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Julia set under q-deformation on a Quadratic Map

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Abstract. The long-term investigation of dynamical systems has served as inspiration for research on the dynamics of families of mappings. The investigation of the behaviour of the mappings on intervals and Cantor sets was made possible by many of these discoveries. In order to comprehend the nature of families of mappings produced by initialising a complex number, Julia sets are essential. Any function subject to q-deformation effectively undergoes alteration, and in the limit where $q \rightarrow 1$, the initial function is restored. In this instance, we use a quadratic map in its complex form. We also employ an entirely imaginary deformation parameter ε. In this study, we apply the Julia set's q-deformation to a quadratic map and generate Julia sets that correspond to various deformation parameter values. We next analyse for what values of the parameter ε the Julia sets cease to exist or fill the entire space. We also plot the heat maps for these ε values.

INTRODUCTION

The Julia Set

Julia set fractal is one of the most beautiful dynamical structures obtained in fractal dynamics. In order to understand the complexities of mapping families, Julia sets are essential [1]. The notion of q-deformation was extended to non-linear maps by Jaganathanand Sinha. They applied the q-deformation to the logistic map and studied its dynamical behavior. In contrast to the typical logistic map, the consequent group of q-logistic maps exhibits an intriguingly broad spectrum of behaviors. A rare occurrence in one-dimensional maps was the coexistence of attractors, especially [2].

It is admirable that Devaney has worked on Julia sets and bifurcation diagrams for exponential mappings [1,3]. Julia and Mandelbrot's sets form the epitome of excitation in the graphical representation in the complex plane. They are obtained using iteration dynamics. Non-emptiness is the characteristic of Julia set [4]. Jones threw light on fractals before Mandelbrot [5].

Consider the quadratic family of the form $\mathbf{z=z^2+c}$ (where $x+iy=z$ and $i^2 = -1$ while x, y stand for the image pixel coordinates. c being a fixed complex number). All real quadratic functions are topologically conjugate to real polynomials z for some c. This fact extends to complex quadratic functions. All complex quadratic functions are topologically conjugate to the complex polynomial z for some c sets and are used to obtain beautiful and fascinating figures of the Julia sets [6]. Peitgen, Jurgens, and Saupe made Bicomplex numbers are a commutative extrapolation of complex numbers., to generate Julia sets in three and four dimensions [7,8]. Rochon generalized the filled Julia set in three and four dimensions by making use of bicomplex dynamics that were introduced by using bicomplex numbers [8].

Mamta Rani and Vinod Kumar introduced the Mann iterative procedure in study of Julia sets [9]. It is remarkable that Shishikura studied on the Hausdorff dimension of the limit of the Mandelbrot and Julia set. [10]. Levin and Strien studied the local connectivity of Julia set of real polynomials [11]. Masood et.al. integrated the Julia set and Lorenz chaotic map to obtain image encryption [12].

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q-deformation

The book on q-deformation by Castellani and Wess emphasizes quantum groups, or continuous Lie group deformations, and their usefulness in physics. [13]. Quantum groups (q-groups) are a generalization of symmetry concepts and involve two fundamental and distinct ideas: deformation and non-commutative comultiplication. The concept of deformation in physics is a useful and old one. Quantum mechanics being a deformation of classical mechanics led Drinfeld to call quantum group (q-group) [13]. q-deformation works in the sense that a function when modified in terms of q without altering its basic structure then with $q \rightarrow 1$, we get the original function back.

Notable works involving q-deformation have relevance not only in mathematics, physics, and statistical physics but also in the medical field [14]. A few works that gained prominence are q-deformed Poincare algebra by Lukierski et.al [15], q-deformed Lorenz algebra by Schmidke et.al. [16],q-deformed Gaussian distribution by Leeuwen and Maassen [17], Lorek et al.'s study on the harmonic oscillator's q-deformation [18,22]. Interpreting higher-order impacts in many-body interactions depends heavily on q-deformation [19,22].

Patidar et al. investigated the evolving behavior of the q-deformed Henon map and identified new structures and the path to chaos in the strange attractor. [20,21]. Additionally, they demonstrated that if the values of the deformation parameters are properly adjusted, the q-deformation of the Henon map results in a reduction of chaos [20]. Furthermore, their research shows that all the properties of the canonical Henon map may be accessed by adjusting the deformation parameters without affecting the values of the system parameters for the Henon map and that the Henon map when q-deformed possesses greater behavioral occurrences than the canonical Henon map [20].

Such flourishing is the scheme of q-deformation that yields distinct dynamical behaviour. We apply the q-deformation to Julia set on a quadratic map. The analysis is as under:

The quadratic map we use is $\mathbf{z = z^2 + c.}$ In this equation, c represents a different complex number that produces a distinct Julia set [2]. In our simulation, the real part of c is -0.123 while 0.645 forms the imaginary part. Here, we q-deform the quadratic map and obtain Julia set figures for the same, the deformation parameter ϵ being purely imaginary. It can be varied to get a new q-deformed value of z_q.

The equation for q-deformation is

$$z_q = \frac{z}{1 - \epsilon(z - 1)}$$

The quadratic equation to be q-deformed is

$$z'_n = z_n^2 + c$$

The q-deformed quadratic equation is as under

$$z_{n+1} = {z'}_{n_q}$$

We show a set of initial conditions z_0 that do not blow up in 1000 iterates. In the two-dimensional plots below, the x-axis is real z_0 and the y-axis is imaginary z_0. Following are the few Julia set plots we obtained for εtaking various values.

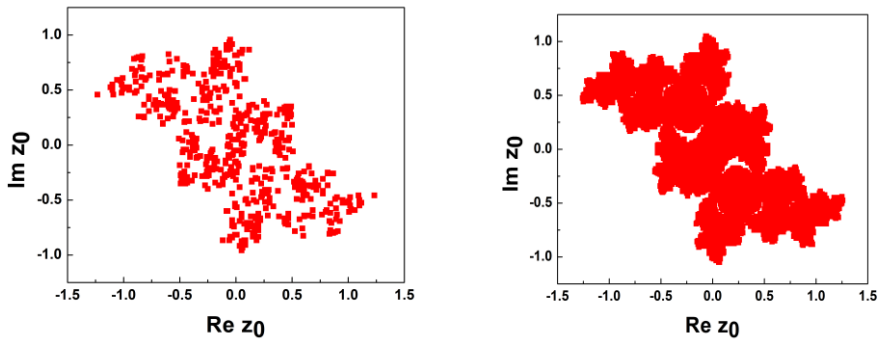

FIGURE 1. Julia set for **(a)** $\epsilon = -0.02i$ and **(b)** $\epsilon = -0.015i$

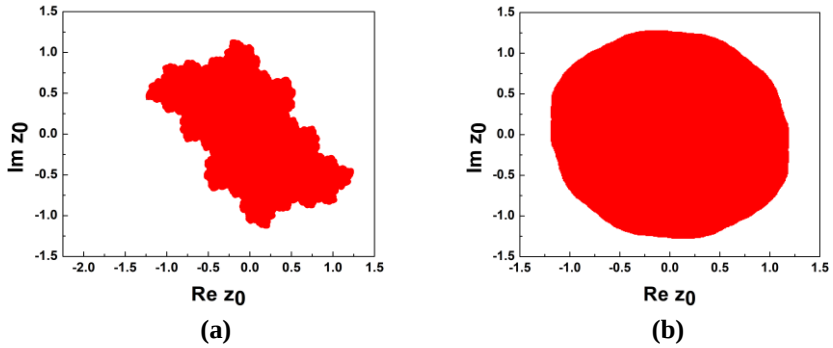

FIGURE 2. Julia set for **(a)** $\epsilon = 0.1i$ and **(b)** $\epsilon = 0.3i$

Heat maps concerning different values of ε are as under

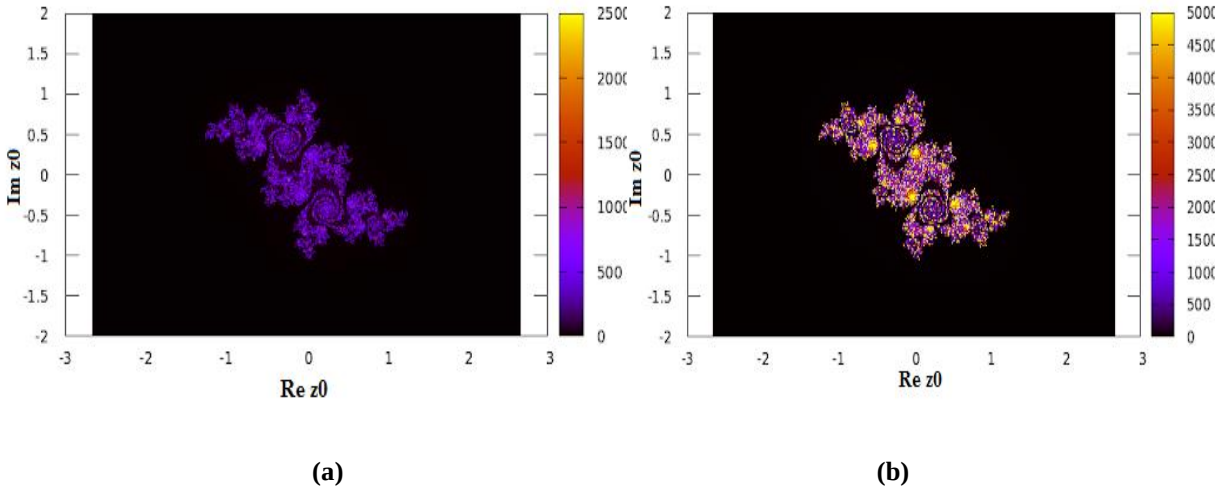

FIGURE 3. Heat map for Julia set **(a)** $\epsilon = -0.02i$ and **(b)** $\epsilon = -0.015i$

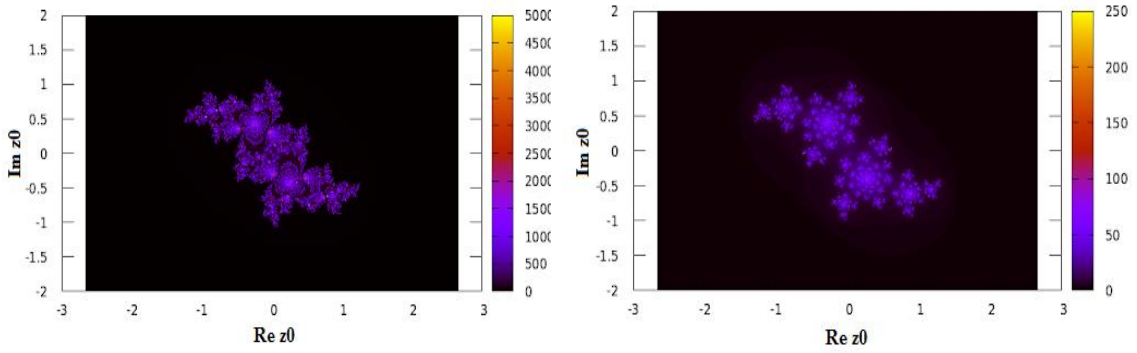

FIGURE 4. Heat map for Julia set (a) $\epsilon = -0.01i$ and (b) $\epsilon = -0.1i$

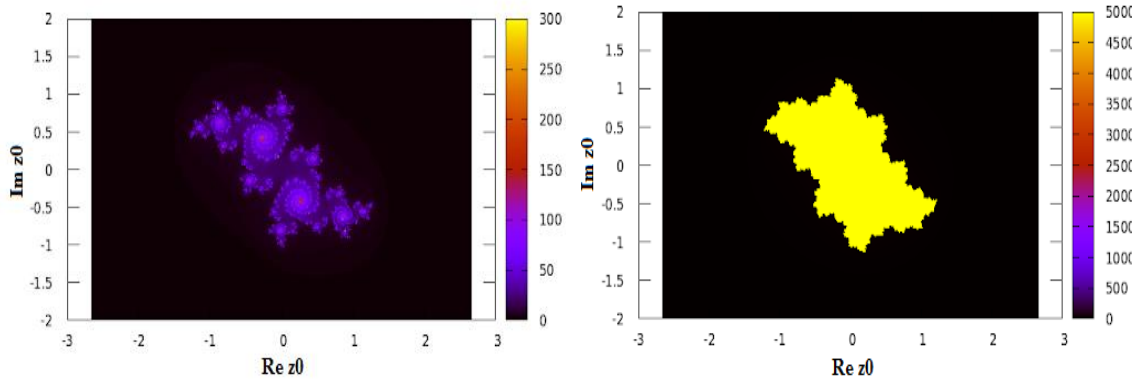

FIGURE 5. Heat map for Julia set (a) $\epsilon = -0.05i$ and (b) $\epsilon = 0.1i$

CONCLUSION

The work intends to study q-deformation on a Julia set. We plot figures corresponding to different values of the deformation parameter ε mentioned in the equations. We obtain beautiful heat maps corresponding to a few specific values of ε. We observe that as we proceed from a negative imaginary value to a positive imaginary value of ε, the q-deformed Julia set fractal occupies more of the space and becomes compact. It almost disappears for a large negative imaginary value of ε.

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Persistence in Kinetic Ising Model of Glass Transition on coupled map lattice.

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Abstract:
We study the persistence in the kinetic Ising model of glass transition by Frederickson and Anderson based on the kinetic Ising model with cooperative spin flip rates. We consider spin models that are standard Ising ferromagnetic ones and not the ones used for modelling spin glasses. We perform a graphical analysis to study the persistence of spins on coupled map lattice. We study Tent map and Logistic map.
Keywords: Persistence; Ising Model; Glass Transition, Coupled Map Lattice.

1. Introduction:

A majority of supercool liquids transit into a metastable glassy state if crystallization is prevented by significant cooling rates. Glass transition is experimentally characterized by relaxation periods of a few minutes or hours. The freezing in of the translational degrees of freedom causes a steady decrease in thermodynamic parameters such as compressibility, specific heat, and thermal expansion, at transition temperature T_g. This is known as the glass transformation range [1]. T_g is sometimes referred to as the "melting point of amorphous materials," and although this term may not sound scientific, it accurately describes the glass transition: polymeric materials are soft and rubbery in the highly viscous region above the T_g, whereas they are hard and brittle below it. However, there is a crucial distinction between glass transition and melting: melting represents a true first-order phase transition, whereas glassification (vitrification) is only a pseudo-second-order transition. In other words, while melting produces a discontinuity in the first derivative of Gibbs free energy (volume, entropy), glassification only causes a (pseudo) discontinuity in the second derivative (e.g., heat capacity, expansion coefficient, etc.).

The actual nature of the glass transition is not widely understood, as it is a complex process controlled by a number of parameters, including heating rate, ageing history, morphology, and molecular weight. Several theories have been proposed to explain the glass transition. It is viewed as a dynamic process in the kinetic theories. The process of "freezing" the motions of chain segments (kinetic units) results in vitrification or glassification. The initial (solid-state) transition starts at extremely low temperatures, at that point, side chain motions and localised bond bending and stretching can happen. This is called the T_γ gamma transition. The material begins to acquire some toughness as the temperature rises and other localised motions involving whole side chain and localised group movements become active. This is called the beta transition (T_β). T_g is reached when the heating continues. Large-scale coordinated motions of the polymer chains take place in this area, and a noticeable shift in characteristics is seen [3].

Leutheusser created a microscopic model of the hard-sphere fluid's glass transition. He developed a straightforward non-linear solution for the time evolution of the density correlation function that forecasts a glass transition by roughly analysing mode coupling equations. A highly cooperative spin-flip rate kinetic Ising model is the foundation of the glass transition microscopic theory. Through graphical analysis, one can derive conclusions for the spin systems that closely resemble Leutheusser's findings for hard spheres. This observation might represent the addition of a universality aspect to the glass transition [4].

2. The Ising Model:

The Ising model is intended to describe how short-range interactions, for example, between molecules in a crystal, result in long-range, correlative behaviour and, in a way, to forecast the possibility of a phase transition. The Ising model has also been used to solve issues in molecular biology, chemistry, and other fields that study the "cooperative" behaviour of complex systems [5] [6]. We assign independent variable $\sigma_i = +1$ or -1 to every lattice site i = 1,2,3, ..., N. Thus, there are only two possible outcomes at each lattice site: *up* or *down* or *occupied* or *vacant*. We create the system's Hamiltonian. The ideal and seemingly extremely severe assumption that only short-range, "nearest-neighbour" interactions and interactions between the lattice sites and an "external field" contribute to the system's energy level is the basis for the definition of the Hamiltonian for the Ising model. For each configuration $\sigma_i = (\sigma_1, \sigma_2, ..., \sigma_N)$ we have,

$$H = H(\sigma) = -\sum_{<i,j>} E\left(\sigma_i \, . \sigma_j\right) - \sum_i J\, \sigma_i$$

where the first sum is over all pairs of the lattice's nearest neighbours and the second sum is over all lattice sites. E and J are the parameters in this equation. For nearest-neighbour interactions and interactions with the external field, respectively, the parameters E and J stand for the "energies" involved. A ferromagnet has an energy level that is lower than a non-magnetized configuration because a "magnetised" configuration (where the majority of nearest-neighbour pairings have parallel moments, $\sigma_i = \sigma_j$) has a positive E. When an "external magnetic field" (represented by the parameter J) is present, the magnetic moments will seek to align with the field's direction, once more "favouring" configurations with shorter energy levels [7].

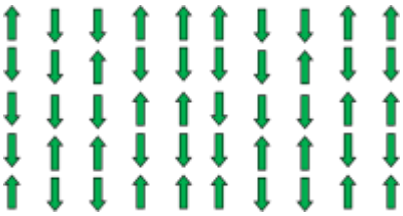

Fig. 1: The Ising model applied to a two-dimensional square lattice. Every arrow is a "spin," a magnetic moment that might point upward or downward.

3. The Model:

We study a variant of the Fredrickson-Andersen model [4] based on an extremely cooperative spin-flip rate kinetic Ising model-based microscopic theory of the glass transition. An n-spin facilitated model is defined as one for which the flip rate of the j^{th} spin is nonzero only if *n* or more near neighbours of spin *j* are in the spin-up state in spin configuration σ [4]. The update rules are as follows:

a) We choose a site randomly on the lattice.
b) If none of the neighbours is 'up' spin, the spin at this site is not changed.
c) If the site has at least one 'up' neighbour, and the site itself has an 'up' spin, it is flipped.
d) If the site has at least one 'up' neighbour and the site itself has a 'down' spin, it is flipped with probability *p*.

An all-spins "down" is the absorbing state for any value of *p*. Spins for *p*=0 will occasionally be "down." This isn't guaranteed for higher values of *p*. We investigate the system's short-time dynamics and memory retention. It is common to observe extended exponential dynamics in glassy systems. For lower values of *p*, the dynamics should be exceedingly sluggish. This will show up as autocorrelation with starting conditions. We have examined the likelihood that the initial conditions will be precisely maintained, or persistence, a stronger quantifier. In this case, it is defined as the fraction of spins that have not altered their original spin state at all until a specific period. Nonzero persistence suggests that the system preserves the initial conditions indefinitely. The decay exponent is referred to as the persistence exponent when the persistence exhibits power-law decay at the critical point. This is a non-Markovian quantity. The exponents are found to be non-trivial even in the simplest of cases [8]. In the previous work, we studied persistence in this model of glass transition and plotted the persistence P(t) vs time t on a semi-logarithmic scale [9]. We obtained a stretched exponential behaviour for all values of probabilities and respective exponents considered.

4. Coupled Map Lattice (CML)

Menon, Sinha, and Ray have extended the Ising model to coupled map Lattice (CML). They suggested that the initial variable value of a site should be represented by (+) spin if it is more than the fixed point and (−) spin if it is less than the fixed point. It is now possible to specify the persistence in a way that is similar to spin systems [10]. We simulate the system of size N= 5 x 10^4 for 10^5 time steps and averaged over 2.5x10^4 configurations. CML was originally introduced to facilitate the study of spatiotemporal chaos, i.e., chaotic dynamics in a spatially extended system [11]. In the spatially extended system, CML is the nonlinear dynamical system. It's a type of iterative system constructed from several similar functions of a single variable that are connected linearly to a network's closest neighbours. The time evolution is given by:

$$x_{t+1}(i) = (1\text{-}\varepsilon)\, f(x_t(i)) + \frac{\varepsilon}{2}\{ f(x_t(i+1)) + f(x_t(i-1))\}$$

where $x_t(i)$ is a continuous variable value x at discrete time t at lattice site i. Here ε is the coupling parameter and f(x) is the underlying map. There are a number of variants to consider, including asymmetric and linear coupling. It is simple to extend the idea to higher-dimensional lattices. Higher-dimensional maps like the Henon map have also used. Nonetheless, logistic and tent maps continue to be the most studied maps.

