = 1 then we have $n = 3q+1 \Rightarrow n-1 = 3q \Rightarrow q = \frac{n-1}{3}$

and the Minimum Dominating set $D = \{v_{3k-1}, v_n / 1 \leq k \leq q\}$ *and* $\gamma = q+1$

i.e., $D = \{v_2, v_5, v_8, \ldots\ldots\ldots\ldots, v_{3q-1}, v_n\}$ *and* $\gamma = q+1$

i.e., $D = \{v_2, v_5, v_8, \ldots\ldots\ldots\ldots, v_{n-2}, v_n\}$ *and* $\gamma = q+1$

and then $D^c = \{v_1, v_3, v_4, v_6, \ldots\ldots\ldots\ldots, v_{n-3}, v_{n-1}\}$ *and* $g^c = 2q$

Case (1): *The theorem will be prove through the quotient q of divisor 3*

We have $\sum_{v \in D} d(v) = 2q+1$ *and* $\sum_{v \in D^c} d(v) = 4q-1$

Now $\sum_{v \in V} d(v) = \sum_{v \in D} d(v) + \sum_{v \in D^c} d(v) = 2q+1+4q-1 = 6q = 2(3q) = 2(n-1) = 2n-2$

$\therefore \sum_{v \in V} d(v) = 2n-2$

Case (2): *The theorem will be prove through the domination number*

We have $\sum_{v \in D} d(v) = 2\gamma - 1$ *and* $\sum_{v \in D^c} d(v) = 2\gamma^c - 1$

Now $\sum_{v \in V} d(v) = \sum_{v \in D} d(v) + \sum_{v \in D^c} d(v) = 2\gamma - 1 + 2\gamma^c - 1 = 2(\gamma + \gamma^c) - 2 = 2n-2 \quad (\because \gamma + \gamma^c = n)$

$\therefore \sum_{v \in V} d(v) = 2n-2$

Case (3): *The theorem will be prove through the number of vertices*

$$We\ have \sum_{v\in D} d(v) = \frac{2n+1}{3}\ and \sum_{v\in D^c} d(v) = \frac{4n-7}{3}$$

$$Now \sum_{v\in V} d(v) = \sum_{v\in D} d(v) + \sum_{v\in D^c} d(v) = \frac{2n+1}{3} + \frac{4n-7}{3} = \frac{2n+1+4n-7}{3} = \frac{6n-6}{3} = 2n-2$$

$$\therefore \sum_{v\in V} d(v) = 2n-2$$

Practical problem

Let I=$\{ I_1, I_2, I_3, I_4, I_5, I_6, I_7 \}$ be an interval family and let G(V, E) be an interval graph corresponding to an interval family I is as follows:

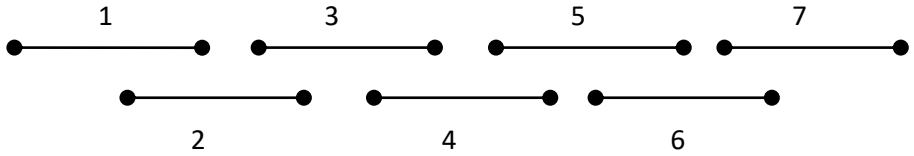


Fig.3 Interval Family

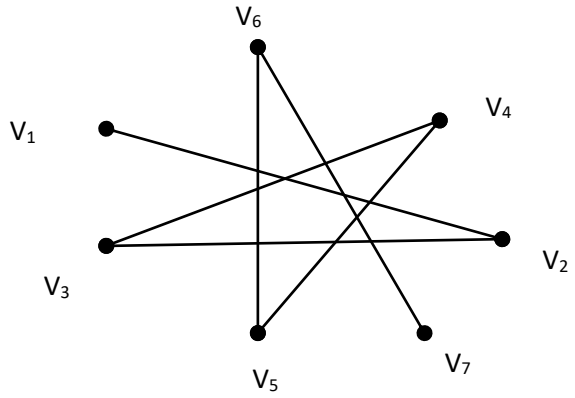


Fig.4 Interval Graph

Here $V = \{v_1, v_2, v_3, v_4, v_5, v_6, v_7\}\ and\ n = |V| = 7$

$d(v_1) = 1, d(v_2) = 2, d(v_3) = 2, d(v_4) = 2, d(v_5) = 2, d(v_6) = 2, d(v_7) = 1$

$$Now \sum_{v\in V} d(v) = d(v_1) + d(v_2) + d(v_3) + d(v_4) + d(v_5) + d(v_6) + d(v_7) = 1+2+2+2+2+2+1 = 12$$

$$\therefore \sum_{v\in V} d(v) = 12 \quad \cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots (1)$$

Here $n = 7 = 3 \times 2 + 1$

This is of the form n = 3q + r, where q = 2 and r = 1.

If r = 1, then Minimum dominating set $D=\{v_{3k-1}, v_n / 1 \le k \le q\}$ and $\gamma = q+1 = 2+1 = 3$.

$D=\{v_{3k-1}, v_n / 1 \le k \le 2\} = \{v_2, v_5, v_7\}$ *and* $\gamma = 3$

$D^c = \{v_1, v_3, v_4, v_6\}$ *and* $\gamma^c = 4$

Case (1): *The theorem will be proved through the quotient q of divisor 3*

We have $\sum_{v \in D} d(v) = 2q+1 = 2(2)+1 = 4+1 = 5$ *and* $\sum_{v \in D^c} d(v) = 4q-1 = 4(2)-1 = 8-1 = 7$

Now $\sum_{v \in V} d(v) = \sum_{v \in D} d(v) + \sum_{v \in D^c} d(v) = 5+7 = 12 \cdots\cdots\cdots\cdots (2)$

and $\sum_{v \in V} d(v) = 2n-2 = 2(7)-2 = 14-2 = 12 \cdots\cdots\cdots\cdots (3)$

From Equations (1), (2) and (3), $\sum_{v \in G} d(v) = 2n-2$

Hence the theorem is verified.

Case (2): *The theorem will be proved through the domination number*

We have $\sum_{v \in D} d(v) = 2\gamma - 1 = 2(3)-1 = 6-1 = 5$ *and* $\sum_{v \in D^c} d(v) = 2\gamma^c - 1 = 2(4)-1 = 8-1 = 7$

Now $\sum_{v \in V} d(v) = \sum_{v \in D} d(v) + \sum_{v \in D^c} d(v) = 5+7 = 12 \cdots\cdots\cdots\cdots (4)$

From Equations (1), (3) and (4), $\sum_{v \in V} d(v) = 2n-2$

Hence the theorem is verified.

Case (3): *The theorem will be proved through the number of vertices*

We have $\sum_{v \in D} d(v) = \frac{2n+1}{3} = \frac{2\times 7+1}{3} = \frac{15}{3} = 5$ *and* $\sum_{v \in D^c} d(v) = \frac{4n-7}{3} = \frac{4\times 7-7}{3} = \frac{28-7}{3} = \frac{21}{3} = 7$

Now $\sum_{v \in V} d(v) = \sum_{v \in D} d(v) + \sum_{v \in D^c} d(v) = 5+7 = 12 \cdots\cdots\cdots\cdots (5)$

From Equations (1), (3) and (5), $\sum_{v \in V} d(v) = 2n-2$

Hence the theorem is verified.

C. Theorem

Let I = $\{ I_1, I_2, I_3, I_4, \ldots\ldots\ldots, I_n \}$, $\forall n \geq 3$ be any finite interval family such that every interval I_i, i ≠ n intersect the next interval only and let G(V,E) be an interval graph corresponding to an interval family I. Suppose n = 3q+r, where r = 0, 1, 2 and q is any positive integer. If r = 2 then two cases will arise.

Case (1): The Minimum dominating set $D = \{V_{3k-1}, V_{n-1} / 1 \leq k \leq q\}$ and γ = q + 1 and then $\sum_{v \in V} d(v) = 2n-2$

Case (2): The Minimum dominating set $D = \{V_{3k-1}, V_n / 1 \leq k \leq q\}$ and γ = q + 1 and then $\sum_{v \in V} d(v) = 2n-2$

Proof:

Let I = $\{ I_1, I_2, I_3, I_4, \ldots\ldots\ldots, I_n \}$, $\forall n \geq 3$ be any finite interval family such that every interval I_i, i ≠ n intersect the next interval only and let G(V, E) be an interval graph corresponding to an interval family I if there is one-to-one correspondence between the vertex set V and interval family I where $V = \{v_1, v_2, v_3, \ldots\ldots\ldots, v_n\}$

By Euclidean division algorithm, n = 3q + r, where r = 0, 1, 2 and q is any positive integer where n is a number of vertices of an interval graph G(V,E).

Suppose r = 2 then we have $n = 3q+2 \Rightarrow n-2 = 3q \Rightarrow q = \frac{n-2}{3}$ and then two cases will arise

Case(1) The Minimum Dominating set $D = \{v_{3k-1}, v_{n-1} / 1 \leq k \leq q\}$ *and* $\gamma = q+1$

i.e., $D = \{v_2, v_5, v_8, \ldots\ldots\ldots\ldots, v_{3q-1}, v_{n-1}\}$ *and* $\gamma = q+1$

i.e., $D = \{v_2, v_5, v_8, \ldots\ldots\ldots\ldots, v_{n-3}, v_{n-1}\}$ *and* $\gamma = q+1$

and then $D^c = \{v_1, v_3, v_4, v_6, \ldots\ldots\ldots\ldots, v_{n-2}, v_n\}$ *and* $g^c = 2q+1$

Sub case (1): *The theorem will be prove through the quotient q of divisor 3*

We have $\sum_{v \in D} d(v) = 2q+2$ *and* $\sum_{v \in D^c} d(v) = 4q$

Now $\sum_{v \in V} d(v) = \sum_{v \in D} d(v) + \sum_{v \in D^c} d(v) = 2q+2+4q = 6q+2 = 2(3q)+2 = 2(n-2)+2 = 2n-4+2 = 2n-2$

$\therefore \sum_{v \in V} d(v) = 2n-2$

Sub case (2): *The theorem will be prove through the domination number*

We have $\sum_{v\in D} d(v) = 2\gamma$ *and* $\sum_{v\in D^c} d(v) = 2\gamma^c - 2$

Now $\sum_{v\in V} d(v) = \sum_{v\in D} d(v) + \sum_{v\in D^c} d(v) = 2\gamma + 2\gamma^c - 2 = 2(\gamma + \gamma^c) - 2 = 2n - 2 \quad \left(\because \gamma + \gamma^c = n\right)$

$\therefore \sum_{v\in V} d(v) = 2n - 2$

Sub case (3): *The theorem will be prove through the number of vertices*

We have $\sum_{v\in D} d(v) = \frac{2n+2}{3}$ *and* $\sum_{v\in D^c} d(v) = \frac{4n-8}{3}$

Now $\sum_{v\in V} d(v) = \sum_{v\in D} d(v) + \sum_{v\in D^c} d(v) = \frac{2n+2}{3} + \frac{4n-8}{3} = \frac{2n+2+4n-8}{3} = \frac{6n-6}{3} = 2n-2$

$\therefore \sum_{v\in V} d(v) = 2n - 2$

Case (2): The Minimum Dominating set $D = \{v_{3k-1}, v_n / 1 \le k \le q\}$ *and* $\gamma = q+1$

i.e., $D = \{v_2, v_5, v_8, ..., v_{3q-1}, v_n\}$ *and* $\gamma = q+1$

i.e., $D = \{v_2, v_5, v_8, ..., v_{n-3}, v_n\}$ *and* $\gamma = q+1$

and then $D^c = \{v_1, v_3, v_4, v_6, ..., v_{n-2}, v_{n-1}\}$ *and* $g^c = 2q + 1$

Sub case (1): *The theorem will be prove through the quotient q of divisor 3*

We have $\sum_{v\in D} d(v) = 2q+1$

and $\sum_{v\in D^c} d(v) = 4q+1$

Now $\sum_{v\in V} d(v) = \sum_{v\in D} d(v) + \sum_{v\in D^c} d(v) = 2q+1+4q+1 = 6q+2 = 2(3q)+2 = 2(n-2)+2 = 2n-4+2 = 2n-2$

$\therefore \sum_{v\in V} d(v) = 2n - 2$

Sub case (2): The theorem will be prove through the domination number

$$We\ have \sum_{v\in D} d(v) = 2\gamma - 1 \ and \ \sum_{v\in D^c} d(v) = 2\gamma^c - 1$$

$$Now \sum_{v\in V} d(v) = \sum_{v\in D} d(v) + \sum_{v\in D^c} d(v) = 2\gamma - 1 + 2\gamma^c - 1 = 2(\gamma + \gamma^c) - 2 = 2n - 2 \qquad \left(\because \gamma + \gamma^c = n\right)$$

$$\therefore \sum_{v\in V} d(v) = 2n - 2$$

Sub case (3): The theorem will be prove through the number of vertices

$$We\ have \sum_{v\in D} d(v) = \frac{2n-1}{3} \ and \ \sum_{v\in D^c} d(v) = \frac{4n-5}{3}$$

$$Now \sum_{v\in V} d(v) = \sum_{v\in D} d(v) + \sum_{v\in D^c} d(v) = \frac{2n-1}{3} + \frac{4n-5}{3} = \frac{2n-1+4n-5}{3} = \frac{6n-6}{3} = 2n - 2$$

$$\therefore \sum_{v\in V} d(v) = 2n - 2.$$

Practical problem

Let I= $\{ I_1, I_2, I_3, I_4, I_5, I_6, I_7, I_8 \}$ be an interval family and let G(V, E) be an interval graph corresponding to an interval family I is as follows:

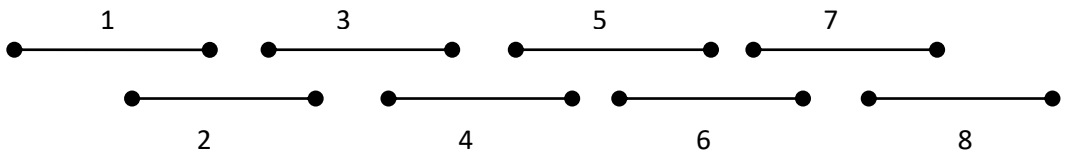


Fig.5 Interval Family

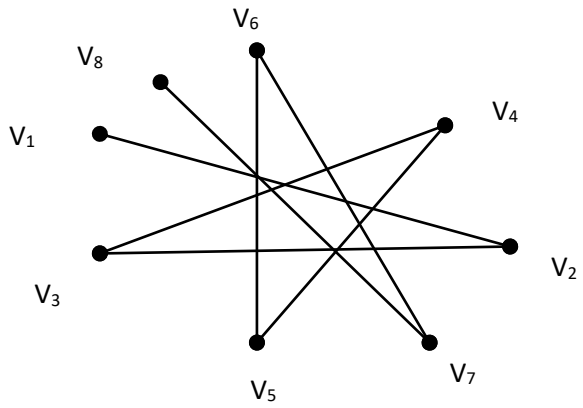


Fig.6 Interval Graph

Here $V=\{v_1,v_2,v_3,v_4,v_5,v_6,v_7,v_8\}$ *and* $n=|V|=8$

$d(v_1) = 1$, $d(v_2) = 2$, $d(v_3) = 2$, $d(v_4) = 2$, $d(v_5) = 2$, $d(v_6) = 2$, $d(v_7) = 2$, $d(v_8) = 1$

$$\text{Now } \sum_{v\in V} d(v) = d(v_1)+d(v_2)+d(v_3)+d(v_4)+d(v_5)+d(v_6)+d(v_7)+d(v_8)$$
$$=1+2+2+2+2+2+2+1$$
$$=14$$
$$\therefore \sum_{v\in V} d(v)=14 \quad \cdots\cdots\cdots\cdots\cdots\cdots\cdots (1)$$

Here $n = 8= 3 \times 2 + 2$

This is of the form $n = 3q + r$, where $q = 2$ and $r = 2$.

If $r = 2$ then two cases will arise

Case (1): The Minimum Dominating set $D=\{v_{3k-1}, v_{n-1}/1\le k\le q\}$ *and* $\gamma = q+1 = 2+1 = 3$

$D=\{v_{3k-1}, v_{n-1}/1\le k\le 2\}=\{v_2,v_5,v_7\}$ *and* $\gamma = 3$

$D^c=\{v_1,v_3,v_4,v_6,v_8\}$ *and* $\gamma^c = 5$

Sub Case (1): *The theorem will be proved through the quotient q of divisor 3*

$$\text{We have } \sum_{v\in D} d(v) = 2q+2 = 2(2)+2 = 4+2 = 6$$
$$\text{and } \sum_{v\in D^c} d(v) = 4q = 4(2) = 8 = 8$$

$$\text{Now } \sum_{v\in V} d(v) = \sum_{v\in D} d(v) + \sum_{v\in D^c} d(v) = 6+8 = 14 \cdots\cdots\cdots\cdots (2)$$
$$\text{and } \sum_{v\in V} d(v) = 2n-2 = 2(8)-2 = 16-2 = 14 \cdots\cdots\cdots\cdots (3)$$

From Equations (1), (2) and (3), $\sum_{v\in V} d(v) = 2n-2$

Hence the theorem is verified.

Sub Case (2): *The theorem will be proved through the domination number*

$$\text{We have } \sum_{v\in D} d(v) = 2\gamma = 2(3) = 6 \text{ and } \sum_{v\in D^c} d(v) = 2\gamma^c - 2 = 2(5)-2 = 10-2 = 8$$

$$\text{Now } \sum_{v\in V} d(v) = \sum_{v\in D} d(v) + \sum_{v\in D^c} d(v) = 6+8 = 14 \cdots\cdots\cdots\cdots (4)$$

From Equations (1), (3) and (4), $\sum_{v\in V} d(v) = 2n-2$

Hence the theorem is verified.

Sub Case (3): *The theorem will be proved through the number of vertices*

We have $\sum_{v\in D} d(v) = \frac{2n+2}{3} = \frac{2\times 8+2}{3} = \frac{18}{3} = 6$

and $\sum_{v\in D^c} d(v) = \frac{4n-8}{3} = \frac{4\times 8-8}{3} = \frac{32-8}{3} = \frac{34}{3} = 8$

Now $\sum_{v\in V} d(v) = \sum_{v\in D} d(v) + \sum_{v\in D^c} d(v) = 6+8 = 14 \cdots\cdots\cdots\cdots (5)$

From Equations (1), (3) and (5), $\sum_{v\in V} d(v) = 2n-2$

Hence the theorem is verified.

Case (2): The Minimum Dominating set $D = \{v_{3k-1}, v_n / 1 \le k \le q\}$ *and* $\gamma = q+1 = 2+1 = 3$

$D = \{v_{3k-1}, v_n / 1 \le k \le 2\} = \{v_2, v_5, v_8\}$ *and* $\gamma = 3$

$D^c = \{v_1, v_3, v_4, v_6, v_7\}$ *and* $\gamma^c = 5$

Sub Case (1): *The theorem will be proved through the quotient q of divisor 3*

We have $\sum_{v\in D} d(v) = 2q+1 = 2(2)+1 = 4+1 = 5$

and $\sum_{v\in D^c} d(v) = 4q+1 = 4(2)+1 = 8+1 = 9$

Now $\sum_{v\in V} d(v) = \sum_{v\in D} d(v) + \sum_{v\in D^c} d(v) = 5+9 = 14 \cdots\cdots\cdots\cdots (6)$

From Equations (1), (3) and (6), $\sum_{v\in V} d(v) = 2n-2$

Hence the theorem is verified.

Sub Case (2): *The theorem will be proved through the domination number*

We have $\sum_{v\in D} d(v) = 2\gamma - 1 = 2(3) - 1 = 6 - 1 = 5$

and $\sum_{v\in D^c} d(v) = 2\gamma^c - 1 = 2(5) - 1 = 10 - 1 = 9$

$$Now \sum_{v\in V} d(v) = \sum_{v\in D} d(v) + \sum_{v\in D^c} d(v) = 5+9 = 14 \cdots\cdots\cdots\cdots (7)$$

From Equations (1), (3) and (7), $\sum_{v\in V} d(v) = 2n-2$

Hence the theorem is verified.

Sub Case (3): *The theorem will be proved through the number of vertices*

$$We\ have \sum_{v\in D} d(v) = \frac{2n-1}{3} = \frac{2\times 8-1}{3} = \frac{15}{3} = 5$$

$$and \sum_{v\in D^c} d(v) = \frac{4n-5}{3} = \frac{4\times 8-5}{3} = \frac{32-5}{3} = \frac{27}{3} = 9$$

$$Now \sum_{v\in V} d(v) = \sum_{v\in D} d(v) + \sum_{v\in D^c} d(v) = 5+9 = 14 \cdots\cdots\cdots\cdots (8)$$

From Equations (1), (3) and (8), $\sum_{v\in V} d(v) = 2n-2$

Hence the theorem is verified.

V. CONCLUSION

Graphs play a pivotal role and remain more important in their applications than we imagine. Their presence is ubiquitous in natural as well as the man-made models and structures. Graph theory is a fast developing area in mathematics with a wide range of applications including computer science. In this paper, we derived a relation to sum of degrees of the elements in a Vertex Set of an Interval Graph.

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COMPLEMENTARY DOMINATING SET OF AN INTERVAL GRAPH USING EULIDEAN DIVISION ALGORITHM

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Abstract: **If D is a Dominating set then $D^C = V \setminus D = \{x \in V / x \notin D\}$ is a Complement of a Dominating set. In this paper we concentrated on the Complement of a Dominating set of the Interval Graph and tried to present the some relations to sum of the degrees of the elements in a Complement of a Dominating set with the quotient of an Euclidean division algorithm of divisor 3, complementary domination number, the number of vertices of an Interval Graph corresponding to an Interval family I.**

Keywords: **Dominating set, Complement of a Dominating set, Interval family, Interval Graph, Euclidean division algorithm.**

I. INTRODUCTION

Domination[1] in graphs has applications to several fields. Domination arises in facility location problems, where the number of facilities is fixed and one attempts to minimize the distance that a person needs to travel to get to the closest facility. A similar problem occurs when the maximum distance to a facility is fixed and one attempts to minimize the number of facilities necessary so that everyone is serviced. Concepts from domination also appear in problems involving finding sets of representatives, in monitoring communication or electrical networks[9], and in land surveying. All graphs considered in this Paper are finite, undirected, with no loop or multi edge. A graph is said to be a simple graph if it has no loops and no parallel edges. A graph is said to be connected if there is a path between every pair of vertices, otherwise it is said to be disconnected graph.

II. PRELIMINARIES

Let G = (V, E) be a graph, a set $D \subseteq V$ is a dominating set{1] of G if every vertex in V\D is adjacent to some vertex in D. The domination number $\gamma(G)$ of G is the minimum cardinality of a dominating set. The number of edges incident with a vertex V is called degree of V and is denoted by d(v). If d(v) = 1 then the vertex v is said to be a pendent vertex. If d(v) = 0 then the vertex v is said to be an isolated vertex. A dominating set D of a graph G is a non - split dominating set[6] if the vertex induced sub graph < V – D > is connected. A dominating set D of a graph G is called a split dominating set if the vertex induced sub graph < V – D > is disconnected. If D is a set, then the absolute compliment of D (or simply the compliment of D) is the set of elements not in D. In other words, if V is

the universe that contains all the vertices in a graph G that is $D^C = V \setminus D = \{x \in V / x \notin D\}$.The absolute compliment of D is usually denoted by D^C which is also called Complementary Dominating set[4][10][11] . Let γ be the domination number of D and γ^C be the complementary domination number[10][11] of D^C . According to the Euclidean division algorithm[7] if we have two positive integers a and b, then there exists unique integers q and r which satisfies the condition a = bq + r where $0 \le r < b$.

III. PREREQUISITE RESULTS

A. Result

Let $I = \{ I_1, I_2, I_3, I_4, \cdots\cdots\cdots, I_n \}$, $\forall n \ge 3$ be any finite interval family such that every interval I_i, $i \neq n$ intersect the next interval only and let G(V, E) be an interval graph corresponding to an interval family I Suppose n = 3q + r, where r = 0, 1, 2 and q is any positive integer. If r = 0, then the Minimum dominating set $D = \{v_{3k-1} \ / \ 1 \le k \le q\}$ and the domination number $\gamma(G)$ = q i.e., D = $\{v_2, v_5, v_8, \cdots\cdots\cdots, v_{n-4}, v_{n-1}\}$ and $\gamma(G) = \frac{n}{3}$

B. Result

Let $I = \{ I_1, I_2, I_3, I_4, \cdots\cdots\cdots, I_n \}$, $\forall n \ge 3$ be any finite interval family such that every interval I_i, $i \neq n$ intersect the next interval only and let G(V, E) be an interval graph corresponding to an interval family I Suppose n = 3q+r, where r = 0, 1, 2 and q is any positive integer. If r = 1, then the Minimum dominating set $D = \{v_{3k-1}, v_n / 1 \le k \le q\}$ and the domination number $\gamma(G)$ = q + 1 i.e., D = $\{v_2, v_5, v_8, \cdots\cdots\cdots, v_{n-2}, v_n\}$ and $\gamma(G) = \frac{n+2}{3}$

C. Result

Let $I = \{ I_1, I_2, I_3, I_4, \cdots\cdots\cdots, I_n \}$, $\forall n \ge 3$ be any finite interval family such that every interval I_i, $i \neq n$ intersect the next interval only and let G(V, E) be an interval graph corresponding to an interval family I Suppose n = 3q+r, where r = 0, 1, 2 and q is any positive integer. If r = 2, then the domination number $\gamma(G)$ = q+1 and it will arise two cases

Case(1): Minimum dominating set $D = \{v_{3k-1}, v_{n-1} / 1 \le k \le q\}$ i.e., D = $\{v_2, v_5, v_8, \ldots\ldots\ldots, v_{n-3}, v_{n-1}\}$ and $\gamma(G) = \frac{n+1}{3}$

Case(2): Minimum dominating set $D=\{v_{3k-1}, v_n / 1\le k\le q\}$ i.e., D = $\{v_2, v_5, v_8, \ldots\ldots\ldots\ldots, v_{n-3}, v_n\}$ and $\gamma(G)=\frac{n+1}{3}$

D. Result

Let I = $\{I_1, I_2, I_3, I_4, \cdots\cdots\cdots, I_n\}$, $\forall n \ge 3$ be any finite interval family such that every interval I_i, i ≠ n intersect the next interval only and let G(V, E) be an interval graph corresponding to an interval family I if there is one-to-one correspondence between the vertex set V and interval family I where $V = \{v_1, v_2, v_3, \ldots\ldots\ldots, v_n\}$ then $d(v_1) = d(v_n) = 1$ and $d(v_2) = 2$ $d(v_3) = d(v_4) = d(v_5) =$ ××××××××= $d(v_{n-1}) = 2$.

E. Result

Let I = $\{I_1, I_2, I_3, I_4, \cdots\cdots\cdots, I_n\}$, $\forall n \ge 3$ be any finite interval family such that every interval I_i, i ≠ n intersect the next interval only and let G(V,E) be an interval graph corresponding to an interval family I. Suppose n = 3q+r, where r = 0, 1, 2 and q is any positive integer. If r = 0, then the Minimum dominating set $D=\{v_{3k-1} / 1\le k\le q\}$ and γ = q and then the following deductions are true. $(1)\sum_{v\in D} d(v) = 2q$ $(2)\sum_{v\in D} d(v) = 2\gamma$ $(3)\sum_{v\in D} d(v) = \frac{2n}{3}$.

F. Result

Let I = $\{I_1, I_2, I_3, I_4, \cdots\cdots\cdots, I_n\}$, $\forall n \ge 3$ be any finite interval family such that every interval I_i, i ≠ n intersect the next interval only and let G(V,E) be an interval graph corresponding to an interval family I. Suppose n = 3q+r, where r = 0, 1, 2 and q is any positive integer. If r = 1, then the Minimum dominating set $D=\{v_{3k-1}, v_n / 1\le k\le q\}$ and γ = q + 1 and then the following deductions are true. $(1)\sum_{v\in D} d(v) = 2q+1$ $(2)\sum_{v\in D} d(v) = 2\gamma-1$ $(3)\sum_{v\in D} d(v) = \frac{2n+1}{3}$.

G. Result

Let I = $\{I_1, I_2, I_3, I_4, \cdots\cdots\cdots, I_n\}$, $\forall n \ge 3$ be any finite interval family such that every interval I_i, i ≠ n intersect the next interval only and let G(V,E) be an interval graph corresponding to an interval family I. Suppose n = 3q+r, where r = 0, 1, 2 and q is any positive integer. If r = 2 then two cases will arise.

Case (1): The Minimum dominating set $D=\{v_{3k-1}, v_{n-1} / 1\le k\le q\}$ and γ = q + 1 and then the following deductions are true $(1)\sum_{v\in D} d(v) = 2q+2$ $(2)\sum_{v\in D} d(v) = 2\gamma-1$ $(3)\sum_{v\in D} d(v) = \frac{2n-1}{3}$.

Case (2): The Minimum dominating set $D=\{v_{3k-1}, v_n / 1\le k\le q\}$ and γ = q + 1 and then the following deductions are true $(1)\sum_{v\in D} d(v)=2q+1$ $(2)\sum_{v\in D} d(v)=2\gamma-1$ $(3)\sum_{v\in D} d(v)=\frac{2n-1}{3}$.

IV. MAIN THEOREMS AND PRACTICAL PROBLEMS

A. *Theorem*

Let I = $\{I_1, I_2, I_3, I_4, \cdots\cdots\cdots, I_n\}$, $\forall n\ge 3$ be any finite interval family such that every interval I_i, i ≠ n intersect the next interval only and let G(V, E) be an interval graph corresponding to an interval family I. Suppose n = 3q+r, where r = 0, 1, 2 and q is any positive integer. If r = 0, then the Minimum dominating set $D=\{v_{3k-1} / 1\le k\le q\}$ and γ = q and then the following deductions are true. $(1)\sum_{v\in D^c} d(v)=4q-2$

$(2)\sum_{v\in D^c} d(v)=2\gamma^c-2$ $(3)\sum_{v\in D^c} d(v)=\frac{4n-6}{3}$.

Proof:

Let I = $\{I_1, I_2, I_3, I_4, \cdots\cdots\cdots, I_n\}$, $\forall n\ge 3$ be any finite interval family such that every interval I_i, i ≠ n intersect the next interval only and let G(V, E) be an interval graph corresponding to an interval family I if there is one-to-one correspondence between the vertex set V and interval family I where $V = \{v_1, v_2, v_3, \ldots\ldots\ldots, v_n\}$

By Euclidean division algorithm, n = 3q + r, where r = 0, 1, 2 and q is any positive integer where n is a number of vertices of an interval graph G(V,E).

Suppose r = 0 then we have $n=3q+0 \Rightarrow n=3q \Rightarrow q=\frac{n}{3}$

And we have the Minimum Dominating set $D=\{v_{3k-1} / 1\le k\le q\}$ *and* $\gamma = q$

$D = \{v_2, v_5, v_8, \ldots\ldots\ldots\ldots, v_{3q-4}, v_{3q-1}\}$ *and* $g = q = \frac{n}{3}$

$D = \{v_2, v_5, v_8, \ldots\ldots\ldots\ldots, v_{n-4}, v_{n-1}\}$ *and* $g = \frac{n}{3}$

and then $D^c = \{v_1, v_3, v_4, v_6, \ldots\ldots\ldots\ldots, v_{n-2}, v_n\}$

and we have $g^c = n - g = 3q - q = 2q$

$\therefore g^c = |D^c| = 2q$

$\therefore q = \frac{g^c}{2}$

Now (1) $\sum_{v\in D^c} d(v) = d(v_1) + d(v_3) + d(v_4) + d(v_6) + \ldots\ldots\ldots + d(v_{n-2}) + d(v_n)$

$= 1+ 2 + 2 + 2 + \ + 2+1$

$= (2+ 2 + 2 + 2 + \ + 2+2) -2$

$= 2 (1 + 1 + 1 +1+ \ + 1+1) - 2$

$= 2 (2q) - 2 \qquad (\text{since } |D^c| = 2q)$

$= 4q - 2$

$\therefore \sum_{v\in D^c} d(v) = 4q - 2$

(2) $\sum_{v\in D^c} d(v) = 4q - 2 = 4(\frac{\gamma^C}{2}) - 2 = 2\gamma^C - 2 \qquad (\because q = \frac{\gamma^c}{2})$

$\therefore \sum_{v\in D^c} d(v) = 2\gamma^c - 2$

(3) $\sum_{v\in D^c} d(v) = 4q - 2 = 4\left(\frac{n}{3}\right) - 2 = \frac{4n}{3} - 2 = \frac{4n-6}{3}$

$\therefore \sum_{v\in D^c} d(v) = \frac{4n-6}{3}$

Practical problem

Let I = $\{ I_1, I_2, I_3, I_4, I_5, I_6, I_7, I_8, I_9 \}$ be an interval family and let G(V, E) be an interval graph corresponding to an interval family I is as follows.

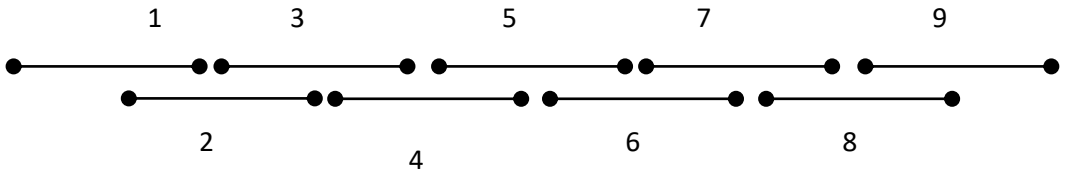


Fig.1 INTERVAL FAMILY

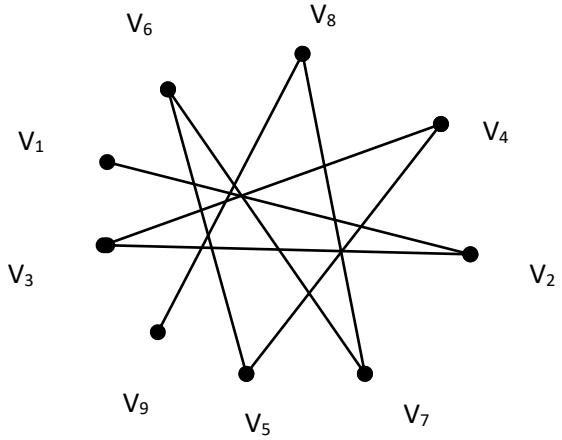


Fig.2 I NTERVL GRAPH

Here $V=\{v_1,v_2,v_3,v_4,v_5,v_6,v_7,v_8,v_9\}$ *and* $n=|V|=9$

$d(v_1) = 1$, $d(v_2) = 2$, $d(v_3) = 2$, $d(v_4) = 2$, $d(v_5) = 2$, $d(v_6) = 2$, $d(v_7) = 2$, $d(v_8) = 2$, $d(v_9) = 1$

Here $n = 9 = 3 \times 3 + 0$

This is of the form $n = 3q + r$, where $q = 3$ and $r = 0$.

If r = 0, then Minimum dominating set $D=\{v_{3k-1}/1\le k\le q\}$ and $\gamma=q=3$

$D=\{v_{3k-1}/1\le k\le 3\}$

$D=\{v_2,v_5,v_8\}$ *and* $\gamma=3$

$D^c=\{v_1,v_3,v_4,v_6,v_7,v_9\}$ *and* $\gamma^c=6$

$$Now \sum_{v\in D^c} d(v)=d(v_1)+d(v_3)+d(v_4)+d(v_6)+d(v_7)+d(v_9)=1+2+2+2+2+1=10$$
$$\therefore \sum_{v\in D^c} d(v)=10$$

$$(1)\ \sum_{v\in D^c} d(v)=4q-2=4(3)-2=12-2=10$$
$$\therefore \sum_{v\in D^c} d(v)=10$$

$$(2)\ \sum_{v\in D^c} d(v)=2\gamma^c-2=2(6)-2=12-2=10$$
$$\therefore \sum_{v\in D^c} d(v)=10$$

$$(3)\ \sum_{v\in D^c} d(v)=\frac{4n-6}{3}=\frac{4(9)-6}{3}=\frac{36-6}{3}=\frac{30}{3}=10$$
$$\therefore \sum_{v\in D^c} d(v)=10$$

Hence theorem is verified.

B. Theorem

Let $I=\{I_1,I_2,I_3,I_4,\cdots\cdots\cdots,I_n\}$, $\forall n\ge 3$ be any finite interval family such that every interval I_i, $i\ne n$ intersect the next interval only and let G(V,E) be an interval graph corresponding to an interval family I. Suppose n = 3q+r, where r = 0, 1, 2 and q is any positive integer. If r = 1, then the Minimum dominating set $D=\{V_{3k-1}, V_n/1\le k\le q\}$

and γ = q + 1 and then the following deductions are true. $(1)\sum_{v\in D^c} d(v) = 4q-1$ $(2)\sum_{v\in D^c} d(v) = 2\gamma^c - 1$

$(3)\sum_{v\in D^c} d(v) = \frac{4n-7}{3}$.

Proof:

Let I = $\{ I_1, I_2, I_3, I_4, \cdots\cdots\cdots, I_n \}$, $\forall n \geq 3$ be any finite interval family such that every interval I_i, i ≠ n intersect the next interval only and let G(V, E) be an interval graph corresponding to an interval family I if there is one-to-one correspondence between the vertex set V and interval family I where $V = \{v_1, v_2, v_3, \ldots\ldots\ldots, v_n\}$

By Euclidean division algorithm, n = 3q + r, where r = 0, 1, 2 and q is any positive integer where n is a number of vertices of an interval graph G(V,E).

Suppose r = 1 then we have $n = 3q+1 \Rightarrow n-1 = 3q \Rightarrow q = \frac{n-1}{3}$

and we have the Minimum Dominating set $D = \{v_{3k-1}, v_n / 1 \leq k \leq q\}$ *and* $\gamma = q+1$

i.e., $D = \{v_2, v_5, v_8, \ldots\ldots\ldots\ldots, v_{3q-1}, v_n\}$ *and* $\gamma = q+1 = \frac{n-1}{3}+1 = \frac{n+2}{3}$

i.e., $D = \{v_2, v_5, v_8, \ldots\ldots\ldots\ldots, v_{n-2}, v_n\}$ *and* $\gamma = \frac{n+2}{3}$

and then $D^c = \{v_1, v_3, v_4, v_6, \ldots\ldots\ldots\ldots, v_{n-3}, v_{n-1}\}$

and we have $\gamma^c = n - \gamma = 3q+1-(q+1) = 2q$

$\therefore \gamma^c = |D^c| = 2q$

$\therefore q = \frac{\gamma^c}{2}$

Now (1) $\sum_{v\in D^c} d(v) = d(v_1) + d(v_3) + d(v_4) + d(v_6) + \ldots\ldots\ldots\ldots + d(v_{n-3}) + d(v_{n-1})$

= 1+ 2 + 2 + 2 + + 2+2

= (2+ 2 + 2 + 2 + + 2+2) - 1

= 2 (1 + 1 + 1 +1+ + 1+1) - 1

= 2 (2q) - 1 $\left(\text{since } |D^c| = 2q\right)$

= 4q - 1

$\therefore \sum_{v\in D^c} d(v) = 4q-1$

$$(2)\ \sum_{v\in D^c} d(v) = 4q-1 = 4\left(\frac{\gamma^C}{2}\right)-1 = 2\gamma^C - 1 \quad (\because q = \frac{\gamma^c}{2})$$

$$\therefore \sum_{v\in D^c} d(v) = 2\gamma^c - 1$$

$$(3)\ \sum_{v\in D^c} d(v) = 4q-1 = 4\left(\frac{n-1}{3}\right)-1 = \frac{4n-4}{3}-1 = \frac{4n-7}{3}$$

$$\therefore \sum_{v\in D^c} d(v) = \frac{4n-7}{3}$$

Practical problem

Let I = $\{ I_1, I_2, I_3, I_4, I_5, I_6, I_7, I_8, I_9, I_{10}\}$ be an interval family and let G(V, E) be an interval graph corresponding to an interval family I is as follows.

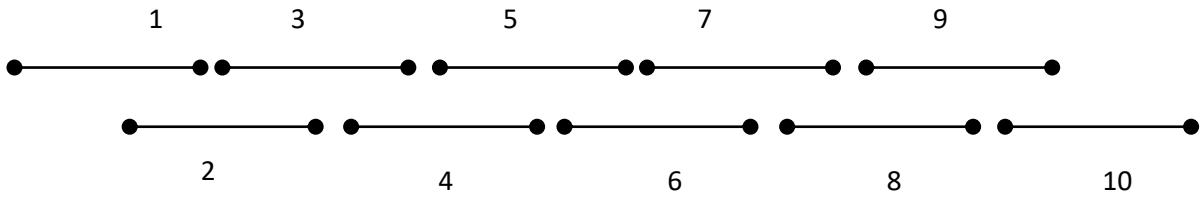


Fig. 3 INTERVAL FAMILY

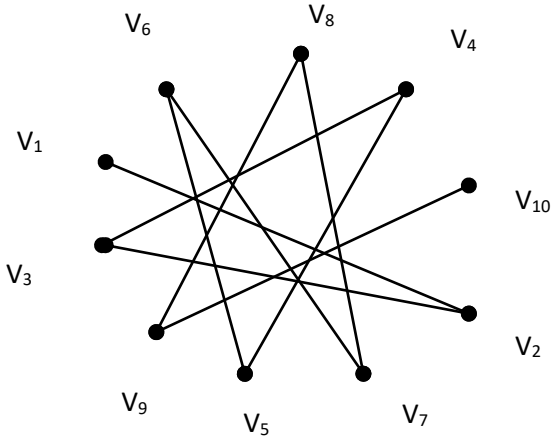


Fig.4 INTERVAL GRAPH

Here $V = \{v_1, v_2, v_3, v_4, v_5, v_6, v_7, v_8, v_9, v_{10}\}$ *and* $n = |V| = 10$

$d(v_1) = 1$, $d(v_2) = 2$, $d(v_3) = 2$, $d(v_4) = 2$, $d(v_5) = 2$,$d(v_6) = 2$, $d(v_7) = 2$, $d(v_8) = 2$, $d(v_9) = 2$, $d(v_{10}) = 1$

Here n = 10 = 3 × 3 + 1

This is of the form n = 3q + r, where q = 3 and r = 1.

If r = 1, then Minimum dominating set $D=\{v_{3k-1}, v_n / 1 \le k \le q\}$ and $\gamma = q+1 = 3+1 = 4$.

$D=\{v_{3k-1}, v_n / 1 \le k \le 3\}$

$D=\{v_2, v_5, v_8, v_{10}\}$ *and* $\gamma = 4$

$D^c=\{v_1, v_3, v_4, v_6, v_7, v_9\}$ *and* $\gamma^c = 6$

$$\text{Now } \sum_{v\in D^c} d(v) = d(v_1)+d(v_3)+d(v_4)+d(v_6)+d(v_7)+d(v_9)$$
$$= 1+2+2+2+2+2$$
$$= 11$$
$$\therefore \sum_{v\in D^c} d(v) = 11$$

$$(1)\ \sum_{v\in D^c} d(v) = 4q-1 = 4(3)-1 = 12-1 = 11$$
$$\therefore \sum_{v\in D^c} d(v) = 11$$

$$(2)\ \sum_{v\in D^c} d(v) = 2\gamma^c-1 = 2(6)-1 = 12-1 = 11$$
$$\therefore \sum_{v\in D^c} d(v) = 11$$

$$(3)\ \sum_{v\in D^c} d(v) = \frac{4n-7}{3} = \frac{4(10)-7}{3} = \frac{40-7}{3} = \frac{33}{3} = 11$$
$$\therefore \sum_{v\in D^c} d(v) = 11$$

Hence theorem is verified.

C. Theorem

Let I = $\{ I_1, I_2, I_3, I_4, \cdots\cdots, I_n\}$, $\forall n \ge 3$ be any finite interval family such that every interval I_i, $i \ne n$ intersect the next interval only and let G(V,E) be an interval graph corresponding to an interval family I.Suppose n = 3q+r, where r = 0, 1, 2 and q is any positive integer. If r = 2 then two cases will arise.

Case (1): The Minimum dominating set $D=\{V_{3k-1}, V_{n-1}/1\le k\le q\}$ and γ = q + 1 and then the following deductions are true $(1)\sum_{v\in D^c} d(v)=4q$ $(2)\sum_{v\in D^c} d(v)=2\gamma^c-2$ $(3)\sum_{v\in D^c} d(v)=\frac{4n-8}{3}$.

Case (2): The Minimum dominating set $D=\{V_{3k-1}, V_n/1\le k\le q\}$ and γ = q + 1 and then the following deductions are true $(1)\sum_{v\in D^c} d(v)=4q+1$ $(2)\sum_{v\in D^c} d(v)=2\gamma^c-1$ $(3)\sum_{v\in D^c} d(v)=\frac{4n-5}{3}$.

Proof:

Let I = $\{ I_1, I_2, I_3, I_4, \cdots\cdots\cdots, I_n\}$, $\forall n\ge 3$ be any finite interval family such that every interval I_i, i ≠ n intersect the next interval only and let G(V, E) be an interval graph corresponding to an interval family I if there is one-to-one correspondence between the vertex set V and interval family I where $V = \{v_1, v_2, v_3, \ldots\ldots\ldots, v_n\}$

By Euclidean division algorithm, n = 3q + r, where r = 0, 1, 2 and q is any positive integer where n is a number of vertices of an interval graph G(V,E).

Suppose r = 2 then we have $n=3q+2\Rightarrow n-2=3q\Rightarrow q=\frac{n-2}{3}$

and then two cases will arise

Case(1): The Minimum Dominating set $D=\{v_{3k-1}, v_{n-1}/1\le k\le q\}$ *and* $\gamma=q+1$

$D = \{v_2, v_5, v_8, \ldots\ldots\ldots\ldots, v_{3q-1}, v_{n-1}\}$ *and* $g = q+1 = \frac{n-2}{3}+1 = \frac{n+1}{3}$

$D = \{v_2, v_5, v_8, \ldots\ldots\ldots\ldots, v_{n-3}, v_{n-1}\}$ *and* $g = \frac{n+1}{3}$

and then $D^c = \{v_1, v_3, v_4, v_6, \ldots\ldots\ldots\ldots, v_{n-2}, v_n\}$

and we have $g^c = n - g = 3q + 2 - (q+1) = 2q+1$

$\therefore g^c = |D^c| = 2q+1$

$\therefore q = \frac{g^c - 1}{2}$

Now $(1)\ \sum_{v\in D^c} d(v) = d(v_1) + d(v_3) + d(v_4) + d(v_6) + \ldots\ldots\ldots + d(v_{n-2}) + d(v_n)$

$= 1 + 2 + 2 + 2 + \ldots + 2 + 1$

$= (2 + 2 + 2 + 2 + \ldots + 2 + 2) - 2$

$= 2(1 + 1 + 1 + 1 + \ldots + 1 + 1) - 2$

$= 2(2q+1) - 2$ $\quad (\text{since } |D^c| = 2q)$

$= 4q + 2 - 2 = 4q$

$$\therefore \sum_{v\in D^c} d(v) = 4q$$

$$(2)\ \sum_{v\in D^c} d(v) = 4q = 4\left(\frac{\gamma^C - 1}{2}\right) = 2\left(\gamma^C - 1\right) = 2\gamma^c - 2 \quad (\because q = \frac{\gamma^c - 1}{2})$$

$$\therefore \sum_{v\in D^c} d(v) = 2\gamma^c - 2$$

$$(3)\ \sum_{v\in D^c} d(v) = 4q = 4\left(\frac{n-2}{3}\right) = \frac{4n-8}{3}$$

$$\therefore \sum_{v\in D^c} d(v) = \frac{4n-8}{3}$$

Case(2): The Minimum Dominating set $D = \{v_{3k-1}, v_n / 1 \le k \le q\}$ *and* $\gamma = q+1$

Þ $D = \{v_2, v_5, v_8, ..., v_{3q-1}, v_n\}$ *and* $g = q + 1 = \frac{n-2}{3} + 1 = \frac{n+1}{3}$

Þ $D = \{v_2, v_5, v_8, ..., v_{n-3}, v_n\}$ *and* $g = \frac{n+1}{3}$

and then $D^c = \{v_1, v_3, v_4, v_6, ..., v_{n-2}, v_{n-1}\}$

and we have $\gamma^c = n - \gamma = 3q + 2 - (q+1) = 2q + 1$

$$\therefore \gamma^c = \left|D^c\right| = 2q + 1$$

$$\therefore q = \frac{\gamma^c - 1}{2}$$

Now (1) $\sum_{v\in D^c} d(v) = d(v_1) + d(v_3) + d(v_4) + d(v_6) + ... + d(v_{n-2}) + d(v_{n-1})$

$= 1 + 2 + 2 + 2 + \ + 2 + 2$

$= (2 + 2 + 2 + 2 + \ + 2 + 2) - 1$

$= 2\,(1 + 1 + 1 + 1 + \ + 1 + 1) - 1$

$= 2\,(2q + 1) - 1 \qquad (\text{since } |D^c| = 2q)$

$= 4q + 2 - 1$

$= 4q + 1$

$$\therefore \sum_{v\in D^c} d(v) = 4q + 1$$

$$(2)\ \sum_{v\in D^c} d(v) = 4q + 1 = 4\left(\frac{\gamma^C - 1}{2}\right) + 1 = 2\left(\gamma^C - 1\right) + 1 = 2\gamma^c - 2 + 1 = 2\gamma^c - 1 \qquad \left(\because q = \frac{\gamma^c - 1}{2}\right)$$

$$\therefore \sum_{v\in D^c} d(v) = 2\gamma^c - 1$$

$$(3)\ \sum_{v\in D^c} d(v) = 4q + 1 = 4\left(\frac{n-2}{3}\right) + 1 = \frac{4n-8}{3} + 1 = \frac{4n-5}{3}$$

$$\therefore \sum_{v \in D^c} d(v) = \frac{4n-5}{3}.$$

Practical problem

Let I $= \{ I_1, I_2, I_3, I_4, I_5, I_6, I_7, I_8, I_9, I_{10}, I_{11} \}$ be an interval family and let G(V, E) be an interval graph corresponding to an interval family I is as follows.

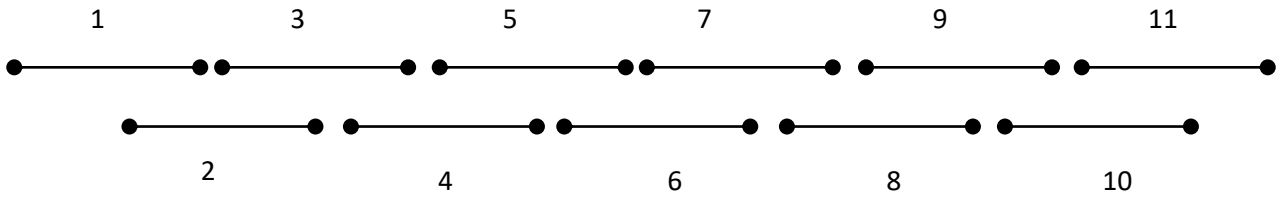


Fig.5 INTERVAL FAMILY

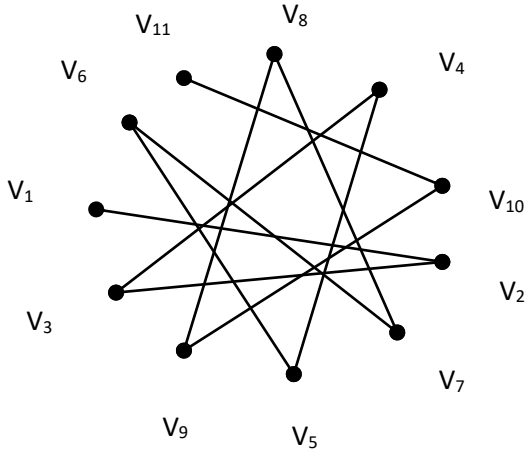


Fig.6 INTERVL GRAPH

Here $V = \{v_1, v_2, v_3, v_4, v_5, v_6, v_7, v_8, v_9, v_{10}, v_{11}\}$ *and* $n = |V| = 11$

$d(v_1) = 1$, $d(v_2) = 2$, $d(v_3) = 2$, $d(v_4) = 2$, $d(v_5) = 2$, $d(v_6) = 2$,

$d(v_7) = 2$, $d(v_8) = 2$, $d(v_9) = 2$, $d(v_{10}) = 2$, $d(v_{11}) = 1$

Here $n = 11 = 3 \times 3 + 2$

This is of the form $n = 3q + r$, where $q = 3$ and $r = 2$.

If r = 2, then there will be arose two cases

Case(1): Then Minimum dominating set $D=\{v_{3k-1}, v_{n-1}/1\le k\le q\}$ and $\gamma = q+1 = 3+1 = 4$.

$D=\{v_{3k-1}, v_{10}/1\le k\le 3\}$

$D=\{v_2, v_5, v_8, v_{10}\}$ *and* $\gamma = 4$

$D^c=\{v_1, v_3, v_4, v_6, v_7, v_9, v_{11}\}$ *and* $\gamma^c = 7$

$$\text{Now } \sum_{v\in D^c} d(v) = d(v_1)+d(v_3)+d(v_4)+d(v_6)+d(v_7)+d(v_9)+d(v_{11})$$
$$= 1+2+2+2+2+2+1$$
$$= 12$$
$$\therefore \sum_{v\in D^c} d(v) = 12$$

$$(1)\ \sum_{v\in D^c} d(v) = 4q = 4(3) = 12$$
$$\therefore \sum_{v\in D^c} d(v) = 12$$

$$(2)\ \sum_{v\in D^c} d(v) = 2\gamma^c - 2 = 2(7) - 2 = 14 - 2 = 12$$
$$\therefore \sum_{v\in D^c} d(v) = 12$$

$$(3)\ \sum_{v\in D^c} d(v) = \frac{4n-8}{3} = \frac{4(11)-8}{3} = \frac{44-8}{3} = \frac{36}{3} = 12$$
$$\therefore \sum_{v\in D^c} d(v) = 12$$

Case(2): Then Minimum dominating set $D=\{v_{3k-1}, v_n/1\le k\le q\}$ and $\gamma = q+1 = 3+1 = 4$.

$D=\{v_{3k-1}, v_{11}/1\le k\le 3\}$

$D=\{v_2, v_5, v_8, v_{11}\}$ *and* $\gamma = 4$

$D^c=\{v_1, v_3, v_4, v_6, v_7, v_9, v_{10}\}$ *and* $\gamma^c = 7$

$$\text{Now } \sum_{v\in D^c} d(v) = d(v_1)+d(v_3)+d(v_4)+d(v_6)+d(v_7)+d(v_9)+d(v_{10})$$
$$= 1+2+2+2+2+2+2$$
$$= 13$$
$$\therefore \sum_{v\in D^c} d(v) = 13$$

$$(1)\ \sum_{v\in D^c} d(v) = 4q+1 = 4(3)+1 = 12+1 = 13$$
$$\therefore \sum_{v\in D^c} d(v) = 13$$

$$(2)\ \sum_{v\in D^c} d(v) = 2\gamma^c - 1 = 2(7)-1 = 14-1 = 13$$
$$\therefore \sum_{v\in D^c} d(v) = 13$$

$$(3)\ \sum_{v\in D^c} d(v) = \frac{4n-5}{3} = \frac{4(11)-5}{3} = \frac{44-5}{3} = \frac{39}{3} = 13$$
$$\therefore \sum_{v\in D^c} d(v) = 13$$

Hence theorem is verified.

V.CONCLUSION

Dominating sets plays predominant role in theory of Graphs. In general the concept of dominating sets in the Graph theory finds wide application in different types of communication networks. In this paper, we derived some relations to sum of degrees of the elements in a complement of a Dominating set in different quotients of Euclidean division algorithm of divisor3

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Some Relations on Degree of Vertices in the Dominating Set of the Interval Graph G by using the Euclidean Division Algorithm

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ABSTRACT:

The prominence of Interval graphs in the current times is evident from the enhanced research focus and attempts for extensive exploration during the recent years. The earnest efforts of the researchers are perceivable in the relevant establishment of the subject integrating coherent practicality and reality. Dominating sets have a vital function regarding the theory of graphs. A communication network is one of the largely discussed applications from among the diverse applications dealing with the theory of domination. In this paper, we tried to present some relations to sum of the degrees of the vertices in dominating set with quotient of an Euclidean division algorithm of divisor 3, domination number of the dominating set and the total number of vertices of the interval graph G corresponding to an interval family I.

KEY WORDS:

Dominating set, domination number, degree of vertices, Interval family, Interval graph, Euclidean division algorithm.

1. INTRODUCTION:

All graphs considered in this paper are finite, undirected, with no loop or multi edge. A graph [3, 6] is said to be a simple graph if it has no loops and no parallel edges. A graph is said to be connected if there is a path between every pair of vertices, otherwise it is said to be disconnected graph [8, 9]. The number of edges incident with a vertex V is called degree of V and is denoted by d(v). Let G = (V, E) be a graph, a set $D \subseteq V$ is a dominating set of G if every vertex in V\D is adjacent to some vertex in D. The domination number $\gamma(G)$ of G is the minimum cardinality of a dominating set [1, 4, 5, 7]. A minimum dominating set with minimum cardinality among all the dominating sets of a graph G is said to be Minimum dominating set. According to the Euclidean division algorithm [2] if we have two positive integers a and b, then there exists unique integers q and r which satisfies the condition a = bq + r where$0 \leq r < b$. If a prime p divides the product ab of two integers a and b, then p must divide at least one of those integers a and b.

2. PRELIMINARIES:

Let I = $\{ I_1, I_2, I_3, I_4, ..., I_n \}$ be an interval family, where each I_i is an interval on the real line

And $I_i = [a_i, b_i]$ for i = 1, 2, 3,.....,n. Here a_i is called the left end point and b_i is called the right end point. Without loss of generality, one can assume that, all end points of the intervals are distinct numbers between 1 and 2n. An interval of degree one is called a pendent interval. The intervals are named in the increasing order of their right end points. The graph G is an interval graph if there is one-to-one correspondence between the vertex set V and the interval family I. Two vertices of G are joined by an edge if and only if their corresponding intervals in I intersect. That is if $I_i = [a_i, b_i]$ and $I_j = [a_j, b_j]$, then I_i and I_j will intersect if $a_i < b_j$ or $a_j < b_i$.

Interval graphs are rich in combinatorial structures and have found applications in several disciplines such as traffic control, ecology, biology, computer science and particularly useful in cyclic scheduling and computers storage allocation problems etc. Have a representation of graph with intervals or arcs can be helpful in combinatorial problems of the graph, such as

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isomorphism testing and finding maximum independent set and cliques graphs.

3. PRE-REQUISITE RESULTS:

3.1. RESULT:

Let I = $\{ I_1, I_2, I_3, I_4, \cdots\cdots\cdots, I_n \}$, $\forall n \geq 3$ be any finite interval family such that every interval I_i, $i \neq n$ intersect the next interval only and let G(V,E) be an interval graph corresponding to an interval family I Suppose n = 3q + r, where r = 0, 1, 2 and q is any positive integer. If r = 0, then the Minimum dominating set $D = \{V_{3k-1} \ / \ 1 \leq k \leq q\}$ and the domination number $\gamma(G)$= q i.e., D = $\{V_2, V_5, V_8, \cdots\cdots\cdots, V_{n-4}, V_{n-1}\}$ and $\gamma(G) = \frac{n}{3}$

3.2. RESULT:

Let I = $\{ I_1, I_2, I_3, I_4, \cdots\cdots\cdots, I_n \}$, $\forall n \geq 3$ be any finite interval family such that every interval I_i, $i \neq n$ intersect the next interval only and let G(V,E) be an interval graph corresponding to an interval family I Suppose n = 3q+r, where r = 0, 1, 2 and q is any positive integer. If r = 1, then the Minimum dominating set $D = \{V_{3k-1}, V_n / 1 \leq k \leq q\}$ and the domination number $\gamma(G)$= q + 1 that is D = $\{V_2, V_5, V_8, \cdots\cdots\cdots, V_{n-2}, V_n\}$ and $\gamma(G) = \frac{n+2}{3}$

3.3. RESULT:

Let I = $\{ I_1, I_2, I_3, I_4, \cdots\cdots\cdots, I_n \}$, $\forall n \geq 3$ be any finite interval family such that every interval I_i, $i \neq n$ intersect the next interval only and let G(V,E) be an interval graph corresponding to an interval family I Suppose n = 3q+r, where r = 0, 1, 2 and q is any positive integer. If r = 2, then the domination number $\gamma(G)$= q+1 and it will arise two cases and $\gamma(G) = \frac{n+1}{3}$

Case(i): Minimum dominating set D is $D = \{V_{3k-1}, V_{n-1} / 1 \leq k \leq q\}$

i.e., D = $\{V_2, V_5, V_8, \ldots\ldots\ldots, V_{n-3}, V_{n-1}\}$.

Case(ii): Minimum dominating set D is $D = \{V_{3k-1}, V_n / 1 \leq k \leq q\}$

i.e., D = $\{V_2, V_5, V_8, \ldots\ldots\ldots, V_{n-3}, V_n\}$.

3.4. RESULT:

Let I = $\{ I_1, I_2, I_3, I_4, \cdots\cdots\cdots, I_n \}$, $\forall n \geq 3$ be any finite interval family such that every interval I_i, $i \neq n$ intersect the next interval only and let G(V,E) be an interval graph corresponding to an interval family I if there is one-to-one correspondence between the vertex set V and interval family I where $V = \{V_1, V_2, V_3, \ldots\ldots\ldots, V_n\}$ then $d(v_1) = d(v_n) = 1$ and $d(v_2) = d(v_3) = d(v_4) = d(v_5) = \cdots\cdots\cdots = d(v_{n-1}) = 2$.

4. MAIN THEOREMS:

4.1. THEOREM:

Let I = $\{ I_1, I_2, I_3, I_4, \cdots\cdots\cdots, I_n \}$, $\forall n \geq 3$ be any finite interval family such that every interval I_i, $i \neq n$ intersect the next interval only and let G(V,E) be an interval graph corresponding to an interval family I Suppose n = 3q+r, where r = 0, 1, 2 and q is any positive integer. If r = 0, then the Minimum dominating set $D = \{V_{3k-1} / 1 \leq k \leq q\}$ and γ = q and then the following deductions are true.

$(i) \sum_{v \in D} d(v) = 2q$ $\qquad$ $(ii) \sum_{v \in D} d(v) = 2\gamma$

$(iii) \sum_{v \in D} d(v) = \frac{2n}{3}$.

PROOF:

Let I = $\{ I_1, I_2, I_3, I_4, \cdots\cdots\cdots, I_n \}$, $\forall n \geq 3$ be any finite interval family such that every interval I_i, $i \neq n$ intersect the next interval only and let G(V,E) be an interval graph corresponding to an interval family I if there is one-to-one correspondence between the vertex set V and interval family I where $V = \{V_1, V_2, V_3, \ldots\ldots\ldots, V_n\}$

Suppose n = 3q + r, where r = 0, 1, 2 by Euclidean division algorithm.

If r = 0 then $n = 3q \Rightarrow q = \frac{n}{3}$

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Also we have $D = \{V_{3k-1} / 1 \le k \le q\}$ *and* γ = q

i.e., D = $\{V_2, V_5, V_8, \ldots\ldots\ldots\ldots, V_{n-4}, V_{n-1}\}$

$$(i)\sum_{v\in D} d(v) = d(v_2) + d(v_5) + \ldots\ldots\ldots\ldots + d(v_{n-1})$$

$= 2 + 2 + 2 + \ldots\ldots\ldots\ldots + 2$

$= 2\,(1 + 1 + 1 + \ldots\ldots\ldots\ldots + 1)$

$= 2\,(q)$

$$\therefore \sum_{v\in D} d(v) = 2q$$

$$(ii)\sum_{v\in D} d(v) = 2q$$

$$= 2\gamma \quad (\because q = \gamma)$$

$$\therefore \sum_{v\in D} d(v) = 2\gamma$$

$$(iii)\sum_{v\in D} d(v) = 2q$$

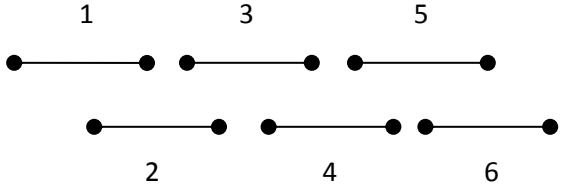
$$= 2\left(\frac{n}{3}\right) \qquad \left(\because q = \frac{n}{3}\right)$$

$$= \frac{2n}{3}$$

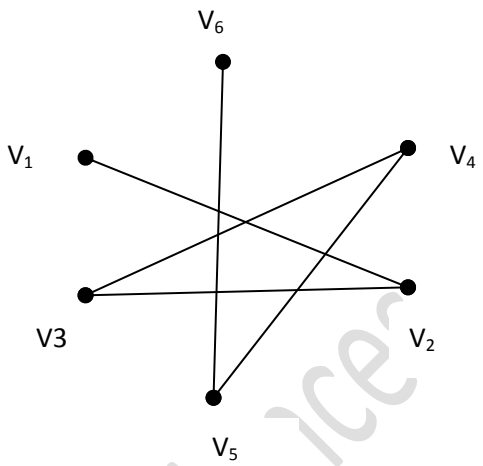
$$\therefore \sum_{v\in D} d(v) = \frac{2n}{3}$$

PRACTICAL PROBLEM:

Let I = $\{I_1, I_2, I_3, I_4, I_5, I_6\}$ be an interval family and let G(V, E) be an interval graph corresponding to an interval family I is as follows:



INTERVAL FAMILY I



INTERVL GRAPH G

Here n = 6 = 3 × 2 + 0

This is of the form n = 3q + r here q = 2 and r = 0.

If r = 0, then Minimum dominating set D = { v_2, v_5 } and $\gamma = 2$, since theorem 1.

$$\sum_{v\in D} d(v) = d(v_2) + d(v_5)$$

$= 2 + 2 = 4$

$$\sum_{v\in D} d(v) = 4$$

$$(i)\sum_{v\in D} d(v) = 2q$$

$= 2 \times 2 = 4 \qquad (\because q = 2)$

$$\sum_{v\in D} d(v) = 4$$

$$(ii)\sum_{v\in D} d(v) = 2\gamma$$

$= 2 \times 2 = 4 \qquad (\because \gamma = 2)$

$$\sum_{v\in D} d(v) = 4$$

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$$(iii)\sum_{v\in D} d(v) = \frac{2n}{3}$$

$$= \frac{2\times 6}{3} \quad (\because n = 6)$$

$$= \frac{12}{3} = 4$$

$$\sum_{v\in D} d(v) = 4$$

Hence theorem is verified with r = 0.

4.2. THEOREM:

Let I = $\{ I_1, I_2, I_3, I_4, \ldots\ldots\ldots, I_n \}$, $\forall n \geq 3$ be any finite interval family such that every interval I_i, $i \neq n$ intersect the next interval only and let G(V,E) be an interval graph corresponding to an interval family I Suppose n = 3q+r, where r = 0, 1, 2 and q is any positive integer. If r = 1, then the Minimum dominating set $D = \{V_{3k-1}, V_n / 1 \leq k \leq q\}$ and γ = q + 1 and then the following deductions are true.

$$(i)\sum_{v\in D} d(v) = 2q+1 \qquad (ii)\sum_{v\in D} d(v) = 2\gamma - 1$$

$$(iii)\sum_{v\in D} d(v) = \frac{2n+1}{3}.$$

PROOF:

Let I = $\{ I_1, I_2, I_3, I_4, \ldots\ldots\ldots, I_n \}$, $\forall n \geq 3$ be any finite interval family such that every interval I_i, $i \neq n$ intersect the next interval only and let G(V,E) be an interval graph corresponding to an interval family I if there is one-to-one correspondence between the vertex set V and interval family I where $V = \{V_1, V_2, V_3, \ldots\ldots, V_n\}$ Suppose n = 3q + r, where r = 0, 1, 2 by Euclidean division algorithm.

If r = 1 then $n = 3q+1 \Rightarrow q = \frac{n-1}{3}$

And also $D = \{V_{3k-1}, V_n / 1 \leq k \leq q\}$ $and \gamma$ = q + 1

i.e., D = $\{V_2, V_5, V_8, \ldots\ldots\ldots, V_{n-2}, V_n\}$

$$(i)\sum_{v\in D} d(v) = d(v_2) + d(v_5) + \ldots\ldots + d(v_{n-2}) + d(v_n)$$

= 2 + 2 + 2 + ... + 2 + 1

= 2 + 2 + 2 + ... + 2 + 2 –1

= 2(1 + 1 + 1 + ... + 1) – 1

= 2 (q +1) – 1 = 2q + 2 - 1 = 2q + 1

$$\therefore \sum_{v\in D} d(v) = 2q+1$$

$$(ii)\sum_{v\in D} d(v) = 2q+1$$

$$= 2(\gamma - 1) + 1$$
$$= 2\gamma - 2 + 1 = 2\gamma - 1$$

$$\therefore \sum_{v\in D} d(v) = 2\gamma - 1$$

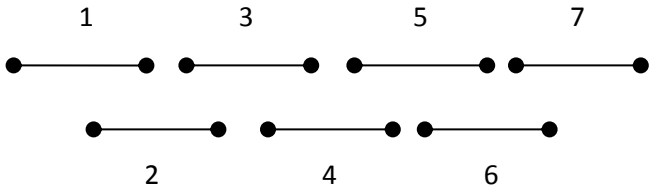
$$(iii)\sum_{v\in D} d(v) = 2q+1$$

$$= 2\left(\frac{n-1}{3}\right) + 1$$
$$= \frac{2n-2}{3} + 1 = \frac{2n-2+3}{3} = \frac{2n+1}{3}$$

$$\therefore \sum_{v\in D} d(v) = \frac{2n+1}{3}$$

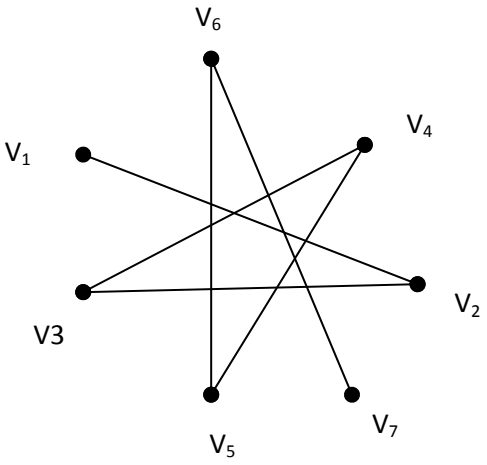
PRACTICAL PROBLEM:

Let I= $\{ I_1, I_2, I_3, I_4, I_5, I_6, I_7 \}$ be an interval family and let G(V, E) be an interval graph corresponding to an interval family I is as follows:



INTERVAL FAMILY I

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INTERVL GRAPH G

Here n = 7 = 3 × 2 + 1

This is of the form n = 3q + r here q = 2 and r = 1.

If r = 1, Minimum dominating set D = { v_2, v_5, v_7} and $\gamma = 3$, since theorem 2.

$$\sum_{v\in D} d(v) = d(v_2) + d(v_5) + d(v_7)$$

= 2 + 2 + 1

= 5

$$\sum_{v\in D} d(v) = 5$$

$$(i)\sum_{v\in D} d(v) = 2q+1$$

= 2 × 2 +1 (∵ q = 2)

= 5

$$\sum_{v\in D} d(v) = 5$$

$$(ii)\sum_{v\in D} d(v) = 2\gamma - 1$$

= 2 × 3 - 1 = 6 -1 = 5 ($\because \gamma = 3$)

$$\sum_{v\in D} d(v) = 5$$

$$(iii)\sum_{v\in D} d(v) = \frac{2n+1}{3}$$

$$= \frac{2\times 7+1}{3} \quad (\because n = 7)$$

$$= \frac{14+1}{3} = \frac{15}{3} = 5$$

$$\sum_{v\in D} d(v) = 5$$

Hence theorem is verified with r = 1.

4.3. THEOREM:

Let I = $\{ I_1, I_2, I_3, I_4, \cdots\cdots, I_n \}$, $\forall n \geq 3$ be any finite interval family such that every interval I_i, i ≠ n intersect the next interval only and let G(V,E) be an interval graph corresponding to an interval family I Suppose n = 3q+r, where r = 0, 1, 2 and q is any positive integer. If r = 2 then two cases will arise .

Case (i): If r = 2 then the Minimum dominating set $D = \{V_{3k-1}, V_{n-1} / 1 \leq k \leq q\}$ and γ = q + 1 and then the following deductions are true

$$(i)\sum_{v\in D} d(v) = 2q+2 \qquad (ii)\sum_{v\in D} d(v) = 2\gamma$$

$$(iii)\sum_{v\in D} d(v) = \frac{2n+2}{3}.$$

Case (ii): If r = 2 then the Minimum dominating set $D = \{V_{3k-1}, V_n / 1 \leq k \leq q\}$ and γ = q + 1 and then the following deductions are true

$$(i)\sum_{v\in D} d(v) = 2q+1 \qquad (ii)\sum_{v\in D} d(v) = 2\gamma - 1$$

$$(iii)\sum_{v\in D} d(v) = \frac{2n-1}{3}.$$

PROOF:

Let I = $\{ I_1, I_2, I_3, I_4, \cdots\cdots, I_n \}$, $\forall n \geq 3$ be any finite interval family such that every interval I_i, i ≠ n intersect the next interval only and let G(V,E) be an interval graph corresponding to an interval family I if there is one-to-one correspondence between the vertex set V

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and interval family I where $V = \{V_1, V_2, V_3, ..., V_n\}$ Suppose n = 3q + r, where r = 0, 1, 2 by Euclidean division algorithm.

If r = 2 then $n = 3q+2 \Rightarrow q = \frac{n-2}{3}$ and then two cases will arise

Case(i): $D = \{V_{3k-1}, V_{n-1} / 1 \le k \le q\}$ *and* γ = q + 1

i.e., D = $\{V_2, V_5, V_8, ..., V_{n-3}, V_{n-1}\}$

$$(i)\sum_{v\in D} d(v) = d(v_2) + d(v_5) + ... + d(v_{n-3}) + d(v_{n-1})$$

= 2 + 2 + ... + 2 + 2

= 2(1 + 1 + ... + 1)

= 2 (q +1) = 2q + 2

$$\therefore \sum_{v\in D} d(v) = 2q+2$$

$$(ii)\sum_{v\in D} d(v) = 2q+2$$

$$= 2(\gamma - 1) + 2$$
$$= 2\gamma - 2 + 2 = 2\gamma$$

$$\therefore \sum_{v\in D} d(v) = 2\gamma$$

$$(iii)\sum_{v\in D} d(v) = 2q+2$$

$$= 2\left(\frac{n-2}{3}\right) + 2 = \frac{2n-4}{3} + 2$$
$$= \frac{2n-4+6}{3} = \frac{2n+2}{3}$$

$$\therefore \sum_{v\in D} d(v) = \frac{2n+2}{3}$$

Case(ii): $D = \{V_{3k-1}, V_n / 1 \le k \le q\}$ *and* γ = q + 1

i.e., D = $\{V_2, V_5, V_8, ..., V_{n-3}, V_n\}$

$$(i)\sum_{v\in D} d(v) = d(v_2) + d(v_5) + ... + d(v_{n-3}) + d(v_n)$$

= 2 + 2 + ... + 2 + 1

= 2 + 2 + ... + 2 + 2 -1

= 2(1 + 1 + ... + 1) - 1

= 2 (q +1) - 1 = 2q + 2 – 1= 2q + 1

$$\therefore \sum_{v\in D} d(v) = 2q+1$$

$$(ii)\sum_{v\in D} d(v) = 2q+1$$

$$= 2(\gamma - 1) + 1$$
$$= 2\gamma - 2 + 1 = 2\gamma - 1$$

$$\therefore \sum_{v\in D} d(v) = 2\gamma - 1$$

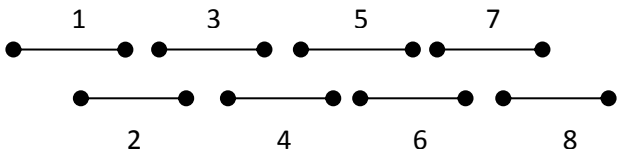
$$(iii)\sum_{v\in D} d(v) = 2q+1$$

$$= 2\left(\frac{n-2}{3}\right) + 1 = \frac{2n-4}{3} + 1$$
$$= \frac{2n-4+3}{3} = \frac{2n-1}{3}$$

$$\therefore \sum_{v\in D} d(v) = \frac{2n-1}{3}$$

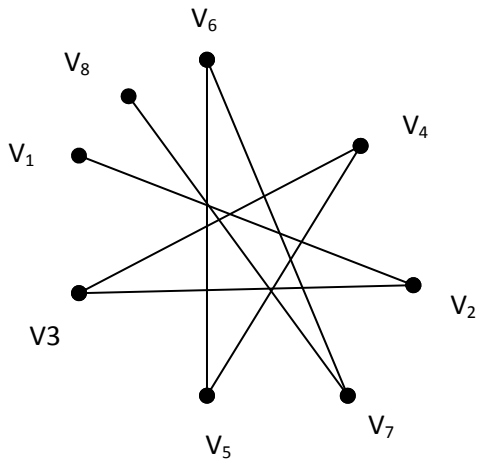
PRACTICAL PROBLEM:

Let I= $\{I_1, I_2, I_3, I_4, I_5, I_6, I_7, I_8\}$ be an interval family and let G(V, E) be an interval graph corresponding to an interval family I is as follows:



INTERVAL FAMILY I

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INTERVL GRAPH G

Here n = 8 = 3 × 2 + 2

This is of the form n = 3q + r here q = 2 and r = 2.

If r = 2 then two cases will arise

Case(i): If r = 2, then the Minimum dominating set D is D = { v_2, v_5, v_7} and $\gamma = 3$, since theorem 3.

$$\sum_{v\in D} d(v) = d(v_2) + d(v_5) + d(v_7)$$

$$= 2 + 2 + 2$$

$$= 6$$

$$\sum_{v\in D} d(v) = 6$$

$$(i)\sum_{v\in D} d(v) = 2q + 2$$

$$= 2 \times 2 + 2 \quad (\because q = 2)$$

$$= 6$$

$$\sum_{v\in D} d(v) = 6$$

$$(ii)\sum_{v\in D} d(v) = 2\gamma$$

$$= 2 \times 3 = 6 \quad (\because \gamma = 3)$$

$$\sum_{v\in D} d(v) = 6$$

$$(iii)\sum_{v\in D} d(v) = \frac{2n+2}{3}$$

$$= \frac{2\times 8+2}{3} \quad (\because n = 8)$$

$$= \frac{16+2}{3} = \frac{18}{3} = 6$$

$$\sum_{v\in D} d(v) = 6$$

Case(ii): If r = 2, then the Minimum dominating set D is D = { v_2, v_5, v_8} and $\gamma = 3$, since theorem 3.

$$\sum_{v\in D} d(v) = d(v_2) + d(v_5) + d(v_8)$$

$$= 2 + 2 + 1$$

$$= 5$$

$$\sum_{v\in D} d(v) = 5$$

$$(i)\sum_{v\in D} d(v) = 2q + 1$$

$$= 2 \times 2 + 1 \quad (\because q = 2)$$

$$= 5$$

$$\sum_{v\in D} d(v) = 5$$

$$(ii)\sum_{v\in D} d(v) = 2\gamma - 1$$

$$= 2 \times 3 - 1 = 6 - 1 = 5 \quad (\because \gamma = 3)$$

$$\sum_{v\in D} d(v) = 5$$

$$(iii)\sum_{v\in D} d(v) = \frac{2n-1}{3}$$

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$$= \frac{2\times 8-1}{3} \quad (\because n = 8)$$

$$= \frac{16-1}{3} = \frac{15}{3} = 5$$

$$\sum_{v\in D} d(v) = 5$$

Hence theorem is verified with r = 2.

5. CONCLUSION:

In this paper focuses on some relations to sum of the degrees of the vertices in dominating set with quotient of an Euclidean division algorithm of divisor 3, domination number of the dominating set and the total number of vertices of the interval graph G corresponding to an interval family I. In future efforts in the paper eventually open up many an avenue in the field of research on interval graphs.

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Comparative study of certain Biochemistry parameters of serum constituents with reference to age

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Abstract: The objective of the current study was to explore the various serum biochemical parameters in people with different ages. When compared to the young age group, biochemical investigation of some instances showed a substantial increase in blood glucose and albumin in the Top aged group as well as a significant drop in total protein and creatinine concentrations. Compared to the young age group, the medium group also had non-significantly higher levels of triglycerides, cholesterol, uric acid, alkaline phosphatase, and creatinine. The list of organic constituents also included triglycerides, glucose, fructose, uric acid, creatinine, urea, total protein, albumin, and cholesterol. Alkaline phosphatase and other metabolic enzymes were quantified. Although not clinically significant increased blood urea nitrogen and creatinine levels were seen in the majority which may have been caused by urinary contamination of the antegrade specimens. Diabetic individuals had considerably higher levels of glucose than age-related levels of albumin and alkaline phosphatase. Additionally, the levels of glucose, uric acid, and all inorganic components were approaching their corresponding levels in serum. It is concluded that certain biochemical parameters variations that are linked to a few blood parameter changes may be helpful in the diagnosis of individuals who belong to certain age groups.

Keywords: Plasma, Serum, Bio-Chemistry Analyzer BA-88A, Biochemical parameters, Age

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Introduction

There exists some studies which demonstrated that age and sex-related individuals exhibit quantitative serum analysis characteristics (Higgins *et al.,* 2019). Investigations into

normative data for various age and sex-variable populations have focused on the concentration of biochemical components in serum/plasma. Three groups, including Top age, Middle age, and Younger age groupings, were experimentally divided. Due to age-related issues, biochemical abnormalities should be taken into consideration as one of the many causes of anomalies in varied populations (Khan *et al.,* 2011). The present study was performed to analyze and evaluate the biochemical properties of diverse biochemical components from volunteers across a range of ages.

An investigation of the biochemistry of plasma or serum and hematology can reveal crucial details about the community under study as well as the individuals involved. In field studies, especially, the ability to gauge a subject's health at the time of the examination can be a crucial tool for gathering information and developing a treatment strategy (Mahaffey, 2003; El-Deeb and Younis, 2009). Because of the diversity that can result from species individuality, season, sex, age, temperature, nutritional and reproductive state, and captivity status, these parameters must be viewed as guides rather than absolutes (Lotfollahzadeh *et al.,*2011). Results may also be impacted by sample handling, analysis methodology, and sampling procedure. The Bio-Chemistry Analyzer BA-88A has become widely used in human medicine and is a useful instrument for evaluating health. They come with a number of advantages, including as mobility, a small volume, quick results, direct control over the sample, and quality control.

For this study, the samples were collected from the teaching, non- teaching staff and students who volunteered for the analysis. After collection and analysis of the samples, we have classified them into three groups (above 40 years, between 35-40 years and between 20-25 years) based on the age.

Materials and Methods

Age-specific blood samples (10 samples T1-T10 from above 40 years, 10 samples M1-M10 from 35-40 years and 10 samples Y1-Y10 from 20-25 years age) were collected. The estimation of various blood parameters were performed.

Blood collection:

Venous blood was drawn in a sterile tube, labelled with the patient's name, identification number, and the date of collection, and drawn in 5 ml increments for adults and 1 ml for and younger subjects. Sterile (unopened) 5 ml Vacutainer Serum Separator Tubes with Clot Activator (SST; Becton Dickinson) and 4.5 ml Vacutainer Plasma Separator Tubes (PST; Becton Dickinson) with 15-20 IU/ml lithium heparin were used. Samples were collected and left to stand at room temperature (25 °C) for 0.5 h before being centrifuged (Remi 10000rpm for 5 min). Whole blood was refrigerated and kept at 4–8°C for up to 24 h before the serum is separated. The Institutional Management authorized the exploratory proposal as a service basis. After explaining the purpose of the study to each subject, their agreement was sought.

Blood parameters:

Albumin, alkaline phosphatase (ALK), aspartate aminotransferase (AST), calcium, total cholesterol, creatinine, creatine kinase (CK), Triglycerides (TGL) glucose, Random Blood Sugar (RBS), total protein, uric acid, and urea were measured with the Bio-Chemistry Analyzer BA-88A. We used Remi-10,000 rpm Centrifuge, auto rotated machine, micropipettes,

Results

From the data of the 30 different age group samples collected and analyzed, younger groups showed much lower levels of the biochemical components than did middle-aged individuals. High levels of RBS, cholesterols and TGL were observed in the adult group. Figure 1 shows the plasma biochemical parameters in the top aged adults. In this study there is significant ($P<0.05$) variations in the plasma concentrations of RBS, albumin, urea, cholesterol, and triglycerides. Some individuals with a genetic susceptibility to diabetes and those under work-related stress

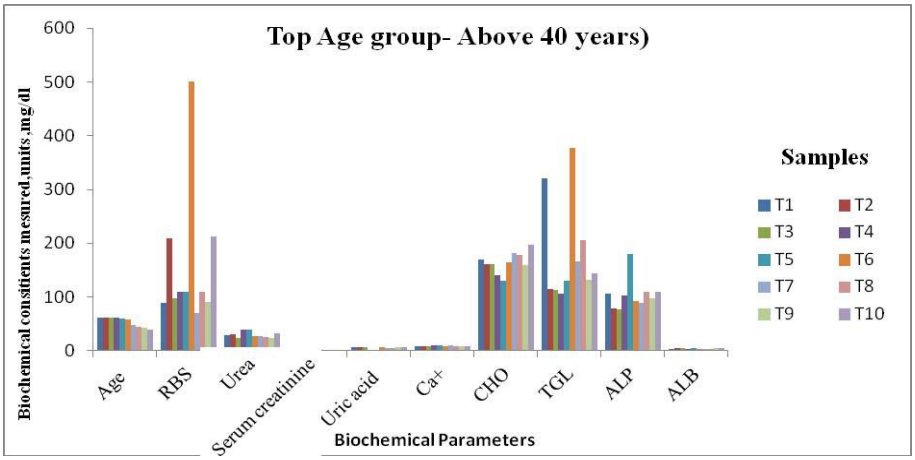


Fig. 1: Blood parameters in group I (above 40 years age group).

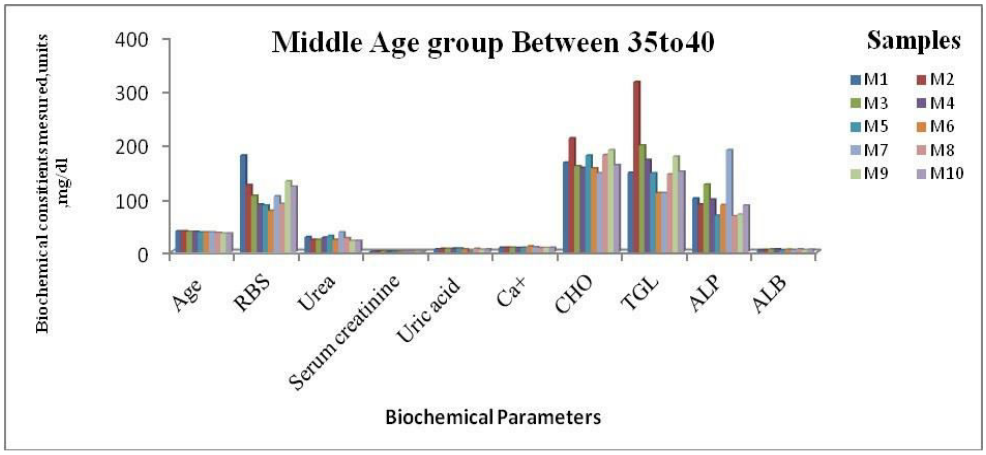


Fig. 2: Blood parameters in group II (between 35-40 years age group).

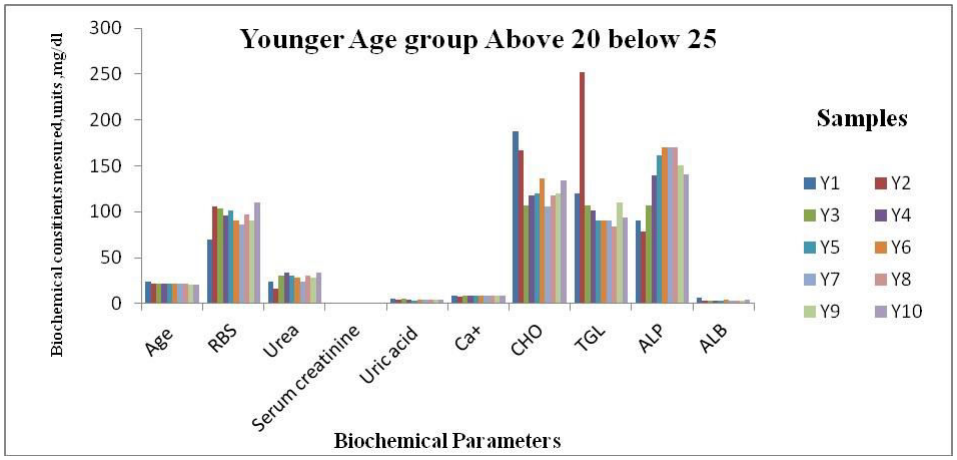


Fig. 3: Blood parameters in group III (between 20-25 years age group).

showed some elevated RBS levels. The remaining values, such as urea, triglycerides, ALP, ALB, serum creatinine, and uric acid, are within normal ranges when compared to T2, T6, and T10 samples. Age-related changes have little impact on most values.

Figure 2 shows blood parameters in age range of 35 to 40 All of the parameters (sugar, RBS, urea, triglycerides, ALP, ALB, serum creatinine, and uric acid) are normal. As a result, this group not exhibited any abnormal results. Subjects between the ages of 20 and 25 are generally quite active, with the exception of a small number of individuals, in these subjects the blood parameters (sugar, urea, RBS, triglycerides, ALP, ALB, serum creatinine, and uric acid) are normal (Fig. 3) .

Discussion

An essential component of the clinical laboratory diagnostic tools accessible to clinical pathologists to evaluate health and illness in both human and animal species is the assessment of blood biochemical parameters (Johnston *et al.,* 2007). Three age groups are examined in this study for various biochemical markers (Kakizoe *et al.,* 2007). Our findings show aberrant values in a small number of carefully chosen individuals associated with changes in a few plasma biochemical markers. The present study's biochemical analysis revealed significant changes in the concentration of RBS as well as other biochemical parameters when comparing various age and sex variable groups (Johnston *et al.,* 2007).

In the current study, participants in aged groups had higher and lower quantities of plasma sugar, urea, creatinine, cholesterol, triglycerides, and albumin. Although the drop in albumin concentration was only statistically significant ($P< 0.05$) (Johnston *et al*., 2007). The considerable drop in plasma albumin concentration could be the result of decreased synthesis by liver. Furthermore, a drop in plasma albumin concentration during theileriosis may be responsible for hypoproteinaemia. Proteinaceous fluids accumulate extravascularly as a result of sick lymph nodes (Nazifi *et al.,* 2008). The considerable increase in bilirubin and urea levels in older adults is consistent with previously published data. The elevated serum bilirubin concentration associated with human diseases may be caused by a number of factors, including the hemolysis of parasitized erythrocytes in the reticuloendothelial system and lymph nodes, hepatic dysfunction, and hemolytic anaemia. A dramatic rise in urea levels could be caused by Theileria infection-related anorexia, renal injury, or an increase in protein catabolism (Omer *et al.,* 2002, 2003). The results are somewhat consistent with a non-significant fall in the infected group's creatinine concentration in the current investigation. Omer *et al.* (2002) demonstrated a considerable drop in human creatinine content which developed numerous alleged health issues, including muscle soreness. Theileriosis in people did not significantly affect the mean uric acid values during joint inflammation (Loh *et al.,* 2014). One of the most common clinical laboratory procedures is the use of enzyme tests to diagnose illnesses. In the current investigation, it was discovered that human ill and borderline populations had higher levels of ALP and ALB.

Conclusion

In conclusion, we found that various blood biochemical components were affected by age-related issues in people, which, when considered collectively, may reflect tissue damage and aid in better understanding the pathophysiology of the disease. This study led to the conclusion that the diagnosis and prognosis of age-related disorders in humans may benefit from the measurement of biochemical parameters.

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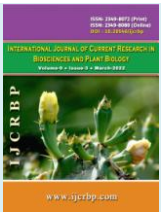
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Original Research Article **doi:** https://doi.org/10.20546/ijcrbp.2022.903.002

Carbon stocks of scattered category of trees outside forest in Prakasam District, Andhra Pradesh, India

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Article Info

Keywords:
Carbon pool
Carbon sequestration
Trees outside forests
Plant biomass

Abstract

In the present study, carbon stocks of scattered structures of Trees outside Forest (TOF) in Prakasam district was estimated through sampling of 116 plots of size, 1 ha. Total number of individuals recorded in the sampled plots are 5014 with a mean stem density, 43.22 in a range of 18-92 per ha plot. The total biomass accounts for 3685.6 Mg. The mean carbon pool density of the sampled plots is 15.09 Mg ha^{-1} ranges between 2.18 and 73.90 Mg ha^{-1} and the total carbon pool for the sampled area is 1750.44 Mg.

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Introduction

Climate change is the most important global environmental challenges affecting all-natural ecosystems consequently leading to species extinctions. Unabated burning of fossil fuels over the past one century has increased the concentration of greenhouse gases especially carbon-di-oxide in the atmosphere consequently resulting in enhanced greenhouse effect, the global warming. (IPCC, 2014). The main natural carbon sinks are plants, the ocean and soil. The uptake of carbon dioxide (CO_2), during photosynthesis is the major pathway by which carbon is removed from the atmosphere and this 'capturing and securing of atmospheric carbon in the form photosynthesis and subsequently to dead organic matter is called as 'carbon sequestration'. Vegetation in the form of forests and trees growing outside forests play a pivotal role in sequestration and trees are the largest component of aboveground biomass in terrestrial ecosystems.

Trees Outside Forests (TOF) are the trees found on neither lands that are not categorized as 'forest' nor 'other wooded land' irrespective of their patch size (FAO, 2010) and include agricultural land (including meadows and pastures), built-on land (including settlements and infrastructure) and barren land (including sand dunes and rocky outcroppings), orchards and plantations. TOF are classified into linear, scattered and block categories. Agricultural fields (field bunds), wastelands, settlements (towns/villages) are categorized under scattered category. Obligations from

international conventions has also made it necessary for conduct TOF assessment particularly the United Nations Framework Convention on Climate Change (UNFCCC) and United Nations Convention on Biological Diversity (UN-CBD) have urged on keeping up-to- date information on tree resources within and outside forests (Beckschafer et al., 2017). Such assessments especially at district level hold immense significance. The present study is oriented with this background to estimate the carbon stocks of scattered category of TOF of Prakasam district, Andhra Pradesh.

Study area

Prakasam (formerly Ongole) District is located in the South-Central Portion of the Coastal districts of Andhra Pradesh and lie approximately between 15 30' to 16 00' NL and 79 0' to 80 0' EL (Fig. 1). The district comprises three revenue divisions namely Ongole, Kandukur and Markapur and 56 Mandals, besides one corporation and three municipalities. As many as 1002 Inhabited Revenue villages are existing in the district constituted into 1043 Gram Panchayats. In Prakasam district, round the year the climate is characterised by humidity and mean annual rainfall is about 900 mm. The mean maximum temperatures from April to June (35.7 C to 37.5 C) and mean maximum temperature is in the month of January (12.40 C). From July to November, the mean maximum temperature generally varies from 39.5 C to 29.5 C.

The district is drained by the rivers, Gundlakamma, Manneru, Musi and Paleru Rivers besides small rivers like Thammileru, Sagileru and Gudisileru and streams like Ogeru vagu, Nallavagu and Vedimangala vagu.

Total forest area of the district is 18.74% (FSI, 2019). In the coastal areas, there is abundant growth of Casurinas and cashew plantations. The important hill ranges in the district are the Nallamalais and the Veligondas which separate the district from Kurnool and Kadapa Districts.

Materials and methods

Sampling

In the present study, a non-destructive approach of Above-Ground Biomass (AGB) estimation was followed to study the carbon stocks of scattered category. A comprehensive format design of Vegetation Carbon pool Assessment (VCP) of Indian Institute of Remote Sensing (IIRS) (Singh and Dadhwal, 2008) was adopted for ground data collection. Sampling sites were identified and located with the help of Google earth software. The geographical co-ordinates for each plot were identified with the help of Global Positioning System (GPS). Plots were selected based on different density classes. All the tree taxa in the sampled plots were inventoried and identified following regional and local floras. A total of 116 sample plots with 100 × 100 m (i.e., 1 ha) dimensions were laid all over the district (covering 56 mandals) in agriculture fields and settlements including towns and villages.

Biomass estimation

Basal area- of each tree was calculated by using following standard formula:

Basal Area (m^2 ha^{-1}) = πr^2 × area (ha)

Growing stock (volume) estimation

Volume of each tree was estimated using the selected species specific volumetric equation developed and compiled by FSI (1996).

Specific gravity

Specific gravity values of different species were selected from literature (Reyes et al., 1992; FRI, 1996; Mani and Parthasarathy, 2007). For stems with unknown specific gravity, the arithmetic mean of all known species was substituted and used in particular sample plot following Brown et al. (1989).

Estimation of above ground biomass

Bole biomass ≥10 cm diameter

The estimated volume was converted into biomass by multiplying with specific gravity (Rajput et al., 1996; Limaye and Sen, 1956). Biomass of all the trees was summed to obtain biomass for 1 ha.

Biomass (tons) = Volume (m^3) × Specific gravity

Bole biomass <10 cm diameter

Volume equations for trees <10 cm diameter are not available, hence a methodology for trees of this class developed in Vegetation Carbon Pool Assessment

Project (Singh and Dadhwal, 2008; Dadhwal et al., 2009; Patil et al., 2011) by relating basal area and biomass has been followed. The model developed was Y=3.6808*X+0.264 and used for assessing the AGB of trees <10cm diameter. Where, Y=Biomass, X= Basal of trees (>10cm diameter and <10cm diameter), 3.6808 and 0.264 = Coefficients.

Estimation of total above ground biomass, below ground biomass and total biomass

The biomass of trees having >10cm diameter and <10cm diameter in each plot were added together to get biomass of one ha plot. In the present study, 26% of the total agb was considered as root biomass following Houghton et al. (2001) and Ramankutty et al. (2007). Total biomass for each one ha plot was obtained by the addition of total agb and bgb. Further the mean was calculated and extrapolated for the whole study area.

Estimation of carbon stocks

Extrapolated biomass was estimated by multiplying the tree covered area with mean biomass of sampled plots of respective category.

Extrapolated biomass (tons) = Tree covered area x mean biomass of sampled plots

Carbon stocks was estimated by multiplying the extrapolated biomass with IPCC default carbon fraction of each category and finally, all TOF categories are added to get the carbon stocks of TOF of the Prakasam district. Carbon stock (tons) = Extrapolated biomass (tons) × IPCC default carbon fraction (0.475). To determine the weight of carbon dioxide sequestered in the tree, multiply the weight of carbon in the tree by 3.6663.

(http://www.ncsec.org/cadre2/team18_2/students/helpCalcCO2.htm).

Results and discussion

In scattered category, 57 species of angiosperms belonging to 53 genera and 27 families. Total number of individuals recorded in the sampled plots are 5014 with a mean stem density, 43.22 in a range of 18-92 per ha plot (Table 1).

Basal area and volume

The mean basal area is 5.08 m^2 ha^{-1} varied between 0.6-15.22 m^2 ha^{-1} Trees having >10 cm diameter shared 99.72% with mean basal area 5.08 m^2 ha^{-1} and remaining 0.28% shared by the trees with <10 cm diameter. The dominant tree species share is 66.45% of the total basal area. The mean volume of trees having >10cm diameter is 37.28 m^3 ha^{-1}, ranging between 3.55-123.47 m^3 ha^{-1} in the plots sampled (Table 2). The total wood volume of sampled plots is 4324.48 m^3.

Above ground biomass

Bole biomass > 10 cm diameter

The trees with > 10 cm diameter are major contributors of total above ground biomass with 99.95% share. The mean is 25.19 Mg ha^{-1} and ranges between 3.55 – 123.47 Mg ha^{-1} (Table 2) in sampled plots. Correlation of basal area and biomass of trees with > 10 cm diameter revealed a determination coefficient of R^2 is 0.765 for 116 plots (Fig. 1).

Bole biomass < 10 cm diameter

The biomass for trees having <10 cm diameter was calculated by using regression equation and coefficients developed between basal area and biomass of trees >10 cm diameter. The mean biomass of these trees is 0.018 Mg ha^{-1} ranges between 0.04 – 0.23 Mg ha^{-1} in the sampled plots inventoried, which accounts for 0.05% of the total above ground biomass (Table 2).

Total above-ground biomass

It is the sum of biomass of trees with >10 cm diameter and the biomass of trees with <10 cm diameter in each plot. The mean total above- ground biomass (TAGB) is 25.21 Mg ha^{-1} ranges between 23.64 and 123.47 Mg ha^{-1} in the sampled plots. The TAGB of sampled area is 2925.1 Mg (Table 2).

Below ground biomass

Below ground biomass was calculated by multiplying the total above ground biomass with 0.26. The mean of below ground biomass is 6.55 Mg ha^{-1} varied across the sampled plots between 0.95- 32.10 Mg ha^{-1} (Table 2) and accounts for 760.5 Mg.

Table 1. List of tree species encountered in the present study.

S. No.	Name of the Species	Family	No. of tree individuals in all inventoried plots
1	*Acacia auriculiformis* Benth	Fabaceae - Mimosoideae	1
2	*Acacia nilotica* (L.) Deliles	Fabaceae - Mimosoideae	47
3	*Aegle marmelos* (L.) Correa	Rutaceae	3
4	*Ailanthus excelsa* Roxb.	Simaroubaceae	1
5	*Albizia lebbeck* (L.) Benth	Fabaceae - Mimosoideae	164
6	*Albizia amara* (Roxb.) B.Bovin	Fabaceae - Mimosoideae	2
7	*Alstonia scholaris* (L.) R. Br.	Apocynaceae	67
8	*Annona squamosa* L.	Annonaceae	3
9	*Azadirachta indica* A.Juss.	Meliaceae	1562
10	*Bambusa arundinacia* (L.) Voss.	Poaceae	1
11	*Borassus flabellifer* L.	Arecaceae	220
12	*Carica papaya* L.	Caricaceae	8
13	*Casuarina equisitifolia* L.	Casuarinaceae	14
14	*Ceiba pentandra* (L.) Gaertn	Malvaceae	2
15	*Citrus aurantifolia* (Christm) Swingle	Rutaceae	1
16	*Cocos nucifera* L.	Arecaceae	504
17	*Cordia dichotoma* G.Forst	Boraginaceae	6
18	*Dalbergia sissoo* DC.	Fabaceae - Faboideae	7
19	*Delonix regia* (Hook.) Raf.	Fabaceae - Caesalpinioideae	85
20	*Dendrocalamus strictus* (Roxb.) Nees.	Poaceae	7
21	*Eucalyptus camaldulensis* Dehnh.	Myrtaceae	135
22	*Ficus benghalensis* L.	Moraceae	106
23	*Ficus racemosa* L.	Moraceae	5
24	*Ficus religiosa* L.	Moraceae	105
25	*Gliricidia sepium* (Jacq.) Walp.	Fabaceae - Faboideae	3
26	*Hardwickia binata* Roxb.	Fabaceae - Caesalpinioideae	1
27	*Holoptelea integrifolia* Planch.	Ulmaceae	1
28	*Lannea coromandelica* (Houtt.) Merr.	Anacardiaceae	1
29	*Lawsonia inermis* L.	Lythraceae	4
30	*Leucaena leucocephala* (Lam.) de Wit	Fabaceae - Mimosoideae	241
31	*Limonia acidissima* Groff	Rutaceae	1
32	*Mangifera indica* L.	Anacardiaceae	5
33	*Manilkara zapota* (l.) P.Royen	Sapotaceae	1
34	*Melia azadirach* L.	Meliaceae	9
35	*Millingtonia hortensis* L.f.	Bignoniaceae	10
36	*Morinda pubescens* Sm.	Rubiaceae	4
37	*Moringa oleifera* Lam.	Moringaceae	58
38	*Murraya koenigii* (L.) Spreng	Rutaceae	1
39	*Nyctanthes arbor-tristis* L.	Oleaceae	1
40	*Peltophorum pterocarpum* (DC.) K.Heyne	Fabaceae - Caesalpinioideae	131
41	*Phoenix sylvestris* (L.) Roxb.	Arecaceae	7
42	*Phyllanthus emblica* L.	Euphorbiaceae	5
43	*Pithecellobium dulce* (Roxb.) Benth	Fabaceae - Mimosoideae	26
44	*Plumeria alba* L.	Apocynaceae	3
45	*Polyalthia longifolia* (Sonn.) Thwaites	Annonaceae	57
46	*Pongamia pinnata* (L.) Pierre	Fabaceae - Faboideae	428
47	*Prosopis cineraria* (L.) Druce	Fabaceae - Mimosoideae	7
48	*Psidium guavaja* L.	Myrtaceae	2
49	*Punica granatum* L.	Lythraceae	2
50	*Sapindus emarginatus* Vahl, Symb.	Sapindaceae	3
51	*Senna siamea* (Lam.) H.S.Irwin & Barneby	Fabaceae - Caesalpinioideae	46
52	*Syzygium cumini* (L.) Skeels	Myrtaceae	24
53	*Tamarindus indica* L.	Fabaceae - Caesalpinioideae	373
54	*Tectona grandis* L.f.	Verbenaceae	420
55	*Teminalia catappa* L.	Combretaceae	9
56	*Thespesia populnea* (L.) Sol. ex Correa	Malvaceae	64
57	*Ziziphus jujuba* Mill.	Rhamnaceae	10

Table 2. Category-wise tree density, basal area, volume, biomass and carbon stock.

Category	Sub category	TNI ha^{-1}	Basal area (m^2 ha^{-1})	Volume (m^3 ha^{-1})	Above ground biomass (t ha^{-1})	Below ground biomass (t ha^{-1})	Total tree biomass (t ha^{-1})	Carbon (t ha^{-1})
Settlements	Village	47.81	6.42	46.80	46.75	12.15	39.77	18.89
	Town	62.15	8.09	64.10	64.10	16.67	54.08	25.69
Agriculture	Field Bund	35.83	3.46	24.75	24.72	6.43	21.21	10.078
Mean		43.22	5.08	37.28	25.21	6.55	31.77	15.09

Table 3. Biomass and carbon stock of TOF (Scattered) of Prakasam district.

Category	Sub category	Estimated TOF area (ha^{-1})	Sampled area	Mean biomass	Extrapolated biomass (tons)	Carbon stock
Settlements	Village	993.55	43	703.143	39706.58	18860.62
	Town	1085.22	13	1710.274	58770.21	27915.84
Agriculture	Field bund	31.5	60	1273.066	10051.04	4774.24
Sub total		2110.27	116	-	-	51550.71 (0.0515 Mt)

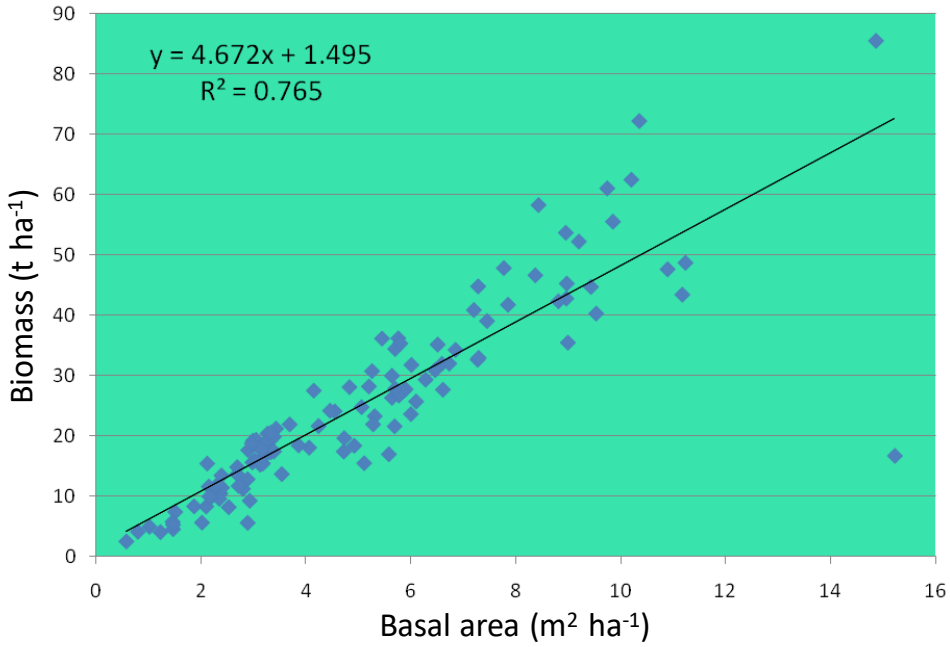


Fig. 1: Correlation between basal area (m^2 ha^{-1}) and biomass (t ha^{-1}) of ≥10 cm diameter of trees sampled in scattered plots.

Total tree biomass

The total tree biomass density is 31.77 Mg ha^{-1} varies between 4.59 – 155.57 Mg ha^{-1} in the plots sampled (Table 2) and accounts for 3685.6 Mg.

Carbon pool

The mean carbon pool density of the sampled plots is 15.09 Mg ha^{-1} ranges between 2.18 and 73.90 Mg ha^{-1} (Table 3). Total carbon pool for the sampled area (15.09 × 116 ha) = 1750.44 Mg.

In Andhra Pradesh, till date only two districts (Kurnool and Ananthapuramu) TOF biomass was worked out. When compared with Kurnool and Ananthapuramu district TOF (Ramesh, 2016; Kavitha, 2017), the scattered blocks represent is about 30% less in terms of area and number of individuals in Prakasam district. However, the mean carbon pool density is 15.09 t/ha for

Prakasam district is higher than Ananthapuramu district (9.56 t/ha), but lesser than Kurnool district, 28.0 t/ha.

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Conflict of interest statement

Authors declare that there is no conflict of interest in this work.

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Inventory of invasive alien plant taxa in gundla brahmeswaram wildlife sanctuary, Nallamalais, India: Implications for monitoring and management

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Abstract
Gundla Brahmeswaram wildlife sanctuary is invaded by many alien plant taxa which interfere with native biodiversity. It is highly important to explore the concerned problems caused by the intrusion of invasive plant taxa and to mitigate the impact on native diversity. To achieve this, the present study has taken up for the first of its kind and listed the 102 plant species representing 84 genera and 32 families. Of these, 54 plant species have their origin in Tropical America followed by many other parts of the world. The predominant family was Asteraceae with 23 plant species, followed by Fabaceae (12), Amaranthaceae (10), Convolvulaceae (7), Malvaceae (6), Euphorbiaceae, Lamiaceae, Solanaceae (4 each), Acanthaceae, Poaceae (3 each), Apocynaceae, Asparagaceae, Cleomaceae and Cuscutaceae (2 each). 18 families were contributed with single species each. The abundant and most serious invasive species were recognized in the sanctuary, namely, *Hyptis suaveolens*, *Lantana camara*, *Senna uniflora*, *Parthenium hysterophorus*, *Ageratum conyzoides*, *Waltheria indica*, *Chromolaena odorata*, *Mimosa pudica* and *Prosopis juliflora*, *Cuscuta* species. The present study calls for a standard, unique planning in early identification, spreading and infestation of invasive weeds and involve taxonomists, forest managers, ecologists to control and monitor.

Keywords: invasion - native diversity - monitor - control - management– wildlife sanctuary

Introduction

Invasive species are non-native which have the potential to threat many aspects such as environment, health and even economy. These are 'the second worst threat to native diversity in the planet earth' after habitat destruction (CBD 1992) [4], and they are severe threat to native biodiversity, habitat destruction and the greatest component of global climatic change (Khuroo *et al*. 2007, Pasha *et al*. 2014) [17, 26]. Alien species are recognized as of casual, naturalized and invasives (Richardson *et al*. 2000) [39]. The introduction of plants to a new place is an age old practice to human kind during migration and is enormously influenced by various factors such as cultural background, political history, extent of trade, etc. (Rhuiller *et al*. 2005, Bomford 2009, Reshi and Khuroo 2012) [2, 40, 38] and accidentally or intentionally happened through the crop seeds, or imported biota (Pimentel *et al*. 2000) [28]. The introduction and spread of non-native species can significantly alter the ecological functions of forest ecosystem and the primary productivity of plant taxa in time and space (Shah *et al*. 2012) [40]. Many indigenous species are threatened by competition and predation from invaders, while many other species are endangered by hybridization and ecosystem changes caused by alien species (Pimentel *et al*. 2005) [29]. Over 40% of the species on the list of threatened and endangered species are due to the invasive species only (Wilcove *et al*. 1998) [51]. Majority of the alien introduced species escape from cultivation, spread slowly and silently at initial stage, but become dominant and widespread at later stages to attain an invasive status in the introduced range and prove detrimental for the native biodiversity (Khuroo *et al*. 2008, 2010) [18, 16]. A large number of plants that are using today either for food, plantation or for ornamental purpose were deliberate introductions during post Columbian period, especially from tropical America (Purseglove 1969, Simmonds 1976, Ferra 1994) [31, 44, 9]. Invasive alien species (IAS) cause major environmental and economic problems in agriculture, forestry, and several other segments of the world economy; adversely affect ecosystem structure and function in habitats through the world by reducing native species, changing soil nutrient status, and altering geomorphological process (Pimentel *et al*. 2000, Mandal and Joshi 2014) [28, 21,]. It is estimated that in India alien species are causing 30% loss in potential crop production worth about US$ 90 billion per year (Kohli and Batish 1996) [19]. Native biodiversity have revealed that both the structural organization and the functional integrity of ecosystems are affected due to invasion by alien species. There is a growing catalogue of the potential impacts of invasive species on native species, wildlife habitats, disturbance regimes, and ecosystem services (Hiremath and Sundaram 2013, Simberloff *et al*. 2013, Foxcroft *et al*. 2014) [14, 43, 10] in worldwide. IAS not only pose a serious threat to native biodiversity but also influence serious consequences for the ecology, economy, public health and biosecurity of the countries involved (Pejchar and Mooney

2009) [27]. Invasive species are able to take more rapid advantage of available resources and at the same time use nutrients more efficiently in low resource environments, when compared with native species (Funk and Vitousek 2007) [11]. Invasive species typically produce large numbers of fruits thus enabling them to exert propagule pressure, both in space (by widespread dissemination or abundant plantings) and time (by long history of cultivation) (Pumberton and Liu 2009, Bucharova and van Kleunen 2009) [30, 3]. The importance of invasive species is underlined by Article 8(h) of the Convention on Biological Diversity (CBD 2002) which asks for measures to prevent the introduction, control or even root out of those alien species which threatens ecosystems, habitats or species. Suthari *et al*. (2016) [48] called for the importance of invasive species documentation, monitoring, spread and implementation levels to control the impacts of invasive species. Weeds grow luxuriantly due to its production of more number of seeds.

The growth of weeds reduces the ground flora, sprouts, and palatable grass, and competes with local flora and inhibits the growth of other species due to its allelopathic effect. India is one of the mega diverse nations in the world with rich plant diversity and has a long history of introduction of exotic plant species to various parts of the nation due to unregulated transportation, quarantines from one place to another. These exotics are widespread in the country. The percentage of alien plant species is negatively correlated with native plant diversity (Liu *et al*. 2005) [20]. Many studies have been conducted on alien species and estimated that India has about 39% (Chatterjee 1940) [6], 40% (CBD 2005), 173 plant taxa are invasives which represent 1% of the Indian Flora (Reddy *et al*. 2008, Goyal and Arora 2009) [36, 13] and 20% or more and in many islands the proportion is 50% or more (Singh *et al*. 2010) [45]. Suthari *et al*. (Suthari *et al*. 2016) [48] documented 74 alien Asteraceae members and their intrusion, residence time in Telangana and Andhra Pradesh states. The problem of plant invasion needs global co-ordination for its effective monitoring and management (McNeely *et al*. 2011). Lack of data on alien species would make the economic and environmental information underestimation. Earlier, many workers provided catalogues of the invasive alien plant species in different parts of the country (Khuroo *et al*. 2007, Hiremath and Sundaram 2013, Suthari *et al*. 2016, Reddy *et al*. 2008, Singh *et al*. 2010, Sharma and Pandey 1984, Pandey and Parmar 1994, Rao and Murugan 2006, Bhatt *et al*. 2002, Jaryan *et al*. 2013, Naidu *et al*. 2015) [17, 14, 48, 36, 45, 41, 25, 35, 15, 24]. Ellis (1987) [8] recorded 743 plant taxa from Nallamalais region and documented in *Flora of Nallamalais* and Rao *et al*. (2007) [34] conducted floristic studies in the area and documented 1521 angiospermous plant taxa of which the 124 species of exotics. Of these, 27 species are endemic to Nallamalais (Reddy *et al*. 2006) [36]. The data on the impact of alien invasive plant species on ecosystem of protected area is sparse, so it is highly needed to estimate the range of threat to existing diversity, and there is no particular study on the inventory and effect of invasive alien plant taxa and ecological significance of Gundla Brahmeswaram wildlife sanctuary (GBWS). The present study focuses on the distribution and quantitative structure of alien invasive species and ecological consequences in Gundla Brahmeswaram wildlife sanctuary, Nallamalais, Andhra Pradesh, India.

Material and Methods

Study area

Our study was conducted at Gundla Brahmeswaram wildlife sanctuary, Andhra Pradesh which plays an important role in the maintenance of ecological balance and biological diversity in the Eastern Ghats. The sanctuary is located in Nallamalais region, the ranges of parallel hills integral to the Eastern Ghats. These hills stretch across parts of Kurnool, Mahabubnagar, Prakasam, Guntur and Kadapa districts. Gundla Brahmeswaram wildlife sanctuary is one of the biologically rich areas in Eastern Ghats, lies between 15°40′ to 15°89′N latitudes and 76°61′ to 78°09′E longitudes and situated in Gundla Brahmeswaram plateau of the central Nallamalais, south to the Nagarjunasagar-Srisailam Tiger Reserve which is the largest tiger reserve in India, spread over an area of 3600 sq km. The sanctuary is one of the oldest sanctuaries in Andhra Pradesh and was established in 1998 for its rich and diverse biota, is an off shoot of *Southern Eastern Ghats*, covering an area of 1194 sq km, supported by the tropical moist and dry deciduous forests and with a domain of rich habitat for many endangered flora and its associated fauna.

Methodology

A comprehensive list of invasive alien plant species from Gundla Brahmeswaram wildlife sanctuary based on the extensive field surveys conducted during the last five years (2014-2019) and the database compiled by after perusal of the available floristic literature dealing with the vascular flora of Andhra Pradesh. Data was collected through standard quadrat method by laying 31.62 × 31.62 m at random sampling method by covering core zone, buffer zones including water bodies and marshy areas (Suthari 2013) [46]. A total of 45 sample sites of which 15 in core areas, 15 in open degraded areas, and 15 in transition areas (edges) were laid in and around the protected area of Gundla Brahmeswaram wildlife sanctuary. The field surveys were resulted in generation of a master list of all plant taxa occurring in Gundla Brahmeswaram along with their family. The nativity of the plants using published information (Khuroo *et al*. 2007, Suthari *et al*. 2016a, Reddy *et al*. 2008, Singh *et al*. 2010, Jaryan *et al*. 2013) [17, 48,36,45, 15] and followed the website http://www.isws.in/invaisve.plant.of.india.php. The alien species were categorized into herbs, shrubs and climbers based on their growth-form with in the alien category, naturalized, noxious and interfering plant species have been recognized. Identification of the plant species was done with the help of standard floras (Rao *et al*. 2007, Cooke 1903, Gamble and Fischer 1915-1935) [34, 7, 12], e-floras, revisions and recent monographic studies of the taxa concerned. Nomenclature of the plant taxa was updated following *International Code of Nomenclature for Algae, Fungi, and Plants* (Shenzhen Code) (Turland *et al*. 2018) and www.theplantlist.org.

Results and Discussion

The present inventory on plant invasions documented 102 plant taxa in various regions of GBWS (Table 1). A total of 102 invasive alien plant species of GBWS has been documented, which are pertaining to 84 genera and 32 families. The scientific name, family, habit, nativity and category were provided in tabular form (Table 1). The plant populations which have the potential of individual growth and recruitment through seeds were treated as *naturalized*, while some species in disturbed areas which show adverse impact on native species categorized as

noxious. The noxious species are notorious and compete with local plant species for space, sunlight, nutrients, and harbor to pests which show harmful effects on native species. Some species are neither harmful nor noxious to indigenous vegetation but these plants interfere to the growth of the native species, these are categorized as *interfering* species in the present study (Table 1).

Of these alien species, 54 plant taxa have their origin in Tropical America, followed by Tropical Africa (12), Tropical South America (9), Mediterranean (3), Tropical Central America (3), Tropical North America (3), West Indies (3), Brazil (2), Europe (2), and Mexico and Central America (2). Only single invasive plant species reached the study area from various native ranges such as Afghanistan, Australia, Mascarene Islands, Mexico, Temperate South America, Tropical Central-South America, Tropical South-Eastern Africa, West Africa and Western Europe (Figure 1). Of 32 families having alien plant species, Asteraceae was the predominant family with 23 plant taxa, followed by Fabaceae (12), Amaranthaceae (10), Convolvulaceae (7), Malvaceae (6), Euphorbiaceae, Lamiaceae, Solanaceae (4 each), Acanthaceae, Poaceae (3 each), Apocynaceae, Asparagaceae, Cleomaceae and Cuscutaceae (2 each). 18 families such as Adiantaceae, Aizoaceae, Cactaceae, Cannabaceae, Nyctaginaceae, Onagraceae, Oxalidaceae, Papaveraceae, Passifloraceae, Pedaliaceae, Phyllanthaceae, Polygonaceae, Portulacaceae, Rubiaceae, Sapindaceae, Scrophulariaceae, Typhaceae and Zygophyllaceae were distributed with single species each within the sanctuary (Figure 2). Of the total plant invasions, 67 species were categorized as naturalized, 22 species as interfering and 8 species as noxious (Figure 3). The alien exotic weed herbs (84 species) and climbers (7 species) are the major menace in the sanctuary. During our field visits, we have observed abundant populations of alien weeds in peripherals of the wildlife sanctuary. They species include *Hyptis suaveolens*, *Lantana camara*, *Senna uniflora*, *Parthenium hysterophorus*, *Ageratum conyzoides*, *Waltheria indica*, *Chromolaena odorata*, *Mimosa pudica* and *Prosopis juliflora*, *Cuscuta* species (stem parasite). Even in the core areas of the sanctuary some of the invasive species such as *Hyptis suaveolens*, *Ageratum conyzoides*, *Waltheria indica*, *Bidens pilosa*, *Alternanthera paronychioides* were found. These noxious weeds are rapidly distributed in the sanctuary due to their prolific seed production, light weight of seeds, seed dispersal through different factors, fast-spreading ability, allelopathic effect on other plants, strong competitiveness with indigenous species for nutrients, space, water, sun light and other sources. These species are major invaders and affect the distribution, abundance and reproduction of many indigenous species and cause loss of native biodiversity (Table 1). These can also alter the nutrient cycling, water table, fire regimes, Native vegetation, Availability of native diversity and wildlife populations, prevent recruitment of native species, ecological balance, etc.

