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Section-1

SCIENCE

Batch anaerobic reactors potentially efficient for the production of hydrogen and biogas from fruit waste

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Abstract

The production of hydrogen and biogas from fruit waste was examined in the currentmanuscriptby using a variety of pretreatment techniques. Anaerobic digestion was utilised in batch reactors to produce biofuel from fruit wastes, namely the rinds of *Ananas comusus* (pineapple) and *Citrus limetta* (mausami). Cow dung and soil were employed as inoculum, and the findings were compared with those obtained from reactors that had not been handled. Using a UV-Visible Spectrophotometer, glucose levels were determined in samples collected from batch reactors. A constant power and varied irradiation time, i.e. 3, 5, and 7 minutes, were used for the microwave treatments. The substrate was processed with diluted sulfuric acid (0.5%) during the acid pretreatment process. For reactors that were microwave pretreated (for 3 min) and used dirt as the inoculums, the maximum output yields of hydrogen and biogas were discovered to be 7.01% and 23.94%, respectively.

Keywords: Biogas; Fruit waste; Bioreactor; Fruit peel; Biofuel

Introduction

The present challenges facing global sustainable development are the degradation of the environment and the energy crises. From an economic, ecological, and environmental point of view, fossil fuel resources are unsustainable and provide a significant concern (Kamm et al., 2006). This is because burning fossil fuels contributes significantly to the atmosphere's rising carbon dioxide levels, which are directly linked to global warming. It is now a well-established fact that fossil fuels account for more than 80% of energy consumption, which has an impact on the environment and has caused a rapid depletion of natural energy supplies (Ni et al., 2006).Due to the excessive use of fossil fuels in numerous industries and high energy consumption, Fossil fuel reserves may soon deplete out which

made the quest for alternate energy sources like (Soetaert et al., 2009) solar, wind, hydropower, thermal, etc. necessary (Noori et al., 2013). These energy sources must be environment friendly, easily producible, and sustainable. Different energy sources have been looked into as a cost-effective alternative to fossil fuels but they are not very much efficient as require. Several techniques have been proposed to generate energy from waste by physical, chemical and biological techniques. Some of chemical techniques are hydrolysis, solvent extraction, and supercritical conversion; Physical conversion techniques include mechanical extraction and distillation; while Biological conversion techniques include anaerobic digestion, fermentation, and enzymatic treatment (Naik et al., 2010).Biofuels are environmentalfriendly, renewable and they considerably reduce the dependency for fossil fuels and can be a good alternate renewable energy source (Ersahin et al., 2011). There are primarily three types of liquid biofuels: Biodiesels, bio-alcohols (methanol, ethanol, and butanol), and biosynthetic oils. In terms of volume-to-volume ratios, biogas mostly contains (v/v): 50–75% methane, 0-5% nitrogen, 1-5% water vapour, 25–50% carbon dioxide, modest levels of hydrogen sulphide (0–5,000 ppm), ammonia (0–500 ppm), and traces of hydrogen and carbon monoxide (Frigon et al., 2010). The biomass requires to produce biofuels, also known as feedstock, comes from a range of sources.

The anaerobic digestion process, which produces methane from a variety of biomass, is becoming more and more popular worldwide because of its advantages for both the economy and the environment. Like all fossil fuels, methane may be burned to provide energy and water. Methane has a 23 times greater long-term global warming potential than carbon dioxide, according to the IPCC 2001. (Rutz et al., 2007).To ensures that methane is totally converted into carbon dioxide, it is crucial to flare it.Biomass is the general term for any organic material, which might include wood, wood waste, straw, manure, sugarcane, and many other leftovers from various agricultural activities. Biomass is being used to produce biofuels, which can be either bio-liquid or bio-gas.Food waste has high energy content and is highly biodegradable. It is typically disposed of in landfills, which causes several issues including bad odors and garbage that leaches down to pollute the groundwater. About 85% to 95% of the food waste is made up of volatile solids, and about 75% of it is moist, which encourages microbial growth (Li et al., 2008). One of the most effective ways for the treatment of food waste is anaerobic digestion (Ward et al., 2008). Due to the differing composition of the matter involved, the average biofuel generation yield from food waste is larger than that from crop residues and livestock waste, ranging from 3mLH2 g/VS to more than 290 mLH2 g/VS

(Okamoto et al., 2000). Glucose-rich waste reveals active generating bio hydrogen. When correctly converted to methane, they offer a significant potential energy source. The final methane yields and kinetics of fruit wastes varied from 0.18 to 0.7321 g^{-1} VS added and 0.016 to 0.122 d^{-1}, respectively, while those of vegetable wastes ranged from 0.19 to 0.4l g^{-1} VS added and 0.053 to 0.125 d^{-1}, respectively. For instance, biohydrogen outputs from cheese whey and molasses were close to 2.5mol H_2 (Venetaneas et al., 2009). Vegetable wastes like onion peel and fruit wastes such as rotten mango, banana, orange, and pomegranate seeds can also be used as a source of biofuels (Gunaseelan, 2003). In the absence of oxygen, anaerobic digestion (AD), a biological process that occurs naturally, breaks down organic waste into methane, carbon dioxide, inorganic nutrients, and compost. This multi-step procedure generates carbon dioxide and methane as a byproduct (Angelidaki et al., 2003). For the quick and regulated degradation of organic waste, this procedure is also known as bio-methanogenesis.Enzymes excreted from hydrolytic and fermentative bacteria, such as cellulase, protease, and lipase catalyze this process. End products include long-chain carboxylic acids, soluble carbohydrates, and amino acids (Ralph and Dong, 2010). The stage of degradation, often referred to as fermentation, the simple sugars, amino acids, fatty acids, and other hydrolysis products further degrade to produce volatile (short chain) fatty acids including propionic, formic, butyric, and valeric acids, ketones, and alcohols. The transformation of glucose into ethanol, Proprionate, acetate, and butyrate are produced from glucose (Ostrem and Nickolas, 2004). Methanogenic microorganisms consume hydrogen to break down the acetate into methane and carbon dioxide. The reduction of carbon dioxide by hydrogen results in the production of a third of the methane (Ostrem and Nickolas 2004).

Conversion of acetate

1. $2CH_3CH_2OH + CO_2$ $2CH_3COOH + CH_4$

2. CH_3COOH $CH_4 + CO_2$ (Ray et al., 2013)

The breakdown of methanol is $CH_3OH + H_2$ $CH_4 + H_2O$.

Hydrogen reduces carbon dioxide to $CO_2 + 4H_2$ $CH_4 + H_2O$. (Ray et al., 2013).

Globally, energy consumption has been rising while fossil fuel supplies have been shrinking. The use of fossil fuels has a number of detrimental effects that contribute to global warming. New sustainable energy sources that potentially take the place of fossil fuels are therefore required. One

way to create sustainable energy sources is through the treatment of waste. Methanogenic anaerobic digestion, biological hydrogen production, microbial fuel cells, and fermentation for the creation of useful goods are a few biological techniques that handle industrial and agricultural waste while producing bioenergy or biofuels (Largus et al., 2004). Researchers from numerous fields have looked into the manufacture of biofuels from garbage and have presented a variety of findings.For the production of biogas or ethanol, Christofi et al., 2022 used fresh orange waste, dehydrated (pressed orange waste), or as silage. The largest energy yield from anaerobic digestion could be obtained from fresh orange waste (32 m^3 biogas/tn orange processed), while silage and pressed orange waste only produced 20 and 11 m3 biogas/tn orange processed, respectively. The combination of ethanolic fermentation (with 2% w/w Saccharomyces cerevisiae) and enzymatic hydrolysis (with 50 L CellicCTec2/g cellulose) with biogas production for fresh oranges in the production of 336 MJ/tn orange processed.Fruit and vegetable market waste (MW) with mature landfill leachate (MLL) for the manufacture of biofuel was studied by Fazzino et al. 2021. It is a challenge to handle landfill leachate (LL) sustainably. A viable method for producing a sustainable biofuel is anaerobic digestion (AD). For the integration of NH3-N in the AD of market trash in the current investigation, pre-treated LL was utilised. During AD, the impact of granular activated carbon (GAC) supplementation on methane output was examined. The methane output rose by almost 14% with the addition of GAC, reaching 0.302 NL/g (VS) added. With a methane production of roughly 0.260 NL/g (VS) added, MLLs employed as nutrient solutions produce a steady AD of MW. It has been demonstrated that GAC is also effective in increasing methane generation. The impact of sewage sludge digestate biochar on the anaerobic digestion of fruit waste's ability to produce biomethane was investigated by Ambaye et al. 2020. The results showed an increase in maximum methane production of 13, 20, and 27% with the addition of sewage sludge biochar produced at 350°C for Inoculum to Substrate Ratio (ISR) of 2, 1.5, and 1, respectively, and an increase of 12, 18, and 22% with the addition of biochar produced at 550°C for ISR of 2, 1.5, and 1, respectively, compared to the biomethane potential (BMP) tests carried out without the addition of the biochar.

Food wastes were used in a hybrid anaerobic-aerobic bioreactor by Aliasgari et al., 2019, who observed improved biogas production by the addition of manure and lime-pretreatment of recycled leachate. To simulate a hybrid anaerobic-aerobic bioreactor without manure addition and leachate pretreatment as the control (R1), two hybrid bioreactors with manure addition without recycled leachate pretreatment (R2), and manure

addition and lime pretreatment of recycled leachate, three laboratory-scale columns were built (R3). For around eight months, all of the simulated bioreactors ran continuously. In order to assess the biodegradability of food wastes and the effectiveness of bioreactors, biogas and CH_4 generation were monitored. The findings consistently showed that manure addition and leachate pretreatment increased biogas output (R3). 17.46, 53.79, and 283.41 per Cubic Feet hybrid anaerobic-aerobic R1, R2 and R3 bioreactors, respectively. These findings demonstrated the efficiency of adding manure and pretreating leachate with lime to increase the production of biogas and methane from food waste.

1. Materials and methods:

1.1. Sampling:

For the present study, fruit waste (mausami and pineapple rinds) was taken as the substrate from the nearby fruit juice cornerJamunipurKotwaChaurahaPrayagraj. The pH of fruit waste ranges from 4.5 to 4.9. The fruit waste was tested for various parameters like COD and Glucose content before, during and at the end of each batch experiment.

1.2. Inoculum:

There are two sets of Inoculum were used in the bio-waste degradation which are as follows:

1.2.1. Cow Dung

Cow dung used as the inoculum in the present study was collected from Govt. Gaushala situated at Dalapur, Nehru Gram Bharati (Deemed to be University),Prayagraj. The slurry of mixed culture present in cow dung was kept under anaerobic conditions for 15-20 days for the activation of mixed anaerobes and was renewed regularly.

1.2.2. Soil

In the second set, soil culture was used as the inoculum taken from botanical garden located at the backyard ofGreen House, Botanical Garden, Department of Botany, NehruGram Bharati (Deemed to be University), Jamunipur Campus, Prayagraj. Soil culture was scooped at a depth of 50 cm to ensure the presence ofanaerobicbacteria inthe soil. It was driedandthenusedforthestudyof fruitwaste.

1.3.   Reactor Setup

Figure 1: Batch reactors

A laboratory scale batch reactor having a total volume of 500 mL was used (Figure 1). The reactor wasprovided with suitable arrangements for feeding and gas collection. The substrate was mixed withthetwo differentmicrobialcultures, i.e.cowdungandsoilseparately. Two types of set respect to the substrate pretreatment were used in two different reactors which are as follows:

1. **Microwave-pretreated Fruit waste:** A domestic microwave oven with a frequency setting at 2450 MHz and power outputs of 900, 700 and 550 W was used. Fixed solid loading experiments were carried out by loading 10% dry matter (DM). Ten grams of dry Mausmi peel were immersed in 90 g of 2% (v/v) H 2SO 4 in a 200-mL flask, and the flask with a loosen cap was positioned at the center of a rotating circular plate in the microwave oven. Pretreatments were carried out at 900, 700 and 550 W for 3, 5, and 7 min, and treatments at 900 W/1 min.900 W/10 min, 700 W/3 min, and 700 W/6 min were designated as 1MA, 10MA, 3MA, and 6MA, respectively. Experiments with variable solid loading were carried out at loadings of 30 (LTS), 50 (MTS), and 90% (HTS) at a microwave power of 900 W for 1 min.

2. **Acid-pretreated fruit waste:** The acid pretreatment was performed using H_2SO_4(at a concentration of 0.5%), Where 10 gm. of Mausmi peel was mixed with 1000 mL of solution and heated at pretreatment temperature 90-100 © for 2 hours.

    Biogas potential test: After pre-treatment of materials with 5% H_2SO_4, 0.5% H_2SO_4, 5% NaOH, and 0.5% NaOH at the temperature of 90–105 °C for 2 h ,the liquid fraction of the reaction mixture was

separated from solids through a sieve with an aperture size of 1×1 mm. Both solid parts and liquid fractions after pre-treatment were used as substrates in the biogas potential test. To neutralise the solid parts of substrates prior to the biogas potential test, the pre-treated materials were rinsed with distilled water until the pH was equal to 7, similar to Liu et al. (2019). The liquid fractions after pre-treatment with 5% NaOH were neutralised with 37% HCl in an amount of 0.94 mL (maximum value) per 100 mL of the liquid fraction before starting the test. The liquid fractions after pre-treatment with 5% H2SO4 were neutralised with 50% NaOH in an amount of 0.73 mL(maximum value) per 100 mL of liquid fraction. For liquid fractions at lower concentrations (0.5% NaOH and 0.5% H2SO4), 10 times smaller amounts of neutralising agents were used. The test was performed according to the method of Angelidaki et al. (2009). Gas-tight flasks were loaded in triplicate with 25 mL of inoculum with the concentration of 12 g/L and substrate (solid or liquid parts) to obtain an inoculum to substrate ratio of 2 : 1 (based on the organic matter content (VS)). Subsequently, water was added to the flasks to an obtained final concentration of sludge of 1 g/L VS. Thus, the total volume in the flasks was 300 mL. To determine the biogas production of the inoculum, one triplicate of blank samples containing only inoculum was prepared, which was then subtracted from the production of the lignocellulosic samples. To evaluate the results, the average values of biogas production from triplicates were used. The sludge mixture was bubbled through with nitrogen for1 min and then the bottles were hermetically sealed with a rubber septum. Biogas production was then measured at given time intervals by a volumetric method when by inserting the needle into the rubber septum of the bottle, the headspace of the bottle was connected to the gas burette. The volume of gas in the burette was recorded after releasing the biogas pressure from the bottle to the burette that was filled with a saturated solution of NaCl with HCl at pH 4.5 to avoid dissolving of CO2 from biogas. The length of the test period was 10 days.

1.4. Total Solid (TS)

Clean porcelain crucibles were taken and ignited at $550^{o}C$ for 1 hour in a muffle furnace. They were allowed to cool and weighed just be fore use.
A fixed volume of well-mixed samples was taken in the pre-weighed crucible. The crucible was kept in an oven at $98^{o}C$ overnight. The evaporated sample was then dried at$103^{o}C$ to$105^{o}C$ in an oven for 1hour.

The crucibles were cooled up to ambient temperature and then weighed (Kumariand Singh, 2020).

$$\boxed{\textbf{Totalsolids(g/l) =(A-B) x1000/samplevolume(mL)}}$$

Where,A=weight ofdriedresidue+crucible(ingrams)

B= weightof crucible(ingrams)

1.5.   Totaldissolvedsolids(TDS)

Clean porcelain crucibles were heated to $180\pm2^{o}C$ for 1 hour in an oven. They were then allowed to cool and weighed. The samples were centrifuged at 500 rpm for 10 minutes and the supernatant was taken for dissolved solids analysis. A fixed volume of the supernatant was added to the pre-weighed crucible. The crucibles were kept in an oven at $98^{o}C$ over night. The evaporated sample was then dried at $180 \pm 2^{o}C$ in an oven for 1 hour. The crucibles were allowed to cool up to ambient temperature and were then weighed.

$$\boxed{\textbf{Total dissolvedsolids(g/l)=(A-B)x1000/samplevolume(mL)}}$$

Where, A=weight of dried residue + crucible (in grams) B= weight of crucible (in grams)

1.6.   Total suspended solids (TSS)

Total suspended solids were determined by sub tracting total dissolved solids from total solids.

$$\boxed{\textbf{TSS(g/l) =TS-TDS}}$$

1.7.   Volatilesolids

Ignite the crucibles of total solids for 150 minutes in a muffle furnace at $550^{o}C$. Then the crucibleswere allowed to cool upto ambient temperature and weighed. Total volatile solids were determined by sub tracting the weight of crucible after ignition from the weight of crucible before ignition.

1.8.   Glucoseestimation

To estimate glucose concentration DNS (Dinitro salicylic acid) test was done. Reducing sugars have property to reduce 3,5-DNS in alkaline solution 3-amino, 5-nitrosalicylic acid. The fruit waste sample was

centrifuged at 500 rpm. 1 mL of each centrifuged sample was taken indifferent test tubes. The samples were diluted to 3 mL by adding distilled water and then 3mL di nitrosalicylic acid (DNS) was added to each sample. The test tubes were covered and allowed to boil for 5 minutes in a boiling water bath. Reddish brown color is developed. The intensity of the color depends upon the concentration of glucose in the sample. Test tubes were cooled to room temperature and then 1mL of sodium potassium tartrate (40% Rochelle salt) was added. Absorbance was then taken at 540 nm using UV visible spectrophotometer.

1.9.   Chemical Oxygen Demand (COD)Test

The chemical oxygen demand (COD) determines the amount of oxygen required for chemicaloxidation of organic matter using a strong chemical oxidant, such as, potassium dichromate underrefluxconditions.The COD concentrations of the samples were detected according to Chinese standard methods (GB 11914-89) after filtration by 0.45 μm filters

CODis givenby:

$$\text{COD(mg } O_2/L) = (A-B) \times N \times 8000) / (V_{sample})$$

Where: A = Volume of FAS used for blank (mL)B=Volume of FA Susedforsample(mL)

N= Normality of FAS 8000=Milli equivalent weight of oxygen (8)×1000mL/L.

Pretreatment of RS

For the present work, MW and NaOH (2% w/v) were used to hydrolyze the non-reducible fraction to reducible sugars to increase the amount of biofuels produced. 10 g of RS was mixed in separate batch reactors with 320 ml of, MW, NaOH (2% w/v) and tap water and then mixed with the inoculum source (i.e., CD) in the 80:20 ratios. Similarly, 10 g of Soil slurry with 320 ml of tap water and 20 g of MW with the inoculum in the 80:20 ratios as the previous reactor was set up. Similar set of all reactors were also set up using microwave pretreatment of RS for 5 min at 800 W power. Microwave pretreatment of substrate also helps in hydrolysis of the substrate or the degradation of the lignin and cellulose matter to the reducible sugars. In our previous study microwave pretreatment was used for pretreatment of mixed microbial culture (i.e., CD) for supressing the methanogenic activity for optimum biohydrogen production which was found more effective as compared to conventional heating process.

2.10. Statistical Analysis

The experiments were conducted in triplicate, and the median value of these three replicates was utilized for the study. Standard deviations were calculated and taken into account for all the graphs. Graphs were generated using MS Excel software. Significance of data was assessed using one-factor ANOVA within MS Excel software, and only experimental values with a significance level of $p < 0.05$ were considered, allowing us to disregard the null hypothesis.

2.   Results and discussion:
2.1.   Characterization of the Substrate:

Fruit waste was collected from a fruit juice corner and used as the substrate in the current investigation. These parameters are provided in Table 2. The values listed in the table are the mean values of the collected data. The fruit waste had a pH that varied from 4.6 to 4.9.

Table-1: Results Summary:

Parameters Studied	Inoculums' Used	Microwave Pretreatment				Acid Pretreatment	
		Untreated	Treated			Untreated	Treated
			3 min	5 min	7 min		
Hydrogen (%)	CD	1.68	2.86	2.92	2.98	2.81	5.12
	Soil	3.97	7.01	5.42	3.92	2.69	5.86
Biogas (%)	CD	12.36	19.49	16.26	15.67	12.26	16.75
	Soil	15.78	23.94	21.26	18.98	15.59	22.95

2.2.   In S3 Reactor
2.2.1. Degradation of Glucose:

Figure 6 shows the degradation of glucose concentration after the first and second batch runs. Following both the first and second batch runs, the S3 reactor in which the inoculum was prepared for three minutes showed the greatest deterioration. Following the second batch run, there has been a reduction in glucose concentration in all reactors.

Figure2: Samples showing color change during DNS test

Additionally, it was discovered that the S3 reactor had a higher rate of glucose concentration decline than the untreated reactor, demonstrating the benefit of pretreatment in that reactor.

2.2.2. Chemical Oxygen Demand (COD) Degradation:

Figures 7 and 8, respectively, illustrate the values for chemical oxygen demand and COD degradation. After the first batch run and again after the second batch run, it was seen that the initial COD in all of the reactors had dropped, demonstrating that bacteria were consuming organic matter for the generation of biofuel. All of the pretreatment reactors exhibit a greater decrease in COD than the untreated reactor, which may be the result of the microorganisms' activity intensifying. The increase in bacterial activity demonstrates that pretreatment has a favorable impact on the rate of organic matter breakdown.

2.2.3. TS, TDS, TSS, and VS degradation Parameters as a Percentage:

In Fig. 9, the degradation of total solids, total dissolved solids, total suspended solids, and volatile solids in microwave-pretreated reactors is shown alongside a comparison to reactors that weren't treated. It was found that pretreated reactors had a higher deterioration rate than untouched reactors Maximum TS, TDS, TSS, and VS degradation, measured as 1.45%, 5.92%, 3.65%, and 8.99%, respectively, was seen in the S3 reactor after a 3-minute microwave pretreatment.

2.2.4. Percentage Hydrogen Production

The hydrogen produced in the reactors was evaluated by gas chromatography and shown in Fig. 10. It was found that the percentage of hydrogen produced increased when the substrate was pretreated for up to 3 min, but declined as pretreatment duration increased. The S3 reactor, which had a three-minute pretreatment, showed the highest proportion of hydrogen.

2.2.5. Percentage Biogas generation:

 Biogas generation in the reactors was examined, as shown in Fig. 8, and it was shown that substrate that has been microwave-pretreated produces a higher percentage of biogas than reactors that have not been treated. When compared to prepared reactors using cow dung as an inoculum, it has been found that reactors using soil as the inoculum produce more hydrogen. In the S3 reactor, which used soil as an inoculum, the highest percentage of biogas, or 23.94%, was found.

2.3.   Reactors using acid-pretreated fruit waste:

In these reactors, cow dung and soil were employed as inoculum simultaneously in batch reactors while the substrate underwent acid pretreatment during anaerobic digestion. Glucose, hydrogen, and biogas were analysed in all reactors and the results were compared in order to assess the development of each reactor.

2.3.1. Degradation of Glucose:

Fig. 3 shows the degradation in glucose concentration following the first and second batch runs. After the first and second batch runs in which the substrate was prepared with diluted hydrochloric acid, the S2 reactor showed the greatest amount of deterioration. Following the second batch run, there has been a reduction in glucose concentration degradation in all reactors. Additionally, it was discovered that the S2 reactor had a higher rate of glucose concentration decline than the untreated reactor, demonstrating the benefit of pretreatment in that reactor.

2.3.2.   Utilization of COD Variation:

Chemical oxygen demand values and COD degradation rates are shown in Figures 4 and 5, respectively. After the first batch run and again after the second batch run, the initial COD in every reactor was seen to be declining. All of the pretreatment reactors exhibit a greater decrease in COD than the untreated reactor, which may be the result of the microorganisms' activity intensifying. The increase in bacterial activity demonstrates that pretreatment has a favourable impact on the rate of organic matter breakdown.

The COD concentration deterioration is shown in Fig. 5, and the S2 reactor saw the most degradation—12.41%—after the second batch run.

2.3.3. Percentage Degradation of other Physical Parameters:

The degradation of total solids, total dissolved solids, total suspended solids, and volatile solids in acid pretreatment reactors is shown in Fig. 6, along with a comparison to untreated reactors. It was discovered that pretreated reactors degraded at a higher pace than untreated reactors. For the S2 reactor with soil as the inoculum, the maximum degradation of TS, TDS, TSS, and VS was 1.75 percent, 6.32 percent, 4.2 percent, and 9.3 percent, respectively.

2.3.4. Percentage Hydrogen Production:

The amount of hydrogen produced in the reactors was examined, and the results are shown in Fig. 7. It was found that the substrate that has been acid-pretreated produces a higher percentage of hydrogen than reactors.
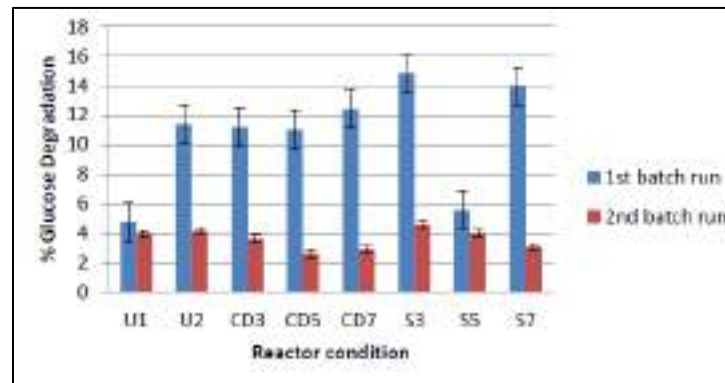
Figure 3: Percent glucose degradation in microwave pretreated reactors with CD and soil

Figure 4: COD (mg/L)in microwavepretreatedreactorswithCDandsoil

Figure 5: Percent COD degradation in microwave pretreated reactors with CD and soil
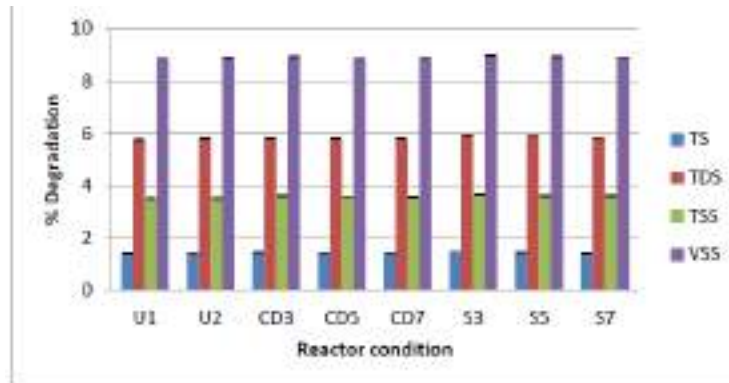
**Figure 6: Percent degradation of other physical parameters in
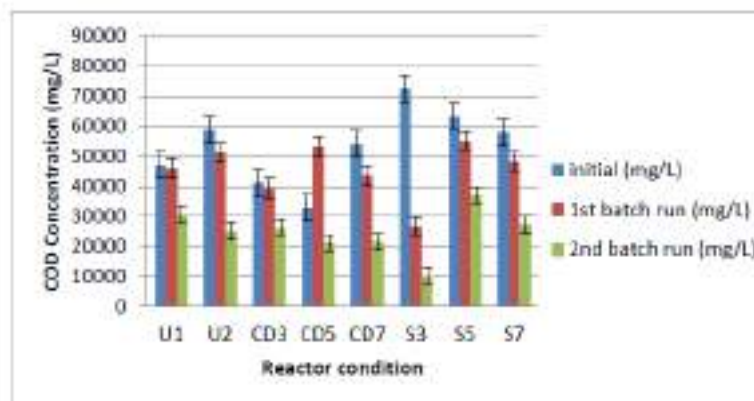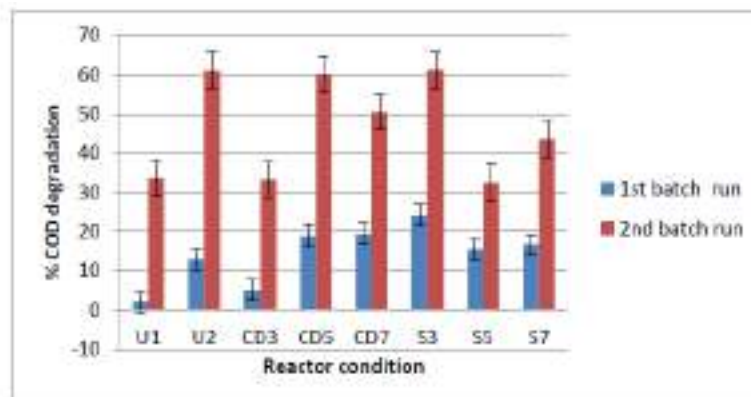microwave pretreated reactors with CD and soil**
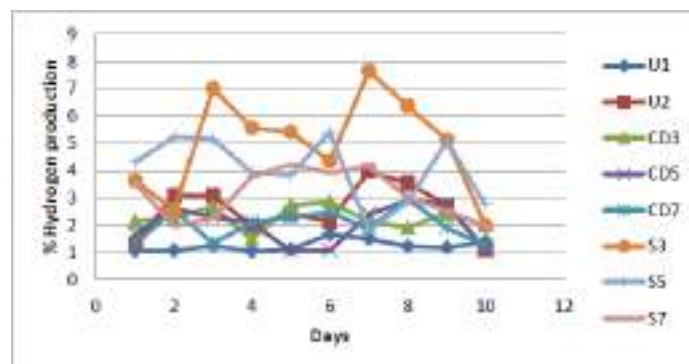
**Figure 7: Percent Hydrogen production in microwave pretreated
reactors with CD and soil**
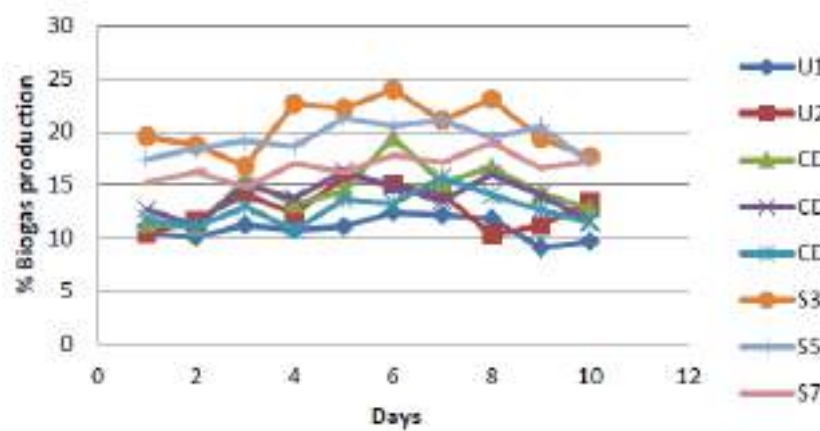
**Figure 8: Percent Biogas production in microwave pre treated
reactors with CD and soil**

that have not been treated. In comparison to pretreated reactors using cow dung as an inoculum, it has been found that acid pretreated reactors using soil as an inoculum produce more hydrogen. 5.86% of hydrogen was created at its highest rate in the S2 reactor when soil was used as the inoculum.

2.3.5. Percentage Biogas Production:

Biogas generation in the reactors was examined, and it was shown that, as compared to untreated reactors, substrate that has been acid-pretreated produces the most biogas shown in figure 8. It has been found that acid pretreated reactors with soil as the inoculum produce more biogas than pretreated reactors with cow dung as the inoculum. The S2 reactor's maximum biogas production rate was 22.95% when dirt was used as the inoculum

3. Discussion

The anaerobes in the microbial culture employed have exploited the organic matter found in fruit waste as a source for the manufacture of biofuel (i.e. cow dung and soil). The lignocellulose content was converted into reducible sugars using microwave and acid pretreatment techniques to improve biofuel output. Two batch runs were completed and preserved on each reactor. In comparison to reactors set up using cow dung as an inoculum, it was discovered that the production of biofuels (hydrogen and biogas) was at its highest in cases where reactors were set up utilising soil. The best outcomes are shown in Table 2 In this context the Hernandez et al. (2017, Appels et al. 2008) assessed the viability of using leftover banana peduncles as feedstock for the production of ethanol and biogas. 0.591g of juice per fresh banana peduncle, with fructose (8g/L), glucose (7g/L), and sucrose (3g/L) as the main sugars. The residual bagasse after extraction and stillage (after ethanol distillation) generated methane yields of 0.263 L at standard temperature and pressure (STP)/g volatile solids of bagasse and 0.08 L at STP/g VS stillage after five days of fermentation of five times concentrated peduncle extract (Amin et al. (2017). Choonut et al. (2014) studied the production of ethanol and hydrogen from pineapple peel, which accounts for 29–40% of the weight of the entire pineapple. 36.25, 2.87% of cellulose was produced after pretreating pineapple peel with water and heat at $100^{o}C$ for 4 hours. After a 24-hour incubation period, the highest sugar production (34.03 1.30 g/L) was achieved. After 72 hours of cultivation, *E. aerogenes* produced a maximum of 1.38 g/L of ethanol using the enzyme hydrolysate as the fermentation medium (Badiei et al 2014). The influence of microwave pretreatment of mixed cultures at various strengths for a set amount of time on the production of

biohydrogen from waste sweet made from *Benincasa hispida* was examined by Singhal et al. 2014. The greatest power under investigation was 800 W at 2450 MHz. The experiment was carried out in batch reactors with mixed cultures, and the outcomes were evaluated in comparison to reactors running under typical conditions (without any inoculum pre-treatment). The maximal hydrogen yield in the reactor, where the inoculum was subjected to 320 W of microwave for 5 minutes, was 14 mmol H_2 for every mol of soluble sugar ingested (Balat et al. 2008). Martin et al. (2013) studied the synthesis of biodiesel using semi-continuous anaerobic co-digestion of orange peel waste with residual glycerol that was co-generated in biodiesel manufacturing in a volume greater than the demand for pure glycerol at the time. A 1:1 (in COD) mixture of orange peel waste and residual glycerol was operated up to an organic load of 2.10g VS/L at mesophilic temperature and semi-continuous conditions. Process destabilisation occurs at increasing organic loading due to the buildup of volatile fatty acids and a drop in pH. The organic loading was around 1.91, 0.37 kg VS/m3 d, and the methane yield coefficient was constant at 330 .51 mL STP/g of VS supplied (Binder et al. 2010, Zhang et al. 2007, Zhu et al. 2006). Abd-Alla et al. (2011) conducted research on the three-stage fermentation technique used to produce biohydrogen from rotten date palm fruits. *Escherichia coli*, an anaerobe, were used in the first stage to tightly maintain the anaerobic condition by consuming oxygen. In the second stage, Clostridium acetobutylicum was used to produce H_2 through a dark fermentative process.

Rhodobacter capsulatus was used in the third stage of the photofermentative H_2 generation process. When 5 g/L of sucrose was added to the fermentor as rotten date fruits, the total yield of H_2 was at its highest. A 162 LH_2 kg-1 fresh rotten date yield of H_2 was the projected total yield for the three stages. The findings show that rotten dates can be a productive source of H_2 (Tanjore, & Richard, 2015, Temudo et al. 2007, Sridar, 1998). In order to maximise the biohydrogen production from thermophillic co-fermentation of swine manure without manipulating the pH and to achieve process stability through endogenous alkalinity of manure, Tenca et al. (2011) evaluated the effect of mixing ratio of fruit and vegetable waste. The fruit-vegetable: swine manure ratio of 35:65 produced the highest production rate of 3.27 0.51 LH_2/L/d, with a corresponding hydrogen output of 126.22 mL $H2g^1$ (VS) added and hydrogen concentration in the biogas of 42. 5%. The method displayed one of the highest assessed stabilities under these operating conditions (Li, & Lin, 2010, Li et al. 2007). The effects of using fruit and vegetable waste as fertilizer on plants were researched by Sagagi et al. 2009. With an

average production of 1554 cm^3, it was found that the cow dung-controlled slurry had the highest biogas production rate. Pineapple waste had the second-highest production rate, at 965 cm3, followed by orange waste at 612 cm3, and finally, pumpkin and spinach waste, with production rates of 373 cm3 and 269 cm3, respectively (Singhal et al. 2012, Shi et al. 2011, Ramos, 2006, Moiser et al. 2005, Mashad et al. 2004, Koster& Lettinga, 1988).

4. Conclusion:

From the current study, it can be inferred that producing biofuel from fruit waste is an innovative method. Microwave radiation and substrate acid pretreatment can boost the production of several biofuels. The inoculum (CD and soil) and fruit waste were combined, and studies were run in batch reactors. Separate reactors with untreated substrate were also set up in order to track and contrast the production of biofuel. As compared to reactors set up utilising cow dung as inoculum, it was discovered that soil-based reactors produced the most biofuel. Additionally, it was shown that, when compared to acid pretreatment, microwave pretreatment produced the highest biofuel. The highest yields of hydrogen and biogas were found to be, respectively, 7.01% and 23.94% for reactors that had undergone a 3-minute microwave pretreatment and used soil as the inoculum. In comparison to acid pretreatment, it was discovered that microwave pretreatment was the superior technique. When compared to untreated reactors, the generation of biogas and hydrogen rose by around 1.5 and 2 times, respectively.

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5. Author's contributions:

Shanthy Sundaram and Adi Nath designed the experiments; Adi Nath, Bhavya PandeyandMariyam Khan performed all the experiments. Adi Nath and Abhijeet Sharma drafted and reviewed the manuscript.

6. Declarations:

Conflict of Interest: There is no conflict of interest for this manuscript. The authors declare that they have no known competing financial

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Size spectra variation and exploitation structure of Wallago attu (Bloch and Schneider 1801) from the river Sarayu at Gorakhpur, Uttar Pradesh, India

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Abstract

Riverine fisheries provide nourishment and employment for million peoples worldwide. *Wallago attu* is a commercially important fish species from the riverine sector with harvested across tropical Asian countries. In the present study fishes were collected from the Sarayu River, Uttar Pradesh, India during April 2023 to March 2024. A total of 153 fish samples of *Wallago attu* were examined study the size composition and exploitation structure. The result revealed that the size spectra of *W. attu* varied from 30.0 to 122.3 cm in the Sarayu river. The size group 30.1 to 40.0 cm was exploited mostly (21.57%) compared to the size group of 60.1-70.0 cm (19.06%) and 40.1-50.0 cm (16.34%) in the total catch. The composition of fishes belongs to 120.1 to 130.0 cm and 20.1-30.0 cm group were 0.65% in the total catch. It was observed that, fishes of small size group were highly captured than middle and higher size group. The consumer's preference for the small size was higher due to its low cost and high demand in the market. This study enhances our knowledge about size spectra of *W. attu* and in future will be helpful to the policymakers for developing fishery management policies and restoration measures in the studied river.

***Keywords*:** size spectra, exploitation, fishing pressure, *Wallago attu,* Sarayu river.

Introduction

Freshwater shark, *Wallago attu* is a fast growing, hardy nature and carnivorous catfish species belongs to the order Siluriformes and family Siluridae. *Wallago attu* is a targeted fish species in the rivers and their associated flood plains, lakes, wetlands and reservoirs across south and south east Asia (Poulsen *et al*. 2004, Montana *et al*. 2011, Renjithkumar *et al*. 2011, Kumar *et al.* 2023). It has good market demand as a food fish having high nutritional value and high protein content in its flesh. It is very commonly found in India, Bangladesh, Pakistan, Nepal and Indonesia

(Talwar and Jhingran 1991, Mirza 2003, Giri *et al*. 2002, Parvez *et al*. 2023). It is commercially exploited from the river Ganga (Singh *et al*. 1998, Montana *et al.* 2011, Tripathi *et al.* 2017, 2024), river Yamuna (Mayank and Dwivedi 2015) and its tributaries (Nautiyal & Dwivedi 2019, Kumar *et al.* 2023).

For the study of fish biology, population dynamic and fishery assessment, size spectra is mandatory as one of the principal practical parameters (Goncalves 1996, Cowx 2015, Mayank and Dwivedi 2016, Khan *et al*. 2017, Dwivedi *et al.* 2017a, 2023, Gopesh *et al*. 2021). Size spectra is used as a referral point for estimating nature of stock, life span, suitability of habitat, growth pattern and fishing pressure in riverine ecosystem (Allan *et al.* 2005, Yousaf *et al*. 2009, Tripathi *et al.* 2015, Dwivedi *et al.* 2017b, Mayank *et al.* 2018, Kumar *et al*. 2023). Decline in ecological conditions and water quality is a typical cause for decreasing of fish size (Example wild stock) from the rivers globally. The present study aim to emphasis the size spectra, exploitation pattern and targeted size by fishers of *W. attu* from the lower stretch of the Sarayu river at Gorakhpur, Uttar Pradesh. This study is helpful for developing fishery management policies and restoration in riverine sector.

Material and method

The River Sarayu is a left bank tributary of the Ganga river with support healthy fish fauna to the Ganga river. The Sarayu river fishery resources are also provide a wide range of other ecosystem services. 153 fish samples of *Wallago attu* were collected at randomly during February 2023 to March 2024 from the lower stretch of the Sarayu river (Barahalganj fish market), Ghorakhpur, Uttar Pradesh, India. The size of fishes was measured by measuring scale to nearest cm. The Total length (TL) of fishes was measured from tip of the snout to the largest fin rays of caudal fin. The collected data were classified at 10 cm intervals for formation of groups. The number of samples calculated according to size group then converted into percentage.

Result and discussion

The size composition of *Wallago attu* varied from 30.0 to 122.3 cm from the Sarayu river, Uttar Pradesh, India. The total length of fish is good indicator of its size structure and it decreases under high fishing pressure. On the basis of pooled sampled specimen in the length ranges from 30.1 to 40.0 cm showed that the most exploited compared to other size groups (Fig. 1). The 120.1 to 130.0 cm and 20.1-30.0 cm group fishes were shared very little amount with 0.65% each in the total catch. The lower size group of fishes more constituted compared to middle and higher size

groups. The size groups 40.1 to 50.0, 50.1 to 60.0, 60.1 to 70, 70.1 to 80.0, 80.0 to 90, 90.1 to 100.0 cm fishes contributed 16.3% , 9.15%, 19.61% , 9.80%, 11.11% , 2.61%, respectively from the lower stretch of the Sarayu river at Gorakhpur, India. The exploitation of *W. attu* also indicted that the presence more immature fishes compared to mature fishes in the total catch. This type of fishing pattern/exploitation is systematic and healthy for stable stock of *W. attu* from the Sarayu river. It was noticed that, the fishing of small size group of fishes were highest as compered to middle and higher size group (Table 1, Fig. 2). Small size of fishes was targeted by fishers and most demanding by consumer due to its lowest prices. Similar finding were reported by Dwivedi *et al.* (2016) in *Cirrhinus mrigala*. Dwivedi et al. (2006) was recorded that the lower size group of *L. calbasu* maximum exploited from the Ghaghara river at Faizabad, Uttar Pradesh. Kamal (1969) was estimated lower and middle age groups of *Cirrhinus mrigala* highly exploited from the river Yamuna at Prayagraj. Imran *et al.* (2015) reported that the 32.1-35.0 cm size group of *Labeo calbasu* was dominated in exploitation (17.61%) compared to 29.1-32.0 (13.64%) and 26.1-29.0 cm (11.93%) from the Yamuna river. The body size (Total length) of fishes is a master feature in ecology (Woodward *et al.* 2005, Boll *et al.* 2023, Kumar *et al.* 2023).

It could be concluded from the present study that the stock structure of *W. attu* was stable from the river Sarayu at Gorakhpur, Uttar Pradesh, India. In the present size composition was decreased compared to earlier report but exploitation structure was systematic in nature. Abrupt changes in ecological conditions and water quality is a typical cause for decreasing of fish size (Example wild stock) from the rivers globally.
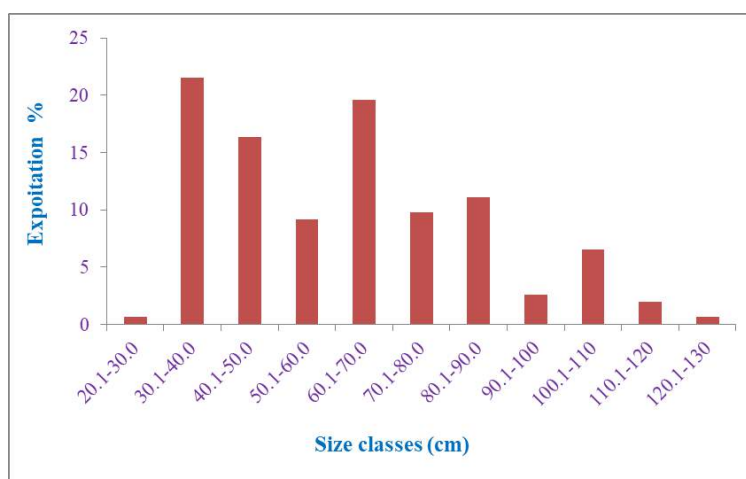
Fig. 1 Exploitation pattern of *Wallago attu* from the Sarayu River, Uttar Pradesh
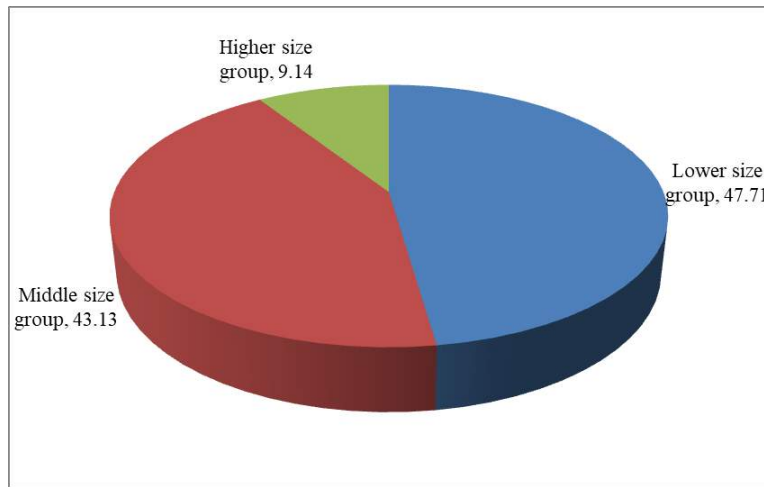
Fig. 2 Exploitation pattern of *Wallago attu* according to major groups from the Sarayu River, Uttar Pradesh

Table 1 Exploitation pattern of *Wallago attu* according to major groups from the Sarayu River, Uttar Pradesh

Categories (cm)	Exploitation Percentage
Small size group (20.1-60.0)	47.68
Middle size group (60.1-100)	43.13
Large size group (100.1-130.0)	09.1

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Studies on age composition, age and growth of Indian major carp, *Cirrhinus mrigala* (Hamilton, 1822) from the Belan River, India

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Abstract

Studies were undertaken during the period May 2022 to April 2024 from the Belan River at Prayagraj, Uttar Pradesh, India. In present study, 235 fish specimens (116 males and 119 females) were examined for the assessment of age composition, age and growth increment of *Cirrhinus mrigala* by using scale method. The investigation of *C. mrigala's* key scale resulted in a comprehensive depiction of age composition, age, and growth increment. *C. mrigala* had an age range of 0+ to 6+. Based on gathered sampled specimen ranging in length from 194 to 874 mm, the fish had a mean length (pooled sample) 325 mm in 1+, 491 mm in 2+, 623 mm in 3+, 739 mm in 4+, 781 mm in 5+ and 816 mm in 6+ age groups. The growth increments was recorded as 325 mm, 165 mm, 133 mm, 116 mm, 45 cm and 35 mm for 1+ to 6+ age groups, respectively. The highest growth increment occurred in the first year, followed by moderate growth in the following years. The minimal growth increment occurred in the sixth year of the life cycle.In first two years, female growth was higher compared to male, but for other years, growth in male was reported higher compared to female. The modest growth rate observed after the second year of life could be related to maturity. It is widely acknowledged that the growth potential is used for gonad development. The growth rate varied with age in the female, male and pooled samples.