5. Results:

We study Coupled Tent and Logistic Map. We consider two values of probability p<1 (p=0.8 in this case) and p=1 for both the maps.

a) Tent Map

The canonical form of Tent map is:

$$x_{i+1} = f(x_i) = \mu x_i \quad \text{for} \quad x_i < \frac{1}{2} \quad \text{and}$$
$$= \mu(1 - x_i) \quad \text{for} \quad x_i \geq \frac{1}{2}$$

where μ=1.47. We study phase diagram for p=0.8 for various combination of μ (in range 1.2-2) and ε (in range 0-0.4) (See **Fig:2**). We plot the persistence exponent for various values of ε in the range [0.291:301]. We do not observe a power law in this case as seen in

Fig.3. In the case of p=1, we plot the phase diagram for various combinations of μ (in the range 1-2) and ε (in the range 0-0.45) (See **Fig:4**). We obtain power-law decay of persistence $P(t) \sim t^{-\theta}$, where θ is the decay exponent, at ε=0.314 (θ=0.122 as seen in **Fig:5**).

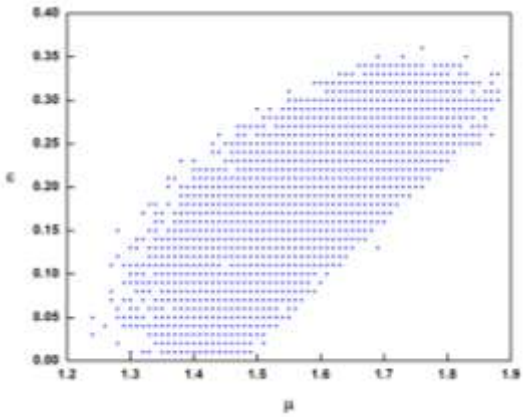

Fig.2: Shows phase diagram for p=0.8 for several combinations of μ and ε in case of coupled tent map.

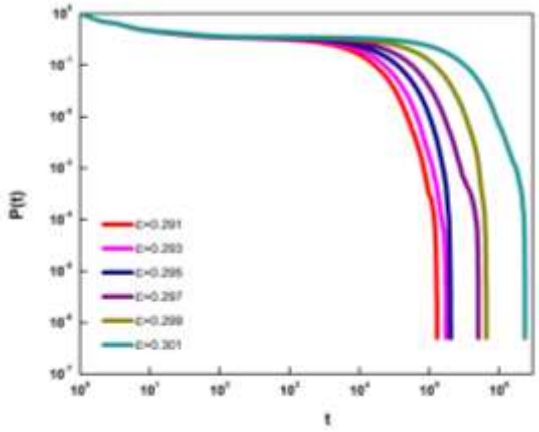

Fig.3: Shows the time evolution of persistence P(t) on log-log scale for several values of ε in the range [0.291:301] for coupled tent map.

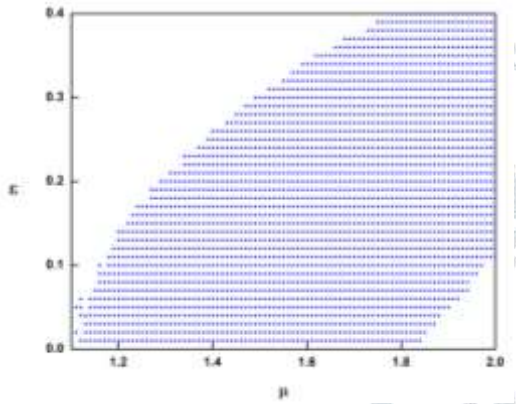

Fig.4: Shows phase diagram for p=1 for several combinations of μ and ε in case of coupled tent map.

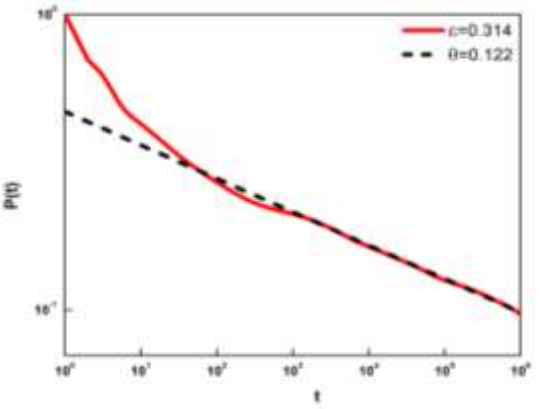

Fig.5: Shows the time evolution of persistence P(t) on log-log scale. We obtain power law at ε=0.314. The decay exponent θ= 0.122 for coupled tent map.

b) Logistic map

The canonical form of Logistic map is:

$$x_{i+1} = f(x_i) = \mu x_i(1 - x_i)$$

where μ=3.474. We study the phase diagram for p=0.8 for various combinations of μ (in the range 3-4) and ε (in the range 0-0.3) (See **Fig:6**). We plot time variation of the persistence on log-log scale. We obtain power law $P(t) \sim t^{-\theta}$ at ε=0.168. θ=0.37 as shown on **Fig.7.** In case of p=1, we plot the phase diagram for various combination of μ (in range 3-4) and ε (in range 0-0.3) (See **Fig:8**). We do not obtain power law in the case as seen in **Fig:9**.

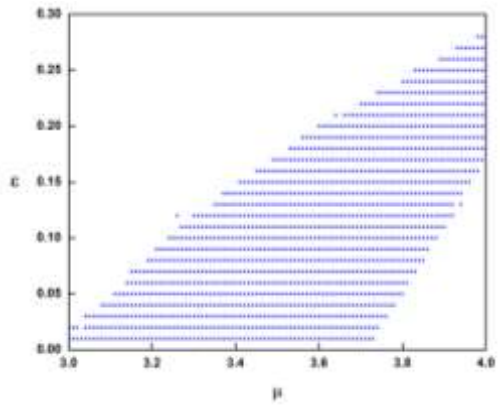

Fig.6: Shows phase diagram for p=0.8 for several combinations of μ and ε in case of coupled Logistic map.

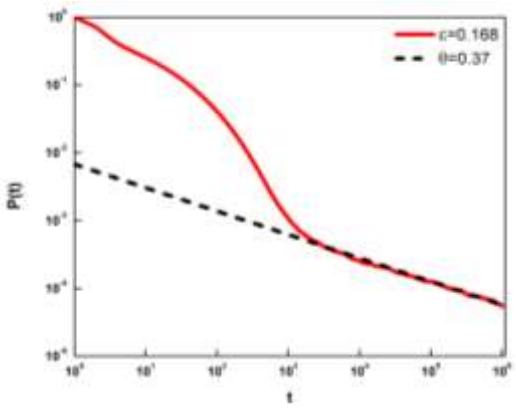

Fig.7: Shows the time evolution of persistence P(t) on log-log scale. We obtain power law at ε=0.168. The decay exponent is θ= 0.37 in the case of coupled Logistic maps.

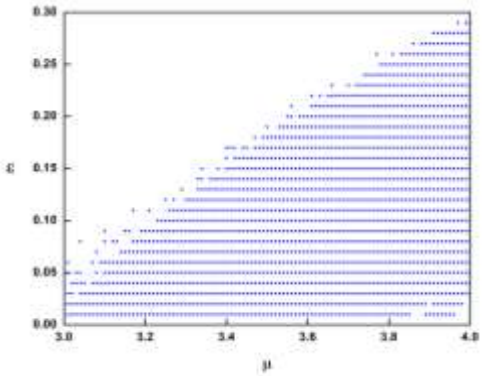

Fig.8: Shows phase diagram for p=1 for several combinations of μ and ε in case of coupled Logistic map.

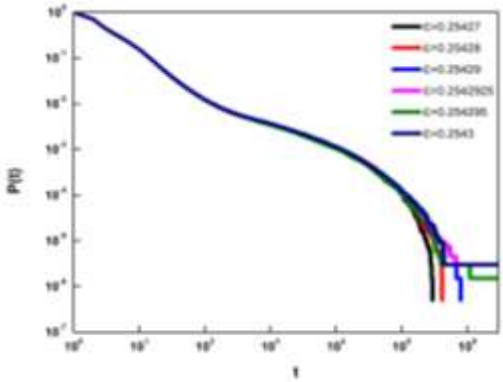

Fig.9: Shows the time evolution of persistence P(t) on log-log scale with ε in the range [0.25427:2543].

6. Summary:

Fredrickson and Andersen introduced the kinetic Ising model of glass transition [4]. In our work, we make a study of the existence of persistence in this model on coupled map lattice where the underlying maps are Tent map and Logistic map. Our function consists of a Hamiltonian that comprises the sum over all pairs of the lattice's nearest neighbours along with the sum over all lattice sites. We consider two cases, p=0.8 and p=1 for the coupled tent map and coupled logistic map. We plot phase diagrams for all of these. For the tent map (p=1) and logistic map (p=0.8) we get a clean power law with exponents θ=0.122 and θ=0.37 respectively.

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VOLUME II : Physics

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Dynamics of Coupled Circle Map on Diffusion Limited Aggregate

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Abstract. Complex networks and d-dimensional Euclidean lattices have both been researched using coupled map lattices. Additionally, it has been examined on the deterministic fractal known as the Sierpinski Gasket. In this work, we investigate the coupled map lattice on a random fractal called diffusion limited aggregate (DLA). We create a map and examine it from the perspective of the circle map. In the event of a DLA, a site's neighbors may number one to four. We examine the scenario in which the total weight does not stay constant. In this regard, we plot bifurcation diagrams.

Keywords: Coupled Map Lattice, Circle Map, Diffusion limited Aggregate

INTRODUCTION
Dynamics-displaying fractals on Coupled Map lattices

A system that has been extensively investigated is coupled map lattices on Euclidean lattices in d-dimensions. In this regard, the most researched maps are circular, tent, and logistical maps. Few studies have been done on the dynamics of fractals. Fractal connectivity scales with distance.

In the case of connected map lattices, such systems exhibit a transition from spatial order to spatially uniform or chaotic states when coupling is changed. Based on simulations of neural networks, coupled oscillators, and coupled maps, nodes are divided into regions of fixed point, chaotic, and oscillating regions.

Network connectivity has an impact on how activities are divided inside networks. We can achieve these partially arrested states in what are known as chimaera states. This article here examines a fractal model known as the diffusion limited aggregate (DLA). Coupled map lattices are dynamical networks that act like complicated models and are spatially homogeneous and computationally feasible. Things having fractal architectures exhibit exciting physical phenomena [3]. In CMLs, coupling is diffusively discrete. Similar to the logistic map, the circle map is a chaotic map. Similar to the dynamics of neurons, chaotic, oscillatory, and fixed-point behavior can be seen. Each of these many dynamical kinds is dependent upon the type of coding and the applied stimulus [4].

If systems exhibit statistical symmetry, long-range interactions, and are probabilistic in nature, they can have chaotic temporal states and long-range spatial order with temporal disorder. We can learn about the stability of randomly connected elements from the Wigner-May theorem. The instabilities to a spatially uniform state vary, and the eigen-values of fractals exhibit intriguing structure [5].

Diffusion Limited Aggregate (DLA)

Written and Sander [1] generated a metal-particle aggregation process model whose correlations were measured. They concluded that, like metal aggregates, the density correlations in the model aggregates decrease with distance along a fractional power law. The metal aggregates' radius of gyration follows a power law pattern.

The DLA model is based on the Eden model, in which randomly added particles are introduced to sites next to occupied sites one at a time. However, Written and Sander discovered that the fractional power law of distance was how the metal aggregates slid off. The irreversible growth process is the source of these relationships. Similarities between the DLA model and the discrete Langer-Krumbhaar model of dendritic development are found [6].

COUPLED MAPS ON DLA

Initially, we start with a seed particle at the lattice origin. Next, we introduce a second particle at a random location, a considerable distance from the origin. Up until it reaches the location next to the seed, the second particle travels at random. After then, this particle joins the cluster. Similar actions are taken by additional particles that are introduced at random times. If a particle crosses the lattice's borders, it is eliminated and a new one is added. Over 10^5 sites are used to recreate the DLA.

We define variable value xi,j(t) to the site (i,j) at time t. The evolution is given by:

$$x_{i,j}(t+1) = (1-\varepsilon)\mathrm{f}\left(x_{i,j}(t)\right) + \frac{\varepsilon}{4}\left(\mathrm{f}\left(x_{i+1,j}(\mathrm{t})\right) + \mathrm{f}\left(x_{i-1,j}(\mathrm{t})\right) + \mathrm{f}\left(x_{i,j+1}(\mathrm{t})\right) + \mathrm{f}\left(x_{i,j-1}(\mathrm{t})\right)\right) \quad \textbf{(1)}$$

where sites that are not part of the DLA cluster are considered to have contributed nothing and have not changed over time.

Alternatively,

$$x_{i,j}(t+1) = \left(1 - N(i,j)\frac{\varepsilon}{4}\right)\mathrm{f}\left(x_{i,j}(t)\right) + \frac{\varepsilon}{4}\sum_{\eta(\mathrm{i,j})}\mathrm{f}\left(x_{\eta(i,j)}(t)\right) \quad \textbf{(2)}$$

where N(i,j) is the total number of DLA cluster neighbors for site (i,j). Sites that are not part of the DLA cluster are not taken into account and are not thought to have changed over time.

In order to clarify the distinction, we consider the scenario in which site (i,j) on the cluster has just two neighbors: (i+1,j) and (i-1,j). By (1), the evolution will be:

$$x_{i,j}(t+1) = (1-\varepsilon)\,\mathrm{f}\left(x_{i,j}(t)\right) + \frac{\varepsilon}{4}\left(\mathrm{f}\left(x_{i+1,j}(\mathrm{t})\right) + \mathrm{f}\left(x_{i,j-1}(\mathrm{t})\right)\right) \quad \textbf{(3)}$$

And that according to (2) will be

$$x_{i,j}(t+1) = \left(1 - \frac{\varepsilon}{2}\right)\mathrm{f}\left(x_{i,j}(t)\right) + \frac{\varepsilon}{4}\left(\mathrm{f}\left(x_{i+1,j}(\mathrm{t})\right) + \mathrm{f}\left(x_{i,j-1}(\mathrm{t})\right)\right) \quad \textbf{(4)}$$

The total of the weights is not conserved in rule (1), but it is in rule (2). In rule (1), the evolution of a given site is dependent on the number of neighbors; in rule (2), this dependency is absent. A typical DLA cluster produced by the aforementioned technique is displayed in Fig. 1. We examine the coupled circle map's dynamics on the DLA.

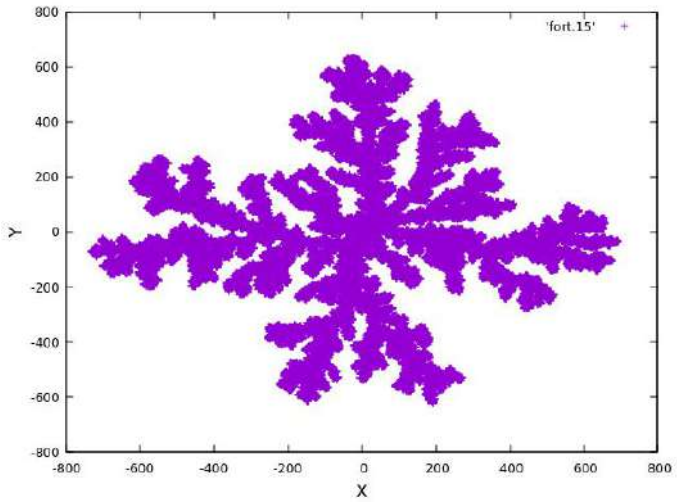

Figure 1: A typical DLA cluster

Circle map

The circle map is a one-dimensional map which maps a circle onto itself, where θ_{n+1} is computed *mod 1* and K is a constant. Note that the circle map has two parameters Ω and K. Ω can be interpreted as an externally applied frequency, and K as a strength of nonlinearity. The circle map exhibits very unexpected behavior as a function of parameters, as illustrated below [7].

$$\theta_{n+1} = \theta_n + \Omega - \frac{K}{2\pi} \sin(2\pi\theta_n),$$

The circle map coupled on a DLA with one, two, three, and four neighbours is now plotted using bifurcation diagrams. Plotting the bifurcation diagrams against the control parameter ε, which ranges from 0 to 1, is done for two-dimensional sites.

Bifurcation Diagrams for Circle Map

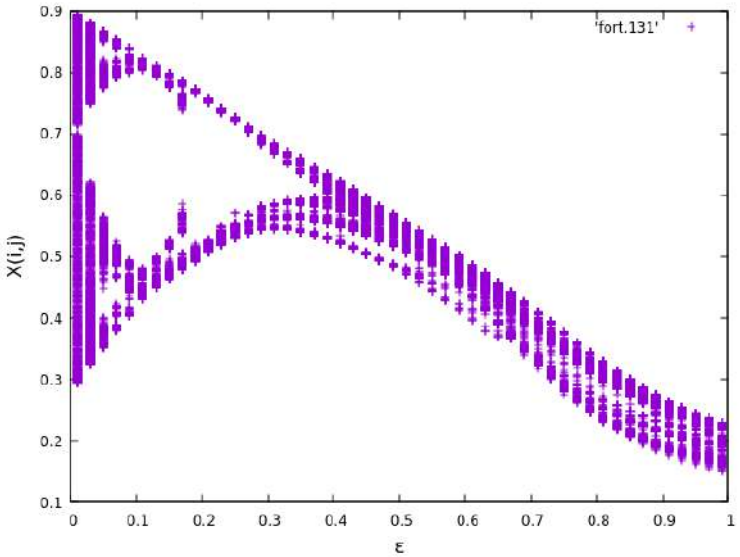

Figure 2: Bifurcation diagram for the non-conserved case for sites with one neighbor.

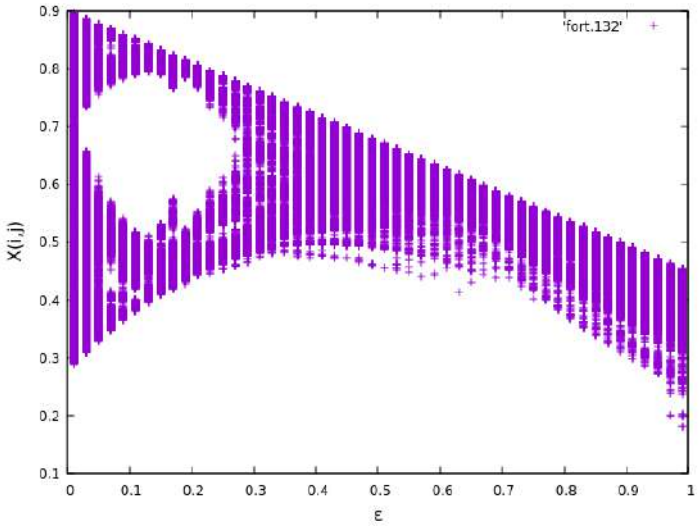

Figure 3: Bifurcation diagram for the non-conserved case for sites with two neighbors.

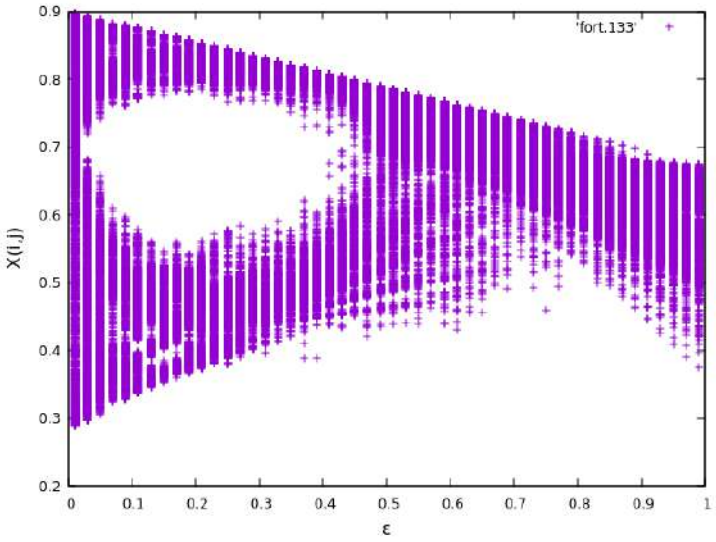

Figure 4: Bifurcation diagram for the non-conserved case for sites with three neighbors.

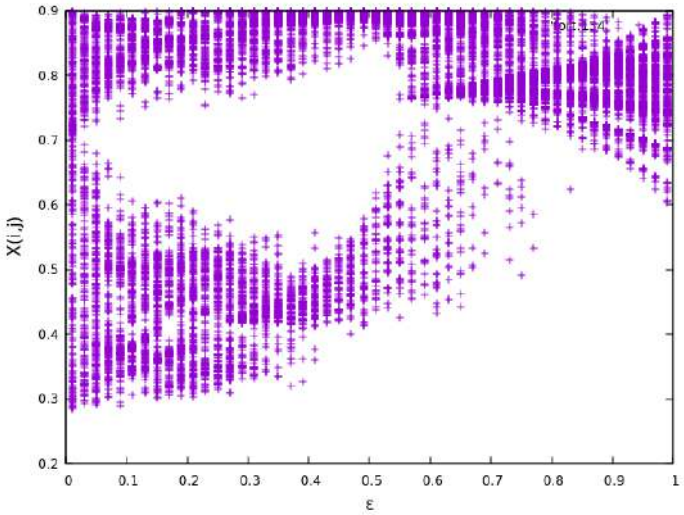

Figure 5: Bifurcation diagram for the non-conserved case for sites with four neighbors.