Table 1: Inventory of plant invasions from gundla brahmeswaram wildlife sanctuary

	Plant taxon	Family	Habit	Nativity	Category
1	*Aeschynomene americana* L.	Fabaceae	Herb	West Africa	Naturalized
2	*Acacia farnesiana* (L.) Willd.	Fabaceae	Shrub	Tropical South America	Naturalized
3	*Acanthospermum hispidum* DC.	Asteraceae	Herb	Brazil	Naturalized
4	*Acmella paniculata* (Wall. ex DC.) R.K.Jansen	Asteraceae	Herb	Tropical South America	Naturalized
5	*Adiantum lunulatum* Burm.f.	Adiantaceae	Herb	Australia	Naturalized
6	*Aerva javanica* (Burm.f.) Juss. ex Schult.	Amaranthaceae	Herb	Tropical America	Naturalized
7	*Aerva lanata* (L.) Juss.	Amaranthaceae	Herb	Tropical Africa	Naturalized
8	*Agave americana* L.	Asparagaceae	Herb	Tropical America	Naturalized
9	*Agave vivipara* L.	Asparagaceae	Herb	Mexico and Central America	Naturalized
10	*Eupatorium glandulosum* Kunth	Asteraceae	Herb	Mexico and Central America	Naturalized
11	*Ageratum conyzoides* (L.) L.	Asteraceae	Herb	Tropical America	Noxious
12	*Alternanthera paronychioides* A.St.-Hil.	Amaranthaceae	Herb	Tropical America	Naturalized
13	*Alternanthera philoxeroides* (Mart.) Griseb.	Amaranthaceae	Herb	Tropical America	Naturalized
14	*Alternanthera pungens* Kunth	Amaranthaceae	Herb	Tropical America	Naturalized
15	*Alternanthera sessilis* (L.) R.Br. ex DC.	Amaranthaceae	Herb	Tropical America	Naturalized
16	*Amaranthus spinosus* L.	Amaranthaceae	Herb	Tropical America	Naturalized
17	*Antigonon leptopus* Hook. & Arn.	Polygonaceae	Climber	Tropical America	Noxious
18	*Argemone mexicana* L.	Papaveraceae	Herb	Tropical Central-South America	Noxious
19	*Bidens pilosa* L.	Asteraceae	Herb	Tropical America	Naturalized
20	*Blumea lacera* (Burm.f.) DC.	Asteraceae	Herb	Tropical America	Interfering
21	*Boerhavia diffusa* L.	Nyctaginaceae	Herb	Tropical South-Eastern Africa	Naturalized
22	Car*diospermum halicacabum* L.	Sapindaceae	Climber	Tropical America	Naturalized
23	*Calotropis gigantea* (L.) Dryand.	Apocynaceae	Shrub	Tropical Africa	Interfering
24	*Calotropis procera* (Aiton) Dryand.	Apocynaceae	Shrub	Tropical Africa	Interfering
25	*Celosia argentea* L.	Amaranthaceae	Herb	Tropical Africa	Naturalized
26	*Chamaesyce hirta* (L.) Millsp.	Euphorbiaceae	Herb	Tropical America	Naturalized
27	*Chloris elata* Desv.	Poaceae	Herb	Tropical America	Naturalized
28	*Chromolaena odorata* (L.) R.M.King & H.Rob.	Asteraceae	Shrub	Tropical America	Interfering
29	*Chrozophora rottleri* (Geiseler) A.Juss. Ex Spreng.	Euphorbiaceae	Herb	Tropical Africa	Naturalized
30	*Cleome gynandra* L.	Cleomaceae	Herb	Tropical America	Naturalized
31	*Cleome viscosa* L.	Cleomaceae	Herb	Tropical America	Naturalized
32	*Convolvulus arvensis* L.	Convolvulaceae	Herb	Europe	Naturalized

33	*Corchorus aestuans* L.	Malvaceae	Herb	Tropical America	Naturalized
34	*Croton bonplandianus* Baill.	Euphorbiaceae	Herb	Temperate South America	Naturalized
35	*Cuscuta chinensis* Lam.	Cuscutaceae	Herb	Mediterranean	Interfering
36	*Cuscuta reflexa* Roxb.	Cuscutaceae	Climber	Mediterranean	Interfering
37	*Cynodon dactylon* (L.) Pers.	Poaceae	Herb	Tropical Africa	Naturalized
38	*Cyperus iria* L.	Poaceae	herb	Tropical America	Naturalized
39	*Datura metel* L.	Solanaceae	Herb	Tropical America	Interfering
40	*Echinops echinatus* Roxb.	Asteraceae	Herb	Afghanistan	Naturalized
41	*Eclipta prostrata* (L.) L.	Asteraceae	Herb	Tropical America	Naturalized
42	*Emilia sonchifolia* (L.) DC. ex DC.	Asteraceae	Herb	Tropical America	Naturalized
43	*Evolvulus alsinoides* (L.) L.	Convolvulaceae	Herb	Tropical America	Naturalized
44	*Evolvulus nummularius* (L.) L.	Convolvulaceae	Herb	Tropical America	Naturalized
45	*Flaveria trinervia* (Spreng.) C.Mohr	Asteraceae	Herb	Tropical Central America	Naturalized
46	*Galinsoga parviflora* Cav.	Asteraceae	Herb	Tropical America	Naturalized
47	*Gnaphalium coarctatum* Willd.	Asteraceae	Herb	Tropical America	Interfering
48	*Gomphrena serrata* L.	Amaranthaceae	Herb	Tropical America	Naturalized
49	*Grangea maderaspatana* (L.) Poir.	Asteraceae	Herb	Tropical South America	Naturalized
50	*Hyptis saveolens* (L.) Poit.	Lamiaceae	Herb	Tropical America	Interfering
51	*Indigofera astragalina* DC.	Fabaceae	Herb	Tropical America	Naturalized
52	*Ipomoea obscura* (L.) Ker Gawl.	Convolvulaceae	Climber	Tropical America	Naturalized
53	*Ipomoea carnea* Jacq.	Convolvulaceae	Shrub	Tropical America	Naturalized
54	*Ipomoea hederifolia* L.	Convolvulaceae	Climber	Tropical America	Naturalized
55	*Lantana camara* L.	Lamiaceae	Shrub	Tropical America	Noxious
56	*Leonotis nepetifolia* (L.) R.Br.	Lamiaceae	Herb	Tropical Africa	Interfering
57	*Lagascea mollis* Cav.	Asteraceae	Herb	Tropical Central America	Noxious
58	*Mikania micrantha* Kunth	Asteraceae	Climber	Tropical America	Noxious
59	*Mimosa pudica* L.	Fabaceae	Herb	Brazil	Naturalized
60	*Ludwigia adscendens* (L.) H.Hara	Onagraceae	Herb	Tropical America	Naturalized
61	*Martynia annua* L.	Pedaliaceae	Herb	Tropical America	Interfering
62	*Melochia corchorifolia* L.	Malvaceae	Herb	Tropical America	Interfering
63	*Merremia dissecta* (Jacq.) Hallier f.	Convolvulaceae	Herb	Tropical America	Naturalized
64	*Ocimum americanum* L.	Lamiaceae	Herb	Tropical America	Naturalized
65	*Opuntia stricta* (Haw.) Haw.	Cactaceae	Herb	Tropical America	Noxious
66	*Oxalis corniculata* L.	Oxalidaceae	Herb	Europe	Naturalized
67	*Parthenium hysterophorus* L.	Asteraceae	Herb	Tropical North America	Noxious
68	*Passiflora foetida* L.	Passifloraceae	Climber	Tropical South America	Interfering
69	*Peristrophe paniculata* (Forssk.) Brummitt	Acanthaceae	Herb	Tropical America	Interfering
70	*Phyllanthus tenellus* Roxb.	Phyllanthaceae	Herb	Mascarene Islands	Naturalized
71	*Physalis angulata* L.	Solanaceae	Herb	Tropical America	Interfering
72	*Portulaca oleracea* L.	Portulacaceae	Herb	Tropical South America	Naturalized
73	*Prosopis juliflora* (Sw.) DC.	Fabaceae	Shrub	Mexico	Naturalized
74	*Pupalia lappacea* (L.) Juss.	Amaranthaceae	Herb	Tropical Africa	Interfering
75	*Ricinus communis* L.	Euphorbiaceae	Shrub	Tropical Africa	Interfering
76	*Ruellia longifolia* (L.) Roxb.	Acanthaceae	Herb	Tropical America	Interfering
77	*Ruellia tuberosa* L.	Acanthaceae	Herb	Tropical America	Naturalized
78	*Scoparia dulcis* L.	Scrophulariaceae	Herb	Tropical America	Naturalized
79	*Senna absus* (L.) Roxb.	Fabaceae	Herb	Tropical America	Naturalized
80	*Senna alata* (L.) Roxb.	Fabaceae	Herb	West Indies	Interfering
81	*Senna obtusifolia* (L.) H.S.Irwin & Barneby	Fabaceae	Herb	Tropical America	Naturalized
82	*Senna occidentalis* (L.) Link	Fabaceae	Herb	Tropical South America	Interfering
83	*Senna tora* (L.) Roxb.	Fabaceae	Herb	Tropical South America	Naturalized
84	*Senna uniflora* (Mill.) H.S.Irwin & Barneby	Fabaceae	Herb	Tropical South America	Interfering
85	*Sida acuta* Burm.f.	Malvaceae	Herb	Tropical America	Naturalized
86	*Solanum americanum* Mill.	Solanaceae	Herb	Tropical America	Interfering
87	*Solanum torvum* Sw.	Solanaceae	Shrub	West Indies	Naturalized
88	*Solidago canadensis* L.	Asteraceae	Herb	Tropical North America	Naturalized
89	*Sonchus asper* (L.) Hill	Asteraceae	Herb	Mediterranean	Interfering
90	*Spermacoce articularis* L.f.	Rubiaceae	Herb	Tropical America	Naturalized
91	*Synedrella nodiflora* (L.) Gaertn.	Asteraceae	Herb	West Indies	Naturalized
92	*Trema orientalis* (L.) Blume	Cannabaceae	Herb	Tropical Africa	Naturalized
93	*Trianthema portulacastrum* L.	Aizoaceae	Herb	Tropical Africa	Interfering
94	*Tribulus lanuginosus* L.	Zygophyllaceae	Herb	Tropical America	Naturalized
95	*Tridax procumbens* (L.) L.	Asteraceae	Herb	Tropical Central America	Naturalized
96	*Triumfetta rhomboidea* Jacq.	Malvaceae	Herb	Tropical America	Naturalized

97	*Typha angustata* L.	Typhaceae	Herb	Tropical America	Interfering
98	*Ulex europaeus* L.	Fabaceae	Shrub	Western Europe	Interfering
99	*Urena lobata* L.	Malvaceae	Shrub	Tropical Africa	Naturalized
100	*Waltheria indica* L.	Malvaceae	Herb	Tropical America	Naturalized
101	*Xanthium strumarium* L.	Asteraceae	Herb	Tropical North America	Interfering
102	*Youngia japonica* (L.) DC.	Asteraceae	Herb	Tropical South America	Naturalized

Total area surveyed for alien plant species was 4.5 ha by laying quadrats with a size of 31.62 × 31.62 m

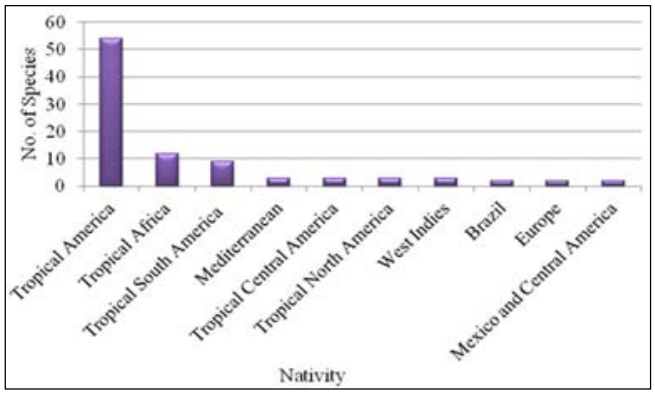


Fig 1: Top five native regions of invasive species documented from GBWS

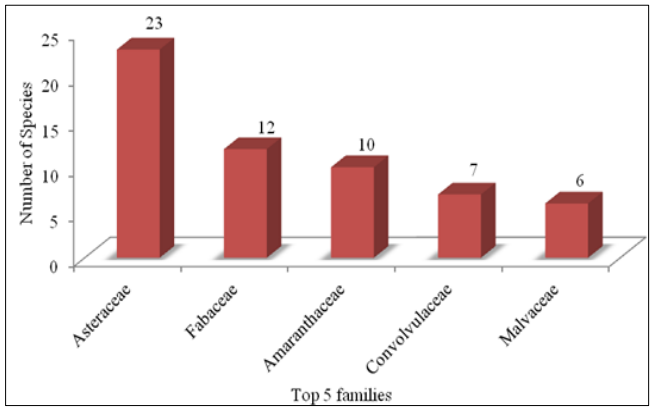


Fig 2: Families accounting for >5 invasive species in Gundla Brahmeswaram wildlife sanctuary, Nallamalais

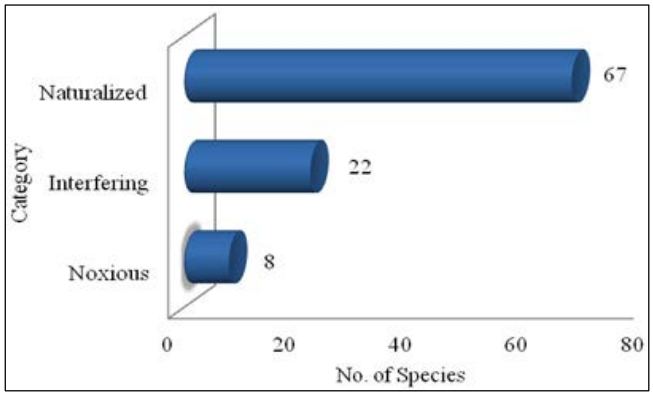


Fig 3: Three various categories of invasive plant taxa in GBWS

Monitoring and Management

Forests are the living resource base for sustenance of its inhabitants besides serving as a storehouse of biodiversity. India is the seventh largest and one of the 17 mega diversity countries of the world and accounts with just 2.5% of the total land area having 7.8 % of the recorded species and 668 Protected Areas account for about 4.9 % of the country's geographic area (Raju *et al*. 2010) [33]. Habitat destruction is the single greatest threat to native biodiversity followed by introduction of alien species (CBD 1992) [4]. Habitat destruction is caused due to agricultural practices, land conversions, grazing of livestock, mining activities, logging, developmental activities (roads/tracks/reservoirs/dams construction), outdoor recreation, pollutants, disruption of fire ecology, military activities, establishment of new towns/cities, etc. Invasive alien species are emerging as one of the major threats to sustainable development. The global extent and rapid increase in invasive species is homogenizing the world's flora and fauna (Mooney and Hobbs 2000) [23] and is recognized as a primary cause of global biodiversity loss. In most of the areas of the existing ecosystems are already degraded due to anthropogenic pressure leading to the creation of habitats suitable for colonization by exotics. This has paved the way for successful invasion of the forest areas by alien plants.

The increasing population and luxurious growth made competition on the native species. In earlier, weeds are grown in waste and degraded open areas but now they are common in crop and forest lands including protected areas due to uncontrolled measures by the authorities and lack of awareness. Monitoring is highly important in the invasive species management to determine the early detection of invasive species, spread and impact of exotic plants on native species. Invasive alien species are a worldwide problem and have variability and plasticity. These cannot be eradicated without the cooperation at international, national, regional, transboundary and local levels. Simberloff (2002) [42] recognized four main methods to eradicate the invasions, namely, mechanical control, chemical control, biological control and cultural control. The *physical and mechanical control* includes hand removal, tillage, deep ploughing, discing, mowing, sickling, grazing, burning, digging, mulching and summer fallow where in *chemical control*, it is the application of chemicals, i.e. soil application, foliar application. e.g. triazones, aniline, 2,4-D, atrazine, glyphosate, etc. Other mode of control is *biological* in which living organisms (bioagents) can be utilized to eradicate weeds (e.g. moths, some insects) while *cultural control* is basically associated with farming systems (Figure 5). Locally, the mechanical removal of these species before flowering and fruiting is most suitable and effective. This process may last for four to five years to eradicate the invasions completely. There is a need to improve the native species growth, reintroduction of native species for the restoration of indigenous vegetation to mitigate negative impacts of invasive alien species in the region. Chemical control is expensive and also shows effect on native useful plants, these chemicals may enter the plant body to living beings through food chain. Regular monitoring and biological control are the main processes for the eradication. The invasions prevent the growth

of grasses and herbaceous layer which lead to unpalatable to wild and domestic animals. Unbridled urbanization, agricultural expansion, unsustainable livestock grazing, unregulated introduction of alien plants for ornamental and plantation purposes, unplanned road construction, rapid development of tourism, clearing of open lands, etc. are also major causes for the intrusion of plant invasions. Apart from these, a '4Ps' formula strategy was also evolved for the management of invasive alien species, namely, prediction, prevention, prescription and public awareness. Public awareness about the economic, ecological, and health risks from invasives is essential for successful implementation of policy and enforcement. It is mandate to prevent the invasives to protect the native biodiversity. The local people are to be educated about the negative impacts of IAS to their agricultural crops and NTFPs extraction from the local forests. The Government of India has to develop a national level policy towards the control of invasive alien species and implement it at the earliest before we lose our indigenous biodiversity once for all (Suthari *et al*. 2016b) [48].

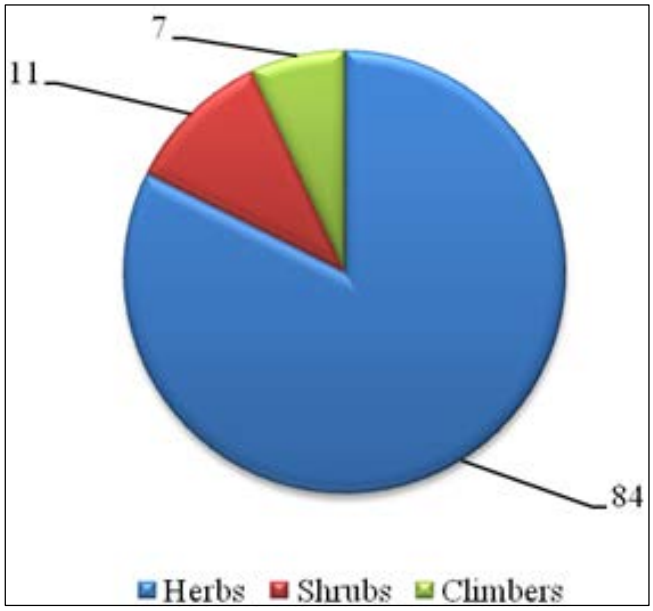


Fig 4: Number of plant invasive species under growth-form categories from GBWS

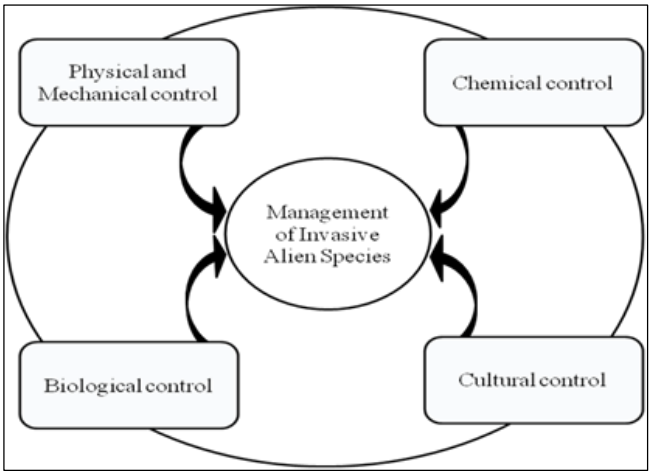


Fig 5: Integrated invasive species management

Conclusions

Early detection and rapid response activities are crucial ingredients of management programmes developed for invasives species. A comprehensive inventory of alien species needs to be formulated and launched. Introduction pathways and vectors of alien species need to be detected and necessary modeling approaches such as remote sensing (RS), geographical information systems (GIS) need to be undertaken. It is very important to utilize the newly emerging technologies and approaches for effective management of these alien species.

Regular surveillance, systematic removal and monitor the impact of invasive species on native biodiversity are very important aspects for the control of invasives. For the effective control, needs cooperation from local people, non-governmental, voluntary organizations, weed interest groups and the government should also create awareness among people about problems associated with these invasive species. For the effective prevention and management practices, also follow GISP (the Global Invasive Species Programme) toolkit which comprises 4 stages, namely, prevention, early detection, eradication and control (Wittenberg and Cock 2001) [52]. More taxonomic research is needed for the proper identification, documentation, monitoring and for the collection of baseline species data. Specific trainings should also be conducted for the identification tools, collection, monitoring techniques. Awareness programmes to be raised in various localities, communities, educational institutions through pamphlets, seminars, group discussions, print and electronic mass media and social network groups. There is also a need to build research networks throughout the world, nation or state, regional level that incorporate risk assessment and risk management of invasive species. Foresters, environmentalists, field researchers and conservation managers are need to pay urgent attention on the ecological impact of invasive exotics both at the species and at the ecosystem levels. The decisions need to be made on whether benefits derived from the invasive spread of an exotic species outweigh the reduced value of ecosystem services, e.g. the loss of grazing land in areas invaded with *Prosopis juliflora*. A better planning is needed for early detection and reporting of infestations of spread of new and naturalized weeds by creation of Plant Detection Network in each State by establishing communication links between taxonomists, ecologists and forest managers to monitor and control (Pyšek *et al*. 2004) [32].

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Disclosure Statement

No potential conflict of interest was reported by the authors.

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Review Article
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Phytochemical Screening and Antioxidant activity of aqueous extract Of *Allophylus serratus* fruit.

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Abstract: The present work aimed to determine the quantitative screening of phytochemicals and Antioxidant activity of *Allophylus serratus* fruit aqueous extract (A.S.Fr.). Results showed the presence of phenolic compounds, flavonoids, alkaloids, phenols and proteins in the extract and showed antioxidant capacity with high amounts of Total phenolic content (63.60 ± 0.88 mg $GAEg^{-1}$), Total flavonoid content (44.51 ± 0.46 mg QEg^{-1}). The radical scavenging activity measurement, done by DPPH assay (EC_{50} = 29.24 ± 0.18 µg/mL) and ABTS assay (EC_{50} = 21.64 ± 1.35 µg/mL) revealed that, fruits of *Allophylus serratus* found to be potential source of natural antioxidants and therefore, recommended for utilization as natural nutritional supplemented medicine which supported the traditional claim by herbal healers.

Keywords: *Allophylus serratus,* Aqueous extract, Antioxidant Activity,

Introduction

Phytochemical processing of raw plant material is essentially requisite to optimize the concentration of known constituents and also to maintain their activities. Recently, interest has noticeably amplified in finding naturally occuring antioxidant to replace synthetic antioxidants (Benabdallah *et al*., 2016). Nutraceutical and herbal medicine prominence is typically allied to their antioxidant power, which can be determined by spectrophotometric methods that can be influenced by phytocompounds which demonstrate antioxidant behavior (Oliveira Neto *et al*., 2017; Leite *et al*., 2018).

Awareness of medicinal plant usage is a result of the many years of struggle against diseases and man learned to pursue drugs in barks, seeds, fruits, and other parts of the plants (Srivastava, 2018). By combining the knowledge derived from traditional medicinal practices with modern science, the possibilities for drug discovery and use of plants in the treatment of wide array of conditions seems endless (Reid *et al*., 2018). In a way to find the substitute of synthetic anti-oxidant drugs and after perusal of literature and by enquiring traditional therapists, Village vaidyas, Ayurvedic physicians, it was found that some of the local plants were used as medicine in different dosage, with admixtures of other material for protection against oxidative stress, body abnormalities, Lithergic conditions, Indigestion, constipation etc., without knowing the hidden biomolecules which act inside the body. It is interesting to document and reveal the bio constituents and its antioxidant potency in the naturally available sources.

In our recent Medicobotanical studies conducted during (2016-2018) around Sri Kalahasti area of Chittoor dt. in Rayalaseema region the Natu-Vaidhyas, Village herbalists, Traditional herbal

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healers claimed that *Allophylus serratus* fruits in decoction form were prescribed as a multifaceted drug and prominent natural remedy for strength adding gastric ailments, stress related, against heat and for other digestion complication. For the determination of this claim we here in this research, fruits of *Allophylus serratus* of Sapindaceae family for its biochemical analysis and antioxidant potentiality.

Materials and Methods

Collection and identification of plant material

Identification of the *Allophylus serratus* was done by Dr.K.Madhava chetty, Plant Taxonomist, Sri Venkateswara University, Tirupati and Voucher specimen deposition (SVUTY/ ARD/ 3744) was done in the Herbarium, Department of Botany, Sri Venkateswara University, Tirupati. The fruiting stage of *A. serratus* is shown in Figure 1.

Seeds and skins of the mature fruits of *A.serratus* were removed, and the pulps were dried in a convection oven at 50°C for one week.



Figure 1 : **A.** Habitat of *Allophylus serratus*



Figure 1 : **B**. Mature fruits of *A.serratus*

A.serratus pulps (2 kg approx.,) were extracted with 95% EtOH at 60°C for 4 h, and the extract was evaporated under reduced pressure to yield a dark brown residue (55g). The residue was suspended in water were carried out to evaluate the Phytochemicals and antioxidant potency.

Preliminary Phytochemical Analysis

The fruit extract was subjected to qualitative phytochemical analysis for determination of major biochemical ingredients using standard methods (Harborne 1984; Stahl 1989; Raaman, 2006) with slight assay modifications followed by Mahendranath *et al*., (2013 & 2014).

Estimation of flavonols (TFLC)

Total flavonols was appraised using Aluminum chloride assay as described by (Manipal *et al*., 2017). The absorbance of triplicate mixtures was read at 440 nm and results were expressed as equivalents of Quercetin in mg QE/g dry weight.

Estimation of proanthocyanidins (Tp)

The value of proanthocyanidin was estimated based on the procedure described by Unuofin *et al*., (2017) with a minor modification.

Condensed tannins (CT)

Total tannins were determined according to Rebaya *et al.* (2015).

Protein content

Estimation of Protein content was determined by Horowitz (2000) and followed according to Aliakbarkhani *et al*., (2018).

Total phenolic content (TPC)

Quantification of phenolic compounds determined according to the method of Folin-Ciocalteu (FC) (Singleton et al., 1999; Yorulmaz and Konuskan, 2017) with slight modification. Briefly, 5gm of crude extract diluted at 1:20 with methanol : water (6:4) was mixed with 1.2 mL of 7.5% Na_2CO_3 and 1.5 mL of Folin–Ciocalteu reagent diluted in the ratio of 1:10. After incubi-

tion in the dark at 25°C for 2 h, the absorbance of the reaction mixture was measured at 760 nm against a methanol blank using a UV-VIS Spectrophotometer (Hitachi U-1900, Japan). All measurements were made in triplicateS. Gallic acid (0–1000 mg/L) was used as a standard to derive the calibration curve. The phenol contents were expressed in terms of milligrams of gallic acid equivalent per gram of dry weight (mg GAE/g DW) (Ali *et al*., 2014; Limmongkon *et al*., 2017).

Total flavonoid content (TFC)

Total flavonoid contents were measured according to the Aluminum chloride ($Alcl_3$) colorimetric method (Chang *et al.,* 2002). Total flavonoid contents were expressed as mg catechin equivalents per gram (mgCA/g) through the calibration curve with catechin. The calibration curve range was 50–400 mg/mL. The calibration curve was made by preparing quercetin solutions at different concentrations.

Antioxidant Activity

The antioxidant power of the crude extract of *A.serratus* pulps were evaluated by DPPH, ABTS, and EC_{50} values are the effective concentration in which DPPH and ABTS radicals were scavenged by 50% and are often used to evaluate the antioxidant power (Brand-Williams *et al.,* 1995; Shimada *et al.,* (1992); Oliveira-Neto *et al*., (2017). EC_{50} values of the extract, fractions and BHT tested at the same condition are listed in Table 1.

The antioxidant activity was determined according the equation mentioned below:

$$\textbf{Antioxidant activity}\ (\%) = (A_{control} - A_{sample}/A_{control}) \times 100$$

where $A_{control}$ is the absorbance of the control reaction and A_{sample} is the absorbance of the tested sample. The concentration of extract that could scavenge 50% of the DPPH radicals (IC_{50}) was calculated. Trolox and Butylhydroxyl toluene (BHT) were used as positive control.

Results and Discussion

Preliminary phytochemical analysis

The qualitative phytochemical screening of the extract revealed the presence of Alkaloids, Anthocyanins, Flavonoids, Indoles, Steroids, Carbohydrates, Phenols, Proteins, Saponins, Lignins (Table 1).

Table 1. Preliminary Phytochemical screening

S.No.	Phytocompound	Result
1.	Alkaloids	+++
2.	Flavonoids	+++
3.	Indoles, Terepenoids	-
4.	Anthocyanins	++
5.	Steroids	+
6.	Carbohydrates	++
7.	Phenols	+++
8.	Proteins	+++
9.	Saponins	++
10.	Lignins	++

Quantitative analysis of antioxidants

The results for antioxidants of *A.serratus* (mean ± standard deviation) were tabulated (Table : 2).

Table 2. Antioxidant compounds

Variable	Quantity
TPC (mg GAE/gDW)	63.60 ± 0.88
TFC (mg QE/gDW)	44.51 ± 0.46
TFl.C (mg QE/gDW)	24.69 ± 0.24
TP (mg CA/gDW)	26.16 ±1.42
CT (mg RU/gDW)	22.36 ± 1.06

Equivalent's: RU = Rutin, CA = Catechin, GAE = Gallic acid equivalent, QE = Quercetin. The data represent the mean ±SD of triplicate assay for each sample.

Table 3: Estimation of pH, Moisture, Sugar value

Variable	Quantity
pH	6.4 ± 0.8
Protein Content (g 100-1 g)	49.84 ± 2.44
Moisture content (g 100-1 g)	89.62 ± 2.42
Sugar content (g 100 g-1 DW)	72.4 ± 4.02

Table 3 represents estimation of pH, Moisture, Sugar value expressed in g 100 g^{-1} DW of the extract.

The total phenolic content (TPC) of the extract was 63.60 ± 0.88 mg gallic acid equivalent/g dry weight. The total flavonoid content (TFC) of the extract was 44.51 ± 0.46 mg of quercetin equivalent/g dry weight. The tannin content (CT) was 22.36 ± 1.06mg rutin equivalent/g dry weight. The ascorbic acid content of the extract was 19.62 g/g dry weight of extract.

DPPH and ABTS assay (IC_{50} Value)

DPPH and ABTS assay can measure antioxidant capacity of lipophilic and hydrophilic compounds in the same sample which are very simple, inexpensive and usually employed methods for the determination of antioxidant activity and can give reproducible results (Iqbal *et al.,* 2015).

The results were expressed using the term IC_{50}. The lower the IC_{50} is the higher antioxidant capacity (Brand-williams *et al.,* 1995, Noreen *et al.*,2017). The results show that DPPH value (IC_{50}) as 29.24 ± 0.18 (µg/mL) and 21.64 ± 1.35 for ABTS showed lower scavenging ability on DPPH and ABTS radicals when compared to the synthetic antioxidant BHT (IC_{50}= 23 µg/ml). However, for measuring the IC_{50}, reaction between DPPH free radical and antioxidant of *A. serratus* fruit achieved the steady state in 1&1/2 hr.

Other workers Bharat and Krishna (2017) attempted GC-MS analysis of young leaves of *A. serratus*. Chavan and Gaikwad (2016) studied Phytochemicals isolated from different parts of *A.serratus*. Some of the phytochemicals detected in a present study are well known about their bioactivities, fewer are known but little is known about their bioactivities while some are known but there are no reports on their biological activities.

The total antioxidant capacity of fruits of *A.serratus* may be changed via synergistic, additive, or antagonistic interactions among the phytochemical compounds present in the riped fruit. Pulps have provided phytochemical basis of the principal application to better understand the antioxidant power. This study revealed *Allophylus serratus* fruit aqueous extract (A.S.Fr.) contained high amounts of polyphenols, flavonoids and tannins contents and high antioxidant potential for producing specific health promoting antioxidants which could be attractive to the food or pharmaceutical industry. This edible botanic traditional application is proved to be a potent natural remedy.

Conclusions

In conclusion, by preliminary phytochemical and antioxidant activity screening of *Allophylus serratus* fruit correspond to a high source of natural therapeutic bioactive compounds as bonafied by herbals healers and village traditional physicians and was roved by our research. A further study for the analytical characterization of the biochemical profiles in vivo conditions is required to strengthen antioxidant abilities which may be used as antioxidant drugs and in natural therapies.

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Research Article

Antibacterial activity of four ethnobotanical drugs of Rayalaseema, Andhra Pradesh, India.

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Abstract: The study aimed to evaluate the antibacterial activity by crude aqueous extract of ethnobotanical drugs prepared and prescribed by ethnic healers of Rayalaseema region. Ethnic drugs prepared from whole plant parts of *Litsea deccanensis* (LD), *Atalantia racemosa* (AR), *Hiptage benghalensis* (HB) and *Lagerstroemia parviflora* (LP) at dosages of 25,50,75 mg/mL were tested against pathogenic bacteria (*Bacillus subtilis, Staphylococcus aureus, Escherichia coli* and *Klebsiella pneumonia)* using agar well diffusion technique. Results reported significant antibacterial effect at 50 & 75 mg/mL for all the drugs tested and recommend these crude drugs as antibacterial agents.

Keywords: Ethnobotanical drugs; Rayalaseema; Antibacterial activity.

Introduction

The existing antimicrobial agents depriving its potency and efficacy against new microbial evolution and resistance resulting need to optimize microbial infestations and its control by developing novel antimicrobial agents (Balouiri *et al.,* 2016; Mostafa *et al.,* 2018; Boakye *et al.,* 2019). The mining of novel antimicrobial agents from traditional medicinal plants is critically needed due to the surge in antimicrobial resistance in global health concerns and there is a vital need to replenish our arsenal of antimicrobial agents. Plant derived formulations proved to be historical pharmacopoeias with potential therapeutic properties with ample diversity of metabolites which act as antimicrobial agents (Valgas *et al.,* 2007; Sinha *et al.,* 2013; Dubey *et al.,* 2018; Elhidar *et al.,* 2019). In the vision of ethnic healing commodities, there are plenty of ethnic drugs prepared from the locally available plants setting up by varied formulation, dosage and citing precautions.

Research concerning the biological efficiency of whole plant crude drugs proposed by ethnic healers of rayalaseema were scarce which made to take up this investigation. Studies on the ethnobotanical crude drugs which were prepared from whole plant parts are not properly documented.

In the present paper, we have attempted to scientifically validate the ethnic antibiotic plant crude drugs prescribed and recommended by ethnic healers of Rayalaseema region of Andhra Pradesh.

Materials and Methods

Ethnobotanical exploration in Rayalaseema revealed few commonly used crude ethnobotanical drugs prescribed for different microbial infestations and for wounds. Data on ethnic plant drugs and its dosage, composition, applied conditions in intake were collected from different ethnobotanical healers and village

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vaidyas by interviews. we have selected four highly recommended crude drugs as prescribed by ethnic healers which were prepared by maceration and drying of whole plant parts (Root: stem: Leaf in 1:1:1 ratio) of *Litsea deccanensis* (LD), *Atalantia racemosa* (AR), *Hiptage benghalensis* (HB) and *Lagerstroemia parviflora* (LP). The plant taxa which were used in the drugs preparation was revealed by them and identified on critical examination thorough scrutiny of relevant taxonomic literature, flora's (Pullaiah *et al.,* 2007; Chetty *et al*., 2015). Voucher specimens of the identified taxa were deposited in the Herbarium, Department of Botany, Sri Venkateswara University, Tirupati.

Determination of Antibacterial Assay

In-vitro antibacterial activity of the crude aqueous extract was investigated against four bacterial strains (Gram positive - *Bacillus subtilis, Staphylococcus aureus;* gram negative bacteria- *Escherichia coli* and *Klebsiella pneumonia*) by the agar well diffusion method followed in various research studies (Perez *et al.*, 1990; Balouiri *et al.,* 2016; Valgas *et al.,* 2007; Oses *et al.,* 2016) with minor modifications. Mueller Hinton agar (MHA) (HiMedia, India) was used as the bacteriological medium. The MHA was melted and cooled to 48^{o}C-50^{o}C and a standardized inoculum (1.5×10^{8} CFU/mL, 0.5 McFarland standard) was then added aseptically to the molten agar and transferred into sterile Petri dishes to give a solidified plate. Four wells (6mm) were prepared in the seeded agar plate. The testing material (25 - 75 mg/mL) was introduced in the well accordingly and the seeded plates were incubated overnight at 37^{o}C. Bacterial zones of inhibitions were measured in mm (Kirby *et al.,* 1957). Commonly used antibiotics Ciprofloxacin (CF) (0.4 µg/mL) and Gentamycin (GM) (0.4 µg/mL) were considered for control and comparison was done with selected susceptibility testing methods were performed as recommended by CLSI (M07-A). The bacterial growth was assessed by a stereo microscope after the incubation period. All tests were done in triplicates and the mean value is scored.

Results and Discussion

In our observation, whole plant drugs are prominent in ethnic hamlet of rayalaseema tribal hamlets. Inorder to validate scientifically, and to evaluate the antibacterial activity by aqueous crude drug extracts prepared with whole plants of *L. deccanensis* (LD), *A. racemosa* (AR), *H. benghalensis* (HB) and *L. parviflora* (LP) were tested against gram positive (*B.subtilis, S.aureus)* and gram negative bacteria (*E.coli* and *K. pneumonia)* at 25 mg/mL, 50 mg/mL, 75 mg /mL. Results showed the inhibitory effect of aqueous extracts of the selected ethnobotanical drugs increased with increasing the concentration from 25 to 75 mg/mL. (Table 1; Fig. 1).

The antimicrobial spectrum of the drugs extract was determined in terms of zone sizes around each well (Fig. 1: A, B, C, D). The diameters of zone of inhibition produced by the drugs were compared with the zone diameter showed by the control Ciprofloxacin (CF) and Gentamycin (GM). Dose response of the crude drugs against pathogenic bacteria has been illustrated in Table 1. and Figure 1. The experiment was performed three times to minimize the error and the mean values are presented in Table 1.

In general, all the selected bacterial strains were highly susceptible at 75 mg/mL against all the four drugs (LD, AR, HB, LP) possessing great inhibitory effect whereas intermittently susceptible at 50mg/mL with less inhibitory effect. Three drugs LD, AR and HB showed good antibacterial effect for all the concentrations (25, 50 & 75 mg/mL). The drug LD formulated with *L. deccanensis* is found to be highly anti-bacterial agent among all the drugs. Bacterial strains *E. coli* and *B.subtilis* found to be resistant against LP at 25 mg/mL and are susceptible at 50 and 75 mg/mL only. Due to this, antibacterial activity of the drug prepared

from *L. parviflora* is very less and showed moderate antibacterial activity at 50 mg/mL. It is interesting to note that extracts were more effective against bacteria equal to the antibiotics CF and GM at 50 mg/mL. (Figure 1. A, B, C, D). The overall anti-bacterial effect (when compared with zone size of inhibition) for the four selected ethnic drugs were in the order: LD > AR > HB > LP in terms of activity when compared between them.

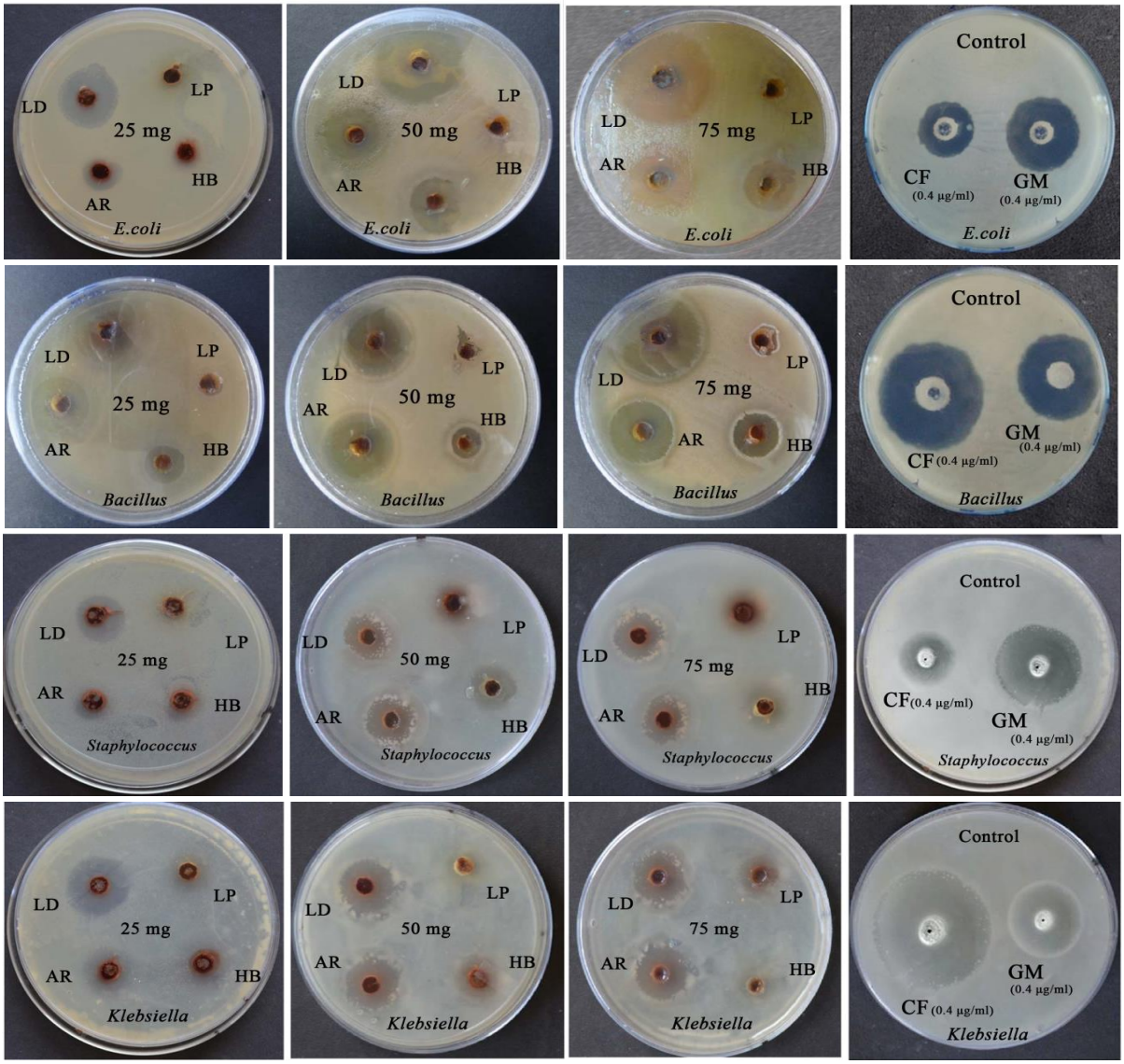


Figure 1. A, B, C, D. Illustrates antimicrobial activity of four selected ethnic drugs (LD, AR, HB, LP) at 25, 50, 75 mg/ml against pathogenic bacteria *E. coli, B. subtilis, K. pneumonia* and *S. aureus* were compared with standard antibiotics Ciprofloxacin (CF) & Gentamycin (GM).

In this experiment the tested product are crude drugs, where the rate of diffusion depended on its solubility as opined by Valgas *et al*., (2007). Previously, we have done comparative morpho anatomical studies of these four taxa (Naga Padmavathi *et al*., 2018; Naga Padmavathi and Madhavachetty, 2019). This promissory crude drug extracts which were prepared in equal ratio of vegetative parts of *L.deccanensis*, *A.racemosa*, *H.benghalensis* and *L.parviflora* laid the possibility of finding new clinically effective antibacterial compounds and ingredients. Additional research on these ethnic crude drugs prescribed by the tribal healers in rayalaseema region are necessary concerning the application of different extraction methods, isolation, purification of antibacterial compounds totestify and formulate the standard antimicrobial drugs.

Table 1: Antibacterial effect of ethnobotanical drugs of Rayalaseema

Bacteria	Conc. of extract mg/mL)	*Litsea deccanensis*	*Atalantia racemosa*	*Hiptage benghalensis*	*Lagerstroemia parviflora*
Escherichia coli	25	10.33±1.52	4.33±0.58	1.23±0.58	0
	50	13.64±2.08	8.82±0.58	4.32±1.15	1.22±0.58
	75	16.33±1.15	13.33±1.15	6.88±1.53	1.68±1.15
Bacillus subtilis	25	11.21±0.58	18.33±0.58	2.22±0.58	0
	50	15.14±1.15	8.33±0.58	3.22±0.58	1.2±1.15
	75	18.42±1.15	11.87±±1.15	4.3±0.58	1.6±1.15
Klebsiella pneumonia	25	6.67±1.15	4.83±0.58	1.7±0.58	5.33±1.15
	50	8.33±0.58	6.2±1.15	2.9±0.58	7.33±0.58
	75	9.2±1.53	7.2±0.58	3.1±0.58	9.67±0.58
Staphylococcus aureus	25	4.33±0.58	1.66±0.58	1.7±0.58	1.1±0.58
	50	5.13±0.58	3.66±0.58	2.9±0.58	2.53±1.15
	75	8.33±1.058	4.78±3.21	3.12±0.58	3.33±1.15

Conclusion

In conclusion, scientific validation has been done on the four crude drugs prescribed by ethnic healers of rayalaseema and demonstrated as the reliable source for the ethnic treatments against infectious diseases.

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Research Article

Anatomical features of *Gynura lycopersicifolia* DC.

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Abstract: The present paper deals with anatomical features of *Gynura lycopersicifolia*, a rare medicinal plant collected from Tirumala hills of Andhra Pradesh. Photographs of Habitat, live specimen, dried plant parts, stem and Transverse sections (T.S) and internal anatomy with cell measurements of Leaf, Stem and Root were provided for easy identification and authentication of the species were provided with note on diagnostic characters.

Keywords: *Gynura lycopersicifolia*; Anatomical features; Tirumala hills.

Introduction

In pursuance of Pharmacognostical and ethnobotanical studies on some important medicinal plants in Chittoor district of Andhra Pradesh in India, it was found that some important medicinal plants were under studied and misidentified (Pushpalatha and Sujathamma, 2019). *Gynura lycopersicifolia* (Asteraceae), a rare succulent erect herb, a medicinal valued plant species is one among misidentified and adultered with diverse impediments. It was established that anatomical characters can imped the identification when morphological features are indistinct (David *et al.,* 2008). Some researchers (Kavitha *et al.*,2019; Jyothi *et al.*,2015; Prathap *et al.*,2012 &2014; Ramesh and chetty *et al.,* 2014) studied anatomical studies on medicinal plants of Tirumala and revealed the taxonomic ambiquity with anatomical studies.

Gynura lycopersicifolia DC., Prodr. [A. P. de Candolle] 6: 300 (1838). (Figure.1.A - C)
Vernacular names are Adavitametaaku and Needa chamanthi and the flowering and fruiting occurs between December – March.

Perusal of literature revealed that, Pullaiah and Ramamurthy (2007) reported this species occurance from Tirumala and Vishkapatanam associated areas. Chetty *et al.,* (2018) reported it from Ghat roads, Papavinasanam, Japali hanuman teertham areas in Tirumala of Andhra Pradesh.

In this present research, we intended to work on anatomical features of *Gynura lycopersicifolia* which should be considered as rare species. This investigation aims to improve the existing data for identification in the typical *Gynura* species and this forms the additional feature.

Materials and Methods

The specimens of *Gynura lycopersicifolia* were collected from the rocky crevices in foot path waysides from Akasaganga theertham to Papavinasanam in of Tirumala in Andhra Pradesh (Figure 1.A - D). The botanical identification of the taxa was carried out by using regional and local floras (Hooker, 1982; Gamble and Fischer, 1957; Pullaiah and Sri Ramamurthy., 2007 and Chetty *et al.,* 2018). The herbarium was prepared according to the method of Jain and Rao (1977) and deposited in the Herbarium of Department of Botany, Sri Venkateswara University, Tirupati, Andhra Pradesh for further use. The voucher specimens (SVUTY/AST/3174) were authenticated by comparing voucher herbarium specimens deposited at BSI, Southern circle, Coimbatore (MH), Tamil Nadu.

Anatomical study- Microtomy

Healthy whole plant (leaf, petiole, stem, root) in vegetative stage were chopped and fixed in the field immediately in FAA (Formalin - 5ml + Acetic acid – 5ml + 70% ethyl alcohol – 90 ml).

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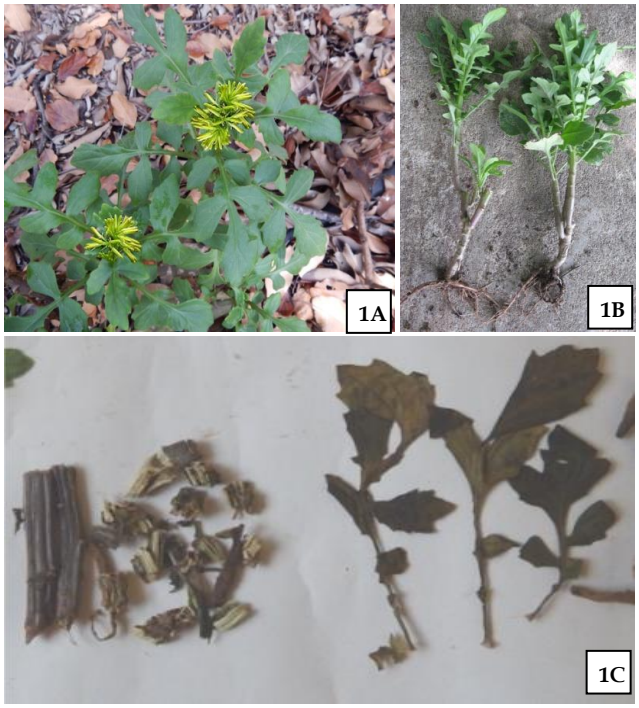


Figure 1. *Gynura lycopersicifolia*
Fig.1.A. Habitat. **Fig.1B.** Specimen.
Fig.1C. Dried parts.

After 24 hours of fixing, the different organs were dehydrated with graded series of tertiary–butyl alcohol as per the procedures (Sass, 1940; Ramesh *et al.* ,2014). After dehydration, infiltration of the parts was carried out with gradual addition of paraffin wax until tertiary-butyl alcohol solution attained super saturation. The plant organs were casted into paraffin blocks. The paraffin embedded parts were sectioned with the help of rotary microtome. The thickness of the sections maintained to be between 10-12m. The sections were stained with toluidine blue as per the method of O'Brien *et al.*, (1964).

For studying stomatal morphology, venation pattern (vein-islet, vein-termination) and trichome distribution were performed according to the modified protocol of Rao *et al., (*2014). Paraffin embedded lamina were used for paradermal sections. From these sections, the epidermal layers as well as vein-islets and vein-terminations were studied. The alternative method was clearing the leaf fragments by immersing the material in alcohol (chlorophyll content will be expelled) followed by treating with 5-10% of sodium hydroxide (NaOH) (Sivaja *et al.*, 2012 & Ramesh *et al.*, 2013). The cleaned materials were washed thoroughly, stained with safranin for further studies. Microscopic descriptions of all necessary cells and tissues are supplemented with photomicrographs and measurements are given. The mounted histological sections were then analyzed and imaged using Nikon E220 LED microscope (Nikon Inc., Japan). Descriptive terms of the anatomical features were used as per the terminology found in standard literature (Evart, 2007; Fahn,1982)

Results & Discussion

Anatomy with micromorphology

In this investigation, observations on *Gynura lycopersicifolia* anatomical sections of Leaf, petiole, stem and root were summarized below for micromorphological standardization.

Macroscopic features of vegetative parts of *Gynura lycopersicifolia*

It was observed that the Root is fibrous, Stem scabrous. Leaves rhomboid lyrate to pinnate partite, lower pinnae smaller than upper, terminal pinnae ovate to lanceolate, base auricled.

Anatomical features of the Leaf (2.A- 2.I)

Midrib

The midrib is circular in sectional view, projecting hemispherical body on both upper and lower sides. It is almost 550 mm thick and 1.3 mm wide. It consists of a thin well defined epidermal layer of small squarish cells. The ground tissues is homogeneous consisting, fairly wide thin walled compact parenchyma cells. The vascular strands are four, two placed on the adaxial side and other two on the abaxial side have a few short rows of small xylem elements and small mass of phloem. (Fig.2A)

Lamina

The lamina is fairly thick and soft dorsiventral different is not district. It consists of a thin spindle shaped adaxial epidermal cells. The abaxial epidermis is also thin. The lamina is amphistomatic and occured on both upper and lower epidermal layers. The mesophyll includes 6 or 7 layers of lobed loosely arranged cells; palisade zone not distinct. The lamina is 400 mm thick non-glandular, uniseriate multicellular unbranched epidermal trichomes are often seen in the

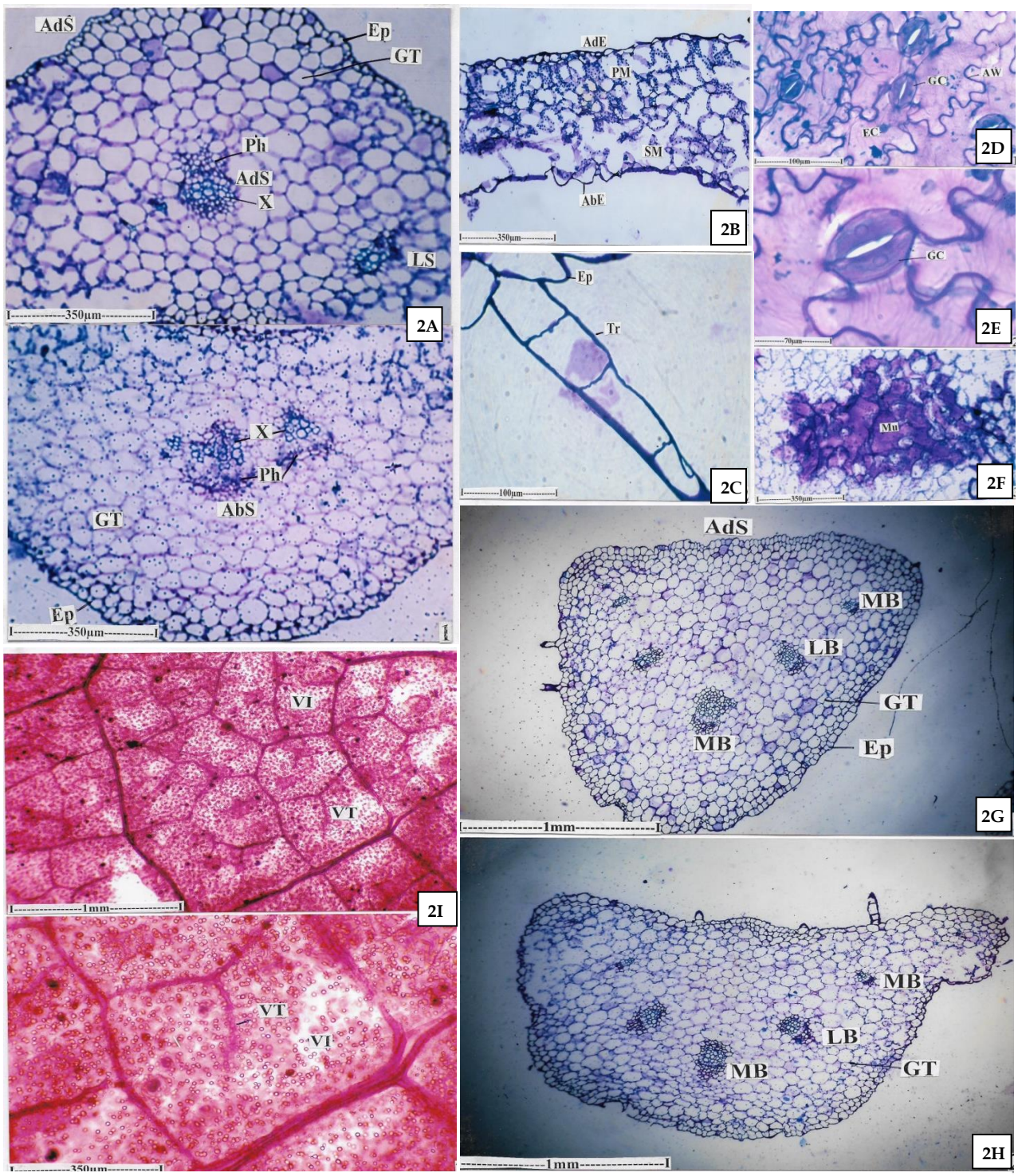


Figure 2. Leaf Micromorphology.

Fig. 2A. T.S. of Midrib of the leaf. **Fig.2B**. T.S. of Lamina **Fig.2C.** Non-glandular trichome. **Fig.2D.** Paradermal section of the lamina – abaxial side **Fig. 2E.** stomata – enlarged. **Fig.2F.** Mucilaginous mass in the mesophyll tissue. **Fig. 2G.** T.S. of Petiole – distal part (lower end) & **Fig. 2H.** T.S. of Petiole – Proximal part (Upper end). **Fig.2I.** Lamina cleared showing venation pattern. & Vein-islet – vein termination – enlarged.

Abbreviations in Figure. 2.A-I:

AbS : Abaxial side; **AdS :** Adaxial side; **Ep :** Epidermis; **GT :** Ground tissue; **LS :** Lateral side; **X :** Xylem; **Ph :** Phloem; *T.S. of Lamina:* **AbE:** Abaxial epidermis; **AdE :** Adaxial epidermis; **PM :** Paliside mesophyll; **Tr :** Trichome; **SM :** Spongy mesophyll; **AW :** Anticlinal clea-red; **GC :** Guard cell; **EC :** Epidermal cell; **Mu :** Mucilage; **VI :** Vein-islet; **VT :** Vein termination; **MB :** Median bundles; **LB** : Lateral bundles.

abaxial epidermis. The cells of the trichomes are vertically rectangular with thin walled and hyaline. The trichome is 300 mm long and 50 mm wide. (Fig.2.B,C)

Epidermal cells and stomata

In paradermal sections, the epidermal cells appear much wider, highly lobed with thin anticlinal walls. The stomata anomocytic type and no subsidiary cells are seen around the guard cells. The guard cells are prominent and elliptical measures 30 x 40 mm in size. The mesophyll tissues posses thick accumulation of mucilage.The mucilage cells are normal cells and are not different from non-mucilaginous cells. (Fig.2D,E)

Venation pattern

The general pattern of venation is reticulate type. The major views and vein lets are thin and straight. The vein islets are polygonal and well defined with district boundaries. The vein terminations of are unbranched, long, thin and slender. Occasionally the vein-terminations are forked once. (Fig.2I)

Petiole

The petiole is triangular at the distal and the planoconvex at the proximal end. The distal petiole is flat at the adaxial side and conical at the abaxial side. It consists of a thin well defined epidermal layer of squarish thin walled cells and homogeneous parenchymatous ground tissue. There are 5 vascular strands, which are arranged in a line of arc; of the 5 bundles, the lower median bundle is the largest; the two lateral bundles are smaller and two marginal bundles are the smallest. The petiole is 1.4× 1.5 mm is size. The proximal end of the petiole is 1.2×1.8 µm is size. The structure is basically similar to the distal petiole; the epidermal and ground tissues are as in the distal petiole. The vascular strands are five arranged in wide. The vascular bundles are found to be collateral and wedge shaped. (Fig.2.G.H)

Anatomical features of stem (Fig. 3.A- 3.E)

(A) Young stem (Fig. 3A-3C)

The young stem is 2 × 2.6 mm thick. It consists of prominent, thin walled cubical epidermal cells followed by 4 layers of cells similar both epidermis. Inner cortex fairly wider comparing large compact cells. (Fig.3.A, B).

The vascular system is eustele comprising several discrete collateral wedge shaped vascular bundles arranged in a ring and the bundles are separated from each other by wide parenchymatous medullary rays. The vascular bundles have small cluster of narrow, angular thick-walled xylem elements and 3 or 4 layers of short rows of sieve elements and a prominent sclerenchyma cap. (Fig.3.C).

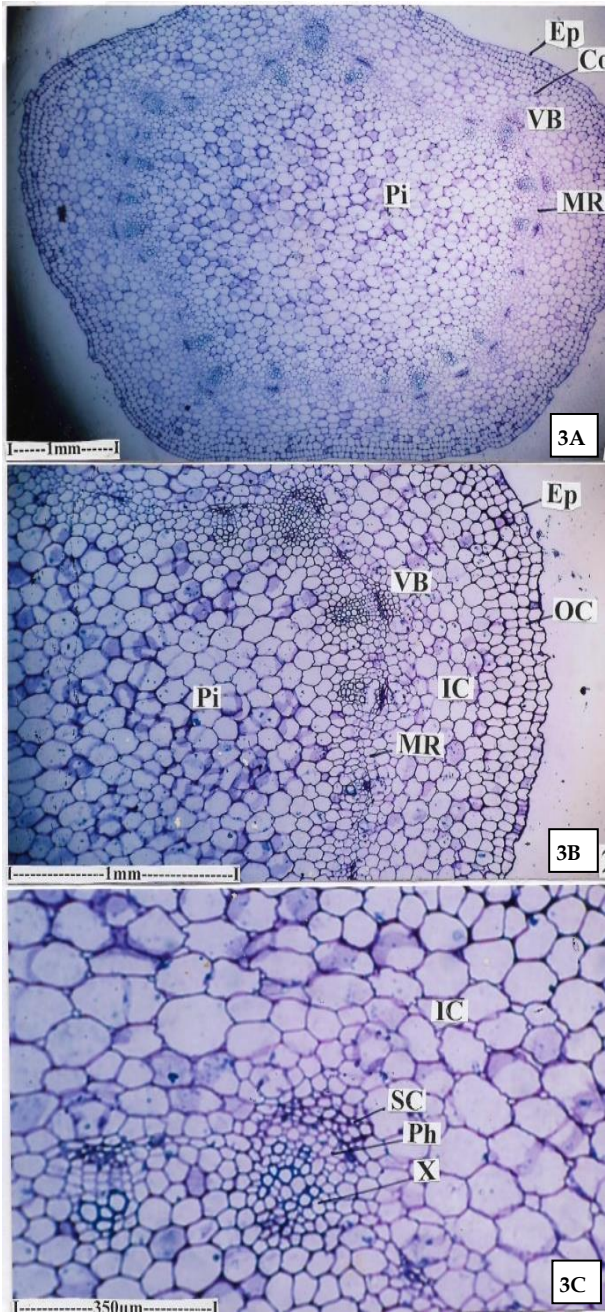


Figure. 3A. T.S. of Young stem – entire view.
Fig. 3B. T.S. of Young stem – sector.
Fig. 3C. Vascular bundles enlarged.

(b) Thick stem (Fig.3.D,E).

The thick stem is about 3 mm in diameter. It consists of thin periderm and thick cylinder of secondary xylem. Periderm includes three or four layers of narrow phellem cells. The cortex is 700 µm wide and includes large, compact polygonal parenchyma cells. Secondary xylem consists mostly of xylem fibres. vessels are scanty. The fibres are thin walled with wide luman. The piths is wide and parenchymatous. (Fig.3.D,E).

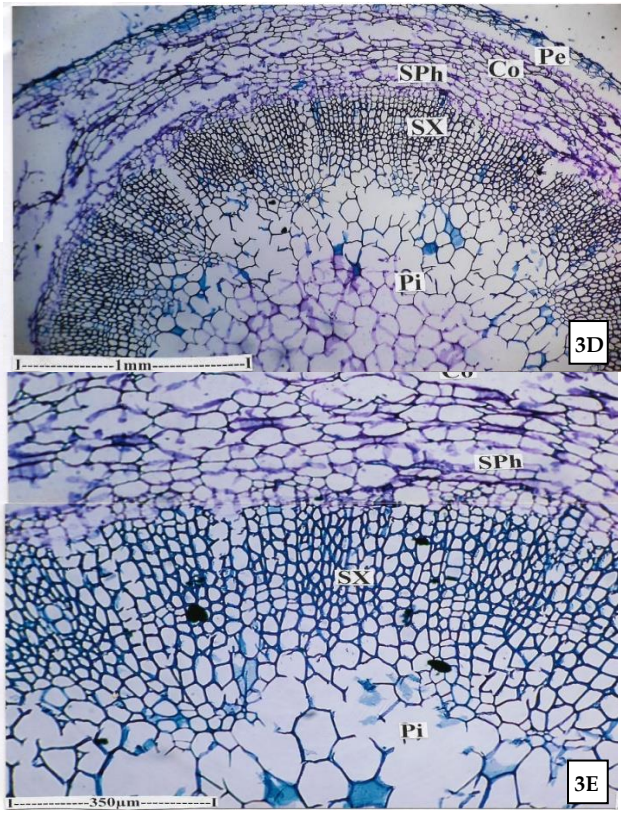


Figure. 3D. T.S of Old Stem
Fig. 3E. A sector enlarged.

Abbreviations in Figure. 3.A-E:
Ep : Epidermis; **Co :** Cortex; **IC :** Inner cortex; **SC :** Sclerenchyma; **MR :** Medullary ray; **Pi :** Pith; VB : Vascular bundle; **X :** Xylem; **Ph :** Phloem; **Co :** Cortex; **SPh :** Secondary phloem; **Pe :** Periderm; **SX :** Secondary xylem.

Anatomical features of Root (Fig. 4A, 4B, 4C)

The root exhibits unusual structure due to deep cleavage of xylem cylinder into four fan shaped lobes. The root is 2 mm thick. There is uniformly thick superificial periderm consisting of three layers of narrow tabular phellem cells. Cortex is 400 µm thick; the cortical cells are large, thin walled and less compact. Secondary phloem occurs in small nests all around the xylem. Secondary xylem is divided into four fan shaped segments by wide xylem rays. The segments are 650 µm thick and 400 µm wide at the wide outer part. It consists of wide, circular thin walled vessels and wide, thin walled lignified fibres. The vessels are upto 120 µm wide.

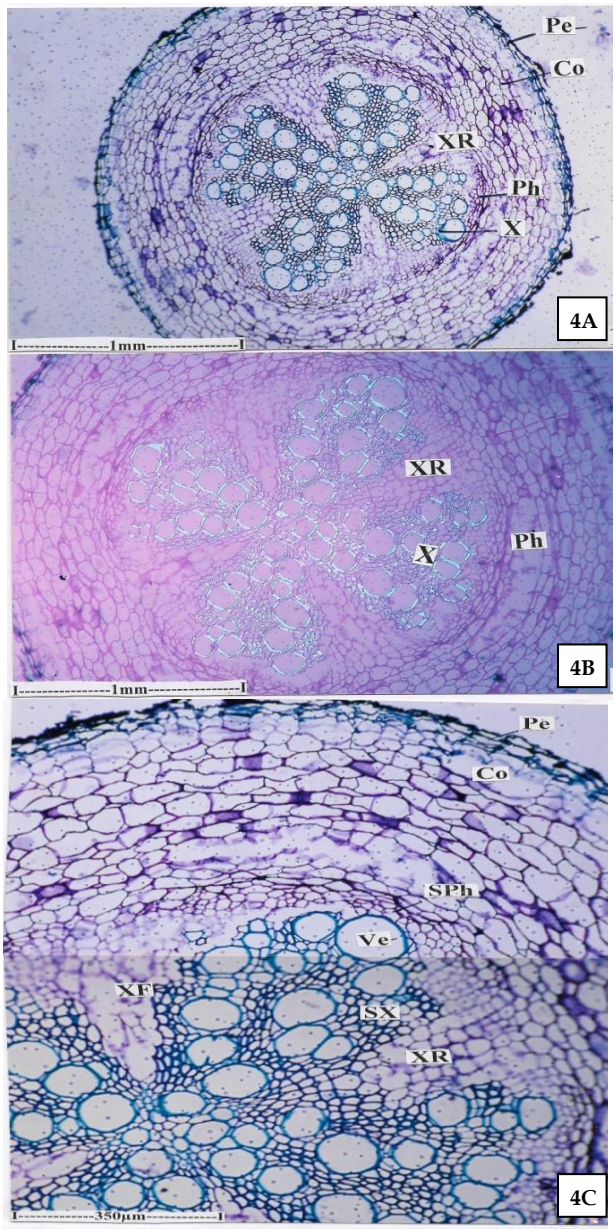


Figure. 4A. T.S of Root –entire view.
Fig. 4B. T.S. of Root under polarized light.
Fig. 4C. T.S. of Root - A sector enlarged.

Abbreviations in Figure. 4A - 4C:
T.S. of Root as visualized under polarized light -
Co : Cortex; **Pe :** Periderm, **XR :** Xylem ray; **X :** Xylem; **Ph :** Phloem; **SX :** Secondary xylem; **SPh** : Secondary phloem; **Ve :** Vessel; **XF :** Xylem fibre.

Previously, Bercu (2014) done on microanatomical studies in *Gynura aurantiaca*. Phytochemical investigation on *Gynura lycopersicifolia* was performed by Reddy *et al., (*2019) and Shankaraiah and Santosh (2017). Studies on the synthesis, characterization and antibacterial properties of green-synthesized silver nanoparticles from whole plant aqueous extracts of *G.lycopersicifolia* was investigated by Peer and yasodamma (2019). Reddy *et al., (*2019) worked on pharmacological activities *G. lycopersicifolia*. In-vitro antihelmintic activity of the leaves of *G. lycopersicifolia* was done by Shankaraiah and Santosh (2017). Hitherto no reports on anatomical studies on *Gynura lycopersicifolia* work has been published.

In the present study, Anatomical features of *Gynura lycopersicifolia,* a rare distinct species was studied in order to characterize the systematic utility and to comprehend the pharmacopoeial efficacy. For this, transverse section (T.S) taken from the top, middle and lower part of the leaf, stem and root was observed under microscope. For this investigation, toluidine blue (polychromatic stain), which resulted remarkably good and some cytochemical reactions (cell inclusions) was obtained. The dye rendered pink colour to the cellulose walls, blue to the lignified cells (lignin), dark green to suberein (cuticular cell wall), violet to the mucilage, blue to the protein bodies (Ashokan, 2006; Cutler *et al*.,2008; Saukel and Ginko, 2014). Wherever necessary sections were also stained with saffranin and fast-green and solution of Potassium iodide(KI) & iodine (I_2) for starch test changed to blue colour, 1% solution of ferric chloride ($Fecl_3$) exhibited light blue/ black colour to the tannins when applied to the sections. Some anatomical characters such as the number, measurement and shape of epidermal and inner tissue cells, internal microscopic characters like palisade and spongy parenchyma layers, abaxial and adaxial stomata, trichome types provide information of taxonomical significance.

These anatomical features in addition to existing macro characters of the genera and species level distinction would be useful in correct identification and authentication of plant species (Jyothi *et al*., 2015; Saukel and Ginko (2014; Ramesh *et al*., 2014; Sonibare and Osiyemi, 2012).

Conclusion

In conclusion, this study form the first of its kind repot on anatomy and micromorphology of *Gynura lycopersicifolia* revealed a scientific authentication, proper identification and standardization of anatomical profile distinguishing other *Gynura* spp. and it is essential to undergo molecular studies for further validation which can resolve any taxonomic ambiguity within this genus.

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Inventory of invasive alien plant taxa in gundla brahmeswaram wildlife sanctuary, Nallamalais, India: Implications for monitoring and management

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Abstract
Gundla Brahmeswaram wildlife sanctuary is invaded by many alien plant taxa which interfere with native biodiversity. It is highly important to explore the concerned problems caused by the intrusion of invasive plant taxa and to mitigate the impact on native diversity. To achieve this, the present study has taken up for the first of its kind and listed the 102 plant species representing 84 genera and 32 families. Of these, 54 plant species have their origin in Tropical America followed by many other parts of the world. The predominant family was Asteraceae with 23 plant species, followed by Fabaceae (12), Amaranthaceae (10), Convolvulaceae (7), Malvaceae (6), Euphorbiaceae, Lamiaceae, Solanaceae (4 each), Acanthaceae, Poaceae (3 each), Apocynaceae, Asparagaceae, Cleomaceae and Cuscutaceae (2 each). 18 families were contributed with single species each. The abundant and most serious invasive species were recognized in the sanctuary, namely, *Hyptis suaveolens*, *Lantana camara*, *Senna uniflora*, *Parthenium hysterophorus*, *Ageratum conyzoides*, *Waltheria indica*, *Chromolaena odorata*, *Mimosa pudica* and *Prosopis juliflora*, *Cuscuta* species. The present study calls for a standard, unique planning in early identification, spreading and infestation of invasive weeds and involve taxonomists, forest managers, ecologists to control and monitor.

Keywords: invasion - native diversity - monitor - control - management– wildlife sanctuary

Introduction

Invasive species are non-native which have the potential to threat many aspects such as environment, health and even economy. These are 'the second worst threat to native diversity in the planet earth' after habitat destruction (CBD 1992) [4], and they are severe threat to native biodiversity, habitat destruction and the greatest component of global climatic change (Khuroo *et al*. 2007, Pasha *et al*. 2014) [17, 26]. Alien species are recognized as of casual, naturalized and invasives (Richardson *et al*. 2000) [39]. The introduction of plants to a new place is an age old practice to human kind during migration and is enormously influenced by various factors such as cultural background, political history, extent of trade, etc. (Rhuiller *et al*. 2005, Bomford 2009, Reshi and Khuroo 2012) [2, 40, 38] and accidentally or intentionally happened through the crop seeds, or imported biota (Pimentel *et al*. 2000) [28]. The introduction and spread of non-native species can significantly alter the ecological functions of forest ecosystem and the primary productivity of plant taxa in time and space (Shah *et al*. 2012) [40]. Many indigenous species are threatened by competition and predation from invaders, while many other species are endangered by hybridization and ecosystem changes caused by alien species (Pimentel *et al*. 2005) [29]. Over 40% of the species on the list of threatened and endangered species are due to the invasive species only (Wilcove *et al*. 1998) [51]. Majority of the alien introduced species escape from cultivation, spread slowly and silently at initial stage, but become dominant and widespread at later stages to attain an invasive status in the introduced range and prove detrimental for the native biodiversity (Khuroo *et al*. 2008, 2010) [18, 16]. A large number of plants that are using today either for food, plantation or for ornamental purpose were deliberate introductions during post Columbian period, especially from tropical America (Purseglove 1969, Simmonds 1976, Ferra 1994) [31, 44, 9]. Invasive alien species (IAS) cause major environmental and economic problems in agriculture, forestry, and several other segments of the world economy; adversely affect ecosystem structure and function in habitats through the world by reducing native species, changing soil nutrient status, and altering geomorphological process (Pimentel *et al*. 2000, Mandal and Joshi 2014) [28, 21,]. It is estimated that in India alien species are causing 30% loss in potential crop production worth about US$ 90 billion per year (Kohli and Batish 1996) [19]. Native biodiversity have revealed that both the structural organization and the functional integrity of ecosystems are affected due to invasion by alien species. There is a growing catalogue of the potential impacts of invasive species on native species, wildlife habitats, disturbance regimes, and ecosystem services (Hiremath and Sundaram 2013, Simberloff *et al*. 2013, Foxcroft *et al*. 2014) [14, 43, 10] in worldwide. IAS not only pose a serious threat to native biodiversity but also influence serious consequences for the ecology, economy, public health and biosecurity of the countries involved (Pejchar and Mooney

2009) [27]. Invasive species are able to take more rapid advantage of available resources and at the same time use nutrients more efficiently in low resource environments, when compared with native species (Funk and Vitousek 2007) [11]. Invasive species typically produce large numbers of fruits thus enabling them to exert propagule pressure, both in space (by widespread dissemination or abundant plantings) and time (by long history of cultivation) (Pumberton and Liu 2009, Bucharova and van Kleunen 2009) [30, 3]. The importance of invasive species is underlined by Article 8(h) of the Convention on Biological Diversity (CBD 2002) which asks for measures to prevent the introduction, control or even root out of those alien species which threatens ecosystems, habitats or species. Suthari *et al*. (2016) [48] called for the importance of invasive species documentation, monitoring, spread and implementation levels to control the impacts of invasive species. Weeds grow luxuriantly due to its production of more number of seeds.

The growth of weeds reduces the ground flora, sprouts, and palatable grass, and competes with local flora and inhibits the growth of other species due to its allelopathic effect. India is one of the mega diverse nations in the world with rich plant diversity and has a long history of introduction of exotic plant species to various parts of the nation due to unregulated transportation, quarantines from one place to another. These exotics are widespread in the country. The percentage of alien plant species is negatively correlated with native plant diversity (Liu *et al*. 2005) [20]. Many studies have been conducted on alien species and estimated that India has about 39% (Chatterjee 1940) [6], 40% (CBD 2005), 173 plant taxa are invasives which represent 1% of the Indian Flora (Reddy *et al*. 2008, Goyal and Arora 2009) [36, 13] and 20% or more and in many islands the proportion is 50% or more (Singh *et al*. 2010) [45]. Suthari *et al*. (Suthari *et al*. 2016) [48] documented 74 alien Asteraceae members and their intrusion, residence time in Telangana and Andhra Pradesh states. The problem of plant invasion needs global co-ordination for its effective monitoring and management (McNeely *et al*. 2011). Lack of data on alien species would make the economic and environmental information underestimation. Earlier, many workers provided catalogues of the invasive alien plant species in different parts of the country (Khuroo *et al*. 2007, Hiremath and Sundaram 2013, Suthari *et al*. 2016, Reddy *et al*. 2008, Singh *et al*. 2010, Sharma and Pandey 1984, Pandey and Parmar 1994, Rao and Murugan 2006, Bhatt *et al*. 2002, Jaryan *et al*. 2013, Naidu *et al*. 2015) [17, 14, 48, 36, 45, 41, 25, 35, 15, 24]. Ellis (1987) [8] recorded 743 plant taxa from Nallamalais region and documented in *Flora of Nallamalais* and Rao *et al*. (2007) [34] conducted floristic studies in the area and documented 1521 angiospermous plant taxa of which the 124 species of exotics. Of these, 27 species are endemic to Nallamalais (Reddy *et al*. 2006) [36]. The data on the impact of alien invasive plant species on ecosystem of protected area is sparse, so it is highly needed to estimate the range of threat to existing diversity, and there is no particular study on the inventory and effect of invasive alien plant taxa and ecological significance of Gundla Brahmeswaram wildlife sanctuary (GBWS). The present study focuses on the distribution and quantitative structure of alien invasive species and ecological consequences in Gundla Brahmeswaram wildlife sanctuary, Nallamalais, Andhra Pradesh, India.

Material and Methods

Study area

Our study was conducted at Gundla Brahmeswaram wildlife sanctuary, Andhra Pradesh which plays an important role in the maintenance of ecological balance and biological diversity in the Eastern Ghats. The sanctuary is located in Nallamalais region, the ranges of parallel hills integral to the Eastern Ghats. These hills stretch across parts of Kurnool, Mahabubnagar, Prakasam, Guntur and Kadapa districts. Gundla Brahmeswaram wildlife sanctuary is one of the biologically rich areas in Eastern Ghats, lies between 15°40′ to 15°89′N latitudes and 76°61′ to 78°09′E longitudes and situated in Gundla Brahmeswaram plateau of the central Nallamalais, south to the Nagarjunasagar-Srisailam Tiger Reserve which is the largest tiger reserve in India, spread over an area of 3600 sq km. The sanctuary is one of the oldest sanctuaries in Andhra Pradesh and was established in 1998 for its rich and diverse biota, is an off shoot of *Southern Eastern Ghats*, covering an area of 1194 sq km, supported by the tropical moist and dry deciduous forests and with a domain of rich habitat for many endangered flora and its associated fauna.

Methodology

A comprehensive list of invasive alien plant species from Gundla Brahmeswaram wildlife sanctuary based on the extensive field surveys conducted during the last five years (2014-2019) and the database compiled by after perusal of the available floristic literature dealing with the vascular flora of Andhra Pradesh. Data was collected through standard quadrat method by laying 31.62 × 31.62 m at random sampling method by covering core zone, buffer zones including water bodies and marshy areas (Suthari 2013) [46]. A total of 45 sample sites of which 15 in core areas, 15 in open degraded areas, and 15 in transition areas (edges) were laid in and around the protected area of Gundla Brahmeswaram wildlife sanctuary. The field surveys were resulted in generation of a master list of all plant taxa occurring in Gundla Brahmeswaram along with their family. The nativity of the plants using published information (Khuroo *et al*. 2007, Suthari *et al*. 2016a, Reddy *et al*. 2008, Singh *et al*. 2010, Jaryan *et al*. 2013) [17, 48,36,45, 15] and followed the website http://www.isws.in/invaisve.plant.of.india.php. The alien species were categorized into herbs, shrubs and climbers based on their growth-form with in the alien category, naturalized, noxious and interfering plant species have been recognized. Identification of the plant species was done with the help of standard floras (Rao *et al*. 2007, Cooke 1903, Gamble and Fischer 1915-1935) [34, 7, 12], e-floras, revisions and recent monographic studies of the taxa concerned. Nomenclature of the plant taxa was updated following *International Code of Nomenclature for Algae, Fungi, and Plants* (Shenzhen Code) (Turland *et al*. 2018) and www.theplantlist.org.

Results and Discussion

The present inventory on plant invasions documented 102 plant taxa in various regions of GBWS (Table 1). A total of 102 invasive alien plant species of GBWS has been documented, which are pertaining to 84 genera and 32 families. The scientific name, family, habit, nativity and category were provided in tabular form (Table 1). The plant populations which have the potential of individual growth and recruitment through seeds were treated as *naturalized*, while some species in disturbed areas which show adverse impact on native species categorized as

noxious. The noxious species are notorious and compete with local plant species for space, sunlight, nutrients, and harbor to pests which show harmful effects on native species. Some species are neither harmful nor noxious to indigenous vegetation but these plants interfere to the growth of the native species, these are categorized as *interfering* species in the present study (Table 1).

Of these alien species, 54 plant taxa have their origin in Tropical America, followed by Tropical Africa (12), Tropical South America (9), Mediterranean (3), Tropical Central America (3), Tropical North America (3), West Indies (3), Brazil (2), Europe (2), and Mexico and Central America (2). Only single invasive plant species reached the study area from various native ranges such as Afghanistan, Australia, Mascarene Islands, Mexico, Temperate South America, Tropical Central-South America, Tropical South-Eastern Africa, West Africa and Western Europe (Figure 1). Of 32 families having alien plant species, Asteraceae was the predominant family with 23 plant taxa, followed by Fabaceae (12), Amaranthaceae (10), Convolvulaceae (7), Malvaceae (6), Euphorbiaceae, Lamiaceae, Solanaceae (4 each), Acanthaceae, Poaceae (3 each), Apocynaceae, Asparagaceae, Cleomaceae and Cuscutaceae (2 each). 18 families such as Adiantaceae, Aizoaceae, Cactaceae, Cannabaceae, Nyctaginaceae, Onagraceae, Oxalidaceae, Papaveraceae, Passifloraceae, Pedaliaceae, Phyllanthaceae, Polygonaceae, Portulacaceae, Rubiaceae, Sapindaceae, Scrophulariaceae, Typhaceae and Zygophyllaceae were distributed with single species each within the sanctuary (Figure 2). Of the total plant invasions, 67 species were categorized as naturalized, 22 species as interfering and 8 species as noxious (Figure 3). The alien exotic weed herbs (84 species) and climbers (7 species) are the major menace in the sanctuary. During our field visits, we have observed abundant populations of alien weeds in peripherals of the wildlife sanctuary. They species include *Hyptis suaveolens*, *Lantana camara*, *Senna uniflora*, *Parthenium hysterophorus*, *Ageratum conyzoides*, *Waltheria indica*, *Chromolaena odorata*, *Mimosa pudica* and *Prosopis juliflora*, *Cuscuta* species (stem parasite). Even in the core areas of the sanctuary some of the invasive species such as *Hyptis suaveolens*, *Ageratum conyzoides*, *Waltheria indica*, *Bidens pilosa*, *Alternanthera paronychioides* were found. These noxious weeds are rapidly distributed in the sanctuary due to their prolific seed production, light weight of seeds, seed dispersal through different factors, fast-spreading ability, allelopathic effect on other plants, strong competitiveness with indigenous species for nutrients, space, water, sun light and other sources. These species are major invaders and affect the distribution, abundance and reproduction of many indigenous species and cause loss of native biodiversity (Table 1). These can also alter the nutrient cycling, water table, fire regimes, Native vegetation, Availability of native diversity and wildlife populations, prevent recruitment of native species, ecological balance, etc.

Table 1: Inventory of plant invasions from gundla brahmeswaram wildlife sanctuary

	Plant taxon	Family	Habit	Nativity	Category
1	*Aeschynomene americana* L.	Fabaceae	Herb	West Africa	Naturalized
2	*Acacia farnesiana* (L.) Willd.	Fabaceae	Shrub	Tropical South America	Naturalized
3	*Acanthospermum hispidum* DC.	Asteraceae	Herb	Brazil	Naturalized
4	*Acmella paniculata* (Wall. ex DC.) R.K.Jansen	Asteraceae	Herb	Tropical South America	Naturalized
5	*Adiantum lunulatum* Burm.f.	Adiantaceae	Herb	Australia	Naturalized
6	*Aerva javanica* (Burm.f.) Juss. ex Schult.	Amaranthaceae	Herb	Tropical America	Naturalized
7	*Aerva lanata* (L.) Juss.	Amaranthaceae	Herb	Tropical Africa	Naturalized
8	*Agave americana* L.	Asparagaceae	Herb	Tropical America	Naturalized
9	*Agave vivipara* L.	Asparagaceae	Herb	Mexico and Central America	Naturalized
10	*Eupatorium glandulosum* Kunth	Asteraceae	Herb	Mexico and Central America	Naturalized
11	*Ageratum conyzoides* (L.) L.	Asteraceae	Herb	Tropical America	Noxious
12	*Alternanthera paronychioides* A.St.-Hil.	Amaranthaceae	Herb	Tropical America	Naturalized
13	*Alternanthera philoxeroides* (Mart.) Griseb.	Amaranthaceae	Herb	Tropical America	Naturalized
14	*Alternanthera pungens* Kunth	Amaranthaceae	Herb	Tropical America	Naturalized
15	*Alternanthera sessilis* (L.) R.Br. ex DC.	Amaranthaceae	Herb	Tropical America	Naturalized
16	*Amaranthus spinosus* L.	Amaranthaceae	Herb	Tropical America	Naturalized
17	*Antigonon leptopus* Hook. & Arn.	Polygonaceae	Climber	Tropical America	Noxious
18	*Argemone mexicana* L.	Papaveraceae	Herb	Tropical Central-South America	Noxious
19	*Bidens pilosa* L.	Asteraceae	Herb	Tropical America	Naturalized
20	*Blumea lacera* (Burm.f.) DC.	Asteraceae	Herb	Tropical America	Interfering
21	*Boerhavia diffusa* L.	Nyctaginaceae	Herb	Tropical South-Eastern Africa	Naturalized
22	Car*diospermum halicacabum* L.	Sapindaceae	Climber	Tropical America	Naturalized
23	*Calotropis gigantea* (L.) Dryand.	Apocynaceae	Shrub	Tropical Africa	Interfering
24	*Calotropis procera* (Aiton) Dryand.	Apocynaceae	Shrub	Tropical Africa	Interfering
25	*Celosia argentea* L.	Amaranthaceae	Herb	Tropical Africa	Naturalized
26	*Chamaesyce hirta* (L.) Millsp.	Euphorbiaceae	Herb	Tropical America	Naturalized
27	*Chloris elata* Desv.	Poaceae	Herb	Tropical America	Naturalized
28	*Chromolaena odorata* (L.) R.M.King & H.Rob.	Asteraceae	Shrub	Tropical America	Interfering
29	*Chrozophora rottleri* (Geiseler) A.Juss. Ex Spreng.	Euphorbiaceae	Herb	Tropical Africa	Naturalized
30	*Cleome gynandra* L.	Cleomaceae	Herb	Tropical America	Naturalized
31	*Cleome viscosa* L.	Cleomaceae	Herb	Tropical America	Naturalized
32	*Convolvulus arvensis* L.	Convolvulaceae	Herb	Europe	Naturalized

33	*Corchorus aestuans* L.	Malvaceae	Herb	Tropical America	Naturalized
34	*Croton bonplandianus* Baill.	Euphorbiaceae	Herb	Temperate South America	Naturalized
35	*Cuscuta chinensis* Lam.	Cuscutaceae	Herb	Mediterranean	Interfering
36	*Cuscuta reflexa* Roxb.	Cuscutaceae	Climber	Mediterranean	Interfering
37	*Cynodon dactylon* (L.) Pers.	Poaceae	Herb	Tropical Africa	Naturalized
38	*Cyperus iria* L.	Poaceae	herb	Tropical America	Naturalized
39	*Datura metel* L.	Solanaceae	Herb	Tropical America	Interfering
40	*Echinops echinatus* Roxb.	Asteraceae	Herb	Afghanistan	Naturalized
41	*Eclipta prostrata* (L.) L.	Asteraceae	Herb	Tropical America	Naturalized
42	*Emilia sonchifolia* (L.) DC. ex DC.	Asteraceae	Herb	Tropical America	Naturalized
43	*Evolvulus alsinoides* (L.) L.	Convolvulaceae	Herb	Tropical America	Naturalized
44	*Evolvulus nummularius* (L.) L.	Convolvulaceae	Herb	Tropical America	Naturalized
45	*Flaveria trinervia* (Spreng.) C.Mohr	Asteraceae	Herb	Tropical Central America	Naturalized
46	*Galinsoga parviflora* Cav.	Asteraceae	Herb	Tropical America	Naturalized
47	*Gnaphalium coarctatum* Willd.	Asteraceae	Herb	Tropical America	Interfering
48	*Gomphrena serrata* L.	Amaranthaceae	Herb	Tropical America	Naturalized
49	*Grangea maderaspatana* (L.) Poir.	Asteraceae	Herb	Tropical South America	Naturalized
50	*Hyptis saveolens* (L.) Poit.	Lamiaceae	Herb	Tropical America	Interfering
51	*Indigofera astragalina* DC.	Fabaceae	Herb	Tropical America	Naturalized
52	*Ipomoea obscura* (L.) Ker Gawl.	Convolvulaceae	Climber	Tropical America	Naturalized
53	*Ipomoea carnea* Jacq.	Convolvulaceae	Shrub	Tropical America	Naturalized
54	*Ipomoea hederifolia* L.	Convolvulaceae	Climber	Tropical America	Naturalized
55	*Lantana camara* L.	Lamiaceae	Shrub	Tropical America	Noxious
56	*Leonotis nepetifolia* (L.) R.Br.	Lamiaceae	Herb	Tropical Africa	Interfering
57	*Lagascea mollis* Cav.	Asteraceae	Herb	Tropical Central America	Noxious
58	*Mikania micrantha* Kunth	Asteraceae	Climber	Tropical America	Noxious
59	*Mimosa pudica* L.	Fabaceae	Herb	Brazil	Naturalized
60	*Ludwigia adscendens* (L.) H.Hara	Onagraceae	Herb	Tropical America	Naturalized
61	*Martynia annua* L.	Pedaliaceae	Herb	Tropical America	Interfering
62	*Melochia corchorifolia* L.	Malvaceae	Herb	Tropical America	Interfering
63	*Merremia dissecta* (Jacq.) Hallier f.	Convolvulaceae	Herb	Tropical America	Naturalized
64	*Ocimum americanum* L.	Lamiaceae	Herb	Tropical America	Naturalized
65	*Opuntia stricta* (Haw.) Haw.	Cactaceae	Herb	Tropical America	Noxious
66	*Oxalis corniculata* L.	Oxalidaceae	Herb	Europe	Naturalized
67	*Parthenium hysterophorus* L.	Asteraceae	Herb	Tropical North America	Noxious
68	*Passiflora foetida* L.	Passifloraceae	Climber	Tropical South America	Interfering
69	*Peristrophe paniculata* (Forssk.) Brummitt	Acanthaceae	Herb	Tropical America	Interfering
70	*Phyllanthus tenellus* Roxb.	Phyllanthaceae	Herb	Mascarene Islands	Naturalized
71	*Physalis angulata* L.	Solanaceae	Herb	Tropical America	Interfering
72	*Portulaca oleracea* L.	Portulacaceae	Herb	Tropical South America	Naturalized
73	*Prosopis juliflora* (Sw.) DC.	Fabaceae	Shrub	Mexico	Naturalized
74	*Pupalia lappacea* (L.) Juss.	Amaranthaceae	Herb	Tropical Africa	Interfering
75	*Ricinus communis* L.	Euphorbiaceae	Shrub	Tropical Africa	Interfering
76	*Ruellia longifolia* (L.) Roxb.	Acanthaceae	Herb	Tropical America	Interfering
77	*Ruellia tuberosa* L.	Acanthaceae	Herb	Tropical America	Naturalized
78	*Scoparia dulcis* L.	Scrophulariaceae	Herb	Tropical America	Naturalized
79	*Senna absus* (L.) Roxb.	Fabaceae	Herb	Tropical America	Naturalized
80	*Senna alata* (L.) Roxb.	Fabaceae	Herb	West Indies	Interfering
81	*Senna obtusifolia* (L.) H.S.Irwin & Barneby	Fabaceae	Herb	Tropical America	Naturalized
82	*Senna occidentalis* (L.) Link	Fabaceae	Herb	Tropical South America	Interfering
83	*Senna tora* (L.) Roxb.	Fabaceae	Herb	Tropical South America	Naturalized
84	*Senna uniflora* (Mill.) H.S.Irwin & Barneby	Fabaceae	Herb	Tropical South America	Interfering
85	*Sida acuta* Burm.f.	Malvaceae	Herb	Tropical America	Naturalized
86	*Solanum americanum* Mill.	Solanaceae	Herb	Tropical America	Interfering
87	*Solanum torvum* Sw.	Solanaceae	Shrub	West Indies	Naturalized
88	*Solidago canadensis* L.	Asteraceae	Herb	Tropical North America	Naturalized
89	*Sonchus asper* (L.) Hill	Asteraceae	Herb	Mediterranean	Interfering
90	*Spermacoce articularis* L.f.	Rubiaceae	Herb	Tropical America	Naturalized
91	*Synedrella nodiflora* (L.) Gaertn.	Asteraceae	Herb	West Indies	Naturalized
92	*Trema orientalis* (L.) Blume	Cannabaceae	Herb	Tropical Africa	Naturalized
93	*Trianthema portulacastrum* L.	Aizoaceae	Herb	Tropical Africa	Interfering
94	*Tribulus lanuginosus* L.	Zygophyllaceae	Herb	Tropical America	Naturalized
95	*Tridax procumbens* (L.) L.	Asteraceae	Herb	Tropical Central America	Naturalized
96	*Triumfetta rhomboidea* Jacq.	Malvaceae	Herb	Tropical America	Naturalized

97	*Typha angustata* L.	Typhaceae	Herb	Tropical America	Interfering
98	*Ulex europaeus* L.	Fabaceae	Shrub	Western Europe	Interfering
99	*Urena lobata* L.	Malvaceae	Shrub	Tropical Africa	Naturalized
100	*Waltheria indica* L.	Malvaceae	Herb	Tropical America	Naturalized
101	*Xanthium strumarium* L.	Asteraceae	Herb	Tropical North America	Interfering
102	*Youngia japonica* (L.) DC.	Asteraceae	Herb	Tropical South America	Naturalized

Total area surveyed for alien plant species was 4.5 ha by laying quadrats with a size of 31.62 × 31.62 m

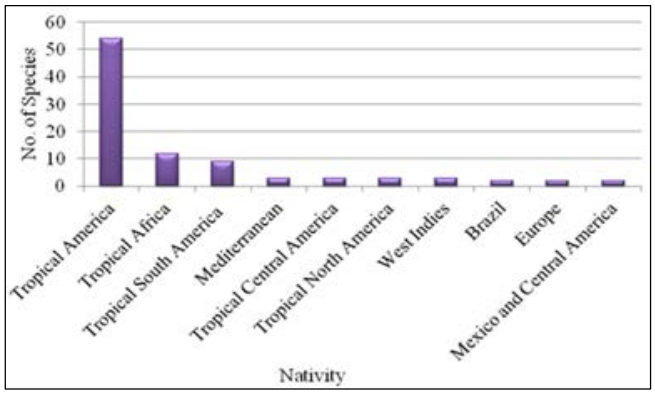


Fig 1: Top five native regions of invasive species documented from GBWS

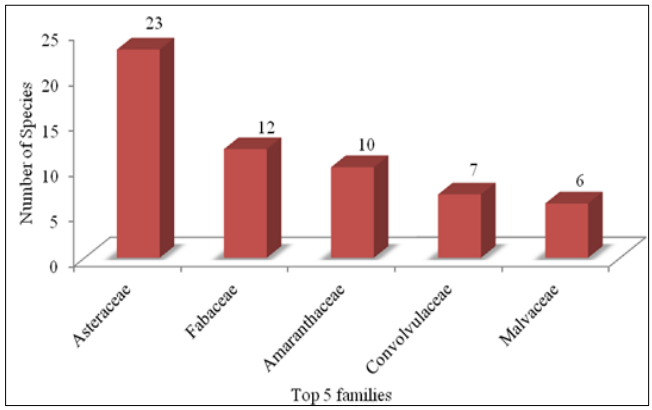


Fig 2: Families accounting for >5 invasive species in Gundla Brahmeswaram wildlife sanctuary, Nallamalais

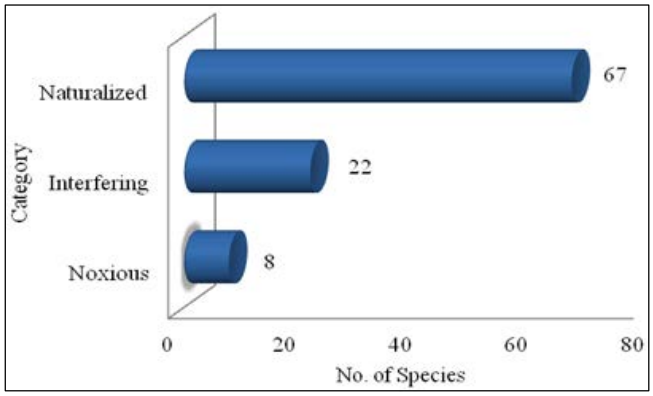


Fig 3: Three various categories of invasive plant taxa in GBWS

Monitoring and Management

Forests are the living resource base for sustenance of its inhabitants besides serving as a storehouse of biodiversity. India is the seventh largest and one of the 17 mega diversity countries of the world and accounts with just 2.5% of the total land area having 7.8 % of the recorded species and 668 Protected Areas account for about 4.9 % of the country's geographic area (Raju *et al*. 2010) [33]. Habitat destruction is the single greatest threat to native biodiversity followed by introduction of alien species (CBD 1992) [4]. Habitat destruction is caused due to agricultural practices, land conversions, grazing of livestock, mining activities, logging, developmental activities (roads/tracks/reservoirs/dams construction), outdoor recreation, pollutants, disruption of fire ecology, military activities, establishment of new towns/cities, etc. Invasive alien species are emerging as one of the major threats to sustainable development. The global extent and rapid increase in invasive species is homogenizing the world's flora and fauna (Mooney and Hobbs 2000) [23] and is recognized as a primary cause of global biodiversity loss. In most of the areas of the existing ecosystems are already degraded due to anthropogenic pressure leading to the creation of habitats suitable for colonization by exotics. This has paved the way for successful invasion of the forest areas by alien plants.

The increasing population and luxurious growth made competition on the native species. In earlier, weeds are grown in waste and degraded open areas but now they are common in crop and forest lands including protected areas due to uncontrolled measures by the authorities and lack of awareness. Monitoring is highly important in the invasive species management to determine the early detection of invasive species, spread and impact of exotic plants on native species. Invasive alien species are a worldwide problem and have variability and plasticity. These cannot be eradicated without the cooperation at international, national, regional, transboundary and local levels. Simberloff (2002) [42] recognized four main methods to eradicate the invasions, namely, mechanical control, chemical control, biological control and cultural control. The *physical and mechanical control* includes hand removal, tillage, deep ploughing, discing, mowing, sickling, grazing, burning, digging, mulching and summer fallow where in *chemical control*, it is the application of chemicals, i.e. soil application, foliar application. e.g. triazones, aniline, 2,4-D, atrazine, glyphosate, etc. Other mode of control is *biological* in which living organisms (bioagents) can be utilized to eradicate weeds (e.g. moths, some insects) while *cultural control* is basically associated with farming systems (Figure 5). Locally, the mechanical removal of these species before flowering and fruiting is most suitable and effective. This process may last for four to five years to eradicate the invasions completely. There is a need to improve the native species growth, reintroduction of native species for the restoration of indigenous vegetation to mitigate negative impacts of invasive alien species in the region. Chemical control is expensive and also shows effect on native useful plants, these chemicals may enter the plant body to living beings through food chain. Regular monitoring and biological control are the main processes for the eradication. The invasions prevent the growth

of grasses and herbaceous layer which lead to unpalatable to wild and domestic animals. Unbridled urbanization, agricultural expansion, unsustainable livestock grazing, unregulated introduction of alien plants for ornamental and plantation purposes, unplanned road construction, rapid development of tourism, clearing of open lands, etc. are also major causes for the intrusion of plant invasions. Apart from these, a '4Ps' formula strategy was also evolved for the management of invasive alien species, namely, prediction, prevention, prescription and public awareness. Public awareness about the economic, ecological, and health risks from invasives is essential for successful implementation of policy and enforcement. It is mandate to prevent the invasives to protect the native biodiversity. The local people are to be educated about the negative impacts of IAS to their agricultural crops and NTFPs extraction from the local forests. The Government of India has to develop a national level policy towards the control of invasive alien species and implement it at the earliest before we lose our indigenous biodiversity once for all (Suthari *et al*. 2016b) [48].

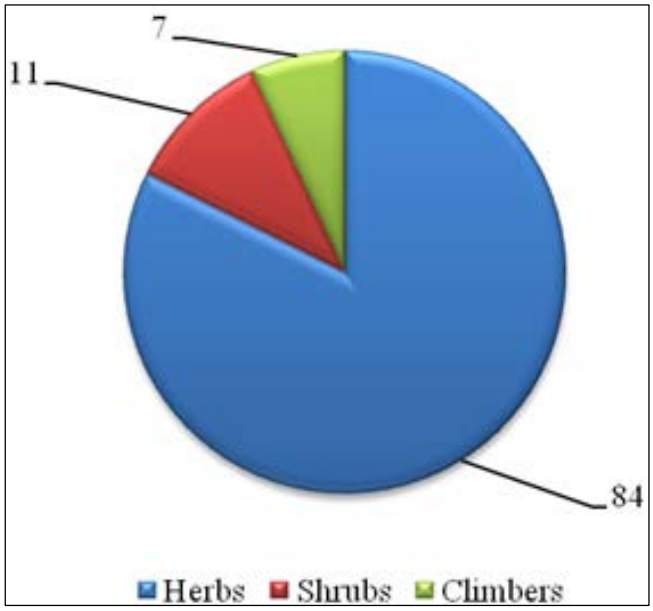


Fig 4: Number of plant invasive species under growth-form categories from GBWS

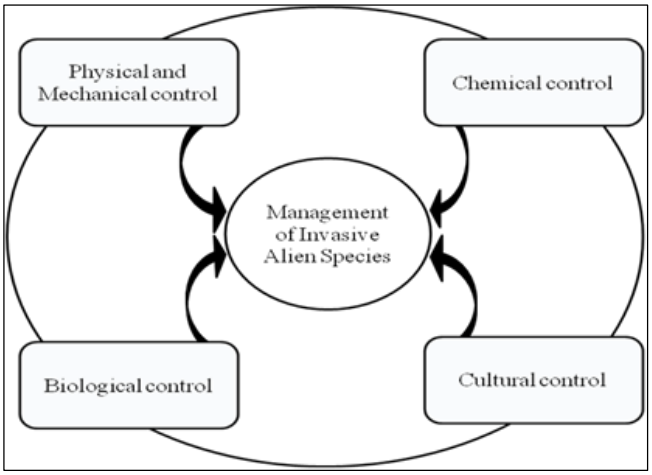


Fig 5: Integrated invasive species management

Conclusions

Early detection and rapid response activities are crucial ingredients of management programmes developed for invasives species. A comprehensive inventory of alien species needs to be formulated and launched. Introduction pathways and vectors of alien species need to be detected and necessary modeling approaches such as remote sensing (RS), geographical information systems (GIS) need to be undertaken. It is very important to utilize the newly emerging technologies and approaches for effective management of these alien species.

Regular surveillance, systematic removal and monitor the impact of invasive species on native biodiversity are very important aspects for the control of invasives. For the effective control, needs cooperation from local people, non-governmental, voluntary organizations, weed interest groups and the government should also create awareness among people about problems associated with these invasive species. For the effective prevention and management practices, also follow GISP (the Global Invasive Species Programme) toolkit which comprises 4 stages, namely, prevention, early detection, eradication and control (Wittenberg and Cock 2001) [52]. More taxonomic research is needed for the proper identification, documentation, monitoring and for the collection of baseline species data. Specific trainings should also be conducted for the identification tools, collection, monitoring techniques. Awareness programmes to be raised in various localities, communities, educational institutions through pamphlets, seminars, group discussions, print and electronic mass media and social network groups. There is also a need to build research networks throughout the world, nation or state, regional level that incorporate risk assessment and risk management of invasive species. Foresters, environmentalists, field researchers and conservation managers are need to pay urgent attention on the ecological impact of invasive exotics both at the species and at the ecosystem levels. The decisions need to be made on whether benefits derived from the invasive spread of an exotic species outweigh the reduced value of ecosystem services, e.g. the loss of grazing land in areas invaded with *Prosopis juliflora*. A better planning is needed for early detection and reporting of infestations of spread of new and naturalized weeds by creation of Plant Detection Network in each State by establishing communication links between taxonomists, ecologists and forest managers to monitor and control (Pyšek *et al*. 2004) [32].

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Disclosure Statement

No potential conflict of interest was reported by the authors.

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ADVANTAGES AND DISADVANTAGES OF GREEN TECHNOLOGY: A STUDY

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Abstract:

The concept of green process and technologies is the processes and technologies which are environmentally friendly and clean technology. The goals of green technologies are as follow which are to meet the needs of society in the way without depleting or damaging natural resources on earth which is the major target of green technologies. The concept is to make products which can be fully reclaimed or reused. Furthermore, by changing patterns of production and consumption, steps are being taken into account to diminish waste and pollution as one of the most indispensable aims of green technologies. Many companies have committed for establishing manufacturing practices and business regarding green technologies. Besides, this kind of technology implies to a system which utilizes innovative techniques to create environmental friendly products. Predominantly, it contains the various everyday cleaning products, waste, inventions, energy sources, clothing and host of others. Going green or using technologies which are environmental friendly is amongst the many methods which countries are looking in order to spur economic growth and develop the lives of its citizens. Green processes and technologies use renewable and natural resources which never depletes. Besides, green technology utilizes innovative and new techniques in terms of energy generation.

KeyWords: Green Technology,Pollution, Wastemanagement, recycling methods.

I. INTRODUCTION

1.1 Advantages of Green Processes and Technology

Slow the impacts of global warming by reducing CO_2 emissions The advantage of using green energy sources is that it must be clean therefore there is no discharge or damage into the environment or atmosphere. Besides, it is also replenishable in contrast to oil. In addition, green energy facilities are difficult on the pocketbook to build, it demands a lesser amount of upkeep thus it lacks to spend some huge cash to work it. Moreover, this

may also create economic advantages to some particular areas and even develop tourism industry. Even while these seem excellent, there are a few who believe there exists profits to use such technology. Establishing these facilities additionally needs plenty of land so we might have to cut on farmland which explains what many are worried about if more wind generators have to be set up. A second negative aspect is the fact many of the green energy sources cannot really be installed in specific places of the earth. As an example, wave energy can only be made use of if the waves from the sea attain at the least 16 feet. The utilization of geothermal energy only works in geologically unstable areas of the planet. But if we look at these kinds of arguments, areas that can't utilize one method of green energy source could be replaced for another.

Preventing environmental damage

How to tackle environmental damage from the throwaway society is one of the defining questions of the twenty-first century. We must encourage and support sustainable production and consumption, notably through the establishment of a circular economy. These essays by an international group of leading scholars from a range of disciplines analyse policies and legal instruments and challenge mainstream assumptions, from the choice of a policy mix to the actual effect of imposing standards on the market, and from corporate objectives and priorities to the use of precaution in assessing particularly harmful substances. Each chapter contributes to a better understanding of the current policy and regulatory framework in Europe and identifies the challenges and opportunities ahead. The book breaks new ground by examining how product policies can contribute to important objectives and visions. It is a must-read for researchers as well as for policymakers and practitioners.

II Methodology

The information was collected from various books, Journals, books and internet. This studied was performed systematically and analyzed properly. This study reports the favorable and adverse effect on society as facing various issues and challenges faced by the society and its current demands. Various issues analyzes and observed systematically in perspective of sustainable living issues.

III. Results and Discussion

3.1 Shifting Emphasis to Pollution Prevention

While the pollution control approach has achieved considerable success in producing short-term improvements for local pollution problems, it has been less effective in addressing cumulative problems that are increasingly recognized on regional (e.g., acid rain) or global (e.g., ozone depletion) levels.

The aim of a health-oriented environmental pollution control programme is to promote a better quality of life by reducing pollution to the lowest level possible. Environmental pollution control programmes and policies, whose implications and priorities vary from country to country, cover all aspects of pollution (air, water, land and so on) and involve coordination among areas such as industrial development, city planning, water resources development and transportation policies.

As environmental pollution control technologies have become more sophisticated and more expensive, there has been a growing interest in ways to incorporate prevention in the design of industrial processes - with the objective of eliminating harmful environmental effects while promoting the competitiveness of industries. Among the benefits of pollution prevention approaches, clean technologies and toxic use reduction is the potential for eliminating worker exposure to health risks.

The pollution prevention approach focuses directly on the use of processes, practices, materials and energy that avoid or minimize the creation of pollutants and wastes at source, and not on "add-on" abatement measures. While corporate commitment plays a critical role in the decision to pursue pollution prevention (see Bringer and Zoesel in Environmental policy), Bennett draws attention to the societal benefits in reducing risks to ecosystem and human health—and the health of workers in particular. He identifies principles that can be usefully applied in assessing opportunities for pursuing this approach.

3.2 Cost of Public Health and Environmental Effects; Cost-Benefit Analysis

The estimation of the costs of public health and environmental effects is the most difficult part of a clean air implementation plan, as it is very difficult to estimate the value of lifetime reduction of disabling illnesses, hospital admission rates and hours of work lost. However, this estimation and a comparison with the cost of control measures is absolutely necessary in order to balance the costs of control measures versus the costs of no such measure undertaken, in terms of public health and environmental effects.

3.3 Motto of Green Technology

To full fill the needs of demanding, damaging or depleting the natural sources on the earth is the main target of Green Technology. This Idea fulfill the present needs without making any compromises [1]. We have to know the destination to reach the goals. For reduction of waste and pollution steps are to be taken by changing the patters and production. For further protection of environment it is required to develop the technology. Speedy implementation benefit the implementation and will protect earth. To search the goals of green Technology which are introducing sustainable living, developing reduce waste and developing renewable energy.

3.4 Disadvantages of Green Processes and Technology

Green processes and technology to minimize the pollution formed by our home, living habits, and business. The main adverse impact of process and technology is may to reduce the potential negative impact that energy consumption and pollution can have on the environment [2]. While environmentally friendly living is a positive ideal, there are several possible disadvantages of Green processes and technology such as: high implementing costs, lack of information, no known alternative chemical or raw material inputs, no known alternative process technology, uncertainty about performance impacts, and lack of human resources and skills.

IV. Conclusions:

It is studied tha as various parameters like advantages of green process and Technology, Preventing environment damage, Shifting Emphasis to Pollution Prevention, Cost of Public Health and Environmental Effects; Cost-Benefit Analysis, motto of green technology and disadvantages of green processes and technology. The green technology has some disadvantages

also which is reduce the potential negative impact that energy consumption and pollution can have on the environment . Speedy implementation benefit the implementation and will protect earth. To search the goals of green Technology which are introducing sustainable living, developing reduce waste and developing renewable energy

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Benefits of Renewable Energy Sources to the Environment

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ABSTRACT

All non-renewable energy sources have great impact on Environment. Non-Renewable energy sources (fossil fuel, Petrol, Coal, natural gas, oil, etc.) will became great threat to us in the future. We have to explore another alternative to produce electricity. Renewable energy sources (solar, wind, Geothermal, Biomass, Hydrothermal, Ocean, etc ;) will be that problem. With electricity became a basic requirement from day to day, renewable sources will become a good solution not only for our requirement but also to the environment. This review paper briefly describes, Why should we have to prefer renewable energy sources than non-renewable energy sources?. The effects we will face in the future by using non-renewable sources and how we will be benefited by renewable energy sources.

1. Introduction

Carbon is the main element in fossil fuels. For this reason, the time period that fossil fuels formed (about 360-300 million years ago) is called the Carboniferous Period. Over time, the dead plants were crushed under the seabed. Rocks and other sediment piled on top of them, creating high heat and pressure underground. In this environment, the plant and animal remains eventually turned into fossil fuels i.e. coal, natural gas, petroleum. These are abounded and inexpensive but impossible to reuse. When they are burnt, they produce large amount of carbon dioxide into the atmosphere. This gas is the greatest defaulter in producing global warming. The carbon dioxide keeps the heat in the atmosphere of the earth. This process is called the "greenhouse effect." Life on Earth requires heat to survive, but it is based on a balanced carbon budget. To protect Environment, control pollution and the potential for global warming may encourage wider access to alternative energy sources such as renewable energy source [1]. All these sources are renewable process of energy generation and do not cause environmental pollution.

2. Environmental impact of non-renewable energy source

There are two types of sources for producing electric power energy.

- Conventional Sources (Non renewable sources)- fossil fuel, Petrol, Coal, natural gas,Oil
- Non Conventional Sources (renewable sources)- solar, wind, Hydro, Geothermal, Biomass, Hydrothermal, Ocean, Tidal Energy.

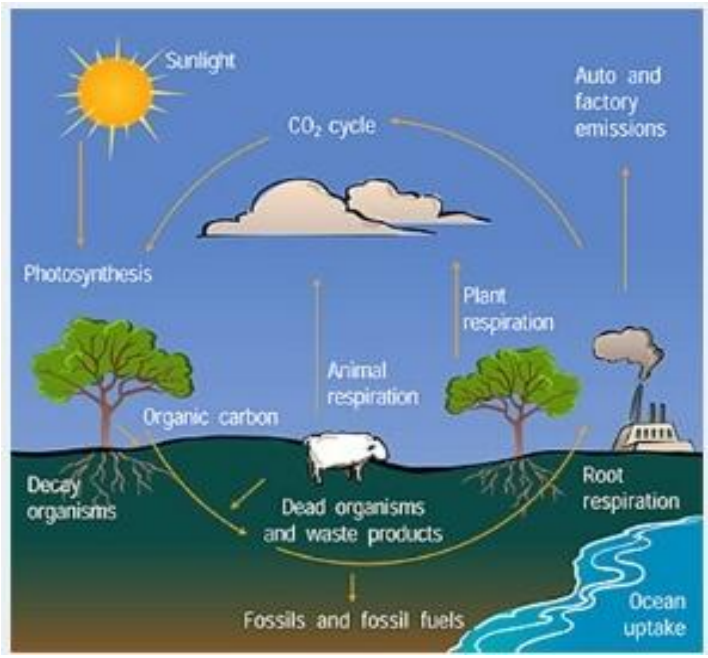
For industrialized nations like the United States, without fossil fuels, we can not imagine modern life. The majority of our transport and heating, and the power stations we use to generate electricity depend on burning coal, oil or natural gas.. However, fossil fuel production also carries severe economic, environmental and social costs.. Whenever we burn a fossil fuel, we are producing more carbon dioxide, toxic gases into the atmosphere, resulting in potentially devastating long-term contamination of land, air and water resources.

Acid rain refers to precipitation that carries sulfur and nitrogen compounds from the atmosphere to the ground. Negative environmental consequences include damage to vegetation and declining aquatic populations. Decreased agricultural production is also likely, since acid rain depletes the soil of nutrients that crops need to grow.

The temperature in the atmosphere increases due to the greenhouse effect. The result is an increase in global temperatures, the U.S. Environmental Protection Agency states. This phenomenon of climate change is associated with floods and heavy rain falls in many regions, as well as more frequent droughts and severe heat waves.

Fossil fuels are a major contributor to health-harming air pollution. The combustion process also creates nitrogen oxides that lead to the creation of smog, These materials can cause bronchitis and pneumonia, decrease resistance to respiratory infections and irritate the lungs. Power plant and transportation-related activities are about equally responsible for nitrogen oxide emissions

Coal-fired power plants also release pollutants that contaminate nearby soils. The transportation of oil raises the risk of spills that leave oceans and waterways uninhabitable for years to come [2].



Fossil fuel combustion is the part of carbon cycle

To protect the environment from these dangerous pollutants, we need cheap, natural and friendly environment production of Electricity resources are required. For this reason, the importance of renewable resources has increased. Renewable energy sources are sources that constantly renew throughout the human lifespan.

They are also referred to as Green Energy or Clean Energy as they do not emit carbon-di-oxide or other greenhouse gases. The major sources of renewable energy source are Solar, Wind, and Biomass Hydropower, Geothermal, and Tidal energy

All India the total installed capacity due to renewable energy sources is 62846.90MWh on 30-12-2018 [3].

While there are no global warming emissions associated with generating electricity from solar energy, there are emissions associated with other stages of the solar life-cycle, including manufacturing, materials transportation, installation, maintenance, and decommissioning and dismantlement.

The wind is one of the cleanest and most sustainable ways to generate electricity as it produces no toxic pollution or global warming emissions. Wind is also abundant, inexhaustible, and affordable, which makes it a viable and large-scale alternative to fossil fuels.

3. Nuclear Power

Nuclear power is energy released from the radioactive decay of elements, such as uranium, which releases large amounts of energy. Nuclear power plants produce no carbon dioxide and, therefore, are often considered an alternative fuel (fuels other than fossil fuels). Currently, world production of electricity from nuclear power is about 19.1 trillion KWh, with the United States producing and consuming about 22% of that. Nuclear power provides about 9% of the electricity in the United States (Figure 7).

There are environmental challenges with nuclear power. Mining and refining uranium ore and making reactor fuel demands a lot of energy. Also, nuclear power plants are very expensive and require large amounts of metal, concrete, and energy to build. The main environmental challenge for nuclear power is the wastes including uranium mill tailings, spent (used) reactor fuel, and other radioactive wastes. These materials have long radioactive half-lives and thus remain a threat to human health for thousands of years. The half life of a radioactive element is the time it takes for 50% of the material to radioactively decay. The U.S. Nuclear Regulatory Commission regulates the operation of nuclear power plants and the handling, transportation, storage, and disposal of radioactive materials to protect human health and the environment.

By volume, the waste produced from mining uranium, called uranium mill tailings, is the largest waste and contains the radioactive element radium, which decays to produce radon, a radioactive gas. High-level radioactive waste consists of used nuclear reactor fuel. This fuel is in a solid form consisting of small fuel pellets in long metal tubes and must be stored and handled with multiple containment, first cooled by water and later in special outdoor concrete or steel containers that are cooled by air. There is no long-term storage facility for this fuel in the United States.

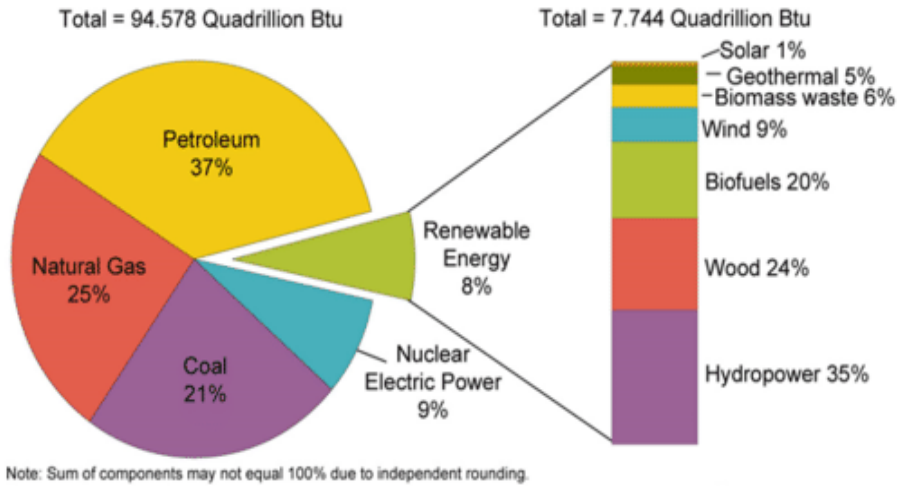


Figure 7. U.S. Energy Consumption by Energy Source, 2009
Renewable energy makes up 8% of U.S. energy consumption. Source: U.S. Energy Information Administration

There are many other regulatory precautions governing permitting, construction, operation, and decommissioning of nuclear power plants due to risks from an uncontrolled nuclear reaction. The potential for contamination of air, water and food is high should an uncontrolled reaction occur. Even when planning for worst-case scenarios, there are always risks of unexpected events. For example, the March 2011 earthquake and subsequent tsunami that hit Japan resulted in reactor meltdowns at the Fukushima Daiichi Nuclear Power Station, causing massive damage to the surrounding area.

The report outlined three broad strategies to shift to a circular economy. The use of products should be maximized, such as through car-sharing or keeping vehicles for longer, it said. Recycling and reducing waste are also key, as is using natural, low-carbon materials in construction, like bamboo and wood instead of cement, it said.

4. Green ambitions — on renewable energy targets

In a surprising statement this month, Union Power Minister R.K. Singh said India would overshoot its target of installing 175 gigawatts of capacity from renewable energy sources by 2022. India was on track, he said, to hit 225 GW of renewable capacity by then. This is a tall claim, considering India has missed several interim milestones since it announced its 175 GW target in 2015. The misses happened despite renewable capacity being augmented at a blistering pace, highlighting how ambitious the initial target was. Technological and financial challenges remain: both wind and solar generation could be erratic, and India's creaky electricity grid must be modernised to distribute such power efficiently. Meanwhile, wind and solar tariffs have hit such low levels that suppliers are working with wafer-thin margins. This means small shocks can knock these sectors off their growth trajectories. The obstacles have capped capacity addition to 69 GW till date, with India missing its 2016 and 2017 milestones. To hit its 2022 target of 175 GW, 106 GW will have to be added in four years, more than twice the capacity added in the last four.

In the solar sector alone, which the government is prioritising, policy uncertainties loom large. Manufacturers of photovoltaic (PV) cells have demanded a 70% safeguard duty on Chinese PV imports, and the Directorate General of Trade Remedies will soon take a call on this. But any such duty will deal a body blow to solar-power suppliers, who rely heavily on Chinese hardware, threatening the growth of the sector. There is also the problem of the rooftop-solar segment. Of the current goal of 100 GW from solar energy by 2022, 40 GW is to come from rooftop installations, and 60 GW from large solar parks. Despite being the fastest-growing renewable-energy segment so far — rooftop solar clocked a compound annual growth rate of 117% between 2013 and 2017 — India only hit 3% of its goal by the end of 2017, according to a Bloomberg New Energy Finance report. The reason? Homeowners aren't warming up to the idea of installing photovoltaic panels on their terraces because the economics does not work out for them. Compared to industries and commercial establishments, a home typically needs less power and will not use everything it generates. So, homeowners need to be able to sell electricity back to the grid, which in turn needs a nationwide "net-metering" policy. As of today, only a few States have such policies, discouraging users elsewhere. Such challenges can be overcome with the right incentives, but they will take time to kick in. The good news is that even if India hits the 175 GW target, it stands to meet its greenhouse-gas emission goal under the Paris climate agreement. This in itself will be a worthy achievement. Overshooting this target will be a plus, but until the government tackles the policy challenges, it must hold off on implausible claims.

5. Conclusion

Burning fossil fuels gives out toxic gases like carbon dioxide. Trees, eco life, infrastructure and monuments get damaged due to pollution caused by this toxic gases. Burning fossil fuels also increases the greenhouse effect because of increased carbon dioxide emissions. Scientists are increasingly worried about global warming and the melting of polar ice-caps, rising sea levels, and changing weather patterns around the world. 7 million people die every year due to pollution. We argued that clean and low carbon energy is the only logical choice for our future.Renewable energy sources play a major role to modify these deficiencies. Due to this, There is no pollution or ecological balance problem.Several renewable energy sources are financially and economically competitive for certain applications.

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A SIMPLE SPECTROPHOTOMETRIC ASSAY OF EDARAVONE IN BUILK SAMPLES

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ABSTRACT

A simple, sensitive, rapid and accurate colorimetric method has been developed for the estimation of edaravone in bulk and pharmaceutical dosage forms. The proposed method was based on the formation of chloroform extractable complex of edaravone with wool fast blue. The absorbance of the extractable ion pair complex is measured at the wavelength of maximum absorbance 585 nm against the reagent blank. Results obtained are statistically validated and found to be reproducible.

KEYWORDS: Spectrophotometry, Wool fast blue, edaravone, Pharmaceutical and Formulation

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INTRODUCTION

Edaravone (EDR) is a well-recognized lipophilic free radical scavenger for diseases including neurodegenerative disease, cardiovascular disease, and cancer. However, its oral use is restricted due to poor oral bioavailability. Literature survey reveals that a specific, sensitive and fast method based on reverse phase high performance thin layer liquid chromatography (RP-HPTLC)[1], HPLC[2-3] HPTLC[4] and LC-MS/MS[5] for the determination of edaravone in human, rat plasma and pharmaceutical formulations. No analytical methods reported so far for the estimation of edaravone in pharmaceutical formulations.

MATERIALS AND METHODS

Instrument

All measurement were done on Milton Roy 1001spectrophotometer by using 10 mm matched quartz cuvettes.

Materials

All chemicals used are of A.R. grade and were purchased from S.D. fine chemicals and LOBA-Chemi, Mumbai. Doubled distilled water were used for preparation of solutions

Buffer solution (p H 1.5): Buffer solution is prepared by mixing 289 ml of glycine solution (37.52 gm of glycine and 29.24 gm of NaCl are dissolved in 500ml of distilled water) with 711ml of 0.1 M Hcl.

Wool Fast Blue solution (0.2% w/v)

Wool Fast Blue solution is prepared by dissolving 200 mg of wool fast blue (Fluka) in 100 ml of distilled water.

Preparation of standard stock solution

The standard stock solution (1mg/ml) of edaravone was prepared by dissolving 100mg of edaravone in 100 ml distilled water. The working standard solutions of edaravone were obtained by appropriately diluting the standard stock solution with the same solvent.

Preparation of Calibration curve

Various aliquots of the standard edaravone solution ranging from 0.5-2.5 ml are transferred into a series of separating funnel. To each flask, 1.0 ml of wool fast blue solution, 1.5 ml of buffer solution and 5 ml of chloroform are added. Reaction mixture in each funnel is shaken gently for 5 min and allowed to stand for 5 min so as to separate aqueous and chloroform layer. The chloroform layer is separated out and absorbance is measured at 590 nm, against the reagent blank prepared in similar manner omitting drug solution. Calibration graph is obtained by plotting absorbance values against the concentration of edaravone solution. The calibration curve is found to be linear over a concentration range of 50 to 250 µg/mL of edaravone. The amount of edaravone present in the sample is estimated from the calibration graph. The results are presented in table 2.

Assay of Bulk drugs

For analysis of bulk drugs, 100 mg of the drug was weighted accurately and transferred into a 100 ml volumetric flask and the volume is made up to 100 ml with methanol. The concentration of the drug solutions is now 1mg/ml. This stock solution is further diluted to obtain the working concentration and treated as per the procedure of the calibration curve. Amount of the drug present in sample was computed from respective calibration curve.

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Amount of the drug present in sample was computed from respective calibration curve. The results are represented in table 2.

RESULTS AND DISCUSSION

In this method the edaravone treated with wool fast blue dye at 1.5 pH. The resultant solution is extracted with chloroform. The ion pair complex is form in extractable chloroform layer. The absorbance of the extractable ion pair complex is measured at 590 nm against the reagent blank (prepared in a similar manner devoid of drug solution). The calibration curve (concentration vs absorbance) is linear over the range of 50-250 µg/mL of edaravone. The optical characteristics of the proposed method such as absorption maxima, Beer´s law limits, molar absorptivity and Sandell´s sensitivity are presented in Table 1. The molar absorptivity and Sandell´s sensitivity values shows sensitivity of the method. The regression analysis using method of least squares was made for the slope (b), intercept (a) and correlation (r) obtained from different concentrations and results are summarized in the Table 1. The value of correlation coefficient was 0.999, which indicated the good linearity of calibration lines. The percent relative standard deviation calculated from the five measurements of edaravone shown in Table 2. The % RSD is less than 2, which indicates that the method has good reproducibility. The values of standard deviation values are low, indicates high accuracy and reproducibility of the method. The 't' calculated values are compares well with the theoretical value of 2.78 there by indicating that the precision of the method.

The proposed method is found to be simple, precise, accurate and time saving, reproducible and can be conveniently adopted for routine analysis of estimation of edaravone in bulk drugs samples.

Table 1: Optical Characteristics of the Proposed Method.

Parameters	Proposed method
Wavelength (nm)	590
Beer's limits, mcg/ml	50-250
Sandell's, sensitivity, (µg cm^{-2})	0.0639
Molar absorptivity, (L mol^{-1} cm^{-1})	$1.56x10^{3}$
Regression equation, Y^{*}	Y= 0.0044x+0.0011
Correlation coefficient, (r)	0.9999
Intercept (a)	0.0020
Slope (b)	0.0060

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Table 2: Assay of Edaravone in Bulk Samples.

Pure sample(mg)	*Amount found (mg) ±S.D*	% Label claim	*t_{cal}	%RSD
100	99.9±0.26	99.9	0.8431	0.2655

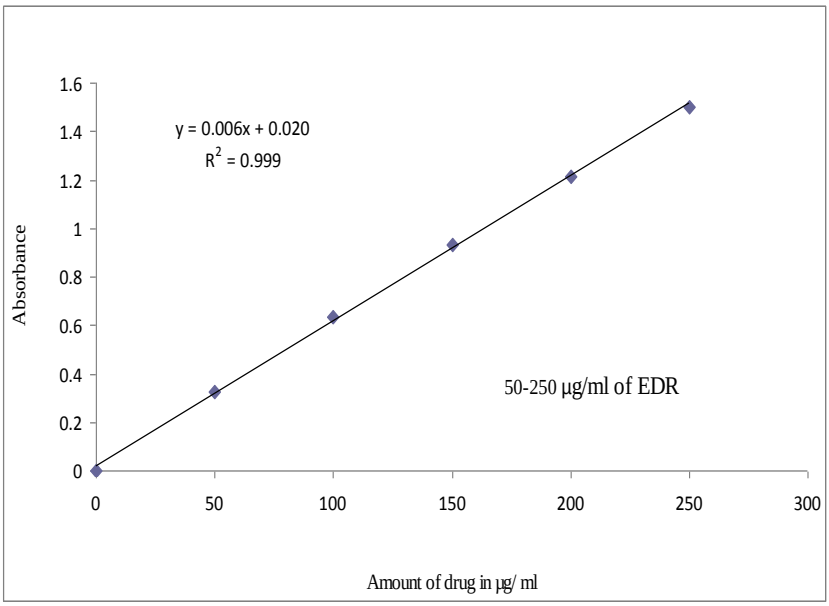


Fig.1: Calibration curve of Edaravone.

CONCLUSION

The developed visible spectrophotometric method was simple, sensitive, accurate, precise, and reproducible and can be successfully applied for the routine estimation of edaravone in bulk samples.

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A SIMPLE SPECTROPHOTOMETRIC ESTIMATION OF EDARAVONE IN BULK SAMPLES

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ABSTRACT

A simple, sensitive, rapid and accurate colorimetric method has been developed for the estimation of edaravone in bulk and pharmaceutical dosage forms. The method is based on the reaction of edaravone with 2, 3-dichloro-5, 6-dicyano-1, 4-benzquinone (DDQ) to form an orange red coloured charge–transfer complex. The orange red colour solution is used to determine the edaravone spectrophotometrically. Results obtained are statistically validated and found to be reproducible.

KEYWORDS: Spectrophotometry, 2, 3-dichloro-5, 6-dicyano-1, 4-benzquinone, edaravone, Pharmaceutical and Formulation.

INTRODUCTION

Edaravone (EDR) is a well-recognized lipophilic free radical scavenger for diseases including neurodegenerative disease, cardiovascular disease, and cancer. However, its oral use is restricted due to poor oral bioavailability. Literature survey reveals that a specific, sensitive and fast method based on reverse phase high performance thin layer liquid chromatography (RP-HPTLC),[1] HPLC[2,3] HPTLC[4] and LC-MS/MS[5] for the determination of edaravone in human, rat plasma and pharmaceutical formulations. The No analytical methods reported so far for the estimation of edaravone in pharmaceutical formulations.

MATERIALS AND METHODS

Instrument

All measurement were done on Milton Roy 1001spectrophotometer by using 10 mm matched quartz cuvettes.

Materials

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Buffer solution(pH 1.5)

Buffer solution is prepared by mixing 289 ml of glycine solution (37.52 gm of glycine and 29.24 gm of NaCl are dissolved in 500ml of distilled water) with 711ml of 0.1 M Hcl.

Wool Fast Blue solution (0.2% w/v)

Wool Fast Blue solution is prepared by dissolving 200 mg of wool fast blue (Fluka) in 100 ml of distilled water.

Preparation of standard stock solution

The standard stock solution (1mg/ml) of edaravone was prepared by dissolving 100mg of edaravone in 100 ml distilled water. The working standard solutions of edaravone were obtained by appropriately diluting the standard stock solution with the same solvent.