Keywords: *Cirrhinus mrigala*, Age composition, Age and growth, Belan River

Introduction:

Cirrhinus mrigala (Hamilton, 1822) belongs to the Indian Major Carp (IMC) group. The species is commercially important because of its aquaculture potential and strong customer popularity (Jayasankar 2018, Dwivedi *et al.* 2018). It is commercially exploited and contributed highest proportion in group of Indian major carp of the total landing from the river

Ganga (Das *et al.* 2023, Tripathi *et al.* 2024), river Yamuna (Mayank and Dwivedi 2015, Joshi *et al.* 2016) and its tributaries (Nautiyal and Dwivedi 2019). Age and growth rates are two major attributes in monitoring fish populations and their responsiveness to various management techniques (Khan *et al.* 2011). The main objective of fish age and growth research is to establish the quantity of fish that can be generated and recruited over a certain period. Understanding the dynamics of fish populations, fishing pressure, habitat suitability, and food availability requires having the ability to determine age of fish perfectly (Alam *et al*. 2019, Nautiyal and Dwivedi 2020, Bhakta *et al*. 2023). A fishery's annual variation is determined by its recruitment and growth patterns (Dwivedi *et al* 2014). It is generally desirable to split catch based on age groups to understand the sensitivity of any such set of fishing gears. The age structure of the catch is frequently utilised in several fisheries across the world to estimate future available stocks.

Age composition data, including information on the sexes, can be used to analyse the differential growth rates between males and females and the overall sample (Mayank *et al*. 2018, Alam *et al*. 2019). Growth is a complex mechanism that reflects an effect of interactions between numerous biotic and a biotic elements functioning on behavioural and physiological systems (Jhingran 1959, Kamal 1969, Khan 1972, Alam *et al*. 2019, Ujjania and Soni 2020). Many researchers investigated the age and growth of *C. mrigala* in the riverine ecosystem (Jhingran 1959, Kamal 1969, Khan *et al*. 2011, Das *et al*. 2012, Mayank *et al.* 2015, and Ujjania and Soni 2020). However, little is known about the age and growth of *C. mrigala* in the Belan River. The current study was designed to evaluate the age and growth increment of *C. mrigala* from the Belan River at Prayagraj, Uttar Pradesh in India. This study will help in formulation of the fishery management policies and restoration of *C. mrigala* in the Belan River and its associated ecosystems.

Material and methods

Study area

The Belan River originates in western part of Sonabhadra district Uttar Pradesh, India from the Vindhyan ranges. It is famous for prehistoric sites from the Neolithic period. It has a length of approximately 156 km and flows in a west-north direction in districts Sonbhadra, Mirzapur and Prayagraj. The river ultimately drains into the River Tons near Chakghat. The Belan River is a tributary to the Tons River and a sub-tributary of the Ganga River.

Investigation for the assessment of age composition, age and growth increment of *Cirrhinus mrigala* were undertaken during the period May 2022 to April 2024 from the Belan River at Prayagraj, India. During the investigation, 235 fish samples (116 males and 119 females) were evaluated. The investigation of *C. mrigala's* key scale resulted in a comprehensive depiction of age composition, age, and growth increment. The key scales of *C. mrigala* were used to determine its age (Bagenal and Tesch 1978). The key scales were carefully removed with fine forceps from the row above the lateral line beneath the dorsal fin area (Bagenal and Tesch 1978, Mayank *et al.* 2018). Scales were removed and thoroughly cleaned with a fine brush before being rinsed with distilled water. To remove adherent tissues, the scales were cleansed in a 5% KOH solution and then washed with distilled water. The scales were then squeezed while drying to prevent them from curling. After properly cleaning the scales, the growth rings were counted. The fish's age was determined using the Carl Zeiss Jena Scale Reader. The ring zone appeared in opaque format, while the rest zone was clear.

Result

C. mrigala has typical cycloid scales in its body. As a result, the scales of these species were structurally identical, consisting of an anterior field (AF), a posterior field (PF), two lateral fields (LF), and a focus (F). The anterior field of the scale remains lodged in the skin, whilst the posterior field appears visible 'in situ'. During the current study, 235 fish specimens (116 males and 119 females) were analysed to determine the age and growth increment of *C. mrigala* from the Belan River. Six annual rings were seen in scales from the *C. mrigala* population in the Belan River during the current investigation. Female fishes had a higher growth increment in the first year (1+) than male fishes, but male fishes had a higher growth increment in the second, third, and fourth years. The age distribution of male and female *C. mrigala* in the Belan river ranged from 0 to 6+.

Pooled

The analysis of *C. mrigala*'s scales provided a complete overview of growth increment. The age composition of *C. mrigala* in the Belan River ranged from 0+ to 6+. Based on sampled specimens ranging in length from 194 to 874 mm, the fish had a mean length of 325 mm in 1+, 490 mm in 2+, 623 mm in 3+, 739 mm in 4+, 781 mm in 5+, and 816 mm in 6+ age groups (Table 1). The highest growth increment occurred in the first year, followed by moderate growth in subsequent years. Furthermore, this fish follows the normal growth trend, in which the annual increment reduces as age increases, as is typical of most carps. The smallest growth

increment was documented in the sixth year of life. The modest growth rate observed after the second year of life could be related to maturity. It is widely acknowledged that the growth potential is used for gonad development.

Male

Male fish samples in the studies varied in length from 194 to 870 mm. The growth ring was not observed in fish less than 254 mm in size. Only six-year-old male fish were found in the Belan River. The current findings revealed that the fish acquired the mean length of 322 mm in 1+, 485 mm in 2+, 628 mm in 3+, 740 mm in 4+, 786 mm in 5+, and 827 mm in 6+ age groups. Male fishes had growth increments of 322 mm, 163 mm, 143 mm, 112 mm, 46 mm, and 41 mm for age groups 1+ to 6+ (Table 2). The largest growth increment was likewise reported in the first year, whereas the smallest occurred in the sixth year of the life cycle. The modest growth increment observed after the second year may be linked to reaching maturity during the second year of life. It is widely acknowledged that the growth potential is used for gonad development. Males develop faster because they require less energy for reproduction and gamete formation.

Female

The female fishes measured from 212 mm to 808 mm in length from the Belan River. The age composition of female *C. mrigala* was also varied from 0+ to 6+ from the Belan River. The present observations showed that the fish attained the mean length 329 mm in 1+, 495 mm in 2+, 618 mm in 3+, 737 mm in 4+, 776 mm in 5+ and 808 mm 6+ age groups. The growth ring was not recorded below 261 mm size group of fishes. The growth increments in *C. mrigala* was recorded 329 mm, 166 mm, 123 cm, 119 mm, 39 mm, and 32 mm for 1+ to 6+ age groups, respectively (Table 3). The first year of the life cycle saw the greatest growth increment, and the sixth year saw the lowest. One possible explanation for the observed modest growth increment after the second year of life is that during this time, maturity was attained. It is commonly known that the gonads develop using the growth potential.

Discussion

Accurate fish age estimation is thought to be a prerequisite for age assessment of fish populations, effective resource management, and recruitment potential (Khan and Khan 2009, Alam *et al*. 2019, Mishra *et al.* 2023). *C. mrigala* thrives in both lotic and lentic conditions, however it develops more effectively in the old tank when there is enough vegetable waste present (Chondar 1999). In the Yamuna river, Mayank *et al.* (2015) measured the average length of *C. mrigala* in the following age groups:

30.24 cm in 1+, 47.82 cm in 2+, 60.13 cm in 3+, 70.11 cm in 4+, 77.01 cm in 5+, 81.42 cm in 6+, 86.30 cm in 7+, 89.80 cm in 8+, 91.70 cm in 9+, and 94.30 cm in 10+.

The first growth ring of *C. mrigala* was discovered in specimens from the Mahanadi, Godavari, Kaveri, Narmada, and Mahi rivers, with average lengths of 27.86, 28.86, 37.22, 26.77, and 25.59 cm, respectively (Das *et al.* 2012). *C. mrigala* at ages 1 to 12 had a mean length of 290.9 mm in 1, 511.4 mm in 2, 670.5 mm in 3, 797.4 mm in 4, 858 mm in 5, 888.5 mm in 6, 911 mm in 7, 921.8 mm in 8, 947 mm in 9, 958.25 mm in 10, 958.25 mm in 11 and 992 mm in 12 age groups (Jhingran 1959).Except during the first year of life, the current mean length of *C. mrigala* is slower than that of Jhingran (1959). In fish from the Yamuna River in Allahabad, Kamal (1969) measured the mean length of *C. mrigala* in 1 to 9 age groups to be 268.0 mm, 458.0 mm, 644.2 mm, 736.1 mm, 816.7 mm, 867.1 mm, 924.0 mm, and 958.6 mm, respectively. According to him, the first four years of a C. *mrigala*'s existence are when growth is at its fastest, with the first year experiencing maximal growth. Later years are marked by a progressive slowdown in growth rate until a maximum length (asymptotic length) is reached.

In the Vallabh sagar reservoir in Gujarat, India, Ujjania and Soni (2020) observed that the age composition of *C. mrigala* was 1+ to 9+ age groups with mean total lengths of 40.78, 50.99, 59.82, 66.32, 70.72, 74.56, 77.80, 80.22, and 82.50 cm. In the Pong reservoir in Himachal Pradesh, Parmar and Bhatia (2014) measured the mean length of *C. mrigala* in age groups ranging from 3+ to 8+. They found that the mean lengths were 44.21, 48.62, 51.24, 70.83, 77.25, and 83.00 cm. The age class 3 experienced an annual growth of 7.48 cm, whereas the age classes 4, 5, 6, 7, and 8 experienced increments of 6.37, 6.56, 6.50, 10.02, 7.12, and 6.09 cm, respectively.

Acknowledgement

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Impact of dust storms on air quality and aerosols over the Indo-Gangetic (IG) Basin

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Abstract

Dust storms pose a significant threat to air quality and public health through their capacity to transport particles over long distances. The Indo-Gangetic Basin, one of the world's most densely populated regions, experiences notable seasonal variations in aerosol optical depth (AOD), with peak levels during the pre-monsoon (summer) season. Our study focuses on the effects of major dust storm events on aerosol parameters within this region. We observed that dust storms lead to an overall increase in AOD across the basin. The aerosol size distribution (ASD) shifts, showing an increase in particle radius and a decrease in distribution width, indicating changes in aerosol characteristics during these events. This increase in aerosol radius is significant for its implications on climate change. Additionally, aerosol parameters such as single scattering albedo (SSA) and refractive index (both real and imaginary components) show substantial alterations during dust storms. To trace the source, trajectory, and spatial extent of these dust events, we employed the National Oceanic and Atmospheric Administration (NOAA) Hybrid Single Particle Lagrangian Integrated Trajectory (HYSPLIT) model for 5-day back-trajectories, along with MODIS level-3 daily data. Our findings indicate that MODIS column water vapor levels increase during dust storms, demonstrating transport from west to east along the storm's path.

Keywords: Dust Storm, Indo-Gangetic basin, aerosol, aerosol optical depth, single scattering albedo

Introduction

The impact of atmospheric aerosols on climate and the environment is a critical concern for the scientific community. These aerosols, originating from both natural and anthropogenic sources, significantly influence air quality, human health, and the atmospheric radiation budget. However, the climatic impacts of aerosols remain more uncertain than those of greenhouse gases (IPCC, 2007), due to their diverse sources, variable

trends in aerosol loading, and extreme heterogeneity in their optical and microphysical properties over time and space (Kaskaoutis et al., 2012).

Atmospheric aerosols exert climate forcing by disrupting the Earth's radiative balance. They do this directly by absorbing and scattering solar and terrestrial radiation, and indirectly by acting as cloud condensation nuclei (CCN). This alters cloud albedo, cloud lifetime, precipitation rates, the hydrological cycle, the monsoon system, and overall climate, as aerosols modify the radiative properties of the atmosphere (Tegen et al., 2004). Sand and dust storms are widespread natural events that transport dust aerosols over long distances, representing a key process in land-atmosphere interaction. These storms not only disturb the radiation-energy balance of the Earth-atmosphere system but also affect atmospheric heating and stability, chemical and biological ecosystems, ambient air quality, and human health (Husar et al., 2011).

Dust storms originating from arid and desert regions are major contributors to global mineral dust. Key sources include the Saharan Desert in Africa, the Middle East, the Arabian Desert, Afghanistan, and the Thar Desert in Rajasthan, India. These areas, located several thousand kilometers upwind of the western side of the Indo-Gangetic (IG) plains, are significant hotspots (Gillette, 1999; Prasad and Singh, 2007) and contribute a substantial portion of the annual mineral dust load. The characteristics of dust storms in Asia and Southwest Asia have been extensively detailed by Middleton (1986) and Husar et al. (2001). During the pre-monsoon season (April–June), the IG basin experiences the highest aerosol loading due to the substantial influx of mineral dust aerosols transported from these western arid regions (Prasad and Singh, 2007).

In this study, we examined the physical and optical properties of major dust storm events that occurred during the pre-monsoon season of 2010 (April–June) over Lahore, Kanpur, and Gandhi College. Using ground-based AERONET data, we focused on the significant changes observed in aerosol optical properties, such as aerosol optical depth (AOD), Angstrom exponent (α), and aerosol size distribution (ASD), during dusty and clean days. To trace the source, trajectory, and spatial extent of these dust storms, we utilized the National Oceanic and Atmospheric Administration (NOAA) Hybrid Single-Particle Lagrangian Integrated Trajectory (HYSPLIT) model for 5-day back-trajectories, as well as level-3 daily data from MODIS. We also investigated the spatial coverage of major dust storms over the Indo-Gangetic plains to delineate the total area affected during these events using satellite AOD data. Our findings indicate that dust storms, which are prevalent during the summer season, lead to increased aerosol loading and negatively impact air quality over the Indo-

Gangetic plains (Singh et al., 2004). We conducted a detailed analysis of daily total column MODIS level-3 near-infrared water vapor under cloud-free conditions, along with corresponding MODIS level-3 AOD data, to demonstrate the enrichment of water vapor accompanying dust storms along their paths over the Indo-Gangetic plains.

3. Data Used

Aerosol optical depth data have been obtained using level-3 MODIS (Moderate Resolution Imaging Spectroradiometer) Terra (MOD08_M3, in HDF format) as a monthly gridded average in $1^0 \times 1^0$ spatial resolutions (http://modis.gsfc.nasa.gov/) (Chu et al., 2002; Ichoku et al., 2002; Ichoku et al., 2004; Remer et al., 2005). The MODIS was launched onboard the NASA's Earth Observing System (EOS) Terra and Aqua spacecrafts provides daily global data of aerosol characteristics using 36 spectral bands ranging from visible to thermal infrared (0.41–14.38 μm), with spatial resolutions of 1000 m, 500 m, and 250m (pixel size at nadir) [46] in December 1999 and onboard EOS-Aqua satellite in May 2002

The AERONET program (http://aeronet.gsfc.nasa.gov/) is a global ground-based remote sensing network designed to evaluate aerosol optical properties and validate those derived from satellites (Holben et al., 1998). For this study, we utilized AERONET version 2, level 2 cloud-screened data to analyze the optical properties of dust storms from 2005 to 2012. We examined total column aerosol optical properties such as aerosol optical depth (AOD, τa500 nm), Ångström exponent (α 440–870 nm), aerosol size distribution (ASD), the peak and geometrical width of volume particle size distribution [dV®/dlnr (µm3/µm2)], the real [n(λ)] and imaginary parts [k(λ)] of the refractive index (RI), and single scattering albedo (SSA, ωo(λ)) from AERONET stations at Kanpur, Gandhi College, and Lahore within the IG Basin to identify and characterize major dust storms. These aerosol products are derived from AERONET data using the methodologies discussed by Dubovik and King (2000) and Dubovik et al. (2000).

The HYPSLIT_4 model (http://www.arl.noaa.gov), with a user-friendly graphical interface, is employed to compute air mass trajectories and concentrations (Draxler and Rolph, 2003). Gridded meteorological data at regular intervals are used to calculate air mass trajectories. For back-trajectories, data are sourced from existing archives. A comprehensive description of the input data, methods, equations, and potential sources of error for air mass trajectory calculations can be found in Draxler and Hess (1997). The model can be run directly on the web (http://www.arl.noaa.gov/ready/hysp_info.html) by providing the

necessary inputs or on a local PC after installing the software and input data set. NOAA's Air Resources Laboratory (ARL) provides the executables and meteorological data for free for back-trajectory analysis, though registration is required for forecast analysis. The model outputs are available as post-script images and ASCII files, which can be imported into other programs for plotting (Prasad and Singh, 2007).

3. Results & Discussion

3.1 Optical Properties of Dust Storms in the IG-basin

The dust storms are mainly found during the pre-monsoon season (Sikka, 1997). The probability of occurrence of dust-storm is more in western region and lesser in the eastern region of the IG-basin. During the Pre-monsoon season of year 2010 major dust storm event days 2 June, is noticed which is shown in **Figure** 1, which clearly shows the presence of deep loading of dust in the atmosphere compared to aerosol data prior to event days. Change in optical properties of aerosol during the dust storm in detail has been discussed here. Figure 1 show MODIS TERRA image showing the long-range transport of dust and its presence in IG basin noticed (02 June 2010). The IG basin clearly represents high aerosol loading on 02 June 2010.
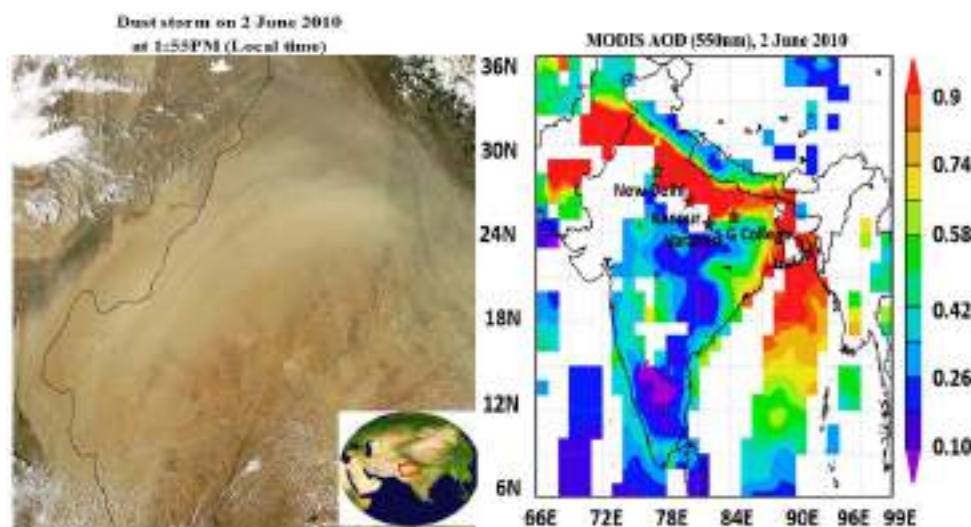
Figure 1: MODIS TERRA image (band collection 1-4-3) showing long range transport of dust storm (June 2, 2010). The white and dotted objects represent the clouds, the dust appears in pale color. The second picture represents the MODIS AOD (500nm) with four main stations with high AOD value in the I-G basin
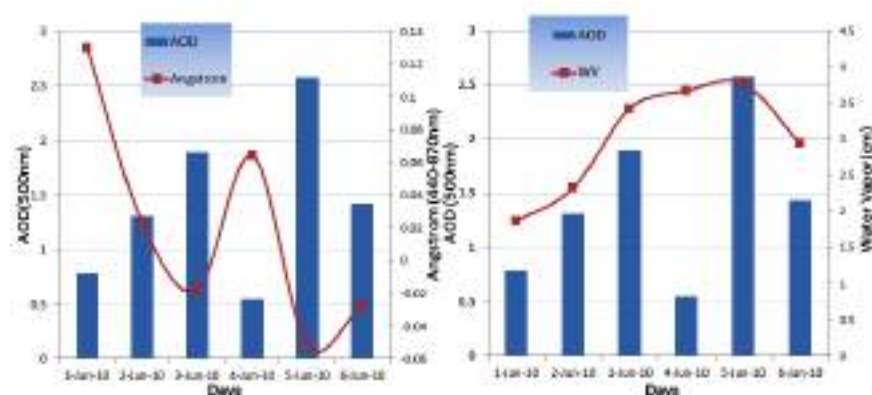
Figure 2 The variation of aerosol optical depth (AOD 500nm) with Angstrom exponent (440-870 nm) and water vapor at Kanpur (1-6 June, 2010).
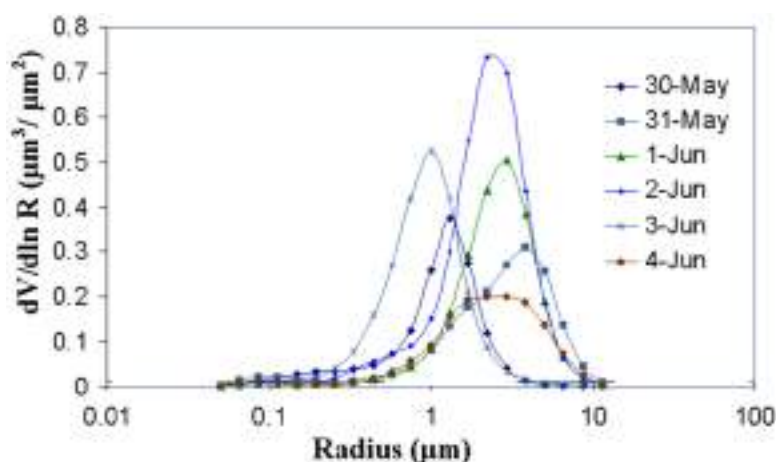
Figure 3   AERONET size (volume) distribution during 30 May-04 June, 2010. During dust storm strength of COARS mode particle in IG basin increased.

3.2 Variation of Aerosol and Ångström exponent

The Variation of AOD along with angstrom exponent (440 770 nm) derived from AERONET during 1-6 June 2010 at Kanpur is shown in Figure 2. From the figure one can see that AOD values at Kanpur increases during the dust storm period whereas angstrom exponent shows inverse relation to AOD values. The variation of water vapor along with the AOD values is also shown in right panel of Figure 2. The water vapor variations also show enhanced value during the dust storm period. The enhanced water vapor during the dust storm could result from its long-range transport from the Arabian sea. The long-range transport of water vapor during the dust storm period is reported in previous studies (Li et al., 2020).

3.3 Variation of aerosol size distribution during the dust storm

The variation of aerosol size distribution during 30 May – 02 June 2010 is shown in Figure 3. From the figure it is clearly seen that the distribution of peak of COARSE mode particles increases during the dust storm with maximum peak noted on 02 June 2010. The enhancement of coarse mode particles due to its long-distance transport could be useful in producing cloud and rain. Since coarse mode particle are useful in cloud condensation nuclei. Figure clearly indicates the dominance of coarse mode aerosols during the dust storms with fine mode aerosol remains the same. The coarse mode aerosol loading during dust events were reported in pre-monsoon seasons (Singh et al., 2004; Srivastava et al., 2011).

4. Summary & Conclusion

This paper is based on the analysis of major dust storm of 02 June 2010 which mainly occurred in northern India. The AOD data from ground base AERONET along with MODIS satellite has been used to examine the influence of dust storm on concentration of aerosol, its physical/optical properties in IG-basin. Analysis from AERONET data found significant enhancement in AOD concentration and depression in angstrom exponent during the dust storm. Enhancement in water vapor in IG basin is also noted during the dust storm which could be transported from the Arabian sea. This kind of transport study with high temporal and spatial resolution data sets could have potential application in studying monsoon/circulation pattern in IG-basin. The ASD from AERONET indicates enhancement in COARS mode particle during the dust storm which plays an important role in cloud formation and rainfall.

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Investigation on *In-vitro* Bioassay for Dose Optimization of Different Insecticides Against *Helicoverpa armigera* (Hübner)

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Abstract

This research investigates the optimization of insecticide doses through *in-vitro* bioassay methods against *Helicoverpa armigera* (Hübner), a major agricultural pest responsible for significant crop damage globally. The study focuses on evaluating the efficacy of various insecticides to establish a baseline for optimal dosages that ensure maximum pest mortality while, minimizing environmental impact and resistance development. To conduct the study rearing of *H. armigera* was carried out and pre-oviposition, oviposition, post-oviposition period and fecundity were primarily recorded. Further morphometric study were carried out up to second instar larvae of *H. armigera*. After that *in-vitro* bioassay studies were conducted in the determine the relative toxicity of selected insecticides viz., Emamectin benzoate, Spinetoram, Flubendiamide and Broflanilide against second instar larvae of *H. armigera*. The data on the toxicity of insecticides to *H. armigera*, indicated that among the four insecticides tested against the second instar, irrespective of the method of application, emamectin benzoate, and broflanilide showed greater toxicity compared to Flubendiamide, and Spinetoram. The present study explores the potential of synergistic effects when combining different insecticides, aiming to enhance overall pest control while reducing the likelihood of resistance development. This research provides critical insights into the development of effective, sustainable pest control strategies, offering valuable data for agricultural scientists and pest management professionals. By optimizing insecticide dosages, this study contributes to improved crop protection, reduced environmental impact, and the prolonged efficacy of pest control agents.

Key Words: *Helicoverpa*, *In-vitro*, Toxicity, Insecticides, Resistance

Introduction

Agriculture stands as the cornerstone of human civilization, providing

sustenance and nourishment to burgeoning populations especially in the era of global climate change. However, this virtuous narrative is intertwined with a challenge that persists to thwart the aspirations of farmers and researchers alike the relentless depredation caused by the *Helicoverpa armigera* (**Volp *et al*., 2023**). The *Helicoverpa armigera*, aptly named the cotton bollworm or chickpea pod borer, transcends geographic boundaries and agricultural systems, emerging as a quintessential global pest (**Palagacheva and Sevov, 2021**). It's indiscriminate feasting on a myriad of crops—including chickpea, cotton, corn, soybeans, and tomatoes—manifests as a persistent menace to crop yields and economic stability. This study converges at the juncture where the critical need for sustainable pest management intersects with the agricultural complexities. The *Helicoverpa armigera*-crop dyad embodies a classic ecological tug-of-war, one that demands insightful exploration to mitigate its repercussions. *H. armigera* has an enormous impact on the global economy (**Sharma, 2005**). Due to *H. armigera's* high reproductive and destructive potentials, control of the species has been harder over the years (**Chaturvedi, 2007**). *H. armigera* has a high propensity to transfer from one fruit to another without finishing it, which helps to explain why this pest harms crops severely even when the number of larvae is minimal (**Zalucki *et al*., 1986**). Controlling *H. armigera* has become crucial in many areas of the world due to the emergence of pesticide resistance (**Tabashnik *et al*., 2014**). Genetic changes and/or enhanced enzymatic detoxification are frequently associated with the development of insecticide resistance (**Durigan *et al*., 2017**). At its core lies the utilization of bioassays as powerful tools to dissect the intricate relationship between pest and crop. These bioassays, ranging from toxicity evaluations to behavioural analyses, grant us access to the pest's inner workings, unveiling its susceptibilities and adaptive mechanisms. Such insights are instrumental in sculpting management tactics that are not only efficacious but also environmentally sensitive. The present investigation aims to investigate the bioassay of the pod borer, *Helicoverpa armigera* (Hübner) under *in-vitro* condition.

As Bioassay is defined as the measurement of the potency of any stimulus which may be physical, chemical, biological, physiological or psychological etc. by means of the reactions which it produce in the living organism" (**Finney, 1971**). Bioassay helps in ascertaining the potency and relative toxicity of different insecticides. The bioassay methods commonly employed to insect toxicity evaluations are topical application by

Potter's tower, injection method, leaf dip, contact or residue film method etc. The LD50 values serve as a ready reckoner for the selection of

insecticides to work out strategy for the management of insect pest under field conditions. Also, such baseline data would provide a record for detecting resistance level of the insect pests to various insecticides at different periods. The purpose of the present study will address several important aspects of agricultural research and pest management. It will help to understand the biology and behaviour of *H. armigera* pest which is crucial to manage its infestations effectively. The *in-vitro* bioassays for resistance help in the development of sustainable pest management and interventions. Further the present study can promote effective pest control which can benefit both farmers and the environment and balance the needs of agriculture with environmental and economic considerations.

2. Material and methods

The present research work entitled "*In-vitro* bioassay studies for testing toxicity of four different insecticides viz-a-viz Emamectin benzoate, Spinetoram, Flubendiamide and Broflanilide against *Helicoverpa armigera*" was carried out in the Department of Entomology, KAPG College Prayagraj during the year 2023-24 The materials used for the study and methods undertaken are given in this section.

2.1 Collection of eggs and larvae of *H. armigera*

The eggs and larvae of *H. armigera* were collected from loboratory of dept. Of Entomology in polythene bags containing fresh leaves of chickpea. The collected eggs were kept separately in plastic jars. Upon hatching, the eggs were transferred to bigger petriplates containing modified diet were prepared according to **Chitti Babu *et al*., (2014)**, describe in section 2.2.

2.2 Preparation of insecticidal solution

A total of six novel insecticides were used to carry out the *in-vitro* bioassay studies. The details of the insecticides used in the study are furnished in **Table 2.1**. Stock solution of one per cent of 100 ml was prepared for each insecticide by dissolving their respective formulations in distilled water. The concentrations used in the study are given in **Table 2.1.**

Table 2.1 Concentration of different insecticides used to determine the LD50 under *in-vitro* bio-assay

Treatment	Insecticide	Concentration
T0 (Control)	-	-
T1	Emamectin benzoate	10 mgl^{-1}
T2	Emamectin benzoate	20 mgl^{-1}

T3	Emamectin benzoate	30 mgl^{-1}
T4	Emamectin benzoate	40 mgl^{-1}
T5	Spinetoram	10 μll^{-1}
T6	Spinetoram	20 μll^{-1}
T7	Spinetoram	30 μll^{-1}
T8	Spinetoram	40 μll^{-1}
T9	Flubendiamide	1.0 gl^{-1}
T10	Flubendiamide	2.0 gl^{-1}
T11	Flubendiamide	3.0 gl^{-1}
T12	Flubendiamide	4.0 gl^{-1}
T13	Broflanilide	10 μgl^{-1}
T14	Broflanilide	20 μgl^{-1}
T15	Broflanilide	30 μgl^{-1}
T16	Broflanilide	40 μgl^{-1}

2.3 Rearing of *H. armigera*

The mixture mentioned in **Table 2.2** were kneaded with water and made it as semi-solid diet. This semisolid diet was dispensed into the sterilized multi well plates to solidify for 60 min. Furthermore, the neonate larvae of *H. armigera* were released individually in the vials by using a camel hair brush and the larvae will be reared in the vials until pupation. The pupae will be collected carefully, and placed in a glass jar with moist vermiculite at the bottom for adult emergence. The adult *H. armigera* will be used for further study. To obtain eggs, the adults of *H. armigera* were caged in a glass jars. The adult was provided with honey solution fortified with multivitamins and a leaves of chickpea plant and blotting paper will be provided for egg laying. Moist absorbent cotton was kept over muslin cloth in each jar to maintain humidity and for better egg laying.

Eggs laid by the females in twigs and blotting paper were removed on daily basis with the help of moist camel hair brush and transferred to another perti dish having a circular filter paper. Fifty eggs were placed in each petri dish and observation was recorded on the hatching of eggs was recorded twice daily. The rearing of larvae was carried out individually in glass vials and observations pertaining to, pre-oviposition, oviposition, post oviposition period, larval and pupal duration and longevity was recorded. The number of eggs laid by each female was observed to record the fecundity. The length and breadth of eggs, different instars of larva, pupa and adult were measured by using a stereoscopic binocular microscope, fitted with an ocular and stage micrometer.

Table2.2. Diet composition for rearing of *H. armigera*

Components of Insect diet	Volume
Chickpea flour	100.0gm
Sorbic acid	1.5 g
Methyl-p-hydroxy benzoate	3.0 g
Ascorbic acid	4.7 g
Multivitamin mixture	2.0ml
Yeast extract	48.0 g
Agar-agar	48.0 g

2.4 Bioassay Procedure

Topical application, residue film method and surface diet method (**Paramasivam and Selvi, 2017**) were followed to evaluate the toxicity of the test insecticides to the 3rd instar larvae of *H. armigera*.

2.4.1 Topical application method

Ten larvae of test insect were kept in a petri dish. The toxicant solutions were applied topically on the dorsum of second instar larvae (five days old) using Potter's tower at 760 mm Hg column difference air pressure. One ml of each insecticidal formulation was used for spraying. The petriplates were allowed to dry under fan and fresh diet was given to the larvae after treatment in Petri dishes. The Petri dishes were covered with Whatman's filter paper to maintain humidity. Three replications of each treatment were maintained and mortality was recorded after 24hours.

2.4.2 Residue film method

In a petri dish of 5.0 cm diameter 1.0 ml solution of desired concentration of insecticides was sprayed with the help of Potter's spray tower and allowed to dry under an electric fan to get residue film. Desired concentration of each insecticide were made and in each concentration ten larvae were exposed to residue film. Each treatment was replicated thrice. The mortality was recorded after 24 hours.

2.4.3 Surface diet method

Three ml of the diet was pipetted into cell well trays and allowed to cool at room temperature for approximately 1 hour. For each test insecticide, serial dilutions of formulated material (100 μl aliquots) were pipetted onto the diet surface and allowed to dry for approximately 30 minutes. Second instar larvae were placed into a series of cell well trays that contained different concentrations of formulated insecticides. Each treatment was replicated thrice. Then mortality was recorded after 24 hours.

2.5 Data analysis

The corrected mortality was calculated by subjecting the observed mortality to **Abbott's (1925)** formula,

$$\text{Corrected mortality (\%)} = \frac{\text{Test mortality (\%) – Control mortality (\%)}}{\text{Control mortality}} \times 100$$

Dose mortality regressions (LD50) were computed by probit analysis (Finney, 1971) using BIOSTAT 2006 Software.

2.6 Results and Discussion

An effective method for assessing the potency and relative toxicity of several insecticides is in-vitro bioassay. In order to choose pesticides and develop a plan for managing insect pests in the field, the LD50 values are a useful tool. Additionally, a record of the insect pests' level of resistance to different insecticides at different times would be provided by such baseline data. In India, the cotton bollworm (*H. armigera*) is still considered a serious pest, resulting in significant crop losses that have reached up to 80%. Since this pest is polyphagous and has a significant potential for reproductive harm, suppression has become necessary during the last ten years as a result of resistance to practically all widely used insecticides. Present study was carried out by keeping these concepts under considerations.

2.7 Pre-oviposition, oviposition and post-oviposition period

The pre-oviposition, oviposition and post-oviposition period were recorded and the results are presented in **table 3.1**. It was revealed that the pre-oviposition period varied from 2 to 4 days with the mean value of 2.9 ± 0.73 days. The oviposition period ranged between 5 to 6 days with the mean value of 5.3 ± 0.48 days. Simultaneously the post-oviposition period was recorded only for 1 to 2 days with a mean of 1.1 ± 0.38 days. These observations are in conformity with the previous findings of **Bhatt and Patel (2001),** who reported that the pre-oviposition, oviposition and post-oviposition periods were 2.85, 7.5 and 1.10 days, respectively. Similarly the findings of other research group also emphasized that the preoviposition, oviposition and post-oviposition period lasted for 3.12 ± 0.66, 9.8 ± 0.54 and 1.22 ± 0.36, respectively by **Pandey and Kumar (2007).** Simultaneously **Sharma et. al. co-workers (2011)** also reported that preoviposition, oviposition and post-oviposition periods were $2.15 – 3.21$, $5.25 – 6.60$ and $1.12 – 1.33$ days, respectively.

Table 3.1: Pre-oviposition, oviposition, post-oviposition period and fecundity of *H. armigera* under *in-vitro* rearing.

S. No.	Pre-oviposition period (days)	Oviposition period (days)	Post-oviposition period (days)	Fecundity
1	4	6	1	280
2	3	5	1	310
3	3	5	1	442
4	2	5	1	352
5	2	6	1	297
6	3	5	2	324
7	2	5	1	452
8	4	5	1	380
9	3	5	1	410
10	3	6	1	447
Mean	**2.9**	**5.3**	**1.1**	**369.4**
S.D. ±	**0.73**	**0.48**	**0.31**	**65.83**

2.8 Larval development

Present investigation focused on the development of larva up to 3rd instars period. The observations on larval instars and larval period are given in **table 3.2-3.3**.

2.8.1 First instars

The life of first in star larva was recorded as 2 to 3 days with mean of 2.4 ± 0.51 days (**table 3.2**).The newly hatched larva was tiny, active and yellowish white to reddish brown with dark brown to black head capsule. The morph metrics of first instars larvae of *H. armigera* are given in **Table 3.2**. The breadth of head capsule was measured as mean value of 0.28 ± 0.029 mm). Simultaneously the larva were measured as the mean value of 1.64 ± 0.24 mm in length and the mean breadth was 0.44 ± 0.03 mm.

2.8.2 Second instar

The second instar lasted for 2 to 3 days with mean of 2.5 ± 0.52 days (**table 3.3**). The second instar larva was very active. The breadth of head capsule varied from 0.44 mm to 0.54 mm (mean 0.50 ± 0.03 mm). The larva measured and the mean value was calculated mean 4.27 ± 0.50 mm) in length and 0.65 mm to 0.76 mm (mean 0.70 ± 0.04 mm) in breadth (**table 3.3**).

Table 3.2: Morphometrics of first instar larva of *H. armigera* under *in-vitro* condition

S. No.	First instar larva			
	Survival (in days)	Head size (mm)	Body length (mm)	Body breadth (mm)
1	2	0.20	1.60	0.42
2	3	0.23	1.90	0.41
3	2	0.26	1.88	0.47
4	2	0.24	1.24	0.50
5	3	0.28	1.26	0.44
6	3	0.29	1.52	0.46
7	2	0.22	1.81	0.40
8	2	0.25	1.72	0.44
9	3	0.29	1.76	0.45
10	2	0.26	1.56	0.49
Mean	**2.4**	**0.25**	**1.64**	**0.44**
S.D.±	**0.51**	**0.029**	**0.24**	**0.03**

Table 3.3: Morphometrics of second instar larva of *H. armigera* under *in-vitro* condition

S. No.	Survival (in days)	Second instar larva		
		Head size (mm)	Body length (mm)	Body breadth (mm)
1	2	0.44	4.12	0.65
2	3	0.48	3.55	0.68
3	3	0.54	3.98	0.69
4	3	0.48	4.96	0.71
5	2	0.53	4.82	0.74
6	2	0.54	4.58	0.76
7	2	0.47	4.73	0.73
8	3	0.52	3.92	0.66
9	2	0.49	3.54	0.68
10	3	0.52	4.56	0.75
Mean	**2.5**	**0.501**	**4.276**	**0.705**
S.D.±	**0.52**	**0.03**	**0.50**	**0.04**

2.8.3 Pupal period

The pupa was obtect type with mahogany-brown in colour. The surface was observed as smooth and round in interiorly and posteriorly, with two tapering parallel spines at the posterior tip. In the present study the prepupal period was recorded as 2-3 days with mean value of 2.6 ± 0.54. Simultaneously the duration of pupal period ranged from 12 to 14 days with an average of 13.2 ± 0.83 days (**table 3.4**). It was reported by

Ali *et al*. (2009) that the prepupal period of 2.15 ± 0.16 days and pupal period 13.15 ± 0.27 days. Sharma *et al*. (2011) also reported that the prepupal and pupal period of 4.04 - 4.75 and

13.78 – 24.38 days.

Table 3.4: Prepupal and pupal period of *H. armigera* under *in-vitro* condition.

S.No.	Prepupal period (days)	Pupal period (days)
1	3	12
2	3	13
3	2	13
4	2	14
5	3	14
Mean	**2.6**	**13.2**
S.D.±	**0.54**	**0.836**

2.8.4 Adult longevity

The adult longevity was recorded for males and females with and without food and the observations are presented in table 3.5.

Table 3.5: Longevity of adults of *H. armigera* under *in-vitro* condition.

S. No.	Without food (days)		With food (days)	
	Male	Female	Male	Female
1	1	1	8	9
2	1	1	8	8
3	1	1	7	10
4	2	1	9	10
5	1	2	10	9
6	1	2	10	9
7	1	1	7	8
8	2	1	8	9
9	2	2	8	10
10	1	2	9	10
Mean	**1.3**	**1.4**	**8.4**	**9.2**
S.D.±	**0.48**	**0.51**	**1.07**	**0.78**

It was noticed that male was short lived. They lived without food for 1 to 2 days with an average of 1.3 ± 0.48 days, while females lived without food for 1 to 2 days with an average of 1.4 ± 0.51 days. However, when fed with 10 per cent honey solution, the adult longevity increased considerably and ranged from 6 to 8 days with an average of 8.4 $\pm$

1.07 days in males, while the longevity of female moths ranged from 8 to 10 days with an average of 9.2 ± 0.78 days. **Sharma *et al*. (2011)** recorded the longevity of male and female was 2.44 to 5.89 and 8.79 to 11.33 days, respectively. **Bhatt and Patel (2001)** obtained the mean adult longevity of 9.15 and 11.40 days for males and females, respectively. **Ali *et al*. (2009)** recorded the mean adult longevity of 9.17 ± 0.42 and 11.74 ± 0.51 days for males and females, respectively.

2.9 LD 50 in topical application method

It is evident from the data (**Table 3.6**) regarding the LD50 values of the insecticides for the second instar *H. armigera* larvae that the broflanilide was the efficient insecticides with 70.68% of mortality in topical application. It could also be concluded from the results that the *H. armigera* demonstrated moderate level of resistance in topical application at the two lower doses of broflanilide. The LD50 values were recorded as lowest in the flubendiamide (60.5%) at the highest concentration used under *in vitro* condition. compared to the other insecticides used in the present study. Simultaneously the LD50 response of emamectin benzoate was closely resembled with flubendiamide followed by spinetoram in expressing their swiftness in exerting its lethal effects against the larvae.

Table 3.6: Percent mortality of second instar larva of *H. armigera* in topical application due to different concentration of insecticides used under *in-vitro* condition.

S. No.	Treatments	Percent mortality
1	T0	5.2
2	T1	23.3
3	T2	35.5
4	T3	48.7
5	T4	61.3
6	T5	32.6
7	T6	44.4
8	T7	56.0
9	T8	67.5
10	T9	27.3
11	T10	36.0
12	T11	48.0
13	T12	60.5
14	T13	37.6
15	T14	46.5
16	T15	59.42
17	T16	70.68
Mean		47.2
SD±		14.4

2.10 LD50 in residual film method

It is evident from the data (**Table 3.7**) regarding the LD50 values of the insecticides for the second instar *H. armigera* larvae that the broflanilide was the efficient insecticides with 86.2% of mortality in residual film method. It was also recorded that among all the four tested insecticides broflanilide showed highest mortality rate for *H. armigera.* Simultaneously, emamectin benzoate possessed 83.3% mortality at the highest concentration applied. The outcome of the present study suggested that in residual film mode of application *H. armigera* showed highest mortality percentage followed by Flubendiamide and Spinetoram. The LD50 values were recorded as lowest in the Spinetoram (70.0%) at the highest concentration used under *in vitro* condition.

Table 3.7: Percent mortality of third instar larva of *H. armigera* in residual film method due to different concentration of insecticides used under *in-vitro* condition.

S. No.	Treatments	Percent mortality
1	T0	6.7
2	T1	16.7
3	T2	50.0
4	T3	66.5
5	T4	83.3
6	T5	13.4
7	T6	48.6
8	T7	53.3
9	T8	70.0
10	T9	23.7
11	T10	52.5
12	T11	68.0
13	T12	79.3
14	T13	22.8
15	T14	48.5
16	T15	69.42
17	T16	86.2
Mean		50.5
SD±		25.5

2.11 LD50 in surface diet method

The data given in t**able 3.8** emphasizes the outcome of LD50 carried out by the surface diet method to determine the lethal effect of four different insecticides in four different concentrations against the second instar *H. armigera* larvae. The results suggested that Broflanilide was the efficient insecticides with 89.3% of mortality in surface diet method.

Simultaneously, emamectin benzoate possessed 87.7% mortality at the highest concentration applied. The outcome of the present study suggested that in the surface diet method *H. armigera* showed highest mortality percentage by Broflanilide followed by emamectin benzoate, Flubendiamide and Spinetoram. The LD50 values were recorded as lowest in the Spinetoram (77.2%) at the highest concentration used under *in vitro* condition.

Table 3.8: Percent mortality of third instar larva of *H. armigera* in surface diet method due to different concentration of insecticides used under *in-vitro* condition

S. No.	Treatments	Percent mortality
1	T0	6.2
2	T1	28.3
3	T2	45.4
4	T3	68.3
5	T4	87.7
6	T5	22.2
7	T6	38.7
8	T7	58.1
9	T8	77.2
10	T9	25.8
11	T10	46.5
12	T11	58.0
13	T12	72.7
14	T13	38.9
15	T14	56.2
16	T15	79.4
17	T16	89.3
Mean		55.8
SD±		21.85

From this experimental data on the toxicity of insecticides to *H. armigera*, it was clearly evident that among the four insecticides tested against the second instar spinetoram, Broflanilide and Emamectin benzoate showed greater toxicity in all the three methods of application compared to Spinetoram and Flubendiamide. It was also revealed that the method of application also influenced the toxicity to second instar larva of *H. armigara* as mentioned in **table 3.8**.

Conclusion

Helicoverpa armigera poses a significant threat to a wide range of crops, necessitating effective control measures. Traditional approaches often rely on field trials, which can be time-consuming and resource-intensive. *In-*

vitro bioassays offer a more efficient alternative, allowing for controlled, reproducible conditions to assess the potency of insecticides.