Conclusion

Since DLA is a well-studied model for random fractals, we examine its dynamics. On this random fractal, we examine coupled circle maps. It is discovered that the band attractor differs in each scenario, whether there are one, two, three, or four neighbours. Although there are no periodic windows, the regions exhibit band periodicity. Graphs of this kind appear to be prevalent in all non-conserved scenarios.

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Seasonal Variation of Cestode parasite *Moniezia* (Blanchard) of the host Sheep and Goats from Jalna Dist. (M.S.), India

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Abstract:
The present study deals with to investigate the seasonal variation of cestode parasite *Moniezia* (Blanchard) collected from intestine of sheep and goats in Jalna District (M.S.) India. A total of 499 host intestine were examined during the research period out of these, 344 were found infected with cestode parasite *Moniezia* (Blanchard). The analysis of data showed that the prevalence of cestode parasites variable according to season. The cestode parasite *Moniezia* (B) recorded high prevalence in the rainy season 78.60% followed by winter season 66% whereas low prevalence recorded in summer season 62% in two annual cycles during Jan-2015 to Dec-2016.

Keywords: *Moniezia*, Seasonal Variation, Cestodes, Sheep, Goats, Jalna

Introduction:

Parasitology is one of the vast and highly advanced branch of zoology. Parasitism is undoubtedly an ecological relationship between two different populations. Noble and Noble, 1976 stated that parasitism is an association of two organisms of different species, in which one is benefited and other harmed. The organism, which is benefited, is the parasite and that which suffers is the host.

Small ruminants are widely distributed and are of great importance as a major source of income for small and the landless farmers in rural areas. Sheep and goat with large genetic diversity accounts for about 0.5 to 5% of total output of livestock sector in India (Singh, K. 1995). Helminthiasis, especially parasitic gastroenteritis, pose a serious health threat and a limitation to the productivity of small ruminants due to the associated morbidity, mortality, cost of treatment and control measures (Nwosu, C. O., Madu, P. P. and Richards, W. S., 2007). In addition to these threats, infestation with helminthes lowers the animal's immunity and renders it more susceptible to other pathogenic infections; finally, this may result in heavy economic losses (Garedaghi, Y., *et. al.*, 2011). The problem is however much severe in tropical countries due to very favorable environmental conditions for helminth transmission (Mohanta, U.K., et. al., 2007).

Results of present study are expected to be helpful for future research on helminth parasites of sheep and goat in this area. Keeping in view, importance of cestode infections of sheep and goat, the present study was designed to evaluate the prevalence of cestode genus *Moniezia* (Blanchard) parasitizing of Sheep and Goat.

Materials and methods

The Sheep and Goat intestines were collected from slaughter houses from different places of Jalna district during Jan, 2015 to Dec, 2016. Covering the three different seasons of the year i.e., rainy, winter and summer from Jalna district covering all areas. The small intestine, and caecum were kept in separate petri dishes containing normal saline. The organs observed and recorded the data of infected and normal hosts examined. After separating and counting the population of different cestode parasites from host, the parasites were preserved in separate bottles. Some of these were used for the taxonomic study. The drawings are made with the aid of camera lucida and measurements taken in mm. The identification of these parasites were made by using keys "Systema Helminthum" (Yamaguti, S. 1957). Prevalence of infection calculations were based on the following formula.

$$\text{Incidence of infection} = \frac{\text{Infected host}}{\text{Total host Examined}} \times 100$$

Results and Discussion:

Table No. 1:- Prevalence of *Moniezia* Sp. from intestine of Sheep and Goats during Jan 2015- Dec 2016 from Jalna District (M.S.) India.

Name of Month	No. of hosts Examined	No. of hosts Infected	No. of parasites collected	Prevalence %	Locality
Jan-15	20	15	17	75%	Jalna
Feb-15	20	12	14	60%	Ambad
Mar-15	17	11	12	65%	Bhokardan
Apr-15	19	11	12	58%	Badnapur
May-15	23	13	14	57%	Ghansavangi
Jun-15	18	13	14	72%	Partur
Jul-15	24	18	25	75%	Mantha
Aug-15	20	17	17	85%	Jafrabad
Sep-15	19	16	20	84%	Jalna
Oct-15	24	14	15	58%	Ambad
Nov-15	18	10	17	56%	Bhokardan
Dec-15	22	17	20	77%	Badnapur
Jan-16	20	16	18	80%	Ghansavangi
Feb-16	17	12	12	71%	Partur
Mar-16	22	14	14	64%	Mantha
Apr-16	23	15	15	65%	Jafrabad
May-16	24	14	14	58%	Jalna
Jun-16	21	16	21	76%	Ambad
Jul-16	25	19	22	76%	Bhokardan
Aug-16	26	20	20	77%	Badnapur
Sep-16	18	15	18	83%	Ghansavangi
Oct-16	21	12	15	57%	Partur
Nov-16	20	12	14	60%	Mantha
Dec-16	18	12	16	67%	Jafrabad
Total	**499**	**344**	**396**	**69%**	

Graph No. 1:- Prevalence of *Moniezia Sp.* from intestine of Sheep and Goat during Jan-2015- Dec-2016

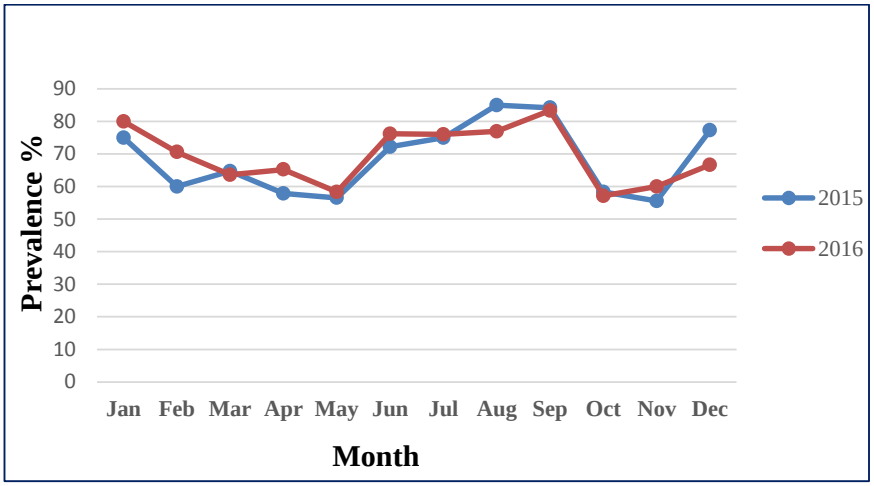
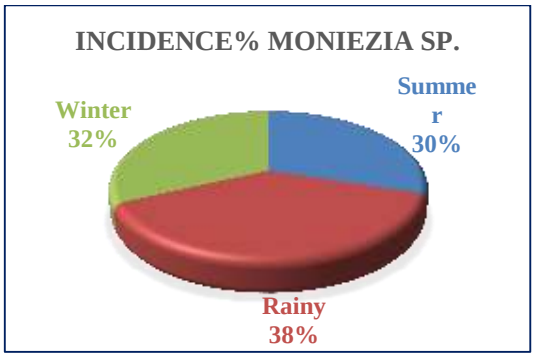


Table No. 2 - Seasonal fluctuation of cestodes *Moniezia* Sp., of Sheep and Goats from Jalna district during Jan 2015-Dec 2016.

Season	Incidence% (*Moniezia* Sp.)
Rainy	78.60%
Winter	66%
Summer	62%

Graph No. 2- Seasonal fluctuation of cestodes *Moniezia* Sp., of Sheep and Goats from Jalna district during Jan 2015-Dec - 2016.



The data shows the prevalence of cestode parasites of sheep and goats in Jalna district (M.S.) India during Jan-2015 to Dec-2016. The prevalence or incidence of infection of cestode parasites *Moniezia* sp., was calculated (Table No. 1, 2).

The analysis of data showed that the prevalence of cestode parasites variable according to season (Table No. 2) *Moniezia* sp. recorded high prevalence in the rainy season 78.60 % followed by winter season 66% whereas low prevalence recorded in summer season 62% in two annual cycles during Jan-2015 to Dec-2016.

Similar results also observed Yadav and Khajuria (2006) examined gastro-intestinal parasitic infection throughout the year; seasonal variation was recorded and was highest during rainy season (88.54%) followed by summer (83.15%) and winter (76.01%). Similar findings were reported by Atul Humbe *et. al*., in 2010 that the total 338 cestode were removed from 460 hosts. The total ten species were found in present investigation which contains six species of *Moniezia* and four species of *Stilesia*, the high prevalence occur in rainy season (72.19%) followed by in winter season (68.46%) and lower prevalence in summer season (61.29%).

SAR. Al-Qureishy (2008) reported the prevalence of tapeworm infections among sheep slaughtered in Riyadh city were studied from February 2007 to March 2008. The highest infection rate was in autumn (8.1%), and the lowest one was in summer (1.7%). Similar finding was reported by Chandana Choudhury Barua *et. al.* 2015 the prevalence of gastrointestinal helminthic infections in goats raised at Goat Research Station Byrnihat during the period of June 2013 to May 2014. The higher prevalence rate was observed in rainy season (92.06%) followed by winter (75.00%) and lower in summer season (32.14%). Also, higher fecal egg count was observed in rainy season (3525±170.40) followed by winter (1575±62.92) and summer season (1225±85.39).

Kennedy C.R. (1976) reported temperature; humidity, rainfall, feeding habits of host, availability of infective host and parasite maturation are responsible for influencing the parasitic infections. Feeding activity of the host is reason for seasonal fluctuation of infections (Pennuyuick, 1973). Nair and Nadakal (1981) explained retarded growth, decreased egg production, reduced weight gain, significant haemoglobin depression due to infections of cestode parasites in chickens. Jadhav and Bhure, (2006) noticed high temperature, low rainfall and sufficient moisture were necessary for development of parasite.

Conclusion:

After the analysis of data, the present study can be concluded that high prevalence of cestode parasites i.e. *Moniezia* sp. occurred in rainy season followed by winter season and low in summer season, this type of results indicates that environmental factors and feeding habitats are influencing that seasonality of parasitic infection either directly or indirectly.

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Diversity of Butterfly in Dnyanganga Wildlife Sanctuary, Maharashtra, India

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Abstract

An assessment of the diversity of butterflies in the Dnyanganga Wildlife Sanctuary, Maharashtra, was carried out through research. The survey found that there were 89 species of butterflies, with the Nymphalidae family accounting for the majority (32.18%), Lycaenidae for 27.59%, Pieridae for 27.59%, Hesperiidae for 18.75%), and Papilionidae for 6.90%.The quantity of butterflies appears to have increased from the monsoon to the winter, but dropped in the summer and before the monsoon, presumably as a result of variations in the temperature and humidity of the affected habitats as well as the possible lack of nectar. According to the study's findings, the Dnyanganga Wildlife Sanctuary in Maharashtra features a thriving ecosystem that supports a wide variety of butterflies.

Keywords: Dnyanganga Wildlife Sanctuary, Maharashtra, Butterfly, Diversity.

Introduction

According to Whitaker and Captain (2008), one of the most fascinating aspects of the world is its remarkable diversity, which includes roughly 10 million species. Ecosystems depend on this diversity to survive. Features that enable the species to function and produce commodities and services necessary for human welfare. Analysing regional diversity makes it feasible to assess potential functional roles for the species (Wilson 1997). According to this theory, research on the diversity of species is essential to comprehending how human growth affects an ecosystem's capacity to sustain itself. Numerous studies have highlighted the diversity of insects because they provide ecological services such pollination, nutrient decomposition, pest control, and species maintenance in both terrestrial and aquatic environments (Koh and Sodhi 2004; Losey and Vaughan 2006). Butterflies are the most beautiful things in the cosmos, among insects. Their involvement in pollination are significant (Tiple et al. 2006; Tiple 2018). While caterpillars are dependent on particular host plants for leaves, adult butterflies are only fed by nectar and pollen (Nimbalkar et al. 2011). The health of any given terrestrial ecosystem is best predicted by butterflies, according to Thomas (2005) and Bonebrake et al. (2010). As such, butterflies are considered a key model group in the fields of ecology and conservation (Watt and Boggs 2003; Ehrlich and Hanski 2004; Mukherjee et al. 2015). In this regard, the preservation of several ecological services for human well-being depends on the survival of butterflies. The purpose of the current study was to estimate the diversity of butterflies in the Dnyanganga environment in light of the vital ecological services that they provide and to support conservation management. Maharashtra, India's Wildlife Dnyanganga Sanctuary. The study's findings should strengthen the ecological roles that various butterfly species play in the Dnyanganga and add to the information that is already required for conservation managementWildlife Sanctuary and comparable geographic areas

Materials and methods

Study area

The Dnyanganga Wildlife Sanctuary is a small, diverse area in the Indian state of Maharashtra that is rich in biodiversity. It has an amazing abrupt drop in elevation, a difficult topography, a healthy environment, and hilly scenery. Around Buldana district, it proliferates. District of Buldana's Khamgaon Tahsil encompasses the sanctuary's area. The Maharashtra town of Khamgaon is located 20 miles from the Dnyanganga Sanctuary, while Buldana is 28 km away. It is close to the Dnyanganga River in the Buldana District. Within the 205 sq km sanctuary are two lakes. In addition to tigers, additional attractions include leopards, sloth bears, blue bulls, barking deer, spotted deer, hyenas, jungle cats, and jackals. There are roughly 150 species of birds there. Visits to the refuge are best made between January and June. The greatest months to see wild animals are February through May. The land is sloping, with gentle-sloped hillocks dotted throughout. The Sanctuary, which is overseen by the Maharashtra Forest Department's Office of Field Director at the Melghat Tiger Reserve, provides a natural habitat for a variety of animal and bird species, many of which

are seasonal. well-distributed rainfall during the south-west monsoon season and generally dry weather during rest of the year. The cold season is from December to February (Buldana Gazetteer 2020).

Survey methodology

A year-long period, from January to December 2022, saw the butterflies being observed at the sampling sites. A well-functioning protocol was used during the survey. A "Pollard Walk" approach (Pollard 1977; Pollard and Yates 1993) was used to conduct the survey, with the appropriate adjustments. Under favourable weather conditions, the study area was visited twice a month from early in the morning (7:00 AM) to late in the afternoon (5:00 PM).

Identification of species

During discovery, a specimen was recognised using obvious structural traits and photographed using a Nikon D7100 camera (Nikon Inc., Tokyo, Japan).

Keys and techniques recommended by Evans (1932), Wynter-Blyth (1957), Haribal (1992), Kunte (2000), and Kehimkar (2008) were used for the identification and comparative analyses of observed specimens.

Analysis of data

By utilising the following formulas, the Microsoft Excel programme conducted a species occurrence analysis The formula for calculating Relative Dominance (RD) of species is [RD=Ni × 100/Nt], where Ni is the number of individuals in a species and Nt is the total number of individuals in all species (Basavarajappa 2006; Joshi 2014). The formula for calculating the mean percent occurrence (M%) for a given month is [M% = Nm × 100 /Nt], where Nm represents the number of participants in each month and Nt represents the total number of participants over the course of the study (Basavarajappa 2006; Joshi and Tantarpale 2016). The monthly diversity of and classification of the local status of species were computed using the mean values of the pooled species occurrence data.

Highlighting the butterfly species' observed pattern of species richness was made possible by the diversity assessment. PAST Version 1.60 software (Palaeontological Association, Norway; Hammeret al., 2001) was used to quantify the diversity indices. The species richness was obtained using the Margalef equation [R= (S-1)/ log N], where R is the index of species richness, S is the total number of species, and N is the total number of individuals (Magurran 1988); Vidyabharati International Interdisciplinary Research Journal 13(1) ISSN 2319-4979 Sept. 2021 756 www.viirj.org. The species diversity was calculated using the Shannon diversity index, which was calculated as [$H' = -Pi\log Pi\ R$ i=1]; Pi is the proportion of the first species, which is given by Pi= ni/N (Magurran 1988). However, the Pielou equation [J= N1/N0], where N1 is the number of abundant species in the sample and N0 is the total number of species in the sample, was used to evaluate the species equitability (Hammeret al., 2001). Using the nearest neighbour pair linkage algorithm using the Euclidean distance index for presence and absence data, the similarity association matrix, upon which the cluster was based, was calculated (Hammeret al., 2001). Statistical analysis was performed using Analysis of Variance (ANOVA) to examine the differences between the diversity and evenness indices with species occurrence among the various research months. The statistical analyses were carried out using SPSS version 10 (SPSS Inc., Chicago, Il, USA; Kinnear and Grey 2000), in accordance with Zar (1999).

Results

In the research area, 89 butterfly species belonging to five families were recorded (Table 1). Considering the butterfly's relative value dominance in the research region, 37.93% of the species were classified as abundant, compared to 39.08% common, 8.05% frequent, 12.64% infrequent, and 2.30% extremely rare. The family Nymphalidae had the highest number of butterfly species (32.18%), followed by Lycaenidae (27.59%), Pieridae (27.59%), Hesperiidae (18.75%), and Papilionidae (6.90%). The number of butterfly species seen in a year varied in degree of resemblance, as demonstrated by a multidimensional dendrogram created by Euclidean distance cluster analysis. One cluster consists of the months with a minimal to moderate number of species, while another cluster is created by the other months with a moderate to maximum number of species . The quantity of butterflies appears to have increased from the monsoon to the winter, but dropped in the summer and before the monsoon, presumably as a result of variations in the temperature and humidity of the affected habitats as well as the possible lack of nectar. According to observations, the monthly fluctuations in butterfly abundances show a low from February to May and a peak from July to January. Butterfly mean percent abundance varied significantly ($F = 80.23$, $df = 11$, $p < 0.05$); butterfly Shannon diversity values varied significantly ($F = 102.3$, $df = 11$, $p < 0.05$); butterfly species evenness varied significantly ($F = 109$, $df = 11$, $p < 0.05$); butterfly species richness varied significantly ($F = 97.02$, $df = 11$, $p < 0.05$). The opposing tendencies were demonstrated by a trend in species richness, species equitability, Shannon diversity, and mean% abundance.

Table 1. Diversity of Butterflies during January 2022to December 2022 in the Dnyanganga Wildlife Sanctuary, Maharashtra, India

Common Name	Scientific Name	IUCN Status	Relative Dominance	Local Status
Family: Papilionidae				
Tailed Jay	Graphium agamemnon (Linnaeus, 1758)	NE	1.272	Common
Common Jay	Graphium doson (Felder and Felder, 1864)	NE	1.198	Common
Common rose	Pachliopta aristolochiae (Fabricius, 1775)	LC	1.087	Common
Crimson rose	Pachliopta hector (Linnaeus, 1758)	NE	1.026	Common
Lime Butterfly	Papilio demoleus (Linnaeus, 1758)	NE	1.444	Abundant
Family: Pieridae				
Common Mormon	Papilio polytes (Linnaeus, 1758)	NE	1.351	Abundant
Common Albatross	Appias albino (Fabricius, 1775)	NE	1.135	Common
Indian Pioneer	Belenois aurota (Fabricius, 1793)	NE	1.536	Abundant
Common Emigrant	Catopsilia pomona (Fabricius, 1775)	NE	1.004	Common
Mottled Emigrant	Catopsilia pyranthe (Linnaeus, 1758)	NE	1.332	Abundant
Common Gull	Cepora nerissa (Fabricius, 1775)	NE	1.495	Abundant
Small salmon Arab	Colotis amata (Butler, 1870)	NE	0.112	Rare
Crimson Tip	Colotis danae (Fabricius, 1775)	NE	0.194	Rare
Small Orange Tip	Colotis etrida (Boisduval, 1836)	NE	1.147	Common
White Orange Tip	Ixias Marianne (Cramer, 1775)	NE	1.122	Common
Yellow Orange Tip	Ixias pyrene (Linnaeus, 1764)	NE	0.778	Occasional
Common Jezebel	Delias eucharis (Drury, 1773)	NE	1.326	Abundant
One Spot Grass Yellow	Eurema andersoni (Moore, 1865)	LC	1.581	Abundant
Three Spot Grass Yellow	Eurema blanda (Boisduval, 1836)	NE	1.096	Common
Small Grass Yellow	Eurema brigitta (Stoll, 1780)	LC	1.237	Common
Common Grass Yellow	Eurema hecabe (Linnaeus, 1758)	NE	1.412	Abundant
Spotless Grass Yellow	Eurema laeta (Boisduval, 1836)	NE	1.485	Abundant
Psyche	Leptosia nina (Fabricius, 1793)	NE	0.768	Occasional
Common Wanderer	Pareronia valeria (Cramer, 1776)	NE	1.218	Common
Family: Nymphalidae				
Tawny Castor	Acraea violae (Fabricius, 1775)	NE	1.068	Common
Angled Castor	Ariadne ariadne (Linnaeus, 1763)	NE	1.262	Common
Common Castor	Ariadne merione (Cramer, 1779)	NE	1.176	Common
Plain Tiger	Danaus chrysippus (Linnaeus, 1758)	NE	1.517	Abundant
Striped Tiger	Danaus genutia (Cramer, 1779)	NE	1.386	Abundant
Common Crow	Euploea core (Cramer, 1780)	LC	1.571	Abundant
Baronet	Euthalia nais (Cramer, 1779)	NE	1.020	Common
Great Eggfly	Hypolimnas bolina (Linnaeus, 1758)	NE	1.163	Common
Danaid Eggfly	Hypolimnas misippus (Linnaeus, 1764)	NE	1.045	Common
Peacock Pansy	Junonia almana (Linnaeus, 1758)	LC	1.431	Abundant
Grey Pansy	Junonia atlites (Linnaeus, 1763)	NE	1.154	Common
Yellow Pansy	Junonia hierta (Fabricius, 1775)	LC	1.211	Common
Chocolate Pansy	Junonia iphita (Cramer, 1779)	NE	1.058	Common
Lemon Pansy	Junonia lemonias (Linnaeus, 1758)	NE	1.294	Abundant
Blue Pansy	Junonia orithya (Linnaeus, 1764)	NE	1.549	Abundant
Common Evening Brown	Melanitis leda (Linnaeus, 1758)	NE	1.364	Abundant
Great Evening Brown	Melanitis zitenius(Linnaeus, 1758)	NE	0.790	Occasional