Preparation of Calibration curve

Various aliquots of the standard (100µg) edaravone solution ranging from 0.5-2.5 ml are transferred into a series of standard flasks. To each flask, 1.0 ml of DDQ solution is added to produce an orange red colour. The final volume is brought to 10 ml with methanol. The reaction mixture in each flask is well shaken and allowed to stand for 5 min to complete the reaction. The absorbance of the orange red colour solution is measured at 460 nm, against the reagent blank prepared in similar manner omitting drug solution. Calibration graph is obtained by plotting absorbance values against the concentration of edaravone solution. The calibration curve is found to be linear over a concentration range of 50 to 250 µg of edaravone. The amount of edaravone present in the sample is read from the calibration graph. The results are presented in table 2.

Assay of edaravone in bulk samples

50 mg of pure edaravone is dissolved in methanol and the volume is made upto 50 ml with methanol. Further dilution is made as described in the preparation of standard solution of edaravone. Further analysis is carried out as per procedure described above and results are summarized in the Table 2. The amount of drug present in the sample is estimated from calibration graph.

RESULTS AND DISCUSSION

In this method the drug react with DDQ solution to form an orange red charge complex. The orange red coloured charge complex solution formed is measured at 460 nm against reagent blank. The amount of drug read from calibration curve. The calibration curve is linear over the range of 50-250 µg of edaravone. The optical characteristics of the proposed method such as absorption maxima, Beer´s law limits, molar absorptivity and Sandell´s sensitivity are presented in Table 1. The molar absorptivity and Sandell´s sensitivity values show sensitivity of the method. The regression analysis using method of least squares was made for the slope (b), intercept (a) and correlation (r) obtained from different concentrations and results are summarized in the Table 1. The value of correlation coefficient (r) was 0.999, which indicated the good linearity of calibration lines. The percent relative standard deviation calculated from the five measurements of edaravone shown in Table 2. The % RSD is less than 2, which indicates that the method has good reproducibility. The values of standard deviation values are low, indicates high accuracy and reproducibility of the method. The 't' calculated values are compares well with the theoretical value of 2.78 there by indicating that the precision of the method.

The proposed method is found to be simple, precise, accurate and time saving, reproducible and can be conveniently adopted for routine analysis of estimation of edaravone in bulk drugs samples.

Table 1: Optical Characteristics of the Proposed Method.

Parameters	Proposed method
Wavelength (nm)	460
Beer's limits, mcg/ml	50-250
Sandell's , sensitivity, (µg cm^{-2})	0.0974
Molar absorptivity, (L mol^{-1} cm^{-1})	$1.02x10^3$
Regression equation, Y*	Y= 0.006x+0.017
Correlation coefficient, (r)	0.9999
Intercept (a)	0.006
Slope (b)	0.0017

Table 2: Assay of Edaravone in Bulk Samples.

Pure Sample(mg)	*Amount found (mg)±S.D*	% Label clam	%RSD*	*t cal
100	100.07±0.09	100.07	0.0899	1.7412

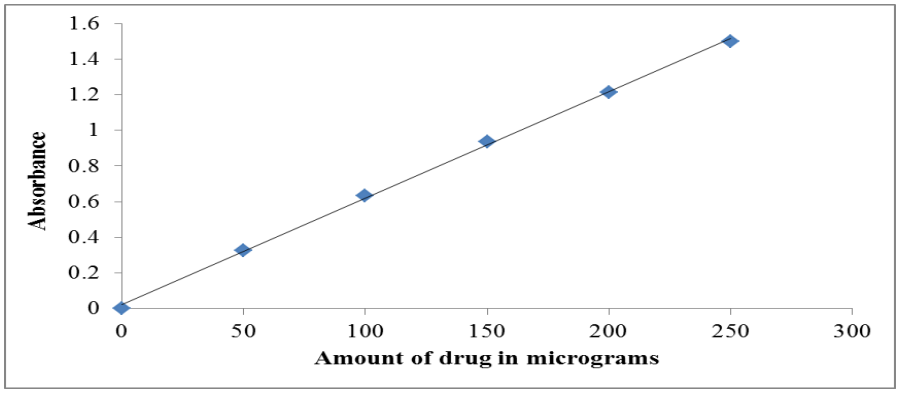


Fig. 1: Calibration curve of Edaravone.

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Photoluminescence studies on holmium (III) and praseodymium (III) doped calcium borophosphate (CBP) phosphors

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ABSTRACT

Using solid state reaction method, Ho^{3+} and Pr^{3+} doped calcium borophosphate (CBP) phosphors were prepared. These phosphors were characterized using XRD, SEM, FT-IR, ^{31}P solid state NMR, photoluminescence (PL) and decay profiles. Structural details were discussed from XRD and FT-IR spectra. From ^{31}P NMR spectra of these phosphors, mono-phosphate complexes Q^0-(PO_4^{3-}) were observed. Photoluminescence spectra were measured for both Ho^{3+} and Pr^{3+} doped calcium borophosphate phosphors and the spectra were studied for different concentrations. Decay curves were obtained for the excited level, $^5F_4$+$^5S_2$ of Ho^{3+} and $^1D_2$ level of Pr^{3+} in these calcium borophosphate phosphors and lifetimes were measured. CIE color chromaticity diagrams are drawn for these two rare earth ions in calcium borophosphate phosphors. Results show that Ho^{3+} and Pr^{3+} doped CBP phosphors might be served as green and red luminescence materials.

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1. Introduction

Nowadays, the phosphors have been extensively used in the development of wide variety of display, lighting applications and other related communication technologies like UV–Visible light emitting diodes, solid state lasers and various photoluminescence materials [1,2]. Among various host materials, phosphate is an excellent host for preparation of phosphors due to various advantages such as low synthesis temperature, ease of preparation, good thermal and chemical stability and high emission brightness for solid state lighting applications. Among different emission materials, orthophosphates have good fundamental properties such as high band gap, high absorption of PO_4^{3-} in UV–visible region, low phonon energy and exceptional optical damage threshold [3,4].

Rare earth ions doped phosphors have been utilized in modern lighting and display field devices such as FED, PDP, VFDs and WLEDs [5,6]. The generation of white light is easily realized either by incorporation of tricolor phosphors (blue, green and red) with UV-emitting chips or by combination of phosphors (green and red) with blue GaN chips [7]. The pure rare earth ions have not so far been extensively used in practical applications as tunable solid state lasers or phosphors devices mainly because of their drawbacks such as low thermal and photo stability and poor mechanical properties. As a result, increasing attention has been focused on the design and synthesis of organic-inorganic hybrid composites owing to their good mechanical, thermal and chemical properties [8].

Among all rare earth ions, Ho^{3+} and Pr^{3+} ions are good luminescent centers since their energy levels have several metastable multiplets, which can emit light from the level $^5F_4$+$^5S_2$ (green emission) for Ho^{3+} ion and $^1D_2$ level (red emission) for Pr^{3+} ion in visible region [9,10]. Ho^{3+} and Pr^{3+} ions exhibit interesting energy level schemes and the energy levels are well separated, thus radiative transitions are favoured through the energy separation between the respective levels, which give a suitable combination for many up and down conversion processes [11].

Recently, Zhou et al. [12] initiated a study on multi-parametric thermal sensing based on NIR emission of Ho^{3+} doped $CaWO_4$ phosphors and reported the thermometry effect of $CaWO_4$:Ho^{3+} phosphors through the near infrared emission intensity of Ho^{3+}: $^5I_6 \rightarrow {}^5I_8$ transition at ~1190 nm. Wang et al. [13] observed luminescence properties of novel bluish green long-lasting phosphor $LiBaPO_4$:Eu^{2+}, Ho^{3+} and achieved good persistent luminescence in $LiBaPO_4$ phosphor with co-doped Eu^{2+}, Ho^{3+} without changing the emission band. Singh et al. [14] studied defects and optical properties of $CaAl_{12}O_{19}$:Ho^{3+} phosphor material and also studied thermoluminescence (TL) at different temperatures and defect centres induced by gamma irradiation. Juache et al. [15] reported luminescence properties of Pr^{3+} doped $SrZrO_3$ phosphors and observed that luminescence increased remarkably with higher sintering temperatures. Xiong et al. [16] studied luminescence properties of novel red-emitting phosphors $LaBMO_6$: Pr^{3+} and reported the photoluminescence properties of novel red emitting $LaBMO_6$: Pr^{3+} phosphor for the application in white LEDs. Boronat et al. [17] investigated on cathodluminescence emission of Pr^{3+} doped $LaAlO_3$ phosphors reported the results obtained from the cathodoluminescence (CL) properties of undoped $LaAlO_3$ and $LaAlO_3$:RE^{3+} (RE = Dy, Pr and Eu).

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In this paper, an attempt is made to report the influence of different concentrations of Ho^{3+} and Pr^{3+} ions on the photoluminescence properties in $2CaO-B_2O_3-P_2O_5$ (CBP) phosphors. Changes in spectroscopic properties as a function of concentration were observed and are discussed in terms of local environment of the Ho^{3+} and Pr^{3+} ions. Different concentrations of Ho^{3+} and Pr^{3+} doped CBP phosphors were synthesized using solid state reaction method and investigated the structural and luminescence properties. Together with the concentration dependent luminescence, the color perception and photoluminescence decay of $^5F_4+^5S_2$ level of Ho^{3+} and $^1D_2$ level of Pr^{3+} ions were also studied. The measured lifetimes (τ_{meas}), CIE color coordinates (x, y) and absolute quantum efficiencies (Q_E) were calculated for these two ions in the CBP phosphors. The luminescence properties indicated that these phosphors were good candidates for green (Ho^{3+}) and red (Pr^{3+}) emission applications.

2. Experimental

Using solid state reaction method, Ho^{3+} and Pr^{3+} doped $2CaO-B_2O_3-P_2O_5$ (CBP) phosphors ((2-x)$CaO-B_2O_3-P_2O_5$-xRE (where $RE=Ho_2O_3$ and Pr_6O_{11}, x = 0.2, 0.4, 0.6, 0.8 and 1.0 mol%)) were prepared using raw materials, $CaCO_3$, H_3BO_3, $NH_4H_2PO_4$, Ho_2O_3 and Pr_6O_{11} with 99.9% purity. A batch of 10 gm of raw material was weighed as per the composition given. These materials were taken in an agate mortar and after grinding they are preheated at 650 °C for 2 h in porcelain crucible and then cooled to room temperature. The preheated batches were again ground and heated at 950 °C for 4 h in an electrical furnace. The obtained phosphor powders were used for various characterizations and analysis.

Crystal structure and phase purity of Ho^{3+} and Pr^{3+} doped CBP phosphors were characterized by X-ray diffraction (XRD) with Rigaku D/Max-2400 instrument, using Ni filtered Cu tube with K_α radiation. SEM morphology of Ho^{3+} and Pr^{3+} doped CBP phosphors were taken by Carl Zeiss EVO-MA15 scanning electron microscope. Fourier transform infrared spectra were recorded at room temperature with 4 cm^{-1} spectral resolution between 400 and 4000 cm^{-1} using BRUKER FTIR spectrometer. Solid state ^{31}P NMR spectra of host, Ho^{3+} and Pr^{3+} doped CBP phosphors were obtained at 400 MHz using a JEOL ECX400 DELTA2 NMR spectrometer with a 4 mm probe. Excitation, photoluminescence and decay lifetimes of Ho^{3+} and Pr^{3+} doped CBP phosphors were acquired using FLS-920 Edinburg-fluorimeter (Horiba FL3- 22iHR320). The absolute photoluminescence quantum efficiencies of the prepared samples were measured by using an integrating sphere which is connected to the fluorescence spectrometer (Horiba FL3- 22iHR320). The integrating sphere was mounted on the side of the fluorescence spectrometer sample chamber, opposite to the excitation source. The CIE 1931 chromaticity coordinates of all the present phosphors were obtained by a color analyzer equipped with a CCD detector (HAAS-2000).

3. Results and discussion

3.1. X-ray diffraction spectra (XRD)

X-ray diffraction patterns of host material, $0.6Ho^{3+}$ and $0.6Pr^{3+}$ doped CBP phosphors in the range, 10°–80° are shown in Fig. 1. It is observed that, all the samples showed similar diffraction peaks reported in JCPDS card No: 0-018-0283 and they are in good agreement. It was also found that, with the variation of doping concentration, no changes in JCPDS structure, thus implying the formation of pure crystalline phase of Ho^{3+} and Pr^{3+} doped CBP phosphors. A well crystallized hexagonal symmetry with group space *P6cc* (184) was observed.

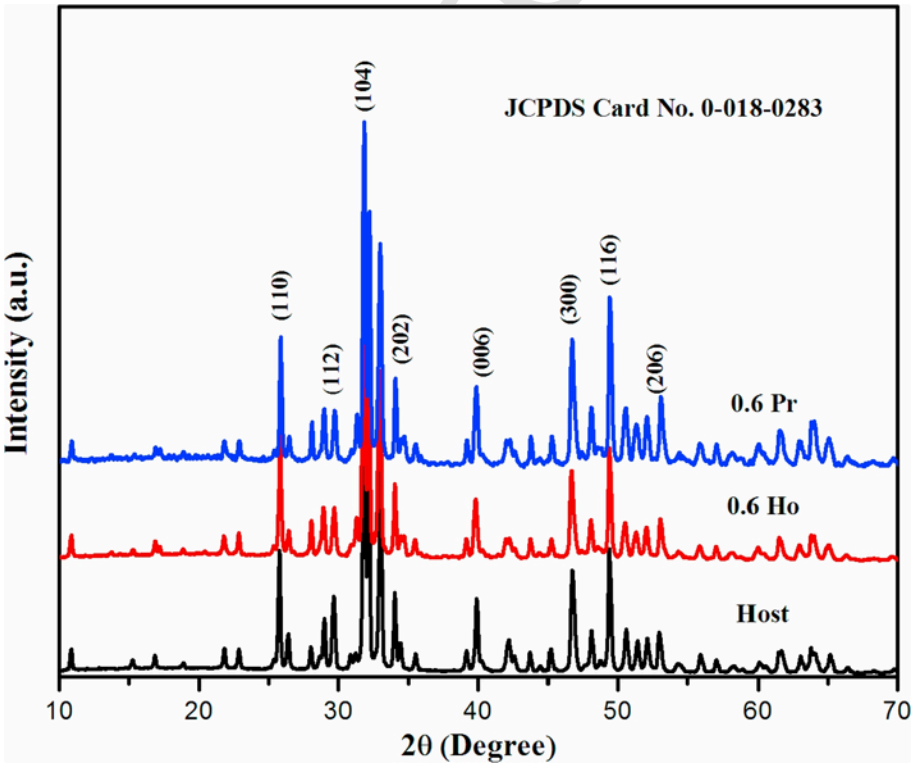


Fig. 1. XRD profiles of host, Ho^{3+} (0.6 mol %) and Pr^{3+} (0.6 mol %) doped $2CaO-B_2O_3-P_2O_5$ phosphors.

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3.2. SEM morphology

SEM morphologies are shown in Figs. 2(a–e) and 3(a-e) for different concentrations of Ho^{3+} and Pr^{3+} doped CBP phosphors. From the figure, it is found that the particle size has increased as the Ho^{3+} and Pr^{3+} concentration increased from 0.2 to 1.0 mol% and the particles have more irregular morphologies. The luminescence properties of phosphors depend on the particle size, shape, crystallinity and defects. In the present work, the sizes of the particles are in the range between few microns and several tens of microns and they are suitable for use in the WLEDs applications.

3.3. FT-IR spectra

Fourier transform infrared spectrum of CBP phosphor is measured in the range 500–3600 cm^{-1} and is shown in Fig. 4. From the figure, it is observed that the spectrum consists of eight bands centered at ~570, ~1029, ~1511, ~1702, ~2337, ~3119, ~3241 and ~3601 cm^{-1}. The bands at 570, 1029 and 1511 cm^{-1} are attributed to the $(PO_4)^{-3}$ vibrational bands [18] and correspond to asymmetric stretching vibrations. The band at 570 cm^{-1} is due to O—P—O asymmetric bending vibrations, while the band at 1029 cm^{-1} is due to O—P—O asymmetric stretching vibrations of $[PO_4]^{3-}$ tetrahedrons [18]. The band at 1511 cm^{-1} is attributed to the asymmetric stretching

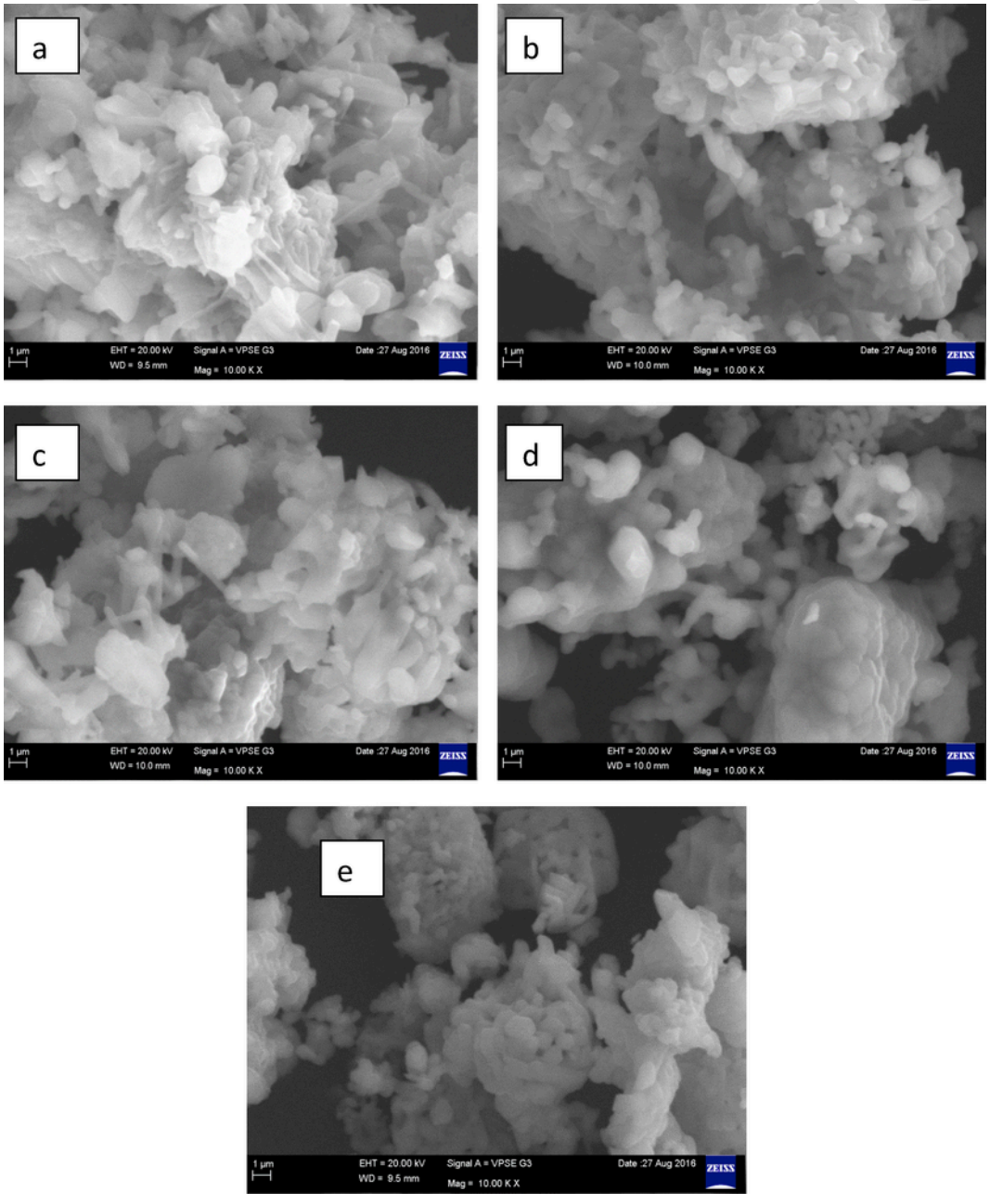


Fig. 2. SEM images (a = 0.2, b = 0.4, c = 0.6, d = 0.8 and e = 1.0 mol %) of Ho^{3+} doped $2CaO\text{-}B_2O_3\text{-}P_2O_5$ phosphor.

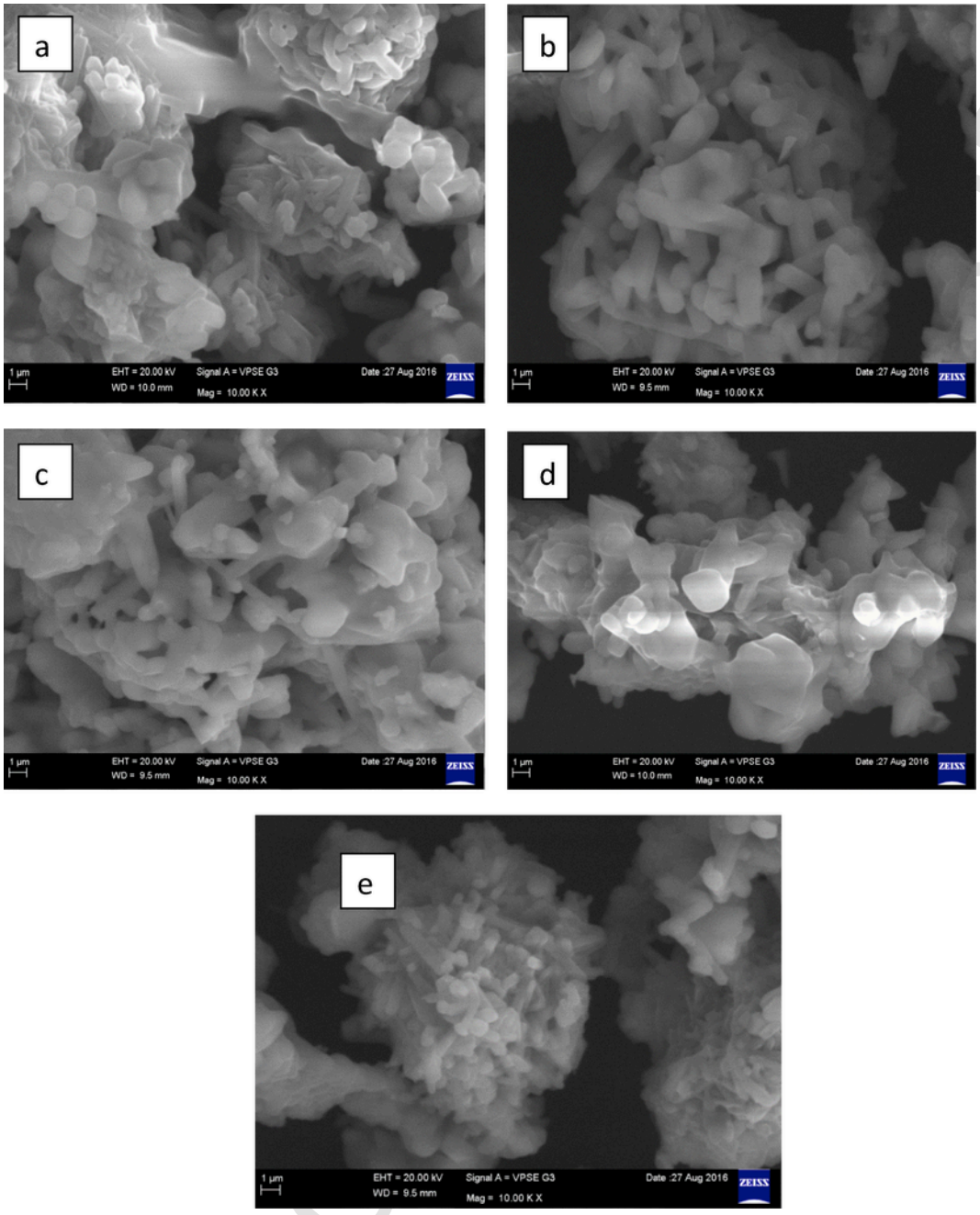


Fig. 3. SEM images (a = 0.2, b = 0.4, c = 0.6, d = 0.8 and e = 1.0 mol %) of Pr^{3+} doped $2CaO\text{-}B_2O_3\text{-}P_2O_5$ phosphor.

of C—O bonds [19]. The bands observed between the energy range 1702–3601 cm^{-1} are assigned to the H—O—H bending vibrational mode of the H_2O molecule.

3.4. ^{31}P solid state NMR spectra

^{31}P solid state NMR is one of the important techniques in characterizing the structures of phosphate-type phosphors due to the chemical shifts being sensitive to the phosphorus environment. The phosphate bonding is described via Q^n species, where the superscript n refers to the number of bridging oxygens per tetrahedron [20]. ^{31}P NMR spectra of CBP and CBP: $0.6Ho^{3+}$ and CBP: $0.6Pr^{3+}$ phosphors are shown in Fig. 5. The component band of the phosphate group corresponding to the chemical shift located in the positive frequency region is assigned in line with literature data, to the presence of mono-phosphate complexes Q^0 -(PO_4^{3-}), while the line corresponding to the chemical shift in the negative frequency region is attributed to the presence of di-phosphate complexes (PO_7^{4-})-Q^1 [21]. In the present work, the obtained spectrum (from Fig. 5) shows single, symmetric Gaussian peak and the positions of lines for CBP and CBP: $0.6Ho^{3+}$ and CBP: $0.6Pr^{3+}$ phosphors are at +3.9 ppm. This value indicates the presence of mono-phosphate complexes Q^0-(PO_4^{3-}) (phosphate tetrahedral with zero bridging oxygens) in CBP and CBP: $0.6Ho^{3+}$ and CBP: $0.6Pr^{3+}$ phosphors network [22,23].

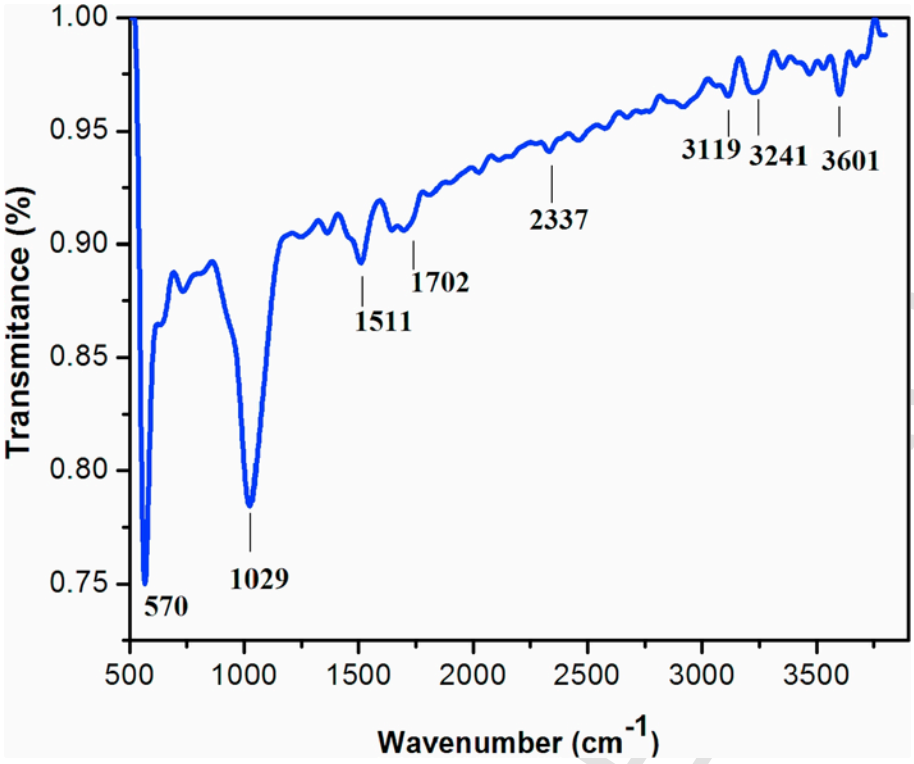


Fig. 4. FT-IR spectrum of $2CaO\text{-}B_2O_3\text{-}P_2O_5$ phosphor.

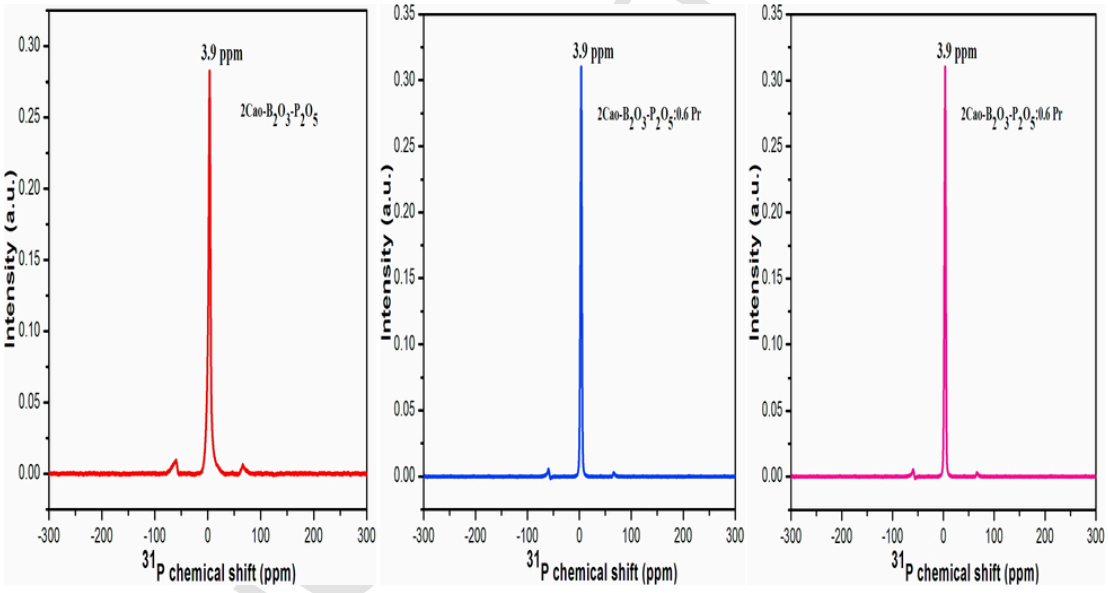


Fig. 5. ^{31}P Solid State NMR Spectra of (a) host, (b) Ho^{3+} (0.6 mol%) and (c) Pr^{3+} (0.6 mol %) doped $2CaO\text{-}B_2O_3\text{-}P_2O_5$ phosphors.

3.5. Emission spectra of Ho^{3+} doped CBP phosphors

Excitation spectrum of 0.6 mol% Ho^{3+} doped CBP phosphor is shown in the inset of Fig. 6 recorded in the wavelength region 325–450 nm using the emission wavelength of 532 nm and is similar to all other Ho^{3+} doped CBP phosphors. It consists four bands corresponding to transitions from the ground state, $^5I_8$ to different excited states, $^3H_5$ (365 nm), $^5G_4$ (382 nm), $^5G_5$ (415 nm) and $^5G_6$ (445 nm). Among the four bands, the band at 365 nm ($^5I_8 \rightarrow {}^3H_5$) showed sharp and high intensity; hence this transition wavelength (365 nm) is selected to investigate the visible photoluminescence spectra for different concentrations of Ho^{3+} ion doped CBP phosphors.

The emission spectra of different concentrations of Ho^{3+} doped CBP phosphors are measured in the range 500–700 nm using the excitation wavelength 365 nm and are shown in Fig. 6. The spectra show two emission peaks one in the green region (532 nm) which is due to $(^5F_4 + {}^5S_2) \rightarrow {}^5I_8$ transition and the other in the red region

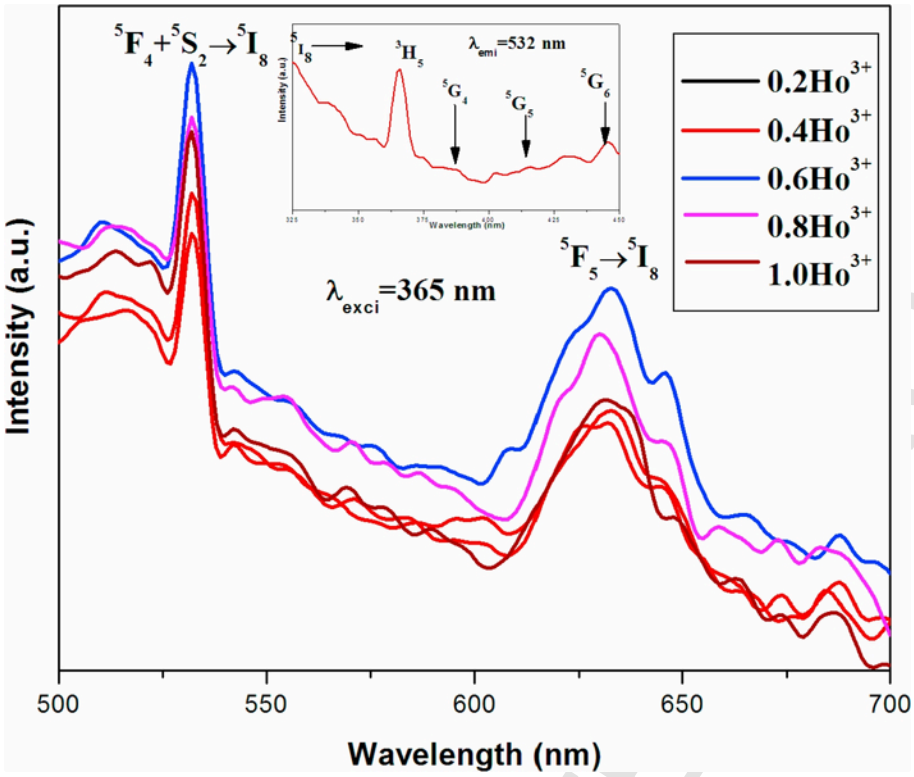


Fig. 6. Emission spectra (inset shows the excitation spectrum of 0.6 mol%) of Ho^{3+} doped 2CaO-B_2O_3-P_2O_5 phosphor for different concentrations.

(635 nm) which is due to $^5F_5\rightarrow{}^5I_8$ transition. When excited at 365 nm ($^5I_8\rightarrow{}^3H_5$), there is a non-radiative decay from $^3H_5$ to ($^5F_4$+$^5S_2$) and $^5F_5$ levels due to the closely spaced higher energy levels. The de-excitation from these levels emits green and red emissions, respectively.

3.6. Emission spectra of Pr^{3+} doped CBP phosphors

Excitation spectrum of 0.6 mol% Pr^{3+}: CBP phosphor recorded in the region 400–550 nm using an emission wavelength of 608 nm is depicted as inset of Fig. 7. The spectrum consist of three sharp excitation bands peaking at 445 ($^3H_4\rightarrow{}^3P_2$), 468 ($^3H_4\rightarrow{}^3P_1$) and 487 nm ($^3H_4\rightarrow{}^3P_0$), which are attributed to $4f^2$-$4f^2$ transitions of Pr^{3+} ion. Among all excited transitions, the strong excitation band at 445 nm corresponding to $^3H_4\rightarrow{}^3P_2$ transition shows high intensity and it is used to measure the photoluminescence spectra of different concentrations of Pr^{3+} doped CBP phosphors.

The emission spectra of Pr^{3+} doped CBP phosphors for different concentrations are measured in the wavelength region 500–750 nm using excitation wavelength 445 nm and are shown in Fig. 7. From the figure, it is observed that the emission spectra consists six bands corresponding to the transitions, $^3P_1\rightarrow{}^3H_5$, $^1D_2\rightarrow{}^3H_4$, $^3P_0\rightarrow{}^3F_2$, $^3P_1\rightarrow{}^3F_3$, $^3P_0\rightarrow{}^3F_3$ and $^3P_0\rightarrow{}^3F_4$ appeared at ~528, ~608, ~648, ~686, ~711 and ~731 nm, respectively. The emission bands in the orange-red region are due to $^1D_2\rightarrow{}^3H_4$ and $^3P_0\rightarrow{}^3F_2$ transitions which show higher intensity when compared with other emission transitions. The peak to peak separations of this transition are 142, 125, 99, 83 and 82 cm^{-1} for 0.2, 0.4, 0.6, 0.8 and 1.0 mol% of Pr^{3+} doped CBP phosphors respectively. The peak intensity ratios of the longer and shorter wavelength components are designated as I_L/I_S. An increase in intensity ratio indicates a shift of the center of gravity of the emission peak to longer wavelength which is an indication of increase in covalency of Pr—O bond [24]. The peak intensity ratios of $^1D_2\rightarrow{}^3H_4$ transition were 0.99, 1.03, 1.08, 1.04 and 1.02 for 0.2, 0.4, 0.6, 0.8 and 1.0 mol% of Pr^{3+} doped CBP phosphors respectively.

Fig. 8 shows the variation of emission intensities of $^5F_4$ + $^5S_2\rightarrow{}^5I_8$ (Ho^{3+}) and $^1D_2\rightarrow{}^3H_4$ (Pr^{3+}) transitions with the Ho^{3+} and Pr^{3+} concentrations, respectively. The emission intensities of Ho^{3+} and Pr^{3+} ions increased with increasing concentration and reached maximum at 0.6 mol% and then decreased due to the concentration quenching. Generally, quenching effect mechanism can be explained by two ways. First one is through the defects or impurity ions that are present in the crystals, so energy is transferred to the phonon spectrum of the host lattice. Second one is through cross relaxation due to which excitation energy is lost by the luminescence state [25]. In the present work, the concentration quenching phenomenon occurred due to the cross-relaxation channels by the respective luminescence states of Ho^{3+} and Pr^{3+} ions. The excitation energy which strongly depends on RE^{3+} concentration is transferred between rare earth ions. Based on the increasing concentration of individual Ho^{3+} and Pr^{3+} ions, the distance between Ho^{3+} ions and Pr^{3+} ions decreases, which promotes non-radiative energy transfer between their respective Ho^{3+} and Pr^{3+} ions. And also Ho^{3+} and Pr^{3+} ion pairs accumulate more and more, which leads to the luminescence quenching due to efficient resonant energy transfer between their individual Ho^{3+} ions and Pr^{3+} ions.

The critical energy transfer distance or critical distance (R_c) between the rare earth ions in the host can be estimated by Blasses's formula [25],

$$R_c = 2\left[\frac{3V}{4\pi xZ}\right]^{1/3} \quad (1)$$

where x is critical concentration of rare earth ion, Z is the number of host cations in the unit cell, and V is the volume of the unit cell.

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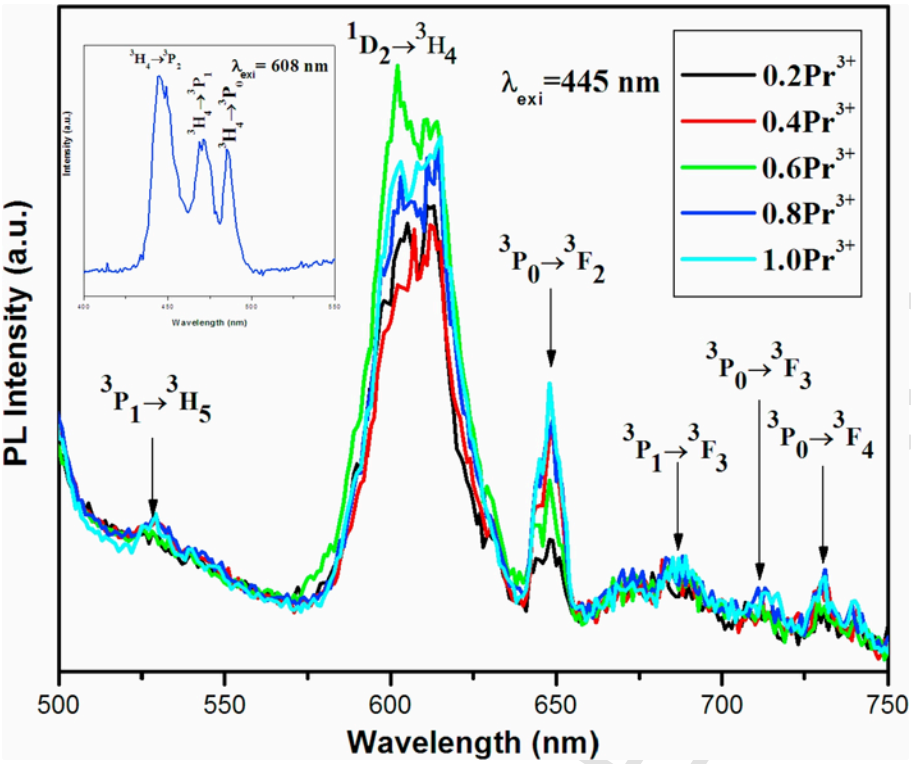


Fig. 7. Emission spectra (inset shows the excitation spectrum of 0.6 mol%) of Pr^{3+} doped 2CaO-B_2O_3-P_2O_5 phosphor for different concentrations.

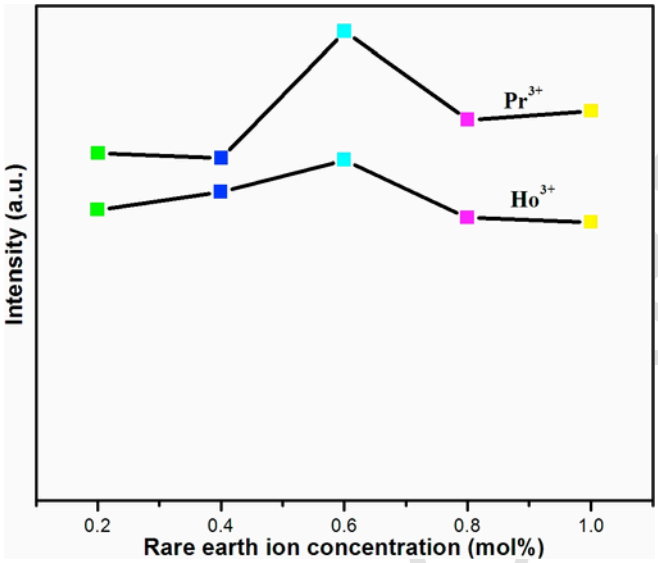


Fig. 8. Variation of emission intensities of Ho^{3+} and Pr^{3+} doped 2CaO-B_2O_3-P_2O_5 phosphors with the variation of concentrations.

The energy transfer parameter (Q) can be expressed as follows

$$Q = \frac{4\pi}{3}\Pi\left(1-\frac{3}{s}\right)N_0R_c^3 \quad (2)$$

Here, N_0 is the concentration of rare earth ions, R_c is the critical energy transfer distance. For CBP phosphor, Z is 16 and V is 512.49 $Å^3$ which are obtained from the XRD profile and s = 6 (for dipole-dipole interaction). Thus, the critical distances (R_c) and energy transfer parameters (Q) of Ho^{3+} and Pr^{3+} doped CBP phosphors are calculated using Eqs. (1) and (2) for all concentrations and are presented in Table 1. From the table, it is observed that the energy transfer parameter increases while critical distance between Ho^{3+} ion pairs and Pr^{3+} ion pairs decreases with the increase of Ho^{3+} and Pr^{3+} ions concentrations and there may be a chance for increased energy transfer due to luminescence decay.

3.7. Decay profiles of Ho^{3+} and Pr^{3+} doped CBP phosphors

The luminescence decay curves are measured for $^5F_4$+$^5S_2$ excited level of Ho^{3+} doped CBP phosphors using the excitation and emission wavelengths, 365 and 532 nm respectively and are shown in Fig. 9a. From the figure, it is observed that all the Ho^{3+} doped CBP phosphors showed non-exponential behavior due to the existence of non-radiative channels. The non-exponential behavior in Ho^{3+} doped CBP phosphors indicates the similar local environment of holmium ion for all concentrations. The decay lifetimes (τ_{meas}) of $^5F_4$+$^5S_2$ level are measured and are presented in Table 2. From the table, it is observed that the measured lifetimes are maximum at 0.6 mol% and then decreased for 0.8 and 1.0 mol% of Ho^{3+} ion due to energy transfer between excited Ho^{3+} ions through cross-relaxation channels. The de-

Table 1
Critical transfer distance (R_c, Å) and energy transfer parameter (Q) of Ho^{3+} and Pr^{3+} doped 2CaO-B_2O_3-P_2O_5 phosphor for different concentrations.

Concentration (mol%)	R_c	Q
0.2	6.73	4.52
0.4	5.34	4.85
0.6	4.67	5.02
0.8	4.24	5.37
1.0	3.94	5.88

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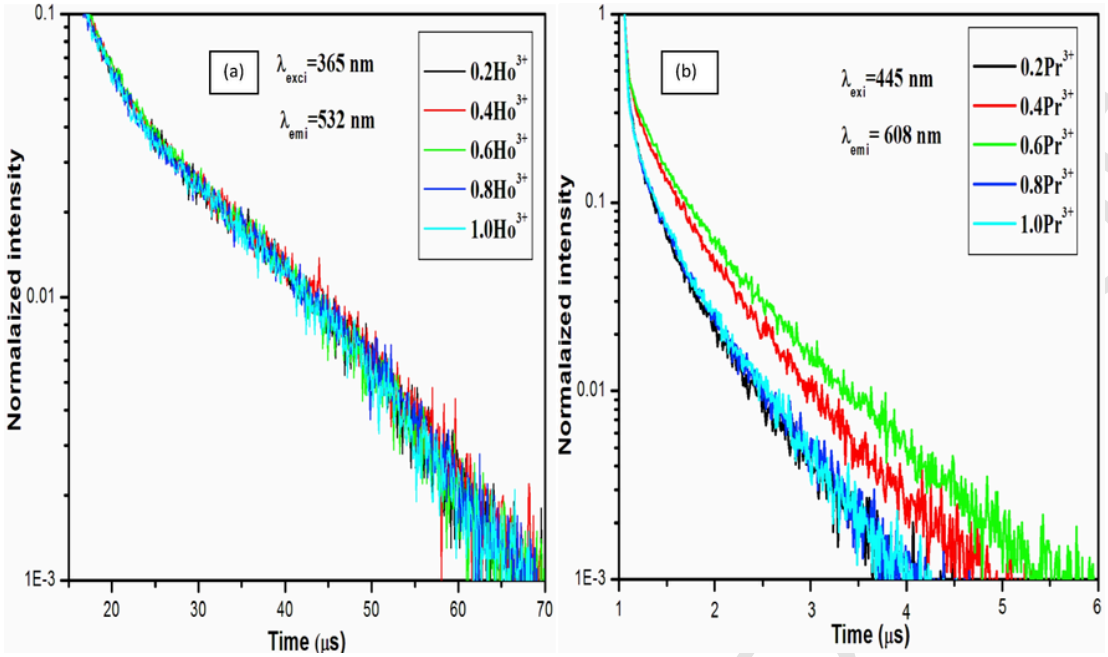


Fig. 9. Decay profiles of (a) Ho^{3+} and (b) Pr^{3+} doped $2CaO\text{-}B_2O_3\text{-}P_2O_5$ phosphor for different concentrations.

Table 2
Measured lifetimes (τ_{meas}, ms), absolute quantum efficiencies (Q_E, %) and color coordinates of Ho^{3+} and Pr^{3+} doped $2CaO\text{-}B_2O_3\text{-}P_2O_5$ phosphor for different concentrations.

Rare earth ion	Concentration (mole%)	τ_{meas}	Q_E	Color coordinates x y
Ho^{3+}	0.2	6.335	96.01	0.37 0.58
	0.4	6.310	74.62	0.38 0.57
	0.6	6.477	65.57	0.39 0.58
	0.8	6.291	62.51	0.40 0.57
	1.0	6.271	45.74	0.42 0.57
	$CaWO_4$ [12]	5.841	–	–
	$LiBaPO_4$ [13]	14.271	–	0.19 0.33
Pr^{3+}	0.2	0.135	95.53	0.59 0.32
	0.4	0.255	71.29	0.62 0.33
	0.6	0.321	57.39	0.65 0.32
	0.8	0.143	42.61	0.63 0.33
	1.0	0.139	29.03	0.62 0.32
	$SrZrO_3$ [15]	0.129	–	–
	$LaBMO_6$ [16]	–	–	0.62 0.33

crease in lifetime and non-exponential fit were the characteristics of the existence of concentration quenching mechanism at higher concentrations of Ho^{3+} ion. The measured lifetimes of Ho^{3+} doped CBP phosphors were compared with other reported phosphors such as $CaWO_4$ [12] and $LiBaPO_4$ [13]. It is noticed that, the present phosphor (0.6 mol% Ho^{3+}) has higher τ_{meas} value than $CaWO_4$ [12].

Fluorescence decay profiles of $^1D_2$ level of Pr^{3+} doped CBP phosphors are recorded (λ_{exci}: 445 and λ_{emi}: 608 nm) and are shown in Fig. 9b. The decay profiles for all concentrations of Pr^{3+} doped phosphor are fitted to non-exponential function. The measured lifetimes are obtained for all Pr^{3+} doped CBP phosphors and are presented in Table 2. It is observed that the measured lifetimes are increased with an increase of Pr^{3+} ion concentration up to 0.6 mol% and then decreased for higher concentrations (0.8 and 1.0 mol%) of Pr^{3+} doped CBP phosphors. In the present work, the lifetimes of $^1D_2$ level for Pr^{3+} ion in different CBP phosphors are found to be in the range 0.13–0.32 ms. The τ_{meas} values of Pr^{3+} doped CBP phosphors were compared with other reported $SrZrO_3$ [15] phosphor. It is noticed that, the present phosphor (0.6 mol% Pr^{3+}) has higher τ_{meas} value than $SrZrO_3$ [15].

The absolute quantum efficiencies (Q_E) are measured under excitation wavelengths 365 and 445 nm for Ho^{3+} and Pr^{3+} doped CBP phosphors, respectively with the fluorescence spectrometer by using an integrating sphere. The Q_E values of Ho^{3+} and Pr^{3+} doped CBP phosphors are presented in Table 2 for different concentrations and compared with measured lifetimes. It is observed that Q_E values decreased with increasing of Ho^{3+} and Pr^{3+} ion concentration indicating the decrease of luminescence intensity at higher concentrations. It is also observed that as Q_E values decreased with increasing Ho^{3+} and Pr^{3+} ion concentration, the lifetimes are increased with an increase of Pr^{3+} ion concentration up to 0.6 mol% and then decreased. For Ho^{3+} ion, the lifetimes were slightly changed.

3.8. CIE-color coordinates of Ho^{3+} and Pr^{3+} doped CBP phosphors

Commission International de l'Eclairage (CIE) color coordinates of Ho^{3+} and Pr^{3+} doped CBP phosphors are calculated from photoluminescence spectra using equidistant wavelength method and shown in Fig. 10(a&b). The CIE coordinates are very much useful to detect the exact luminescence color and color purity of samples from color chromaticity diagram [26]. In the present work, the color coordinates such as X, Y and Z of Ho^{3+} and Pr^{3+} doped CBP phosphors are obtained by formulae [26] as follows,

$$x = \frac{X}{X+Y+Z} \text{ and } y = \frac{Y}{X+Y+Z} \quad (3)$$

and color purity of present ions are calculated using formulae given in Ref. [26].

For Ho^{3+} ion (Fig. 10a), the color chromaticity coordinates are calculated at 365 nm excitation wavelength for all concentrations and are presented in Table 2. From the table, it is observed that 0.6 mol% of Ho^{3+} doped CBP phosphor gives green color and remaining concentrations (0.2, 0.4, 0.8 and 2.0 mol%) of Ho^{3+} show yellowish

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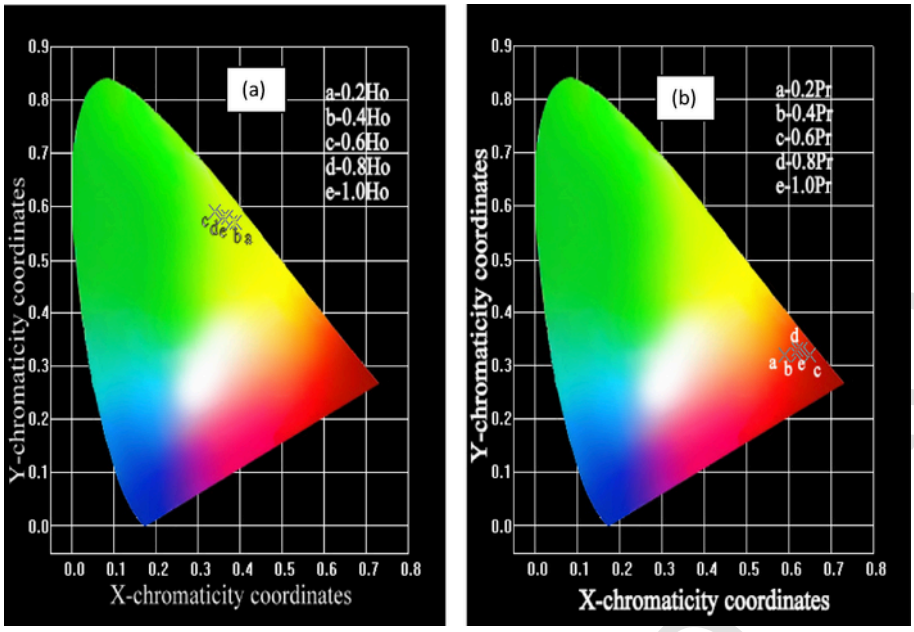


Fig. 10. CIE chromaticity diagram of (a) Ho^{3+} and (b) Pr^{3+} doped $2CaO\text{-}B_2O_3\text{-}P_2O_5$ phosphor for different concentrations.

green. The color purity of $0.6Ho^{3+}$: CBP phosphor are obtained from color chromaticity coordinates and is found to be 97.49%. Hence, 0.6 mol% of Ho^{3+} doped CBP phosphor might be useful for green emission applications.

The CIE color chromaticity diagram of Pr^{3+} doped CBP phosphor for all concentrations is shown in Fig. 10b and the color coordinates are presented in Table 2. From the figure, it is noticed that with the increase of Pr^{3+} concentration from 0.2 to 0.6 mol%, the color tone changes from reddish orange region to pure red region and then the color tone turns back to reddish orange region for higher concentrations (0.8 and 1.0 mol%) of Pr^{3+} ions. The color purity of $0.6Pr^{3+}$ doped CBP phosphor is 98.96%. Therefore, 0.6 mol% of Pr^{3+} doped CBP phosphor might be useful for red luminescence applications.

4. Conclusions

Calcium borophosphate (CBP) phosphor doped with Ho^{3+} and Pr^{3+} ions for different concentrations are prepared by solid state reaction method. SEM images confirmed that the particles exhibit more irregular morphologies due to Ho^{3+} and Pr^{3+} incorporation. From XRD patterns, all Ho^{3+} and Pr^{3+} doped CBP phosphors are well crystallized into hexagonal symmetry with group space *P6cc* (184). From the FT-IR spectrum, the prominent band at 1029 cm^{-1} is assigned to the asymmetric stretching vibrations of $[PO_4]^{3-}$ tetrahedrons. From ^{31}P NMR spectra of Ho^{3+} and Pr^{3+} doped CBP phosphors, the component lines corresponding to the chemical shifts located in the positive frequency region indicated the presence of mono-phosphate complexes $Q^0\text{-}(PO_4^{3-})$. From luminescence spectra, concentration quenching is observed at 0.6 mol % of Ho^{3+} and Pr^{3+} doped CBP phosphors. From the decay profiles, it is observed that the all decay curves are well fitted to non-exponential behavior due to the existence of non-radiative channels. From CIE chromaticity diagram, green and red color luminescence are observed at 0.6 mol % of Ho^{3+} and Pr^{3+} doped CBP phosphors. Hence, 0.6 mol % of Ho^{3+} and Pr^{3+} doped CBP phosphors could be used as potential green and red emission material.

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వెళ్తూ దుర్వేశిగ్రామంలో శిలలుగా మారారని అంటారు" గదిపేముల మండలంలోని బోగీశ్వరస్వామి క్షేత్రంలో శివరాత్రికి బ్రహ్మోత్సవాలు జరుగుతాయి. గదిగోపుల గ్రామం నుంచి స్వామి వారి ఉత్సవమూర్తులను ఆలయానికి తీసుకొని రావడంతో ఉత్సవాలు ప్రారంభం అవుతాయి. స్వామివారికి ధ్వజారోహణం, భేరీపూజలు, ఋష్యశృంగ మహర్షిని కళ్యాణానికి ఆహ్వానించడం, రాత్రి లింగోద్భవ సమయంలో మూలనరులకు మహాన్యాన పూర్వక రుద్రాభిషేకం, అమ్మవారికి సహస్ర నామకుంకుమార్చన అనంతరం శ్రీవారుల కళ్యాణ మహోత్సవం నిర్వహిస్తారు. తరువాత నంది వాహనోత్సవం, రథోత్సవం, వసంతోత్సవం, సాయంత్రం పారువేట తదినంతరం గదిగోపుల గ్రామంలో ఉత్సవ కార్యక్రమం ముగుస్తుందని ఆలయ అధికారి బుద్దన్న తెలిపారు.

ముగింపు :

శైవమత ప్రాధాన్యం గల వాటిలో యాగంటి, కైరుప్పల, హొళగుంద, ఎమ్మిగనూరు నీలకంఠేశ్వరుడు, గురజాల శ్రీరామలింగేశ్వరస్వామి, మద్దికెర వనమహేశ్వర స్వామి, కాలబుగ్గ రామేశ్వరస్వామి, పత్తికొండ వీరభద్ర స్వామి, శ్రీశైలం మల్లికార్జునస్వామి, మహానంది మహా నందీశ్వరస్వామి మొదలగు ఉత్సవాలు ప్రజలలో అనందాన్ని, ఆత్మీయతను, భక్తిని బిన్నత్వంలో ఐకత్వాన్ని చాటుతాయి.

ఎక్కడ నుండో ప్రజలు ఈ ఉత్సవాలు తిలకించడానికి వస్తారు. క్రిములను, చీమ, జంతుజాలాన్ని కూడ సమానంగా ప్రేమించే శివుడంటే అందరికి ఇష్టం. క్రూర, విష సర్పాలను సైతం ప్రేమిచగలిగే దైవం శివుడే అని ప్రజల నమ్మకం.

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54. తెలుగు సాహిత్యంలో జీవన నైపుణ్యాలు - డి. రూతమ్మ
55. ప్రపంచీకరణ నేపథ్యంలో రుబాయి కవితాస్థానం - ఆర్. మమత
56. ప్రాచీన ఆధునిక విద్యావిధానాలు - ప్రపంచీకరణ పాత్ర - నారాయణదాసు మంజులాదారి
57. రుబాయి కవితలోని జ్ఞాన ప్రాధాన్యత - ఎం. భవాని
58. పీర్ల పండుగ కథ - పల్లె జీవనం - డా. హరిన కళ
59. ఆధునిక యుగ విమర్శ వికాసంలో మన తెలుగువారు - డా. మల్లెపాగు వెంకటలక్ష్మమ్మ

డాలరు కోడలు నవలలో కుటుంబ సంబంధా

- డా. ఐ. శ్రీదేవి, కళాశాల అధ్యక్షులు, ప్రభుత్వ మహిళా కళాశాల, చేబ్రోలు, గుం

"మానవ సంబంధాలను ఆర్థిక సంబంధాలే" అన్నాడు అనంద్యోగాలు ఈ విధంగా అలోచిస్తే వాల

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ఆధునిక యుగ విమర్శ వికాసంలో మన తెలుగువా

- డా॥ మల్లెపోగు వెంకటలక్ష్మణ్, తెలుగు అధ్యా

'వి' అను ఉపసర్గకు 'మృశ్' అను ధాతువు చేరి విమర్శ' అనే పదం పుట్టింది. వి+మృశ్ = విమర్శ. పరామర్శించుట, పరిశీలించుట, పరీక్షించుట, చర్చించుట, విమర్శ అనగా లోక సాధారణార్థం. తప్పులెన్నుట, సాహిత్యపరంగా విమర్శ అంటే గుణదోష ప్రకటన. ప్రాచీన కాలంలో విమర్శకు వ్యాఖ్య, వివరణము, మీమాంస మున్నగు పదముల పర్యాయపదములుగా వ్యాప్తిలో కలవు. "గ్రంథములకు సంబంధించిన సర్వ విషయములను కూలంకుషంగా చర్చించి వాఙ్మయమున ఆ గ్రంథమునకు గల స్థానం నిరూపించుట విమర్శ అనబడును.

గ్రంథసేకరణ, సంస్కరణ, పరిష్కరణ అన్నవి సాహిత్య పరిశోధనలో ప్రధానమైనవి. పరిశోధనకు, సాహిత్య విమర్శకు అవినాభావ సంబంధం వుంది. ఒక ప్రాచీన రచనకు సంబంధించి సాధ్యమైనన్ని లిఖిత ప్రతులను సేకరించి, అవసరమైన చిన్నచిన్న సవరణలు చేసి, సరియైన పాఠనిర్ణయం చేసి, విభాగాలను సూచించి, గ్రంథానికి తుదిరూపం ఇవ్వటాన్ని పరిష్కరణమంటారు. పరిష్కర్త గ్రంథానికి పీఠికను కూడ సమకూర్చుతారు. ఈ తరహా విమర్శను పాఠ్య విమర్శ అంటారు.

ఇక విమర్శలో నేను చర్చించిపోయే విమర్శకులు ప్రధానంగా 1. కందుకూరి వీరేశలింగం, 2. కాశీభట్ల బ్రహ్మయ్యశాస్త్రి, 3. వేదం వెంకటరాయశాస్త్రి, 4.పుదప్పాకం సుబ్రమణ్య అయ్యర్, 6. వింజమూరి రంగాచార్యులు 6. గురజాడ అప్పారావు, 7. రాళ్ళపల్లి అనంతకృష్ణశర్మ, 8. విశ్వనాథ సత్యనారాయణగార్లు.

చార్లెస్ ఫిలిప్ బ్రౌన్ ఈస్టిండియా కంపెనీ ఉద్యోగిగా తృప్తిపడక తెలుగు భాషా సాహిత్యాలను అధ్యయనం చేసి విమర్శ చేశారు.

వేమన రాసిన 693 పద్యాలను బ్రౌన్ అనువదించారు. అందులో ఆయన మత, నీతి, మర్మ అని నాలుగు భాగాలు విభజన చేసి అ తృప్తిపడక అవసరమైన చోట శబ్ద చర్చ చేసి, వ్యాఖ్య చేశారు. యతిభంగం కలిగినట్లుగా కనిపించే సంద తొందరపడకుండా ఉచ్చారణ రీతులను దృష్టి నిర్ణయానికి రావాలని దీన్నే ఆయన 'దుర్వుమర్శ' ఆశుపద్ధతికి చెందిన వేమన పద్యాలన దుర్వు దృష్ట్యా పరిశీలించుట, లయజ్ఞానం కలిగిన మా వ్యవహర్తలకు మాత్రమే సాధ్యం. అలాంటిది బ్రౌ విదేశీయుడికి సాధ్యమైందంటే ఆయన తెలుగు సాహిత్యాల మీద ఎంత అధికారాన్ని సంపాదించా చెప్పనక్కరలేదు.

అంతేకాకుండా ఒక వద్యం ద్వారా అ విమర్శపై శాస్త్రియత ఉందని తెలునుకోవచ్చు.

ఉదా :

"చంపదగిన యట్టి శత్రువు తన చేత
చిక్కెనేని కీడు చేయరాదు
పాపగమేలు చేసి పామునుబో లాలు"

అన్న వేమన పద్యం చివరి చరణంలో " అన్నమాటలకు బదులు "బావు" అన్న పాఠం కూ ప్రతుల్లో ఉంది. బ్రౌన్ "బావు" అన్న పాఠమే చేశారు. ఈ పీఠికలో వేమన స్థల, కాలాదులకు సం చిన చర్చ కూడా ఉంది. ముఖ్యంగా వేమన పద్యా మాండలిక పదాల ఆధారంగా కూడా వేమన వివ

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Experimental and Computational Study of Thiophene Based Calamitic Liquid Crystals

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ABSTRACT

The structurally analogous calamitic mesogens 4-((4-(decyloxy) phenoxy) carbonyl) phenyl thiophene-2-carboxylate [2TWC10] and 4-(Thiophen-3-yl) phenyl 4-dodecylbenzoate [S12] based on thiophene were synthesized and structures of the molecules were confirmed by spectroscopic techniques. Among the two molecules, only 2TWC10 mesogen with alkoxy terminal exhibited a typical threaded structure indicating a homeotropic nematic phase under hot stage-polarizing optical microscopy (HOPM). Further, it is supported by differential scanning calorimetry (DSC). Remarkably, alkyl terminal S12 mesogen is not showing liquid crystalline properties. This is because S12 has alkyl group as the terminal group instead of alkoxy group which was used generally, resulting in bent shape to the molecule which reduced aspect ratio which is essential for liquid crystalline property. UV-Visible absorption maxima because of π-$\pi*$ transitions in these mesogens were found at 280-300nm in chloroform solution. The DFT study shows that the alkoxy terminal in 2TW10 is contributing to polarity of the molecule but in S12 there is no contribution from terminal chain because it is non polar group. The DFT study also shows that 2TWC10 is more reactive and less stable than S12 molecule.

Keywords: Nematic phase, Photo-physical, Thiophene, DFT Study, Calamitic.

INTRODUCTION

Heterocyclic thiophene based liquid-crystalline materials found potential use in optical information storage, photovoltaic cells, organic thin-film transistors, spatial light-modulation, fast switching ferroelectric materials, in optical signal processing, fluorescent probes, chemosensors and so on[1-3]. The extent of use of liquid crystalline molecules in various fields depends on molecular

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structure and their organization because structure and organization influence their properties[4]. So, the properties of these molecules are dependent on substituents, hetero cyclic rings and π-conjugated cores. The conjugation in the core is responsible for charge carrier mobility in the liquid crystal molecules. The thiophene based π-functionalized mesogen with imine and ester-based moieties exhibit fluorescence in addition to liquid crystalline property, so these moieties have been used for inducing light responsive and optical properties in the molecules[5-10]. Due to this, thiophene unit was extensively used in the design of topologically different mesogens such as discotic, bent-core, polycatenar, dendron, star-branched, V-shape, cone type, ring form and polyphilic molecules[11-14]. The trend of insertion of thiophene ring in the core of mesogen gained significance as it reduces the melting point and viscosity, increases optical anisotropy and induces negative dielectric anisotropy. It also alters the symmetry of micro or nano segregation, molecular shape as well as mesophase formation[15-16]. The functionalized thiophene liquid crystalline oligomers and polymeric thiophenes are used in plastics, electronics, organic photovoltaic, solid-state lasers, field-effect transistors, radio frequency identification tags, and sensors[17-20]. These promising materials exhibit a high charge transporting organic semiconductors of the ordered alignment of molecules[20-22]. It is also found that self-organization by the liquid crystalline molecule is one of the critical approaches to controlling the order and packing with an aim to suppress the defect formation usually found in non-mesogenic organic materials[23-28].

In the present work, thiophene based three ring compounds were synthesized. 2TWC10 and S12 were chosen to understand the effect of terminal chain and direct bond between thiophene and phenyl ring in core on liquid crystalline property. The structures of the molecules were confirmed using spectroscopic techniques. The phase behaviour and mesomorphism of the thiophene compounds were investigated using the HOPM and their enthalpies were measured using DSC. The absorption maxima of the compounds were measured with UV-Visible absorption spectroscopy. The structure and property relationship was investigated. The energy minimized model structures and dipole-moment of two mesogens were obtained from density functional theory (DFT).

EXPERIMENTAL

Materials

4-dodecylbenzoic acid, 4-hydroxy benzaldehyde, 4-bromophenol and 2-thiophene carboxylic acid were purchased from Sigma-Aldrich Chemicals & Co India. N, N -dimethylformamide, thionyl chloride ($SOCl_2$), ethanol, Triethylamine, tetrahydrofuran and methanol were bought from SD Fine, Mumbai. n-hexane, hydrochloric acid, n-heptane, Silica gel (100-200 mesh), ethyl acetate, acetone, isopropanol, potassium bromide, ethyl methyl ketone (EMK), acetonitrile, dichloromethane, anhydrous sodium sulphate, calcium chloride, sodium hydroxide, and sodium bicarbonate were purchased from AVARA chemicals (India).

Measurements

An ABB BOMEM MB3000 was used for measuring FT-IR spectroscopy. The JEOL ECA 500NMR spectrometer was used for measuring ^{1}H and ^{13}C NMR spectra. The Carl Zeiss Axiocam MRC5 polarizing microscope attached with Linkam THMS 600 stage was used for identifying phases and transition temperatures. The A2M digital camera imager was used to capture the texture of mesophase. DSC Q200 TA instruments Q-10 series was used for conducting Differential scanning colorimetry (DSC). The data collected from second heating and cooling cycle was used for the study after conducting two heating and cooling cycles for each sample[29]. The Becke's three-parameter hybrid exchange functional and Lee-Yang-Parr correlation functional (B3LYP) method employing 6-31G(d) basis set. Gaussian 03W suite of program was used for density functional theory (DFT) calculations[30-32]. Shimadzu UV-1800 spectrophotometer was used for obtaining absorption spectra in solution.

Synthesis

The synthetic route of thiophene based mesogens are shown in Schemes 1-2. 4-((4-(decyloxy) phenoxy)carbonyl)phenylthiophene-2-carboxylate (2TWC10) was prepared by esterification using respective carboxylic acids coupled with 4-decyl oxy phenol using DCC/DMAP method and 4-(thiophen-3-yl)phenyl 4-dodecylbenzoate (S12) prepared by Suzuki method.

Synthesis of 4-formylphenyl thiophene-2-carboxylate [I]

To 4-hydroxy benzaldehyde (5.0 g, 40 mmol) dissolved in ethyl methyl ketone, Tri ethylamine (3.3 mL, 23 mmol) dissolved in same solvent was added slowly. To the reaction mixture 2-thiophene carbonyl chloride (5.9 g, 40 mmol) was added slowly at 0°C through dropping funnel and it was stirred for 4 hours. Then, the precipitated triethyl ammonium chloride salt was removed by filtration and filtrate was evaporated. The obtained solid was recrystallized from hot isopropyl alcohol.

Yield: 88%, colourless solid, m.p.: 89-91°C, FT-IR: 3102 (aromatic C-H stretching), 2813, 2721, 2064 (C-H), 1721 (C=O), 1603, 1592 (aromatic C=C stretching), 1409, 1356, 1304 (C-$H_{bending}$), 1261, 1206, 1153 (C-O-C of ester and ether). ^{1}H NMR (500 MHz, $CDCl_3$): 9.90 (d, *J*=2.1, 1H), 7.99 (d, *J*=4.0, 1H), 7.93 (d, *J*=8.6, 2H), 7.69 (t, *J*=5.5 1H), 7.39 (d, *J*=8.5, 2H), 7.18 (m, 1H). ^{13}C NMR (125 MHz, $CDCl_3$): 191.03, 159.92, 155.33, 135.33, 134.30, 134.18, 132.20, 131.35, 128.33 and 122.53.

Synthesis of 4-((thiophene-2-carbonyl) oxy) benzoic acid [II]

4-formyl phenyl thiophene-2-carboxylate (1.0 g, 4.3 mmol) was dissolved in tetrahydrofuran (THF) placed in flask. A mixture of anhydrous sodium dihydrogen phosphate (NaH_2PO_4) (4.7 g, 4 mol) and sodium chlorite ($NaClO_2$) (8 g, 4 mol) dissolved in 25 mL distilled water and slowly added to the flask at 0°C using dropping funnel[33]. The reaction was stirred for 10 hours. After completion of reaction the solution was neutralized with 10% sodium bicarbonate ($NaHCO_3$) solution to get white solid precipitate. The obtained solid was recrystallized from hot n-heptane. Yield 78%, colourless solid powder. FT-IR (KBr, cm^{-1}): 3074 (C-H of aromatic ring), 2932, 2864.9 (C-H of alkyl chain), 2662, 2549 (O-H of -COOH) 1734 (C=O ester), 1682 (C=O of -COOH), 1603 and 1528 (C=C), 1478, 1427 (C-H bending), 1252, 1206 and 1164 (C-O-C of ester and ether groups). ^{1}H NMR (500 MHz, DMSO-d_6) δ 8.0 (d, *J*=8.6, 2H), 7.9 (d, *J*=3.7 1H), 7.7 (dd, *J*=4.9, 1.0, 1H), 7.2 (d, *J*=8.6, 2H), 7.16 (t, *J*=4.1, 1H). ^{13}C NMR (125 MHz,) δ 172.07, 164.79, 158.73, 140.07, 136.90, 136.12, 136.06, 133.73, 133.33, 133.30 and 126.60.

4-((4-(decyloxy) phenoxy) carbonyl) phenyl thiophene-2-carboxylate [2TWC10]

4-((thiophene-2-carbonyl)oxy)benzoic acid (0.5 g, 2.0 mmol) and 4-decyloxy phenol (0.5 g, 2.4 mmol) were dissolved in 20 mL tetrahydrofuran (THF) solution. The solution was stirred on a magnetic stirrer, after half an hour N, N-di cyclohexyl carbodiimide (DCC) (0.6 g, 2.44 mmol) and 4-dimethylaminopyridine (DMAP) (30 mg, 0.24 mmol) dissolved in dichloromethane were added slowly. The stirring was continued for 12 hours. The reaction progress was monitored using TLC. The biproduct was filtered and the filtrate was washed with sodium bicarbonate and followed by distilled water using 250 mL separating funnel. The filtrate was evaporated to get the semi-solid. column chromatography was used to purify. Yield: 78%, colorless solid, FT-IR (KBr, cm^{-1}): 3096, 2952, 2926, 2882 (C-H stretching), 1710 (C=O), 1606 (C=C, aromatic), 1464, 1426 (C-H bending), 1278, 1145, 1094, (C-O-C). ^{1}H NMR (400 MHz, $CDCl_3$) 8.28 (d, *J*=3.8 1H), 8.21 (d, *J*=8.0, 2H), 7.62 (dd, *J*=5.0, 2H), 7.34–7.32 (m, *J*=5.0, 1H), 7.28 (d, *J*=8.0, 2H), 6.87–6.85 (d, 2H), 3.96 (t, *J*=3.4 Hz, 2H), 1.72 (p, 2H), 1.45 (m, 19H alkyl group), 1.38–1.27 (m, 4H), 0.94 (t, 2H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 164.77, 159.96, 156.99, 154.66, 144.19, 135.13, 134.03, 132.33, 131.80, 128.19, 127.39, 122.35, 121.88, 115.16, 68.48, 31.82, 29.70, 29.36, 29.28, 29.25, 26.05, 22.66, 14.10.

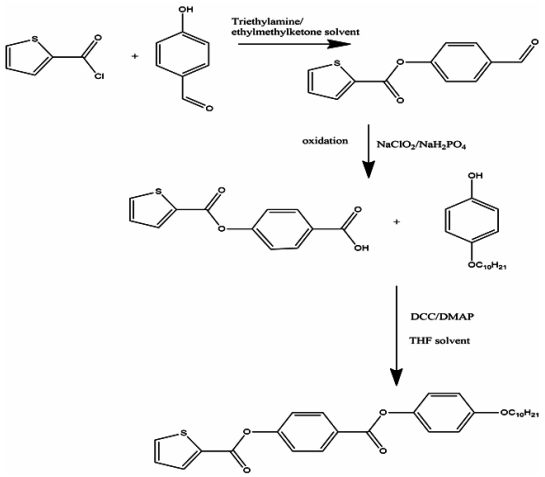
Synthesis of 4-bromophenyl 4-dodecyl benzoate [III]

2 mL of thionyl chloride, 4-dodecylbenzoic acid (1.0 g, 3.4 mmol) and few drops of N, N-dimethyl formamide (DMF) were taken in the round bottom flask and it was refluxed for 1 h under inert atmosphere. 3 mL of triethylamine and 3 mg of DMAP were added to another flask containing 4-bromo phenol (0.58 g, 3.4 mmol) dissolved in 50 mL of dichloromethane. Then, acid chloride was added drop by drop using pressure dropping funnel at 0°C for 10 min and refluxed for 4 h at 50°C. Then the filtrate was washed using sodium bicarbonate solution. A semi solid was obtained on evaporating the solvent, column chromatography was used to purify. then, recrystallized using heptane solvent. Colorless solid was obtained. Yield: 77%, m.p.: 108-110°C. FT-IR (KBr, cm^{-1}): 2992, 2848 (C-$H_{of\ alkylchain}$), 1716 (C=O ester), 1439 (C-H bend), 1248, (C-O-C). ^{1}H NMR (500 MHz, $CDCl_3$) 8.09 (*J*=8.3, 2H, d), 7.63–7.48 (m, 2H), 7.31 (d, *J*=8.3, 2H), 7.16–7.02 (m, 2H), 2.68 (t, *J*=7.9, 2H), 1.61 (m, 2H), 1.38–1.19 (m, 19H alkyl chain), 0.88 (t, *J*=6.8, 2H). ^{13}C NMR (125

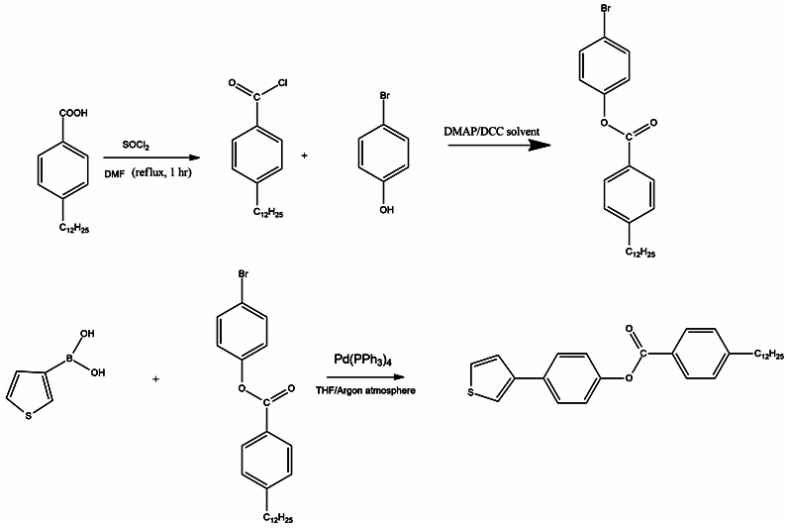
MHz, $CDCl_3$) δ 164.98, 150.07, 149.71, 132.51, 130.30, 128.74, 126.55, 123.62, 118.88, 36.12, 31.94, 31.16, 29.68, 29.66, 29.58, 29.48, 29.38, 29.27, 22.72, 14.15.

4-(Thiophen-3-yl) phenyl 4-dodecylbenzoate [S12]:

Thiophene 3-boronic acid (0.5 g, 3.9 mmol), potassium carbonate (K_2CO_3) (2.70 g, 39 mmol) and 4-bromophenyl 4-dodecyl benzoate (1.76 g, 3.9 mmol) were dissolved in 50 mL of tetrahydrofuran. Tetrakis(triphenylphosphine) palladium(0), [$Pd(PPh_3)_4$] (92 mg, 0.3 mmol) was added to reaction mixture in the presence of argon atmosphere and the reaction was refluxed overnight at 75°C[34]. A semi solid was formed when the solvent was evaporated after completion of reaction. The column chromatography was used to purify impure semi solid using ethyl acetate-hexane as an eluant. Yield: 80%, colourless solid. FT-IR: 3103 (sp^2 C-H_{str}), 2981, 2940 (-CH_2 stretching), 1710 (C=O), 1616 (C=C), 1425, 1281, 1106 (C-O-C stretching) ^{1}H NMR (500 MHz, $CDCl_3$): δ 8.05 (d, *J*=8.1 Hz, 2H), 7.36 (m, 1H), 7.56 (d, *J*=8.5 Hz, 2H), 7.31 (m, 1H, ArH), 7.17 (d, *J*=8.5 Hz, 2H), 7.24 (m, 1H, ArH), 2.62 (t, *J*=7.7 Hz, 2H), 1.67 (p, 2H), 1.60–1.14 (m, 19H alkyl chain), 0.81 (t, *J*=6.7 Hz, 3H). ^{13}C NMR (125 MHz, $CDCl_3$) δ 165.30, 150.18, 149.48, 141.61, 133.67, 130.29, 128.69, 127.51, 126.94, 126.38, 126.35, 122.10, 120.38, 36.12, 31.94, 31.16, 29.68, 29.66, 29.58, 29.48, 29.37, 29.28, 22.71, 14.14.



Scheme 1. Synthesis of 2TWC10 mesogen by multistep approach



Scheme 2. Synthesis of S12 mesogen by multistep method

RESULTS AND DISCUSSIONS

FT-IR Analysis

The FT-IR spectrum of 2TWC10 and S12 mesogens were shown in Fig. 13 & 14. The comparison of both spectrums revealed that the absorption bands of Carbonyl group in both molecules were at 1710 cm^{-1}. So, there was no effect of change in terminal chain from alkoxy chain to alkyl chain on the characteristic ester carbonyl (C=O) absorption peak. The C-O stretching frequency of S12 molecule is 1106 cm^{-1} which is due to C-O bond of ester group but for 2TWC10 the C-O absorption bands were at 1145, 1094 cm^{-1} which are due to ester group and alkoxy chain.

NMR analysis

The 2TWC10 molecule ^{1}H NMR was

shown in Fig. 1 and discussed in detail. The peaks at 8.21, 7.62, 7.28, and 6.87ppm are clearly seen as four doublets corresponding to four methine protons of core phenyl rings. For thiophene methine protons noticeably seen as multiplets at 8.28, 7.34, and 7.32ppm along with phenyl ring protons. The chemical shift values and intensity pattern of ^{1}H and decoupled ^{13}C NMR spectroscopy are confirming the structure of the molecule. The spectrum shows well separated 14 lines in the range of 115.16–164.77 ppm are accounted for aromatic thiophene, carbonyl carbons as well as phenyl rings. Four peaks 134.03, 122.35, 121.88, 115.16 of comparable intensity are assigned to ortho and meta carbons of the phenyl rings. The four peaks for all ortho and the meta carbons indicate rapid π-flips of the phenyl rings about their C_2 axes. three methine carbons of thiophene ring are appeared in between 135.0-128.0 ppm of moderate intensity. The low intense lines seen in the region of 164.77-134.03ppm are accounted for the quaternary carbons in the molecule.

Liquid crystalline properties by HOPM and DSC studies

The liquid crystalline property and mesophase transition enthalpies of structurally comparable molecules were investigated by polarizing optical microscope (OPM), About 2 mg of the sample was taken between glass cover slips. Only (2TWC10) exhibits typical nematic droplets further cooling gives threads texture with two or four brushes[35-37]. Typically, this observation is common in three rings or four rings calamitic mesogens. The nematic phase is noticed both in heating and cooling cycle as enantiotropic manner. The appearance of nematic phase was further confirmed by DSC measurements (Fig. 6). Interestingly S12 compound does not show any liquid crystal property, it transforms from crystal to isotropic liquid in heating stage while in cooling transforms from isotropic to crystallization. The transition temperatures, mesophase type and transition enthalpy values were listed in Table 1[36]. Typically, in DSC scan two peaks are noticed in (2TWC10) (Fig. 6). The characteristics of crystal to nematic transition has higher enthalpy value of ~6 kcal/ mole while for nematic to isotropic transition the enthalpy value is ~0.01-0.02 kcal/mole which are significantly lower. These results are in consistent with three or four ring rod-like mesogens reported recently. Remarkably, a close observation of optimized energy minimized structure of S12 (Fig. 12) reveals terminal alkyl chain is deviating from linearity to terminal bent shape as a result, there was a substantial decrease in the lateral dipolar interactions in the molecule. In addition, the direct linking of thiophene and phenyl ring in the molecule lead to insufficient aspect ratio of the molecule which is essential for mesophase property. So, decrease in lateral dipolar interactions due to terminal alkyl chain and insufficient aspect ratio of molecule due to direct linking of thiophene and phenyl ring in the molecule lead to absence of mesophase in S12 molecule[37].

Table 1: DSC data of phase transition temperatures and enthalpies of heating (delta H in kJ/mol) and cooling cycles of thiophene mesogen. (Cr=crystalline, N=Nematic, I=Isotropic)

S. No	Compound		Melting temperature (Cr-N)	Clearing temperature (N-I)	Nematic phase stability (°C)
1	2TWC10	Heating	95.5°C (6.22)	115.5°C (0.128)	20
		Cooling	78.2°C (7.38)	114.1°C (0.112)	36

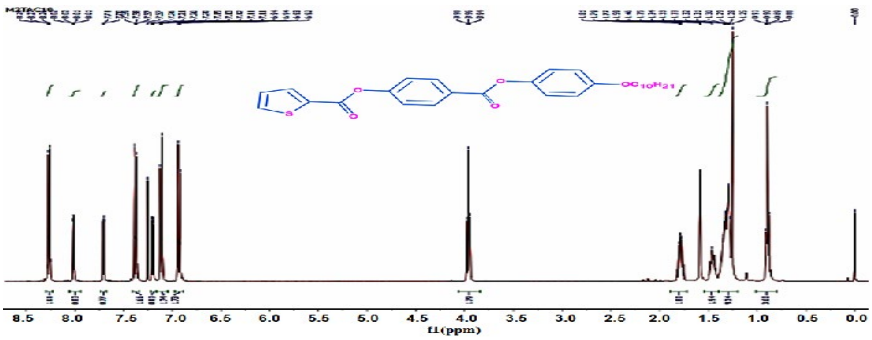


Fig. 1. Solution ^{1}H NMR spectrum of 2TWC10 mesogen in $CDCl_3$ at 25°C

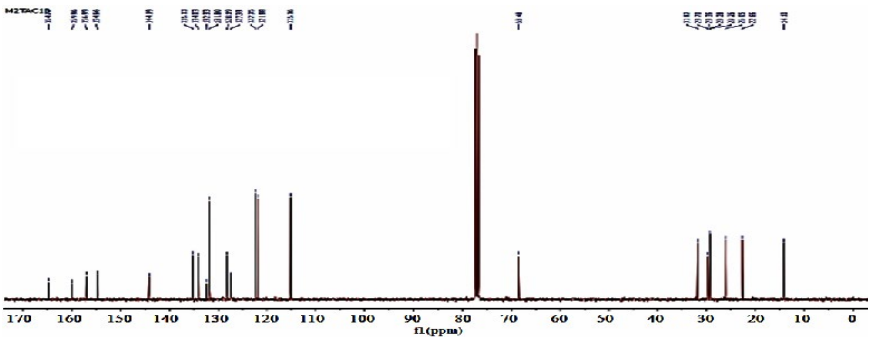


Fig. 2. Solution ^{13}C NMR spectrum of 2TWC10 in $CDCl_3$ (25°C)

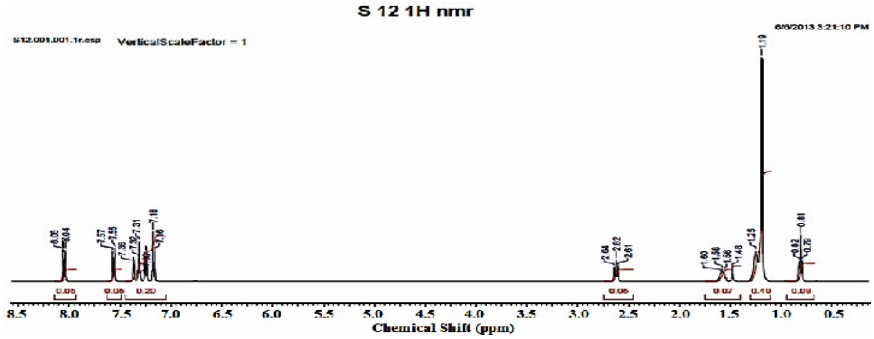


Fig. 3. Solution ^{1}H NMR spectrum of S12 mesogen in $CDCl_3$ at 25°C

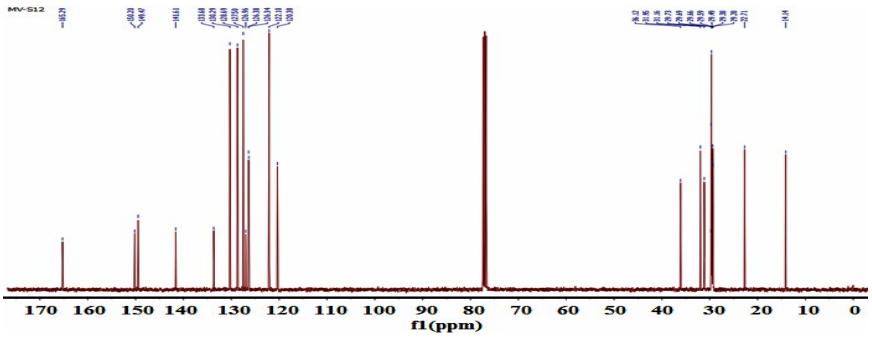


Fig. 4. Solution ^{13}C NMR spectrum of S12 mesogen in $CDCl_3$ at 25°C

Optical absorption in solution:

The Fig. 6,7 shows the solution UV-Visible absorption spectrum of 2TWC10 and S12 respectively. The absorption maximum of 2TWC10 was noticed around ~252, ~278nm but the absorption maximum of S12 is ~300nm, so a red shift of 20nm is observed. The 3-phenylthiophene moiety in S12 increases conjugation resulting in narrowing the energy gap of π-π^* transition which lead to shift in absorption maxima towards red colour i.e., lower energy[38,39]. This indicates a little change in structure effects the optical properties of mesogens.

Computational studies

HOMO tends to donate electron as it has filled orbital and LUMO accepts electron as it has unoccupied orbital. The difference in energy between HOMO and LUMO is referred as band gap. The molecules having larger band gap have higher kinetic stability resulting in lower chemical reactivity (42).

Chemical reactivity

Ionization potential (IP) measures the electron donating nature which depends on the energies of highest occupied molecular orbital (HOMO). Electron affinity (EA) measures electron accepting nature which depends on energy of lowest unoccupied molecular orbital (LUMO). The ionization potential, chemical hardness, electronegativity and electron affinity

data of the two molecules are shown in Table 2. The electron affinity of alkoxy terminal 2TWC10 is lower values than alkyl terminal S12. The data of chemical reactivity descriptors like chemical potential (μ), hardness (η) was tabulated in Table 2. Chemical hardness measures the resistance to change the electron cloud density of chemical system. So, chemical hardness indicates chemical stability of the molecules. The S12 molecule has high chemical hardness, so it is more stable than 2TWC10. Chemical potential indicates the electron-leaving tendency. The alkoxy terminal 2TWC10 has high chemical potential of -0.0719 than the chemical potential of S12 (-0.1315), so 2TWC10 is more reactive and less stable than S12, due to the high electron releasing tendency. Both the chemical reactivity descriptors i.e., chemical potential (μ), hardness (η) indicate that S12 is more stable than 2RWC10.

Table 2: Calculated Molecular properties to give insight towards the stability of molecule

Molecules	Dipole moment (Debye)	Ionization Potential (-HOMO)(au)	Electron Affinity (-LUMO)(au)	Electron negativity χ=1/2 (I.P+E.A)(au)	Chemical Hardness η=(I.P–E.A)(au)	Chemical potential μ=-1/2(I.P+E.A)
S12	1.42	0.21363	0.04933	0.1315	0.1643	- 0.1315
2TWC10	2.73	0.11839	0.02546	0.0719	0.093	-0.0719

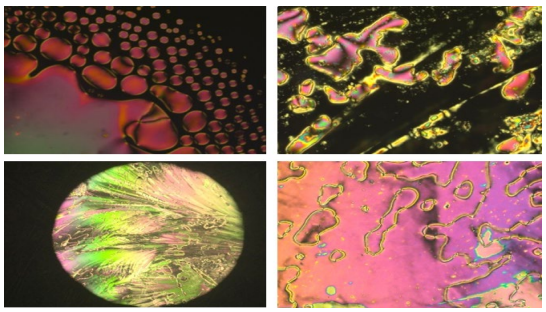


Fig. 5. HOPM photographs of nematic phase of 2TWC10

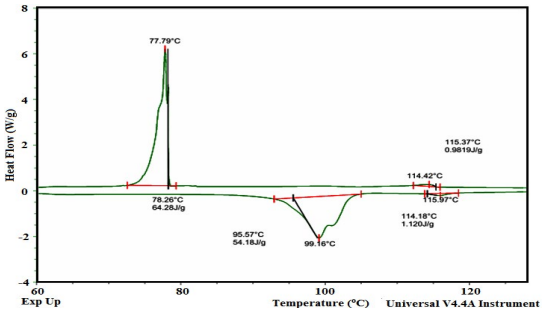


Fig. 6. DSC thermogram of 2TWC10 mesogen second heating and cooling cycles

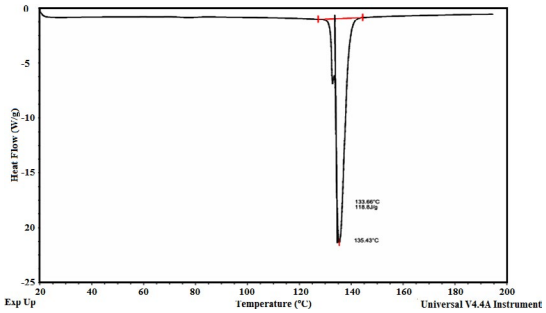


Fig. 7. DSC thermogram of S12 mesogen in first heating cycles

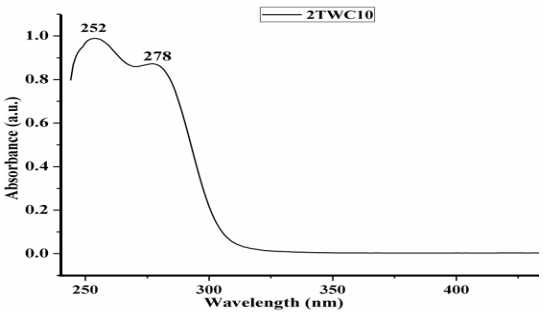


Fig. 8. 2TWC10 mesogen UV-Visible absorption spectrum in $CHCl_3$ solution at 25_oC

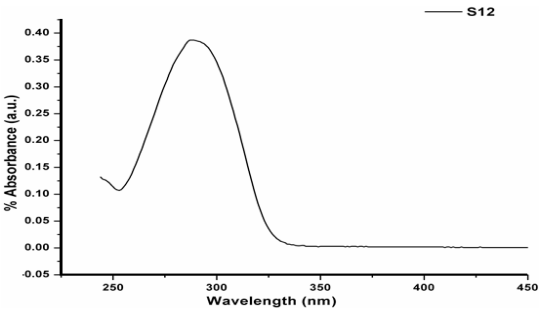


Fig. 9. S12 mesogen UV-Visible absorption spectrum in $CHCl_3$ solution at 25°C

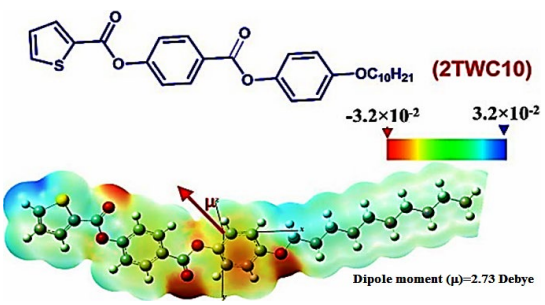


Fig. 10. MEP surface diagram of 2TWC10

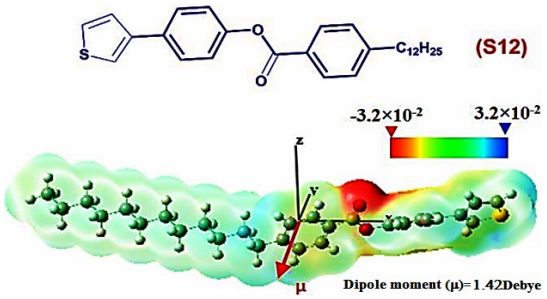


Fig. 11. MEP surface diagram of S12

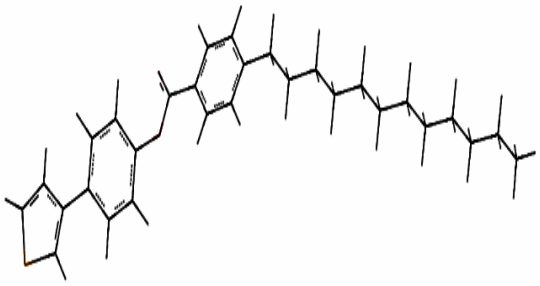


Fig. 12. DFT energy minimized structure of S12 mesogen

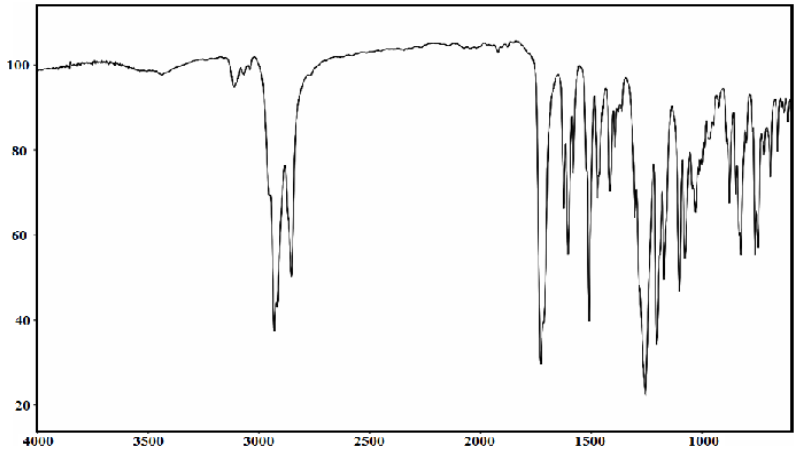


Fig. 13. FT-IR spectrum of S12 molecule

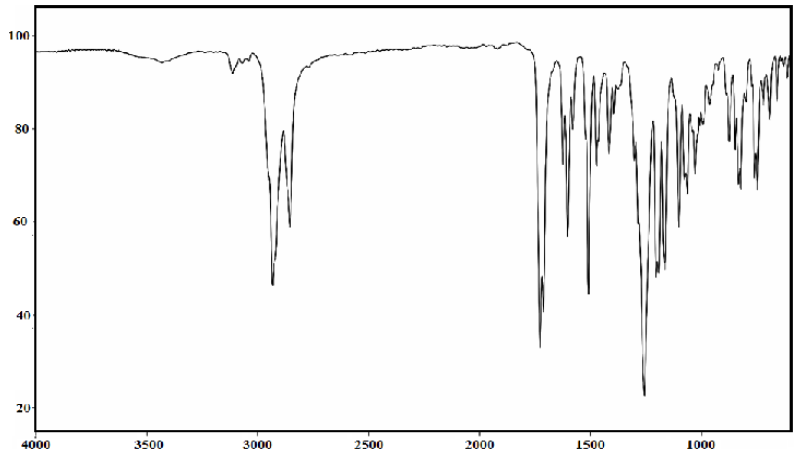


Fig. 14. FT-IR spectrum of 2TWC10

Molecular electrostatic potential (MEP) surface

The electrostatic potential map of molecules is very important tool to illustrate three-dimensional charge and electronic distribution in the molecule thereby dipole moment and polarizability of molecules. This information is helpful to predict reactive sites of the molecules where nucleophilic and electrophilic attacks occur and to study intermolecular interactions. The ESP follows the trend blue colour > green colour > yellow colour > red colour. The blue region in the molecule has higher electrostatic potential due to low electron density so this region is prone to nucleophilic attack. The lower electrostatic potential red region has high electron density so red region in the molecule is prone to electrophilic attack (40,41). ESP (Electrostatic Potential) map of 2TWC10 and S12 high electron density on carboxylate groups

and lower electron density on thiophene ring and alkyl groups.

Dipole moment for the compounds has been calculated along the three Cartesian directions. The resultant dipole moment of 2TWC10 is higher (2.48 Debye with B3LYP/3-21G level) than S12 (1.42 Debye with B3LYP/3-21G level). the blue colour on phenyl group and its alkyl terminal in MEP surface of S12 molecule indicates uniform electron distribution in phenyl alkyl terminal chain unit. Due to uniform distribution of electrons the phenyl alky terminal unit is non polar. So, the overall polarity of the S12 molecule is not increased by terminal phenyl alkyl chain. The MEP surface of 2TWC10 has red region on oxygen of alkoxy terminal chain linked to phenyl ring and blue colour on remaining group indicating uneven distribution of electrons resulting in polarity of the phenyl alkoxy terminal unit, so alkoxy terminal is contributing to polarity of the molecule in 2TWC10 but in S12 there is no contribution from terminal chain to polarity due to direct linking of alkyl chain to phenyl ring.

CONCLUSION

Two thiophene based mesogens were synthesized and their mesophase properties were evaluated. The HOPM and DSC investigations revealed nematic mesophase for 2TWC10. Remarkably, S12 does not show any liquid crystalline property. The present experimenal results shows that the mesogen having terminal alkoxy chain has liquid crystal property but terminal alkyl chain mesogen do not observe any liquid crystal property. Further, differential scanning calorimetry (DSC) supported it. The UV absorption maximum of two mesogen noticed around ~252-300nm due to $\pi-\pi^*$ transition in the mesogenic core. The MEP surface diagrams are indicating that alkoxy terminal is contributing to polarity of the molecule in 2TWC10 but alkyl terminal has no contribution to the polarity of S12 molecule because the alkyl terminal group is non polar. So polarity of 2TWC10 is higher than S12 molecule. The computational studies shows that S12 molecule has high chemical hardness, so it is more stable than 2TWC10.

ACKNOWLEDGMENT

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Conflict of Interest

No conflict of interest was reported by all the authors.

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Influence of Gd^{+3} Cation Substitution on the Functional Properties of $Al_{0.8}La_{0.2}TiO_3$ Nanoparticles

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Abstract:- **In present, the work reports on the effect of Gd-substitution on Aluminum Lanthanum Titanate (ALT) perovskite structures, structural and optical properties. The $Al_{0.8}Gd_yLa_{0.2-y}TiO_3$ (y= 0.01, 0.02, 0.03, 0.04) (AGLTO) hydrothermally synthesized nanoparticles. The XRD indicates crystallite size, Micro-strain, dislocation density and FWHM (full-width half maxima). The Scherer's formula and Williamson-Hall (W-H) analysis used the X-ray peak expansion technique to determine the crystalline sizes and lattice strain; it was observed that an inversely proportional relationship exists. Fourier transforms infrared spectra (FT-IR) tested the presence of Al-O, Gd-O, La-O & Ti-O based metal oxide (M-O) bonds at A & B sites. The E_g values are increased from 3.293 to 3.372 eV with increase of Gd content from y = 0.01 to 0.04 contents show the wide E_g values suggesting optoelectronic and sensor applications.**

1. INTRODUCTION

The perovskite titanates doped with rare earth components offered fascinating structural, morphological, electrical, dielectric, magnetic, magneto-caloric and piezoelectric, etc., properties [1]. Numerous researchers focused on different properties of notable perovskite titanates like MTiO3 (M = Ba, Ni, Mg, Sr, Pb, Al, La, Ca, Zn, Mn, Co, Eu, Zr and so forth,) [1]. Among these titanates, the aluminum titanates (AT) were concentrated in an exceptionally restricted way. Aluminum titanate perovskites were concentrated by past researchers [2-6] for primary, optical, photocatalytic, electrical and mechanical properties.

Specifically, Sahu et al. [2], arranged the AT nanoparticles and detailed the tetragonal design and dielectric properties. Azarniya et al. [3], fostered the AT nanoparticles just as nanofibers. Further, the inside and out microstructure was explored. Bakhshandeh et al [4], detailed he photocatalytic action of AT nanoparticles. Ewais et al. [5], separated the AT based earthenware production from the aluminum sludge waste. Tang et al. [6], noticed the goliath electro rheological impacts in AT nanoparticles. From this review, unmistakably the writing on AT and its based nanomaterials was not accessible in a bountiful way. To expand the dielectric steady of $Al_{0.8}La_{0.2}TiO_3$, we wanted to substitute the Gd-rare earth component. Consequently, the $Al_{0.8}Gd_yLa_{0.2-y}TiO_3$ (y = 0.01 - 0.04)/AGLTO nanoparticles were arranged through aqueous strategy, wherein a few benefits like low working temperatures, less force and tedious, great crystallinity, simple example planning, and modest were accomplished [7].

2. EXPERIMENTAL PART

To set up the AGLTO nanoparticles, the trailblazer materials like La $(NO_3)_3.6H_2O$ (99.8% temperance, Sigma-Aldrich), Al $(NO_3)_3$ $9H_2O$ (99.8% flawlessness, Sigma-Aldrich), $Gd(NO_3)_3$. $6H_2O$ (99.9% faultlessness, Sigma-Aldrich), and TiO_2 (99.9% temperance, Sigma-Aldrich) were taken into another glass container containing refined water as per the stoichiometric extent. With the help of appealing stirrer, the forerunner mix was blended at a consistent blending speed of 420 rpm. After some time, the white and blended nitrate game plan was outlined. Finally, they got course of action was moved to another Teflon bowl of 300 ml limit. Thusly, the Teflon bowl containing the game plan was brought into the solidified steel autoclave. By then, to play out the watery reaction, the autoclave was kept inside the hot air oven for 8 h at 150ºC. Besides, the autoclave was chilled off to room temperature followed by the ejection of tests from the Teflon bowl. Accordingly, they got test was cleaned for a couple of times until the pH worth of the model shows up at 7. In addition, using the hot air grill, the model was dried for 120 min at 60º C. Fittingly, they got AGLTO nanoparticles gone through different depictions, for instance, X-ray diffractometer (XRD, Bruker, CuKa, k = 0.15406 nm), FT-IR spectrophotometer (IR inclination 1, Shimadzu) and UV–Apparent spectrophotometer (JASCO, V-670 PC) to ponder the underlying and optical properties, separately.

3. XRD ANALYSIS

The X-ray diffraction patterns of AGLTO nanoparticles are recording as shown in Fig.1. These patterns provided multiple number of diffraction peaks indicating the polycrystalline nature. It is observed that the maximum intensity is recorded at two-theta angle 13.472º for all the samples. From the maximum intensity (I_{max}) data (see Table.1), it's find that the intensity of the maximum peak position is increased from 6155 to 11840 with increase of Gd-content in the $Al_{0.8}La_{0.2}TiO_3$ system. Therefore, it is confirmed that the substitution of Gd-element induced the crystallinity of $Al_{0.8}La_{0.2}TiO_3$. However, its notice that these peak positions are not matched with any standard structure. Herein, the peak positions of x = 0.01 – 0.04 contents are identifying to be

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similar. Therefore, it indexed this unknown structure as X-structure. Furthermore, the average crystallite size (D) is evaluated using the Scherrer equation: $D = 0.9\lambda/\beta Cos\theta$, λ = wavelength of the CuKα spectral line (0.15406 nm), β = full width half maxima (FWHM) and θ = angle of diffraction [8]. The achieved data ensured that the D is note down to be altering from 23.2 to 41.5 nm for x = 0.01 – 0.04. The disorganized distinction trend is observed due to the unsystematic FWHM values. As the Gd^{+3} cations are substituted into the $Al_{0.8}La_{0.2}TiO_3$ system, the resultant X-structure will be contracted. The reason can be well understood by Shannon ionic radii table [9]. According to this table, the ionic radii of cations are give as, Al^{+3}: 0.039 nm, La^{+3}: 1.22 Å, Gd^{+3}: 1.053 Å, and Ti^{+4}: 0.68 Å. In the AGLT resultant structure, the Gd^{+3} cations of small ionic radii can replace the La^{+3} cations of high ionic radii. Thus, the dimensions of the building block will be decreased. These result can be attributed to the significant homogeneity of the prepared AGLTO nanoparticles shown in Table.1; where dislocation density (ρ) shows the values between 5.806 x 10^{14} and 18.57 x 10^{14} m^{-2} respectively; an alternative form of the Gd contents is y = 0.01 to 0.04.This trend is attributed to the molecular weight of the sample is that raise from 145.412 to 145.963 g/mol as a content with "y".

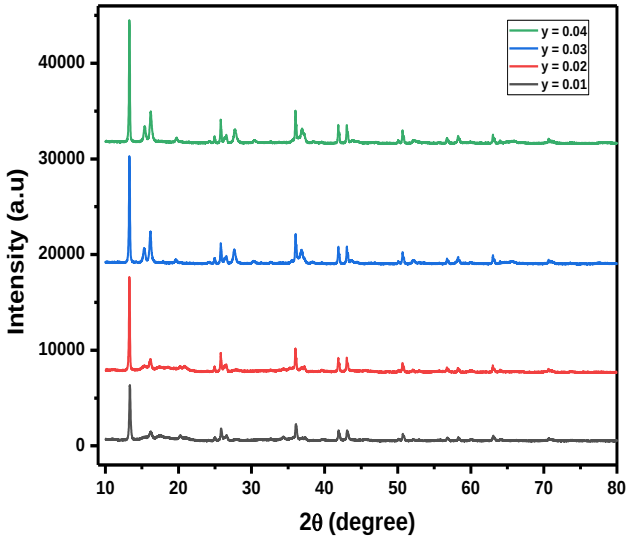


Fig.1. XRD spectra of AGLTO nanoparticles

Table: 1. Data on structural and physical parameters of AGLTO nanoparticles

y	0.01	0.02	0.03	0.04
D (nm)	23.2	41.5	38	37.9
I_{max}	6155	9185	10421	11840
M (g/mole)	145.412	145.596	145.779	145.963
FWHM (β) (radian)	0.9676	0.4031	0.4437	0.4592
ε	0.00457	0.00337	0.00330	0.00478
ε'	0.00124	0.00123	0.00107	0.00272
D'	26.4	45.6	38.4	38.3
ρ (m^{-2})	18.579 x 10^{14}	5.806 x 10^{14}	6.925 x 10^{14}	6.961 x 10^{14}

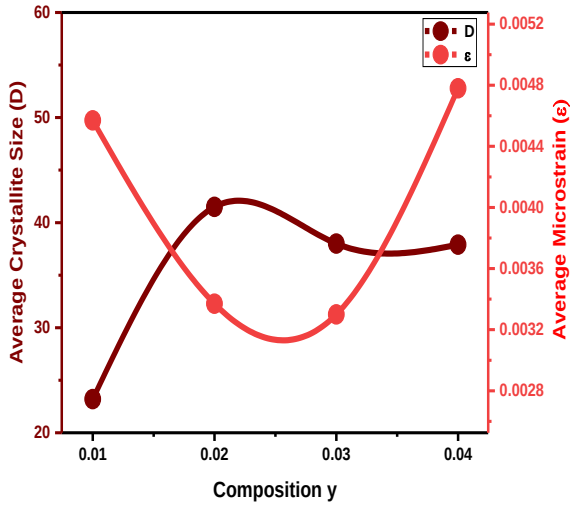


Fig.2. Compositional dependence of D & ε of AGLTO nanoparticles

Williamson - Hall (W - H) plot (Fig.3) is a known planning tool for estimating the average size of crystals (D′) and fine deformation. W-H schemas are developed between βCosθ versus 4Sinθ of the current study using compatible linear relationships:

$$\beta Cos\theta = \frac{0.9\lambda}{D'} + \varepsilon' 4\sin\theta \text{ (i .e. } y = c + mx \text{ form)},$$

Here, the slope of the straight line is related to microstrain (ε'), and the intercept value is related to the crystallite size (D'). The resulting values ε' and D' are listed in Table 1. Finally, a good agreement is noticed between the values derived from the W - H plots based on Scherrer's theory and the values ε' & D'. Based on the formula x = 0.01 to 0.02, D' increases and x = 0.03 -0.04 decreases D'. Micro-strain (ε') is decreases from x = 0.01 - 0.03 after x= 0.04 increase ε' [11]. It can be seen in Fig.2, that there is an inverse proportional relationship between the two parameters D & ε [10]. In literature, similar types of results have been published. [9-12].

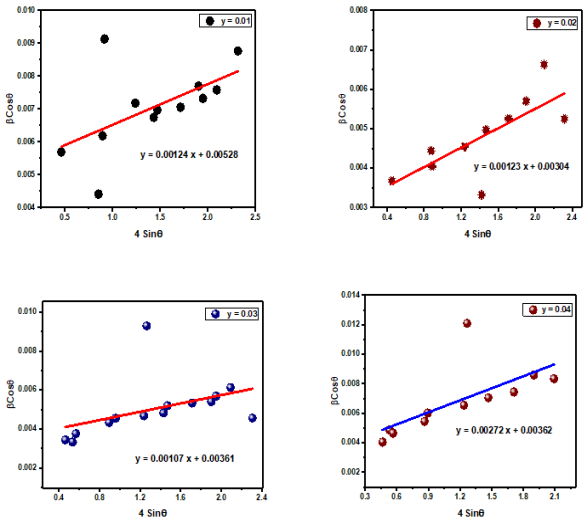


Fig.3. W-H Plots of AGLTO nanoparticles

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4. UV-VIS ANALYSIS

In order to calculate the optical energy gap (E_g), the Kubelka-Munk function is consider. Using this, the function of reflectance F(R): $(1-R)^2/2R$, (where R = reflectance which is recorded from diffuse reflectance spectra as shown in the inset of Fig.4 is computed [13]. Herein, the F(R) is observed to be directly proportional to the absorptivity (α) and therefore, in place of 'α', its can substitute F(R). Further, using the equation: $(\alpha h\upsilon)^n = m (h\upsilon - E_g)$ and the $(\alpha h\upsilon)^n$ versus photon energy (hυ) plots, it is calculating the E_g values of AGLT. The exponent (n) in the band gap equation is taken as 2 for direct transition of charge carriers between two energy bands [13]. The $(\alpha h\upsilon)^n$ versus hυ plots of x = 0.01-0.04 contents showed the linear portions. These linear portions are extrapolated towards the hυ-axis. Then, using the intersecting position of the straight line at the hυ-axis, wherein α approaches to zero, the E_g values are calculated. These E_g values are indexed in Fig.4. The results indicates that the E_g values are increased from 3.293 to 3.372 eV with increase of Gd-content from x = 0.01 to 0.04. This kind of behavior is mainly attributed to the oxygen vacancies present in the each composition. That is, the E_g value will be high for the less number of oxygen vacancy and vice versa [13]. In case of AGLT nanoflowers, the numbers of oxygen vacancy are decreased with increase f Gd-content. Therefore, the concerned distances between the valence and conduction bands are increased from 3.293 to 3.372 eV (see Table 2). However, the x = 0.01-0.04 contents show the wide E_g values suggesting optoelectronic and sensor applications [13].

Table.2. Optical band gap (E_g) of AGLTO nanoparticles

y	0.01	0.02	0.03	0.0.4
Optical band gap (E_g) eV	**3.293**	**3.303**	**3.338**	**3.372**

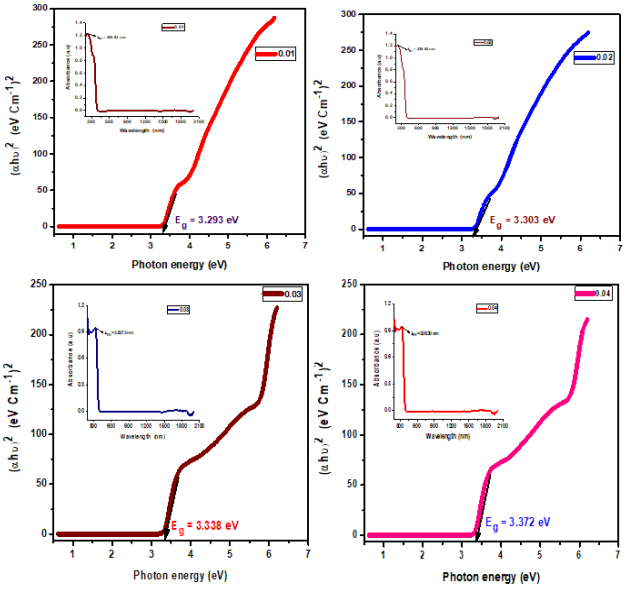


Fig.4. $(\alpha h\upsilon)^2$ versus hυ plots of AGLTO nanoparticles

5. FT-IR ANALYSIS

The Fourier transform infrared spectra (FTIR) spectra of AGLT nanoparticles are recorded over 4000 - 400 cm^{-1} wave number range and show in Fig.5. The A and B-site locations are indexed using the ν_a and ν_b. These two positions suggest indirectly the formation of perovskite structure. The ν_a and ν_b peaks are notice during the range of 590 to 613 cm^{-1} and 450 to 462 cm^{-1}, respectively (see Table 3.). The formation of ν_a and ν_b absorption bands revealed the existence of the metal oxide (M-O: Al-O, La-O, Gd-O, Ti-O) stretching vibrations [8, 14]. Besides, the additional bands recorded at 720 to 736 cm^{-1} are also associated with the metal oxide bonds of parent perovskite. During 1057-1069 cm^{-1} and 3072-3617 cm^{-1} wave number range, the peaks are tailored owing to the O-H stretching and bending vibrations of H_2O molecules absorbed by the AGLTO nanoparticles [8, 14]. This implied that all the contents are affected with moisture up to smaller extent.

Table.3. Data on FTIR spectra of AGLTO nanoparticles

y	A-site vibrational frequency υ_a (cm^{-1})	B-site vibrational frequency υ_b (cm^{-1})
0.01	613.4	462.42
0.02	581.8	460.66
0.03	594.08	451.88
0.04	590.57	460.66

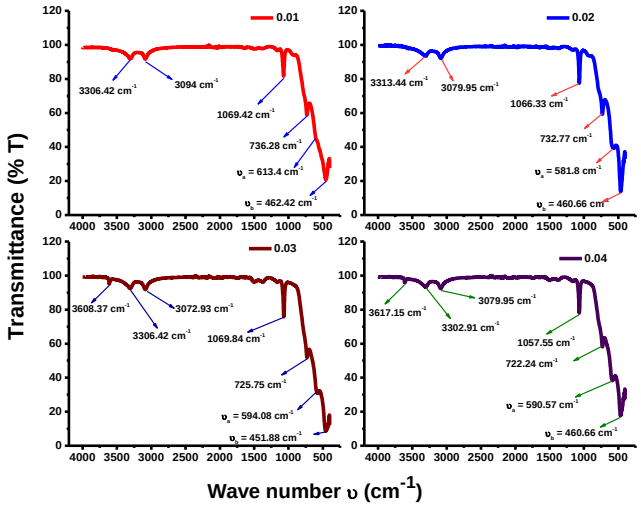


Fig.5. FTIR spectra of AGLTO nanoparticles

6. CONCLUSION

The AGLTO nanoparticles were prepared using the hydrothermal method. The XRD patterns of all samples indicated the highest peak at 13.472°. Also, the average crystallite size (D) was noted to be changing from 23.2 to 41.5 nm for AGLTO samples. The dislocation density (ρ) values are between 5.806 x 10^{14} and 18.57 x 10^{14} m^{-2} respectively; an alternative form of the Gd contents is y = 0.01 to 0.04. The W - H plots based on Scherrer's theory and the values ε' & D' is a good agreement is. Furthermore, the optical band gap (E_g) was found to be increasing from

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3.293 to 3.372 eV as a function of 'y'. The formation of ν_a and ν_b absorption bands revealed the existence of the M-O stretching vibrations.

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Structural and Optical Properties of $ZnTiO_3$ Nanoparticles Synthesized by Hydrothermal Method

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Abstract:- **$ZnTiO_3$ is a promising wide-energy band gap semiconductor material because of its current and potential uses in catalysts, microwave insulators, luminous materials, nonlinear optics, solar cells, and gas sensors. In the present work, $ZnTiO_3$ nanoparticles were synthesized by hydrothermal method. The structural properties and parameters have been investigated by using X-ray diffraction (XRD). The XRD results raveled that the particle attributed high phase purity, and good crystalline. The structure of $ZnTiO_3$ nanoparticles found cubic spinel phase and using the Scherrer equation the average crystallite size was calculated as 31.74 nm. The X-ray peak broadening analysis was used to evaluate the crystalline sizes and lattice strain by the Williamson-Hall (W-H) analysis. The functional group information conforms to the $ZnTiO_3$ nanoparticles. The FE-SEM images showed the particle shape spherical with partial agglomeration. Furthermore, the optical band gap (E_g) was determined using UV–Visible spectra.**

Keywords: XRD, FTIR, UV-Vis, Hydrothrmal Method and Optical band gap

1. INTRODUCTION

The development of nanomaterials has been strongly pursued due to their unique features such as electronic, chemical, mechanical, magnetic, and optical properties that differ from bulk materials [1–11]. Size-dependent properties are observed such as surface plasmon resonance in some metal particles, quantum confinement in semiconductor particles, and superparamagnetism in magnetic materials. Among the different nanomaterials, perception of the behavior of ferroelectric materials at the nanoscale is important for the growth of molecular electronics. Indeed, perovskite-phase mixed-metal oxides are significant for their advantageous electrostrictive, pyroelectric, piezoelectric, electro-optic and dielectronic properties with corresponding applications in the electronics industry for high-k-dielectrics, actuators, and transducers [12, 13]. Among perovskite-phase mixed-metal oxides, $ZnTiO_3$ has been reported to have superior electrical properties that are sufficient for applications towards microwave dielectrics [14]. Furthermore, $ZnTiO_3$ is an effective photocatalyst because this compound is categorized in a group of coupled photocatalysts that can help to enhance the photocatalytic activity of TiO_2 through reducing recombination process and change band gap to enhance the optical response in the UV to the visible light range [15, 16]. Pure h- $ZnTiO_3$ represents superior dielectric properties in the microwave range. Many reports have been made to produce pure $ZnTiO_3$ powders and ceramics. But the synthesis of pure $ZnTiO_3$ from a mixture of ZnO and TiO2 with a molar ratio of 1 was not successful. There are various problems with the synthesis of pure $ZnTiO_3$ powders by the solid-state reaction method such as large particle size, a limited degree of chemical homogeneity, high temperature, and long range of diffusion distance. In the past two decades, the sol-gel route has been successfully used for the preparation of ceramics, thin films, fibers, and glasses; this method has various advantages such as low calcination temperature, low cost, chemical homogeneity, and easy component adjustment. Besides, the sol-gel route is one of the methods for the synthesis of nanomaterials [17, 18]. Here, $ZnTiO_3$ nanostructures were synthesized by an unusual sol-gel method. Utilizing new and smaller number chemical materials in addition to a simple procedure is the characteristic benefit of this method in assessment to the other reports [19, 20]. In this paper, $ZnTiO_3$ nanoparticles were successfully synthesized by hydrothermal method. The products were characterized by various analyses such as XRD, SEM, TEM, EDS, FT-IR, and UV-Vis spectroscopy.

2. EXPERIMENTAL

To synthesize the ZT nanoparticles, the starting materials were chosen as Zn $(NO_3)_2$ $6H_2O$ and TiO_2 (each of 99.9% purity, Sigma-Aldrich). These precursors were mixed after taking their stoichiometric ratio. The whole mixed precursors were transferred to a glass beaker. Furthermore, distilled water was added to the precursors in a ratio of 1:4 (mixed precursors (gm): distilled water (ml)) and the resultant solution was kept on a magnetic stirrer. A stirring rate of 500 rpm was maintained to stir the solution. Later NaOH solution was slowly added, and the pH value reached 11. Furthermore, this solution was transferred to a 500 ml Teflon bowl

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inserted in an autoclave. The sealed autoclave was kept in a hot-air oven at an operating temperature of 150°C/8 hours. After completion of the reaction, the autoclave was slowly cooled to room temperature. The final $ZnTiO_3$ nanoparticles were removed from the Teflon-lined autoclave and washed with acetone and distilled water several times until the pH was reduced to 7. Later it was heated at 60°C/2 hour. The final ZT new particles were removed and characterized for various characterized techniques such as the X-ray diffraction method, field emission scanning, and transition electron microscopy. In addition, the Fourier transform infrared spectroscopy (FTIR), and UV-Visible techniques were used to find the presence of metal oxide bands and the optical energy band gap.

3. *Results and discussion*

3.1. XRD analysis

The diffraction pattern of ZT nanoparticles is depicted in Figure 1. It can be seen that the Zinc titanate (ZT) nanoparticles exhibit the cubic perovskite structure about the reflection planes as indicated in Figure 1. These reflection planes are in good agreement with the Joint Committee on Powder Diffraction Standards (JCPDS) data of file number: 39–0190. Amongst these planes, the 211 planes at 25.3579° revealed the maximum intensity. No secondary peaks are observed in the ZT structure. The average crystallite size (D_a) is evaluate with the help of the average full-width at half maxima (FWHM) of reflection planes using the Debye-Scherrer equation [22],

$$D_a = (k\lambda) / \beta Cos\theta \qquad (1)$$

Where β is full-width half maxima, λ is the wavelength of CuK_α radiation (0.15406 nm), θ is the diffraction angle, and "k" is a numerical constant that is equal to 0.9 for a spherical atom. The results are repeated in Table 1. It is clear from the table that the average crystal size is D_a is calculated to be 31.74 nm.

Figure 2, depicts the variation of D_a and micro-strain as a function of diffraction angle. It is very clear from the figure that there exists a reciprocal relationship between micro-strain and D_a. Similar kinds of observations were previously reported in the literature [23]. In addition, the lattice constant (a) is calculated after finding the inter-planar spacing (d) and miller indices (hkl) by using the following formula [23]:

$$a = d\,(h^2+k^2+l^2)^{1/2} \qquad (2)$$

The lattice parameter is found to be 8.391 Å. The X-ray density (D_x) is evaluated using the formula Z M.W/NV, where "Z" is the number of molecules per unit cell (Z = 8), "M.W" is the molecular weight of the composition, "N" is Avogadro's number (6.023 x 10^{23}), and "V" is the Volume [23]. The calculated numerical value of D_x is 3.517 g/cm^3 of ZT nanoparticles [24]. This may be attributed to the high homogeneity of prepared ZT nanoparticles. Moreover, the structural parameters such as inter-planer spacing (d), FWHM, micro-stain (ε), miller indices (h k l), and dislocation density (ρ) are listed in Table 1 as a function of diffraction angle.

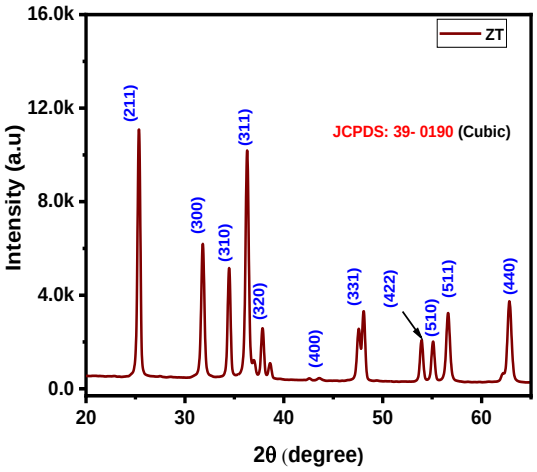


Fig. 1. The diffraction pattern of ZT nanoparticles.

Table 1. The data on structural and physical parameters of ZT nanoparticles

2θ (°)	FWHM β (°)	d (Å)	ε	D_a (nm)	hkl	ρ (m^{-2})
25.3579	0.1861	3.509	0.003609	43.7528	211	5.22E+14
31.8093	0.2630	2.810	0.004027	31.4075	300	1.01E+15
34.4708	0.2090	2.599	0.002940	39.7828	310	6.32E+14
36.2927	0.2743	2.473	0.003652	30.4756	311	1.08E+15
37.8497	0.2182	2.375	0.002776	38.4871	320	6.75E+14
47.8762	0.8057	1.898	0.007919	10.7881	331	8.59E+15
53.9284	0.2442	1.698	0.002095	36.4878	422	7.51E+14
55.0872	0.2501	1.665	0.002092	35.8263	510	7.79E+14
56.6124	0.3383	1.624	0.002741	26.6667	511	1.41E+15
62.8195	0.3924	1.478	0.002803	23.7221	440	1.78E+15

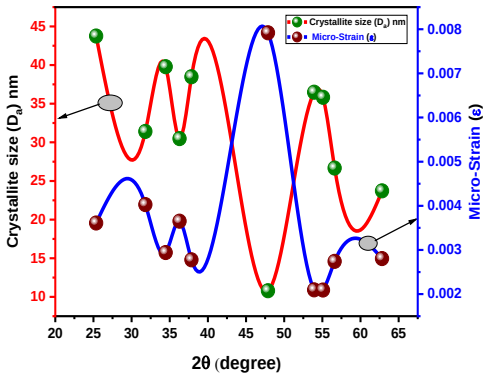


Figure 2. The variation of micro-strain and D_a of ZT nanoparticles

The inter-planer spacing is decreasing with an increase of 2θ angle. In addition, the dislocation density is a parameter that evaluates the defects per unit area of the sample. The smaller value of ρ indicates the low porous structure of ZT nanoparticles and vice versa. In the current study, the

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average ρ is ~ 1.72 × 10^{15} m^{-2}. The micro-strain at an average of all diffraction angles is noticed as 0.00346. The specific surface area (S) is a significant physical parameter for nanoparticles and is computed using the relation $6000/D_aD_x$, where the symbols have their usual meaning [25]. In this study, the S is achieved to be ~ 54 m^2/g. This kind of high value of S can be attributed to the smallest value of D_a when compared with bulk materials. This larger S value in turn affects the electrical, optical, and morphological properties of nanoparticles.