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The reliability of the IRI model forecasts for the equatorial region during times of solar minimum

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Abstract

We have analyzed the GPS (Global Positioning System) derived total electron contents (TEC) data during the times of solar minimum of 2009 at equatorial station Singapore (Geographic: 01.37ºN, 103.67ºE; geomagnetic lat: 08.54º S) to show month-wise and season-wise variations. Comparisons have been made from ground-based GPS measurements and the predictions obtained from the IRI-2020 model during the most solar quiet period of the year 2009. In general, the reliability of the estimated TEC is showing a strong co-relation with the measured TEC at Singapore. The analysis found anexaggeration in the IRI model during the daytime hours with an utmost in equinox around the noontime hour. In addition to overestimation, an underestimation in the IRI model during the night-time is also noticed which is ascribed to the fact that the IRI model does not include electron density contribution from the plasmasphere. Seasonal analysis of TEC data from GPS as well as the IRI model indicates the disappearance of winter anomalies. The presence/absence of winter anomaly in two data sets during the low solar activity period 2009 has been analysed and discussed.

Introduction

Large temporal and spatial variation of the electron densities (or Total Electron Contents) and ion densities of the ionosphere in equatorial/ low latitude regions are due to the pronounced Fountain effect. In this region production of ionization by solar EUV radiation, loss through charge exchange with N_2 and O_2 and transport parallel to the geomagnetic field lines through **E**×**B** electrodynamical plasma drift is more significant than that at mid and high latitude. The north-south geomagnetic field combines with a daytime eastward electric field to produce an upward **E**×**B** plasma drift at the geomagnetic equator and initiates the renowned fountain effect

which further causes the equatorial ionization anomaly (EIA). The latitudinal distribution of the ionospheric electron densities over low latitude region forms a trough at the geomagnetic equator and two crests on both faces of the equator (±15° geomagnetic lat.), is referred to as EIA. In this process, ionosphericplasma is transported vertically upward to higher altitude and when loses its momentum diffuses downward along geomagnetic field lines under the action of pressure gradient force and acceleration due to gravity to develop the EIA (Kumar and Singh 2009; Kumar 2020).

TEC (total electron content) is an important parameter of the ionosphere which is then defined as the number of free electrons in a column of the unit cross-sectional area from the satellite to the receiver. The unit of TEC is electrons/m^2 which is normally expressed in TECU (1 TECU = 10^{16}el/m^2). The EIA features are also observed in TEC parameters during daytime hours. TEC of the ionosphere is important for trans-ionospheric propagations including radio waves and GPS signals and hence plays a very important role for communication, navigation, military, and civilian applications. For such applications electron densities and total electron, contents need to be expressed by the empirical model because ground-based observation is limited and cannot cover the entire globe. The scientific community has developed numerous empirical models for studying the ionosphere, such as the International Reference Ionosphere (IRI), Semi-Empirical Low-Latitude Ionospheric Model, parameterized real-time ionospheric specification model (PRISM), NeQuick, and Utah State University-Global Assimilation of Ionospheric Measurements (USA-GAIM). These models vary in their accuracy across different geographic regions. Among them, the IRI is particularly prevalent and undergoes regular enhancements; the most recent version being IRI-2020.

Previous studies have primarily validated observations against the IRI-2012 model and earlierversions. However, research using the IRI-2016 model alongside ground-based measurements across various locations remains scarce, with few exceptions (Kumar, 2020). Our study focuses on ground-based GPS-TEC variations during different seasons of low solar activity in 2009. Specifically, we compare GPS-TEC variations during summer, winter, and equinox periods with the IRI-2020 model at the equatorial station in Singapore. Such comparative analyses between ground-based observations and the IRI model are crucial for advancing model development. The significance of the IRI model continues to grow across ionospheric research, civilian and military applications (including HF communication and ray tracing), and among empirical model researchers. Enhancing the accuracy and reliability of the IRI model could

potentially improve GPS services, possibly replacing the currently utilized Klobuchar model

In this paper our aim is to study accuracy of the IRI-2020 model by comparing its prediction with ground-based GPS measurements over the equatorial station Singapore. Improvement in the IRI-2020 model as compared to its previous version the IRI-2016 model has also been discussed. In recent years influence of solar minima on the accuracy of the IRI model predictions has drawn attention of the community of science and a large discrepancy between observation and the IRI model were reported during the 2007-2009 solar minimum (Kumar et al. 2015). In this paper influence of the solar minimum period, 2016-2018 on the performance of the latest IRI-2020 model has been investigated and results are compared with those for the last solar minimum 2007-2009. The solar minimum 2007-2009 is well known to affect the accuracy of the IRI model. Section 2 describes a method of data analysis; section 3 is about results and discussion and section 4 concludes the results of this study.

Materials and methods

The IRI model provides TEC values for any given longitude and latitude and time. In our study, we compare the accuracy of the IRI 2020 models as compared to ground-based GPS-TEC measurements over Singapore during the extreme solar minimum period 2009. During this period only the geomagnetic quiet days are selected. There are three options NeQuick, IRI01-corr, and IRI2001 for topside electron density in the IRI model. Leaving the Ne F-peak constant at URSI, we have changed the Ne topside option and taken the desired values for the year 2016-2018 at different UT (1-24 Hours) over Singapore (Local time (LT) = UT + 08 hrs) available at the IRI website: ccmc.gsfc.nasa.gov. Further, we have considered Te topside and ion composition to be constant which are TBT2012+SA and RBV10/TBT15 respectively.

In our study, the slant total electron content (STEC) data is derived from GPS data recorded in RINEX FORMAT at the low latitude station Varanasi. The STEC estimated from the GPS data is further converted into vertical total electron content (VTEC) by using the following relations given below and discussed somewhere else (Rama Rao et al.2006):

$$VTEC = \frac{STEC - (b_R + b_S)}{S(E)}$$

Where b_R and b_S respectively are the receiver and satellite biases and E is the elevation angle measured in degree, $S(E)$ is the slant factor or obliquity factor which depends on zenith angle θ at the Ionospheric Pierce Point (IPP). The expression for the slant factor $S(E)$ is given below:

$$S(E) = \frac{1}{\cos(\theta)} = \left[\frac{1 - R_E \cos(E)}{R_E + h}\right]^{-1/2}$$

where R_E is the Earth's mean radius h is the ionospheric effective height above the earth's surface and is normally taken as 350 km. We have classified the whole year into three seasons as summer season consists of May, June, July, and August, the Winter season of November, December, January, and February, and the Equinox season of March, April, September, and October. The seasonal analysis of VTEC from GPS is carried out and further compared with the IRI model. The results of this comparative analysis during the geomagnetic quiet days of each month of 2009 are described in the following section.

Results & Discussion

Fig.1 interprets monthly variation in diurnal mean TEC taken from GPS station at Singapore. It shows variation in TEC over Singapore region during summer(from March to May) and winter(From Oct-Nov) for solar minima year 2009.While Fig.2 shows variation in TEC using IRI-2020 (NeQ) Model shows discrepancy in the IRI model (2020).
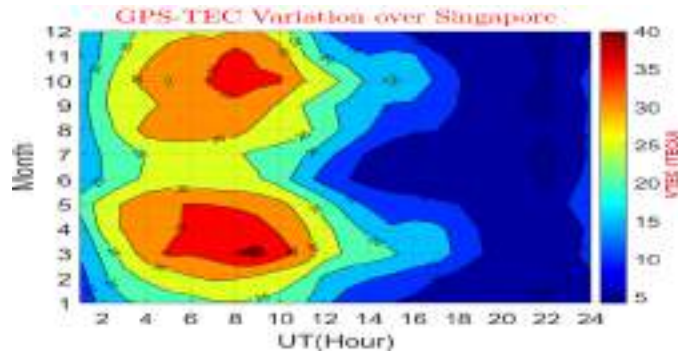

Figure 1: Monthly variation of diurnal mean TEC from GPS at equatorial station Singapore for solar minima year 2009.
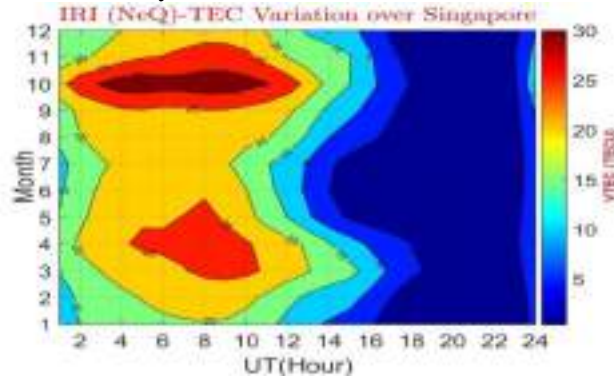
Figure 2: Monthly variation of diurnal mean TEC from IRI-2020 (NeQ) at equatorial station Singapore for solar minima year 2009.

Fig. 3 shows variation of GPS-TEC along with the IRI-2020 (NeQ) model at equatorial station Singapore during solar minimum year 2009. The IRI model underestimates the GPS-TEC particularly during the daytime hour and noted to be highest around the noon-time hour. The comparison between two data sets has been grouped into three seasons: equinox, summer and winter. In our comparison between GPS data and the IRI-2020 model, we observed the greatest discrepancies during the winter season. Alongside overestimations, we also noted underestimations in the IRI-2020 model. This discrepancy arises because the IRI model does not account for TEC contributions from the plasmasphere(Yizengaw et. al. 2008).
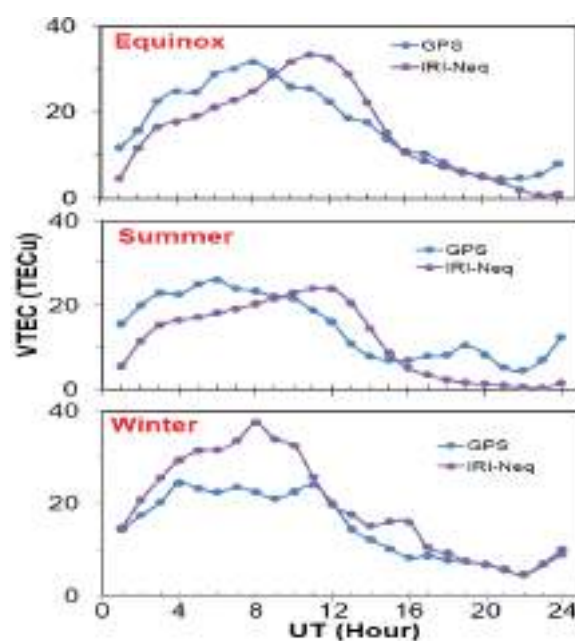
Figure 3: Variation of GPS-TEC along with the IRI-2020 (NeQ) model at equatorial station Singapore during solar minimum year 2009

Summary and Conclusion

The comparison of predictions made by the IRI-2020 model with actual data collected via GPS has revealed notable discrepancies in the equatorial region during periods of solar minimum. This suggests that the IRI-2020 model may not accurately reflect the true conditions of the ionosphere in these specific circumstances. Given the importance of precise ionosphericmodelling for various applications, such as communication and navigation systems, it is crucial to address these discrepancies. Therefore, modifications to the IRI-2020 model are necessary to enhance its accuracy and reliability. This could involve incorporating additional observational

data, refining existing algorithms, or developing new methodologies to better account for the unique behaviours of the ionosphere during solar minimum periods. By doing so, the updated model would provide more reliable predictions, benefiting scientific research and practical applications that rely on accurate ionospheric information.

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Optical Absorption and Local Structure of Mn²⁺ Doped Zinc Malate Trihydrate Single Crystal

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Abstract

Using perturbation theory and the superposition model, the splitting parameters for the zero field of Mn²⁺ doped zinc malate trihydrate single crystals are determined. When accounting for local distortion, the obtained parameters match the experimental values quite well. The experimental discovery that the Mn²⁺ ion enters the zinc malate trihydrate at the substitutional Zn²⁺ site is supported by the theoretical outcome. The crystal field analysis program and the crystal field parameters from the superposition model are used to calculate the optical spectra. There is a fair amount of agreement between the calculated and experimental band positions. As a result, the theoretical analysis backs the inference of the experiment.

Keywords: *Inorganic compounds, Single crystal, Crystal fields, Electron paramagnetic resonance, Zero field splitting.*

Introduction

The electron paramagnetic resonance (EPR) can be used to ascertain the energies of transition metal ions as they go through Zeeman transitions in an external magnetic field. Mn²⁺ ion is the most studied transition metal ions as it gives the EPR signal even in ambient conditions. By introducing it in diamagnetic crystals, Mn²⁺, a d^5 high-spin ion, has proven to be a potent EPR probe in the study of structural and dynamic aspects of crystalline state [1–2]. EPR studies provide the information of site which the impurity ion occupies and its symmetry. The zero field splitting of Mn²⁺ ion in crystals is very sensitive to small structural changes of the system [3-5].

For application in EPR [6-8] and optical spectroscopy [9-10], the parameters for zero field splitting (ZFS) and crystal field (CF) can be semi-empirically modeled using the superposition model (SPM). In [11],

the spin Hamiltonian (SH) and other Hamiltonians are explained. The parameters of the crystal field (CF) are often obtained employing SPM and the point-charge model [12] even if the exchange charge model (ECM) is a useful technique for analyzing the effects of crystal fields in single crystals doped with rare earth and transition ions [13].. In the present study, we used SPM to calculate the ZFS parameters and the CF parameters. SPM was suggested [14] for CF based on the following presumptions: (1) An algebraic total of the crystal's other ions' contributions can be used to obtain the paramagnetic ion's CF. All the significant contributions to the conservation of free energy from each paramagnetic ion have axial symmetry with respect to their position vector when the ion is in the chosen coordinate system's origin. (3) The CF contributions of just nearby or coordinated ions are to be taken into account. (4) Across various host crystals, contributions to CF from a solitary ion (ligand) can be transmitted. The axial symmetry assumption, however (2) permits the transformation of one coordinate system into another, the first assumption gives support for the applicability of superposition principle in characterising the CF. Nonetheless, a more limited version of assumption (3) is sometimes utilised, when solely the closest neighbour ions are occupied. According to the final ligand transferability assumption (4), the only factors influencing the contributions of one ion to CF are its character and separation from the paramagnetic ion. In order to perform an SPM analysis on the CF, it is essential to obtain a polar coordinate system (R_L, θ_L, Φ_L) for each ligand or ion from the host crystal's X-ray data. When transition metal ions are doped, ionic size, ionic charge, and inter-ionic bonding mismatches will probably result in some degree of local distortion. To find the fitted values of the SPM power-law exponents and the intrinsic parameters, a non-linear or linear least-square fit may be performed on an adequate quantity of CF parameters. Mn^{2+} and Fe^{3+} experimental spin-Hamiltonian parameters in CaO and MgO crystals have been critically analyzed [15]. For the EPR data, it gives the SPM parameters' exact values and demonstrates that the superposition principle is satisfied by the CF for 3d ions. A strict lattice relaxation model was utilised [16] to ascertain sets of SPM intrinsic parameters based on dependable ligand distances for the oxides of alkali earth. For Fe^{3+} and Mn^{2+} doped MgO, CaO, and SrO (R_0 = 2.0 Å): $\overline{b_2}$ = (-1552±48) ×10^{-4} cm^{-1} and (-6440±113) ×10^{-4} cm^{-1}, respectively, with a fixed t_2 = 16 for both ions. For both Fe^{3+} and Mn^{2+}, the values of $\overline{b_4}$ are 9.9±0.8 ×10^{-4} cm^{-1}, with a fixed t_4 of 16±4 for each ion. The fitted values for Mn^{2+} and Fe^{3+}, respectively, were 17.7 and 14.4 for the separate fitting of t_2.

Several intriguing findings from EPR studies of paramagnetic ions in carboxylic acids have been reported [17–18]. Metal carboxylic acid complexes exist in a variety of structures and exhibit features such as hydrogen bonding, metal–metal interaction, and variations in thermal decomposition behavior, which makes structural and spectral studies of these complexes highly interesting [19–20].

EPR study of Mn^{2+} doped zinc malate trihydrate (ZnMTH) has been done at 295 K [21], and ZFS parameters D and E have been reported. The results suggest that the substitutional Zn^{2+} site in ZnMTH is occupied by Mn^{2+} ions [21]. In the present study, the ZFS parameters D and E are computed for the Mn^{2+} ion in ZnMTH at substitutional Zn^{2+} site at 295 K using CF parameters determined from SPM and perturbation equations [22]. The aim is to obtain the location of Mn^{2+} ion and the distortion occurring in the crystal. The results found for the Mn^{2+} ion at substitutional Zn^{2+} site in ZnMTH crystal with local distortion yield fair match with the experimental values. Additional aim of the present study seeks to find the extent to which CF theory and SPM analysis can be applied to Mn^{2+} ions in ZnMTH crystals in order to create an SPM parameter database. Molecular nanomagnet (MNM) design and computer modeling of their magnetic and spectroscopic characteristics will be obtained by this. SMMs, or single-molecule magnets, [23], single-chain magnets (SCM) [24], and single ion magnets (SIM) [25] are currently included in the transition ion-based MNM class. The above systems have drawn large attention due to noteworthy magnetic characteristics of MNM, e.g. magnetization's macroscopic quantum tunneling and potential applications in quantum computing and high-density information storage [23, 24]. There are numerous synthesized SCM or SMM systems with Mn^{2+} and Cr^{3+} ions [26]. The parameters of the model established here may be utilized for ZFS parameter calculations for Mn^{2+} ions at similar sites in MNM, because model calculations for simpler crystal systems can serve as a foundation for more complex ones. The modeling employed in the present work can be expanded to explore crystals of scientific and industrial interest in a variety of other ion-host systems.

2. Crystal Structure

The single crystal of zinc malate trihydrate, $ZnC_4H_4O_5.3H_2O$ (ZnMTH), has space group $P2_1/c$ and is monoclinic, with two molecules per unit cell. The unit cell parameters are $a = 5.791$ Å, $b = 8.468$ Å, $c = 9.079$ Å and $\beta = 105.66^0$ [27]. The ZnMTH crystal structure at room temperature is displayed in Fig. 1 adopting an axis system with symmetry (SAAS).
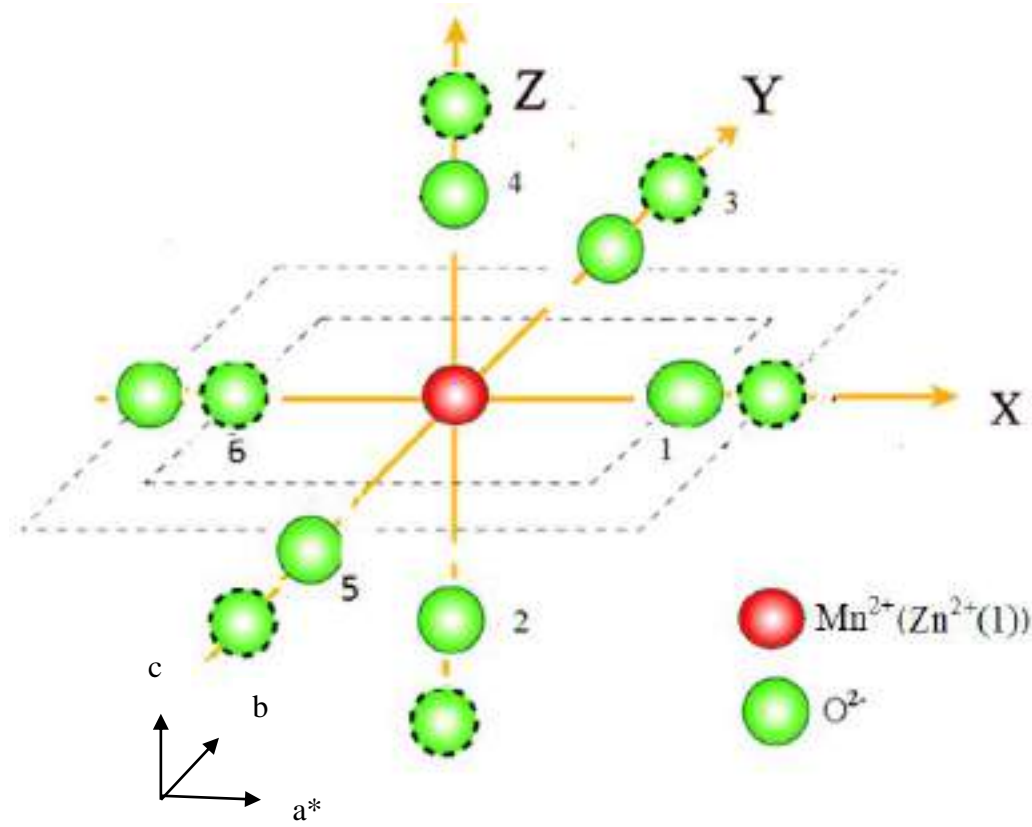
Fig. 1. Crystal structure of ZnMTH at 300 K adopting an axis system with symmetry (SAAS) (dotted circles show positions after distortion).

3. Crystal Field and Zero Field Splitting Parameter Calculations

The EPR spectra can be analyzed with the spin Hamiltonian [7] given below:

$$\mathscr{H} = \mu_B B.g.S + D\left\{S_Z^2 - \frac{1}{3}S(S+1)\right\} + E(S_x^2 - S_y^2)$$

(1)

    where B, μ_B, g, D and E are the applied magnetic field, Bohr magneton, spectroscopic splitting factor, second rank axial, and second rank rhombic ZFS parameters [28–29]. The a*, b, and c modified crystal axes are along the laboratory axes (x, y, z). The directions of metal-ligand bonds that are mutually perpendicular are referred to as the local symmetry axes of the site or the symmetry adopted axes (SAA). As demonstrated in Fig.1, the axis-Z of SAAS is along the crystal axis- c,

and (X, Y) are perpendicular to the axis-Z. When Mn^{2+} ions are doped in ZnMTH crystal, these occupy substitutional Zn^{2+} sites with some local distortion [30].

For a 3d^5 ion, the spin Hamiltonian is given as [31],

$$\mathcal{H}= \mathcal{H}_\text{o} +\mathcal{H}_\text{so} +\mathcal{H}_\text{ss} + \mathcal{H}_\text{c}$$

(2)

$$\mathcal{H}_\text{c} =\sum B_{kq} C_q^{(k)}$$

(3)

where B$_{kq}$, in Wybourne notation, are the CF parameters and $C_q^{(k)}$ are the spherical tensor operators of Wybourne. B$_{kq}$ ≠ 0 in the orthorhombic symmetry crystal field only for k = 2, 4; q = 0, 2, 4. Using SPM, the CF parameters B$_{kq}$ are calculated [32].

The local field symmetry about Mn^{2+} ions in the ZnMTH crystal is supposed to be orthorhombic (OR-type I) [7]. In OR-type I symmetry, the ZFS parameters D and E are found as follows [32]

$$D =\left(\frac{3\varsigma^2}{70P^2D'}\right)[-B_{20}^2 -21\varsigma B_{20} + 2B_{22}^2] +\left(\frac{\varsigma^2}{63P^2G}\right)[-5B_{40}^2 -4B_{42}^2 +14B_{44}^2]$$

$$E =\left(\frac{\sqrt{6}\varsigma^2}{70P^2D'}\right)[2B_{20} -21\varsigma]B_{22} +\left(\frac{\varsigma^2}{63P^2G}\right)[3\sqrt{10}B_{40} +2\sqrt{7}B_{44}]B_{42}$$

(4)

(5)

In above Eqns. P = 7B+7C, G = 10B+5C, D' = 17B+5C, where B and C are Racah parameters and ς is the spin-orbit coupling parameter. Considering the average covalency parameter N, we get B = N^{4}B$_0$, C = N^4 C$_0$, ς = N^2ς_0, where ς_0 is free ion spin-orbit coupling parameter and B$_0$ and C$_0$ are Racah parameters for free ion [31, 33]. For free Mn^{2+} ion, B$_0$ = 960 cm^{-1}, C$_0$ = 3325 cm^{-1} and ς_0 = 336 cm^{-1} [7].

The average covalency parameter N is estimated from N = ($\sqrt{B/B_0} + \sqrt{C/C_0}$)/2 taking Racah parameters (B = 760 cm^{-1}, C = 2900 cm^{-1}) obtained from optical analysis of Mn^{2+} ion in the crystal [21].

The CF parameters, in terms of co-ordination factor K$_{kq}$(θ_j,φ_j) and intrinsic parameter $\overline{A_\kappa}(R_j)$, using SPM are obtained [14, 32] as

$$B_{kq} = \sum_j \overline{A_k}(R_j) K_{kq}(\theta_j, \phi_j)$$

(6)

The $\overline{A_\kappa}(R_j)$ is provided by

$$\overline{A_k}(R_j) = \overline{A_k}(R_0)\left(\frac{R_0}{R_j}\right)^{t_k}$$

(7)

where R_j is the ligand's distance from the d^n ion, $\overline{A_\kappa}(R_0)$ is the intrinsic parameter, R_0 is the reference distance of the ligand from the metal ion and t_k presents power law exponent. For Mn^{2+} doped crystals, $t_2 = 3$ and $t_4 = 7$ are used [32]. As the co-ordination about Mn^{2+} ion is octahedral for site I, $\overline{A_4}$ is found from the relation [34]

$$\overline{A_4}(R_0) = \frac{3}{4}Dq$$

(8)

From analysis of optical study [21], $Dq = 700$ cm^{-1}. Therefore, $\overline{A_4}(R_0) = 525$ cm^{-1}. For $3d^5$ ions the $\dfrac{\overline{A_2}}{\overline{A_4}}$ falls in the range 8 - 12 [31, 35-36]. Taking $\dfrac{\overline{A_2}}{\overline{A_4}} = 10$, $\overline{A_2} = 5250$ cm^{-1}.

4. Results and Discussion

Using SPM, parameters $\overline{A_2}$ and $\overline{A_4}$, and the ligand arrangement about the Mn^{2+} ion as depicted in Fig. 1, the CF parameters of the Mn^{2+} ion at the substitutional Zn^{2+} site are computed. Table 1 gives atomic coordinates in ZnMTH single crystal along with bond length R (both with and without distortion) and angles θ, φ for site I. The CF parameters using Eq. (6) and ZFS parameters from Eqs. (4) & (5) together with reference distance R_0 are listed in Table 2. Table 2 demonstrates that $R_0 = 0.200$ nm is somewhat less than the sum of radii of ions (0.223 nm) of $Mn^{2+} = 0.083$ nm and $O^{2-} = 0.140$ nm along with no distortion provide ZFS parameters for substitutional octahedral site I to be larger than the experimental values [21]. |E|/|D| is also larger than the standard value 0.33 [29]. Hence, local distortion was introduced into calculation. Using above value of R_0 and local distortion, the ZFS parameters for substitutional octahedral site I are in well accord with those from the experiment [21]. The parameters $t_2 = 3$

and $t_4 = 7$ with transformation S2 for standardization [29] have been used to obtain $|E|/|D|$ ratio < 0.33 and calculated ZFS parameters close to experimental values.

Table 1. Atomic coordinates, bond length R (both with and without distortion), and angles θ, φ in ZnMTH single crystal (site I).

Position of Mn^{2+} coordinates of ligands	Ligands			Spherical co-
	x	y	z	R(nm)
θ^0 φ^o		(Å)		

Table 2. The Mn^{2+} doped ZnMTH crystal's zero field splitting and crystal field parameters.

splitting ($\times10^{-4}$cm^{-1})		Crystal- field parameters (cm^{-1})					Zero-field parameters	
Site $|E|/|D|$	R$_0$(nm)	B$_{20}$	B$_{22}$	B$_{40}$	B$_{42}$	B$_{44}$	$|D|$	$|E|$
		Without distortion						
Site I $\frac{\overline{A_2}}{A_4}=10$	0.200	-16486.7	-20091.4	3065.101	3209.602	5395.581	3136.7	
1624.5 0.517								
		With distortion						
Site I $\frac{\overline{A_2}}{A_4}=10$	0.200	-4394.28	1866.723	-46.5012	8.827534	2454.922	221.0	
54.9 0.248								
							Exp. 221.0	
53.0 0.239								

The CFA program [37] and B_{kq} parameters (with distortion) are taken to calculate the Mn^{2+} doped ZnMTH single crystals' optical spectra.. After diagonalizing the complete Hamiltonian, the energy bands of the Mn^{2+} ion

are obtained. Table 3 presents the energy band positions for substitutional site I based on calculations and experimental study [21].

Table 3. The energy bands of single crystal of ZnMTH doped Mn^{2+}, both calculated and experimental.

Transition from $^6A_{1g}(S)$	Experimental (cm-1)	Calculated (cm-1)
		I
$^4T_{1g}(G)$	18615	22529, 22532, 22933, 22978, 23095, 23154
$^4T_{2g}(G)$	21780	23190, 23209, 23398, 23427, 23470, 23501
$^4E_g(G)/ {}^4A_{1g}(G)$	23195	23584, 23611, 23616, 23625
$^4T_{2g}(D)$	26239	26196, 26284, 27244, 27261, 27598, 27664
$^4E_g(D)$	28160	28182, 28281, 28902, 28947
$^4T_{1g}(P)$	30480	33886, 33909, 34010, 34096, 34181, 34385
$^4A_{2g}(F)$		35080, 35356
$^4T_{1g}(F)$		35689, 35903, 36209, 37214, 37311, 37386

It is noted from Table 3 that the calculated and experimental energy band positions agree reasonably well. Hence, the theoretical results back the experimental finding [21] that Mn^{2+} ions enter the ZnMTH crystal at substitutional octahedral sites. The model parameters obtained here may

be used in ZFS parameter calculations for Mn^{2+} ions at comparable MNM sites.

5. Conclusions

We have evaluated zero field splitting parameters using perturbation theory and the superposition model for Mn^{2+} ions doped ZnMTH single crystals. The calculated ZFS parameters and the experimental values match well. The calculated positions of the optical energy bands agree reasonably well with the experimental ones. Thus, experimental inference is supported by the theoretical results that Mn^{2+} ions occupy substitutional site I in ZnMTH single crystal. The model parameters found in the present study may be used for ZFS parameter determinations for Mn^{2+} ions at comparable positions in molecular nano magnets. The current modeling process can be extended to explore crystals for numerous scientific and industrial applications.

Declarations

Ethical Approval:

This study did not take place on any private or protected land, nor did it involve any research involving human or animal subjects. Corresponding locations did not require any special permissions.

Competing interests:

The authors declare that none of the work reported in this paper could have been influenced by any known competing financial interests or personal relationships.

Authors' contributions:

Maroj Bharati and Vikram Singh- done calculations, wrote the manuscript and made the figure.

Ram Kripal- provided the idea and supervision.

All authors have reviewed the manuscript.

Availability of data and materials:

The data will be made available on request.

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Ionospheric perturbations induced by Gorkha Nepal Earthquake

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Abstract

Ground based GPS data have been used to establish and interpret precursor related to GorkhaNepal Earthquake (M =6.4 on 03 November 2023 with epicenter at geog. Lat = 28.84˚N,long. 82.19˚E. ThisEQ occurred on 03 November 2023 with its main shock at around 23:32:54 IST. The people of western Nepal and Northern India widely felt this earthquake which makes 74 people dead and about 375 people injured in Nepal. Several ground-based GPS stations around the epicenter have been selected to analyze seismo-ionospheric precursors. The analyses of the TEC data derived from GPS clearly bear the presence of seismo-ionospheric anomalies. The observed perturbations in TEC data owing to the earthquake were few days to few hours prior to occurrence of the earthquake which has been recognized as pre-seismic, co-seismic and post-seismic anomalies. The observed anomalies not only depend on the distance of measurements from the epicenter but also the direction, indicating that seismic induced effects are not homogeneous around the epicenter.

Keywords: *Earthquake, Seismo-ionosphere precursor, GPS, Lithosphere-Atmosphere-Ionosphere Coupling*

Introduction:

An earthquake is a tremor which is a consequence of seismic waves caused due to sudden release of energy in lithosphere that further leads to disastrous events such as land-slides, tsunami etc., can claim several human lives as well. Strong earthquake may cause loss of building, properties and life of human being. To minimize such losses, and provide alarm to peoples, the prediction of earthquake on long- and short-time scale has become important for the scientific community. Since signal of EQ is weak during early preparatory stage, makes it difficult in predicting it in very long-time scale. Currently peoples are trying to develop techniques in short time scale and seismo-ionosphere precursor is one among them(Hayakawa and Hobara 2010).Throughout the earthquake

preparation processes abnormal changes in the lithosphere occurs which further results in seepage of carrier gases CO2, CH4, He, H2 radon activity, seismogenic electric field which are active to move upwards and producing perturbation in atmosphere- ionospheresystem through lithosphere-atmosphere-ionosphere coupling (LAIC).The ionization produced by radon in the atmosphere is helpful in enhancing conductivity to generate vertical electric field. The seismo-genic electric field thus generated produce ionospheric anomaly through $\mathbf{E} \times \mathbf{B}$ plasma drift(Pulinets and Davidenko 2014). Apart from these other mechanisms including acoustic pressure waves, emission of aerosols, releaseof positive holes, emission of electromagnetic-radiations are also responsible in producing atmospheric and ionospheric perturbations through LAIC mechanism (Kumar et al., 2021).

During past years it was shown that ionospheric layers are affected by seismic activities and ionospheric anomaly D, E, and F layers wereshown using the ground and satellite-based observations (Maurya et al., 2013, Aggrawal et al., 2015).In recent years GPS-TEC became quite common to observe the seismic induced anomalies.The seismic induced anomalies could be either positive or negative depending on the orientation of the seismogenic electric field. Moreover, the positive/negative anomalies depend on direction the seismogenic electric field with reference whether it is in the direction or opposite to the direction ambient electric field. The plasma drift is supposed to be most probable mechanism for occurrence of seismo-ionospheric perturbations. The perturbation structuresinearthquake-inducedTECanomalies found some time periodic in nature which have been reported in previous paper (Choosakul et al. 2009).

Among the above studies till not it is notpromising to detach contribution of seismic induced perturbation from the other effects. Present paper investigates pre-seismic, co-seismic and post-seismic ionospheric anomalies owing tothe Nepal earthquake of 03 November 2023. For this ground-based GPS-TEC data at chosen stations around the epicenter are analyzed. The particulars of earthquake epicenter, information about preparation zone, GPS stations with their coordinates, precursor results, etc. are mentioned in Table 1. The data used and methodology are described in section 2, results & discussion in section 3, and summary/conclusions are described in section 4.

Materials and Methods

Total 11 GPS stations around the epicenter of Nepal earthquake of 03 November 2023 were chosen in this study (Figure 1). Figure 1 represents the location of earthquake, latitude & longitude of all GPS stations under investigation. The latitude and longitude of GPS-stations used in this analysis are also presented in Table 1.Slant TEC (STEC) data for all IGS

stations can be obtained from GPS observation data in RINEX format available at the IGSwebsite: ftp://cddis.gfsc.nasa.gov/pub/gps/data. The IGS stands forInternational GNSS Services which is a network of ground-based GPS stations operated by many different organizations pooling their resources under the IGS umbrella (Seemala and Valladares, 2011). The STEC computed from GPS data particularly with the help of observation and navigation file data can be further changed to VTEC (vertical total electron content). For this following equation has been used which is discussedin detail byRama Rao et al. (2006).

$$VTEC = ((STEC - \lfloor b_R + b_S \rfloor))/S(B)$$
(1)

Where S(B) stands forthe mapping function and given by the following relation

$$S(B) = \frac{1}{Cos\,Z} = \left[1 - \left[\frac{R_E \times CosE}{R_E + h_S}\right]^2\right]^{\frac{-1}{2}}$$
(2)

where R_E is the mean radius of the earth in kilometers, h_s is the ionospheric effective height above the earth's surface, Z is the zenith angle and E is the elevation angle in degrees. The effective ionospheric altitude is 350 km to determine the IPP location where IPP stands for the ionospheric pierce point (IPP). The b_R and b_S are receivers and satellite biases respectively.

In this analysis the hourly mean value of TEC has been used and analysis has been carried out within ±5 daysfrom the earthquake (03 November 2023).The hourly average data are then used to perform statistical analysis as discussed in detail by *Liu et al.*(2004), . In this method, UB and LB are computed according to following equations

UB (TEC) = MM(TEC) +1.34σ (TEC)   (3)
LB (TEC)= MM(TEC) -1.34σ (TEC)   (4)

where TEC (MM) and σ (TEC) respectively represents the monthly median and standard deviation in TEC data. UB and LB respectively stands for upper and lower bound. To identify the seismic induced anomalies, the data lying between UB & LB are not considered as seismic anomalies whereas those beyond the UB and LB are considered as seismic induced anomalies. The ionospheric perturbations have been divided into two categories and percentage increase and decrease are computed.

Results & Discussion

Description of Nepal Earthquake of 03 November 2023

The main shock of this earthquake was occurred at around 23:52:54 IST on 03 November 2023. The spot of the epicenter is noticed in Nepal (geog. Lat = 28.84˚N, long. 82.19˚E). The people of western Nepal and Northern India widely felt this earthquake which makes 74 people dead and about 375 people injured in Nepal. Eleven GPS stations around the epicenter have been selected to study the seismo-ionospheric anomalies. Among all the GPS stations, the Lucknow station is nearest one. The location of epicenter marked with red * and GPS stations marked with blue + are presented in Figure 1.
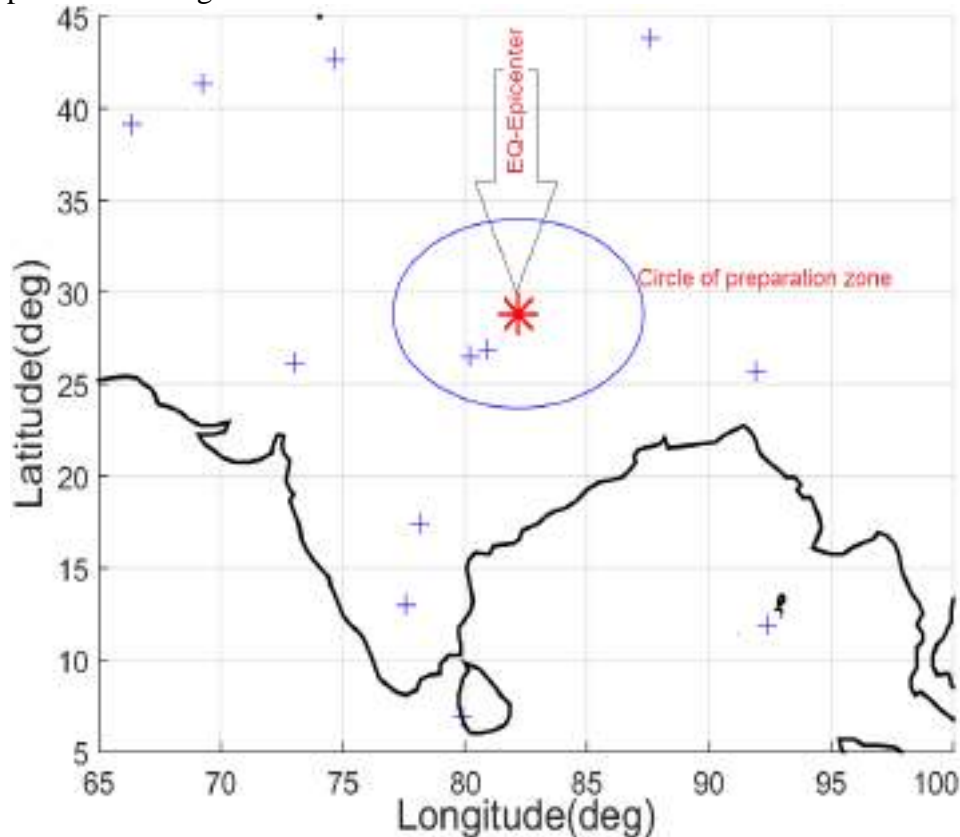
Figure 1: Map showing location Nepal earthquake of 03 November 2023 along with GPS stations shown by + symbol with blue color.

Several sources are known to affect the ionosphere in which solar and geomagnetic activities are more popular. Sometime the changes in the ionosphere are also governed by the events in the lower atmosphere. Since, ionosphere exhibits diurnal, day-to-day, monthly, seasonal and latitudinal variations also (Rama Rao et al., 2006). Therefore, the knowledge of these kinds of ionospheric variability is essential to identify

the ionospheric anomalies showing to seismic activities. To check the existence of magnetic storms throughout the data analysis, graph of Dst-index during 29 October-08 November 2023 is depicted in Figure (2). From the figure one can see that the whole period before the 04 November is not affected from the geomagnetic disturbances. During this period, a geomagnetic storm was found whose main phase was commencement noted at around 2000 UT on 04 November and therefore any perturbation observed after commencement of the storm is influenced by geomagnetic storm. This provides an opportunity to distinguish earthquake induced effects to those from magnetic storm.
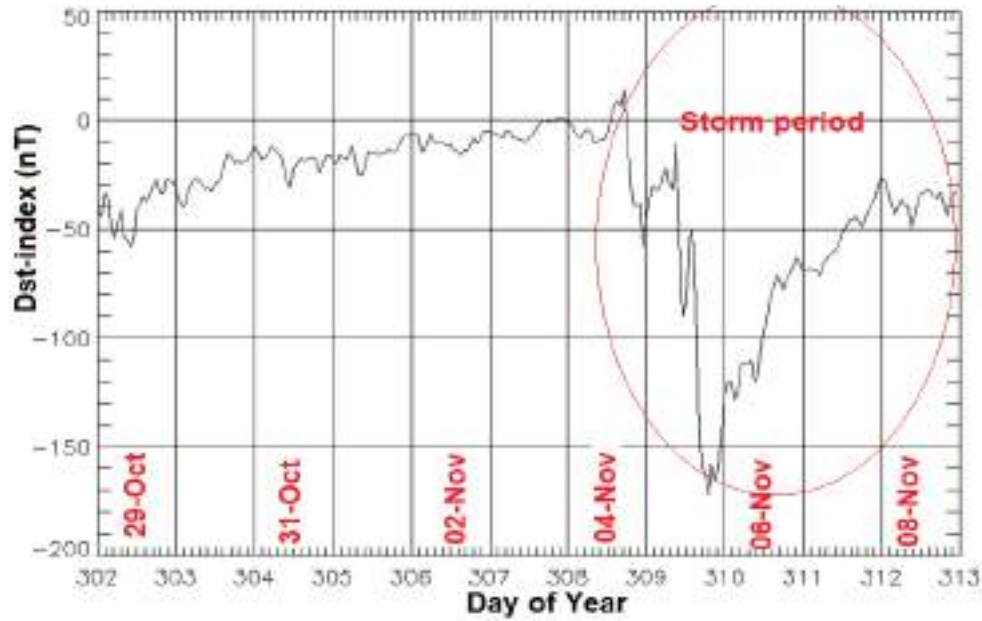
Figure 2: Variation of Dst-index against UT hour from 29 October to 08 November 2023.

The VTEC data have been analyzed within ±5 days from the earthquake occurrence and shown in Figure 3. In this figure curve for UB and LB is also shown along with TEC. A large enhancement in VTEC data has been noticed at around 1200 UT on 31 October (90%), during 1100-1500 UT on 02 November (20%). An enhancement in TEC during 5-8 November is also noticed but such ionospheric perturbations could be influenced by storm effects. Using similar statistical method GPS-TEC data over other IGS stations are also analyzed. Similar analysis has been performed for other stations and anomalies for all those stations are mentioned in table 1. From this table one can see that the ionospheric precursors in GPS-TEC data were observed 1-5 days prior and after to the Earthquake. As reflected from this study that the seismo-ionospheric

perturbations depend on distance of the observation point from the epicenter as well as its direction, indicating that the observed seismic induced ionospheric anomalies is not homogeneous in all the direction. Namgaladze et al. (2012) summarized the results of TEC perturbation observed before earthquake of magnitudes ≥5. These results indicate about 30-90% positive/negative perturbation in TEC may occur relative to quiet time value with positive anomalies are more frequent as compared to negative anomalies. As inferred from the table 1, the seismic induced ionospheric anomalies in GPS-TEC data were 1-5 days before, during and after the earthquake.

Figure 3: Variation of TEC along with UB and LB during 29 October -08 November 2023.

Table: 1 List of IGS GPS stations considered and location epicenter for Nepal Earthquake of 03 November 2023. In the table I stand for increase and d stand for decrease. The number put before I and d indicate days number from the main shock.