Common Name	Scientific Name	IUCN Status	Relative Dominance	Local Status
Common Bush Brown	Mycalesis perseus (Fabricius, 1775)	NE	1.036	Common
Common Sailer	Neptis hylas (Linnaeus, 1764)	NE	1.014	Common
Common Leopard	Phalanta phalantha (Drury, 1773)	LC	1.457	Abundant
Blue Tiger	Tirumala limniace (Cramer, 1775)	NE	1.422	Abundant
Commander	Moduza procris (Cramer, 1777)	NE	1.246	Common
Painted Lady	Synthia cardui (Linnaeus, 1764)	NE	0.994	Common
Joker	Byblia ilithyia (Drury, 1773)	NE	0.985	Common
Common Three Ring	Ypthima asterope (Klug, 1832)	NE	1.249	Common
Large Three Ring	Ypthima nareda (Kirby, 1871)	LC	0.908	Frequent
Anomalous Nawab	Polyura agrarian (Linnaeus, 1764)	NE	0.736	Occasional
Towny Rajah	Charaxes bernardus (Fabricius, 1793)	NE	0.743	Occasional
Family: Lycaenidae				
Pointed Ciliate Blue	Anthene lycaenina (C. Felder, 1868)	NE	1.256	Common
Large Oak Blue	Arphopala amantes (Hewitson, 1862)	NE	0.730	Occasional
Dull Babool Blue	Azanus uranus (Butler, 1886)	NE	0.870	Frequent
Bright Babool Blue	Azanus ubaldus (Stoll, 1782)	NE	0.682	Occasional
Lime Blue	Chilades lajus (Stoll, 1780)	NE	1.562	Abundant
Gram Blue	Euchrysops cnejus (Fabricius, 1798)	NE	1.310	Abundant
Pea Blue	Lampides boeticus (Linnaeus, 1767)	NE	1.342	Abundant
Zebra Blue	Leptotes plinius (Fabricius, 1793)	NE	1.504	Abundant
Tailless Line Blue	Prosotas dubiosa (Semper, 1879)	NE	1.112	Common
Common Line Blue	Prosotas nora (Felder, 1860)	NE	1.227	Common
Guava Blue	Virachola isocrates (fabricius, 1793)	NE	0.720	Occasional
Dark Grass Blue	Zizeeria karsandra (Moore, 1865)	NE	1.374	Abundant
Lesser Grass Blue	Zizina otis (Fabricius, 1787)	NE	1.291	Abundant
Tiny Grass Blue	Zizula hylax (Fabricius, 1775)	NE	1.441	Abundant
Plum Judy	Abisara echerius (Moore, 1901)	NE	0.752	Occasional
Common Pierrot	Castalius rosimon (Fabricius, 1775)	NE	0.857	Frequent
Forget-Me-Not	Catochrysops strabo (Fabricius, 1793)	NE	1.399	Abundant
Plains Cupid	Luthrodes pandava (Horsfield, 1829)	NE	0.943	Frequent
Indian cupid	Cupido lacturnus (Godart, 1824)	NE	1.077	Common
Grass Jewel	Freyeria trochylus (Freyer, 1845)	NE	1.469	Abundant
Common Cerulean	Jamides celeno (Cramer, 1775)	NE	1.485	Abundant
Indian Red Flash	Rapala airbus (Fabricius, 1787)	NE	0.663	Occasional
Common Silverline	Spindasis vulcanus (Fabricius, 1775)	NE	1.530	Abundant
Rounded Pierrot	Tarucus extricates (Kollar, 1848)	NE	1.285	Abundant
Family: Hespiridae				
Brown awl	Badamia exclamationis (Fabricius, 1775)	LC	1.463	Abundant
Plain Banded Awl	Hasora vita (Cramer, 1780)	NE	0.867	Frequent
Rice swift	Borbo cinnara (Wallace, 1866)	NE	1.559	Abundant
Small branded swift	Pelopidas mathias (Fabricius,1798)	NE	1.339	Abundant
Conjoined Swift	Pelopidas conjuncta (Moore, 1878)	NE	0.959	Common
Paintbrush Swift	Baoris farri (Moore, 1878)	NE	0.886	Frequent
Common Straight Swift	Parnara guttatus (Bremer and Gray, 1853)	LC	1.205	Common
Indian Palm bob	Suastus gremius (Fabricius, 1798)	NE	0.979	Common
Dark Palm-Dart	Telicota ancilla (Moore, 1878)	NE	1.141	Common

Common Name	Scientific Name	IUCN Status	Relative Dominance	Local Status
Indian skipper	Spialia galba (Fabricius, 1793)	LC	0.819	Frequent
Grass Demon	Udaspes folus (Cramer, 1775)	NE	0.692	Occasional

Please note that "NE" stands for "Not Evaluated" in the IUCN status column.

Discussion

According to Stefanescu et al. (2004), butterflies are an important ecological species that can be used as indicators of environmental conditions. The diversity of butterfly observations reveals differences in species richness and abundance in connection to the vegetation along the landscape and interactions between species (Öckinger and Smith 2006;Öckinger et al 2006; Mutmainnah and Santosa 2019). Accordingly, from January to December 2022, researchers examined the variety of butterflies at the Isapur Wildlife Sanctuary in Maharashtra, India. The largest dam in the district, the Isapur dam, borders the study area. Dense vegetation of diverse plant species is the dominant feature, supporting colonies of butterflies. Previous research (Kuussaari et al., 2007; Mukherjee et al., 2015, Virani and Madavi 2022) demonstrated that the rich diversity of butterflies is supported by the environments' variability with respect to the plant species that are present. Previous research comparing the diversity of butterfly species in agricultural areas versus urban and suburban settings indicates that the availability of green space and the variety of plant species present in the habitats increased the richness of the butterflies (Öckinger et al, 2009; Mukherjee et al 2015). The current observation recorded 89 species in all, representing five families in the study area, which is consistent with earlier investigations. The Nymphalidae, Lycaenidae, Pieridae, Hesperiidae, and Papilionidae families had the greatest number of species of butterflies. These 89 species are included in The research area's butterfly relative dominance value classified 41.38 percent of the species as abundant, compared to 39.08 percent of common, 5% of frequent, 11.49% of occasional, and 2.30 percent of uncommon species. Colotis amata and Colotis danae were two of the rare species. Of these 87 species of butterflies, 14 species that were listed in the Indian Wildlife (Protection) Act of 1972 were found in good quantities. While Hasora vita and Baoris farri are classified as Schedule IV, the butterflies Pachliopta hector, Castalius rosimon, and Virachola isocrates are placed in Schedule I Part IV. The species Appias albino, Cepora nerissa, Hypolimnas misippus, Melanitis zitenius, Charaxes bernardus, Anthene lycaenina, Euchrysops cnejus, Lampides boeticus, and Prosotas dubiosa are protected under Schedule II Part II. It seems that the quantity of butterflies rose during the monsoon and dropped during the summer and premonsoon, presumably as a result of nector scarcity and habitat-related temperature and humidity fluctuations. According to observations, butterfly interactions peak between September and December and have a low between January and June. The current observations are in line with reports and perspectives from butterfly species across the globe (Wilson et al., 2004; Tiple et al., 2006; Sodhi et al., 2010; Tiple 2018). The number of species found in this study was comparable to that found in other places of India with comparable topography (Roy et al., 2012; Harsh, 2014; Saikia, 2014; Mukherjee et al., 2015). The current study has demonstrated that the study region is home to at least 89 different species of butterflies, varying in abundance. The dominance of Nymphalidae butterflies is comparable to what has been noted in other regions of the world (Mutmainnah and Santosa 2019). Based on the species diversity found in Maharashtra, India's Isapur Wildlife Sanctuary, it may be inferred that butterflies provide a variety of functional purposes for the ecosystems' wellbeing. A notable feature of the current inquiry was the richness of species composition in the study region. The reported differences in the butterfly species observed in the current study may be attributed in part to the availability of vegetation, seasonal wetlands, and related elements that provide stability to the butterfly population and assemblages in the landscapes. The diversity of butterflies seen in the research area indicated that conservation management is necessary to guarantee the continuation of ecosystem services provided by butterflies. Only a small area and specific habitats are included in the current diversity analysis. There's a possibility that more species will be discovered in the future because the researched area has limited niches and habitats that need more thorough investigation.

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Physico-Chemical Analysis of Rajur River and Nalgangna Reservoir, Nalgangapur, Dist. Buldana, M. S., India

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Abstract:
The present study evolved physico-chemical parameters from the year February 2011 to January 2013. For the study of this reservoir sampling locations Rajur river and Nalganga reservoir. Total 13 parameters analysed during research. The study of physico-chemical parameters of water is a basic aspect of limnology, which is defined as the study of the functional relationship and productivity of freshwater and marine ecosystems as they are regulated by the dynamics of their chemical, physical and biotic environment.

Keywords: Physico-chemical parameters, Winkler's method, Rajur river and Nalganga reservoir.

Introduction:

Water is also known as "Blue Diamond". It is one of the most precious gifts tocreature given by the nature. Man uses water for different purposes like drinking, washing, in agriculture, food processing and in many other applications. People say Earth is "Blue Planet" because the largest part of the earth is occupied by water. Water covers more than 70% of the earth surface, 97.3% is in ocean and 20% is fresh water. Thus, water exist as a continuous exchange and circulations between the earth and atmosphere. Nalganga Reservoir is the second biggest reservoir in Bulhana district of Maharashtra, built on Nalganga River. Buldana district is situated at westernmost border of Vidarbha which lies between latitude parallel 19º 51' to 21º17' N and longitude parallel 75º 57' to 76º 49' E. District covers 9,640 Sq. km. area. The Nalganga reservoir and its tributaries like Khadaki, Mohgaon, Gulbheli, Rajur, Rohinkhed, Chinchpur, and Motala. The reservoir is situated in a good rainfall zone, receiving 825 mm average annual rainfall. The climate of the area is temperate practically.

River water is one of the most important and widely distributed natural resources which are considered as supplemental resource to meet the domestic, agriculture and industrial requirements. Freshwater has become a scarce commodity due to over exploitation and contamination of water. Increasing population and its necessities have lead to the deterioration of surface water studied by Nagnandi and Hosmani (1998); Bhadja and Vaghela (2013). The important physical and chemical parameters influencing the aquatic environment are temperature, rainfall, pH, salinity dissolved oxygen and these parameters are the limiting factors for the survival of aquatic organisms observed by Mahesh *et al.* (2013).

Materials and Methods

The study was conducted on Nalganga reservoir situated 18 Km away from Malkapur, which lies between 20º 43' 34'' N latitude and 76º 10' 49'' E longitude. The study evolved physico-chemical parameters from the year February 2011 to January 2013. For the study sampling locations were selected like Rajur river and Nalganga reservoirs. For the analysis of physico-chemical parameter Winkler's methods were used during the research work.

Observation Table: 1.1 Spot – Rajur
2011- 12

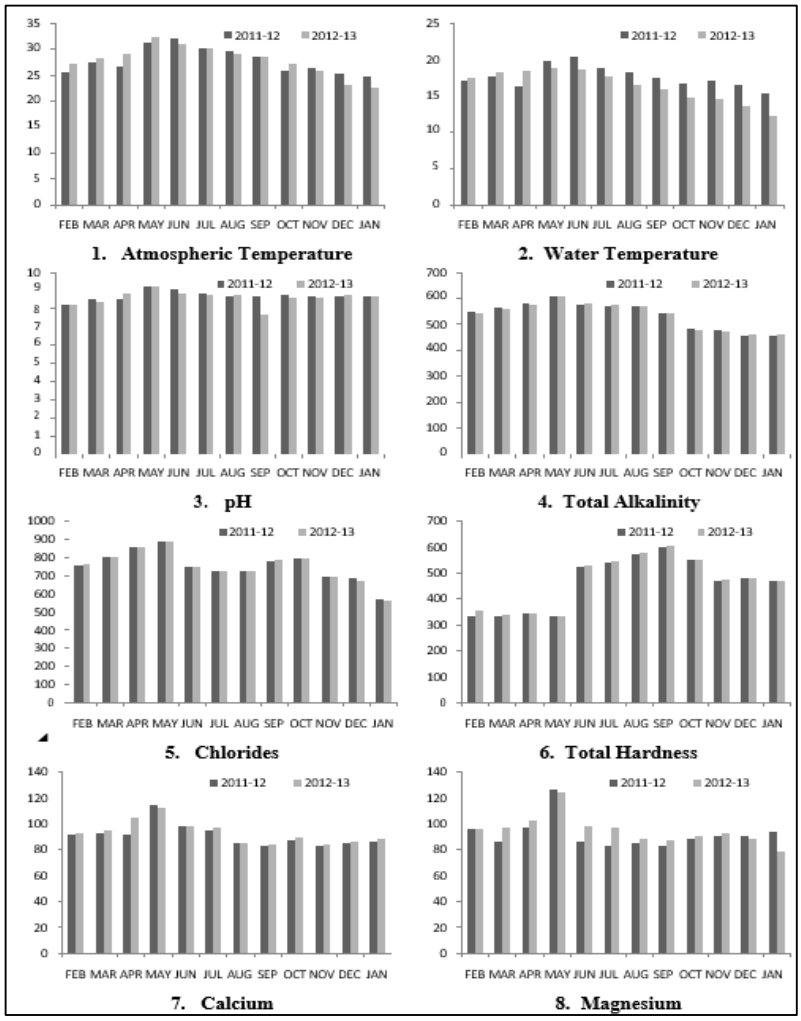
S.N.	Parameters	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	JAN
1	Atmospheric Temp. (^{0}C)	25.6 ±2.28	27.6 ±2.28	26.8 ±2.50	31.4 ±2.28	32.2 ±2.40	30.4 ±2.28	29.6 ±2.44	28.6 ±2.60	25.8 ±1.68	26.4 ±2.07	25.2 ±1.78	24.8 ±1.58
2	Water Temp. (^{0}C)	17.2 ±1.30	17.8 ±1.48	16.4 ±1.32	19.8 ±1.81	20.4 ±1.51	18.8 ±2.28	18.2 ±1.73	17.6 ±1.41	16.8 ±1.30	17.2 ±1.14	16.6 ±1.06	15.4 ±2.60
3	pH	8.27 ±0.03	8.55 ±0.03	8.52 ±0.04	9.24 ±0.03	9.12 ±0.24	8.86 ±0.08	8.68 ±0.03	8.72 ±0.04	8.76 ±0.04	8.68 ±0.02	8.72 ±0.02	8.71 ±0.03

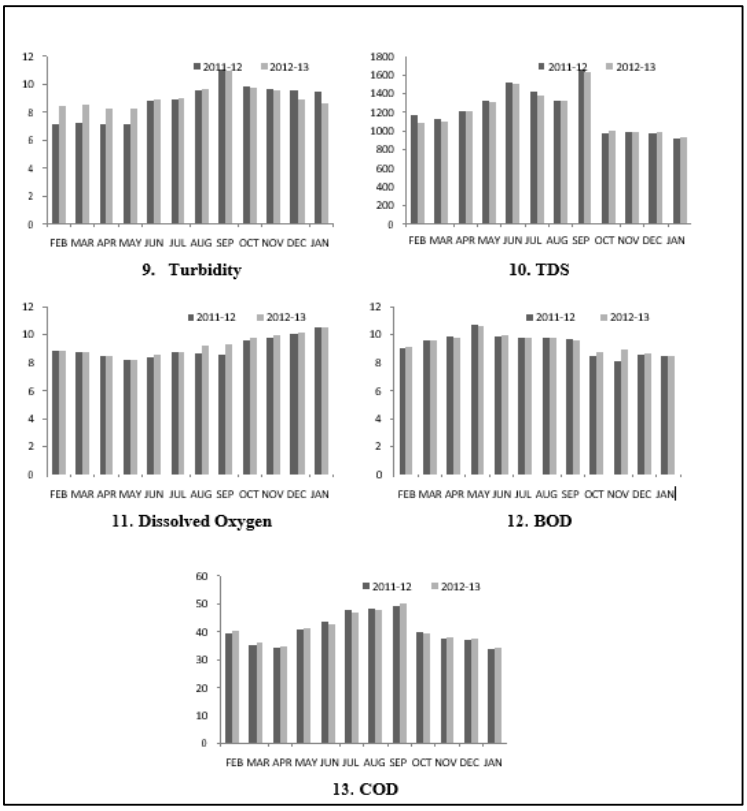
4	Total alkalinity (mg/L)	548.4 ±2.28	564.2 ±2.96	580.4 ±3.16	608.2 ±2.28	575.4 ±2.28	570.2 ±2.28	568.4 ±2.96	546.2 ±3.16	482.4 ±3.19	476.2 ±3.71	458.8 ±3.55	458.2 ±2.28
5	Chlorides (mg/L)	758.2 ±0.29	799.6 ±0.72	856.8 ±0.26	891.8 ±0.30	750.8 ±0.22	726.8 ±0.22	722.4 ±0.21	782.2 ±0.22	791.6 ±0.78	692.2 ±0.16	684.4 ±0.22	571.8 ±0.22
6	Total Hardness (mg/L)	333.6 ±0.22	332.2 ±0.22	342.8 ±0.22	334.4 ±0.31	522.6 ±0.16	541.6 ±0.50	575.4 ±0.22	601.4 ±0.16	551.6 ±0.29	472.8 ±0.91	480.6 ±0.27	668.2 ±0.26
7	Calcium (mg/L)	91.8 ±1.67	92.8 ±1.67	99.4 ±2.28	114.6 ±1.67	97.8 ±2.14	95.4 ±2.60	84.6 ±3.52	82.8 ±1.67	88.4 ±1.67	82.6 ±1.67	85.4 ±2.28	86.4 ±2.28
8	Magnesium (mg/L)	95.8 ±0.22	96.6 ±0.22	97.2 ±0.22	126.4 ±0.16	86.2 ±0.21	82.6 ±0.21	84.8 ±0.22	82.8 ±0.26	88.4 ±0.22	90.2 ±0.26	92.8 ±0.31	93.6 ±0.16
9	Turbidity (mg/L)	7.18 ±0.22	7.2 ±0.26	7.18 ±0.26	7.14 ±0.29	8.82 ±0.22	8.96 ±0.14	9.58 ±0.24	11.4 ±0.24	9.88 ±0.26	9.67 ±0.22	9.56 ±0.22	9.48 ±0.22
10	Total Dissolve Solids (mg/L)	1076.4 ±3.16	1124.2 ±1.41	1210.4 ±2.68	1320.8 ±5.0	1520.4 ±3.60	1422.4 ±3.16	1328.4 ±2.28	1654.8 ±3.43	980.8 ±2.28	992.4 ±3.16	982.8 ±3.03	924.8 ±3.16
11	Dissolved Oxygen (mg/L)	8.86 ±0.36	8.76 ±0.22	8.48 ±0.28	8.22 ±0.16	8.42 ±0.14	8.72 ±0.22	8.64 ±0.22	8.56 ±0.16	9.64 ±0.22	9.74 ±0.26	10.08 ±0.22	10.54 ±0.17
12	Biological oxygen demand (BOD) (mg/L)	9.08 ±0.22	9.62 ±0.26	9.85 ±0.22	10.68 ±0.52	9.92 ±0.67	9.78 ±0.2	9.82 ±0.30	9.72 ±0.16	8.52. ±0.14	8.12 ±0.26	8.54 ±0.22	8.46 ±0.26
13	Chemical Oxygen Demand (COD) (mg/L)	39.3 ±0.38	35.2 ±0.16	34.2 ±0.22	40.8 ±0.16	43.6 ±0.24	47.8 ±0.34	48.4 ±0.29	49.4 ±2.28	39.8 ±0.29	37.4 ±1.67	34.2 ±1.67	33.8 ±0.17