Williamson–Hall (W–H) plot (as shown in Figure 3) is drawn for βcosθ versus 4sinθ to evaluate micro-strain (ε) and crystallite size (D_p) using the following relation [26],

$$\beta\,Cos\theta = (0.9\lambda/D) + 4\varepsilon\,Sin\theta \qquad (3)$$

where the slope of a straight line offers micro-strain while D_a is associated with to intercept parameter. This provides the correlation between strain and size of the crystallite. The results from W–H plot express that the stain (0.00131) is almost consistent with the Scherrer strain from the diffraction pattern. The average D_a is of the order of 61.08 nm which is almost in agreement with the Scherrer size.

3.2. Surface morphology

The surface morphology of ZT nanoparticles is analyzed by a field emission scanning electron microscope (FESEM) and a High-Resolution transmission electron microscope (HRTEM). The FESEM photographs of ZT nanoparticles are shown in Figure 4(a). From Figure 4(a), it is noticed that ZT shows well-defined spherical shapes and rods. The grain size (G_a) is determined using the linear intercept method [25]

$$G_a = \frac{3\,L}{2MN} \qquad (4)$$

where "L" is the line length, "N" is the number of grains intercepting the test line, and "M" is the magnification. The average grain size (G_a) is 135.03 nm. This confirms the presence of microspheres and rods. The energy dispersive X-ray analyzer (EDAX) (Figure 4(c)) reveals the presence of Zn, Ti, and O elements. HRTEM generally provides information about the existence of nanoparticles. The HRTEM images of ZT nanoparticles are shown in Figure 4(b). It is seen from Figure 4(b) that all ZT nanoparticles are spherical in shape. The average particle size is 112.57 nm. In HRTEM images a weak agglomeration is identified.

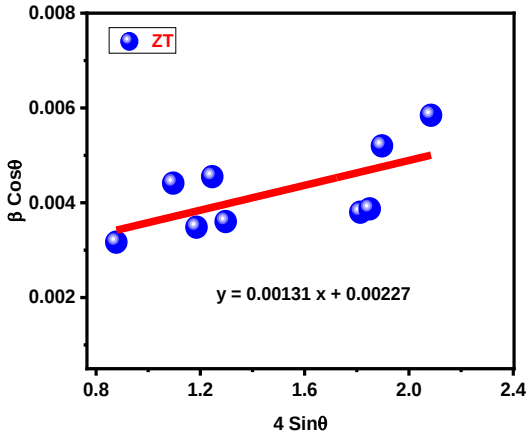


Figure 3. The W–H plot of ZT nanoparticles

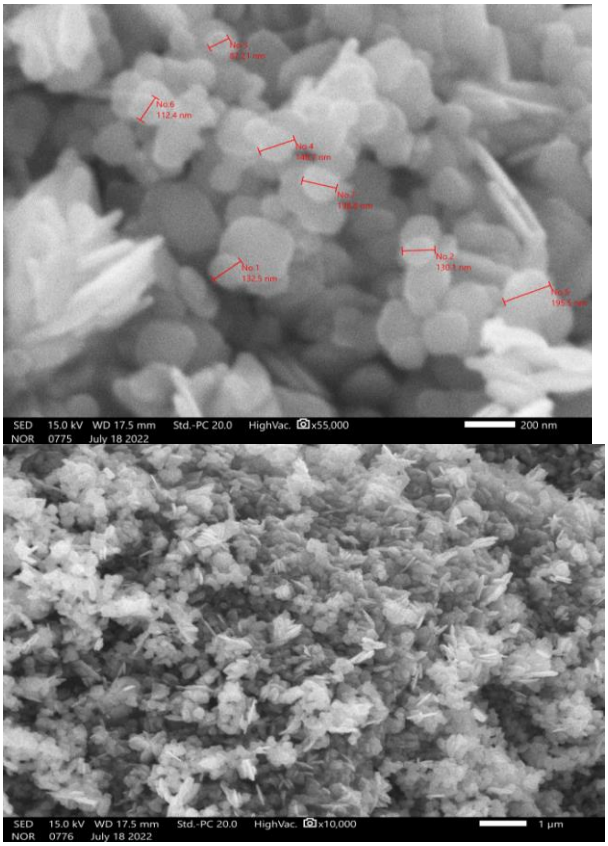


Figure 4. (a) The FESEM photos of ZT nanoparticles

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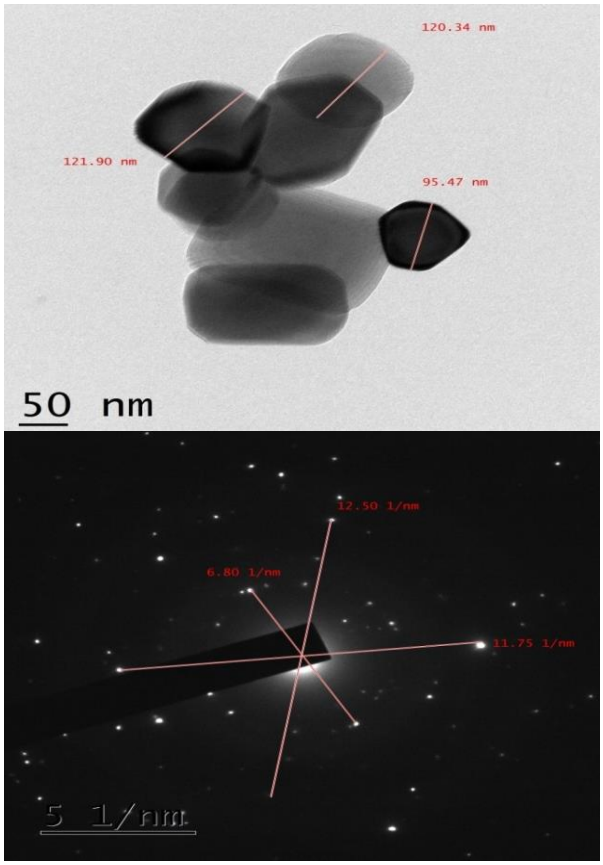


Figure 4. (b) The HRTEM with SAED photos of ZT nanoparticles.

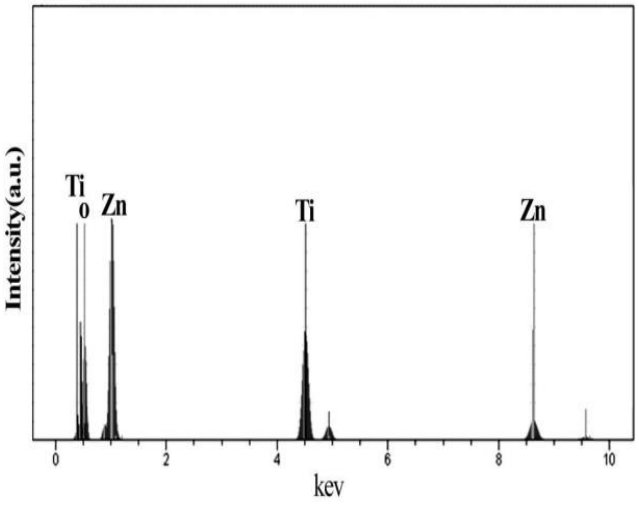


Figure 4. (c) The EDAX of ZT nanoparticles.

3.3 Optical Properties

3.3.1. FTIR analysis

In order to study the characteristic vibration bands corresponding to different bonds, the FT-IR spectra (Fig. 5) is used in the spectral range of 400–4000 cm^{-1}. It is well known that the characteristic vibration bands corresponding to metal-oxygen bonds be in the range of 400–700 cm^{-1}. As seen from the spectrum, peaks 464.84 cm^{-1} and 634.58 cm^{-1} are the characteristic bands of ZnTiO3, corresponding to the stretching vibration of the Zn–O and Ti–O bond [26]. Also, in the bonds at 1529.41–2090.28 cm^{-1} and 2337.43–3742.81 cm^{-1} wave number range, the peaks were tailored owing to the O–H stretching and bending vibrations of H_2O molecules absorbed by the ZT nanoparticles [27]. So, the FT-IR spectrum confirms that ZnTiO3 nanostructures were produced according to appeared peaks.

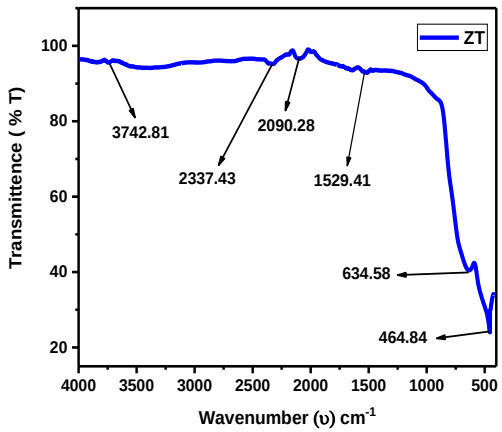


Figure 5. The FTIR spectra of ZT nanoparticles

3.3.2. UV-visible spectral analysis

The room temperature UV–Vis absorption spectra of ZnTiO3 nanoparticles were also measured in the range of 200–1600 nm. Fig. 6 (a) shows the diffuse reflection adsorption spectra (DRS) of the ZnTiO3 nanoparticles at room temperature. The figure indicates that the ZnTiO3 nanoparticles show absorption maxima at 312.04nm, the direct optical band gap estimated from the absorption spectra of the $ZnTiO_3$ nanoparticles is shown in Fig. 6(b). An optical band gap is obtained by plotting $(\alpha h\upsilon)^2$ vs $h\upsilon$ where α is the absorption coefficient and $h\upsilon$ is photon energy. Extrapolation of the linear portion at $(\alpha h\upsilon)^2 = 0$ gives the band gaps of 3.19 eV for perovskite ZnTiO3 nanoparticles. The optical band gap of ZnTiO3 nanoparticles is smaller than those of the bulk ZnTiO3 (band gap 3.70 eV) [29].

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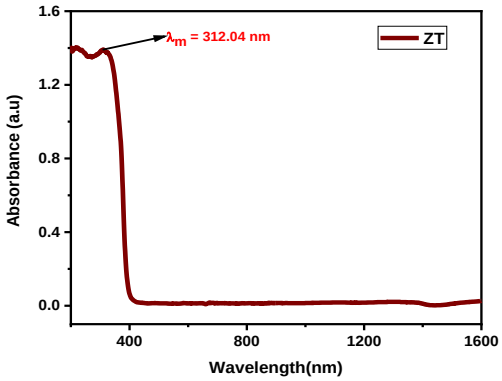


Figure 6(a). The absorption spectra of ZT nanoparticles.

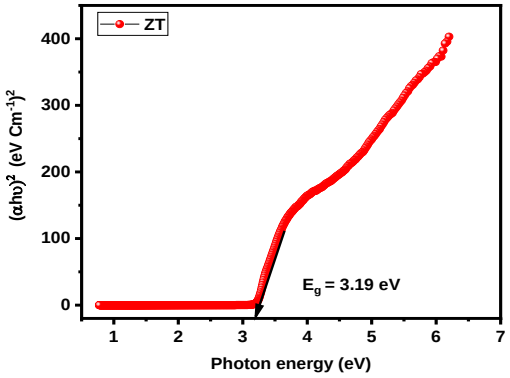


Figure 6(b). The "αhv" versus photon energy of ZT nanoparticles.

4. CONCLUSIONS

The hydrothermal method in comparison to other synthetic methods of nanoparticle preparation has many advantages, for example: simple, available, and inexpensive. In this work, we have prepared the $ZnTiO_3$ nanoparticles by hydrothermal method. A systematic study on the structural, morphological, and optical properties of $ZnTiO_3$ nanoparticles was carried out using various analyses. FESEM images reveal that the $ZnTiO_3$ have a mean particle size of about 135.03, with spherical-like shapes and rods. The average particle size was 112.57 nm using HRTEM images. The band gap was 3.19 eV estimated by UV-vis spectroscopy.

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Structural, Optical and Thermal Characterizations of PVA/MAA:EA Polyblend Films

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Films of polyvinyl alcohol (PVA), Methacrylic Acid - Ethyl Acrylate (MAA:EA) copolymer and their blends PVA:MAA:EA of composition 80:20, 60:40, 50:50, 40:60, 20:80 (wt %) were prepared by using the solution cast technique. The prepared films were investigated by structural, optical and thermal studies. X-ray diffraction (XRD) scans revealed the semicrystalline nature of the blends for lower concentrations of PVA up to 60 wt % and the amorphous nature for higher ones. Fourier transform infra-red spectroscopy (FTIR) of blend samples indicates that there is a compatibility between PVA and MAA:EA copolymers through the formation of hydrogen-bonding between their polar groups. SEM image of polymer blend suggested the presence structural reorganization of polymer chains. UV-Visible spectral analysis revealed that the intensity of the shoulder around 271 nm decreases with increasing MAA:EA content. In DSC analysis, a single glass transition temperature for each blend was observed, which supports the existence of compatibility of such systems. From the observed results, 50:50 (wt %) PVA/MAA:EA is found to be the optimum blending ratio.

Keywords: *PVA/MAA:EA film, XRD, FTIR, SEM, TGA, DSC, optical and thermal parameters.*

1. Introduction

Polyvinyl alcohol (PVA) is a polymer with carbon chain backbone attached with hydroxyl groups. These OH groups can be a source of hydrogen bonding and hence assist in the formation of polymer blends. PVA is non-toxic, water-soluble synthetic polymer, which is widely used in the polymer blends due to its good physical and chemical properties, excellent film forming characteristics, emulsifying capability, non-carcinogenic, biodegradable and biocompatible qualities[1]. These unique characteristics enable it for its applicability in pharmaceutical fields, drug coating agents, material for surgical structures and cosmetic industries[2].

Nowadays, the polymer electrolytes are of immense interest because of their potential applications in the field of thin film formation, interfacial contacts, desirable sizes etc. The development of miniature electronic gadgets like mobile phones and laptops has been remarkable in the last decade to a strong need for high energy batteries. However, those polymer electrolytes are unable to satisfy certain properties such as good mechanical strength, high ionic conductivity, long - term phase stability, tensile strength, and good abrasion resistance. In order to overcome these drawbacks, copolymers (or blending of polymers) have been considered for enhancing the properties of polymer electrolytes. Polymer blend can be more useful because of its easier preparation method and its ease to control the properties of polymer electrolytes by changing the composition of the blended polymer. These polymer blends have gained an ever - increasing importance as an excellent way to develop, without chemical synthesis, new materials with improved properties. From the scientific point of view, polymer blends can enlighten structural properties relationships helping us to understand the underlying physics of polymer interactions. Due to the importance in the field of polymer applications, special emphasis has been given to those blends in which the polymeric components are believed to be mixed at the molecular level mixtures[3].

Recently, some of the polymer blend electrolytes such as (PVA - PANI)[4], (PVA - PAN), (PVP - PVA)[5,6], (PMVEMA - PVA) , (PVA - PEI), (PVA - PVdF), (PEO - PVA)[7], (PVA - PAA)[8], (PVA - PEG)[9], (PEO - PMMA)[10], (PVC - PS), (Chitosan - PVA)[2], (PVA - NyC), (PEMA - PVdF), (PVA - NaAlg) etc. have been studied extensively by various techniques. These polymer electrolytes satisfy most of the properties required in the field of battery applications.

Methacrylic Acid - Ethyl Acrylate (MAA:EA) copolymer has been occupied the center stage amongst the copolymers because of its good environmental stability, easier processability and transparency. MAA:EA copolymer is having a substantial charge capacity and dopant dependent electrical and optical properties[11]. Both PVA and MAA:EA possesses film forming property. Accordingly, PVA/ MAA:EA film was thought to be a good candidate to enhance the cost to performance ratio on commercial products and of significant practical applications[12].

However, polyvinyl alcohol (PVA) - Methacrylic Acid-Ethyl Acrylate (MAA:EA) polymer blend electrolyte has yet to be studied. In the present work, structural, optical and thermal properties of PVA/MAA:EA blends in the range of composition 80:20, 60:40, 50:50, 40:60, 20:80 wt% were investigated.

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2. Materials and Methods

MAA:EAcopolymer (1:1) dispersion 30 percent is a dispersion in water of a copolymer of Methacrylic Acid and Ethyl Acrylate having a mean relative molecular mass of about 250000 (supplied by Merck Millipore India Ltd.,) and had high purity. Polymer films of PVA/MAA:EA blend in different concentrations were prepared at room temperature by solution casting method. The desired concentrations of PVA/MAA:EA solution (80:20, 60:40, 50:50, 40:60, 20:80wt %) were prepared by using distilled water. The solution was stirred magnetically for 10-12 hours to get a homogeneous mixture and then cast onto plastic dishes. The solution was slowly evaporated at room temperature to obtain free-standing pure and blended films at the bottom of the dishes.

In order to investigate the nature of the copolymer films, differential scanning calorimetry (DSC) measurement was carried out by a SEIKO calorimeter (DSC - 220) with a continuous heat rate of 10ºC/min under a nitrogen atmosphere from 40 to 600ºC. The thermogravimetric analysis (TGA) was done using SEIKO thermal analysis system (TGA - 20) in the presence of nitrogen flow from 40 to 600ºC, at the heating rate of 10ºC/min. X-ray diffraction measurements were carried out using a Siemens D5000 diffractometer with CuKα radiation (λ= 1.5406 Å). The films were scanned at 2θ angles between 10 and 40º with a step size of 0.02º. FTIR spectra of these films were recorded using a Perkin-Elmer FTIR spectrometer. The morphology of the polymer films was characterized by the Hitachi (TM - 3000 and H - 8100) electron microscope with scanning attachment. The spectra were taken over a wavenumber range 500 - 4000 cm^{-1}. UV-Vis absorption spectra of the prepared samples were recorded in the range 200 - 800 nm at room temperature using JASCO UV-VIS-NIR spectrophotometer (model - V.700). From the optical absorption data, the optical constants such as band edge, optical band gap (both direct and indirect) were determined.

3. Results & Discussion

3.1. Fourier transform infra-red spectroscopy (FTIR)

Polymer structure and their chemical species could be investigated by using FTIR spectroscopy. Infrared spectra of these materials vary according to their composition and may be able to show the occurrence of complexation and interaction between various constituents. The mutual interaction between them generates change in their vibrational modes of the atoms or molecules in the material which introduces change in physical and chemical properties of the constituents of the complex.

The FTIR spectrum for pure MAA:EA copolymer is shown in the Figure 1. The spectrum exhibits bands characteristics of stretching, bending vibrations of O - H, C - H, C = O, CH_3 - O and CH_2 + α - CH_3 groups. The observed FTIR band positions and their assignments are presented in Table 1. In this film, a strong band observed at 1452 cm^{-1} has been assigned to bending mode vibration corresponding to CH_3 group, while another strong band observed at 1492 cm^{-1} has been attributed to C - H bending of CH_2[13]. The FTIR absorption bands appeared as weak bands in 1601 cm^{-1} range are attributed to carbonyl stretching of the acid and ester units[14]. A broad and very strong band observed at 2923 cm^{-1}, arising from C - H stretching frequency shows the presence of methylene group[11]. Asymmetric C - H stretching of methyl groups shows a peak at 3026 cm^{-1} and C - H stretching of the methylene group gives two peaks at 3059 cm^{-1} and 3082 cm^{-1}.

As shown in Figure 2, the FTIR spectrum of pure PVA exhibits several bands characteristic of stretching and bending vibrations of O - H, C - H, C = C and C - O groups. A broad and very strong band observed at 2813 - 3601 cm^{-1}, which arises from O - H stretching frequency is an indicator of the presence of hydroxyl groups. Another band observed at 2905 cm^{-1} indicates an asymmetric stretching mode of theCH_2 group. The band corresponding to CH_2 symmetric stretching vibration occurs at about 2168 cm^{-1}. Absorbance at 1720 cm^{-1} corresponds to an acetyl C = O group, which could be explained on the basis of intermolecular hydrogen bonding with the adjacent OH group. The shape of the carbonyl bands (C = O) for blend samples is different from that of pure

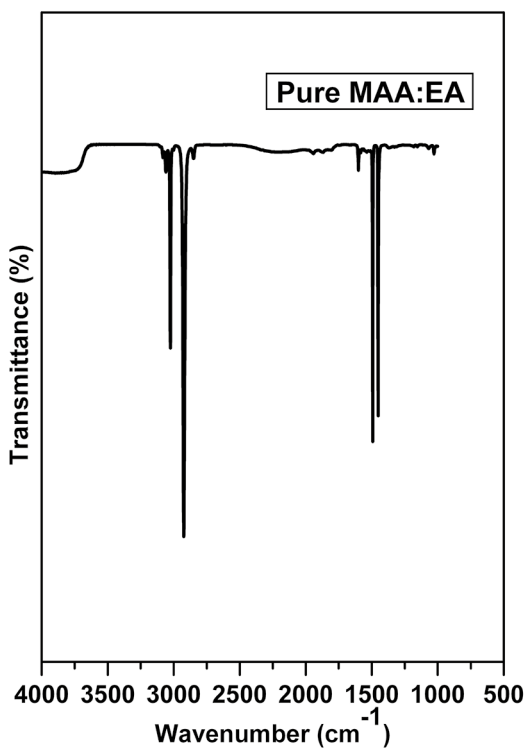


Figure 1. FTIR spectrum of pure MAA:EA copolymer

Table 1. FTIR peak assignment of pure and PVA/MAA:EA blend films.

Wavenumber (cm^{-1})	Band assignment
1452	CH_3– O bending
1492	C – H bending of CH_2
1601	C = O stretching
2923	C – H stretching of methylene group
3026	C – H stretching methyl group
3059	C – H stretching methylene group
3082	C – H stretching methylene group
2813 – 3601	O – H stretching frequency
2905	Asymmetric stretching mode of CH_2group
2168	CH_2symmetric stretching vibration
1711	C = O stretching
1658	C = C stretching
1566	C = C stretching vibration
1349	CH + OH combination frequencies
1080	C – O stretching
918	C – C stretching

homopolymers, indicating a change in the balance of true and associated carbonyl groups in the blends. The increase in the multiplicity of hydroxyl band (OH) with increasing MAA:EA content in the blend samples may reflect possible interactions through hydrogen bonding of hydroxyl bread on the backbone of PVA and MAA:EA. Similar behavior was observed by Attia and Abd El - Kader [12] on PVA/ 2HEC polyblend films. The increased intensity of bands indicates that greater amount of MAA:EA have complexed with the oxygen and hydrogen atoms. The effect of blending on the modes of vibration is observed interms of increase in the intensity of bands and appearance of new bands, which results from the formation of crosslinks between the MAA:EA and oxygen atoms of carbonyl groups. This indicates the increase in the basicity of C = O groups with an increase in the MAA:EA concentration. Absorption band observed at 1711cm^{-1} is due to C = O of carbonyl group. A moderate absorption peak at 1658 cm^{-1} has been attributed to the C = C stretching mode. Another band at 1566 cm^{-1} was attributed to stretching vibration of C = C and a characteristic alcohol band at 1080 cm^{-1} was assigned to the stretching of C - O of PVA, which is affected by hydrogen bonding along with C - H and O - H bending [15]. A C - C stretching mode of absorption is observed at 918 cm^{-1}. The band observed at 1349 cm^{-1} has been attributed to combination frequencies of (CH + OH).

The miscibility between the polymer and the copolymer (PVA / MAA:EA) blend is due to the hydrogen bonding between PVA hydroxyl groups and carbonyl groups of MAA:EA copolymer. The possibility of interactions between the polymer pair in the blend through specific polar groups is examined using FTIR analysis. FTIR spectra of PVA/

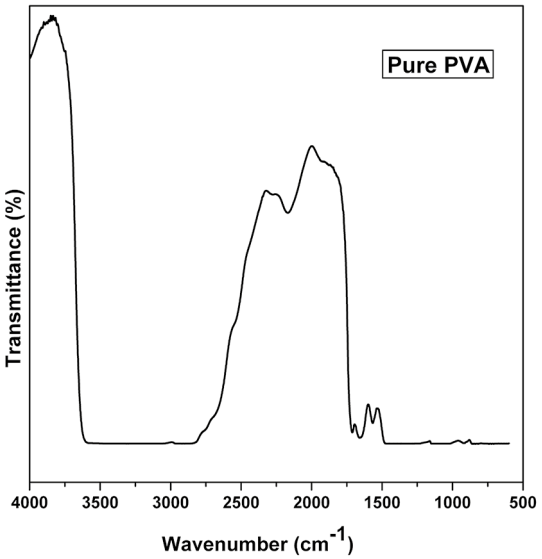


Figure 2. FTIR spectrum of pure PVA

MAA:EA blends (80:20, 60:40, 50:50, 40:60, 20:80 wt %) are also shown in Figure 3(a - e). The FTIR spectra of all blended films exhibit bands, whose vibrational frequencies are found to be similar to several bands observed for pure PVA polymer film. IR features of PVA are more dominant even in 20:80 composition because PVA sample has dense molecular packing in the crystal and also stronger intermolecular hydrogen bonds comparing with MAA:EA, which are responsible for disappearance of functional groups of MAA:EA in the polymer blend. The FTIR spectrum shows shift in some of the band positions and change in the intensities of some other bands compared with pure films. O - H stretching frequency observed at 2813 - 3601 cm^{-1} for pure PVA shows a large shift towards the low-frequency region in the blended films, which indicates the presence of a broad range of associated hydroxyls in blended films. The CH_2 stretching frequency at 2905 cm^{-1} shifts towards higher frequency for all the blends and the shift is found to be very high for 50:50 (wt %) blend i.e 2939cm^{-1}. CH_2 stretching frequency observed at 2905cm^{-1} for pure PVA disappeared for 40:60 (Wt %) blend film. This change indicates the possibility of MAA:EA copolymer to be attached to methylene (CH_2) and C - H in the side chain of PVA molecule [16]. The shift in the 2813 - 3601 cm^{-1} band corresponding to OH groups resulted from in inter/ intramolecular interactions in PVA/MAA:EA blends. The band at 2168 cm^{-1} is assigned to CH_2 symmetric stretching vibrations. For the blend samples, the band shifts to lower frequency and the intensity of the band is decreased, which indicates the change in the chemical structure.

The appearance of a band at 1658 cm^{-1} (C = C) confirms the semi-crystalline nature of the blends as reported by Ragab[6]. A weak peak around 1658 cm $^{-1}$ is observed in the present work, which confirms the semicrystalline nature

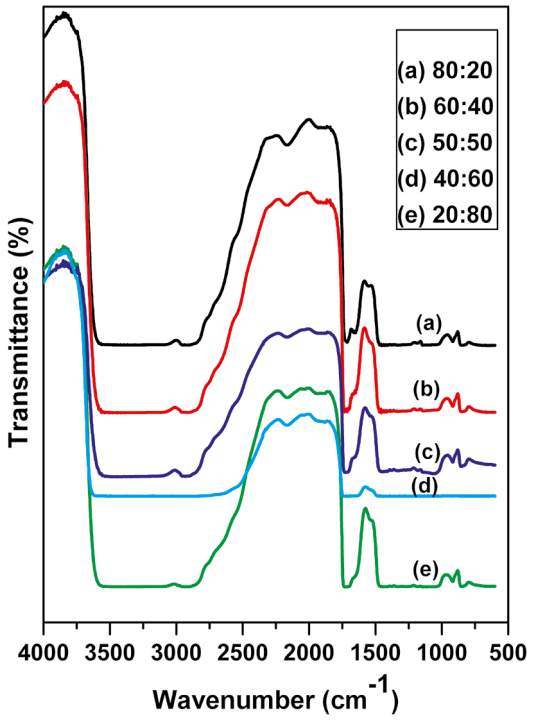


Figure 3. FTIR curves of PVA/MAA:EA blend samples (a) 80:20 (b) 60:40 (c) 50:50 (d) 40:60 (e) 20:80

polymer blend films. This occurs as the elimination of water proceeds isolating C = C in acyclic ring structure.

The small absorption band around 918 cm^{-1} was found to be characteristic of the syndiotactic structure of the prepared films, Nagura et al.[17] reported that the syndiotacticity of the PVA samples causes dense molecular parking in the crystal and stronger intermolecular hydrogen bonds , which inturn are responsible for the disappearance of the molecular motion. This band was appeared in the spectra of pure PVA and other blend samples. These results manifested the conclusion of the specific interaction in PVA/MAA:EA blend matrix. In the case of PVA/MAA:EA, FTIR spectra shows shifts in some bands and change in the intensities of other bands comparing with the pure films which indicates the considerable coupling between the polymer and copolymer.

3.2. Differential scanning calorimetry (DSC)

Thermal characterization techniques are the convenient tools to determine the physical and chemical changes such as phase transitions, glass transition temperature (T_g) and melting temperature (T_m). A temperature range of 0 - 250ºC at a heating rate of 10ºC/min was utilized under nitrogen atmosphere. The DSC patterns in Figure (4) show endothermic peaks of glass transition temperature (T_g) and melting temperature (T_m). T_g of polymer blends is a typical characteristic which is used in studying the miscibility and interaction between polymers and T_m is mostly used in investigating the crystallization of polymers. In Figure 4, one can see that all blended films have only one T_g indicating that the blends are homogeneous. Theoretically, the glass transition temperature of miscible polymer blends could be calculated by using Fox equation[18].

$$\frac{1}{T_{g(blend)}} = \frac{W_1}{T_{g1}} + \frac{W_2}{T_{g2}} \quad (1)$$

In which W_1, W_2 and are weight fractions and the glass transition temperatures of component 1 and 2 respectively. The observed transition temperature $T_{g(o)}$ and theoretical value $T_{g(th)}$ of the blends are presented in Table 2.

For pure PVA, T_g observed is 96.3ºC [19] and for copolymer (MAA:EA) shown in the Figure 5, it is 103ºC [11]. The small traces at about 41ºC for the MAA:EA sample could be due to a small amount of moisture. The T_g for blend varies from 90 to 103.6ºC with the blend ratio. All the observed transition temperatures show variation compared to their theoretical values calculated by equation (1). This deviation from the theoretical value of the glass transition temperature is also observed in an earlier report [20] in which they attributed this behavior to deviation with respect to free volume linearity in the blends. Changes in the free volume are related to specific interactions between polymer chains, increasing specific interactions lead to the formation of a more compact molecular network and diminish the free volume of molar

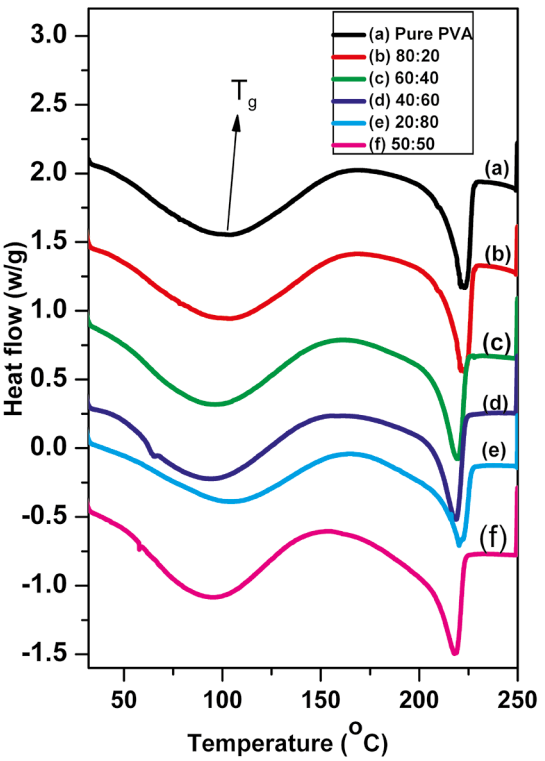


Figure 4. DSC curves of (a) Pure PVA and PVA/MAA:EA blend sample (b) 80:20 (c) 60:40 (d) 40:60 (e) 20:80 (f) 50:50

Table 2. Comparison of observed transition temperatures $T_{g(o)}$ and theoretical Value $T_{g(th)}$ of the blends.

PVA/MAA:EA	$T_{g(th)}$ ºC	$T_{g(o)}$ ºC
20:80	100.00	103.6
40:60	99.07	94.7
60:40	98.3	95.0
80:20	97.21	99.6
50:50	98.59	90.0

chains. In this system, the mobility of the chains decreases due to the presence of hydrogen bonds.

An endothermic peak was observed at around 222ºC for pure PVA and MAA:EA copolymer shows it at 210ºC, which corresponds to the melting temperature of PVA and MAA:EA respectively. A slight shift of T_m towards lower temperature has been observed for blended samples, which reveals the transition from semi-crystalline to an amorphous phase. The lowering of T_m for blend films is quite common and has been related to decreasing spherulite sizes[21] and their surface free energy. As a result of more flexible amorphous environment getting trapped in or adjacent to the crystalline matrix, the suppressed crystalline portion of the MAA:EA copolymer melts probably at lower temperatures. This clearly indicates the suppression of crystallites and there by increase in the amorphous content in the polymer. This leads to favoring in transport and thus to enhance the ionic conductivity of the electrolyte[22].

3.3. Thermogravimetric analysis (TGA)

Figure (6), shows dTG thermograms of pure films and PVA/MAA:EA blends with a heating rate of 10ºC/min in the temperature ranging from room temperature to 800ºC. It is found that there are three temperature regions over which most of the weight loss occurs. These stages can be distinguished in the diagram of weight loss (TG%) during heating as well as more clearly in the diagram of derivative mass loss (DTA). The decomposition steps and percentage weight loss for individual polymers and their blends are represented in Table 3.

For pure PVA the first weight loss occurs between 30 - 157ºC with a weight loss of 13 %, which corresponds to the removal of water. The second weight loss occurs between 219 - 345ºC and corresponds to the thermal degradation of PVA intermolecular hydrogen bonding. The third degradation between 387 - 479ºC corresponds to the decomposition of PVA main backbone chain. The DTG curve of the pure MAA:EA copolymers shown in inset of Figure (6), reveals that there are three distinct steps of weight loss. The 4 - 5% weight loss below 170ºC is attributed to the loss of adsorbed water[23]. The second and third steps observed in the temperature ranges 210 - 400ºC and above 400ºC are the regions of major weight loss and appeared to be due to the extensive degradation of the polymer backbone. The

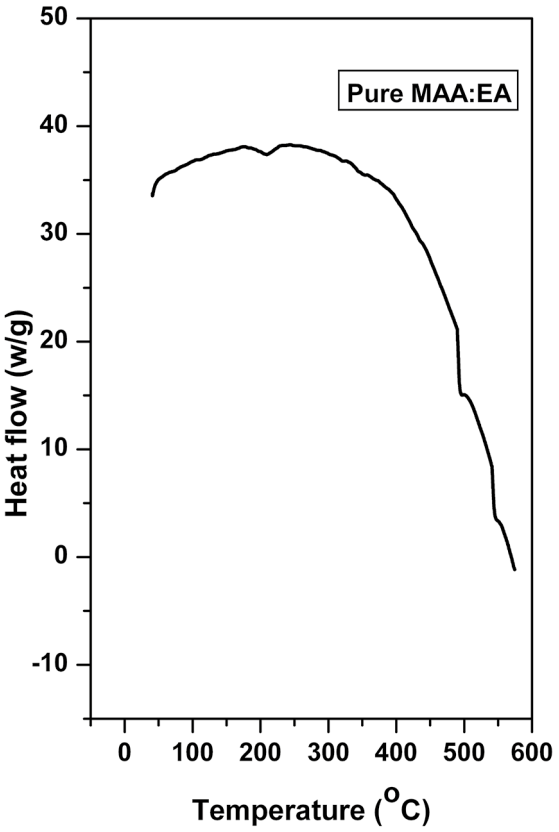


Figure 5. DSC curve of pure MAA:EA copolymer

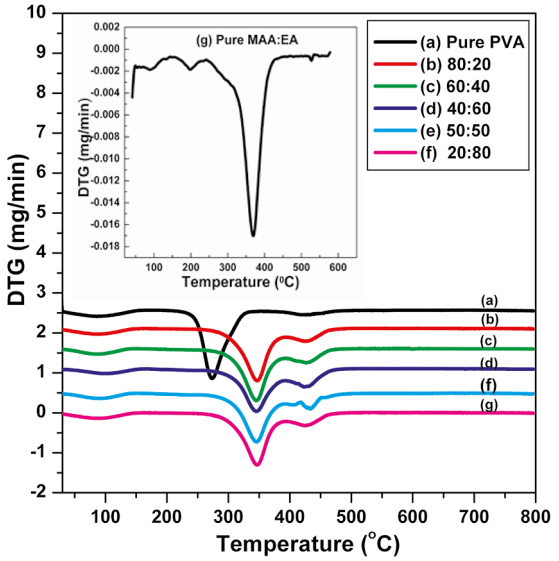


Figure 6. DTG curves of pure and blended PVA/MAA:EA samples (a) Pure PVA (b) 80:20 (c) 60:40 (d) 40:60 (e) 50:50 (f) 20:80 (g) Pure MAA:EA

second decomposition occurred at 210ºC is attributed to the elimination of evaporated molecules in the side groups of MAA:EA copolymer and the third decomposition at above 400ºC is due to quantized graft chain degradation[24].

Table 3.TGA and DTG data for individual Polymers and their blends of PVA/ MAA:EA (wt/wt).

PVA/ MAA:EA (wt/wt)	Temperature (ºC)			Weight loss (%)	
	Start	End	T_P	Partial	Total
Pure PVA	30	157	95	13	83
	219	345	273	73	
	387	479	425	7	
80:20	32	147	87	11	92
	261	387	346	63	
	388	472	427	18	
60:40	30	132	87	9	92
	273	385	347	64	
	386	475	427	19	
40:60	35	147	106	9	89
	271	387	346	59	
	388	477	426	21	
20:80	28	142	86	12	87
	247	390	346	60	
	395	465	426	15	
50:50	25	139	92	9	90
	264	410	345	64	
	411	465	431	17	
Pure MAA:EA	46	135	86	7.5	87
	135	243	194	35	
	243	458	367	55.65	

The blends of PVA and MAA:EA also exhibit three weight loss stages as shown in Figure (6), followed by a final decomposition at 500ºC for all the membranes. The lower values of weight loss percentage in the first decomposition step are responsible for the volatilization of small molecules and or evaporation of residual absorbed water. The second weight loss may be due to the splitting of monomers and bond scission in the polymeric backbone and also the ionic interaction between the homopolymers. The major weight loss percentage in the third decomposition step is attributed to fragmentation of the macromolecular structure of both PVA polymer and MAA:EA copolymer [12]. The blends thus exhibit a relatively good thermal stability than pure films. Therefore, it can be concluded that the blend sample of 50:50 wt % has a more thermal stability and lower order than the other samples.

3.4. X - ray diffraction analysis (XRD)

The X-ray diffraction technique is a useful tool to determine the structure and crystallization of the polymer matrices. Figure 7 shows the X - ray diffraction patterns of PVA and MAA:EA copolymers as well as their blend samples at room temperature in the scanning range $0º \leq 2\theta \leq 40º$. Pure PVA spectrum [Figure 7 (a)] shows small peaks at $2\theta = 0.6º$, 1.46º and relatively broad peak at $2\theta = 19.52º$ diffused in the hallow amorphous region[25]. The appearance of sharp reflections and diffuse scattering is characteristic of crystalline and amorphous phases of convectional semicrystalline polymers. Accordingly, the PVA/MAA:EA blends [Figure 7 (b-f)] also exhibited semicrystalline nature. From the spectra of PVA/MAA:EA blends, one distinct peak at $2\theta = 19.52º$ corresponding to crystal, which is responsible for separation as it comprises of functional groups such as - CH_2 - CH_3 and - OH , has not undergone any significant change after adding more amount of PVA. However, the spectrum of pure MAA:EA copolymer shown in the inset of Figure 7 exhibits a broad amorphous halo with a scattered intensity maximum corresponding to $2\theta = 16.39º$. The patterns revealed that there are no sharp diffraction lines and the broad background scattering of MAA:EA copolymer suggests the presence of amorphous nature.

XRD patterns of blend samples with concentrations 60, 40, 20 and 50 (wt %) PVA (Figure 7) exhibit the characteristics of pure PVA, but varying intensity for the reflection peak.

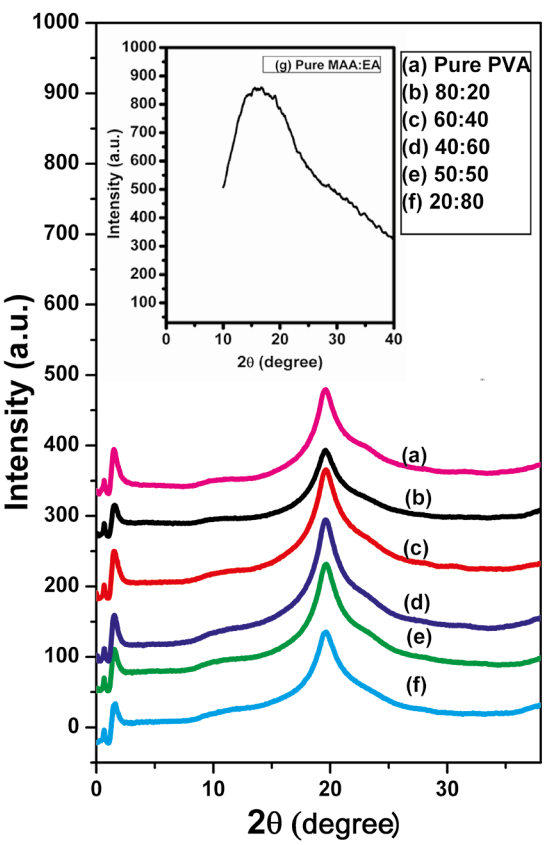


Figure 7. XRD curves of pure and blended PVA/MAA:EA samples (a) Pure PVA (b) 80:20 (c) 60:40 (d) 40:60 (e) 50:50 (f) 20:80 (g) Pure MAA:EA

Thus, one can say that the semicrystalline nature of PVA is decreased upon mixing with the relatively higher content of MAA:EA copolymer. For such blends, compatibility between the semicrystalline and amorphous components of copolymers is possible. Thus, it can be suggested that the crystalline forms in PVA do not prevent the compatibility between amorphous regions of the two polymers in the blend system[26]. The tendency of varying crystallinity in blend sample implies a decrease of a number of hydrogen bonds that are formed between PVA and MAA:EA if present[7].

It can be seen that the peaks at θ = 0.6º and 1.46º got slightly displaced in the complex 80 wt % PVA polymer blend film. The intensity of the peak at $2\theta = 19.52^0$ decreased and peak width increased to 80 wt % of PVA film. The decrease in the intensities of 80 % complexed PVA blend films causes a decrease in the degree of crystallinity and a simultaneous increase in the amorphous nature of complexed films. Hence this amorphous nature of the film is responsible for greater ionic diffusivity which may results in high ionic conductivity, which can be obtained in amorphous polymers that have flexible backbone[16]. This observation confirms that complexation has taken place in the amorphous phase.

3.5. Scanning electron microscopy (SEM) Studies

The Scanning electron microscope produces images of a sample by scanning it with a focused electron beam. The beam of electrons interacts with electrons in the sample, which produces various signals that can be detected and that contain the information about the sample's surface morphology and composition. The beam of electrons generally scanned by the method of raster scan pattern, and the position of the beam is combined with detected signal to create an image.

SEM is often used to study the compatibility between various components of the polymer electrolytes through the detection of phase separations and interfaces[27,14]. The compatibility between the polymer blend and the inorganic dopants has great influence on the properties of thermal, mechanical and ionic conductivity of the polymer electrolytes.

Figure 8 (a-c) shows the SEM images of Pure MAA:EA, Pure PVA and PVA/MAA:EA (50:50) blend.It can be seen from Figure 8 (a) that pure MAA:EA copolymer film shows smooth surface, suggesting that MAA and EA molecules may disperse in the soft-segment phase with little influence on the micro phase separation and mixing of the hard and soft segments[28]. SEM of pure PVA film exhibits no features attributable to any crystalline morphology as shown in Figure 8 (b). So the semicrystallinity of PVA discussed earlier is likely to be submicroscopic in nature. SEM image of polymer blend electrolyte is shown in Figure 8 (c).The side branches are not well correlated along the length of the dendrites trunk. The growth of the dendritic-like shape, which represents the gathering of the branched aggregate clusters, became more clear leading to the formation of condensed aggregated dendrites shape. This suggests the presence of structural reorganizations of polymer chains[10].

3.6. UV - Visible absorption studies

The study of optical absorption, the absorption edge, in particular, has been proved to be the very useful in the elucidation of the optical properties and optical constants of crystalline and non - crystalline materials. Figure 9 shows the absorption spectra of PVA and MAA:EA copolymers and their blends 80:20, 60:40, 50:50, 40:60, and 20:80 (wt %) PVA/MAA:EA in the wavelength range 200 - 800 nm. The spectra of pure PVA and pure MAA:EA copolymer exhibited a shoulder like band at 274 and 221nm as shown in Figure 9 (a) and insert of Figure 9 respectively, which may be due to $\pi \rightarrow \pi^*$ electronic transition (k - band) of carbonyl groups[29]. All the blended samples contain only one remarkable shoulder like a band with an irregular deviation in the position. The absorption of all blended samples increases as copolymer content increases. This is the evidence for the miscibility between copolymers. The UV - Visible spectra for the blended PVA/MAA:EA samples with the composition of 40:60, 50:50, and 20:80 (wt %) contained sharp intense bands at 213, 208 and 201 nm, beside a shoulder like band at about 276 nm.

The absorption coefficient 'α' is related to absorbance 'A' by the equation

$$\alpha = 2.303 \times \left(\frac{A}{d}\right) \qquad (2)$$

Where A is the absorbance and d is the thickness of the sample. When direct band gap exists, the absorption coefficient has the following dependence on the energy of the incident photon[30]

$$\alpha h\upsilon = C(h\upsilon - E_g)^{1/2} \qquad (3)$$

Where E_g is the band gap, C is a constant, υ is the frequency of light and h is plank's constant. A plot of $(\alpha h\upsilon)^2$ vs hυ is shown in Figure 10. The intercept on the energy axis on extrapolating the linear portion of the curve to zero absorption value may be taken as the value of the band gap. For both pure PVA and MAA:EA films, the direct band gap lies at 5.87 and 5.16 eV respectively. The direct band gap values for blended films vary from 5.77 eV to 5.05 e V and are presented in Table 4. For indirect transitions, which requires phonon assistance, the absorption coefficient has the following dependence on the photon energy[11].

$$\alpha h\upsilon = A(h\upsilon - E_g + E_p)^2 + B(h\upsilon - E_g - E_p) \qquad (4)$$

Where E_p is the phonon energy associated with transition and A and B are the constants depending on the band structure.

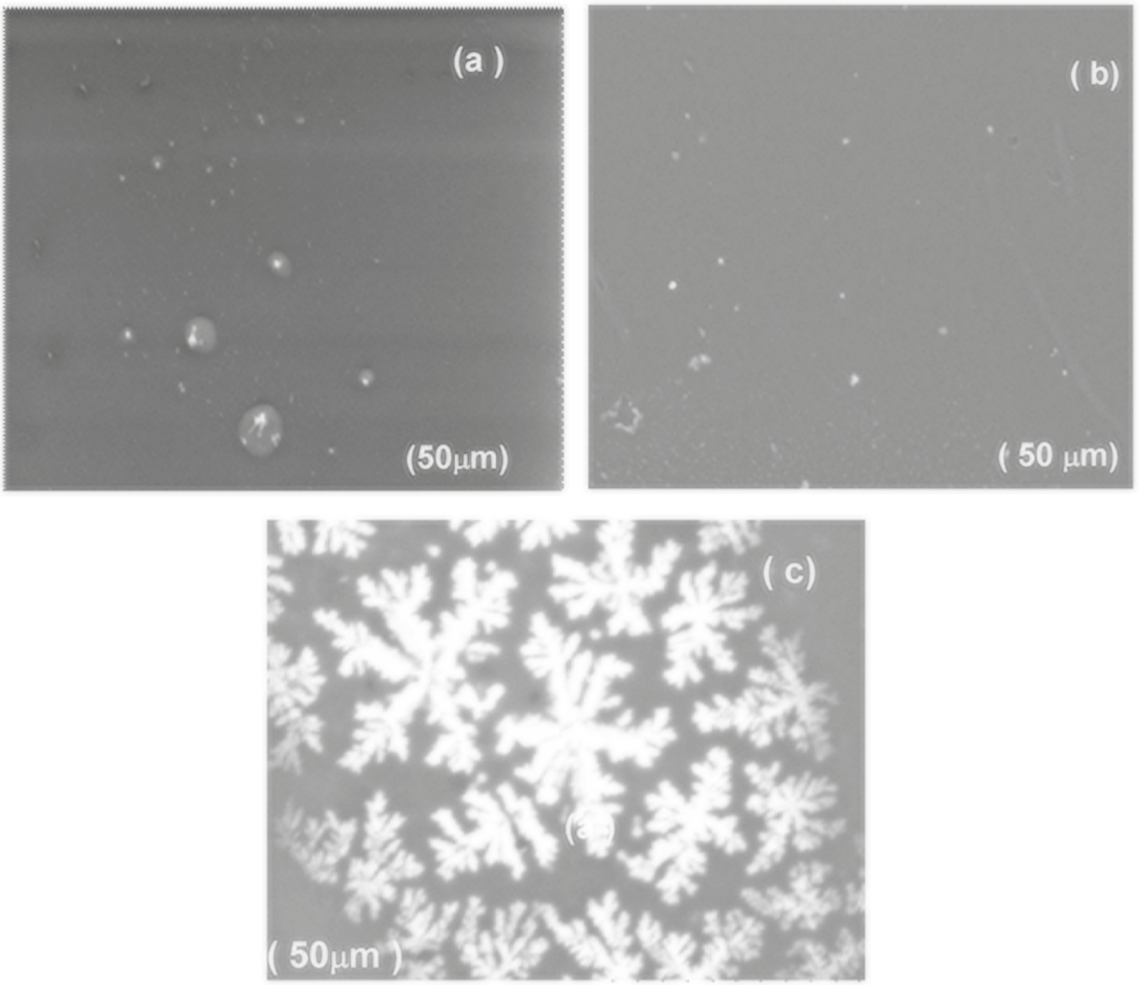


Figure 8. SEM images of (a) Pure MAA:EA (b) Pure PVA (c) PVA/MAA:EA (50:50) blend

The indirect band gap values can be calculated by plotting $(\alpha h\upsilon)^{1/2}$ vs $(h\upsilon)$ as shown in Figure 11. For both pure PVA and MAA:EA films, the indirect band gap values lie at 5.68 and 4.82 eV respectively. The values of all blended samples vary from 5.28 to 4.39 eV (Table 4).

The position of absorption edge was obtained by extrapolating the linear portion of α vs hυ plot (Figure 12) to zero absorption value. For both PVA and MAA:EA films, the absorption edge lies at 5.94 and 5.04 eV respectively, and the absorption edge for the blends vary from 5.79 to 4.83 eV (Table 4)

From Table 4, it is evident that the values of direct and indirect band gap varies with increase in MAA:EA content. This may be reflecting the induced changes in the number of available final states according to blend compositions[12]. Among the all blend samples, the sample with 50:50 (wt %) shows minimum optical band gap value (Table 4), this indicates that it shows more semiconducting nature than remaining blend samples.

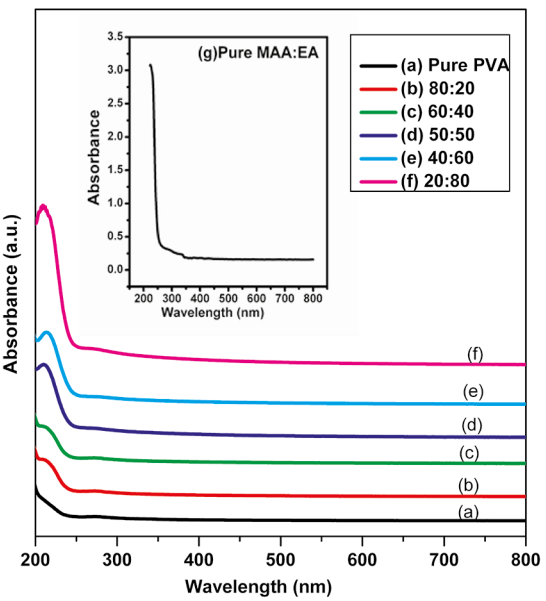


Figure 9. Absorption spectra of pure and blended PVA/MAA:EA samples (a) Pure PVA (b) 80:20 (c) 60:40 (d) 50:50 (e) 40:60 (f) 20:80 (g) Pure MAA:EA

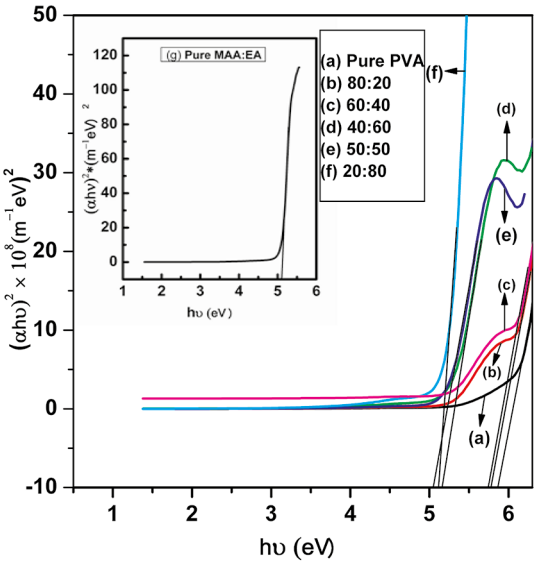


Figure 10. $(\alpha h\upsilon)^2$ vs hυ curves of pure and PVA/MAA:EA blend samples (a) Pure PVA (b) 80:20 (c) 60:40 (d) 40:60 (e) 50:50 (f) 20:80 (g) Pure MAA:EA

Table 4. Values of absorption edge and optical band gap of pure and PVA/MAA:EA blend samples.

PVA/ MAA:EA (wt/wt)	Absorption edge (eV)	Optical bandgap energy (eV)	
		Direct	Indirect
Pure PVA	5.94	5.87	5.68
80:20	5.79	5.77	5.28
60:40	5.62	5.74	5.21
50:50	4.83	5.05	4.39
40:60	4.89	5.16	4.47
20:80	5.04	5.12	4.68
Pure MAA:EA	5.04	5.16	4.82

4. Conclusions

The existence of maximum absorbing edge and minimum in band tail for 50:50 (wt/wt) % PVA/MAA:EA blend sample indicate that it has more carrier concentration in the localized levels. On the basis of the observed data from the XRD, FTIR, DSC and TGA, it could be concluded that the formation of hydrogen bonding between PVA and MAA:EA is possible with in the investigated composition ranges. FTIR spectra of all blend samples shows the variation in the intensities of peaks with increasing the MAA:EA content in the polymer matrix , which indicate the considerable interaction between PVA and MAA:EA. XRD studies on the blend samples of 20, 40, 50 and 60 wt % PVA content revealed that the semi-crystalline structure of PVA is essentially sustained while

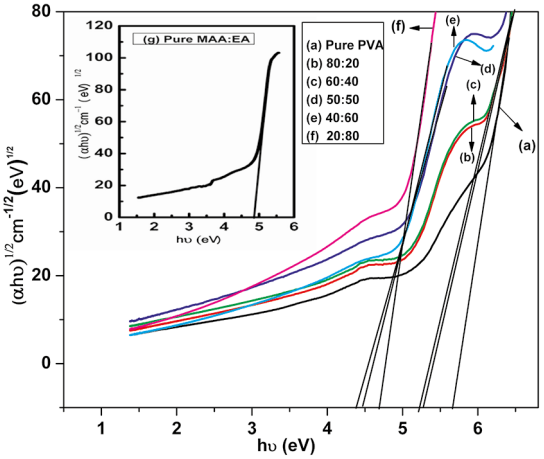


Figure 11. $(\alpha h\upsilon)^{1/2}$ vs hυ curves of pure and PVA/MAA:EA blend samples(a) Pure PVA (b) 80:20 (c) 60:40 (d) 50:50 (e) 40:60 (f) 20:80 (g) Pure MAA:EA

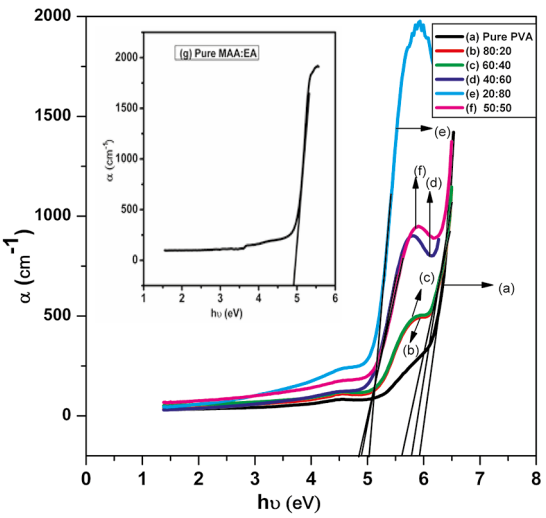


Figure 12. α vs hυ curves of pure and PVA/MAA:EA samples (a) Pure PVA (b) 80:20 (c) 60:40 (d) 40:60 (e) 20:80 (f) 50:50 (g) Pure MAA:EA

for relatively higher concentration 80 wt % the amorphous nature is observed. SEM image of polymer blend shows the dendrites like shape. Thermogravimetric analysis of pure and blend samples shows three distinct steps of weight loss, the first step corresponds to removal of water, second step is due to thermal degradation of intermolecular hydrogen bonding and the third step leads to decomposition of the main backbone chain. Out of all the blend samples, the blend with 50:50 (wt/wt) % PVA/MAA:EA shows higher decomposition temperature (T_d). DSC analysis shows a single glass transition temperature for each blend, which supports the miscibility of the system and among the all blend samples, 50:50 (wt/wt) % PVA/MAA:EA sample shown lower melting temperature

(Tm). Out of all the blend films, PVA/MAA:EA with 50:50 (wt %) shows optimal properties.

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PEO based polymer composite with added acetamide, NaI/I_2 as gel polymer electrolyte for dye sensitized solar cell applications

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Abstract. Poly (ethylene oxide) (PEO) based gel polymer electrolytes (GPEs) with added acetamide, NaI/I_2 have been prepared for dye-sensitized solar cells application (DSSC). The Dye-sensitized solar cell investigated the performance of the optimized gel polymer electrolyte. GPEs synthesized by adding up of acetamide with different wt% in poly (ethylene oxide) (PEO) and poly (ethylene glycol) dimethyl ether (PEGDME) with NaI/I_2. A maximum power conversion efficiency of 5.92% is achieved for PEO/PEGDME with 10 wt% acetamide in the photovoltaic performance under 100 mW/cm^2 illumination and it exhibits maximum ionic conductivity ($\sigma = 2.81\times10^{-3}$ S/cm) among all electrolytes, compared to PEO without acetamide ($\eta = 4.35\%$). The gain in open circuit voltage (V_{oc}) was observed for GPEs due to the decrease in the recombination effect and electron lifetime increases by the addition of acetamide on the PEO. The fill factor (FF) is increased due to the growth in the ionic conductivity and amorphous nature of the GPE increases by the addition of acetamide on the PEO.

1. Introduction:

Investigate gatherings are concentrating on finding new sustainable power sources to accomplish overall energy requirements towards increasing population and emergent technology. Grätzel created a dye-sensitized solar cell (DSSC) in 1991 and delegated as 3rd generation solar photovoltaics [1]. The efficiency of DSSCs announced as high as ~13% and working process as like the rule of plant photosynthesis [2]. However, DSSC still has few issues such as unstable nature of organic solvents and combustible, stability issues because of the degradation of dyes in the photoanode, corrosion of counter electrode and severe leakage and sealing issues in pragmatic applications [3]. Along these lines, numerous specialists have been set up to substitute the liquid electrolyte by organic based materials [4, 5], ionic liquids [6, 7], solid polymer electrolytes [8, 9] and gel polymer electrolytes [10-12].

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Nevertheless, unfortunately, DSSCs made with solid polymer electrolytes (SPEs) shows very low efficiency (4%) [13] due to their low ionic conductivity [14,15].To beat this issue, gel polymer electrolytes (GPEs) newly introduced. Even though, the higher efficiency of GPEs and a considerable stability, their efficiency values are still lower than that of liquid electrolytes. Consequently, various endeavors made to build the cell performance of DSSCs containing GPE by utilizing different polymers, biopolymers, and additives, for example, nanofillers and plasticizers [16, 17]. Specifically, the addition of plasticizer provides to reduce crystallinity and gives free space to ionic mobility for GPE [18]. De Paoli et al. assembled first DSSC by using a copolymer of poly (epichlorohydrin-co-ethylene oxide) and poly (o-methoxy aniline) with NaI/I_2 based electrolyte [19].A quasi solid state DSSC, with PEO/P(VDF-HFP) complex polymer using acetamide with SiO_2 nanoparticles, KI/I_2 was made-up by Cui et al. revealed photovoltaic conversion efficiency (PCE) of 6.04 %[20]. The witnessed efficiencies in the literature, reports are sensibly little for made-up of DSSCs with solid polymer electrolytes (SPE) because of its unfavorable ionic conductivity in the polymer system, poor crystallinity could bring about the drop of PCE. Hence, a significant report focused on improving the efficiency of DSSC with GPEs [21, 22]. A recent report by Pavithra et al. revealed the PCE of 9.01 % by GPEs consisting with Poly (ethylene oxide)-acetamide composite [23]. Chen et al. achieved 9.5% efficiency using of Poly (acrylonitrile-co-vinyl acetate) (PAN-VA) and TiO2 nanofiller [24].

In this paper, a sequence of GPEs by the addition of different wt% of acetamide as a plasticizer in PEO/PEGDME polymer matrix and NaI/I_2 redox couple are prepared. Among frequently utilized polymers, poly (ethylene oxide) is one of the best polymers broadly utilized as polymer electrolyte because of its excellent solvation and chemical stability. In any case, PEO has semi-crystalline nature at room temperature and reductions its ionic conductivity that confines its useful applications [25]. A liquid oligomer (i.e., Poly (ethylene glycol) dimethyl ether) is blended to PEO to improve the ion mobility and diffusion of electrolyte through the mesoporous of a TiO_2 based photoelectrode. Acetamide is utilized as a plasticizer and it has two important groups: one carbonyl group present in the nitrogen atom and another one in the oxygen atom. The -NH_2 groups cooperate with PEO to form polymer complexation with fascinating electrochemical properties [23]. The conformational changes in acetamide altered GPE are examined utilizing FTIR, DSC, XRD and SEM. The ionic conductivity and temperature dependence of ionic conductivity were resolved. At long last, DSSCs are assembled utilizing the acetamide altered GPEs and described by solar simulator under 100 mW/cm^2 illumination to a measured efficiency of the cell.

2. Experimental:

2.1 Materials:

Poly (ethylene oxide) (PEO, $M_w = 10^6 gmol^{-1}$), Poly (ethylene glycol) dimethyl ether (PEGDME, M_w = $250gmol^{-1}$), Acetamide, LiI, Iodide (I_2), N719 and FTO covered glass from Sigma-Aldrich, acetonitrile (Merck), Titanium dioxide (TiO_2, Dyesol), platinum solution (Solaronix) were purchased.

2.2 Preparation of Polymer Gel Electrolytes:

GPEs were set up by including 0.5 g of poly (ethylene oxide) (PEO) in a mix of acetonitrile and Poly (ethylene glycol) dimethyl ether (PEGDME) under nonstop mixing for 2 hours. To this blend around 0.2 g of NaI, 0.08 g of I_2 and different wt% of acetamide (0%, 5%, 10%, 20%) were blended and stirring has proceeded for an extra 2 hours. The prepared electrolyte solution continued stirring during the night. Therefore, such homogeneous solution heated at 80 ^{0}C to dissipate acetonitrile and to yield gel polymer electrolyte. For all GPEs, the concentration ratio kept up at 0.4 for the iodine salt and iodide [NaI/ I_2]. A sequence of gel polymer electrolytes (**A**: PEO + NaI+ I_2, **B**: PEO + PEGDME + NaI + I_2, **C**: PEO + PEGDME + 5 wt% Acetamide+ NaI + I_2, **D**: PEO +PEGDME + 10 wt% Acetamide + NaI + I_2, **E**: PEO + PEGDME +20 wt% Acetamide + NaI + I_2) were synthesized.

2.3 Fabrication of dye sensitized solar cells:
DSSCs were fabricated following the procedures identified in the literature [26]. Briefly, as mentioned below:

2.3.1. Preparation of photo electrodes:
Fluorine doped SnO_2 (FTO) covered glass substrates are washed by a delicate detergent solution taken after by deionized water, acetone and 2-proponol in an ultrasonic shower. A smaller TiO_2 blocking layer was deposited onto the surface of cleaned FTO by treat with 40 mM $TiCl_4$ solution at 70 ^{0}C for 30 min, cleand with deionized water. Nanocrystalline titanium dioxide (TiO_2, Dyesol) transparent layer was secured onto $TiCl_4$ treated FTO glass substrate, repeated the procedure to accomplish 12 μm thick TiO_2 film. Further, 4 μm thick film of scatter TiO_2 (Dyesol) is coated, sintered at 500 ^{0}C for 30 min. $TiCl_4$ treatment was performed at 70 ^{0}C for 30 min to upgrade the surface area of TiO_2. These electrodes are dipped in the N719 dye solution (0.3 mM) for 18 hr under dark condition. The obtained photo electrodes were rinsed twice by absolute ethanol to expel any unanchored dye molecules, finally dried under nitrogen purge.

2.3.2. Preparation of counter electrodes:
spin coating technique is utilized to prepare counter electrodes. Briefly, cleaned FTO substrates were located on the substrate holder of spin coater and a 40 μl of platinum solution (Solaronix) was dispensed and rotated of 5000 RPM for 30 sec, followed by sinter at 500 °C for 15 min.

2.3.3. DSSC Assembling:
Test cells were assembled by utilization of 60μm thickness polymer film, which was located between the counter electrodes and photo electrodes, and the developed polymer gel electrolytes were filled in the middle. The assembled DSSC have an active area of 0.16 cm^2.

2.4 Characterizations:
The structural properties of GPE were done by Philips: PW1830 X-ray diffractometer. BRUKER FT-IR Spectrometer measured Fourier transform infrared spectra (FTIR) of the GPEs. Surface morphology was obtained by Hitachi Model S-3400 SEM instrument. DSC thermograms were studied at the heating rate of 10 ^{0}C min^{-1} with help of a Mettler-Toledo DSC1 instrument. The conductivity of the GPEs was studied by Broadband dielectric spectroscopy (BDS). Current density-Voltage (J-V) characteristics were done with the PEC-L01 solar simulator (Paccell Inc.) associated to source meter (2401, Keithley). The simulator was adjusted with standard Si cell to get 100 mW/cm^2 output powers (1 Sun condition). Broadband dielectric spectroscopy (BDS) studies were conducted by use of NOVOCONTROL in the frequency range of 1 Hz to 1 MHz.

3. Results and discussion:
In order to identify modifications in the polymer chain, GPEs were analyzed by FTIR, DSC, XRD and SEM results and how such compliance change may follow up on the ionic conductivity was examined. Finally, how these factors influenced on ionic conductivity of GPEs was verified and the obtained results were compared with impendence studies.

3.1 Fourier transforms infrared spectroscopy:
FTIR is useful to give data on the chain formation of polymers and the presence of collaborations among the segments in PEO based electrolyte [27]. FT-IR spectra of the GPEs appear in figure 1.The-stretching vibrations of $-CH_2$ in PEO happens at 2871 cm^{-1} because of the cooperation of sodium-ion and acetamide with a polymer in GPE and intensity of this peak diminishes [28]. These progressions of $-CH_2$ confirms the coordination amongst PEO and acetamide. Additionally, a peak identified due to C-O-C stretching vibrations at 1106 cm^{-1} in PEO chain [29]. For GPEs containing acetamide, this peak

gets broad and the intensity reduced by the supply of acetamide substance up to 10 wt%. In the meantime, the peak appeared at 1340 cm^{-1} due to the characteristic of the crystallized PEO gets sharpened and the intensity also reduced upon supply of acetamide substance up to10 wt%. Acetamide has two important groups: one carbonyl group present in the nitrogen atom and another one in the oxygen atom. The C=O group in carbonyl can synchronize effectively with the polymer matrix in the GPE through sodium ion while the polar -NH_2 group have a single pair of electrons will cooperate through the iodide ions in the redox couple. The absorption peaks of acetamide were observed due to the presence of –NH_2 and –C=O groups at 1659 cm^{-1} and 3460 cm^{-1} respectively [23].

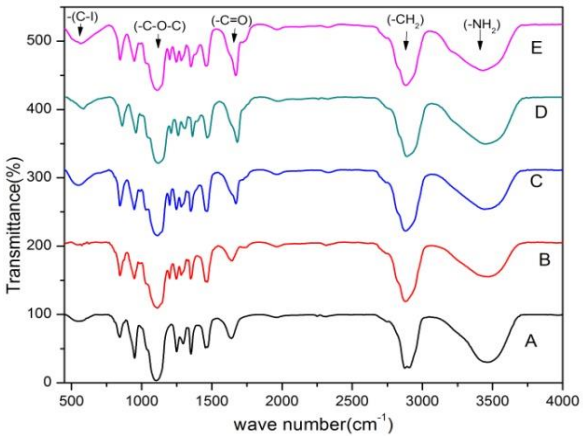


Figure1: FTIR spectra of GPEs (A, B, C, D and E represents PEO/PEGDME with different wt% of acetamide)

3.2 Differential Scanning Calorimetry:

Differential scanning calorimetry (DSC) is broadly applied to examine the phase modulation of the gel polymer electrolytes. The DSC thermograms appear in figure 2 containing a different wt % of acetamide in GPE. The flexibility of the polymer can be clarified by one of the imperative parameters know as glass transition temperature (Tg)[30]. The Tg estimations of various wt % of acetamide in GPE are given in the Table-1. By the addition of acetamide, Tg decreases up to PEO/PEGDME with 10 wt% of acetamide. This demonstrates that the increase in the amorphous nature and increment free volume of the GPE by the addition of acetamide, as a result mobility of the ions is improved which indicates that the ionic conductivity of GPEs also increases [31]. Further, the adding of acetamide over 10 wt% shows a decrement in Tg which shows excessively of acetamide may decrease the free volume and flexibility in the polymer matrix. In this manner, such changes in Tg may impact the ionic conductivity and activation energy [32].

3.3 Structural properties:

The X-ray diffraction studies provide probable influence on PEO of semi crystalline phase by adding acetamide content. X-ray diffraction pattern of GPEs with various wt% of acetamide are shown in figure 3. Pure PEO is a semi crystalline polymer and exhibits two strong crystalline peaks at 19.1º and 23.2º [33]. PEO with 0 wt% of acetamide (sample A) shows some semi crystalline peaks and remains all GPEs show amorphous nature. The XRD pattern shows only one broad peak appeared at 22.62 ^{O}, which indicates the variation in the crystalline phase of gel polymer electrolytes. The diffraction peaks become broad up to PEO/PEGDME with 10 wt% acetamide content is inserted in the polymer complexes. Hence, it can suggest that the PEO undergoes significant structural reform while blending and thus complexation occurs in the amorphous phase. It has been reported that ion mobility is better in the amorphous phase because their mobility is helped by polymer segmental motion [34]. Among all GPEs, PEO/PEGDME with 10wt% acetamide shows wide and less intensity curve, which exhibits high amorphous nature compare to others.

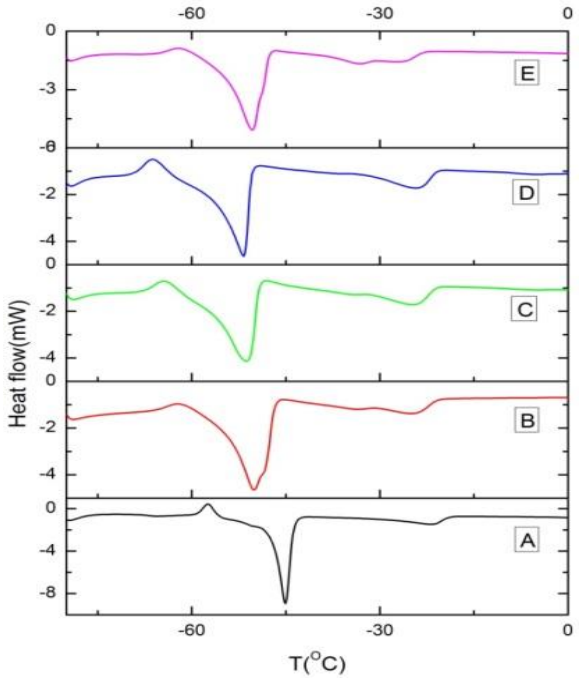


Figure 2: DSC thermograms of GPEs (A, B, C, D and E represents PEO/PEGDME with different wt% of acetamide)

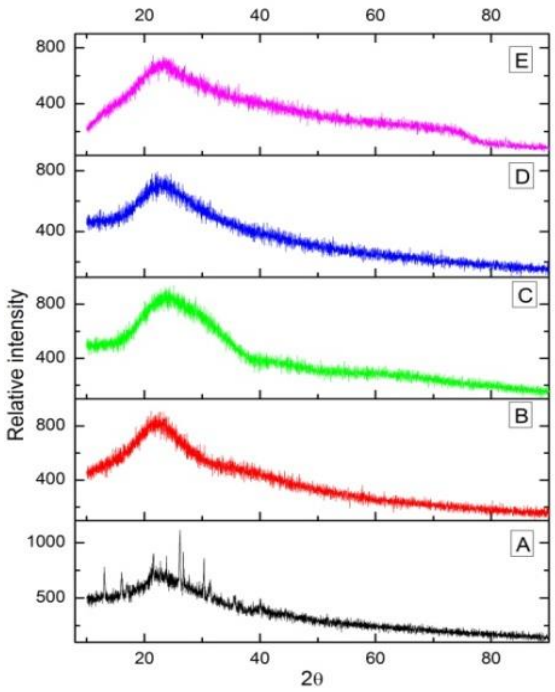


Figure 3: X-ray diffraction pattern of GPEs (A, B, C, D and E represents PEO/PEGDME with different wt% of acetamide)

3.4 Scanning electron microscopy:

SEM image of GPEs with different wt% of acetamide are displayed in the Figure.4. SEM images of GPE (Figure 4a-b) demonstrate a broke layer structure yet GPE containing PEO/PEGDME with 10 wt% of acetamide[35]. Figure 4d demonstrate a fibrous unbreakable structure due to the interaction of acetamide with the ether oxygen in PEO and images revealed that the redox couple bound inside the walls of the gel structure establishes a homogeneous allotment [23]. SEM images of GPE (Figure 4c-e) show tiny gaps between the layers in GPE by a blend of acetamide. In this manner, a blend of acetamide gives impressive adjustments in the surface morphology and increment in the free volume of the GPE that makes development in the ionic conductivity [36].

3.5. Ionic conductivity of gel polymer electrolytes:

In DSSC, the improvement in mobility of the redox couple and ionic conductivity of the GPE provides better power conversion efficiency [37]. Figure 5 indicates complex impedance plots (Z' vs Z") for GPEs with different wt% of acetamide. In the complex impedance plots, bulk resistance (R_b) was measured by extrapolated intercepts on the Z' of the common part of two arcs. Therefore, the ionic conductivity of the prepared GPEs is measured by bulk resistance (R_b) values acquired in Broadband Dielectric Spectroscopy (BDS) by applying the formula [38]:

$$\sigma = \frac{l}{AR_b} \qquad (1)$$

Where 'A' is the area, 'l' is the space between two electrodes and 'R_b' is the bulk resistance measured from BDS spectrum. From Table-1 it is resolved that the ionic conductivity of GPE maximum for PEO/PEGDME with 10 wt% acetamide. It is broadly speaking that ionic conductivity is large in the amorphous phase of GPE [39]. Upon addition of acetamide, Ionic conductivity is increased; this is because of the decrease of crystallinity of the GPE and because of the collaboration of acetamide with

PEO. A Further blend of a large amount of acetamide may decrease the free volume and flexibility in the polymer system that indicates a decrement in ionic conductivity.

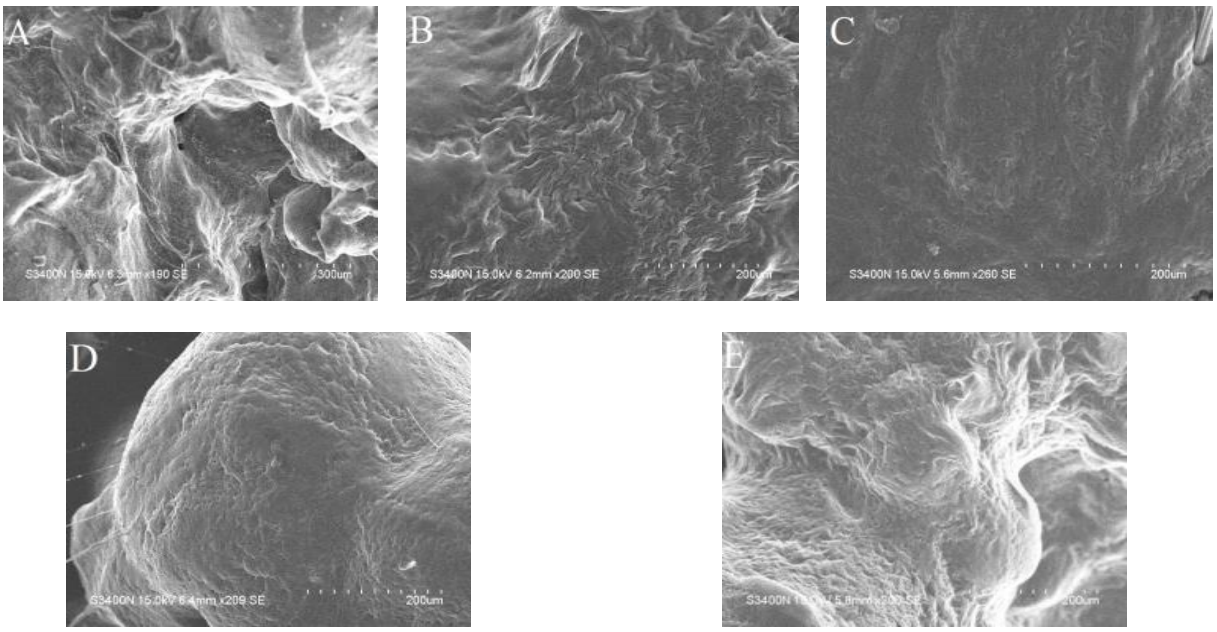


Figure 4: Scanning electron microscope images of GPEs (A, B, C, D and E represents PEO/PEGDME with different wt% of acetamide).

The temperature variation ($25^{O}C$–$60^{O}C$) of the ionic conductivity of GPEs with different wt% of acetamide is shown in Figure 6. The flexibility and free volume in the GPE increase with an increase of temperature and hence enhances the mobility of ions in the polymer systems [40]. As can be seen, the ionic conductivity increments incredibly at the melting temperature of PEO ($60^{O}C$), which shows that the electrolyte has turned out to be completely amorphous [27]. Therefore, the Arrhenius equation is used to demonstrate the temperature - conductivity performance of the GPEs [41]:

$$\sigma = \sigma o \exp\left\{\frac{E_a}{KT}\right\} \qquad (2)$$

Where σo is a pre-exponential factor, E_a is activation energy for ionic mobility, K is Boltzmann constant and T is the absolute temperature in Kelvin scale. The activation energy (E_a) values evaluated from the Arrhenius equation and tabulated in Table-1 for various samples. From figure 6, the ionic conductivity was observed to increase with increasing temperature and GPEs are easily expand as temperature increases hence creating more free volume [42].The results clearly illustrate that the adding of acetamide to electrolyte can reduce the activation energy of redox couple. In fact, lower E_a is liable for higher ionic conductivity in correlation with pure PEO based GPE. This is mostly due to the amorphous phase of the polymer matrix, which will helpful for ion mobility [43].

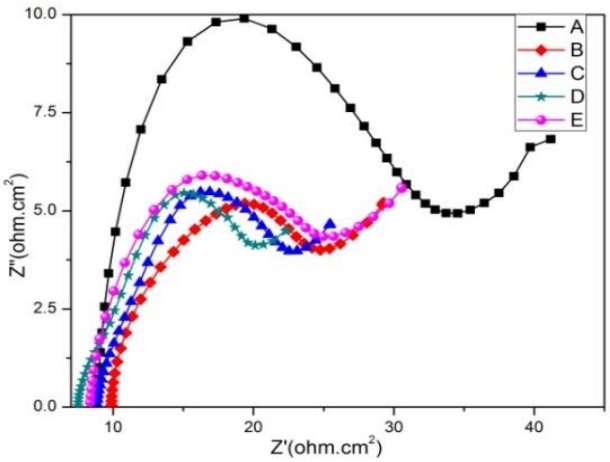


Figure 5: impedance spectra of GPEs (A, B, C, D and E represents PEO/PEGDME with different wt% of acetamide)

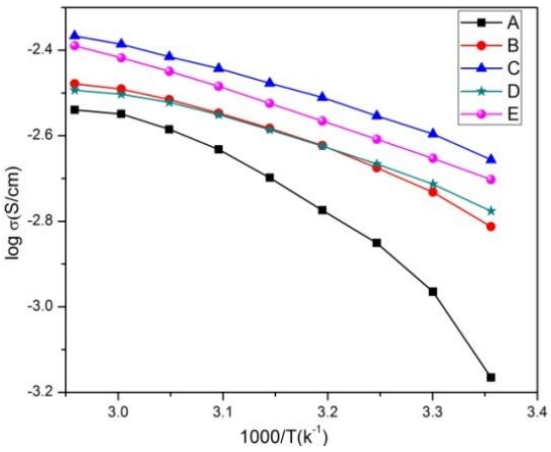


Figure 6: Temperature dependence of ionic conductivity of GPEs (A, B, C, D and E represents PEO/PEGDME with different wt% of acetamide).

3.6 Photovoltaic performance of the DSSCs:

DSSCs assembled to determine the performance of prepared GPEs potentiality in a practical application. The photovoltaic characteristics of the DSSC using gel polymer electrolytes with different %wt of acetamide are shown in Figure 7 and the results are tabulated in Table 1. The performance parameters of all DSSC such as open circuit voltage V_{oc} (V), short-circuit current density J_{sc} (mA/ cm^2), fill factor (FF) and power conversion efficiency η% were obtained with different gel polymer electrolytes. The fill factor (FF) was calculated using:

$$FF = \frac{V_{max} \times J_{max}}{V_{oc} \times J_{sc}} \quad (3)$$

Where V_{max} and J_{max} are the voltage and current density at the maximum power output point.

The power conversion efficiency η was calculated $$\eta\% = \frac{V_{oc} \times J_{sc} \times FF}{Total\ incident\ light\ power\ density} \times 100 \quad (4)$$

Figure 7. Reveals the voltage- current density (V-J) characteristics of DSSCs by platinum electrodes under solar simulator irradiation of 100 mW/cm^2 (AM 1.5). The power conversion efficiency of Cell-D shows superior in a performance of η = 5.92 %, J_{SC} = 13.91 mA/cm^2, V_{OC} = 0.70 V and FF = 0.60, which indicates the GPE with 10% acetamide having good potentiality than the other electrolytes, reflects the enhanced DSSC performance. However, for higher wt% of acetamide, the photocurrent conversion efficiency values reduce due to the complex formation between I_3^- and acetamide which may decrease the ionic conductivity (σ). Consequently, photocurrent conversion efficiency reduces for 20% wt of acetamide. Considering the favorable high conductivity of GPE with 10% acetamide, the platinum CE can exhibit the improved efficiency. A systematic study is conducted to assessment the acetamide and PEGDME loads in GPE and shown in Figure 7. The conversion efficiencies of DSSCs with different acetamide concentrations are 4.35 %, 4.67 %, 5.58 %, 5.92 % and 5.13 % for Cell-A, Cell-B, Cell-C, Cell-D and Cell-E respectively and the other photovoltaic parameters are evaluated from the J-V characteristic are given in Table-1.

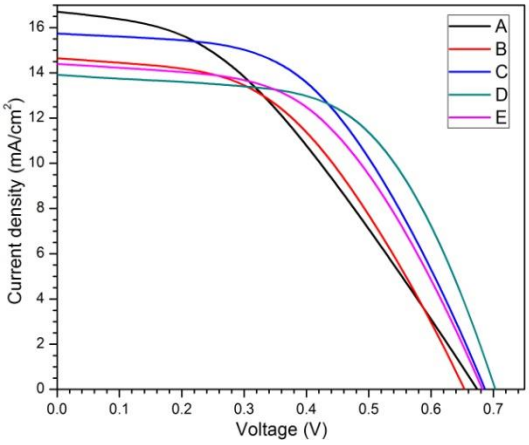


Figure 7: Current density - Voltage characteristics of DSSCs under 1 sun illumination.

Table-1: Gel polymer electrolyte parameters and Photovoltaic cell parameters of fabricated test cells.

Gel Polymer Electrolyte	Glass transition temprature T_g (^OC)	Ionic Conductivity σ (mS/cm)	Activation Energy(eV)	V_{oc} (V)	J_{sc} (mA/cm^2)	Fill Factor	Efficiency η (%)
A	-45.06	1.67	0.1320	0.67	16.70	0.38	4.35
B	-50.11	2.23	0.0715	0.66	14.65	0.48	4.67
C	-51.43	2.49	0.0619	0.69	15.74	0.51	5.58
D	-51.78	2.81	0.0618	0.70	13.91	0.60	5.92
E	-50.46	2.27	0.0683	0.68	14.39	0.51	5.13

4. Conclusions:

In this review, the impact of acetamide on PEO and performance of gel polymer electrolyte were verified by DSSCs. The reduction of crystallinity in the GPE by the blend of acetamide due to increasing amorphous nature was examined by FTIR spectroscopy. The variation of glass transition temperature (Tg) on the GPE by the incorporation of acetamide was investigated by DSC. By the addition of acetamide, Tg decreases up to PEO/PEGDME with 10 wt% of acetamide. Ionic conductivity and temperature dependent of conductivity were investigated by BDS. The flexibility and free volume in the GPE increase with an increase of temperature and hence improve the ion mobility of the polymer systems. The ionic conductivity high for PEO/PEGDME with 10 wt% of acetamide as 2.81×10^{-3} S/cm and less for the PEO without acetamide as 1.67×10^{-3} S/cm. Finally, photovoltaic performance of DSSC was analyzed by the implementation of GPEs in the dye-sensitized solar cells. The GPE contains PEO/PEGDME with 10 wt% acetamide exhibits a high photovoltaic conversion efficiency of 5.92% compared with 4.35% for PEO without acetamide under 100 mW/cm^2 illuminations. However, more amount of acetamide over 10 wt% decreases the photovoltaic performance of the DSSCs due to the complexation between I_3^- and acetamide which may reduce the ionic conductivity of polymer electrolyte and mobility of ions. As a result, photocurrent conversion efficiency reduces for 20 wt% of acetamide when compare to 10 wt% of acetamide.

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SYNTHESIS, CHARACTERIZATION AND AC CONDUCTIVITY STUDIES OF MgO DOPED POLYMER NANO COMPOSITES.

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ABSTRACT: In the present study, a facile, cost effective, synthetic route low temperature solution combustion synthesis was introduced to prepare Magnesium oxide (MgO) nano particles and chemical oxidative polymerization method to synthesize PAni / MgO Nano Composites. Further these nano composites were characterized by PXRD, FESEM and EDAX to investigate their structural and morphological studies. As a part of electrical studies, dielectric constant and AC conductivity measurements were done by AC6500B precision impedance analyser.

KEYWORDS: Nano particles, solution combustion XRD, FESEM, EDAX, Dielectric constant, AC conductivity.

I. INTRODUCTION

Among conducting polymers, polyaniline (PAni) has gained much interest due to simple preparation of powders and composites with better environmental stability and suitable conductivity. These features are mainly responsible to utilize PAni for some interesting applications such as sensors, microactuators, polymeric batteries, electronic devices and electrolytic capacitors.[1] Chemical oxidative polymerization has been used for the preparation of PAni, because of its preparation in short duration.[2] The value of electrical conductivity, actually, distinguishes the polymers from metals. For metals, electrical conductivity is of the order of $10^4 – 10^6$ s/cm where as for polymers, it doesn't exceed 10^{-14} s/cm. By simple modification of pure conducting polymer, that is by doping the conducting polymer with nano structured metal oxides such as [ZnO, MgO, CuO, TiO_2, ZrO_2, NiO, SnO_2] the electrical conductivity can be enhanced or modified.[3]

In this work, MgO nano particles (Synthesized by low temperature solution combustion method) were doped to pure PAni with different wt % (0.1, 0.3, 0.5) to prepare PAni/MgO nano composites. Here we present the structural, compositional and electrical properties of synthesized pure PAni as well as PAni/MgO nano composites. These properties were investigated by means of PXRD, FTIR, FESEM and impedance analyzer measurements done by AC 6500 B precision Impedance analyzer.

By using chemical oxidative and electrochemical methods, polyaniline the conducting polymer was synthesized and characterized. The conductivity studies were performed by four-point probe technique by measuring the electrical resistance at room temperature. Magnesium oxide MgO nanoparticles were prepared by sonication method to understand their antibacterial property. By increasing the calcinations time, the Lethal effect of MgO nanoparticles was studied. MgO particles of nano scale were fabricated by solution combustion method and characterized. The relative fuel-to-oxidant ratio (φ_e) is also calculated and concluded that they exhibit larger specific surface area than the other powders. The Electrical conductivity studies of characterized Polyaniline/ZnO nano rods found the decrease in the electrical conductivity of PANI/ZnO nano rods as compared to PANI. By using extract of orange peel as fuel, MgO nano particles were synthesized via green synthesis which is ecofriendly.

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II. EXPERIMENTAL

Magnisium Nitrate, Sugar, Aniline (monomer), Ammonium peroxy- disulphate (APS), Hydrochloric acid, Ammonia, Methanol of A.R. Grade were obtained and used as received. PXRD measurements were carried out by an X PERT-PRO Diffractometer using Cu K_α λ= 0.1540 nm in a range of 2θ ($5^0 \leq 2\theta \leq 85^0$).The scanning electron microscope (SEM) (Cambridge stereoscan S-360) was used for the surface features of the composites. The measurements for dielectric constant and Ac electrical conductivity studies were carried out by precision impedance analyzer Ac 6500-B.

SYNTHESIS OF PANI

PAni was synthesized by chemical oxidative polymerization method using aniline as monomer in the presence of hydrochloric acid as catalyst and Ammonium peroxydisulphate (APS) as an Oxidant. 10ml of 0.1 M HCl is mixed with 1ml of Aniline. This mixture was stirred for 1 hour at constant RPM. The solution of 2.5 ml of APS was added drop wise into the mixture. This reaction mixture was continuously stirred in a magnetic stirrer at constant RPM for 24 hrs. under ice cold (0^0C) temperature. After 24 hrs the Precipitate was separated out by filtering. The obtained final suspension was dried in oven at 80^0C for 24 hrs. The final product was grounded into fire powder[4].

SYNTHESIS OF MgO NANO PARTICLES

Nano structured Magnesium oxide particles were synthesized by low temperature solution combustion method. Magnesium nitrate Mg $(NO_3)_2$ and sugar were taken in the appropriate stoichiometric ratio. The required amounts of starting materials for synthesis of MgO nano particles were calculated according to the reaction.

$$Ng\,(NO_3)_{2\,(aq)} + C_{12}H_{22}O11_{(aq)} \rightarrow Mg\,O_{(s)} + N_{2(g)} + 11\,H_2O + 12\,CO_{2\,(g)}$$

5g of Mg $(NO_3)_2$ and 1.4g of sugar were added to 25ml of double distilled water. To get homogeneity the solution is stirred in a magnetic stirrer at constant RPM for 15 min. The Homogeneous solution was then taken in a petridish and kept in a pre heated Muffle furnace maintained at 400^0C to carryout combustion. Fig(1)



The solution undergoing spontaneous combustion during the synthesis

Fig.1 : Solution combustion synthesis

N_2 and CO_2 were evolved as bright pale yellow gas mixture and MgO was left behind as the end residue. This final product was grounded into the fine powder.

SYNTHESIS OF PANI/MgO NANO COMPOSITES

0.1 M of 10ml HCl and 1g of polyaniline are mixed at a very low temperature and is mixed drop wise to the main solution of polyaniline. This obtained solution is stirred for a period of 24hr and then filtered. The precipitate was collected on a Buchner funnel and rinsed with water, and then kept in a microwave oven maintained at 80^0C for again 24 hr. The final product obtained will be the powder form PAni/ZnO nano composite.

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III.RESULTS AND DISCUSSION

PXRD ANALYSIS

The PXRD spectrum is a characteristic finger print of a phase and no broad peaks represent 100% crystallinity. The positions of the peaks in a powder pattern determine the size, shape and symmetry of the unit cell and the peak intensities determine the arrangement of atoms within the unit cell .

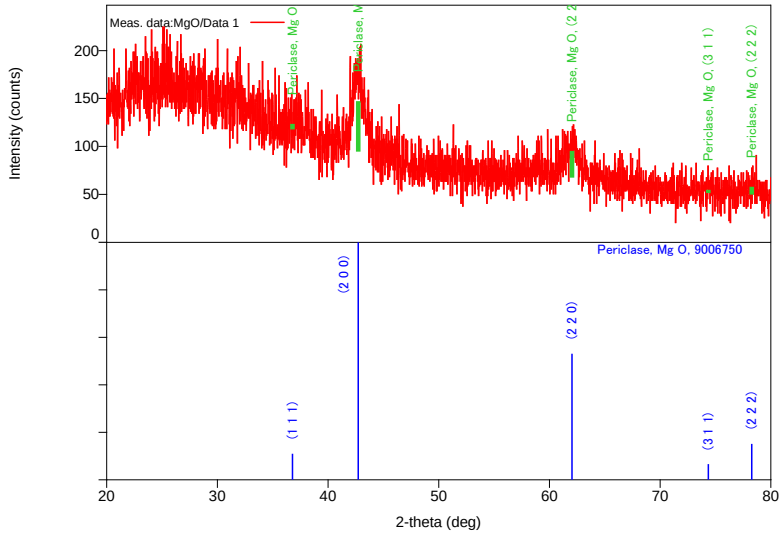


Fig.2 : PXRD spectrum of MgO Nano particles

Fig (2)shows the PXRD spectrum of MgO nano particles. All the diffraction lines are assigned to cubic crystalline phase of Magnesium oxide [JCPDS 4-829] and no other impurity peaks are observed. It confirms the purity of the compound. The crystallite size of the as made MgO nano particles was calculated from the broadening of the X-ray diffraction using the Debye Scherrer's formula and found in the range 7-10 nm [5].

Debye Sherrer's formula

$$D = \frac{K\lambda}{\beta \mathrm{Cos}\theta}$$

Where D is crystallite size, k is shape factor, which can be taken a value of 0.89 if the shape is unknown, θ is the diffraction angle at maximum peak intensity and β Is the full width at half maximum of diffraction angle in radians.The peak list is shown in Table (1)

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Table 1.

NO	2-theta	d (ang.)	Height (counts)	FWHM (deg)
1	42.64(10)	2.119(5)	49(7)	1.29(8)
2	62.2(2)	1.492(4)	24(5)	1.3(2)

The peaks (111) , (200), (220) , (311) , (222) at (37.5), (42.8) , (62.3), confirm the FCC structure of MgO nano particles. The peaks at 22^0, 26^0, 72.5^0 were attributed to (111), (202), (101). PAni/MgO nano composites.

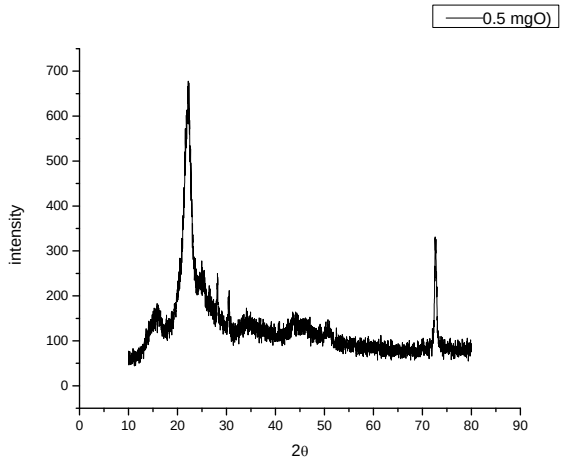


Fig.3. PXRD of PAni/MgO nano composites

FESEM

The scanning electron microscopy images of MgO nano particles of different magnifications shown in Fig (4).

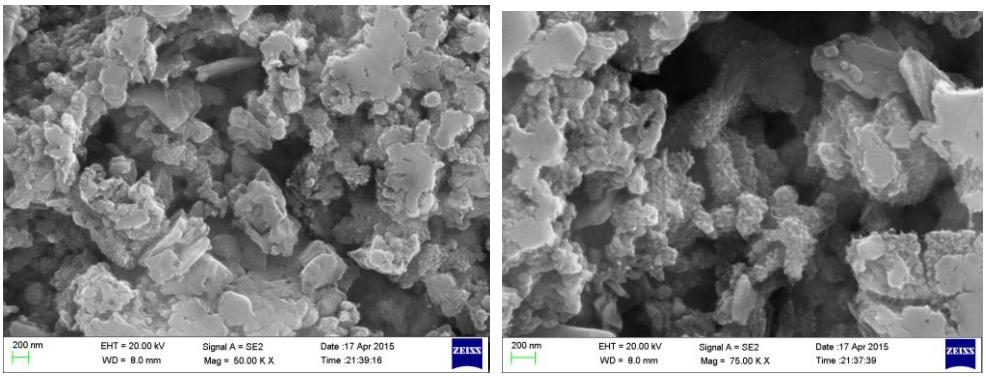


Fig.4 : FESEM micro graphs of MgO

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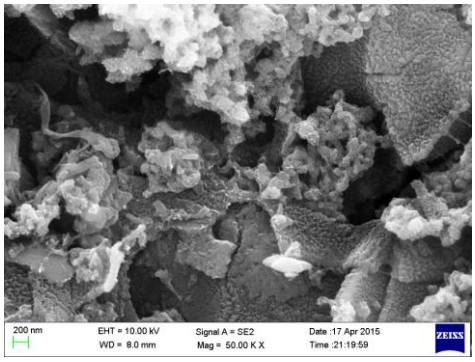


Fig5: FESEM image of PAni

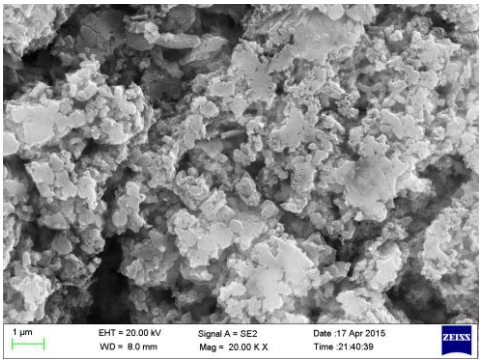


Fig.6.FESEM image of MgO Nano composites

From these images, the average grain size was calculated as 20-30nm. In addition to these micrographs, the SEM images of P Ani as well as its MgO nano composites of different magnifications were also shown in Fig (5,6). It is confirmed that the MgO nano particles were equally distributed in polymer matrix [6].

EDAX ANALYSIS

The EDAX spectroscopy image was shown in Fig (7) It confirm the percentage of Magnesium was (60.29) and oxide nano particles was (39.67). No other peaks of impurities were observed [7].

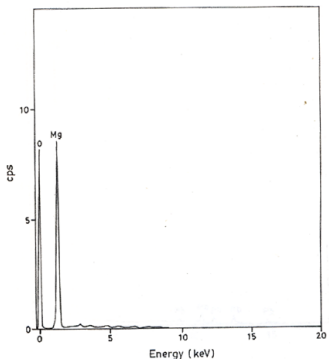


Fig.7 : EDAX of MgO nano composites

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AC ELECTRICAL CONDUCTIVITY MEASUREMENTS

AC frequency has been varied from 100 KHz to 5 MHz to the polyaniline as well as polyaniline / MgO nano composite pellets to conduct two probe method, interfaced to AC 6500 B precesion impedance analyzer to study the conductivity. [8]. The table (2) shows that AC electrical studies of polyaniline in its pure form and PAni / MgO nanocomposites. The capacitance is measured by varying the AC frequency at room temperature to calculate the real dielectric constant

$\epsilon^1 = C_p\, t/\epsilon_0\, A$

Where t is the thickness of the sample (pellet)

A is the surface area

ϵ_0 is the permittivity of free space.

The imaginary part of dielectric constant is also measured by

$\epsilon^{11} = \epsilon^1 \tan\delta$, here $\tan\delta$ is the tangent loss which is equal to $\tan(90 + \theta)\, \Pi/180^0$ where θ is the phase angle.

The real and imaginary electric moduli were calculated by the formulae

$$M^1 = \frac{\epsilon^1}{(\epsilon^1)^2 + (\epsilon^{11})^2} \quad \text{and} \quad M^{11} = \frac{\epsilon^{11}}{(\epsilon^1)^2 + (\epsilon^{11})^2}$$

By measuring the resistance over the specified frequency AC conductivity (σ_{Ac}) was determined using

$$\sigma_{Ac} = \frac{1}{\rho} \quad \text{Here } \rho = \frac{RA}{t}$$

ρ is the resistivity measured in Ω - m. [9-12]

IV.CONCLUSION

As frequency increases, the AC conductivity was found to be decreased but with increase of doping percentage of MgO nano particles it was found to be increased. This feature can be attributed to the hyper electronic polarization and strong polaron delocalization.

PAni / MgO nano composites were synthesized by low temperature solution combustion and chemical oxidative polymerization methods. Their structural and morphological studies were confirmed by PXRD and FESEM respectively.

AC conductivity measurements confirm that the conductivity of MgO nano composite were slightly greater that of Pure PAni due to the localized motion of the ions at lower frequencies and due to segmentation motion dipolar relaxations as well as polarization of charge carriers.

Tables (2) (3) (4) and (5) show the estimated values of the parameters σ (Ac conductivity), ϵ^1 (real dielectric constant), ϵ^{11} (imaginary dielectric constant), Tan δ (dielectric loss), M^1 (real electric modules) and M^{11} (imaginary electric modules) of PAni and Pani/MgO nano composites.

Table: 2

AC electric conductivity (σAc) of pure PAni and PAni/MgO nano composites are shown below

σAc	At 0.1 MHz	At 4.9 MHz
PAni	3.985 x 10^{-2} S/cm	0.5305 x 10^{-2} S/cm
PAni/0.1 MgO	4.186 x 10^{-2} S/cm	0.673 x 10^{-2} S/cm
PAni/0.3 MgO	7.34 x 10^{-2} S/cm	0.847 x 10^{-2} S/cm
PAni/0.5 MgO	9.675 x 10^{-2} S/cm	0.962 x 10^{-2} S/cm

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Table 3
Dielectric loss (tan δ) tangent loss of pure PAni and PAni/MgO nanocomposites are shown below

Tan δ	At 0.1 MHz	At 4.9 MHz
Pure PAni	15.2712	1.5831
PAni/0.1 MgO	16.022	2.402
PAni/0.3 MgO	16.462	2.7428
PAni/0.5 MgO	16.712	2.947

Table :4
The Real electric modulus M^1 variation

M^1	At 0.1 MHz	At 4.9 MHz
PAni	9.52×10^{-8}	2.33×10^{-4}
PAni/0.1 MgO	8.66×10^{-8}	1.441×10^{-4}
PAni/0.3 MgO	8.152×10^{-8}	1.367×10^{-4}
PAni/0.5 MgO	7.60×10^{-8}	1.264×10^{-4}

Table :5
The Imaginary electric modulus M^{11} variation

M^1	At 0.1 MHz	At 4.9 MHz
PAni	14.56×10^{-8}	3.69×10^{-4}
PAni/0.1 MgO	13.89×10^{-8}	3.479×10^{-4}
PAni/0.3 MgO	12.65×10^{-8}	1.172×10^{-4}
PAni/0.5 MgO	12.152×10^{-8}	2.921×10^{-4}

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Thermophysical properties of 1-butyl-3-methylimidazolium bis (trifluoromethylsulfonyl) imide with 2-ethoxyethanol from $T = (298.15$ to $323.15)$ K at atmospheric pressure

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ABSTRACT

Density (ρ) and speed of sound (u) data is determined for various binary compositions of 1-butyl-3-methylimidazolium bis (trifluoromethylsulfonyl) imide ([Bmim][NTf_2]) and 2-ethoxyethanol (2EE) at different temperatures. The experimental data of density and speed of sound is used to calculate the values of excess molar volume, excess isentropic compressibility, excess intermolecular free length and excess speed of sound. The variations in these parameters are analysed to understand the nature of molecular interactions between the chemical species. Redlich-Kister equation is used to estimate the deviations between the calculated and experimental excess values. The values of partial molar volume, excess partial molar volume and excess partial molar volume at infinite dilution have been calculated. The trends of variation of these properties have been interpreted in light of the solute-solvent interactions occurring in the system. Further, the experimental FT-IR analysis is used to study the interactions between the chemical species.

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1. Introduction

Ionic liquids (ILs), also known as green solvents, are a new class of solvents with unlimited applications in various disciplines [1–4]. The remarkable physico-chemical and recyclability properties of ILs, have made them popular "green" media for researchers [5–6]. The accurate selection of cation and anion, in the preparations of IL, enables to use it for a specific application [7]. Hence, ILs are also known as "designer solvents" having a large number of possible combinations of cation and anion. The peculiar properties of ILs like – negligible vapour pressure, more solvating capability, high electrochemical and thermal stability have made them "environmental friendly solvents" alternative to "volatile organic solvents" [8]. Further, the information about the physico-chemical properties of ionic liquid mixtures with other organic compounds is very much useful for various industrial applications.

In continuation of our previous work on ILs and their binary mixtures with organic solvents [9–12], in the present study, we have chosen the IL – 1-butyl-3-methylimidazolium bis (trifluoromethylsulfonyl) imide ([Bmim][NTf_2]) and 2-ethoxyethanol (2EE) binary mixture. The relatively low viscous nature of imidazolium based ILs can be used for easy handling and adequate performance in extractive applications. Hence, these ILs are more environment friendly than other ILs [13]. [Bmim][NTf_2] is a preferred ionic liquid as an electrolyte for capacitive energy storage and also in the process of nuclear fuel recycling [14]. The amphiphilic organic solvents like alkoxyethanols can be utilized in several chemical applications. The liquid mixtures having alkoxyethanols are important due to the existence of –O– and –OH groups in the same compound. 2EE is used as a solvent in paints, surface coatings, inks and dyes.

The thermodynamic behaviour of solutions are very much useful to obtain information on the intermolecular interactions and geometrical effects in the mixture systems. Furthermore, the knowledge of the thermodynamic properties of binary mixtures is crucial for the proper design of industrial processes. Thus, the accurate knowledge of thermodynamic properties of [Bmim][NTf_2] + 2EE binary mixture can be of great importance for their possible use in batteries, separation technology, catalysis, synthesis of nano objects etc. [15].

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Table 1
List of chemicals with details of provenance, CAS number, mass fraction purity and water content.

Chemical	Provenance	CAS number	Initial mass fraction purity (by supplier)	Purification method	Final mass fraction purity	Water content (ppm)	Analysis method
1-butyl-3-methylimidazolium bis (trifluoromethylsulfonyl) imide	Io-Li-Tec, Germany	174,899–83-3	0.995	Used as received	–	40	NA
2-ethoxyethanol	Sigma Aldrich, USA	110–80-5	0.998	Fractional distillation	0.999	100	Gas Liquid Chromatography

2. Experimental section

2.1. Materials

[Bmim][NTf_2] is obtained from Io-Li-Tec, Germany and 2EE is obtained from Sigma Aldrich, USA. 2EE is further purified using distillation process and [Bmim][NTf_2] is used without further purification. The values of water content of [Bmim][NTf_2] and 2EE are measured with the help of Karl Fischer titrator (Metrohm, 890 Titrando). The detection limits of this instrument are from 10 ppm to 100%. The chemicals are dried for 72 h, prior to the measurements, at a pressure of 0.1 MPa in vacuum and at moderate temperature (starting from room temperature and increasing slowly up to 333 K within a time period of 6 h). The details of mass fraction and purification methods of the chemicals are presented in Table 1.

2.2. Apparatus and procedure

After preparing the binary mixtures by mass, all the samples are kept in glass vials (8 mL and amber color) with PFE septa screw caps. In order to avoid the atmospheric moisture absorption, the glass vials are closed with parafilm. The Sartorius balance (CPA-225D, Germany) with a readability of 1×10^{-7} kg is used for mass measurements. The estimated uncertainty in mole fraction is $\pm 2 \times 10^{-4}$.

Density (ρ) and speed of sound (u) values of pure and mixture samples are determined with Anton Parr – DSA 5000 M. The instrument works with the oscillating U-tube principle and propagation time technique for the measurement of ρ and u (at 3 MHz frequency) respectively. The instrument can simultaneously measure ρ (0 to 3×10^3 kg·m^{-3}) and u (1000 to 2000) m·s^{-1} in 273.15 K to 343.15 K range, under varying pressure (0 to 0.3 MPa). As described in the manual, double distilled degassed water (supplied by the manufacturer with density 997.075 kg·m^{-3} (at 298.15 K and 0.1 MPa)) is used, at equal intervals of time, to standardise the density meter. The repeatabilities of $\rho$and u are respectively 1×10^{-3} kg·m^{-3} and 1×10^{-2} m·s^{-1}. The vibrating tube is cleaned, after each measurement, with distilled water and anhydrous ethanol. Each measurement is performed successively three times and the average value is reported. The uncertainty in the measurement of temperature is ± 0.01 K and the estimated uncertainties of ρ and u are respectively ± 0.5 kg·m^{-3} and ± 0.5 m·s^{-1}. The heat

Table 2
Comparison of density (ρ) and speed of sound (u) of pure compounds with literature at temperatures from $T = (298.15$ to $323.15)$ K at pressure $P = 0.1$ MPa.

Compound	T/K	ρ/kg. m^{-3}		u/m. s^{-1}		C_p/J K^{-1} mol^{-1}	
		Experimental	Literature	Experimental	Literature	Literature	Literature
1-butyl-3-methylimidazolium bis (trifluoromethylsulfonyl)imide	298.15	1437.12	1436.8[16] 1436.50[17] 1437.7[18]	1227.8	1226.7[19] 1227.52[20]	567.22	567.33[22]
	303.15	1432.51	1432 [16] 1431.69[17] 1432.9[18]	1216.7	1215.6[19] 1217.51[21]	569.85	569.74[22]
	308.15	1427.43	1427.2[16] 1426.90[17] 1428.0 [18]	1205.8	1204.6[19]	572.64	572.82[22]
	313.15	1422.86	1422.5[16] 1422.15[17] 1423.2[18]	1194.9	1193.7[19] 1194.50[21]	575.47	575.56[22]
	318.15	1417.91	1417.8[16] 1417.41[17] 1418.5[18]	1184.2	1183.99[20]	578.38	578.49[22]
	323.15	1413.58	1413.1[16] 1412.70[17] 1413.7[18]	1173.6	1172.58[21]	581.52	581.68[22]
2-ethoxyethanol	298.15	925.11	925.99[23] 924.97[24] 925.20[25] 925.60[26]	1302.8	1303.06[23] 1303.96[26]	209.22	209.82[26]
	303.15	920.95	921.45[23] 921.17[25]	1285.1	1285.42[23]	210.97	211.87[26]
	308.15	916.78	916.86[23] 917.35[24] 917.96[25] 916.52[26]	1267.3	1267.68[23] 1269.53[26]	213.71	214.01[26]
	313.15	912.62	912.24[23] 913.70[24] 911.59[25]	1249.6	1250.01[23]	215.67	216.10[26]
	318.15	908.46	907.58[23] 909.94[24] 907.31[26]	1232.0	1232.39[23] 1232.11[26]	217.62	218.20[26]
	323.15	904.30	906.02[24]	1214.3		219.43	220.33[26]

Standard uncertainties u are u (T) = ± 0.01 K, u (ρ) = ± 0.5 kg m^{-3}, u (u) = ± 0.5 m s^{-1}, u (C_p) = $(0.003 \cdot C_p)$ J K^{-1} mol^{-1}, u (P) = ± 0.002 MPa.

Table 3
Density (ρ), speed of sound (u), molar isentropic compressibility ($\kappa_{s,m}$) and inter molecular free length (L_f) with mole fraction (x_1) of 1-butyl-3-methylimidazolium bis (trifluoromethylsulfonyl) imide in the binary mixture of 1-butyl-3-methylimidazolium bis (trifluoromethylsulfonyl) imide +2-ethoxyethanol from $T = (298.15$ to $323.15)$ K at pressure $P = 0.1$ MPa.

x_1	ρ/kg. m^{-3}	u/m. sec^{-1}	$\kappa_{s,m}\cdot10^{15}$/m^3 Pa^{-1} mol^{-1}	$L_f\cdot10^{11}$/m
$T = 298.15$ K				
0.0000	925.11	1302.8	62.04	5.19
0.1036	1059.59	1279.9	68.50	4.97
0.1905	1141.91	1261.2	74.28	4.85
0.2965	1215.07	1247.8	82.06	4.74
0.3882	1263.69	1240.5	88.85	4.67
0.4890	1305.68	1234.5	96.47	4.61
0.5889	1339.99	1231.4	104.11	4.56
0.7018	1370.94	1230.7	112.86	4.51
0.7928	1393.19	1229.9	119.67	4.48
0.9071	1418.28	1228.3	128.06	4.45
1.0000	1437.12	1227.8	134.68	4.42
$T = 303.15$ K				
0.0000	920.95	1285.1	64.34	5.32
0.1036	1055.40	1264.6	70.82	5.09
0.1905	1137.66	1246.6	76.73	4.96
0.2965	1210.69	1234.2	84.51	4.85
0.3882	1259.20	1227.5	91.43	4.77
0.4890	1301.20	1223.9	99.16	4.71
0.5889	1335.05	1219.6	106.92	4.65
0.7018	1366.05	1219.0	115.83	4.61
0.7928	1388.29	1218.4	122.74	4.57
0.9071	1413.38	1217.3	131.34	4.54
1.0000	1432.51	1216.7	138.06	4.51
$T = 308.15$ K				
0.0000	916.78	1267.3	66.76	5.46
0.1036	1051.21	1248.9	73.25	5.21
0.1905	1133.41	1232.1	79.18	5.08
0.2965	1206.30	1220.6	87.09	4.95
0.3882	1254.70	1214.5	94.06	4.87
0.4890	1296.71	1210.4	101.92	4.80
0.5889	1330.10	1207.6	109.83	4.75
0.7018	1361.16	1207.2	118.89	4.70
0.7928	1383.39	1206.9	125.95	4.67
0.9071	1408.48	1206.1	134.72	4.63
1.0000	1427.43	1205.8	141.52	4.60
T/K = 313.15				
0.0000	912.62	1249.6	69.29	5.60
0.1036	1047.02	1230.1	75.75	5.34
0.1905	1129.16	1217.7	81.73	5.19
0.2965	1201.91	1207.1	89.75	5.07
0.3882	1250.20	1201.6	96.82	4.98
0.4890	1292.23	1198.0	104.79	4.91
0.5889	1325.16	1197.7	112.82	4.85
0.7018	1356.27	1196.5	121.96	4.80
0.7928	1378.49	1196.0	129.20	4.76
0.9071	1403.57	1195.0	138.19	4.72
1.0000	1422.86	1194.9	145.07	4.69
T/K = 318.15				
0.0000	908.46	1232.0	71.95	5.74
0.1036	1042.83	1217.4	78.36	5.47
0.1905	1124.91	1203.3	84.39	5.31
0.2965	1197.53	1193.6	92.51	5.18
0.3882	1245.71	1188.9	99.61	5.09
0.4890	1287.75	1187.7	107.60	5.01
0.5889	1320.21	1186.9	115.83	4.95
0.7018	1351.38	1185.9	125.08	4.89
0.7928	1373.58	1185.6	132.48	4.85
0.9071	1398.67	1185.0	141.60	4.81
1.0000	1417.91	1184.2	148.69	4.78
T/K = 323.15				
0.0000	904.30	1214.3	74.74	5.89
0.1036	1038.64	1201.5	81.08	5.60
0.1905	1120.65	1189.0	87.21	5.44
0.2965	1193.14	1180.3	95.30	5.29
0.3882	1241.21	1176.2	102.38	5.19
0.4890	1283.27	1175.5	110.45	5.11
0.5889	1315.27	1175.0	118.95	5.05
0.7018	1346.48	1174.9	128.39	4.99
0.7928	1368.68	1174.3	135.91	4.95
0.9071	1393.76	1174.0	145.20	4.91
1.0000	1413.58	1173.6	152.41	4.87

Standard uncertainties u are u (T) = ±0.01 K, u (x_1) = $\pm2\times10^{-4}$, u (ρ) = ±0.5 kg m^{-3}, u (u) = ±0.5 ms^{-1}, u (V_m) = $\pm0.005\times10^{-6}$ m^3.mol^{-1}, u ($\kappa_{s,m}$) = $\pm0.05\times10^{-15}$ m^3 Pa^{-1} mol^{-1}, u (L_f) = $\pm0.01\times10^{-11}$ m, u (P) = ±0.002 MPa.

capacity (C_p) values of [Bmim][NTf$_2$] and 2EE are determined with micro DSC 7 evo (SETARAM instrumentation, France) differential scanning calorimeter. It has a double – stage temperature controller which works in the temperature range (228.15 to 393.15) K, with a heating rate of (0.001 to 2) K·min^{-1}. A "mixing batch cell" made up of Hastelloy C276 is used with a sample capacity of (10–50) μL. The instrument is calibrated by determining the heat of fusion of Naphthalene (147.78 J·g^{-1}) using the joule effect method. The comparison of ρ, u and C_p values with the NIST ThermoLit data at temperatures $T = (298.15$ to $323.15)$ K is shown in Table 2 [16–26]. FT-IR spectrometer (Agilent Cary 630) is used to record the spectra of [Bmim][NTf$_2$], 2EE and their mixtures for different mole fractions in the region 500–3500 cm^{-1}.

3. Results and discussion

Density and speed of sound values for different mole fractions (x_1) of [Bmim][NTf$_2$] at the studied temperatures are shown in Table 3. It is found that, for all studied temperatures, the values of density are increasing with x_1. Further, there is a significant decrement in density with increasing temperature. The values of u are found to be decreasing with increasing x_1 and temperature. The significant variations of ρ and u with respect to temperature and mole fraction demonstrate that the physical and chemical properties of IL can be tuned in a desired way by changing temperature or by adding 2EE.

Excess molar volume (V_m^E) is given by the equation,

$$V_m^E = \left(\frac{x_1M_1 + x_2M_2}{\rho}\right) - \left(\frac{x_1M_1}{\rho_1} + \frac{x_2M_2}{\rho_2}\right) \quad (1)$$

where ρ_1, ρ_2 and ρ are the densities of [Bmim][NTf$_2$], 2EE and binary mixture respectively. x_1 and x_2 are respectively the mole fractions of

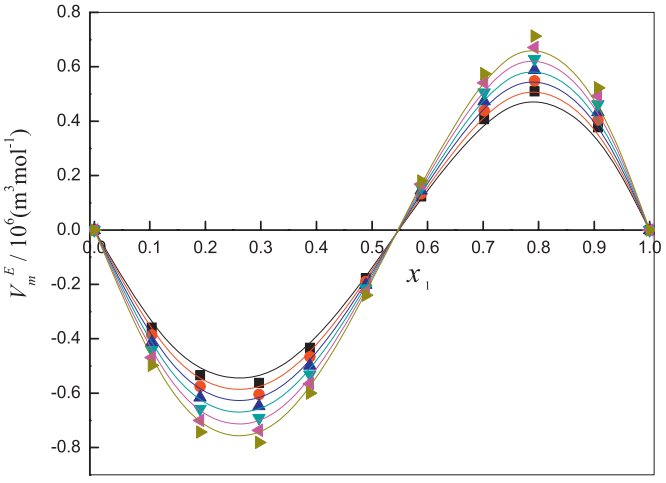


Fig. 1. Excess molar volume V_m^E vs mole fraction of [Bmim][NTf$_2$] (x_1) in the binary mixture of [Bmim][NTf$_2$] + 2EE at 298.15 K (■), 303.15 K (●), 308.15 K (▲), 313.15 K (▼), 318.15 K (◀) and 323.15 K (▶). The symbols represent experimental and the solid curves represent the values calculated from Redlich-Kister equation (Eq. 9).

[Bmim][NTf_2] and 2EE. $M_1$and M_2 are the molar weights of [Bmim][NTf_2] and 2EE respectively.

The graphical representation of V_m^E (Fig. 1), for [Bmim][NTf_2] + 2EE, shows an inversion in the sign from negative to positive at all investigated temperatures. It is also observed that the values of V_m^E in the binary mixture are negative in 2EE rich region and positive in [Bmim][NTf_2] rich region. This trend shows that as $x_1$is increasing the strength of molecular interactions in the mixture are decreasing. The negative V_m^E values designate that more efficient packing is taking place when [Bmim][NTf_2] is mixed with 2EE [27]. Further, these negative values designate that the molecules of 2EE give more packed arrangement in [Bmim][NTf_2] relative to their pure state. This phenomenon of close packing may be due to (i) smaller molar volume of 2EE (97.415×10^{-6} $m^3.mol^{-1}$ at $T = 298.15$ K) compared with [Bmim][NTf_2] (291.813×10^{-6} $m^3.mol^{-1}$ at $T = 298.15$ K), which allows the molecule of 2EE to fit into the interstices of [Bmim][NTf_2] in the binary mixture, and (ii) ion - dipole interactions between [Bmim][NTf_2] and 2EE. While, the positive values of V_m^E indicate the decreasing packing arrangement with increasing IL concentration [28]. Further, as the temperature is increasing, the absolute minimum value of V_m^E (at $x_1 = 0.2965$) is decreasing and the absolute maximum value of V_m^E (at $x_1 = 0.7928$) is increasing.

Isentropic compressibility (κ_s) is calculated using the following equation,

$$\kappa_s = \frac{1}{u^2\rho} \tag{2}$$

Molar isentropic compressibility ($\kappa_{s,m}$) can be calculated from the equation,

$$\kappa_{s,m} = V_m\kappa_s \tag{3}$$

where $V_m$is molar volume.

The existence of interactions between the compounds of a binary mixture shows a non-linear variation of $\kappa_s$with respect to the mole fraction [29,30]. In the present work, κ_s values are observed to be varying non-linearly with x_1 (Fig. 2) and it is also observed that as the temperature is increasing the values of κ_s are increasing. This phenomenon designates the complex formation in the mixture. Further, at all studied temperatures, as x_1 is increasing the values of $\kappa_{s,m}$ are found to be increasing (Table 3). It indicates that the interactions in the mixture are leading to complex formation.

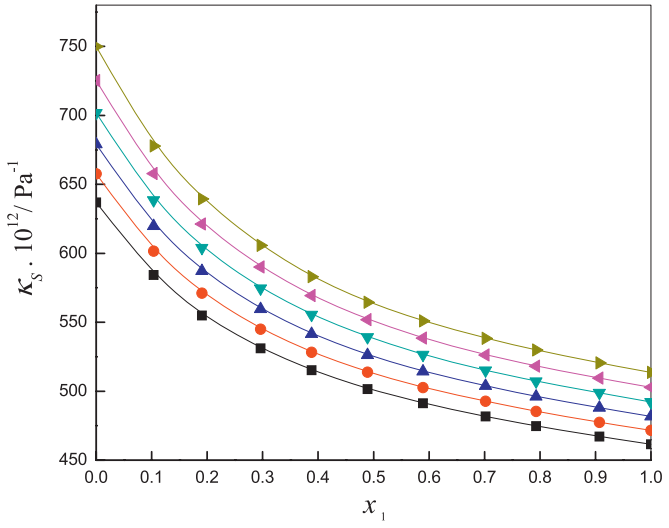


Fig. 2. Isentropic compressibility κ_s vs mole fraction of [Bmim][NTf_2] (x_1) in the binary mixture of [Bmim][NTf_2] + 2EE at 298.15 K (■), 303.15 K (●), 308.15 K (▲), 313.15 K (▼), 318.15 K (◀) and 323.15 K (▶).

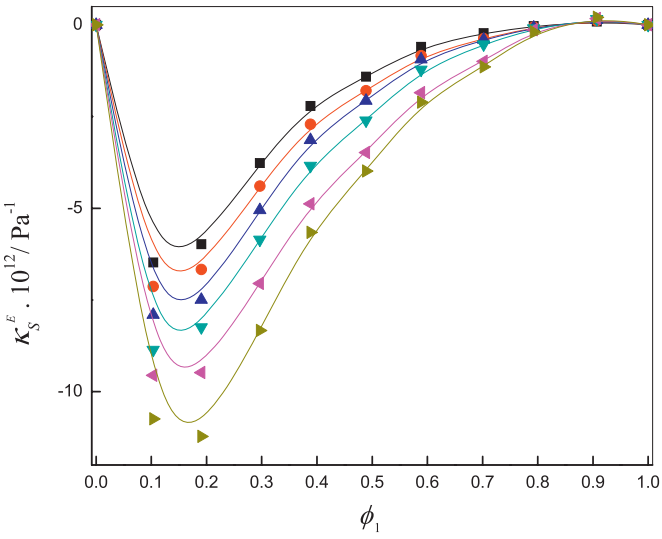


Fig. 3. Excess isentropic compressibility κ_s^E vs volume fraction of [Bmim][NTf_2] (ϕ_1) in the binary mixture of [Bmim][NTf_2] + 2EE at 298.15 K (■), 303.15 K (●), 308.15 K (▲), 313.15 K (▼), 318.15 K (◀) and 323.15 K (▶). The symbols represent experimental and the solid curves represent the values calculated from Redlich-Kister equation (Eq. 9).

Excess isentropic compressibility (κ_s^E) is calculated from the following relations [31–34],

$$\kappa_s^E = \kappa_s - \kappa_s^{id} = \kappa_s - \sum_{i=1}^{2}\varphi_i\left[\kappa_{s,i} + \frac{TV_i(\alpha_i^2)}{C_{p,i}}\right] - \left\{\frac{T\left(\sum_{i=1}^{2}x_iV_i\right)\left(\sum_{i=1}^{2}\varphi_i\alpha_i\right)^2}{\sum_{i=1}^{2}x_iC_{p,i}}\right\} \tag{4}$$

where φ_i, $\kappa_{s,i}$, V_i, α_i,$C_{p,i}$, and x_i are the volume fraction, isentropic compressibility, molar volume, coefficient of isobaric thermal expansion, heat capacity and mole fraction of pure compounds respectively.

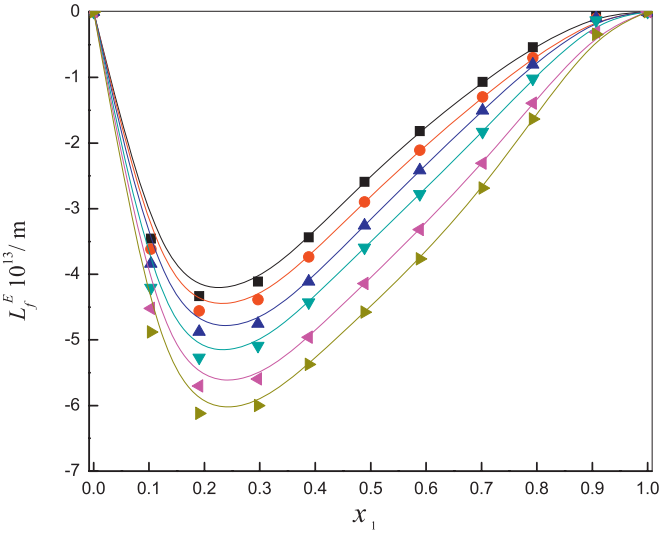


Fig. 4. Excess intermolecular free length L_f^E vs mole fraction of [Bmim][NTf_2] (x_1) in the binary mixture of [Bmim][NTf_2] + 2EE at 298.15 K (■), 303.15 K (●), 308.15 K (▲), 313.15 K (▼), 318.15 K (◀) and 323.15 K (▶). The symbols represent experimental and the solid curves represent the values calculated from Redlich-Kister equation (Eq. 9).

The coefficient of isobaric thermal expansion is calculated from the relation,

$$\alpha = -\frac{1}{\rho}\left(\frac{\partial \rho}{\partial T}\right)_P \tag{5}$$

The strong interactions between the chemical species of a binary mixture give negative κ_s^E values. In addition, the negative κ_s^E values also specify that the solvent molecules around the solute in a binary mixture are less compressible compared to the solvent molecules in the bulk solution. In this work, for all concentrations and at all studied temperatures, the κ_s^E values are found to be negative (Fig. 3). The increment in the concentration of IL decreases the negative values of κ_s^E. This trend can be attributed to the decrement in the attraction between 2EE and IL molecules at higher concentrations of IL.