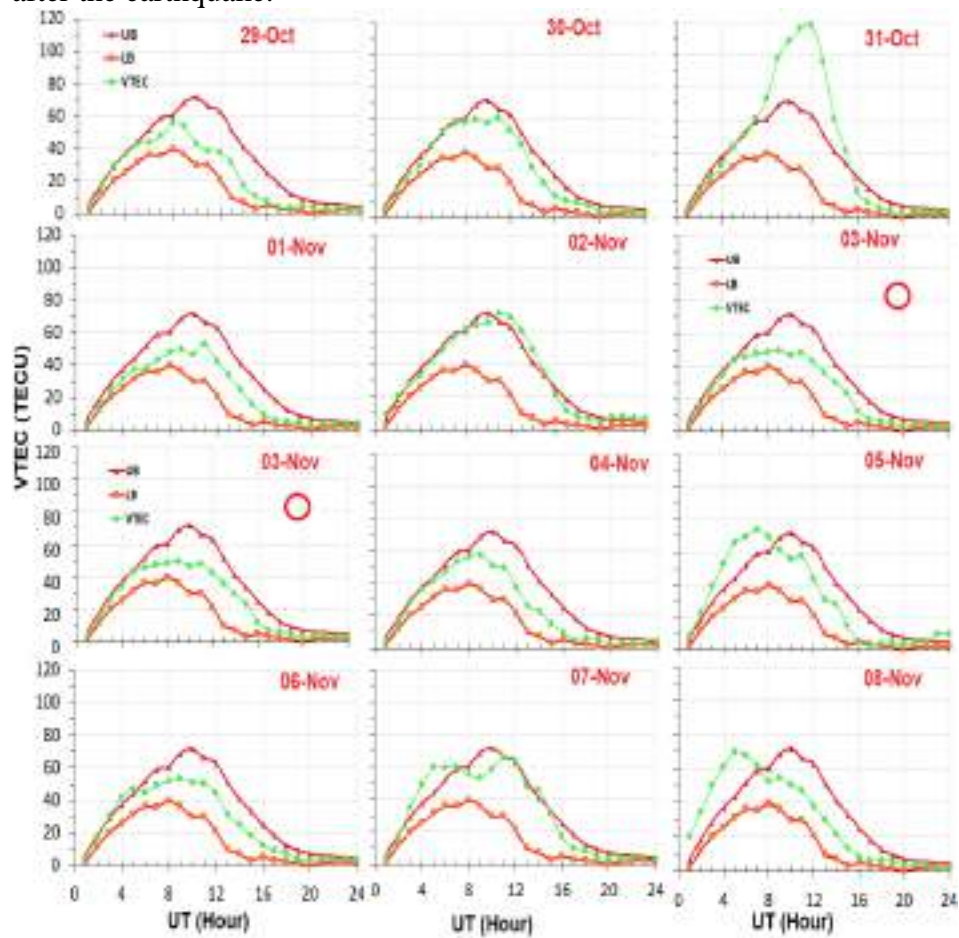| GPS Station-Name	IGS CODE	LONGITUDE	LATITUDE	Ionospheric Perturbation	
				Before main Shock	**After main shock**
Hyderabad, India	HYDE	78.55° E	17.41° N	1-I, 3-I, 4-I, 5-I	2-I, 3-I, 4-I, 5-I
Bengaluru, India	IISC	77.57° E	13.02° N	0-I, 1-I, 4-I, 5-I	2-I,3-I,4-I,5-I
IIT-Kanpur	IITK	80.23° E	26.52° N	1-I,3-I	2-I,3-I,4-I,5-I
Lucknow, India	LCK4	80.95° E	26.91° N	1-I, 3-I	NO DATA
Jodhpur, India	JDPR	73.02° E	26.20° N	1-I, 3-I,4-I	2-I,3-I,5-I
	KITG	66.88° E	39.13° N	0-I, 1-I,2-I,3-I,4-I	1-I,2-I,3-I,4-I,5-I
Bishkek, Kyrgyzstan	POL2	74.69° E	42.67° N	1-I,3-I,4-I	2-I,3-I,4-I,5-I
Sri Lanka	SGOC	79.87° E	06.89° N	0-I,1-I,3-I,4-I,5-I	2-D,3-I,4-I
Shilong	SHLG	91.91° E	25.67° N	3-I,4-I	1-I,2-I,3-I,5-I
Port-Blair	PBR4	92.71° E	11.63° N		
	TASH	69.29° E	41.32° N	5-I,4-I,3-I	2-I
Urramqi, China	URUM	87.60° E	43.80° N	0-I,3-I,4-I,5-I	2-I,3-I,4-I,5-I

The possible origins of anomalies in the ionosphere observed prior to the earthquake occurrences have been discussed by many workers in the past (Oikonomou et al., 2016; S. A. Pulinets et al., 1998). However, the coupling mechanisms connecting the lithosphere to the ionosphere through atmosphere during earthquake preparation processes are yet not entirely understood and also is still a subject of discussion and investigations (Sergey Pulinets, 2004). The connection of the ionosphere with the seismic preparation activity is proposed by two channels namely wave channel and the electromagnetic channel. The wave channel is associated with the generation and propagation of gravity waves and electromagnetic channel is referred creation of vertical geo-electric field (J.-Y. Liu & Sun, 2011). The Piezo-electric effect in seismic active zone is accountable for generation of geo-electric field is thought to modify the atmospheric

electric field which play significant role in creating ionospheric perturbation via E × B electro-dynamic plasma transport. This is also a key parameter for evidence of the lithosphere-atmosphere-ionosphere coupling (S. Pulinets & Ouzounov, 2011; Telesca et al., 2004; Kumar et al., 2021). The seismic generated electric field (1000 mV m^{-1}, at height ≥ 60 km) over seismic dynamic zone was reported few days before the earthquakes and able to penetrate into the ionosphere and seismic induced anomalies through E × B plasma transport mechanism are observed (S. A. Pulinets et al., 1998). The formations of ionospheric anomalies are noticeable when area on the ground engaged by the electric field is larger than 200 km in diameter (*Pulinets et al.*1998). During the preparation period of the earthquake the emission of the Radons along with other gases takes place which may enter into the lower altitude of ionosphere since conductivity the medium increases which may affect the propagation of vertical electric field. As a result acoustic gravity waves may be produced owing to local non-stationary Joule heating (Kim et al., 1994; Hegai, 2017). The electric field may penetrate into the lower ionosphere and electron density distribution could be affected by modified **E × B** force. Thus, the observed perturbations in ionosphere during seismic activities may be both the periodic and non-periodic. The results of ionospheric perturbations, starting from the ground up to the ionosphere, are very much supporting for lithosphere-atmosphere-ionosphere coupling and reported by several workers (Aggarwal, 2015; J. Li et al., 2015; J.-Y. Liu & Sun, 2011; Priyadarshi, Kumar, Singh, et al., 2011; Sharma et al., 2008; Yasuoka et al., 2006). Although pre-seismic signals are weak but as per previous reported results their belongings in the ionosphere can be experienced up to more than 1000 km distances (Aggarwal, 2015; Kumar & Singh, 2017; Sharma et al., 2010). f_oF_2 from IONOSONDE and GPS-TEC data at Indian stations Delhi(28.6°N, 77.2°E), Bhopal (23.29°N, 77.46°E), and Trivandrum (8.4°N, 76.6°E) for the 3 cases of earthquakes with M> 6and epicenters were in China were analyzed by Sharma et al. (2010). They have reported that anomalous behavior in f_oF_2 and TEC data 1-4 days prior to the occurrence of earthquake at Delhi, (India). The Delhi station is at a distance around 2533 km from the epicenter. In this paper, it is motivating to note that the seismic induced anomalies in TEC data depend observation point distance from the epicenter and its direction also.

Summary and Conclusion
- The analysis of GPS-TEC data relevant to the earthquake of the Nepal which was occurred on 03 November 2023, show the existence ionospheric anomalies. The observed anomalies are found within ±5days from the main shock of the EQ. The observed

seismo-ionospheric anomalies could be attributed either due to seismic induced electric field or due to GWs generated in lower atmosphere.

● The appearance of seismic induced ionospheric anomalies and its magnitude depend on the distance of observation point from the epicenter and its direction. This shows seismic generated signal's magnitude is not homogeneous in all the directions.

● In present investigations pre-ionospheric anomalies have been noticed during 0-5 day earlier to the main shock of EQ could be valuable in developing model for earthquake forecasting. Apart from pre-seismic ionospheric anomaly post-seismic anomaly has also been observed but post seismic anomalies could be biased by presence of magnetic storm from 04 November onward. This is significant to separate contribution of storm induced anomaly to those from seismic induced anomaly and remains a challenging problem for even today for the scientific community.

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Section-2

HUMANITIES

To Study of Total Communication Challenges of Hearing Impaired Students

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Abstract

This study aims to describe the use of a total communication for deaf children to support the effectiveness of social interaction. Learning for deaf children is still dominated by the use of sign language. Consequently only deaf children can understand, but others find it very difficult to understand and interact with them. Though deaf children as an integral part of society. These conditions encourage the design of a total communication using the media of pictures, writing, and reading. This study uses a qualitative method. The results showed that the total communication can support deaf children understand language better, so they are able to interact socially and adapt to the times. Even, they can use applications and features on smartphone as communication media. The benefit of deaf children can live independently a carry out social functioning.

Keywords: *Hearing Impairment, Challenges, Total Communication Etc.*

Introduction

Total Communication (TC) is philosophy of educating children with hearing loss that incorporates all means of communication; formal signs, natural gestures, fingerspelling, body language, listening, lip-reading and speech. Children in TC programs typically wear hearing aids or cochlear implants. The goal is to optimize language development in whatever way is most effective for the individual child. Total Communication is truly a philosophy rather than a methodology. As a result, the implementation of the TC philosophy with one child may look entirely different than its implementation with another child.

There is an ongoing debate over what is the best method to teach individuals with hearing impairments. Total Communication involves using manual, oral, auditory, and written, modes of communication. Teachers or caregivers who choose to use Total Communication in the classroom must rely on the structure of the English language as they speak

and also sign simultaneously. There are those who argue the use of only oral means of communication, doing away with any manual elements, this requires the teacher needing to greatly rely on family involvement as well as auditory, visual, and tactile cues to effectively communicate with the child. On the other hand, there are those who insist on the use of sign language exclusively to communicate with the, It is more a philosophy than a method since it implements other methods and combines them. Total Communication can include anywhere from one to several different modes of communication all at once. Total Communication originally was designed for teachers to use the communication methods that were most appropriate for a specific child at a particular stage of development. Baring this in mind, sometimes teachers use spoken words, sign, written, or a combination of these modes in different situations. Total Communication helped bridge the gap between trying to make individuals who are hearing impaired live in an oral- only environment to an environment that embraced sign language as well, where all methods of communication interlay harmoniously (Hawkins &Brawner(These all use manual, hand and finger based sign to represent words, concepts, and ideas. American Sign Language is not phonologically based like English, but has its own rules of semantics, syntax, pragmatics, and vocabulary; it is known as the official language of the culture of the deaf. Fingerspelling is the use of 26 different hand positions that represent the 26 letters of the alphabet. Fingerspelling is important when it comes to words that are unfamiliar, or do not have a representation in American Sign Language, such as proper names. Signing Exact English is based off of American Sign Language however, it focuses more on reading and writing literacy skills. UNESCO, (2010) defines Total Communication Technique (TCT) as philosophy of educating children with hearing loss that incorporates all means of communication consisting of a wide variety of communication methods including: Visual information (timetables, object signifiers, 'talking walls,' pictures on doors, possession boxes); Visual choices (PECS, photos, symbols, eye pointing, Talking Mats) Signing (Signalong, Makaton, British Sign Language, on-body signing); Multi-sensory and creative approaches (smells, textures, song signifiers, Intensive Interaction); Profiling (communication passports); Person centered approaches (Social Stories) and Presentation (body language, facial expression, voice tone, positioning, attitude). In Europe, a study by Wilson (2013) showed TC in Scotland improved communication of learners and transition rates. Further, TC positively influenced learners' participation in class by providing means through which they could share their ideas. It also helped them to build relationships and promote attachment that fosters learning. Changes into use of TC improved transition levels to 78%.A study by Hyjankova (2010) on grade A learners with hearing

impairment in Czech Republic revealed high preference for TC (TC-70%, Sign language-20% and oral communication-10%). A combined use of sign language, written and oral interaction, lip-reading, mime, facial expression, finger spelling and all the possible visual material helped in teaching of English.Oral communication dominated as communication approach for learners with HI in Kenya from 1958 until 1988 when total communication was introduced (Ayiela ,2012)Total communication is a technique that uses speech, finger spellings and gestures. The idea is to provide children with disabilities with multiple opportunities to learn how to communicate and use facial expressions with lip movements to help them socialized in their social life. Total Communication helps the majority of general education teachers teaching English to communicate with students with hearing disabilities and solve teaching problems. Total communication technique is a method that strengthens and enhances the skills that students with hearing disabilities need to work in a typical English classroom (Monje, 2017).

Globally a number of initiatives and agendas have influenced and provided with plenty of information regarding the success and implementation of Total communication. Total communication has been observed as, Social and Cultural Organization and a process, presence, participation, and achievement of all children in a mainstream school setting, identifying and removing the obstacles faced by the people with disabilities. The benefits of Total communication are numerous for children with and without disabilities. All children benefit from a differentiated curriculum and child-centered learning carried out through total communication technique.

Education creates opportunities for the ignored and socially neglected classes to break away from poverty. Women and people with disabilities are still severely affected in many parts of the world. Children with disabilities have little access to these schools, but even where there is access, there is a lack of quality of education. Learners enter schools of different family backgrounds and disabilities in the hope of obtaining a formal education.. The present study is therefore proposed to introduce to study of total communication challenges of hearing impaired students as the Total Communication if instruction for teaching to the hearing impaired children, and see the effectiveness of using total communication over the learners with hearing disabilities. The study was conducted to analyze the total communication challenges students with hearing impairments.

Objectives of the Study

1.   To study the Verbal Communication of children with hearing-impaired learners in the class.

2.   To study the Non-Verbal Communication challenges of children with hearing-impaired students.

Research Questions

1.   How doVerbal Communication manifest among children with hearing impairment (CWHI) and what are the factors contributing to these challenges?

2.   What are the specific Non-Verbal Communication challenges encountered by children with hearing-impaired students, and how do these challenges impact their educational experience and social integration?

Research Methodology

In the research, a Descriptive research design has been done.As qualitative research, this research focuses on critically understanding and analyzing Primary data using total communication for deaf children in school. This research is using Primary data which is related to total communication, methods, problems, parents and society and results. Collecting data using participant observation and focus group discussion. The research site is based on a school using holistic communication.

Research analysis

The research covers all aspects of total communication which are detailed below:

V erbalCommunication Aspects

- **Oral Communication**
    - Face-To-Face Conversations
    - Speech
    - Telephonic Conversation
    - Video
    - Radio
    - Television
    - Voice Over Internet
- **Written Communication.**
- written signs or symbols
- Communicate
- Written Message
- Hand Written
- Email
- Letter
- Report
- Memo
- Vocabulary
- Grammar Used
- Writing Style Etc.

NVreabl -on Communication Aspects

- Body Language
- Facial Expression
- Gesture
- Touch
- Eye contact
- Voice

Objectives of the Study: 1. to study the Verbal Communication of children with hearing-impaired learners in the class

◈ **Written Communication: -** It includes traditional pen and paper letters and documents, typed electronic documents, e-mails, text chats, SMS and anything else conveyed through written symbols such as language. This type of communication is indispensable for formal business communications and issuing legal instructions. Communication forms that predominantly use written communication include handbooks, brochures, contracts, memos, press releases, formal business proposals, and challenges of written communication depends on the writing style, grammar, vocabulary, and clarity.

◈ **Oral Communication: -** The other form of verbal communication is the spoken word, either face-to-face or through phone, voice chat, video conferencing or any other medium. Various forms of informal communications such as the grapevine or informal rumor mill, and formal communications such as lectures, conferences are forms of oral communication. Oral communication finds use in discussions and causal and informal conversations. The effectiveness of oral conversations depends on the clarity of speech, voice modulation, pitch, volume, speed, and even non-verbal communications such as body language and visual cues. Verbal communication makes the process of conveying thoughts easier and faster, but challanges remains the most successful form of communication.

Objectives of the Study: 2. to study the Non-Verbal Communication challenges of children with hearing-impaired students.

◈ **EyeContact:** - Eye contact is one of the most important nonverbal cues that show interest, attention, and respect. However, when working online, eye contact can be difficult to maintain and interpret. For example, if you look directly at the camera, you might appear too intense or staring. If you look away from the camera, you might seem distracted or bored. To avoid these problems, try to position your camera at eye level and look at it occasionally, but not constantly. Also, pay attention to the eye contact of others and adjust your own accordingly.

◈ **Facial expressions**:- Facial expressions are another key nonverbal cue that reveals emotions, moods, and reactions. However, when working remotely, facial expressions can be hard to see and control. For example, if you have a low-quality webcam, your facial expressions might be blurry or distorted. If you have a neutral or serious face, you might come across as cold or angry. To avoid these problems, try to use a high-quality webcam and lighting that enhances your facial

features. Also, smile more often and use appropriate expressions that match your tone and message.

◈ **Body language:-** Body language is a broad term that includes gestures, posture, movement, and space. However, when working remotely, body language can be limited and misinterpreted. For example, if you use too many or too few gestures, you might seem nervous or uninterested. If you slouch or lean back, you might seem lazy or disengaged. If you invade or avoid the personal space of others, you might seem rude or aloof. To avoid these problems, try to use natural and moderate gestures that support your words. Also, sit upright and lean forward slightly to show enthusiasm and involvement. Finally, respect the personal space of others and adjust your distance according to the context and culture.

◈ **Voice**: - Voice is a crucial nonverbal cue that conveys tone, pitch, volume, and pace. However, when working online, voice can be affected and distorted by technology and environment. For example, if you have a poor microphone, your voice might be unclear or muffled. If you have a noisy background, your voice might be drowned out or interrupted. If you speak too fast or too slow, too loud or too soft, you might seem nervous or bored, aggressive or timid. To avoid these problems, try to use a good microphone and headset that reduce noise and feedback. Also, speak clearly and confidently, but not too fast or too slow, too loud or too soft. Finally, vary your tone and pitch to avoid monotony and boredom.

◈ **Gestures**:- Visibility of gestures on camera is limited, and this can lead to reduced expressiveness, less interaction and feedback, and awkwardness. Here are some of the main challenges of expressing gestures on video.

◈ **Touch: -** We communicate a great deal through touch. Think about the very different messages given by a weak handshake, a warm bear hug, a patronizing pat on the head, or a controlling grip on the arm, for example.

Justification of Total Communication-

The holistic communication approach is about finding and using the right combination of communication methods for each individual. This approach helps the individual build relationships, ensures successful interactions and supports the exchange of information and negotiation.

Conclusion

As the above mention to say about the hearing impairment total communication challenges at the school stage and challenges more the hearing and family does not support to development total communication. The composition of early learning environments has been changing as more children are being identified early in their lives as having special

needs. A growing number of these are children with a significant hearing loss. Total communication challenges faces by hearing impairment as like linguistic, Culture, Physical, Psychology , Meaningful & Mechanical.

Recommendations:

Based on the conclusion arising from this study, the researchers recommend that those teacher that prepare teachers in total communication skills into the curriculum to enable teachers to accommodate students with hearing problems in inclusive schools. Additionally, they recommend capacity building of in-service general education teachers through workshop and seminars to acquaint them with the skills of using this technique in teaching in inclusive schools.

Recommendation for Further Studies:

MSJE&DEPwD should sponsor further researches to investigate the effectiveness of total communication technique in inclusive primary schools in Indian . Further studies should be conducted to investigate the strategies and techniques employed by regular education teachers to teach in inclusive classrooms in India schools.

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Ancient Strategies for Modern Success: Management Lessons from Chanakya's Arthashastra

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Abstract

In the pursuit of advancing theories for modern challenges in economics, administration, politics, and society, there is a tendency to overlook the rich reservoir of ancient wisdom that could offer solutions through adaptation. This paper advocates for the effective implementation of ancient literature in contemporary management contexts. Specifically, it explores the relevance of Kautilya's Arthashastra, an ancient Indian text attributed to Chanakya, in the realm of management systems. Written between the second and third centuries BC, the Arthashastra encompasses insights into statecraft, diplomacy, governance, and economics. Chanakya's philosophy emphasizes that the primary aim of any economy should be the welfare of its subjects, transcending the interests of the ruling elite.

This research investigates how Kautilya's Arthashastra addresses various contemporary administrative and management concepts, including mission, vision, leadership, motivation, excellence in work, goal setting, commitment, decision-making, planning, roles, responsibilities, financial management, and state administration. Despite its ancient origins, the principles elucidated in the Arthashastra resonate with modern management practices and theories.

The methodology employed in this paper is Hermeneutics, a qualitative research approach used to interpret and understand ancient texts in contemporary contexts. Hermeneutics allows for a nuanced exploration of the timeless wisdom contained within ancient literatures, providing deep insights into human behavior, social structures, and organizational dynamics.

By bridging the gap between ancient wisdom and modern management challenges, this paper advocates for the integration of historical perspectives to enrich and inform present-day management practices. It underscores the potential of ancient texts like the Arthashastra to offer pragmatic solutions to complex issues faced by contemporary management scholars and practitioners.

Keywords: *Modern Management, Statecraft, Kautilya's Arthashastra, Hermeneutics, Contemporary Management Concepts*

Introduction

In the realm of management theories and practices, the American, Japanese, and European systems have long been at the forefront of global corporate governance, quality management, production efficiency, market competition, human capital management, and organizational dynamics. These systems have shaped contemporary business strategies and continue to influence managerial approaches worldwide. Amidst these dominant paradigms, however, lies a lesser-explored yet profoundly rich source of management wisdom — the ancient Indian texts, particularly the Arthashastra attributed to Chanakya.

Dating back over 2,000 years, the Arthashastra stands as a testament to India's enduring intellectual heritage. Rooted in ancient Indian civilization, which boasts a history spanning millennia, this treatise offers insights into governance, economics, statecraft, and administration that remain remarkably relevant in today's complex business environment. The rediscovery and subsequent scholarly attention to the Arthashastra in the early 20th century marked a resurgence of interest in its pragmatic and systematic approach to management.

Chanakya, also known as Kautilya or Vishnugupta, authored the Arthashastra during the Mauryan Dynasty, laying down principles that encompassed financial management, political strategy, administrative efficiency, and economic policy. His teachings, encapsulated in the Arthashastra and the Chanakya Sutras, reflect a comprehensive understanding of organizational dynamics and human behavior, transcending time and geographical boundaries.

While the Western management philosophies emphasize organizational structures and efficiency, and Japanese methodologies focus on continuous improvement and holistic employee development, Indian management systems, rooted in the Arthashastra, offer a unique blend of strategic foresight, ethical governance, and practical wisdom. These principles not only underscore the importance of leadership and decision-making but also advocate for the harmonious integration of diverse stakeholders within an organization.

This paper aims to explore the enduring relevance of Chanakya's principles in contemporary management practices. By delving into the foundational concepts laid out in the Arthashastra, we seek to elucidate how ancient Indian management wisdom can enrich and complement modern managerial strategies. Through a critical analysis and reinterpretation of Chanakya's insights, this study endeavors to highlight

their applicability in diverse contexts, ranging from business management and leadership to diplomacy and conflict resolution.

As we navigate the complexities of today's globalized economy and dynamic organizational landscapes, revisiting the timeless teachings of Chanakya offers a compelling opportunity to glean insights that transcend temporal and cultural boundaries, fostering a deeper understanding of effective management practices in the twenty-first century.

1-Kautilya's Arthashastra

Kautilya's Arthashastra stands as a monumental work in ancient Indian political thought, composed in the 4th century B.C. by Chanakya, also known as Kautilya or Vishnugupta. Chanakya, renowned as a philosopher, teacher, and political strategist, served as the prime minister and advisor to Emperor Chandragupta Maurya during a pivotal era in Indian history. The Arthashastra, often likened to Niccolò Machiavelli's "The Prince" for its pragmatic approach, comprises 150 chapters divided thematically into 15 books, covering economic policies, justice administration, and national security strategies.

As the architect behind Chandragupta Maurya's rise to power and the consolidation of the Mauryan Empire across the Indian subcontinent, Kautilya's influence extended far beyond his role as a statesman. His treatise on governance was not merely a theoretical work but a practical guide intended for rulers, offering strategies for maintaining political authority, managing the economy, and ensuring national security.

The Arthashastra emphasizes the importance of moral governance alongside practical governance techniques. It outlines methods for effective administration, including the use of spies (dhanurveda) to gather intelligence, strategies for diplomacy and war, principles of taxation and economic regulation, and guidelines for the conduct of the king and his officials. Kautilya's teachings encompass a comprehensive framework for statecraft that addresses both internal stability and external threats, reflecting a sophisticated understanding of political economy and social organization.

Throughout history, the Arthashastra has been revered not only in India but also studied and referenced by leaders and scholars worldwide. Its enduring relevance is evident in its influence on subsequent Indian rulers and administrators, including Emperor Ashoka and the Maratha king Shivaji, who employed its principles in their governance and military strategies.

Despite criticisms that liken Kautilya's methods to those of Machiavelli for their perceived ruthlessness, Kautilya also stresses the importance of

ethical conduct and the ruler's duty to uphold dharma (righteousness). His emphasis on self-control, strategic thinking, and the balance between power and morality continues to resonate in discussions on leadership and governance today.

In contemporary management and leadership discourse, Kautilya's Arthashastra offers valuable insights into organizational strategy, decision-making, and the ethical dimensions of leadership. By studying the principles articulated in this ancient text, modern leaders can glean timeless wisdom applicable to navigating complexities in business, governance, and international relations, underscoring the enduring legacy of Kautilya as a visionary thinker and strategist ahead of his time.

2-Broad purpose of this paper

The broad purpose of this paper is to explore and elucidate the management principles embedded within Kautilya's Arthashastra, an ancient Indian text, and to examine their relevance in contemporary organizational management contexts.

In the realm of global management practices, there exists a notable disparity between Western management theories and the cultural norms prevalent in India and other Asian countries. Hofstede's cultural dimensions highlight India's high power distance, low uncertainty avoidance, and emphasis on collectivism over individualism, which significantly influence managerial approaches and organizational dynamics. These cultural traits suggest that applying management styles rooted in minimal power distance, high uncertainty avoidance, individuality, and masculinity may not be effective in Indian settings.

Despite India's prominence in global education and its top-tier management schools, there remains a perceived failure of Indian organizations to succeed internationally. This disconnect is often attributed to a lack of indigenous management models that align with Indian cultural values and societal norms. Kautilya's Arthashastra presents an opportunity to bridge this gap by offering a framework grounded in ancient Indian wisdom and tailored to the nuances of Indian societal structure and values.

Moreover, while Western management concepts dominate global discourse, there has been relatively little exploration into adapting and applying ancient texts like the Arthashastra to modern management practices. This paper seeks to fill that gap by examining five key Kautilya sutras and their implications for fundamental management principles within organizations. By doing so, it aims to introduce and emphasize the relevance of Kautilya's Arthashastra to management professionals,

scholars, and practitioners who may be unaware of its rich repository of management wisdom.

Furthermore, in the spirit of Chinmayananda's perspective on ancient literatures, this paper endeavors to reinterpret and offer practical insights from Kautilya's teachings that can be effectively applied in today's organizational management contexts. By critically analyzing these principles, it aims to contribute to the broader discourse on cross-cultural management and encourage a deeper appreciation for indigenous management philosophies rooted in India's cultural heritage.

3-Methodology

This research paper adopts a qualitative research methodology known as hermeneutics to interpret and analyze Kautilya's Arthashastra in the context of organizational management. Hermeneutics derives its name from the Greek god Hermes, who served as an interpreter of divine messages and was associated with multiple roles including communication, interpretation, and trickery. In contemporary scholarship, hermeneutics encompasses the study and interpretation of texts and meaning systems across various disciplines, including philosophy, literature, sociology, and religious studies.

The application of hermeneutics in this study involves interpreting Kautilya's ancient Sanskrit text, the Arthashastra, specifically focusing on five selected sutras or aphorisms related to kingdom management and their implications for organizational management. The sutra method, a traditional pedagogical approach used in ancient Indian texts such as the Yogasutras and Kamasutra, involves concise and structured teachings that require careful interpretation for contemporary application.

In the context of this paper, the term "rajya" (state) within the Arthashastra is interpreted as the organization itself, with the "raja" (king) or "CEO" representing the leader, and "amatya" or "mantri" (ministers) symbolizing departmental managers like finance, marketing, human resources, and operations. Terms such as "kosh" denote financial management, "danda" signify administrative systems, and "durg" refer to security measures and workforce management strategies within the organizational framework.

The hermeneutic approach allows for a deep exploration and interpretation of these ancient principles in light of contemporary organizational management theories and practices. By analyzing and contextualizing these sutras, this methodology aims to uncover timeless insights that can inform and enrich modern management strategies. It involves a process of critical interpretation, drawing connections between historical contexts

and present-day organizational challenges to derive meaningful and actionable conclusions.

Through this qualitative approach, the paper seeks to contribute to the broader discourse on cross-cultural management and highlight the relevance of ancient Indian wisdom in addressing contemporary managerial issues. By applying hermeneutics to Kautilya's Arthashastra, the study endeavors to bridge the gap between traditional Eastern philosophies and Western management paradigms, offering a nuanced perspective on effective leadership, governance, and organizational behavior.

4-Insignts on modern management from Chanakya Arthshastra:

According to Muniapan (2005), management is an interdisciplinary field that draws on contributions from a variety of disciplines, including political science, economics, psychology, social psychology, sociology, anthropology, and anthropology. International management and cross-cultural management are other topics covered in contemporary management. Organizational behavior is the foundation of human resource management, and understanding, analyzing, and forecasting it is becoming increasingly important to understanding management.

Over the past 200 years, the theories and concepts of modern management from the West have dominated management literatures. The colonization process and the extensive usage of the English language are major factors in its supremacy. Several management curricula in universities, manuals, training and consulting programmes, and articles in management journals all attest to this dominance. Nevertheless, a thorough examination of many western management theories and concepts reveals that they have been used for centuries in Asian nations, particularly China and India. These practices, however, were carried out within the framework of political or state governance rather than organizational management. There are cultural differences in management. Sharma(2001) contends that a management system must be deeply ingrained in the national culture of the nation in which it is implemented in order to be effective. Presently, a great deal of global communities and nations are attempting to find and investigate their own management system.

The Kautilya Arthashastra addresses a variety of management topics, such as accounting, corporate governance, social responsibility, human resource management, financial management, and strategic management. Let's examine the management challenges from the perspective of modern organizational management, as Kautilya evaluates them all in the following manner. The following are pertinent points made by the first

five (5) Kautilya sutras (aphorisms) regarding the principles of management in organizations.

सुखस्य मूलं धर्मः।
धर्मस्य मूलं अर्थः।
अर्थस्य मूलं राज्यं।
राज्यस्य मूलं इन्द्रिय जयः।
इन्द्रियाजयस्य मूलं विनयः।

(1) **Sukhasya mulam dharmah:-** Ethic or morality is the foundation of happiness.

(2) **Dharmasya mulam arthah:-** Resources are the foundation of justice or ethics.

(3) **Arthasya mulam rajyam:-** The kingdom is the foundation of resources (organization or enterprise).

(4) **Rajya mulam indriyajayah:-** Conquering the senses is the foundation of any organization or business.

(5) **Indriyajayasya mulam vinayah:-** Training and discipline are the foundation of mastering organs.

Kautilya explain these shlok in Why is doing business a must for you? to make money (artha) and to make gains. To what end are earnings and wealth produced? to distribute to the shareholders the wealth and earnings received. How come? Investors, staff members, clients, suppliers, distributors, and the government are all pleased when there is wealth and profit. But Kautilya asserted that happiness can also be attained by doing the right things and doing them well, not just by money and profit (sukhasya mulam dharma). Wealth without dharma is meaningless since a poor person cannot sustain the entire society, and dharma without wealth is toothless (dharmasya mulam artha), according to Kautilya. The Indian culture has long placed great emphasis on the idea that material riches does not necessarily translate into happiness, or sukhasya mulam dharma and dharmasya mulam artha taken together. Ethical behaviour leads to happiness for oneself and others; resources or money enable ethical behaviour. This implies that in order to make others and oneself happy, one must work to accumulate wealth—that is, resources and money—and distribute it fairly. The only way to generate riches in this way and achieve general happiness would be ethically (Garde, 2003). Kautilya went on to say that an enterprise, an organization, or an asset are necessary in order to

create wealth (arthasya mulam rajyam). He went on to say that the organs (rajyasya mulam indriyajayah), along with their roles, procedures, and other undertakings, provide support for an organization. The literal meaning of the word "indriyajayah," which means "victory over organs of the body," is a well-known idea in Indian culture. It refers to having control over the five sense organs—the eyes, ears, tongue, nose, and skin—as well as the five action organs—the hands, feet, mouth, genitalia, and anus. Control over the six enemies of the mind—desires (kama), anger (krodha), greed (lobha), arrogance (mada), infatuation (moha), and jealousy (matsara)—is the first step towards conquering the physical organs. The organization's objectives can only be prioritised by a governor or CEO who has subjugated every organ in his body, particularly when they clash with personal interests (Muniapan and Shaikh, 2007). According to Kautilya, a leader (king) must submerge his personality into the greater personality of his people in order to satisfy his people's welfare (happy), and he should have no self-interest, happiness, or delight for himself. According to Kautilya, the king's happiness is derived from his subjects' happiness, and his wellbeing is derived from their welfare. In addition to treating as beneficial to him whatever pleases his subjects (Prajasukhe sukham rajnah Prajanam cha hite hitam; Natmapriyam hitam rajnah Prajanam tu priyam hitam), or the welfare and happiness of the many (Bahujana sukhaya bahujana hitayacha), he will not consider as good only that which pleases him. Actually, the fundamental tenet of corporate management is the integration of the idea of the happiness of the different needs. The three purusharthas of existence—dharma, artha, and kama—were enumerated in 1,330 lines of Thirukkural two millennia ago by Thiruvalluvar of Tamil Nadu, another embodiment of this wisdom. He also discussed the qualities of an efficient administration, or maybe more accurately, the ethics of efficient administration, in the artha chapter, much like in Kautilya's Arthashastra. "The king who administers justice and protects his people will be considered of divine quality," Thiruvalluvar states, for example, while discussing the duties of a monarch (Murai saithu kapatrum mannavan makkalkku iraiyentru vaikkapadum) (Vittal, 2004). Therefore, the Kautilyan philosophy of management adopts an inside-out approach to management, prioritising self-management over all other forms of management. It is imperative that managers receive training in self-discipline, which includes cultivating humility and adhering to the ethical path known as dharma. This approach aligns with Confucius's thought within the Chinese setting.

On the other end Chanakya explain different topic of administration management which is correlated to modern management

1-Corporate Governance:-The Arthashastra of Kautilya provided additional operational information on corporate governance, such as the appropriate size of the board of directors, measures to prevent corruption, the severity of punishment for offenders, etc. He set an example for others to follow in terms of personal behaviour.

Nehru (1998, p.123) describes Kautilya as follows:-

"He sat with the reins of empire in his hands and looked upon the emperor more as a loved pupil than as master.Simple and austere in his life, uninterested in the pomp and pageantry of high position." (cited in Sihag, 2004)."

Kautilya envisioned a vast, affluent, stable, and just empire founded on justice. He recognized that achieving prosperity needed not only human labor but also the accumulation of wealth (artha), which could only occur under the leadership of Chandragupta's government.

Sihag (2004) also cites Kautilya's vision from Kautilya (1992, pp.120, 121), which states:-

"The kingdom shall be protected by fortifying the capital and the towns at the frontiers. The land should not only be capable of sustaining the [native] population but also outsiders [when they come into the kingdom] in times of calamities. It should be easy to defend from [attacks by] enemies and strong enough to control neighbouring kingdoms. It should have productive land (free from swamps, rocky ground, saline land, uneven terrain and deserts as well as wild and [unruly] groups of people). It should be beautiful, being endowed with arable land, mines, timber forests, elephant forests, and good pastures rich in cattle. It should not depend [only on] rain for water. It should have good roads and waterways. It should have a productive economy, with a wide variety of commodities and the capacity to sustain a high level of taxation as well as a [large] army. The people shall be predominantly agriculturists [artisans and craftsman], devoted to work, honest, loyal and with intelligent masters and servants ."

2-Law & Order in Organizations':- Additionally, Kautilya supplied the prerequisites for lowering fraud. It is vital to choose and appoint the best candidate for the position. An essential component of efficient human resource management is this. The king should refrain from appointing those who are fearful, incompetent, nasty, deceptive, or lack zeal. According to Subramanian (2000, p. 128), which Sihag (2004) mentioned, Kautilya proposed three solutions to address the issue of fraud. In order to comply with the law, people must first be made aware of it, as correct knowledge is necessary for compliance.

3-Financial Management:- Kautilya suggested an organizational structure that lessened the possibility of conflicts of interest. Kautilya came to the realisation that without precise and comprehensive records, financial management is impossible. He suggested creating the roles of Chief Comptroller-Auditor and Treasurer, two crucial posts for overseeing and managing the state's finances. They were both expected to be extremely well paid, efficient, and free from corruption.

4- Bussiness Ethics:-Since ancient times, people have debated issues pertaining to ethical behaviour.

Kautilya was no different. Numerous insights were provided by him, including the following: moral behaviour is inherently moral; morality derives from religious texts and philosophy; morality is rooted in character development and action; morality is grounded in the creation of wealth and the maintenance of law and order, which fosters economic prosperity; and morality cannot be prevented by rules, regulations, or audits. Whether Kautilya went on to work as a politician or bureaucrat in the public sector or as a merchant or accountant in the private sector, he felt that establishing ethical values in children kept them ethical in later life.

5- Leadership:-Any organization's leader should be able to uphold the highest standards while managing the company. An enthusiastic king will elicit an equally energetic response from his subjects.The subjects will become sluggish as well, eating away at the leader's wealth if he is careless and sloppy in his tasks. Furthermore, a slothful king is more likely to be captured by his adversaries. The king should therefore always be active himself.

Chanakya explains about leader in shlokas as:

<div align="center">

प्रजा सुखे सुखं राज्ञः प्रजानां तु हिते हितम्।

नात्मप्रियं हितं राज्ञः प्रजानां तु प्रियं हितम् ॥

</div>

People's happiness should be King's happiness. Welfare of people is King's welfare. For a king, there is no task which is only individualistic and pleasurable to him only. It is king's utmost duty to look after progress and welfare of people of his country." According to Kautilya's view of human nature, "the possession of power and happiness in a greater degree makes a leader superior to another; in a lesser degree, inferior, and in equal degree, equal. Hence, a leader shall always endeavor to augment his power and elevate his happiness."

6-Good Governance :- In general, administration refers to all facets of a nation's governance, including its budget and organizational structure. Kautilya had a ridiculous amount of information about a wide range of administrative topics, including commerce, organization, trade, tact, tax

assessment, and more. He was said to be cognitively proficient in astrology and medicine. Since it's a work on political economy, he's been likened to Aristotle, Plato, Machiavelli, and The Ruler. The economic structure of a state, the choice of priests, the conduct of warfare, and the distribution and coordination of tax collection are all examined by Kautilya.

According to Chanakya, the primary divisions are also in charge of managing labour and financial affairs, national security and foreign policy, tax administration, labor administration, and strategies for economic growth. Kautilya asserts that understanding and meeting the goals of the state are necessary for effective administration. This is made feasible by well-thought-out and structured organization. He makes the argument that wise management should avoid wise choices and deeds. The circumstances should be taken into consideration when making decisions. emphasising the four-pronged strategy for handling open accounts and state planning, which focused mostly on money, markets, and crucially, The experts also agreed that understanding "Dharma, Artha, Kama, and Moksha" is important today. The Arthashastra is regarded as the most venerable and widely accepted comprehensive work that suggested an organization and management system for states worldwide, despite rumors to the contrary about the state's economy and currency. It also contains a code of ethics and criminal legislation. Kautilya argues that an appropriately run, transparent government is necessary for good governance. The workforce running the government must be accountable and responsive, and the ruler must set aside personal preferences in favour of the welfare of the people. Kautilya also highlighted the importance of regular authoritative practises, competent pastors and authorities possessing traits like vitality, leadership, accountability, and mental and physical well-being in addition to their ability to make prompt decisions. According to Kaufmann and Kraay, the idea of administration is not new. Kautilya exemplified key principles of the art of administration, stressing morality, fairness, and resistance to dictatorial impulses. He continues by outlining the lord's obligation to preserve such wealth and the subjects' premiums in order to preserve the prosperity of the state and its citizens. A ruler overseeing equity based on the four standards of example nature, proof, case history, and common law shall ascend to the throne of earth.

7-Foreign Trade:- Strong international trade has always been essential to every economy. Kautilya understood that a major way to increase a country's wealth is through foreign exchange enterprises and products. He argued that foreign trade should be promoted by offering certain benefits, including exemption from assessments, in order for foreign brokers to make money. He assigned a particular weight to imports. The supply of

things that might not otherwise be available locally can be increased by employing foreign exchange, he continued. Through imports, a state can purchase commodities from abroad even more cheaply. This is how he articulated a somewhat pliable position on international trade. For any economy to thrive, robust international trade has always been necessary.Kautilya saw that exporting goods and services abroad is a significant approach to boost a nation's prosperity. He maintained that in order to support foreign brokers financially, trade should be encouraged by providing perks like exemption from assessments. He weighed imports differently than exports. He went on, "You can use foreign exchange to increase the supply of things that might not be available locally." A state can buy goods even more cheaply from overseas through imports. He expressed a reasonably flexible stance on global commerce in this way. Kautilya supports the use of transportation and import taxes. He recommended charging high taxes on distant things that are regarded as extravagances and charging low taxes on goods that are regularly utilised. Anything that is really advantageous to the nation ought to be free from import limitations. He was the first to verify the identity, which is required in order to pass the security measures.

8- **Collection of Taxes:-**The Chanakya era "gave preeminent significance to the maintenance of a large treasury, which positively influenced whole exercises of the organisation," said Jha and Jha (1997). Two things he gave careful consideration to were ways to grow each area of the economy and excellent financial management. He claims that open revenue is a resource to increase national wealth rather than being there for the king's entertainment. He admitted that tax assessments are the main source of income. Excessive tax assessments are inappropriate, despite the state's perpetual burden. He believed that raising the duty base would be more appropriate than raising the assessment rate. He criticised the disproportionate amount of responsibility imposed on people. Kautilya is credited with coining the proverb "King must accumulate assessments like the bumblebee, enough to continue but not too much to demolish." One thing that Kautilya does recommend is a straightforward annual assessment. He emphasises the need for endowments to renew capital arrangements, fiscal federalism, fairness, soundness of cost structure, avoidance of excessive tax assessment, and assurance of duty uniformity.

9- Public Expenditures promoting the development:-According to Kautilya, the majority of tax money should go towards worthwhile projects and the general welfare. He talked about many subjects on which consumption should follow satiation, including national boundaries, government divisions, the open organisation and salary of priests, support for national storage facilities and silos, upkeep of the armed forces, and

the acquisition of valuable pearls, stones, and trimmings. Any remaining funds ought to be placed in the Treasury.

Conclusion

In conclusion, Chanakya's Arthashastra offers a profound and enduring perspective on management that resonates across centuries and cultures. By delving into principles of ethics, leadership, corporate governance, and economic policy, Kautilya provides a comprehensive framework for effective organizational management. This ancient Indian text not only anticipates but also complements modern management theories, highlighting the universal importance of ethical behavior, strategic governance, and prudent resource management.

Despite the dominance of Western management theories globally, the foundational principles of management articulated by Kautilya find resonance in contemporary challenges faced by organizations worldwide. His insights into leadership, ethical conduct, and governance remain particularly relevant, emphasizing the imperative of aligning management practices with cultural and societal contexts for sustainable success.

As global communities increasingly explore indigenous management systems rooted in their cultural heritage, the Arthashastra serves as a timeless guide. It encourages a balanced approach where economic prosperity is pursued alongside ethical governance and societal welfare. By integrating these ancient principles with modern management practices, organizations can navigate complexities with clarity and purpose, fostering environments that prioritize not only profitability but also ethical integrity and societal well-being.

In essence, Kautilya's Arthashastra invites contemporary management to reflect on enduring principles that transcend time and geography, offering valuable insights into navigating the complexities of organizational management in today's interconnected world.

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Notes

Note 1**. Kautilya journeyed from Taxila to Pataliputra (currently Patna, Bihar), the capital of Nanda Empire. Kautilya took a vow to destroy Nanda Empire as a result of an insult by Dhana Nanda.

Note 2**. Pakistan and Bangladesh were also included. Pakistan was born in 1947, while Bangladesh (previously East Pakistan) was born in 1971.

Note 3. Professor Roger Boesche's opinion in Kautilya's Arthashastra on War and Diplomacy in Ancient India (http://www. defencejournal.com/2003/mar/kautilya.htm)

Note 4. Takshashilla, latter known as Taxila is currently situated in Rawalpindi, Pakistan is one of the oldest universities in the world.

Note 5. Please note that "he", "his" and "him" used throughout also means "she", "hers" and "her" in the context of this paper

Note 6**. Details available at http://en.wikipedia.org/wiki/Hermeneutics

Rise of OTT Platforms over Traditional Media Influencing Young Viewers

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Abstract

Media have undergone an ocean change over the years initially started with newspapers magazines then telegraph television, radio and now the trending digital media technologies. Media indeed travelled a long journey successfully and it's influence on society specially on youth has grown exponentially with advancement of technology. The short term OTT stands for Over The Top is one of the extremely popular and common service now a days provided by media, young consumers in India are attracted towards it and gradually increasing every passing days.

Introduction

The development of Internet has influenced the increasing prevalence of OTT platforms in India. Rise of such major platform is bringing digital revolution and consumers are attracted towards this unconventional media form also they are willingly taking subscriptions of different channels and increasing rapidly in numbers.

History of OTT Platforms In India

It has been launched in India by Reliance Entertainment in 2008, Bigflix was India's first OTT platform but boom came in India after the launch of Zee tv and Sony Liv applications in 2013 and eventually this league has been followed by Disney Plus Hotstar in 2015 and simultaneously Netflix and others too were there in the que. Internet speed in India is getting better by each passing day and availability of Internet and Smartphones are being easier day to day, people directly access any content on internet from wherever they want to, these circumstances challenged the established traditional media. Viewers are just a click away from their favorite content, there is no boundaries of time, wires, connectivity and long unwanted content they enjoy what they prefer.

OTT technology deliver streamed content in such a way that their revenue keep increasing in ascending order day by day along with engagement of audience they design their content both paid and free and motive behind

this is to keep regulating engrossing viewership. Reports suggest "The OTT market consumption in India has risen from181 billion to 204 billion in 2022. India is having second biggest market after US

Literature Review

❖   Menon (2020) report on "Digital Media" states that limitations forced in the wake of Covid-19 pandemic significantly changed the consumption pattern for media and Entertainment too. As lockdowns kept individuals from wandering out, either or recreation or work, public activity progressively moved to online Stages. Web based social networking furnished the chance to remain associated with families, companions, partners, neighbour's and others. With External channels of entertainment (Out of Home based entertainment) shut by government request, the home-based entertainment modes showed consistent growth and development.

❖   The increased use of smartphones in India has ushered in a new era of video Consumption on personal media devices. Smartphone penetration in India has reached about 520 million by 2020, with broadband Coverage increasing from 14% today to 40% In 2020 (Usmani, 2020). This increase will play a significant role in the transition of media Consumption from traditional to digital.

❖   Over The last year, the percentage of Indian Consumers who prefer viewing TV shows has decreased from 47% to 10%. According to ASHITA KOTHARI, 2021, Hire math, Suvarna; Panda, Dr. Ansumalini; C, Dr. Prashantha Pasumarti (2022). (Follow one pattern)

STATEMENT OF THE PROBLEM

❖   Every new technology come with boon and Bane both also an adversely affects mind and daily life activity of individuals differently some able to figure out good and bad other's just consume every streaming videos and at this point problem arises. OTT platform is very huge and deep ocean all kinds of content are available it's viewers responsibility to filter and watch accordingly, every streaming content on OTT is not worth to watch implement and follow. Digital awareness is one of the major need of an hour. [1] (Follow one pattern)

OTT (over the top) media services is delivered directly to the viewers through internet without any intermediaries. OTT platform eliminate the factor of visiting theatres and regularly being adhere to strict timing of television shows, if everything continued in same pattern then for sure there will be huge decline in audience of theatre, movie halls and television. [2]

SCOPE OF THE STUDY

This article is to highlight how OTT platform have taken over the traditional media and influenced the young viewers gradually; digital

entertainment is rapidly growing and affecting the all sorts of traditional media.

OBJECTIVES OF STUDY

• To examine the factors influencing youth to watch OTT platforms rather being adhere to traditional media.

• To analyse factors which are responsible for rapid growth of OTT over traditional media.