2012-13

S.N.	Parameters	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	JAN
1	Atmospheric Temp. (^{0}C)	27.2 ±0.31	28.2 ±0.31	29.2 ±0.94	32.4 ±0.46	31.1 ±0.42	30.2 ±0.31	29.2 ±0.42	28.6 ±0.31	27.2 ±0.26	25.8 ±0.38	23.2 ±0.31	22.6 ±0.31
2	Water Temp. (^{0}C)	17.6 ±0.40	18.2 ±0.42	18.4 ±0.38	18.8 ±0.42	18.6 ±0.31	17.8 ±0.31	16.5 ±0.42	15.9 ±0.31	14.8 ±0.31	14.5 ±0.28	13.6 ±0.42	12.3 ±0.40
3	pH	8.25 ±0.03	8.39 ±0.03	8.82 ±0.02	9.24 ±0.03	8.88 ±0.03	8.78 ±0.02	8.17 ±0.03	7.66 ±0.02	8.63 ±0.02	8.6 ±0.02	8.74 ±0.02	8.73 ±0.03
4	Total alkalinity (mg/L)	546.6 ±3.16	562.2 ±2.28	578.8 ±3.16	610.2 ±2.60	519.2 ±2.28	573.6 ±3.16	571.8 ±3.16	542.2 ±3.16	479.2 ±3.16	472.4 ±3.16	459.2 ±3.16	460.4 ±3.16
5	Chlorides (mg/L)	762.4 ±0.33	803.2 ±0.24	859.6 ±0.2	892.7 ±0.24	752.2 ±0.38	728.5 ±0.31	727.4 ±0.24	186.2 ±0.42	794.2 ±0.36	892.6 ±0.26	667.8 ±0.26	559.2 ±0.33
6	Total Hardness (mg/L)	353.4 ±0.26	337.6 ±0.36	342.2 ±0.24	335.2 ±0.26	527.8 ±0.31	546.4 ±0.31	578.6 ±0.31	604.2 ±0.26	552.8 ±0.31	476.6 ±0.24	482.2 ±0.31	470.2 ±0.26
7	Calcium (mg/L)	92.2 ±2.75	94.4 ±2.60	104.6 ±3.16	112.6 ±2.28	98.6 ±2.44	97.4 ±3.16	85.2 ±2.28	83.8 ±3.16	89.6 ±2.60	84.2 ±2.28	88.6 ±2.44	88.2 ±2.75
8	Magnesium (mg/L)	95.8 ±0.26	98.6 ±0.26	102.8 ±0.28	124.2 ±0.26	98.2 ±0.31	96.8 ±0.26	88.2 ±0.24	86.8 ±0.26	90.2 ±0.31	92.8 ±0.26	8.88 ±0.31	79.2 ±0.26
9	Turbidity (mg/L)	8.48 ±0.31	8.58 ±0.31	8.29 ±0.24	8.26 ±0.44	8.9 ±0.3	8.98 ±0.31	9.68 ±0.34	11 ±0.24	9.78 ±0.26	9.56 ±0.24	984.6 ±0.26	8.62 ±0.31

10	Total Dissolve Solids (mg/L)	1086.2 ±2.60	1098.2 ±2.60	1205.4 ±3.31	1310.2 ±3.43	1508.4 ±2.28	1378.4 ±3.74	1326.2 ±3.16	1638.8 ±2.28	1010.2 ±2.60	994.6 ±5.01	1010.2 ±2.28	932.8 ±2.60
11	Dissolved Oxygen (mg/L)	8.82 ±0.31	8.72 ±0.24	8.52 ±0.24	8.16 ±0.31	8.58 ±0.31	8.76 ±0.26	9.24 ±0.31	9.32 ±0.31	9.82 ±0.31	9.98 ±0.31	8.68 ±0.38	10.48 ±0.31
12	Biological oxygen demand (BOD) (mg/L)	9.12 ±0.26	9.58 ±0.67	9.82 ±0.31	10.59 ±0.26	9.96 ±0.26	9.82 ±0.31	9.78 ±0.31	9.56 ±0.31	8.78 ±0.24	8.96 ±0.31	37.6 ±0.24	8.48 ±0.26
13	Chemical Oxygen Demand (COD) (mg/L)	40.32 ±0.46	36.16 ±0.31	34.78 ±0.42	41.16 ±0.42	42.78 ±0.3	46.98 ±0.38	47.88 ±1.71	50.14 ±0.42	39.58 ±0.26	38.2 ±0.31	31.2 ±0.31	34.2 ±0.46





1.2 SPOT – Nalganga Reservoir

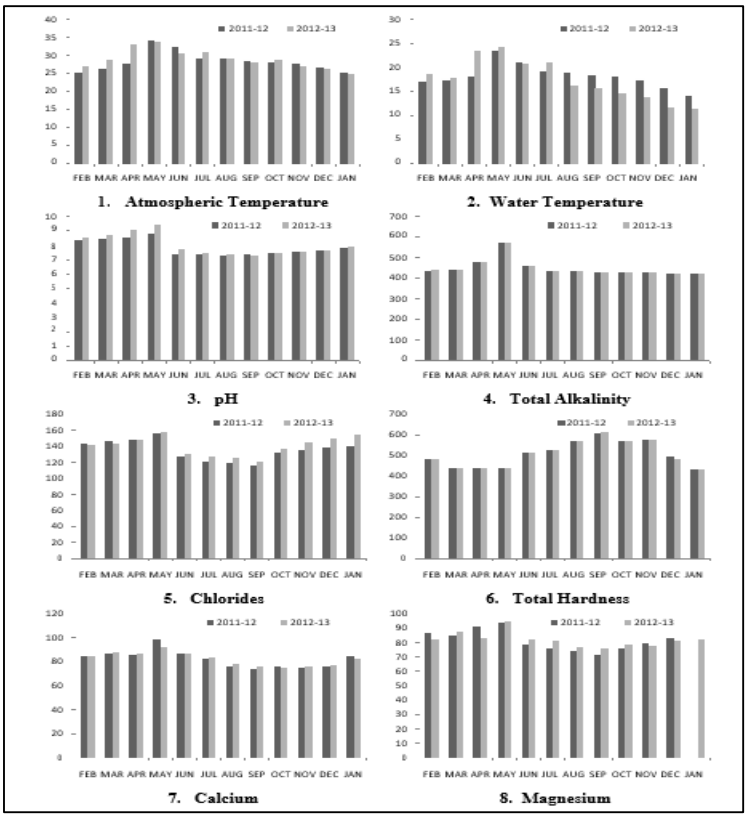
2011-2012

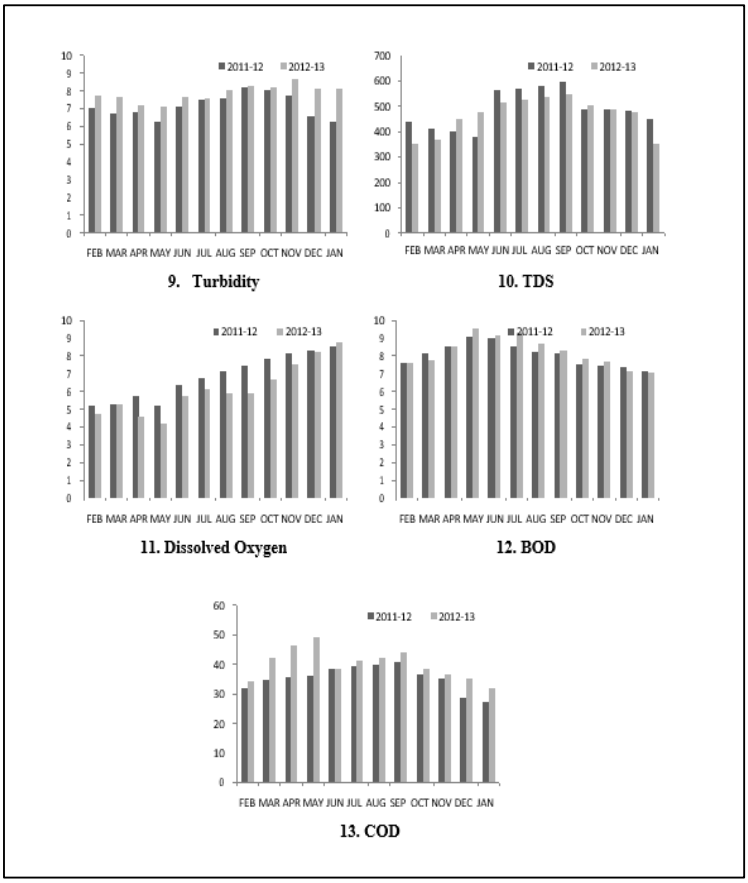
S.N.	Parameters	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	JAN
1	Atmospheric Temp. (^{0}C)	25.4 ±2.19	26.4 ±1.41	27.8 ±1.58	34.2 ±2.60	32.4 ±2.82	29.6 ±1.89	29.4 ±1.63	28.6 ±2.30	28.2 ±1.92	27.6 ±1.89	26.8 ±1.58	25.2 ±2.60
2	Water Temp. (^{0}C)	17.2 ±2.60	17.5 ±1.37	18.2 ±1.30	23.4 ±1.67	21.2 ±1.37	19.2 ±0.67	19 ±2.28	18.4 ±1.09	18.2 ±2.70	17.5 ±1.61	15.8 ±1.30	14.2 ±4.0
3	Ph	8.36 ±0.02	8.43 ±0.03	8.56 ±0.05	8.85 ±0.26	7.38 ±0.02	7.4 ±0.02	7.32 ±0.02	7.35 ±0.02	7.45 ±0.02	7.54 ±0.01	7.64 ±0.02	7.87 ±0.02
4	Total alkalinity (mg/L)	437.6 ±2.28	436.6 ±2.28	482.4 ±2.28	572.6 ±3.19	460.4 ±2.28	437.8 ±2.96	435.2 ±2.44	430.8 ±1.67	429.4 ±1.78	430.2 ±2.96	426.6 ±3.13	425.2 ±2.0
5	Chlorides (mg/L)	144.2 ±2.0	145.8 ±1.67	148.6 ±1.78	156.4 ±2.28	127.2 ±1.67	121.2 ±1.09	118.8 ±1.67	115.6 ±2.0	131.6 ±1.67	135.6 ±2.60	138.4 ±2.60	140.2 ±2.96
6	Total Hardness (mg/L)	480.2 ±0.21	440.4 ±0.2	438.4 ±2.19	436.2 ±0.22	515.4 ±0.22	527.6 ±0.22	568.2 ±0.29	602.2 ±2.0	571.2 ±1.5	578.4 ±0.2	495.2 ±1.22	432.4 ±0.22
7	Calcium (mg/L)	84.2 ±2.44	86.7 ±2.0	85.9 ±2.28	90.8 ±2.44	86.8 ±2.0	82.2 ±2.0	75.4 ±1.48	74.2 ±1.30	75.6 ±1.89	75.2 ±1.44	76.8 ±1.67	84.2 ±2.0
8	Magnesium (mg/L)	86.4 ±0.13	85.2 ±0.17	91.2 ±0.69	93.4 ±0.16	78.8 ±0.22	76.2 ±0.16	74.4 ±0.22	71.2 ±0.2	75.6 ±0.16	79.4 ±0.24	82.8 ±0.2	84.2 ±0.16
9	Turbidity (mg/L)	7.04 ±0.16	6.72 ±0.24	6.78 ±0.2	6.24 ±0.24	7.12 ±0.24	7.52 ±0.16	7.58 ±0.16	8.18 ±0.47	8.02 ±0.87	7.72 ±0.32	6.58 ±0.23	6.24 ±0.22
10	Total Dissolve Solids (mg/L)	440.2 ±2.96	410.8 ±1.67	400.2 ±2.0	380.8 ±1.67	565.8 ±1.18	570.8 ±1.67	578.4 ±4.24	598.2 ±1.78	490.2 ±2.96	488.2 ±1.67	480.8 ±1.67	448.2 ±3.06

11	Dissolved Oxygen (mg/L)	5.18 ±0.14	5.28 ±0.16	5.76 ±0.22	6.16 ±0.14	6.4 ±0.21	6.78 ±1.48	7.12 ±0.19	7.48 ±0.16	7.82 ±0.14	8.12 ±0.14	8.28 ±0.22	8.58 ±0.22
12	Biological oxygen demand (BOD) (mg/L)	7.58 ±0.16	8.18 ±0.2	8.52 ±0.21	9.12 ±0.26	9.04 ±0.16	8.52 ±0.17	8.24 ±0.2	8.12 ±0.22	7.56 ±0.10	7.48 ±0.28	7.35 ±0.19	7.12 ±0.2
13	Chemical Oxygen Demand (COD) (mg/L)	32.12 ±0.16	34.56 ±0.17	35.52 ±0.22	36.22 ±0.14	38.56 ±0.22	39.54 ±2.24	39.82 ±2.96	40.54 ±2.28	36.42 ±1.67	35.2 ±1.09	28.62 ±2.28	27.48 ±0.24

2012-2013

S.N.	Parameters	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	JAN
1	Atmospheric Temp. (^{0}C)	27.2 ±1.67	28.8 ±1.78	33.2 ±1.18	33.8 ±2.04	30.6 ±1.78	31.1 ±1.73	29.1 ±2.64	28.1 ±1.41	28.8 ±1.67	27.2 ±2.28	24.8 ±1.67	26.4 ±1.67
2	Water Temp. (^{0}C)	18.8 ±1.67	17.8 ±2.28	23.4 ±1.67	24.2 ±1.78	20.8 ±2.28	21.2 ±1.41	16.4 ±1.67	15.8 ±1.67	14.6 ±1.09	13.8 ±1.08	12.6 ±1.67	11.4 ±1.67
3	pH	8.5 ±0.02	8.71 ±0.022	9.12 ±0.02	9.48 ±0.02	7.77 ±0.03	7.49 ±0.02	7.37 ±0.33	7.3 ±0.026	7.48 ±0.026	7.52 ±0.024	7.66 ±0.026	7.89 ±0.04
4	Total alkalinity (mg/L)	438.8 ±3.13	440.4 ±2.28	481.6 ±2.28	571.2 ±1.67	459.6 ±1.67	435.4 ±2.28	434.4 ±1.41	428.8 ±2.28	428.4 ±2.28	432.2 ±1.73	425.6 ±3.16	424.8 ±2.44
5	Chlorides (mg/L)	141.4 ±2.28	142.6 ±2.60	148.6 ±2.28	158.2 ±3.16	130.4 ±2.28	127.6 ±1.73	125.6 ±2.28	121.6 ±2.64	137.4 ±2.28	144.6 ±2.28	150.4 ±2.28	154.6 ±2.28
6	Total Hardness (mg/L)	481.4 ±2.28	441.6 ±2.64	439.6 ±2.28	435.6 ±2.28	516.2 ±2.28	524.8 ±2.28	570.6 ±2.28	612.4 ±2.44	592.4 ±2.28	575.4 ±2.60	485.4 ±2.28	431.2 ±2.28
7	Calcium (mg/L)	84.3 ±2.28	87.4 ±2.32	86.4 ±2.0	92.4 ±3.16	87.2 ±2.60	83.2 ±2.60	77.6 ±2.60	76.4 ±2.28	75.2 ±2.28	75.4 ±2.60	77.2 ±2.60	82.2 ±2.28
8	Magnesium (mg/L)	82.4 ±0.26	87.1 ±0.55	93.2 ±0.24	94.4 ±0.24	82.2 ±0.31	81.4 ±0.26	77.1 ±0.26	76.2 ±0.26	78.5 ±0.79	78.1 ±0.24	81.4 ±0.28	82.5 ±0.24
9	Turbidity (mg/L)	7.72 ±0.24	7.7 ±0.24	7.21 ±0.24	7.14 ±0.26	7.71 ±0.26	7.62 ±0.26	8.02 ±0.26	8.28 ±0.42	8.24 ±0.36	8.71 ±0.31	8.14 ±0.31	8.15 ±0.26
10	Total Dissolve Solids (mg/L)	357.2 ±2.28	367.4 ±2.60	449.6 ±2.28	478.2 ±2.28	512.4 ±2.28	525.2 ±2.60	535.6 ±2.60	546.2 ±2.28	505.2 ±2.8	487.6 ±2.28	479.6 ±2.28	353.2 ±2.28
11	Dissolved Oxygen (mg/L)	4.72 ±0.31	5.3 ±0.31	4.62 ±2.61	4.16 ±2.61	5.72 ±2.61	6.12 ±3.23	5.86 ±3.80	5.92 ±1.81	6.66 ±2.61	7.5 ±2.61	8.24 ±0.31	8.76 ±3.80
12	Biological oxygen demand (BOD) (mg/L)	7.64 ±2.61	7.76 ±0.31	8.54 ±2.61	9.52 ±2.61	9.52 ±3.31	9.54 ±2.29	9.32 ±3.31	9.14 ±2.61	8.66 ±2.61	7.84 ±2.61	7.04 ±2.61	7.76 ±2.61
13	Chemical Oxygen Demand (COD) (mg/L)	56.22 ±3.23	49.28 ±3.80	47.26 ±2.61	46.14 ±2.61	44.34 ±2.61	42.2 ±0.31	41.22 ±3.80	38.34 ±2.61	36.76 ±2.61	35.24 ±2.61	32.14 ±2.61	58.14 ±2.97


2011-12
2012-13
FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC JAN
1. Atmospheric Temperature
2. Water Temperature
3. pH
4. Total Alkalinity
5. Chlorides
6. Total Hardness
7. Calcium
8. Magnesium


2011-12
2012-13
FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC JAN
9. Turbidity
10. TDS
11. Dissolved Oxygen
12. BOD
13. COD

Result and Discussion: Water quality assessment river feeding Nalganga Reservoir was under taken from February 2011 to January 2013. It was with the view of investigate the various changes in its physico-chemical features and for confirming the good quality of water resources large number of physico-chemical parameters.

The result showed a direct relationship between atmospheric temperature, water temperature, pH, total alkalinity, chlorides, total hardness, calcium, magnesium, turbidity, total dissolved solids, biological oxygen demand, and chemical oxygen demand and inversed relation between temperature and dissolved oxygen. There is not a single factor but various factors have direct and indirect influences in the ecological system. It varies at different times of the day and during seasonal year from February 2011- January 2013.

Atmospheric Temperature: The atmospheric temperature was always higher than that of water temperature. In April and May temperature of atmosphere were generally higher as compared to other months. Atmospheric temperature was maximum in summer season than other months of both the years and minimum in winter and monsoon season. According to Singhai *et al*., (1990) the atmospheric temperature varies with the water temperature and also found by a direct relationship between atmospheric and water temperature. Also, by Afreen (2010) from Rui project, Bade *et al.,* (2009) in Sai reservoir, Latur.

Water Temperature: In winter season the water temperature were low as compared to other seasons in both the years but water becomes clear and calm due to sunlight penetrated in water due to the luxuriant growth of aquatic animals were recorded. In monsoon water temperature was recorded moderate. The variation occurs in the pH values to change in the values of CO_2, carbonate and bicarbonate in the water reported by APHA (1998); Gatlewar *et al.,* (2011).

pH : The pH of rivers feeding Nalganga Reservoir ranged between acidic and less alkaline. It was less alkaline throughout the year and showed minor seasonal variations of Rajur rivers also. The present pH ranges showed that the water of the Nalganga reservoir were suitable for aquatic life, irrigation and domestic uses. Higher pH values of studied lake water during summer ascribed to increased photosynthetic assimilation of dissolved inorganic carbon by planktons studied. Some workers studied on pH ranges by Kataria *et al.,* (1996); Jakhar and Rawat (2003) observed the maximum pH during summer, explained by correlating rise of temperature with increase in rate of photosynthesis which results in higher consumption of carbon-dioxide.

Total Alkalinity: The total alkalinity of water from the water body was mainly due to bicarbonates. The total alkalinity values were higher in summer and lower in winter season. The presence of total alkalinity indicated that the reservoir is productive. According to Latha and Mohan (2010) increase in atmospheric temperature and the consequent increase in photosynthetic process in hot season, alkalinity values usuallydecrease in summer. Also Dhanorkar (2011); Rahul *et al.,* (2012) observed the declinedalkalinity during summer.

Chlorides: The chloride values were higher in summer and less in winter of all rivers and streams feeding Nalganaga reservoir. This indicated that the contamination of water is negligible except Rajur river. Adoni (1985) attributed high chloride values due to increased organic matter, chloride also increases the degree of eutrophication also by WHO (1993); Lohar and Patel (1998). Similar trend of chloride ion concentration was given by Garg *et al.,* (2010). **s**

Total Hardness : Total Hardness values were higher in monsoon season, moderate in winter season, and lower in summer season in all rivers and streams of Nalganga reservoir. Similar result reported by Salve and Hiware (2008) that the total hardness were higher in winter, moderate in monsoon, and lower in summer season.

Calcium: The values of calcium were maximum during monsoon and minimum during summer and winter season of rivers and streams of Nalganga reservoir. The maximum values were recorded in the summer season as high temperature causes rapid decomposition of organic matter and minimum values were recorded in the winter season due to lowtemperature. Similar results were observed by Rajshekhar *et al*., (2007).

Magnesium: The values of magnesium were maximum during monsoon and minimum during summer and winter season. Magnesium contents were observed relatively lower than calcium in both the years of study period of rivers, Nalganga reservoir. Similar findings by Sachidanandamurthy and Yajurvedi (2006); Singh *et al*., (2012). Generally, magnesium content is lower than calcium ions in natural water also follows the same trend in the fish ponds due to the addition of animal manures and other waste in the water bodies, which increases the values of magnesium. These element increases the hardness of the water reported by Choudhary *et al.,* (2010) observed in a Kolar dam in different season.