Intermolecular free length (L_f) can be determined from the following relation [35],

$$L_f = K_j\sqrt{\kappa_s} \tag{6}$$

where $K_j = (93.875 + 0.375\ T) \times 10^{-8}$. It is a temperature dependent Jacobson's constant.

Intermolecular free length values of [Bmim][NTf_2] + 2EE, investigated at various temperatures, are shown in Table 3. It is found that, at all temperatures, the L_f values of 2EE are greater than the L_f values of [Bmim][NTf_2]. But, in the binary mixture, as x_1 is increasing the L_f values of 2EE are decreasing. This behaviour shows the existence of intermolecular interactions between the compounds of the mixture. Further, as the temperature is increasing L_f values are also increasing. As a result of the increment in the value of L_f, the distance between [Bmim][NTf_2] and 2EE molecules increases and thereby the speed of sound decreases.

Excess intermolecular free length ($L_f{}^E$) can be determined using the following relation [36],

$$L_f^E = L_f - K_j\sqrt{\kappa_s^{id}} \tag{7}$$

The nature of molecular interactions can be predicted based on the sign and magnitude of $L_f{}^E$. The positive $L_f{}^E$ values indicate the dispersion forces or weak dipole-dipole interactions and the negative $L_f{}^E$ values indicate the formation complexes due to charge transfer or strong dipole-dipole interactions [11]. In this work, negative $L_f{}^E$ values (Fig. 4) designate complex formation in the mixture and the higher negative $L_f{}^E$ values designate more tightly packed structure in the binary mixture.

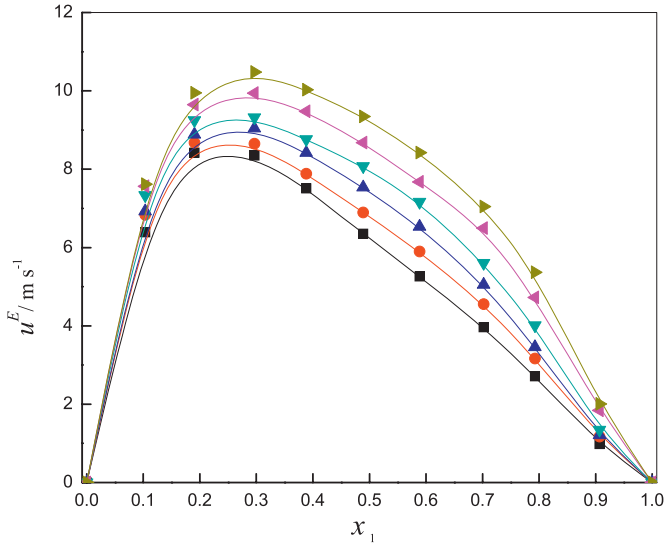


Fig. 5. Excess speed of sound u^E vs mole fraction of [Bmim][NTf_2] (x_1) in the binary mixture of [Bmim][NTf_2] + 2EE at 298.15 K (■), 303.15 K (●), 308.15 K (▲), 313.15 K (▼), 318.15 K (◀) and 323.15 K (▶). The symbols represent experimental and the solid curves represent the values calculated from Redlich-Kister equation (Eq. 9).

Table 4
Coefficients (A_0, A_1, A_2 & A_3) of Redlich-Kister equation (Eq. (12)) and corresponding standard deviations (σ) for 1-butyl-3-methylimidazolium bis (trifluoromethylsulfonyl) imide + 2-ethoxyethanol from T = (298.15 to 323.15) K.

Functions	A_0	A_1	A_2	A_3	σ
T = 298.15 K					
$V_m^E \cdot 10^6$/m^3 mol^{-1}	−0.580	−5.920	1.316	1.166	0.0442
$\kappa_s^E \cdot 10^{12}$/Pa^{-1}	−21.716	−36.502	−36.131	−28.153	0.2867
$L_f{}^E \cdot 10^{13}$/m	−10.007	−16.232	−14.364	−10.649	0.1226
u^E/m.s^{-1}	24.918	22.129	28.954	26.698	0.3001
T = 303.15 K					
$V_m^E \cdot 10^6$/m^3 mol^{-1}	−0.621	−6.387	1.402	1.309	0.0378
$\kappa_s^E \cdot 10^{12}$/Pa^{-1}	−24.446	−37.065	−36.524	−30.471	0.2264
$L_f{}^E \cdot 10^{13}$/m	−11.228	−16.348	−14.322	−11.521	0.0907
u^E/m.s^{-1}	27.148	19.627	26.948	27.944	0.2851
T = 308.15 K					
$V_m^E \cdot 10^6$/m^3 mol^{-1}	−0.656	−6.858	1.481	1.423	0.0354
$\kappa_s^E \cdot 10^{12}$/Pa^{-1}	−27.623	−39.097	−36.485	−33.479	0.2394
$L_f{}^E \cdot 10^{13}$/m	−12.644	−17.109	−14.011	−12.695	0.0958
u^E/m.s^{-1}	29.725	18.759	24.141	29.732	0.2503
T = 313.15 K					
$V_m^E \cdot 10^6$/m^3 mol^{-1}	−0.698	−7.323	1.576	1.522	0.0382
$\kappa_s^E \cdot 10^{12}$/Pa^{-1}	−30.691	−38.063	−40.283	−44.073	0.1825
$L_f{}^E \cdot 10^{13}$/m	−14.008	−16.455	−15.374	−17.194	0.0666
u^E/m.s^{-1}	31.975	14.370	25.474	39.304	0.1846
T = 318.15 K					
$V_m^E \cdot 10^6$/m^3 mol^{-1}	−0.736	−7.821	1.675	1.665	0.0449
$\kappa_s^E \cdot 10^{12}$/Pa^{-1}	−35.628	−38.312	−43.096	−48.170	0.3528
$L_f{}^E \cdot 10^{13}$/m	−16.206	−16.379	−16.296	−18.557	0.1383
u^E/m.s^{-1}	36.024	11.408	25.691	40.630	0.3087
T = 323.15 K					
$V_m^E \cdot 10^6$/m^3 mol^{-1}	−0.779	−8.306	1.778	1.783	0.0546
$\kappa_s^E \cdot 10^{12}$/Pa^{-1}	−42.275	−44.323	−39.632	−44.814	0.5922
$L_f{}^E \cdot 10^{13}$/m	−17.968	−15.867	−16.999	−22.675	0.1765
u^E/m.s^{-1}	41.471	14.308	19.035	34.525	0.5399

Excess speed of sound (u^E) is estimated from the following eq. [37],

$$u^E = u - u^{id} = u - \left(\rho^{id}\kappa_s^{id}\right)^{-1/2} \tag{8}$$

(where) $\rho^{id} = \sum_{i=1}^{2} \phi_i \rho_i$

The variation of u^E with mole fraction and temperature is shown in Fig. 5. u^E plays a key role in describing the structural rearrangements taking place in a liquid mixture. Generally, in a mixture, strong molecular interactions give positive u^E values and weak molecular interactions give negative u^E values [38]. In the present work, positive u^E values are observed for all mole fractions and at all investigated temperatures, representing the existence of strong ion-dipole interactions in the mixture.

The excess values (V_m^E, κ_s^E, $L_f{}^E$ and u^E) are fitted by the following Redlich-Kister eq. [39],

$$Y^E = x_1 x_2 \sum_{i=0}^{n} A_i \left(1 - 2x^i\right) \tag{9}$$

where x_1 and x_2 are respectively the mole fractions of [Bmim][NTf_2] and 2EE. A_i is adjustable coefficient. The values of A_i are determined from multi-parametric regression analysis and F-test is used to optimize the number (n) of A_i coefficients.

Table 5
Partial molar volumes of 1-butyl-3-methylimidazolium bis (trifluoromethylsulfonyl) imide ($\overline{V}^{o}_{m,1}$) and 2-ethoxyethanol ($\overline{V}^{o}_{m,2}$) with mole fraction (x_1) of 1-butyl-3-methylimidazolium bis (trifluoromethylsulfonyl) imide in the binary mixture of 1-butyl-3-methylimidazolium bis (trifluoromethylsulfonyl) imide +2-ethoxyethanol from $T =$ (293.15 to 323.15) K at Pressure $P = 0.1$ MPa.

x_1	$\overline{V}^{o}_{m,1}\cdot10^{6}$/m^3 mol^{-1}	$\overline{V}^{o}_{m,2}\cdot10^{6}$/m^3 mol^{-1}
$T = 298.15$ K		
0.0000	287.794	97.415
0.1036	288.979	97.342
0.1905	290.280	97.116
0.2965	291.733	96.651
0.3882	292.628	96.190
0.4890	293.124	95.814
0.5889	293.148	95.802
0.7018	292.786	96.491
0.7928	292.372	97.735
0.9071	291.941	100.226
1.0000	291.813	102.905
$T = 303.15$ K		
0.0000	288.484	97.855
0.1036	289.727	97.778
0.1905	291.124	97.535
0.2965	292.694	97.032
0.3882	293.662	96.534
0.4890	294.197	96.128
0.5889	294.219	96.119
0.7018	293.826	96.869
0.7928	293.379	98.212
0.9071	292.917	100.879
1.0000	292.780	103.714
$T = 308.15$ K		
0.0000	289.143	98.301
0.1036	290.479	98.218
0.1905	291.980	97.956
0.2965	293.667	97.416
0.3882	294.705	96.881
0.4890	295.276	96.448
0.5889	295.297	96.442
0.7018	294.872	97.252
0.7928	294.392	98.695
0.9071	293.898	101.547
1.0000	293.753	104.561
$T = 313.15$ K		
0.0000	289.811	98.749
0.1036	291.239	98.660
0.1905	292.842	98.381
0.2965	294.644	97.804
0.3882	295.752	97.233
0.4890	296.361	96.772
0.5889	296.383	96.766
0.7018	295.928	97.632
0.7928	295.415	99.173
0.9071	294.888	102.215
1.0000	294.733	105.427
$T = 318.15$ K		
0.0000	290.502	99.201
0.1036	291.995	99.108
0.1905	293.700	98.811
0.2965	295.624	98.194
0.3882	296.809	97.584
0.4890	297.459	97.091
0.5889	297.480	97.088
0.7018	296.992	98.018
0.7928	296.443	99.666
0.9071	295.882	102.903
1.0000	295.718	106.296
$T = 323.15$ K		
0.0000	291.188	99.657
0.1036	292.761	99.559
0.1905	294.569	99.244
0.2965	296.612	98.589
0.3882	297.871	97.941
0.4890	298.562	97.417
0.5889	298.583	97.415
0.7018	298.063	98.404
0.7928	297.481	100.155
0.9071	296.886	103.588
1.0000	296.712	107.179

Standard uncertainties u are u (T) = ±0.01 K, u (x_1) = $\pm2\times10^{-4}$, u ($\overline{V}^{o}_{m,1}$) = $\pm0.005\times10^{-6}$ m^3.mol^{-1}, u ($\overline{V}^{o}_{m,2}$) = $\pm0.005\times10^{-6}$ m^3.mol^{-1}, u (P) = ±0.002 MPa.

The standard deviation (σ) is estimated from the following equation,

$$\sigma = \left[\frac{\sum\left(Y^{E}_{\exp}-Y^{E}_{cal}\right)^{2}}{N-n}\right]^{\frac{1}{2}} \quad (10)$$

where N and n are the number of experimental points and the number of coefficients respectively.

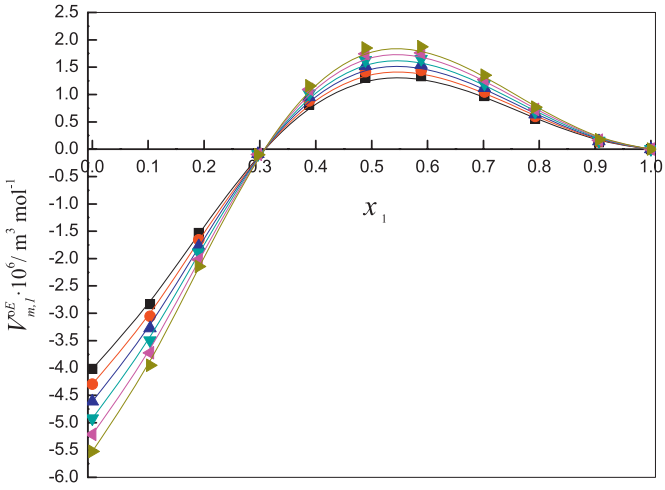


Fig. 6. Excess partial molar volume $\overline{V}^{oE}_{m,1}$ of [Bmim][NTf$_2$] vs mole fraction of [Bmim][NTf$_2$] (x_1) in the binary mixture of [Bmim][NTf$_2$] + 2EE at 298.15 K (■), 303.15 K (●), 308.15 K (▲), 313.15 K (▼), 318.15 K (◀) and 323.15 K (▶).

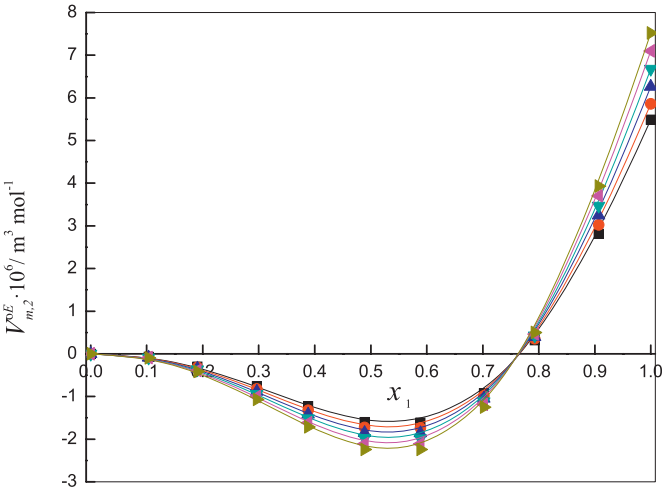


Fig. 7. Excess partial molar volume $\overline{V}^{oE}_{m,2}$ of 2EE vs mole fraction of [Bmim][NTf$_2$] (x_1) in the binary mixture of [Bmim][NTf$_2$] + 2EE at 298.15 K (■), 303.15 K (●), 308.15 K (▲), 313.15 K (▼), 318.15 K (◀) and 323.15 K (▶).

Table 6
Molar volumes of 1-butyl-3-methylimidazolium bis (trifluoromethylsulfonyl) imide ($V^*_{m,1}$), 2-ethoxyethanol ($V^*_{m,2}$), partial molar volumes at infinite dilution for 1-butyl-3-methylimidazolium bis (trifluoromethylsulfonyl) imide ($\overline{V}^{o,\infty}_{m,1}$), 2-ethoxyethanol ($\overline{V}^{o,\infty}_{m,2}$) and excess partial molar volumes at infinite dilution for 1-butyl-3-methylimidazolium bis (trifluoromethylsulfonyl) imide ($\overline{V}^{oE,\infty}_{m,1}$), 2-ethoxyethanol ($\overline{V}^{oE,\infty}_{m,2}$) from $T = (293.15$ to $323.15)$ K at pressure $P = 0.1$ MPa.

T/K	$V^*_{m,1}\cdot10^6$/m^3 mol^{-1}	$\overline{V}^{o,\infty}_{m,1}\cdot10^6$/m^3 mol^{-1}	$\overline{V}^{oE,\infty}_{m,1}\cdot10^6$/m^3 mol^{-1}	$V^*_{m,2}\cdot10^6$/m^3 mol^{-1}	$\overline{V}^{o,\infty}_{m,2}\cdot10^6$/m^3 mol^{-1}	$\overline{V}^{oE,\infty}_{m,2}\cdot10^6$/m^3 mol^{-1}
298.15	291.813	287.794	−4.019	97.415	102.905	5.490
303.15	292.780	288.484	−4.296	97.855	103.714	5.859
308.15	293.753	289.143	−4.610	98.301	104.561	6.260
313.15	294.733	289.811	−4.922	98.749	105.427	6.678
318.15	295.718	290.502	−5.216	99.201	106.296	7.095
323.15	296.712	291.188	−5.524	99.657	107.179	7.522

Standard uncertainties u are u $(T) = \pm0.01$ K, u $(x_1) = \pm2\times10^{-4}$, u $(V^*_{m,1}, V^*_{m,2}) = \pm0.005\times10^{-6}$ m^3.mol^{-1}, u $(\overline{V}^{o,\infty}_{m,1}, \overline{V}^{o,\infty}_{m,2}) = \pm0.005\times10^{-6}$ m^3.mol^{-1}, u $(\overline{V}^{oE,\infty}_{m,1}, \overline{V}^{oE,\infty}_{m,2}) = \pm0.005\times10^{-6}$ m^3.mol^{-1}, u $(P) = \pm0.002$ MPa.

Table 4 depicts the values of A_i and standard deviation obtained from R-K equation. The standard deviation values are showing satisfactory results for the experimental values.

The partial parameters (partial molar volume ($\overline{V}^o_m$), excess partial molar volume ($\overline{V}^{oE}_m$) and excess partial molar volume at infinite dilution ($\overline{V}^{oE,\infty}_m$)) are used describe the nature of molecular interactions taking place in a mixture. The theory related to these parameters was discussed in our previous study [40].

Table 5 shows $\overline{V}^o_{m,1}$ and $\overline{V}^o_{m,2}$ values for various mole fractions of [Bmim][NTf$_2$] for all studied temperatures. It is observed that, for both [Bmim][NTf$_2$] and 2EE, the $\overline{V}^o_{m,1}$ and $\overline{V}^o_{m,2}$ values in the mixture are different from their respective individual values in the pure state. The lower values indicate the contraction of volume and the higher values indicate the expansion of volume, upon mixing of [Bmim][NTf$_2$] with 2EE. Figs. 6 and 7 respectively represent the variations of $\overline{V}^{oE}_{m,1}$ and $\overline{V}^{oE}_{m,2}$ in the binary mixture, with concentration and temperature. Generally, in a binary mixture, solute–solvent interactions give negative $\overline{V}^{oE}_{m,1}$ and $\overline{V}^{oE}_{m,2}$ values and solute–solute or solvent–solvent interactions give positive $\overline{V}^{oE}_{m,1}$ and $\overline{V}^{oE}_{m,2}$ values [41]. In the present study, negative $\overline{V}^{oE}_{m,1}$ and $\overline{V}^{oE}_{m,2}$ values are observed for the lower concentrations of [Bmim][NTf$_2$] and positive $\overline{V}^{oE}_{m,1}$ and $\overline{V}^{oE}_{m,2}$ values are observed for the higher concentrations of [Bmim][NTf$_2$]. The negative $\overline{V}^{oE}_{m,1}$ and $\overline{V}^{oE}_{m,2}$ values designate that [Bmim][NTf$_2$] – 2EE interactions are stronger than [Bmim][NTf$_2$] – [Bmim][NTf$_2$] or 2EE – 2EE interactions and the positive $\overline{V}^{oE}_{m,1}$and $\overline{V}^{oE}_{m,2}$ values designate that [Bmim][NTf$_2$] – 2EE interactions are weaker than [Bmim][NTf$_2$] – [Bmim][NTf$_2$] or 2EE – 2EE interactions.

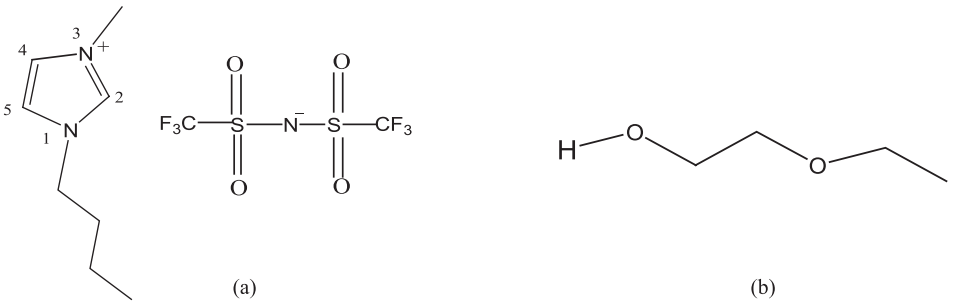
Table 6 shows the values of $V^*_{m,1}$, $\overline{V}^{o,\infty}_{m,1}$, $\overline{V}^{oE,\infty}_{m,1}$, $V^*_{m,2}$, $\overline{V}^{o,\infty}_{m,2}$ and $\overline{V}^{oE,\infty}_{m,2}$ for pure [Bmim][NTf$_2$] and 2EE. The negative values of $\overline{V}^{oE,\infty}_{m,1}$ and $\overline{V}^{oE,\infty}_{m,2}$, at each studied temperature, indicate that there is a decrement in the volume upon mixing of IL with 2EE. Further, the increment in the negative values of $\overline{V}^{oE,\infty}_{m,1}$ with temperature, designates the expansion of volume in the binary mixture. This trend suggests that at higher temperatures there exists more possible ways for the smaller molecules (2EE) to fit into the voids formed by larger molecules ([Bmim][NTf$_2$]).

In the imidazolium salts, across the N_1–C_2–N_3 moiety, there exists a delocalized 3-center-4-electron configuration. Further, there is a double bond between C_4 and C_5 in the electronic structure with a weak delocalization at the center [42]. The carbon C_2 is charged positively due to the deficit of electron in C=N bond, while C_4 and C_5 are almost neutral. In C_2—H, C_4—H and C_5—H, the hydrogen atoms possess nearly equal charge (Scheme 1). The properties of these imidazolium salts can be understood based on the acidic nature of the hydrogen atoms. The solute molecules are bounded specifically by the hydrogen atom present in C_2—H.

FT-IR spectra of pure 2EE, $x_1 = 0.1905$, $x_1 = 0.4890$, $x_1 = 0.7928$ and pure [Bmim][NTf2] are recorded in 500 to 3500 cm^{-1} region (Fig. 8). The C—H stretchings between 2800 and 3200 cm^{-1} are analysed to understand the influence of molecular interactions on [Bmim] cation. The aliphatic C—H group vibrations of butyl moiety are present between 2800 and 3000 cm^{-1} [43–47]. The vibrations between 3000 and 3200 cm^{-1} correspond to the C—H mode of imidazolium aromatic ring, C_2—H and $C_{4,5}$–H stretchings [46].

The lower shifting of C_2—H stretching vibration (3153.6 cm^{-1}) by 38.4 cm^{-1} compared to C_4—H and C_5—H stretching vibrations (3115.2 cm^{-1}) is due to its stronger acidic nature. The C_2—H vibrations show a linear and moderate blue shift, starting from$x_1 = 0.1905$ (Table 7). The C_2—H and $C_{4,5}$–H blue shifts indicate the encountering of aromatic C—H group with peculiar type of hydrogen bonding interactions in mixed state compared to those of pure [Bmim][NTf2].

In [Bmim][NTf2], there is a strong hydrogen bond between the aromatic C—H hydrogens of imidazolium ring and the nearby nitrogen atoms of [NTf2] anion, making the C—H bonds in the cation less covalent. Whereas, in the binary mixture, 2EE breaks these strong hydrogen bonds by interacting with the existing ion pairs. This strengthens the covalent nature of C—H bonds in [Bmim] cation, resulting a blue shift in



Scheme 1. Schematic structures for (a) [Bmim][NTf2] (b) 2EE.

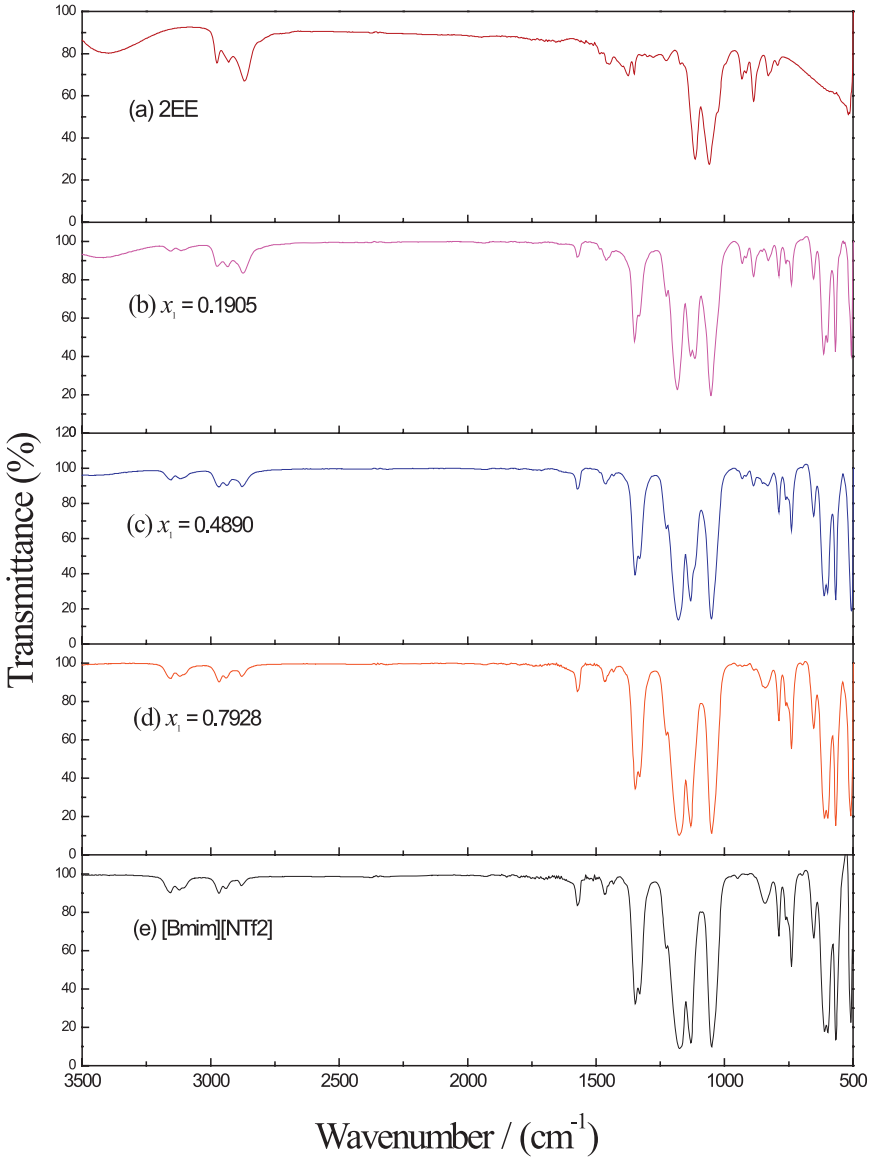


Fig. 8. FT-IR spectra of (a) pure 2EE (b) $x_1 = 0.1905$ (c) $x_1 = 0.4890$ (d) $x_1 = 0.7928$ and (e) pure [Bmim][NTf_2].

the stretching vibrations of C—H group. Same trend was studied for the mixtures containing imidazolium ILs and organic solvents [47–51]. For [NTf2] anion, the wave numbers in between 630 and 680 cm^{-1} are studied. In case of pure [Bmim][NTf2] spectrum, a peak at 653 cm^{-1} is observed due to the S—N—S bending mode. As the concentration of IL is increasing, the transmittance of S—N—S bending peak is decreasing. This behaviour designates the existence of interactions between alkyl hydrogens of 2EE and [NTf2] anions [51].

When IL is added with 2EE, the initiation of hydrogen bonds takes place between (i) –OH of 2EE and C—H hydrogens of [Bmim] cation and (ii) alkyl hydrogens of 2EE and nitrogen atoms of [NTf2] anion. There is a significant weakening of interionic interactions, upon further addition of 2EE, resulting ion pair dissociation. These disassociated ions are saturated rapidly with 2EE molecules and there by the imidazolium C—H vibrations remain unchanged. The presence of wide hydrogen bonds is observed in such systems and these bonds significantly affect the physical properties of the binary systems such as stability, miscibility etc.

In the present work, a different kind of molecular interaction mechanism has been observed between [Bmim][NTf2] and 2EE. The significant groups contributing the interactions with 2EE molecules are C—H groups of [Bmim] cation and nitrogen of [NTf2] anion. From the FT-IR analysis, it is observed that as the concentration of 2EE increases the hydrogen bond strength decreases in C—H groups of cation. But, the sufficient number of hydrogen bonds between 2EE and [Bmim][NTf2] allows the organic solvent to get complete miscibility. Hence the hydrogen bonds between [Bmim][NTf2] and 2EE can make notable contraction of volume in the binary mixture.

Table 7
FT-IR wavenumbers between 2800 and 3200 cm^{-1} with mole fraction (x_1) of 1-butyl-3-methylimidazolium bis (trifluoromethylsulfonyl) imide in the binary mixture of 1-butyl-3-methylimidazolium bis (trifluoromethylsulfonyl) imide + 2-ethoxyethanol at room temperature.

x_1	C_2—H stretching/cm^{-1}	$C_{4,5}$—H stretching/cm^{-1}
0.1905	3153.6	3115.2
0.4890	3154.9	3116.6
0.7928	3156.3	3119. 5
1.0000	3157.7	3120.9

4. Conclusions

The data of ρ and u of [Bmim][NTf_2] + 2EE binary mixture is measured for the complete concentration range at different temperatures. This data is utilized to calculate different acoustic and thermodynamic parameters. The variations in these parameters are analysed to understand the behaviour of molecular interactions occurring between [Bmim][NTf_2] and 2EE molecules in the mixture. The negative V_m^E values indicate that more efficient packing is taking place when [Bmim][NTf_2] is mixed with 2EE. The positive u^Evalues designate the presence of strong ion-dipole interactions between [Bmim][NTf_2] and 2EE. The presence of ion-dipole interactions in the mixture is supported by FT-IR analysis.

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اُردو جرنل ۱۲

۲۰۲۱

شعبۂ اردو، پٹنہ یونیورسٹی کا اکیڈمک ریسرچ اینڈ ریفریڈ جرنل



اکبر الہ آبادی گوشے ساحر لدھیانوی

مدیر

ڈاکٹر شہاب ظفر اعظمی

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ڈاکٹر شیخ فاروق باشا
لیکچرار، شعبہ اردو، گورنمنٹ ڈگری کالج، رائے چوٹی، آندھرا پردیش

کلام اکبرالہ آبادی میں مزاحمتی رویہ

لسان العصر اکبرالہ آبادی کی ولادت اس وقت ہوئی جب کہ سلطنت مغلیہ کا آخری چراغ ٹمٹما رہا تھا۔ ایسٹ انڈیا کمپنی کا ظالم شکنجہ تقریباً سارے ہندوستان کو جکڑ چکا تھا۔ ۱۸۵۷ء کی ناکام بغاوت کے بعد ہندوستانیوں کی رہی سہی طاقت توڑ دی گئی۔ اس وقت اکبرالہ آبادی کی عمر صرف گیارہ سال تھی۔ انگریزوں کے ظلم و استبداد کا نقش ہمیشہ کے لیے ان کے دل و دماغ پر مرتسم ہوگیا۔ بغاوت کے بعد ہندوستانی خصوصاً مسلم قوم انگریزوں کے عتاب کا شکار رہی۔ خوف و دہشت، ذلت و رسوائی، فقر و فاقہ اور غلامی و محکومی ان کا مقدر بن گئی۔ اسی زمانے میں محسن قوم وملت سرسید احمد خاں نے محسوس کیا کہ انگریزی حکومت سے مبارزت کے بجائے مصالحت کا رویہ اپنانا چاہیے، عداوت کے بجائے رفاقت کا راستہ اختیار کیا جائے، سرسید نے اپنی قوم کو مغربی علوم سے استفادہ کرنے کی تلقین کی۔ اس سلسلہ میں ان کے تعلیمی کارنامے ہمیشہ یاد رکھے جائیں گے۔

ہندوستان پر انگریزی حکومت کا جب پوری طرح تسلط ہو چکا تو انہوں نے مسلم قوم پر طرح طرح کے مظالم شروع کر دیے۔ قتل و غارت گری کا بازار گرم ہوگیا، سرکاری ملازمتوں سے انہیں کنارہ کش کیا گیا، جاگیریں، مناصب اور وظیفے ختم کر دیے گئے۔ بہت سے لوگوں کو کالے پانی کی سزا سنائی گئی۔ کل تک جو برسر اقتدار تھے آج وہ محکوم، مجبور اور مقہور ہو گئے۔ بقول میر تقی میرؔ

دلی میں آج بھیک بھی ملتی نہیں انہیں
تھا کل تلک دماغ جنہیں تخت و تاج کا

مغربی نظام تعلیم کا رواج، مغربی تہذیب کا جنون، مغرب کی کورانہ تقلید، عریانیت اور فیشن پرستی، اختلاط مرد و زن، الحاد پرستی، مفاد پرستی، غلامانہ ذہنیت، عیسائیت کی تبلیغ جیسے امور ہندوستان میں پنپ رہے تھے جن کی روک تھام کے لیے اکبرالہ آبادی کو شدید مزاحمت کرنی پڑی۔ مزاحمت، مصالحت اور مفاہمت کی ضد ہے۔ چونکہ برسر اقتدار حکومت کے خلاف مزاحمت ہے اس لیے انہوں نے راست اور سنجیدہ تیر و نشتر چھوڑنے کے بجائے طنز و مزاح کا اسلوب اختیار کیا۔ برسر اقتدار حکومت کے خلاف، آواز اٹھانا، ناخوشگوار اور ناسازگار حالات میں صدائے حق بلند کرنا، گویا اپنی موت کو آواز دینا تھا۔ لیکن اکبرالہ آبادی نے یہ کام بڑی خوبی اور ہمت سے کیا۔ کبھی اشارے

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اور کنایے میں مزاحمت کی، کبھی دبے الفاظ اور دھیمے لہجہ میں، کبھی کھل کر بھی مزاحمتی رویہ اختیار کیا اور مختلف اشاروں ،علامتوں اور استعاروں میں اپنی مزاحمت پیش کی۔ چند علامتیں پیش ہیں۔

بت، انگریزوں کی علامت، پیر اور مرشد، سر سید احمد خاں کی علامت، اونٹ مسلمانوں کی، گائے ہندوؤں کی، برہمن ہندوؤں کی مذہبی جماعت کا نمائندہ، جہاز اور کشتی ملک کی، زاغ اور الو انگریزوں کے نقالوں کی، بدھو عام مسلمانوں کی علامت ہے۔ اکبر نے ان علامتوں کو بعض جگہ واضح بھی کیا ہے۔

بدھو سے صرف ہند کا مسلم مراد ہے — مقصود عاجزی ہے غرور اک فساد ہے

دل مرا جس سے بہلتا، کوئی ایسا نہ ملا — بت کے بندے ملے، اللہ کا بندہ نہ ملا

واہ کیا راہ دکھائی ہے ہمیں مرشد نے — کردیا کعبے کو گم اور کلیسا نہ ملا

رشید احمد صدیقی اکبر الہ آبادی کے مزاحمتی رویہ کے تعلق سے کہتے ہیں۔

''حوصلہ و ہوس کی، الفت و آویزش کی، پیش قدمی و پسپائی کی، شور و سکوت کی اور سود و زیاں کی اکبر کی شاعری میں جلوہ گری ہے۔ کہیں خفی، کہیں جلی، کہیں شگفتہ، کہیں حزیں لیکن ہر جگہ دلنشیں، اس عہد کے سیاسی شعور کو سمجھنے کے لیے اکبر کے کلام سے ہر طرح کی مدد لی جاسکتی ہے، شاید اتنی قیمتی مدد کہیں اور سے حاصل بھی نہیں ہوسکتی''۔

اکبر الہ آبادی نے سب سے زیادہ مغربی تہذیب سے مزاحمت کا رویہ اپنایا ہے۔ وہ مشرقی تہذیب کے دلدادہ تھے اور مشرقی تہذیب کی اساس اور بنیاد، مذہب، روحانیت اور اخلاق پر ہے۔ مغربی تہذیب کی بنیاد الحاد ،مادیت اور فحاشی پر ہے۔ اکبر اپنی قوم کو اس تہذیب کی پرچھائیوں سے بچانا چاہتے تھے۔ یہ امر مسلم ہے کہ محکوم قوم بہت جلد حاکم قوم کی کورانہ تقلید کرتی ہے۔

مغربی تہذیب کی اندھی تقلید کے خلاف اردو زبان کے بہت سے ادیبوں اور شاعروں نے مزاحمتی رویہ اپنایا ہے لیکن اس سلسلہ میں شاعر مشرق علامہ اقبال اور اکبر الہ آبادی سب سے بیش پیش نظر آتے ہیں۔ علامہ اقبال کی مزاحمت کی ایک مثال ملاحظہ ہو۔

تمہاری تہذیب اپنے خنجر سے آپ ہی خودکشی کرے گی
جو شاخ نازک پہ آشیانہ بنے گا نا پائیدار ہوگا

اکبر الہ آبادی نے بھی جابجا اپنے کلام میں طنز و مزاح کے پیرائے میں مغربی تہذیب پر وار کیا ہے۔ وہ کہتے ہیں۔

مرید دہر ہوئے وضع مغربی کرلی — نئے صنم کی تمنا میں خودکشی کرلی

تھے کیک کی فکر میں سو روٹی بھی گئی — چاہی تھی شے بڑی سو چھوٹی بھی گئی

واعظ کی نصیحتیں نہ مانیں آخر پتلون کی تاک میں لنگوٹی بھی گئی

اکبرالہ آبادی کو یہ خوف شدید تھا کہ مغربی تہذیب وتمدن مسلم قوم کو اخلاقی انحطاط کے سمندر میں ڈبو دے گی۔آخر ہوا بھی یہی۔

نئی تہذیب سے ساقی نے ایسی گرمجوشی کی کہ آخر مسلموں میں روح پھونکی بادہ نوشی کی

ایک اور جگہ کہتے ہیں:

تہذیب نو کے رنگ پر بلبل بنے ہیں سب واللہ کیا بہار ہے اس سبز باغ میں

یہ موجودہ طریقے راہی ملک عدم ہوں گے نئی تہذیب ہوگی اور نئے ساماں بہم ہوں گے

اکبرالہ آبادی ایک مشرقی تہذیب کے پیروکار اور مذہب پسند شخص تھے،مغربی تہذیب کی اندھی تقلید سے انہیں مشرقی تہذیب کے اعلی اقدار خطرے میں دکھائی دے رہے تھے، بے حیائی اور فیشن پرستی کی وبا عام ہو رہی تھی۔حقوق نسواں اور مساوات مرد وزن کی آڑ میں مغربی دنیا نے خواتین کو سڑکوں پر مردوں کے برابر لا کھڑا کر دیا تھا۔اکبر نے خواتین کو عریانی اور فحاشی سے بچنے کی تلقین کی ہے۔ایک رباعی میں خواتین کی بے حیائی اور بے حجابی کے تعلق سے کہتے ہیں۔

بے پردہ کل جو آئیں نظر چند بیبیاں اکبر زمیں میں غیرت قومی سے گڑ گیا

پوچھا جو ان سے آپ کا پردہ وہ کیا ہوا کہنے لگیں کہ عقل پہ مردوں کی پڑ گیا

برطانوی حکومت نے حصول اقتدار کے بعد اس بات کی کوشش کی کہ مشرقی طرز تعلیم کا سد باب کیا جائے تا کہ ان میں مذہب سے بیزاری ،قدامت پسندی اور اعلی اقدار کا فقدان ہو چنانچہ انہوں نے مغربی طرز تعلیم ہندوستان بھر میں رائج کرنا شروع کر دیا۔جدید فلسفہ اور سائنسی علوم کو عام کر دیا تا کہ مذہبی عقائد اور روایات کی قدر ومنزلت کم ہو۔مسلمانوں میں مغربی تہذیب کے پیروکار اور تقلید کرنے والے پیدا ہوں۔برطانوی حکومت کے لیے کم تنخواہ پر کام کرنے والے ملازمین ہندوستان ہی میں مل جائیں،انگلستان سے نہ منگوانا پڑے اور یہ فکر دی گئی کہ برطانوی تہذیب اور معاشرت خوشحالی اور ترقی کی علامت ہے اور مشرقی تہذیب تنزلی وانحطاط کی علامت، ان مقاصد کے حصول کے لیے نئے تعلیمی نصاب اور نئی تعلیمی پالیسوں کو نافذ کیا گیا۔ایسے میں اکبرالہ آبادی کو اس بات کا شدید احساس تھا کہ نئی تعلیمی پالیسی سے تہذیب وتمدن، دینی وملی غیرت، ہمدردی اور رحمدلی ختم ہو جائے گی۔ محض دولت حاصل کرنا ،ڈگری پانا ،نوکری کرنا اور پنشن لینا ہو جائے گا۔ان خیالات کا کھل کر اپنی شاعری میں اظہار خیال کیا ہے۔کہتے ہیں:

میں کیا کہوں احباب کیا کار نمایاں کر گئے بی اے کیا ،نوکر ہوئے ،پنشن ملی اور مر گئے

ایک اور شعر یوں ہے۔

واعظ کی نصیحتیں نہ مانیں آخر پتلون کی تاک میں لنگوٹی بھی گئی

اکبرالہ آبادی کو یہ خوف شدید تھا کہ مغربی تہذیب وتمدن مسلم قوم کو اخلاقی انحطاط کے سمندر میں ڈبو دے گی۔ آخر ہوا بھی یہی۔

نئی تہذیب سے ساقی نے ایسی گرمجوشی کی کہ آخر مسلموں میں روح پھونکی بادہ نوشی کی

ایک اور جگہ کہتے ہیں:

تہذیب نو کے رنگ پر بلبل بنے ہیں سب واللہ کیا بہار ہے اس سبز باغ میں

یہ موجودہ طریقے راہی ملک عدم ہوں گے نئی تہذیب ہوگی اور نئے ساماں بہم ہوں گے

اکبرالہ آبادی ایک مشرقی تہذیب کے پیروکار اور مذہب پسند شخص تھے، مغربی تہذیب کی اندھی تقلید سے انہیں مشرقی تہذیب کے اعلی اقدار خطرے میں دکھائی دے رہے تھے، بے حیائی اور فیشن پرستی کی وبا عام ہو رہی تھی۔ حقوق نسواں اور مساوات مرد وزن کی آڑ میں مغربی دنیا نے خواتین کو سڑکوں پر مردوں کے برابر لا کھڑا کر دیا تھا۔ اکبر نے خواتین کو عریانی اور فحاشی سے بچنے کی تلقین کی ہے۔ ایک رباعی میں خواتین کی بے حیائی اور بے حجابی کے تعلق سے کہتے ہیں۔

بے پردہ کل جو آئیں نظر چند بیبیاں اکبر زمیں میں غیرت قومی سے گڑ گیا

پوچھا جو ان سے آپ کا پردہ وہ کیا ہوا کہنے لگیں کہ عقل پہ مردوں کی پڑ گیا

برطانوی حکومت نے حصول اقتدار کے بعد اس بات کی کوشش کی کہ مشرقی طرز تعلیم کا سد باب کیا جائے تاکہ ان میں مذہب سے بیزاری، قدامت پسندی اور اعلی اقدار کا فقدان ہو چنانچہ انہوں نے مغربی طرز تعلیم ہندوستان بھر میں رائج کرنا شروع کر دیا۔ جدید فلسفہ اور سائنسی علوم کو عام کر دیا تاکہ مذہبی عقائد اور روایات کی قدر ومنزلت کم ہو۔ مسلمانوں میں مغربی تہذیب کے پیروکار اور تقلید کرنے والے پیدا ہوں۔ برطانوی حکومت کے لیے کم تنخواہ پر کام کرنے والے ملازمین ہندوستان ہی میں مل جائیں، انگلستان سے نہ منگوانا پڑے اور یہ فکر دی گئی کہ برطانوی تہذیب اور معاشرت خوشحالی اور ترقی کی علامت ہے اور مشرقی تہذیب تنزلی وانحطاط کی علامت، ان مقاصد کے حصول کے لیے نئے تعلیمی نصاب اور نئی تعلیمی پالیسوں کو نافذ کیا گیا۔ ایسے میں اکبرالہ آبادی کو اس بات کا شدید احساس تھا کہ نئی تعلیمی پالیسی سے تہذیب وتمدن، دینی وملی غیرت، ہمدردی اور رحمدلی ختم ہو جائے گی۔ محض دولت حاصل کرنا، ڈگری پانا، نوکری کرنا اور پنشن لینا ہو جائے گا۔ ان خیالات کا کھل کر اپنی شاعری میں اظہار خیال کیا ہے۔ کہتے ہیں:

میں کیا کہوں احباب کیا کار نمایاں کر گئے بی اے کیا، نوکر ہوئے، پنشن ملی اور مر گئے

ایک اور شعر یوں ہے۔

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پڑھ کر انگریزی میں دانا ہوگیا "کم" کا مطلب ہی کمانا ہو گیا

اکبرالہ آبادی کے خیال میں تعلیم وہ واحد ذریعہ ہے جس سے قوموں کے قلوب واذہان کو غلام بنایا جاسکتا ہے، یہ ایسا موثر ہتھیار ہے جو قتل وخون سے بھی زیادہ اہمیت رکھتا ہے۔ اپنے ایک مشہور شعر میں اس خیال کو اس طرح پیش کرتے ہیں۔

یوں قتل سے بچوں کے وہ بدنام نہ ہوتا افسوس کہ فرعون کو کالج کی نہ سوجھی

قوم کے تعلیمی رہنما اور سماجی مصلح سرسید احمد خاں کے تعلیمی افکار سے اکبرالہ آبادی مطمئن نہیں تھے کیونکہ ان کے خیال میں علی گڑھ کا تعلیمی مرکز ظاہری چمک دمک اور دنیاوی ترقی کی حد تک محدود ہو گیا تھا۔ یہاں کے تعلیم یافتہ مادیت اور عقلیت کو سب کچھ سمجھ رہے تھے۔ وہ سرسید اور علی گڑھ کو ہدف تنقید بناتے ہوئے کہتے ہیں۔

ابتدا کی جناب سید نے جن کے کالج کا اتنا نام ہوا
انتہا یونیورسٹی پر ہوئی ،قوم کا کام اب تمام ہوا

اس فکر کی طرف اشارہ کرتے ہوئے کہتے ہیں

پانی پینا پڑا ہے پائپ کا حرف پڑھنا پڑا ہے ٹائپ کا
مل کا آٹا ہے نل کا پانی ہے آب و دانہ کی حکمرانی ہے

مغربی علوم وفنون، کے خلاف مزاحمتی رویہ کو دیکھ کر کوئی یہ خیال نہ کرے کہ اکبر جدید تعلیم اور علوم وفنون ،صنعت وحرفت کے مخالف ہیں۔ انہوں نے صرف تعلیم کے نام پر مرد وزن کے اختلاط، بے پردگی، مغربی فیشن پرستی اور ناچ گانے پر چوٹ کی ہے۔ ہر حال میں دینی مزاج اور مذہب کو قابل نمونہ سمجھنے کی تلقین کی ہے۔ ان کے چند اشعار اس بات کی غمازی کرتے ہیں۔

دو باتیں جن سے قومیں ہو رہی ہیں نامور سیکھو اٹھو تہذیب سیکھو ،صنعتیں سیکھو، ہنر سیکھو
بڑھاؤ تجربے ،اطراف دنیا میں سفر سیکھو خواص خشک و تر سیکھو علوم بحر و بر سیکھو

دینی غیرت اور حمیت کو ابھارتے ہوئے کہتے ہیں۔

خدا کے واسطے اے نوجوانو ،ہوش میں آؤ دلوں میں اپنی غیرت کو جگہ دو ،جوش میں آؤ

ایک اور جگہ اسی خیال کو پیش کرتے ہوئے مذہب اور دین کو سرچشمہ ہدایت سمجھنے کی تلقین کرتے ہیں۔

تم شوق سے کالج میں پھلو، پارک میں پھولو جائز ہے غباروں میں اڑو ،چرخ پہ جھولو
بس ایک سخن بندہء عاجز کا رہے یاد اللہ کو اور اپنی حقیقت کو نہ بھولو

پڑھ کر انگریزی میں دانا ہوگیا "کم" کا مطلب ہی کمانا ہو گیا

اکبرالہ آبادی کے خیال میں تعلیم وہ واحد ذریعہ ہے جس سے قوموں کے قلوب واذہان کو غلام بنایا جاسکتا ہے، یہ ایسا موثر ہتھیار ہے جو قتل وخون سے بھی زیادہ اہمیت رکھتا ہے۔ اپنے ایک مشہور شعر میں اس خیال کو اس طرح پیش کرتے ہیں۔

یوں قتل سے بچوں کے وہ بدنام نہ ہوتا افسوس کہ فرعون کو کالج کی نہ سوجھی

قوم کے تعلیمی رہنما اور سماجی مصلح سرسید احمد خاں کے تعلیمی افکار سے اکبرالہ آبادی مطمئن نہیں تھے کیونکہ ان کے خیال میں علی گڑھ کا تعلیمی مرکز ظاہری چمک دمک اور دنیاوی ترقی کی حد تک محدود ہوگیا تھا۔ یہاں کے تعلیم یافتہ مادیت اور عقلیت کو سب کچھ سمجھ رہے تھے۔ وہ سرسید اور علی گڑھ کو ہدف تنقید بناتے ہوئے کہتے ہیں۔

ابتدا کی جناب سید نے جن کے کالج کا اتنا نام ہوا
انتہا یونیورسٹی پر ہوئی قوم کا کام اب تمام ہوا

اس فکر کی طرف اشارہ کرتے ہوئے کہتے ہیں

پانی پینا پڑا ہے پائپ کا حرف پڑھنا پڑا ہے ٹائپ کا
مل کا آٹا ہے نل کا پانی ہے آب و دانہ کی حکمرانی ہے

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وہ باتیں جن سے قومیں ہو رہی ہیں نامور سیکھو اٹھو تہذیب سیکھو ،صنعتیں سیکھو، ہنر سیکھو
بڑھاؤ تجربے ،اطراف دنیا میں سفر سیکھو خواص خشک و تر سیکھو علوم بحر و بر سیکھو

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خدا کے واسطے اے نوجوانو ،ہوش میں آؤ دلوں میں اپنی غیرت کو جگہ دو ،جوش میں آؤ

ایک اور جگہ اسی خیال کو پیش کرتے ہوئے مذہب اور دین کو سرچشمہ ہدایت سمجھنے کی تلقین کرتے ہیں۔

تم شوق سے کالج میں پھلو، پارک میں پھولو جائز ہے غباروں میں اڑو ،چرخ پہ جھولو
بس ایک سخن بندہء عاجز کا رہے یاد اللہ کو اور اپنی حقیقت کو نہ بھولو

اکبرالہ آبادی اس خیال کی پرزور مخالفت کرتے ہیں کہ انگریز جہاں جائیں گے وہاں سائنسی ایجادات اور ٹکنالوجی ترقی کرے گی۔ ایجادات ان ملکوں میں بھی ہیں جہاں انگریز حکمران نہیں ہیں۔ جدید ایجادات کی

مخالفت انہوں نے کبھی نہیں کی بلکہ اس کے سیکھنے پر ابھارا ہے۔ وہ کہتے ہیں۔

عزم کر تقلید مغرب کا ہنر کے زور سے　　لطف کیا جو لد لیے موٹر پر زر کے زور سے

ان کے علاوہ الحاد پرستی کے خلاف بھی ان کی مزاحمت قابل قدر ہے۔ وہ کہتے ہیں۔

صدائے الحاد اٹھ رہی ہے خدا کی اب یاد اٹھ رہی ہے　　دلوں سے فریاد اٹھ رہی ہے کہ دین سے ہم گزر رہے ہیں

غرض اکبر الہ آبادی نے اپنے قلم و قرطاس کے ذریعہ ہر اس ناخوشگوار اور نامناسب رویے کے خلاف مزاحمت کی جو ہمارے ملک میں پنپ رہے تھے، سماجی برائیوں، معاشرتی ناہمواریوں اور ناانصافیوں کے خلاف آواز اٹھائی، حالانکہ وہ حکومت کے اعلی عہدوں پر قائم رہے اس کے باوجود حکومت کے خلاف صدائے احتجاج بلند کیا۔ اور یہ کہنا بے جا نہ ہوگا کہ اردو کے مزاحمتی ادب میں اکبر الہ آبادی کا احتجاجی اور مزاحمتی رویہ بہت توانا دکھائی دیتا ہے۔



بہار کی بہار (جلد اول و دوم)

مصنف۔ پروفیسر اعجاز علی ارشد

بہار کی ادبی و تہذیبی تاریخ کا دستاویزی سلسلہ

ملنے کا پتہ

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ماہنامہ

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عظیم مجاہد آزادی، امام الہند مولانا ابوالکلام آزاد

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oOo

ڈاکٹر شیخ فاروق باشاہ
لکچرر، گورنمنٹ ڈگری کالج
رائے چوٹی، ضلع کڈپہ (آندھراپردیش)

تحریکِ آزادی کے دو جانباز سپاہی۔ آزاد و جوہر

ہندوستان کی تحریک آزادی میں مسلمانوں کا رول نہایت واضح اور دوٹوک رہا ہے۔ مسلمان اپنے رہنماؤں کی رہبری میں ہندوستانی اقلیتی طبقے ہونے کے باوجود اکثریتی طبقہ سے کہیں بڑھ کر جان و مال کی قربانی پیش کی۔ مسلمانوں میں قومیت، وطنیت اور جذبہء حریت پیدا کرنے میں جن اہم قائدین کا رول رہا ہے ان میں سرفہرست امام الہند مولانا ابوالکلام آزاد اور رئیس الاحرار مولانا محمد جوہر ہیں۔

خدا نے ان دونوں قائدین کو بے شمار صلاحیتوں اور لیاقتوں سے نوازا تھا۔ تقریر ہو یا تحریر، صحافت ہو یا سیاست، قیادت ہو یا امامت، نظم ہو یا نثر، ہر میدان کے وہ ماہر تھے، سب سے بڑھ کر دونوں جذبہء ایمانی سے سرشار تھے۔ کبھی انہوں نے اپنے ذاتی مفاد کے لیے کسی سے سمجھوتہ نہ کیا۔ اور نہ دشمنوں کے آگے سرِ تسلیم خم کیا۔ اپنی بے پناہ صلاحیتوں کے باعث وہ چاہتے تو انگریزی حکومت میں بڑے سے بڑا عہدہ پا سکتے تھے۔ اور ان کی زندگی شاہانہ گزر سکتی تھی لیکن انہوں نے فقیری اور اسیری کی زندگی کو محبوب جانا۔

بیسویں صدی کے اوائل میں حالات شدید انتشار سے دوچار تھے۔ ہندوستانیوں کے لیے ہر قدم پر کانٹے بچھے ہوئے تھے۔ ان حالات میں صحافت کی پر خار وادی میں قدم رکھنا اپنے لیے موت کو دعوت دینا تھا۔ محمد علی جوہر آزاد سے دس سال بڑے تھے۔ چنانچہ ان کو صحافت کے میدان میں اولیت کا درجہ حاصل ہے۔ وہ انگریزی زبان پر بے پناہ قدرت رکھتے تھے۔ چنانچہ قوم و ملک کی خدمت کے لیے انہوں نے کامریڈ کے نام سے ۱۴۔ جنوری ۱۹۱۱ء میں کلکتہ سے ہفتہ وار اخبار جاری کیا۔ جسے بے پناہ مقبولیت حاصل ہوئی۔ ہندوستانیوں کے دل جیت ہی لیے لیکن اہل زبان انگریز بھی مولانا کے اسلوب پر فریفتہ ہو گئے اور بے چینی سے اخبار کی راہ تکتے تھے۔

مولانا ابوالکلام آزاد ۱۳ جولائی ۱۹۱۲ء کو کلکتہ سے ''الہلال'' اخبار جاری کیا۔ جس کے عزائم جتنے بلند تھے زبان و اسلوب بھی اتنا ہی دلکش اور پر تاثیر تھا۔ مولانا آزاد بھی صحافت کے ذریعے قوم ملت کی خدمت اور اہل ہند میں جذبۂ حریت پیدا کرنا چاہتے تھے۔ الہلال میں لکھتے ہیں۔ ''ہم اس بازار میں سودائے نفع کے لیے نہیں بلکہ تلاش زیاں و نقصان کے لیے آئے ہیں۔ صلہ و تحسین کے لیے نہیں بلکہ نفرت و دشنام کے طلبگار ہیں، عیش کے [illegible]ول

نہیں بلکہ خلش واضطراب کے کانٹے ڈھونڈتے ہیں۔''

(ایوان اردو، دہلی دسمبر ۱۹۸۸ء ص ۴۸)

جس طرح مولانا محمد علی کی انگریزی نے ساری دنیا میں دھوم مچادی اسی طرح مولانا آزاد کی نثر نے حیات آفرین کا درجہ پایا۔ مولانا آزاد کی اردو نثر کے تقابل میں مولانا محمد علی تو کیا کوئی بھی اہل قلم دور دور تک ان کا ہم سایہ نظر نہیں آتا ہے۔

''الہلال اور ہمدرد'' نے اردو صحافت کو ایک نیا معیار عطا کیا۔ قوم دوستی، حب الوطنی، سیاسی بیداری کے جذبات پیدا کیے۔ باطل اوہام اور فرسودہ تصورات کا قلع قمع کیا۔ اہل ہند کے دلوں میں تحریک آزادی کی روح پھونک دی دونوں اخباروں نے کھل کر ہندو مسلم اتحاد اور یکجہتی کا سبق پڑھایا۔ محمد علی اپنے اخبار ہمدرد میں اتحاد کے تعلق سے مولانا ابوالکلام آزاد کا یہ بیان جاری کیا۔

''اس وقت کی اہم ترین ضرورت اتحاد ہے' میں توقع کرتا ہوں کہ لیڈران چھوٹے چھوٹے اختلافات کو نظر انداز کردیں گے۔ اور وقت کا جو کچھ تقاضہ ہے اس کو پورا کرنے کے لیے تیار ہوں گے''۔

(ہمدرد ۲۴۔ نومبر ۱۹۲۴ء ص ۵)

ہندوستان کی تحریک آزادی کو تقویت پہنچانے میں تحریک خلافت کا بڑا عمل دخل رہا ہے۔ یہ حقیقت ہے کہ اس تحریک کے تاسیس گزاروں میں مولانا محمود الحسن اور مولانا عبد الباری ہیں لیکن اس تحریک کو عام کرنے اور بلاتفریق مذہب و ملت سارے ہندوستانیوں کو اس میں شمولیت کے لیے فضا تیار کرنے میں جہاں بہت سے علماء کا رول رہا ہے وہیں علی برادران اور مولانا ابوالکلام آزاد کی کاوشیں بھی ناقابل فراموش ہیں۔ خلافت تحریک کو اس وقت اور بھی استحکام ملا جب اس میں گاندھی جی بھی شریک ہوگئے۔ بالآخر یہی تحریک تحریک آزادی میں تبدیل ہوگئی۔ علی برادران اور تحریک خلافت ایک جاں دو قالب ہوگئے۔ یہ اشعار زبان زد خاص و عام تھے:

بولیں اماں محمد علی کی
جان بیٹا خلافت پہ دے دو
ساتھ ہیں تیرے شوکت علی بھی
جان بیٹا خلافت پہ دے دو
ہوتے میرے اگر سات بیٹے
کرتی سب کو خلافت پہ صدقے

مولانا آزاد اور مولانا محمد علی کو صحافت اور خطابت کی بدولت کئی بار جیل جانا پڑا، قصور صرف یہ تھا کہ دونوں صحافت کے ذریعہ ہندوستانیوں کے دلوں میں آزادی کی روح پھونک رہے تھے اور مکمل آزادی کا مطالبہ کررہے تھے۔ مولانا آزاد اپنی زندگی کے ۹ رسال ۷ رمہینے زندان فرنگ میں رہے اور محمد علی تقریباً ۷ رسال قید فرنگ میں رہے۔ ان دونوں بزرگوں نے قید کی زندگی کو ہنسی خوشی قبول کرلیا۔

مولانا آزاد ایک خط میں لکھتے ہیں:

''وقت کے حالات پیش نظر رکھتے ہوئے اس تناسب پر غور کرتا ہوں تو تعجب ہوتا ہے، اس پر نہیں کہ

نہیں بلکہ خلش واضطراب کے کانٹے ڈھونڈتے ہیں۔''

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سات برس آٹھ مہینے قید و بند میں کیوں کٹے؟ اس پر کہ صرف سات برس آٹھ مہینے ہی کیوں کٹے؟۔

(ایوان اردو دہلی، دسمبر ۱۹۸۸ء ص ۴۲)

مولانا محمد علی اپنی اسیری کے ایام کو خوش قسمتی سے تعبیر کرتے ہیں:

فیض سے تیرے ہی اے قید فرنگ
بال و پر نکلے قفس کے در کھلے

آزاد و جوہر خوددار طبیعت کے مالک تھے۔قوم کے مفاد کی خاطر انہوں نے اپنے ذاتی مفاد کو قربان کردیا۔دوران اسیری مولانا آزاد نے اپنی رفیق حیات کی شدید علالت، رحلت اور آخری رسومات میں شرکت کے لیے درخواست دینے کو قوم کے مفاد کے مغائر اور اپنے لیے باعث ہزیمت سمجھا۔اپنی وفا شعار بیوی کی ہمیشہ کی جدائی کو گوارا کرلیا لیکن حکام وقت کے آگے جھکنا پسند نہیں کیا۔بالکل اسی طرح مولانا محمد علی بھی بیجاپور جیل میں محروس تھے، بیٹی آمنہ شدید ترین مرض دق میں مبتلا تھیں اور اسی مرض میں وہ بھی اس دنیا سے رحلت کرگئیں۔بیٹی کی وفات والد کے دل پر کیا قیامت ڈھائی ہوگی لیکن مولانا نے غم جدائی کو برداشت کرلیا۔صبر و شکر اور تسلیم و رضا کا پیکر بنے رہے۔اور کیا ہی خوب کہا:

تیری صحت ہمیں مطلوب ہے لیکن اس کو
نہیں منظور تو پھر ہم کو بھی منظور نہیں

مولانا آزاد اور مولانا محمد علی کے مابین کئی چیزوں میں مماثلت پائی جاتی ہے۔صحافت، سیاست اور خطابت کی صلاحیتیں دونوں کے رگ و پے میں سرایت کرگئی تھیں۔راسخ العقیدہ مذہبی پیروکار ہونے کے ساتھ حب الوطنی، قوم دوستی اور ملت کی خیر خواہی کے جذبات سے سرشار تھے۔صاحب طرز ادیب، بلند پایہ نثر نگار اور کہنہ مشق شاعر تھے۔ایک کو شاعری میں تفوق ہے تو دوسرے کو نثر میں تقدم۔

مولانا آزاد اور جوہر کی نثر کا تقابل کیا جائے تو یہ واضح ہوتا ہے کہ مولانا محمد علی جوہر کے یہاں مولانا آزاد جیسا حُسن، دلکش اسلوب اور زور بیان نہیں لیکن خلوص، درد، تاثیر، عام فہمی اور سلاست اور دل نشینی میں یقیناً ان کی نثر کسی طرح سے پیچھے نہیں ہے۔

سید حامد مولانا آزاد اور مولانا جوہر کی نثر کا تقابل کرتے ہوئے لکھتے ہیں:

''ابوالکلام کی بلند پروازی کے مقابلے میں جوہر کے یہاں پیادہ روی ہے۔ وہاں ادب عالیہ اور اختراعات فائقہ، یہاں صرف یہ جاں سوز فکر کہ ایک قوم کی قوم کو، ایک جاہل پس ماندہ قوم کو اپنا مفہوم کس طرح ذہن نشین کرایا جائے، لیکن محمد علی کا انگریزی پر اہل زبان کا سا عبور وہ اضافی وصف ہے جو ابوالکلام کو میسر نہ تھا۔علاوہ بریں محمد علی کی نثر (اُردو) زبان اور محاورہ کی اُن غلطیوں سے محفوظ ہے جو رُخِ زیبا پر تل کی طرح ابوالکلام کے یہاں مل جاتی ہے''۔

(نظر برنی، مولانا محمد علی شخصیت اور خدمات نئی دہلی، ص ۱۹۲)

مولانا محمد علی جوہر اور مولانا آزاد جنگ آزادی میں دونوں ہم سفر تھے۔حصول آزادی میں دونوں کا ساتھ

تقریباً ۱۵ سال رہا۔ دونوں میں بہت ساری مماثلتیں اور مشابہتیں پائی جاتی ہے۔ دونوں بے باک اور اعلیٰ درجے کے صحافی تھے۔ دونوں شاعر اور نثر نگار۔ دونوں سچے اور پکے مسلمان اور مذہبی عبادات کے پابند تھے۔ ۱۵ سال کے عرصہ میں صحافت، سیاست اور ملکی و مسلکی مسائل کے تئیں دونوں کے درمیان رفاقت اور رقابت رہی۔ پھر بھی دونوں ایک دوسرے کا بے حد احترام کرتے تھے اور اختلافات رائے کا اظہار بھی برملا کرتے تھے۔ مولانا آزاد کا اسلوب اشارے اور کنایے کی زبان میں ہوتا، لیکن مولانا محمد علی کا اظہار برملا جوشیلے انداز میں ہوتا، اور انداز تخاطب بالکل راست ہوتا۔ دونوں میں رقابت کی وجہ ذاتی رائے نہیں بلکہ قوم وملت کی فلاح و بہبودی تھی۔ مولانا محمد علی اور مولانا آزاد بعض مسائل میں ایک دوسرے سے متفق نہیں تھے۔ مولانا آزاد نے اپنے اخبار ''الہلال'' میں مولانا محمد علی کے بارے میں اس طرح اظہار خیال کیا ہے:

''مسٹر محمد علی سے ہمارے تعلقات اب صرف دوستانہ ہی نہیں، ایسے قریب کہ عزیزانہ ہیں کہ ان کی نسبت رائے قائم کرنے کا پورا موقع رکھتے ہیں۔ ہم نے اچھی طرح اندازہ کرلیا کہ ان کے دل میں آزادی اور جوش، دونوں چیزیں موجود ہیں''۔

(ضیاء الحسن فاروقی ماہنامہ جامعہ اپریل ۱۹۷۹ء ص ۱۰۲)

مولانا محمد علی کی انگریزی انشا پردازی اور قوت تحریر کا ان الفاظ میں اعتراف کرتے ہیں:

''یہی مسٹر محمد علی ہیں جو اِن تمام تعلیمات و ہدایات عالیہ کے مرکز جمود (علی گڑھ کالج) کے تعلیم یافتہ اور ایک ایسی ریاست کے عہدہ دار تھے۔ چند مضامین اور ایک رسالہ لکھ کر اُنہوں نے اپنی قابلیت ضرور منوائی تھی۔ لیکن کوئی بھی ان کی موجودہ حیثیت ملی سے واقف نہ تھا لیکن جب زمانے نے مہلت دی اور قوتوں کو چمکنے کے اسباب میسر آئے تو آج کوئی نہیں جو ان کی انگریزی انشا پردازی اور قوت تحریر و بحث کا معترف نہ ہو''۔

(ماہنامہ نیا دور لکھنؤ، جوہر نمبر ۱۹۸۶ء ص ۱۰۲)

مولانا محمد علی جوہر گرچہ کہ عمر میں مولانا آزاد سے بڑے تھے پھر بھی وہ انہیں اپنا استاد مانتے تھے، لیکن جب ان دو عظیم شخصیتوں کے درمیان اختلاف ہوا تو ہر ایک نے کھل کر اس کا اظہار کیا۔ لیکن وہی شائستہ اور سلجھے ہوئے انداز میں، کہیں اُنھوں نے ذاتیات کو موضوع بحث بننے نہیں دیا۔ دونوں کی تحریریں پُر وقار، سنجیدگی اور متانت کے ساتھ ساتھ ادبی رنگ میں ڈوبی ہوئی ہیں۔

مولانا آزاد کا الہلال جب منظر عام پر آیا تو مسلم یونیورسٹی کی تحریک شروع ہوچکی تھی۔ چنانچہ اول روز ہی سے اس تحریک سے متعلق لکھنا شروع کردیا تھا۔ یکم ستمبر ۱۹۱۲ء کی اشاعت میں مولانا آزاد نے ''مسلم یونیورسٹی کانسٹی ٹیوشن کمیٹی'' کے عنوان سے ایک مضمون لکھ کر مولانا محمد علی سے چند اُمور کی وضاحت چاہی تھی۔ الہلال کی اس اشاعت میں مولانا آزاد کے اس مضمون کی دوسری اور آخری قسط بھی چھپی تھی جس کا عنوان تھا

''نشۂ شام کی نصف شب''۔

مولانا آزاد ''مسلم یونیورسٹی کانسٹی ٹیوشن کمیٹی'' کے عنوان کے تحت لکھتے ہیں:

''ہم کو معلوم ہے کہ ہمارے دوست وہی محمد علی ہیں جنھوں نے نواب محسن الملک مرحوم کے زمانے میں اپنے کالج سے نئے نئے خطابات حاصل کئے تھے اور پھر یہ وہی محمد علی ہیں جنھوں نے ہمیشہ کالج کی زر پرستی کی مخالفت کی اور ٹرسٹیوں کی دائمی حکمرانی کے مسئلے کو بار بار چھیڑا۔ وہ گو ہمیشہ علی گڑھ میں رہے مگر ہم نے تو ہمیشہ ان کو اس کے باہر ہی دیکھا ہے اور اب تو میلوں دور دیکھتے ہیں۔ خدا تعالیٰ نے جب چاہا تھا کہ آذر کے بتکدے کو توڑے تو خود اسی کے گھر میں خلیل بت شکن کو پیدا کر دیا تھا۔ ہم کو یقین ہے کہ مسٹر محمد علی بھی علی گڑھ سے اس لئے اُٹھائے گئے ہیں تاکہ اپنے گھر کی دیواروں سے بت پرستی کے نقوش مٹا دیں.....

یونیورسٹی کمیٹی کے متعلق عام طور پر موجودہ حالات نے بے اعتمادی اور شکوک پیدا کر دیئے ہیں۔ کیا اچھا ہو اگر وہ حق گوئی اور بے لاگ سچائی کی قدر و قیمت کو پیش نظر رکھ کے مندرجہ ذیل اُمور پر اپنی معلومات ظاہر کر دیں۔ وہ ابتداء سے شریکِ کار رہے ہیں اور ہم کو شکوک اور سوءِ ظن سے نجات دے سکتے ہیں''۔

(ضیاء الحسن فاروقی ماہنامہ جامعہ اپریل ۱۹۷۹ء ص ۱۰۳)

مولانا محمد علی کب خاموش رہنے والے تھے۔

الہلال کے دونوں مضامین کا جواب دیتے ہوئے اپنا ایک مکتوب شائع کرایا جس کے چند ٹکڑے درج ذیل ہیں:

''مانا کہ الہلال افقِ عالم پر اس وقت نمودار نہ ہوا تھا مگر آزادی کے بدر کامل کو یہ کیسا گہن لگا تھا کہ آج کامل ایک سال بعد ظلمتِ علی گڑھ پر نور ایمان غالب آیا ہے''۔

''آنجناب نے صرف سر ہارکورٹ بٹلر کی ۹/ اگست ۱۹۱۲ء کی تحریر کا ترجمہ علی گڑھ انسٹی ٹیوٹ گزٹ میں پڑھا اور اس میں جو فقرہ ۳۱/ جولائی ۱۹۱۱ء سے ماخوذ تھا اس کی غلط تاویل فرما کر بلا غور و فکر اور بے تامل پچاس ساٹھ مسلمانوں کو کاذب اور فریبی ٹھہرا دیا اور (آگے آیت) کلام الٰہی سے اپنے فتوے کی تصدیق بھی حسب معمول فرما دی، شاید ظن مومن کی یہی تعریف ہو۔ مگر یہ مسائل مذہبی ہیں اور میں محض سگِ دنیا، البتہ اتنا ضرور عرض کروں گا کہ یہ طریقۂ اخبار نویسی خواہ لکھنے والے کے لئے کتنا ہی دل خوش کن اور عوام کے لئے کیسا ہی دلچسپ کیوں نہ ہو، جن پر سب و شتم کی بوچھار پڑتی ہے ان کے لئے ضرور بہت کچھ دل شکن ہے''۔

(ضیاء الحسن فاروقی ماہنامہ جامعہ اپریل ۱۹۷۹ء ص ۱۰۳)

مولانا آزاد نے بھی جوابی وار کیا، لکھتے ہیں:

''آپ نے ''آزادی کا بدرِ کامل'' اگر محض ''ہلال'' کے لئے لکھا ہے تو اس زورِ عبارت سے خود بھی مزہ لیتا ہوں، لیکن اگر طنزاً ہے تو مزاح سے الگ ہو کر مجھے کہنے دیجئے کہ آزادی اور آزاد بیانی کے درجہ کو تو اپنی بساط سے بہت بلند سمجھتا ہوں۔ اس منزل تک پہنچنے کے لئے جن قربانیوں اور خود فروشیوں کی ضرورت ہے وہ ہر کس و ناکس کو نصیب نہیں ہو سکتیں۔ میرے دل میں تو ایک لمحہ کے لئے بھی اس دعوے کا خطرہ نہیں گذرا مگر میری محرومی سے آزادی کی آواز دنیا سے معدوم نہیں ہو سکتی۔ اس کو مجھ

میں نہ ڈھونڈیے۔ البتہ اس کی آواز اُٹھے تو کانوں کو بند بھی نہ کیجئے۔

منکر نتواں گشت اگر دم زغم از عشق
ایں نشہ بمن گر نبود بادِ گرے ہست

(ایضاً ۱۰۳، ۱۰۴)

محمد علی جوہر بھی وار کرنے سے کب چوکتے، اس کا بھی جواب دیا۔ لیکن وہی شائستہ اور شگفتہ انداز میں:

''آپ متعجب ہیں کہ ''ظن المومنین خیرا'' کی کیا یہی تعریف ہے کہ کمیٹی کو ایسے سخت الزام دیئے جائیں؟ لیکن آپ نے اس پر غور نہیں کیا کہ آخر حسن ظن کی کوئی حد بھی تو ہونی چاہئے۔ برسوں مسلمانوں نے اپنے لیڈروں کے ساتھ حسنِ ظن سے کام لیا لیکن اس حسن ظن کا جو نتیجہ نکلا وہ آپ کے دل میں اور میری زبان پر ہے۔ اب تو کچھ دنوں سوءظن ہی سے کام لینے دیجئے۔ آپ نے ''سگِ دنیا'' کے لقب کی ٹوپی خود ہی اپنے سر اوڑھ لی۔ حالانکہ جن سروں کے لئے قطع کی گئی تھی ان کو آپ مجھ سے بہتر جانتے ہیں' گو آپ اس طرف اشارہ نہ کریں۔ حیران ہو کہ آپ کو کسی خیال میں اپنے سے مختلف نہیں پاتا، لیکن پھر دیکھتا ہوں تو بہت دور ہوں۔ اصل بات یہ ہے کہ جام تو آپ کے ہاتھ میں بھی ہے مگر ''فسق'' کے الزام کے لئے میرا ہی وجود موزوں ہے:

لالہ ساغر گیرو نرگس مست و برما نام فسق'' (۱۰۴)

اس کے بعد مولانا آزاد نے فروری اور مارچ ۱۹۱۳ء کی الہلال کی اشاعتوں میں ''حدیث الغاشیہ'' کے عنوان سے اور ''نشۂ نیم شبی کا صبح خمار'' کے تحتی عنوان کے تحت مولانا محمد علی کے انقلابِ حال پر پھبتیاں کسی ہیں۔ گرچہ کہ وہ بادہ و ساغر کی زبان میں ہیں کہیں کہیں صاف نام بھی لیا ہے۔ مولانا محمد علی نے بھی اس کا جواب دیا۔ وہی طرز اپنایا جو مولانا آزاد نے اختیار کیا تھا۔ لیکن دونوں کا انداز بیان شائستہ اور سلجھا ہوا نظر آتا ہے۔

مولانا محمد علی نے مولانا آزاد اور علامہ اقبال کو اپنا مذہبی استاد تسلیم کیا ہے۔ مولانا کی ذہانت اور ذکاوت کی خوب تعریف کرتے ہیں اور ان کو ایک اچھے مقرر بھی مانتے ہیں۔ ایک جگہ ہمدرد میں لکھتے ہیں:

''مولانا ابوالکلام سے میری رقابت کی حقیقت یہ ہے کہ میں ہر جگہ اس کی شہادت دینے کو تیار ہوں کہ مولانا کی ذکاوت و ذہانت مجھ سے کہیں زیادہ ہے''۔
(ماہنامہ نیا دور لکھنؤ، جوہر نمبر ۱۹۸۶ء ص ۲۰۵)

اِن دونوں بزرگوں نے ایک دوسرے پر جو اعتراض کئے ہیں اس میں کہیں بھی ذاتیات کو ذرہ برابر بھی دخل نہیں ہے۔ صرف قوم و ملک کا مفاد عزیز تھا۔ اختلافی نظریات کے پیچھے کبھی بھی اپنی انا کو دخیل ہونے نہیں دیا۔ یہی وجہ ہے کہ ہم دیکھتے ہیں مولانا جوہر آزادیٔ کامل کا مطالبہ کرتے ہوئے دیارِ غیر میں اپنی جان قربان کردی اور مولانا آزاد تقسیم کا تلخ گھونٹ پی کر بھی ہندوستان ہی میں اپنی ناقابل فراموش خدمات سے مسلمانوں کے لیے ہمیشہ کے لیے وقار اور تمکنت کا باعث بنے۔ اور سیاست، صحافت اور ادب میں ایسے نقوش چھوڑے کہ آنے والی نسل ہمیشہ اس سے مستفیض ہوتی رہے گی۔

○○○

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ماہنامہ قومی زبان
حیدرآباد

تلنگانہ ریاستی اُردو اکیڈیمی کا علمی، ادبی، سائنسی، فنی و سماجی جریدہ

QAUMI ZABAN Monthly, Hyderabad



مرزا اسداللہ خان غالبؔ



مولانا محمد علی جوہر



ڈاکٹر سید محی الدین قادری زور



ڈاکٹر محمد غوث ڈائرکٹر / سکریٹری تلنگانہ ریاستی اُردو اکیڈیمی اردو مسکن خلوت حیدرآباد میں اردو اکیڈیمی کے مرکزی دارالمطالعہ و تحقیقی مرکز کے زیر اہتمام بضمن ''نیشنل لائبریری ویک'' 14 تا 20 نومبر 2021 بعنوان ''طلبہ کی ذہن سازی میں کتب خانوں کا رول'' منعقدہ ادبی اجلاس سے صدارتی خطاب کرتے ہوئے۔ تصویر میں ڈاکٹر محمدی اسریٰ سلطانہ، اسسٹنٹ پروفیسر حسینی علم ڈگری کالج برائے اناث، ڈاکٹر محمد عبدالقدوس اسسٹنٹ پروفیسر شعبہ اردو حسینی علم ڈگری کالج برائے اناث، جناب سردار سلیم و دیگر دیکھے جاسکتے ہیں



تلنگانہ ریاستی اردو اکیڈیمی کے زیر اہتمام علامہ اقبال اور مولانا ابوالکلام آزاد کے یوم پیدائش (عالمی یوم اردو اور قومی یوم تعلیم) کے ضمن میں ہائی اسکول، جونیر و ڈگری کالج، یونیورسٹی کے طلبہ و طالبات و ریسرچ اسکالرس کے لئے منعقدہ تحریری مقابلوں کے کامیاب طلباء و طالبات میں ڈاکٹر محمد غوث ڈائرکٹر / سکریٹری اردو اکیڈیمی کے ہاتھوں انعامات کی تقسیم عمل میں لائی گئی۔ اس موقع پر لی گئی تصویر میں ڈاکٹر محمد غوث ڈائرکٹر / سکریٹری کے علاوہ کنوینرس ڈاکٹر محمد ناظم علی، محمد مصطفیٰ علی سروری، ڈاکٹر محمد اسلم فاروقی، ڈاکٹر محمد عبدالقدوس، ڈاکٹر جہانگیر احساس و انعام یافتگان دیکھے جاسکتے ہیں



تلنگانہ ریاستی اردو اکیڈیمی، انڈین کونسل فار کلچرل ریلیشنز اور حیدرآباد آرٹس اینڈ کلچرل اسوسی ایشن کے اشتراک سے 4 ڈسمبر 2021ء کو سالار ملت میموریل آڈیٹوریم، اردو مسکن، خلوت، موتی گلی، حیدرآباد ''شام قوالی'' کا اہتمام کیا گیا، جس میں ممتاز وارثی فیملی کے احمد برادرس نے اپنے فن کا مظاہرہ کیا۔



QAUMI ZABAN Monthly, Hyderabad.

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ایڈیٹر

ڈاکٹر محمد غوث

ڈائریکٹر/سکریٹری تلنگانہ ریاستی اُردو اکیڈیمی

ناشر و طابع

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☆

''قومی زبان'' میں شائع شدہ مضامین میں اظہار کردہ خیالات سے ادارہ کا متفق ہونا ضروری نہیں ہے۔

☆

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ہم کلامی

ہم نے سال 2021 کے آخری مہینے یعنی ماہ ڈسمبر کے شمارے کی ابتداء'' یادرفتگاں'' کے ذیلی عنوان کے تحت نامور شاعر و ادیب مرزا اسداللہ خان غالبؔ پر حافظ وڈاکٹر صابر پاشاہ قادری کے مضمون' عظیم مجاہد آزادی ممتاز صحافی وادیب مولانا محمد علی جوہر پر ڈاکٹر فاروق باشا کی تحریر' دکن کی معروف ادبی شخصیت ڈاکٹر محی الدین قادری زور پر ڈاکٹر جعفر جری اور ڈاکٹر محمد عظمت اللہ خان احساس کے مضامین سے کی ہے۔اس کے بعد تلنگانہ ریاستی اردو اکیڈیمی کے زیر اہتمام شائع ہونے والے بچوں کے رسالے ''روشن ستارے'' پر ممتاز فکشن نگار محترمہ قمر جمالی کا مضمون' جناب جہانگیر عالم اور ڈاکٹر حیدر علی کا ''ریاضی کا خوف: اسباب اور حل کے عنوان سے مشترکہ مضمون' ڈاکٹر شہناز بیگم کا ''تحریک جنگ آزادی سے متعلق اردو میں تاریخیں'' کے عنوان سے' خواجہ کوثر حیات کا ''نئی قومی پالیسی ایک غیر جانب دار جائزہ کے عنوان سے' ڈاکٹر شیخ عبدالطؔ کا مضمون ''ہندوستان میں مساوی مواقع کمیشن کی مطابقت'' جناب محمد عبدالرحیم کا مضمون ''ہندوستان میں درج فہرست ذات اور درج فہرست قبائل کے لئے تحفظاتی پالیسی' حیدرآباد ریاست میں ریڈیو نشریات' کے عنوان سے جناب محمد عقیل احمد کا مضمون ''قطب شاہی دور میں بچوں کے ادب کی نمائندگی'' کے عنوان سے محمد رفیع الدین کا مضمون ''ضلع ورنگل کے چند نامور شعراء'' کے عنوان سے محترمہ آمینہ اختر کی تحریر' اسی طرح نامور افسانہ نگار قدرت اللہ شہاب کا کلاسیکل افسانہ ''ماں جی'' اور آخر میں حسب معمول حصہ نظم میں ممتاز شعرائے کرام جناب رشید شہیدی' جناب راشد احمد راشدؔ' جناب رحیم قمر اور جناب سید تمجید حیدر کے کلام شائع کئے گئے ہیں۔ امید کہ یہ نگارشات ہمارے قارئین کی دلچسپی اور معلومات کا ذریعہ بنیں گی۔

تلنگانہ ریاستی اردو اکیڈیمی اپنے رسالے کے ذریعہ اس زبان کو موجودہ دور کے حساب سے سائنس وٹکنالوجی سے مربوط کررہی ہے' اس سلسلہ میں ہم نے ماہ اکتوبر کے شمارے کو ''سائنس نامہ'' کے عنوان سے شائع کیا جس کی سارے ہندوستان سے پذیرائی ہورہی ہے' ہم چاہتے ہیں کہ یہ سلسلہ جاری رہے اور ہر ماہ دو ایک مضامین سائنس وٹکنالوجی پر شائع ہوں' ہمارے مضمون نگار اس طرف توجہ کریں اور سائنس وٹکنالوجی پر اپنے مضامین روانہ کریں۔

یہ بات قابل ذکر ہے کہ موجودہ حالات خاص کر کووڈ 19 کی دوسری لہر نے انسانی وسائل کو نہ صرف متاثر کیا تھا بلکہ حکومتی آمدنی کو بھی شدید نقصان اٹھانا پڑا۔اس پس منظر میں مختلف حکومتی شعبوں نے اپنا بجٹ کم کرتے ہوئے سرگرمیوں کو انجام دیا جس میں اردو اکیڈیمی بھی شامل ہے۔مگر ان حالات میں بھی اردو اکیڈیمی فروغ اردو کے ضمن میں سال 21-2020 میں بیسٹ ٹیچر ایوارڈ و بیسٹ اردو اسٹوڈنٹ ایوارڈز کی تقسیم کے علاوہ بہت سارے اختراعی پروگرامس منعقد کرچکی ہے جن میں مختصر مدتی آن لائن اردو بنیادی کورس' مولانا آزاد نیشنل اردو یونیورسٹی کے اشتراک سے اردو اساتذہ اور اردو اسکالرس کی تربیت' اسی طرح اردو صحافیوں اور شعراء کی تربیت' ڈاکٹر مری چنا ریڈی ایچ آر ڈی انسٹی ٹیوٹ کے اشتراک سے اردو اکیڈیمی کے ملازمین کی تربیت' ماہنامہ ''قومی زبان'' اور بچوں کے رسالے ماہنامہ ''روشن ستارے'' کی سالگرہ کے ضمن میں ادبی اجلاس' اس کے علاوہ اہم قومی دنوں اور دیگر مواقع پر طلبہ ونوجوانوں کے لئے تحریری مقابلہ جات' ڈگری کی نصابی کتابوں کی اشاعت' اہم اور تاریخی کتابوں کی اشاعت اور بھی کئی اختراعی پروگرامس منعقد کئے گئے۔اردو اکیڈیمی آئندہ دنوں میں مولانا آزاد نیشنل اردو یونیورسٹی اور سیٹ وِن کے اشتراک سے اردو سے فارغ طلبہ کے لئے جاب میلہ منعقد کررہی ہے' علاوہ ازیں ایک سنجیدہ اور مزاحیہ مشاعرہ' تلنگانہ اقلیتی تعلیمی ادارہ جات سوسائٹی کے اشتراک سے ''جشن اردو' اور عالمی اردو کانفرنس کی بھی تجویز ہے۔ ہماری کوشش رہے گی کہ آنے والے سال میں بھی ہم فروغ اردو کے سلسلہ میں کچھ نئے پروگرامس ترتیب دیں۔

بہرحال محبان اُردو سے یہی توقع ہے کہ آنے والے سال کا استقبال ہم اس عزم وارادے سے کریں گے کہ ہم اپنی مادری زبان کی حفاظت کریں گے اور اپنے نونہالوں کو اس زبان سے واقف رکھیں گے۔اس کے ساتھ ساتھ اس زبان کو نئے دور سے ہم آہنگ کرنے کی ہر کوشش کا ساتھ دیں گے۔

آخر میں اس شعر کے ساتھ ہم اپنی بات کو ختم کرتے ہیں:۔

نہ کوئی رنج کا لمحہ کسی کے پاس آئے
خدا کرے کہ نیا سال سب کو راس آئے

محمد غوث

ڈاکٹر محمد غوث
ایڈیٹر

دبیرالملک نجم الدولہ مرزا اسداللہ خان غالبؔ
کی ایک خوبصورت غزل



درد منت کش دوا نہ ہوا
میں نہ اچھا ہوا برا نہ ہوا
جمع کرتے ہو کیوں رقیبوں کو
اک تماشا ہوا گلہ نہ ہوا
ہم کہاں قسمت آزمانے جائیں
تو ہی جب خنجر آزما نہ ہوا
کتنے شیریں ہیں تیرے لب کہ رقیب
گالیاں کھا کے بے مزا نہ ہوا
ہے خبر گرم ان کے آنے کی
آج ہی گھر میں بوریا نہ ہوا
کیا وہ نمرود کی خدائی تھی
بندگی میں مرا بھلا نہ ہوا
جان دی دی ہوئی اسی کی تھی
حق تو یوں ہے کہ حق ادا نہ ہوا
زخم گر دب گیا لہو نہ تھما
کام گر رک گیا روا نہ ہوا
رہزنی ہے کہ دل ستانی ہے
لے کے دل دل ستاں روانہ ہوا
کچھ تو پڑھیے کہ لوگ کہتے ہیں
آج غالبؔ غزل سرا نہ ہوا

مرزا اسداللہ خان غالب

اُردو شاعری سے دِل چسپی نہ رکھنے والا بھی غالبؔ کے نام سے ضرور واقف ہے اور یہ واقفیت اس بات کی غمّاز ہے کہ عظمت کا تاج، اُردو شاعری کے بے تاج بادشاہ مرزا اسداللہ خاں غالبؔ کے سَر ہے۔ غالبؔ کے گوناگوں کمالات میں سے ایک کمال اُن کی تعلّی بھی ہے۔ تعلّی، اُردو شاعری کی اصطلاح میں اپنی بڑائی کے اظہار کو کہتے ہیں۔ غالبؔ کی شاعرانہ تعلّی کے لیے یہاں اُن کے محض ایک شعر سے مدد لی جارہی ہے۔ تاہم، ذہن میں رکھنا ہوگا کہ یہ تعلّی اس قدر وزنی ہے کہ اس کا بوجھ کسی دوسرے شاعر سے شاید ہی اُٹھایا جاسکے۔ یہ شعر کچھ یوں ہے کہ:

ہیں اور بھی دُنیا میں سُخن وَر بہت اچّھے
کہتے ہیں کہ غالبؔ کا ہے اندازِ بیاں اور

دوسرے مصرعے کو خواہ جتنے بھی زاویوں سے پڑھیں، آپ کو غالبؔ کے ذہنِ رسا کی داد دینی ہی پڑے گی۔ مغل سلطنت کا آفتاب غروب ہوا چاہتا تھا لیکن غروب ہوتے ہوئے بھی لعل بدخشاں کے جوڈھیر اس آفتاب نے چھوڑے ان میں سے ایک کو دنیا اسداللہ خاں غالبؔ کے نام سے جانتی ہے۔ یہ زمانہ اگرچہ مغلیہ سلطنت کے سقوط کا تھا لیکن اردو شاعری کا آفتاب نصف النہار پر تھا۔ بہادر شاہ ظفر اگرچہ برائے نام بادشاہ تھے لیکن علم وفن کے قدرداں تھے، ادبی نورتنوں کو اپنے ہاں جمع کررکھا تھا۔ پھر جہاں تک شعروادب کا تعلق ہے، دہلی تو ایسی دلی تھی کہ چشم فلک نے پھر کبھی ایسی دلی نہیں دیکھی ہوگی۔ غالبؔ، ظفرؔ، شاہ نصیرؔ، مولوی فضل حق خیرآبادی، ذوقؔ، مومنؔ، امام بخش صہبائیؔ، میرؔ، مہدیؔ مجروح، ہرگوپال تفتہؔ، شیفتہؔ، حالیؔ، ہرایک دُرِّ نایاب اپنی مثال آپ اور بے بدل تھا۔

غالبؔ نے ہر چند کہ 13-1812 سے دہلی میں سکونت اختیار کرلی تھی لیکن ان کا دلی آنا جانا تو اسی وقت سے تھا جب وہ سن شعور کو پہنچ چکے تھے۔ غالبؔ کے آبا واجداد کا وطن نہ تو دلی تھا اور نہ آگرہ۔ کہتے ہیں ان کے دادا مرزا قوقان بیگ جو تورانی نسل سے تعلق رکھتے تھے، سمرقند کے رہنے والے تھے۔ احمد شاہ ابدالی کے تیسرے حملے (دسمبر 1751ء تا مارچ 1752ء) سے ہندوستان ابھی سنبھل ہی رہا تھا کہ مرزا قوقان بیگ تلاش معاش میں یہاں آئے۔ پہلے تو وہ لاہور میں نواب معین الملک کے ہاں ملازم رہے پھر عالم گیر کے عہد میں دہلی پہنچے اور ڈیڑھ دوسال بعد شاہ عالم کی شہزادگی کے عہد میں شاہی ملازم ہوئے۔ پھر نجف خان کی ملازمت اختیار کی بعد ازاں وہاں سے مستعفی ہوکر مہاراجہ جے پور کے یہاں ملازم رہے۔ اس طرح آگرہ ان کی جائے سکونت بنا۔ مرزا قوقان بیگ کی شادی 1763ء میں ہوئی اور غالبؔ کے والد مرزا عبداللہ بیگ خاں 1765ء میں دہلی میں پیدا ہوئے جن کی شادی آگرے میں 1793ء میں خواجہ غلام حسین خاں کمیدان کی دختر عزت النساء بیگم سے ہوئی۔ ان کے بطن سے 27 دسمبر 1797ء بمطابق 8 رجب المرجب 1212ھ کو غالبؔ پیدا ہوئے۔ مرزا عبداللہ بیگ خاں نے کبھی حیدرآباد میں ملازمت کی تھی، بعد ازاں وہ ریاست الور کی فوج میں ملازم ہوئے۔ 1801ء میں

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ایک گڑھی کے زمیندار سے مقابلہ کرتے ہوئے انھیں گولی لگ گئی اور وہ جانبر نہ ہوسکے۔ ان کی تدفین الور ہی میں عمل میں آئی غالبؔ نے اردو غزل گوئی میں اپنا الگ مقام بنایا وہ دوسروں کی راہ پر چلنے سے کتراتے تھے۔ ابتداء میں فارسی میں شاعری کرتے رہے۔ بعد میں اردو شاعری کی۔ غالبؔ کا اردو دیوان مختصر ہے۔ لیکن اسے عالمی طور پر مقبولیت حاصل ہوئی۔ موضوعات اور انداز بیان میں جدت، شوخی، ظرافت اور دیگر زبان و بیان کی خوبیاں انہیں اردو کا ایک منفرد شاعر بناتی ہیں۔ غالبؔ نے بغیر القاب و آداب استعمال کئے آپسی گفتگو کی طرح خط لکھے جو بہت مشہور ہوئے۔ مجموعی طور پر غالبؔ نے اردو شاعری کو نئی فکر عطا کی اور آج بھی ان کی شاعری سے نئے مفاہیم تلاش کئے جارہے ہیں۔

غالبؔ کی شاعری میں جا بجا قلندرانہ صوفیانہ رنگ ملتا ہے ایک شعر دیکھیں کہ:

ہاں۔! بھلا کر تیرا بھلا ہوگا
اور درویش کی صدا کیا ہے

اس مختصر سی زندگی میں انسان کیا کیا تکلیفیں اور دکھ برداشت کرتا ہے کہ ایک وقت ایسا بھی آتا ہے کہ انسان زندگی میں ملے مسلسل دکھوں و رنج سے دل برداشتہ ہوکر رونے کو مجبور ہوجاتا ہے اور پھر وہ بے اختیار کہہ اٹھتا ہے کہ:

دل ہی تو نہ سنگ و خشت درد سے بھر نہ آئے کیوں
روئیں گے ہم ہزار بار کوئی ہمیں ستائے کیوں

انھیں اس بات کا بھی احساس ہے کہ اللہ نے جس مقصد کے لیے انھیں اس دنیا میں بھیجا تھا اس کا حق اس سے شاید ادا نہ ہوسکا۔ اسی کے چلتے وہ خود پہ طنز کرتے ہوئے کہتے ہیں کہ:

کعبہ کس منہ سے جاؤ گے غالبؔ
شرم تم کو مگر نہیں آتی

اسی غزل کے ایک دوسرے شعر میں موت کے معین و مقرر ہونے کی حکایت کو اس طرح بیان کرتے ہیں کہ:

موت کا ایک دن معین ہے
نیند کیوں رات بھر نہیں آتی

غالبؔ کو اس بات کا بھی احساس تھا کہ اللہ پاک نے جو عقل سلیم اور تصوفانہ طبیعت و صلاحیت انھیں عطا کی ہے اگر وہ اس کا صحیح طریقہ سے یعنی خدا کے بتائے ہوئے احکام کے مطابق استعمال کرتے تو آج وہ یقیناً ایک ولی کی حیثیت میں ہوتے۔ ملاحظہ فرمائیں:

یہ مسائلِ تصوف یہ تیرا بیان غالبؔ
تجھے ہم ولی سمجھتے جو نہ بادہ خوار ہوتا

غالبؔ کے کچھ اشعار ایسے بھی ہیں جن میں وہ صحابہ کی سوچ و فکر پہ پہرا دیتے ہوئے دِکھائی دیتے ہیں۔ جیسے کہ حضرت ابوبکرؓ جنکے تعلق سے اللہ کے آخری پیغمبر حضرت محمد ﷺ نے دنیا میں ہی جنتی ہونے کی بشارت دی ہے اس کے باوجود ابوبکرؓ یوم حشر میں اللہ کی بارگاہ میں پیش ہونے سے کس قدر ڈرتے تھے کہ فرمایا کرتے تھے کہ کاش میں کوئی درخت ہوتا جو کاٹ دیا جاتا، کبھی فرماتے کاش میں کوئی گھاس ہوتا کہ جانور اس کو کھالیتے، کبھی فرماتے کاش میں کسی مومن کے بدن کا بال ہوتا۔ ایک مرتبہ باغ میں تشریف لے گئے اور ایک جانور کو بیٹھا

ادبی گوشہ

دیکھ کر ٹھنڈا سانس بھرا اور فرمایا کہ تو کس قدر لطف میں ہے کہ کھاتا ہے پیتا ہے، درختوں کے سائے میں پھرتا ہے اور آخر میں تجھ سے کوئی حساب کتاب نہیں۔ کاش ابوبکرؓ بھی تجھ جیسا ہوتا۔ ہم سمجھتے ہیں کہ مذکورہ واقعہ میں پیش کیے خیالات کی ترجمانی غالبؔ نے اپنے درج ذیل اشعار میں کچھ اس انداز میں کی ہے کہ:

نہ تھا کچھ تو خدا تھا، کچھ نہ ہوتا تو خدا ہوتا
ڈبویا مجھ کو ہونے نے، نہ ہوتا میں تو کیا ہوتا

غالبؔ کو احساس تھا کہ ایک دن موت آنی ہے اور اس کے بعد انسان کو اپنے اچھے برے اعمال کا اللہ کے یہاں روز محشر میں حساب دینا ہے' یہی وجہ ہے کہ اپنے وجود پہ پچھتاوے کا اظہار کرتے ہیں اور کہتے ہیں جب دنیا میں کچھ بھی نہیں تھا تو خدا تھا' اگر یہ دنیا کی سبھی چیزیں انسان وغیرہ وغیرہ نہ ہوتے، تب بھی خدا کی واحد ذات ہوتی۔ لیکن میرے ہونے نے گویا مجھے ہلاکت میں ڈال دیا ہے۔ اگر میں دنیا میں پیدا نہ ہوا ہوتا تو روزِ جزا میں حساب کتاب دینے سے بچ جاتا۔ جہاں غالبؔ نے اپنی شاعری میں قاری کے لئے نامانوس، اجنبی تشبیہات اور استعارات، غیر مرئی اشیا کو مرئی اشیا کی حیثیت سے پیش کیا ہے وہیں نشتریت، کثیر المعانی خیالات، ایجاد وابداع، فکر و تصوف، تصورات کی ندرت، دقیق مطالب، تراکیب، مضامین، الفاظ کی بندش، معنی آفرینی، شوخی تحریر اسلوب، فلسفہ حیات۔ غرض یہ کہ غالبؔ کے بیشتر تاثرات ذاتی تجربات اور عینی مشاہدات کی بنیاد پر مبنی محسوس ہوتے ہیں جس میں صداقت کی تہہ داری پنہاں ہے، قدرتی جبر و انسان کی بے چارگی، ظریفانہ شوخی اور طنزیہ اشعار ملاحظہ فرمائیے:

پکڑے جاتے ہیں فرشتوں کے لکھے پر ناحق
آدمی کوئی ہمارا دمِ تحریر بھی تھا

جس پاس روزہ کھول کے کھانے کو کچھ نہ ہو
روزہ اگر نہ کھائے تو ناچار کیا کرے

کی مرے قتل کے بعد اس نے جفا سے توبہ
ہائے اس زود پشیماں کا پشیماں ہونا

اس بحث کا محاصل یہ ہے کہ غالبؔ ایک ذی شعور فنکار تھے۔ ان کے اشعار کی نفسیاتی اور عملی زندگی کے علاوہ ان کی نظریاتی تھیوری کو سمجھنے میں مددگار ہیں۔ غالبؔ کا ایک مقبول و معروف شعر ہے:

قاصد کے آتے آتے خط اک اور لکھ رکھوں
میں جانتا ہوں جو وہ لکھیں گے جواب میں

اردو کے مقبول ترین شاعر اسداللہ خاں غالبؔ کو دنیا ایک شاعر کی حیثیت سے جانتی اور مانتی ہے لیکن ان کے خطوط ان کے دور کی بہترین عکاسی کرتے ہیں جس سے اکثر لوگ ناواقف ہیں۔ غالبؔ کی شاعری ان کی شخصیت کی پہچان ہے لیکن غالبؔ نے اپنے دوستوں، شاگردوں اور نوابوں کو بہت سے خطوط لکھے۔ یہ خطوط انھیں سمجھنے کے لیے ان کی شاعری کی ہی طرح اہم ہیں۔ ان خطوط میں خوشی ہے، شفقت ہے، بے بسی ہے، التجا ہے، تعصب ہے، پریشانیوں کا ذکر ہے، دل کی جلن ہے، آب و ہوا کا احساس ہے، شراب ہے، مرغیوں کے انڈوں کے برابر گرنے والے اولے ہیں، بارش ہے۔ کھیت ہیں، ربیع و خریف کی فصلیں ہیں، گھر کی دیواروں کی دراڑیں ہیں، دیواروں تلے دب کر مرنے والے لوگ ہیں، انسان کے سکھ

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چین پر ٹوٹ پڑنے والے لشکر ہیں، قحط ہیں، سیلاب ہیں، وبائیں ہیں، بخار ہیں، رات کی تاریکیاں ہیں، رات کی تاریکیوں میں نقب لگا کر تختے، دروازے اور چوکھٹیں نکال کر لے جانے والے چور ہیں، اس چوری سے پریشان غریب غربا ہیں، جیٹھ یعنی مئی جون کی گرمی اور گرم ہوائیں ہیں، گرمیوں کی شدت کم کرنے کے لیے خس ہے، شاعری اور ادب کے تعلق سے مباحثے ہیں، مالی تنگیوں کا رونا ہے، گندم، چنے، باجرے، بیسن اور گھی کی آسمان چھوتی قیمتیں ہیں۔ قبل از وقت مرگ کا نوحہ ہے، دوستوں سے بچھڑنے کا رنج ہے، یادیں، افسردگی، اجڑے اور ویران بازار ہیں، حویلیوں کا ذکر ہے۔ گزرے ہوئے ماضی اور آنے والے مستقبل کا ذکر ہے۔ غالبؔ منٹو کی طوائف کی روشنی میں 'غالبؔ اردو کا پہلا جدید ذہن تھا' غالبؔ کے اشعار سے سجی کولکتہ کی گلیاں۔

غالبؔ کے خطوط کا ایک دلکش حصہ کاغذ پر بکھرے ہوئے موسم کے رنگ ہیں، یہ خطوط آب وہوا کے مرقعے ہیں، یہ اس دہلی کا منظر پیش کرتے ہیں جس کے اوپر کے آسمان اور آنکھوں کے درمیان گرد کا پردہ نہیں تھا۔

رات ہوتے ہی انجمِ رخشندہ یعنی کہکشاں اس طرح پھیل جاتی تھی جیسے کوئی روشنیوں سے جگمگاتا ہوا مندر اپنے دروازے کھول رہا ہو اور اس کی روشنی سے سارا ماحول روشنیوں میں نہا گیا ہو۔ شاید اسی طرح کے کسی منظر کے تحت مرزا غالبؔ کے دل نے یہ کہا ہوگا۔

شب ہوئی پھر انجمِ رخشندہ کا منظر کھلا
اس تکلف سے کہ گویا بت کدے کا در کھلا

ہوئی مدت کہ غالبؔ مر گیا، پر یاد آتا ہے
وہ ہر اک بات پر کہنا کہ یوں ہوتا کیا ہوتا؟

پتا نہیں غالبؔ کے اس شعر کو اچھے اشعار میں شامل کیا جا سکتا ہے یا نہیں، اس لیے کہ ایک حلقہ ان کے علامتی اور استعاراتی اشعار ہی کو ان کے اچھے اشعار سمجھنے اور سمجھانے پر مصر ہے اور دوسرا حلقہ صرف بیانیہ اشعار ہی کو غالبؔ کا ''اصلی'' رنگ سمجھتا ہے۔ مجھے یہ شعر اس لیے پسند ہے کہ غالبؔ کا یہ شعر ایک روشن دماغ اور سوالیہ ذہنیت کا نمائندہ ہے۔ میری ناچیز رائے میں ہر مسئلے اور اس سے وابستہ سوالات کا حرف آغاز ''یوں ہوتا تو کیا ہوتا'' میں پنہاں ہے۔ یہی وجہ ہے کہ میرے لیے غالبؔ کا یہ شعر انوکھی کشش رکھتا ہے۔ میں نہ تو غالبؔ کا ماہر ہوں اور نہ ہی میں نے غالبیات کے سلسلے میں لکھی گئی ساری کتابیں اور مضامین پڑھے ہیں، ہاں چند کتابوں اور چند مضامین کا مطالعہ کیا ہے اور کلیات غالبؔ (ڈاکٹر گیان چند نسخہ عرشی کو اسی نام سے یاد کرتے ہیں اور میں سمجھتا ہوں کہ یہ صحیح بھی ہے) کا مطالعہ کرنے کا شرف ضرور حاصل ہے، اس لیے میں اپنے ''پراگندہ ذہن'' کی مدد سے چند باتیں لکھنے کی جرأت کر رہا ہوں۔

مجھے ہمیشہ کی طرح غالبؔ کی شخصیت کا مطالعہ ایک ایسے ڈیلیما سے دوچار کرتا ہے جس کا حل آسان نہیں ہے۔ غزل کا بنیادی موضوع حسن وعشق کی باتیں کرنا ہے۔ واردات قلبی کا اظہار اس کا خاصہ ہے، ابتدائی دور کی غزلوں میں معاملات عشق، عاشق، معشوق اور رقیب کا ذکر کثرت سے ملتا ہے۔

میرؔ سے غالبؔ تک کے عہد میں غزل اپنی کلاسیکی روایت پر قائم رہی یعنی عشقیہ کیفیات کی مختلف جہتیں بیان کی

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جاتی رہیں لیکن کے بعد اس کے موضوعات تبدیل ہوگئے۔ حالؔی نے اس پر قدغن لگا اور سادگی اصلیت اور جوش کی بنیاد پر اسے حقیقی زندگی کا ترجمان بنایا اور اس سے قوم کو بیدار کرنے کے لیے انقلابی روح پھونکی جس کے بعد اس کے موضوعات تبدیل ہونے لگے۔ ذہنی وفکری تقاضوں کی تکمیل کے ساتھ ساتھ سیاسی وسماجی تقاضوں کو پورا کرنے کی کوشش کی گئی۔ چنانچہ ۱۸۵۷ کے بعد غزل میں سیاسی وسماجی مسائل کی عکاسی کی جانے لگی۔ حتیٰ کہ غالبؔ نے عشق کو فلسفیانہ نظر سے دیکھا۔ اس کے بعد یہ روایت قائم ہوگئی جس میں تصوف و فلسفہ کو موضوع بنایا جانے لگا۔ غالبؔ کا آخری دور ہی جدید غزل کا آغاز ہے غالبؔ نے غزل کو فکر وخیال کی گہرائی عطا کی۔ اس کے بعد یہ اثر فانیؔ اور اصغرؔ کے یہاں دکھائی دیتا ہے، چونکہ حالیؔ نے غزل کی اصلاح کے ذریعے شعرا کو جدید موضوعات سے باخبر کردیا تھا۔ حالیؔ نے شاعری کا جو اصول مرتب کیا تھا اقبالؔ نے اس سے خوب فائدہ اٹھایا بلکہ اس سے ایک قدم آگے بڑھ کر اس میں فکر وخیال کی نئی روح پھونکی جس میں خودی کی شناخت اور عظمت رفتہ کی یاد اور ملت اسلامیہ کی شیرازہ بندی کا پیغام تھا۔ حالیؔ نے جس چیز کی شکایت کی تھی اقبالؔ نے اسے پورا کر دکھایا لیکن جدید غزل کی تشکیل نو اور اس کی احیا میں فانیؔ، اصغرؔ، حسرتؔ اور جگرؔ کو نمایاں مقام حاصل ہوا ان لوگوں نے غزل میں داخلی کیفیات اور واردات قلبی کا اظہار کیا۔ فراقؔ اور چکبستؔ نے زندگی کے بنیادی حقائق کو بیان کیا جس میں سیاسی وسماجی مسائل کی عکاسی کی گئی تھی۔ اس کے بعد ترقی پسند تحریک کے زیر اثر غزل کو انقلاب زمانہ کا حصہ بنا دیا گیا اور اس میں انقلاب زندہ باد کے نعرے، تحریک آزادی کی گونج، سرمایہ دارانہ نظام کے خلاف بلند ہوتی ہوئی آواز حب الوطنی کے گیت اشتراکی نظام کی عکاسی، مارکسی نظریہ، اجتماعی مسائل، مزدوروں کی نمائندگی، عورتوں کے حقوق، نوآبادیاتی نظام کے اثرات اس میں دکھائی دینے لگتے ہیں۔ اس دور میں مجازؔ، جذبیؔ، فیضؔ، فراقؔ، مخدومؔ محی الدین وغیرہ نے اس خیال کی کھل کر نمائندگی اور غزل کو نئے موضوعات سے روشناس کرایا۔ غالبؔ کی شخصیت جامع الصفات تھی۔ وہ ایک شاعر کی حیثیت سے معروف تو ہیں ہی، ایک نثر نگار کی حیثیت سے بھی ان کا پایہ بلند ہے۔ ان کے خطوط اردو میں جدید نثر کا سنگ بنیاد ہیں۔ اس کے علاوہ بھی ان کی چند ایک کتابیں ہیں۔ شاعری میں غالبؔ نے قصیدے لکھے اور مثنویاں وغیرہ بھی لیکن جس صنف کی وجہ سے غالبؔ، غالبؔ ہیں وہ ان کی غزل ہے۔ غالبؔ کو فارسی اور اردو، دونوں زبانوں پر قدرت حاصل تھی۔ انھیں اردو سے زیادہ اپنی فارسی دانی پر فخر تھا۔ انھوں نے کبھی اپنی فارسی شاعری پر ناز کرتے ہوئے اردو شاعری کو "بے رنگ من است" کہا تو کبھی اردو شاعری کو رشک فارسی قرار دیا۔ ابتدا میں وہ فارسی شاعر بیدل کی پیروی کرتے تھے۔

☆☆☆

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یادرفتگاں

مولانا محمد علی جوہر کی انگریزی صحافت

مولانا محمد علی جوہر تحریک آزادی کے جانباز سپاہی، بے باک اور نڈر صحافی تھے۔انہوں نے اپنی تحریری اور تقریری صلاحیتوں سے ملک کی آزادی کے لیے جدو جہد کی۔اردو اور انگریزی زبان میں اخبارات جاری کیے۔مولانا کا باضابطہ صحافتی میدان میں داخلہ ''ٹائمز آف انڈیا'' میں سلسلہء مضامین سے ہوا' جس میں ''موجودہ بے چینی پر چند خیالات'' کے عنوان سے مضامین لکھتے رہے۔ٹائمز آف انڈیا ایک معیاری اخبار تھا۔مولانا اپنے مضامین کے ذریعہ ملک کے حالات پر بے باک تجزیہ پیش کرتے اور سیاسی مسائل پر بے لاگ تبصرہ کرتے۔مولانا کے خیالات سے لوگوں کو اتفاق ہو یا نہ ہوالبتہ ان کے انگریزی اسلوب پر سب لوگ فدا تھے۔مولانا نے بہت ہی جلد بہ حیثیت انشاء پرداز اور کالم نویس اپنی شناخت بنالی۔نومبر ۱۹۰۷ء میں ٹائمز آف انڈیا میں شائع شدہ مولانا کے مضامین "Some thoughts on present discontentment" کے عنوان سے کتابی صورت میں بمبئی سے شائع ہوئے۔

ٹائمز آف انڈیا کے علاوہ ''ابزرور'' اور ''انڈین ریویو'' میں بھی مولانا کے مضامین شائع ہوئے۔مولانا ہمیشہ انتہائی اہم موضوعات پر قلم اُٹھاتے اور نہایت سنجیدگی اور وضاحت کے ساتھ اپنی بات پورے وثوق اور دلائل کی روشنی میں پیش کرتے۔ مولانا محمد علی کے بارے میں مشہور انگریزی ادیب ایچ جی ویلز نے کہا تھا ''ان کا دل نپولین کا، ان کی زبان برک کی، اور ان کا قلم میکالے کا تھا''۔

مولانا مودودیؒ کہتے ہیں:

''وہ ایک غلام ملک کا باشندہ تھا لیکن دنیا کی سب سے بڑی سامراجی حکومت اس سے ڈرتی تھی۔ وہ بڑی آسانی سے انگریزی دور میں کم سے کم وائسرے کی اکزیکٹیو کونسل کا ممبر تو بن ہی سکتا تھا لیکن ان مناصب عالیہ پر اس نے کبھی نگاہِ غلط انداز ڈالنا بھی گوارا نہ کیا''۔(شخصیات، ابوالاعلی مودودی، ص ۱۱۸۹)۔

کامریڈ کا محرک: کامریڈ نکالنے کا اصل مقصد یہ تھا کہ اس کے ذریعہ مسلمانوں میں قومی بیداری پیدا کی جائے اور انھیں ایک فکر پر مجتمع کیا جائے۔مولانا کا خیال تھا کہ اس مقصد کے لیے اُردو اخبارات کافی نہیں ہیں اور جو اخبارات اس وقت انگریزی میں شائع ہو رہے تھے وہ مسلمانوں کی مکمل ترجمانی نہیں کرتے تھے۔اس لیے مسلمانوں کی آواز ایوان حکومت تک پہنچتے پہنچتے دب کر رہ جاتی۔مولانا نے سوچا ایک انگریزی اخبار کے ذریعہ مسلمانوں کے خیالات کو ایوان حکومت اور ارباب حکومت تک بہ آسانی پہنچایا جاسکتا ہے۔

اس مقصد کے لیے مولانا نے کلکتہ سے کامریڈ جاری کیا۔ رئیس احمد جعفری کامریڈ کے بارے میں لکھتے ہیں:

''حاکموں، محکوموں، انگریزوں، ہندوستانیوں، سارے انگریزی داں طبقے میں اس کی دھوم مچ گئی کیونکہ وہ قوم کی خستہ حالت کی عکاسی کررہا تھا۔اس کا اصلی مقصد یہ تھا کہ ہندوستان کے مسلمانوں میں، خاص طور سے تعلیم یافتہ طبقہ میں خودداری کے احساسات میں بیداری پیدا ہو اور اس سے انگریزوں کی گرفت سے نکلنے کا راستہ اختیار کریں۔اس کے اجراء کے ساتھ ہی مقبولیت کا ڈنکا بجانا شروع ہوگیا۔ اس پرچہ کی شہرت کا یہ عالم تھا کہ لارڈ ہارڈنگ وائسرائے ہفتہ بھر پرچے کو نہ چھوڑتے تھے۔لیڈی ہارڈنگ اس کی منتظر رہتیں۔مسٹر میک ڈانلڈ، وزیراعظم برطانیہ بالالتزام کامریڈ پڑھتے تھے، جرمنی کا ولیعہد اس کا خریدار تھا۔سرفلیٹ وڈلسن ہندوستان سے جاتے ہوئے اپنے دوست اور لندن والوں کے لیے پرچے تحفۃً لے گئے''۔ (سیرت محمد علی۔ص۱۹۸)

کامریڈ کا اسلوب: کامریڈ اپنے منفرد اسلوب کی بدولت بہت جلد ایک انٹرنیشنل اخبار بن گیا۔اس کے خریدار نہ صرف ہندوستان بلکہ برطانیہ میں بھی موجود تھے۔صرف برطانیہ میں تین سو خریدار تھے۔کامریڈ کے دور اول کا اسٹاف لائق اور تجربہ کار تھا۔ان کے تعاون سے کامریڈ نے بہت جلد کامیابی حاصل کرلی۔کامریڈ میں ملک کے سیاسی، سماجی اور اسلامی موضوعات پر کھل کر بحث کی جاتی۔ عالم اسلام کے مسلمانوں کے مسائل حل کرنے کی کوشش کی جاتی۔کامریڈ کا اداریتی نوٹس خود مولانا تحریر کرتے۔ان کے غیاب میں راجہ غلام حسین لکھتے۔راجہ غلام حسین ایک سلجھے ہوئے انگریزی کے پختہ قلم کار تھے۔ بسا اوقات ایڈیٹر اور راجہ صاحب کی تحریروں میں فرق کرنا محال ہوجاتا۔

کامریڈ میں ''گپ''(Gup) کے عنوان سے ایک مستقل فکاہیہ کالم شائع ہوتا جس نے بہت مقبولیت حاصل کی۔ اس کالم میں سماجی اور سیاسی مسائل کے مضمرات کو فکاہیہ مولانا کی صحافتی قابلیت کا ذکر کرتے ہوئے جناب محمد اسحاق صاحب رقمطراز ہیں۔

''اُن کی (مولانا محمد علی کی) صحافتی گل کاری، طرز تحریر کی انقلاب آفرینی، الفاظ ومحاورات کی رفعت شان استدلال کی اصابت، زور بیاں کی اثر انگیزی، سیاسی فکر ونظر کی پختہ کاری اور طنز ومزاح کی سلامت روی کے ساتھ تلخی اور ترشی نے نہ صرف ہندوستان کے سیاسی حلقوں میں ہلچل پیدا کردی۔ بلکہ مغرب کے عالی مرتبت ارباب دانش اور اہل سیاست بھی ان کو خراج تحسین پیش کرتے رہے''۔ (معارف اعظم گڑھ،ص۳۶۲)

کامریڈ نے اپنے اسلوب بیان کی ندرت اور مضامین کی دلنشینی کے باعث بہت جلد بین الاقوامی شہرت حاصل کرلی۔درجہ ذیل سطور میں کامریڈ کے اسلوب کی چند جھلکیاں ملاحظہ ہوں۔

کامریڈ کا شہرہ آفاق کالم گپ (Gup) کا ایک اقتباس ملاحظہ ہو جس میں آنریری مجسٹریٹ کا نقشہ کھینچا گیا ہے:

"He is an apollilisis of intellectual inanity, and an official recognition of native imbecility..... His loyalty is an over mastering passion".

''ایسی عقل جو اپاہج اور بے دم ہو، اس کو دیوتا بنادیا گیا اور اس کا نام رکھ دیا گیا آنریری مجسٹریٹ یا اسے ذہنی نامردی کا سرکاری اعتراف کہیے۔ اس کی سرشت کا غالب عنصر اس کا تیز وتند جذبہ وفاداری ہے''۔

ستمبر ۱۹۱۹ء میں لندن ٹائمز نے The Choice of the turks کے نام سے ایک افتتاحیہ اداریہ شائع کیا جس میں ترکوں کو جنگ عظیم میں شرکت نہ کرنے اور مکمل غیر جانبدار رہنے کی دھمکی دی گئی۔ لندن ٹائمز کے اداریہ کا آغاز یوں ہوتا ہے:

"Let the Turks be under no delusion. The stand at the parting of the ways. If they elect for war at the bidding of Germany, they will be staking their existence as a state".