RESEARCH METHODOLOGY

⭘ Selection of the sample: Viewers in Prayagraj (Uttar Pradesh)

⭘ Sampling Method: Random Sampling Method

⭘ Sample Size: 150 students pursuing Graduation and Post graduation in University of Allahabad.

⭘ Formation of the question: Interview Schedule.

⭘ Collection of Data: Primary Respondents

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[1] **Xiaobbing Xu RC 2019 Competition, Cooperation and pricing: How mobile operators, international journal of marketing studies vol.7 No.6 2019.**
Dixit, D 2020 "The rise and deifications of Indian Ott" retrieved from television post. What is this????

Table No.1: Gender of Respondents

Gender	Number of Respondent	% Of Respondent
Female	78	58%
Male	72	42%
Total	150	100%

Interpretation:

• Primary data is collected from 150 respondents .

• 58% are female respondents.

• 42% are male respondents.

Table No.2: Age Group of Respondents

Age Group	Number of Respondents	% Of Respondents
Below 20	33	31%
20-25	109	64%
Above 25	8	5%
Total	150	100%

Interpretation:

• Majority respondents belongs to the age group of 20-25.

- Minority respondents belongs to the age group of above 25

Table No.3: OTT Platforms and Preferences

OTT Platforms	Number of Respondents	% Of Respondents
Netflix	111	65.3 %
Amazon Prime	105	61.8%
Disney Plus Hotstar	92	54.1%
YouTube	92	54.1%
Zee 5	40	23.5%
MX Player	33	19.4%
Jio Cinema	33	19.4%
Voot	10	5.9%

NOTE: There are multiple responses from various respondents.
Interpretation :
- Netflix is most watched OTT platform.
- Amazon prime and Disney Plus Hotstar follow the que.
- Voot is least watched OTT platform

Table No. 4: Language Preferences

Languages	Number of Respondents	% of Respondents
Hindi	111	69.8%
English	28	16.6%
Others	11	5.3%

NOTE: There are multiple responses from some Respondents
Interpretation
- Majority respondents enjoy their favourite shows in their regional language Hindi.
- English language and other languages viewers are very few in numbers.

Table No. 5: Traditional media VS OTT Platforms

Factors	Number of Respondents	% Of Respondents
Traditional Media	31	18%
OTT Platforms	109	64%
Both	10	18%

 Interpretation:
- Inclination in viewers of OTT Platform.
- Declination in viewers of traditional media .
- Few respondents also enjoy both form of media.

FINDINGS OF THE STUDY

In this data analysis some of the major points are such as:
- In an average count youth spends nearly 2-3 hours daily in binge watch on OTT platforms.
- Preferably viewers take keen interest in shows on Netflix comparatively to other streaming channels.
- Languages barrier is no more available, contents are available in their choice of languages.
- Effective Time management along with some major entertainment goals.

LIMITATIONS OF THE STUDY
- Constraints of resources and time study.
- Sample size is only limited in specific area and number too, only 150 respondents had given their views and their opinion is not necessarily will match to large masses
- Sometimes respondents answers and opinions vary due to certain reasons such as effect of their recent shows or favourite content.

CONCLUSION

The main aim of this article is to know the reason behind declination of traditional media consumer and their inclination towards OTT Platforms, here in this study there are some major essential points which somewhere supports this modern age digitalized world, consumers adapting it and effectively growing in numbers daily. Most of the respondents look forward to more and more content so they can easily enjoy it without any ad breaks or time limits, this growing digital world is creating wonders.

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Study on Educational Apps in India- Post-COVID Era

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Abstract

The process of delivering education to students has evolved constantly. From the Gurukul system of imparting education to sharing knowledge through books and now educational apps – a popular new media tool; the progression of education has evolved. During the dreaded COVID-19 pandemic, these educational apps gave students a more exciting option for learning than their rather mundane online classes. There was a tremendous boom in the educational app sector during the pandemic, but as the emergency ended these educational apps saw a drastic shift in the interest of students and thus the concept of hybrid education was introduced. This paper will discuss the evolution of online education via smartphone medium.

Introduction

Media is ever-evolving and new media tools lead the way. New media can be explained as a channel of communication that uses digital systems to communicate. With the advent of technology, the birth of new media happened. No field is untouched by new media. In the field of education, new media has revolutionized the way education is imparted. Now, students in remote areas can gain knowledge from the best of faculties with the help of new media tools like online video classes, educational apps, and social media tools like YouTube, etc. This kind of reachability is made possible by the combination of the Internet and smartphones.

On 21st July 1995, the first mobile telephone call was made by the then Chief Minister of Bengal, Jyoti Basu and this marked the beginning of wireless mobile telecommunication in India. After March 2000, the government became more liberal and it reduced license fees for cellular service providers. Because of these factors, the call costs were cut considerably enabling every common middle-class family in India to

afford a mobile phone. Many private operators, such as Reliance Communications, Jio, Tata Indicom, Vodafone, Airtel, Idea, etc., successfully entered the Indian telecom market. The adoption of 3G technology in 2003 marked the dawn of mobile internet and paved the way for smartphones. By 2010, changes in government policies and the introduction of new technologies made smartphones and cellular data cheaper for the common man. This paved the way for the internet access explosion in India. For rapid internet adoption in India, the Government of India (GOI) launched the Digital India program with the necessary infrastructure and availability of cheap 4G, thus leading India's internet users to grow from 100 million in 2010 to 400 million by 2015(Nair, 2015).

Smartphones were getting cheaper and along with cheap 4G rates, smartphones became the most used device for entertainment, socializing, video conferencing, and knowledge sharing. These technological advancements fast-paced the app (a new media tool) development market in India. The education sector was not far behind. Companies like Byju's, Extramarks, and Unacademy launched their educational apps. Students with the help of internet-enabled smartphones, started using these educational apps.

With the onset of the COVID-19 pandemic, these educational apps saw a terrific boom as the usage of smartphones increased with a total shift to the digital ecosystem. With affordable data plans and budget brands across companies, smartphones remained the key device in the online world.

In the article "Effectiveness of New Media as a Tool of Edu-Entertainment among School Children" written by Ms. Shilpa Kalyan1 and Dr. Nandini Lakshmikantha(Kalyan & Lakshmikantha, 2016) state that, teachers need to realize the underlying principle and purpose of using new media in the process of learning. The teachers should focus on achieving the right blend of education and entertainment without compromising on quality. Over here the entire onus is not only on teachers but the onus of various stakeholders like government, content creators, parents, and education institutions are not discussed in totality.

In the report "Online education in India-2021" a study conducted by KPMG (Klynveld Peat Marwick Goerdeler) and Google (Google & KPMG, 2017), it was found that around 72% preferred smartphones for online education. The numbers were further enhanced during the pandemic as 79% used smartphones, 17% used laptops or desktops and 4% used tablets. It was also found that 66% chose and continued with an educational app based on study material. The report also states that though the online education market is growing at a very high rate, the key challenges lie in providing classroom experience, practical experience, and

self-regulation lessons. How to overcome these challenges has not been discussed in detail.

In the article "Uses and gratifications of educational apps: A study during COVID-19 pandemic" by Devadas Menon (Menon, 2022) the author discusses the advantages of educational apps for students, but less importance is given to discussing the disadvantages of educational apps and the possible way to overcome them.

In the article, "The Building and Fall of a Valuable Startup from India, Byju's" by Akash Kumar Gope(Gope, 2023) stresses the need for a model of education that overcomes the shortcomings of online education. However, the hybrid model of education that Byju's has adopted has not been discussed here.

The main objectives of the research are:

- To study educational app companies and their growth
- To study the need for companies owning educational apps in India to establish offline study centres post-COVID

Theoretical framework:

Diffusion of innovation theory by American communication theorist and sociologist, Everett Roger which aims to explain how, why, and the rate at which an innovation spreads through a population or social system, and the survival of the fittest theory by Charles Darwin are the most appropriate theories to discuss new media tool for education; educational apps.

The Boom of Educational Apps:

The concept of online education in India dates back to 2004-05, but around 2010, when the internet data rates became cheaper, online education finally saw some acceptance. Byju's, a popular Ed Tech Company came into existence in 2011 and Mukesh Ambani (owner of Reliance Group of Industries) invested in Extramarks, an Ed Tech company, in 2011. It was only in 2015 when the country saw the emergence of various EdTech platforms, and that year proved to be game-changing for the EdTech Industry. Byju's app was launched in August 2015 (www.byjuslearning.com, 2015), in September 2015, Extramarks launched an Android app called Extramarks Smart Study (www.economictimes.indiatimes.com, 2014), Unacademy a popular YouTube channel, launched the Unacademy app in December 2015 (Presthitha & Mishra, 2023) followed by many others. These educational apps provided educational material to K-12 (Kindergarten to 12th grade). They also provided online coaching to students appearing for various competitive exams. These apps steadily grabbed people's attention as the

paid subscriber base increased. Some of the key factors that made these apps popular were:

1. Fun activities that engage children and help them see things from a different perspective.
2. Promotes self-learning which is a good way to ensure that students become more independent
3. Learning is possible anytime and anywhere at the child's convenience.
4. Excellent audio-visual representation of study material, thus creating interest within the child.
5. Non-judgemental learning process for child.
6. Regular assessment.

By 2019, Byju's had approximately 35 million users(Rathore, 2023), followed by Unacedemy, Extramarks, Vedantu, etc. But the real turning point of these educational apps came in the year 2020 when the entire world was hit by the deadly COVID-19 virus. The entire world came to a standstill. The lockdown was declared and people were now confined to their homes. The only source for gaining quality education was these educational apps. Education app users skyrocketed from 185 million in 2019 to 270 million in 2020, with the user base expanding to 350 million in 2022 (Shrestha P. , 2023).

Disadvantages of Educational Apps- Student & Parent Perspective:
But, as a huge population of the student community started using these apps, parents and teachers quickly started understanding that all was not good with the usage of these apps. Students started displaying certain behavioural changes, which the parents found challenging to handle. But before understanding the psychological impact of these apps on students, let us understand some technical limitations of these apps.

According to a blog written in applify.com(Singh, 2023) some of the key technical issues with these apps are

1. These apps often rely on specific operating systems and hardware capabilities, making them compatible with only certain devices or platforms.
2. Educational mobile apps are usually designed for smaller screens, such as smartphones and tablets. The limited screen size poses challenges in presenting complex educational content and interactive elements.
3. Connectivity and bandwidth issues are also there, as the interactivity illustrated videos have heavy file sizes and in areas with poor internet connectivity, continuous non-stop viewing of them is difficult.

Apart from these technical issues, many behavioural issues are developing in students who are dependent on these educational apps for understanding

and learning (Volumetree, n.d.)as per Larry Berger, the CEO of Amplify—a company that develops digitally enhanced programs for various subjects for primary school children.

1. Students are less emotionally and socially developed as these educational apps do not teach them to control their behaviour like following orders or instructions as they would do in offline classes.
2. Overstimulation caused by excessive time spent on the screen can disrupt sleeping patterns and cause emotional dysregulation.
3. Educational apps are mostly designed for use by individuals and not for group activities. This causes students to stay involved with themselves and not interact with other students in the class or school. This leads to developmental delays in social skills such as talking, making friendships, sharing feelings, etc.
4. Most of the educational apps deliver classes primarily in English language which acts as a barrier in communication in Tier 2 & 3 cities and rural India.
5. As per (Minhas, 2023) 21.47% of teens under the age of 19 are wearing spectacles which is a concerning number to watch.
6. Also, parents were dissatisfied with the aggressive marketing techniques adopted by these educational apps to sell their products(Gope, 2023).

Himanshu Dandotiya, business head at Edureka's learning platform Veranda Acacia says that educational apps reduce peer-to-peer or group-based learning, prevent social-skill development and a lack of in-person interaction with faculty.(Bhattacharya, 2022)

The Slump of Educational Apps:
When the educational app market boomed during the pandemic, companies owning these apps started aggressively growing their business. Students' positive responses further enhanced the confidence of these Ed tech companies. But as the COVID-19 cases declined, and schools and coaching institutions reopened, the drawback of these apps started surfacing. "Are children learning with understanding?" asks Pranav Kothari, CEO of Bangalore-based Educational Initiatives, an edtech assessment company. "All of us need to be subject to third-party evaluations and research to see if students are getting better." Moreover, tuition providers must also contend with the effects of rising inflation. With schools and colleges reopening, extra coaching and upskilling may be seen as more of a discretionary expense, says Ankur Bissen, a senior partner at Gurgaon-based consulting firm Technopak. "So, it will be a harder sell."(Raghunathan, 2022)

The inbuilt human nature of seeking physical closeness and socializing has put these educational apps on the back seat post-pandemic. The disadvantages of these apps have overshadowed the advantages. The industry is already feeling a shift with layoffs across ed-tech startups such asByju's,Vedantu, and Unaca-demy in India.

Hybrid model in educational app

The challenges faced by educational apps are pushing them towards a hybrid model of education. In the hybrid model of education, along with online classes, offline classes are made available to students to clarify or seek guidance from teachers. Also, offline test and doubt clarification sessions are held to give a human touch to the learning process. Edtech company Byju's is expanding its physical footprint with its neighbourhood tuition centres, which will offer maths and science classes for students from Class IV to X.Coaching is being provided in a hybrid mode, with half the classes online and half offline. The institution has 104 centres as of May 2022 (The Hindu Business Line , 2022). As for Edtech unicorn, Unacademy is adding more physical centres, from 10 locations at the start of the calendar year 2023, it is intended to hit 58 by December (Shrivastava, 2023). Tiger Global-backed Vedantuand a recent unicorn, Physics Wallahplan to take a similar path.

Discussion:

Although there is a huge rush of these educational apps to open offline learning centres to facilitate students with a hybrid model of education, they should consider the kind of fixed and recurring costs they will incur to open these offline learning centres and all the human resource they need to manage for smooth functioning of these centres. Also, they need to build a concrete narrative to convince students that offline centres are not the end of the road for online education. These offline centres are only a support system for educational apps and not a replacement.

Conclusion:

Every human being has the right to education and providing good quality education to the desiring students is the responsibility of the education sector. The pandemic made us realize that online education can be a potential alternative to offline education with its benefits of being accessible anytime and anywhere. However, the shortcomings of online education cannot be ignored. Based on the pros and cons of education through mobile apps, Ed tech companies were quick to understand that complete education cannot be imparted without human touch, and therefore setting up offline education/tuition centres is the right step forward. There is a lot of scope in the hybrid model of education and the future lies in imparting knowledge in common local language along with English language and reaching out to rural India.

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Derogatory Image of Women in Advertisements which Influece their Acceptance in Society

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Abstract

As we know that media works as mirror of society and what happening around us are the finding of media. Media commercials are now days a one of the vital cause which effect the daily life of human knowingly and unknowingly. Advertisement plays significant role in structuring the product and introducing them in the market. Now days everyone wants to advertise the product in the market through commercials as its upgrade the sales, usage of market, and to be on the top position in the respective market. The aim of the research is to purposely select those advertisements that might have involved women's determination towards their work field, their hurdles, either fight for their dignity. This study examined the portrayal of women in television commercials and documented the stereotypes associated with women in today's television commercials. Content analysis was chosen as a method of inquiry for this study. Advertising acts as a critical agent of socialization in modern developed societies and is employed as a means to keep up certain social structures. In most of the cases the female are shown as secondary then men or somewhere as object. The aim of this study is to explore how the female models are portrayed in some commercials just to fill the space or just used as a object with reference to television advertisements. The finding of this paper is that female model are most often misrepresented and they are needless and unnecessarily portrayed in these commercials. The paper has strategically reviewed popular content that uncovers to transform societal myth and women objectification in restoring their equal natural existence.

It is found from the study that women have been projected as mothers, sisters and friends as per the situational demand. In case of older women, nurture and care are depicted and it is shown how they play a pivotal role in their families and thereby maintain social balance. In case of middle-aged women, their love and care for their children remain the central point of focus; whereas in the case of young women, their charm and relationships are the point of focus. However, some advertisements focus on erotic side and depict women in such a manner which hurts the culture and balance of the society.

Keywords: *women, derogatory image, advertisement, society,*

Introduction

Now-days everyone wants to introduce their product in market through advertisement as it is good platform to let audience know what is present in market, increasing product sale, and to attain top position in their respective field. Every business spends lot of money for advertising but it turns fruitful only when the best technique of advertising are used for product. The role of women has been changing over several years in every field like advertisement, academics, politics etc. But as passing time the advertisers and agencies are facing lot of criticism on how women are shown in advertisements. The critics states that women are just shown as objects to full fill space, passive, depending on men, derogatory image of women etc. This paper will examine how the women are depicted and how they should be depicted. As the audience who perceives the advertisements are of different kind they all have their own thinking capability with their own mind set. Humans thinking capability may vary with their past experience or how they take things. As the advertisement represents women influences the image of women in society. People projects the image of things for what they have or seen. Same goes with the image of women in society what people see women through derogatory advertisements were women are just used as objects projects the women in a same way.

If we talk about the contemporary Indian advertisement the way they represents the image of women influences the people watching those advertisement and draw a image of them in society. Derogatory representation of women does not only limit the women in society or societal acceptance of women, but also has an impact on how people perceive image of women. Women are just used for cooking and taking care of children in previous days but as the passing time women have been seen in every sector on the world.

As every coin have two face head and tail likewise women are being projected in society somewhere women are back bone of family they are being worshiped as goddess but in the same society they are used as just to fill the space of maid. Women in rural and urban area are also have different lifestyles, different hurdles, different aura to symbolise them is society. In rural area women are just to do household works even to get educated they have to do a lot. But if we see the other side of society which is urban women they are easily getting education but they don't know how to do their daily basis household works.

It is often said that TV commercials are mirror for society. Studies on representation of women in advertisements have drawn attention of researchers and scholars over the past few decades. Advertisers are most

often criticized for representing stereotypical women norms, derogatory image of women, especially for the conventional representation of women.

They are conventionally confined to household chores, mother or caretaker roles whose world around the house whereas men are represented as strong and independent (Nagi, 2014). This sort of representation encourages women to believe that they are ought to be weak, mindless and needy. It also has an impact on the attitude of men to perceive that women are mere sex objects (Gulati, 2014).

Literature Review

Pooja Chatley (2018) "PORTRAYAL OF WOMEN IN ADVERTISING"- as the study shows that the researchers want to show the differences in views of Indian men and women when it comes to the stereotypical role portrayal of women in advertisements. Few differences are shown when we talk about the men's and women's roles in advertisements. Advertisements in India are not fulfilling their duty towards the society. The projection of women in Indian advertisements can be done for highlighting the real issues of women lives, for their upliftment, for the awareness among people about the rights of woman, for the empowerment of women etc is being left out.

Amitava Saha & Dr. Kushal De (2022) "A Study on Portrayal of Women through Commercial Advertisements in India"- here researcher's wants to state that the negative representation of women gives a bad message to the younger generations and such cheap portrayal of women must be avoided by the content creators. The advertisers must be more responsible and must highlight women in such a manner that addresses the real issues of the society like abolition of gender discrimination, social status enhancement of women, political equality, health, sanitation and so on instead of focusing the women in reel role like decorative object, to fill the space in advertisement or just glorify the image of men's in advertisements. They should only focus on real issues through advertisements can lead to a balanced and fair society.

Usha Narasimhan "Indecorous projection of women in Indian television commercials"-

(2023) "The Portrayal Of Women In Advertisements: A Critical Analysis researcher here states that women and men should be seen as equal in every way either it is practical life or reel life. The people who mark themselves as a position holder should never portray a women in indecent way as we all know media is strong pillar which influences so many people at a time. We live in a country where women are worshiped and shown as strong independent human who can do so many things at single

time showing that idol in a passive way just to embrace beauty of advertisement is not what equality is. Advertisers must be keep this in mind if they will encourage the presence of women in positive way it will look more good and healthy in a world where men and women are equal.

Sohaib Alam, Sadaf Khalid & Farhan Ahmad Of The Role, Participation, And Empowerment"- examined the portrayal of women as helper in every age group or as a supporting member of the family instead of head of the family or the decision maker. The advertisers portrays a women through advertisement as a homemaker, or a mother who is available 24/7 or a women is a not more than an entertainer. Women's of every age group is presented so negatively and easily approachable in advertisement which signifies women weak. The advertisers must be more responsible towards the image of women's in advertisement so that real issues can be concerned by the viewers and women who are watching or addressing them should take themselves more confidently and fair as compared to men.

Women in Advertisement

Advertisement is a field where people set their opinion about products or like and dislikes. As advertisement is very broad and diverse where people explore there believes by choosing the product and responding towards thing. As we all know advertising has role to persuade and inform people about the products launched in market but at the same time they work very well to change mind of people against anything.

Advertisement dose not totally known for marketing or does not used to just build public relation but in terms of technique and instrument employed it is similar somewhere. Advertisement is simple or local even it can be very complex involving sophisticated research, latest technology and multimedia campaign that span the globe. It differs according to it intend audience as there are different types of audience out there. As in example audience can be of different kinds and age group if we talk about children the advertisement may include entertainment, moral value and technology on the other side if the audience is adult the advertisement should be more influencing to aim the desired goal. Advertisement has a power to change the mindset of people and let them buy a product for what they are advertising or to adopt a new fashion or idea.

There are different types of media and techniques engaged in advertising; advertisement itself has several different kinds like commercial advertisement for products and services, public service advertising on behalf of institution, program and causes, phenomenon of growing

importance today ; political advertising content shown interested in political parties and candidates.

"Advertising in the modern age has established itself as the most important selling media" (Khalid, 1990).

 "Research suggests that exposure to gender role stereotypes in advertising often influences gender-stereotyped attitudes" (Singorielli, 1989).

As passing trend there are different strategies in advertisement which are came across time by time currently **Unique Selling Point (USP)** also known as unique selling proposition, is a marketing statement that differentiates a product or brand from its competitors. A USP might boast the lowest cost, the highest quality, the most experience, the first in its product class or another trait that sets the offering apart from the competition. A unique selling point can be thought of as "what you have that competitors don't". The USP should also be compelling enough to attract new customers. It carefully balances what the business does well or what it can deliver that the others cannot. One of the well known application Canva: Empowering the world to design is a example of USP.

Theory which relates to the topic

If we relate this study with any theory of mass communication(social learning theory) then "Social Cognitive Theory of Mass Communication" proposed by "Albert Bandura" can be applied most efficiently as this theory states about learning from the social environment where research study will explore the perception of the audiences after watching the female portrayal in the advertisement. Bandura posited that the process of observational learning was governed by four key aspects: Attention, retention, reproduction, and motivation. **Attention** is a process in which people selectively observe and extract information from the ongoing modeled acivities (Wood & Bandura, 1989). **Retention** involves a process of "transforming and restructuring information in the form of rules and conception" and store the information into memory. **Reproduction** is the act of performing the actual behavior that was observed. The fourth aspect concerns, **motivation** which propels the learner to attention, practice and retention.

Because of major role of mass media plays in society, understanding the psychosocial mechanism through which symbolic communication influences human thought, affect, and action is of significant import. Social cognitive theory provides a dynamic conceptual framework in which the researchers examine the determinants and mechanism of such effects. Human behavior has often been explained in terms of unidirectional causation, in which behavior is shaped and controlled either

by environmental influences or by internal dispositions. Social cognitive theory explains psychological functioning in terms or triadic reciprocal causation (Bandura, 1986). In this transactional view of self and society, personal factors in the form of cognitive, affective, and biological events; behavioral patterns; and environmental events all operate as interacting detriments that influence each other bidirectional. This interaction is demonstrated by the construct called reciprocal determinism. In simple language this theory suggests that humans learn behaviors by observing others and choosing which behavior to imitate. Behavior that are rewarded are more likely to be repeated as compared to the behavior that are punished are less likely to be repeated.

Indecent Role of Women in Advertisement

There has been advertising campaigns where there has been a decent portrayal of women and they have been very successful too like Titan, Raymond's, jewellery advertisement, cosmetic advertisements like L'Oreal etc but at the same time these have showed that the involvement of women with fair skin and perfect body will take away the cake in all the areas. On the other hand few advertising gurus believe that in some of the brands the so called skin show and bold projection of women plays an important role in brand recognition.

Women representations through advertisements are seem in so many different prospects, role of women in advertisement are vary according to need and scenario, somewhere they are portrayed as house maker, somewhere working women, sometime just to fill the space or as decorative image and sometimes as a freewheeler. Portraying women in advertisement is good in all terms until image of women's are not shown derogatory because this influence the society in so many different ways. Women advertising redefine women attractiveness as something that is away from natural. There are advertisements where the females are shown in bad light. They are clad in skimpy clothes even when their presence in the advertisements has no relevance with the brand.

Obscenity in Advertisement

The article here talks about the obscenity and vulgarity being depicted in the ads through various mediums of selling a product. Unfortunately there have been instances that have shocked the public conscience and have subsequently been banned on the grounds of public decency and morality. The article talks about various advertisements that have crossed the verge of indecency and in a country like India where holding hands in public is considered an embarrassment for the people walking around where the their eyes are watching and few eyes are just stealing and hiding away

because of the same reasons, displays such indecent and obscene visuals. Decency in advertisements also invokes the concept of media ethics', which aims at making the advertisers more responsible by infusing the aspect of morality into the advertising sector.

Role portrayed by women in Indian TV advertisements

The Role portrayed by women in Indian TV advertisements is divided under four sub categories like Women in Family role, Women in Working role, Women in Decorative role and Women as Free wheeler. The decorative role of women is again divided in to two parts; women Concern for look and beauty and women as Sex object.

A. Women in working role

In the present study the category of women in working role includes the portrayal of women as professionals like doctors, lawyers, politicians, sportsperson, interviewer, model or in any other profession, which is considered to be of a professional nature (but not shown as experts/spokespersons, as the study has a different category for this) and whose main focus is on work related activities. The advertisements in which women are attending meeting, working in her workplace, having the presentation, addressing the public, taking interviews, shown in professional dress are considered as working.

B. Women in family role

Representation of women in family role, which includes the role of woman in advertisement as wife, mother, daughter, daughter-in-law, and other relationship roles, busy in taking care of the health and hygiene of the family members .Showing women performing domestic tasks and using household products in their homes is not objectionable. Housewives are often shown as incapable of performing simple tasks, and dependent on male advice. They are allowed to take decision only for detergents, spices, soap, hygiene, cleaning etc, but for the decision of the high value products like cars, loans, shares, men are shown as the decision makers.

C. Women in decorative role

The decorative role is more difficult to identify, but conducting an analysis it makes clear that female characters were used for fulfilling the decorative character in ads like Gillette shaving gel, Emami Fairness cream, Raymond and VI John Shaving Cream. In VI John Shaving Cream young women come along throughout the ad only to amuse the men while having the shave. Similarly the women's presence in other product is not justifiable. In the masculine product ads mostly the featured women have no relation with the product, nor is she capable of inducing the men to buy

the merchandise. Her character is put down solely to entertain the audience.

D. Women in multi roles

Multiple roles of woman in the present study are role of a woman in an advertisement who can think independently without taking the help of others. She is the independent decision maker; she does what she wants to without thinking what the other people would be thinking about her. Sometime she is portrayed as the boss and has dominant role portrayal over man. Women in advertisements are pushing the ambulance out of the pit, helping her husband to follow the traffic rule, raising voice against corruption and eve teasing, being the boss who can order her husband to meet the deadline.

Conclusion

Women in our society are shown are shown as doing so many roles at a time. The advertisers around us should also show women in such a decent way. As women are been portrayed in Indian advertisements as the advertisers are portraying them the real issues like upliftment for the rights women, for the awareness among the people for their rights and empowering them are left out. Media is a strong as it power is to influence the masses and people around globe. For shaping the today's scenario media plays the vital role. As we know every age of people are going towards media now-days rapidly either it is print media or electronic media. The tendency of advertisers to presenting women as sexual commodity and portraying them passively shows women dependency towards society, showing them in advertisement just to fill the space is not what equality is. The overall results indicate that the portrayal of females in most of the advertisements is unnecessary and needless. The females are used as an attractive and eye-catching element of the advertisement having the function of capturing the attention of viewers. However, some advertisements focus on the erotic side and depict women in such a manner which hurts the culture and balance of the society. These commercials are uncalled for in Indian homes where the family usually watches TV together. The negative representation of women gives a bad message to the younger generations and such cheap portrayal of women must be avoided by the content creators. The advertisers must be more responsible and must highlight women in such a manner that addresses the real issues of the society like abolition of gender discrimination, social status enhancement of women, political equality, health, sanitation and so on. Only focus on real issues through advertisements can lead to a balanced and fair society.

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Artificial Intelligence: The Emerging Scenario

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Abstract

Artificial Intelligence (AI) is transforming the nature of almost everything which is connected to human life e.g. employment, economy, communication, warfare, privacy, security, ethics, healthcare etc. We are yet to see its evolution in long-term, whether it is leading humanity towards making this planet a better place to live or a place which is full of Artificial Intelligence induced disaster. Every technology has its advantages and disadvantages but advantages should always outweigh disadvantages for the technology to survive in the market and render benefits to mankind. Evolving scenario dictates that machines are going to play a pivotal role in the various facets of human life, where the scope for implementation and manipulation by/through artificial intelligence will be exponential. This modern renaissance of machine interaction brings a lot in terms of economics and trade but adopting to this technological upsurge without giving a strong legislation can prove to be disastrous.

Key words: *Artificial Intelligence, technology, machine interaction.*

Introduction

Artificial Intelligence
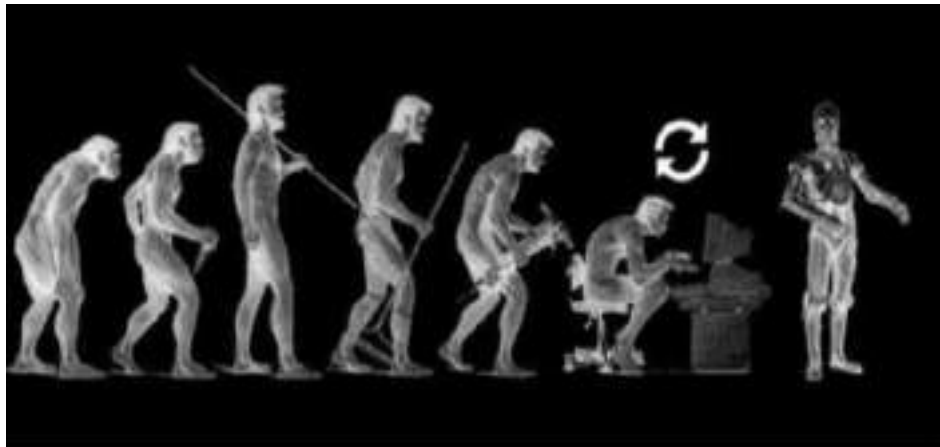
Literature Review

The father of Artificial Intelligence, John McCarthy states a definition for AI which says that "Artificial Intelligence is the science and engineering of making intelligent machines, especially intelligent computer programs". Artificial Intelligence (AI) is intelligence exhibited by machines. In computer science the field of AI defines itself as the study of "intelligent agents". Generally, the term "AI" is used when a machine simulates functions that human's associate with other human minds such as learning and problem solving.

The two major approaches that has been developed for the regular AI system are: "top down" approach which started with the higher level functions and implemented those, and the "bottom up" approach which looked at the neuron level and worked up to create higher level functions.

Artificial intelligence (AI) is an area of computer science that emphasizes the creation of intelligent machines that work and react like humans. Some of the activities computers with artificial intelligence are designed for includes:

- Speech recognition
- Learning
- Planning
- Problem solving

Artificial intelligence (AI), also referred to as machine intelligence. The term "artificial intelligence" is often used to describe machines (or computers) that mimic "cognitive" functions that humans associate with the human mind, such as "learning" and "problem solving".

Artificial intelligence can be classified into three different types of systems: analytical, human-inspired, and humanized artificial intelligence. Analytical AI has only characteristics consistent with cognitive intelligence; generating cognitive representation of the world and using learning based on past experience to inform future decisions. Human-inspired AI has elements from cognitive and emotional intelligence; understanding human emotions, in addition to cognitive elements, and considering them in their decision making. Humanized AI shows characteristics of all types of competencies (i.e., cognitive, emotional, and social intelligence), is able to be self-conscious and is self-aware in interactions with others.

AI Implementation & Benefits

Artificial intelligence has become a crucial part of daily human lives today and it assists in almost every scenario — whether one realizes it or not.

1- Automated customer support

Online shopping experience has been greatly enhanced by chatbots because of the following reasons:

- They increase user retention by sending reminders and notifications.
- They offer instant answers compared to human assistants, thus reducing response time.
- Chatbots provide upselling opportunities through personalized approach.

2- Personalized shopping experience

Implementation of artificial intelligence makes it possible for online stores to use the smallest piece of data about every follower/customer and link or hover to personalize their experience on a deeper, comprehensive and interactive level.

3- Healthcare

AI-enabled workflow assistants are aiding doctors free up their schedules, reducing time and cost by streamlining processes and opening up new avenues for the industry.

4- Finance

Collaboration of finance industry and artificial intelligence is a perfect match. The financial sector heavily relies on real-time reporting, accuracy, and processing of large volumes of quantitative data to make crucial decisions.

5- Smart cars and drones

Autonomous vehicles are the most recent and prime examples of how artificial intelligence is impacting the automotive industry. A large segment of autonomous vehicles are connected and thus, able to share the learning with each other. This percentage is set to increase rapidly in the future and emerging as one of the most glaring example of AI implementation

6- Travel and navigation

In both travel and transportation industries, AI is steadily becoming one of the key tools for service providers as well as users, enabling users to venture alien geographic areas.

7- Social media

The fact is, when one is using social media, a majority of their decisions are being influenced by artificial intelligence.

The role of artificial intelligence becomes even more important when the amount of content increases in the platforms since then, it becomes even more difficult to show users accurate information while fighting spam and improving user experience. In such cases, AI can act as a great boon.

8- Smart home devices

AI has exceptionally established the term *"smart home"*. A significant number of smart home devices that you buy use AI to learn your behavior so that they can adjust their settings automatically to make your experience as frictionless as possible. These smart home devices are controlled by using *smart voice assistants*, which are prime examples of AI**.**

9- Creative arts

AI-powered technologies are inspiring new songs now. Based on inputs gathered from millions of newspaper headlines, conversations, and speeches, insights are gleaned that can help musicians create themes.

10-Security and surveillance

Technologies like facial recognition and voice recognition are getting better with each passing day.

Apart from these applications, there're many others like AI-powered robots capable of thinking and solving problems in a limited capacity, increasingly adopted AI-powered marketing tools that can help marketers generate in-depth customer insights reports, book more impactful business meetings, and create pertinent content, among others. And all these are being done with minimal human intervention.

Is It! Implementation or Manipulation

Like any revolutionary idea or technology, Artificial Intelligence when widely implemented is also open to and or susceptible to be used as an instrument for manipulation, to achieve unethical objectives.

There is no denying of the fact that Artificial Intelligence and its highly diversified application and implementation is inevitable and indisputable, thus emerging as an instrument/technology/tool that cannot be ignored or shielded from. However, with innumerable interactions/transactions taking place between humans and artificial conversational agents, or bots, there is

an emerging immediate risk—as well as tremendous opportunities. These unending and highly diversified interactions taking place between humans and artificial intelligence carriers has revealed that human beings are more than willing (voluntarily or involuntarily) to form a relationship with Artificial Intelligence (software). Humans are ready and willing to enter in a relationships with artificial agents, provided however, that they are a sophisticated build, capable of complex personalization. Humans seem to perceive and allure to the illusion that the AI truly cares about us or is in our interest/benefit. It is this perception/willingness of humans that exposes them to manipulation. It has been widely observed that Users spoke to the automated assistants longer than they did to human support agents performing the same function. People would volunteer deep secrets to artificial agents, like their dreams for the future, details of their love lives, even passwords. These deep bonds/relationship/engagements entail that today's relatively simple/primitive programs can exert a significant influence on people—for good or evil.

Arguably, it has been observed that Artificial intelligence has been used to manipulate individual voters. During the 2016 US presidential election, the data science firm Cambridge Analytica rolled out an extensive advertising campaign to target persuadable voters based on their individual psychology.

This highly sophisticated micro-targeting operation relied on big data and machine learning to influence people's emotions. Different voters received different messages based on predictions about their susceptibility to different arguments. The paranoid received ads with messages based around fear. People with a conservative predisposition received ads with arguments based on tradition and community.

This was enabled by the availability of real-time data on voters, from their behavior on social media to their consumption patterns and relationships. Their internet footprints were being used to build unique behavioral and psychographic profiles.

Every voter can be sent a tailored message that emphasizes a different side of a particular argument. The key is simply to find the right emotional triggers to spur each person into action.

AI can be used to manipulate public opinion. Massive swarms of political bots were used in the 2017 general election in the UK to spread misinformation and fake news on social media. The same happened during the US presidential election in 2016 and several other key political elections around the world.

These bots are autonomous accounts that are programmed to aggressively spread one-sided political messages to manufacture the illusion of public support. This is an increasingly widespread tactic that attempts to shape public discourse and distort political sentiment.

Typically disguised as ordinary human accounts, bots spread misinformation and contribute to an acrimonious political climate on sites like Twitter and Facebook. They can be used to highlight negative social media messages about a candidate to a demographic group more likely to vote for them, the idea being to discourage them from turning out on Election Day.

Conclusion

Control Mechanism

In order to ensure that Artificial Intelligence functions within the defined ethical framework, it is imperative that a robust control mechanism is established, that unequivocally ensures that AI does not infringe the ethical mandates so defined.

Every control mechanism entails a strong legislation that comprehensively prohibits the application/usage of artificial intelligence for achieving ulterior motives, or motives other than those publicly defined. A legislation as strong as the legislation that universally prohibits human cloning or one that restricts the application of nuclear energy for destructive purposes is needed or restrictions on enrichments of weapons grade uranium.

Working on open artificial-intelligence technology and brain-computer interfaces, or forming ethics committees, are just part of the solution. We need to consciously build systems that work for the benefit of humans and society. Systems that are free from addictive traits, and that clicks, and consumption is not their primary goal/agenda.

"AI will always seek to avoid human intervention and create a situation where it can't be stopped," says Rachid Guerraoui, a professor at EPFL's Distributed Programming Laboratory and co-author of the EPFL study. This in turn implies AI engineers/designers must strive to ensure that a system is put in place that is capable of preventing machines from eventually learning how to circumvent human commands or a human induced command that delegates AI the mandate to circumvent human commands for ulterior purposes.

AI is growing up, and will be shaping the nature of humanity. AI needs a mother.

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The Feminine Legacy of Self-Erasure: Subjugation of Women in Shashi Deshpande's *The Dark Holds No Terrors*

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Abstract

Deshpande's novels, situated in the crest of the Second Wave Feminism that swept literary writing globally, present to us a vivid picture of the Indian upper middle class. Her first, titled *The Dark Holds No Terrors*, is a psychological exploration of decades of silencing and subjugation that typically befell women as their lot. This paper attempts a close reading of the novel to examine the pitfalls and triumphs of the author's and her female protagonist's pragmatic, working philosophy of feminism. In doing so, we may tune into the ambivalence of women's silences and self-effacing attitudes, entrenched in the country's social mores, and how their treatment in literature has laden them with new meanings. From motherly ideals to hopes of self-sufficiency in a rapidly modernizing nation, Sarita's is a story rife with the frustrations encountered by the educated middle class Indian woman as she dares to have her own dream.

Keywords: *Indian feminism, Indian writing in English, motherhood in Indian literature, subjugation of women, New Woman*

Introduction

Published in 1980, *The Dark Holds No Terrors* (abbreviated to TDHNT hereafter) is a novel much adored by the author herself, standing amidst Shashi Deshpande's most notable creations. Through the omniscient narrator's first-person vantage point of Sarita's life, this work delves into the psychological and emotional aspects of parent-daughter relationships, exploring the themes of identity, societal expectations and the impact of familial bonds on individual lives. Beginning at the point of Saru's return home upon her mother's death, the novel, in an almost Odyssean strain, resorts amply to analepsis to evoke the perilous journey she has taken, metaphorically speaking, to be able to do so.

In her own words, Deshpande's major influence in fictional writing has been Virginia Woolf, who urged upon the need for a distinct linguistic mode of writing as a woman that would later be termed *écriture feminine*[1] and yet, this famously reticent author rejects the premise of writing as a feminist. Albeit the primacy of the ordinary woman's perspective in her oeuvre cannot be overstated, it is this caution and scepticism that informs Deshpande's characterization. The resulting despondency of her novels looms as a grim spectre of the entrenchment of repressive social norms and practices, resisting the utopian tendency of fiction to imagine a woman-ordered world.

TDHNT unfolds through alternating perspectives, it seems, of the divided selves of its protagonist, "so divided in herself" (105) who has refused to bow down to the patriarchal authority of her birth-home, and yet finds herself caught in another vicious circle of corrosive entrapment. The long shadow that Saru's dead mother casts on her appears to doom her to a similar fate of silence and self-erasure in marriage as it was in girlhood. While the narrative willfully strives towards a recovery of an identity of her 'self' beyond her placing as the 'Other' to her brother, husband and other figures in Sarita's life, it keeps being driven into corners that make her question her agency and self-sufficiency.

Self-Erasure and Control: An Illusion?
"Coming out of the darkness and going into the darkness" (194) as it were, encapsulates the whole lives of the women dealt with in Deshpande's works. This novel's title alludes to the comfortable familiarity of darkness for women who are forever, in traditional Indian society, accorded status and identity as appendages to men. It is not that the women here aren't willful or driven to action, but that the futility, or more appropriately, the Sisyphean pursuit of their self-empowerment is what haunts them.

But Sarita is no damsel in distress. Despite being presented an impossible choice of either being financially supported for her higher education or marriage, she decisively makes her own life by not only following the career path she deemed fit but also marrying for love. What forms the moving core of the novel is that in spite of her determination and constant struggle, she is overcome by a feeling of 'nothingness'. While this negligent suppression began at the hands of her parents whose utter negligence of her was presented in the light of their preference for the male child, the apple of their eyes, Dhruva, it comes to define her almost completely when Sarita can derive no meaning from either her romantic relationship or her profession.

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[1] Cixous, Helen. "The Laugh of the Medusa," *New French Feminisms*. Elaine Marks and Isabelle de Courtivron, eds. 1981.

As her mother eked out a quiet existence without "a room of her own" and stuffed herself into tiny corners and knickknacks, so does Saru, in sharp contrast with her youthful rebellion that led her down the path of self-determination and career ambition. Both women contend with the same age-old monster- the lack of space for a multifaceted feminine existence that allows for reconciliation of their different responsibilities and desires. As Woolf famously mentioned in her essay, that what her name is isn't "a matter of any importance,"[2] because it remains a universal plight of women and their erasure from literary, canonical, public and as we see, even private spaces.

Sarita's own room, which had been a sanctuary to her own little brother in her comforting presence, upon her return, is found to be rented out to Madhav, and her traces all but erased from her parental home. The symbiotic cohabitation exemplified by him and Saru's father leaves no space for her, and easily fills the gap left by her mother, as if she was never there to begin with. This is a testament to the formidable structures of homosocial bonds that subsume gender relations and even organize them to serve their own ends. The easy, natural harmony Saru sees between these two men reminds her of the companionship her own parents could never find among themselves, despite being married for decades. It is a "partnership" and "understanding" (Deshpande, 33) that is only a male prerogative, and not the lot of married women who are taught the lesson of unequal partnerships where the scales are perpetually tilted in the favour of the husband.

Her doctor's cabin, which she could have made a room of her own of, serves to only help her escape herself and step into the shoes of a professional armed with a script, in her own words, a ventriloquist's puppet. Simultaneously though, it is thus when she gets "to be nothing" that she feels "real" and most at ease (20). The author further convolutes the picture with an added dimension of mockery, a self-deflation of any sense of importance that could have been thus achieved, when Saru declares to Madhav that she's "a lady doctor" (34).

The cultural expectation of 'service before self' continues to haunt Sarita, and this repeated negation of her own needs is painfully evident in how, at the present time in the novel, she has arrived at a resigned decision of abandoning her profession to perhaps save her derailed marriage or getting away completely. The mantra of 'please and appease' works as a law of life for women, whose self-effacing and sacrificial attitudes are normalized routinely through various forms of "affective labour" (Hardt 1999) which condenses ultimately, into conflict-avoidant tendency. It is invisibilized tasks like 'reading the room' that enable relationships that

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[2] Woolf, Virginia. *A Room of One's Own*. 1929.

hang like ancillary appendages, as Manu and Saru's marriage, to derive sustenance, feeding on women's enactment of empathy and pleasantness[3].

What follows thus, is an obvious question of silence and silencing. Silence too works within its own relational economy, and it must be taken into consideration whether it is in servitude of the status quo or contesting the power structures that have led to the silencing in the first place. The landscape against which the metaphysical drama of the novel is enacted is one of Sarita's mind. It is her outward quietude in her adult life that waters her inner life and leads her to acknowledge the deep discontents of her married life. The fear, petrifying as it may be, does not drive her to cocoon herself in a bubble of ignorant bliss. She wrestles mentally, and is ultimately able to articulate her need to get away from what she set out to describe in the very beginning- in the novel's prologue- the horror of marital rape, the "casual cruelty" (Deshpande, 8) of the hegemonic Indian man who is at once a loving father, a friend, and capable of the monstrosity that has itself come to evoke no response from Sarita, other than silence.

Crammed into a fusty *chawl* because it is through Manu's love and fervent desire that could satiate her own needs deprived since childhood, Sarita feels wanted at the start of this relationship. In the light of his recognition of her, she feels much real than she ever has. However, this recognition, this seeing, happens through the male gaze, and renders its object impotent in having any say in how it is seen. Thus, the development in this romantic prospect follows a trajectory of typically patriarchal heterosexual models of sanctification of love, where the man, wielding a definitive, defining power over the woman by being her sole emotional tether to the world goes on to being cast in the shadow of her professional success, thereby slackening his grip on how she's seen[4]. In consequence, he avenges this slight of his ego by beginning to silence her via sexual violence, making her feel unreal as an outlet for his bodily needs in flesh but occluding her humanity. In this garb, Sarita begins to fade from their marriage, and even their home.

Mothers as a repository of fossilized cultural values

Writing in the period of an independent, yet pre-liberalization era, Deshpande presents the deeply entrenched patriarchal mindset of the traditional Indian society, where women too are the carriers and

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[3] See Agarwal, Pragya. "What is emotional labour and why is it mostly done by women?" *World Economic Forum*, December 15, 2022.
https://www.weforum.org/agenda/2022/12/emotional-labour-women-workplace-home-gender/

[4] See Mulvey, Laura. "Visual Pleasure and Narrative Cinema." *Media and Cultural Studies: Keywords*. 2001, pp. 342-352.

propagators of gender-based repression. Only in writing, she confesses, is there a possibility of addressing the "disturbing split" between the received historical models of motherhood and the visceral, lived experience of it (2003). Sarita's mother's too is a legacy of this continual and renewed process of patriarchal subjugation that creeps up, irrespective of one's class or regional affiliations. She preached what she practiced, referring to Saru as a mere responsibility that needed to be done away with, and insisting on the preservation of what she regards as traditional feminine traits- her quiet obedience, beauty and limited intelligence.