Turbidity: The turbidity of water showed fluctuations. Turbidity values were higher in monsoon, moderated in winter season and lowered in summer season of all rivers of Nalganga reservoir. Turbidity of Rajur, were much higher due to this it becomes contaminated. According to Bordoloi *et al.,* (2012), the reservoirs with clay bottom have high turbidity. Turbidity reduces sunlight penetration and photosynthesis and acts as a

limiting factor. High turbidity reduces the dissolved oxygen in water. In less turbid water, the aquatic weed growth is more. In high turbid water, particles accumulated inthe gills of fish and prawns, causing suffocation and excessive secretion of mucous reported by (Siddaramu and Puttaiah 2013).

Total Dissolved solids: Total Dissolved solids means the amount of particles that are dissolved in water. The total dissolved solids were maximum in monsoon and winter season and minimum during summer. Total dissolved solid play an important role in cultivation of fishes stated by Gaddamwar and Rajput (2010).

Dissolved Oxygen: The dissolved oxygen values were lower in summer which created favourable conditions for the development of blue green algae. The dissolved oxygen level rises in winter. The value of dissolved oxygen is remarkable in determination of water quality criteria of an aquatic system. In system where the rates of respiration and organic decomposition are high, the dissolved oxygen values usually remain lower than those of the system, where the rate of photosynthesis is high stated by Ahirwar *et al.,* (2011). Dissolved Oxygen is one ofthe most important parameter. Its correlation with water body gives direct and indirect information like bacterial activity, photosynthesis, availability of nutrients, stratification investigated by Vikal (2009); Patil *et al.,* (2012).

Biological Oxygen Demand: Biological oxygen demand showed variation in dissolved oxygen. The seasonal average concentration of biological oxygen demand showed fluctuations. The maximum value of biological oxygen demand in summer and minimum in monsoon season. In both the years biological oxygen sdemand is higher in Rajur rivers. . BOD depends on temperature, extent of biochemical activities, concentration of organic matter and such other related factors studied by Prasanna and Panda (2010). It has been used as a measure of the amount of organic materials in aquatic solutions, which support the growth of micro-organisms explained by Thirumala *et al.,* (2011).

Chemical Oxygen demand: The chemical oxygen demand were maximum in summer and winter. It was minimum in monsoon season. Chemical oxygen demand were higher in Rajur river in summer. The higher value of chemical oxygen demand indicates the presence of oxidizable organic matter reported by Sleema and Ramesh Babu (2009). Chemical oxygen demand test is quite useful in finding out the contamination strength of industrial waste and sewage. Chemical oxygen demand as is the amount of oxygen required for a sample to oxidize at its organic and inorganic matter stated by Khan *et al.,* (2012).

Summary and Conclusion:

In brief summarizing the present study results, it is very clear that in summer, monsoon and winter season showed different seasonal fluctuations in various physico-chemical parameters of water of Nalganga reservoir and tributaries such as Rajur river.

Among these river Rajur are found contaminated because of some physico-chemical parameters like total alkalinity, chlorides, total hardness, calcium, magnesium, turbidity, total dissolved solids, Biological oxygen demand, chemical oxygen demand values were found in higher range than the other rivers and streams feeding Nalganga reservoir and also due to the domestic sewage and human activities. These rivers sites are not fit for drinking purposes. In conclusion, today our responsibility is to preserve water and to avoid contamination. Public awareness is essential to effective water resources management changes in basic behavior and practices are necessary to achieve long term improvement in water use and water quality.

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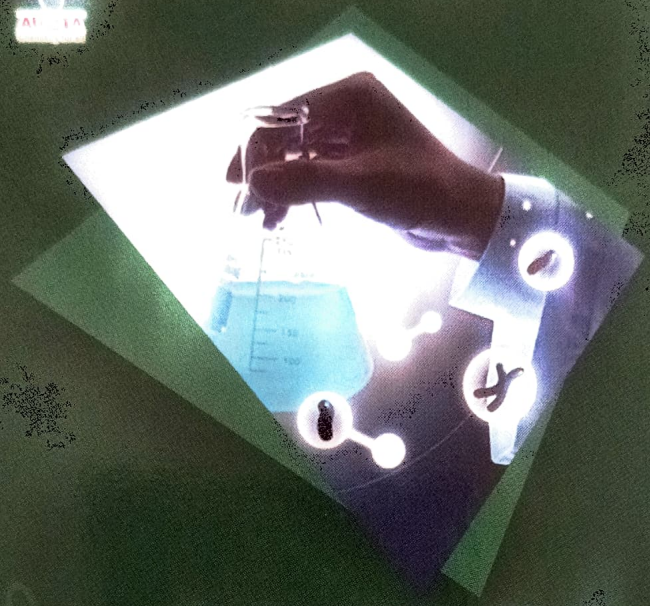

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महात्मा गांधी यांच्या विचारांची वर्तमान प्रासंगिकता

प्रा. पुरुषोत्तम रंगराव चाटे

विभाग प्रमुख, अर्थशास्त्र विभाग, श्री शिवाजी महाविद्यालय मोताळा, जि. बुलढाणा ४४३१०३ महाराष्ट्र, भारत

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प्रस्तावना

"महात्मा म्हटला गेलो म्हणून माझे वचन प्रमाण आहे असे समजून कोणी चालू नये. महात्मा कोण हे आपल्याला माहित नाही, म्हणून चांगला मार्ग हा की महात्म्याचे वचन देखील बुद्धीच्या कसोटीवर तपासून घ्यावे आणि ते सकस न उतरल्यास त्याचा त्याग करावा."ज्यांची जयंती जागतिक अहिंसा दिवस म्हणून साजरी करण्याचा निर्णय संयुक्त राष्ट्र संधाने घेतला आहे. भारताला नव्हे तर संपूर्ण जगाला सत्य आणि अहिंसा या तत्त्वावर राजकारण, समाजकारण आणि अर्थकारण करण्याचा मंत्र त्यांच्या मुळे मिळाला. महात्मा गांधीनी भारताच्या स्वातंत्र्य चळवळीच्या काळात लाखों भारतीयांना शांततापूर्व संघर्षाची प्रेरणा त्यांच्या विचार व नेतृत्वामुळे मिळाली. गांधीच्या कार्याचा प्रभाव भारतापुरचा मर्यादित न राहता जागतिक पातळीवर त्यांची दखल घेतली जाते. भारतावर विविध परकीय राजवटींचे राज्य होते. त्यामध्ये ब्रिटिश राजवटीचा जास्त उल्लेख भारताच्या जडणघडणी त असल्याची नोंद आहे. भारताने स्वातंत्र्यानंतर नियोजनाचा आधार घेऊन समाजवादी समाज रचनेच्या व्याहूरचनेखाली विकास करण्याचा मार्ग अवलंबला. कारण पंडित जवाहरलाल नेहरू यांच्यावर रशियन राज्यव्यवस्थेचा प्रभाव होता आणि त्यामुळे रशियामध्ये समाजवादी शासन व्यवस्था असल्यामुळे भारताने सुद्धा याच व्यवस्थेचा पुरस्कार केला. त्यामध्ये सार्वजनिक क्षेत्राच्या माध्यमातून दारिद्र्य निर्मूलन, रोजगार निर्मिती, गरिबी हटाव, कृषी अनुदान आणि लघु आणि कुटीर उद्योगाला चालना, वंचित घटकांसाठी विविध सरकारी योजना व सार्वजनिक क्षेत्राचे सबलीकरण इत्यादी घटकांचा विचार समाजवादी समाज रचनेमध्ये करणे अभिप्रेत होते. मात्र १९८० च्या दशकानंतर वरील धोरणाची दिशा बदलण्यास प्रारंभ झाला. भारताची सर्व आघाड्यावर होत असलेली पीछेहाट वाढते कर्ज, महागाई, बेरोजगारी तसेच रुपयाचे घसरते मूल्य या मधून मार्ग काढण्यासाठी नवीन आर्थिक धोरणाचा स्वीकार करण्यात आला. १९९०-९१ ला भारताने समाजवादी समाज रचनेचा त्याग करून भांडवलवादी अर्थव्यवस्थेकडे वाटचाल सुरू केली. यामध्ये खाऊजा धोरणाचा स्वीकार केला त्यामध्ये खाजगीकरण उदारीकरण आणि जागतिकीकरण अशा त्रिसूत्रीचा स्वीकार करण्यात आला. आज या धोरणाची अंमलबजावणी होऊन ३२ वर्ष पूर्ण झाली आहे. नवीन आर्थिक धोरणामुळे भारतीय अर्थव्यवस्थेचे सर्वच स्तरातील संदर्भ

बदलले आहे. प्रामुख्याने वापरा आणि फेकून द्या, बेरोजगारी, भ्रष्टाचार,नैतिक अध:पतन,अमर्याद उपभोग आणि अविश्वास,पर्यावरणाची हानी यासारख्या असंख्य समस्या निर्माण झाल्या आहेत. या बदलाच्या संदर्भात महात्मा गांधीजींचे धोरण उपयोगी पडते काय या प्रश्नाची उकल करण्यासाठी प्रस्तुत शोधनिबंधात वेध घेण्याचा प्रयत्न करण्यात आला आहे. कारण महात्मा गांधींनी स्वातंत्र्य मिळाल्यानंतर "पश्चिमेचे वारे आडवा" अशा आशयाचे विधान केले होते, त्या पाठीमागे कदाचित त्यांचा हा गर्भित इशारा असावा असे वाटते. श्रमाचे शोषण होता कामा नये.निर्मिकाने प्रत्येकाला आपली भाकरी निढळाच्या घामाने मिळवून खायाचे सांगितले आहे.त्यामुळे जगासाठी गांधीजीचे तत्वज्ञान तरणोपाय आहे असे म्हटले तरी वावगे ठरणार नाही.

संशोधनाचा उद्देश

१. महात्मा गांधी यांच्या विचाराची वर्तमानकलीन प्रासंगीकता तपासणे.
२. महात्मा गांधी यांच्या कार्याला उजाळा देणे.

जागतिकीकरण

०१ जानेवारी १९९५ रोजी भारताने जागतिक व्यापार संघटनेच्या करारावर स्वाक्षरी केली. त्यामुळे भारत जागतिक घडामोडीशी जोडला गेला.भारतीय सीमारेषेमध्ये परकीय कंपन्या परकीय गुंतवणूक, परकीय उत्पादने व परकीय सेवा इत्यादी बावीचा प्रभाव वाढला.बहुराष्ट्रीय कंपन्यासोबत स्पर्धा करणे देशी उद्योगांना आणि विशेष करून लघुकटीर उद्योगांना अवघड बनले होते. बहुराष्ट्रीय कंपन्यांचा स्पर्धेच्या रेट्यात उत्पादन वेग तसेच उच्च कोटीचे तंत्रज्ञान व उत्पादनाचा दर्जा भारतीय उत्पादनापेक्षा सरस आणि किंमतही कमी त्याचा परिणाम भारतीय मालाला अपेक्षित प्रतिसाद मिळत नाही किंवा भारतीय मालाची निर्यातीच्या स्पर्धेमध्ये पीछेहाट झालेली दिसते. दुसऱ्या बाजूला भारताला आयातीचा सामना करावा लागतो जागतिक व्यापार संघटनेच्या व्यापारविषयक तरतुदीमुळे भारताला परदेशी आयात निर्यातीवर संख्यात्मक आणि गुणात्मक निर्बंध लावण्यावर मर्यादा आल्या. याचच अर्थ भारतातील लघु आणि कुटिर उद्योगाला फारसे भविष्य दिसत नाही. या परिस्थितीमध्ये महात्मा गांधी यांनी सुचविलेले स्वदेशी व लघु-कुटीर उद्योग विषयक धोरण उपयोगी पडते. स्वदेशीच्या धोरणामुळे भारतीय उत्पादनाची मागणी वाढण्यास मदत होईल त्याचबरोबर खादीच्या आणि स्वदेशी वस्तू वापराच्या आग्रहामुळे भौतिक वादावरील अवलंबित्व, अनावश्यक आयात कमी होऊन व्यापारातील प्रतिकूलता कमी होण्यास मदत होईल.

ग्रामीण अर्थव्यवस्था

महात्मा गांधी यांनी खेड्याकडे चला असा संदेश दिला होता.कारण भारत हा कृषिप्रधान देश आहे या देशांमध्ये साडेसहा लाख खेडी आहेत जोपर्यंत खेडी स्वयंपूर्ण आणि समृद्ध होणार नाहीत तोपर्यंत भारत महासत्ता होऊ शकत नाही. हे सांगण्यासाठी कोणत्याही तत्ववेत्याची गरज नाही.त्यामुळे वर्तमान परिस्थितीमध्ये ५५ टक्के लोकसंख्या ग्रामीण भागात राहते व ४५ टक्के लोकसंख्या शहरी भागात राहते.शहरी वस्तीत लोकांच्या गर्दीमुळे अनारोग्य,अस्वच्छत्ता, प्रदूषण यामुळे हैराण आहे, तर खेडी ओस पडत चाललेली आहे.या विदारक स्थितीमध्ये मार्ग काढण्यासाठी महात्मा गांधीजींनी ग्राम स्वराज्याची सांगितलेली संकल्पना लागू पडते.त्यांच्या मतानुसार पूर्वी गावातील कारभार गावातील लोकांच्या सल्ल्याने चालायचा परंतु इंग्रजी राजवटीमध्ये आपल्या स्वार्थासाठी खेड्यामधील शासन व्यवस्था संपुष्टात आणली आणि खेड्यातील जनता परावलंबी झाली. गांधीजींच्या मते प्रत्येक खेड्यात उत्पादन,वितरण व उपभोग या गोष्टी घडल्या पाहिजेत म्हणजेच प्रत्येक खेडे स्वयंपूर्ण होईल.गांधीच्या ग्रामोधाराच्या प्रक्रियेमुळे खेड्यात नव विचारांचे वारे जोरात वाहू लागेल, येथे आरोग्य, शिक्षण,स्वच्छता व स्वावलंबन या गोष्टीला चालना मिळेल. खेड्यातील लोकांचा व त्यांच्या गरजांचा गांधीजींनी सूक्ष्म अभ्यास केला होता. त्यांच्यामते ग्राम जर आदर्श बनायचे असेल तर तेथील लोकांनी कामाचे नीट नियोजन केले पाहिजेत,लोकांनी शेतात पिके घेताना नगदी पिकांचा पहिल्यांदा विचार करावा. शेती हा

खेड्यातील लोकांचा मुख्य व्यवसाय असल्यामुळे येथील लोकांनी बारोमास काम मिळत नसल्याने त्यांच्यावर उपासमारीची पाळी यायची जेव्हा ही समस्या त्यांच्या लक्षात आली तेव्हा त्यांनी फावल्या वेळात सूतकताई,चरखा चालविणे इत्यादी प्रकार खेड्यात रूढ केले.शेतीतील कापूस त्यापासून सूत काढणे व त्यापासून कापड तयार करणे सुरू झाले. त्यांनीच खादीला प्रतिष्ठा मिळवून दिली.

शैक्षणिक विचार

मुळात शिक्षण हे समाज परिवर्तनाचे उत्तम माध्यम आहे.कोणत्याही राष्ट्राचा विकास अथवा विनाश करायचा तर त्यासाठी शिक्षणासारखे शस्त्र नाही.शिक्षणाचा मूळ उद्देश मनुष्याचा सर्वांगीण विकास करणे होय.केवळ पुस्तकी किडा न होता व्यवहार ज्ञानही मनुष्याला शिक्षणातून प्राप्त व्हावे असे गांधीजींना वाटायचे.मातृभाषेतून शिक्षण देण्यात यावे यावर त्यांचा जोर होता.कारकूनी शिक्षण पद्धती बदलून त्या जागी मूलउद्योगी शिक्षण पद्धतीचा पुरस्कार करून नई तालीम हे शिक्षण सुरू केले.शिक्षण क्षेत्रातून व्यवसाय शिक्षण देऊन मुलांमध्ये संपूर्ण माणूस तयार करणे आणि स्वावलंबी होऊन शारीरिक कार्य करून आपला उदरनिर्वाह चालवावा अशी गांधीजीचे विचार होते. वर्तमान परिस्थितीमध्ये शिक्षणाचे जे काही हाल झाले आहेत त्यावरून स्पष्टपणे असेल दिसून येते की समकालीन परिस्थितीमध्ये महात्मा गांधी यांनी सांगितलेला श्री एच फार्मूला अत्यंत फलदायी ठरतो. कारण आज पारंपारिक अथवा व्यावसायिक शिक्षण घेऊन रोजगारीचा प्रश्न निर्माण झालेला आहे.त्यामुळे महात्मा गांधींनी सांगितलेली नई तालीम किंवा श्री एच चा सूत्र प्रमाणे शिक्षण मातृभाषेतून देण्याचे प्रयोजन नवीन शैक्षणिक धोरणात करण्यात येत आहे.

श्रमाविषयी विचार

आराम हराम आहे असे गांधीजी म्हणत मेहनत मजुरी करावी,कष्ट करावे व स्वतःचे व देशाचे स्वास्थ्य सुस्थित ठेवावे याकरिता दररोज एक तास श्रमदान मनुष्यांनी करावे असे गांधीजीचे मत होते.वर्तमान परिस्थितीचा आढावा घेतला तर जगामध्ये भारत सर्वात जास्त तरुण लोकसंख्या असणारा देश आहे. मात्र या तरुणाईला विधायक कार्याकडे वळविण्यासाठी आवश्यक असणारे धोरण आज सुद्धा शासनाकडे उपलब्ध नाही. त्यामुळे ही तरुण युवाशक्ती व त्यांची ऊर्जा व्यर्थ जाण्याची भीती निर्माण झाली आहे.आज देशात एकूण बेरोजगरीच्या तीन पट बेरोजगारी उच्च शिक्षण घेतलेल्या तरुणांमध्ये आहे. महात्मा गांधी यांच्या मते प्रत्येकाने श्रम करावे आणि श्रम करूनच उदरनिर्वाह भागवावा.

आर्थिक विचार

आपल्या देशामध्ये प्रचंड प्रमाणामध्ये आर्थिक विषमता आहे.जगात ६२ लोकांकडे ५०% संपत्ती आहे,त्यामध्ये ६ जन भारतीय आहे.तर भारत देशातील ०३ टक्के जनतेकडे एकूण संपत्तीच्या ८० टक्के संपत्ती आहे व उर्वरित जनतेकडे २० टक्के संपत्ती आहे यावरून श्रीमंत अधिक श्रीमंत गरीब अधिक गरीब बनत जात आहे. महात्मा गांधी यांनी तत्कालीन परिस्थितीमध्ये आर्थिक समानतेवर भाष्य केलेले आहे.त्यांच्या मते प्रत्येक मनुष्याने आपल्या गरजा मर्यादित ठेवाव्या आणि आपला उदरनिर्वाह चालवावा, आपल्या संपत्तीचा उपयोग मनुष्याने लोककल्याणकरिता केला पाहिजे प्रत्येकाने आपल्या उत्पन्नाची एक सीमा ठरून उर्वरित संपत्ती दान करावी त्यामुळे समाजातील विषमता नष्ट होईल असा त्यांचा विश्वास होता.

चिरस्थायी विकास

भारतामध्ये विकासासाठी अनेक विकास योजना राबविण्यात आल्या.सर्व विकास योजनांची शिडी बनवून आपण केव्हाच चंद्रावर पाऊल ठेवले असते. आज सुद्धा भारताच्या अनेक भागांमध्ये प्रादेशिक असमतोल,आर्थिक विषमता, नैसर्गिक साधन संपत्तीची लूट, अविवेकी उत्पादन व उपभोग प्रवृत्तीमुळे विविध प्रकारच्या प्रदूषणात वाढ झाली. त्यामध्ये जल, जंगल, जमीन या सर्वांचे अस्तित्व धोक्यात येत आहे. त्यामुळे ११ व १२ व्या पंचवार्षिक योजनेत सर्वसमावेशक

वृद्धीसह विकास साधने या तत्वाचा स्वीकार केला. त्याचबरोबर पंचवार्षिक योजनेनंतर नव्याने अस्तित्वात आलेल्या नीती आयोगाने देखील याच बाबीची दखल घेतली. यावरून असे सिद्ध करता येते की उत्पादन करण्यासाठी महात्मा गांधी यांनी मांडलेले पर्यावरण विषयक धोरण अंगीकारून उत्पादन करणे आवश्यक ठरते. गांधीजीचे विचार चिरस्थायी विकासाला पूरक असल्याचे दिसते महात्मा गांधी नेहमी म्हणायचे "पृथ्वी सर्वांची गरज भागविते परंतु कुणा एकाची हाव भागवू शकत नाही".