''ترک کسی مغالطے میں نہ رہیں۔ (اس وقت) وہ اس مقام پر کھڑے ہیں جہاں سے راستے جدا ہو جاتے ہیں۔ اُنھوں نے جرمنی کے کہنے پر جنگ میں کود پڑنے کا فیصلہ کیا تو ان کا یہ قدم اپنی مملکت کے وجود کو داؤ پر لگانے کے مترادف ہوگا''۔ (محمد علی، شخصیت وخدمات، نظر برنی، ص: ۲۰۸)

اس کے علاوہ ترکوں کو لالچ دی گئی کہ اگر اس نے اتحادیوں کا مطالبہ تسلیم کرلیا تو اسے مملکت عثمانیہ کی سلامتی، مالی امداد اور اسے جرمنی کے یک طرفہ معاہدوں سے نجات دلانے کی ضمانت بھی دی جائے گی۔ اس کے ساتھ یہ بھی دھمکی دی گئی کہ اگر اس نے جرمنی کا ساتھ دیا تو اتحادی طاقتیں سلطنت عثمانیہ کا نام ونشان مٹادیں گے۔

لندن ٹائمس کے مضمون کی تلخی اور دھمکی آمیز لہجہ کو دیکھ کر مولانا کو شک ہوا کہ کہیں ترکی اس قدر تلخ لہجہ کو برداشت نہ کرکے برطانوی فوج کے خلاف جنگ کر نہ بیٹھے، چنانچہ ترکوں کو روکنے کے لیے بھی مولانا نے یہ مضمون لکھا۔ مولانا کا مضمون ۲۶ ستمبر ۱۹۱۴ء کو کامریڈ میں شائع ہوا۔ مولانا کے کئی دوست احباب نے اس مضمون کو شائع نہ کرنے کا مشورہ دیا اور سراسر اس کو مصلحت وقت کے منافی قرار دیا۔ لیکن مولانا کب ماننے والے تھے' ان کا طرہ امتیاز صحافت ''کلمۃ حق عند سلطان جائر'' تھا چنانچہ مولانا نے اس مضمون کو شائع کرنے کا فیصلہ کیا۔ مولانا محمد علی کہتے ہیں:

''میں جانتا ہوں میں نے موت کے وارنٹ پر دستخط کیے ہیں مگر اب میں رائے قائم کرچکا ہوں، جو ہونا تھا وہ ہوچکا، اب کچھ نہیں ہوسکتا''۔ (ہندوستانی ادب کے معمار، مولانا محمد علی جوہر، شہزاد انجم، ص: ۵۵)

مولانا نے اس مضمون میں ترکوں میں اسلام کے پہنچنے کی مکمل تاریخ پیش کرنے کی کوشش کی ہے اور اس مضمون کے ذریعہ لندن ٹائمس کی دھمکیوں، جھوٹے دعوؤں،

تاریخ کوتوڑ مروڑ کر پیش کرنے اور انگلینڈ کے خود عالم اسلام کے دوست کے طور پر سامنے لانے کی خواہش کا پردہ چاک کر کے دنیا کے سامنے رکھ دیا ہے۔

مولانا نے کامریڈ کو جس انداز سے شروع کیا آخری دور میں ان کی قوت مختلف سمتوں میں تقسیم ہونے کی وجہ سے وہ انداز باقی نہیں رہا۔ مولانا وقت کی پابندی کرنے سے بھی قاصر رہے۔ حالات نے بھی ان کا ساتھ نہیں دیا۔ نتیجتاً ۲۲؍جنوری ۱۹۲۶ء کا شمارہ کامریڈ کے لیے آخری ثابت ہوا اور کامریڈ ہمیشہ کے لیے بند ہوگیا۔

مولانا کامریڈ کے ذریعہ ہندو مسلم اتحاد کے لئے صدق دل سے کوشاں رہے۔ وہ ہندوستان کو انگریزوں کے تسلط سے نکالنا چاہتے تھے اور مسلمانوں کو عظمت رفتہ کی یاد دلا کر ان کو بیدار کرنا اور اقوام عالم میں انھیں ایک باعزت مقام دلانا چاہتے تھے۔ مولانا کا قول ہے ''میں نے ہمیشہ اتحاد کی حمایت کی اور میرے اخبار کا نام کامریڈ اسی پر دلالت کرتا ہے''۔

مولانا اپنی ہنگامہ خیز سیاسی مصروفیتوں کی وجہ سے آخر میں کامریڈ کے لیے زیادہ وقت نکال نہ سکے جس کی وجہ سے کامریڈ کا دور ثانی پہلے دور کی طرح روشن نہیں رہا۔ احمد سعید ملیح آبادنے بالکل صحیح لکھا ہے:

''کامریڈ دنیائے صحافت میں ایک دھماکہ بن کر نمودار ہوا اور اس شان سے نکلا کہ انٹرنیشنل اخبار بن گیا اور جب تک نکلا، اپنے قدردانوں میں خوب مقبول رہا۔ اگرچہ دور ثانی ۱۹۲۵ء تا ۱۹۲۶ء میں حالت یہ ہوگئی تھی کہ کامریڈ نام کو تو ہفتہ وار تھا مگر مہینے میں کہیں ایک آدھ ایشو جیسے تیسے نکل جاتا جس میں مولانا محمد علی کی زندگی کے آخری دور کی بے ترتیبی، بدنظمی اور انتشارِ ذہن کو دخل تھا''۔ (اردو معلیٰ غالب نمبر ۳۱۸)

کامریڈ کا بے باک لہجہ ہمیشہ یاد رکھا جائے گا۔ اس دور میں جبکہ دوسرے اخبار انگریز حکومت کی مدح سرائی میں مصروف تھے' کامریڈ نے حکومت کی پالیسیوں کی کھل کر مخالفت کی اور انگریزی زبان کا جو رعب و دبدبہ اور نفسیاتی دباؤ ہندوستانیوں پر چھایا ہوا تھا اس کو مولانا نے کامریڈ کے ذریعہ ختم کرنے کی کوشش کی۔ مسلمانوں کے خیالات کو حکومت وقت تک پہنچانے کے لیے کامریڈ نے اہم رول ادا کیا ورنہ ان کی آواز کو دبایا اور کچلا جارہا تھا۔ مسجد کانپور کے مسئلہ میں مولانا محمد علی نے کامریڈ کے ذریعہ حالات کی صحیح عکاسی کی۔ کامریڈ نے خبروں کی صحت کے معیار کو قائم رکھا، بے ہودہ اشتہارات اور بغیر تصدیق کے خبروں کی اشاعت سے اپنے آپ کو باز رکھا۔ کامریڈ ایک غیر جانبدار اخبار تھا، بے جا کسی کی طرف داری کو اس نے اپنا شعار نہیں بنایا۔

غرض مولانا نے جن مقاصد کے تحت کامریڈ اخبار نکالا' اُن میں مولانا پوری طرح کامیاب نظر آتے ہیں۔

☆☆☆

ڈاکٹر شیخ فاروق باشا
اسسٹنٹ پروفیسر
گورنمنٹ ڈگری کالج، رائے چوٹی' آندھرا پردیش

یادرفتگاں

ڈاکٹر زورؔ کی مقدمہ نگاری

مشرقِ وسطیٰ اور وسط ایشیا کے ملکوں کی طرح ہندستان میں بھی صوفی خانقاہیں قائم تھیں ۔انہی خانقاہی نظام کے حضرت سانگڑے سلطانؒ سے ہوتے ہوئے حضرت زعمؒ کی اولاد میں ڈاکٹر سید محی الدین قادری زورؔ ،جو اپنی ذات میں ایک اِدارہ تھے اور اپنے علمی و اَدبی کارناموں کی بنا اَدبی دنیا میں ایک بڑے اسکالر مانے جاتے ہیں ۔اُردو اَدب کے اِس اعلیٰ پایہ سپوت نے نہ صرف دکنی زبان و اَدب کی حفاظت کے لیے بہترین سعی کی بلکہ اپنے رفقا و شاگردوں کے ساتھ ایک کاروانِ اَدب کو اپنے ہم راہ لیے ہرطرح سے اُردو اَدب کی بقاء اور ترویج وترقی کا سلسلہ شروع کیا۔

ڈاکٹر زورؔ بیک وقت اَدیب ، نقاد، محقق ، ماہر لسانیات ، ماہر دکنیات ، مورخ ، مدون اور شاعر تھے ۔ یہی وہ خوبی تھی کہ اَدب کی تقریباً سبھی اَصناف پر اپنی تحریریں ثبت کی ہیں جن میں سے ایک اُن کے لکھے ہوئے مقدمے بھی ہیں ۔جس میں ڈاکٹر زورؔ کی تحریر کا اپنا ایک مخصوص اَنداز اور طرز بیان ہے ،''اِفاداتِ زورؔ'' میں شامل مقدمات کی روشنی میں چند اَقتباسات کے ساتھ یہ مضمون رقم کرنے کی کوشش کی گئی ہے جن کی اپنی ایک ندرت ہے ۔ڈاکٹر زورؔ نے نہ صرف بڑے اُدبا وشعرا اور اپنے ساتھیوں کی تصنیفات پر مقدمے لکھے ہیں بلکہ نئے لکھنے والے اور اپنے شاگردوں کی تحریر کردہ تصانیف پر بھی مقدمات لکھتے ہوئے اُن کی بھرپور ہمت افزائی بھی کی ہے۔

ایک زمانہ تھا آر۔ایچ ۔ پول نے اپنی انگریزی شگفتہ تحریروں کی وجہ سے کافی مقبولیت پائی تھی جس کے انگریزی ناول ''ہزمیک بلیو وائف'' کا اُردو زبان میں ترجمہ کی ہوئی عباس حسین لطفی کی کتاب ''مصنوعی بیوی'' کے مقدمہ میں ڈاکٹر زورؔ یوں رقم طراز ہیں:

''خدا کا لاکھ لاکھ شکر ہے کہ جامعہ عثمانیہ کے تعلیم یافتہ نونہال اُس مقصد کے حصول کی طرف نہایت مستعدی کے ساتھ متوجہ ہوگئے ہیں ، جو اس جامعہ کا بنیادی عنصر ہے۔'' (حوالہ مشمولہ ''اِفاداتِ زورؔ''، جلد اوّل،ص:۱۰۳)

ڈاکٹر زورؔ نے اپنی پہلی یورپ کی روانگی سے قبل اگست ۱۹۲۷ء میں یہ مقدمہ لکھا تھا ،اس طرح ڈاکٹر زورؔ کا یہ پہلا مقدمہ بھی ہے، جو بی ۔اے (سالِ آخر) کے طالبِ علم کی کوششوں اور اِس ذوقِ اَدب کو جاری رکھنے کے لیے کس طرح سراہتے ہیں ملاحظہ فرمائیں:

یادرفتگاں

''تخلیقی اَدب کا صحیح اور دلچسپ ترجمہ کرنا ایک معمولی اور آسان کام نہیں ۔لطفی صاحب نے اِس دشوار گذار منزل میں جس کامیابی کے ساتھ گامزنی کی ہے، اس کا اَندازہ اُن کے ترجمہ کے مطالعے کے بعد ناظرین کرسکتے ہیں ۔لیکن ہم یہاں لایق مترجم کو اُن کے ترجمہ کی خوبی ، دلکشی اور صحت پر مبارکباد دیے بغیر نہیں رہ سکتے ۔'' (حوالہ مشمولہ ''اِفاداتِ زورؔ''، جلد اوّل،ص:۱۰۳)

پریم چند اُردو کے پہلے اَدیب ہیں ، جنھوں نے اعلیٰ یا علمی طبقہ کو مخاطب کرنے کی جگہ عوام سے سروکار رکھا، اور اپنی ساری عمر ہندستانی اَدب اور اُردو زبان کی بےلوث خدمت میں گذاری ۔ پریم چند اُردو زبان کے اُن چند معدودے محسنوں میں سے ہیں جنھوں نے اپنی کوششوں کے ذریعہ اُردو زبان کو دنیا کی دوسری ترقی یافتہ زبان کے پہلو بہ پہلو کھڑا کردیا۔ اِن کی تحریروں میں کسی بھی قسم کا تصنع اور بناوٹ نہیں ، جنھوں نے ایک ایسے اَدب کا اِضافہ کیا جو اِس زبان کے بولنے والوں کی زندگی اور معاشرت کا سچا آئینہ دار ہے ۔ مولوی حسام الدین غوری کی مرتبہ کتاب ''پریم سوگ'' کے مقدمہ میں ڈاکٹر زورؔ لکھتے ہیں:

''پریم چند سے پہلے کسی اُردو اَدیب نے عوام کی زندگی اور دیہات کی معاشرت کا نقشہ اس خوبی اور بےتکلفی سے نہیں کھینچا تھا۔ مسائلِ حاضرہ اور ضروریاتِ زمانہ سے وہ اچھی طرح باخبر تھے اور اُن کے افسانے اور ناول انہی جدید رُجحانات کی نمائندگی کرتے ہیں ۔ وہ اپنے مقصد کے حصول کے لیے مانگے تانگے کے مسالے سے کام نہیں لیتے ۔ انشاء پردازانہ قوت اور عبارت آرائی کے اِظہار سے زیادہ غریبوں اور امیروں، مزدوروں اور سرمایہ داروں، عورتوں اور مردوں کی اصلی زندگی کے ایسے نمونوں اور ان کے متضاد کردار کے ایسے پہلوؤں پر زور دیتے ہیں جن کا مطالعہ ہر طبقہ اور ہر استعداد کے پڑھنے والوں کے لیے دلچسپی کا باعث ہوتا ہے ۔'' (حوالہ مشمولہ ''اِفاداتِ زورؔ''، جلد اوّل،ص:۱۰۴)

پریم چند کی زندگی محبت ،خلوصِ عمل اور سادگی سے معمور تھی اور اُن کی جملہ تحریروں میں بھی یہی خصوصیات ہمیں ملتی ہیں وہ تعصب سے پاک تھے ۔ اِن سے بڑھ کر کامیاب اَدبی زندگی اُس عہد کے کسی اور اَدیب کو شاید ہی نصیب ہوئی ہو ۔ اِس بارے میں ڈاکٹر زورؔ اس طرح رقم طراز ہیں:

''جس شخص میں محبت کا عنصر اِتنا زیادہ ہو کہ اپنا اصل نام چھوڑ کر پریم چند نام رکھ لے تو اُس کے دل میں کینہ و حسد کے جذبات کیوں کر راہ پاسکتے ہیں ۔'' (حوالہ مشمولہ ''اِفاداتِ زورؔ''، جلد اوّل ، ص:۱۰۵)

نئے لکھنے والے محمد حسام الدین خاں غوری کی

کوششوں پر کس قدر ہمت افزائی کرتے ہوئے لکھتے ہیں آپ بھی ملاحظہ فرمائیں:

''محمد حسام الدین خاں غوری نے بڑا اچھا کیا کہ اُن (پریم چند) کے حالاتِ زندگی اور خصوصیاتِ تحریر کے متعلق یہ مختصر سی کتاب مرتب کردی۔ یہ ایک تعارفی کوشش ہے اور منشی پریم چند کے مکمل سوانح حیات کا پیش خیمہ سمجھی جاسکتی ہے۔ کیوں کہ یہ یقینی ہے کہ اُردو اور ہندی دونوں زبانوں میں اِس محسنِ اَدب کی نسبت آئندہ طویل سے طویل کتابیں ضرور لکھی جائیں گی۔ توقع ہے کہ یہ مخلصانہ کوشش ضرور قبول ہوگی۔'' (حوالہ مشمولہ ''اِفاداتِ زورؔ''، جلداوّل، ص:۱۰۶)

مولوی نصیرالدین ہاشمی اُن باہمت نظر بازوں میں ایک مخصوص حیثیت کی حامل شخصیت جو ڈاکٹر زورؔ کے رُفقائے خاص میں شامل تھے۔ اُن کی کتاب ''یورپ میں دکنی مخطوطات'' کے لیے اُنھوں نے یورپ جاکر دکنی مخطوطات پر کام کیا۔ نصیرالدین ہاشمی اپنے خاندان کے قابلِ تقلید بزرگوں کی طرح تاریخ دکن سے خاص انہماک رکھتے تھے، اُن کی کتاب ''دکن میں اُردو'' بھی اپنی قسم کی پہلی کتاب ہے۔

نصیرالدین ہاشمی کی کتاب ''یورپ میں دکنی مخطوطات'' کا موضوع کئی وجوہ سے اہم ہے۔ اس کتاب میں جن مخطوطات اور مصنفوں کی نسبت معلومات پیش کی گئی ہیں وہ اُردو زبان کے قدیم ترین کارنامے اور اَساتذہ ہیں۔ اِس ضخیم کتاب میں صرف یورپ کے مخطوطات کا ذکر ہے۔ سرزمین دکن میں لکھی ہوئی وہ سینکڑوں بیش بہا کتابیں اِس میں درج نہیں ہیں جو ہندستان میں موجود ہیں۔ اس کتاب کے مقدمہ میں ڈاکٹر زورؔ جس اَنداز و سلیقے سے اِس کمی کو پُر کرنے کی طرف اِشارہ کیا ہے، ایک نظر آپ بھی ملاحظہ کیجیے:

''کیا ہی اچھا ہو، اگر انجمن ترقی اُردو، نواب سالار جنگ، آغا حیدرحسن اور حیدرآباد کے دوسرے امیروں اور عالموں کے کتب خانوں میں جو نایاب ذخیرے محفوظ ہیں، اُن کے تذکرے بھی اسی تفصیل اور تحقیق کے ساتھ شائع ہوجائیں۔ اور اُردو اَدب کی تاریخ کی تکمیل میں آسانی ہو۔'' (حوالہ مشمولہ ''اِفاداتِ زورؔ''، جلداوّل، ص:۱۵۰)

نواب عزیز یار جنگ بہادر اُستاد الاساتذہ نواب مرزا داغؔ دہلوی کے تلامذہ میں سے تھے۔ ذوقِ سخن اور پختہ مشقی کی وجہ سے اپنے عہد کے اَساتذہ فن میں شمار کیے جاتے تھے۔ دولت وثروت اور عمر و تجربے کی بناء پر اِس درجہ پر پہنچ چکے تھے کہ کسی سے رشک وحسد یا مقابلہ کا خیال اُن کے لیے کسرِ شان تھا۔ وہ دبستانِ داغؔ کے ایسے مستحکم پیرو تھے کہ زبان کی ذرا سی لغزش یا آزاد روی کو قطعاً پسند نہیں کرتے۔ زبان کے تقدس اور اہمیت کا اِتنا ہی لحاظ رکھتے جتنا قدیم شعرا میں ذوقؔ و غالبؔ، آتشؔ و ناسخؔ اور داغؔ و امیرؔ نے اپنی کاوشوں سے سنوارا اور اِس کے معیار کو

ایک بلند درجے پر پہنچایا۔نواب عزیز یار جنگ کے شعری مجموعہ ''نقدِ سخن'' پر مقدمہ لکھتے ہوئے نوخیز شعراء کی رہنمائی اور اِس بات کی تقلید کے لیے کہتے ہیں:

''نقدِ سخن'' کی یہی وہ تاریخی اور فنی اَہمیت ہے جس کی بناء پر اِدارہ ءاَدبیاتِ اُردو کے مدیرِ عمومی نے نواب عزیز سے اِستدعا کی تا کہ اس کو اِدارہ کی طرف سے شائع کرنے کی اِجازت دی جائے۔اس کی اِشاعت سے نوجوان شاعروں کو معلوم ہوگا کہ زبان ومحاورہ کا خیال کس حد تک ضروری ہے اور زبان کے قواعد اور اُصولوں کی پابندی اَساتذہ ءفن کی نظر میں کیا اہمیت رکھتی ہے۔اس کا مقصد محض باقیاتِ فانی پر تنقید ہی نہیں ہے بلکہ اس کو دوسرے نوخیز شعرا کو بے راہ روی سے باز رکھنے کی ایک مخلصانہ کوشش سمجھنا چاہیے۔'' (حوالہ مشمولہ ''اِفاداتِ زورؔ''، جلداوّل،ص:۱۶۶)

شاعری کی اہمیت پر زور دیتے ہوئے ایک اور جگہ لکھتے ہیں کہ اُردو زبان شاعروں کی بھی مرہونِ منت ہے شاعروں کی خدمات عالموں اور فاضلوں کے بڑے سے بڑے کارناموں سے زیادہ مفید ثابت ہوئی ہے۔اس بارے میں ڈاکٹر زورؔ کہتے ہیں:

''کسی زبان کے بنانے اور بگاڑنے والے زیادہ تر شاعر ہی ہوتے ہیں۔خاص کر اُردو زبان تو اِبتداء ہی سے شاعروں کی مرحونِ منت رہی ہے۔اِس کو مقبولِ عام بنانے میں جتنی خدمت کی ہے، بادشاہوں کے درباروں اور عالموں اور فاضلوں کی مجلسوں نے نہیں کی۔ مشاعرہ ہی ایک ایسا مشترکہ پلیٹ فارم ثابت ہوا ہے جس پر صدیوں سے ہندو، مسلمان، اُردوداں اور غیر اُردوداں سب بلاتفریق مذہب وملت برابر کا حصہ لیتے آئے ہیں۔ اس میں نہ ذات پات کا اِمتیاز ہے نہ اَمیر غریب کا۔'' (حوالہ مشمولہ ''اِفاداتِ زورؔ''، جلداوّل،ص:۱۶۴)

آخر میں ایک اور مقدمہ کا اقتباس پیش ہے، جو اِدارۂ اَدبیاتِ اُردو کے بہت پرانے رفیق اور کارکن پروفیسر محمد بن عمر نے اپنی تعلیمی مصروفیات اور جامعہ عثمانیہ میں تدریسی کام انجام دیتے ہوئے ،گلبرگہ شہر میں اِدارے کا اِمتحانی مرکز قائم کیا اور پندرہ سال تک وہاں ہر عمر کے بچوں اور بڑوں میں اُردو زبان واَدب کا اچھا ذوق پیدا کیا۔جن کی تحقیقی کتاب ''کلیاتِ غواصیؔ'' کے مقدمہ سے ایک اقتباس ملاحظہ فرمائیں:

''جب محمد بن عمر مرحوم کی زیرِ ترتیب کتابوں اور کاغذات کا صندوق اُن کے کپڑوں اور دوسرے سامان کے ساتھ ترکی سے حیدرآباد آیا تو اُن کے بھائی مولوی علی بن عمر اور مرحوم کی غمزدہ بیوہ نے ''کلیاتِ غواصیؔ'' کا مسودہ اِدارے کے سپرد کردیا کہ اِس کو شائع کرے یا اپنے کتب خانہ میں محفوظ رکھے۔اِس مسودہ کے دیکھنے سے معلوم ہوا کہ مرحوم نے اس کی ترتیب میں بڑی زحمت اُٹھائی تھی۔'' (حوالہ مشمولہ ''اِفاداتِ زورؔ''، جلداوّل، ص:۲۰۲)

یادرفتگاں

اِسی مقدمہ میں آگے لکھتے ہیں کہ:

''پروفیسر محمد بن عمر نے اِس کلیات کا جو مقدمہ تحریر کیا تھا وہ بھی ایک ناقص شکل میں دستیاب ہوا ہے۔ چوں کہ وہ پی ایچ۔ڈی کے لیے مقالہ لکھ رہے تھے، اس لیے اس میں قطب شاہی دور اور غواصؔی کے ہمعصروں پر بڑی تحقیقی تفصیلات درج ہیں۔ خود غواصؔی کے بارے میں اور اِس کلیات کی نسبت اُن کا لکھا ہوا مسودہ دستیاب نہیں ہوا۔ اِس لیے میں نے اُس شاعر کے کچھ حالات بہ طور مقدمہ شریک کروائے ہیں اور آخر میں مرحوم محمد بن عمر کے مقالے کے چند اجزاء بھی شامل کیے ہیں تاکہ معلوم ہو وہ کس عمدہ طریقے پر اس کی تکمیل کر رہے تھے۔''

(حوالہ مشمولہ ''اِفاداتِ زورؔ''، جلد اوّل، ص:۲۰۳)

اس مضمون میں ڈاکٹر زورؔ کے لکھے ہوئے چند مقدمات سے لیے گئے اَقتباسات کو پڑھنے سے خاص طور پر اَدب کے قاری، طالبِ علم اور ریسرچ اِسکالرس کو اِن مقدماتِ زورؔ کی اہمیت و اِفادیت کا اَندازہ ہوگا اور اُمید کہ ڈاکٹر زورؔ کے لکھے ہوئے مقدموں کی روشنی میں آگے لکھنے والوں کو ایک طریقے وسلیقے کی راہ میسر ہوگی۔

◆◆◆◆

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دوراندیشی

ایک بوڑھے میاں ہانپتے ہوئے زرگر (سنار) کے پاس گئے اور کہنے لگے بیٹا مجھے تھوڑی دیر کیلئے سونا تولنے والی ترازو دیدو مجھے سونے کا برادہ تولنا ہے۔ زرگر نے جواب میں کہا ''بڑے میاں معافی چاہتا ہوں میرے پاس چھلنی نہیں ہے''۔ بڑے میاں نے حیرت سے کہا ''ارے بیٹا مجھ بوڑھے سے مذاق کرتا ہے میں ترازو مانگ رہا ہوں اور تو کہتا ہے میرے پاس چھلنی نہیں ہے''۔ سنار نے کہا ''قبلہ میں سچ کہہ رہا ہوں میری دکان میں جھاڑو بھی نہیں ہے''۔ بڑے میاں کو غصہ آیا اور کہنے لگے ''تجھے خدا کا خوف نہیں تو کیسی باتیں کر رہا ہے' یا تو تو بہرا ہے یا میری بات کو سمجھ نہیں رہا''۔۔۔ سنار نے کہا ''جناب میں بہرا نہیں ہوں میں آپ کی باتیں سن رہا ہوں اور نہ ہی دیوانہ ہوں کہ آپ زمین کی پوچھیں اور میں آسمان کی کہوں۔ آپ شاید حقیقت پر غور نہیں کر رہے۔ میں آپ کی حالت دیکھ کر انجام پر غور کر رہا ہوں کہ آپ کے ہاتھوں میں رعشہ ہے اور نظر بھی کمزور ہے اور اس عمر میں وہم کی بیماری بھی ہوجاتی ہے۔ آپ کے پاس سونے کی ٹھوس ڈلی تو ہے نہیں کہ جس کا آپ نے وزن کرنا ہے۔ آپ کے پاس جو سونا ہے وہ برادے کی شکل میں ہے۔ ظاہر ہے جب آپ اس برادے کو تولنے لگیں تو ہاتھ میں رعشہ کی وجہ سے اس کے ذرّات زمین پر گر پڑیں گے' پھر انہیں اکھٹا کرنے کے لئے آپ کو جھاڑو کی ضرورت پڑے گی' جب آپ جھاڑو سے مٹی اکٹھی کرلیں گے تو لامحالہ آپ کو چھلنی کی بھی ضرورت پڑے گی' میں نے پہلے ہی آپ کا انجام دیکھ لیا ہے اس لئے میں آپ کو ترازو نہیں دے سکتا''۔ اس حکایت میں ہمیں یہ درس حیات ملتا ہے کہ جو شخص صرف آغاز پر نظر رکھتا ہے وہ بصارت سے محروم ہے اور جو انجام پر نگاہ رکھتا ہے وہ دوراندیش اور عقلمند ہے' وہ کبھی شرمسار نہیں ہوتا۔ (حکایات رومی: نمبر 72' ص:241/42)

ڈاکٹر سید محی الدین قادری زورؔ

بقول پروفیسر عنوانؔ چشتی ''دنیا میں اشخاص بہت ہیں شخصیتیں کم ہیں'' پھر شخصیتوں میں بھی کثیر الجہت شخصیتیں خال خال ہی ہوتی ہیں، شخص کے شخصیت بننے کا عمل درحقیقت قطرہ کے گہر بننے کا عمل ہے جو اہل نظر سے مخفی نہیں مگر ''دیکھیں کیا گزرے ہے قطرہ پہ گہر ہونے تک'' مسلم ہے، غرض شخص کا دائرہ کار نہایت محدود اور کم ہوتا ہے جبکہ شخصیت کا دائرہ فکر و عمل غیر محدود اور بہت زیادہ ہوتا ہے جو سماج کے ہر طبقہ کو ممتاز کرتا ہے اور ہمہ جہت خدمات انجام دیتا ہے۔ اردو اور اہل دکن کے لئے یہ بڑے فخر کی بات ہے کہ انہیں اردو کا وہ مجاہد اور متوالا نصیب ہوا جو صدیوں میں کہیں پیدا ہوتا ہے اور بڑی مشکل سے چمن میں ایسے دیدہ ور پیدا ہوتے ہیں جن کا ناز اور کار طلسم شب کو توڑنا اور جمود کے سحر کو ختم کرنا اور گراں قدر کارہائے نمایاں انجام دے کر تا آخر دم زیست اپنے مشن کی تکمیل اور اپنے نصب العین کو برقرار رکھنا اور زندگی کا حق ادا کرنا ہوتا ہے، خوش نصیبی سے ڈاکٹر زورؔ کا شمار بھی ایسی ہی عدیم المثال شخصیات میں ہوتا ہے۔

نام اور مختصر خاندانی تعارف: حیدرآباد کے ایک معزز اور سادات گھرانے میں ڈاکٹر زورؔ ۲۸ رمضان المبارک ۱۳۲۲ھ کو حیدرآباد کے محلّہ شاہ گنج میں پیدا ہوئے۔ ان کا سلسلۂ نسب ان کے جد اعلیٰ سید شاہ سانگڑے سلطان کے واسطے سے حضرت قطب الاقطاب سید احمد رفاعیؒ سے جا ملتا ہے۔ خود ڈاکٹر زور کے والد حضرت سید غلام محمد زعمؔ بھی ایک متبحر عالم و فاضل اور واعظ و شاعر گزرے ہیں، اسی طرح ڈاکٹر زور کی والدہ محترمہ کا نام بشیر النساء بیگم تھا، ان کے نانا بھی اپنے وقت کے ایک بڑے عالم اور صاحب تصنیف تھے۔

تعلیمی مراحل: فضیلت جنگ حضرت مولوی انوار اللہ خان صاحب رحمتہ اللہ علیہ نے ڈاکٹر زورؔ کی تسمیہ خوانی کی، چار سال کی عمر میں انہیں کایستھ پاٹھ شالہ بارہ گلی میں شریک کیا گیا، پھر مدرسہ مفید الانام میں زیر تعلیم رہ کر مڈل کا امتحان پاس کیا، بعد ازاں دانشگاہ علوم و معارف جامعہ نظامیہ میں مولوی کے نصاب کی تکمیل کی اور گوپال رتنم کے کوچنگ اسکول میں خانگی طور پر میٹرک کے امتحان کی تیاری کی اور ۱۹۲۱ء میں میٹرک کامیاب کیا۔ اس طرح بی۔ اے کی تکمیل کے بعد ایم۔ اے کا امتحان دے کر امتیازی نشانات سے کامیابی حاصل کی، پھر جب نواب رفعت یار جنگ اور سر نظامت جنگ سے قربت بڑھی تو زورؔ صاحب کی تعلیمی جستجو سے متاثر ہو کر انہوں نے حکومت سے اعلیٰ تعلیم کے لئے وظیفہ کو منظور کرایا، جس کے نتیجہ میں ۱۹۲۷ء میں یورپ گئے پھر لندن یونیورسٹی سے استحقاق کے بعد پی ایچ۔ ڈی کی ڈگری کے لئے اردو زبان کے آغاز و ارتقاء کے موضوع پر مقالہ لکھا پھر برٹش میوزیم کے کتب خانے اور انڈیا آفس لائبریری سے استفادہ کر کے تحقیق کے معرکے سر کئے۔ ۱۹۲۹ء میں حیدرآباد لوٹنے کے بعد تین ماہ اس مواد کے حسن ترتیب میں صرف کئے اور اردو شہہ پارے کے نام سے کتاب شائع کر کے دوبارہ لندن روانہ ہو گئے اور وہاں اسکول آف اورینٹل اسٹڈیز اور یونی ورسٹی کالج آف لندن میں لسانیات کی اہمیت کے پیش نظر صوتیات کی تعلیم حاصل کی، انہوں نے پروفیسر ٹرنر سے سنسکرت اور لسانیات کا

یادرفتگاں

درس لیا جبکہ یونی ورسٹی کالج آف لندن کے پروفیسر اور صدر شعبۂ لسانیات پروفیسر لائیڈ جیمس سے صوتیات کی تعلیم حاصل کی۔ یہ دونوں پروفیسر صاحبان ڈاکٹر زورؔ کو ان کے حصول علم کی تڑپ کے باعث بہت عزیز رکھتے اور ان کی قدر کرتے تھے۔

ملازمت: ۱۹۳۰ء میں ڈاکٹر زورؔ کی یورپ سے واپسی کے بعد ان کی علمی قابلیت کی بنا پر جامعہ عثمانیہ کے شعبۂ اردو میں بحیثیت ریڈر ان کا تقرر عمل میں آیا، اس وقت بابائے اردو مولوی عبدالحق صدر شعبہ تھے، مولوی عبدالحق اور سید سجاد صاحب کی وظیفہ پر سبکدوشی کے بعد ڈاکٹر زورؔ پروفیسر بنے اور ۱۹۴۸ء تک صدارت ہی پر فائز رہے۔ اسی طرح وہ صدر شعبۂ اردو و فارسی کے ساتھ ڈین فیکلٹی آف آرٹس اینڈ اورینٹل لینگویجس بھی مقرر ہوئے، بعد ازاں ۱۹۴۸ء دارالعلوم کالج کے پرنسپل کی حیثیت سے چادرگھاٹ کالج کی پرنسپلی پر ڈاکٹر زورؔ کا تبادلہ کردیا گیا، دس سال اس کے پرنسپل رہنے کے بعد ۱۷/ڈسمبر ۱۹۶۰ء میں وظیفہ پر سبکدوش ہوئے۔ چند ماہ بعد ریاست کشمیر کے وزیراعلیٰ بخشی غلام کی خواہش پر انہوں نے کشمیر یونی ورسٹی میں شعبۂ اردو کی صدارت قبول کی اور ۱۰ سال اس پر فائز رہے، چونکہ اردو زبان کو سرکاری زبان کی حیثیت دی گئی تھی اس لئے اردو کام کے مواقع بہت تھے، ڈاکٹر زورؔ نے اردو کے طلبہ اور اساتذہ کو تحقیق کی طرف مائل کیا اور ان کی خوب ذہن سازی کی۔

اردو کے فروغ کے لئے ڈاکٹر زور کے نمایاں کارنامے: اس مقالے میں جامعہ نظامیہ کی نسبت سے بہت سی نامی گرامی قابل ذکر شخصیات کا نام اور کام اہم ہے اور اس مقالہ میں شامل ہے تاہم اگر اردو ادب کے انسائیکلو پیڈیا ڈاکٹر محی الدین قادری زورؔ کا ایک ہی نام اردو ادب اور تحقیق کے فروغ میں ان کی خدمات ہی کافی تھیں۔ غرض ڈاکٹر زورؔ کی شخصیت ایک ہشت پہلو نگینہ کی سی ہے جس کے ہر پہلو کی تب و تاب اور آب اپنی جداگانہ چمک رکھتی ہے اور ڈاکٹر زورؔ کی ہمہ پہلو صفات شخصیت کا ہر پہلو ایک علاحدہ دفتر یا کتاب کا متقاضی ہے۔ ان کی ادبی جہات میں تاریخ، تحقیق، تنقید، نظامت، لسانیات، دکنی خدمات، ترتیب و تدوین، مخطوطہ شناسی، دیباچہ نگاری، افسانہ نگاری، فارسی خدمات، شاعری اور مکتوب نگاری وغیرہ پہلو شامل ہیں۔ ہر پہلو کے لئے جداگانہ دفتر درکار ہے تاہم یہاں ان پہلوؤں پر مختصراً روشنی ڈالی جاتی ہے تاکہ اردو ادب کے تئیں ان کی خدمات کی ایک جھلک سامنے آجائے۔

تحقیق: یوں تو ڈاکٹر زورؔ ادب کے ہر پہلو پر گہری نظر رکھتے تھے مگر تحقیق ان کا خاص میدان ہے اور خود ڈاکٹر زور بھی اس کے لئے نہایت اہل اور موزوں تھے اور وہ ''ایں کار از تو آید و مرداں چنیں کنند'' کے مصداق تھے، اردو کی چار سو سالہ ادبی اور لسانی روایات کے بکھرے سلاسل کو انہوں نے گولکنڈہ کی تہذیبی تاریخ اور دکنی مخطوط پر کام کر کے ملا دیا ہے، اردو شہہ پارے، حیات اور قلی، حیات میر محمد مومن، دکنی ادب کی تاریخ، کلیات محمد قلی کی تدوین، داستانِ ادب حیدرآباد، حیدرآباد فرخندہ بنیاد اور دکنی مخطوطات کی توضیحاتی فہرستوں کی ترتیب اس تحقیقی کام کی نمایاں مثالیں ہیں، علاوہ ازیں انہوں نے گولکنڈہ کے ہیرے اور سیر گولکنڈہ جیسی کتابیں لکھ کر دکنی تہذیب و تاریخ کو استحکام بخشنے میں اہم رول ادا کیا، وہ بلاشبہ تحقیق کے مرد آہن تھے اور اس کے لئے درکار خوبیوں کے جامع تھے، لسانیات اور صوتیات پر ان کی

گرفت نہایت مضبوط تھی۔ انگلینڈ اور فرانس میں انہوں نے ان تمام علوم وفنون کی مہارت حاصل کی تھی، یہی وجہ تھی کہ وہ مخطوطہ پڑھنے، کاغذ پہچاننے، نستعلیق، نسخ اور کوفی کے علاوہ خط ثلث کے پڑھنے میں ماہر تھے، اردو شہہ پارے حیات میر محمد مومن، مرقع سخن اور کلیات محمد قلی کی ترتیب وتدوین اور اس کی اشاعت کر کے انہوں نے دکن میں اردو ادب پر احسان عظیم کیا ہے۔

افسانہ نگاری: ڈاکٹر زورؔ کثیر الجہت ادیب و شاعر تھے چنانچہ وہ ایک بہترین افسانہ نگار بھی تھے اور اس کے ثبوت کے لئے ان کے افسانے سیر گولکنڈہ، طلسمِ تقدیر، تازیانہ، اور گولکنڈہ کے ہیرے، لائق مطالعہ اور قابل دید ہیں جس سے ان کی افسانہ نگاری کے جوہر و گوہر کھل کر سامنے آتے ہیں۔ طلسم تقدیر کے افسانوں میں تخیل زیادہ ہے اور تاریخ کم جبکہ سیر گولکنڈہ اور گولکنڈہ کے ہیرے میں تاریخی عناصر زیادہ ہیں۔ جن کے ماخذ بقول زورؔ یہ ہے گولکنڈہ کے ان نیم تاریخی افسانوں کا مواد قدیم تاریخوں، یوروپی سیاحوں کے سفر ناموں، یادداشتوں اور گولکنڈہ اور بیجاپور میں لکھی ہوئی اردو کتابوں کے علاوہ ان روایات سے بھی حاصل کیا گیا ہے جو اس ملک کے عہد حاضر کے باشندوں تک سینہ بہ سینہ منتقل ہوتی آرہی ہیں۔

ڈاکٹر زورؔ کی افسانہ نگاری پر مضمون لکھتے ہوئے ڈاکٹر گیان چند جین نے یوں لکھا ''اس سے اندازہ ہوتا ہے کہ مصنف کو ان مختصر افسانوں کا مواد بہم پہونچانے میں کتنی تحقیق کرنی پڑی ہوگی، سیر گولکنڈہ کے افسانوں کی بنیاد مضبوط تاریخی بنیادوں پر ہے جس طرح سنگھاسن بتیسی میں راجہ بکر ماجیت کے گن گائے گئے ہیں اسی طرح مصنف نے ان افسانوں میں قطب شاہی بادشاہوں کو مثال بنا کر پیش کیا ہے، طویل دیباچے میں قطب شاہی خاندان کے بادشاہوں کی خوبیاں بیان کی ہیں۔

ڈاکٹر زورؔ کے تیسرے افسانے ''گولکنڈہ کے ہیرے'' کا پہلا افسانہ ''بالا'' ہے۔ جس میں گولکنڈہ کی ایک حسین ہندو رقاصہ کی ذہانت و فطانت اور فہم وفراست کی بڑی دلچسپ باتیں ہیں، شہزادہ کام بخش خداداد محل کے ایک دالان میں ٹہل رہا ہے، محل کی ویرانی اور شہزادے کے اضطراب کا مرقع ملاحظہ ہو جس سے ڈاکٹر زورؔ کی نثر نگاری اور داستان نگاری کے حسن بیان کا اظہار ہوتا ہے:

''اس عظیم الشان محفل کا گوشہ گوشہ اپنی عظمت گزشتہ پر نوحہ خوانی کرتا نظر آرہا تھا، ایسا معلوم ہوتا تھا کہ ایک نئی نویلی اور آراستہ و پیراستہ دلہن یکا یک بیوہ ہوگئی ہے اور اس کا تمام سنگھار اس کے سہاگ کے ساتھ ختم ہوگیا ہے، لیکن اس تباہی کے باوجود اس کے نوعروسی کے آثار باقی ہیں۔

کام بخش کے مضطرب دل کو اس ستم زدہ ماحول اور اجڑے دیار کا چپہ ہر گھڑی ایک نئی ٹھیس لگاتا تھا، جب کبھی کسی دروازہ یا کھڑکی کے اکھڑے ہوئے زریں یا ہاتھی دانت کے نقش ونگار یا چھتوں، محرابوں اور دیواروں کے طلا کار حاشیوں کے باقی ماندہ آثار پر اس کی نظر پڑتی تو اس کی وحشت میں اور اضافہ ہوجاتا۔ وہ کبھی اپنے فتح مند باب کی ظالم فوجوں اور اس کے متعین کردہ صوبہ داروں کی ان تباہ کاریوں پر افسوس کرتا اور کبھی قطب شاہی حکمرانوں کے ذوق لطیف اور سلیقۂ زندگی کی بے تحاشہ تعریف اس کے منہ سے نکل پڑتی''۔

اس کا پانچواں افسانہ ''دفینہ'' ہے جو ایک خاص رومانی

قصہ ہے، اس میں ایک ہیروں سے زیادہ بیش بہا رسال دار کی حسین بیٹی ہے جس کا پاؤں پھسلنے سے وہ باؤلی میں ڈوبنے لگی، ہیرا سے باہر نکال لایا، اس کے بعد کی منظر کشی مختصراً ملاحظہ ہو جس سے زورؔ صاحب کی نثر نگاری اور افسانہ نگاری کے خوب جوہر نمایاں ہیں:

''وہ دوشیزہ! اس کا جسم تو حریر و پرنیاں سے زیادہ نازک تھا، اس کی آنکھوں میں دلوں کو مسخر کر لینے والی موہنی تھی، اس کی آواز نغمہ سے زیادہ شیریں اور اس کے الفاظ جادو سے زیادہ پُراثر تھے، اس کے جسم کی لطافت، اس کے چمکدار اور نرم نرم بالوں کی خوشبو اور اس کے تنفس کی گرمی مجھے اب تک محسوس ہو رہی تھی''۔

ڈاکٹر زورؔ کے افسانوں کے مطالعہ کے بعد ڈاکٹر گیان چند جین نے اپنے مضمون ''ڈاکٹر زورؔ کی افسانہ نگاری'' میں ایک جگہ ان کی افسانہ نگاری کی خوبیوں کا اعتراف کرتے ہوئے لکھا ہے، چوتھا اور پانچواں افسانہ ''سروِ صحرا'' اور ''دفینہ'' میری رائے میں ڈاکٹر زورؔ کی بہترین افسانوی تخلیقات ہیں، ان کے جملہ افسانوں میں یہی دو افسانے جذبۂ عشق کے گرد بنے گئے ہیں، ان میں ادبِ لطیف کا ماحول ہے''۔

دیباچہ نگاری: کسی کتاب کا بغور اور بالاستیعاب مطالعہ کرنے کے بعد دیباچہ نگاری کرنا ایک گراں قدر ذمہ داری ہے اور حق یہ ہے کہ دیباچہ نگاری کا حق ادا کرنا خاصا دشوار طلب کام ہے اور یہ ظاہر ہے کہ ہر کس و ناکس کے بس کی بات نہیں ہے۔ مگر ڈاکٹر زورؔ صاحب جیسے تصانیف کثیرہ ادیب کی دیباچہ نگاری ملاحظہ کی جائے تو ہمیں واضح طور پر پتہ چلتا ہے کہ انہوں نے کچھ اس انداز سے دیباچہ نگاری کی ہے کہ اس سے قارئین کو کتاب کی روح سمجھنے میں بآسانی مدد ملتی ہے اور قارئین مصنف و مرتب کے مقصد تحریر کو پالیتے ہیں، یہاں ایک دو مثالوں پر اکتفا کیا جاتا ہے جن میں زورؔ صاحب نے اپنے معاصرین ادباء و شعراء کی کھلے دل سے پذیرائی کی اور بھرپور ان کا اعتراف کیا ہے۔

''ترجمانِ زندگی'' حضرت علی منظور کا مجموعہ کلام، حضرت علی منظور اپنے دور کے ایک منفرد شاعر تھے مگر وہ ہمارے قدیم دبستان سے تعلق رکھنے کے باعث بدلتی شعری قدروں کے پوری طرح ہم رکاب نہیں ہو سکے، گوشہ نشین رہے، ڈاکٹر زورؔ نے کس عمدگی سے ان کی شخصیت کا تجزیہ کیا ہے ملاحظہ ہو:

''ان کی گوشہ نشینی کی ایک بڑی وجہ یہ سمجھ میں آتی ہے کہ وہ بڑے ہی وضعدار واقع ہوئے ہیں اور موجودہ سوسائٹی جو ایک عبوری دور کے انتشار اور مختلف و متضاد نقاطِ نظر کے ٹکراؤ کا شکار بنی ہوئی ہے ان کی افتادِ طبع کو بہت کم بھائی ہے وہ اگرچہ اپنی وضع چھوڑ نہیں سکتے جیسا کہ ان کی اکثر نظموں اور غزلوں سے ظاہر ہوتا ہے لیکن زمانے کے جدید رجحانات سے غیر محفوظ بھی نہیں ہیں اور کوشش کرتے ہیں کہ کچھ دور اس کے ساتھ بھی چلیں جیسا کہ ان کی چند منظومات سے ثابت ہوتا ہے لیکن اس قسم کا کلام بھی ظاہر کرتا ہے کہ وہ اپنی پاس وضع سے مجبور ہیں اور چوں کہ رنگ گہرا ہو چکا ہے۔ اس کو بدلنا ان کے بس کی بات بھی نہیں، وہ اپنے رنگ ہی میں ایک ایسے باکمال شاعر ہیں اور اس وضع کو اس خوبی سے نبھاتے ہیں کہ ان میں ایک انفرادی شان پیدا ہوگئی ہے اور عہد حاضر کا کوئی شاعر اس آن بان میں ان کا حصہ دار نہیں۔ اسی طرح ''حیدرآباد کے بڑے لوگ'' کے مقدمہ میں سید غلام پنجتن

کے مزاج کے بارے میں یوں اظہار خیال کیا ہے:

''مولوی غلام پنجتن صاحب شمشاد، علی گڑھ کے کھلنڈروں اور زندہ دل فرزندوں میں سے ہیں۔ ان کی تربیت علی گڑھ کے ایک بڑے معمار نواب محسن الملک کے سایۂ عاطفت میں ہوئی اور وہ اتنے عرصے علی گڑھ میں رہے اور وہاں کے سرد و گرم سے اتنے متاثر ہوئے کہ فرانس کے بادشاہ لوئی چہارم کی طرح 'علی گڑھ! یہ میں ہی ہوں' کہنا ان کو زیب دیتا ہے''۔

''مشتے نمونہ از خروارے'' کے تحت یہ چند مثالیں پیش کی گئیں ورنہ ادباء و شعراء کی کتابوں پر لکھے گئے ان کے دیباچے واقعی لائق مطالعہ ہیں جن سے غیر معمولی طور پر ادبی بصیرت حاصل ہوتی ہے۔

مخطوطہ شناسی: دکن میں جن شخصیات نے اولاً مخطوطہ شناسی کی راہیں ہموار کی ہیں ان میں حکیم شمس اللہ قادری، نصیر الدین ہاشمی، پروفیسر عبدالقادر سروری کے ساتھ ساتھ ڈاکٹر محی الدین قادری زورؔ کا کام بھی نہایت اہمیت و وقعت کا حامل ہے جنہوں نے پورے لوازمات کی رعایت کے ساتھ مخطوطہ شناسی کی ہے اور اس فن کو فروغ دینے میں اپنی صلاحیتوں کو تج دیا، چونکہ مخطوطہ شناسی کے لئے مختلف معلومات کے ساتھ ساتھ، مصنف کا نام، عہد اور زبان اور مختلف خطوط سے واقفیت ناگزیر ہے جس کے بغیر مخطوطہ شناسی کا نازک کام متصور نہیں، اس پس منظر میں ڈاکٹر زور کی مرتب کردہ کتابوں کو ملاحظہ کیا جائے تو ''تذکرۂ اردو مخطوطات (جلد اول) مطبوعہ ۱۹۴۳ء، جلد دوم مطبوعہ ۱۹۵۱ء اور جلد سوم، چہارم اور پنجم (۱۹۵۷ ۔ ۱۹۵۸ ۔ ۱۹۵۹) وغیرہ ان کی ذہنی صلاحیتوں، بیدار مغزی اور دقت نظری پر دلالت کرتے ہیں، انہوں نے عربی، فارسی، اردو، ہندی اور سنسکرت کے ایک ہزار ایک سو مخطوطات کی توضیحات پیش کی ہیں۔

تذکرہ مخطوطات جلد پنجم کے دیباچہ (طبع اول) میں یوں لکھا ہے:

''ادارے کے جملہ ۱۵۰ مخطوطات کے بارے میں تفصیلات (پانچ جلدوں میں) منظر عام پر آ رہی ہیں ابھی چار ہزار مخطوطات ایسے ہیں جن کی ایسی ہی توضیحی فہرست مرتب اور شائع کرنی ہے اور اس تعداد میں روز بروز اضافہ ہوتا جا رہا ہے''۔

ادارۂ ادبیات اردو کے قیام ۱۹۳۱ء سے ہی ڈاکٹر زورؔ نے مخطوطہ شناسی کے لئے جو مصیبتیں گوارا کی ہیں اس کے بارے میں خود انہوں نے یوں اظہار خیال کیا:

''اس تذکرۂ مخطوطات کی ترتیب کے سلسلے میں مؤلف کو جو زحمتیں اٹھانی پڑی ہیں اور جو وقت صرف ہوا اس کا اندازہ وہی اصحاب کر سکتے ہیں۔ جنہیں قلمی نسخوں سے کام لینے کا تجربہ ہوا ہو، اکثر مخطوطوں کے مصنفوں کے نام یا زمانۂ تصنیف اور زمانۂ کتابت وغیرہ کی تحقیق میں بیسوں قلمی و مطبوعہ کتب کی ورق گردانی کرنی پڑی اور بڑا وقت صرف ہوا''۔

ڈاکٹر زورؔ کی اس تحقیق اور مخطوطہ شناسی کی دنیا میں قدم رکھنے سے متعدد غیر معروف شعراء و ادباء کے نام اور کام سامنے آئے اور ان کے تعارف سے ادبی دنیا کو معلومات حاصل ہوئیں۔

غرض ان کی عرق ریزی سے مخطوطہ شناسی کی بڑی خدمت ہوئی، جس سے مستقبل کے مورخ کو دکنی تحقیق وغیرہ کے سلسلہ کو دیگر کڑیوں میں جوڑنا آسان ہو گیا اور یہ بھی اردو ادب کی بہت بڑی خدمت ہے۔

ڈاکٹر زورؔ کی شاعری: جو عہد طفلی ہی سے خاندانی، معاشرتی اور

علمی ماحول کا پروردہ ہو اور مستقل علمی و فنی کاموں اور شخصیتوں سے سابقہ پڑا ہو اور پیہم جسے دنیائے کتب کی سیر کرنے سے فرصت نہ ہو اور زبان و بیان پر مکمل قادر ہو اور اس میں خون کی تاثیر بھی در آئی ہو تو وہ کیسے شعر گوئی کی دولت سے تہی داماں رہ جائے گا، چنانچہ ڈاکٹر زورؔ کے والد حضرت سید غلام محمد زعمؔ اپنے وقت کے بہترین عالم و فاضل، واعظ اور ایک خوش فکر شاعر تھے اور داغؔ کے تلامذہ میں شامل تھے، اس طرح ڈاکٹر زورؔ میں شاعری کے جراثیم کا تحلیل ہونا لازمی بات ہے۔ یہ اور بات ہے کہ ان کی انتہائی مصروف زندگی میں انہیں شاعری کرنے کے مواقع کم کم ہی میسر آئے مگر ان کی شاعری کا جو ذخیرہ و سرمایہ مختلف تذکروں میں موجود ہے اس سے ان کی شاعرانہ حیثیت بخوبی آشکار ہوجاتی ہے، ان کی ایک نظم چاندنی کے چند اشعار ملاحظہ ہوں جو زبان و بیان اور تعبیر کے اظہار پر ان کی غیر معمولی صلاحیت و قابلیت کی چغلی کھاتے ہیں: ؎

پھر ذکرِ رونقِ شبِ مہتاب آ گیا
سامانِ وحشتِ دلِ بے تاب آ گیا
موسم وہی فضاء وہی کہسار بھی وہی
اے کاش مل سکے نگہہِ یار بھی وہی
ہوگا یوں ہی فلک پہ سوا ماہِ ضوفشاں
مل جائے میرا چاند ہے وہ چاندنی کہاں

اسی طرح ان کی ایک نظم ''جامعہ عثمانیہ اور نونہالانِ دکن'' کے چند اشعار ملاحظہ ہوں جن سے ڈاکٹر زورؔ کی شاعرانہ عظمت بخوبی ہویدا ہوجاتی ہے اور جس سے ان کی طبع موزوں کی روانی خوب جھلکتی ہے اور غیر معمولی طور پر ان الفاظ و تراکیب اور قوافی و ردیف کو شعری پیرائے میں چست کرنے کا ہنر ظاہر ہوتا ہے، ملاحظہ ہوں: ؎

اس کے ہر ذرے کو رشکِ آفتاب اب دیکھئے
عظمتِ ملکِ دکن کو بے نقاب اب دیکھئے
ہوچکا منت کشی کا سدِباب اب دیکھئے
دیکھئے ہاں دیکھئے یہ انقلاب اب دیکھئے
داغ ہائے منتِ اغیار دھوتے جائیں گے
نونہالانِ وطن شاداب ہوتے جائیں گے

مختلف تذکروں اور ڈاکٹر زورؔ کی کتابوں کی مدد سے ان کی شاعرانہ لیاقت پر بآسانی ایک کتاب ترتیب دی جاسکتی ہے۔ تاہم طوالت سے گریز کرتے ہوئے ان کے چند متفرق اشعار پیش کرنے پر اکتفا کیا جاتا ہے:

انسانیت کے رستے ہوئے زخم چھوڑ کر
دانشوروں کو چاند ستاروں کا شوق ہے
انسان مرچکا ہے مشینوں کا دور ہے
اب کیا کسی کو زہر کہ امرت پلایئے
کیا ستم ہے وہی بے نام و نشاں رہتے ہیں
جن غریبوں کے پسینے سے نکھرتی ہے زمیں
فردا کے انتظار میں کٹتی ہے زندگی
بہتر ہے روز و شب کا نہ پردہ اٹھایئے
فدا کرنا پڑے گا زورؔ ان پر دونوں چیزوں کو
مرا دل میرا دل کب تک، مری جاں میری جاں کب تک
کچھ ایسے لوگ ابھی تک چمن میں ہیں شاید
فریب خوردہ خزاں میں نہ خوش بہار میں ہیں

یادِ رفتگاں

اے زورؔ وہ بت حسن پہ جو اپنے ہیں مغرور
قابو میں نہ وہ زور سے آئیں گے نہ زر سے
موت سے بھی مریں گے نہیں زورؔ ہم
زندگی میں جو کچھ کام کرجائیں گے

ڈاکٹر زور کی خدمات کا مجموعی جائزہ :

ڈاکٹر زورؔ تقریباً ۳۴ سال تک اردو زبان و ادب کی خدمت میں ہمہ تن مصروف رہے اور مختلف موضوعات (تحقیق، تنقید، لسانیات، دکنیات، ترتیب وتدوین، دیباچہ نگاری، افسانہ نگاری، فارسی خدمات، صحافت، شاعری، مکتوب نگاری، مخطوطہ شناسی وغیرہ) پرانہوں نے تین درجن کے قریب تصنیفات وتالیفات کا ذخیرہ دنیائے اردو کو دیا، علاوہ ازیں ادارۂ ادبیات اردو کا قیام اور سب رس کا استحکام بھی اردو تاریخ میں ان کے نام کی اہمیت کو بڑھاتا ہے۔ان کی کتابیں کچھ اس طرح ہیں: (۱) ہندوستانی لسانیات (لکھنؤ نسیم بک ڈپو، ۱۹۶۰ء، ۱۱۶صفحات)، (۲) ہندوستانی صوتیات (انگریزی میں ہے، پیرس سارن بون یونیورسٹی)، (۳) اردو شہہ پارے (مکتبہ ابراہیمیہ، حیدرآباد ۱۹۲۹ء، ۳۵۶+۱۵صفحات)، (۳) عہدِ عثمانی میں اردو کی ترقی (اعظم اسٹیم پریس، حیدرآباد، ۱۹۳۵ء ۲۰۶صفحات) (۴) داستانِ ادب حیدرآباد (ادارۂ ادبیات اردو ۱۹۵۱ء، ۲۲۲صفحات)، (۵) دکنی ادب کی تاریخ ۱۹۶۵ء (کراچی، اردو اکیڈمی سندھ، ۱۸۸صفحات)، (۶) اردو کے اسالیب بیان۔طبع اول ۱۳۴۶ھ ۱۹۲۷ء۔طبع ثانی۔حیدرآباد (احمد پریس ۱۹۳۲ء، ۱۷۵صفحات، طبع ثالث حیدرآباد، اعظم اسٹیم پریس ۱۹۴۰ء)، (۷) روحِ تنقید ۱۹۲۵ء (۲۸۵صفحات، شمس الاسلام پریس، حیدرآباد)، (۸) تنقیدی مقالات (حیدرآباد، مکتبہ ابراہیمہ، (بار دوم)، ۱۹۳۲ء ۲۴ + ۴۹۶ صفحات) (۹) ادبی تحریں (مرتبہ: گوپی چند نارنگ۔حیدرآباد۔ادارہ ادبیاتِ اردو ۱۹۶۳ء۔۱۶۸صفحات)، (۱۰) جواہرِ سخن، حیدرآباد، عہد آفریں پریس۔۵۲صفحات، (۱۱) تین شاعر (مرتقی میر۔میر انیس اور ہوریس اسمتھ کا تذکرہ) کراچی، صفیہ اکیڈیمی ۱۹۶۵ء ۱۹۸ صفحات (۱۲) مرقع سخن جلد اول حیدرآباد مکتبہ ابراہیمہ ۱۹۳۷ء صفحات ۳۹۲ (شعراء ادباء کا تذکرہ) (۱۳) مرقعِ سخن جلد دوم سعید آباد مکتبہ ابراہیم ۱۹۳۷ء ۴۳۱ صفحات (شعراء ادباء کا تذکرہ) (۱۴) گلزار ابراہیم۔(اردو شعراء، کا تذکرہ ہے) بطور مسلم یونی ورسٹی (۱۹۳۴ء، ۳۷۰ صفحات۔علی گڑھ۔ (۱۵) تذکرۂ اردو مخطوطات، جلد اول ۱۹۴۳ء ۳۹۶صفحات) جلد دوم، ۱۹۵۱ء، صفحات ۱۷۶۔جلد سوم ۱۹۵۷ء، ۳۸۴ صفحات، (جلد چہارم، ۱۹۵۸ء، ۲۹۲صفحات) یہ کتابیں تذکروں پر مشتمل تھیں، اسی طرح یہ کتابیں سوانح پر مشتمل ہیں۔(۱۷) گارساں دتاسی۔اور اس کے ہم عصر بہی خواہانِ اردو، (الہ آباد، ہندوستانی اکیڈیمی ۱۹۳۱ء، ۱۹۸ صفحات) (۱۸) سرگزشتِ غالبؔ، (حیدرآباد۔ادارہ ادبیات اردو ۱۹۳۹ء، ۶۴۰ صفحات)، (۱۹) حیاتِ سلطان محمد قلی قطب شاہ (حیدرآباد، ادارہ ادبیات اردو ۱۹۵۸ء، ۲۲۸صفحات)، اب یہاں سے منتخبات نظم ہیں۔ (۲۰) کیفِ سخن یعنی انتخاب کلام رضی الدین حسن کیفی مع مقدمۂ زور (مکتب ابراہیمہ ۱۹۳۵ء، ۱۲۲صفحات)، (۲۱) بادۂ سخن (یعنی انتخاب کلام ڈاکٹر احمد حسین مائلؔ)، مکتبہ ابراہیمہ ۱۹۳۵ء، ۱۲۸ (صفحات)، (۲۲) متاعِ سخن، یعنی انتخاب کلام نواب عزیز

یادرفتگاں

یار جنگ بہادر عزیز، شاگرد داغ، (حیدرآباد مکتبہ ابراہیمہ، ۱۹۳۵ء، ۱۲۵ صفحات)، (۲۳) فیض سخن یعنی انتخاب کلام میر شمس الدین فیض، استاد کل، (مکتبہ ابراہیمہ ۱۹۳۵ء)، رمز سخن یعنی انتخاب کلام سدانند جوگی بہاری لعل رمز (حیدرآباد ادارہ ادبیات اردو ۱۹۵۱ء، ۹۶ صفحات) (۲۴) کلیات قلی قطب شاہ مع تفصیلی مقدمۂ زور (حیدرآباد مکتبہ ابراہیمہ ۱۹۴۰ء) (۲۵) معانی سخن انتخاب کلام محمد قطب شاہ، (حیدرآباد نیشنل پرنٹنگ پریس ۱۹۵۸ء، ۱۱۲ صفحات) (۲۶) اردو شاعری کا انتخاب (از ابتداء تا زور، ۱۰۸ شاعروں کے کلام انتخاب) نئی دہلی ساہتیہ اکیڈیمی ۱۹۶۰ء ۳۰۶ صفحات)، (۲۷) مثنوی طالب و موہنی (حیدرآباد ادارہ ادبیات اردو ۱۹۵۷ء)، (۲۸) روحِ غالب (حیدرآباد ادارۂ ادبیات اردو، ۱۹۳۹ء، ۶۴ + ۷۵ صفحات)، (۲۹) مکاتیبِ شاد عظیم آبادی (حیدرآباد ادارۂ ادبیات اردو ۱۹۳۹، ۲۹۹ صفحات)، (۳۰) شاد اقبال (مہاراجہ کشن پرشاد شاد اور علامہ اقبال کی باہمی خط و کتابت اور مراسلت ہے) (حیدرآباد اداہ ادبیات اردو ۱۹۴۲ء)، اب یہاں سے افسانوں کی تعداد ہے:

(۳۱) طلسم تقدیر (خود ڈاکٹر زور کا افسانہ ہے) حیدرآباد (مطبع معلم العلوم ۱۹۲۵ء، ۵۲ صفحات)، (۳۲) سیر گولکنڈہ (افسانہ) حیدرآباد انتظامی پریس ۱۹۴۲ء، ۱۶۰ صفحات (۳۳) گولکنڈہ کے ہیرے افسانہ (حیدرآباد، مکتبہ ابراہیمہ، ۱۹۳۷ء، ۱۳۶ صفحات)، (۳۴) فن انشاء پردازی حیدرآباد، اعظم اسٹیم پریس ۱۹۳۵، ۱۱۵ صفحات (۳۵) حیدرآباد فرخندہ بنیاد (حیدرآباد طارق پریس ۱۹۵۲) ۔ (۳۶) خطبۂ صدارت اردو کانفرنس برہان پور ۔ ۱۹۵۷ء، (۳۷) قطب سلاطین اور آندھرا ۱۹۶۷، ص: ۵۴۵ ۔

علاوہ ازیں دیگر کتابیں اور ان گنت مضامین ہیں جو اس وقت ماہناموں (جیسے تحفہ، ارتقاء، سہیل، نیرنگ خیال، ناظر، نگار، مجلّہ عثمانیہ، تجلی، زبان، مجلّہ مکتبہ، جامعہ، اردو، رہبر دکن، کاروان، حسن کار، منشور، نظام گزٹ، آئینہ ادب، شہاب المویٰ، سب رس، عصمت، نقش اولین، نوائے ادب، آج کل، صبا، شاعر، نقوش، آندھرا پردیش، مجلس، نیا دور اور تعمیر وغیرہ میں متعدد بار اشاعت کا شرف پا چکے ہیں ۔ (تفصیل کے لئے دیکھئے ڈاکٹر زور، حیات اور کارنامے، ص: ۴۶۹ تا ۴۲۸)

یہاں پیش کردہ مواد سے اس بات کا بخوبی اندازہ ہوجاتا ہے کہ ڈاکٹر زور نہ صرف ایک اردو کے شاعر و ادیب تھے بلکہ وہ اپنی ذات میں ایک ادبی تحریک، ادارہ اور جامع فردِ فرید تھے جنہوں نے اردو ادب میں نہایت پیش بہا خدمات انجام دیں ۔ جن پر جامعہ نظامیہ اور جامعہ عثمانیہ اور اہل دکن کو فخر و ناز ہے کہ اس کے سپوت نے یہ کارہائے گراں مایہ انجام دئے جو ادب کی تاریخ کا ایک روشن باب ہیں، ۲۳ر اور ۲۴ر ستمبر ۱۹۶۲ء کی درمیانی شب ان کا انتقال ہوگیا۔

حق مغفرت کرے عجب آزاد مرد تھا۔

☆☆☆

ڈاکٹر محمد عظمت اللہ خان احساس
ایس اے، ای آر پی، محکمہ تعلیمات
حیدرآباد، تلنگانہ
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''روشن ستارے'' برفلک ادبِ اطفال

فَاقْصُصِ الْقَصَصَ لَعَلَّهُمْ يَتَفَكَّرُونَ○

(سورۃ الاعراف:۱۷۶)

''قصے بیان کرتے رہو تا کہ لوگ سوچ وچار کریں۔''

کہانی ـــــ ازل سے کہی جاتی رہی ہے اور تا ابد یہ سلسلہ یوں ہی قائم رہے گا۔

ایک اور مقام پر قرآن مجید میں سورۂ یوسف کی آیت نمبر:۳ میں اللہ تعالیٰ فرماتا ہے:

نَحْنُ نَقُصُّ عَلَيْكَ أَحْسَنَ الْقَصَصِ ۔(سورۃ یوسف:۳)

''آؤ ہم تمہیں اچھا قصہ سناتے ہیں۔''

اس آیت سے یہ بات ثابت ہوتی ہے کہ ''کہانی'' کہنا ایک احسن عمل ہے، یہی وجہ ہے کہ کہانی ابتدائے آفرینش سے ہی مختلف انداز میں کہی جاتی رہی ہے، اس وقت بھی جب دنیا میں کاغذ قلم ایجاد نہیں ہوا تھا۔

ابھی پچھلی صدی تک بھی ہم نے دیکھا کہانیاں دادی، نانی، پھوپھی، چاچی، ماں، ماں جائی کے توسط سے ننھے ذہنوں کی پرورش اور اخلاقی تربیت کا ذریعہ تھیں، اس توسط کو ''زبانی ادب'' کہا جاتا ہے، یہ کہانیاں چھوٹی چھوٹی حکایتوں، داستانوں، گیتوں اور لوریوں کی شکل میں ہوتیں۔ رابندر ناتھ ٹیگور نے کہا تھا:

''ٹھیک سے دیکھنے پر بچہ جیسی پرانی چیز اور کوئی نہیں۔''

بچہ خواہ کسی قوم، کسی ملک یا کسی بھی علاقے میں پیدا ہوا، غور کرو تو محسوس ہوگا کہ روزِ اول جیسا تھا ـــــ ویسا ہی ہے۔ ساری آلائشوں سے پاک، غلاظتوں سے مبرّا، بالکل کورے کاغذ کی طرح صاف اور شفاف۔ کیوں کہ بچہ خدا کی دین ہے، اس کی فطرت میں کھوٹ شامل نہیں ہوتی۔ بعد ازاں مرورِ وقت کے ساتھ جھوٹ اور مصلحتوں کی ملمع کاری، اس کے ماحول کے مطابق اس کی شخصیت سازی کرتی ہے۔ اب یہ ہماری ذمہ داری ہے کہ اس نوخیز ذہن کی پرورش کے لئے صحت مند ماحول تیار کریں۔

جس طرح اچھی جسمانی صحت کے لئے صاف ستھری اور متوازن غذا کی ضرورت ہوتی ہے، اسی طرح ذہنی پرورش کے لئے اچھے ادب کی ضرورت ہوتی ہے۔ مہذب اور ترقی پذیر دنیا نے جہاں اس ضرورت کو محسوس کیا وہیں یہ خطرہ بھی محسوس کیا کہ وقت کی سیلِ رواں کے ساتھ یہ زبانی ادب معدوم ہوجائے گا۔ لہٰذا قلم و قرطاس کے ذریعہ اسے محفوظ کرنے کی کاوشیں شروع ہوئیں۔

اس طرح ایک اندازے کے مطابق یہ زبانی کہانیاں اور قصے کم از کم پانچویں صدی سے قبل ہی تحفظ کے دائرے میں آگئیں۔ یہ بات ہر کوئی جانتا ہے کہ ''بچہ'' قوم کا مستقبل ہوتا ہے۔ چنانچہ قوم کی چند ذمہ دار شخصیتوں، سرکاری اور غیر سرکاری اداروں نے اس ضرورت کی طرف توجہ دی اور اس پر عمل درآمد

مضامین

کیا۔ آج ہندوستان میں بیشمار سرکاری اور غیر سرکاری ادارے اس ذمہ داری کو بحُسن وخوبی نبھا رہے ہیں۔

۱۹۶۴ء۔۶۵ء میں بچوں کے رسالے ''کھلونا''، ''پیامِ تعلیم'' اور ''کلیاں'' جیسے رسالوں نے نوخیز ذہنوں کی پرورش میں مثبت رول ادا کیا۔ ان رسالوں میں نہ صرف سبق آموز قصے بلکہ سلسلہ وار کہانیاں چھاپی جاتی تھیں جو بچوں میں ذوقِ مطالعہ اور تجسس کو بڑھاوا دیتے تھے۔ ''گھر کا بھیدی'' اور ''چچا مرغ سسرال گئے'' ایسی قسط وار کہانیاں تھیں جس کی وجہ سے بچوں کو دوسرا رسالہ آنے تک صبر کرنا دشوار لگتا۔ 'پیامِ تعلیم' ایک معلوماتی رسالہ ہوتا۔ اس رسالے نے نت نئے انداز میں تعلیمی پیغام کو پھیلایا۔ ہاں مگر 'کھلونا' سب سے منفرد رسالہ تھا۔ یہ رسالہ چھ (۶) سے اسّی (۸۰) سال کے قارئین میں بھی برابر کا مقبول تھا۔ اس کے مضامین میں تنوع ہوتا۔ مستزاد یہ کہ کہانیاں باتصویر ہوا کرتیں جو ننھے قارئین کو لبھاتیں۔ 'میاں فولادی'، 'تاریخ پارے'، 'نو پھول راج کماری'، ''نیلی کھوپڑی'، 'چندا ماموں'، 'سرکس کے کھیل' اور 'گھسیٹیا کی بھتنا شاہی' آج بھی بوڑھے حافظوں میں محفوظ ہیں۔

ہمارے بچپن میں دہلی، بمبئی اور رامپور سے رسالے آیا کرتے تھے۔ ہم ان شہروں کی بچہ دوستی کو فراموش نہیں کر سکتے۔ حق بات تو یہ ہے کہ یہ بارِ گراں سرکاری اداروں سے زیادہ خانگی اداروں نے اٹھایا، آج بھی بمبئی سے فاروق سید ''گل بوٹے'' کے نام سے یہ نیک کام کر رہے ہیں۔ ماضی بعید میں انفرادی طور پر ادبِ اطفال پر نظم ونثر دونوں اصناف میں علم وادب کے جید قلمکاروں نے بہت کچھ لکھا۔ مثلاً اسماعیل میرٹھی کی نظمیں: برسات، دال چپاتی، گرما کا موسم، پن چکّی، ریل گاڑی' بلکہ یوں کہو تو اسماعیل میرٹھی کا پورے کا پورا بنیادی کام ادبِ اطفال سے متعلق رہا۔ امیر خسرو کی نظم ''خالقِ باری'، غالب کا ''قادر نامہ'، میر کی ''مونی بلی'، نظیر اکبر آبادی کی 'تل کے لڈو'، 'روٹی نامہ' اور اقبال کی متعدد نظمیں 'پرندے کی فریاد، پہاڑ اور گلہری، گائے اور بکری، ماں کا خواب، جگنو، مکڑا، اور 'مکھی' وغیرہ اور نثری ادب میں ڈاکٹر ذاکر حسین کی 'ابو جان کی بکری'، پریم چند کی 'نادان دوست' احمد ندیم قاسمی کی 'چوہوں کی بارات' کہانیاں اور عہدِ حاضر میں جناب حافظ کرناٹکی جن کی ادبِ اطفال پر ننانوے (۹۹) کتابیں منظر عام پر آچکیں اور سوویں کتاب زیرِ ترتیب ہے۔ یہ سارا ادب قوم کی تعمیر کے لئے وجود میں آیا۔ یہ قلمکار قوم کے بڑے معمار ہیں جنہیں فراموش نہیں کیا جاسکتا۔

۱۹۷۵ء میں ریاست حیدرآباد میں اردو اکاڈمی کا قیام عمل میں آیا، اس کاڈمی نے پرانے لکھنے والوں کی ادبی خدمات کے اعتراف اور نئے لکھنے والوں کی ہمت افزائی اور پذیرائی میں کوئی دقیقہ اٹھا نہیں رکھا۔ مگر بچوں کے رسالہ نکالنے میں تقریباً پنتالیس سال لگ گئے اور ایک مدت بعد ۲۰۱۹ء میں اردو اکاڈمی ریاست تلنگانہ حیدرآباد کے سابق صدرنشین عالی جناب محمد رحیم الدین انصاری نے رسالہ اطفال کی ضرورت کو محسوس کیا اور نہایت جستجو اور تگ ودو سے ''روشن ستارے'' کے نام سے ماہنامہ جاری کیا جسے حیدرآباد ہی نہیں بلکہ ہندوستان

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کے مہذب طبقے نے ہاتھوں ہاتھ لیا۔

مگر کچھ مہینوں بعد ہی رسالے کو کسی کی نظر لگ گئی۔ ٹائٹل رجسٹرین جو Pending Approval تھا، کی غیر موجودگی کی پاداش میں کچھ مہینوں کے لئے رسالہ تعطل کا شکار ہوگیا۔ بفضلِ تعالیٰ اب بڑی پابندی سے نکل رہا ہے۔

روشن ستارے اپنی عمر کے لحاظ سے ابھی ایامِ طفلگی سے ہی گذر رہا ہے مگر صوری، بصری اور معنوی اعتبار سے جوانی کی حد میں داخل ہو چکا ہے۔ آفریں ہیں اس کے ایڈیٹر ڈاکٹر محمد غوث صاحب، ڈائریکٹر/ سکریٹری اکاڈمی جن کی سرپرستی میں یہ رسالہ نکلتا ہے اور جناب سردار سلیم صاحب، نائب مدیر جو اس رسالے کے کرتا دھرتا ہیں، جن کی شب و روز کی تگ و دو نے اتنی کم مدت میں رسالے کو یہ اعتبار بخشا۔

۴۸ صفحات پر مبنی ''روشن ستارے'' کی تزئین و ترتیب اور مواد کی تبویب نہایت ماہرانہ انداز میں کی گئی ہے۔ بصری اعتبار سے بھی رسالہ کیا بچے کیا بوڑھے سب کے دل موہ لیتا ہے۔ اول تو اس کا سرورق اور اندرونی صفحات پر باتصویر کہانیاں بچوں کے لئے جاذب نظر ہیں۔ بچوں کی نفسیات اور ذہنی اپج کے لحاظ سے مواد کی مناسب انداز میں زُمرہ بندی کی گئی ہے جو اس رسالے کی کامیابی کی ضامن ہے۔

رسالے میں رُلا ملا کر کل بارہ (۱۲) موضوعات کو نہایت ہنرمندی سے مرتب کیا گیا ہے۔ ان ۴۸ صفحات میں بچوں کے مزاج اور مذاق کے مطابق ذہنی اور اخلاقی تربیت کا پورا سامان موجود ہے۔ صوری اعتبار سے سرِ ورق جاذب نظر ہے جو بچوں کی توجہ اپنی طرف کھینچتا ہے۔ سرورق کے اندرونِ صفحہ پر ننھے منھے بچوں کی روشن تصویریں ہیں۔ اور آخری صفحے پر ادب عالیہ سے کسی مشہور شاعر کی نظم ہوا کرتی ہے۔

اندراجات میں سب سے اول: بچوں سے گفتگو کے عنوان سے اداریہ ہے جسے مدیرِ رسالہ ڈاکٹر محمد غوث صاحب، ڈائریکٹر/ سکریٹری اکاڈمی تحریر فرماتے ہیں۔ پھر حمدِ باری تعالیٰ اور ثنائے رسول، چوتھے، زمرے میں سائنس پر مبنی مضامین، اس کے بعد معاونین قلم کاروں کی کہانیاں، مضامین اور شعری تخلیقات ہوتی ہیں۔ چھٹا زمرہ ''ننھے قلمکاروں کا صفحہ'' اس زمرے کا میں دل سے خیر مقدم کرتی ہوں۔ یہ زمرہ ننھے قلمکاروں کی رشحات کے لئے مختص ہے۔ اس اختراع پر میں اکاڈمی کی شکر گذار ہوں کہ انہوں نے اس ضرورت کو محسوس کیا۔ آج کی نسل بے حد زِیرک اور Talented ہے۔ ان کی تخیلی پرواز بہت اونچی ہے۔ انہیں پرواز کے لئے کھلا آسمان تو ہے مگر سمت کا یقین چیستاں ہے۔ انہیں ایک ایسے سہارے کی ضرورت ہے جو انہیں اظہار کی آزادی تو دے، ساتھ ہی سمت کا تعین بھی کر سکے۔ ''روشن ستارے'' کے مرتبین نے اس ضرورت کو محسوس کیا۔ یہ ایک تعمیری اقدام ہے جس کے لئے میں اربابِ مجاز کو مبارک باد پیش کرتی ہوں۔ ساتویں زمرے ''ہنسو اور ہنساؤ'': میں لطیفوں کا چٹخارہ خوب ہے۔

آٹھ تا گیارہ زمرے صرف اور صرف بچوں کے عملی تجربوں اور مشقوں کے لئے مخصوص ہیں۔ ان میں کوئز، چیستاں، تصویروں اور لفظوں کو جوڑ کر محاورے ترتیب دینا،

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بکھرے حرفوں کو جوڑ کر الفاظ بنانا، 'آؤ اردو سیکھیں' کے تحت جملے بنانا، نقطوں کو جوڑ کر تصویریں بنانا، تصویروں میں رنگ بھرنا' جیسی مشقیں ہونہار ذہنوں کی تربیت کا سامان مہیا کرتی ہیں۔ آخر میں زمرہ نمبر (۱۲) میں ''تعلیمی خبرنامہ'' کے تحت کسی بھی تعلیمی ادارے کی بہت مختصر خبریں چھپتی ہیں۔

''روشن ستارے'' کو بہترین قلمکاروں کا تعاون حاصل ہے۔ اس سے ظاہر ہوتا ہے کہ مدیر صاحبان کے مراسم یعنی Social Report بہت اچھا ہے۔ اتنی کم مدت میں ہندوستان کی ہر ریاست سے قلمی تعاون حاصل ہے جو اپنے آپ میں بڑی بات ہے۔

بچوں کے نامور ادیب: سراج عظیم (دہلی)، ڈاکٹر بانو سرتاج (مہاراشٹرا)، جناب پرویز شہریار (دہلی)، جناب رونق جمال (چھتیس گڑھ)، قاضی مشتاق احمد (مہاراشٹرا)، جناب اشتیاق سعید (ممبئی)، جناب قمر سلیم (مہاراشٹرا)، جناب مختار ٹونکی (راجستھان)، مسعود جاوید ہاشمی، انور ادیب، قمر ہاشمی، کوثر صدیقی، عزیز احمد عرسی کے علاوہ دہلی سے جناب محمد خلیل، محترمہ زیب النساء، مہاراشٹرا سے شہ تاج خان، رحیم رضا، رفیق گلاب، حیدر بیابانی اور آفتاب حسنین، کرناٹک سے ظہیر رانی بنوری، بنگال سے فیروز اختر، اتر پردیش سے ڈاکٹر رضاء الرحمٰن، عاکف سنبھلی، حیدرآباد سے راقم قمر جمالی، ڈاکٹر مجید بیدار، رفیعہ نوشین، ڈاکٹر ناظم علی، مومن خان شوق، ثریا جبین، ڈاکٹر م۔ق۔ سلیم، ظفر فاروقی، عاتکہ نور، کشور سلطانہ اور کڑپہ، آندھرا پردیش سے ستار فیضی وغیرہ شامل ہیں۔

یہ ایک ادھوری سی اور آج تک کی فہرست ہے۔ آگے آگے دیکھئے ہوتا ہے کیا۔ رسالے کے نہج کو دیکھتے ہوئے یہ کہنے میں کوئی تکلف نہیں کہ ان شاء اللہ ''روشن ستارے'' بہت جلد اسم بامسمّٰی ثابت ہوگا اور برفلکِ ادبِ اطفال ستارہ بن کر چمکے گا۔

آخر میں دو باتیں دل کی: اول یہ کہ رسالے کو باتصویر بنانے میں جس مصوّر کی خدمات حاصل ہیں وہ لائق ستائش ہے۔ مصوّر کا نام مخفی رکھا گیا ہے۔ کیا ہی اچھا ہو کہ وہ ظاہر ہو۔

دوم یہ کہ ''ننھے قلمکاروں کا صفحہ'' کے تحت ایک ہی صفحہ مختص کیا گیا ہے۔ میری رائے ہے کہ اسے ''ننھے قلمکاروں کا صفحہ'' کے بجائے ''ننھے قلمکاروں کی رشحات'' یا پھر جو بھی اکاڈمی مناسب سمجھے رکھیں تاکہ ایک صفحے کی پابندی نہ ہوتا کہ اگر کسی بچے کی کہانی دو صفحوں تک جاتی ہے تو وہ رسالے میں جگہ پانے سے محروم نہ ہو۔

میں دل کی گہرائی سے مدیر صاحبان ''روشن ستارے'' کی خدمت میں مبارک باد پیش کرتی ہوں۔ دعاء کرتی ہوں کہ:

ننھے پودے مرے شجر ہو جائیں
فاختاؤں کے ان میں گھر ہو جائیں
ذرّۂ ذات میں ہیں سمٹے ہوئے
ہم جو پھیلیں تو بحر و بر ہو جائیں

(عارف شفیق، کراچی)

مکان نمبر: 5-4، ہیما گری نگر کالونی، گندم گوڑہ، حیدر شاہ کوٹ،
حیدرآباد۔ 500091، تلنگانہ اسٹیٹ، انڈیا
فون نمبر: 9985503977

مضامین

ریاضی کا خوف: اسباب اور حل

خلاصہ: ریاضی ہماری زندگی کے ہر پہلو سے متعلق ایک ضروری اور منطقی مضمون ہے۔ ریاضی کو حسابات، اعداد، شکلوں، پیمائش، مقدار اور سمت وغیرہ کی سائنس کہا جاتا ہے۔اسکول کی سطح پر ریاضی کو سب سے بڑا ڈراونا مضمون سمجھا جاتا ہے۔ کچھ طلبہ ریاضی کے سوالات کو آسانی کے ساتھ حل کردیتے ہیں،تو وہیں بیشتر طلبہ میں اس کی وجہ سے خوف اور ناکامی کا احساس رہتا ہے۔

آخر کچھ طلبہ کو ریاضی سے ڈر کیوں لگتا ہے؟ کیا ریاضی میں آنے والے اس مسئلہ کی وجہ ریاضی کی نوعیت ہے یا اسے پڑھائے جانے کا انداز یا پھر یہ دونوں؟ وہ کونسی وجوہات ہیں جو ریاضی کو لے کر طلبہ میں خوف پیدا کرتی ہیں؟ طلبہ کے ریاضی کے خوف کو کس طرح دور کیا جاسکتا ہے؟

اس مضمون میں انہی نکات پر روشنی ڈالی گئی ہے۔

تعارف: ریاضی کو اسکولی مضامین میں اہم ترین مضمون کی حیثیت سے جانا جاتا ہے۔ ریاضی پڑھنے لکھنے کا مقصد صرف اعداد اور ان کے حل کردینے کی معلومات کو پُر کردینا نہیں ہے، بلکہ ریاضی کا مقصد کسی فرد میں ایسی استعداد کو فروغ دینا ہے جس سے اس کے اندر استدلال، تجزیہ، سوچنے سمجھنے کی قابلیت وصلاحیت وغیرہ پیدا کرنا ہے۔(قومی تعلیمی پالیسی۔ 1986)۔

ریاضی کو اسکول کی تعلیم کا ایک اہم حصہ سمجھا جاتا ہے کیونکہ اس کا ہر مضمون سے مثبت تعلق ہوتا ہے اور ہم روزمرہ کی زندگی میں ریاضی کا استعمال کرتے ہیں۔ اس کے مطالعہ سے طلبہ میں خوداعتمادی اور خودانحصاری پیدا ہوتی ہے۔ ریاضی میں مجرد مفروضوں کی وضاحت کی جاتی ہے۔ لاک کے مطابق ''ریاضی وہ شاہراہ ہے جس کے ذریعہ بچوں کے دماغ اور ذہن میں استدلال کی عادت پیدا ہوتی ہے۔''

ریاضی کی اہمیت کو دیکھتے ہوئے راجر بیکن (Roger Bacon) نے سچ ہی کہا :''ریاضی تمام علوم کا دروازہ اور کلید ہے''۔

آج اسکولوں میں ریاضی کی تعلیم کے مقاصد کو صحیح طریقے سے پورا نہیں کیا جارہا ہے، اسکولی ریاضی سے متعلق وسائل کے مطالعہ اور کلاس میں طلبہ سے ریاضی کے مضمون پر گفتگو کرنے سے بہت سارے مسائل سامنے آتے ہیں۔ جس میں ریاضی کا خوف ایک سنگین مسئلہ ہے، جس کے حل کے لیے کوششیں جاری ہیں۔

ریاضی کا خوف: ریاضی سے ڈرنے کو ہی ریاضی کا خوف کہا جاتا ہے۔ دوسرے الفاظ میں ،'ریاضی کے متعلق بے بسی کا احساس ہونا یا خود کو ریاضی کے مفروضوں اور سوالوں کو حل کرنے سے قاصر سمجھنا ہی ریاضی کا خوف ہے۔'

ریاضی کا خوف ہی بچوں کی ریاضی میں منفی کارکردگی کی سب سے بڑا سبب ہے۔ باصلاحیت طلبہ بھی

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ریاضی کے خوف سے دوچار پائے گئے۔ وسائل سے پتہ چلتا ہے کہ زیادہ تر طلبہ ابتداء ہی سے ریاضی سے خوفزدہ ہیں۔ ریاضی کے خوف کا اثر بچوں کی ریاضی کی کارکردگی کے ساتھ ساتھ ان کے ہمہ جہت ترقی پر بھی پڑ رہا ہے۔ اب سوال یہ پیدا ہوتا ہے کہ طلباء کے ذہنوں میں ریاضی کا خوف کیوں پیدا ہوتا ہے؟

ریاضی کے خوف کے اسباب: ریاضی اس مضمون کو طلباء زندگی کا سب سے مشکل مضمون سمجھ کر ہمیشہ خوفزدہ رہتے ہیں جس کی وجہ سے کلاس میں ریاضی کی پڑھائی میں ان کی دلچسپی نہ کے برابر رہتی ہے۔ ہمارے ملک میں ابتداء ہی سے ریاضی کو اہم ترین مضمون سمجھا جاتا رہا ہے۔ ریاضی کو ثقافت اور تہذیب کی تشکیل اور ان کی نشو وارتقاء کرنے والا مضمون سمجھا جاتا ہے۔ ہر فرد کو راست یا بالراست طور پر ریاضی کے علم سے واقفیت ہونا ضروری ہوتا ہے۔ ریاضی کے علم کی کمی کی وجہ سے وہ اپنی خاندانی اور معاشرتی ذمہ داریوں کو بھی بخوبی نہیں نبھا سکتا ہے۔ ہمارے ملک میں ریاضی اسکولی سطح پر ایک لازمی مضمون ہے۔ ریاضی کی غلط پڑھائی اور منفی سوچ کی وجہ سے، طلباء ریاضی میں ناکامی سے خوفزدہ رہتے ہیں اور جلد ہی وہ ریاضی کی سنجیدہ پڑھائی سے کنارہ کشی اختیار کر لیتے ہیں۔ اس کے نتیجہ میں ریاضی پر مبنی تمام مضامین اسے مشکل معلوم ہوتے ہیں اور طلباء ریاضی کے متعلق تناؤ کا شکار ہو جاتے ہیں، جس کی وجہ سے بچے ریاضی سے بھاگنے لگتے ہیں اور وہ ریاضی کے متعلق منفی رویہ اختیار کرنے لگتے ہیں۔ جس کے نتیجے میں ایک منفی صورتحال پیدا ہو جاتی ہے اور طلباء ریاضی اور ریاضی سے متعلق تمام مضامین سے خوفزدہ رہتے ہیں۔

جب ہم نے کچھ طلباء سے ریاضی کے منفی رویہ کے بارے میں پوچھا تو ریاضی کے متعلق ان کا ردعمل اس طرح سامنے آیا:

تقریباً 40 فی صد طلباء کو یہ کہتے ہوئے پایا گیا کہ،

- مجھے ریاضی بہت مشکل معلوم ہوتی ہے۔
- ریاضی مشکل ہے،
- میں ریاضی نہیں کر سکتا۔ وغیرہ۔

اس کے علاوہ 50% طلباء کا ردعمل کچھ اس طرح رہا۔

- میں ریاضی میں کبھی اچھا نہیں ہو سکتا۔
- میں ریاضی کی کلاس کے دوران اکتا جاتا ہوں۔
- ریاضی کو چھوڑ کر سبھی مضامین میں مجھے اچھے نمبرات ملتے ہیں۔

جبکہ 10 % طلباء نے کوئی جواب نہیں دیا۔

اس کے علاوہ ریاضی کے کچھ اساتذہ نے ہمیں بچوں میں ریاضی کے خوف کی ایک وجہ بچوں کا ریاضی کا کمزور پس منظر بتایا، ان کا موقف تھا کہ ریاضی میں جو موضوع آگے آتا ہے اس کا انحصار پچھلے موضوع پر ہوتا ہے۔ جیسے تفریقی مساوات کو تفریق اور جمع کے آنے پر ہی حل کیا جا سکتا ہے۔ 3D سے پہلے 2D کو سمجھنا ضروری ہے۔ مربع کو جاننے سے پہلے ہمیں نقطہ، لکیر، زاویہ، مثلث وغیرہ کو جاننے کی ضرورت ہے ورنہ اگر ہم ایک کو چھوڑ دیں تو دوسرا سمجھ میں نہیں آتا۔ اسی

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طرح، تقسیم کے سوالات سے پہلے ہمیں جمع، تفریق، ضرب وغیرہ سیکھنا پڑتا ہے۔ اگر ہم پہلی (Step) کو چھوڑ دیں تو دوسری سمجھ میں نہیں آئے گی، جس کا مطلب ہے کہ ان بچوں کے لئے جن کا ریاضی کا پس منظر کمزور ہے، ریاضی بعد میں ایک مشکل مضمون بن جاتا ہے۔ اس کی وجہ سے، بچوں میں ریاضی کے بارے میں منفی رویہ پیدا ہوتا ہے۔

اس کے علاوہ بچوں میں ریاضی کی مساوات، اعداد وغیرہ کے بارے میں ایک خاص قسم کا خوف پایا گیا۔ جس کی وجہ سے بچے ریاضی کے لیکچر، ریاضی پر گفتگو اور ریاضی کی کلاس میں جانے سے کترانے لگتے ہیں۔

اسکولوں میں ریاضی کے استاد کی کمی یا ریاضی کو دوسرے مضامین کے اساتذہ کے ذریعہ پڑھایا جانا، جنہیں ریاضی سے واقفیت نہیں رہتی، ایسے اساتذہ بچوں کو ریاضی کی مکمل معلومات نہیں دے پاتے۔ (اولانیان اور سیل مین۔ 2015)۔

اگر اساتذہ کمزور اور ذہین طلباء کو ساتھ لے کر ان کی حوصلہ افزائی کریں تو طلباء کو ریاضی میں سیکھنے میں کم مسائل آئیں گے۔ ریاضی کی تدریس میں اساتذہ کا موثر تدریسی طریقہ کو بروئے کار نہ لانا بھی بچوں کے ذہنوں میں ریاضی کا خوف پیدا کرنے کی ایک اہم وجہ بن کر سامنے آئی ہے۔ (یاہا اور فسائی۔ 2012)۔

اس طرح ہم دیکھتے ہیں کہ ریاضی سیکھنے میں منفی، ریاضی کا کمزور پس منظر، ریاضی کے بارے میں منفی طرز عمل، ریاضی کی تجریدی نوعیت، ریاضی میں اچھے تدریسی مواد کی کمی، گننے کی صلاحیت کا قدان (Dyscalculia)، اعتماد کا فقدان، ریاضی میں بنیادی کمزوری، نصابی دشواریاں، نصاب یا قدر پیمائش کے طریقہ کار میں نقائص، شماریات (حساب کتاب) پر زیادہ زور، ریاضیاتی طریقہ سے سوچ کا فقدان، ناقص رہنمائی، روایتی طریقہ تدریس کا استعمال، سرگرمیوں کی کمی اور عمومی تجربات ریاضی کی بنیاد کو کمزور کردیتے ہیں اور طلباء ریاضی کو لے کر تناو کا شکار ہوجاتے ہیں۔

اس کے علاوہ ریاضی میں بچوں کی منفی سوچ کی ذمہ داری بھی معاشرے کی قدامت پسندی پر ہے۔ عام طور پر یہ خیال کیا جاتا ہے کہ لڑکیاں پیدائشی طور پر کمزور ہوتی ہیں یا لڑکیوں میں ریاضی کی مہارت کم ہوتی ہے جبکہ لڑکوں میں ریاضی کی مہارت پیدائشی ہوتی ہے۔ جب میں نے کلاس کے اپنے طلباء جن میں لڑکیاں بھی شامل تھیں سے کچھ ریاضی دانوں کے نام لکھنے کو کہا تب 90% نے مرد ریاضی داں جیسے بھاسکراچاریہ، آریہ بھٹ، سری نواس رامانوجن وغیرہ کے نام لکھے، صرف 10% طلباء وطالبات نے صرف ایک خاتون ریاضی داں شکنتلا دیوی کا نام لکھا۔ اس کی ایک بنیادی وجہ ہماری نصابی کتب میں زیادہ تر مرد ریاضی دانوں کی تفصیلات دی گئی ہیں۔ یہی وجہ ہے کہ اگر کوئی لڑکی ریاضی میں اچھے نمبرات حاصل کرتی ہے تو لوگ عام طور پر اس کی خصوصی محنت کو اس کی خاص وجہ بتاتے ہیں، اور جب لڑکے اچھے نمبر

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حاصل کرتے ہیں تو اسے وہ اس کی پیدائشی خصوصیت سے وابستہ کرتے ہیں۔اس کے علاوہ ہمارے سماج میں ریاضیاتی توہمات بھی رائج ہیں۔ جیسے ریاضی بہت مشکل ہے، ریاضی دلچسپ نہیں ہے، ریاضی کے اساتذہ بہت سخت ہوتے ہیں، تمام لڑکیاں ریاضی میں کمزور ہوتی ہیں۔صرف ذہین طلباء ہی ریاضی پڑھ سکھتے ہیں ۔(تری ویدی، 2012) وغیرہ بھی طلباء میں منفی رویہ اور ریاضی کو تناو والا مضمون بنانے کے ذمہ دار ہیں۔ بہت سی تحقیقات نے ثابت کیا ہے کہ ان تمام توہمات اور مفروضوں کی کوئی سائنسی بنیاد نہیں ہے۔

NCF-2005 کے مطابق:

- ہر بچہ ریاضی سیکھ سکتا ہے۔
- ریاضی ہر ایک بچے کی ضرورت ہے۔

تحقیق سے پتہ چلتا ہے کہ ریاضی کے بارے میں منفی رویہ ایک سیکھا ہوا ردعمل ہے، اگر اسے سیکھا جاسکتا ہے تو اسے بھلایا بھی جاسکتا ہے ریاضی کا ایک ایسا مثبت ماحول پیدا کیا جاسکتا ہے جس میں بچے ریاضی سے خوفزدہ ہونے کے بجائے ریاضی سے لطف اندوز ہوں، ریاضی پر تبادلہ خیال کریں، ریاضی کے مسائل حل کریں اور ریاضی کے بنیادی ڈھانچہ کو سمجھیں۔

ریاضی کا ڈر کیسے دور کریں؟: ریاضی کے خوف پر قابو پانے کے طریقے درج ذیل ہیں:

ریاضی کی تعلیم میں خوشگوار ماحول کی ضرورت: "بچوں کے لیے بستے کے بوجھ سے بھی بدتر ہے، نہ سمجھ پانے کا بوجھ"۔ پروفیسر یش پال کمیٹی (بوجھ کے بغیر تعلیم) ۔1993:

ریاضی کے استاد کو اپنے مضمون کا جتنا علم ہونا چاہیے، اتنا ہی علم اسے اپنے طالب علم کے بارے میں بھی ہونا چاہیے تاکہ وہ ہر بچے کی صلاحیت کو سمجھ سکے اور اس کے مسئلے کو آسان بنا سکے اور اس میں ریاضی کے خوف کا تدارک کر سکے۔ ریاضی کے استاد کو ایسے طریقے اپنانے چاہئے جس کے ذریعے بچے میں ریاضی سے دلچسپی پیدا ہو اور طلباء خوشی سے ریاضی کا پڑھ سکیں۔ بچوں اندخوشی کے ماحول کو پیدا کریں کیونکہ خوش رہنے والے بچے جلدی سیکھتے ہیں اور ان میں زیادہ تخلیقی سوچ پیدا ہوتی ہے۔ وہ ہر شعبے میں اچھی کارکردگی کا مظاہرہ کرتے ہیں۔ وہ ناکامی سے نہیں ڈرتے اور پوری ہمت کے ساتھ حالات کا سامنا کرتے ہیں۔اپنی ناکامی کی وجوہات کا پتہ لگا کر اسے دور کرتے ہیں۔اس طرح طلباء جلدی کامیابی حاصل کرتے ہیں۔ ریاضی ایک دماغی کھیل ہے۔ ریاضی کو خوشی سے سیکھنے کے لیے بچوں کو آزادی دینا بھی ضروری ہے۔اس کے لیے اسکول میں ایسا طریقہ کار اپنایا جانا چاہیے جس سے طلباء غلطیوں کے خوف کے بغیر اور ناکامی کے خوف کے بغیر آزادانہ طور پر اپنے خیالات کا اظہار کرسکیں اور ریاضی کی تعلیم حاصل کرسکیں۔

بچوں کو ریاضی کی اہمیت کی تعلیم دینا: طلباء میں ریاضی کی دلچسپی بڑھانے کے لیے انہیں بتانا چاہیے کہ بیرونی زندگی میں ریاضی کا کیا استعمال ہے اور بچوں کو یہ بھی بتایا جائے کہ ریاضی کا دیگر مضامین سے کیا تعلق ہے۔اور اگر ہم ریاضی کو سمجھ سکتے

ہیں تو ہمارے لیے بہت سارے مضامین آسان ہوں گے۔ ہمارے ملک میں زمانہ قدیم ہی سے ریاضی کو بطور مضمون بہت اہمیت دی جاتی رہی ہے۔ موجودہ دور میں بھی ہماری زندگی میں ریاضی کی بے حد اہمیت ہے۔ طلباء کو ریاضی کی اہمیت اور دیگر مضامین کے ساتھ ریاضی کے تعلق کو اجاگر کر کے بچوں میں ریاضی سے دلچسپی پیدا کی جاسکتی ہے۔ ریاضی کا استعمال ہماری روزمرہ کی زندگی میں تقریباً ہر جگہ ہوتا ہے۔ ایک کسان سے لے کر ڈاکٹر، مزدور سے انجینئر، طالب علم سے تاجر، گھریلو کام سے لے کر بازار کی خریداری تک، ریاضی ہر جگہ استعمال ہو رہی ہے، یعنی ہر جگہ ریاضی ہے۔ ریاضی کا تمام مضامین کے ساتھ مثبت تعلق ہے۔ یعنی اگر کسی طالب علم کی ریاضی اچھی ہو تو سائنس جیسے مضامین بھی اچھے ہو جائیں گے۔ اس کے علاوہ، ریاضی کے مطالعہ سے طلباء میں استدلال کی عادت، ذہنی قوتوں کی ترقی، تخلیقی سوچ اور مسائل کو حل کرنے جیسی صلاحیتیں بھی فروغ پاتی ہیں۔ بچوں میں ریاضی کے ذریعے جمالیاتی، جذباتی، سماجی، سائنسی، عملی اور اخلاقی اقدار بھی پروان چڑھتی ہیں۔ اس طرح بچوں کو ریاضی کی اہمیت بتا کر ریاضی کے متعلق ان میں دلچسپی پیدا کی جاسکتی ہے۔

روزمرہ زندگی سے ریاضی کو جوڑنا: ریاضی کو بچوں کی روزمرہ کی زندگی سے جوڑ کر سکھایا جانا چاہیے تاکہ وہ ریاضی کی عملیت اور اطلاق سے واقفیت حاصل کر سکیں اور ریاضی کی بنیادی ساخت کو سمجھ سکیں۔ قومی نصاب کے خاکہ (2005) کی تجویز ہے کہ بچے کی اسکول کی زندگی کو بیرونی زندگی سے جوڑنا چاہیے اور ہر مضمون کو ایک مضبوط دیوار سے گھیرے اور معلومات کو رٹا دینے کے رجحان کو روکنا چاہئے اور اسکول میں ایک چھوٹے سے سماج کا ماحول پیدا کرنا چاہیے جو سیکھنے اور کھیل کے ذریعے سیکھنے پر مبنی ہو۔ مہاتما گاندھی کے مطابق اسکول اور گھر کے درمیان تال میل ہونا چاہیے، تجارت اور تعلیم کے درمیان تال میل ہونا چاہیے۔ انہوں نے بنیادی تعلیم میں ربط کو اہمیت دی ہے۔ ہمیں ریاضی کی تدریس طلباء کی روزمرہ کی زندگی سے جوڑ کر کرنا ہوگا تاکہ بچہ اپنے آپ کو سماج سے جوڑ سکے۔ ریاضی ہر جگہ موجود ہے۔ ریاضی سے کوئی چیز بھی چھوٹی ہوئی نہیں ہے۔ ہمیں بچوں کے تجربے اور پیشگی معلومات کا استعمال کرتے ہوئے بچوں کو سماج سے جوڑنا ہے تاکہ بچہ سیکھی ہوئی ریاضی کو سماجی مسائل کے حل کے لیے استعمال کر سکے۔ اسی بات کی تائید کرتے ہوئے، رابندر ناتھ ٹیگور جی نے یہ بھی کہا ہے کہ، "بہترین تعلیم وہ ہے جو ہمیں نہ صرف معلومات اور علم مہیا کرتی ہو، بلکہ ہماری زندگی کا دنیا کے تمام جانداروں کے ساتھ تعلق بھی پیدا کرتی ہو۔"

ریاضی کا کمرۂ جماعت: اسکول کا ماحول بھی ریاضی سیکھنے کے عمل کو فروغ دیتا ہے۔ بچے بھی اسکول ہی کا حصہ ہیں۔ وہ اسکول کے ماحول کے ساتھ ربط میں رہتے ہیں۔ اسکول کی دیواریں، کونے، کھڑکیاں، دروازے، سیڑھیاں وغیرہ بھی ریاضی کے وسائل کے طور پر استعمال ہونے چاہئیے۔ ریاضی شکلوں کا بھی مطالعہ ہے، اس لیے اسکول کی عمارت کی تعمیر میں شکل، ڈیزائن، پیٹرن، ساخت، ٹائلنگ وغیرہ پر خصوصی توجہ

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دی جانی چاہیئے ۔ کمرۂ جماعت کے کونے کے زاویے، پنکھے کا دائرہ، ٹیبل بورڈ مستطیل اور کھڑکیوں کا کونہ، متوازی اور عمودی لکیر، کھیل کے میدان کی گولائی شکل، بیلن کی شکل میں رولر، دائرے کی شکل میں فٹ بال وغیرہ کا استعمال تعلیمی وسائل کے طور پر ہونا چاہیے۔ اس لیے اسکول کی دیواریں، عمارت اور ڈھانچہ اس طرح تیار کریں کہ اس میں ریاضی کے تصورات واضح طور پر نظر آئیں۔

ریاضی کی تعلیم میں سابقہ معلومات اور تجربہ: سوامی وویکانند جی کے مطابق، " کوئی بھی علم باہر سے نہیں آتا، وہ ہی اندر ہوتا ہے، ہم کہتے ہیں کہ کوئی شخص کسی کو نہیں سکھاتا ہے۔ ہر شخص خود سیکھتا ہے۔ باہر کا استاد/شخص صرف تجاویز ہی دیتا ہے جس سے استاد کو سمجھنے یا سیکھنے کے لیے ترغیب ملتی ہے۔"

بچوں کا ریاضی سیکھنا اسکول آنے سے پہلے ہی شروع ہو جاتا ہے۔ بچے اپنا نقطہ نظر، تجربہ، زبان وغیرہ گھر سے لاتے ہیں۔ جیسے وہ کھیل کے میدان سے گھر تک کا فاصلہ جانتا ہے۔ وہ بس، اسکوٹر وغیرہ کے پہیے کا سائز، چاند اور روٹی کی شکلوں وغیرہ سے واقف ہوتا ہے۔ وہ وقت پر جاگتا ہے، وقت پر سوتا ہے، وقت پر اسکول جاتا ہے یعنی بچہ وقت سے واقف ہوتا ہے۔ بچہ کھیلتے ہوئے اپنے ساتھیوں کے گروپ کو دو برابر حصوں میں تقسیم کر سکتا ہے۔ اسے چھوٹے، بڑے، موٹے، پتلے، کم، زیادہ، نفع، نقصان وغیرہ کا علم ہوتا ہے۔ وہ تصویر کو دیکھ کر چھوٹے، بڑے جانوروں کو پہچان سکتا ہے۔ وہ گھوڑے، گائے، کتے وغیرہ کی ٹانگوں اور گائے کے سینگوں کی تعداد بتا سکتا ہے۔ بچے کو دکان سے ٹافیاں، کیلے، مونگ پھلی وغیرہ لینے کا تجربہ بھی ہوتا ہے۔ بچے اس طرح کے بہت سے طاقتور تجربات اپنے ساتھ اسکول لاتے ہیں۔ ان کے پاس پہلے سے موجود علم کی دولت ہوتی ہے۔ ان کی معلومات کے سرمایے کا استعمال ہمیں ریاضی سیکھنے کے لیے کرنا چاہیے۔

ریاضی کی تعلیم کے دوران زندہ مثالیں پیش کرنا: ریاضی کو خوف سے پاک، بامعنی، مختصر، سادہ اور خوشگوار بنانے میں زندہ مثالیں بڑی اہمیت کی حامل ہوتی ہیں۔ بچوں کے لیے مثالیں بہت ہی اہم ہوتی ہیں۔ یہ بچوں میں سوچ کی وسعت کو بڑھا دیتی ہیں اور بچوں کو بیرونی دنیا کے ساتھ تعامل کرنے کا موقع فراہم کرتی ہیں۔ ہمیں کمرۂ جماعت میں بچوں کے ماحول سے متعلق ہی مثال استعمال کرنی چاہیے۔ بچوں کی درسی کتابوں میں ایسے سوالات اور مثالیں ہونی چاہئے جن میں مقامی علم اور روایتی مہارت شامل ہو۔ مثال کے طور پر دیہی طلباء کو کھیتوں، گودام، نہر کی چوڑائی، دریا، تالاب، درخت کی اونچائی، فٹ پاتھ، بیج، گنے کی اونچائی وغیرہ کی مثالیں دینی چاہیئے، جبکہ شہری ماحول کے بچوں کو پل، ہائی وے، سڑک، عمارت، میٹرو ٹرین کی رفتار، پارک کا سائز وغیرہ کی مثالیں دی جانی چاہیئے ۔ جس کی وجہ سے ریاضی سے بچوں کو لگاو پیدا ہوگا۔

سرگرمیوں کے ذریعے پُر دلچسپ ریاضی سیکھنا: سوامی وویکانند کے مطابق ، "اگر تعلیم کا مطلب صرف معلومات ہوتا تو لائبریریاں دنیا کے بہترین اولیاء (سنت) ہوتے اور انسائیکلوپیڈیا رشی بن جاتے۔" علم استعمال کے ذریعہ طاقت

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بن جاتا ہے۔مختلف سرگرمیوں کے ذریعے ریاضی سیکھے کے عمل کو آسان بنایا جاسکتا ہے۔ یہاں بچے کو کر کے سیکھنے (عملی کام) کا موقع ملتا ہے اور بچے کی سمجھ ریاضی میں بنتی ہے۔ہمیں بچوں کی نظریاتی تعلیم کی بجائے عملی تعلیم پر زور دینا چاہیے، جس میں بچوں کو کر کے سیکھنے کا نظم ہونا چاہیئے۔اس کے لیے نصاب میں بہت سی سرگرمیاں شامل ہونی چاہیئے اور اسکول میں مقابلوں کا انعقاد کر کے بچوں کو کھیل کھیل میں ریاضی کے سیکھنے کے عمل کا حصہ بنانا ایک منفرد اور قابل ستائش کوشش ہوگی۔

کھیل کے ذریعے ریاضی کی تعلیم: فروبیل (Froebel) کے مطابق، "بچے کی خود عملی کھیل کے ذریعے فروغ پاتی ہے، جس سے شخصیت کی نشو ونما قدرتی طور پر ہوتی ہے۔" ابتدائی سطح پر بچوں کو کھیلوں کے ذریعہ سکھانا ایک بہترین طریقہ ہے۔ بچوں کی تعلیم اس ماحول میں بہترین ہوتی ہے، جب وہ تناؤ، خوف، اضطراب وغیرہ سے آزاد ہو کر اپنی دلچسپی کے مطابق آزادانہ طور پر آگے بڑھ سکتے ہیں۔ استاد کمرۂ جماعت میں تعلیمی کھیل سیکھنے کی رفتار میں اضافہ کرتے ہیں۔ تمام بچے کھیلوں میں دلچسپی لیتے ہیں۔ بچے کھیلتے ہوئے اپنے دماغ، جسم اور جذبات کا استعمال کرتے ہیں۔کھیلتے وقت بچوں میں، خود حوصلہ افزائی، جوش، توانائی، دلچسپی وغیرہ کا تعامل ہوتا ہے۔ ابتدائی سطح پر کھیلوں کے ذریعے، بچوں کو کم، زیادہ، تعداد، گننے، موازنہ کرنے، فرق دیکھنے، چھوٹا، بڑا کرنے، گھٹتی بڑھتی ترتیب اور حکمت عملی بنانے کا موقع ملتا ہے۔کھیل کے ذریعے بچے اپنی دلچسپیوں، ضروریات، مہارتوں اور صلاحیتوں کے مطابق خود سیکھتے ہیں۔اس لیے ابتدائی سطح پر بچوں کو ریاضی سے متعلقہ کھیلوں کے ذریعے تعلیم دی جانی چاہیے۔

نظموں کے ذریعے ریاضی کی تعلیم: نظم اپنی شاعری، تال اور دُھن وغیرہ کی وجہ سے بچوں کے ذہن کو موہ لیتی ہے اور پڑھنے میں بچوں کی دلچسپی میں اضافہ کرتی ہے۔بچوں کو ابتدائی طور پر کسی بھی موضوع کو نظم کی شکل میں ڈھال کر سکھایا جانا چاہیے۔ اس کے ذریعے ریاضی کی تعلیم کو خوشگوار، تفریح آمیز، موثر، آسان اور دلچسپ بنایا جاسکتا ہے۔

ریاضی کی تعلیم میں آئی سی ٹی کا استعمال: آج تعلیم میں آئی سی ٹی کی اہمیت سے انکار نہیں کیا جا سکتا۔ ریاضی کی تعلیم میں آئی سی ٹی کا استعمال کر کے ریاضی سیکھنا آسان بنایا جا سکتا ہے۔آئی سی ٹی نے طلباء کو آزادی دی ہے کہ وہ اپنی سمجھ کو، تحریر سے، سن کر، دیکھ کر اور تجربہ کے ذریعہ جس طرح چاہیں اس کا اظہار کر سکتے ہیں ہیں۔ یہاں پر موضوع سے متعلق پی ڈی ایف، ویڈیو، آڈیو، کتاب اور ٹیوشن ہر عنوان پر دستیاب ہیں۔ کوئی بھی طالب علم کسی بھی وقت کوئی بھی لیکچر سن سکتا ہے۔آج بیشتر طلباء کے پاس موبائل، اسمارٹ فون، لیپ ٹاپ وغیرہ ہیں۔انہیں وسائل سمجھ کر ان کے ذریعہ تعلیم دی جائے۔

ان سب کے علاوہ، ریاضی کی تعلیم کو موثر بنانے کے لیے، اسکولوں میں عظیم ریاضی دانوں کی سوانح، جدوجہد اور ان کی خدمات کے بارے میں طلباء کو واقفیت کروائی جانی چاہیے۔ریاضی کے تجربہ کار اساتذہ کے ریاضی پر لیکچرز ہونے چاہیئے اور اسکولوں میں ریاضی پر مضمون نویسی جیسے مقابلوں کا

اہتمام کیا جانا چاہیے۔ ہر اسکول میں ریاضی کی لیبارٹری بھی ہونی چاہیے جو جدید آلات اور سمعی بصری تعلیمی وسائل (Audio Visual Teaching Aids) سے لیس ہو۔ ریاضی میں، اساتذہ، ریاضی دان اور اسکالر اپنی تحقیق اور تجربے کی بنیاد پر ریاضی کی دلچسپ کتابیں تالیف کریں۔ جس میں نفسیات کے اصولوں کو مکمل طور ملحوظ رکھا جائے اور جو بچوں اور اساتذہ کو اپنی طرف راغب کرسکتی ہوں۔

اختتامیہ: مذکورہ بالا تفصیل کی بنیاد پر یہ کہا جاسکتا ہے کہ استاد کی صحیح سمت میں کی جانے والی کوششوں کے نتیجہ میں بچوں کو تناؤ سے پاک، نڈر، خوشگوار، اور ریاضی سیکھنے کا نتیجہ خیز ماحول دیا جاسکتا ہے۔ یصرف یہ ضروری ہے کہ بچے کی ذہنی کیفیت کو سمجھا جائے اور اس کی دلچسپی کو پرکھا جائے۔ اس کی سیکھنے کی صلاحیت کا مطالعہ کیا جانا چاہیے اور پھر اس کے مطابق آسان اور دلچسپ و مناسب طریقوں کو بروئے کار لایا جانا چاہیے، جو کہ عملیت کے ساتھ ساتھ تصورات پر مبنی ہوتا کہ بچہ جو کچھ سیکھے وہ اس کے ذہن میں نقش کر جائے۔ اور جس کا استعمال وہ اپنی مستقبل کی پیشہ ورانہ زندگی میں مناسب طور پر دباؤ سے پاک اور بے خوف ریاضی کے ساتھ کرسکے۔

☆☆☆

جہانگیر عالم (اسسٹنٹ پروفیسر، ڈپارٹمنٹ آف ایجوکیشن اینڈ ٹریننگ، مولانا آزاد نیشنل اردو یونیورسٹی، حیدرآباد)
ڈاکٹر علی حیدر (اسسٹنٹ پروفیسر، سی ٹی ای، مولانا آزاد نیشنل اردو یونیورسٹی، اسنسول)

صرف ایک داؤ

ایک شخص کشتی لڑنے کے فن میں مشہور تھا' وہ تین سو ساٹھ داؤ پیچ جانتا تھا اور ہر روز ان میں سے ایک داؤ کے ساتھ کشتی لڑا کرتا۔ وہ اپنے ایک شاگرد پر بہت مہربان تھا۔ اس کو تین سو اُنسٹھ (359) داؤ سکھا دیئے' صرف ایک اپنے پاس رکھا۔ وہ نوجوان کچھ عرصہ میں زبردست پہلوان بن گیا اور دور دور تک اس کی شہرت پھیل گئی۔ ملک بھر میں کسی پہلوان کو اس سے مقابلہ کرنے کی جرأت نہ ہوتی تھی۔ ایک دفعہ اس نوجوان نے اپنے طاقت کے زعم میں بادشاہ وقت سے کہا کہ استاد کو مجھ پر جو فوقیت حاصل ہے وہ اس کی بزرگی اور تربیت کے حق کی وجہ سے ہے ورنہ قوت اور فن میں اس سے کم نہیں ہوں۔ بادشاہ کو اس کی تعلّی پسند نہ آئی اور اس نے استاد اور شاگرد میں کشتی کرانے کا حکم دیدیا۔ وقت مقررہ پر کشتی شروع ہوئی۔ نوجوان مست ہاتھی کی طرح دنگل میں آیا۔ بوڑھا استاد سمجھ گیا کہ نوجوان طاقت کے زعم میں مجھ سے کشتی لڑنے آیا ہے لیکن وہ میرا وہ داؤ نہیں جانتا جو میں نے اس کو نہیں بتایا ہے۔ جیسے ہی شاگرد اس سے مقابلے کے لئے آگے بڑھا استاد نے اسے اپنے ہاتھوں سے سر پر اٹھایا اور زمین پر پٹخ دیا' ہر طرف واہ واہ کا شور مچ گیا' بادشاہ نے استاد کو انعام واکرام سے سرفراز کیا اور نوجوان کو لعن طعن کی کہ تو نے اپنے محسن استاد سے مقابلہ کیا۔ نوجوان نے کہا کہ بادشاہ سلامت استاد اپنے طاقت کی وجہ سے نہیں جیتے بلکہ انہوں نے یہ ایک داؤ مجھے نہیں بتایا تھا۔ اس حکایت سے ہمیں سبق ملتا ہے استاد استاد ہوتا ہے' اس لئے کبھی استاد سے مقابلہ کی جرأت نہیں کرنی چاہیے۔

(ماخوذ از: حکایات سعدیؒ)

مضامین

تحریکِ جنگ آزادی سے متعلق اردو میں تاریخیں

تحریک جنگ آزادی ہندوستان کی تاریخ کا اہم ترین باب ہے۔اس موضوع پر اردو میں بے شمار تاریخیں لکھی گئیں جو تاریخ نگاری کے نقطۂ نظر سے اہمیت کی حامل ہیں۔۱۸ویں صدی سے ۱۹۴۷ء تک تحریک جنگ آزادی سے متعلق اردو میں مختلف موضوعات پر تاریخیں لکھی گئیں ان موضوعات میں انڈین نیشنل کانگریس، مسلم لیگ، تقسیم بنگال، سودیشی تحریک، تحریک خلافت، جنگ عظیم، رولٹ ایکٹ، جلیاں والا باغ، سائمن کمیشن، سوراجیہ، وہابی تحریک، آزاد ہند فوج اور مجاہدین آزادی پر بھی اردو میں تاریخیں لکھی گئیں۔اس ضمن میں ابوالکلام' گاندھی جی' محمد علی جوہر' بال گنگا دھر تلک' لالہ لاج پت رائے' گوکھلے اور دیگر مجاہدین آزادی سے متعلق تاریخیں قابل مطالعہ ہیں۔ان تصانیف میں کچھ کتابیں مختصر اور کچھ بہت ضخیم ہیں۔اختصار کے پیش نظر میں نے چند اہم تصانیف کا ذکر کیا ہے۔اس طرح اس دوران لکھی گئیں ان تمام کتابوں کا احاطہ کرنا ممکن نہیں۔اس مقالے میں ان کتب کا احاطہ کرنے کی حتی المقدور کوشش کی گئی ہے جو مختلف کتب خانوں میں دستیاب ہیں۔اس لیے ممکن ہے کہ کچھ اہم کتابیں اس کوشش میں شامل نہ ہوں۔میں نے بیشتر کتابوں کا مطالعہ کرکے اس مقالے میں صرف ان تاریخوں کا ذکر کیا ہے جو کسی نہ کسی حیثیت سے اہم ہیں۔اس ضمن میں بعض اہم تاریخوں کا مفصل تعارف درج ذیل ہے۔

انڈین نیشنل کانگریس اور مسلمانانِ ہند' از: ملا عبدالقیوم: یہ کتاب ۱۹۰۶ء میں علی گڑھ سے شائع ہوئی جو ۶۴ صفحات پر مشتمل ہے۔اس کتاب میں کانگریس میں مسلمانوں کی شرکت کی ضرورت اور اہمیت پر روشنی ڈالی گئی ہے اور جنگ آزادی میں ان کی ایثار و قربانیوں اور خدمات کا جائزہ لیا گیا ہے

بیداری ہند: کارنامۂ مہاتما گاندھی' از: لالہ متصدی لال ہندی: یہ کتاب ۱۹۲۷ء میں میرٹھ سے شائع ہوئی جو ۴۰۰ صفحات پر مشتمل ہے۔اس میں مہاتما گاندھی کے ابتدائی حالات و واقعات کے علاوہ ان کے ذریعے چلائی گئی تحریکات، عدم تعاون کی تحریک، سول نافرمانی کی تحریک وغیرہ کا تذکرہ بڑی شرح وبسط کے ساتھ کیا گیا ہے۔

آزادی کی جنگ' از: عبدالوحید خاں: یہ کتاب ۱۹۳۷ء میں لکھنؤ سے شائع ہوئی۔اس میں مجاہدین آزادی کے ایثار وقربانیوں کا ذکر بڑی شرح وبسط کے ساتھ کیا گیا ہے۔علاوہ ازیں ۱۹۲۰ء کی تحریک خلافت، مسلمانوں کا ایثار، محمد علی کی تقریر پارلیمنٹ میں، مسلم لیگ کی اہمیت، مکمل آزادی کا اعلان وغیرہ موضوعات کا احاطہ کیا گیا ہے۔

مسلمانوں کا ایثار اور آزادی کی جنگ' از: عبدالوحید خاں: یہ کتاب ۱۹۳۸ء میں لکھنؤ سے شائع ہوئی جو ۴۵۳ صفحات پر مشتمل ہے۔اس میں ۱۸۵۷ء کے بعد جنگ آزادی میں مسلمانوں کی قربانیاں ور ملک کی مختلف سیاسی تحریکات کا

مضامین

تذکرہ کیا گیا ہے۔ یہ کتاب دو حصّوں میں منقسم ہے۔ حصّہ اوّل میں پندرہ ابواب ہیں۔ ان ابواب میں جن پہلوؤں پر روشنی ڈالی گئی ہے ان میں ۱۸۵۷ء کا غدر اور اس کے تباہ کن نتائج، سرسید کی سیاسی رہنمائی، جنگِ عظیم کا آغاز اور زمانہ جنگ کی سیاست ہند، تحریکِ خلافت کے آغاز تک کانگریس کی برطانیہ نواز پالیسی، ترک موالات کا آغاز۔ التوا تحریک کے بعد شدھی اور سنگھٹن، سائمن کمیشن کا بائیکاٹ، نہرو رپورٹ اور کانگریس کے منصوبے، گول میز کانفرنس وغیرہ اہم ہیں۔ حصّہ دوم دس ابواب پر مشتمل ہے۔ اس میں گورنمنٹ آف انڈیا ایکٹ کی کمی، تحریکِ وطنیت، مسئلہ اقلیت اور کانگریس، آزاد ہندوستان میں آزاد اسلامی ریاست کا قیام، مسلم لیگ کی اہمیت، جمعیۃ العلماء ہند کی پالیسی پر ایک نظر وغیرہ پہلوؤں کا احاطہ کیا گیا ہے۔ اس کتاب کی تصنیف و تالیف میں تاریخ کانگریس، تاریخ مہاراشٹر، اخبار ملاپ، مسلمانوں کا روشن مستقبل، مسلمانان ہند، مجموعہ لیکچر سرسیّد وغیرہ ماخذات سے استفادہ کیا ہے۔

مسلمانان ہند کی سیاست وطنی' از: محمد امین زبیری مارہروی: یہ کتاب ۱۹۳۸ء میں شائع ہوئی جو ۱۲ ابواب اور ۲۱۹ صفحات پر مشتمل ہے۔ اس میں ۱۸۵۷ء سے ۱۹۳۸ء تک کے ان سیاسی حالات و واقعات کا تاریخی بیان درج ہے۔ جو ہندوستان میں مسلمانوں کی سیاسی تحریک، مسلم لیگ کے قیام اور اس کی جدوجہد انتخابات جداگانہ اور کانگریس کے مذاکرات اور دیگر ضمنی امور سے متعلق ہیں۔

سیاست ملّیہ' از: محمد امین زبیری: یہ کتاب ۱۹۴۱ء میں آگرہ سے شائع ہوئی جو ۱۹ ابواب اور ۵۹۹ صفحات پر مشتمل ہے۔ اس میں مسلمانان ہند کی سیاسی تحریکات (۱۸۵۷ء تا آغاز ۱۹۴۱ء) کی مکمل و مفصل تاریخ درج ہے۔ اس کتاب میں ۱۸۵۷ء سے ۱۹۴۱ء تک جن پہلوؤں پر روشنی ڈالی گئی ہے۔ ان میں غدر ۱۸۵۷ء مسلمانوں سے متعصّبانہ انتقام، سرسید کی مدافعانہ جدوجہد، سرسید احمد خاں کی تحریک، کانگریس کی تاسیس اور اس کے مقاصد، بانی کانگریس کا نظریہ قومیت، تقسیم بنگال، آل انڈیا مسلم لیگ کی تاسیس، مسلم لیگ کا مسلک، جنگ عظیم ۱۹۱۴ء کا آغاز، اجلاس مسلم لیگ ۱۹۱۵ء منعقدہ بمبئی، ہندو مسلم فسادات، تحریک خلافت کا اثر، ترک موالات کا خاتمہ، سائمن کمیشن، نہرو رپورٹ کی ترتیب و اشاعت، سول نافرمانی کی تحریک کانگریس اور لیگ میں مذاکرات، اقبال کا نظریۂ پاکستان، مسلم لیگ کا اجلاس لاہور ۱۹۴۰ء، کانگریس سے گاندھی کی سبکدوشی، کانگریس کا نظریہ قومیت اور ایک وفادار کانگریسی مسلمان کی علیحدگی وغیرہ پہلوؤں کا احاطہ کیا گیا ہے۔ کتاب کے آخر میں ایک ضمیمہ ہے جس میں مسلم اسٹورنٹ فیڈریشن اور مردم شماری درج ہے۔

آزادی کی بھینٹ' از: بی۔ کے نارائن: یہ کتاب ۱۹۴۲ء میں حیدرآباد سے شائع ہوئی۔ اس کتاب میں انگریزی حکومت کے خلاف جدوجہدِ آزادی کے اہم پہلوؤں پر روشنی ڈالی گئی ہے۔

مکمل تاریخ آزاد ہند فوج' از: اسرار احمد آزاد: یہ کتاب سترہ ابواب اور ۵۶۵ صفحات پر مشتمل ہے۔ اس میں غدر ۱۸۵۷ء

مضامین

سے لے کر تمام انقلابی تحریکات کا تذکرہ شامل ہے۔مؤلف نے اس کتاب میں جن پہلوؤں پر روشنی ڈالی ہے ان میں ۱۸۵۷ء کی جنگ آزادی ،گذشتہ اور موجودہ صدی کی تمام انقلابی تحریکات ،انقلابی تحریکات میں مسلمانوں کی شرکت ، پنجاب کے سکھوں اور سکھ تارکانِ وطن کی انقلابی جدوجہد،غدر پارٹی اور ہندوستانی انقلاب پسندوں کے کارناموں پر روشنی ڈالی گئی ہے۔اس میں سبھاش چندر بوس کی ان تقریروں اور عارضی حکومتِ ہند کے ان فرامین اور اعلانات کو بھی شامل کیا گیا ہے۔جنھوں نے آزاد ہندفوج نیز حکومت آزاد ہند کو زندہ حقیقت بنایا دیا پھر اس میں اس فوج کی لڑائیوں اور اس کے انتظامی شعبوں کے حال کے علاوہ کپتان شاہنواز ، کپتان پریم سہگل اور لیفٹننٹ گورنر بخش سنگھ ڈھلن کے مقدمے کے حالات بھی درج ہیں۔

تحریک ۱۹۴۲ء کی داستان' از : شری دھرم پال :یہ کتاب ۱۵۵صفحات اور نو ابواب پر مشتمل ہے۔ان ابواب میں جن پہلوؤں پر روشنی ڈالی گئی ہے۔ان میں آغاز جدوجہد ، ہندوستان چھوڑو تحریک ،آزاد ہندفوج،مسلم لیگ ،کمیونسٹ وغیرہ پہلوؤں پر روشنی ڈالی گئی ہے۔اس کتاب میں خاص طور سے ہندوستان چھوڑو تحریک پر فوکس کیا گیا ہے ۔اور اسے ہندوستان کی دوسری جنگ آزادی کی مکمل تاریخ بتایا ہے۔اس کتاب کا اشاعت سن ندارد ہے۔

سی۔پی میں کانگریس راج' از اسرار احمد کریوی: یہ کتاب ۱۹۴۱ء میں ناگپور سے شائع ہوئی جو ۳۰۰صفحات پر مشتمل ہے۔اس میں سی۔پی میں کانگریسی حکومت کے قیام (۱۹۳۵ء تا۱۹۳۹ء) کے دوران مسلمانوں کے ساتھ حکومت کے جانبدارانہ رویے کی روداد درج ہے۔اس کتاب میں صرف صوبہ متوسط وبرار کے واقعات درج ہیں۔

مسلم لیگ کیوں' از: ذاکر حسین فاروقی: یہ کتاب ۱۹۴۷ء میں بمبئی سے شائع ہوئی ۔جو۲۶۳صفحات پر مشتمل ہے۔اس میں مسلم لیگ کی تاریخ ،نظریہ پاکستان کا سیاسی و تاریخی پس منظر پر روشنی ڈالی گئی ہے۔

تقسیم ہند' از : عبدالوحیدخاں: عبدالوحید کی تالیف تقسیم ہند۱۹۵۶ء میں نقوش پریس لاہور سے شائع ہوئی جو ۴۰۸ صفحات پر مبنی ہے۔اس کتاب میں ابوالکلام آزاد کی خودنوشت تالیف ''انڈیا ونس فریڈم'' کا جواب تاریخی نقطۂ نظر سے پیش کیا گیا ہے۔یہ کتاب مولانا آزاد کی سیاسی زندگی کے پہلو پر روشنی ڈالتی ہے۔ہندوستان کی تقسیم سے متعلق تاریخوں میں یہ کتاب اہمیت کی حامل ہے۔

''آزادی ہند'' از: رئیس احمد جعفری: تحریک آزادی سے متعلق مآخذ میں ''آزادی ہند'' اہم ترین تصنیف ہے۔ یہ کتاب ۱۹۵۹ء میں مقبول اکیڈمی، لاہور سے شائع ہوئی، جو ۵۰۰صفحات پر مشتمل ہے۔اس میں ابوالکلام کی خودنوشت تصنیف انڈیا ونِس فریڈم پر تبصرہ شرح وبسط کے ساتھ پیش کیا گیا ہے۔''آزادی ہند'' ابوالکلام کی اہم ترین خودنوشت تالیف انڈیا ونِس فریڈم کا اردو ترجمہ ہے۔جس کے مترجم رئیس احمد جعفری ہیں۔''آزادی ہند'' میں رئیس احمد جعفری

مضامین

نے ''India Wins Freedom'' کے مباحث کو اردو میں ترجمہ کرکے اپنے مشاہدات ومعلومات کی روشنی میں گفتگو کی ہے۔ اس کتاب میں مولانا ابوالکلام کے ذاتی حالات وسوانح سے متعلق معلومات خود مولانا آزاد کا لکھا ہوا مفصل تذکرہ موجود ہے۔اس کتاب میں ابوالکلام آزاد کے سیاسی مباحث کا تذکرہ ملتا ہے، جو کہ تاریخی نقطۂ نظر سے اہمیت کا حامل ہے۔رئیس احمد جعفری نے واقعات ومباحث پر الگ الگ عنوانات کو یکجا کرکے ان کی تشریح کی ہے۔

آزادی ہند از : مولانا ابوالکلام آزاد، مرتبہ ہمایوں کبیر: آزادی ہند مولانا ابوالکلام آزاد کی انڈیا ونس فریڈم کا اردو ترجمہ ہے۔ یہ کتاب مکتبہ جمال لاہور سے ۲۰۰۳ء میں شائع ہوئی جسے ہمایوں کبیر نے مرتب کیا ہے۔اس کتاب میں مولانا ابوالکلام آزاد کی نہ صرف ابتدائی زندگی کے بارے میں معلومات فراہم ہوئی ہیں بلکہ کانگریس کے ساتھ منسلک ہونے کے بعد کی جدوجہد کی مکمل عکاسی کی گئی ہے۔آزادی ہند پر یہ کتاب اساس کی حیثیت رکھتی ہے۔

جیل خانہ کی کہانی مرتبہ لال چند فلک: یہ کتاب ۱۹۲۱ء میں شائع ہوئی،اس کتاب میں جیل خانے کے حالات وواقعات کا تذکرہ قیدیوں کی زبانی کیا گیا ہے۔ جیل خانہ میں ان قیدیوں کو جن مسائل اور مشکلات کا سامنا کرنا پڑ رہا تھا۔اس کتاب کے مرتب لال چند فلک نے اپنی شاعری کے ذریعہ عکاسی کی دیباچہ میں ان قیدیوں کے حالات کے بارے میں اس طرح روشنی ڈالی ہے:

''ہر قسم کے مجرموں سے پولیٹیکل قیدی کا خطرناک اور معزز ہونا اس لیے کہ وہ ایسے بہادر ہوتے ہیں جنھیں دنیا کی کوئی طاقت نہیں ڈرا سکتی ہے۔حاکم وقت کے خلاف زبان قلم اور ضرورت ہو تو ہاتھ پیر سے بھی مقابلہ کرتے ہیں جب وہ کوئی ظلم ہوتا دیکھتے ہیں تو وہ رہ نہیں سکتے جب کوئی کمزور ستایا جاتا ہے تو ان کو تکلیف ہوتی ہے اور اکثر ایسے ہی لوگ ظالموں کے ظلم زبردستوں کی زبردستی کا خاتمہ کرتے ہیں پس ان سے زیادہ اور کون خطرناک ہوسکتا ہے۔معزز اس لیے ہیں کہ وہ ہرگز کسی جرم کے مجرم نہیں ہوتے ان پر جو کچھ الزام لگایا جاتا ہے سراسر بہتان ہوتا ہے۔وہ یہی کرتے ہیں جو ایک ایمان دار خداترس محبّ قوم کیا کرتا ہے اور کرنا فرض جانتا ہے۔''

جدید ہندوستان کے سیاسی اور سماجی افکار از: ڈاکٹر محمد ہاشم قدوائی: یہ کتاب ۱۹۸۸ء میں ترقی اردو بیورو، دہلی سے شائع ہوئی۔اس کتاب میں تحریک مجاہدین آزادی کے سماجی، سیاسی افکار پر روشنی ڈالی گئی۔اس ضمن میں راجہ رام موہن رائے، سرسید، ڈاکٹر مسز اینی بسنت اور بھگوان داس کے سیاسی وسماجی خیالات، بال گنگا دھر تلک کا سیاسی اور سماجی فلسفہ، وپن چند پال اور لالہ لاج پت رائے، گوپال کرشن گھوکھلے کے سیاسی نظریات، مہاتما گاندھی محمد علی اور ابوالکلام آزادی کے سیاسی فلسفہ پر روشنی ڈالی گئی ہے۔

آزادی کی منزل تک از : جواہرلعل نہرو، مرتبہ پریم چند: یہ کتاب لاہور سے شائع ہوئی۔ اس تصنیف میں جن موضوعات کا احاطہ کیا گیا ہے اس ضمن میں برطانوی

شہنشاہیت کو ہندوستان سے چلے جانے کا نوٹس ہندوستان کی آزادی کے لیے شہنشاہیت ختم کرنی پڑے گی، ہم پر کسی کو حکومت کا اختیار نہیں، غلامی، غربت، پاکستان اور انگریزی راج سے چھٹکارا ۱۹۴۲ء کو فراموش کرنا دشوار ہے، برطانوی حکومت زیادہ دیر تک ٹھہر نہیں سکتی، آزادی کی منزل تک پہنچ چکے ہیں۔ برطانیہ ہندوستان کو آزاد کرنے پر مجبور ہے۔ ہندوستان میں بغاوت کے شعلے، آزادی کے ڈرامے کا آخری ایکٹ وغیرہ حقائق کی عکاسی کی ہے۔