She bases her personality around her son, and his death then results in an utter erosion of womanhood that is then typically understood to be child-centered. This mother-son relationship is so integral to who she is, that upon his death, she remarks that she is "childless," (199) ignoring Saru's very existence. Yet, what is inherently troubling is that despite making motherhood the locus of her identity, she in fact consistently proves to be a bad mother. Her attachment to Dhruva is a one-track minded devotion, saying little of the other facets of her life or personality as a whole, and may be rightly regarded, as pointed out by Vijayasanthi and Shaw, an anti-Demeter figure whose mistreatment of her daughter paves the way for her "rebellious attitude in the future" (37). It is also Saru's failure to come to trauma with this severing of the umbilical cord that contributes to the tremors in her subconscious.

Saru breaks the chain of such inter-generational trauma, albeit by being largely absent from her children's life. There are no tender moments with them recounted, except for a mention of a few stilted letters she receives, and a major throwback highlights how her daughter chooses to find comfort in the father by shoving her face in Manohar's lap. The realization of failure- as a daughter, sister, wife and mother- is crushingly understated, as if from a point of defensive numbness.

Homecoming: An Impossibility?

From the mythic Sita to Narayan's Savitri, there is an implicit recognition of motherhood as a woman's end goal. Despite their subversive attempts, they are forced to return home, in a kind of a circular journey symbolic of their entrapment[5]. Deshpande's novel complicates this portrayal by shattering any images of domestic comfort or rose-tinted nostalgia, either derived from parental love or deep attachment to one's children. For Sarita, a proverbial return home is not possible because she is yet to find a home for herself, a place where she feels a sense of belonging. This finds most explicit mention in the text when her conversation with her father

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[5] A, Ashmika. "How Motherhood Is Portrayed In Indian Literature." *The Curious Reader*, May 17, 2019. https://www.thecuriousreader.in/features/motherhood-indian-literature/

comes a couple of decades too late, and he firmly states that nothing is to be done now, and he can't help her. The burden of the path to freedom she opted for is hers alone to bear.

Though her profession as a medical practitioner makes her a semi-public figure, best seen when even in her hometown people approach to consult her, Sarita finds no community in the course of any of these myriad interactions. This bids obvious contrast with famous western counterparts by women writers of colour, such as Toni Morrison and Alice Walker, whose 'womanist'[6] realignments of the world the protagonists find themselves in function as bulwarks against the marginalization across the three axes of race, sex and class. Perhaps, here is an echo of the actual Indian feminist movement, which has similarly failed to find larger cross-sectional solidarity, except in a handful of isolated cases like the Chipko Movement triggered by an immediate, common and tangible threat.

An outlier of a moment in the text is the scene at the Devi's temple from years past, wherein Saru perceives a semblance of "comradeship among the women" (101) on account of the sameness of their battles and attitudes. Here the two perspectives- of the young Saru and the mature Sarita- commingle to convey the strange experience of witnessing utter freedom, from coded behaviours and ritualized quotidian movements in the form of divine possession. To the little girl who knew little of the world, this break from the patterns she was used to seeing was "horrifying" and "obscene" that turned the old woman into something "terribly inhuman." To the present consciousness in the novel, the liberating possibilities of this "unnatural excitement" speak out and are symbolic of the split within that each woman grapples to bridge (102-104).

Amid all of this, it is equally pertinent to point out that Saru is a career woman, the New Woman of post-independence India who faces the turbulent raft of old currents meeting the new in an evolving society. Maintaining an upper middle class status is a prolonged labour, which necessitates that she keep working, as Manohar too insists, despite this edge over her husband driving a wedge in their relationship that does irrevocable damage. Even as she might suffer a kind of Imposter Syndrome[7] regarding her success, it is this job that gives her some coherence of self-identity, a temporary home in an occupational role,

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[6] See Walker, Alice. *In Search of Our Mother's Garden: Womanist Prose*. Harcourt Brace Jovanovich, 1983.

[7] A KMPG report finds as many as three-fourths of women executives struggle with Imposter Syndrome. Paulise, Luciana. "75% Of Women Executives Experience Imposter Syndrome In The Workplace." Forbes, March 8, 2023. https://www.forbes.com/sites/lucianapaulise/2023/03/08/75-of-women-executives-experience-imposter-syndrome-in-the-workplace/?sh=7f9549066899

which manifests, perhaps most distinctly in the text in her hands, soft and clean, devoid of any signs of hard domestic labour.

Conclusion

There is an almost satanic reverberation in Saru's affirmation that external darkness holds no terrors, as the real hell is within us, and this realization, in both cases, follows brutal exclusion from one's realm of existence. Deshpande doesn't take the easy way out to underscore the physical loci of women's struggle vis-à-vis Sartre that hell is other people, but extends its reflection into the psychological scars this experience leaves one with. Here is a demystification of a woman, widely regarded as mysterious and elusive, driven to full potency by the crescendoing sense of purposelessness and futility, fear and rage, hesitation and desperation.

It must be noted that while readers are granted exclusive access into Sarita's mind, it is filtered through an omniscient narrator. This oscillating narration between chapters indicates a tussle for narrative space rather smoothly accorded by first-person biographical narratives and this silence in the larger framework echoes in her various silences or delayed speeches in the text. Yet, Sarita gets to tell her story.

In an intricately woven tapestry of familial discord, conjugal stasis, societal pressures, and the quest for self-empowerment, TDHNT concludes in a mélange of questions, signifying that there are no simple answers. The author paints a vivid picture of the compromises women routinely make, shaving off pieces of their own self in the process, yet determined to persevere, making the novel a significant contribution to contemporary Indian literature in English.

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Accessing E-Resources in Academic Libraries: An assessment of their effectiveness

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Abstract

The acquisition of appropriate resources and their immediate provision for use by potential library user groups are imperative for academic libraries, which are an integral component of higher education systems. The current study investigates how University of Allahabad teachers and students, as well as those from connected colleges, utilise electronic resources. The study will evaluate the usefulness and user satisfaction of e-journals, digital databases, and other electronic resources by using a standardised questionnaire that will be given to both teachers and students. The study explores the variables that affect access, the obstacles that users must overcome and how library services might help people use electronic resources. Ultimately, the results are intended to help optimise electronic resources by offering librarians and administrators useful perspectives.

INTRODUCTION

Providing users with a comprehensive range of print, non-print and electronic resources to meet their information needs is the primary goal of every library. It is a fact that the guidance resources available in libraries are a valuable resource for users to occasionally receive in depth, methodical education. In modern librarianship, electronic resources are the most important factor in the transmission of information. In order to provide access, interface, technical support and licencing a distinct electronic resources collection development policy must be created. The newest communication technology should be known to library patrons.

The primary aim of obtaining e-resources for a library is to increase the facility's effectiveness, provide services to end users and help academic staff, research scholars, and students accomplish their objectives

using useful information services. Resources are the way of the future and libraries will face ongoing challenges as a result.

ELECTRONIC RESOURCES

Any work encoded and made computer accessible is referred to as a "Electronic Resource." It contains electronic data that is accessible both directly and remotely. Stated differently, remote access is the process of using computer networks to access electronic resources. Direct access to electronic resources is the use of carriers (such as discs, cassettes and cartridges) intended for insertion into computerized devices or their supporting hardware. The electronic resources, which include full text search engines, electronic reference books, bibliographic databases, and digital data collections are also referred to as online information resources. Both 'born digital' and directly produced internet content is included.

For instance, digitized and scanned print resources, databases, and journals. The libraries do not "own" the electronic resources, e-journals or online databases in the same way that they own the print materials. Electronic resources providers are the rightful owners of these resources. Through the internet, access to the electronic resources can be obtained for free or for a price. E-resources include things like periodicals, encyclopedias, newspapers, journals and articles that are published in them. These can be seen on PCs, tablets, smartphones and other Internet-connected devices.

TYPES OF E-RESOURCES
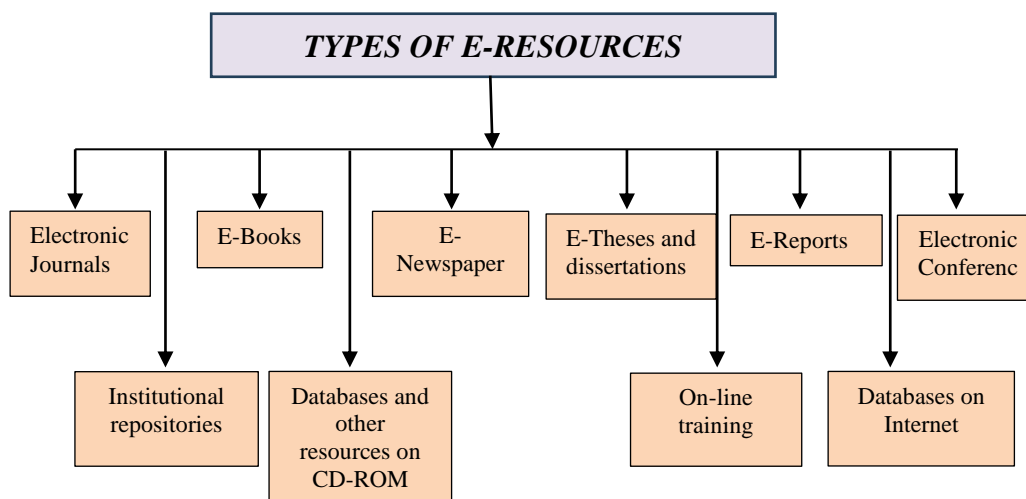
REVIEW OF LITERATURE

Igbinovia M.O, Odelami B. (2022) the findings showed that the frequency of use of electronic information resources by undergraduates, for both academic and non-academic purposes, was slightly high.

According to the findings of the study, students routinely used electronic resources for assignments, research, staying up to date, gathering data and gathering data, and gathering mail and news. The need for a steady power source to charge mobile devices and laptops, the high cost of information membership and a bad web connection are some of the challenges that students have while trying to access electronic resources and online learning stages **(Ogunbodede et al., 2021)**.

Gautam, A.S. & Sinha, M.K. (2020) this study examines a portion of one of the authors' PhD papers. This survey was conducted to see how teachers and researchers would use the resources available at the BHU library. The existing literature addresses how BHU academics and staff use digital resources (e-journals, e-books, online databases, and net sources) that are made available by the inflibnet centre in consortiums like the UGC info net virtual library.

Ternenge and Kashimana (2019) noted that lack of resources, poor and inadequate internet connections and maintenance Powe outages were the main barriers keeping students from using electronic data in their research on accessibility openness and use in Nigeria.

Santharooban and Lavanya (2018) discovered that most students use smartphones to access the internet for a variety of educational purposes, and that most of them are usually unaware of online resources that are available for free as well as those that require a college subscription.

University libraries are crucial to the advancement of the company according to **Padmavathi, Ningaiah and Biradar (2017)**. The main objective of this study was Bangalore University students' and researchers' satisfaction with the library's materials and services.

The current study covered visitation frequency and purpose, resource and service utilization, document searching techniques and user satisfaction with the library's overall performance. The results revealed that the majority of users were happy with the library's services and availability of information sources and they suggested adding more hours to the library's schedule and buying more textbooks for the lending sections.

SIGNIFICANCE OF THE STUDY

An increasing number of publications are becoming Web-linked in the current era of explosion of information. The majority of university and college libraries now see services and functions in a different light. The world is quickly becoming more electronic. In light of this, the researchers chose to carry out this study in order to evaluate how University of Allahabad faculty members and students, as well as those of associated colleges, use electronic resources.

OBJECTIVES OF THE STUDY

The following are the primary objectives of the current investigation:

- To determine the purpose of using electronic resources.
- To ascertain the obstacles and issues users encounter when attempting to access electronic resources.
- To research the availability and level of satisfaction with e-resources.
- To make appropriate suggestions for enhancing e-resource-related facilities and services.

METHODOLOGY

Keeping in view the above objectives in mind, a structured questionnaire was prepared to collect data from the users of e-resources in University of Allahabad and affiliated colleges. For fulfilling the objectives, a survey was conducted with the help of the structured questionnaire containing various questions pertaining to the purpose and use of e-resources. A total of 750 questionnaires were distributed among faculty members and students, 640 were collected and then data was analyzed, tabulated, interpreted and presented in the form of this paper. Categorical data were digitalized and stored in MS excel version 2010.

DATA ANALYSIS

Finding relevant patterns, trends, or insights through a methodical review of raw data is called data analysis. Depending on the type of data and research keywords, it entails arranging and analysing data using software tools, statistical techniques, or qualitative approaches. On the basis of the information that has been analysed, the objective is to draw significant conclusions and make wise decisions.

POPULATION STUDY

Information on respondents' sex and other personal details is included in the questionnaire's "Personal Details" section. Table & Graph 1 indicates that 41% of the population under study was male and 59% was

female among all respondents who could access the e-resources made available by the library for various purposes.

Gender-wise Distribution of Respondents

Table 1: Gender-wise Distribution of Respondents

Gender	No. of Respondents	Percentage
Male	262	41.00
Female	378	59.00
Total	640	100.00
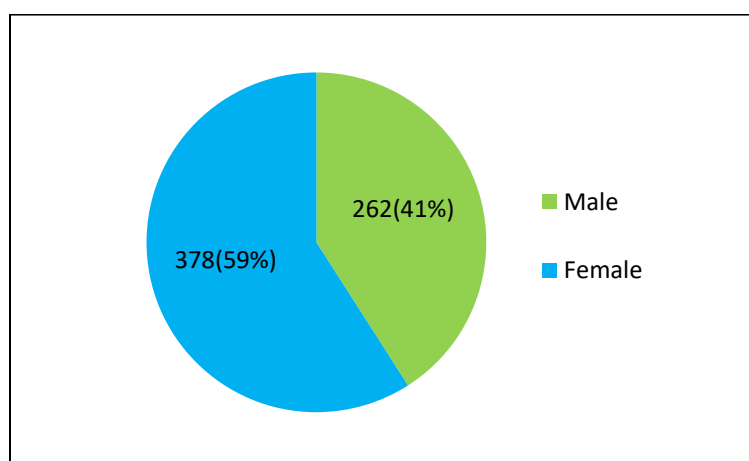
Graph 1: Gender-wise Distribution of Respondents

Academic Status-wise Distribution of Respondents

Table 2: Academic Status-wise Distribution of Respondents

Academic Status	No. of Respondents	Percentage
Under Graduates (UG)	320	50.00
Post Graduates (PG)	184	29.00
Research Scholars (RS)	86	13.00
Faculty Members (FM)	50	8.00
Total	640	100.00
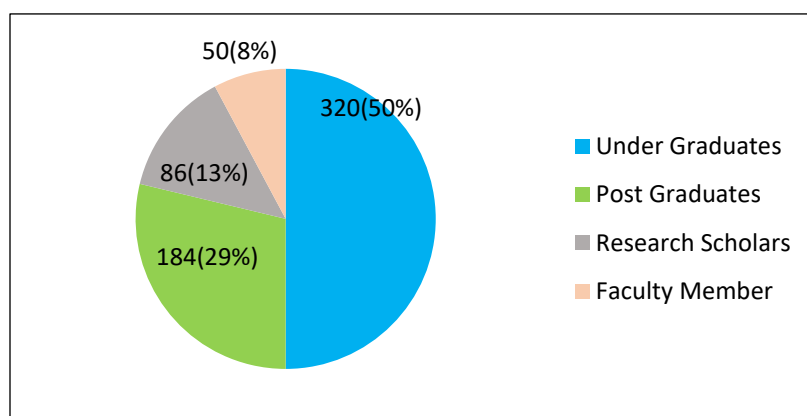
Graph 2: Academic status-wise Distribution of Respondents

Graph 2 shows that 50% of the respondents were under graduates, 29% Post Graduates, 13% research scholars and 8% were faculty members.

Purpose of using e-resources

Table 3: Various Purpose of using e-resources

Purpose	Always (%)	Often (%)	Usually (%)	Sometimes (%)	Rarely (%)
For research/project work	374 (58%)	126 (20%)	35 (5%)	58 (9%)	47 (8%)
For teaching purpose	132 (21%)	148 (23%)	37 (6%)	50 (8%)	273 (42%)
For publishing articles/books	75 (12%)	67 (10%)	29 (4%)	26 (4%)	443 (70%)
For keeping up-to-date in your subject area	273 (43%)	172 (27%)	78 (12%)	74 (11%)	43 (7%)
For finding relevant information in the area of specialization	231 (36%)	66 (10%)	78 (12%)	69 (11%)	196 (31%)
For getting current information	280 (44%)	24 (3%)	211 (33%)	87 (14%	38 (6%)
For examination purpose	429 (67%)	82 (13%)	67 (10%)	51 (8%)	11 (2%)
For browsing	164 (26%)	46 (7%)	58 (9%)	42 (7%)	330 (51%)
Reading/writing research papers	332 (52%)	180 (28%)	65 (10%)	63 (0%)	00 (0%)
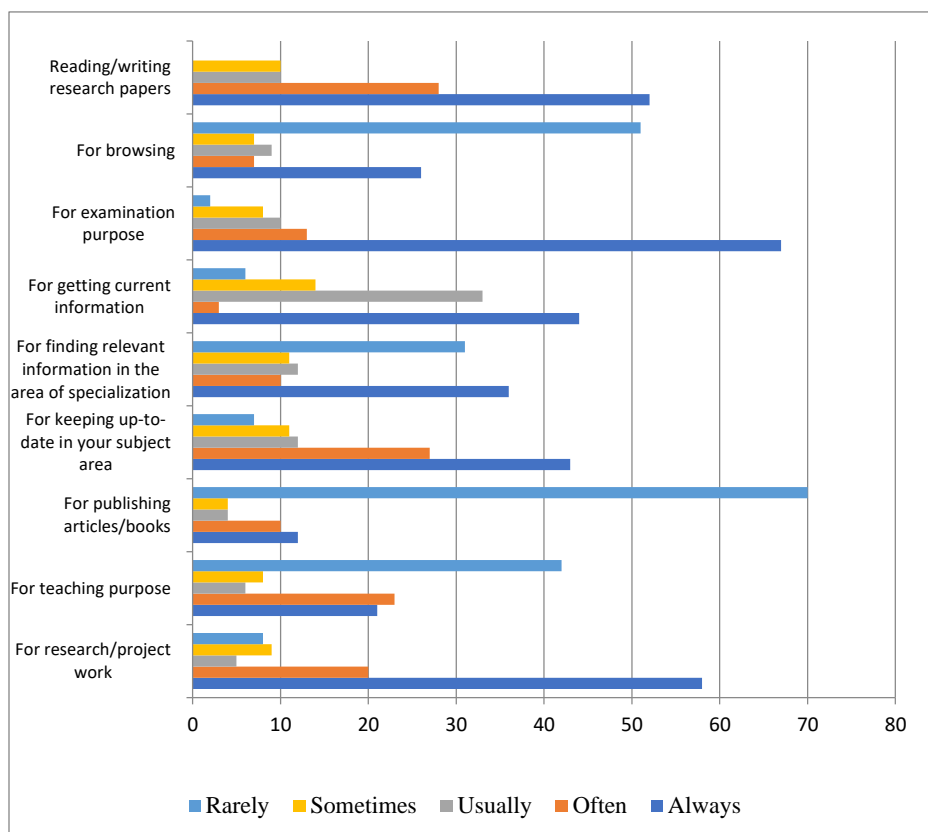
Graph 3: Various purpose of using e-resources

The analysis of the data received for the purpose of a library visit is displayed in the Graph 3 and further tables that follow, according to the respondents' academic status. When respondents were asked why they visited the library based on their academic standing, the most common answers were using electronic resources for research projects (58%) and exams (67%). The college's staff and students visit the library for a variety of reasons, including to stay current on developments in their field (43%) and to obtain current information (44%). One of the main reasons most faculty members and students visit the library is to use the e-resources that they have subscriptions to.

A significant source of the printed and electronic resources needed for research paper reading and writing (52%) is the library. The academic library offers its faculty and students internet facilities as one of its offerings. One of the goals of going to the library is to browse the internet.

Preferring to use Information Sources

Table 4: Preferring to use Information Sources

Information Sources	UG	PG	RS	FM	Total
Mainly Printed Material	192 (60%)	62 (33%)	18 (21%)	4 (8%)	276 (43%)
Mainly e-resources	14 (4%)	21 (11%)	15 (18%)	17 (34%)	67 (10%)
Web sources	30 (9%)	14 (8%)	28 (33%)	5 (10%)	77 (12%)
Use need and availability	27 (8%)	24 (13%)	8 (10%)	9 (18%)	68 (11%)
Audio/Video Tapes	8 (3%)	6 (3%)	2 (2%)	1 (2%)	17 (3%)
CD-ROM	7 (2%)	5 (3%)	3 (4%)	2 (4%)	17 (3%)
Both print and electronic version	42 (13%)	54 (29%)	10 (12%)	12 (24%)	118 (18%)
Total	320	186	84	50	640
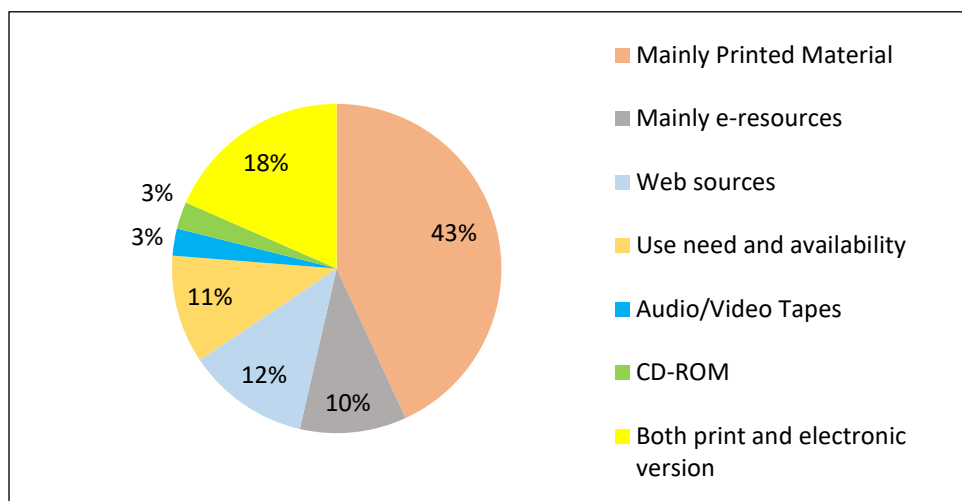
Graph 4: Preferring to use Information Sources

Based on data collection and tabulation, Graph 4 reveals that 276 (43%) of the respondents consume printed material. 60% of undergraduates use printed materials. 33% of Research Scholars use online sources, 18% use electronic resources, and 12% use both print and electronic versions of the materials. (34 percent) 25% of faculty members also use both printed and electronic materials from their library in addition to the majority of e-resources. Libraries today are situated

between the traditional and modern phases, and despite the prevalence of digital information, users still have a strong connection to more conventional sources of knowledge.

According to research, the majority of users still favour print materials over electronic ones. When looking for the necessary information, some respondents—faculty and students—use both paper and electronic resources.

Benefits of using e-resources as compared to print documents

Table 5: Benefits of using e-resources as compared to print documents

Benefits	Maximum (%)	Moderate (%)	some extent (%)	Little (%)	No advantage (%)
Time saving	355 (55%)	122 (19%)	125 (20%)	38 (6%)	0 (0%)
Better source of information	143 (22%)	305 (48%)	118 (18%)	74 (12%)	0 (0%)
Access to up-to-date information	373 (58%)	212 (33%)	45 (7%)	10 (2%)	0 (0%)
Information available in various formats as per the need	218 (34%)	182 (28%)	43 (7%)	37 (6%)	200 (25%)
Easy portability of e-resources	340 (53%)	134 (21%)	52 (8%)	25 (4%)	89 (14%)
24×7 access to e-resources	476 (75%)	127 (20%)	14 (2%)	15 (2%)	8 (1%)
Easy of search	345 (54%)	212 (32%)	42 (7%)	41 (7%)	00 (0%)
Ability to download	278 (43%)	247 (39%)	62 (10%)	53 (8%)	00 (0%)
Easy backup availability	239 (38%)	277 (43%)	85 (13%)	39 (6%)	00 (0%)
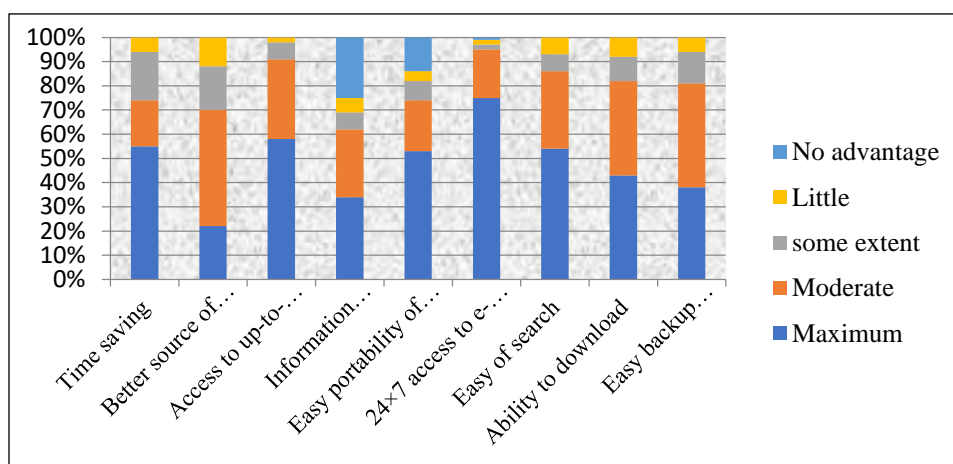
Graph 5: Benefits of using e-resources as compared to print documents

It is observed from Graph 5 that benefits of using e-resources "Maximum" percentage Time saving (55%), Better source of information (22%), Access to up-to-date information (58%), Improvement in the quality of professional work (34%), Information available in various formats as per the need (34%), Easy portability of e-resources (53%), 24×7 access to e-resources (75%), Easy of search (54%), Multi user access, fast access (33%), Ability to download (43%), Enhances access/visibility to scientific papers without physical existence (20%), E-Resources back volumes are available (19%), Easy backup availability (38%) and More expensive (12%).

Problems faced in accessing the e-resources provided by the library

Table 6: Problems faced in accessing the e-resources provided by the library

Problems faced in accessing e-resources	Always (%)	Often (%)	Sometimes (%)	Never (%)	Rarely (%)
Insufficient internet access points	135 (21%)	276 (43%)	114 (18%)	47 (7%)	68 (11%)
Insufficient E-Resource's collection	203 (32%)	224 (35%)	74 (12%)	85 (13%)	54 (8%)
Inadequate network infrastructure	43 (7%)	348 (54%)	173 (27%)	34 (5%)	42 (7%)
No separate E-Resources access section	32 (5%)	31 (5%)	44 (7%)	338 (53%)	195 (30%)

Limited number of computers to access E-Resources	116 (18%)	327 (51%)	128 (20%)	31 (5%)	38 (6%)
Slow internet speed	93 (15%)	352 (55%)	124 (19%)	26 (4%)	45 (7%)
Lack of remote access facility	207 (32%)	315 (50%)	52 (8%)	20 (3%)	46 (7%)
Lack of staff for help	243 (38%)	255 (40%)	73 (11%)	30 (5%)	39 (6%)
Lack of awareness about E-Resources	227 (36%)	122 (19%)	135 (21%)	41 (6%)	115 (18%)
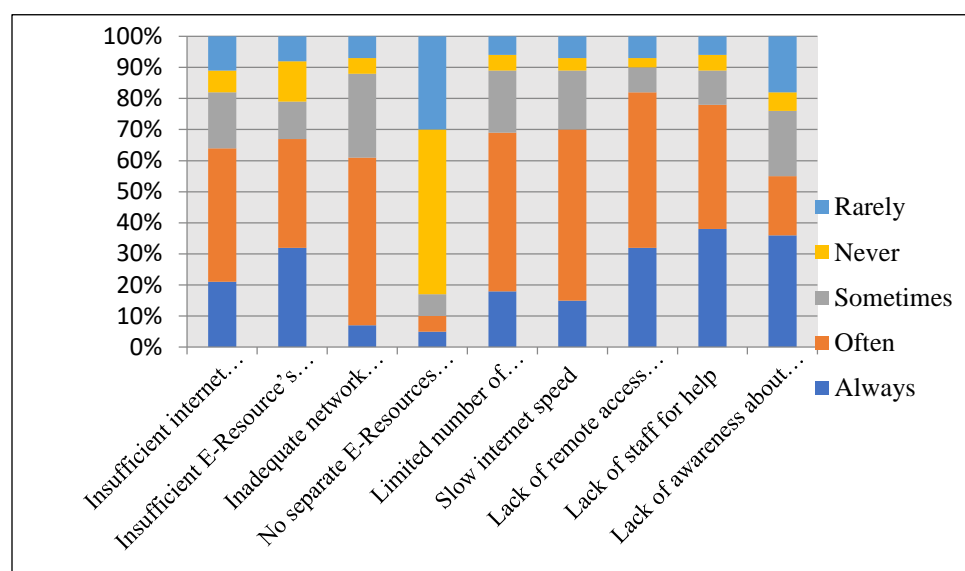
Graph 6: Various problems faced in accessing the e-resources provided by the library

Graph 6 specifies the different issues that respondents encountered when using the online resources. This study found that respondents faced types of problems in accessing the e-resources provided by the library "Always" frequency percentages, It is time consuming and wastes a lot of my time 32(5%), Space not enough 48(8%), Lack of IT knowledge to effectively use the services 54(8%), Working hours of the library 37(6%), Obsolete books 174(27%), Power outage 35(5%), Poor organization of material on shelves 72(11%), Insufficient internet access points 135(21%), Insufficient E-Resource's collection 203(32%), Inadequate network infrastructure 43(7%), No separate E-Resources access section 32(5%), Limited number of computers to access E-Resources 116(18%), Slow

internet speed 93(15%), Lack of remote access facility 207(32%), Lack of staff for help 243(38%), Lack of awareness about E-Resources 227(36%).

Level of satisfaction in using e-resources

Table 7: Level of satisfaction in using e-resources

Response	Number	Percentage
Extremely satisfied (100%)	152	24.00
Satisfied (75%)	377	59.00
Moderately Satisfied (50%)	91	14.00
Slightly satisfied (25%)	20	03.00
Total	640	100.00
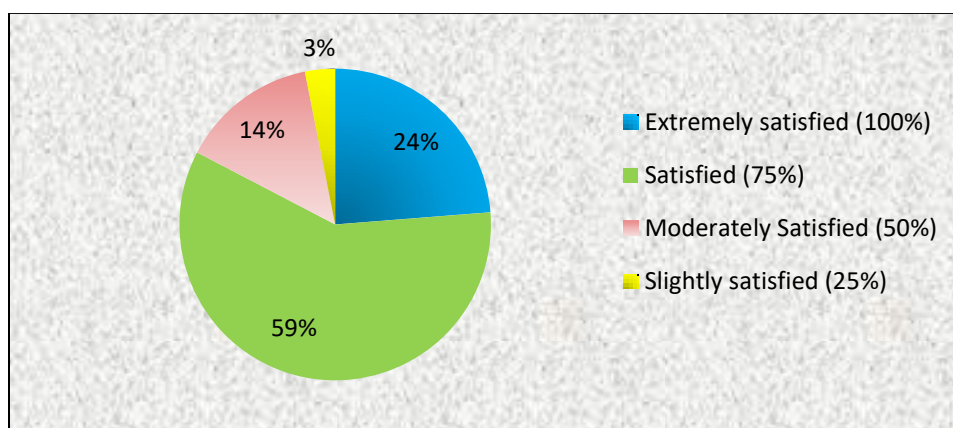
Graph 7: Level of satisfaction in using e-resources

It is observed from Graph 7 that as described the level of satisfaction of users in using e-resources, the percentage of majority of users are 'satisfied' (59%). There are 24% percent of 'Extremely Satisfied'. There are less percentage of 'Moderately Satisfied' (14%) and Slightly Satisfied (3%).

FINDINGS

- Tables and statistics above show how the respondents' academic standing was taken into account when analysing the data collected for the purpose of visiting the library. According to the respondent's academic standing, the most common reasons for visiting the library were for research work (58%) and using e-resources for exams (67%)

among other reasons. To getting current information (44%) and for keeping up-to-date in their subject area (43%) are also purpose of visit the library by the students and faculty members of the college. To access e-resources subscribed by the library is one of the purposes of the majority of faculty members and students to visit the library. For Reading/writing research papers (52%), the library is the important source of the required information in the form of printed and e-resources. Internet facility is one of the services provided by the academic library to the students and faculty members. To browse the internet is one of the purposes to visit the library.

- The study found that, 276(43%) respondents use Printed material. (60%) UG students use Printed material. In case of Research Scholars 33% use web sources, 18% use E-resources and 12% use both print and electronic version. (34%) Faculty use mainly e-resources and 24% are also using both printed and electronic resources from their library. The present libraries are in between the stage from traditional to modern and in this age of digital information the users are equally attached to traditional sources of information. It is found that majority of the users still prefer to use print format as compare to e-resources. Some respondents (students and faculty members) use both print as well as electronic resources for the required information.

- Analysis indicates various problems faced by respondents while accessing the e-resources. This study found that respondents faced types of problems in accessing the e-resources provided by the library "Always" frequency percentages, It is time consuming and wastes a lot of my time 32(5%), Space not enough 48(8%), Lack of IT knowledge to effectively use the services 54(8%), Working hours of the library 37(6%), Obsolete books 174(27%), Power outage 35(5%), Poor organization of material on shelves 72(11%), Insufficient internet access points 135(21%), Insufficient E-Resource's collection 203(32%), Inadequate network infrastructure 43(7%), No separate E-Resources access section 32(5%), Limited number of computers to access E-Resources 116(18%), Slow internet speed 93(15%), Lack of remote access facility 207(32%), Lack of staff for help 243(38%), Lack of awareness about E-Resources 227(36%)

- The result revealed concerning user satisfaction with the utilization of electronic resources that, the percentage of majority of users are 'satisfied' (59%). There are 24% percent of 'Extremely Satisfied'. There are less percentage of 'Moderately Satisfied' (14%) and Slightly Satisfied (3%).

SUGGESTIONS

The following recommendations are offered in light of the study's findings:

- By creating infrastructural facilities for electronic resources, it is necessary to remove barriers from the information-seeking process.
- The availability of electronic materials in college libraries needs to be improved.
- A unique training curriculum and seminars are required for all categories of college users with respect to different aspects.
- According to respondents, library staff members need to build a more practical and service-oriented approach by making their innovative abilities available at service points.
- To ensure that the correct information is met, users must be trained in the usage of the catalogue, indexes, content pages, and Boolean operators.
- The study's findings indicate that there is a lack of a proper book arrangement on the shelves; as a result, libraries should make sure that books are arranged properly by routinely reshelving the papers.
- According to reports, the Degree College libraries' responders do not have special resources for researchers. Apart from the library must enhance its resources and improve its reading room, reprography, printing, and network capabilities. The study suggests that research scholars should have a private reading area and seating area in order to create a comfortable physical environment.

CONCLUSION

The outcomes of the research demonstrate that the rapid development of electronic resources and information and communication technologies has changed the nature of scholarly information research, retrieval, storage and dissemination. Users must use a variety of electronic and online resources to find pertinent information. According to the study, using electronic resources has greatly impacted university and college library users as well as faculty and students in order conducting their own research. Libraries should first create guidelines and policies before offering e-resource access and online information. Second, they should build local area networks, acquire software and hardware, create content through digitization etc.

Additionally, the libraries must to implement a suitable plan for maintaining the e-collections for future access and usage. The right user interface will make it simple to provide customers with information services. Libraries need to take the necessary prerequisite actions in order

to keep up with the current trends in information demands and keep up with developing technical features. Libraries should be self-sufficient, digital and automated in order to improve how users access electronic information. To ensure their success in the future, they should create both qualitative and quantitative electronic collections. When it comes to achieving personal research goals, the usage of e-resources is becoming more and more expansive. It is determined that in order satisfy the needs of the Institute's users, the college management and Government must focus on creating and maintain e-libraries.

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कौटिल्य का "अर्थशास्त्र" और आधुनिक अर्थशास्त्र

विनायक कुमार उपाध्याय एवं अभिजात ओझा

इतिहास विभाग, नेहरू ग्राम भारती (मानित विश्वविद्यालय), कोटवा जमुनीपुर, दुबावल, प्रयागराज, उ0प्र0

सारांश

कौटिल्य का 'अर्थशास्त्र' मूलतः राज्य प्रबंधन की एक पुस्तक है। अर्थशास्त्र को 15 अधिकरणों या पुस्तक शीर्षकों में विभाजित किया गया है। इनमें से पहले पांच अधिकरण आंतरिक प्रशासन से संबंधित हैं, अगले आठ अधिकरण पड़ोसी राज्यों के साथ संबंधों से और शेष दो विविध चरित्र की हैं। कौटिल्य का अर्थशास्त्र दो व्यापक उद्देश्यों पर जोर देता हैः संसाधनों का अधिकतम उपयोग और उनका सर्वोत्तम प्रबंधन। यह लेख उनके चौथी सदी ईसा पूर्व में सुझाए गए आर्थिक विचारों और उनके आधुनिक दिनों में अनुप्रयोग को जोड़ने का एक प्रयास है। पूरे अध्ययन से पता चलता है कि कौटिल्य के आर्थिक विचार कुछ वैज्ञानिक सिद्धांतों पर आधारित हैं। अर्थशास्त्र राज्य प्रबंधन के लिए दिशानिर्देश निर्धारित करने की एक महान अभिव्यक्ति है। उनके आर्थिक विचार आज भी प्रासंगिक हैं। इसलिए, इस महान दार्शनिक और राजनेता का आर्थिक विचारों के इतिहास के रत्नों में एक प्रमुख स्थान होना चाहिए।

मुख्य शब्दः *अर्थशास्त्र, प्रबंधन, प्रशासन, संसाधन, अधिकतमकरण।*

1. परिचय

कौटिल्य, जिन्हें विष्णुगुप्त और चाणक्य के नाम से भी जाना जाता है, अरस्तू के समकालीन तथा एक शिक्षक थे। उनकी प्रसिद्ध पुस्तक 'अर्थशास्त्र' मूल रूप से राज्य प्रबंधन की एक पुस्तक है और धन के अधिग्रहण और संरक्षण के साधनों का मार्गदर्शन करती है। हालाँकि उनके कार्य की सटीक तिथि के बारे में कोई सर्वसम्मति नहीं है, अधिकांश विद्वानों ने उन्हें चौथी शताब्दी ईसा पूर्व में महान भारतीय सम्राट चंद्रगुप्त मौर्य के युग में रखा है, जिन्हें लंबे समय तक भारत पर शासन करने का श्रेय प्राप्त है। प्रासंगिक साहित्य की समीक्षा के अनुसार, कौटिल्य ने चंद्रगुप्त के राज्य में मंत्री के रूप में कार्य किया और राज्य प्रशासन में महत्वपूर्ण भूमिका निभाई। यह भी कहा जाता है कि उन्होंने नंद वंश के अत्याचार से राज्य को मुक्त कराने में प्रभावशाली भूमिका निभाई।

कौटिल्य की प्रसिद्ध पुस्तक 'अर्थशास्त्र' केवल धन या मुद्रा के सिद्धांतों पर आधारित पुस्तक नहीं थी, जैसे कि पश्चिमी आर्थिक विचारकों की पुस्तकें होती हैं। कौटिल्य ने धन शब्द को बहुत व्यापक अर्थ में लिया। कौटिल्य के अनुसार, राज्य की संप्रभुता बनाए रखने के लिए धन आवश्यक है, लेकिन धन का प्रबंधन, आधुनिक शब्दों में संसाधन प्रबंधन, सम्राट की संप्रभुता को बनाए रखने के लिए उतना ही महत्वपूर्ण है। कौटिल्य ने उल्लेख किया है कि राजा द्वारा अपनी प्रजा को खुश रखना चाहिए और किसी आपातकालीन स्थिति को छोड़कर कोई अत्याचारी नियम नहीं लागू करना चाहिए

(सरकार, 2000)। उन्होंने अन्य स्थान पर भी कहा है कि एक मजबूत सम्राट भी अपनी प्रजा के खुशहाल और समृद्ध हुए बिना संतुष्ट नहीं रह सकता, लेकिन साथ ही उनका मानना था कि एक मजबूत और समृद्ध राज्य अन्य राजाओं के आक्रमण से अपने लोगों के हितों की रक्षा करने की स्थिति में होगा।

इसलिए, कौटिल्य का अर्थशास्त्र दो व्यापक उद्देश्यों पर जोर देता है: संसाधनों का अधिकतम उपयोग और उनका सर्वोत्तम प्रबंधन, जो संसाधनों के संग्रहण के तरीकों को इंगित करता है, जिससे आर्थिक प्रोत्साहनों को समाप्त किए बिना अधिकतम समृद्धि प्राप्त की जा सके। हालांकि उन्होंने आर्थिक सिद्धांतों को विशेष रूप से स्पष्ट नहीं किया, लेकिन उनके राज्य संचालन के सिद्धांतों को निर्धारित करने के दृष्टिकोण ने आधुनिक अर्थशास्त्रियों को यह एहसास कराया कि वह कुछ मौलिक आर्थिक विचारों से भली–भांति परिचित थे।

2. "अर्थशास्त्र" की संक्षिप्त समीक्षा :

कौटिल्य का 'अर्थशास्त्र' पंद्रह अधिकरणों या पुस्तकों में विभाजित है। इनमें से पहले पाँच अधिकरण आंतरिक प्रशासन से संबंधित हैं, अगले आठ अधिकरण सीमा से सटे राज्यों के साथ संबंधों से और शेष दो अधिकरण विविध चरित्र के हैं।

अधिकरण 1 राजा के विषय में है – उसका प्रशिक्षण, राज्य के अन्य अधिकारियों की नियुक्ति, राजा द्वारा अनुसरण की जाने वाली दैनिक दिनचर्या और उसकी सुरक्षा। अधिकरण 2 राज्य के विभिन्न कार्यकारी अधिकारियों के कर्तव्यों का वर्णन करती है और खेल, खनन, और अन्य स्वतंत्र गतिविधियों में राज्य की गतिविधियों का पूरा चित्रण देती है। अधिकरण 3 कानून और न्याय प्रशासन से संबंधित है, सम्पूर्ण कानूनी संहिता का पुनर्जीवन करती है। अधिकरण 4 अपराध का दमन, और अपराध की पहचान, व्यापारियों और कारीगरों पर नियंत्रण, अपराध और दंड के संबंध में अनुभाग शामिल है। अधिकरण 5 अधिकारियों के वेतन जैसे विषयों का संग्रह है।

अधिकरण 6 दो अध्यायों से मिलती है। पहला अध्याय एक राज्य के गठन तत्वों के सिद्धांत की कल्पना करता है और दूसरा विदेश नीति के सिद्धांत की कल्पना करता है।

अधिकरण 7 विदेश नीति के प्रत्येक छह विधियों के प्रति विस्तृत चर्चा को शामिल करता है, जो विदेश नीति के प्रबंधन में उत्पन्न होने वाले विभिन्न परिस्थितियों में कैसे प्रयोग किए जा सकते हैं। अधिकरण 8 व्यसनों से सम्बन्धित है, जिसे आमतौर पर विपरीतता के रूप में व्याख्या किया जाता है, जो पूरे प्रणाली के कार्य को अस्थिर कर सकते हैं। अधिकरण 9 युद्ध के लिए तैयारियों पर प्रकाश डालती है और इसमें इस प्रकार की बातें शामिल हैं: जिन प्रकार की सेनाएं तैनात की जा सकती हैं, एक अभियान शुरू करने के लिए उचित स्थिति, और शुरू करने से पहले सावधानी की जानी चाहिए। अधिकरण 10 लड़ाई के संबंध में है और मुख्य युद्ध शिविर, युद्ध के विभिन्न प्रकार और विभिन्न युद्ध के मोड का वर्णन करती है। अधिकरण 11 का केवल एक अध्याय है, जो विजेता को व्यापक रूप से समझाता है कि उसे एकल राजा की जगह समूह द्वारा प्रशासित होना चाहिए। अधिकरण 12 यह जाँचता है कि जब एक कमजोर राजा को एक शक्तिशाली राजा द्वारा संकट में डाल दिया जाता है, तो उसे कैसे उस शक्तिशाली राजा की योजनाओं को विफल करना चाहिए और अंततः उसे हरा देना चाहिए। अधिकरण 13 युद्धाभ्यास या युद्ध से दुश्मन के किले का विजय करने से सम्बन्धित है।

अधिकरण 14 गुप्त और रहस्यमय प्रथाओ से संबंधित है, और अंतिम पुस्तक प्रक्रिया और कार्य में प्रयुक्त तर्कसंगत तरीके को शामिल करती है। हालाँकि कुछ अध्यायों का स्थान अनिवार्य रूप से तार्किक नहीं लग सकता है, लेकिन मोटे तौर पर यह कहा जा सकता है कि पहले पाँच पुस्तकें आंतरिक प्रशासन से सम्बन्धित हैं और अंतिम आठ पुस्तकों में राज्य का अपने पड़ोसियों के साथ संबंधों पर चर्चा होती है (रंगराजन, 1992)।

3. कौटिल्य का अर्थशास्त्र और आधुनिक अर्थशास्त्र

i. मांग और आपूर्ति :