सारांश

भारताला वर्तमान परिस्थितीतून मार्ग काढण्यासाठी समाधानकारक उपाय म्हणून गांधीजींच्या विचाराचा आणि मूल्यांचा आधार घेणे गरजेचे वाटते. कारण भारतीय अर्थव्यवस्थेतील आर्थिक, सामाजिक ,राजकीय आणि नैतिक परिस्थिती फार समाधानकारक नाही. आज दारिद्र्य,पर्यावरण, भ्रष्टाचार, नैतिक मूल्यांचा ऱ्हास, परकीयांवरील अवलंबित्व अविवेकी औद्योगिक धोरण, नैसर्गिक साधन संपत्तीचे शोषण, प्रदूषण इत्यादी असंख्य समस्यांवर प्रभावी उपाययोजनासाठी गांधीजीच्या तत्वज्ञानांची आवश्यकता आहे.त्याचबरोबर समाज व राष्ट्राच्या अस्तित्वावर प्रश्न निर्माण होतील अशा बिकट परिस्थितीत महात्मा गांधींच्या विचारांची धोरणांची प्रासंगिकता वाढते यात शंका नाही. महात्मा गांधींच्या विचारांची आवश्कता भारतासह जगातील सर्व राष्ट्रांना आहे.कारण जग बुद्ध आणि युद्ध आशाच टोकावर पोहचलेले आहे ,यात आपल्याला जर बुद्ध पाहिजे तर गांधीजीची विचारसरणी शिवाय भारताला व जगाला पर्याय नाही.कारण अल्बर्ट आईन्स्टाईन असं म्हणतो की महात्मा गांधी सारखा महान मानव या भूतलावावर होऊन गेला यावर भावी पिढ्यांचा विश्वास बसणार नाही.त्यामुळे वर्तमान परिस्थितीत महात्मा गांधीच्या विचारांची गरज आहे.

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Kisan Shikshan Prasarak Mandal, Hadolti.

Karmayogi Tulshiram Pawar Mahavidyalaya, Hadolti.

Tq. Ahmedpur Dist. Latur - 413514 (M.S.)

Department of History, Economics & Philosophy in collaboration with Swami Ramanand Teerth Marathwada University, Nanded.

One Day Interdisciplinary National Conference on 'Thoughts of Mahatma Gandhi : Yesterday, Today & Tomorrow'

CERTIFICATE

Date : 28 / 10/ 2023

This is to certify that Dr./Prof./Mr./Miss Purushottam Ramgrao Chate

of shri shivaji Arts, Commerce & science college, motala *attended One Day Interdisciplinary National Conference on 'Thoughts of Mahatma Gandhi: Yesterday, Today and Tomorrow' organized by Department of History, Economics and Philosophy, Karmayogi Tulshiram Pawar Mahavidyalaya, Hadolti in collaboration with Swami Ramanand Teerth Marathwada University, Nanded on 28th October 2023. He/She has also chiared session/acted as Resource Person/presented a paper entitled* महात्मा गांधी यांच्या विचारांची वर्तमान प्रासंगिकता.

Dr. Ramesh Gangthade	Dr. Raosaheb Ingle	Dr. Suvarna Tenkale	Dr. Deepak Bachewar
Organizer & Co-Convener	Organizer & Co-Convener	Organizer & Co-Convener	Principal & Convener

Kai. Bapusaheb Ekambekar Sevabhavi Sanstha's

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NAAC Accredited 'B' Grade with CGPA 2.45

(Affiliated to Swami Ramanand Teerth Marathwada University, Nanded)

One Day Multidisciplinary National Conference on

"Azadi Ka Amrit Kaal: Achievements, Opportunities and Challenges"

Sponsored by

Indian Council of Social Science Research (ICSSR), Mumbai

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This is to certify that, Mr./Ms./Dr./Prof. Purushottam Rangrao Chate

of Shri Shivaji Arts, Commerce & Science College, Motala, Dist. Buldhana has Participated as Resource Person/Chairperson/ Presented a paper entitled भारतातील लोकसंख्या वाढ आणि बेरोजगारीचे कारण.

in the One Day Multidisciplinary National Conferences held on Monday, 02 March 2024 organized by the Department of Economics, Kai. Bapusaheb Patil Ekambekar Mahavidyalaya, Udgir.

Dr.Vijaykumar Patil	Dr. Mdan Selke	Dr. Omprakash Kshirsagar
(Secretary)	(Convener)	(Principal)

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"Azadi ka Amrit Kaal: Achievements, Opportunities and Challenges"

आहे. सर्वच जीवसृष्टीचे अस्तित्व प्रत्यक्ष किंवा अप्रत्यक्षपणे वनांवर अवलंबून असते. वने पर्यावरणाचा समतोल राखण्यात मोलाची भूमिका बजावतात. पर्यावरणाच्या संरक्षण आणि संवर्धनासाठी दिर्घकालीन उपाययोजना कराव्या लागणार आहेत. कार्बनडाय ऑक्साईड शोषून घेण्यासाठी वृक्षांच्या हरित पट्टयांची निर्मिती करणे व ग्रीन ग्रीन टॅक्स लावणे, ग्रीन फंडाची स्थापना करणे, हरितग्राम योजना व हरित शहर योजना सुरू करणे, शास्त्रशुध्द व्यवस्थापन तंत्राचा वापर करून नैसर्गिक आणि मानव निर्मित वनांचे संवर्धन आणि चिरंतन विकास करणे तसेच वन्यजीव व जैविक विविधतेचे रक्षण व विकास करणे, वनांमध्ये वाढ करणे आदिंमुळे ग्लोबल वॉर्मिंगचे महासंकट कमी करण्यास मदत होईल पर्यावरणाची रक्षा हीच संपूर्ण जगाची सुरक्षा आहे. यासाठी कृतीची गरज आहे.

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भारतातील लोकसंख्या वाढ आणि बेरोजगारीचे कारणे

प्रा. पुरुषोत्तम चाटे
अर्थशास्त्र विभाग,
श्री शिवाजी महाविद्यालय मोताळा, जि. बुलढाणा

****

प्रस्तावना :—

देश विकसित असो अथवा विकसनशील त्या देशा समोर लोकसंख्या,बेरोजगारी आणि शेतीशी निगडीत समस्या मध्ये साम्य दिसून येते.देशाच्या भवितव्याचा दूरगामी विचार केला तर आपल्या देशापुढे सध्या तीन प्रमुख आर्थिक समस्या आहेत. लोकसंख्या नियंत्रण, पर्यावरण रक्षणासह आर्थिक विकास आणि दारिद्रय निवारण व रोजगार निर्मिती. लोकसंख्या वाढ ही समस्या आपल्याला नवीन नाही. अगदी १९४७ पासून आपल्या नेत्यांना या समस्येची कल्पना होतीच. वाढत्या लोकसंख्येचे देशाच्या भवितव्यासाठी नियंत्रण करणे कसे आवश्यक आहे, हे अनेक तज्ज्ञांनी अनेक वेळा सांगितले आहे. तथापि अगदी ह्याच्यघ मध्येसुद्धा लोकसंख्या नियंत्रणाचा प्रश्न सुटला असे कोणीही आत्मविश्वासाने सांगत नाही. किंबहुना प्रत्येक शिरगणतीच्या अहवालामध्ये लोकसंख्या वाढीच्या धोक्याची नव्याने जाणीव करून दिलेली असते. यासंबंधी थोडी आकडेवारी पाहणे अधिक उद्बोधक होईल. १९७१ पासून २०११ या ४० वर्षांमध्ये देशाची लोकसंख्या ५४ कोटी ८१ लाखवरून १२१ कोटींपर्यंत वाढली आहे. दुपटीपेक्षा जास्त! या ४० वर्षांमध्ये लोकसंख्येच्या वाढीचा वेग जरी प्रत्येक शिरगणतीमध्ये घटत असला तरी लोकसंख्येमध्ये होणारी एकूण वाढ मात्र दर शिरगणतीमध्ये वाढती आहे. उदा. १९७१—८१ मध्ये १३कोटी ५२ लाख, १९८१—९१ मध्ये १६ कोटी ३० लाख, १९९१ ते २००१ मध्ये

१८ कोटी २३ लाख, तर २००१—२०११ मध्ये १८ कोटी १५ लाख, ह्यघ्यघ ते २०२३ मध्ये ह्यह्य कोटी वाढ झालेली दिसते. २००१—११ व २०११ ते २०२१ या वीस वर्षामध्ये लोकसंख्येतील एकूण वाढ आधीच्या वर्षापेक्षा थोडी कमीच दिसते. मात्र आपली लोकसंख्या खऱ्या अर्थाने स्थिर केव्हा होईल हे निश्चित सांगणे कठीण आहे. देशाच्या एकूण लोकसंख्येमध्ये सर्वात मोठा वाटा उत्तर प्रदेशचा तर दुसरा क्रमांक महाराष्ट्राचा आहे. जागतिक लोकसंख्येमध्ये साधारण ऋऋ कोटी असून भारताचा वाटा १७.५ टक्के व चीन चा वाटा १९ टक्के आहे. गेल्या कित्येक वर्षामध्ये प्रभावी आणि कडक उपाययोजना करून चीनने लोकसंख्या नियंत्रणामध्ये उल्लेखनीय यश मिळविले आहे. आपल्याला अजून तरी तसे जमलेले नाही.

पोट भरण्याइतकाच महत्त्वाचा दुसरा प्रश्न म्हणजे रोजगारनिर्मितीचा! रोजगाराविना आर्थिक विकास जरी घडून आला तरी तो निर्थक आहे. आर्थिक विकासाचे पर्यवसान पुरेशा रोजगारनिर्मितीमध्ये झालेच पाहिजे. याबाबत आपली परिस्थिती काय आहे? देशामध्ये आजमितीस ढोबळमानाने ४८ कोटी इतकी कामगारसंख्या असून, त्यामध्ये दरवर्षी १ कोटी २० लाख इतकी भर पडत आहे. या ४८ कोटींपैकी साधारण २६ कोटी शेती क्षेत्रामध्ये, तर २२ कोटी बिगरशेती क्षेत्रामध्ये आहेत.रोजगारनिर्मितीच्या क्षेत्रामध्ये अनेकविध आव्हाने आहेत. एक तर कामगारसंख्येमध्ये भर पडणाऱ्या १ कोटी २० लाख कामगारांसाठी तितकेच रोजगार दरवर्षी निर्माण करावे लागतील. शिवाय जलद आर्थिक विकास साधण्यासाठी शेती क्षेत्रावरील कामगारांची अवलंबीत्व कमी करावे लागेल. त्यासाठी बिगरशेती क्षेत्र— विशेषत: लहान व मध्यम उद्योग यांचा विकास वेगाने घडवून आणावा लागेल. सर्व रोजगार नसतातच! तेथे कामगार अतिरिक्त— जादा असतात. या प्रकारास 'छुपी बेकारी' म्हटले जाते. हा प्रकार कमी करण्यासाठी प्रयत्न करावे लागतील. तथापि सध्याच्या रोजगारनिर्मितीचा वेग दरवर्षी साधारण साठ लाख! गरज आहे १२० लाख रोजगारांची! पाहता हे 'दुष्कर कर्म' आहे यात शंका नाही! यासाठी र्सवकष आर्थिक विकास घडवून आणणे हेच मोठे आव्हान असेल. सध्या आपल्याकडे 'समावेशक विकासासंबंधी' बरेच बोलले व लिहिले जाते. आर्थिक विकास समावेशक असलाच पाहिजे. तथापि 'दारिद्रयाचे पूर्ण निवारण' आणि पुरेशी रोजगारनिर्मिती घडून आल्याशिवाय कोणताही विकास समावेशक होणार नाही. येणाऱ्या, नवीन सरकारने जलद आर्थिक विकास, दारिद्रय निवारण आणि रोजगारनिर्मिती यांना सर्वोच्च प्राधान्य द्यावे लागणार आहे.जगातील सर्व अर्थव्यवस्थांमध्ये विकासाची पातळी निश्चित करण्यासाठी मानव संसाधनांची मोठी भूमिका आहे. लोकसंख्येचा उच्च वाढ दर, दारिद्र्य, बेरोजगारी असमानता, निरक्षरता आणि मृत्युदर इ. यासारख्या अनेक कारणांमुळे मानव संसाधन विकासाच्या निम्न पातळीला जावू शकतो. एखाद्या देशात विशिष्ट वेळी राहणाऱ्या लोकांची संख्या आणि त्यांची वाढ ज्या दराने होत आहे, म्हणजेच लोकसंख्येची वाढ हे प्रमाणात्मक दृष्टीने जाणून घेणे आवश्यक आहे. वाढत्या लोकसंख्येचा इतर आर्थिक गतिशीलतेशी विशेषत: गरिबी आणि बेरोजगारी यांचा ऊच कोटीचा संबंध आहे. वाढत्या लोकसंख्येसोबत समाजाच्या श्रमशक्तीमध्ये वाढ होते ज्यामुळे लोकसंख्येचा मोठा भाग बेरोजगारीकडे जातो. वाढत्या लोकसंख्येचा गरिबीवरही गंभीर परिणाम होतो. गरिबीची व्याख्या एक सामाजिक घटना म्हणून केली जाऊ शकते ज्यामध्ये समाजातील एक घटक त्याच्या जीवनाच्या मूलभूत गरजा देखील पूर्ण करू शकत नाही. २००१—२०११ जनगणनेच्या आकडेवारीचे सांख्यिकीय विश्लेषण असे दर्शविते की या दशकात ग्रामीण लोकसंख्येच्या तुलनेत नागरी लोकसंख्या अधिक वेगाने वाढली आहे. कमी—अधिक प्रमाणात, ग्रामीण लोकसंख्येच्या तुलनेत शहरी लोकसंख्येमध्ये दुपटीने वाढ झाल्याचे आढळून आले आहे. गरिबी आणि बेरोजगारी कमी करण्याच्या आघाडीवर चांगली कामगिरी करूनही, अजूनही संपूर्ण भारतामध्ये गरीब आणि बेरोजगारांचे प्रमाण जास्त आहे. त्यामुळे लोकसंख्या वाढ, गरिबी आणि बेरोजगारी या समस्यांना आळा घालण्यासाठी सरकारकडून प्रयत्न करणे आवश्यक आहे.

बेरोजगारी ही एक गंभीर समस्या आहे जी भारताच्या आर्थिक परिदृश्याला आव्हान देत आहे. वैविध्यपूर्ण कार्यबल तसेच जगातील सर्वाधिक लोकसंख्या असलेल्या राष्ट्रांपैकी एक म्हणून, बेरोजगारीच्या दरातील चढउतारांचा देशाच्या वाढीवर आणि विकासावर दूरगामी परिणाम होतो. तर, भारतातील सध्याचा बेरोजगारीचा दर किती आहे? भारतातील बेरोजगारीचा दर नुकताच घसरला असल्याने नवीनतम आकडेवारी आशेचा किरण दर्शवते. नॅशनल सॅम्पल सर्व्हे सर्व्हे नुसार, शहरी भागात १५ वर्षे आणि त्याहून अधिक वयाच्या व्यक्तींसाठी बेरोजगारीचा दर जानेवारी–मार्च २०२३ मध्ये ६.८ टक्क्यांवर घसरला आहे, जो एका वर्षापूर्वी ८.२ टक्के होता. हा सकारात्मक विकास प्रचलित आर्थिक गुंतागुंतींमध्ये नोकरीच्या बाजारपेठेत संभाव्य बदल सुचवतो. तथापि, शाश्वत नोकऱ्यांच्या वाढीला चालना देण्यासाठी आणि देशाची भविष्यातील समृद्धी सुरक्षित करण्यासाठी सतत दक्षता आणि प्रभावी धोरणात्मक उपाय महत्त्वपूर्ण आहेत. भारतात बेरोजगारी हा चिंतेचा विषय आहे, ज्यामध्ये विविध क्षेत्रे आणि क्षेत्रांमध्ये चढउतार दिसून येत आहेत. सेंटर फॉर मॉनिटरिंग इंडियन इकॉनॉमी च्या जुलैच्या आकडेवारीचा संदर्भ देणाऱ्या अलीकडील ब्लूमबर्ग अहवालानुसार, जुलै २०२३ पर्यंत भारतातील एकूण बेरोजगारीचा दर ७.९५ टक्के आहे.शिवाय, ताज्या नियतकालिक श्रमदलाच्या सर्वेक्षणानुसार, १५वर्षे व त्यावरील लोकांसाठी शहरी भागातील बेरोजगारीचा दर गेल्या वर्षीच्या तुलनेत एक टक्क्याने कमी झाला आहे. एप्रिल–जून २०२३ मध्ये तो ६.६ टक्के आहे, जो पूर्वी ७.६ टक्के होता.

उद्दिष्टे :–

१) भरतातीतील लोकसंख्या वाढीचा अभ्यास करणे.

२) भरतातीतील बेरोजगरीचा अभ्यास करणे.

३) भरतातीतील लोकसंख्या वाढ व बेरोजगारी कमी करण्यासाठी उपाय सूचविणे.

भारतात लोकसंख्या वाढीमुळे निर्माण होणाऱ्या समस्या :–

संसाधनांवर ताण: – :– सातत्याने वाढत असलेल्या लोकसंख्येमुळे निर्माण होणारं सगळ्यात मोठं आव्हान म्हणजे नैसर्गिक संसाधनांवरील वाढता ताण.या नैसर्गिक संसाधनांमध्ये जमीन, पाणी, जंगल आणि खनिज यांचा समावेश आहे.लोकसंख्या वाढीमुळे या संसाधनांचा प्रमाणापेक्षा जास्त वापर होतो.परिणामी, कृषि उत्पादकता आणि पाण्याची कमतरता यांच्यासह पर्यावरणाच्या स्थितीतही घसरण होण्याची शक्यता वाढते.महाराष्ट्रात लातूर जिल्ह्यातील पाण्याच्या संकटमुळे जी वाटर ट्रेन सुरू केली होती ती आशा समस्येचे ज्वलंत उदराहण आहे.

पायाभूत सुविधांवरील ताण :– वाढत्या लोकसंख्येमुळे रहिवास, परिवहन, आरोग्य आणि शिक्षण सुविधांशी संबंधित पायाभूत सुविधांचा विस्तार करण्याची गरज भासते.मोठ्य लोकसंख्येच्या आवश्यकता पूर्ण करणं हे अवघड बनतं. लोकसंख्येचा एक मोठा भाग बिकट परिस्थितीत जगत असतो.स्वातंत्र्याचा अमृत महोत्सव साजश होत असताना देशातील बहुतांश भागात रास्ते,वीज आणि शुद्ध पिण्याच्या पाण्याचा प्रश्न आहे.

बेरोजगारी :– इतक्या मोठ्या लोकसंख्येला कामात सामावून घेण्याचा प्रश्नही निर्माण होतो.यामुळे मोठ्य संख्येने लोकांना रोजगार मिळण्यात आव्हानात्मक बनतं. आजच्या घडीलाही भारतात बेरोजगारीचा ज्वलंत प्रश्न आहे. सतत वाढणाऱ्या लोकसंख्येमुळे ही समस्या विक्राळ रुप घेऊ शकते.रोजगाराच्या अभावामुळे विषमता आणि दारिद्र्य,भराष्ट्राचार, गुन्हेगारी वाढून सामाजिक शांततेचा भंग होण्याचीही शक्यता नाकारता येत नाही.

शिक्षण आणि कौशल्य विकास :– मोठ्या लोकसंख्येच्या देशात शिक्षण आणि कौशल्य विकास हा मुद्दा आव्हानात्मक ठरू शकतो. कारण लोकांना सुशिक्षित करणे, कुशल बनवणे यासाठी आवश्यक असलेल्या शैक्षणिक संस्थांची संख्या त्या प्रमाणात असावी लागते.त्याचा थेट परिणाम म्हणजे अनेकांचा चांगल्या दर्जाचं शिक्षण मिळू शकत नाही.त्याच प्रकारे त्यांच्याकडे असलेलं कौशल्य हे नोकरी मिळवण्यासाठी पुरेसं ठरत नाही.इन्फोसिस चे संचालक नारायण मूर्ती यांच्या मते देशात ५ लाख अभियंते दरवर्षी पदवी घेवून बाहेर पडतात मात्र ५ हजार विद्यार्थी कंपण्यासाठी उपयोगी पडतात. यावरून अतिरिक्त लोकसंख्ये मुळे गुणवत्तापूर्ण शिक्षण देण्याचा प्रश्न निर्माण होतो.

दारिद्र्य आणि विषमता :— वाढत्या लोकसंख्येमुळे दारिद्र्यरेषेखालील लोकांची संख्या वाढू शकते.लोकांच्या उत्पन्नामध्येही फरक दिसण्याचा धोका आहे.गरीबी कमी करण्याचे प्रयत्न अशा स्थितीत जास्त करावे लागतील. एकूणच लोकांच्या जीवनशैलीचा स्तर, आरोग्य आणि शिक्षण यांची सांगड घालण्यात विषमता दिसू शकते.

पर्यावरणाशी संबंधित आव्हाने :— वाढत्या लोकसंख्येमुळे त्याचा थेट परिणाम पर्यावरणावर दिसून येईल.जंगलतोड, वायू प्रदूषण आणि जल प्रदूषण या समस्यांमुळे पर्यावरणाचं संरक्षण आव्हानात्मक विषय ठरू शकतो.भारतात लोकसंख्या वाढीचा दर कमी असला तरी धोरणाबाबत नक्कीच प्रश्न उपस्थित होतील. लोकसंख्या वृद्धी दर कमी असूनही भारताची लोकसंख्या वाढणं काही वर्षे सुरू राहील. अशा स्थितीत सरकारला त्याला तोंड देण्यासाठी प्रभावी धोरण स्वीकारावं लागणार आहे.