تحریک آزادی ہند میں مسلم علماء عوام کا کردار' از: محمد سلمان منصور پوری: اس کتاب میں تحریک جنگ آزادی ہند میں مسلم علماء کی خدمات پر روشنی ڈالی گئی ہے۔ اس میں یہ بتانے کی کوشش کی گئی ہے کہ کس طرح جنگ آزادی میں مسلم علماء نے بڑا موثر کردار ادا کیا ہے۔ اس ضمن جن موضوعات کا احاطہ کیا گیا ہے ان میں حضرت شاہ عبدالعزیزؒ سید احمد رائے بریلوی' ملک کے دیگر حصوں سے سید صاحب کا رابطہ، سید صاحب کے اخلاق و اوصاف، سید صاحب کی شہادت کے بعد علماء صادق پور کی قربانیاں، مولانا ولایت علی صاحب کی گرفتاری، مولانا عنایت کی امارت، شیخ الاسلام حضرت مولانا سید حسین احمد مدنی کی پر اثر تاریخی تقریر، جمعیۃ علماء ہند کا قیام، جامعہ ملیہ کا قیام، جمعیۃ علماء کا دوسرا اجلاس عام، تحریک عدم تعاون، نہرو رپورٹ، تحریک نمک سازی، تحریک سول نا فرمانی، مسلم لیگ اور جمعیۃ علماء میں سمجھوتہ کی کوشش، مسلم لیگ اور کانگریس کی مہر تصدیق، ہندوستان چھوڑ و تحریک وغیرہ پہلوؤں پر روشنی ڈالی گئی ہے۔

تحریک آزادی ہند اور مسلمان' از: محمد احمد صدیقی: ۱۹۹۸ء میں گورکھپور سے شائع ہوئی۔ اس کتاب میں تحریک آزادی میں مسلمانانِ ہند کی خدمات کا جائزہ لیا گیا ہے۔ جس میں ۱۵۸۵ء سے ۱۹۴۷ء تک مسلمانانِ ہند کی قربانیوں کا اجمالی خاکہ پیش کیا گیا ہے۔ اس ضمن میں تحریک حریت حضرت مجدد الف ثانی سرہندی' شاہ ولی اللہ تحریک، ۱۸۵۷ء کا خونیں انقلاب، تقسیم بنگال اور مسلمان، مسلم لیگ کا قیام، ریشمی رومال تحریک، اردو صحافت اور تحریک آزادی، رولٹ ایکٹ، حادثہ جلیانوالہ باغ ۱۹۱۹ء، ۱۹۱۹ء کے مسلم شہدا، خلافت تحریک، نان کو آپریشن تحریک، چوری چورا کا واقعہ وغیرہ تحریک آزادی سے متعلق واقعات کی عکاسی کی گئی ہے۔

تحریک آزادی ہند اور مسلمان' از: سید ابوالاعلی مودودی، مرتبہ خورشید احمد: اس کتاب میں مسلمانانِ ہند کی تاریخ پر اسلامی نقطۂ نظر سے تبصرہ کیا گیا ہے۔ علاوہ ازیں آزادی کی تحریک میں مسلمانان ہند کی خدمات کا جائزہ لیا گیا ہے۔ یہ کتاب چار حصوں پر مشتمل ہے۔ اس کتاب میں جن پہلوؤں پر روشنی ڈالی گئی۔ ان میں قومی تحریک، کانگریس، متحدہ قومی تحریک اور مسلمان، کانگریس اور ہندو مہا سبھا، کانگریس اور انگریزی حکومت جنگ آزادی کی نوعیت، کانگریس اور مسلمان وغیرہ جیسے پہلوؤں پر روشنی ڈالی گئی ہے۔

تحریک آزادی ہند اور مشائخ و علماء کا کردار' از: مولانا محمد شہزاد قادری ترابی: اس کتاب میں تحریک آزادی ہند میں مشائخ و

مضامین

علماء کی خدمات پر روشنی ڈالی گئی ہے۔ کتاب کی ابتداء میں انتساب ہے جوان مجاہدین اورعلماء کے نام خصوصاً علامہ کفایت علی کافی، علامہ فضل حق خیرآبادی، امام احمد رضا فاضل بریلی اور آپ کے تلامذہ اوران تمام مجاہدین تحریک آزادی رحمۃ اللہ علیہم اجمعین کے نام ہے۔ یہ کتاب تحریک آزادی سے متعلق تصانیف میں اہمیت کی حامل ہے۔

جنگ آزادی اور مسلمان از: انیس چشتی: اس تصنیف میں جنوبی ہندوستان کی ایک تاریخ ساز تحریک آزادی کا جائزہ لیا گیا ہے۔ یہ کتاب ۲۰۰۸ء میں شائع ہوئی۔ اس کتاب میں مؤلف نے تحریک جنگ آزادی سے متعلق جن موضوعات پر روشنی ڈالی ہے ان میں جنگ آزادی میں مسلم کردار، شہدا و مجاہدین آزادی ۱۸۵۷ء اور جلیاں والا باغ کا سانحہ، کالا پانی، مولانا جعفر تھانیسری، جمعیۃ العلماء، خلافت کمیٹی وغیرہ موضوعات پر روشنی ڈالی ہے۔

مجاہدین آزادی سے متعلق تصانیف: ذیل میں چند اہم مجاہدین آزادی سے متعلق تصانیف کا تعارف درج ہے۔

ابوالکلام آزاد ایک شخصیت ایک مطالعہ از: ابوسلمان شاہجہاں پوری: یہ کتاب ۱۹۶۷ء میں دین محمدی پریس، لاہور سے شائع ہوئی، جو ۴۱۶ صفحات پر مشتمل ہے۔ اس میں مولانا ابوالکلام آزاد کی شخصیت کے مختلف پہلوؤں پر مرتب اور مشاہیر، محققین ہندو پاک کے تقریباً پندرہ مضامین کا مجموعہ منسلک ہے۔

امام الہند (تعمیر افکار) از: ابوسلمان شاہجہاں پوری: اس کتاب میں مولانا ابوالکلام آزاد کے ابتدائی ۲۴ سالہ زندگی کے حالات اوران کے اساتذہ کا تذکرہ شامل ہے۔ یہ کتاب ۱۹۶۲ء میں انجمن پریس، کراچی سے شائع ہوئی۔ یہ ۴۰۲ صفحات پر مشتمل ہے۔

مولانا ابوالکلام آزاد' از: ابوسعید: یہ کتاب ۱۹۴۶ء میں لاہور سے شائع ہوئی، جو ۱۱۶ صفحات پر مشتمل ہے اس میں مولانا ابوالکلام آزاد کے علمی، مذہبی اور سیاسی شخصیت کے چند اہم پہلوؤں کا تذکرہ کیا گیا ہے۔

بھگوان تلک از: آنند کشور مہتا: یہ کتاب ۱۹۲۱ء پنجابی پریس، لاہور سے شائع ہوئی، جو ۳۶ صفحات پر مشتمل ہے۔ اس میں ہندوستان کے مشہور ومعروف مجاہدین آزادی بال گنگا دھر تلک کے حالات درج ہیں۔

بھارت سپوت از: سید امتیاز علی تاج: مہاتما گاندھی کی سوانح عمری پر مشتمل یہ کتاب ۱۹۱۹ء میں لاہور سے شائع ہوئی۔ کتاب کی ابتداء میں تمہیدی الفاظ موتی لعل نہرو نے قلم بند کیے ہیں۔ ذیل میں تمہیدی الفاظ بطور نمونہ درج ہیں۔ میں نے اس کتاب پر ایک سرسری نظر ڈالی ہے۔ اس میں شک نہیں۔ مؤلف نے اپنا مطالب نہایت سلیس اور پراثر الفاظ میں ادا کیا ہے۔ مہاتما گاندھی کے اوصاف محتاج بیان نہیں۔ مجھے اس بات سے بہت خوشی ہوئی کہ ایک مسلمان نوجوان نے ایک ہندو بزرگ قوم کی سوانح عمری مرتب کی ہے۔ جو ایک طرف تو نوجوان موصوف کی نیک دلی اور سعادت مندی کی اور دوسری طرف ہندو مسلمانوں کے سچے اتحاد کی نشانی ہے۔ مؤلف نے وطن کی خدمت کی ہے۔ اور مجھے امید ہے کہ اہل وطن اس کی قدر کریں گے۔

دستخط، پنڈت موتی لعل نہرو

مضامین

گاندھی نامہ' از: خواجہ حسن نظامی: گاندھی نامہ خواجہ حسن نظامی کے متفرق مضامین کا مجموعہ ہے۔ یہ مضامین اخبارات اور رسائل میں مہاتما گاندھی کی نسبت شائع ہوئے تھے یا جن رسائل میں کچھ ذکر بھی مہاتما گاندھی سے متعلق پایا گیا تو ان کو یکجا کردیا گیا۔ ان مضامین کی حالت بالکل جداگانہ معلوم ہوتی ہے۔ کیونکہ یہ مضامین الگ الگ اوقات میں لکھے گئے تھے۔ غالباً تین چار سال کے مضامین اس مجموعے میں شامل ہیں۔ لیکن اس کے باوجود سبھی مضامین کی کیفیت متحد ہے۔اس کی کتاب کی اشاعت ۱۹۲۲ء میں ہوئی۔

باپو کے قدموں میں' از: ڈاکٹر رجندر پرشاد، مترجم محمد عبدالغفار: یہ کتاب ۱۹۵۳ء میں شائع ہوئی جو ڈاکٹر راجندر پرشاد کی کتاب کا اردو ترجمہ ہے۔اس کتاب کی ضخامت ۲۲۷ صفحات ہیں۔ اس میں گاندھی جی کے حالاتِ زندگی کا تذکرہ بڑی شرح وبسط کے ساتھ کیا ہے اور تحریک آزادی میں گاندھی جی کے خدمات پر روشنی ڈالی گئی ہے۔اس ضمن میں چمپارن کے کسانوں پر انگریزوں کی سختیاں چمپارن کے متعلق گاندھی جی کی لفٹیننٹ گورنر بہار سے ملاقات، چمپارن کے تحقیقاتی کمشن کا قیام، ہندی پرچار، ۱۹۱۹ء ، ہندوستان اور کالا قانون، ۱۹۲۰ء کا نیا انتخاب اور ناگپور کانگریس کا فیصلہ، علی برادران کے ساتھ مہاتما گاندھی کا دورہ، نمک کے قانون کو توڑنا اور مہاتما گاندھی کی ڈانڈی کو روانگی، بہار میں نمک کے قانون کے خلاف ستیہ گرہ، بھاگلپور کی ستیہ گرہ وغیرہ موضوعات کا احاطہ کیا گیا ہے۔اس کتاب کے مطالعہ سے گاندھی جی کی تحریک آزادی میں اہم ترین کردار پر روشنی پڑتی ہے۔

محمد علی جوہر از: محمد دین ادیب: یہ کتاب ۱۹۳۱ء میں لاہور سے شائع ہوئی، جو ۸۰ صفحات پر مشتمل ہے۔اس میں محمد علی جوہر کی وفات پر ملک کے اخبارات ورسائل کے تعزیتی اداریے اور شعراء اکرام کا خراجِ عقیدت پر روشنی ڈالی گئی ہے کتاب کے شروع میں مولانا کی خودنوشت سوانح عمری اور کتاب کے آخر میں جوہر کا کچھ کلام بھی شامل کیا گیا ہے۔

حالاتِ برادران از: خواجہ سید نقشبندی: یہ کتاب ۱۹۲۱ء میں حمیدیہ پریس دہلی سے شائع ہوئی، جو ۶۰ صفحات پر مبنی ہے اس میں مولانا محمد علی جوہر اور مولانا شوکت علی کے حالاتِ زندگی اور سیاسی خدمات کا تذکرہ بڑی شرح وبسط کے ساتھ کیا گیا ہے۔

سیرتِ محمد علی' از: رئیس احمد جعفری: یہ کتاب مولانا محمد علی جوہر کی سیرت وسوانح حیات پر مشتمل ہے، جو ۱۹۳۲ء میں مکتبہ جامعہ اسلامیہ، نئی دہلی سے شائع ہوئی۔اس کتاب کی ضخامت ۵۴۴ صفحات ہیں۔اس تصنیف میں تحریک آزادی میں محمد علی جوہر کی خدمات پر روشنی ڈالی گئی ہے۔

لالہ لاج پت رائے از: پنڈی داس: لالہ لاج پت رائے کے حالاتِ زندگی پر مشتمل پنڈی داس کی کتاب ''لاج پت'' لاہور سے شائع ہوئی، جو ۱۰۲ صفحات پر مبنی ہے۔اس میں ہندوستان کی جنگ آزادی میں لالہ لاج پت رائے کی قربانیوں کا ذکر کیا گیا ہے۔

لالہ لاج پت از: کشور جی، مہتہ آنند: یہ کتاب ۱۹۲۲ء میں لاہور سے شائع ہوئی، جو ۱۶۰ صفحات پر مشتمل ہے۔اس میں

مضامین

سیاسی لیڈر لالہ لاج پت رائے کی سوانح حیات درج ہے جو کہ لالہ لاج پت رائے کی زندگی ہر پہلو کی عکاسی کی گئی ہے۔

خیالاتِ گوکھلے از: لال چند فلک: یہ کتاب ۱۹۶۵ء میں لاہور سے شائع ہوئی اس کتاب میں گوکھلے کی سوانح عمری کے ساتھ ساتھ ان کے اصولوں اور خیالات وعقیدوں پر بھی روشنی ڈالی گئی ہے۔تحریک آزادی میں گوکھلے کی خدمات اور ان کی قربانیوں کا تذکرہ بڑی شرح وبسط کے ساتھ کیا گیا ہے۔اس کتاب کی تصنیف وتالیف میں مختلف رسالاجات، کانگریس کی رپورٹوں، ٹائمز آف انڈیا بنگالی اخبارات سے ترجمہ وغیرہ مآخذات سے اقتباس اخذ کیے گئے ہیں۔

حالات گوکھلے از: مظفر حسن خاں: یہ کتاب گوپال کرشن گوکھلے کی زندگی کے حالات پر مشتمل ہے اس کی اشاعت ۱۹۱۹ء میں حیدرآباد دکن سے ہوئی جو ۱۵۶ صفحات پر مبنی ہے۔ اس طرح تحریک جنگ آزادی پر لکھی گئیں ان تاریخوں کے مطالعے سے نہ صرف جنگ آزادی سے متعلق تحریکات کے بارے میں معلومات فراہم ہوتی ہیں بلکہ مجاہدین آزادی کی خدمات اور ان کی قربانیوں کا بھی اندازہ ہوتا ہے۔یہ تاریخیں اردو تاریخ نگاری کے ارتقاء میں اضافے کا باعث ہیں۔

☆☆☆

ڈاکٹر شہناز بیگم، اسسٹنٹ پروفیسر، (دہلی یونیورسٹی)
ایڈریس: 3234، کوچہ پنڈت،
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مضامین

مضمون نگاران سے ایک درخواست

مضامین صاف' خوش خط اور صفحہ کے ایک جانب لکھ کر روانہ کریں ۔ اگر Inpage میں ٹائپ کروارہے ہوں تو اس کی Soft Copy قومی زبان کے ای میل پر روانہ فرمائیں۔اپنے مضامین کے ساتھ اپنا صحیح نام جو بنک اکاؤنٹ میں درج ہے ضرور لکھیں اور بنک پاس بک کی کاپی' اپنا مکمل پتہ معہ پن کوڈ نمبر روانہ کریں۔

ادارہ قومی زبان

خوشبودار باتیں

☆ زیادہ باتیں وہ لوگ کرتے ہیں جن کے پاس کہنے کو کچھ نہیں ہوتا۔

☆ دوسروں کے آنسوؤں کو زمین پر گرنے سے پہلے اپنے دامن میں جذب کر لینا انسانیت کی معراج ہے۔

☆ نیک بننے کی کوشش کرو جیسے حسین بننے کی کوشش کرتے ہو۔

☆ اعتماد وہ شیشہ ہے جو ایک بار ٹوٹ جائے تو دوبارہ نہیں بنتا۔

☆ جو یہ کہے کہ اس کی بات سچی ہے تو اس کی ہر بات جھوٹ ہوگی۔

ہندوستان میں مساوی مواقع کمیشن کی مطابقت: ایک تجزیہ

تمہید: آج کی دنیا مطلوبہ احداف کی تکمیل کے لیے خواہشات اور چنوتیوں سے بھری پڑی ہے۔ احداف کو سماجی طور پر منظور کیا جاتا ہے جبکہ ادارہ جاتی طریقہ کار تقریباً تمام افراد کو پلیٹ فارم اور ذرائع فراہم کرتا ہے۔ لیکن یہ کسی بھی معاشرے میں عام نہیں ہے۔ وسائل کی دستیابی کبھی بھی کسی معاشرے میں یکساں طور پر تقسیم نہیں کی جاسکتی ہے۔ جب تک ایک مناسب پالسی اور منصوبہ بندی اچھی طرح سے تیار نہ کی جائے۔ مساوی مواقع ایک وضاحتی اصطلاح ہے جس کا مقصد ایک مخصوص سماجی قانونی ماحول فراہم کرنا ہے۔ جہاں معاشرے کے ہر طبقے کو مواقع کے مناسب مساوی اشتراک کے ساتھ پیش کیا جاتا ہے۔ اس قسم کی پالسی کے ذریعے ریاست روزگار، بینکنگ، بھرتی کے عمل، تعلیم، صحت اور شہری زندگی کے دیگر تمام شعبوں میں انصاف اور غیر جانب داری کو یقینی بنانے کے لیے اقدامات کو اپنانے کی کوشش کرتی ہے۔

ریاست کا بنیادی ہدف کسی کے پس منظر، یعنی نسل، رنگ، جنس وغیرہ کی بنیاد پر کئے جانے والے تمام قسم کے امتیازات کو ختم کرنا ہے۔ مساوات اس وقت موجود ہوتی ہے جب یکساں صلاحیتوں کے حامل افراد کو یکساں کام کرنے کے بعد یکساں نتائج تک رسائی حاصل ہوتی ہیں۔ لہٰذا مساوی مواقع اور نتائج کے مساوات کو اکثر متضاد نظریے کے بجائے تکمیلی تصورات کے طور پر دیکھا جاتا ہے۔

تعریف: عدم امتیاز کا اصول جو اس بات پر زور دیتا ہے کہ تعلیم، روزگار، ترقی، فوائد اور وسائل کی تقسیم اور دیگر شعبوں میں مواقع تمام شہریوں کو ان کی عمر، نسل، جنس، مذہب، سیاسی وابستگی، نسلی اصل یا کسی سے قطع نظر آزادانہ طور پر دستیاب ہونے چاہئے۔

مساوی مواقع کیا ہیں؟ ہر ایک موقع ہر کسی کے لیے یکساں طور پر دستیاب ہو، قطع نظر اس کی عمر، نسل، جنس، مذہب، سیاسی وابستگی، نسلی تعلق اور کسی انفرادی یا گروہ کی خصوصیت، قابلیت، کارکردگی اور اہلیت سے کوئی تعلق نہیں ہے۔ یہ عدم امتیاز کا بہترین اصول ہے۔ یہ تصور پختہ یقین رکھتا ہے کہ تعلیم روزگار و ترقی کے امکانات کے ساتھ ساتھ فوائد اور وسائل ہر شہری کے لئے کھلے عدم دستیاب ہونے چاہیے۔

جواہر لعل نہرو نے اپنی کتاب ''دی ڈسکوری آف انڈیا'' میں ملک کے تمام گروہوں کو یکساں مواقع فراہم کرنے کی اہمیت کے بارے میں بات کی ہے۔ انہوں نے کہا کہ ہمیں ہندوستان میں مساوات کا مقصد رکھنا چاہیے۔ اس کا یہ مطلب نہیں ہے کہ ہر شخص جسمانی یا ذہنی یا روحانی طور پر برابر ہے یا ایسا بنایا جاسکتا ہے۔ لیکن اس کا مطلب یہ ہے کہ سب کے لیے یکساں مواقع اور کوئی سیاسی، معاشی یا سماجی رکاوٹیں نہ ہو۔ اس کا مطلب اس حقیقت کا ادراک ہے کہ کسی بھی گروہ کی پسماندگی اس میں موروثی ناکامی کی وجہ سے نہیں ہے۔

مضامین

بلکہ بنیادی طور پر مواقع کی کمی اور دوسرے گروہوں کی طرف سے طویل دباؤ ہے۔

امتیاز اور مساوات کا نہ ہونا: یکساں اور مصنفانہ برتاؤ کا مطلب یہ ہے کہ سب کے ساتھ یکساں مواقع ہوں اور آپ کی اپنی خوبیوں اور صلاحیتوں کی بنیاد پر ایک فرد کے ساتھ یکساں سلوک کیا جائے تاکہ وہ اکثریت کی طرح عزت حاصل کر سکیں۔ یہ تعصب، تنگ نظری اور دقیانوسی تصورات سے آزاد رکھنا بھی ہے۔ باہم ہندوستان کے معاملے میں قبائلی اور مسلمان ابھی بھی مساوی مواقع اور مصنفانہ سلوک کو حاصل کرنے سے محروم ہیں۔

امتیازی سلوک سے مراد عام طور پر لوگوں کے دوسرے گروہوں کے خلاف لوگوں کے کم سازگار عمل یا عقائد کو ظاہر کرنا ہے۔ یہ وہ تعصب لوگوں یا گروہوں کے دماغ کی اختراع ہے۔ کوئی بھی براہ راست یا بالواسطہ امتیازی سلوک کا شکار ہوسکتا ہے۔ براہ راست امتیازی سلوک ہونا ہے۔ اگر کسی کے ساتھ دوسرے کے مقابلے میں کم موافق سلوک کیا جاتا ہے تو تقابلی صورت حال میں غیر تبدیل شدہ خصلتوں کی بنیاد پر باہم یا زیادہ لطیف شکلوں میں ہوتا ہے۔ بالواسطہ امتیاز اکثر اقلیتوں اور باریکین بدن کے ساتھ ہونا ہے۔ یہ غیر مادی ہے لیکن براہ راست امتیاز سے کم نقصان نہیں پہنچایا۔ اگر کوئی بظاہر غیر جانبدار فراہمی قواعد عمل کسی گروہ یا لوگوں کو مخصوص موقع سے نقصان پہنچانا ہے۔ اگر کوئی بظاہر غیر جانبدار فراہمی قواعد، عمل یا کسی گروہ یا لوگوں کو مخصوص موقع سے نقصان پہنچانا ہے تو اسے بالواسطہ امتیاز سمجھا جاتا ہے۔ یہاں ایک کے قوانین بھی اس بات پر اصرار کرتے ہیں کہ کسی کو ایسی ضرورت پوری کرنی چاہیے جس کا خود اس شخص سے کوئی تعلق نہ ہو۔ اس قسم کے امتیازی سلوک شکار کی بہت واضح شکل ہیں اور یہ کہیں بھی اور کسی کے ساتھ بھی ہو سکتے ہیں۔ تعلیم، بینک، قرض، روزگار، سامان اور خدمات اور ہاؤسنگ یا عوامی اجتماع یا عوامی جگہ جیسے شعبوں میں امتیازی سلوک کے بڑے شعبوں کے طور پر درج کیا جاسکتا ہے۔ ان تمام قسم کے غیر انسانی یا ذیلی انسانی طریقوں سے بچنے کے لئے Equal Oppotunity Commission (EOC) کی ضرورت کو سب سے زیادہ تسلیم کیا جاتا ہے۔ مساوی مواقع، کمیشن (EOC) کے لیے تاریکین وطن کے حق میں کئی مثبت اقدامات کی سفارش کر سکتا ہے۔ اسے ایک ریگولیٹری ادارے کے طور پر مثبت سرگرمی کے نام سے جانا جاتا ہے جس کا مقصد تاریخی طور پر غیر غالب سماجی و اقتصادی حصوں عام طور پر اقلیتیں، خواتین، مہاجرین، مہاجر کی حالت کو بہتر بنانا ہے۔ یہ مطلوبہ پالیسیوں اور تقرر کے پروگراموں کے ذریعے حاصل کیا جاسکتا ہے۔ یہاں معاشرے کے امتیازی یا پسماندہ طبقات کے ساتھ ترجیحی سلوک کیا جاتا ہے۔

مساوی مواقع کا کمیشن ... مفہوم: مساوی مواقع کمیشن ایک قانونی ادارہ یا کمیشن ہے۔ جو خاص طور پر اقلیتوں کے ساتھ کیے گئے کسی بھی نوعیت کے امتیازی سلوک کے معاملات سے نمٹتا ہے۔ کیمبرج کی شائع کردہ لغت کے لحاظ سے اس

مضامین

اصطلاح کا مفہوم یہ ہے ''سب لوگوں کے ساتھ یکساں سلوک روا رکھنے کا اصول، کسی شخص کی جنس، نسل، مذہب وغیرہ سے متاثر ہوئے بغیر'' بنیادی طور پر اصطلاح مساوات / برابری خود اس مفہوم کو ظاہر کرتی ہے یعنی '' یکساں حقوق یا سلوک جو امتیاز یعنی تعصب یا نقصان سے مبرّا ہو'' لفظ موقع کا مفہوم یہ ہے۔ ایسے حالات جو کچھ کرنے کو ممکن بناتے ہیں۔'' اس لیے مساوی موقع، ایک پالیسی ہے جس میں موافق ماحول اور صحیح وقت پر معاشرے کے نقصان زدہ (disadvantaged) اور نظر انداز کیے گئے (marginalised) طبقات، مساوی مواقع حاصل کرتے ہیں۔

مساوی مواقع کے کمیشن کا تصور: مساوی مواقع کمیشن مساوات کے لیے اور کام کے لئے برابر حقوق کے لیے کام کرتا ہے یہ امتیاز یعنی تعصب کو ختم کرنے کے لیے کام کرتا ہے۔ نابرابری یعنی عدم مساوات کو کم کرتا ہے۔ حقوق انسانی کی حفاظت کرتا ہے اور اس بات کا تیقن دلاتا ہے کہ معاشرے کی سرگرمیوں میں حصہ لینے کا ہر ایک کے لئے مساوی مواقع ہیں۔ یہ کمیشن، قوانین وضوابط کی عمل آوری یعنی نفاذ میں باقاعدگی پیدا کرنے والے ادارہ کی حیثیت سے کام کرتا ہے۔

وہ کسی بھی نوعیت کے تعصب (bias) اور یک طرفہ پاسداری (prejudice) کے واقعات نمٹتا ہے جو کسی گروہ کے ساتھ روا رکھے جاتے ہیں چاہے وہ معاشرتی ہوں کہ مذہبی، ذات سے متعلق ہوں یا کسی اور طرح کے ہوں، مساوی موقع کمیشن تعلیم، روزگار، رہائش، طبی نگہداشت اور ترقیاتی اسکیمات تک رسائی کے سارے معاملات پر نظر رکھتا ہے۔ مساوی مواقع کمیشن کا اہم مقصد، معاشرتی تنوع کو فروغ دینا اور تعصب کے اُن واقعات پر نظر رکھنا ہے جو نسل، جنس، مذہب وغیرہ کی بنیاد پر اقلیتی اور مہاجر طبقات کو پیش آتے ہیں تا کہ انہیں حکومت اور خانگی اداروں کی جانب سے فراہم کی جانے والی خدمات اور سہولتوں میں برابر کا حصہ مل سکے۔

تنوع کا اشاریہ: معاشرتی تنوع کی پیائش کرنے کے لئے تنوع کا اشاریہ مدون کیا گیا ہے تا کہ اس بات کا جائزہ لیا جاسکے کہ آبادی نسلی اور نسبی اعتبار سے کتنی متنوع ہے۔ مساوی مواقع کے کمیشن کی کارکردگی کو موثر انداز سے چلانے کے لیے حکومتوں کو مشورہ دیا گیا ہے کہ وہ تنوع کا اشاریہ مدون کریں اور دیکھیں کہ کس بہترین انداز سے اس کو نافذ کیا جاسکتا ہے۔ ریاست میں کسی بھی ادارہ کو اُس کی ہیئت ترکیبی کے لحاظ سے جانچ کر کے تنوع کی درجہ بندی کی جائے گی۔ کئی تحقیقی مطالعات نے یہ سفارش کی کہ تنوع کا اشاریہ ریاست کے ہر ادارہ پر لاگو کیا جائے۔ تنوع کا اشاریہ غیر مذہبی طریقے سے عمل کرتا ہے اور متاثر ہونے والے سارے طبقات کو یہ تیقن دیتا ہے کہ مختلف شعبوں میں اُن کی نمائندگی اور ان کی آبادی کے تناسب سے ہوں گی اور یہ عمل موجودہ اسکیم کو چھیڑے بغیر نافذ کی جائے گی۔

ایک ادارے کی حیثیت سے مساوی مواقع کمیشن نے یوروپی

ممالک اورامریکہ میں قابل لحاظ کامیابی حاصل کی ہے۔مساوی مواقع کمیشن کو جمہوریت کے اساسی اقدار کے برقرار رکھنے کے لیے مناسب طریق کار کی ضرورت ہے اور یہ سمجھتا ہے کہ پسماندہ طبقات کے ساتھ امتیازی سلوک کرنا قانوناً واجرم ہے۔مساوی مواقع کمیشن سہولت کار ایک نگراں کارادارہ کی طرح کام کرتا ہے۔ یہ حکومت کو نئی پالیسیوں کی تدوین میں مدد دیتا ہے۔مساوی مواقع کمیشن مسلسل اس بات کا جائزہ لیتا رہتا ہیکہ جوقوانین اُس کے لئے وضع کیے گئے ہیں اُن پر نیک نیتی سے عمل ہورہا ہے یانہیں' اگر کسی قسم کے امتیازی سلوک کی اطلاع دی جائے تو یہ فوراً مناسب کارروائی کرتا ہے۔ یوروپ کی ہدایات The Directives of the Year 2000 کے مطابق اس کمیشن کو یہ اختیار دیا گیا ہے کہ یہ خاطی فرد یا گروہ کے خلاف نوٹس جاری کرسکتا ہے یاعدالت میں مقدمہ چلاسکتا ہے۔

مساوی مواقع کمیشن۔ ہندوستانی منظرنامہ : ہندوستانی معاشرہ ایک اعلیٰ درجے کے معاشرتی طبقات اورعدم مساوات سے متصف ہے جوگروہی صفات جیسے ذات' نسل' مذہب' نسب' رنگت' علاقہ اورمعاشرتی تعلق کی صورت میں پائے جاتے ہیں۔ یہ عوامل یہاں پراتنے ہی اہم ہیں جتنے کسی اورجگہ' تاہم ہندوستان' اپنی ذات پات اورنسل کی بنیاد پرطبقاتی تقسیم کے لحاظ سے منفرد ملک ہے۔

مملکت اوراس کی پالیسی بنانے والے ان عوامل کی مداخلت کوتسلیم کرتے ہیں کیوں کہ بعض طبقات پراس کے مضراثرات مرتب ہوتے ہیں' حکومت سے اُن طبقات پر جوتاریخی امتیاز اورمعاشرتی کا شکار بنتے ہیں۔

امتیاز کے خلاف' حکومت کے اقدامات پر جودستور ہند کے تشکیل شدہ قوانین کی متابعت میں کئے گئے ہیں وہ یہ تیقن فراہم کرتے ہیں

- قانون کے سامنے سب برابر
- محروم طبقات کی ترقی کے لیے تعلیمی اورمعاشی مفادات کوفروغ دینے کے لیے خصوصی توجہ
- معاشرتی ناانصافی اور ہرقسم کے استحصال سے تحفظ
- چھوت چھات کی وجہ سے پیداہوئے امتیاز کودستور ہند ختم کردیتا ہے۔

ہندوستان جیسے ملک کی نظر میں' ایسے فیصلے اوراقدامات' وسیع پیمانے پرسبق آموز ہیں۔ ہم یہ نتیجہ اخذ کرتے ہیں کہ ان اقدامات کی وجہ سے ایک اعلیٰ سطحی کمیٹی قائم کی جانی چاہئے تھی جوہندوستان میں مسلم طبقات کی معاشی اورتعلیمی حالت کا مطالعہ کرسکے۔

9مارچ 2005ء کوسچر کمیٹی کا قیام اور 17 نومبر 2006ء کواُس کی رپورٹ کی پیش کشی اُس دہائی میں عمل میں آئی۔ جس عرصے میں برطانوی حکومت نے بھی شمولیاتی اقدامات کا آغاز کیا۔مسلمان جیسے بڑے طبقے کے حالات کے مطالعہ کے معاملے میں ہندوستان تاریخ میں کبھی بھی پیچھے نہیں رہے جوتجربے اورمشاہدے کے اعتبار سے ایک واضح تشریح پسماندہ اورنظرانداز کئے گئے طبقے کے بارے میں پیش

مضامین

کرسکے۔

مساوی مواقع کمیشن کی ضرورت کیوں؟: مساوات' ہندوستان کی جمہوریت کی ایک اساسی قدر ہے۔ اس کو دستور ہند کے بنیادی حقوق اور مملکت کی پالیسیوں کے رہنمایانہ اصولوں کی شکل میں عوامی زندگی میں وسیع پیمانے میں مشتہر کیا گیا ہے۔ پھر بھی معاصر معاشرے میں شدید نوعیت کی عدم مساواتیں موجود ہیں جو مستقبل کی نسل کی ترقی کے مواقع کو متاثر کرتی ہیں۔ سب سے بدترین عدم مساوات اکثر معاشرتی گروہوں اور طبقات سے متعلق ہوجاتی ہیں۔ جس کی وجہ سے بین طبقاتی عدم مساوات پہلے سے زیادہ نمایاں ہوجاتی ہیں۔ یہاں ضرورت اس بات کی ہے کہ ان عدم مساواتوں کا جائزہ لیا جائے اور تحفظات کی موجودہ پالیسیوں کا جائزہ لیا جائے اور آگے کی طرف لے جانے والے مثبت اقدامات کا آغاز کیا جائے۔ اسی وجہ سے یہ خیال کیا گیا کہ ہندوستان کو مساوی مواقع کمیشن کی ضرورت ہے۔ مجوزہ مساوی موقع کا کمیشن ایک راہ تلاش کرنے والے ادارہ کی حیثیت سے کام کرے گا جو ایک ایسے طریق عمل کی نشان دہی کرے گا اور یہ ادارہ تجربات کی اتباع کرتے ہوئے مثبت کارروائی کے لئے اقدامات تجویز کرے گا اور ان کی جانچ کے طریقے بھی وضع کرے گا۔

سچر کمیٹی کی سفارشات میں ایک سفارش مساوی موقع کے کمیشن کے قائم کرنے کے بارے میں ہے تاکہ ہندوستانی معاشرے میں نظرانداز کیے گئے طبقات کے لیے معاشرتی انصاف کو یقینی بنایا جاسکے اور ان کے لیے مساوی مواقع فراہم کیے جاسکیں۔ سچر کمیٹی نے برطانیہ کے نمونے کی اتباع کی جس نے نسلی تعلقات کا قانون (Race Relation Act) بابتہ 1976ء منظور کیا تھا۔

''مختلف اقسام کے امتیاز کی تلافی کے طریق عمل کو فراہم کرتے ہوئے یہ اقلیتوں کو مزید تیقن دے گا کہ ان کے خلاف کسی بھی غیر صحیح کارروائی یعنی عمل قانونی کارروائی کی راہ ہموار کرے گا۔''

تاہم' سچر کمیٹی کی رپورٹ نے مساوی موقع کمیشن کے قائم کرنے کے بارے میں تفصیلات نہیں فراہم کیں۔ اُس نے یہ کام حکومت کے لیے چھوڑ دیا۔ اس کمیٹی نے اس بات کی بھی وضاحت نہیں کی کہ یہ کمیشن' قومی اقلیتی کمیشن سے خدمات انجام دینے کے معاملے میں اور اس کی ہیئت ترکیبی میں کس طرح مختلف ہوگا۔ یہ بھی واضح نہیں ہے کہ آیا مساوی موقع کمیشن اور قومی اقلیتی کمیشن ایک ساتھ موجود رہیں گے یا مساوی موقع کمیشن' قومی اقلیتی کمیشن کی جگہ لے لیگا۔

اس رپورٹ میں آگے چل کر یہ تحریر کیا گیا ہے کہ ''محرومی' غریبی' امتیاز سارے معاشرتی اور مذہبی طبقات میں موجود ہوسکتے ہیں۔ اگرچہ کہ وہ مختلف تناسب میں ہوں گے۔ لیکن اس حقیقت سے انکار نہیں کیا جاسکتا کہ یہ خامیاں' اقلیتی طبقہ میں پائی جاتی ہیں جو اس طبقے میں اندرونی طور پر حساس نوعیت کی امتیازی خصوصیات ہیں۔ یہ حساسیت فطری ہے اور شاید اس نوعیت کی حساسیت ملک کی دیگر مذہبی اقلیتوں میں

بھی پائی جاتی ہو۔''

دستوری تیقنات کے باوجود' کئی مسلمان یہ محسوس کرتے ہیں کہ اُن کے خلاف کھلا تعصب برتا گیا ہے۔ یہ الزام دیا گیا ہے کہ قومی اقلیتی کمیشن کو حقیقی قانونی اختیارات نہیں دیئے گئے ہیں تاکہ وہ ملک میں جاری رہنے والے امتیازات کو ختم کرسکے۔ اس بات کو ذہن میں رکھتے ہوئے' کئی دانشوروں نے یہ محسوس کیا کہ منصفانہ شمولیت کے لیے مساوی موقع کمیشن ضروری ہے۔

مادھومینن کمیٹی: سچر کمیٹی کی سفارشات کی اساس پر ہندوستان کی حکومت نے پروفیسر این آر مادھومینن کی صدارت میں' ماہرین کی ایک کمیٹی کا 31 آگسٹ 2007 کو تقرر کیا تاکہ مساوی موقع کمیشن کی ہیئت ترکیبی کے دائرہ عمل کا جائزہ لے کر تجاویز پیش کی جاسکیں۔ ان ماہرین نے 28 فروری 2008ء کو اپنی سفارشات پیش کردیں۔ جس میں مساوی موقع کمیشن کا مسودہ قانون بھی تھا۔ ان ماہرین نے ان تجاویز کو مختلف جمہوری اقوام کے اسی نوعیت کے قوانین کا مطالعہ کرنے کے بعد ہندوستان کے دستور کو پیش نظر رکھ کر مرتب کیا تھا۔ یہ مسودہ مساوی موقع کمیشن کی تشکیل کے لئے فراہم کیا گیا تھا جو کہ حکومت کے لئے فعال اور خودمختار ہونا تھا۔

- مساوی موقع کمیشن' ایک ایسا ادارہ ہوگا جو کسی طبقے سے امتیاز کے بارے میں ثبوت اکٹھا کرکے اُس کی اشاعت کرے گا۔ یہ ثبوت پر مبنی معاملات کی وکالت کرے گا جن میں علمی تحقیق اور تفصیلات اکٹھا کرنے کے کام سلسلہ میں کئی امور شامل ہیں۔
- ان امور کے علاوہ مساوی موقع کمیشن کارکردگی کی نگرانی اور جانچ کرنے کا کام بھی اپنے ذمے لے گا تاکہ قوانین اور پالیسیوں کی اثر پذیری کا جائزہ لیا جاسکے۔ مختلف اداروں کے لیے یہ مشاورت کا کام کرے گا اور حکومت کی مختلف سطحوں پر رہنمائی کرے گا علاوہ ازیں حکومت کی پالیسی میں مداخلت کرے گا اور تکالیف کی تلافی کے کام بھی انجام دے گا۔ ان امور کی انجام دہی کے لیے مساوی موقع کمیشن کو شہری عدالت کے اختیارات حاصل ہونے چاہیں تاکہ وہ تحقیق و تفتیش کرسکے۔ جیسے کمیشن کے سامنے حاضر ہونے کے لیے سمن (Summon) جاری کرنا اور دستاویز پیش کرنے کے لیے حکم دینا' گواہوں کا حلفیہ بیان درج کرنا' معلومات کے حصول کے لیے دستاویزات طلب کرنا اور ریکارڈ کا معائنہ کرنا وغیرہ۔

مساوی موقع کمیشن کے بعض اہم فرائض حسب ذیل ہیں:

- مساوی موقع کے کمیشن کو یہ اختیار حاصل ہے کہ وہ اپنی تحقیق و تفتیش کے سلسلے میں حکومت نے کسی عہدہ دار محکمہ کی خدمات حاصل کرسکتا ہے اور شکایت کنندگان کو قانونی امداد فراہم کرسکتا ہے۔
- مساوی موقع کمیشن اختیارات حاصل کرنے کی غرض سے مسودہ ترتیب دے سکتا ہے تاکہ اُسے امتیاز سے متعلق سنوائی کے اختیارات حاصل ہوسکیں۔

مضامین

l مساوی موقع کمیشن کا اہم فریضہ تاہم' یہ ہونا چاہئے کہ سارے متعلقہ اصحاب سے مشورہ کرکے ''اچھے قواعد کا ضابطہ'': (Good Practice Code-GPC) تیار کرے۔

l اچھے قواعد کا ضابطہ (GPC)' تعلیمی اداروں آجرین اور دیگر اداروں (رہائشی مکانات تعمیر کرنے والے ادارے) کے لیے اساسی قواعد مرتب کرے گا جو زیادہ شفاف طریقے فراہم کریں گے۔ جس سے امتیاز کے امکانات ختم ہوجائیں گے۔

l اچھے قواعد کا ضابطہ (GPC) قانونی احکامات کی طرح ہوگا۔ جس کی اتباع کرنا ہر ایک کے لیے لازمی ہونا اور اس کی خلاف ورزی مستوجب سزا ہوگی۔ GPC کی عمل آوری سے دو برسوں تک تجربات سے سبق حاصل کرکے اور متعلقہ افراد سے مشاورت کے بعد' مساوی موقع کمیشن' مساوی موقع کے طریق عمل کا ضابطہ (Equal Opportunity Practice Code) مدون کرے گا۔

l حتمی طور پر مساوی موقع کمیشن' مساوی موقع طریق عمل کی عمل آوری کے اختیارات حاصل کرے گا تاکہ اس کے قوانین کی خلاف ورزی کرنے والوں کے خلاف عدالتی کارروائی کی جاسکے تاہم مشکل مسئلہ یہ ہے کہ مساوی موقع کے کمیشن کو قابل تعمیل احکامت کی اجرائی کا قانونی اختیار حاصل نہیں ہے اور وہ ان قوانین کی خلاف ورزی کرنے والوں کے خلاف تحقیر کی کارروائی نہیں کرسکتا۔ اس کو جتنے اختیارات دیے جانے چاہیے اس سے کم احتیارات عطا کیے گئے ہیں۔ مساوات کا سلوک کرنا' کسی بھی امن پسند اور ہم آہنگ معاشرے کے لیے شرط لازمی ہے اور دستور کی طرف سے تفویض کردہ اختیار ہے۔

اختتامیہ: مساوی موقع کمیشن' جیسا کہ اس کے نام سے ظاہر ہے یہ بتلاتا ہے کہ یہ سارے محروم کردہ طبقات جس میں اقلیتیں بھی شامل ہیں اور اکثریتی طبقات کے برابر مساوی سہولتوں کی فراہمی کا تیقن دیا گیا ہے جو ایک موثر ہتھیار ثابت ہوسکتا ہے۔ جمہوریت میں سارے شہریوں کو بلالحاظ ذات' نسل یا جنس مساوی مواقع ملنے چاہئیں۔ اور دستور' مساوی مواقع فراہم کرتا ہے۔ مادھومنین کمیٹی کی یہ رائے ہے کہ ملک میں مساوی موقع کمیشن کی ضرورت ہے اور اس نے حکومت ہند سے سفارش کی، کہ رپورٹ میں پیش کردہ اس کی تجاویز کے مطابق مساوی موقع کمیشن کا قیام عمل میں لایا جانا چاہئے۔ جلد یا دیر' مساوی موقع کے کمیشن کا قیام' دستور ہند کے وعدہ کی تکمیل کی طرف ایک اہم اقدام ہوگا جس میں ہندوستان کے سارے شہریوں کو مساوی مواقع حاصل ہوں گے۔

☆☆☆

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مضامین

ہندوستان میں درج فہرست ذات اور درج فہرست قبائل کے لئے تحفظاتی پالیسی: ایک جائزہ

تحفظات کا تصور: تحفظات کی پالیسی یا مثبت اقدام کی پالیسیاں یا ترجیحی سلوک اور معاوضاتی انصاف ان مختلف طریقوں میں سے ایک ہے جنہیں مثبت مساوات کے فروغ کے لئے اپنایا گیا ہے۔ غالب اور مظلوم طبقات کے درمیان تباہ کن حالات اور سماجی تصادم سے بچنے کے لئے مثبت انصاف کے تصور کو اپنایا گیا۔ یہ ایک حقیقت ہے کہ اس طرح کے حالات کو صرف مساوات اور عدم امتیاز پر مبنی زیادہ مساوی سماج کے قیام سے ہی روکا جاسکتا ہے۔

ہندوستان میں تحفظات مثبت اقدام کی ایک شکل ہے جس میں تعلیمی، سماجی اور انتظامی اداروں میں کم نمائندگی رکھنے والے مختلف برادریوں کی کم از کم نمائندگی کو یقینی بنانے کے لئے نشستوں کی تعداد یا فیصد کو مختص کیا جاتا ہے۔

تحفظات تاریخی طور پر ہندوستانی سماج کے محروم طبقات کی شرکت اور با اختیاری کو یقینی بنانے کی مملکت ہندوستان کی ایک سماجی پالیسی ہے جو سماجی و معاشی طور پر پسماندہ و محروم طبقات جیسے درجہ فہرت ذاتیں (SC)، درجہ فہرست قبائل (ST) اور دوسرے پسماندہ طبقات (OBC) کو اوپر اٹھانے کا ایک قدم ہے۔ دراصل یہ محض ایک مخصوص کوٹہ مقرر کرنے کا طریقہ نہیں ہے بلکہ یہ ذات، نسل، مذہب، جنس وغیرہ سے اوپر اٹھ کر سب کے لئے مواقع فراہم کرتے ہوئے سماج کو متحد اور مضبوط بنانے کا ایک مشن ہے۔ اس کے علاوہ سماجی دھارے سے الگ آزادی و وقار سے محروم طبقات کو سہارا دیکر ایک تمدنی سرمایہ (Cultural Capital) بنانا بھی اس پالیسی کا مقصد ہے۔

تحفظات کا مقصد تعلیمی اداروں، ملازمتوں اور قانون ساز اداروں میں داخلہ کی شرائط کو چند قابل شناخت گروہوں کے لئے جو آبادی کے تناسب سے کم نمائندگی رکھتے ہیں کم کرتے ہوئے سماجی تنوع میں اضافہ کرنا ہے۔ تحفظات کو تین زمروں میں تقسیم کیا جاسکتا ہے۔ (1) تعلیمی تحفظات، (2) ملازمت میں تحفظات اور 3) سیاسی تحفظات۔ ان تین تحفظات کے علاوہ حکومتی اسکیمات جیسے فراہمی امکنہ اور دیگر فلاحی اسکیمات میں کوٹہ متعین کیا جاسکتا ہے۔

مرکزی حکومت کے زیر انتظام تعلیمی اداروں میں 22.5 فیصد تحفظات، 15% درج فہرست ذاتوں، 7.5% درج فہرست قبائلیوں کیلئے ہیں۔ تحفظات کے اس فیصد کو دیگر پسماندہ طبقات اوبی سیز کیلئے زائد 27 فیصد دیتے ہوئے جملہ 49.5 فیصد کیا گیا۔ درجہ فہرست ذاتوں کے لئے 15 فیصد اور درج فہرست قبائلیوں کو 7 فیصد تحفظات پارلیمنٹ اور ریاستی اسمبلیوں کے انتخابات میں بھی عمل کیا جارہا ہے۔ چند ریاستوں جیسے ٹاملناڈو میں درج فہرست ذاتوں کے لئے

مضامین

18 فیصد اور درج فہرست قبائل کیلئے ایک فیصد مقامی آبادی کی بنیاد پر دیئے گئے ہیں۔ آندھراپردیش میں دیگر پسماندہ طبقات کے لئے 15 فیصد، درج فہرست ذاتوں کیلئے 6 فیصد درج فہرست قبائیلیوں اور پسماندہ طبقات کے لئے 25 فیصد اور مسلم پسماندہ طبقات کے لئے 4 فیصد کل 50 فیصد تحفظات ذات کی بنیاد پر دیئے گئے ہیں۔

دستور ساز اسمبلی میں مذہبی اقلیتوں کو تحفظات کے دائرے میں لانے پر طویل بحث چلی۔ مذہب کی بنیاد پر ملک کی تقسیم کی وجہ سے پیدا ہونے والے ماحول میں اقلیتوں کو مذہبی بنیاد پر تحفظات فراہم کرنے کو تائید حاصل نہیں ہوئی۔ البتہ دیگر پسماندہ طبقات کو دئے گئے 27 فیصد تحفظات میں کئی مسلم پسماندہ طبقات بھی شامل ہیں۔ کیرالا، تملناڈو، کرناٹک، یوپی، بہار، آندھراپردیش کے علاوہ دیگر کئی ریاستوں میں بھی مسلم پسماندہ طبقات کو تحفظات کے زمرے میں شامل کیا گیا ہے۔ انہیں مذہب کی بنیاد پر نہیں بلکہ ان کی سماجی پسماندگی کی وجہ سے تحفظات کے دائرے میں شامل کیا گیا ہے۔

درجہ فہرست ذاتوں کو دئے گئے تحفظات سے مسلم اور عیسائی دلتوں کو باہر رکھا گیا ہے جبکہ ہندو، سکھ اور بدھ مت کے دلتوں کو درجہ فہرست ذاتوں میں شامل کیا گیا ہے۔ یہاں یہ بات قابل غور ہے کہ درجہ فہرست قبائیلوں کو دئے گئے تحفظات میں مذہب کی کوئی قید نہیں ہے۔ قبائلی علاقوں میں رہنے والے تمام افراد چاہے وہ ہندو ہوں یا مسلمان تحفظات سے استفادہ حاصل کررہے ہیں۔

روزگار میں تحفظات:

تحفظات کی پالیسی کا سب سے اہم پہلو حکومتی خدمات میں تحفظات سے جڑا ہے۔ دستور کی دفعہ 16(4) کے تحت مملکت کو ''تقررات یا عہدوں کے لئے شہریوں کے کسی بھی پسماندہ طبقہ کے لئے تحفظات فراہم کرنے کا اختیار'' دیا ہے۔ اور دفعہ (5)16 کے تحت مملکت کو خدمات میں درج فہرست ذاتوں اور قبائل کے لئے کسی بھی درجہ کے عہدوں کے لئے ترقی کے معاملہ میں تحفظات فراہم کرنے کا اختیار ہے۔ چنانچہ اس مقصد کو پورا کرنے کے لئے حکومت نے درج فہرست ذاتوں اور قبائل کی آبادی کے تناسب سے ان کی حصہ داری کا تعین کرتے ہوئے انہیں تحفظات عطا کئے ہیں اسکے بعد دیگر پسماندہ ذاتوں (او بی سیز) کے لئے بھی تحفظات دیئے گئے ہیں۔ برسرروزگار افراد کے ترقی کے لئے بھی تحفظات ہیں۔ حکومتی خدمات میں وہ تمام لوگ شامل ہیں جو سیول سرویس عوامی شعبہ کے اداروں، قانونی اور نیم حکومتی اداروں اور حکومتی امداد حاصل کرنے والے اداروں میں کام کرتے ہیں۔ تاہم، مرکزی سطح پر چند خدمات کو تحفظات کی پالیسی سے مستثنیٰ رکھا گیا ہے۔ ان میں خاص طور پر دفاع اور عدلیہ کے شعبے شامل ہیں۔

تعلیم میں تحفظات:

تحفظات کی پالیسی کے دوسرے اہم ترین پہلو کا تعلق تعلیم سے ہے۔ دستور کی دفعہ 15(4) میں مملکت کو درج فہرست ذاتوں اور قبائل کی تعلیمی ترقی کیلئے خصوصی

قانون سازی کرنے کے لئے کہا گیا ہے اور حالیہ عرصہ میں یہ بات دیگر پسماندہ طبقات کے متعلق بھی کہی گئی ہے۔ چنانچہ اس دفعہ کی منشاء کو پورا کرنے کے لئے مرکزی اور ریاستی حکومتوں اور حکومتی امداد سے چلنے والے تمام اداروں میں ایس سی، ایس ٹی اور دیگر پسماندہ طبقات کے طلباء کے لئے نشستیں محفوظ کی گئی ہیں۔ بشمول آندھراپردیش کئی ریاستوں میں خواتین کو بھی تعلیمی اداروں میں تحفظات دئے گئے ہیں۔ اسکے علاوہ کئی ایک مالی اسکیمات کے ذریعہ خصوصا وظائف، خصوصی ہوسٹل کے ذریعہ ایس سی/ریس ٹی اور او بی سی طلبہ کو سہولتیں فراہم کی جارہی ہیں اسی طرح کوچنگ اور کتابوں کے لئے مالی امداد اور فیس میں رعایتیں دی جارہی ہیں۔

قانون ساز اداروں میں تحفظات: تحفظات کی پالیسی کا تیسرا اہم میدان مرکزی اور ریاستی مقننہ اوں میں تحفظات سے متعلق ہے۔ دستور کی دفعہ 330، 332 اور 334 کے تحت ST/SC کی آبادی کے تناسب سے مرکزی و ریاستی مقنّنہ میں ان کے لئے نشستیں محفوظ کی گئی ہیں۔ اس طرح کے تحفظات خواتین اور او بی سیز کے لئے شہری و دیہی مقامی سطح کے اداروں میں ضلع، تعلقہ اور دیہات کی سطحوں پر فراہم کئے گئے ہیں۔ ST/SC کی سیاسی شرکت میں اضافہ کے لئے قانونی توضیحات کے ذریعہ بھی ان کی مدد کی گئی ہے چنانچہ ان کے لئے انتخابی پرچہ نامزدگی کے ادخال کے وقت بھری جانے والی رقم (ڈپازٹ) بھی کم رکھی گئی ہے۔

سیاسی نمائندگی کے لئے تحفظات کے لئے متعینہ وقت کی حد ہے۔ ابتداء میں انہیں صرف دس سالہ مدت کے لئے رکھا گیا تھا، لیکن قانون سازی کے ذریعہ ہر دس سال کے بعد مزید دس سال کے لئے اس میں توسیع کی جارہی ہے۔ تاہم، حکومتی خدمات اور تعلیم کے میدانوں میں تحفظات کو جاری رکھنے یا رکھنے کے متعلق فیصلہ کو حکومت پر چھوڑ دیا گیا ہے۔ چنانچہ جب تک حکومت یہ سمجھتی ہے کہ ST/SC اور دیگر پسماندہ طبقات کی ترقی کے لئے تحفظات ضروری ہیں، انہیں جاری رکھ سکتی ہے۔

تحفظات کی تائید میں دلائل: منڈل کمیشن کی رپورٹ کے مطابق ذات پات ہندوستان کی آدھی سے زیادہ آبادی کی مشکلات کی ایک اہم وجہ ہے۔ چنانچہ ذات پات کو ختم کرنے کیلئے یہ ضروری ہے کہ ہم غیر مراعات یافتہ عوام کی مدد کریں تاکہ وہ تعلیم میں بہتر مظاہرہ کرسکیں اور اعلیٰ ذات کے عوام کے برابر وہ بھی سماجی رتبہ پاسکیں۔

قابلیت/میرٹ کی دلیل میں کوئی بڑی منطق نہیں ہے۔ قابلیت کسی کا کوئی پیدائشی حق نہیں ہے۔ اور سماج کے بعض طبقات تاریخی وجوہات کی بناء پر ترقی حاصل کئے ہیں جن میں جاری ذات پات کے سخت نظام کا بڑا دخل ہے۔ تحفظات کی تائید میں دلیلیں اس طرح ہیں۔

(1) تحفظات ایک دستوری ضرورت ہے، یہ نہ صرف ہندوستانی جمہوریت کی بنیاد ہیں، بلکہ یہ خود جمہوریت کے تحفظ کے لئے بھی ضروری ہیں۔ یہ ضروری ہے کہ محروم اور حاشیائی گروہ بھی یہ محسوس کریں کہ وہ بھی ہندوستانی قومی مملکت کا

مضامین

ایک لازمی جز ہیں، اور انہیں قومی دھارا میں شامل ہونے کی اہمیت کا احساس دلایا جائے۔

(2) آج بھی جاری ذات پات پر مبنی امتیاز کی وجہ سے بھی تحفظات کو جائز و صحیح قرار دیا جاسکتا ہے۔ ہندوستانی سماج کی ذات کی بنیاد پر تقسیم سماجی انقلاب کی ناکامی کو بتاتی ہے، ایک مساوی سماج کو قائم کرنے کے لئے تحفظات کو جاری رکھنا ایک سماجی ضرورت بن جاتی ہے۔

(3) محروم اور حاشیائی گروہ عددی اکثریت کے حامل ہیں، جنکے حقوق کو کچلا گیا ہے اور عددی اقلیت نے ہندوستان کی تاریخ کے ہر دور میں انہیں ان کے حقوق و مراعات سے محروم رکھا ہے۔ ان حقائق کی روشنی میں تاریخی غلطیوں کو ابھی تک درست نہیں کیا گیا ہے، اس لئے تحفظات کو جاری رکھنے کی ضرورت ہے۔

تحفظات کے خلاف دلائل: تحفظات کے مخالفین تحفظات کو پسماندہ طبقات کی جانب سے ایک طویل مدتی حکمت عملی سمجھتے ہیں جس کا مقصد دوسروں کی قیمت پر اپنے لئے کچھ حاصل کرنا ہے۔'' وہ لوگ جو حکومت کے اس مثبت اقدام کی مخالفت کرتے ہیں ''اعلیٰ اہلیت'' (میرٹ) کے بڑے حامی دکھائی دیتے ہیں۔ تحفظات کے خلاف دلائیل اس طرح ہیں:

(1) تحفظات کی وجہ سے اہلیت رکھنے والے ذہین لوگ ہندوستان سے باہر اپنے لئے مواقع حاصل کرلیں گے۔ جس سے ہندوستان اعلیٰ صلاحیتوں کے حامل دماغ و ذہن سے محروم ہوجائے گا۔

(2) تحفظات کی وجہ سے ایک فرد میں پنہاں صلاحیت واستعداد کو کچلنے کا رجحان پیدا ہوگا جس کی وجہ سے مجموعی طور پر پورے نظام کی کارکردگی متاثر ہوگی اور اس پر ایک منفی اثر پڑے گا۔

(3) تحفظات کے فوائد سے صرف چند ذاتیں اور گروہ ہی استفادہ کریں گے جس کی وجہ سے پسماندہ طبقات میں ایک برتر یا غالب گروہ پیدا ہوگا۔

(4) تعلیم کے ابتدائی مرحلوں میں کوئی امتیاز یا خصوصی مواقع نہیں ہیں، لیکن اعلیٰ تعلیم اور یا ملازمت کی سطح پر تحفظات دیئے گئے ہیں اس سے یہ پتہ چلتا ہے کہ SC/ST/OBCs کے لوگ اعلیٰ طبقات کے مقابلہ میں کم ذہین ہوتے ہیں اور یہ ایک تنگ نکتہ نظر ہے۔

(5) تحفظات کی پالیسی سیاسی جماعتوں کے ہاتھوں میں کھلونا بن جاتی ہے جسے وہ اپنے انتخابی فوائد کے لئے استعمال کرتے ہیں۔ اس کی وجہ سے سیاسی جماعتوں کو عوام کو مختلف ٹکڑوں اور گروہوں میں بانٹنے کا موقع مل جاتا ہے۔

(6) تحفظات کی پالیسی معاشی موقف کے مقابلہ میں سماجی بنیادوں پر زیادہ زور دیتی ہے لیکن آج کے بدلتے عالمیانہ اور آزاد معیشت کے منظر میں سماجی بنیادوں پر تحفظات فطری معاشی نمو میں ایک رکاوٹ ہے جس کی وجہ سے تحفظات کا سارا مقصد ہی فوت ہوجاتا ہے۔

مضامین

تنقیدی جائزہ : تحفظات کی اچھی پالیسی وہ پالیسی ہوتی ہے جس سے کارکردگی اور اعلیٰ اہلیت (میرٹ) کو نقصان پہنچائے بغیر ایک قوم کے طور پر ہمارے اتحاد کو توڑے بغیر اور ترقی کی جانب ہماری پیشرفت میں رکاوٹ بنے بغیر سماج کے ضرورت مند طبقات کو فائدہ پہنچائے۔

تحفظات کی پالیسی کو سائنٹفک بنانے کیلئے حسب ذیل امور پر غور کیا جانا چاہئے:

1۔ تحفظات کے فوائد سے پسماندہ ذاتوں کے ترقی یافتہ طبقہ کو دور رکھنے کیلئے موثر اقدامات کو اپنایا جانا چاہئے۔

2۔ تحفظات صرف ایک نسل تک محدود ہوں۔ بعد کی ذیلی نسلوں کے لئے یہ لازمی کیا جائے کہ وہ عام درجوں کے ساتھ مسابقت کر کے آگے بڑھیں۔

3۔ تحفظات کی پالیسی کا ہر چند برسوں کے بعد دوبارہ جائزہ لیا جائے تا کہ اس بات کو یقینی بنایا جائے کہ اس کا غلط استعمال نہ ہو اور یہ کہ اس کی وجہ سے انتظامی معیارات اور کارکردگی پر اثر نہ پڑنے پائے۔

4۔ تحفظات کو دستیاب ملازمتوں کے ایک چھوٹے سے فیصد تک محدود کیا جانا چاہئے۔

5۔ متعلقہ مقنّنہ کی منظوری کے بغیر تحفظات کو نافذ کرنے کی کوشش نہیں کی جانی چاہئے۔ تحفظات کی پالیسی کو اپنانے سے قبل مقنّنہ اور اس سے باہر کھلے و آزادانہ مباحث ہونے چاہئیں تا کہ حکومت کو رائے عامہ معلوم ہو سکے اور آبادی کے تمام طبقات کے لئے قابل قبول قانون سازی ہو سکے۔

ماحاصل: دستور ہند ایک سماجی دستاویز ہے اور تحفظات کی پالیسی کو سماجی مصالحت اور اقتدار میں حصہ داری کی ایک کلید کے طور پر تیار کیا گیا ہے۔ اس بات کو ذہن میں رکھتے ہوئے قوم پر مکمل وفاداری، مثبت سوچ، منصفانہ منصوبہ بندی، مناسب وموزوں جستجو تمام پیش قدمیوں کو یکجا کرتے ہوئے اور بے تکان عزم کے ساتھ حکمرانی کی جانی چاہئے۔ مختصراً یہ کہ ایک کامیاب اور مکمل موثر حساس شمولیتی حکمرانی ہو تا کہ قوم کے لئے ترقی کے ایک ایسے عہد میں لے جایا جا سکے جہاں ترقی کا مطلب سب کی ہمہ جہتی ترقی ہو۔ تحفظات کی پالیسی اپنی شکل اور مظاہر میں ہندوستان کی شمولیتی ترقی کے لئے ایک کامیاب وموثر شمولیتی پالیسی یا حکمت عملی ہو۔

//.....☆☆.....//

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حیدرآباد ریاست میں ریڈیو نشریات

الکٹرانک میڈیا، کہنے کو تو یہ دو چھوٹے سے الفاظ ہیں لیکن اس کی اہمیت اور رسائی کی وجہ سے آج ساری دنیا ایک مٹھی میں سما گئی ہے۔ آج تک دنیا کو گلوبل ویلیج کہا جاتا رہا ہے لیکن اب گلوبل ویلیج کا نظریہ بھی قصہ پارینہ بن چکا ہے کیونکہ آئے دن ہر نئی ایجاد دنیا کو مختصر سے مختصر کرتی جارہی ہے۔ آج دنیا کسی فرد واحد کی مٹھی میں بند چھوٹے سے اسمارٹ فون میں قید ہوکر رہ گئی ہے۔ فی زمانہ الکٹرانک میڈیا انسانی زندگی کا ایک ایسا لازمی جز بن چکا ہے جس کے بناء روز مرّہ زندگی کا تصور محال ہو چکا ہے۔ ٹکنالوجی کے میدان میں ٹیلی گراف سے ٹیلی فون، ریڈیو سے ٹیلی ویژن، کمپیوٹر انٹرنٹ سے موبائل فون اور اسمارٹ فون تک ترقی کا سفر طئے کرتے ہوئے دنیا میں انقلابی تبدیلیاں رونما ہوچکی ہیں۔

جدید وسائل اور ٹکنالوجی ہر عام وخاص کے دسترس تک رسائی حاصل کرچکے ہیں۔ اسکے مقابل ماضی میں ٹکنالوجی اور نئی ایجادات کی عوام تک رسائی کے لئے سرکاری انتظامیہ کو کافی مشقت کرنی پڑتی۔ جدید ٹکنالوجی اور وسائل کے حوالہ سے سابقہ حیدرآباد ریاست کو ایک منفرد مقام حاصل تھا۔ سلطنت آصفیہ نہ صرف ایک خوشحال ریاست تھی بلکہ سائنس اور ٹکنالوجی کے میدان میں بھی دیگر علاقوں اور ریاستوں کے مقابل کافی ترقی یافتہ مانی جاتی تھی۔ عوام کی فلاح اور انہیں بہتر سہولیات کی فراہمی کے لئے پرنٹنگ ٹکنالوجی، ریلوے لائین، ٹیلی گراف و ٹیلی فون اور ریڈیو جیسی نئی ایجادات دیگر ریاستوں سے قبل حیدرآباد ریاست میں متعارف اور مستعمل ہوچکی تھیں۔

ہندوستان پر مسلط حکومت برطانیہ نے جب چیمبر آف پرنسیس کے ذریعہ فارن اینڈ پولیٹکل ڈپارٹمنٹ کی قرارداد مورخہ ۲۷ رمئی ۱۹۲۶ کے بموجب ہندوستان اور اس کی خودمختار ریاستوں کو ریڈیو براڈ کاسٹنگ شروع کرنے کی منظوری دی تو آصفیہ حکومت نے بھی حیدرآباد ریاست میں ریڈیو نشریات شروع کرنے کا فیصلہ کیا۔ بعد ازاں ۲۲ رفروری ۱۹۳۲ کو ایک اور قرارداد کے ذریعہ انگریزی حکومت نے ہندوستان اور اس کی علاقائی ریاستوں میں باضابطہ طور پر ریڈیو براڈ کاسٹنگ سروس کی منظوری کو قطعیت دی۔

حیدرآباد ریاست میں وائیر لیس (لاسلکی) ٹرانسمیٹنگ اسٹیشن کا قیام: حیدرآباد ریاست میں جدید مواصلاتی نظام کی بنیاد ڈالنے کا کارنامہ حیدرآباد کے پوسٹ ماسٹر جنرل محمد احمد اور محکمہ ریلوے، میل سرویس کے سپریٹنڈنٹ محبوب علی نے انجام دیا۔ پوسٹ ماسٹر جنرل محمد احمد نے ریاست حیدرآباد میں آزمائشی لاسلکی ٹرانسمیٹنگ اسٹیشن کے قیام کے لئے متعلقہ محکمہ کو ایک درخواست روانہ کی۔ آزمائشی ٹرانسمیٹنگ اسٹیشن کے قیام کی منظوری ملنے کے بعد

مضامین

محکمہ ریلوے کے ملازم محبوب علی کے زیرنگرانی وائرلیس ٹرانسمیٹنگ اسٹیشن کے آلات کی تنصیب عمل میں آئی۔ ان آلات کو محبوب علی نے بمبئی (موجودہ ممبئی) سے منگوایا تھا۔ حکومتِ آصفیہ کی درخواست پر حکومت ہند نے اس آزمائشی لاسلکی ٹرانسمیٹنگ ریڈیو اسٹیشن کے لئے تجرباتی لائسنس منظور کرتے ہوئے ۲۵۰ تا ۳۰۰ میٹرس اور ۷۵ تا ۸۰ میٹرس کے بینڈس پر فریکونسی مختص کی۔ تجرباتی طور پر قائم کردہ اس ریڈیو اسٹیشن کے لئے (وی یو ۷ ایچ اے) نامی کوڈ مختص کیا گیا۔ ڈسمبر ۱۹۳۳ سے ریاست حیدرآباد میں ۷۵ واٹ گنجائش والے ٹرانسمیشن کے ذریعہ خانگی سطح پر بھی ریڈیو نشریات کا آغاز کیا گیا۔ ریڈیو نشریات کو آصفیہ حکومت کے دارالحکومت شہر حیدرآباد سے دو سو میل کے احاطے میں موجود تمام اضلاع کے ہیڈ کوارٹرس پر کامیابی کے ساتھ سُنا جانے لگا۔ تجرباتی طور پر قائم کردہ اس اسٹیشن سے روزانہ خبریں اور مقامی موسیقی کے پروگرام نشر کئے جاتے۔

آزمائشی ٹرانسمیٹنگ اسٹیشن کی کامیابی کے بعد آصفیہ حکومت نے سال ۱۹۳۵ میں ریڈیو اسٹیشن کو مکمل طور پر اپنی نگرانی میں لیتے ہوئے حیدرآباد میں ایک مستقل ٹرانسمیٹنگ اسٹیشن قائم کرنے کی ذمہ داری مارکونی کمپنی کو سونپی۔ ریاست میں ریڈیو نشریات کے دائرہ کار کو وسیع کرنے کے مقصد سے آصفیہ حکومت نے حیدرآباد کے علاوہ اورنگ آباد، ورنگل اور گلبرگہ میں مزید تین ٹرانسمیٹنگ اسٹیشن قائم کرنے کا منصوبہ بنایا۔ اورنگ آباد، ورنگل اور گلبرگہ علاقوں کے انتخاب کی وجہ یہ تھی کہ علاقائی اعتبار سے مراٹھواڑ علاقہ میں واقعہ اورنگ آباد میں مراٹھی زبان، علاقہ تلنگانہ میں واقع ورنگل میں تلگو زبان اور گلبرگہ اور اس کے اطراف و اکناف کے بیشتر علاقوں میں کنڑ زبان بولنے اور سمجھنے والی آبادی کثرت سے پائی جاتی تھی۔ ریاست کے ان تین علاقوں میں علیحدہ علیحدہ زبانیں بولی اور سمجھی جاتی تھیں جس کے باعث آصفیہ حکومت نے ان تینوں علاقوں میں نشریاتی مراکز (ریلے سنٹرس) قائم کرتے ہوئے وہاں کی مادری زبانوں میں عوام تک ریڈیو نشریات کی رسائی کا فیصلہ کیا۔ اس سلسلہ میں اورنگ آباد میں ٹرانسمیٹنگ اسٹیشن کا تعمیری کام شروع کردیا گیا تھا جبکہ ورنگل اور گلبرگہ کے لئے محکمہ پوسٹ اینڈ ٹیلی گراف سے مخصوص فریکونسی مختص اور محفوظ کروالی گئی تھی۔ لیکن اچانک دوسری جنگ عظیم چھڑ جانے اور انگلینڈ و امریکہ سے ٹرانسمیٹنگ اسٹیشنوں کے قیام کے لئے آلات کے حصول میں پیش آرہی دشواریوں کے باعث ورنگل اور گلبرگہ میں ٹرانسمیٹنگ اسٹیشن کے قیام کا منصوبہ منسوخ کرنا پڑا۔

ریڈیو نشریات کے ابتدائی دنوں میں ڈائریکٹر جنرل پوسٹ اینڈ ٹیلی گراف کی جانب سے جاری کردہ وائرلیس ریسیور لائسنس کے عوض حاصل شدہ آمدنی کا ۸۰ فیصد حصّہ انگریزی حکومت کو لازمی طور پر ادا شدنی تھا۔ سرکاری خزانہ پر بڑھتے بوجھ میں کمی کے مقصد سے

آصفیہ حکومت نے ریاست کے لئے حاصل کردہ لائسنس کو ہندوستان کے کسی دوسرے حصّہ میں استعمال کرنے کی اجازت طلب کی لیکن انگریزی حکومت نے اجازت دینے سے انکار کرتے ہوئے ہندوستان کے دیگر علاقوں میں وائرلیس سیٹس اور آلات کی سپلائی کے لئے ڈائریکٹر جنرل پوسٹ اینڈ ٹیلی گراف سے علیحدہ لائسنس حاصل کرنے کا مشورہ دیا۔ ریڈیو نشریات کے ابتدائی دور میں براڈ کاسٹ ریسیور لائسنس فیس ۱۲ روپئے مقرر کی گئی جس میں سے ۱۰ روپئے براڈ کاسٹنگ کمپنی کو ادا شدنی تھے۔ کچھ عرصہ بعد فیس اور کمیشن میں کمی کرتے ہوئے اسے بالترتیب ۱۰ روپئے اور ۸ روپئے کیا گیا۔ ۲

۱۹۳۹ میں حیدرآباد ریاست کے اس ریڈیو اسٹیشن کو سرکاری طور پر دکن ریڈیو کا نام دیا گیا۔ دکن ریڈیو کے حیدرآباد اسٹیشن سے روزانہ شام ساڑھے پانچ بجے تا رات دس بجے تک نشریات کا سلسلہ جاری رہتا۔ دکن ریڈیو سے نشر ہونے والے پروگرامس کا شیڈول ذیل میں درج ہے۔ ۳

پروگرام نشرگاہ لاسلکی حیدرآباد دکن (چہارشنبہ)
(۲۷/امرداد ۱۹۵۰ فصلی م ۲/جولائی ۱۹۴۱ء)

ساعت شام:

۵:۳۰	:	باپوراؤ۔استادی موسیقی
۵:۵۰	:	زہرہ جان انبالہ والی۔عام پسند موسیقی
۶:۱۰	:	باپوراؤ۔استادی موسیقی
۶:۲۵	:	وٹھل راؤ۔بھجن
۶:۳۵	:	زہرہ جان انبالہ والی۔عام پسند نغمے
۷تا۷:۳۰	:	بچوں کا پروگرام، گانا، جادو۔تقریر ریکارڈز، نظم خوانی۔امیر احمد صاحب خسرو نغمہ۔وینو گوپال
۷:۳۰	:	تاریخ ہند کی بڑی ہستیاں سلسلہ (۱۴) مذہبی مصلح سلسلہ (۵) گرو گوبند سنگھ تقریر
۷:۴۵	:	باپوراؤ۔عام پسند نغمہ

ساعت شب:

۸:۰۰	:	اُردو خبریں
۸:۲۰	:	انگریزی خبریں
۸:۴۵	:	زہرہ جان انبالہ والی۔عام پسند موسیقی
۹:۰۵	:	باپوراؤ۔ٹھمری
۹:۲۵	:	زہرہ جان انبالہ والی۔عام پسند موسیقی
۹:۵۵	:	اُردو خبریں یا ریکارڈ
۱۰:۰۰	:	دعائے سلامتی ریڈیو نشریات کا اختتام

دکن ریڈیو سے نشر ہونے والے پروگراموں کی تفصیلات سے یہ بخوبی ظاہر ہوتا ہے کہ آصفیہ حکومت، دیگر مذاہب اور انکے جذبات کا احترام کرتی تھی۔ مسلمانوں کے مذہبی پروگراموں کے ساتھ ساتھ ہندوؤں کے بھجن اور سکھوں

کے مذہبی گرو کی تقاریر کو آصفیہ حکومت نے ریڈیو نشریات کا حصّہ بنایا تھا۔ دکن ریڈیو کے ذریعہ 'تاریخ ہند کی بڑی ہستیاں' کے زیرعنوان ہندوستان کی تاریخی شخصیات کے کارناموں کو سلسلہ وار طور پر نشر کیا جاتا تھا۔ اس کے علاوہ نظم خوانی جیسے ادبی اور موسیقی جیسے تفریحی پروگراموں کے علاوہ اُردو، انگریزی خبریں بھی نشر کی جاتیں۔ ریڈیو نشریات کے اختتام پر گلوکار ایف رؤف کی آواز میں آصف سابع میر عثمان علی خان کی مداحی میں ترانہ نشر کیا جاتا۔ جس کے ابتدائی بول درج ذیل ہیں۔

تا ابد خالق عالم یہ ریاست رکھے
تجھ کو عثمان بصد اجلاس سلامت رکھے

سقوط حیدرآباد کے بعد اس میں ہندی سروس کے اضافہ کے ساتھ کچھ عرصہ تک دکن ریڈیو کے نام سے ہی نشریات کا سلسلہ جاری رکھا گیا۔ ریڈیو اور ٹیلی ویژن کی دنیا کی معروف شخصیت مرحوم منظور الامین نے دکن ریڈیو میں بھی بطور ٹاک پروڈیوسر گراں قدر انجام دی تھیں۔ انہوں نے اپنے ایک انٹرویو کے دوران دکن ریڈیو کے حوالے سے کچھ اس طرح اپنے خیالات کا اظہار کیا۔ ۴

۱۹۴۸ سے پہلے چونکہ آصف جاہی ریاست مملکت محروسہ سرکارِ عالی کہلاتی تھی اور دکن ریڈیو کی نشریات ریاست میں ہی محدود تھیں' اس لئے اس کے پروگرام بھی زیادہ تر اس مقصد سے ہوتے تھے، لیکن بعد میں ہندوستان کی دیگر ریاستوں کی بھی بات ہونے لگی چونکہ نام کے ساتھ مسلمانوں کا جذباتی لگاؤ تھا اس لئے کچھ سالوں تک اسے بدلا نہیں گیا۔ مانا کہ تلگو والے اسکو آکاش وانی اور مراٹھی سروس میں اسکو نبھونی کہا جانے لگا لیکن اُردو اور انگریزی سروس پر یہ دکن ریڈیو ہی کہلاتا تھا' اُردو کا کافی چلن تھا۔ فائلوں پر نوٹنگ اُردو میں ہی ہوتی تھی۔ انگریزی کے پروگراموں کے ٹیپ پر بھی اُردو میں لکھا جاتا تھا۔ ۱۹۵۵ تک آڈٹ بھی اُردو میں ہوتی رہی۔ سقوط حیدرآباد کے بعد رونما ہوتی تبدیلیوں کے باعث دو سال بعد یعنی ۱۹۵۰ میں دکن ریڈیو کے نام کو بھی بالآخر آکاش وانی میں تبدیل کر دیا گیا۔

☆☆☆

مضامین

حوالہ جات :

۱۔ فائل نمبر۔ ایچ ۱۰۔ سی ۱۷۱، انسٹالمینٹ نمبر۔ ۱۵، لسٹ نمبر۔ ۱۔ تلنگانہ اسٹیٹ آرکائیوز۔
۲۔ فائل نمبر۔ کیو ۷۔ ڈی ۶۲، انسٹالمینٹ نمبر۔ ۳۶، لسٹ نمبر۔ ۶۔ تلنگانہ اسٹیٹ آرکائیوز۔
۳۔ روزنامہ رعیت، ۲/جولائی ۱۹۴۱۔
۴۔ منظور الامین کا خصوصی انٹرویو، روزنامہ اعتماد ۱۷/ڈسمبر ۲۰۰۶۔

oOo

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موبائل نمبر۔ 8686613399

قطب شاہی دور میں بچوں کے ادب کی نمائندگی

اگر چہ بچوں کے ادب اور اُس کے تقاضے بنیادی طور پر قصے، کہانی اور حکایات کے علاوہ بے شمار سبق آموز واقعات سے وابستہ تمام سادہ زبان اور ادب میں لکھی ہوئی تحریروں کو اُن کی خصوصیات کی وجہ سے بچوں کے ادب میں شامل کیا جاتا ہے، عادل شاہی دور میں ہی نہیں بلکہ قطب شاہی دور میں بھی اُردو کے شاعروں اور ادیبوں نے دکنی زبان میں ایسی کتابیں لکھیں، جن میں نصیحت آموزی اور مذہبی خصوصیات کے علاوہ اخلاقی خصوصیات کو بھی شامل کیا گیا۔ چنانچہ دکنی زبان کے توسط سے بچوں کے ادب کی نمائندگی کرنے والے عادل شاہی دور کے بعد قطب شاہی دور کو بھی اس لیے اہمیت حاصل ہے کہ گولکنڈہ اور اُس کے اطراف واکناف میں دکنی ادب پروان چڑھنے لگا تو دکنی کے ادیبوں نے ایسے اظہار کو مناسب سمجھا جس میں مذہبی فلسفہ کے علاوہ اسلامی تصوف اور فقہ کی باتوں کے ساتھ ساتھ پندو موعظت بھی شامل ہو، اس لیے دکنی میں لکھی جانے والی ایسی تمام کتابوں کو بچوں کے ادب میں شمار کیا جاتا ہے۔ بہمنی دور کے بعد عادل شاہی دور کے شاعروں نے بچوں کے ادب کی نمائندگی کی اور اُس کے بعد قطب شاہی دور میں بھی دکنی میں بچوں کے ادب کو پیش کرنے کا اہتمام کیا گیا۔ قطب شاہی سلطنت کا آغاز 1525ء میں ہوا، جس کے 8 بادشاہ دکن پر حکمران رہے اور 1687ء میں مغل شہنشاہ اورنگ زیب عالمگیر کے حملہ کی وجہ سے گولکنڈہ کی قطب شاہی سلطنت کا خاتمہ ہوگیا۔ اگر چہ قطب شاہی دور کے بادشاہ خود دکنی کے شاعر رہے جیسے سلطان محمد قلی قطب شاہ، عبداللہ قطب شاہ اور ابوالحسن تاناشاہ کی بھی دکنی شاعری کی خصوصیت کو اپنے کلام میں شامل کیا اور اس دور میں دکنی کے دو بڑے شعراء ملا وجہی اور غوّاصی کو عبداللہ قطب شاہ کے دربار سے ملک الشعراء کا خطاب دیا گیا۔ اُس دور کے 32 شاعروں کے ذریعہ مثنوی، قصیدہ، غزل، مرثیہ، رُباعی جیسی شعری دوسری اصناف کو ترقی حاصل ہوئی جس کے ساتھ ہی بچوں کے ادب پر توجہ دینے والے قطب شاہی دور کے اہم ادیبوں کے نام اور اُن کے کارنامے بڑی اہمیت کے حامل ہیں۔

میراں جی حسن خدا نما (وفات: 1078ھ م 1667ء) کو قطب شاہی دور کے اہم بچوں کے نثر نگار کا درجہ حاصل ہے۔ اُنہوں حضرت امامِ غزالی کے بھائی شیخ احمد کی لکھی ہوئی کتاب ''شرح تمہید ہمدانی'' کا اُردو میں ترجمہ کیا، یہ کتاب سلیس دکنی زبان میں لکھی ہوئی ہے اور اس کی نثر انتہائی سادہ اور آسان ہے، جس میں بچوں کے ادب کی خصوصیت کا لحاظ رکھا گیا ہے۔ اُن کی نثر کا نمونہ پیش ہے:

''اللہ بڑا صاحب ہے، اُس کو بہت سراہنا، ہور بہت نوازنا۔۔۔۔ خدا دائم قائم ہے، اُس کی بندگی کا مہر سب پر ہے، ہور خدا اکیلا ہے، پیدا کرتا ہے، ہور مارتا ہے''۔

مضامین

میراں جی حسن خدا نما ایک صوفی بزرگ تھے جنہوں نے بچوں کی تربیت اور اُنہیں خدا کی ذات کی پہچان کے لیے یہ رسالہ لکھا، جس میں خدا کی بڑائی کو چھوٹے چھوٹے جملوں میں پیش کیا گیا ہے، جس کی وجہ سے اُن کی نثر رواں اور سلیس ہوگئی ہے، اسی لیے قطب شاہی دور کے اولین بچوں کے نثر نگار کی حیثیت سے میراں جی حسن خدا نما کا نام پیش کیا جاتا ہے، جن کے بعد مولانا عبداللہ نامی نثر نگار قطب شاہی دور کے آخری بادشاہ کے زمانے کے بزرگ نے 1032ھ (1614ء) میں مشہور کتاب ''احکام الصلوۃ'' لکھی، جسے فارسی سے اُردو میں ترجمہ قرار دیا جاتا ہے، اس کتاب میں مختصر فقہ حنفی کی نمائندگی کی گئی ہے۔ بچوں کو حنفی طریقہ سکھانے کے لیے یہ کتاب بڑی مفید ہے، زبان آسان ہونے کے باوجود دکنی میں لکھی جانے کی وجہ سے اُس کا مطالعہ آج کے دور میں سخت دشوار ہے، غرض قطب شاہی دور کے دوسرے بچوں کے نثر نگار کی حیثیت سے مولانا عبداللہ کا نام لیا جاتا ہے، جنہوں نے حنفی فقہ کو آسان زبان میں لکھ کر بچوں کی تربیت کا حق ادا کیا۔

قطب شاہی دور میں جس وقت مولانا عبداللہ دینی کتابوں کی تحریر کے ذریعہ بچوں کے ادب میں اضافہ کررہے تھے، اُسی دور میں دکنی کے مشہور شاعر اور نثر نگار کی حیثیت سے عابد شاہ کا نام کافی شہرت رکھتا ہے، اُنہوں نے شاعری میں ''گلزار السالکین''، جیسی کتاب لکھی اور نثر میں ''کنز المؤمنین'' تحریر کی جو حنفی مسائل کی نمائندگی کرتی ہے، اس میں بھی سمجھانے والا انداز شامل ہے، اسی لیے اس کتاب کو قطب شاہی دور کی بچوں کے ادب ایک اہم کتاب کا درجہ حاصل ہے۔

قطب شاہی دور کے بیشتر شاعروں اور ادیبوں نے نثر کے ساتھ ساتھ شاعری میں بھی مذہب پرستی کے مواد کو پیش کرکے زبان کی خدمت اور بچوں کے ادب کی نمائندگی کا حق ادا کیا۔ ایسے ہی قطب شاہی دور کے ایک اہم شاعر سید بلاقی گذرے ہیں جنہوں نے دکنی زبان میں ''معراج نامہ'' تحریر کیا جو فارسی زبان کا اُردو میں ترجمہ ہے۔ یہ کتاب 1065ھ (1654ء) میں لکھی گئی، جو حیدرآباد کے کتب خانوں کے علاوہ یوروپ کے کتب خانوں میں موجود ہے۔ اس کتاب میں داستانی انداز سے معراج کا واقعہ پیش کیا گیا ہے، جس میں ایک یہودی کے انکار کا جواز پیش کیا گیا ہے۔

قطب شاہی دور کے آخری تاجدار ابوالحسن تانا شاہ کے زمانے میں دکنی کا باوثوق شاعر اولیاء گذرا ہے، جس نے 1090ھ مطابق 1679ء میں فارسی ''معراج نامہ'' کو دکنی میں منتقل کیا، اس طرح حضرت عمرؓ کے فرزند ابوشحمہ کے قصے کو اُس زمانے کی خصوصیات کے ساتھ پیش کیا ہے، قطب شاہی دور سے وابستہ شاعروں نے بچوں کے ادب کی نمائندگی کی، جس میں اولیاء کا لکھا ہوا قصہ ابوشحمہ بھی شامل ہے، جس میں بچوں کے ادب کی خصوصیات شامل ہیں، خود قطب شاہی کے آخری بادشاہ کی حیثیت سے ابوالحسن تانا شاہ نے بھی بچوں کے ادب کی طرف خصوصی توجہ دی، تانا شاہ کے مرشد حضرت سید شاہ راجو قتال حسینی رحمۃ اللہ علیہ نے ابوالحسن تانا شاہ کو بہترین تربیت دی۔ غرض ابوالحسن تانا شاہ اور شاہ راجو قتال حسینی رحمۃ اللہ علیہ نے

مضامین

بھی بچوں کے ادب کی خدمت انجام دی۔

قطب شاہی دور کے چھٹویں بادشاہ محمد قلی قطب شاہ معانی نہ صرف بادشاہ تھے بلکہ بچوں کے ادب کے شاعر بھی تھے، جنہیں حضرت امیر خسرو رحمۃ اللہ علیہ کے بعد اُردو کے بچوں کے دوسرے شاعر ہونے کا شرف حاصل ہے، سلطان قلی دکنی کا شاعر اور صوفی منش بزرگوں کی خدمت کیا کرتا تھا، اُس کا وہی دور ہے جب شمالی ہند میں اکبر اعظم حکمران تھا، سلطان محمد قلی نے عوام کے رسم ورواج، تہذیب وتمدن اور تہوار کے علاوہ کھیل کود سے دلچسپی دکھائی، چنانچہ اُس کی شاعری میں رنگا رنگ شعری خصوصیات جلوہ گر ہیں، قلی قطب شاہ کا انتقال 1611ء میں ہوا، اُس نے بچوں کے ادب کی ترقی وترویج کے لیے موسموں اور تیوہاروں پر ہی نہیں' بلکہ کھیل کود اور لڑکیوں کی دلچسپی کے کھیلوں پر نظمیں لکھیں، اُسے اُردو کا پہلا صاحب دیوان شاعر ہونے کا شرف بھی حاصل ہے۔غرض دکنی زبان میں سب سے زیادہ بچوں کے ادب کی تحریروں کے ذریعہ سلطان محمد قلی قطب شاہ نے اہم کارنامے انجام دیئے اوران کارناموں میں تنوع بھی پایا جاتا ہے۔اس طرح اُس کی شاعری میں رنگین بیانی جلوہ گر نظر آتی ہے۔سلطان قلی قطب شاہ نے شب برأت، بقرعید، پوریوں کی عید، عیدنو روز، عیدغدیر، ہولی، بسنت، دیوالی اور عیدالفطر کے علاوہ کئی کھیلوں اور دلچسپیوں اور محلوں پر بھی نظمیں لکھیں، جس کی وجہ سے وہ اپنے عہد کا مشہور دکنی اور بچوں کا شاعر قرار دیا جاتا ہے۔اس طرح قطب شاہی دور میں بچوں کے ادب کی آبیاری کے لیے شاعری کے ساتھ ساتھ نثر نگاری کا سلسلہ بھی جاری رہا۔''کلیات محمد قلی'' میں 50 ہزار اشعار موجود ہیں، اس طرح گولکنڈہ میں قائم قطب شاہی حکومت کے ذریعہ بھی دکنی شاعروں نے بچوں کے ادب کی نمائندگی کرتے ہوئے دکنی باشندوں کی خدمت انجام دی۔اس طرح بہمنی اور عادل شاہی دور کے بعد بچوں کے ادب کو پروان چڑھانے میں قطب شاہی دور کے بادشاہوں اورعوام پسند شاعروں نے دکن کے علاقے میں پھیلنے والی اُردو زبان کی سرپرستی کی اور بچوں کے ادب کو امتیازی مقام عطا کیا، اس طرح دکن میں شاہی سرپرستی اورعوام کی دلچسپی کی وجہ سے بچوں کے ادب کو پروان چڑھنے کا موقع حاصل ہوگیا، جب مغلیہ شہنشاہ اورنگ زیب نے دکن کی پانچ مسلم حکومتوں کا خاتمہ کردیا تو بھی دکنی ادب جاری رہااور دکنی ادیبوں نے ان کی آبیاری میں بڑھ چڑھ کر حصہ لیا۔1347ء سے لے کر 1687ء تک دکنی ادب میں بچوں کی صلاحیتوں کو پروان چڑھانے کے طریقے استعمال کئے جاتے رہے، جس کے بعد مغلیہ دور کے بادشاہوں کی جانب سے دکن کے مقامی باشندوں پر حملوں کی وجہ سے دکنی خصوصیات روبہ زوال ہوئیں۔اور پھر دکن میں مغلیہ سلطنت کی وجہ سے اُردو میں بچوں کے ادب میں نیا رجحان عام ہوا۔مغلیہ سلطنت کے بادشاہ اورنگ زیب کے حملہ کے بعد دکن کی پانچ سلطنتیں روبہ زوال ہوئیں اور مغلیہ دور کا آغاز ہوا۔اس کے بعد بھی شہر اورنگ آباد سے دکنی بچوں کے ادب کی خصوصیات جاری رہیں۔

☆☆☆

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ضلع ورنگل کے چند نامور شعراء

ورنگل شہر تاریخی اہمیت کا حامل شہر ہے۔ کاکتیہ حکمرانوں کا یہ صدر مقام تھا۔ آج بھی عالی شان عمارتیں ومنادر جیسے ہزارستون دیول، قلعہ ورنگل، حکمرانوں کی یاد دلاتے ہیں۔ جب کاکتیہ سلاطین کے آخری بادشاہ کو مسلمانوں کے ہاتھوں شکست ہوئی تب سے مسلمان اس تاریخی شہر میں آباد ہوئے اور یہاں فارسی اوراردوشعروادب کی شروعات ہوئی۔

سب سے پہلا نام ادب کی دنیا میں جوہمیں ملتا ہے وہ حضرت سید شاہ فاضل بیابانیؒ (ورنگل قاضی پیٹ درگاہ شریف) کا ملتا ہے۔جنھوں نے فارسی زبان میں ایک کتاب تخلیق کی جومسلمانوں کی مذہبی رہبری اور رہنمائی پر مشتمل تھی۔ اس کے بعد حضرت سید شاہ افضل بیابانیؒ کا کلام دستیاب ہے۔

تاریخی شہرورنگل (ہنمکنڈہ) کی سرزمین سے کئی قابل قدرشعری وادبی شخصیتیں نمودار ہوئیں۔جنھوں نے شعروادب میں گنج ہائے گراں مایہ ناز کارنامے انجام دیئے۔ سرزمین ورنگل میں ان دنوں بے شمار شعراء وادیب اردوزبان کی خدمت میں لگے ہوئے ہیں۔ان میں چندشاعروادیب دینی ومذہبی کلام پیش کئے اور چند نے اردوادب میں اپنا اچھا کلام پیش کیا۔ کچھ کا ذکر یہاں ہم کئے دیتے ہیں۔

ورنگل کے شعراء:

اقبال شیدائی، نادر اُسلوبی مرحوم، علی الدین گوہر مرحوم، محمدعثمان ورنگلی، ڈاکٹرعزیزاحمدعرسی، اجمل محسن ایڈوکیٹ، تاج مضطر، ڈاکٹرمبشراحمدنشتر، مسعودمرزامحشر، اقبال درد، پروفیسر احمدحسین خیالی، وحیدگلشن (صحافی وشاعر)، اندورعبدالقادر نقشبندی۔

ورنگل کے ادیب، افسانہ نگار:

فضل جاوید، محمدسرورعلی افسر، ڈاکٹرمحمد بہادرعلی، ڈاکٹرعزیزاحمد عرسی، اجمل محسن، مسعودمرزامحشر۔

اقبال شیدائی: اقبال شیدائی کا پورا نام محمد مشید الدین ہے۔ ان کے والد کا نام محمد جلال الدین ہے۔ ان کی ولادت ۱۵/فبروری ۱۹۴۳ء کو ورنگل میں ہوئی۔ وہ سرکاری محکمہ میں منڈل پریشڈ ڈیولپمنٹ آفیسر کے عہدہ سے وظیفہ حسن خدمت پرسبکدوش ہوئے ہیں۔انہوں نے جامعہ عثمانیہ سے بی ایس سی کی ڈگری حاصل کی ہے۔

اقبال شیدائی نہ صرف شاعری میں ذوق رکھتے ہیں بلکہ طنز ومزاح کے مضامین اور خاکہ نگاری بھی بہترین انداز میں کرتے ہیں۔ان کی سب سے بڑی خوبی یہ ہے کہ ان کی تحریروں میں کہیں بھی جھول نہیں ہوتا۔ ان کے افسانے یا مضامین پڑھتے ہوئے قارئین کوایک پل بھربھی بوریت محسوس نہیں ہوتی کیونکہ شیدائی اسے اپنی دلچسپ ڈور سے باندھے

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رکھتے ہیں۔ اقبال شیدائی کا مطالعہ کافی وسیع ہے۔ سیاست سے بھی انھیں گہری دلچسپی ہے۔ سیاسی موضوعات پر اپنا قلم چلا کر مکروہ سیاسی چہرہ کو ننگا کرنا انھیں خوب آتا ہے۔ ایسا کر کے وہ کسی کو خوش کرتے ہوں یا نہیں مگر خود بہت خوش ہوتے ہیں۔ ان کا افسانہ ''مولوی ابوالحسن کا چوکرہ'' میرے خیال کی ایک عمدہ مثال ہے۔

اقبال شیدائی کا شعری مجموعہ ''آتش سیال'' کی طرح ان کے طنزیہ مضامین کا مجموعہ ''جامہ تلاشی'' بھی ہے۔ روزنامہ منصف کے کالم نگاروں میں بعض بہت کڑوا کسیلا طنز شکر کی گولیوں کی طرح پیش کرنے کا ہنر جانتے ہیں۔ ایسا لکھنے والوں میں اقبال شیدائی کا نام کافی اہمیت کا حامل ہے۔ یہ طنز نگاری کے ساتھ شاعری بھی کرتے ہیں اور افسانہ بھی لکھتے ہیں۔ اقبال شیدائی کی دیگر کتابیں اس طرح ہیں:

(۱) آتش سیال (شعری مجموعہ) سال ۱۹۹۶ء (۲) جامہ تلاشی (طنزیہ مضامین) سال ۲۰۰۵ء (۳) خواب جاگتی آنکھوں کے (شعری مجموعہ) سال ۲۰۰۶ء، (۴) بوند میں جکڑا طوفان (بارہ سو غزلیات کا مجموعہ) سال ۲۰۰۷ء (۵) برکتیں وردی کی (طنزیہ افسانوں کا مجموعہ) سال ۲۰۰۸ء میں شائع ہوئیں ہیں۔ جبکہ زیر ترتیب کتابوں میں (۱) صنم ہوتم آقا (نعتیہ کلام)، (۲) آڑی کی بلا باڑی پر شامل ہیں۔

شاعری کے زمرہ میں اردو اکیڈیمی کی جانب سے سعید شہیدی کارنامہ حیات ایوارڈ چیف منسٹر آنجہانی ڈاکٹر وائی ایس راج شیکھر ریڈی کے ہاتھوں ۲۱ر جولائی ۲۰۰۹ء کو دیا گیا' ان کی تین کتابوں' جامہ تلاشی'، 'خواب جاگتی آنکھوں کے اور' بوند میں جکڑا طوفان' کو بھی آندھرا پردیش اردو اکیڈیمی حیدرآباد نے انعامات سے نوازا ہے۔

ڈاکٹر محمد بہادر علی: ڈاکٹر محمد بہادر علی (قلمی نام) ہے۔ ان کا اصلی نام محمد بہادر علی ہے۔ ان کے والد کا نام جناب محمد جعفر علی ہے۔ ان کی پیدائش ۸ر جنوری ۱۹۴۷ء کو ورنگل میں ہوئی۔ یہ ایک اچھے ادیب ہیں۔ ان کی تعلیمی قابلیت ایم۔ اے (سیاسیات)، ایم۔ اے (اردو)، بی ایڈ اور انہوں نے پی ایچ۔ ڈی عثمانیہ یونیورسٹی سے مکمل کی ہے۔ اسلامیہ آرٹس اینڈ سائنس کالج ورنگل کے وظیفہ یاب پرنسپل ہیں اور اب بھی اسی کالج میں سیاسیات اور اردو کے پارٹ ٹائم لکچرر کی حیثیت سے خدمات انجام دے رہے ہیں۔ پی ایچ۔ ڈی میں ان کا موضوع ''اردو ناول۔ تکنیک اور رجحانات'' تھا۔ ان کی تصانیف جو منظر عام پر آئیں ہیں ان میں (۱) عظیم سیاسی مفکرین (۹۲) دستورِ ہند اور عملی سیاست (۳) اردو ناول۔ رجحانات و تحریکات (تحقیق و تنقید پر مبنی) نہ صرف مقبول ہوئیں بلکہ اس تصنیف کو رانچی یونیورسٹی جھارکھنڈ نے بطور حوالا جاتی کتاب ایم۔ اے اردو کے نصاب میں شامل کیا ہے۔ ان کی دوسری تصنیف ''اردو ناول ایک تکنیکی جائزہ'' نے بھی کافی پذیرائی حاصل کی اور ان دونوں تصانیف پر ملک اور بیرون ملک کے نامور ادیب و مصنفین نے اپنے ستائشی آراء کا اظہار کیا ہے۔ ''اردو ناول ایک مطالعہ'' کے زیر عنوان ان کی تصنیف ہے جس میں انھوں نے منتخبہ ممتاز ناول نگاروں کے فن

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کی خصوصیات اور تکنیک پر اپنے تنقیدی مضامین کو شامل کیا ہے۔ ڈاکٹر بہادر علی کی ایک اور کتاب کا نام منشی پریم چند اور گاندھیائی تحریک'' ہے جو کہ سال ۲۰۰۸ء میں شائع ہوئی ہے۔اردو ناول ایک تکنیکی جائزہ'' پر اردو اکیڈیمی آندھراپردیش نے تحقیق وتنقید کے میدان میں ان کوانعام اول کا مستحق قرار دیا ہے۔اس سے قبل ان کی پہلی کتاب اردوناول تحریکات ورجحانات پر بھی اردواکیڈیمی اے پی نے انعام سے سرفراز کیا تھا۔ورنگل شہر میں جو بھی مشاعرے ہوتے ہیں اکثر وبیشتر کی صدارت کاانھیں اعزاز حاصل ہے۔

نادراُسلوبی: پیدائشی نام غلام علی شاہ قادری اورادبی وقلمی نام نادر اُسلوبی ہے۔ان کی پیدائش ۱۵/اگست ۱۹۳۵ء کوحیدرآباد میں ہوئی جوکہ ریاست آندھراپردیش کے ضلع ورنگل کے کہنہ مشق بزرگ شاعر ہیں۔آپ مہندی مبارک حضرت غوث پاک کے واسع بازار گھانسی کے سجادہ نشین ہیں۔ ورنگل ان کا وطن ثانی ہے۔آپ گذشتہ چالیس پینتالیس سال سے اردوزبان وادب کی بےلوث خدمات انجام دے رہے ہیں۔ نادراُسلوبی بطور شخص ایک مخلص، صاحب کردار اور پاک وصاف دل رکھتے ہیں۔ بڑوں کی عزت اور چھوٹوں کے ساتھ شفقت سے پیش آنا ان کا وطیرہ خاص ہے۔ جناب نادر اُسلوبی ورنگل کے ادبی حلقوں میں بحیثیت شاعر اپنی الگ پہچان رکھتے ہیں۔تقریباً پانچ دہوں سے شعر کہہ رہے ہیں۔غزل کے بہت ہی اچھے شاعر ہیں۔ ان کی غزلوں میں فرد کی محرومی موجودہ زمانے کا آشوبِ حال ومستقبل کی بےیقینی اورکہیں کہیں عصری حسیت اور کہیں روایتیں بھی سانس لیتی نظر آتی ہیں۔ان کی شاعری بیان کا تجزیہ نہیں بلکہ تجربہ کا اظہار ہے۔نادراُسلوبی کی شاعری سادہ وسلیس زبان اور لہجہ کی ندرت کے باعث قارئین وسامعین کو لبھاتی ہے۔نادراُسلوبی نعت گوشاعر ہیں۔ان کے نعتیہ مجموعہ کلام ''ثواب میں داخل'' کے نام سے منظرعام پرآیا ہے۔جس میں انھوں نے سرکار کی شان میں عقیدت واحترام کے ساتھ کلام لکھا ہے۔جس کے مطالعہ سے نہ صرف ایمان تازہ ہوجاتا ہے بلکہ قلب وروح کوتسکین ہوتی ہے۔آپ کوفن عروض پر دسترس حاصل ہے۔مختلف اصناف سخن میں اشعار لکھے ہیں۔

نادراُسلوبی کے دوشعری مجموعوں میں (۱) نوکِ قلم اور (۲) حروفِ دل شامل ہیں۔ ان دونوں کو اے۔پی اردواکیڈیمی کے جزوی مالی امداد سے سال ۲۰۰۰ء اور ۲۰۰۵ء کوشائع کئے گئے۔

خواجہ انورحسین : اصل نام انور حیات اور قلمی نام خواجہ انورحسن ہے اور تخلص انورؔ فرماتے ہیں۔ ان کی کتابیں ''شعلہ احساس'' (شعری مجموعہ) اور'' آئینوں کے درمیان (غزلیں) شعری مجموعہ منظرعام پرآئیں ہیں۔ان کے والد کا نام مولوی محمد اسمٰعیل تھا۔ ان کی تاریخ پیدائش ۲/فبروری ۱۹۵۲ء کوورنگل ضلع میں ہوئی۔انورحیات میں شعر کی انفرادی خصوصیات علاحدہ طور پرنظرآتی ہیں۔

خواجہ معین الدین عقیل : تاریخی شہر ورنگل (ہنمکنڈہ) کی سرزمین سے کئی قابل قدرشعری وادبی شخصیتیں نمودار ہوئیں ہیں۔جنھوں نے شعروادب میں گنج ہائے گراں مایہ کارنامے

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انجام دیئے ہیں۔ ان خوش نصیبوں خواجہ معین الدین عقیلؔ بھی شامل ہیں۔ وہ بمقام ہنمکنڈہ ورنگل میں ۱۵؍جنوری ۱۹۴۳ء کو پیدا ہوئے۔ ان کے والد کا نام محمد جمال الدین تھا۔ انھیں بچپن ہی سے شعر وشاعری کا شوق وذوق تھا۔ لیکن ملازمت کی زیر باریوں اور مصروفیت کی وجہ سے اپنے شعری ذوق کو پایہ تکمیل تک نہ پہنچا سکے تاہم وظیفہ حسن خدمت سے سبکدوشی کے بعد پورے انہماک اور خلوص کے ساتھ صنف سخن کی طرف توجہ دیتے ہوئے بہت ہی کم عرصہ میں اپنی الگ پہچان اور شناخت بنانے میں کامیابی حاصل کی۔ مسلسل کوشش کے بعد اپنا پہلا مجموعہ کلام ''ناؤ کاغذ کی'' وجود میں لایا۔ اس مجموعہ کلام میں ایک حمد (مناجات) تقریباً ۱۲؍نعتیں اور بہت سی غزلیات شامل ہیں۔ حضور اکرم ﷺ کی بارگاہ میں عمدہ نعتیں پیش کی ہیں۔ جناب عقیل کی ایک نمایاں خوبی یہ بھی ہے کہ مطالعہ کے وسیلے سے اور کہیں اپنے ذاتی تجربے سے شعر میں جان ڈال دیتے ہیں۔ کلاسیکی روایت سے قربت رکھنے کے باوجود ان کی غزلیں غم ذات کے پہلو بہ پہلو غمِ کائنات کی بہترین ترجمان ہیں۔ وارداتِ حسن وعشق کے ساتھ ساتھ ان کے یہاں عصری حسیت کی تب وتاب خوبصورت انداز میں اپنا جلوہ دکھا رہی ہیں۔ عقیل صاحب کو سماجی مسائل سے بھی دلچسپی ہے۔ اختلافی مسائل سے کنارہ کشی کرتے ہوئے اتحاد واتفاق ویکجہتی کو ترجیح دیتے ہیں۔ ان کا شعری مجموعہ ''ناؤ کاغذ کی'' سال ۲۰۰۷ء میں شائع ہوا ہے۔

اجمل محسنؔ: اجمل محسن ۸؍جون ۱۹۴۴ء کو پیدا ہوئے۔ آپ کا پورا نام اجمل حسین اور قلمی نام 'اجمل محسنؔ' تخلص کرتے ہیں۔ آپ کا تعلق حیدرآباد کے گھرانے سے ہے۔ آبا واجداد نظام شاہی دور میں کانپور لکھنؤ سے حیدرآباد تشریف لائے تھے۔ ان کے والد کا نام سید داؤد حسین تھا جو محکمہ مال سے وابستہ تھے۔ دورانِ ملازمت ضلع در ضلع پھرتے رہے۔

نثر نگاری ایک مشکل اور صبر آزما صنف ادب ہے۔ وقت اور یکسوئی مانتی ہے۔ اسی وجہ سے شعراء کرام کی بہ نسبت ادبا کی تعداد ہر جگہ اور دور میں کم رہی ہے۔ شہر ورنگل کے نثری ادب کے میدان میں پچھلی نصف صدی کے دوران قدم رکھنے والے افسانہ نگاروں میں اجمل محسن بھی شامل ہیں۔ ان کے افسانوں کا مجموعہ ''روشِ دوراں'' جملہ ۲۷؍افسانوں پر مشتمل ہے۔ اجمل محسنؔ کے دو مجموعہ ایک شعری ''پھول، کانٹے اور خوشبو''، سال ۲۰۰۶ء میں اور ایک نثری ''روش دوراں'' سال ۲۰۰۷ء میں منظر عام پر آچکے ہیں۔ اجمل محسن سال ۱۹۹۶ء میں بحیثیت شاعر منظر عام پر آئے تھے۔ ان کے افسانے ''اعتبار کا میزان''، ''لوگ الفاظ میں مطلب کو چھپا لیتے ہیں'' اور ''ذہن لوگ ارادہ بھی چھین لیتے ہیں'' منظر عام پر آئے۔

محمد تاج الدین، المعروف تاج مضطر: اصلی نام محمد تاج الدین قلمی وادبی نام (تاج مضطرؔ) ہے۔ مرکزی بزم محمدی ورنگل کے صدر ہیں۔ اردو ادب اور اردو سخن پردازی ایک وسیع سمندر ہے۔ جس میں ڈوب کر گوہر نکال لانا آسان کام نہیں ہے تاہم تاج مضطر سمندر میں ابھی تک گوہر نکالنے میں مصروف ہیں۔

علی الدین گوہر: علی الدین گوہر اپنی ادبی زندگی کا آغاز نثر

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سے کیا ہے اور بعد میں شاعری کی طرف مائل ہوئے۔ یہ فطری رجحان کی بات ہے کہ علی الدین گوہر نے شاعری کو اپنے اظہار خیال کا ذریعہ بنایا ہے۔ سال ۱۹۷۳ء میں شہر ورنگل میں جدید کاروانِ اردو کی سرگرمیاں عروج پر تھیں۔ علی الدین گوہر قلمی نام ہے جب کہ ان کا اصلی نام خواجہ علی الدین احمد ہے۔ اور تخلص گوہرؔ فرماتے ہیں۔ پیشہ کے اعتبار سے ریٹائرڈ لکچرر ہیں جو اسلامیہ ڈگری کالج ورنگل سے وظیفہ حسن خدمت پر سبکدوش ہوئے ہیں۔ ان کے شاعری میں ''لمحے لہولہو''، ''سرد سناٹے'' اور ''دینی اعتبار سے سراجاً منیرا اسلام'' (مجموعہ سلام) شائع ہوئے ہیں۔

محمد سرور علی افسر: محمد سرور علی افسرؔ تقریباً ۳۰ر سال سے اپنے قلم کے جوہر دکھا رہے ہیں۔ ۱۰ر اکتوبر ۱۹۳۴ء کو ہنمکنڈہ میں پیدا ہوئے۔ سال ۱۹۶۰ء میں انھوں نے محبوبیہ پنجتن ہائی اسکول مٹھواڑہ ورنگل سے بحیثیت ڈرائنگ ٹیچر ملازمت شروع کی تھی۔ سال ۱۹۷۱ء میں جامع اردو علی گڑھ سے ''ادیب کامل'' پاس کیا۔ پی یو سی اور ۱۹۷۳ء میں بی۔اے۔ ۱۹۷۵ء میں ایم (اردو لٹریچر) ۱۹۸۰ء میں ایم۔اے تاریخ اور ۱۹۸۴ء میں بی ایڈ عثمانیہ یونیورسٹی سے درجہ اول میں کامیاب ہوئے۔ سال ۱۹۸۱ء میں ان کا تقرر بحیثیت لکچرر اسی کالج میں ہوا۔ سال ۱۹۹۲ء کو ملازمت سے سبکدوش ہوئے۔ اسلامک اسٹیڈی اینڈ ریسرچ اکیڈیمی کے سکریٹری ہیں۔ اور کئی ادبی انجمنوں سے وابستہ ہیں۔ ان کی کتاب ''تنقیدی کرنیں'' منظر عام پر آیا ہے۔

صادق احمد صادقؔ: صادق احمد صادقؔ کا پہلا شعری مجموعہ ''زادِ سفر'' کے نام سے منظر عام پر آیا ہے۔ وہ بزم نثار، بزم محمدی کے علاوہ تحریک قلم ورنگل کے مشاعروں میں پابندی سے شریک ہوتے ہیں۔ وہ اظہر جعفری مرحوم سے تلامذہ کیا کرتے تھے۔ تعلیمی زمانے سے ہی شاعری کا شوق رہا۔ صادقؔ رضوی قلمی نام ہے۔ ان کا شعری مجموعہ ''زادِ سفر'' سال ۲۰۰۷ء کو شائع ہوا۔

سلطان حمید الم: حضرت سلطان حمید الم ضلع ورنگل کے موجودہ شعرائے کرام میں سب سے بزرگ شاعر ہیں۔ نام سلطان حمید ہے۔ تخلص ''الم'' اور قلمی نام سلطان حمید الم ہے۔ ۸ر ستمبر ۱۹۲۹ء کو قلعہ ورنگل میں پیدا ہوئے۔ وہ محکمہ جنگلات سے منتظم کے عہدہ سے وظیفہ حسن خدمت پر سبکدوش ہوئے ہیں ان کی کتاب کا نام ''رقص شرر'' ہے جو سال ۲۰۰۸ء میں شائع ہوئی اس کتاب کا موضوع شاعری ہے۔ رقصِ شرر کا بڑا حصہ غزلیات پر مشتمل ہے۔ چند نعتیں ہیں۔ یقیناً قابل قدر ہیں اور مقبولیت کی حامل ہیں۔ ادبی شاعری، ندرتِ خیال، شگفتہ مزاجی اور برجستگی سے ان کی منفرد پہچان ہے۔ الم نے فن و جذبات کی بدولت شعری میں اپنا خصوصی مقام بنایا ہے۔

☆☆☆

آمینہ اختر، ایم۔اے، یو پی ٹی
پی ایچ۔ڈی (اردو) ریسرچ اسکالر، عثمانیہ یونیورسٹی
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مضامین

ماں جی

ماں جی کی پیدائش کا صحیح سال معلوم نہیں ہوسکا۔

جس زمانے میں لائل پور کا ضلع نیا نیا آباد ہورہا تھا۔ پنجاب کے ہر قصبے سے غریب الحال لوگ زمین حاصل کرنے کے لئے اس نئی کالونی میں جوق در جوق کھنچے چلے آرہے تھے۔ عرف عام میں لائل پور، جھنگ، سرگودھا وغیرہ کو ''بار'' کا علاقہ کہا جاتا تھا۔

اس زمانے میں ماں جی کی عمر دس بارہ سال تھی۔ اس حساب سے ان کی پیدائش پچھلی صدی کے آخری دس پندرہ سالوں میں کسی وقت ہوئی ہوگی۔

ماں جی کا آبائی وطن تحصیل روپڑ ضلع انبالہ میں ایک گاؤں منیلہ نامی تھا۔ والدین کے پاس چند ایکڑ اراضی تھی۔ ان دنوں روپڑ میں دریائے ستلج سے نہر سرہند کی کھدائی ہورہی تھی۔ نانا جی کی اراضی نہر کی کھدائی میں ضم ہوگئی۔ روپڑ میں انگریز حاکم کے دفتر سے ایسی زمینوں کے معاوضے دیئے جاتے تھے۔ نانا جی دو تین بار معاوضے کی تلاش میں شہر گئے۔ لیکن سیدھے آدمی تھے۔ کبھی اتنا بھی معلوم نہ کرسکے کہ انگریز کا دفتر کہاں ہے اور معاوضہ وصول کرنے کے لئے کیا قدم اٹھانا چاہیے۔ انجام کار صبر وشکر کرکے بیٹھ گئے اور نہر کی کھدائی کی مزدوری کرنے لگے۔

انہی دنوں پرچہ لگا کہ بار میں کالونی کھل گئی ہے اور نئے آبادکاروں کو مفت زمین مل رہی ہے۔ نانا جی اپنی بیوی، دو ننھے بیٹوں اور ایک بیٹی کا کنبہ ساتھ لے کر لائل پور روانہ ہوگئے۔ سواری کی توفیق نہ تھی۔ اس لئے پاپیادہ چل کھڑے ہوئے۔

راستے میں محنت مزدوری کرکے پیٹ پالتے۔ نانا جی جگہ بہ جگہ قلی کا کام کرلیتے یا کسی ٹال پر لکڑیاں چیر دیتے۔ نانی اور ماں جی کسی کا سوت کات دیتیں یا مکانوں کے فرش اور دیواریں لیپ دیتیں۔ لائل پور کا صحیح راستہ کسی کو نہ آتا تھا جگہ جگہ بھٹکتے تھے اور پوچھ پاچھ کر دنوں کی منزل ہفتوں میں طے کرتے تھے۔

ڈیڑھ دو مہینے کی مسافت کے بعد جڑانوالہ پہنچے۔ پاپیادہ چلنے اور محنت مزدوری کی مشقت سے سب کے جسم نڈھال اور پاؤں سوجے ہوئے تھے۔ یہاں پر چند ماہ قیام کیا۔ نانا جی دن بھر غلہ منڈی میں بوریاں اٹھانے کا کام کرتے۔ نانی پرچہ کات کر سوت بیچتیں اور ماں جی گھر سنبھالتیں جو ایک چھوٹے سے جھونپڑے پر مشتمل تھا۔

انہی دنوں بقرعید کا تہوار آیا۔ نانا جی کے پاس چند روپے جمع ہوگئے تھے۔ انہوں نے ماں جی کو تین پنے بطور عیدی دیئے۔ زندگی میں پہلی بار ماں جی کے ہاتھ اتنے پیسے آئے تھے۔ انہوں نے بہت سوچا لیکن اس رقم کا کوئی مصرف ان کی سمجھ میں نہ آسکا۔ وفات کے وقت ان کی عمر کوئی اسی برس کے لگ بھگ تھی۔ لیکن ان کے نزدیک سو روپے، دس روپے،

افسانہ

پانچ روپے کے نوٹوں میں امتیاز کرنا آسان کام نہ تھا عیدی کے تین آنے کئی روز ماں جی کے دوپٹے کے ایک کونے میں بندھے رہے۔ جس روز وہ جڑانوالہ سے رخصت ہو رہی تھیں ماں جی نے گیارہ پیسے کا تیل خرید کر مسجد کے چراغ میں ڈال دیا۔ باقی ایک پیسہ اپنے پاس رکھا۔ اس کے بعد جب کبھی گیارہ پیسے پورے ہو جاتے تو وہ فوراً مسجد میں تیل بھجوا دیتیں۔

ساری عمر جمعرات کی شام کو اس عمل پر بڑی وضعداری سے پابند رہیں۔ رفتہ رفتہ بہت سی مسجدوں میں بجلی آ گئی۔ لیکن لاہور اور کراچی جیسے شہروں میں بھی انہیں ایسی مسجدوں کا علم رہتا تھا جن کے چراغ اب بھی تیل سے روشن ہوتے تھے۔

وفات کی شب بھی ماں جی کے سرہانے ململ کے رومال میں بندھے ہوئے چند آنے موجود تھے۔ غالباً یہ پیسے بھی مسجد کو تیل کے لئے جمع کر رکھے تھے۔ چونکہ وہ جمعرات کی شب تھی۔

ان چند آنوں کے علاوہ ماں جی کے پاس نہ کچھ اور رقم تھی اور نہ کوئی زیور۔ اسباب دنیا میں ان کے پاس گنتی کی چند چیزیں تھیں۔ تین جوڑے سوتی کپڑے، ایک جوڑا دیسی جوتا، ایک جوڑا ربڑ کے چپل، ایک عینک، ایک انگوٹھی جس میں تین چھوٹے چھوٹے فیروزے جڑے ہوئے تھے۔ ایک جائے نماز، ایک تسبیح اور باقی اللہ اللہ۔

پہننے کے لئے تین جوڑوں کو وہ خاص اہتمام سے رکھتی تھیں۔ ایک زیب تن، دوسرا اپنے ہاتھوں سے دھو کر تکیے کے نیچے رکھا رہتا تھا تاکہ استری ہو جائے۔ تیسرا دھونے کے لئے تیار۔ ان کے علاوہ اگر چوتھا کپڑا ان کے پاس آتا تھا تو وہ چپکے سے ایک جوڑا کسی کو دے دیتی تھیں۔ اسی وجہ سے ساری عمر انہیں سوٹ کیس رکھنے کی حاجت محسوس نہ ہوئی۔ لمبے سے لمبے سفر پر روانہ ہونے کے لئے انہیں تیاری میں چند منٹ سے زیادہ نہ لگتے تھے۔ کپڑوں کی پوٹلی کی بکل ماری اور جہاں کہے چلنے کو تیار۔ سفر آخرت بھی انہوں نے اسی سادگی سے اختیار کیا۔ میلے کپڑے اپنے ہاتھوں سے دھو کر تکیے کے نیچے رکھے۔ نہا دھو کر بال سکھائے اور چند ہی منٹوں میں زندگی کے سب سے لمبے سفر پر روانہ ہو گئیں۔ جس خاموشی سے عقبیٰ سدھار گئیں۔ غالباً اس موقع کے لئے وہ اکثر یہ دعا مانگا کرتی تھیں کہ اللہ تعالیٰ ہاتھ چلتے چلاتے اٹھا لے۔ اللہ کبھی کسی کا محتاج نہ کرے۔

کھانے پینے میں وہ کپڑے لتے سے بھی زیادہ سادہ اور غریب مزاج تھیں۔ ان کی مرغوب ترین غذا مکئی کی روٹی، دھنیے پودینے کی چٹنی کے ساتھ تھی۔ باقی چیزیں خوشی سے تو کھا لیتی تھیں لیکن شوق سے نہیں۔ تقریباً ہر نوالے پر اللہ کا شکر ادا کرتی تھیں۔ پھلوں میں کبھی بہت مجبور کیا جائے تو کبھی کبھار کیلے کی فرمائش کرتی تھیں۔ البتہ ناشتے میں چائے دو پیالے اور تیسرے پہر سادہ چائے کا ایک پیالہ ضرور پیتی تھیں۔ کھانا صرف ایک وقت کھاتی تھیں۔ اکثر و بیشتر دوپہر کا۔ شاذ و نادر رات کا۔ گرمیوں میں عموماً مکھن نکالی ہوئی پتلی

انشائیہ

نمکین لسی کے ساتھ ایک آدھ سادہ چپاتی ان کی محبوب خوراک تھیں۔ دوسروں کو کوئی چیز رغبت سے کھاتے دیکھ کر خوش ہوتی تھیں اور ہمیشہ دعا کرتی تھیں۔ سب کا بھلا خاص اپنے یا اپنے بچوں کے لئے انہوں نے براہ راست کبھی کچھ نہ مانگا۔ پہلے دوسروں کے لئے مانگتی تھیں اور اس کے بعد مخلوق خدا کی حاجت روائی کے طفیل اپنے بچوں یا عزیزوں کا بھلا چاہتی تھیں۔ اپنے بیٹوں یا بیٹیوں کو انہوں نے اپنی زبان سے کبھی ''میرے بیٹے'' یا ''میری بیٹی'' کہنے کا دعویٰ نہیں کیا۔ ہمیشہ ان کو اللہ کا مال کہا کرتی تھیں۔

کسی سے بھی کوئی کام لینا ماں جی پر بہت گراں گزرتا تھا۔ اپنے سب کام وہ اپنے ہاتھوں خود انجام دیتی تھیں۔ اگر کوئی ملازم زبردستی ان کا کوئی کام کر دیتا تو نہیں ایک عجیب قسم کی شرمندگی کا احساس ہونے لگتا تھا اور وہ احسان مندی سے سارا دن اسے دعائیں دیتی رہتی تھیں۔

سادگی اور درویشی کا یہ رکھ رکھاؤ کچھ تو قدرت نے ماں جی کی سرشت میں پیدا کیا تھا۔ کچھ یقیناً زندگی کے زیر و بم نے سکھایا تھا۔

جڑانوالہ میں کچھ عرصہ قیام کے بعد جب وہ اپنے والدین اور خورد سال بھائیوں کے ساتھ زمین کی تلاش میں لائل پور کی کالونی کی طرف روانہ ہوئیں تو انہیں معلوم نہ تھا کہ انہیں کس مقام پر جانا ہے اور زمین حاصل کرنے کے لئے کیا قدم اٹھانا ہے۔ ماں جی بتایا کرتی تھیں کہ اس زمانے میں ان کے ذہن میں کالونی کا تصور ایک فرشتہ سیرت بزرگ کا تھا جو کہ کہیں سر راہ بیٹھا زمین کے پروانے تقسیم کر رہا ہوگا۔ کئی ہفتے یہ چھوٹا سا قافلہ لائل پور کے علاقے میں پا پیادہ بھٹکتا رہا۔ لیکن کسی راہ گزار پر انہیں کالونی کا خضر صورت رہنما نہ مل سکا۔ آخر تنگ آ کر انہوں نے چک نمبر ۵۰۶ جوان دنوں نیا نیا آباد ہو رہا تھا ڈیرے ڈال دیئے۔ لوگ جوق در جوق وہاں آ کر آباد ہو رہے تھے۔ نانا جی نے اپنی سادگی میں یہ سمجھا کہ کالونی میں آباد ہونے کا شاید یہی ایک طریقہ ہوگا۔ چنانچہ انہوں نے ایک چھوٹا سا احاطہ گھیر کر گھاس پھونس کی جھونپڑی بنائی اور بنجر اراضی کا ایک قطعہ تلاش کر کے کاشت کی تیاری کرنے لگے۔ انہی دنوں محکمہ مال کا عملہ پڑتال کے لئے آیا۔ نانا جی کے پاس الاٹ منٹ کے کاغذات نہ تھے۔ چنانچہ انہیں چک سے نکال دیا گیا اور سرکاری زمین پر ناجائز جھونپڑا بنانے کی پاداش میں ان کے برتن اور بستر قرق کر لئے گئے۔

عملے کے ایک آدمی نے چاندی کی دو بالیاں بھی ماں جی کے کانوں سے اتروالیں۔ ایک بالی اتارنے میں ذرا دیر ہوئی تو اس نے زور سے کھینچ لی۔ جس سے ماں جی کے کان کا زیریں حصہ بری طرح سے پھٹ گیا۔

چک ۵۰۶ سے نکل کر جو راستہ سامنے آیا اس پر چل کھڑے ہوئے۔ گرمیوں کے دن تھے۔ دن بھر لو چلتی تھی۔ پانی رکھنے کے لئے مٹی کا پیالہ بھی پاس نہ تھا۔ جہاں کہیں کوئی کنواں نظر آیا ماں جی اپنا دوپٹہ بھگو لیتیں تا کہ پیاس لگنے سے اپنے چھوٹے بھائیوں کی چساتی جائیں۔ اس طرح وہ چلتے چلتے چک نمبر ۵۰۷ میں پہنچے جہاں ایک جان پہچان کے آباد

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کار نے نانا جی کو اپنا مزارع رکھ لیا۔ نانا جی ہل چلاتے تھے۔ نانی مویشی چرانے لے جاتی تھیں۔ ماں جی کھیتوں سے گھاس اور چارہ کاٹ کر زمیندار کی بھینسوں اور گایوں کے لئے لایا کرتی تھیں۔ ان دنوں انہیں مقدور بھی نہ تھا کہ ایک وقت کی روٹی بھی پوری طرح کھا سکیں۔ کسی وقت جنگلی بیروں پر گزارہ ہوتا تھا۔ کبھی خربوزے کے چھلکے ابال کر کھا لیتے تھے۔ کبھی کسی کھیت میں کچی انبیاں گری ہوئی مل گئیں تو ان کی چٹنی بنا لیتے تھے۔ اور کنٹھے کا ملا جلا ساگ ہاتھ آ گیا۔ نانی محنت مزدوری میں مصروف تھیں۔ ماں جی نے ساگ چولہے پر چڑھایا۔ جب پک کر تیار ہو گیا اور ساگ کا الن لگا کر گھوٹنے کا وقت آیا تو ماں جی نے ڈوئی ایسے زور سے چلائی کہ ہنڈیا کا پیندا ٹوٹ گیا اور سارا ساگ بہہ کر چولہے میں آ پڑا۔ ماں جی کو نانی سے ڈانٹ پڑی اور مار بھی۔ رات کو سارے خاندان نے چولہے کی لکڑیوں پر گرا ہوا ساگ انگلیوں سے چاٹ چاٹ کر کسی قدر پیٹ بھرا۔

چک نمبر ۵۰۷ نانا جی کو خوب راس آیا۔ چند ماہ کی محنت مزدوری کے بعد نئی آباد کاری کے سلسلے میں آسان قسطوں پر ان کو ایک مربع زمین مل گئی۔ رفتہ رفتہ دن پھرنے لگے اور تین سال میں ان کا شمار گاؤں کے کھاتے پیتے لوگوں میں ہونے لگا۔ جوں جوں فارغ البالی بڑھتی گئی توں توں آبائی وطن کی یاد ستانے لگی۔ چنانچہ خوشحالی کے چار پانچ سال گزارنے کے بعد سارا خاندان ریل میں بیٹھ کر منیلہ کی طرف روانہ ہوا۔ ریل کا سفر ماں جی کو بہت پسند آیا۔ وہ سارا وقت کھڑکی سے باہر منہ نکال کر تماشہ دیکھتی رہتیں۔ اس عمل میں کوئلے کے بہت سے ذرے ان کی آنکھوں میں پڑ گئے۔ جس کی وجہ سے کئی روز تک وہ آشوب چشم میں مبتلا رہیں۔ اس تجربے کے بعد انہوں نے ساری عمر اپنے کسی بچے کو ریل کی کھڑکی سے باہر منہ نکالنے کی اجازت نہ دی۔

ماں جی ریل کے تھرڈ کلاس ڈبے میں بہت خوش رہتیں۔ ہم سفر عورتوں اور بچوں سے فوراً گھل مل جاتیں۔ سفر کی تھکان اور راستے کے گرد و غبار کا ان پر کچھ اثر نہ ہوتا۔ اس کے برعکس اونچے درجوں میں بہت بیزار ہو جاتیں۔ ایک دو بار جب انہیں مجبوراً ائیر کنڈیشن ڈبے میں سفر کرنا پڑا تو وہ تھک کر چور ہو گئیں اور سارا وقت قید کی صعوبت کی طرح ان پر گراں گزرا۔

منیلہ پہنچ کر نانا جی نے اپنا آبائی مکان درست کیا۔ عزیز و اقارب کو تحائف دیئے۔ دعوتیں ہوئیں اور پھر ماں جی کے لئے بر ڈھونڈنے کا سلسلہ شروع ہو گیا۔

اس زمانے میں لائل پور کے مربعہ داروں کی بڑی دھوم تھی۔ ان کا شمار خوش قسمت اور با عزت لوگوں میں ہوتا تھا۔ چنانچہ چاروں طرف سے ماں جی کے لئے پے در پے پیام آنے لگے۔ یوں بھی ان دنوں ماں جی کے ٹھاٹھ باٹھ تھے۔ برادری والوں پر رعب گانٹھنے کے لئے نانی جی انہیں ہر روز نت نئے کپڑے پہناتی تھیں اور ہر وقت دلہنوں کی طرح سجا کر رکھتی تھیں۔

کبھی کبھار پرانی یادوں کو تازہ کرنے لئے ماں جی

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بڑے معصوم فخر سے کہا کرتی تھیں۔ ان دنوں میرا تو گاؤں میں نکلنا دوبھر ہوگیا تھا۔ میں جس طرف سے گزر جاتی لوگ ٹھٹھک کر کھڑے ہو جاتے اور کہا کرتے۔ یہ خیال بخش مربعہ دار کی بیٹی جا رہی ہے۔ دیکھئے کون خوش نصیب اسے بیاہ کر لے جائے گا۔

''ماں جی! آپ کی اپنی نظر میں کوئی ایسا خوش نصیب نہیں تھا!'' ہم لوگ چھیڑنے کی خاطر ان سے پوچھا کرتے۔

''توبہ توبہ پت'' ماں جی کانوں پر ہاتھ لگاتیں ''میری نظر میں بھلا کوئی کیسے ہوسکتا تھا۔ ہاں میرے دل میں اتنی سی خواہش ضرور تھی کہ اگر مجھے ایسا آدمی ملے جو دو حرف پڑھا لکھا ہو تو خدا کی بڑی مہربانی ہوگی''۔

ساری عمر میں غالباً یہی ایک خواہش تھی جو ماں جی کے دل میں خود اپنی ذات کے لئے پیدا ہوئی۔ اس کو خدا نے یوں پورا کر دیا کہ اسی سال ماں جی کی شادی عبد اللہ صاحب سے ہوگئی۔

ان دنوں سارے علاقے میں عبداللہ صاحب کا طوطی بول رہا تھا۔ وہ ایک امیر کبیر گھرانے کے چشم و چراغ تھے لیکن پانچ چھ برس کی عمر میں یتیم بھی ہوگئے اور بے حد مفلوک الحال بھی۔ جب باپ کا سایہ سر سے اٹھا تو یہ انکشاف ہوا کہ ساری آبائی جائیداد رہن پڑی ہے۔ چنانچہ عبداللہ صاحب اپنی والدہ کے ساتھ ایک جھونپڑے میں اٹھ آئے۔ زر اور زمین کا یہ انجام دیکھ کر انہوں نے ایسی جائیداد بنانے کا عزم کرلیا جو مہاجنوں کے ہاتھ گروی نہ رکھی جا سکے۔ چنانچہ عبداللہ صاحب دل و جان سے تعلیم حاصل کرنے میں منہمک ہو گئے۔ وظیفے پر وظیفہ حاصل کر کے اور دو سال کے امتحان ایک ایک سال میں پاس کر کے پنجاب یونیورسٹی کے میٹریکولیشن میں اول آئے۔ اس زمانے میں غالباً یہ پہلا موقع تھا کہ کسی مسلمان طالب علم نے یونیورسٹی امتحان میں ریکارڈ قائم کیا ہو۔

اڑتے اڑتے یہ خبر سرسید کے کانوں میں پڑ گئی جو اس وقت علی گڑھ مسلم کالج کی بنیاد رکھ چکے تھے۔ انہوں نے اپنا خاص منشی گاؤں میں بھیجا اور عبد اللہ صاحب کو وظیفہ دے کر علی گڑھ بلا لیا۔ یہاں پر عبداللہ خوب بڑھ چڑھ کر اپنا رنگ نکالا اور بی اے کرنے کے بعد انیس برس کی عمر میں وہیں پر انگریزی، عربی، فلسفہ اور حساب کے لیکچرر ہوگئے۔

سرسید کو اس بات کی دھن تھی کہ مسلمان نوجوان زیادہ سے زیادہ تعداد میں اعلیٰ ملازمتوں پر جائیں۔ چنانچہ انہوں نے عبد اللہ صاحب کو سرکاری وظیفہ دلوایا تاکہ وہ انگلستان میں جا کر آئی سی ایس کے امتحان میں شریک ہوں۔

پچھلی صدی کے بڑے بوڑھے سات سمندر پار کے سفر کو بلائے ناگہانی سمجھتے تھے۔ عبداللہ صاحب کی والدہ نے بیٹے کو ولایت جانے سے منع کر دیا۔ عبداللہ صاحب کی سعادت مندی آڑے آئی اور انہوں نے

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وظیفہ واپس کر دیا۔

اس حرکت پر سرسید کے بے حد غصہ بھی آیا اور دکھ بھی ہوا۔ انہوں نے لاکھ سمجھایا، بجھایا، ڈرایا دھمکایا لیکن عبداللہ صاحب ٹس سے مس نہ ہوئے۔

''کیا تم اپنی بوڑھی ماں کو قوم کے مفاد پر ترجیح دیتے ہو؟'' سرسید نے کڑک کر پوچھا۔

''جی ہاں'' عبداللہ صاحب نے جواب دیا۔

یہ ٹکا سا جواب سن کر سرسید آپے سے باہر ہو گئے۔ کمرے کا دروازہ بند کر کے پہلے انہوں نے عبد اللہ صاحب کو لاتوں، مکوں، تھپڑوں اور جوتوں سے خوب پیٹا اور کالج کی نوکری سے برخواست کر کے یہ کہہ کر علی گڑھ سے نکال دیا ''اب تم ایسی جگہ جا کر مرو جہاں سے میں تمہارا نام بھی نہ سن سکوں''۔

عبداللہ صاحب جتنے سعادت مند بیٹے تھے۔ اتنے ہی سعادت مند شاگرد بھی تھے۔ نقشے پر انہیں سب سے دور افتادہ اور دشوار گزار مقام گلگت نظر آیا۔ چنانچہ ناک کی سیدھ میں گلگت پہنچے اور دیکھتے ہی دیکھتے وہاں کی گورنری کے عہدے پر فائز ہو گئے۔

جن دنوں ماں جی کی منگنی کی فکر ہو رہی تھی انہی دنوں عبداللہ صاحب بھی چھٹی پر گاؤں آئے ہوئے تھے۔ قسمت میں دونوں کا سنجوگ لکھا ہوا تھا۔ ان کی منگنی ہو گئی اور ایک ماہ بعد شادی بھی ٹھہر گئی تا کہ عبداللہ صاحب دلہن کو اپنے ساتھ گلگت لے جائیں۔

منگنی کے بعد ایک روز ماں جی اپنی سہیلیوں کے ساتھ پاس والے گاؤں میں میلہ دیکھنے گئی ہوئی تھیں۔ اتفاقاً یا شاید دانستہ عبداللہ صاحب بھی وہاں پہنچ گئے۔ ماں جی کی سہیلیوں نے انہیں گھیر لیا اور ہر ایک نے چھیڑ چھیڑ کر ان سے پانچ پانچ روپے وصول کر لئے۔ عبداللہ صاحب نے ماں جی کو بھی بہت سے روپے پیش کیے لیکن انہوں نے انکار کر دیا۔ بہت اصرار بڑھ گیا تو مجبوراً ماں جی نے گیارہ پیسے کی فرمائش کی۔

''اتنے بڑے میلے میں گیارہ پیسے لے کر کیا کرو گی'' عبداللہ صاحب نے پوچھا۔

اگلی جمعرات کو آپ کے نام سے مسجد میں تیل ڈال دوں گی۔ ماں جی نے جواب دیا۔

زندگی کے میلے میں بھی عبداللہ صاحب کے ساتھ ماں جی کا لین دین صرف جمعرات کے گیارہ پیسوں تک ہی محدود رہا۔ اس سے زیادہ رقم نہ کبھی انہوں نے مانگی نہ اپنے پاس رکھی۔

گلگت میں عبداللہ صاحب کی بڑی شان و شوکت تھی۔ خوبصورت بنگلہ، وسیع باغ، نوکر چاکر دروازے پر سپاہیوں کا پہرہ۔ جب عبداللہ صاحب دورے پر باہر جاتے تھے یا واپس آتے تھے تو سات توپوں کی سلامی دی جاتی تھی۔ یوں بھی گلگت کا گورنر خاص سیاسی انتظامی اور سماجی اقتدار کا حامل تھا لیکن ماں جی پر اس سارے جاہ و جلال کا ذرہ بھی اثر نہ ہوا۔ کسی قسم

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کا چھوٹا بڑا ماحول ان پر اثر انداز نہ ہوتا تھا۔ بلکہ ماں جی کی اپنی سادگی اور خود اعتمادی ہر ماحول پر خاموشی سے چھا جاتی تھی۔

ان دنوں سر مالکم ہیلی حکومت برطانیہ کی طرف سے گلگت کی روسی اور چینی سرحدو پر پولیٹیکل ایجنٹ کے طور پر مامور تھے۔ ایک روز لیڈی ہیلی اور ان کی بیٹی ماں جی سے ملنے آئیں۔ انہوں نے فراک پہنے ہوئے تھے اور پنڈلیاں کھلی تھیں۔ یہ بے حجابی ماں جی کو پسند نہ آئی۔ انہوں نے لیڈی ہیلی سے کہا ''تمہاری عمر تو جیسے گزرنی تھی گزر رہی گئی ہے۔ اب آپ اپنی بیٹی کی عاقبت تو خراب نہ کرو۔'' یہ کہہ کر انہوں نے مس ہیلی کو اپنے پاس ملازم رکھ لیا اور چند مہینوں میں اسے کھانا پکانا، سینا پرونا، برتن مانجھنا، کپڑے دھونا سکھا کر ماں باپ کے پاس بھیج واپس بھیج دیا۔

جب روس میں انقلاب برپا ہوا تو لارڈ کچر سرحدوں کا معائنہ کرنے گلگت آئے۔ ان کے اعزاز میں گورنر کی طرف سے ضیافت کا اہتمام ہوا۔ ماں جی نے اپنے ہاتھ سے دس بارہ قسم کے کھانے پکائے۔ کھانے لذیذ تھے۔ لارڈ کچر نے اپنی تقریر میں کہا ''مسٹر گورنر، جس خانساماں نے یہ کھانے پکائے ہیں، براہ مہربانی میری طرف سے آپ ان کے ہاتھ چوم لیں''۔

دعوت کے بعد عبداللہ صاحب فرحاں وشاداں گھر لوٹے تو دیکھا کہ ماں جی باورچی خانے کے ایک کونے میں چٹائی پر بیٹھی نمک اور مرچ کی چٹنی کے ساتھ مکئی کی روٹی کھا رہی ہیں۔

ایک اچھے گورنر کی طرح عبداللہ صاحب نے ماں جی کے ہاتھ چومے اور کہا ''اگر لارڈ کچر یہ فرمائش کرتا کہ وہ خود خانساماں کے ہاتھ چومنا چاہتا ہے تو پھر تم کیا کرتیں؟''

''میں'' ماں جی تنک کر بولیں۔ ''میں اس کی مونچھیں پکڑ کر جڑ سے اکھاڑ دیتی۔ پھر آپ کیا کرتے؟''

''میں'' عبداللہ صاحب نے ڈرامہ کیا۔ ''میں ان مونچھوں کو روئی میں لپیٹ کر وائسرائے کے پاس بھیج دیتا اور تمہیں ساتھ لے کر کہیں اور بھاگ جاتا، جیسے سرسید کے ہاں سے بھاگا تھا''۔

ماں جی پر ان مکالموں کا کچھ اثر نہ ہوتا تھا۔ لیکن ایک بار . . . . .