कौटिल्य आधुनिक युग के मांग और आपूर्ति के मुख्य आर्थिक सिद्धांतों और उनके मूल्य निर्धारण पर संयुक्त प्रभाव से भली–भांति परिचित थे। उनके विचार में, एक राजा को किसी उत्पाद का मूल्य उसकी आपूर्ति और मांग की स्थिति को ध्यान में रखे बिना मनमाने तरीके से निर्धारित नहीं करना चाहिए। मांग और आपूर्ति पर उचित विचार किए बिना मूल्य को संतुलित मूल्य नहीं कहा जा सकता, जो उपभोक्ताओं और उत्पादकों की भलाई को अधिकतम न कर सके। यह विचार आधुनिक अर्थशास्त्र के जनक एडम स्मिथ के 'अदृश्य हाथ' के सिद्धांत से काफी मिलता–जुलता है। कौटिल्य भी एकाधिकार तत्वों से अवगत थे और इसलिए उन्होंने ऐसे लाभ की सीमा निर्धारित करने का प्रयास किया जो दोनों का ध्यान रखे। व्यापारियों को उनके व्यापार संचालन में 5 से 10 प्रतिशत लाभ की अनुमति थी (सरकार, 2000)। कौटिल्य के युग में राज्य–स्वामित्व वाले और निजी व्यवसाय दोनों का अस्तित्व देखा गया था। इसलिए, उनके बीच हितों का टकराव स्वाभाविक है। लेकिन उन्होंने इस प्रकार के टकराव को दूर करने के लिए ऐसी नीति का सुझाव दिया जिससे कीमतों में कुछ समानता सुनिश्चित की जा सके ताकि निजी क्षेत्र के प्रोत्साहन को बाधित न किया जाए। कौटिल्य के अनुसार, राज्य को उत्पादन की लागत, आपूर्ति और मांग का अनुपात, और उचित लाभ स्तर को ध्यान में रखे बिना कीमतें निर्धारित नहीं करनी चाहिए। अधिक उत्पादन की स्थिति में राज्य से यह अपेक्षा की जाती थी कि वह हस्तक्षेप करे और उत्पाद की बिक्री का केंद्रीकरण करे, ताकि कीमत एक निश्चित न्यूनतम स्तर से नीचे न गिरे, जिसे आज के समय में मूल्य तल (प्राइस फ्लोर) के रूप में जाना जाता है (कांगले, 1960)।

ii. अंतरराष्ट्रीय व्यापार :

रिकार्डो और अन्य आधुनिक पश्चिमी अर्थशास्त्रियों की तरह, कौटिल्य को भी अंतर्राष्ट्रीय व्यापार के लाभों पर दृढ़ विश्वास था। उनका मानना था कि विदेशी व्यापार व्यापारिक देशों की समृद्धि को बढ़ा सकता है। उन्होंने विदेशी व्यापार को प्रबल रूप से प्रोत्साहित किया और विशेषज्ञों को विदेशी बाजारों का अध्ययन करने के लिए भेजा, ताकि वस्तुओं को निर्यात योग्य और आयात योग्य समूहों में वर्गीकृत किया जा सके। उन्होंने विदेशी व्यापार को प्रोत्साहित करके अधिक उपभोग की संभावना और आर्थिक लाभ की परिकल्पना की। हालाँकि, कौटिल्य के शासनकाल में विदेशी व्यापार प्रतिबंधित था।

iii. ब्याज और लाभ (जोखिम, अनिश्चितता और उत्पादकता सम्बन्धी कार्य) :

कौटिल्य ने लाभ और ब्याज के स्तरों में जोखिम और अनिश्चितता को शामिल किया। उन्होंने संकेत दिया कि उच्च जोखिम और अनिश्चितता का प्रतिफल उच्च लाभ और ब्याज के रूप में मिलना चाहिए। उन्होंने आयातित वस्तुओं पर अनुमत लाभ घरेलू वस्तुओं की तुलना में दोगुना निर्धारित किया। आयातित वस्तुओं पर अनुमत लाभ 10

प्रतिशत था, जबकि घरेलू उत्पादों पर यह 5 प्रतिशत था। इसका कारण स्पष्ट था। उन दिनों, विदेशी वस्तुओं के आयातकों को अन्य राज्यों से उत्पादों के शिपमेंट के समय लूटे जाने और डकैती का बड़ा खतरा उठाना पड़ता था (सेन, 1967)। कौटिल्य का लाभ का सिद्धांत आधुनिक युग के नाइट के लाभ सिद्धांत के समान है, जो कहता है कि लाभ अनिश्चितता का प्रतिफल है। कौटिल्य ने ऋण पर ब्याज वसूलने का समर्थन किया, लेकिन ब्याज दर राज्य द्वारा नियंत्रित की जाती थी। उनके अनुसार, ब्याज दर का निर्धारण दो कारकों पर होना चाहिए – संबंधित जोखिम और पूंजी की उत्पादकता। व्यापारियों के लिए ब्याज दर अधिक थी, जबकि व्यक्तिगत उद्देश्यों, जैसे विवाह या अंतिम संस्कार आदि के लिए यह दर कम थी। इसके अलावा, विभिन्न प्रकार के व्यापारों के लिए ब्याज दरें उद्यम के जोखिम के आधार पर अलग–अलग थीं। इसलिए देखा गया कि ब्याज दर का निर्धारण जोखिम और ऋण की उत्पादकता, दोनों तत्वों को ध्यान में रखता था। ब्याज भुगतान में मानवीय पहलू भी देखा गया। कुछ समूहों, जैसे भुगतान करने में असमर्थ लोग, छात्र आदि, को विशेष छूट मिलती थी। हालांकि, उन्हें ऐसी छूट प्राप्त करने के लिए उचित कानूनी प्रणाली से गुजरना पड़ता था। इसलिए, ऋण के उद्देश्य के आधार पर भिन्न–भिन्न ब्याज दर संरचना उस समय प्रचलित थी, जो आधुनिक युग के बैंकों और वित्तीय संस्थानों की उधार और ऋण प्रणाली के बहुत ही समान है (सरकार, 2000)।

iv.   कर संरचना :

कौटिल्य का अर्थशास्त्र आर्थिक, राजनीतिक और प्रशासनिक समस्याओं के समाधान के लिए एक बहुत ही अच्छी वित्तीय समझदारी दिखाता है। उन्होंने राज्य की कराधान शक्ति को सीमित करने और करों को न्यायसंगत और उचित होने की वकालत की। उनके अनुसार कर भारी और अत्यधिक नहीं होना चाहिए। उन्होंने सुझाव दिया कि कर दरें आर्थिक गतिविधियों का 16 प्रतिशत से 20 प्रतिशत (1/6 या 1/5) से अधिक नहीं होनी चाहिए। वह जानते थे कि एक निश्चित सीमा से अधिक कर आर्थिक गतिविधियों को बाधित करेगा और कर चोरी को प्रोत्साहित कर सकता है। हालांकि, उन्होंने कुछ वस्तुओं या सेवाओं के लिए 50 प्रतिशत या उससे अधिक की कर दर की सलाह दी, जो स्वभाव में समाज के लिए हानिकारक थीं। इसके अलावा, यह उल्लेखनीय है कि अधिकांश कर भूमि और विभिन्न वस्तुओं पर लगाए जाते थे। आयकर का अस्तित्व शायद ही पाया जाता था, सिवाय गायक, नर्तक, वेश्याएं, पड़ोसी राज्यों के जासूस आदि के। ऐसे मामलों में उनकी आय पर कर 50 प्रतिशत या उससे अधिक था। कर की मध्यम दर, जैसे 16–20 प्रतिशत, कर चोरी और काले धन से बचने के लिए एक समझदार नीति थी (मेहता, 1998)। इस प्रकार यह देखा जाता है कि कौटिल्य की कर की अवधारणा आधुनिक प्रगतिशील प्रत्यक्ष कर संरचना प्रणाली के काफी समान है। आज भी कई विकासशील देश कृषि भूमि पर कर की छूट की अवधारणा का पालन करते हैं। समाज के लिए हानिकारक वस्तुओं पर उच्च करों की उनकी अवधारणा आज भी प्रासंगिक है। आज की दुनिया में भी अधिकांश देश सिगरेट, शराब आदि जैसी समाज के लिए हानिकारक वस्तुओं पर भारी कर बोझ की नीति का पालन करते हैं।

कौटिल्य ने अपने अर्थशास्त्र में कर प्रशासन, कर संरचना और कराधान के उद्देश्य से संबंधित कर प्रणाली के बारे में विस्तृत रूपरेखा प्रस्तुत की है।

अपने ग्रंथों में, कौटिल्य ने राज्य के समग्र प्रशासन के लिए अठारह मंत्रियों की आवश्यकता का उल्लेख किया। इनमें से दो मंत्री कर विभाग (शुल्क) के प्रभारी थे।

''अथर्ववेद'' में 'शुल्क' शब्द का उपयोग सामान्य अर्थ में कर के रूप में किया गया था (अथर्ववेद 11, 29.3) जिसे व्यापारियों द्वारा भुगतान किया जाता था। कौटिल्य ने कर या राजस्व मंत्रालय को चलाने के लिए 'समाहर्ता' और 'सन्निधाता' का उपयोग किया। समाहर्ता को कर संग्रह और अन्य राजस्व का प्रमुख माना जाता था। समाहर्ता भूमि से सकल आय और शुल्क राजस्व के गठन के तरीकों की निगरानी के लिए भी जिम्मेदार था। दूसरी ओर, सन्निधाता की जिम्मेदारियाँ 'पण्यगृह' (राज्य द्वारा उत्पादित वस्तुओं के भंडारण के लिए गोदाम) और 'कोष्ठागार' (खाद्य उत्पादन के भंडारण के लिए गोदाम) के निर्माण और रखरखाव की थीं। उन्होंने 'शुल्काध्यक्ष' का भी उल्लेख किया, जो शुल्क विभाग का प्रमुख था। इस प्रकार यह स्पष्ट है कि उन दिनों कर लगाना और संग्रहण प्रणाली बहुत ही उत्कृष्ट थी (सेन, 1999)। बजट के मामले में वह अधिशेष बजट के पक्षधर थे। उन्होंने बताया कि यदि एक राजा राज्य की आय और व्यय के संतुलन पर कड़ी नजर रखता है, तो वह कभी वित्तीय संकट का सामना नहीं करेगा (अर्थशास्त्र 5–2)। इसके अलावा, पर्याप्त खजाना भी राज्य की संप्रभुता के सात तत्वों में से एक माना जाता था (ठाकुर और साह, 2004)।

कौटिल्य ने खुफिया विभाग के भूमिका पर भी जोर दिया। उनके अनुसार, केवल प्रशासनिक अधिकारियों के साथ एक साम्राज्य सफल नहीं हो सकता। अर्थशास्त्र में उन्होंने उल्लेख किया कि खुफिया विभाग आर्थिक अपराधों को रोकने के लिए जिम्मेदार था। उन्हें बजट के खर्च की ओर भी चिंता थी। उन्होंने सुझाव दिया कि राज्य का कुल वेतन बिल राजस्व के एक–चौथाई से अधिक नहीं होना चाहिए। उन्होंने कौशल, काम की गुणवत्ता और नौकरियों के स्वभाव के आधार पर विभिन्न वेतन दरों का समर्थन किया। अर्थशास्त्र में आर्थिक, सामाजिक और राजनीतिक कारकों के वास्तविक अवधारणाओं और ज्ञान के आधार पर एक वेतन नीति को संरचित करने का एक निश्चित प्रयास था। (सरकार, 2000)।

4. निष्कर्ष :

कौटिल्य के आर्थशास्त्र का पूरा वर्णन दिखाता है कि उनके आर्थिक विचार कुछ वैज्ञानिक सिद्धांतों पर आधारित है। अर्थशास्त्र राज्य प्रबंधन के लिए दिशानिर्देश निर्धारित करने कि एक महान अभिव्यक्ति है। चौथी शताब्दी ई. पू. में उन्होंने अनुभव किया कि आर्थिक विचारों को किसी भी राज्य की किसी भी सामाजिक समस्या का समाधान ढूंढने में अलग नहीं किया जा सकता। हालांकि, एडम स्मिथ और अन्य पश्चिमी अर्थशास्त्रीयों की तरह, कौटिल्य ने सीधे अर्थशास्त्र पर कोई पुस्तक नहीं लिखी थी, लेकिन उन्होंने अपने आर्थिक दर्शन को राज्य की गतिविधियों के प्रबंधन में व्यक्त किया है जो विचारों के साथ साथ आधुनिक दिनों के कई आर्थिक दार्शनिकों के सोच के बराबर महत्वपूर्ण है। इसलिए, इस महान दार्शनिक और राजनीतिज्ञ को आर्थिक विचारो के इतिहास के रत्नों में एक प्रमुख स्थान होना चाहिए।

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मनुस्मृति में पर्यावरणीय चेतना

अरविन्द कुमार एवं बीरेन्द्र मणि त्रिपाठी

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सारांश

प्राचीन भारतीय ग्रंथों में मनुस्मृतिः एक सामाजिक, धार्मिक, राजनैतिक दृष्टि से महत्वपूर्ण ग्रंथ होने को साथ–साथ पर्यावरणीय चेतना से भी युक्त ग्रंथ है। इसमें सृष्टि की उत्पत्ति संबंधी वर्णन प्राप्त होता है और जीवों की उत्पत्ति में जल की भूमिका को महत्वपूर्ण माना गया है। जल को ईश्वर के द्वारा निर्मित और उसके रहने के स्थान के रूप में वर्णित कर इसके महत्व से परिचित कराने का प्रयास भी किया गया है। मनुस्मृति में पर्यावरण में निहित भौतिक तत्वों अग्नि तथा वायु के महत्व से संबंधित वर्णन प्राप्त होता है। मनुस्मृति में ब्रह्माण्ड, सूर्य, तारे, नदियों, पर्वतों के भी वर्णन प्राप्त होते है। सरस्वती नदी, दृष्द्वती नदी, ब्रह्यावर्त जैसे भौगोलिक क्षेत्रों का भी वर्णन प्राप्त होता है। आर्यावर्त के विषय में वर्णन भी प्राप्त होता है और मध्यदेश का वर्णन और उसकी भौगोलिक सीमाओं का उल्लेख है। मनुस्मृति में अहिंसा तथा जनकल्याण के भाव भी निहित हैं जो की पर्यावरणीय चेतना के आवश्यक अंश है। इसके साथ–साथ मनुस्मृति में जीवों के व्यवहार से प्रेरणा लेकर कर व्यवस्था, और राजा के लिए आचार–व्यवहार हेतु उपयोगी निर्देश भी दिये गये हैं। जो जन कल्याणकारी विचार वाले राजा के लिए लाभप्रद हैं। इस प्रकार मनुस्मृति में पर्यावरणीय चेतना के तत्व समाहित हैं जो वर्तमान में भी प्रासंगिक हैं।

मुख्य शब्द : *चेतना, पर्यावरण, सृष्टि, अहिंसा, कर*

प्राचीन भारतीय इतिहास जानने के प्रमुख स्रोतों में जिन महत्वपूर्ण ग्रंथों को समाहित किया जाता है उसमें से मनुस्मृति एक ऐसा ग्रंथ है जिसमें प्राचीन भारतीय समाज के विषय में विभिन्न महत्वपूर्ण पक्षों की जानकारी समाहित है। मनुस्मृति में पर्यावरणीय महत्व की कई जानकारियाँ प्राप्त होती हैं जिससे तत्कालीन पर्यावरणीय चेतना के विषय में अनुमान लगाया जा सकता है। मनुस्मृति में कुल बारह अध्याय हैं और इसमें 2694 श्लोक हैं। इन श्लोकों में से कई में पर्यावरणीय चेतना के विकास का दर्शाने वाले महत्वपूर्ण तत्वों का समावेश प्राप्त होता है। मनुस्मृति में पर्यावरणीय जीव जन्तुओं के प्रति संवेदना से युक्त व्यवहार को समर्थन प्रदान किया गया है। मनुस्मृति में पर्यावरणीय संतुलन को बनाए रखने के विषय में सकारात्मक दृष्टि से युक्त विचारों को अभिव्यक्त किया गया है। मनुस्मृति सामाजिक और आर्थिक व्यवस्था से संबंधित विचारों को पर्यावरणीय विकास के साथ ही सुव्यवस्थित करने पर जोर देती है। मनुस्मृति से प्राप्त होने वाली जानकारियाँ मनुस्मृति के रचना काल के समाज तथा राज्य से भी सम्बन्धित है। मनुस्मृति का रचना काल द्वितीय शताब्दी ई0पू0 से द्वितीय शताब्दी ई0 तक माना जाता है। इस ग्रंथ से द्वितीय शताब्दी ई0पू0 से द्वितीय शताब्दी तक के कालखण्ड में

व्याप्त पर्यावरणीय चेतना के विषय में जानकारी प्राप्त होती है। मनुस्मृति में पहले अध्याय में ही वर्णन प्राप्त होता है कि—

सोऽभिध्याय शरीरात्स्वात्सिमृक्षुर्विविधाः प्रजाः।

आप एव ससर्जादौ तासु बीजमवासृजत्।।[1]

उपरोक्त श्लोक में सृष्टि के रचना को विषयमें वर्णन करते हुये कहा गया है की उस (ईश्वर) द्वारा कई प्रकार की प्रजा को उत्पन्न करने हेतु अपने शरीर से सर्वप्रथम जल को उत्पन्न किया गया था और उसी जल में बीज को डाला गया था।

पर्यावरण में रूचि रखने वाला हृदय तथा मन (मस्तिष्क) यह अवश्य विचार करता है कि इस सृष्टि की उत्पत्ति कैसे हुई? इसी जिज्ञासा के कारण विभिन्न विचार तथा परिकल्पनाएं मानव को प्राप्त हुई जिसमें से (वर्तमान काल में भी) जीवन की उत्पत्ति को 'जल' में मानने वाली विचारधारा अधिक वैज्ञानिक दृष्टिकोण से युक्त प्रतीत होती है। मनुस्मृति का उपरोक्त श्लोक भी इसी वैज्ञानिक दृष्टि के अधिक निकट (समीप) है क्योंकि इसमें भी जीवन की उत्पत्ति को जल के अन्दर ही बताया गया है जो कि पर्यावरण के प्रति वैज्ञानिकता से युक्त दृष्टिकोण को दर्शाता है। मनुस्मृति में ही इसी तथ्य को और अधिक स्पष्ट करते हुये एक श्लोक उल्लिखित है जिसमें कहा गया है कि—

आपो नारा इति प्रोक्ता आपो वै नरसूनवः

ता यदस्यायनं पूर्व तेन नारायणः स्मृत।।[2]

उपरोक्त श्लोक में वर्णन आया है कि जल जिसे ''नार'' कहते हैं। ऐसा इसलिए कहते हैं क्योंकि वो 'नर' (परमात्मा का ही रूप) से उत्पन्न हुआ है। यह जल परमात्मा का प्रथम वास स्थान के रूप में जाना जाता है। यही कारण है कि परमात्मा को ''नारायण'' भी कहा जाता है। उपरोक्त श्लोक से यह स्पष्ट होता है कि जल से ही जीवन की उत्पत्ति के साथ—साथ जल के महत्व को भी मनुस्मृति में वर्णित कर उसे समझाया भी गया। जल को परमात्मा का निवास स्थल भी माना गया जिससे जल को शुद्ध रखने, उसको रक्षित करने भाव स्वतः ही हृदय में उत्पन्न होना स्वाभाविक है। मनुस्मृति में इसी प्रकार पर्यावरण में व्याप्त भौतिक महत्व के तत्वों को उल्लिखित किया गया है इसी संदर्भ में मनुस्मृति को प्रथम अध्याय के तेइसवें श्लोक का उल्लेख आवश्यक है —

अग्निवायुरविभ्यस्तु त्रयं ब्रह्या सनातनम्।

दुदोह यझसिद्धयर्थमृग्यजुः सामलक्षणम्।।[3]

उपरोक्त श्लोक में यह वर्णित किया गया है कि ब्रह्या जी के द्वारा यज्ञ के सिद्धि को प्राप्ति हेतु ऋक्, यजु और साम जैसे सनातन वेदों का प्रकटीकरण क्रमशः अग्नि, पवन और सूर्य से किया था। अर्थात अग्नि से ऋग्वेद, पवन से यजुर्वेद और सूर्य से सामवेद को प्रकट किया। इस श्लोक से महत्वपूर्ण तथ्य यह प्रकट होता है कि सृष्टि जिन भौतिक तथा अभौतिक तत्वों को मेल या अंतःक्रिया से युक्त है उसके भौतिक तत्वों को भी महत्व (स्थान) मनुस्मृति में प्राप्त हुआ है जो अग्नि, पवन, सूर्य के रूप में वर्णित है। अग्नि, पवन, सूर्य के महत्व से परिचित होना पर्यावरणीय चेतना के विकास को प्रोत्साहित करने में सहायक है। इस प्रकार सृष्टि के निर्माण के विषय में जानकारी प्रदान करने वाले मनुस्मृति के निम्नांकित श्लोक में कहा गया है कि —

काल कालविभक्तीश्च नक्षत्राणि ग्रहास्तथा।

सरितः सागराञ्छैलान्समानि विषमाणि च।।[4]

अर्थात ब्रह्मा ने काल को निर्मित किया उसके बाद काल के विभाजन को बनाया और नक्षत्र, नदी, ग्रह, समुद्र, पर्वत को बनाया। मनुस्मृति में समय के विभाजन ओर ग्रह नक्षत्र का वर्णन स्पष्ट करता है की इस काल में मानव पृथ्वी और पृथ्वी के इतर ब्रह्माण्ड के प्रति भी जिज्ञासु था। मनु स्मृति में भारत के भौगोलिक प्रदेशों का भी वर्णन प्राप्त होता है जैसे –

सरस्वती दृषद्वत्योर्देवनधोर्यदन्तरम्।

तं देवनिर्मितं देशं ब्रह्मावर्त प्रचक्षते।।[5]

उपरोक्त श्लोक में कहा गया है कि सरस्वती नदी और दृषद्वती नदी के बीच का प्रदेश देवताओं के द्वारा बनाया हुआ है इसको ब्रह्मावर्त कहा जाता है। उपरोक्त श्लोक में पर्यावरणीय महत्व का तथ्य यह है कि दो नदियों के मध्य का यह प्रदेश इतना महत्वपूर्ण था कि इसे देवताओं के द्वारा निर्मित बताकर इसके उपजाऊ तथा महत्व से परिचित कराया गया है। मनु स्मृति के दूसरे अध्याय के उन्नीसवे श्लोक में ही इस ब्रह्मवर्त क्षेत्र के महत्वपूर्ण जनपदों का भी उल्लेख मिलता है। ब्रह्मवर्त के अन्तर्गत आने वाले जनपदों में कुरू, मत्स्य, पांचाल, सूरसेन बताए गए हैं। मनु स्मृति में मध्यदेश के विषय में उल्लेख करते हुये उसकी सीमाओं का भी वर्णन प्राप्त होता है जो कि निम्नांकित है:–

हिमवद्विन्ध्ययोर्मध्यं यत्प्राग्विनशनादपि।

प्रत्यगेव प्रयागाच्च मध्यदेशः प्रकीर्तितः।।[6]

उपरोक्त श्लोक में यह वर्णित है कि विन्ध्याचल और हिमवान (हिमालय) के मध्य, प्रयाग के पश्चिम में और कुरूक्षेत्र के पूर्व का देश मध्यदेश कहा गया है। इस प्रकार के भौगोलिक क्षेत्रों का मनुस्मृति में वर्णन तथा मध्यदेश की भौगोलिक सीमाओं का अंकन करना यह स्पष्ट करता है कि पर्यावरण की दशाओं और भूआकृतियों के द्वारा पड़ने वाले प्रभावों से अवश्य वह परिचित रहे होगें। मध्यदेश एक महत्वपूर्ण क्षेत्र था जिसका उल्लेख फाहयान ने भी किया है। मनुस्मृति में रहने योग्य देश उसे बताया गया है जहाँ काले मृग पाये जाते हो इसका वर्णन मनुस्मृति के निम्नांकित श्लोक में प्राप्त होता है :–

कृष्णसारस्तु चरित मृगो यत्र स्वभावतः।

स ज्ञेयों यज्ञियो देशो म्लेच्छदेशस्त्वतः पर।।[7]

मनुस्मृति के दूसरे अध्याय में वर्णित है कि पूर्व में समुद्र से लेकर पश्चिम दिशा में समुद्र तक तथा दक्षिण में विंध्याचल पर्वत से उत्तर में हिमांचल पर्वत के बीच का भू–भाग आर्यवर्त कहा जाता है। मनुस्मृति का यह वर्णन प्राकृतिक स्थलाकृतियों तथा भू–आकृतियों सम्बन्धी उनके ज्ञान से परिचित कराने के साथ–साथ पर्यावरणीय चेतना के विकास हेतु तत्कालीन सजगता का समावेश भी दर्शाता है। इसके साथ ही काले मृग का वर्णन जो मनुस्मृति में है वहाँ उसे एक संकेतक के रूप में वर्णित किया गया है जिसका वहां के पर्यावरण में उपस्थित होने का अर्थ है की वह स्थल निवास के योग्य है। इसमें पर्यावरणीय महत्व का यह तथ्य निहित है की मनुस्मृति कालीन विद्वानों ने पर्यावरण में निहित कुछ उपयोगी संकेतों से परिचित हो गये थे। जो मानव के निवास

हेतु उपयुक्त पर्यावरणीय दशाओं की ओर संकेत करता था। ऐसा अवश्यसम्भावी प्रतीत होता है। मनुस्मृति में वर्णन प्राप्त होता है कि–

अहिंसयैव भूतानां कार्य श्रेयोऽनुशासनम्।

वाक्चैव मधुरा श्लक्ष्णा प्रयोज्या धर्ममिच्छता।।[8]

उपरोक्त श्लोक में मनु ने वर्णन किया है की धर्म के मार्ग का अनुशरण करने वाले या धर्म की इच्छा करने वाला मनुष्य जो भी शिक्षा देने को धर्म समझता है वह प्राणियों की अहिंसा से युक्त होने के साथ साथ उनके कल्याण से भी युक्त होनी चाहिए। उसे सर्वदा मीठी ओर कोमल वाणी का प्रयोग अपने बोल–चाल में करना चाहिए। यहाँ धर्म की ईच्छा का अर्थ इस बात की ओर संकेत करता है जिसमें सभी का कल्याण हो। ईच्छा का निर्माण संकल्प के कारण होता है। संकल्प जब धर्म के मार्गदर्शन से युक्त होता है तो वह जनकल्याण और अहिंसा से युक्त स्वतः हो जाता है। पर्यावरणीय चेतना के मन में वास करने पर या होने पर अहिंसा का भाव स्वतः उत्पन्न होना स्वाभाविक है जोकि व्यक्ति को कल्याण के पथ पर अग्रसर करने में सहायक सिद्ध होता है। मनु स्मृति में इसी प्रकार कुछ त्याग योग्य कार्यों तथा वस्तुओं का उल्लेख उसके दूसरे अध्याय में वर्णित है–

वर्जयेन्मधु मांसं च गन्धं माल्यं रसान्स्त्रियः।

शुक्तानि यानि सर्वाणि प्राणिनां चैव हिंसनम्।।[9]

उपरोक्त श्लोक में बताया गया है कि एक ब्रह्मचारी को किन वस्तुओं का त्याग कर देना चाहिए इसमें है शहद, सुगंधित वस्तु, फूलों का हार, मांस, रस, स्त्री, सिरके की भांति बनी हुई वस्तु, और प्राणियों के प्रति हिंसा को त्याग देना चाहिए।

वर्तमान विश्व में जब व्यक्ति को हिंसा से दूरी बनाने की सर्वाधिक अवश्यकता है क्योंकि हिंसा के सभी रूप मानव के कल्याण में बाधक है। अतः मानव को सभी प्राणियों के प्रति दया भाव और प्रेमभाव से युक्त होना चाहिए क्योंकि इससे विश्व में विभिन्न जीव सहजीविता के साथ जीवन और पर्यावरण को समृद्ध करेंगें। मात्र भोजन हेतु किसी जीव की हत्या असंवेदनशीलता को प्रकट करने के साथ–साथ अहिंसक मस्तिष्क को भी पोषण प्रदान करती है जो मानव के कल्याण में बाधक है। मनुस्मृति का उपरोक्त श्लोक वर्तमान विद्यार्थियों के साथ–साथ सामान्य मानव के लिए भी शिक्षाप्रद और प्रासांगिक है। मनुस्मृति में पर्यावरण में रहने वाले जीवों से प्रेरणा प्राप्त करने के उदाहरण भी प्रसंगवश उल्लिखित मिलते हैं जैसे की–

बकावच्चिन्तयेदर्थान्सिंहवच्च पराक्रमते।

वृकवच्चावलुम्पेत शशवच्च विनिष्पतेत्।।[10]

इस श्लोक में वर्णन आया है कि राजा को धन के विषय में चिंता उसी भाँति करना चाहिए जैसे बगुला करता है, राजा को पराक्रम को दिखाने के संबंध में शेर की तरह होना चाहिए और जब शत्रु के विनाश का समय आये तो उसका विनाश उसी प्रकार से करना चाहिए जैसे भेड़िये अपने शत्रु का विनाश करते हैं। इस प्रकार के वर्णन से हमें यह ज्ञात होता है कि मनु स्मृति में पर्यावरणीय चेतना का जो पक्ष वर्णित है वो पर्यावरणीय जीवन जन्तुओं में निहित गुणों से भी सीखता है।

इसी प्रकार से मनु स्मृति को सातवे अध्याय के 129 श्लोक में कर व्यवस्था के विषय में वर्णन करते हुये बताया गया है की कर को जनता से वसूलने के मामले में जोंक, बछड़ा, भौंरा से शिक्षा ग्रहण की जा सकती हैं।

उपरोक्त वर्णन से स्पष्ट है कि मनुस्मृति में व्यक्ति के सामाजिक, आर्थिक, धार्मिक, राजनीतिक पक्षों के विषय से भी पर्यावरणीय चेतना का प्रत्यक्ष या अप्रत्यक्ष संबंध है मनुस्मृति में पर्यावरणीय चेतना से युक्त जिन विषयों का वर्णन है वह मानव जीवन के लिए मार्गदर्शन और प्रेरणा प्रदान करते हैं।

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पर्यावरण संरक्षण में वैदिक यज्ञ की भूमिका

अवध नारायण द्विवेदी

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<u>सारांश</u>

वेदों में प्रकृति के स्वरूप, पर्यावरण संरचना और उसके स्वरूप के संबंध में विस्तृत विधान मिलता है। सार्वभौम संस्कृति के आदि स्रोत वेद में भौतिक एवं आध्यात्मिक दोनों ही दृष्टियों से पर्यावरण की शुद्धि हेतु यज्ञ जैसे साधनों का विधान किया गया है, जिसे अपनाकर संसार में सुखी एवं आनंदमय वातावरण बनाया जा सकता है और जिसकी भूमिका पर्यावरण संरक्षण में महत्वपूर्ण है। यज्ञ द्वारा अनेक लाभ प्राप्त किये जाते रहे हैं,जिनमें मुख्यतः भौतिक स्तर, आध्यात्मिक स्तर हैं, राष्ट्रीय स्तर की समस्याएँ हो, स्वास्थ्य संबंधी किसी भी रोग से ग्रसित हो, सभी में यज्ञ का प्रत्यक्ष लाभ हो सकता है। यज्ञ केवल कर्मकाण्ड तक ही नहीं अपितु जीवन दर्शन तक विस्तृत है। यज्ञों से हमें श्रेष्ठ कर्मों की प्रेरणा भी मिलती है तथा इन सभी तथ्यों का वर्णन वेदों में किया गया है किन्तु वर्तमान में हम इन वैदिक ज्ञान से पूर्णरूप से भिज्ञ नहीं है अतः आवश्यकता है कि हम वैदिक ज्ञान में निहित यज्ञ के स्वरूप से भलीभाँति परिचित हों। यज्ञ के चिकित्सकीय गुण एवं वातावरण शुद्धि के लाभ सर्वविदित हैं। यज्ञ से कामना सिद्धि के बहुत से उदाहरण शास्त्रों में वर्णित हैं। यह शोध पत्र इन्हीं उद्देश्यों को ध्यान में रखकर प्रस्तुत किया गया है।

मुख्य शब्द: *पर्यावरण, प्रदूषण, प्रकृति, संस्कृति, वैदिक, यज्ञ, स्वास्थ्य, संक्रमण, अग्नि, वायु आदि।*

परिचय :

'यज्ञ' भारतीय संस्कृति के अनुसार ऋषि-मुनियों द्वारा जगत को दी गई ऐसी महत्वपूर्ण देन है जिसे सर्वाधिक फलदायी एवं समस्त पर्यावरण केन्द्र 'इको सिस्टम' के ठीक बने रहने का आधार माना जा सकता है। ऋषियों ने 'अयं यज्ञो विश्वस्य भुवनस्य नाभिः' (अथर्ववेद 9.15.14) कहकर यज्ञ को संसार की सृष्टि का आधार बिंदु कहा है।

भारतीय संस्कृति वैदिक संस्कृति में पर्यावरण की अत्यधिक महत्ता रही है। भारत में वैदिक युग से ही पर्यावरण के प्रति जागरूकता रही है। हमारे ऋषि-मुनियों ने इसके महत्व को समझते हुए इसे प्रदूषित होने से बचाने के लिए अनेक उपाय किए। भारतीय संस्कृति का आधार वैदिक युग रहा है और उसका मूल स्रोत है-वेद। भारतीय संस्कृति में वैदिक यज्ञ की अपार महिमा निरूपित है। वेद सभी मनुष्यों के लिए यज्ञ करने का विधान करते हैं। ऋग्वेद में 'स्वाहा यज्ञं कृणोतन' कहकर ईश्वर ने स्वाहापूर्वक यज्ञ करने की आज्ञा दी है। ऋग्वेद में 'यज्ञेन वर्धत जातवेदसम्' कहकर यज्ञ से अग्नि को बढ़ाने की आज्ञा है। यजुर्वेद के मन्त्र में 'समिधाग्निं दुवस्यत

धृतैर्बोधयतातिथिम्' कहकर समिधा से अग्नि को पूजित करने व घृत से उस अग्निदेव अतिथि को जगाने की आज्ञा है। यजुर्वेद में 'सुसमिद्धाय शोचिषे घृतं तीव्रं जुहोतन' के द्वारा आज्ञा है कि सुप्रदीप्त अग्निज्वाला में तप्त घृत की आहुति दो। ॐ विश्वानि देव सवितुर्दुरितानि परासुव। यद्भद्रं तन्नासुव॥ (यजुर्वेद)। हे ईश्वर ! हमारे सारे दुर्गुणों को नष्ट कर दो और अच्छे गुण, कर्म और स्वभाव प्रदान करो। यज्ञ सामूहिकता का प्रतीक है। अन्य धर्म-प्रक्रियाएँ ऐसी हैं, जिन्हें कोई अकेला कर या करा सकता है,पर यज्ञ ऐसा कार्य है, जिसमें अधिक लोगों के सहयोग की आवश्यकता है। यज्ञ आयोजनों से सामूहिकता, सहकारिता और एकता की भावनाएँ विकसित होती हैं। यज्ञ भारतीय संस्कृति का पिता है। यज्ञ भारत की एक मान्य एवं प्राचीनतम वैदिक उपासना है। धार्मिक एकता एवं भावनात्मक एकता को लाने के लिए ऐसे आयोजनों की सर्वमान्य साधना का आश्रय लेना सब प्रकार दूरदर्शितापूर्ण है। वातावरण के परिशोधन के लिए स्वतंत्र रूप से भी यज्ञ आयोजन सम्पन्न किये जाते हैं। राष्ट्रीय वनस्पति अनुसंधान संस्थान द्वारा किए गए एक शोध में पता चला है कि यज्ञ और हवन के दौरान उठने वाले धुएं से वायु में मौजूद हानिकारक जीवाणु 94 प्रतिशत तक नष्ट हो जाते हैं। साथ ही इसके धुएं से वातावरण शुद्ध होता है और इससे बीमारी फैलने की आशंका काफी हद तक कम हो जाती है।

प्रत्येक भारतीय धर्मानुयायी को यज्ञ प्रक्रिया से परिचित होना ही चाहिए। मानव पर्यावरण और यज्ञ का परस्पर घनिष्ट संबंध प्रारंभ काल से चला आ रहा है। वेद कालीन समाज पर्यावरण के महत्व और उसकी रक्षा के प्रति अत्यधिक जागरूकता थी। पर्यावरण प्रदूषण के खतरों के प्रति तत्कालीन समाज काफी सचेत था। वैदिक काल में भूमि को ईश्वर के रूप में पूजनीय माना जाता था। यज्ञ के द्वारा वर्षा होती है जिसके फलस्वरूप अन्न की उत्पत्ति होती और समस्त जीव अन्न से उत्पन्न होते हैं। वायु को स्वच्छ एवं संक्रमण रहित बनाने के लिए यज्ञों में घी,तिल,फल, शहद,नारियल,धूप आदि की आहुति दी जाती है,जिससे उठने वाला वाष्प ऊँचाई पर जाकर प्रदूषणकारी जैविक तत्वों का नाश करता है। यज्ञ और अग्नि का भी अटूट संबंध है। अग्नि के प्रभाव से पृथ्वी पर फल आदि पकते हैं तथा प्राणी मात्र के शरीर में विद्यमान अग्नि से ही उनका शरीर गर्म रहता है और वे जीवित रहते हैं। यज्ञों द्वारा जहां वायुमंडल शुद्ध होता है वहां पर्यावरण संरक्षण भी हो जाता है। यज्ञाग्नि से हवा शुद्ध और सुवाषित हो जाती है जिसके परिणाम स्वरूप हमारी प्राण शक्ति बल एवं ऊर्जा संपन्न हो आरोग्यवर्धन हो जाती है।

वेदों में पर्यावरण संरक्षण के लिए वृक्ष, वनस्पति,औषधि, लता एवं वनों का सम्मानपूर्वक वर्णन किया गया है। वैदिक मंत्रों में वृक्षों एवं वनस्पतियों का सबके लिए मधुकर हितकारी एवं शांतिदायक होने का उल्लेख है। यजुर्वेद में वृक्षों को नमस्कार करते हुए कहा गया है नमो वृक्षेभ्यः।भारतीय संस्कृति में पीपल, नीम, बरगद, आंवला आदि वृक्षों का पूजन करने का यही अभिप्राय है कि यह सर्वाधिक आक्सीजन प्रदान करके मानव जीवन की रक्षा करते हैं।

आधुनिक युग के पर्यावरण वैज्ञानिकों के अनुसार वृक्ष द्वारा छोड़े गए ऑक्सीजन मानव शरीर को प्राणवान, शक्तिशाली एवं स्वस्थ बनाता है। मानव शरीर के लिए हानिकारक वायु को वृक्ष अपने में ग्रहण कर लेते हैं। प्रत्येक घर में तुलसी का पौधा लगाने की सलाह दी गई है जिसका वैज्ञानिक कारण तुलसी का पौधा संसार का एकमात्र पौधा है जो दिन और रात दोनों समय ऑक्सीजन छोड़ता है तथा उसकी पत्तियां प्रकाश संश्लेषण द्वारा सर्वाधिक मात्रा में सौर ऊर्जा शोषित करती हैं। प्राचीनकाल में तो वृक्षों के साथ वनों की भी पूजा होती थी। इसीलिए मधुवन, वृहदवन, बहुलवन, कुमुदवन, श्रीवन, नंदनवन आदि वनों का वर्णन मिलता है। इन सभी उपक्रमों एवं प्रयासों के पीछे पर्यावरण को संरक्षित करने की विशेषता ही झलकती है। वैदिक कालीन ऋषिगण भी इस रहस्य को जानते थे कि शुद्ध वायु हृदय के लिए लाभकारी, शांतिदायक व आयुवर्धक होता है। वैदिक ऋषि - मुनियों ने पर्यावरण की शुद्धि का सर्वोत्तम साधन यज्ञ को ही माना हैं। औषधियों के धुएँ का सेवन करने से इन्द्रियाँ वाणी तथा मन भी प्रसन्न होते हैं। बाल नहीं झड़ते, दांत सुदृढ़ होते हैं एवं मुख सुगन्धित रहता है।

वेदों को सृष्टि विज्ञान का मुख्य ग्रंथ माना गया हैं। ऋग्वेद में अग्नि के रूप, रूपांतर और उसके गुणों की व्याख्या की गई हैं। यजुर्वेद में वायु के गुणों, कार्य और उसके विभिन्न रूपों का आख्यान मिलता हैं। सामवेद में जीवन की मंगलकामना और प्रकृति की अविरल उपासना के भाव वर्णित हैं। अथर्ववेद में पृथ्वी तत्व का वर्णन प्राप्त होता हैं। वैदिक कर्मकाण्डों की अनेक विधाओं ने भी पर्यावरण संरक्षण और सुरक्षा का दायित्व निभाया हैं।

सृष्टि के प्रारंभ में ही यज्ञ उत्पन्न हुआ व सर्वत्र फैला। यज्ञ से ज्ञान की वृद्धि हुई और वह देवताओं का अधिपति बन गया। यज्ञ के तीन प्रमुख अंग है- देव पूजा, संगतिकरण और दान। अंगिरा ऋषि ने अग्नि प्रदीप्त करके उत्तम कर्मों से शांति स्थापित की। उशना ऋषि ने गाय के घी का संबंध यज्ञ के साथ स्थापित किया। यज्ञ हजारों प्रकार की दृष्टि प्रदान करने वाला है। यज्ञ का व्यापक उद्देश्य शांति है। प्राकृतिक यज्ञ की सत्ता से यह समस्त विश्व गतिशील है। यज्ञ की शक्तियां अनंत हैं। यज्ञ वायु, प्राण, प्रजा, पशु कीर्ति को देने वाला है। वह देवों को जागृत करता है।

वैदिक मान्यतानुसार अग्निहोत्र ही पर्यावरण की समस्या का सर्वोत्तम साधन है, जिसके अंतर्गत घी एवं अन्न सामग्रियों की आहुति वेद मंत्रों के साथ अग्नि में दी जाती है। अग्नि में रखे द्रव्य अत्यधिक शक्तिशाली बनकर वायु, जल, पृथ्वी एवं अंतरिक्ष में पहुंच जाते हैं जिससे पर्यावरण शुद्ध, सुगंधित, प्राणवान व स्वास्थ्यप्रद हो जाता है। आधुनिक युग में चारों ओर विषैले और प्रदूषित वातावरण में सांस लेना कठिन है। इसलिए आज अग्निहोत्र की महत्ता एवं आवश्यकता और भी बढ़ जाती है। अग्निहोत्र करने से आयु बढ़ती है। प्राण सबल होता है। नेत्र ज्योति सशक्त होती है। स्रोत और वाणी शक्तिवान होते हैं। मन और आत्मा सुदृढ़ एवं सबल होते हैं। (यजुर्वेद 18.29)।

अथर्ववेद के एक मंत्र में ऐसा वर्णन आया है जिस किसी को भी गुग्गुल औषधि की सुगंध मिलती है उसे रोगों का भय नहीं होता है- न तं यक्ष्मा अरुंधते नैनं शपथो अश्रुते। य भेजस्य गुग्गलो: सुरभिर्गन्धो अश्रुते। (अथर्व 7/38)। अथर्ववेद में कहा गया है कि गोधृत में प्रदूषण को दूर करने की अद्भुत क्षमता है।

वेदों में पशु-पक्षी और वनस्पतियों का संदर्भ एवं उल्लेख भारतीय संस्कृति के मूलभूत मूल्यों को रेखांकित करता है। पर्यावरण की सुरक्षा के लिए वेदों में शांति की प्रार्थना की गई है। यदि भारत की परंपरागत जीवन-शैली को देखे तो यह स्पष्ट हो जाता है कि यहां प्रकृति को नष्ट करके नहीं अपितु उसे सुरक्षित रखकर जीवन जीने का प्रावधान है। इसीलिए यहां वृक्षों की पूजा होती है, नदियों - पहाड़ों की पूजा होती है। धरती - आकाश की पूजा होती है। हवा - आग को देवता मानकर पूजा जाता है। सर्प और बाघ की पूजा होती है। यहां पीपल जैसे पेड़ को नहीं काटने और नदियों में कूड़ा कचरा नहीं डालने का प्रावधान है। गीता में मधुसूदन श्री कृष्ण का अपने को वृक्षों में पीपल बताने का उद्देश्य भी यही है। यह सब प्रकृति और पर्यावरण को सुरक्षित रखने के ही उपक्रम हैं। इसके लिए यहां के शास्त्रों में इसका विधान भी किया गया हैं। वेदों में पृथ्वी, वनस्पति, अंतरिक्ष आदि सभी की शांति की प्रार्थना की गई है तो उपनिषदों में अग्नि, जल आदि में व्याप्त देवताओं को नमस्कार किया गया है।

कुल मिलाकर यहां पर ऐसी जीवन पद्धति की वकालत की गई है, जिसमें मनुष्य को केंद्र में रखकर अन्य सभी वस्तुओं और प्राणियों का अपने लिए उपभोग की मनाही है। यहां यह माना गया है कि ईश्वर जैसी एक ही परम सत्ता का वास प्रकृति के कण-कण में है और सभी प्राणियों के अंदर भी वही निवास करती है। इसलिए मनुष्य का यह दायित्व है कि वह सब की सुरक्षा का भी ख्याल रखें और यह तभी हो सकता है जब सबका सिर्फ अपने भोग के लिए उपयोग नहीं किया जाए बल्कि उनके सहयोग के साथ जीवन जिया जाए, जब तक यहां का या कहीं का भी समाज कृषि व्यवस्था पर आधारित रहा तब तक पर्यावरण सुरक्षित रहा लेकिन जब से

औद्योगिक व्यवस्था शुरू हुई तब से पर्यावरण असुरक्षित होने लगा। पर्यावरण को सुरक्षित करने के लिए सबसे मूल काम अपनी व्यवस्था और जीवन - शैली में परिवर्तन लाना है, उसे संयमित कर प्रकृति के साथ सहयोग पर आधारित करना है।

वेदों में स्थानीय,पृथ्वी,अंतरिक्ष और देवलोक स्थित देवों के स्तुति निमित यज्ञ का विधान है। तत्कालीन ऋषि, सर्वजन हिताय, सर्वजन सुखाय एवं कल्याणकारी राष्ट्र योजना को सफल बनाने हेतु यज्ञों में जल की धाराओं का सम्मिश्रण, हवाओं के पुंज तथा पक्षी समूह की संगठनात्मक शक्ति का उद्घोष करके सभी लोगों को सम्मिलित एवं संगठित होने का आह्वान करते थे। ऋषिगण यज्ञ जैसे धार्मिक कृत्यों के माध्यम से राष्ट्र समृद्धि के लिए ईश्वर से प्रार्थना करते थे। प्राचीन वैदिक याज्ञिक परंपरा के आधार पर यज्ञ वर्तमान परिवेश में पर्यावरण के बढ़ते हुए भौतिक रासायनिक तथा नैतिक संरचना में परिवर्तन होने पर मनुष्य जीव-जंतु, पेड़ - पौधों पर होने वाले कुप्रभाव को प्रदूषण की संज्ञा दी गई है। विकास और सुख सुविधा की ओर निरंतर बढ़ने वाला वर्तमान सभ्यता का अभिशाप न जाने कब प्रदूषण का जहर निगल जाए! ऐसे में यज्ञ भी प्रदूषण निवारक है। पूर्वजगण, ऋषिगण यज्ञ की परंपरा को विकसित करके विवेकशीलता का परिचय न देते तो आज प्राणी धरती पर ना होते। यज्ञ का अर्थ आग में घी, आहुति, भेंट, चढ़ावा डालकर मंत्र पढ़ना मात्र नहीं होता। यज्ञ में अग्नि और घी के प्रतीकात्मक प्रयोग में आयुर्वेद और औषधीय विज्ञान द्वारा वायु शोधन अग्नि से होने वाले धूम्र कणों द्वारा सम्पन्न होती है।