सामाजिक आव्हाने :— वाढत्या लोकसंख्येशी संबंधित आणखी एक मुद्दा हा सामाजिक आव्हानांचा आहे.वाढत्या लोकसंख्येमुळे नियोजनशून्य शहरीकरण आणि विषमता यांच्यात वाढ होऊ शकते. अशा स्थितीत गुन्हेगारीमध्येही वाढ होऊ शकते.कायदा आणि सुव्यवस्था कायम राखणं कठिण होऊ शकतं.टो

स्रोत,GETTY IMAGES

वयोवृद्ध लोकसंख्येचा प्रश्न :— भारतात २५ वर्षापेक्षा कमी वयाच्या लोकांची संख्या सुमारे ४० टक्के आहे. तर, देशात सुमारे निम्म्या लोकसंख्येचं वय हे २५ ते ६४ दरम्यान आहे. भारतात वृद्धत्वाकडे झुकलेल्या ६५ वर्षावरील व्यक्तींची संख्या केवळ ७ टक्के आहे.भारतात लोकसंख्या वृद्धी दर कमी होत असल्याने त्याबाबत चिंता वाढल्या आहेत. त्यामुळे पुढील काही वर्षात वयोवृद्ध लोकांची संख्या वाढण्याची शक्यता आहे.संघमित्रा सिंह म्हणतात, "एका सर्वसामान्य भारतीय व्यक्तीचं वय आज २८ वर्षे आहे, तर पुढील ३० वर्षात ते वाढूही शकतं.पुढील काळात वयोवृद्धांची संख्या वाढत जाईल, या गोष्टीपासून आपण पळ काढू शकणार नाही. मात्र, आपण त्यादृष्टीने तयार राहणं आपल्या हातात आहे.त्या म्हणतात, "आपल्याला सामाजिक सुरक्षेच्या उपायांवर गुंतवणूक करणं गरजेचं आहे. एकीकडे लैंगिक विषमतेदरम्यान वयोवृद्ध महिलांना काही अडचणींना सामोरं जावं लागू शकतं. भविष्यात वृद्धांच्या आरोग्याची देखभाल करण्यासाठी सोयीसुविधा निर्माण कराव्या लागतील."

भारतातील बेरोजगारी वाढीचे कारणे :—

जागतिक आर्थिक संकट २००८ च्या जागतिक आर्थिक संकटाने भारताच्या अर्थव्यवस्थेवर गंभीरपणे परिणाम केला, ज्यामुळे वाढ मंदावली आणि विविध क्षेत्रातील रोजगाराच्या संधी कमी झाल्या.नोटाबंदी २०१६ मध्ये उच्च मूल्याच्या चलनी नोटा बंद करण्याच्या सरकारच्या निर्णयामुळे आर्थिक अडथळे निर्माण झाले, विशेषत: अनौपचारिक क्षेत्रात, परिणामी तात्पुरत्या नोकऱ्यांचे नुकसान झालेवस्तू आणि सेवा कर अंमलबजावणी २०१७ मध्ये करण्यात आली, परंतु यामुळे सुरुवातीला अर्थव्यवस्थेत अल्पकालीन व्यत्यय निर्माण झाला, ज्यामुळे व्यवसाय आणि रोजगारावर परिणाम झाला.कोविड–१९ महामारी २०२० या साथीच्या रोगामुळे आणि त्यानंतरच्या लॉकडाऊन उपायांचा भारतीय अर्थव्यवस्थेवर खोलवर परिणाम झाला, परिणामी व्यवसाय बंद झाल्याने बेरोजगारी वाढली आणि आर्थिक क्रियाकलाप ठप्प झाले वरील तात्कालिक करना व्यतिरिक्त बेरोजगारी वाढिचे प्रमुख कारणे खालील प्रमाणे.

चलनवाढीचा दबाव :— भारतातील सध्याच्या बेरोजगारीच्या दरावर प्रभाव टाकून भारतालाही गेल्या काही वर्षामध्ये महागाईच्या दबावाचा सामना करावा लागला आहे. उच्च महागाई दर ग्राहकांची क्रयशक्ती कमी करू शकतात, ज्यामुळे वस्तू आणि सेवांची मागणी कमी होते. याचा व्यवसायांवर मोठा परिणाम होऊ शकतो, परिणामी खर्चात कपातीचे उपाय, ज्यामध्ये टाळेबंदी आणि नियुक्ती फ्रीज समाविष्ट आहे, ज्यामुळे बेरोजगारीचा दर वाढतो.

जातिव्यवस्था:— भारतामध्ये अनादी काळापासून बेरोजगारी निर्माण करणारे सर्वात महत्त्वाचे घटक म्हणजे जातिव्यवस्था. ठराविक ठिकाणी विशिष्ट जातींच्या सदस्यांसाठी विशिष्ट प्रकारची कामे करण्यास मनाई आहे. काम बऱ्याचदा विशिष्ट समुदायाच्या सदस्यांना दिले जाते, जे खरोखर नोकरीसाठी पात्र आहेत आणि

त्यांच्याकडे योग्य कौशल्ये आहेत. यामुळे बेरोजगारीचा उच्च दर आहे.

अपुरी आर्थिक वाढः— भारतातील आर्थिक वाढ अपुरी आहे आणि त्यामुळे अर्थव्यवस्था अविकसित आहे. मंद वाढ सतत वाढणाऱ्या लोकसंख्येला बेरोजगारीच्या पुरेशा संधी प्रदान करण्यात अपयशी ठरते. लोकसंख्येच्या वाढीसह, अर्थव्यवस्था रोजगाराच्या मागण्या पूर्ण करू शकत नाही आणि लोकांचा वाढता हिस्सा रोजगार शोधण्यात सक्षम नाही. यामुळे देशभरात अपुरा रोजगार मिळतो.

लोकसंख्येच्या दरात वाढ :— २०२३ च्या मध्यापर्यंत भारताची लोकसंख्या चीनपेक्षा जास्त झाली, शिवाय भारत जगात सर्वाधिक लोकसंख्येचा देश झाला. लोकसंख्या वाढ देशाच्या आर्थिक वाढीशी जुळली जाऊ शकत नाही, ज्यामुळे बहुसंख्य समाज बेरोजगार होतो.राहणीमान,आनारोग्य,गुन्हेगारी,विषमता इत्यादी प्रश्न निर्माण होतात.

शेती हंगामी व्यवसाय आहे :— भारतीय शेती मान्सून चा जुगार आहे. त्याचप्रमाणे भारताच्या शेतीची सिंचन क्षमता अत्यंत कमी आहे. बहुसंख्य जमीन कोरडवाहू आहे. केवळ ३८ % जमीन सिंचनाखाली असून उर्वरीत कोरडवाहू आहे.त्यामुळे वर्षाच्या काही महिन्यांसाठीच शेतीतुन लोकसंख्येच्या मोठ्य भागाला रोजगार मिळतो.परिणामी वर्षाचा बराचसा भाग त्यांना बेरोजगार राहावे लागते, अनेक कृषी कामगारांना आवश्यक रोजगार आणि उत्पन्न मिळत नाही.

लघु उद्योग/कुटीर उद्योगांमध्ये घट :— औद्योगिक विकासाच्या प्रगतीमुळे व जगतिकीकरणाच्या स्विकारामुळे आपले लघु— कुटीर उद्योग आर्थिकदृष्ट्या खूपच कमी आकर्षक बनले आहेत, कारण ते मोठ्या प्रमाणावर वस्तूंच्या उत्पादनाची अर्थव्यवस्था देत नाहीत. स्वस्त, मोठ्य प्रमाणात उत्पादित वस्तूंची मागणी ही विशिष्ट कौशल्ये आणि कौशल्य असलेल्यांनी हस्तकला बनवलेल्या वस्तूंच्या इच्छेपेक्षा जास्त आहे. याचा परिणाम लघुउद्योगांवर होत असून त्यामुळे कारागीर बेरोजगार झाले आहेत.

बचत आणि गुंतवणुकीचे कमी दर :— संपूर्ण भारतात पुरेशा भांडवलाची कमतरता आहे. यामुळे बचत कमी होते आणि त्यामुळे गुंतवणूक कमी होते. गुंतवणुकीच्या उच्च दरांच्या उपस्थितीने, नवीन रोजगार निर्माण होऊ शकतात आणि अर्थव्यवस्था तेजीत असेल. तसेच, ग्रामीण भागात गुंतवणुकीचा अभाव आहे

अप्रभावी आर्थिक नियोजन :— कामगार पुरवठा आणि कामगारांची मागणी यांच्यातील महत्त्वपूर्ण अंतरामुळे देशव्यापी योजनांचा अभाव आहे. ज्यांना नोकऱ्यांची गरज आहे त्यांना ते मिळू शकतील याची खात्री करण्यासाठी मजुरांची मागणी आणि पुरवठा यांचा समतोल राखणे महत्त्वाचे आहे किंवा अशा परिस्थितीत अनेक व्यक्ती एकाच कामासाठी स्पर्धा करतील.

श्रमाची गतीहीनता :— भारतीय नागरिकांसाठी कुटुंबाशी जवळीक आणि जवळीक राखणे ही प्रमुख भूमिका आहे. यामुळे लोक नोकरीच्या शोधात कुटुंबापासून लांबचा प्रवास टाळतात. तसेच, श्रमाच्या कमी गतिशीलतेमध्ये योगदान देण्यासाठी भाषा, धर्म आणि हवामान महत्त्वपूर्ण भूमिका बजावतात. त्यामुळे, जे लोक अन्यथा नोकरीसाठी योग्य असतील ते पोहोचण्यासाठी प्रवास करू शकत नाहीत, त्यामुळे बेरोजगारी वाढली आहे.विकसित देशांमध्ये नोकऱ्या अत्यंत विशिष्ट बनल्या आहेत, परंतु भारताची शिक्षण प्रणाली या प्रकारच्या नोकऱ्यांसाठी आवश्यक असलेल्या योग्य प्रशिक्षण आणि स्पेशलायझेशनशी जुळत नाही. अशा प्रकारे, काम करण्यास इच्छुक असलेले बरेच लोक योग्य कौशल्यांच्या अभावामुळे बेरोजगार होतात.

जमिनीचे पक्षपाती वितरण :— भारतासारख्या उदयोन्मुख राष्ट्रांमध्ये बेरोजगारी जिंकण्याचे आणखी एक कारण म्हणजे बागायती निर्मिती आणि कामासाठी महत्त्वपूर्ण संसाधन असलेल्या जमिनीवर असंख्य शेतकरी कुटुंबांना समाधानकारक प्रवेश मिळत नाही या उद्देशाने जमिनीचा पक्षपाती विनियोग आहे. १९५१ च्या आसपास सुरू झालेल्या जलद लोकसंख्येच्या विकासाच्या ताणाखाली जमिनीच्या मालमत्तेच्या उपविभागामुळे काही ग्रामीण कुटुंबांसाठी जमिनीवरील प्रवेश देखील कमी झाला आहे. त्यानुसार, कृषी व्यवसायात स्वतंत्रपणे काम केलेले असंख्य लोक भूमिहीन बागायती कामगार

बनले आहेत ज्यांना तीव्र बेरोजगारी आणि बेरोजगारीचे दुष्परिणाम अनुभवले आहेत.

भारतातील वार्षिक बेरोजगारीचा दर:

अ. क्र.	वर्ष	बेरोजगारी दर
१	२०२४	६.५७ %
२	२०२३	८.०३ %
३	२०२२	७.३३ %
४	२०२१	५.९८ %
५	२०२०	८.०० %
६	२०१९	५.२७ %
७	२०१८	५.३३ %
८	२०१७	५.३६ %
९	२०१६	५.४२ %
१०	२०१५	५.४४ %
११	२०१४	५.४४ %
१२	२०१३	५.४२ %
१३	२०१२	५.४१ %
१४	२०११	५.४३ %
१५	२०१०	५.५५ %

स्रोत: सेंटर फॉर मॉनिटरिंग इंडीयन इकोनॉमी (CMIE) –२०२४

वरील तकत्यावरुण असे निदर्शनास येते की, २०१० पासून बेरोजगरीच्या दरात वाढ होताना दिसते. भारतातील भूतकाळातील आणि सध्याचा बेरोजगारीचा दर हा प्रचलित आर्थिक परिस्थितीच्या आधारे बदलणारी टक्केवारी म्हणून व्यक्त केलेला एक गंभीर आर्थिक निर्देशक आहे.जेव्हा आर्थिक मंदीच्या काळात नोकरीच्या संधी कमी होतात तेव्हा बेरोजगारी वाढते. याउलट, आर्थिक वाढ आणि समृद्धीच्या काळात, लोकांना रोजगाराच्या अनेक संधी उपलब्ध असल्याने, बेरोजगारीचा दर कमी होण्याची अपेक्षा आहे.

बेरोजगारी दूर करण्यासाठी उपाय :–

लोकसंख्या नियंत्रण :– आपल्या देशात लोकसंख्या वाढीवर नियंत्रण ठेवणे अत्यंत आवश्यक आहे. कारण सर्व समस्याचे मूळ अतिरीकक्त लोकसंख्येत आहे. भारतात लोकसंख्या नियंत्रणात आणण्यासाठी आपल्या देशात १९२३ पासून विविध समित्या,धोरणे व कायदे बनविण्यात आले आहे.मात्र चीन सारख्या प्रभावी अंबलबजावणी अभावी आपण लोकसंख्या वाढीवर नियंत्रण ठेवण्यात अपयशी ठरलो.आता सर्व जाती धर्ममतील लोकांना कायद्याच्या प्रभावाखाली घेवून आणि कुटुंब नियोजनाची व्यापकता वाढवून लोकसंख्या नियंत्रित कशी राहील याचा विचार कारणे अनिवार्य आहे.

कौशल्य कार्यक्रमांचा विकास :– कौशल्य विकास कार्यक्रमांच्या सुरुवातीने कामगारांना आपल्याकडे असलेल्या कौशल्यामुळे योग्य रोजगार प्राप्त होतो. जगात सर्वाधिक तरुण लोकसंख्या आपल्या देशात आहे.लोकसंख्या वाढ या समस्येला संधीत रुपांतर करण्यासाठी जागतिक बाजारपेठेला आवश्यक असणाऱ्या कुशल रोजगाराचा पुरवठा आपण करू शकतो.कारण आपली १५ ते ६० या वयोगटातील लोकसंख्या ६४% आहे. २०१० पासून भारत सरकारने कौशल्य विकास कार्यक्रमाची अंमलबजावणी करण्यासाठी सुरवात केली आहे.या मध्ये नव्याने NSQF,NSDC,CVPT,PMKVY इत्यादीची भर पडली.आता या योजनाची प्रभावी अंमलबजावणी कारणे गरजेचे आहे.

शिक्षण क्षेत्रातील सुधारणा :– जागतिक बजारपेठेत आवश्यक असणाऱ्या रोजगाराच्या संधी ओळखून त्या प्रमाणे शैक्षणिक क्षेत्रात सुधारणा करणे गरजेचे आहे. नवीन शैक्षणिक धोरणामुळे विद्यार्थी उद्योजक व रोजगरभिमुख कसा बनेल याचा विचार करावा लागेल. या करता स्वयंम,एनपीटीईएल,मुक या सारख्या ऑनलाइन शिक्षण देणाऱ्या शासकीय संस्थाची व्यापकता वाढवावी लागेल.

पायाभूत सुविधांमध्ये गुंतवणूक व औद्योगिक विविधीकरण :– पायाभूत सुविधा देशाच्या रक्तवाहिन्या आहेत.रस्ते,वीज व पाणी जर योग्य त्या प्रमाणात ग्रामीण भागात उपलब्ध करून दिले तर औद्योगिक विकेंद्रीकरण होण्यासाठी अडचण येणार नाही.पायाभूत सुविधांमधील गुंतवणुकीमुळे योग्य रस्ते तयार होण्यास आणि शहरी विकासास मदत होऊ शकते जी रोजगार निर्मितीच्या प्रक्रियेत मदत करू शकते.उद्योगांचे विविधीकरण तसेच बाजारपेठेत अधिक समतोल नोकऱ्यांची निर्मिती यामुळे पारंपारिक क्षेत्रांच्या पलीकडे

असलेल्या क्षेत्रांच्या वाढीस प्रोत्साहन मिळू शकते.

ग्रामीण विकास :– भारत कृषिप्रधान देश म्हणून जसा जगात ओळखला जातो तसा भारत खेड्यत राहणारा देश म्हणून भारताची ओळख आहे.स्मार्ट शहरे या प्रमाणे स्मार्ट खेडी संकल्पना प्रत्येक्षात राबविणे आवश्यक आहे.ग्रामीण विकासात ग्रामीण भागातील जनतेचा सर्वसमावेशक विचार कसा करता येईल याचा विचार करावा लागेल.शहरी–ग्रामीण अंतर कमी करण्यासाठी आणि रोजगाराच्या संधी उपलब्ध करून देण्यासाठी ग्रामीण भागातील प्रकल्पांमधील गुंतवणूक बेरोजगारी कमी करण्यास आणि शहरांमध्ये होणारे स्थलांतर आणि गर्दी कमी करण्यास मदत करू शकते.

सारांश :– लोकसंख्या नियंत्रणात ठेवण्यासठी कायद्याची कडक अमलबजावणी करावी लागेल.मात्र वर्तमान लोकसंख्या समस्या आहे त्यावर मंथन करण्यापेक्षा वर्तमान लोकसंख्येचे लाभात रुपांतर करण्याची संधी आपल्या हातात आहे.कारण संपूर्ण जग वार्धक्याकडे झुकलेले असताना आपल्या देशात १५ ते ६० वायोगातील ६४% लोकसंख्या आहे.या कार्यकारी लोकसंखेचा योग्य वापर कारणे गरजेचे आहे. त्यासाठी कौशल्य विकास कार्यक्रमाची व्याप्ती वाढवावी लागेल.तेंव्हा आपल्या देशाने पाहिलेली विकसित भारत २०४७ ची स्वप्न वास्तव ठरतील.

संदर्भ ग्रंथ :–

१) भारतीय अर्थव्यवस्था, दत्त व सुंदरम चाँद प्रकाशन नवी दिल्ली–२०१२

२) भारतीय अर्थव्यवस्था, जि. एन. झांबरे, पिंपळपुरे प्रकाशन नागपूर –२००१

३) भारतीय अर्थव्यवस्था,डांगे व रायखेलकर विद्या प्रकाशन नागपूर –१९९८

४) भारतीय अर्थव्यवस्था, प्रा. बी. जी.खटाळ, प्रशांत प्रकाशन जाळगाव –२०१२

५) लोकसंख्याशास्त्र,कुटे व रिठे ,प्रशांत प्रकाशन जाळगाव –२०१९

६) अर्थवेध,मुक्ता जहागीरदार,सेंटर फॉर सोशल अँड इकॉनॉमिक स्टडीज,अमरावती –२०११

७) लोकसत्ता वर्तमानपत्र–१६ फेब्रुवारी २०२४

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सद्यस्थितीत ई–कॉमर्सचे वाढते महत्व

डॉ. संजय मुंडकर
सहयोगी प्राध्यापक, अर्थशास्त्र विभाग प्रमुख,
संभाजीराव केंद्रे महाविद्यालय, जळकोट

प्रस्तावना

आजच्या माहिती युगात, डिजिटल प्रक्रिया हळूहळू भौतिक प्रक्रियांची जागा घेत आहेत. आजकाल, तुम्हाला तुमची खरेदी करण्यासाठी दुकानात जाण्याची गरज नाही. बटणाच्या क्लिकने किंवा स्क्रीनच्या स्पर्शाने तुम्हाला हवे असलेले सर्व काही तुम्ही मिळवू शकता. तांत्रिक प्रगतीमुळे हे डिजिटल व्यवहार करणे अधिक सोपे झाले आहे. ई–वॉलेट्स आणि ४ळ आणि बहुप्रतीक्षित ५ळ सारख्या गोष्टी जलद ऑनलाइन संप्रेषण आणि व्यवहारांना अनुमती देतात. आम्ही संप्रेषण हायलाइट करतो कारण हा व्यवसायाचा एक महत्त्वाचा पैलू आहे.

ई–कॉमर्सचे अनेक फायदे आहेत. ई–कॉमर्स हा डिजिटल प्लॅटफॉर्मवर मुख्यत: इंटरनेटद्वारे केला जाणारा व्यवसाय आहे. २०१९ मध्ये, उदाहरणार्थ, ग्राहकांनी ऑनलाइन खरेदीवर जवळपास ६०० अब्ज खर्च केले. यावरुन ई कॉमर्स व्यावसायिक क्षेत्रात आपली मुळे मजबुत करतांना दिसत आहे. प्रस्तुत शोध निबंधात ई कॉमर्स म्हणजे काय याचा अभ्यास केला आहे त्याचबरोबर पारंपारिक व्यापार पध्दतीच्या तुलनेत ई कॉमर्सचे वाढते महत्व अभ्यासले आहे.

ई–कॉमर्स म्हणजे काय

ई–कॉमर्सची व्याख्या नावातच आहे. ई–कॉमर्स म्हणजे इलेक्ट्रॉनिक कॉमर्स, याचा अर्थ इलेक्ट्रॉनिक प्लॅटफॉर्मद्वारे व्यावसायिक क्रियाकलाप केले जातात.

ई कॉमर्स अंतर्गत केले जाणारे व्यवहार फोन, कॉम्प्युटर किंवा अगदी टीव्हीद्वारे स्मार्ट टीव्ही असलेल्या लोकांसाठी