ماں جی رشک وحسد کی اس آگ میں جل بھن کر کباب ہو گئیں جو ہر عورت کا ازلی ورثہ ہے۔

گلگت میں ہر قسم کے احکامات ''گورنری'' کے نام پر جاری ہوتے تھے۔ جب یہ چرچا ماں جی تک پہنچا تو انہوں نے عبداللہ صاحب سے گلہ کیا۔

''بھلا حکومت تو آپ کرتے ہیں لیکن گورنری گورنری کہہ کر مجھ غریب کا نام بیچ میں کیوں لایا جاتا ہے خواہ مخواہ!''

عبداللہ صاحب ''علی گڑھ کے پڑھے ہوئے

افسانہ

تھے۔ رگ ظرافت پھڑک اٹھی اور بے اعتنائی سے فرمایا۔ بھاگوان یہ تمہارا نام تھوڑا ہے۔ گورنر تو دراصل تمہاری سوکن ہے جو دن رات میرا پیچھا کرتی رہتی ہے''۔

مذاق کی چوٹ تھی۔ عبداللہ صاحب نے سمجھا بات آئی گئی ہوگئی لیکن ماں جی کے دل میں غم بیٹھ گیا۔ اس غم میں وہ اندر ہی اندر کڑھنے لگیں۔

کچھ عرصہ کے بعد کشمیر کا مہاراجہ پرتاب سنگھ اپنی مہارانی کے ساتھ گلگت کے دورے پر گیا۔ ماں جی نے مہارانی سے اپنے دل کا حال سنایا۔ مہارانی بھی سادہ عورت تھی۔ جلال میں آگئی ''ہائے ہائے ہمارے راج میں ایسا ظلم۔ میں آج ہی مہاراج سے کہوں گی کہ وہ عبداللہ صاحب کی خبر لیں''۔

جب یہ مقدمہ مہاراجہ پرتاب سنگھ تک پہنچا تو انہوں نے عبداللہ صاحب کو بلا کر پوچھ گچھ کی۔ عبداللہ اصاحب بھی حیران تھے کہ بیٹھے بٹھائے یہ کیا افتاد آپڑی۔ لیکن جب معاملے کی تہہ تک پہنچے تو دونوں خوب ہنسے۔ آدمی دونوں ہی وضعدار تھے۔ چنانچہ مہاراجہ نے حکم نکالا کہ آئندہ سے گلگت کی گورنری کو وزارت اور گورنر کو وزیر وزارت کے نام سے پکارا جائے۔ ۱۹۴۷ء کی جنگ آزادی تک گلگت میں یہی سرکاری اصطلاحات رائج تھیں۔

یہ حکم نامہ سن کر مہارانی نے ماں جی کو بلا کر خوشخبری سنائی کہ مہاراج نے گورنری کو دیس نکالا دے دیا ہے۔

''اب تم دودھوں نہاؤ، پوتوں پھلو''۔ مہارانی نے کہا۔ ''کبھی ہمارے لئے بھی دعا کرنا''

مہاراجہ اور مہارانی کی کوئی اولاد نہ تھی۔ اس لئے وہ اکثر ماں جی سے دعا کی فرمائش کرتے تھے۔

اولاد کے معاملے میں ماں جی کیا واقعی خوش نصیب تھیں؟ یہ ایک ایسا سوالیہ نشان ہے جس کا جواب آسانی سے نہیں سوجھتا۔

ماں جی خود ہی تو کہا کرتی تھیں کہ ان جیسی خوش نصیب ماں دنیا میں کم ہی ہوتی ہیں۔ لیکن اگر صبر و شکر، تسلیم و رضا کی عینک اتار کر دیکھا جائے تو اس خوش نصیب کے پردے میں کتنے دکھ، کتنے غم، کتنے صدمے نظر آتے ہیں۔

اللہ میاں نے ماں جی کو تین بیٹیاں اور تین بیٹے عطا کئے۔ دو بیٹیاں شادی کے کچھ عرصہ بعد یکے بعد دیگرے فوت ہوگئیں۔ سب سے بڑا عین عالم شباب میں انگلستان جا کر گزر گیا۔

کہنے کو تو ماں جی نے کہہ دیا کہ اللہ کا مال تھا اللہ نے لے لیا۔ لیکن کیا وہ اکیلے میں چھپ چھپ کر خون کے آنسو رویا نہ کرتی ہوگی!

جب عبداللہ صاحب کا انتقال ہوا تو ان کی عمر باسٹھ سال اور ماں جی کی عمر پچپن سال تھی۔ سہ پہر کا

انشائیہ

وقت تھا۔ عبداللہ صاحب بان کی کھردری چارپائی پر حسب معمول گاؤ تکیہ لگا کر نیم دراز تھے۔ ماں جی پائنتی بیٹھی چاقو سے گنا چھیل چھیل کر ان کو دے رہی تھیں۔ وہ مزے مزے سے گنا چوس رہے تھے اور مذاق کر رہے تھے۔ پھر یکا یک سنجیدہ ہو گئے اور کہنے لگے۔ ''بھاگوان شادی سے پہلے میلے میں میں نے تمہیں گیارہ پیسے دیئے تھے کیا ان کو واپس کرنے کا وقت نہیں آیا؟''

ماں جی نے نئی دلہنوں کی طرح سر جھکا لیا اور گنا چھیلنے میں مصروف ہوگئیں۔ ان کے سینے میں بیک وقت بہت خیال امڈ آئے۔ ''ابھی وقت کہاں آیا ہے۔ سرتاج شادی کے پہلے گیارہ پیسوں کی تو بڑی بات ہے۔ لیکن شادی کے بعد جس طرح تم نے میرے ساتھ نباہ کیا ہے اس پر میں نے تمہارے پاؤں دھو کر پینے ہیں۔ اپنی کھال کی جوتیاں تمہیں پہنانی ہیں۔ ابھی وقت کہاں آیا ہے میرے سرتاج۔

لیکن قضا و قدر کے بہی کھاتے میں وقت آچکا تھا۔ جب ماں جی نے سر اٹھایا تو عبداللہ صاحب گنے کی قاش منہ میں لئے گاؤ تکیہ پر سو رہے تھے۔ ماں جی نے بہتیرا بلایا، ہلایا، چمکارا لیکن عبداللہ صاحب ایسی نیند سو گئے تھے جس سے بیداری قیامت سے پہلے نہیں۔

ماں جی نے اپنے باقی ماندہ دو بیٹوں اور ایک بیٹی کو سینے سے لگا لگا کر تلقین کی ''بچہ رونا مت۔ تمہارے ابا جی آرام سے سو رہے تھے، اسی آرام سے چلے گئے۔ اب رونا مت۔ ان کی روح کو تکلیف پہنچے گی''۔

کہنے کو تو ماں جی نے کہہ دیا کہ اپنے ابا کی یاد میں نہ رونا، ورنہ ان کو تکلیف پہنچے گی لیکن کیا وہ خود چوری چھپے اس خاوند کی یاد میں نہ روئی ہوں گی جس نے باسٹھ سال کی عمر تک انہیں ایک الہڑ دلہن سمجھا اور جس نے گورنری کے علاوہ اور کوئی سوکن اس کے سر پر لا کر نہیں بٹھائی۔

جب وہ خود چل دیں تو اپنے بچوں کے لئے ایک سوالیہ نشان چھوڑ گئیں، جو قیامت تک انہیں عقیدت کے بیابان میں سرگرداں رکھے گا۔

اگر ماں جی کے نام پر خیرات کی جائے تو گیارہ پیسے سے زیادہ ہمت نہیں ہوتی، لیکن مسجد کا ملا پریشان ہے کہ بجلی کا ریٹ بڑھ گیا ہے اور تیل کی قیمت گراں ہوگئی ہے۔ ماں جی کے نام پر فاتحہ دی جائے تو مکئی کی روٹی اور نمک مرچ کی چٹنی سامنے آتی ہے لیکن کھانے والا درویش کہتا ہے کہ فاتحہ درود میں پلاؤ اور زردے کا اہتمام لازم ہے۔

ماں جی کا نام آتا ہے تو بے اختیار رونے کو جی چاہتا ہے۔ لیکن اگر رویا جائے تو ڈر لگتا ہے کہ ان کی روح کو تکلیف نہ پہنچے اور اگر ضبط کیا جائے تو خدا کی قسم ضبط نہیں ہوتا۔

☆☆☆

افسانہ

غزلیں

رشیدؔ شہیدی

وہ آئیں شہر میں خوشبو کا قافلہ ٹھہرے
اس انتظار میں کچھ دیر تو صبا ٹھہرے

یہ زندگی کا شب و روز مشغلہ ٹھہرے
نگاہ تجھ سے ملی ہے تو سلسلہ ٹھہرے

تمہارا عکس امانت سمجھ کے رکھ لوں گا
جو چند لمحے میرے دل کا آئینہ ٹھہرے

ہمیں تو یاد نہیں تیری یاد کے جھونکے
کب آئے کب گئے کس وقت کس جگہ ٹھہرے

لکیریں ہاتھوں کی ساکت رہیں تو بات بھی ہے
ہمارے جینے کا کوئی تو آسرا ٹھہرے

گواہی دینے کو ان نیم خواب آنکھوں میں
ہماری آنکھوں کا کوئی تو رت جگا ٹھہرے

ہمیں ہو واسطہ کیا دہر کی خوشی سے رشیدؔ
کہ ہم ازل سے تیرے غم سے آشنا ٹھہرے

oOo

رائل انکلیو، A4
دارالشفاء روڈ، حیدرآباد۔24
فون:040-24510836

راشد احمد راشدؔ

مری شاعری کا مقصد نہ بیانِ دوستاں ہے
نہ گلوں کا کچھ فسانہ، نہ شکایتِ زماں ہے

نہ وہ پاسِ آدمیت، نہ وہ قدرِ بزرگاں ہے
نہ وہ اگلی صحبتیں ہیں، نہ وہ شانِ دوستاں ہے

مین زباں سے اپنی ہرگز نہ بیاں کروں گا کچھ بھی
مری خامشی مسلسل مرے دل کی ترجماں ہے

ہوں شناسِ قدر دل میں، یہ میری اطاعتیں ہیں
یہی میرا دین و ایماں، یہی میرا آستاں ہے

مجھے ڈر نہیں ہے راشدؔ کہ ہوں لاکھ دشمنِ جاں
مری موت، زندگی کی جو خود ایک پاسباں ہے

oOo

حیدرآباد
رابطہ:9951519825

غزلیں

رحیم قمرؔ

کشتیاں اپنی کناروں پہ جلانے والے
عزم کی لو کو دلوں میں تھے بڑھانے والے

نیست و نابود ہوے شر وہ مچانے والے
حق پرستوں کو جو تھے لوگ ستانے والے

حیثیت ہم ہی یہاں اپنی گرانے والے
ہم بھی مجرم ہیں یہاں حق کو چھپانے والے

ساتھ ظلمت کا یہاں تم ہو نبھانے والے
وہ تو سورج کو تھے آئینہ دکھانے والے

خوف کے سائے میں جیتے ہیں ہمارا دل ہے
پھر بھی مرعوب نہیں سن اے زمانے والے

خرمنِ ہستی کو اک آہ جلا دیتی ہے
اتنا بھی خوش نہ ہو اے ٹھور ٹھکانے والے

عقل تسلیم نہیں کرتی جو باتوں کو قمرؔ
لوگ کچھ ایسے ہیں بے پر کی اڑانے والے

oOo

598-9-20، مجاہد نگر
مالا پلی، نظام آباد 503001

سید تمجید حیدر

شہر کی چیخ سے انجان نہیں ہے کوئی
پر اس آواز کی پہچان نہیں ہے کوئی

ہم زمیں زادوں کی تقدیر میں ہے جہد و جہاد
آسمانوں میں پریشان نہیں ہے کوئی

اُونگھ آتی ہے تو پھر لوگ سُلا دیتے ہیں
جاگتے رہنا بھی آسان نہیں ہے کوئی

بھاگنے والوں کے لوٹ آنے کی امید نہ کر
بے وفا لوگوں کا ایمان نہیں ہے کوئی

میری آزادہ مزاجی کو نہ پابند کرو
یہ مرا مُلک ہے، زندان نہیں ہے کوئی

کل ہر اک بات پہ بڑھتا تھا تجسّس سب کا
اب کسی بات پہ حیران نہیں ہے کوئی

سب کے سب اپنے تکبر کو لئے گھومتے ہیں
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یادگاری مجلّہ

ساونیر

مولانا ابوالکلام آزادؒ



بتاریخ 11 رنومبر 2018ء مولانا آزاد کا 131 ویں یومِ ولادت
قومی یومِ تعلیم اور یومِ اقلیتی بہبود کے موقعہ پر شائع کردہ یادگاری مجلہ

آندھرا پردیش اسٹیٹ اردو اکیڈمی، وجے واڑہ

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ڈاکٹر شیخ فاروق باشا عمری
اسسٹنٹ پروفیسر، شعبۂ اردو، گورنمنٹ ڈگری کالج، رائے چوٹی

مولانا ابوالکلام آزاد اور مولانا محمد علی جوہر

ہندوستان کی تحریک آزادی میں مسلمانوں کا رول نہایت واضح اور دوٹوک رہا ہے۔ مسلمان اپنے رہنماؤں کی رہبری میں ہندوستانی اقلیتی طبقے ہونے کے باوجود اکثریتی طبقہ سے کہیں بڑھ کر جان و مال کی قربانی پیش کی۔ مسلمانوں میں قومیت، وطنیت اور جذبہ ٔحریت پیدا کرنے میں جن اہم قائدین کا رول رہا ہے ان میں سرفہرست امام الہند مولانا ابوالکلام آزاد اور رئیس الاحرار مولانا محمد جوہر ہیں۔

خدا نے ان دونوں قائدین کو بے شمار صلاحیتوں اور لیاقتوں سے نوازا تھا۔ تقریر ہو یا تحریر، صحافت ہو یا سیاست ، قیادت ہو یا امامت، نظم ہو یا نثر، ہر میدان کے وہ ماہر تھے، سب سے بڑھ کر دونوں جذبہ ٔایمانی سے سرشار تھے۔ کبھی انہوں نے اپنے ذاتی مفاد کے لیے کسی سے سمجھوتہ نہ کیا۔ اور نہ دشمنوں کے آگے سر تسلیم خم کیا۔ اپنی بے پناہ صلاحیتوں کے باعث وہ چاہتے تو ان کو انگریزی حکومت میں بڑے سے بڑا عہدہ پا سکتے تھے۔ اور ان کی زندگی شاہانہ گزر سکتی تھی لیکن انہوں نے فقیری اور اسیری کی زندگی کو محبوب جانا۔

بیسویں صدی کے اوائل میں حالات شدید انتشار سے دوچار تھے۔ ہندوستانیوں کے لیے ہر قدم پر کانٹے بچھے ہوئے تھے۔ ان حالات میں صحافت کی پرخار وادی میں قدم رکھنا اپنے لیے موت کو دعوت دینا تھا۔ محمد علی جوہر آزاد سے دس سال بڑے تھے۔ چنانچہ ان کو صحافت کے میدان میں اولیت کا درجہ حاصل ہے۔ وہ انگریزی زبان پر بے پناہ قدرت رکھتے تھے ۔ چنانچہ قوم و ملک کی خدمت کے لیے انہوں نے کامریڈ کے نام سے ۱۴، جنوری ۱۹۱۱ء میں کلکتہ سے ہفتہ وار اخبار جاری کیا۔ جسے بے پناہ مقبولیت حاصل ہوئی۔ ہندوستانیوں کے دل جیت ہی لیے لیکن اہل زبان انگریز بھی مولانا کے اسلوب پر فریفتہ ہو گیے اور بے چینی سے اخبار کی راہ تکتے تھے۔

مولانا ابوالکلام آزاد ۱۳ جولائی ۱۹۱۲ء کو کلکتہ سے ''الہلال'' اخبار جاری کیا۔ جس کے عزائم جتنے بلند تھے زبان و اسلوب بھی اتنا ہی دلکش اور پرتاثیر تھا مولانا آزاد نے بھی صحافت کے ذریعے قوم ملت کی خدمت اور اہل ہند میں جذبہ ٔحریت پیدا کرنا چاہتے تھے۔ الہلال میں لکھتے ہیں۔ ''ہم اس بازار میں سودائے نفع کے لیے نہیں بلکہ تلاش زیاں و نقصان کے لیے آئے ہیں۔ صلہ و تحسین کے لیے نہیں بلکہ نفرت و دشنام کے طلبگار ہیں، عیش کے پھول نہیں بلکہ خلش و اضطراب کے کانٹے ڈھونڈتے ہیں۔'' (ایوان اردو، دہلی دسمبر ۱۹۸۸ء ص ۴۸)

جس طرح مولانا محمد علی کی انگریزی نے ساری دنیا میں دھوم مچادی اسی طرح مولانا آزاد کی نثر نے حیات آفرین کا درجہ پایا۔ مولانا آزاد کی اردو نثر کے تقابل میں مولانا محمد علی تو کیا کوئی بھی اہل قلم دور دور تک ان کا ہم سایہ نظر نہیں آتا ہے۔

''الہلال اور ہمدرد'' نے اردو صحافت کو ایک نیا معیار عطا کیا۔ قوم دوستی، حب الوطنی، سیاسی بیداری کے جذبات پیدا کیے۔ باطل اوہام اور فرسودہ تصورات کا قلع قمع کیا۔ اہل ہند کے دلوں میں تحریک آزادی کی روح پھونک دی دونوں اخباروں نے کھل کر ہندو مسلم اتحاد اور یکجہتی کا سبق پڑھایا محمد علی اپنے اخبار ہمدرد میں اتحاد کے تعلق سے مولانا ابوالکلام آزاد کا یہ بیان جاری کیا۔

''اس وقت کی اہم ترین ضرورت اتحاد ہے میں توقع کرتا ہوں کہ لیڈران چھوٹے چھوٹے اختلافات کو نظر انداز کردیں گے۔ اور وقت کا جو کچھ تقاضہ ہے اس کو پورا کرنے کے لیے تیار ہوں گے''۔ (ہمدرد ۲۴، نومبر ۱۹۲۴ء ص ۵)

ہندوستان کی تحریک آزادی کو تقویت پہنچانے میں تحریک خلافت کا بڑا عمل دخل رہا ہے۔ یہ حقیقت ہے کہ اس تحریک کے تاسیس گزاروں میں مولانا محمود الحسن اور مولانا عبد الباری ہیں لیکن اس تحریک کو عام کرنے اور بلاتفریق مذہب وملت سارے ہندوستانیوں کو اس میں شمولیت کے لیے فضا تیار کرنے میں جہاں بہت سے علماء کا رول رہا ہے وہیں علی برادران اور مولانا ابوالکلام آزاد کی کاوشیں بھی نا قابل فراموش ہیں۔ خلافت تحریک کو اس وقت اور بھی استحکام ملا جب اس میں گاندھی جی بھی شریک ہوگیے۔ بالآخر یہی تحریک تحریک آزادی میں تبدیل ہوگئی۔ علی برادران اور تحریک خلافت ایک جاں دو قالب ہو گئے۔ یہ اشعار زبان زد خاص وعام تھے۔

بولیں اماں محمد علی کی — جان بیٹا خلافت پہ دے دو
ساتھ ہیں تیرے شوکت علی بھی — جان بیٹا خلافت پہ دے دو
ہوتے میرے اگر سات بیٹے — کرتی سب کو خلافت پہ صدقے

مولانا آزاد اور مولانا محمد علی کو صحافت اور خطابت کی بدولت کئی بار جیل جانا پڑا، قصور صرف یہ تھا کہ دونوں صحافت کے ذریعہ ہندوستانیوں کے دلوں میں آزادی کی روح پھونک رہے تھے اور مکمل آزادی کا مطالبہ کررہے تھے۔ مولانا آزاد اپنی زندگی کے ۹ رسال ۷ رمہینے زندان فرنگ میں رہے اور محمد علی تقریباً ۷ رسال قید فرنگ میں رہے۔ ان دونوں بزرگوں نے قید کی زندگی کو ہنسی خوشی قبول کرلیا۔ مولانا آزاد ایک خط میں لکھتے ہیں۔ ''وقت کے حالات پیش نظر رکھتے ہوئے اس تناسب پر غور کرتا ہوں تو تعجب ہوتا ہے، اس پر نہیں کہ سات برس آٹھ مہینے قید وبند میں کیوں کٹے؟ اس پر کہ صرف سات برس آٹھ مہینے ہی کیوں کٹے؟۔ (ایوان اردو دہلی، دسمبر ۱۹۸۸ء ص ۴۲)

مولانا محمد علی اپنی اسیری کے ایام کو خوش قسمتی سے تعبیر کرتے ہیں۔

فیض سے تیرے ہی اے قید فرنگ — بال وپر نکلے قفس کے در کھلے

آزاد وجوہر خود دار طبیعت کے مالک تھے۔ قوم کے مفاد کی خاطر انہوں نے اپنے ذاتی مفاد کو قربان کردیا۔ دوران

اسیری مولانا آزاد نے اپنی رفیق حیات کی شدید علالت، رحلت اور آخری رسومات میں شرکت کے لیے درخواست دینے کو قوم کے مفاد کے مغائر اور اپنے لیے باعث ہزیمت سمجھا۔ اپنی وفا شعار بیوی کی ہمیشہ کی جدائی کو گوارا کرلیا لیکن حکام وقت کے آگے جھکنا پسند نہیں کیا۔ بالکل اسی طرح مولانا محمد علی بھی بیجاپور جیل میں محروس تھے بیٹی آمنہ شدید ترین مرض دق میں مبتلا تھیں اور اسی مرض میں وہ بھی اس دنیا سے رحلت کر گئیں۔ بیٹی کی وفات والد کے دل پر کیا قیامت ڈھائی ہوگی لیکن مولانا نے غم جدائی کو برداشت کرلیا۔ صبر وشکر اور تسلیم ورضا کا پیکر بنے رہے۔ اور کیا ہی خوب کہا۔

تیری صحت ہمیں مطلوب ہے لیکن اس کو نہیں منظور تو پھر ہم کو بھی منظور نہیں

مولانا آزاد اور مولانا محمد علی کے مابین کئی چیزوں میں مماثلت پائی جاتی ہے۔ صحافت، سیاست اور خطابت کی صلاحیتیں دونوں کے رگ پے میں سرایت کر گئیں تھیں۔ راسخ العقیدہ مذہبی پیروکار ہونے کے ساتھ حب الوطنی، قوم دوستی اور ملت کی خیر خواہی کے جذبات سے سرشار تھے۔ صاحب طرز ادیب، بلند پایہ نثر نگار اور کہنہ مشق شاعر تھے۔ ایک کو شاعری میں تفوق ہے تو دوسرے کو نثر میں تقدم۔

مولانا آزاد اور جوہر کی نثر کا تقابل کیا جائے تو یہ واضح ہوتا ہے کہ مولانا محمد علی جوہر کے یہاں مولانا آزاد جیسا حُسن، دلکش اسلوب اور زور بیان نہیں لیکن خلوص، درد، تاثیر، عام فہمی اور سلاست اور دل نشینی میں یقیناً ان کی نثر کسی طرح سے پیچھے نہیں ہے۔

سید حامد مولانا آزاد اور مولانا جوہر کی نثر کا تقابل کرتے ہوئے لکھتے ہیں:

> ''ابوالکلام کی بلند پروازی کے مقابلے میں جوہر کے یہاں پیادہ روی ہے۔ وہاں ادب عالیہ اور اختراعات فائقہ، یہاں صرف یہ جاں سوز فکر کہ ایک قوم کی قوم کو، ایک جاہل پس ماندہ قوم کو اپنا مفہوم کس طرح ذہن نشین کرایا جائے، لیکن محمد علی کا انگریزی پر اہل زبان کا سا عبور وہ اضافی وصف ہے جو ابوالکلام کو میسر نہ تھا۔ علاوہ بریں محمد علی کی نثر (اُردو) زبان اور محاورہ کی اُن غلطیوں سے محفوظ ہے جو رُخِ زیبا پر تل کی طرح ابوالکلام کے یہاں مل جاتی ہے''۔ (نظر برنی، مولانا محمد علی شخصیت اور خدمات نئی دہلی، ص ۱۹۲)

مولانا محمد علی جوہر اور مولانا آزاد جنگ آزادی میں دونوں ہم سفر تھے۔ حصول آزادی میں دونوں کا ساتھ تقریباً ۱۵ سال رہا۔ دونوں میں بہت ساری مماثلتیں اور مشابہتیں پائی جاتی ہے۔۔ دونوں بے باک اور اعلیٰ درجے کے صحافی تھے۔ دونوں شاعر اور نثر نگار۔ دونوں سچے اور پکے مسلمان اور مذہبی عبادات کے پابند تھے۔ ۱۵ سال کے عرصہ میں صحافت، سیاست اور ملکی و مسلکی مسائل کے تئیں دونوں کے درمیان رفاقت اور رقابت رہی۔ پھر بھی دونوں ایک دوسرے کا بے حد احترام کرتے تھے اور اختلافات رائے کا اظہار بھی برملا کرتے تھے۔ مولانا آزاد کا اسلوب اشارے اور کنایے کی زبان میں ہوتا، لیکن مولانا محمد علی کا اظہار برملا جوشیلے انداز میں ہوتا، اور انداز تخاطب بالکل راست ہوتا۔ دونوں میں رقابت کی وجہ ذاتی رائے نہیں بلکہ قوم وملت کی فلاح و بہبودی تھی۔ مولانا محمد علی اور مولانا آزاد بعض مسائل میں ایک دوسرے سے متفق نہیں تھے۔ مولانا آزاد نے اپنے

اخبار ''الہلال'' میں مولانا محمد علی کے بارے میں اس طرح اظہار خیال کیا ہے:

''مسٹر محمد علی سے ہمارے تعلقات اب صرف دوستانہ ہی نہیں، ایسے قریب کہ عزیزانہ ہیں کہ ان کی نسبت رائے قائم کرنے کا پورا موقع رکھتے ہیں۔ ہم نے اچھی طرح اندازہ کرلیا کہ ان کے دل میں آزادی اور جوش، دونوں چیزیں موجود ہیں''۔ (ضیاء الحسن فاروقی ماہنامہ جامعہ اپریل ۱۹۷۹ء ص ۱۰۲)

مولانا محمد علی کی انگریزی انشا پردازی اور قوت تحریر کا ان الفاظ میں اعتراف کرتے ہیں :

''یہی مسٹر محمد علی ہیں جو اِن تمام تعلیمات و ہدایات عالیہ کے مرکز جمود (علی گڑھ کالج) کے تعلیم یافتہ اور ایک ایسی ریاست کے عہدہ دار تھے۔ چند مضامین اور ایک رسالہ لکھ کر اُنھوں نے اپنی قابلیت ضرور منوائی تھی۔ لیکن کوئی بھی ان کی موجودہ حیثیت ملی سے واقف نہ تھا لیکن جب زمانے نے مہلت دی اور قوتوں کو چمکنے کے اسباب میسر آئے تو آج کوئی نہیں جو ان کی انگریزی انشا پردازی اور قوت تحریر و بحث کا معترف نہ ہو''۔ (ماہنامہ نیا دور لکھنؤ، جوہر نمبر ۱۹۸۶ء ص ۱۰۲)

مولانا محمد علی جوہر گرچہ کہ عمر میں مولانا آزاد سے بڑے تھے پھر بھی وہ انھیں اپنا استاد مانتے تھے، لیکن جب ان دو عظیم شخصیتوں کے درمیان اختلاف ہوا تو ہر ایک نے کھل کر اس کا اظہار کیا لیکن وہی شائستہ اور سلجھے ہوئے انداز میں، کہیں اُنھوں نے ذاتیات کو موضوع بحث بننے نہیں دیا۔ دونوں کی تحریریں پُر وقار، سنجیدگی اور متانت کے ساتھ ساتھ ادبی رنگ میں ڈوبی ہوئی ہیں۔

مولانا آزاد کا الہلال جب منظر عام پر آیا تو مسلم یونیورسٹی کی تحریک شروع ہو چکی تھی۔ چنانچہ اول روز ہی سے اس تحریک سے متعلق لکھنا شروع کر دیا تھا۔ یکم ستمبر ۱۹۱۲ء کی اشاعت میں مولانا آزاد ''مسلم یونیورسٹی کانسٹی ٹیوشن کمیٹی'' کے عنوان سے ایک مضمون لکھ کر مولانا محمد علی سے چند اُمور کی وضاحت چاہی تھی۔ الہلال کی اس اشاعت میں مولانا آزاد کے اس مضمون کی دوسری اور آخری قسط بھی چھپی تھی جس کا عنوان تھا ''نشہ شام کی نصف شب''۔

مولانا آزاد ''مسلم یونیورسٹی کانسٹی ٹیوشن کمیٹی'' کے عنوان کے تحت لکھتے ہیں:

ہم کو معلوم ہے کہ ہمارے دوست وہی محمد علی ہیں جنھوں نے نواب محسن الملک مرحوم کے زمانے میں اپنے کالج سے نئے نئے خطابات حاصل کئے تھے اور پھر یہ وہی محمد علی ہیں جنھوں نے ہمیشہ کالج کی زر پرستی کی مخالفت کی اور ٹرسٹیوں کی دائمی حکمرانی کے مسئلے کو بار بار چھیڑا۔ وہ گو ہمیشہ علی گڑھ میں رہے مگر ہم نے تو ہمیشہ ان کو اس کے باہر ہی دیکھا ہے اور اب تو میلوں دور دیکھتے ہیں۔ خدا تعالیٰ نے جب چاہا تھا کہ آذر کے بتکدے کو توڑے تو خود اسی کے گھر میں خلیل بت شکن کو پیدا کر دیا تھا۔ ہم کو یقین ہے کہ مسٹر محمد علی بھی علی گڑھ سے اس لئے اُٹھائے گئے ہیں تا کہ اپنے گھر کی دیواروں سے بت پرستی کے نقوش مٹا دیں.....

یونیورسٹی کمیٹی کے متعلق عام طور پر موجودہ حالات نے بے اعتمادی اور شکوک پیدا کر دیئے ہیں۔ کیا اچھا ہوا گر وہ حق گوئی اور بے لاگ سچائی کی قدر و قیمت کو پیش نظر رکھ کے مندرجہ ذیل اُمور پر اپنی معلومات ظاہر کر دیں۔ وہ ابتداء سے شریکِ کار رہے ہیں اور ہم کو شکوک اور سوءِ ظن سے نجات دے سکتے ہیں''۔ (ضیاء الحسن فاروقی ماہنامہ جامعہ اپریل ۱۹۷۹ء ص ۱۰۳)

مولانا محمد علی کب خاموش رہنے والے تھے۔ الہلال کے دونوں مضامین کا جواب دیتے ہوئے اپنا ایک مکتوب شائع کرایا جس کے چند ٹکڑے درج ذیل ہیں:

''مانا کہ الہلال افقِ عالم پر اس وقت نمودار نہ ہوا تھا مگر آزادی کے بدر کامل کو یہ کیسا گہن لگا تھا کہ آج کامل ایک سال بعد ظلمتِ علی گڑھ پر نور ایمان غالب آیا ہے''۔

''آنجناب نے صرف سر ہارکورٹ بٹلر کی ۹/ اگست ۱۹۱۲ء کی تحریر کا ترجمہ علی گڑھ انسٹی ٹیوٹ گزٹ میں پڑھا اور اس میں جو فقرہ ۳۱/ جولائی ۱۹۱۱ء سے ماخوذ تھا اس کی غلط تاویل فرما کر بلا غور و فکر اور بے تامل پچاس ساٹھ مسلمانوں کو کاذب اور فریبی ٹھہرا دیا اور (آگے آیت) کلام الٰہی سے اپنے فتوے کی تصدیق بھی حسب معمول فرما دی، شاید ظن مومن کی یہی تعریف ہو۔ مگر یہ مسائل مذہبی ہیں اور میں محض سگِ دنیا، البتہ اتنا ضرور عرض کروں گا کہ یہ طریقۂ اخبار نویسی خواہ لکھنے والے کے لئے کتنا ہی دل خوش کن اور عوام کے لئے کیسا ہی دلچسپ کیوں نہ ہو، جن پر سب و شتم کی بوچھار پڑتی ہے ان کے لئے ضرور بہت کچھ دل شکن ہے''۔ (ضیاء الحسن فاروقی ماہنامہ جامعہ اپریل ۱۹۷۹ء ص ۱۰۳)

مولانا آزاد نے بھی جوابی وار کیا، لکھتے ہیں:

''آپ نے ''آزادی کا بدرِ کامل'' اگر محض ''ہلال'' کے لئے لکھا ہے تو اس زورِ عبارت سے خود بھی مزہ لیتا ہوں، لیکن اگر طنزاً ہے تو مزاح سے الگ ہو کر مجھے کہنے دیجئے کہ آزادی اور آزاد بیانی کے درجہ کو تو اپنی بساط سے بہت بلند سمجھتا ہوں۔ اس منزل تک پہنچنے کے لئے جن قربانیوں اور خود فروشیوں کی ضرورت ہے وہ ہر کس و ناکس کو نصیب نہیں ہو سکتیں۔ میرے دل میں تو ایک لحہ کے لئے بھی اس دعوے کا خطرہ نہیں گذرا مگر میری محرومی سے آزادی کی آواز دنیا سے معدوم نہیں ہو سکتی۔ اس کو مجھ میں نہ ڈھونڈیئے۔

البتہ اس کی آواز اُٹھے تو کانوں کو بند بھی نہ کیجئے۔

منکر نتواں گشت اگر دم زغم از عشق
ایں نشہ بمن گر نبود باد گرے ہست (ایضاً ۱۰۳، ۱۰۴)

محمد علی جوہر بھی وار کرنے سے کب چوکتے، اس کا بھی جواب دیا۔ لیکن وہی شائستہ اور شگفتہ انداز میں:

''آپ متعجب ہیں کہ ''ظن المومنین خیرا'' کی کیا یہی تعریف ہے کہ کمیٹی کو ایسے سخت الزام دیئے جائیں؟ لیکن آپ نے اس پر غور نہیں کیا کہ آخر حسن ظن کی کوئی حد بھی تو ہونی چاہئے۔ برسوں مسلمانوں نے اپنے لیڈروں کے ساتھ حسنِ ظن سے کام لیا لیکن اس حسن ظن کا جو نتیجہ نکلا وہ آپ کے دل میں اور میری زبان پر ہے۔ اب تو کچھ دنوں سوءِ ظن ہی سے کام لینے دیجئے۔ آپ نے ''سگِ دنیا'' کے لقب کی ٹوپی خود ہی اپنے سر اوڑھ لی۔ حالانکہ جن سروں کے لئے قطع کی گئی تھی ان کو آپ مجھ سے بہتر جانتے ہیں گو آپ اس طرف اشارہ نہ کریں۔ حیران ہو کہ آپ کو کسی خیال میں اپنے سے مختلف نہیں پاتا، لیکن پھر دیکھتا ہوں تو بہت دور ہوں۔ اصل بات یہ ہے کہ جام تو آپ کے ہاتھ میں بھی ہے مگر ''فسق'' کے الزام کے لئے میرا ہی وجود موزوں ہے:

لالہ ساغر گیرو نرگس مست و برما نام فسق'' (۱۰۴)

اس کے بعد مولانا آزاد نے فروری اور مارچ ۱۹۱۳ء کی الہلال کی اشاعتوں میں ''حدیث الغاشیہ'' کے عنوان سے اور ''نشۂ نیم شبی کا صبح خمار'' کے تحتی عنوان کے تحت مولانا محمد علی کے انقلابِ حال پر پھبتیاں کسی ہیں۔ گرچہ کہ وہ بادہ و ساغر کی زبان میں ہیں کہیں کہیں صاف نام بھی لیا ہے۔ مولانا محمد علی نے بھی اس کا جواب دیا۔ وہی طرز اپنایا جو مولانا آزاد نے اختیار کیا تھا۔ لیکن دونوں کا انداز بیان شائستہ اور سلجھا ہوا نظر آتا ہے۔

مولانا محمد علی نے مولانا آزاد اور علامہ اقبال کو اپنا مذہبی استاد تسلیم کیا ہے۔ مولانا کی ذہانت اور ذکاوت کی خوب تعریف کرتے ہیں اور ان کو ایک اچھے مقرر بھی مانتے ہیں۔ ایک جگہ ہمدرد میں لکھتے ہیں:

''مولانا ابوالکلام سے میری رقابت کی حقیقت یہ ہے کہ میں ہر جگہ اس کی شہادت دینے کو تیار ہوں کہ مولانا کی ذکاوت و ذہانت مجھ سے کہیں زیادہ ہے''۔ (ماہنامہ نیا دور لکھنؤ، جوہر نمبر ۱۹۸۶ء ص ۲۰۵)

ان دونوں بزرگوں نے ایک دوسرے پر جو اعتراض کئے ہیں اس میں کہیں بھی ذاتیات کو ذرہ برابر بھی دخل نہیں ہے۔ صرف قوم و ملک کا مفاد عزیز تھا۔ اختلافی نظریات کے پیچھے کبھی بھی اپنی انا کو دخیل ہونے نہیں دیا۔ یہی وجہ ہے کہ ہم دیکھتے ہیں مولانا جوہر آزادیء کامل کا مطالبہ کرتے ہوئے دیار غیر میں اپنی جان قربان کردی۔ اور مولانا آزاد تقسیم کا تلخ گھونٹ پی کر بھی ہندوستان ہی میں اپنی ناقابل فراموش خدمات سے مسلمانوں کے لیے ہمیشہ کے لیے وقار اور تمکنت کا باعث بنے۔ اور سیاست، صحافت اور ادب میں ایسے نقوش چھوڑے کہ آنے والی نسل ہمیشہ اس سے مستفیض ہوتی رہے گی۔

اردو میں مہجری ادب

مہجری ادب سیمینار کے مقالات کا مجموعہ

مرتبین

ڈاکٹر محمد نثار احمد

ڈاکٹر سید اللہ بختیاری

آندھرا پردیش اسٹیٹ اردو اکیڈمی، وجئے واڑہ

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ڈاکٹر شیخ فاروق باشا عمری
اسسٹنٹ پروفیسر، شعبۂ اردو،
گورنمنٹ ڈگری کالج، رائے چوٹی، ضلع کڈپہ

ڈاکٹر حنیف ترین کی شاعری میں مہجری کرب

ڈاکٹر حنیف ترین کی ولادت یکم اکتوبر ۱۹۵۱ء کو سنبھل ضلع مرادآباد میں ہوئی۔ علی گڑھ کے تعلیم یافتہ تھے۔ سری نگر میڈیکل کالج سے ایم بی بی ایس کی سند حاصل کی۔ پھر علی گڑھ مسلم یونیورسٹی سے ایم۔ ڈی کیا۔ پھر چند ماہ ہاؤس جاب کرنے کے بعد تلاش معاش کے سلسلہ میں سعودی عرب چلے گئے جہاں 1982 تا 2004 ان کا قیام رہا۔ پیشہ طب سے وابستہ ہونے کے باوجود اُردو زبان وادب سے غیر معمولی لگاؤ اور شغف تھا۔ اس کی اہم وجہ گھر کا ماحول اور مشاہیر شعراء کی صحبت ہے۔ کالج کی تعلیم کے دوران ایک غزل انہوں نے سنائی جو بہت مشہور ہوئی اور خوب داد ملی جس سے ان کا شعری مذاق پروان چڑھا۔

انسان جب ایک مقام سے دوسرے مقام کو ہجرت کرتا ہے تو اپنے ساتھ ساز وسامان اور زادراہ کے ساتھ اپنی زبان، تہذیب، کلچر اور تمدن کو بھی ساتھ لے کر چلتا ہے۔ اپنی یادوں کے حسین گلدستوں کو بھی ہمیشہ معطر رکھتا ہے۔ ہجرت کا عمل ادیب کے لئے ذہنی کرب کا سامان ہوسکتا ہے لیکن ادب کے لئے ہجرت فال نیک ثابت ہوئی۔ ادب میں نئے موضوعات، نئی بستیاں، نئے مسائل، نئی تہذیبیں، رجائیت اور قنوطیت، سیاسی اقتصادی اور ثقافتی حالات وطن کی یاد، وطن سے محبت کے جذبات، ہجر کا کرب، وصل کی تمنا جیسے مسائل نے اردو ادب کے دامن کو وسیع کیا۔ ڈاکٹر اشفاق احمد مہجری ادب کی تعریف ان الفاظ میں کرتے ہیں۔

"مہجری ادب ایک ایسا ادب ہے جس کی ایک ایک سطر سے خوشبوئے وطن پھوٹتی

ہے، وفا پرستی کے نغمے گونجتے ہیں' فدائیت اور جاں نثاری کا جذبہ پیدا ہوتا ہے۔ جس کا ہر فنکار اپنے میدان تخیل کا شہ سوار' جس کی ہر تحریر دل پذیر' جس کا ہر اسلوب قاری کے لئے پسندیدہ اور مقبول ہے''۔

ڈاکٹر حنیف ترین کی ہجرت تلاش معاش کے سبب ہوئی۔ بائیس سالہ قیام سعودی عرب کے دوران اُن کا شعری سفر روز افزوں ترقی کرتا گیا۔ اس دوران آپ کے کئی ایک شعری مجموعے منظر نامے پر آئے جن میں رباب صحرا (1992)' کتاب صحرا (جنوری 1995)' کشت غزل نما (جنوری 1999)' زمین لاپتہ رہی (2001)' ابابیلیں نہیں آئیں (2004) شامل ہیں۔

ان شعری مجموعوں میں نظم، غزل، قطعات، ترائیلے، دوہے، ہائیکو جیسی اصناف شاعری شامل ہیں۔

حنیف بنیادی طور پر نظم کے شاعر ہیں۔ نظم سے ان کو خاص انسیت ہے۔ نظم کا کینوس وسیع ہوتا ہے۔ ایجاز و اطناب کے دونوں پیرائے نظم کے لئے موزوں ہوتے ہیں۔ ان کی نظموں میں ایک طرف زمین و آسمان کے رنگ، مراد آباد کے کھیت کھلیان، گلیاں، محلے، پیڑ پودے، ندی، تالاب، کنواں اور وہاں کی بے فکری زندگی کا اظہار بڑی خوبی سے کیا گیا ہے۔ دوسری طرف سعودی عرب کے مخصوص صحرا اور تپتی ریت کے مسائل کے ہیں۔

ڈاکٹر حنیف کی ہجرت نہ دین و ایمان کی سلامتی کے لئے' نہ دشمنوں کے ظلم و جبر کا نتیجہ' اور نہ مستقل انہوں نے نقل مکانی کی بلکہ خالص تلاش معاش کے لئے تھی۔ اور یہ امر واضح طلب ہے کہ اگر کوئی شاعر مستقل یا غیر مستقل تلاش معاش کے سلسلہ میں وطن سے دور رہ کر حب الوطنی اور غریب الوطنی کے جذبات پیش کرتا ہے تو وہ مہجری ادب کہلائے گا یا نہیں؟ مہجری ادب کے لئے مستقل ہجرت ضروری ہے یا نہیں؟ یا کسی کا مصیبت یا جان و مال کی امان پانے کے لئے بے حد مجبوری کی حالت میں ہجرت کرنا اور دیار غیر میں رہ کر اپنے وطن عزیز کے لئے تڑپنا اور فراق

کے کرب کو پیش کرنا ہی مہجری ادب کا حصہ ہے؟

مہجری ادب میں تلاش معاش یا غیر مستقل ہجرت کے دوران جو ترک وطن کے نتیجے میں پیدا ہونے والے ذہنی کرب کو شامل کریں تو اس راہ میں حنیف ترین بھی شامل ہیں۔

بہر حال ڈاکٹر حنیف فارغ البال اور مرفہ الحال سرجن تھے۔ دولت، شہرت اور عزت سے وہ مالا مال تھے۔ اس کے باوجود وطن عزیز کی اس خوشبو کو جو دل و دماغ اور روح کو معطر کر چکی تھی کبھی اس سے غافل نہ رہے۔ خوش حالی کتنی ہی زندگی کو مزین کر دے ایک انسان اپنے ماضی کے اس گاؤں کو کبھی بھول نہیں سکتا جہاں اس کی ابتدائی زندگی کا حصہ گزرا ہو۔ حنیف ترین کی شاعری میں غریب الوطنی، حب الوطنی، ہجرت اور نقل مکانی کے کرب کو بخوبی محسوس کیا جا سکتا ہے۔ ایک نظم ''ایک خیال آتا ہے'' میں کہتے ہیں:

گھر سے دوریوں کا غم / آنسوؤں کے صحرا میں / پھول سے کھلاتا ہے /
میری پیاری بیٹی ہے / راگنی ہے الفت کی /
جو گلوں کے ہونٹوں پر / خوشنما کہانی ہے/

ایک اور جگہ کہتے ہیں:

آج کی اِن سہولتوں کے بیچ / میں ہوں دن رات کی مشقت میں (لالہ صحرائی ۲۱)

وادیٔ کشمیر سے حنیف کو خاص لگاؤ اور محبت ہے کیونکہ طب کی تعلیم یہیں سے انہوں نے حاصل کی۔ اور اپنی شریک حیات سے یہیں آنکھیں چار ہوئیں تھیں۔ ایک نظم میں کہتے ہیں:

وادیٔ کشمیر جب سے جسم و جاں بنی
مجھ کو صحرائی تپش میں بھی بڑا آرام ہے
دل کے کتبے پر مرے، نقش ترا نام ہے

نگاہ وادیٔ کشمیر تجھ سے کیا بتاؤں میں
یہا ں رہ کر تو لگتا ہے کہ اپنا گھر بھی زنداں ہے

ڈاکٹر حنیف نے اپنی تخلیقات اور شاعری میں جس ذہنی کرب اور روحانی اذیت کا احسا س دلایا ہے اور اس کے اظہار کے لئے جو تجربات پیش کئے ہیں وہ شعری اسلوب میں ایک اہم اضافہ ہے ۔ بقول قاضی عبیدا لرحمٰن ہاشمی ان کی بہترین غزلیں وہی ہیں جو تخلیقی اضطراب اور سوزِ دروں کی کیفیات سے سرشار ہیں ۔ اور خود بھی اشکوں میں ہیں:

ہر زخم کہنہ وقت کے مرہم نے بھر دیا
وہ درد بھی مٹا جو خوشی کی اساس تھا

حنیف ترین کی شاعری میں زندگی کے بے شمار مسائل موجود ہیں ۔ دیار غیر میں ان کا دل ہمیشہ آشنا چہرو ں کی تلاش میں سرگرداں رہتا ہے ۔ دھنک کے خوشگوار احساسات اور مشاہدات سے تسکین پاتا ہے ۔ جگ کے کرب ، خلوت اور جلوت کے کرب سے وہ اندر سے ٹوٹے ہوئے نظر آتے ہیں ۔ بقول وزیر آغا کہ:

"وہ دو صحراؤ ں کے درمیان کہیں رہ رہے ہیں ۔ ایک طرف ریت کا صحرا ہے اور دوسری طرف پانی کا صحرا ہے ۔ اور یہ دونوں صحراؤں کی ذات کے اندر اتر کر ایک ایسا تیسرا صحرا بن گئے ہیں جس کے قدم پانی اور دھڑ ریت میں ہے" ۔ غزل کا ایک شعر ملاحظہ ہو:

اشک شعلہ نے ، تیلیاں جل گئیں
ساعتیں جب غم ہجر میں ڈھل گئیں

(غزل نما ۲۴)

تلاش معاش میں دیار غیر کا سفر کرتے ہوئے وہ زندگی کے نئے نئے تجربات اور مشاہدات سے آشنا ہوتے ہیں ۔ رنگ تغزل کے یہ اشعار دل شکستگی اور ہجر و وصال کی صدا بن جاتے ہیں:

شور جب سوگیا جاگی وحشت
پھیلا یادوں کا دھواں گلیوں میں
پلکوں پہ نارسائی کی کچھ بدلیاں حنیفؔ
ناسور بن کے دل کی زمین پر برس گئیں
خزاں میں اوڑھ کے قول و قرار کا موسم
بہار ڈھونڈ رہی ہے بہار کا موسم

عام طور پر یہ دیارِ غیر میں ناموافق مشاہدات اور تجربات دیکھ کر مہاجرین کو خاموشی کا زہر پینا پڑتا ہے لیکن ڈاکٹر حنیف قیام سعودی عرب کے دوران ناپسندیدہ چیزوں کو دیکھ کر دبے الفاظ میں یہ صدائے احتجاج بلند کرتے ہیں۔ دھوپ، ریت، دشت، برف جیسے الفاظ کو نئی معنویت عطا کرتے ہیں:

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ان موسموں کو دھوپ کی یلغار چاہئے
فنا کے خوف سے احساس سرد ہیں جن کے
انہیں کڑی کڑی دھوپ کی سزا دینا

غرض ڈاکٹر حنیف ترین نے مہجری فکر کو اس طرح اپنی شاعری میں پیش کیا ہے کہ وہ تمام تارکین وطن جو اپنے گھروں سے دور دیارِ غیر میں رہتے ہیں، اپنے دلوں کی دھڑکنیں ان کی شاعری میں محسوس کر سکتے ہیں۔

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مضامین و مقالات کا مجموعہ

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مقدمہ

ڈاکٹر شیخ فاروق باشا عمری
شعبۂ اردو، گورنمنٹ ڈگری کالج، رائے چوٹی

ڈاکٹر سید وصی اللہ بختیاری عمری، دکن کی مایہ ناز ادبی شخصیت ہیں۔ خوش فکر شاعر، بلند پایہ نثر نگار، معتبر نقاد، مبصر و مفکر، تجزیہ نگار، سب سے بڑھ کر اردو زبان کے معلم و مدرس اور ہمدرد و مشفق استاد ہیں۔ آپ کی مادری زبان اردو ہے، لیکن عربی و فارسی پر بھی قدرت حاصل ہے۔ موصوف کی تحریروں میں تینوں زبانوں کا حسین امتزاج نظر آتا ہے۔

موصوف سے میرے تعلقات گذشتہ تیس برس سے شجرِ مثمرہ کی طرح شاداب و آباد ہیں۔ رائے چوٹی کے گورنمنٹ کالج میں شعبۂ اردو میں ہم دونوں رفیق ہیں۔ لیکن اس کے باوجود آپ کی تحریروں پر تبصرہ یا تجزیہ مجھے علمی کم مائیگی کے احساس کے ساتھ ہی فخر و انبساط کا موقعہ بھی ہے کہ ایسی شخصیت پر کچھ لکھنے کا سنہرا موقعہ نصیب ہوا کہ جن کے ادبی تعلقات کا دائرہ ہند و پاک کی سرزمین سے متجاوز ہو کر عالمی اردو زبان کے مشاہیرِ ادب سے ہے۔ اردو زبان کی مایہ ناز ہستیاں آپ سے ہمکلام ہوتی ہیں، آپ کی تعلیمی صلاحیتوں اور ادبی لیاقتوں کو تسلیم کرتی ہیں۔

ڈاکٹر وصی بختیاری عمری، شیریں مقال، خوش گفتار، خوش اخلاق، پیکرِ علم و عمل، باادب و باصفا، ایک ہی ملاقات سے دل کی گہرائیوں میں اتر جانے کی تاثیر رکھتے ہیں۔ نازک خیال،

لطیف ادراک واحساس کے شاعر جن کو پڑھ کر شدید دھوپ کے مسافر کو نیم کے گھنے سایے کی ٹھنڈک کا احساس ہو اور بھٹکے ہوئے صحرائی مسافر کو نشانِ منزل کا پتہ مل گیا ہو۔ تقریر و تحریر پر ایسی یکساں قدرت کہ جیسے آفتاب کی تمازت سے پھلوں میں رنگت اور ماہتاب کی چاندنی سے پھولوں میں مہک ہو۔

زیرِ نظر مجموعۂ مقالات آپ کے نثری کاوشوں پر مشتمل ہے۔ جنہیں آپ نے مختلف قومی و بین الاقوامی سمیناروں اور کانفرنسوں میں مشاہیرِ ادب کے سامنے پیش کر کے خراجِ تحسین پایا ہے۔ موصوف نے جن ہستیوں پر قلم اٹھایا ہے، وہ خود اپنے دور کے اکابرینِ ادب میں شامل ہیں۔

مفکرِ اسلام حضرت مولانا سید ابوالحسن علی حسنی ندویؒ ممتاز عالمِ دین ہونے کے ساتھ ایک ادیب اور نقاد بھی تھے۔ آپ کی کتاب ''نقوشِ اقبال'' اقبالیات میں ایک گراں قدر اضافہ تسلیم کی جاتی ہے۔ اس میں آپ نے فکرِ اقبالؔ کا ایک متوازن اور معتدل تجزیہ پیش کیا ہے۔ ڈاکٹر وصی بختیاری نے اس کتاب پر مختلف آراء جمع کر کے اس کتاب کی ادبی وقعت کو پیش کیا ہے۔

لسان العصر اکبرؔ الہ آبادی کی ایک نظم جس کا پہلا شعر ہے:

یہ موجودہ طریقے راہیٔ ملکِ عدم ہوں گے
نئی تہذیب ہوگی اور نئے سامان بہم ہوں گے

اس نظم کی روشنی میں انہوں نے اکبرؔ کے کلام کا تجزیہ اور ان کی فکر کا جائزہ پیش کیا ہے۔

شاعرِ جذب و ہوش کے نام سے مشہور صوفی شاعر خواجہ عزیز الحسن مجذوبؔ کا مختصر جائزہ پیش کیا گیا ہے۔

مولانا عبدالسلام ندوی ایک معتبر مؤرخ اور مستند محقق ہیں۔ ڈاکٹر وصی بختیاری نے اس مضمون میں ان کے تنقیدی مضامین کا بحسن و خوبی جائزہ لیا ہے۔ تنقید کے موضوع پر قلم اٹھانے کے لیے بڑی عرق ریزی کی ضرورت ہوتی ہے۔ لیکن انہوں نے باریک بینی سے حقیقت پسندانہ

تبصرہ کرتے ہوئے مولانا عبدالسلام ندوی کو ایک غیر جانب دار، حق گو اور صداقت سے بھرپور تنقید نگار تسلیم کیا ہے۔

مولانا سید نجیب اشرف ندوی اور مولانا حسن مثنیٰ ندوی پر مضامین، علمی اور تعارفی ہیں، جن کے مطالعہ سے ان کی علمی و ادبی خدمات کا پتا چلتا ہے۔ مؤخر الذکر کی ادبی سراغ رسانی اور سرکاری فائلوں کی چوری کافی دلچسپ اور معلوماتی دستاویز ہیں۔

فرزندِ جامعہ عثمانیہ مولانا ثناء اللہ عمری بلند پایہ نثر نگار ہیں۔ مولانا کے کئی ایک ادبی میدان ہیں۔ لیکن اس مضمون میں ان کی مرقع نگاری کی خوبیوں اور محاسن کا کامیابی سے جائزہ لیا گیا ہے۔ اس مضمون کی انفرادیت یہ ہے کہ اب تک کسی نے مولانا کی اس کاوش پر نظر التفات نہیں کیا۔

زہرہ بتولؒ، استاذ الاساتذہ کہنہ مشق شاعر مولانا ابولبیان حمادؔ عمری کی زوجہ محترمہ ہیں، جن کا چند سال پیشتر انتقال ہوا۔ اس مضمون میں محترمہ کی شعری محاسن کو بڑی خوبصورتی سے اجاگر کیا گیا ہے۔

سعادت حسن منٹو کو بحیثیت افسانہ نگار ہر اردو دان بخوبی جانتا ہے۔ منٹو نے اردو افسانہ نگاری کو عالمی سطح کے افسانوں کی صف میں لا کھڑا کیا۔ منٹو پر بہت کچھ لکھا گیا۔ لیکن موصوف کا کہنا درست ہے کہ صحیح معنوں میں منٹو کے ساتھ انصاف نہیں کیا گیا۔ منٹو پر ابھی بھی بہت کچھ لکھنے کی گنجائش ہے۔ جس کی طرف تنقید نگاروں کو توجہ دینے کی ضرورت ہے۔

دکنی حکایات کی لسانیات - ایک جائزہ، اس مقالہ پر تحقیقی رنگ غالب ہے۔ اس میں مقالہ نگار نے کئی مخطوطات کے حوالوں سے قدیم اردو کے لسانی عناصر کو ابھارا ہے۔ اس مقالہ کو ڈاکٹر وصی بختیاری صاحب نے ''اردو کا حکائی ادب - ایک تجزیاتی مطالعہ'' کے عنوان سے منعقدہ میل وشارم سمینار میں پیش کیا۔

قومی یکجہتی کے فروغ میں تراجم کی اہمیت سے انکار نہیں کیا جا سکتا۔ قومی یکجہتی کے لیے

تراجم کی بہت اہمیت پر ایک مقالہ ڈاکٹر وصی بختیاری نے برادر ڈاکٹر ایس محمد یاسر کے ساتھ مشترک طور پر لکھا تھا۔ اسے بھی اس مجموعۂ رطب و یابس میں شامل کیا جا رہا ہے۔

''دبستانِ کڈپہ- شناخت اور امکانات'' یہ ایک قدیم مقالہ ہے جس میں دبستانِ کڈپہ کا ادبی منظر نامہ بڑے شرح وبسط کے ساتھ پیش کیا گیا ہے۔ اس مقالہ کی ادبی افادیت کے پیشِ نظر میرے بے حد اصرار پر اس مقالہ کو اسی مجموعۂ مقالات میں شامل کیا گیا ہے جس کے لیے میں موصوف کا شکر گذار ہوں۔

''اصفا اور صاحبِ اصفاد'' شہر رائے چوٹی کے ایک باوقار شاعر امام قاسم ساقی کے شعری مجموعہ ''اصفاد'' پر تبصرہ ہے۔ اس مختصر تحریر میں صاحبِ اصفاد کی شعری خوبیوں اور شخصیت کی جھلکیوں کو پیش کرنے اور ان کے ادبی مذاق کو جلا بخشنے کی سعی کی ہے۔

ڈاکٹر وصی بختیاری صاحب، صاحبِ طرز ادیب اور نثر نگار ہیں۔ خود شاعر ہونے کی وجہ سے شعری محاسن و معائب کو باریک بینی سے پرکھنے کا ملکہ رکھتے ہیں۔ اسی طرح آپ کی نثر بھی لفظیات کے پیکر میں ڈھل کر بارش کے قطرات کی طرح پاک وصاف نظر آتی ہے۔ مترادفات کی گھن گرج سے دل و دماغ معطر ہو جاتے ہیں۔ قاری کو کسی تشنگی کا احساس نہیں ہوتا۔ اسلوبِ بیان شگفتہ اور شائستہ، طرزِ نگارش عمدہ و اعلیٰ، لفظیات سمندری تموّج کی طرح، یکے بعد دیگرے صف بستہ نظر آتے ہیں۔ اس قسم کی عمدہ نثر کی بہترین مثالیں، اس مجموعۂ مقالات میں ہمیں جا بجا نظر آتے ہیں۔

ع اللہ کرے زورِ قلم اور زیادہ!

اللہ تعالیٰ موصوف سے اسی طرح علمی خدمات لیتا رہے اور متلاشیانِ علم و ادب کو سیراب کرتا رہے۔ آمین۔

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اکبر الہ آبادی گوشے ساحر لدھیانوی

مدیر

ڈاکٹر شہاب ظفر اعظمی

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وائس چانسلر، پٹنہ یونیورسٹی

مدیر

ڈاکٹر شہاب ظفر اعظمی

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''اکبر الہ آبادی کی غزل گوئی'' پر توسیعی خطبہ پیش کرتے ہوئے پروفیسر علی احمد فاطمی
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مجلس مشاورت

ڈاکٹر سورج دیو سنگھ — ڈاکٹر محمد نوشاد احمد

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ڈاکٹر شیخ فاروق باشا

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کلام اکبرالہ آبادی میں مزاحمتی رویہ

لسان العصر اکبرالہ آبادی کی ولادت اس وقت ہوئی جب کہ سلطنت مغلیہ کا آخری چراغ ٹمٹا رہا تھا۔ ایسٹ انڈیا کمپنی کا ظالم شکنجہ تقریباً سارے ہندوستان کو جکڑ چکا تھا۔ ۱۸۵۷ء کی ناکام بغاوت کے بعد ہندوستانیوں کی رہی سہی طاقت توڑ دی گئی۔ اس وقت اکبرالہ آبادی کی عمر صرف گیارہ سال تھی۔ انگریزوں کے ظلم واستبداد کا نقش ہمیشہ کے لیے ان کے دل و دماغ پر مرتسم ہوگیا۔ بغاوت کے بعد ہندوستانی خصوصاً مسلم قوم انگریزوں کے عتاب کا شکار رہی۔ خوف ودہشت، ذلت و رسوائی، فقر و فاقہ اور غلامی ومحکومی ان کا مقدر بن گئی۔ اسی زمانے میں محسن قوم وملت سرسید احمد خاں نے محسوس کیا کہ انگریزی حکومت سے مبارزت کے بجائے مصالحت کا رویہ اپنانا چاہیے، عداوت کے بجائے رفاقت کا راستہ اختیار کیا جائے، سرسید نے اپنی قوم کو مغربی علوم سے استفادہ کرنے کی تلقین کی۔ اس سلسلہ میں ان کے تعلیمی کارنامے ہمیشہ یاد رکھے جائیں گے۔

ہندوستان پر انگریزی حکومت کا جب پوری طرح تسلط ہو چکا تو انہوں نے مسلم قوم پر طرح طرح کے مظالم شروع کر دیے۔ قتل وغارت گری کا بازار گرم ہوگیا، سرکاری ملازمتوں سے انہیں کنارہ کش کیا گیا، جاگیریں، مناصب اور وظیفے ختم کر دیے گئے۔ بہت سے لوگوں کو کالے پانی کی سزا سنائی گئی۔ کل تک جو برسر اقتدار تھے آج وہ محکوم، مجبور اور مقہور ہو گئے۔ بقول میر تقی میرؔ

دلی میں آج بھیک بھی ملتی نہیں انہیں
تھا کل تلک دماغ جنہیں تخت و تاج کا

مغربی نظام تعلیم کا رواج، مغربی تہذیب کا جنون، مغرب کی کورانہ تقلید، عریانیت اور فیشن پرستی، اختلاط مرد وزن، الحاد پرستی، مفاد پرستی، غلامانہ ذہنیت، عیسائیت کی تبلیغ جیسے امور ہندوستان میں پنپ رہے تھے جن کی رو ک تھام کے لیے اکبرالہ آبادی کو شدید مزاحمت کرنی پڑی۔ مزاحمت، مصالحت اور مفاہمت کی ضد ہے۔ چونکہ بر سر اقتدار حکومت کے خلاف مزاحمت ہے اس لیے انہوں نے راست اور سنجیدہ تیر ونشتر چھوڑنے کے بجائے طنز و مزاح کا اسلوب اختیار کیا۔ برسر اقتدار حکومت کے خلاف، آواز اٹھانا، ناخوشگوار اور ناسازگار حالات میں صدائے حق بلند کرنا، گویا اپنی موت کو آواز دینا تھا۔ لیکن اکبرالہ آبادی نے یہ کام بڑی خوبی اور ہمت سے کیا۔ کبھی اشارے

اور کنایے میں مزاحمت کی، کبھی دبے الفاظ اور دھیمے لہجہ میں، کبھی کھل کر بھی مزاحمتی رویہ اختیار کیا اور مختلف اشاروں ،علامتوں اور استعاروں میں اپنی مزاحمت پیش کی۔ چند علامتیں پیش ہیں۔

بت، انگریزوں کی علامت، پیر اور مرشد، سر سید احمد خاں کی علامت، اونٹ مسلمانوں کی، گائے ہندوؤں کی، برہمن ہندوؤں کی مذہبی جماعت کا نمائندہ، جہاز اور کشتی ملک کی، زاغ اور الو انگریزوں کے نقالوں کی، بدھو عام مسلمانوں کی علامت ہے۔ اکبر نے ان علامتوں کو بعض جگہ واضح بھی کیا ہے۔

بدھو سے صرف ہند کا مسلم مراد ہے — مقصود عاجزی ہے غرور اک فساد ہے
دل مرا جس سے بہلتا ،کوئی ایسا نہ ملا — بت کے بندے ملے ،اللہ کا بندہ نہ ملا
واہ کیا راہ دکھائی ہے ہمیں مرشد نے — کردیا کعبے کو گم اور کلیسا نہ ملا

رشید احمد صدیقی اکبر الہ آبادی کے مزاحمتی رویہ کے تعلق سے کہتے ہیں۔

''حوصلہ وہوس کی، الفت وآویزش کی، پیش قدمی و پسپائی کی، شور وسکوت کی اور سود وزیاں کی اکبر کی شاعری میں جلوہ گری ہے۔ کہیں خفی، کہیں جلی، کہیں شگفتہ، کہیں حزیں لیکن ہر جگہ دلنشیں، اس عہد کے سیاسی شعور کو سمجھنے کے لیے اکبر کے کلام سے ہر طرح کی مدد لی جاسکتی ہے، شاید اتنی قیمتی مد کہیں اور سے حاصل بھی نہیں ہوسکتی''۔

اکبر الہ آبادی نے سب سے زیادہ مغربی تہذیب سے مزاحمت کا رویہ اپنایا ہے۔ وہ مشرقی تہذیب کے دلدادہ تھے اور مشرقی تہذیب کی اساس اور بنیاد، مذہب، روحانیت اور اخلاق پر ہے۔ مغربی تہذیب کی بنیاد الحاد ،مادیت اور فحاشی پر ہے۔ اکبر اپنی قوم کو اس تہذیب کی پرچھائیوں سے بچانا چاہتے تھے۔ یہ امر مسلم ہے کہ محکوم قوم بہت جلد حاکم قوم کی کورانہ تقلید کرتی ہے۔

مغربی تہذیب کی اندھی تقلید کے خلاف اردو زبان کے بہت سے ادیبوں اور شاعروں نے مزاحمتی رویہ اپنایا ہے لیکن اس سلسلہ میں شاعر مشرق علامہ اقبال اور اکبر الہ آبادی سب سے پیش پیش نظر آتے ہیں۔ علامہ اقبال کی مزاحمت کی ایک مثال ملاحظہ ہو۔

تمہاری تہذیب اپنے خنجر سے آپ ہی خود کشی کرے گی
جو شاخ نازک پہ آشیانہ بنے گا نا پائیدار ہوگا

اکبر الہ آبادی نے بھی جابجا اپنے کلام میں طنز ومزاح کے پیرائے میں مغربی تہذیب پر وار کیا ہے۔ وہ کہتے ہیں۔

مرید دہر ہوئے وضع مغربی کرلی — نئے صنم کی تمنا میں خودکشی کرلی
تھے کیک کی فکر میں سو روٹی بھی گئی — چاہی تھی شے بڑی سو چھوٹی بھی گئی

واعظ کی نصیحتیں نہ مانیں آخر پتلون کی تاک میں لنگوٹی بھی گئی

اکبر الہ آبادی کو یہ خوف شدید تھا کہ مغربی تہذیب وتمدن مسلم قوم کو اخلاقی انحطاط کے سمندر میں ڈبو دے گی۔ آخر ہوا بھی یہی۔

نئی تہذیب سے ساقی نے ایسی گرمجوشی کی کہ آخر مسلموں میں روح پھونکی بادہ نوشی کی

ایک اور جگہ کہتے ہیں:

تہذیب نو کے رنگ پر بلبل بنے ہیں سب واللہ کیا بہار ہے اس سبز باغ میں

یہ موجودہ طریقے راہی ملک عدم ہوں گے نئی تہذیب ہوگی اور نئے ساماں بہم ہوں گے

اکبر الہ آبادی ایک مشرقی تہذیب کے پیروکار اور مذہب پسند شخص تھے، مغربی تہذیب کی اندھی تقلید سے انہیں مشرقی تہذیب کے اعلی اقدار خطرے میں دکھائی دے رہے تھے، بے حیائی اور فیشن پرستی کی وبا عام ہو رہی تھی۔ حقوق نسواں اور مساوات مرد وزن کی آڑ میں مغربی دنیا نے خواتین کو سڑکوں پر مردوں کے برابر لا کھڑا کر دیا تھا۔ اکبر نے خواتین کو عریانی اور فحاشی سے بچنے کی تلقین کی ہے۔ ایک رباعی میں خواتین کی بے حیائی اور بے حجابی کے تعلق سے کہتے ہیں۔

بے پردہ کل جو آئیں نظر چند بیبیاں اکبر زمیں میں غیرت قومی سے گڑ گیا

پوچھا جو ان سے آپ کا پردہ وہ کیا ہوا کہنے لگیں کہ عقل پہ مردوں کی پڑ گیا

برطانوی حکومت نے حصول اقتدار کے بعد اس بات کی کوشش کی کہ مشرقی طرز تعلیم کا سد باب کیا جائے تا کہ ان میں مذہب سے بیزاری، قدامت پسندی اور اعلی اقدار کا فقدان ہو چنانچہ انہوں نے مغربی طرز تعلیم ہندوستان بھر میں رائج کرنا شروع کر دیا۔ جدید فلسفہ اور سائنسی علوم کو عام کر دیا تا کہ مذہبی عقائد اور روایات کی قدر ومنزلت کم ہو۔ مسلمانوں میں مغربی تہذیب کے پیروکار اور تقلید کرنے والے پیدا ہوں۔ برطانوی حکومت کے لیے کم تنخواہ پر کام کرنے والے ملازمین ہندوستان ہی میں مل جائیں، انگلستان سے نہ منگوانا پڑے اور یہ فکر دی گئی کہ برطانوی تہذیب اور معاشرت خوشحالی اور ترقی کی علامت ہے اور مشرقی تہذیب تنزلی وانحطاط کی علامت، ان مقاصد کے حصول کے لیے نئے تعلیمی نصاب اور نئی تعلیمی پالیسوں کو نافذ کیا گیا۔ ایسے میں اکبر الہ آبادی کو اس بات کا شدید احساس تھا کہ نئی تعلیمی پالیسی سے تہذیب وتمدن، دینی وملی غیرت، ہمدردی اور رحمدلی ختم ہو جائے گی۔ محض دولت حاصل کرنا، ڈگری پانا، نوکری کرنا اور پنشن لینا ہو جائے گا۔ ان خیالات کا کھل کر اپنی شاعری میں اظہار خیال کیا ہے۔ کہتے ہیں:

میں کیا کہوں احباب کیا کار نمایاں کر گئے بی اے کیا، نوکر ہوئے، پنشن ملی اور مر گئے

ایک اور شعر یوں ہے۔

پڑھ کر انگریزی میں دانا ہوگیا ''کم'' کا مطلب ہی کمانا ہو گیا

اکبرالہ آبادی کے خیال میں تعلیم وہ واحد ذریعہ ہے جس سے قوموں کے قلوب واذہان کو غلام بنایا جاسکتا ہے، یہ ایسا مؤثر ہتھیار ہے جو قتل وخون سے بھی زیادہ اہمیت رکھتا ہے۔ اپنے ایک مشہور شعر میں اس خیال کو اس طرح پیش کرتے ہیں۔

یوں قتل سے بچوں کے وہ بدنام نہ ہوتا افسوس کہ فرعون کو کالج کی نہ سوجھی

قوم کے تعلیمی رہنما اور سماجی مصلح سرسید احمد خاں کے تعلیمی افکار سے اکبرالہ آبادی مطمئن نہیں تھے کیونکہ ان کے خیال میں علی گڑھ کا تعلیمی مرکز ظاہری چمک دمک اور دنیاوی ترقی کی حد تک محدود ہو گیا تھا۔ یہاں کے تعلیم یافتہ مادیت اور عقلیت کو سب کچھ سمجھ رہے تھے۔ وہ سرسید اور علی گڑھ کو ہدف تنقید بناتے ہوئے کہتے ہیں۔

ابتدا کی جناب سید نے جن کے کالج کا اتنا نام ہوا
انتہا یونیورسٹی پر ہوئی، قوم کا کام اب تمام ہوا

اس فکر کی طرف اشارہ کرتے ہوئے کہتے ہیں

پانی پینا پڑا ہے پائپ کا حرف پڑھنا پڑا ہے ٹائپ کا
مل کا آٹا ہے نل کا پانی ہے آب و دانہ کی حکمرانی ہے

مغربی علوم وفنون، کے خلاف مزاحمتی رویہ کو دیکھ کر کوئی یہ خیال نہ کرے کہ اکبر جدید تعلیم اور علوم وفنون، صنعت وحرفت کے مخالف ہیں۔ انہوں نے صرف تعلیم کے نام پر مرد وزن کے اختلاط، بے پردگی، مغربی فیشن پرستی اور ناچ گانے پر چوٹ کی ہے۔ ہر حال میں دینی مزاج اور مذہب کو قابل نمونہ سمجھنے کی تلقین کی ہے۔ ان کے چند اشعار اس بات کی غمازی کرتے ہیں۔

وہ باتیں جن سے قومیں ہو رہی ہیں نامور سیکھو اٹھو تہذیب سیکھو، صنعتیں سیکھو، ہنر سیکھو
بڑھاؤ تجربے، اطراف دنیا میں سفر سیکھو خواص خشک و تر سیکھو علوم بحر و بر سیکھو

دینی غیرت اور حمیت کو ابھارتے ہوئے کہتے ہیں۔

خدا کے واسطے اے نوجوانو، ہوش میں آؤ دلوں میں اپنی غیرت کو جگہ دو، جوش میں آؤ

ایک اور جگہ اسی خیال کو پیش کرتے ہوئے مذہب اور دین کو سرچشمہ ہدایت سمجھنے کی تلقین کرتے ہیں۔

تم شوق سے کالج میں پھلو، پارک میں پھولو جائز ہے غباروں میں اڑو، چرخ پہ جھولو
بس ایک سخن بندہء عاجز کا رہے یاد اللہ کو اور اپنی حقیقت کو نہ بھولو

اکبرالہ آبادی اس خیال کی پرزور مخالفت کرتے ہیں کہ انگریز جہاں جائیں گے وہاں سائنسی ایجادات اور ٹکنالوجی ترقی کرے گی۔ ایجادات ان ملکوں میں بھی ہیں جہاں انگریز حکمران نہیں ہیں۔ جدید ایجادات کی

مخالفت انہوں نے کبھی نہیں کی بلکہ اس کے سیکھنے پر ابھارا ہے۔ وہ کہتے ہیں۔

عزم کر تقلید مغرب کا ہنر کے زور سے
لطف کیا جو لد لیے موٹر پر زر کے زور سے

ان کے علاوہ الحاد پرستی کے خلاف بھی ان کی مزاحمت قابل قدر ہے۔ وہ کہتے ہیں۔

صدائے الحاد اٹھ رہی ہے خدا کی اب یاد اٹھ رہی ہے
دلوں سے فریاد اٹھ رہی ہے کہ دین سے ہم گزر رہے ہیں

غرض اکبر الہ آبادی نے اپنے قلم و قرطاس کے ذریعہ ہر اس ناخوشگوار اور نامناسب رویے کے خلاف مزاحمت کی جو ہمارے ملک میں پنپ رہے تھے، سماجی برائیوں، معاشرتی ناہمواریوں اور ناانصافیوں کے خلاف آواز اٹھائی، حالانکہ وہ حکومت کے اعلیٰ عہدوں پر قائم رہے اس کے باوجود حکومت کے خلاف صدائے احتجاج بلند کیا۔ اور یہ کہنا بے جا نہ ہوگا کہ اردو کے مزاحمتی ادب میں اکبر الہ آبادی کا احتجاجی اور مزاحمتی رویہ بہت توانا دکھائی دیتا ہے۔

بہار کی بہار (جلد اول و دوم)

مصنف۔ پروفیسر اعجاز علی ارشد

بہار کی ادبی و تہذیبی تاریخ کا دستاویزی سلسلہ

ملنے کا پتہ

بک امپوریم، سبزی باغ، پٹنہ ۸۰۰۰۰۴

اردو اسکالرس کی دنیا

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اردو لغت نویسی میں مستشرقین کا رول

ڈاکٹر شیخ فاروق باشا
اسسٹنٹ پروفیسر، شعبۂ اردو، گورنمنٹ ڈگری کالج، رائے چوٹی، ضلع کڈپہ، آندھرا پردیش۔ انڈیا

ہندوستان میں مسلم فاتحین کی آمد کے بعد جس طرح ترسیل خیالات کا مسئلہ پیدا ہوا اسی طرح سولہویں صدی میں یوروپی اقوام جیسے برطانیوں، فرانسیسوں اور پرتگالیوں کی ہندوستان میں آمد کے بعد بھی یہی مسئلہ درپیش ہوا۔ چنانچہ لغت نگاری کی شدت سے کمی محسوس ہوئی۔ چنانچہ مستشرقین نے لغت نویسی کے بنیادی کام کیے ان لغات سے جہاں اردو سیکھنے والے انگریزوں کو فائدہ ہوا وہیں اردو اور انگریزی اور دیگر زبانوں کے جاننے والوں کو بھی بیش بہا فائدہ ہوا۔

مستشرقین کو اردو لغت نویسی کے سلسلہ میں مواد کی عدم دستیابی، وسائل کی کمی اور مختلف مشرقی زبانوں کے ماخذ و مصادر کے صحیح نتائج تک رسائی جیسے مشکل امور کا سامنا کرنا پڑا، اس کے باوجود انہوں نے بڑی محنت، عرق ریزی اور تحقیقی کاوشوں سے بہت حد تک کامیابی حاصل کی۔ اور اس سلسلہ میں دیانت و امانت سے کام لیا اور اردو لغت نویسی کے لیے مضبوط بنیادیں فراہم کیں۔ مستشرقین کی اردو لغت نگاری کی خدمات تاریخی اعتبار سے اس طرح ہیں۔

1630ء میں پہلی چہار لسانی لغت (فارسی، ہندوستانی، انگریزی، پرتگالی) سورت کے انگریزی کارخانے میں لکھی گئی جس کو مستشرقین کی پہلی فرہنگ کہا جاسکتا ہے۔ اس لغت کا تذکرہ گریرسن (Greeson) نے مسٹر کورج (Coridge) کی اورینٹل کیٹلاگ (Oriental Catalogue) کے حوالے سے کیا ہے جو فی الوقت عدم دستیاب ہے۔ سہ لسانی لغت میں جیرونیمو خاویر Jeronimo xavier کی تصنیف Hindustani Persisch Portugiesisch جو 1599ء سے قبل کی تصنیف یا تالیف ہے یا اسے Vocabularium Portugalico Hindustano Persicum بھی کہتے ہیں۔ اس کا ایک قلمی نسخہ لندن کے King,s college کے کتب خانہ میں محفوظ ہے۔ اس لغت کو اردو کی قدیم ترین سہ لسانی لغت قرار دی جاسکتی ہے گریرسن Greerson نے ایک اور قدیم لغت کا تذکرہ کیا ہے جو 1704ء کے لگ بھگ لکھی گئی۔ مولوی عبدالحق نے پروشیا کا باشندہ جان جوشوا کٹلر (Joshuas Axteler) کی تالیف کی نشاندہی کی ہے جو۔ 1715ء کی تالیف ہے۔ اس تالیف کو ڈیوڈمل نے 1743ء میں شائع کیا۔ اس میں ہندوستانی الفاظ و محاورات رومن حروف میں اور املا ڈچ طریقے پر ہے اسی طرح سترھویں اور اٹھارہویں صدی میں مستشرقین نے اپنی نجی ضرورتوں، مذہبی یا تبلیغی مقاصد کے پیش نظر لکھیں۔ Antanio de Saldanha کی دعاؤں کی کتاب جس میں ہندوستانی لغات بھی شامل ہے۔ اگناشیو اکارمونے Agnacio Arcamone کی قواعد کی کتاب جس میں لاطینی، کانکنی لغت اور دکنی زبان کی خصوصیتوں پر مضمون شامل ہے۔ ایک اور مستشرق جان دپیڈوزا (S.J.depodaza) 1640 تا 1672 کی تالیف Inistrue -Sampava Comfissa & sacramontal Enlingue Indostantion

بھی سترھویں صدی کے وسط کی ایک ہندوستانی لغت کا قابل ذکر نمونہ ہے۔

جان ہیڈلے نے 1772ء میں صرف ونحو مع فرہنگ انگریزی واردو شائع کی جس میں اردو الفاظ فارسی رسم خط میں لکھے گئے ہیں، جاج فرگوسن کی انگریزی اردو۔اردو۔انگریزی لغت A short Dictionary of the Hindustani Language 1773ء میں شائع ہوئی۔ہنری ہیریسکی انگریزی۔ہندوستانی لغت 1790ء میں شائع ہوئی۔

اٹھارہویں صدی عیسوی میں انگلستان اور فرانس میں سیاسی تسلط کے لیے رسہ کشی شروع ہوئی جس کے نتیجے میں انگلستان نے ہندوستان کے شمال مشرق یعنی کلکتہ کو اپنا مرکز بنایا تو فرانسیسیوں نے دکن کو ترجیح دی۔فرانسیسیوں نے سیاح اور مبلغین کی مدد سے کثیر لسانی لغت کی طرف توجہ دی جن کی ضرورت مذہبی کم، سیاسی زیادہ تھی 1785ء میں فرانسیسی علماء کی مدد سے کاپوچن مشنری میں ایک چہار لسانی لغت (لاطینی، ہندی، فرانسیسی ،اردو) تیار کی جس کو بنیاد بنا کر Garscin de Tassi گارسین دتاسی کے شاگرد دولونکل نے 1876ء میں ندوستان فرانسیسی ،فرانسیسی ہندوستانی لغت کی پہلی قسط شائع کی اسی طرح فرانسیسی مشنریوں نے کئی ایک فرہنگیں تالیف کیں جن میں گیوسامار یا (Givsappe Maria de Berninide Gargano) کی ہندی، لاطینی، اطالوی لغت، فادر کاسیانو Fr.Cassian de macerate کی اطالوی لغت اور ترائی گوئی روس (Euganio Trigueiros) 1687ء تا 1741ء کی کتاب اجزائے ہندوستانی لغت Freagmatode vocalulario de lingua Indostana سیلافس کی ہندوستانی حروف تہجی کی کتاب جس میں قواعد اور لغات کے علاوہ عیسائی عقاید درج ہیں اسی کی ایک اور تصنیف اطالوی، ہندوستانی، ہندوستانی، اطالوی لغت Vocabulario Italiano Indostano and Indostano Italicno قابل ذکر ہے۔

ادھر شمال مشرق میں برطانوی سامراج نے ملک گیری کی ہوس میں ہندوستانی عوام کی زبان کی طرف توجہ دی۔لیکن فرہنگ نویسی میں ان کی خدمات کو اس وقت جب کہ فرہنگ نویسی کے ابتدائی کام ہو رہے تھے کسی بھی طرح فراموش نہیں کیا جا سکتا۔

برطانوی مستشرقین میں جان بارتھوک گل کرسٹ (John Borthwick Gilchrist) کی خدمات بہت زیادہ ہیں۔جن کا زمانہ (1759ء تا 1842ء) تھا ان کو مستشرقین میں اس طرح امتیاز حاصل ہے کہ انہوں نے لغت اور قواعد دونوں میں اپنے محدود وسائل کے باوجود انتھک محنت سے بے مثال کارنامے انجام دیئے۔ان کی انگلش ہندوستانی لغت "English Hindoostanee Dictionary" پہلی بار 1786ء میں کلکتہ سے اس کا پہلا حصہ شائع ہوا۔گلکرسٹ نے لغت کے پہلے ایڈیشن میں رومن املا بروئے کار لایا تھا۔گلکرسٹ نے اس لغت کی ترتیب و تالیف میں اپنی تمام تر صلاحیتوں کو بروئے کار لایا ۔اس کی محنت اور تحقیق کا اندازہ اس بات سے بخوبی لگایا جا سکتا ہے کہ اس نے انگریزی الفاظ کے کثیر مترادفات لکھے ہیں۔مثلاً لفظ Honour کی وضاحت بتیس الفاظ سے کی ہے۔آبرو، عزت، حرمت، نام، وقر، پت، اعزاز، افتخار، اعتبار، وقار، بزرگی، عظمت، بڑائی، شان، اوج، شکوہ، مرتبہ، منزلت، پایہ، منصب، درجہ، سرفرازی، حمیت، غیرت، ننگ آن بان، ادب، تکریم، احترام، تعظیم، آدر ،مان، آرائش، زیب، حقوق، ننگ وناموس۔کہیں کہیں کثرت مترادفات کے چکر میں ان سے غلطی بھی ہوئی ہے۔

Prejudice کے ۱۹ مترادفات اس طرح لکھتے ہیں:

اعتقاد، تعصب، بدگمانی، بدزنی، مضرت، ضرر، نقصان، طرفداری، رغبت، حسن ظن، عقیدہ، عقدہ، گرہ، کھرچی، گانٹھ، گھاٹا، دغدغہ، خلش، اینٹھ۔(بحوالہ گلچرسٹ اینڈ دی لینگویز آف ہندوستان، صدیق الرحمٰن قدوائی۔ص ۹۹)

بعض الفاظ کے معانی میں بھی لغزشوں کا سامنا کرنا پڑا۔ جیسے Self conceited کا معنی من موجی Self praise کا معنی خود فروشی Presumption کا لن ترانی۔ انکل پچو Tohumble چنگا۔ بنانا۔ Flexible کا معنی چمڑا۔ لکھا گیا ہے۔

لفظ Poem کے معانی، قطعہ بند، ریختہ، مثنوی، قصیدہ، غزل، واسوز، ترجیع بند کے ساتھ سوز و گداز کو بھی شامل کیا ہے۔ اس طرح معانی میں اصناف نظم اور خصوصیات نظم کو بھی شامل کر دیا ہے۔ گل کرسٹ نے اپنی بات کی وضاحت کے لیے قدما کے اشعار شواہد کے طور پر پیش کیا ہے جہاں اس نے ذاتی قیاس کیا ہے اس میں چند لغزشوں کا بھی شکار بھی ہوا ہے۔ جیسے عیسوی کلینڈر کا تقابل مشرقی کیلنڈر سے کرنے کے نتیجے میں March کی وضاحت ربیع الاول اور بارہ فات اور September کو ماہ صیام اور روزے کا چاند۔ لکھا ہے۔ اسی طرح تاریخی غلطیوں میں ملکہ نور جہاں کو شاہ جہاں کی بیوی بھی لکھا ہے۔

بعض الفاظ کی تفہیم میں اشعار، محاورات وضرب الامثال سے بھی کی گئی ہے۔ جیسے:

bitten کی مفہوم کی وضاحت اس طرح کی ہے۔ سانپ کا کاٹا سوئے -- بچھی کا کاٹا روئے

اسی طرح بہت سے الفاظ کا مختلف تلفظ بھی دیا گیا ہے جسے عوام مختلف طرح مختلف مقامات پر ادا کرتے ہیں جیسے: سر۔ سر۔ سر۔ سر۔ اور سکھن۔ سخن۔ سخن۔ سخن۔

گلکرسٹ کی لغت کی خصوصیت یہ ہے کہ اس نے ہر مترادف کے ساتھ اس کی اصلی زبان کا مخنف بھی دیا ہے جیسے ۔عربی کے لیے ''a'' فارسی ے لیے ''p'' ہندی کے لیے ''h'' دیا ہے۔

گلکرسٹ کی لغت ہندوستانی ڈکشنری کا کمزور ترین پہلو تعصبانہ طرز فکر بھی ہے جس کی وجہ سے انہوں نے ہندوستانیوں اور انگریزوں کو دو حصوں میں تقسیم کیا ہے۔ انگریزوں کو ہندوستانیوں سے محتاط رہنے کی ہدایت دی ہے۔ مسعود ہاشمی نے اسے ''ہدایت نامہ فرہنگ'' بھی کہا ہے۔

مجموعی طور پر گلکرسٹ کی ڈکشنری اردو لغت کے ارتقا میں اہمیت کی حامل ہے۔ ابتدائی کام میں خامیوں کے پائے جانے کا امکان ہوتا ہے۔ لیکن ان کی وجوہات پر نظر ڈالیں تو معلوم ہوتا ہے کہ انہیں lack of perspective اور مواد اور ماہرین فن کی عدم دستیابی جیسے مشکل امور کا سامنا کرنا پڑا۔ اس کے علاوہ ڈکشنری کی تیاری فورٹ ولیم کالج کے قیام سے پہلے ہوئی تھی جبکہ ابھی ماہرین فن کو یکجا نہیں کیا گیا تھا۔

جان ۔ٹی ۔پلیٹس ۔(Platts) گلکرسٹ کے بعد ایک اہم لغت نویس ہے ۔اس کی لغت A Dictionary of urdu classical Hindi & English ہے اس لغت نے آئندہ آنے والوں کے لیے راہیں متعین کیں۔ اپنی لغت کے جواز میں پلیٹس نے متقدمین کی لغزشوں کو وضاحت کے ساتھ بیان کیا ہے ۔ وہ لکھتا ہے فاربس کی لغت کی تالیف کے بعد مزید نئے الفاظ وجود میں آئے ۔بیٹس (Bates) کی لغت ماخذ لسانی کا تعین نہیں کر سکتی ۔فیلن کی لغت میں ادبی گریز پائی اور الفا ظ ومحاورات کی عدم شمولیت جیسی خامیاں ہیں۔

پلیٹس کی لغت اصل میں اردو، انگریزی ہے۔ ہندی کو اس کی ضمنی اور ثانوی حیثیت ہے۔ ڈاکٹر نذیر آزاد رقم طراز ہیں ''کہ اندراجات کی ترتیب میں یہ لغت جدید لغت نگاری کے نقیب کی حیثیت رکھتی ہے۔'' اس لغت میں مفردات کے علاوہ لاحقوں سے بننے والے مرکبات کو اندراج کیا گیا ہے جیسے زمین سے زمیندار۔ زمینداری۔ وغیرہ اسی طرح یکساں املا لیکن تلفظ اور معنی کی بنیاد پر الفاظ کو الگ الگ درج کیا گیا ہے۔ مثلاً مظہر (اسم فاعل بمعنی ظاہر کرنے والا) مظہر (اسم مفعول بمعنی ظاہر کیا ہوا) اور مظہر (اسم ظرف بمعنی ظاہر ہونے کی جگہ) کو الگ الگ راس لفظ کے طور پر لکھا گیا ہے اسی طرح الفاظ کی معیاری (Standard) عوامی (vulgar) اور بگڑی ہوئی شکل (Corrupt) بھی دی گئی ہے۔ ڈاکٹر حنیف کیفی اس لغت

کے بارے میں لکھتے ہیں

''یہ لغت سازی کے سائنسی اصولوں کی بدولت نہ صرف انگریزی کے زبان دانوں بلکہ اردو کے اہل زبان کے لیے بھی ایک نمونہ ہے''۔
(اردو لغت نگاری روایت وارتقا ص۔ ۱۷۱)

پلیٹس کی خوبیوں کے باوصف اس کی خامیوں پر بھی نکتہ چینی کی گئی ہے۔ وارث سرہندی پلیٹس کی لغت کے بارے میں لکھتے ہے'' علوم شعری میں عدم مزاولت کی بڑی مثال ہے اصناف سخن کا صحیح درک اس میں مفقود ہے یہ اس کا کمزور پہلو ہے''۔ (ایضاص۔۱۷۳)
مجموعی طور پر پلیٹس کی لغت کی یہ خوبی ہے کہ اس کی لغت کا مقصد نہ سیاسی نہ تجارتی تھا بلکہ خالص تعلیمی اور لسانی مقاصد کو سامنے رکھ کر اس نے لغت لکھی مزید خوبی یہ ہے کہ اس کو اپنی غلطیوں کی اصلاح میں کسی بھی قسم کی ہچکچاہٹ نہیں تھی۔

کپتان جوزف ٹیلر نے ایک لغت A Dictionary Hindoostani and English اپنے ذاتی استعمال کے لیے 1805ء میں لکھی تھی۔ ڈاکٹر ولیم ہنٹر نے فورٹ ولیم کالج کے اساتذہ کی مدد سے 1808ء میں شائع کیا۔ اس لغت کو بنیاد بنا کر جان شکسپئر نے ہندوستانی انگریزی ڈکشنری کا پہلا ایڈیشن 1817ء میں شائع کیا بعد میں 1834ء میں جو ایڈیشن شائع ہوا اس کی خصوصیت یہ ہے کہ وہ تمام انگریزی الفاظ اشاریے میں جمع کیے گیے ہیں جو اردو الفاظ کے مترادفات کے طور اصل لغت میں درج ہیں۔ 1849ء میں چوتھا ایڈیشن شائع ہوا جس میں اشاریے کو باضابطہ طور پر لغت (انگریزی اردو) میں تبدیل کیا گیا۔ یعنی یہ تالیف ہندوستانی۔ انگریزی اور انگریزی۔ ہندوستانی ڈکشنری، یعنی دو لغات کی ایک جامع شکل اختیار کر گئی۔ یہ لغت اپنے وقت کی ایک جامع لغت تھی۔

اس روایت کے ارتقا میں جے ٹی ٹامسن کی انگریزی۔ اردو ڈکشنری (1836) اے۔ سی۔ ڈی۔ روزاریو کی انگریزی۔ بنگالی۔ اردو۔ سہ لسانی ڈکشنری (1837) کپتان رابرٹ شیڈون ڈولی کی جیبی انگریزی۔ ہندوستانی۔ ڈکشنری (1846) این براٹس کی مدون کردہ ہندوستانی۔ انگریزی ڈکشنری (1847 کلکتہ) ولیم ہیٹس کی ہندوستانی۔ انگریزی ڈکشنری (1847 لندن) قابل ذکر ہیں۔

ڈنکن فاربس (Duncan Forbes) کی Dictionary Hindustani and English 1848ء میں لندن سے شائع ہوئی۔ اس ڈکشنری کی خصوصیت اور اہمیت پر اظہار کرتے ہوئے نذیر آزاد لکھتے ہیں۔

''فاربس کی محنت کا اندازہ اس بات سے لگایا جاسکتا ہے کہ اس لغت کے اردو ہندی ماخذات میں مستشرقین کی تصنیفات مثلاً ولیم ہنٹر کی ہندوستانی انگریزی ڈکشنری (1808 کلکتہ) گل کرسٹ کی کتاب Hindee moral Preceptor (لندن 1821) گلیڈون کی فرہنگ Dictionary of Mohamedan law and Bengal Revenueterms (کلکتہ 1767) H.M Eliot کی AGlossary of Indian Terms اور ڈاکٹر آدم کی Hindi Dictionary کے علاوہ ہندوستانی مصنفین کی کتابیں مثلاً ''پریم ساگر'' (ہندی) انوار سہیلی (دکنی) اور قانون اسلام (اردو) وغیرہ شامل ہیں۔ (بحوالہ اردو لغت نگاری: روایت وارتقا ص ۱۶۶)

Dr.S.W.Fallon کی Hindustani -English Dictionary بنارس اور لندن سے 1879ء میں شائع ہوئی۔ یہ لغت جدید اصولوں پر مبنی ہے اور پہلی بار اس میں بول چال کی زبان، عورتوں کی زبان، گیتوں، کہاوتوں، پہیلیوں اور لوک کہانیوں سے ماخوذ الفاظ استعمال کیے گیے ہیں۔ عوامی بول چال سے قریب ہونے کی وجہ سے علمی وادبی الفاظ پر زیادہ زور نہیں دیا گیا ہے۔ فارسی اور عربی الفاظ کے تلفظ اور ماخذ کے حوالے سے غلط نتائج اخذ کیے گیے۔ فحش الفاظ کے اندراج کی وجہ سے پہلے تنازع کا شکار بھی رہی بعد میں جدید اصولوں کی رو سے وہی خامی خوبی

قرار دی گئی۔ ڈاکٹر فیلن کی ایک اور ڈکشنری ''انگلش ہندوستانی ڈکشنری 1883'' میں لندن اور بنارس سے شائع ہوئی۔ اس کی خوبی یہ ہے کہ انگریزی نظم ونثر کے اقتباسات اور ان کے اردو ترجمے کیے گیے۔ اسی طرح انگریزی شاعری کے بہترین انتخاب کا اردو میں منظوم ترجمہ ممکن ہوا۔ اس کے علاوہ یورپی آرٹ، فلسفہ اور سائنس کی اصطلاحات کو عام ہندوستانی میں ترجمہ کیا گیا۔

درجہ بالا مستشرقین کی خدمات سے یہ بات واضح ہوتی ہے کہ ذولسانی اور سہ لسانی لغات کا یہ دور اس لیے اہمیت کا حامل ہے کہ ان لغات کے مولفین کے ساتھ کچھ ایسے ہندوستانی مولفین جیسے چرنجی لال، مولف مخزن المحاورات اور سید احمد دہلوی مولف فرہنگ آصفیہ نے مغربی لغت نویسی کے اصولوں سے استفادہ کیا۔ اس طرح اردو لغت کے لیے بھی راہیں ہموار ہوئیں۔ اور مستشرقین نے بڑی محنت اور جدوجہد سے لغت نویسی کے کام میں بہت حد تک دیانت وامانت سے کام لیا اور اردو لغت نویسی کے لیے مضبوط بنیادیں فراہم کیں۔

☆☆☆

اردو اسکالرس کی دنیا

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چیف ایڈیٹر

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9	کڈپہ کے شعری دبستان کی شناخت اور امکانات ڈاکٹر سید وصی اللہ بختیاری عمری، اسسٹنٹ پروفیسر، شعبہ اردو، گورنمنٹ کالج، رائے چوٹی۔ اے پی۔ انڈیا	35-38
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11	نظم حماد میں رنگینیٔ قوس وقزح (مولانا ابوالبیان حماد عمری) ڈاکٹر شیخ فاروق باشا، لیکچرر، شعبہ اردو، گورنمنٹ کالج، رائچوٹی، آندھرا پردیش۔ انڈیا	44-47

نظم حماد میں رنگینیٔ قوس وقزح (مولانا ابوالبیان حماد عمری)

ڈاکٹر شیخ فاروق باشا
لکچرر، شعبہء اردو، گورنمنٹ ڈگری کالج، راپچوٹی، آندھرا پردیش۔انڈیا

قیام انجمن پنجاب کے بعد اردو نظم نگاری کا قافلہ مولانا الطاف حسین حالی، محمد حسین آزاد اور مولانا شبلی نعمانی جیسے اکابرین ادب کی قیادت میں مستقبل کی طرف جو گامزن ہوا تو اس کی تیز اور دھیمی رفتار نے بہت سے نشیب وفراز دیکھے۔علامہ اقبال اور جوش ملیح آبادی اور ان کے معاصرین نے اس قافلے کو ایک نئی سمت ورفتار، توانائی واستحکام، اسلوب بیان کی ندرت، موضوعاتی وسعت، فکر کی بالیدگی، شعور کی پختگی عطا کی اور ایسے مقام پر لا کھڑا کیا جہاں سے اس کا مستقبل روشن نظر آنے لگا۔مولانا ابوالبیان حماد عمری اسی قافلے کے ایک اہم رکن رکین ہیں۔

مولانا بنیادی طور پر مدرس ہیں لیکن اپنی شاعری کی بدولت نہ صرف برصغیر بلکہ بین الاقوامی شہرت کے حامل ہیں اردو زبان کے مقتدر اور معیاری جرائد ورسائل میں آپ کا کلام زیور طباعت سے آراستہ ہوکر داد وتحسین حاصل کر چکا ہے۔گذشتہ نصف صدی سے آپ کا آفتاب شاعری آسمان اردو پر جگمگا رہا ہے۔''بانگ حرا'' آپ کی نظموں کا مجموعہ کلام ہے جس میں چند حمد ونعت کے گلدستے اور ڈیڑھ سو سے زائد خالص نظمیں شامل ہیں۔اس سے قبل آپ کی نعتوں کا پہلا مجموعہء کلام شائع ہوکر مقبول عام ہو چکا ہے۔

''بانگ حرا'' کی وجہ تسمیہ بتاتے ہوئے مولانا کہتے ہیں۔حامل قرآن، خلوت نشین، غار حرا سے مجھے گہری عقیدت ومحبت ہے اس بنا پر مجموعہء کلام کا نام ''بانگ حرا'' مناسب معلوم ہوا۔

مولانا کو علامہ اقبال سے گہری عقیدت ومحبت ہے۔یہی وجہ ہے کہ فکر اقبال کی کونپلیں یہاں بھی پھوٹتی نظر آتی ہیں۔علامہ اقبال سے الفت کا تذکرہ اس طرح کرتے ہیں۔

خدا نے بخشا ہے حماد کو جو ذوق ادب ہے فیض حضرتِ شاکر ہے منتِ اقبال

علامہ اقبال نے اپنے کلام کے ذریعہ سوئی ہوئی قوم کو خواب غفلت سے جگایا اور ان میں عمل کی تحریک پیدا کی، انسانیت کو محبت کا درس دیا، نوجوانان اسلام کو مغربی تہذیب وکلچر سے اپنے دامن کو پاک وصاف رکھنے کی تلقین کی۔مولانا کے کلام میں بھی انہی افکار وخیالات کی صدائے بازگشت سنائی دیتی ہے۔مولانا کے کلام کی روانی، سلاست اور لفظیات کی بندش دیکھ کر کہیں کہیں اسلوب اقبال کا شائبہ ہونے لگتا ہے جیسے۔

یہ عزم ہمارا محکم ہے، یہ فیصلہ اپنا قطعی ہے
گرتوں کو اٹھا کر چھوڑیں گے سوتوں کو جگا کر چھوڑیں گے

دونوں کے کلام میں زندگی کا تقابل دیکھیے۔

اقبال۔ قلزم ہستی سے تو ابھرا ہے مانند حباب اس زیاں خانے میں تیرا امتحاں ہے زندگی
حماد۔ زندگانی امتحاں ہے ہر بشر کے واسطے اک کسوٹی ہے عیار خیر وشر کے واسطے

اقبال۔ یقین محکم، عمل پیہم، محبت فاتح عالم جہادِ زندگانی میں ہیں یہ مردوں کی شمشیریں

حماد۔ سعیٔ پیہم، عزم محکم، چشم پرنم، درد وغم اس طرح تیار ہوتا ہے قوام زندگی

مولانا ابوالبیان حماد عمری، جامعہ دارالسلام عمر آباد میں ایک طویل عرصہ درس وتدریس میں منہمک رہے۔ بحیثیت مفسر قرآن، شارح حدیث، آپ کی خدمات ناقابل فراموش ہیں۔ ظاہر بات ہے جس کا اوڑھنا بچھونا مذہب ہو اس کی صدائے بازگشت کلام میں سنائی نہ دے یہ امر محال ہوگا۔ اسی لیے جا بجا ہمیں ان کے کلام میں حمد ونعت کے گلدستے اور اسلامی فکر کے تار وپود بہت گہرائی تک پیوست نظر آتے ہیں۔

چند اشعار ملاحظہ ہوں۔

جس میں شان بندگی کچھ بھی نہ ہو وہ زندگی ایک کرب مستقل ہے یا مسلسل اک عذاب

جائزہ لیتا ہے وہ ہر وقت اپنے نفس کا مرد مومن کے لیے ہر روز ہے روز حساب

مذہب پسندی اور اسلامی رنگ مولانا کے کلام کی خاص خوبی ہے۔ لیکن ادبیت کے صاف وشفاف چشمے میں دھل کر کلام میں قوس وقزح کی رنگینی پیدا ہوگئی ہے۔

کوئی بھی شاعر اپنے دور کی بدلتی قدروں اور رجحانات ونظریات سے اپنے دامن کو تر کیے بغیر نہیں رہ سکتا۔ مولانا کے کلام میں عصریت اور وقت کی پکار کی گونج صاف سنائی دیتی ہے۔ امید انقلاب صالح، وقت کا تقاضا، مسلم پرسنل لا، پیغام بیداری، دعوت عمل، حیات نو، دینی انقلاب، مراد آباد فسادات، ترانۂ بنات المومنین، مسجد اقصی، زخم خوردہ ارض فلسطین، بابری مسجد کی شہادت، وغیرہ اسی قبیل کی نظمیں ہیں۔ مراد آباد کے فسادات پر آپ کی رگ حمیت پھڑک اٹھتی ہے۔ کہتے ہیں۔

چمن کی جن کو حفاظت مدام کرنا تھا یہ کیا غضب ہے وہ صیاد بن گئے آخر

سنایا جایے کسے درد وغم کا افسانہ قضاتِ شہر ہی جلاد بن گئے آخر

مولانا کے مخاطبین میں سے ایک اہم طبقہ نوجوانوں کا ہے۔ جن سے انہیں ملک کی تعمیر اور اسلامی تہذیب کی حفاظت وصیانت کے تئیں بہت سی امیدیں وابستہ ہیں۔ آپ کی نظمیں نوجوان طبقہ کے لیے رجائیت کی بہتی نہریں ثابت ہوگی۔ مایوسی اور قنوطیت کے بادل چھٹتے نظر آئیں گے۔ ترانۂ دعوت عمل، پیغام بیداری، نوجوانوں سے خطاب، عزائم، کرنوں کا سفر، بنام طلبائے علم جیسی نظمیں اسی قبیل سے تعلق رکھتی ہیں۔

نظم ''نوجوانوں سے خطاب'' میں کہتے ہیں۔

پھر زمانے کو پیام حق سنا اے نوجواں خواب غفلت سے مسلماں کو جگا اے نوجواں

مشکلات راہ سے ہرگز نہ گھبرا تو کبھی جانب منزل قدم اپنا بڑھا اے نوجواں

اتحاد وامن کا پیغام دے انسان کو ٹوٹنے والوں کو آپس میں ملا اے نوجواں

نظم کے ابتدائی دور میں مقصدیت اور افادیت کا غلبہ رہا۔ پھر رومانیت اور جدیدیت کا زور رہا، اختر الایمان کا استعاراتی نظام، ن م راشد کا علامتی اسلوب، ندا فاضلی کا بیانیہ عنصر اردو نظم کے مختلف اسالیب ہیں۔ مولانا کا اسلوب بیانیہ ہے لیکن اس میں جذباتی، احساساتی اور جمالیاتی عناصر کا بھی حسین امتزاج بھی ملتا ہے۔ نظم حرف تمنا کے یہ اشعار دیکھیے۔

میں کبھی باطل کی ہاں میں ہاں ملا سکتا نہیں سر کٹا سکتا ہوں لیکن سر جھکا سکتا نہیں

جانے کب دنیا میں آئے انقلاب خوشگوار یہ جہان کہنہ مجھ کو راس آ سکتا نہیں

مجھ پہ یہ عالم گزرتا ہے محبت میں کبھی یاد کر سکتا نہیں ان کو بھلا سکتا نہیں

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چند اشعار ملاحظہ ہوں۔

جس میں شان بندگی کچھ بھی نہ ہو وہ زندگی ایک کرب مستقل ہے یا مسلسل اک عذاب

جائزہ لیتا ہے وہ ہر وقت اپنے نفس کا مرد مومن کے لیے ہر روز ہے روز حساب

مذہب پسندی اور اسلامی رنگ مولانا کے کلام کی خاص خوبی ہے۔ لیکن ادبیت کے صاف وشفاف چشمے میں ڈھل کر کلام میں قوس وقزح کی رنگینی پیدا ہوگئی ہے۔

کوئی بھی شاعر اپنے دور کی بدلتی قدروں اور رجحانات ونظریات سے اپنے دامن کو تر کیے بغیر نہیں رہ سکتا۔ مولانا کے کلام میں عصریت اور وقت کی پکار کی گونج صاف سنائی دیتی ہے۔ امید انقلاب صالح، وقت کا تقاضا، مسلم پرسنل لا، پیغام بیداری، دعوت عمل، حیات نو، دینی انقلاب، مراد آباد فسادات، ترانہ، بنات المومنین، مسجد اقصی، زخم خوردہ ارض فلسطین، بابری مسجد کی شہادت، وغیرہ اسی قبیل کی نظمیں ہیں۔ مراد آباد کے فسادات پر آپ کی رگ حمیت پھڑک اٹھتی ہے۔ کہتے ہیں۔

چمن کی جن کو حفاظت مدام کرنا تھا یہ کیا غضب ہے وہ صیاد بن گئے آخر

سنایا جایے کسے درد وغم کا افسانہ قضاتِ شہر ہی جلاد بن گئے آخر

مولانا کے مخاطبین میں سے ایک اہم طبقہ نوجوانوں کا ہے۔ جن سے انہیں ملک کی تعمیر اور اسلامی تہذیب کی حفاظت وصیانت کے تئیں بہت سی امیدیں وابستہ ہیں۔ آپ کی نظمیں نوجوان طبقہ کے لیے رجائیت کی بہتی نہریں ثابت ہوگی۔ مایوسی اور قنوطیت کے بادل چھٹتے نظر آئیں گے۔ ترانہ، دعوت عمل، پیغام بیداری، نوجوانوں سے خطاب، عزائم، کرنوں کا سفر، بنام طلبائے علم جیسی نظمیں اسی قبیل سے تعلق رکھتی ہیں۔

نظم ''نوجوانوں سے خطاب'' میں کہتے ہیں۔

پھر زمانے کو پیام حق سنا اے نوجواں خواب غفلت سے مسلماں کو جگا اے نوجواں

مشکلات راہ سے ہرگز نہ گھبرا تو کبھی جانب منزل قدم اپنا بڑھا اے نوجواں

اتحاد وامن کا پیغام دے انسان کو ٹوٹنے والوں کو آپس میں ملا اے نوجواں

نظم کے ابتدائی دور میں مقصدیت اور افادیت کا غلبہ رہا۔ پھر رومانیت اور جدیدیت کا زور رہا، اختر الایمان کا استعاراتی نظام، ن م راشد کا علامتی اسلوب، ندا فاضلی کا بیانیہ عنصر اردو نظم کے مختلف اسالیب ہیں۔ مولانا کا اسلوب بیانیہ ہے لیکن اس میں جذباتی، احساساتی اور جمالیاتی عناصر کا بھی حسین امتزاج بھی ملتا ہے۔ نظم حرف تمنا کے یہ اشعار دیکھیے۔

میں کبھی باطل کی ہاں میں ہاں ملا سکتا نہیں سر کٹا سکتا ہوں لیکن سر جھکا سکتا نہیں

جانے کب دنیا میں آئے انقلاب خوشگوار یہ جہان کہنہ مجھ کو راس آ سکتا نہیں

مجھ پہ یہ عالم گزرتا ہے محبت میں کبھی یاد کر سکتا نہیں ان کو بھلا سکتا نہیں

بانگ حرا میں مختصر سی مختصر بحریں بھی اور طیل سے طویل بحریں بھی ہیں جن کے مطالعے سے بحروں پر مولانا کی گرفت کا اندازہ ہوتا ہے۔ مثلاً، کہتے ہیں:

زیست کا حاصل ہے تو جوہر قابل ہے تو
شاید عادل ہے تو رہبر کامل ہے تو
سرور منزل ہے تو رونق محفل ہے تو
جاگ مسلمان جاگ چھیڑ محبت کے راگ

طویل بحر کی ایک مثال ملاحظہ ہو۔

نبض دوراں بھی کچھ دیر رک جائے گی چلتے چلتے جہاں ہم ٹھہر جائیں گے
ہم جو چاہیں سمٹ جائیں گے فاصلے سب ادھر جائیں گے ہم جدھر جائیں گے

مولانا کے کلام میں موضوعات کی فراوانی، عصری حسیت، متعلقات زندگی جیسے سماجی و معاشی، اصلاحی و اخلاقی، سیاسی و مذہبی، تہذیبی و تمدنی، تاریخی و ثقافتی، اخلاقی و اقداری، سیاسی و تحریکی جیسے موضوعات حقیقت کے آئینے میں صاف نظر آتے ہیں۔ حقیقت نگاری مولانا کی نظموں کی ایک خاص خوبی ہے۔ وہ بلند بانگ دعوؤں پر یقین نہیں رکھتے بلکہ زندگی کے ان مسائل کو سلجھانے کی کوشش کرتے ہیں جو ان کے اپنے بس میں ہوتے ہیں۔ اپنی شاعری کے تعلق سے کہتے ہیں:

میں نقیب انقلاب دین ہوں شاعر نہیں میرا پیغام حقیقت وقت کی آواز ہے

بانگ حرا مجموعہ میں بعض نظمیں ایسی بھی ہیں جن کی اصل عربی زبان یا فارسی ہے آپ نے بے حد خوبصورتی سے اردو میں منظوم ترجمہ کیا ہے ۔جس سے اردو عربی اور فارسی زبانوں پر آپ کی دستگاہ کا علم ہوتا ہے۔

علامہ اقبال کی ایک فارسی نظم ''حدی'' جاوید نامہ میں مذکور ہے جس میں عربوں کی اونٹوں کی دوڑ کا ایک نقشہ کھینچا گیا ہے۔ مولانا نے اسی زمین میں اردو میں ''نغمہ ساربان'' کے عنوان سے بہت خوبی سے منظوم ترجمہ کیا ہے۔ ملاحظہ ہو:

تیز ترک گام زن منزل ما دور نیست دلکش و زیباستی
شاہد رعناستی روکش حوراستی
غیرت لیلاستی دختر صحراستی
تیز ترک گام زن منزل ما دور نیست

مولانا نے اسی زمین میں منظوم ترجمہ کیا ہے۔ کہتے ہیں:

تیز قدم رکھ تیز قدم رکھ اپنی منزل دور نہیں ہے
شکل میں ہے کتنی خوبی تیری ہستی سب کو پیاری
تجھ پر قرباں حور بہشتی لیلی بھی ہے تیری فدائی
جنگل کی ہے دوشیزہ بھی
تیز قدم رکھ تیز قدم رکھ اپنی منزل دور نہیں ہے

اسی طرح مصر کا مشہور نابینا شاعر طہ حسین ''انہ طفل ضریر'' ایک اندھے بچے کی فریاد و فغاں'' کے نام سے ایک نظم لکھی جس میں ایک نابینا بچہ کے جذبات

واحساسات کو بے حد موثر پیرائے میں بیان کیا گیا ہے جسے ساری دنیا میں پسند کیا گیا۔ دنیا کے بیشتر عربی مدارس میں اسے شامل نصاب کیا گیا۔ مولانا نے اسی خوبصورتی سے اردو زبان میں منظوم کیا ہے۔ عربی اور اردو جاننے والے اس کی تاثیر سے متاثر ہوئے بغیر نہیں رہ سکتے۔ طہٰ حسین کے اشعار ہیں۔

یا امی ما شکل السماء وما الضیاء وما القمر
بجمالها تتحدثون ولا اری منها اثر
وانا ضریر قاعد فی عقر داری مستقر
واللہ یلطف بی ویصرف ما اقاسی من کدر

منظوم ترجمہ ملاحظہ ہو۔

اے مری مادر مہرباں سن لے مری عرضِ بیاں یہ روشنی، یہ چاند کیا، کیسی ہے، شکل آسماں
سنتا ہوں میں تم سے بہت ذکر جمال کائنات لیکن مجھے اس کا نظر آتا نہیں کچھ بھی بیاں
اندھا جو ہوں بیٹھا ہوا رہتا ہوں میں گھر میں صدا مجبور ہوں معذور ہوں اس حال میں جاؤں کہاں
اللہ کا فضل و کرم مجھ پر کبھی ہوگا ضرور اس کے سوا میرے لیے ہے کون آخر مہرباں

غرض مولانا ابوالبیان حماد نے اردو نظم کے دائرے کو وسعت بخشی ہے۔ ۱۹۶۰ء کے بعد جو اہم شعراء ہیں ان میں امتیاز رکھتے ہیں۔ مولانا کی نظموں میں صالح فکر و عمل کے نغمے ہیں، قلوب و اذہان کو معطر کر دینے والے خوش فکر شاعری کے گلدستے ہیں، رجائیت و نوامیدی کی بہتی نہریں ہیں۔ اسلوب بیان کی چاشنی اور شگفتگی ہم کو اپنی جانب کھینچتی ہے۔

☆☆☆