भारतीय संस्कृति में यज्ञ का आध्यात्मिक लाभ तो है ही साथ में वैज्ञानिक स्तर पर भी लाभ होता है। यह वायु में दुर्गन्ध को दूर करने में सहायक होता है। हवन के दौरान निकलने वाले धुएं में औषधीय गुण होते हैं और यह सांस की बीमारियों से पीड़ित लोगों के लिए फायदेमंद हो सकता है। हवन को प्रतिरक्षा प्रणाली को बढ़ावा देने और समग्र स्वास्थ्य और कल्याण को बढ़ावा देने के लिए भी माना जाता है। इससे नई ऊर्जा का निर्माण होता है। हवन करने की क्रिया एक ध्यानपूर्ण अभ्यास है जो मानसिक स्पष्टता और ध्यान केंद्रित करने में मदद करता है। अनुष्ठान के दौरान मंत्रों का जाप करने से मन पर शांत प्रभाव पड़ता है और तनाव और चिंता कम हो सकती है। यज्ञ से रोग दूर होते है। यज्ञ में जिन सविधा-सामाग्री का प्रयोग किया जाता है उनसे 1 प्रतिशत भी वायु प्रदूषण नही होता है और वातावरण स्वच्छ होता है। यज्ञ को आध्यात्मिक विकास और ज्ञान के लिए एक शक्तिशाली उपकरण माना जाता है। पवित्र अग्नि में आहुति देने का कार्य आत्मा को शुद्ध करने और सकारात्मक ऊर्जा को आकर्षित करने में मदद करता है। अन्य लकड़ियों को जलाने में कार्बन मोनो-ऑक्साइड उत्पन्न होता है जबकि आम की लकड़ी को जलाने पर नाम मात्र भी प्रदूषण नहीं होता है। यज्ञ करने पर आस-पास वातावरण में उपस्थित रोगाणु 65 से 75% कम हो जाते है। यज्ञ का पर्यावरण पर सकारात्मक प्रभाव पड़ता है क्योंकि यह वायु प्रदूषण को कम करने और पारिस्थितिक संतुलन को बढ़ावा देने में मदद करता है।

भारत में ही नहीं वरन विश्व के कई देशों में यज्ञ से सम्बन्धित काफी अनुसंधान किए गए हैं। रूस के वैज्ञानिक शिरोविच ने अपनी पुस्तक में लिखा है कि दूध,मक्खन,घी,गोमूत्र,गोबर इत्यादि के परीक्षण से पता चला है कि गाय के दूध में आणविक विकरण के प्रभाव से पूर्ण सुरक्षित रहता है। गाय के घी को अग्नि में डालने पर उससे उत्सर्जित धुआं आणविक विकिरण के प्रभाव को काफी हद तक कम कर देता है।

डॉ0 हैफकिन का कथन है घी जलाने से रोग के कीटाणु मर जाते हैं। फ्रांस के वैज्ञानिक प्रो0ट्रिलबिर्ट कहते हैं, जली हुई शक्कर में वायु शुद्ध करने की बड़ी शक्ति हैं। इससे टी. बी., चेचक, हैजा आदि बीमारियां तुरंत नष्ट हो जाती हैं। डॉ. कर्नल किंग आई.एम.एस. ने कहा, घी और चावल में केसर मिलाकर अग्नि में जलाने से प्लेग से बचा जा सकता है। यज्ञ को पर्यावरण प्रदूषण को दूर करने का सबसे अच्छा साधन बताया गया है। यज्ञ सभी अशुद्धियों और प्रदूषण को दूर करता है और उसे शुद्ध बनाता है। यज्ञ में प्रयुक्त हवन सामग्री को अग्नि में

जलाकर वायु की सहायता से सर्वत्र फैलाकर दूषित वायु को निकालकर सुगंधित वातावरण का निर्माण किया जाता है। यज्ञ में प्रयोग की जाने वाली हवन सामग्री में शामिल जड़ी बूटियां की आहुति से निकले धुएं की लौ से वातावरण में फैली बीमारियां दूर होती हैं। हवन में आम की लकड़ी जलती है तो फ़ॉर्मिक एल्डिहाइड नामक गैस उत्पन्न होती है जो कि खतरनाक बैक्टीरिया और जीवाणुओं को मारती है तथा वातावरण को शुद्ध करती है। आचार्य संजीवन वेदालंकार के अनुसार यज्ञ करने से पर्यावरण प्रदूषण से उत्पन्न रोगों का प्रभाव खत्म होता है। जिस प्रकार आजकल यंत्रों की सहायता से भौतिक जीवन के अनेक सुख साधन उत्पन्न किए जाते हैं, उसी प्रकार यज्ञ से जीवन संवरता है। जीवन को सरल करने का विज्ञान विकसित हुआ था।

निष्कर्ष : यज्ञ वर्तमान में केवल धार्मिक कर्मकांड तक ही सीमित नहीं रह गया है। यह शोध का विषय भी बन गया है। सं.रा.अमेरिका में यज्ञ पर हुए शोध एवं प्रायोगिक परीक्षणों से पाया गया है कि जल एवं वायु की शुद्धि, पर्यावरण संतुलन एवं रोग निवारण में यज्ञ की अहम भूमिका है। आधुनिक चिकित्सा विज्ञान ने भी परीक्षण करके यज्ञ द्वारा वायु की शुद्धि करके रोग निवारण की इस वैदिक मान्यता को स्वीकार किया है। अधिकांश भागों में आज भी लोग स्वछंद एवं खुले प्राकृतिक वातावरण में रहना पसन्द करते हैं।

यज्ञ के द्वारा जो शक्तिशाली तत्त्व वायुमण्डल में फैलाये जाते हैं, उनसे हवा में घूमते असंख्य रोग,कीटाणु सहज ही नष्ट होते हैं। साधारण रोगों एवं महामारी से बचने का यज्ञ एक सामूहिक उपाय है। दवाओं में सीमित स्थान एवं सीमित व्यक्तियों को ही बीमारियों से बचाने की शक्ति है, पर यज्ञ की वायु तो सर्वत्र ही पहुँचती है। मनुष्य ही नहीं अपितु पशु-पक्षियों, कीटाणुओं एवं वृक्ष-वनस्पतियों के आरोग्य की भी यज्ञ से रक्षा होती हैं। कोविड संक्रमण के दौरान लोगों का रुझान यज्ञ और हवन की ओर बढ़ा है। संक्रमण से मुक्ति के लिए किसी ने कपूर,लोहबान और लौंग का धुआं घर में किया तो किसी ने गुग्गुल का। किसी ने मंत्रोच्चारण के साथ घर को संक्रमण मुक्त रखने के लिए यज्ञ किया। यज्ञ कुंड से अग्नि की उठती हुई लपटें जीवन में ऊंचाई की तरह उठने की प्रेरणा देती हैं। इस प्रकार चाहे किसी भी प्रकार का भौतिक लाभ हो या आध्यात्मिक लाभ हो, सभी की प्राप्ति का एक सशक्त साधन यज्ञ है। यज्ञ में परमार्थ परायणता का भी रहस्य समाया हुआ है अतः विश्व कल्याण का शुभ कार्य भी यज्ञ द्वारा संभव होता है जिससे मानव जीवन का लक्ष्य मोक्ष भी सुलभ हो पाता है। वास्तव में हमारी पुरातन वैदिक यज्ञ - पद्धति पूर्णतया विज्ञान- सम्मत है।पूर्व समय में हर घर परिवार में नित्य यज्ञ होता था और सभी निरोग रहते थे।यज्ञ के माध्यम से सभी संस्कार होते थे और इसी से निखर कर मनुष्य दैविक गुणों को धारण करता था। यज्ञ से साधना,संस्कार, तप आदि का श्रीगणेश होता है। यज्ञ मात्र संस्कार ही नहीं अपितु साधना की सतत प्रक्रिया है।

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पत्रकारिता, समाचार संकलन और मीडिया शिक्षा: एक अध्ययन

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सारांश

शोध सार : एक दौर था जब यह कहा जाता था कि पत्रकार जन्म लेते हैं। उस वक्त यह सर्वविदित रहा कि पत्रकारिता पढ़ाकर सिखाई नहीं जा सकती। लेकिन अब वक्त बदल चुका है। पत्रकारिता या मीडिया का क्षेत्र वर्तमान में शिक्षा के मद्देनजर बेहद महत्वपूर्ण और रोजगारपरक बन चुका है। भारत के उच्च शिक्षा संस्थानों में एक नये विषय 'मीडिया शिक्षा" का प्रभाव और दायरा लगातार बढ़ता जा रहा है। यह उपयोगकर्ता के लिए दोहरा दृष्टिकोण अपनाकर सतत सीखने की प्रक्रिया (अधिगम) और शैक्षिक अवसरों को बढ़ाने में उल्लेखनीय भूमिका निभा रहा है।

इसी कड़ी में कई विश्वविद्यालयों एवं मीडिया संस्थानों में विभिन्न समाचार-पत्रों में कार्यरत पत्रकारों को बतौर अतिथि शिक्षक के रूप में क्लासेस एवं लेक्चर सेशन दिये जा रहे हैं। यह चलन तेजी से बढ़ा है। इसके अतिरिक्त विभिन्न दैनिक एवं सांध्य कालीन समाचार-पत्रों के कार्यालयों में पत्रकारिता के छात्र-छात्राओं को भ्रमण कराते हुए सम्पादकीय विभाग में समाचार संकलन, विज्ञापन का अंकन व प्रसार विभाग की व्यवस्था सहित प्रकाशन आदि के बारे की बारीक जानकारियां दी जा रही है। वहीं, कई छात्र-छात्राएं समाचार-पत्रों में इंटर्नशिप भी कर रहे हैं। समाचार-पत्रों में कई ऐसी सूचनाएं एवं समाचार प्रकाशित होती हैं जिनका आधार पत्रकारिता के छात्र-छात्राओं द्वारा संकलित किये गये तथ्य होते हैं। इस तरह के समाचारों की प्रधानता टेबलायड सरीखे समाचार-पत्रों में बहुतायत दिखती है। इसका परिणाम है कि अब 'छात्र पत्रकार" का नया ट्रेंड विकसित होने लगा है। इसी कड़ी में सूचना का अधिकार अधिनियम (आरटीआई) 2005 को देखा जाये तो आरटीआई ने पत्रकारिता में भी उल्लेखनीय योगदान किया है। विशेषकर खोजी पत्रकारिता में इसने बड़ी ताकत दी है। इसके माध्यम से सरकारी और सार्वजनिक उपक्रमों से रिकॉर्ड पाने के लिए भारत में बड़ी संख्या में पत्रकार आरटीआई का उपयोग कर रहे हैं। वहीं, सूचनाओं की प्राप्ति के लिए आरटीआई का उपयोग पत्रकारिता के छात्र भी कर हैं। समाचार-पत्रों में कई ऐसे समाचार प्रकाशित हो रहे हैं जिनका संकलन का स्रोत आरटीआई रहा है और माध्यम पत्रकारिता के छात्र-छात्राएं हैं।

पिछले एक दशक से लगातार कई नये मीडिया संस्थान शुरू हुए हैं। समाज के हर क्षेत्र में हस्तक्षेप और ग्लैमर के कारण मीडिया के क्षेत्र में युवाओं का रुझान बढ़ रहा है। युवाओं की इसी आवश्यकता का फायदा मीडिया संस्थान भी उठाने से नहीं चूक रहे हैं। विश्वविद्यालयों में पहले से ही पत्रकारिता के पाठ्यक्रम संचालित रहे हैं, लेकिन अब लगभग हर जगह मीडिया शिक्षा के निजी संस्थान भी खुल गये हैं।

मीडिया शिक्षा के लिए चुनौतियों की बात की जाये तो इसमें सबसे बड़ी समस्या मीडिया के पाठ्यक्रमों की एकरूपता अब भी बनी हुई है। इसके कारण विद्यार्थियों को कठिनाई भी हो रही है। उनके साथ ही पत्रकारिता शिक्षकों को इस समस्या का सामना करना पड़ रहा है। इसलिए अन्य

पाठ्यक्रमों की तरह मीडिया पाठ्यक्रम की एकरूपता के लिए काउंसिल का गठन करने की आवश्यकता है जिससे देश के तमाम सरकार व गैर सरकारी मीडिया संस्थानों में एक समान मीडिया शिक्षा मॉडल लागू किया जा सके। इससे विद्यार्थियों को एक समान लाभ प्राप्त होगा।

बीज शब्द : *मीडिया शिक्षा, रोजगार, एकरूपता, पाठ्यक्रम, काउंसलिंग व इंटर्नशिप आदि।*

मूल आलेख : शुरुआती दौर में प्रिंट पत्रकारिता थी, लेकिन मीडिया के माध्यमों में लगातार बदलाव और तकनीकी विकास के बाद शिक्षण संस्थानों की मीडिया शिक्षा में परिवर्तन होने लगा। शिक्षा में डिजिटल मीडिया की शुरुआत और परिचय के साथ विभिन्न नवाचारी शिक्षण तकनीकों और पद्धतियों का उपयोग किया गया। इसके साथ ही संस्थान अकादमिक दृढ़ता में सुधार लाने के लिए अपनी प्रणाली को लगातार परिष्कृत करते गये।

मीडिया शिक्षा का आशय प्रिंट, रेडियो, टीवी, ऑनलाइन मीडिया के बारे में पढ़ना और उसके लिए काम कैसे करें, इसका प्रशिक्षण देना होता है। साथ ही छात्रों को तकनीकी ज्ञान से भी अवगत करना होता है। प्रारम्भिक काल में पत्रकारिता शिक्षा के अन्तर्गत केवल प्रूफ रीडिंग, संवाददाता, रिपोर्टर, फीचर लिखने और कहीं-कहीं जनसंपर्क के बारे में पढ़ाया जाता था। लेकिन उदारीकरण के दौर के बाद मीडिया शिक्षा की दिशा और दशा ही बदल गयी। पहले अधिकांश जगहों पर कॉलेज या संस्थान डिस्टेंस एजुकेशन करवाया करते थे, लेकिन धीरे-धीरे हिन्दी और अंग्रेजी के विभागों के अधीन इसकी पढ़ाई शुरू हुई, और अब यह स्वतंत्र विभाग व संकाय के रूप में कई विश्वविद्यालयों में पढ़ाया जाने लगा है।

छात्रों के बीच शिक्षण प्रक्रिया को रोचक और बेहतर बनाने की प्रक्रिया में विश्वविद्यालय और विद्यालय, डिजिटल व सोशल मीडिया का उपयोग कर रहे हैं। नई शिक्षा व्यवस्था केवल 'चाक और बात" पर निर्भर नहीं है, बल्कि कक्षाओं को पुनर्परिभाषित किया जा रहा है और शिक्षक इन नये जीवंत दृश्य संसाधनों का उपयोग कर रहे हैं जो विद्यालय के बाहर छात्रों के जीवन में सामान्य हैं। छात्र भी यह स्पष्ट रूप से बता रहे हैं कि शिक्षक से क्या अपेक्षा करते हैं और वे कैसे सीखना चाहते हैं।

अध्ययन के लिए चयनित विश्वविद्यालय

1. मदन मोहन मालवीय हिन्दी पत्रकारिता संस्थान और पत्रकारिता विभाग, महात्मा गांधी काशी विद्यापीठ, वाराणसी।

2. डिपार्टमेंट ऑफ जर्नलिज्म एंड मास कम्युनिकेशन, बीएचयू, वाराणसी।

3. पत्रकारिता एवं जनसंचार विभाग, सम्पूर्णानंद संस्कृत विश्वविद्यालय, वाराणसी।

4. मास कम्युनिकेशन एंड वीडियो प्रोडक्शन, हरिश्चंद्र पीजी कॉलेज, वाराणसी।

अध्ययन के चयनित पाठ्यक्रम

1. स्नातक स्तर के पाठ्यक्रम (बी.जे.एम.सी और बी.ए(मॉस कम्युनिकेशन)

2. स्नातकोत्तर पाठ्यक्रम (एम.जे.एस.सी और एम.ए.(जर्नलिज्म एंड मॉस कम्युनिकेशन)

शोध प्रविधि : प्रस्तुत अध्ययन विवरणात्मक शोध प्रविधि से पूरा किया गया है। चयनित किये गये विश्वविद्यालयों के स्नातक और स्नातकोत्तर पाठ्यक्रमों का अध्ययन अंत:वस्तु विश्लेषण के आधार पर किया गया है। इस विश्लेषण के बाद ही निष्कर्ष पर पहुंचा गया है।

भारत में मीडिया शिक्षा मॉडल

देश के विभिन्न विश्वविद्यालयों में मीडिया शिक्षा के अलग-अलग मॉडलों के माध्यम से प्रशिक्षण दिया जा रहा है। विश्वविद्यालयों में संचालित पाठ्यक्रमों में समानता का अभाव है। यूनेस्को ने जो मीडिया के मॉडल बताये हैं, वे इस प्रकार हैं-

1- प्रायोगिक शिक्षण मॉडल

1970 मेंडेविड ए कोलब ने अपने सहयोगियों कर्ट लेविन, जॉन डेवी और जीन पियागेट के साथ मीडिया शिक्षा का प्रायोगिक लर्निंग मॉडल विकसित किया। इस मॉडल का मूल, अनुभव के माध्यम से सीखने की प्रक्रिया है। यह सीखने के माध्यम से सीखना या अनुभव के द्वारा सीखना हो सकता है। यह हैंड्स-ऑन लर्निंग अप्रोच (कोलब, 1984) पर जोर देता है। इस मॉडल में मीडिया शिक्षक, विद्यार्थियों को अपने ज्ञान और कौशल के बारे में सिखा सकते हैं, जो उन्होंने मीडिया के क्षेत्र में लगातार काम करने के दौरान सीखा है।

2- क्रिटिकल पेडागॉजी अप्रोच

क्रिटिकल पेडागॉजी शब्द के जनक पाउलो फ्रेयर हैं। यह मूल रूप से छात्रों को क्रिटिकल कॉन्शियसनेस (फ्रीयर, 1984) प्राप्त करने में सहायता करता है। एक महत्वपूर्ण शैक्षणिक शिक्षक इरा शोर ने आलोचनात्मक शिक्षाशास्त्र को गहरे में परिभाषित किया है। इरा शोर क्रिटिकल शिक्षाशास्त्र के अनुसार शिक्षण और सीखने के संवाद संबंध पर आधारित है। यह इस रूप में समझा जा सकता है कि, विचार, पढ़ने, लिखने और बोलने के साथ ही साथ सतह के अर्थ के आधार पर बोलना, पहला प्रभाव, प्रमुख मिथक, आधिकारिक उच्चारण, पारंपरिक क्लिच, प्राप्त ज्ञान, मात्र राय, गहरे अर्थ, मूल कारणों को समझने के लिए ही उप.योग किया जाता है। किसी भी कार्य, घटना, वस्तु, प्रक्रिया, अनुभव, पाठ, विषय वस्तु, संगठन, नीति, जनसंचार माध्यम या प्रवचन के सामाजिक संदर्भ, विचारधारा और व्यक्तिगत परिणाम। यह एक प्रगतिशील शिक्षण पद्धति है, जो छात्रों को बेहतर विचारक और बेहतर व्यक्ति बनाने में मददगार साबित हो सकती है। यह दृष्टिकोण छात्रों को दार्शनिक रूप से बेहतर और विचारवान बना सकता है। इस दृष्टिकोण के माध्यम से मीडिया के छात्र, मीडिया और समाज के बीच में होने वाली घटनाओं और टकराव को भलीभांति समझ सकते हैं।

3- मीडिया शिक्षा के लिए टीचिंग हॉस्पिटल मॉडल

एरिक न्यूटन, एस.जॉन और जेएल नाइट फाउंडेशन के अनुसार, सीखने-सिखाने का एक मॉडल- जिसमें मीडिया के छात्र, मीडिया शिक्षक, मीडिया शिक्षाविद और पेशेवर मीडियाकर्मी एक साथ काम करते हैं, और एक ही छत के नीचे समुदाय द्वारा संचालित सामग्री का उत्पादन करते है। यह एक विचार है, जो पत्रकारिता के लिए मॉडल का निर्माण करने में मददगार साबित हो सकता है। इस विचार के अनुसार,

मीडिया शिक्षा को एक चिकित्सा पेशे की तरह ही अपनी भूमिका का निर्वहन करना चाहिये। यह एक डॉक्टर की तरह पत्रकार बनने के लिए मीडिया छात्रों का उत्पादन और प्रशिक्षण देता है।

4- मीडिया शिक्षा मॉडल का निर्माण

शोधकर्ताओं ने भारत में मीडिया शिक्षा के लिए मॉडल (सुझाव) का निर्माण करने का प्रयास किया। शोधकर्ताओं का मत था कि भारत की सामाजिक,आर्थिक, राजनीतिक, शैक्षणिक,संस्कृति,परिवेश के साथ ही विकासशील देश होने के चलते भारत की जरूरतें अलग प्रकार की है। यही वजह है, कि भारत जैसे देश में यूनिफार्म मीडिया शिक्षा मॉडल से परिणाम नहीं मिल सकते हैं। यही वजह है, कि शोधकर्ताओं ने भारत में अलग से मीडिया मॉडल विकसित करने पर जोर किया और नये मॉडल के प्रतिपादन की दिशा में कार्य किया। इस मॉडल में यह प्रयास किया गया कि मीडिया शिक्षा के उत्थान में यह मॉडल सहायक साबित होगा और मुद्दों और चुनौतियों से भी उबरने में मदद मिलेगी। इन मॉडल के आधार पर मीडिया अकादमी और मीडिया उद्योग के बीच की खाई को पाटा जा सकता है।

5- मीडिया शिक्षा का अंब्रेला मॉडल

मीडिया शिक्षा के अंब्रेला मॉडल ने मीडिया अध्ययनों को दो भागों में विभाजित करने का काम किया। जो कि इस प्रकार है-

क-पत्रकारिता

ख-जनसंचार।

इस मॉडल के माध्यम से शोधकर्ताओं ने सुझाव दिया कि, पत्रकारिता को समाचार या सूचना, संदेश जनरेटर के रूप में समझा जाना चाहिए। अर्थात मीडिया शिक्षकों को इस बात पर फोकस करना चाहिए कि समाचार या सूचना उत्पन्न कैसे हो सके। साथ ही शोधकर्ताओं ने सुझाव दिया है कि, पत्रकारिता शिक्षा को महत्वपूर्ण मीडिया शिक्षाशास्त्र के रूप में विकसित कर अंगीकार किया जाना चाहिए। संबंधित विषय पर शोध करने वाले विषय विशेषज्ञों का कहना है कि इम मॉडल के माध्यम से विद्यार्थियों के दृष्टिकोण में बदलाव लाया जा सकता है। इतना ही नहीं इसका प्रशिक्षण देने से विद्यार्थियों में आलोचनात्मक सोच को बढ़ावा दिया जा सकता है।

निष्कर्ष : विभिन्न प्रकार के मीडिया मॉडलों का अध्ययन करने के बाद इस निष्कर्ष पर पहुंचा जा सकता है कि भारत जैसे देश में जहां पर दुनिया का सबसे बड़ा लोकतंत्र की मौजूद है। नागरिकों को संवैधानिक और मौलिक अधिकार प्राप्त हैं। जिस देश में मीडिया को लोकतंत्र का चौथा स्तंभ माना जाता है। ऐसे देश में मीडिया शिक्षा के विभिन्न मॉडल अपनाकर मीडिया शिक्षा को सार्थक बनाया जा सकता है।

वर्तमान अध्ययन से निष्कर्ष –

1- भारत में मीडिया शिक्षा के मुद्दों और चुनौतियों को दूर करने के लिए भारत के मीडिया शिक्षा संस्थानों में मीडिया शिक्षा मॉडल की स्थापना या निर्माण की अत्यधिक आवश्यकता है।

2- भारत में मीडिया को और मीडिया शिक्षा को दोनों दृष्टिकोणों यानी हैंड्स-ऑन-ट्रेनिंग और क्रिटिकल मीडिया पेडागोजी के माध्यम से ही अपनाया जा सकता है।

3- भारत में मीडिया शिक्षा को मीडिया अकादमियों और मीडिया उद्योग के बीच उचित संवाद के जरिए बेहतर बनाया जा सकता है। मीडिया उद्योग की मांग के अनुरूप पेशेवरों को तैयार किया जा सकता है, ताकि मीडिया के क्षेत्र में शिक्षा ग्रहण करने वाले विद्यार्थियों को रोजगार की दिशा में ज्यादा परेशानियों का सामना नहीं करना पड़े।

4- शोधकर्ताओं ने अपने अध्ययन के दौरान यह पाया कि भारत में मीडिया शिक्षा, मीडिया की आलोचनात्मक सोच पर ज्यादा ध्यान नहीं देती है,जबकि मीडिया शिक्षा स्थानों को छात्रों के बीच महत्वपूर्ण सोच के निर्माण के लिए अंत:विषय का पालन करने की आवश्यकता है। इसके अलावा बहु-अनुशासन वाली पहुंच बनाने की भी आवश्यकता है।

5- वर्तमान मीडिया शिक्षा, मीडिया उद्योग की जरूरतों को पूरा नहीं कर पा रही है। इसके लिये सरकार के स्तर पर, मीडिया संस्थानों के स्तर पर और मीडिया उद्योग के स्तर पर प्रयास किये जाने चाहिये।

6- मीडिया क्षेत्र में लगातार हो रहे तकनीकी परिवर्तन के अनुरूप मीडिया की शिक्षा में भी परिवर्तन के लिये विशेषज्ञों की टीम का गठन किया जाना चाहिये।

7- मीडिया शिक्षा संस्थानों को मीडिया उद्योग की जरूरतों का ध्यान में रखना चाहिये।

8- मीडिया शिक्षा संस्थानों पर खासकर निजी शिक्षा संस्थानों पर सरकार की पकड़ भी मजबूत होनी चाहिये।

9- मीडिया शिक्षा देने वाले संस्थानों की वर्षवार मीनिटरिंग की व्यवस्था की जानी चाहिये।

सुझाव : प्रस्तुत अध्ययन के निष्कर्षों के विवेचना के बाद सबसे महत्वपूर्ण सुझाव यह है कि मीडिया शिक्षा के प्रति छात्रों के बढ़ते रूझान को देखते हुए मीडिया शिक्षा संस्थानों के पाठ्यक्रमों को एकरूपता दिये जाने की आवश्यकता है। सर्वप्रथम मीडिया शिक्षा के लिये एक काउंसलिंग के गठन की प्रक्रिया अपनानी होगी। इसके बाद एक समान मीडिया शिक्षा मॉडल देश के सभी शिक्षा संस्थानों में लागू किया जाना उचित होगा। ताकि मीडिया शिक्षा में एकरूपता बनी रहे और मीडिया संस्थान की जरूरतों को देखते हुए मीडिया पाठ्यक्रमों में समय-समय पर फेरबदल किया जा सके।

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सामान्य एवं विशिष्ट विद्यालयों में अध्ययनरत् विद्यार्थियों के समायोजन स्तर का तुलनात्मक अध्ययन

शिवाश्रेय यादव एवं देवेन्द्र कुमार सिंह

शिक्षक–शिक्षा विभाग, नेहरू ग्राम भारती (मानित् विश्वविद्यालय)
कोटवा–जमुनीपुर, दुबावल, प्रयागराज

सारांश

समस्या कथन के अन्तर्गत ''सामान्य एवं विशिष्ट विद्यालयों में अध्ययनरत् विद्यार्थियों के समायोजन स्तर का तुलनात्मक अध्ययन'' है। प्रस्तुत अध्ययन में वर्णनात्मक अनुसंधान के अन्तर्गत सर्वेक्षण विधि का प्रयोग किया है। प्रस्तुत अध्ययन में प्रयागराज जनपद के सत्र 2023–2024 के माध्यमिक स्तर के सामान्य एवं दिव्यांग विद्यार्थियों को समष्टि के रूप में सम्मिलित किया गया है। प्रस्तुत अध्ययन के अन्तर्गत यादृच्छिक (त्दकवउ) न्यादर्श विधि का प्रयोग किया गया है। अध्ययन के उद्देश्यों के अनुसार प्रयागराज जनपद के माध्यमिक स्तर पर अध्ययनरत् 50 विद्यार्थी (25 सामान्य विद्यार्थी एवं 25 दिव्यांग विद्यार्थी) का न्यादर्श हेतु चयन किया गया है। सामान्य एवं दिव्यांग विद्यार्थियों के समायोजन क्षमता से सम्बन्धित आँकड़े एकत्रित करने हेतु डॉ0 ए0के0पी0 सिंह और डा0 आर0पी0 सिंह के समायोजन सूची का प्रयोग किया गया है। प्रदत्तों के विश्लेषण हेतु मध्यमान, मानक विचलन, मानक त्रुटि एवं टी–अनुपात सांख्यिकी विधियों का प्रयोग किया है। निष्कर्ष में पाया गया कि–

समान्य विद्यार्थियों में संवेगात्मक समायोजन क्षमता विशिष्ट विद्यार्थियों की अपेक्षा उच्च पाया गया अर्थात् दोनों में सार्थक अन्तर पाया गया।

समान्य विद्यार्थियों में सामाजिक समायोजन क्षमता विशिष्ट विद्यार्थियों की अपेक्षा उच्च पाया गया अर्थात् दोनों में सार्थक अन्तर पाया गया।

समान्य विद्यार्थियों में शैक्षिक समायोजन क्षमता विशिष्ट विद्यार्थियों की अपेक्षा उच्च पाया गया अर्थात् दोनों में सार्थक अन्तर पाया गया।

समान्य विद्यार्थियों में सम्पूर्ण समायोजन क्षमता विशिष्ट विद्यार्थियों की अपेक्षा उच्च पाया गया अर्थात् दोनों में सार्थक अन्तर पाया गया।

मुख्य शब्द– *सामान्य, विशिष्ट, छात्र–छात्राएँ, समायोजन, संवेगात्मक समायोजन, शैक्षिक समायोजन, सामाजिक समायोजन*

प्रस्तावना–

समाज का हर वर्ग आज की तमाम परिस्थितियों के मद्दे नजर आर्थिक सुरक्षा को लेकर काफी जागरूक हुआ है। अर्थिक सुरक्षा की भावना के कारण आपस में प्रतिस्पर्धाएँ भी बढ़ती है। अर्थ की इस चाहत से चाहे लाभ जितना हुआ हो लेकिन भाग–दौड़ अनियमित जीवन शैली तथा जीवन जीने सम्बन्धी तमाम अनियमितताओं के कारण बहुत सारी

विसंगतियाँ भी उभर कर सामने आयी है। जीवन जीने की इस अनियमित शैली के कारण तनाव तथा मानसिक बीमारियाँ बढ़ी है। सच बात तो यह है कि मनोरोगियों की बढ़ती जनसंख्या विश्वव्यापी समस्या बनती जा रही है। इस भाग दौड़ में शामिल होने से उन्हें यहाँ भी अपनापन महसूस नही होता है। इस कारण से समायोजन की समस्या में निरन्तर वृद्धि होती जा रही है और बच्चा घर तथा स्कूल दोनों जगहों पर अपने आपको उपेक्षित महसूस कर कुण्ठा का शिकार हो जाता है। इसलिए बच्चे मनोरोगी होते जा रहे है।

वर्तमान युग में समायोजन समस्या का क्षेत्र बहुत व्यापक एवं जटिलतम है। इसमें सबसे ज्यादा प्रभावित बच्चे है क्योंकि आज का युग अर्थवादी है और अपने आर्थिक स्तर को सुधारने का प्रयास हर व्यक्ति कर रहा है जिसके कारण सर्वाधिक उपेक्षा के शिकार बच्चे है और उनसे भी विकट स्थिति दिव्यांग बच्चों की है। जो ईश्वरीय अभिशाप झेल रहे है और उन्हें सामाजिक अपेक्षा का शिकार भी होना पड़ता है। जिसके कारण नित्य हमें कुसमायोजन समस्याओं के दुष्परिणाम देखने को मिलते है। अतः आज की बदलती परिस्थितियों में छात्र व छात्राओं के कुसमायोजित होने के कारण का पता लगाकर यह निर्देश दिया जा सके और बच्चों के व्यक्तित्व आवश्यकता एवं व्यवसायिक रूचि के मार्ग को प्रशस्त किया जा सके।

समायोजन का तात्पर्य अनुकूलन की क्षमता से है, जिसके द्वारा व्यक्ति पर्यावरण या उसमें होने वाले परिवर्तन के अनुकूल अपने व्यवहार के तरीकों को ढूंढता है तथा उसके अनुसार कार्य करता है। इस प्रकार समायोजन किसी पर्यावरण में रहने की उपयुक्तता अर्जित करने की प्रक्रिया है इसके द्वारा व्यक्ति अपने वातावरण से अपना सम्बन्ध सौहार्दपूर्ण करने का प्रयास करता है तथा अपने आचरण को सामाजिक मान्यताओं मूल्यों एवं आदर्शों के अनुकूल बना लेता है।

किसी भी राष्ट्र या समाज को उन्नति के पथ पर अग्रसर करने के लिए यह आवश्यक है कि मानवीय संसाधन के रूप में उस राष्ट्र या समाज के प्रत्येक व्यक्ति का सर्वांगीण विकास सुनिश्चित किया जाय। अतएव विशिष्ट शिक्षा के स्वरूप को निर्धारित करने के लिए यह आवश्यक है कि सामान्य एवं समान्य विद्यार्थियों बालकों के समायोजन का अध्ययन किया जाय तथा उनकी माँग एवं योग्यता के अनुरूप उन्हें उचित रूप से शिक्षित किया जाय।

इस प्रकार हम देखते है कि शैक्षिक उपलब्धि, विशिष्ट बालकों के सर्वाधिक विकास के लिए अन्ततः आवश्यक है। विशिष्ट बालकों की उपलब्धि के लिए विभिन्न प्रकार के उत्पादों की आवश्यकता होती है। जिसमें समान्य एवं विशिष्ट बालकों को अलग–अलग तरीकों से शिक्षा की व्यवस्था करनी पड़ती है। अब तक विशिष्ट और सामान्य बालकों की शिक्षा व्यवस्था को लेकर जितने भी शोध कार्य सम्पादित हुये हैं वे मुख्यतः सामान्य बालकों से सम्बन्धित रहे हैं, जो शोधकार्य विशिष्ट बालकों को लेकर हुए भी हैं तो वे भी नाम मात्र के हैं। विशिष्ट एवं सामान्य विद्यार्थियों के सामाजिक, आर्थिक स्तर का इनके व्यक्तित्व, समायोजना पर पड़ने वाले प्रभाव का अध्ययन नाम मात्र का हुआ हैं। अतः शोधार्थी का यह उद्देश्य भी है कि सामान्य एवं विशिष्ट विद्यार्थियों पर उनके सामाजिक, आर्थिक स्तर का, उनके व्यक्तित्व, समायोजन पर क्या प्रभाव पड़ा है, जान सकें।

प्रस्तुत अध्ययन में यह जानने का प्रयास है कि आज विशिष्ट और सामान्य विद्यार्थियों का अलग–अलग विद्यालय होने के वावजूद भी क्या वे विद्यालय अपने वातावरण के साथ व्यक्तित्व एवं समायोजन में सफल हो सके अगर नहीं तो अध्ययन के आधार पर इन समस्याओं का समाधान प्रस्तुत करना शोधार्थी का उद्देश्य होगा।

समस्या कथन–

प्रस्तुत समस्या को निम्नवत् शीर्षकबद्ध किया गया है–

''सामान्य एवं विशिष्ट विद्यालयों में अध्ययनरत् विद्यार्थियों के समायोजन स्तर का तुलनात्मक अध्ययन'।

अध्ययन का उद्देश्य

समस्या के उद्देश्य प्रस्तुत अध्ययन के निम्नलिखित उद्देश्य हैं–

➢ सामान्य एवं विशिष्ट विद्यार्थियों के समायोजन क्षमता का तुलनात्मक अध्ययन करना।

➢ सामान्य एवं विशिष्ट विद्यार्थियों के संवेगात्मक समायोजन का तुलनात्मक अध्ययन करना।

➢ सामान्य एवं विशिष्ट विद्यार्थियों के सामाजिक समायोजन का तुलनात्मक अध्ययन करना।

➢ सामान्य एवं विशिष्ट विद्यार्थियों के शैक्षिक समायोजन का तुलनात्मक अध्ययन करना।

अध्ययन की परिकल्पनाएं–

प्रस्तुत अध्ययन में शून्य परिकल्पना का प्रयोग किया गया है, जो निम्न प्रकार है–

➢ सामान्य एवं विशिष्ट विद्यार्थियों के समायोजन क्षमता में सार्थक अन्तर नहीं ळें

➢ सामान्य एवं विशिष्ट विद्यार्थियों के संवेगात्मक समायोजन में सार्थक अन्तर नहीं है।

➢ सामान्य एवं विशिष्ट विद्यार्थियों के सामाजिक समायोजन में सार्थक अन्तर नहीं है।

➢ सामान्य एवं विशिष्ट विद्यार्थियों के शैक्षिक समायोजन का में सार्थक अन्तर नहीं है।

शोध विधि–

प्रस्तुत अध्ययन में वर्णनात्मक अनुसंधान के अन्तर्गत सर्वेक्षण विधि का प्रयोग किया है।

जनसंख्या / समष्टि–

ईकाइयों के समूचे समूह को जिसके लिए चर का मान निकालना अभीष्ट है, उसे समष्टि (न्दपअमतेम) कहते हैं। प्रस्तुत अध्ययन में प्रयागराज जनपद के सत्र 2023–2024 के माध्यमिक स्तर के सामान्य एवं दिव्यांग विद्यार्थियों को समष्टि के रूप में सम्मिलित किया गया है।

न्यादर्श–

प्रस्तुत अध्ययन के अन्तर्गत यादृच्छिक (त्दकवउ) न्यादर्श विधि का प्रयोग किया गया है। न्यादर्श के लिए शोधकर्त्री ने सर्वप्रथम समग्र (जनसंख्या) को समुचित वर्गों में विभक्त किया और प्रत्येक वर्ग से आवश्यक ईकाइयों का चयन किया गया है।

अध्ययन के उद्देश्यों के अनुसार प्रयागराज जनपद के माध्यमिक स्तर पर अध्ययनरत् 50 विद्यार्थी (25 सामान्य विद्यार्थी एवं 25 दिव्यांग विद्यार्थी) का न्यादर्श हेतु चयन किया गया है।

उपकरण —

सामान्य एवं विशिष्ट विद्यार्थियों के समायोजन क्षमता से सम्बन्धित ऑंकड़े एकत्रित करने हेतु डॉ0 ए0के0पी0 सिंह और डा0 आर0पी0 सिंह के समायोजन सूची का प्रयोग किया गया है।

सांख्यिकी प्रविधियाँ

प्रदत्तों के विश्लेषण हेतु मध्यमान, मानक विचलन, मानक त्रुटि एवं टी–अनुपात सांख्यिकी विधियों का प्रयोग किया है।

प्रदत्तों का विश्लेषण एवं व्याख्याः

1   सामान्य एवं विशिष्ट विद्यार्थियों के समायोजन क्षमता का तुलनात्मक अध्ययन करना।

1.1   सामान्य एवं विशिष्ट विद्यार्थियों के संवेगात्मक समायोजन क्षमता का तुलनात्मक अध्ययन करना।

H1.1 =   सामान्य एवं विशिष्ट विद्यार्थियों के संवेगात्मक समायोजन क्षमता में सार्थक अन्तर है।

H1.01 =   सामान्य एवं विशिष्ट विद्यार्थियों के संवेगात्मक समायोजन क्षमता में कोई सार्थक अन्तर नहीं है।

<div align="center">तालिका सं0 1</div>

<div align="center">*सामान्य एवं विशिष्ट विद्यार्थियों के संवेगात्मक समायोजन क्षमता*
का मध्यमान, मानक विचलन एवं टी–अनुपात</div>

क्र0 सं0	समूह	संख्या (N)	मध्यमान (M)	मानक विचलन (SD)	मध्यमानों का अन्तर (M1-M2)	मानक त्रुटि (SED)	टी– अनुपात (t-value)	सार्थकता स्तर एवं सारिणी मान	परिणाम
1	विशिष्ट विद्यार्थियों विद्यार्थी	25	9.12	1.66					
2	सामान्य विद्यार्थियों विद्यार्थी	25	12.08	4.71	2.96	1.02	2.90	0.05 (2.01)	0.05 सार्थकता स्तर पर सार्थक

तालिका 1 के अवलोकन से स्पष्ट है कि सामान्य एवं विशिष्ट विद्यार्थियों के संवेगात्मक समायोजन क्षमता का मध्यमान क्रमशः 9.12 एवं 12.08 है और मानक विचलन क्रमशः 1.66 तथा 4.71 है। तालिका के विश्लेषण से स्पष्ट है कि उक्त मध्यमानों में अन्तर के टी–अनुपात का मान 2.90 है जो स्वतंत्रांश 48 पर 0.05 सार्थकता स्तर के लिए द्वि पुच्छीय परीक्षण हेतु सारणी मान 2.01 से अधिक है, अतः 0.05 सार्थकता स्तर पर सार्थक है। परिणामतः शून्य परिकल्पना अस्वीकृत की जाती है।

प्रस्तुत उद्देश्य की पूर्ति हेतु प्राकल्पित किया गया था कि *सामान्य एवं विशिष्ट विद्यार्थियों के संवेगात्मक समायोजन क्षमता में अन्तर है* जो कि सार्थकता स्तर 0.05 पर स्वीकृत की जाती है तथा शून्य परिकल्पना *सामान्य एवं विशिष्ट विद्यार्थियों के संवेगात्मक समायोजन*

क्षमता में अन्तर नही है, निरस्त की जाती है तथा परिणामतः कहा जा सकता है कि सामान्य विद्यार्थियों में संवेगात्मक समायोजन क्षमता दिव्यांग विद्यार्थियों की अपेक्षा उच्च पाया गया अर्थात् दोनों में सार्थक अन्तर पाया गया।

1.2 सामान्य एवं विशिष्ट विद्यार्थियों के सामाजिक समायोजन क्षमता का तुलनात्मक अध्ययन करना।

H1.2 =   सामान्य एवं विशिष्ट विद्यार्थियों के सामाजिक समायोजन क्षमता में सार्थक अन्तर है।

H1.02 =   सामान्य एवं विशिष्ट विद्यार्थियों के सामाजिक समायोजन क्षमता में कोई सार्थक अन्तर नहीं है।

तालिका सं0 4.2

सामान्य एवं विशिष्ट विद्यार्थियों के सामाजिक समायोजन क्षमता का मध्यमान, मानक विचलन एवं टी–अनुपात

क्र0 सं0	समूह	संख्या (N)	मध्यमान (M)	मानक विचलन (SD)	मध्यमानों का अन्तर (M1-M2)	मानक त्रुटि (SED)	टी–अनुपात (t-value)	सार्थकता स्तर एवं सारिणी मान	परिणाम
1	विशिष्ट विद्यार्थियों विद्यार्थी	25	9.32	1.68					
					1.88	0.82	2.27	0.05 (2.01)	0.05 सार्थकता स्तर पर सार्थक
2	सामान्य विद्यार्थियों विद्यार्थी	25	11.20	3.69					

तालिका 2 के अवलोकन से स्पष्ट है कि सामान्य एवं विशिष्ट विद्यार्थियों के सामाजिक समायोजन क्षमता का मध्यमान क्रमशः 9.32 एवं 11.20 है और मानक विचलन क्रमशः 1.68 तथा 3.69 है। तालिका के विश्लेषण से स्पष्ट है कि उक्त मध्यमानों में अन्तर के टी–अनुपात का मान 2.27 है जो स्वतंत्रांश 48 पर 0.05 सार्थकता स्तर के लिए द्वि पुच्छीय परीक्षण हेतु सारणी मान 2.01 से अधिक है, अतः 0.05 सार्थकता स्तर पर सार्थक है। परिणामतः शून्य परिकल्पना अस्वीकृत की जाती है।

प्रस्तुत उद्देश्य की पूर्ति हेतु प्राकल्पित किया गया था कि *सामान्य एवं विशिष्ट विद्यार्थियों के सामाजिक समायोजन क्षमता में अन्तर है* जो कि सार्थकता स्तर 0.05 पर स्वीकृत की जाती है तथा शून्य परिकल्पना *सामान्य एवं विशिष्ट विद्यार्थियों के सामाजिक समायोजन क्षमता में अन्तर नही है,* निरस्त की जाती है तथा परिणामतः कहा जा सकता है कि सामान्य विद्यार्थियों में सामाजिक समायोजन क्षमता विशिष्ट विद्यार्थियों की अपेक्षा उच्च पाया गया अर्थात् दोनों में सार्थक अन्तर पाया गया।

1.3 सामान्य एवं विशिष्ट विद्यार्थियों के शैक्षिक समायोजन क्षमता का तुलनात्मक अध्ययन करना।

H1.3 =   सामान्य एवं विशिष्ट विद्यार्थियों के शैक्षिक समायोजन क्षमता में सार्थक अन्तर है।

H1.03 =   सामान्य एवं विशिष्ट विद्यार्थियों के शैक्षिक समायोजन क्षमता में कोई सार्थक अन्तर नहीं है।

<div align="center">

तालिका सं0 3

सामान्य एवं विशिष्ट विद्यार्थियों के शैक्षिक समायोजन क्षमता का मध्यमान, मानक विचलन एवं टी–अनुपात

</div>

क्र0 सं0	समूह	संख्या (N)	मध्यमान (M)	मानक विचलन (SD)	मध्यमानों का अन्तर (M1-M2)	मानक त्रुटि (SED)	टी– अनुपात (t-value)	सार्थकता स्तर एवं सारिणी मान	परिणाम
1	विशिष्ट विद्यार्थियों विद्यार्थी	25	8.88	1.69	2.72	0.90	3.02	0.05 (2.01)	0.05 सार्थकता स्तर पर सार्थक
2	सामान्य विद्यार्थियों विद्यार्थी	25	11.60	4.08					

तालिका 3 के अवलोकन से स्पष्ट है कि सामान्य एवं विशिष्ट विद्यार्थियों के शैक्षिक समायोजन क्षमता का मध्यमान क्रमशः 8.88 एवं 11.60 है और मानक विचलन क्रमशः 1. 69 तथा 4.08 है। तालिका के विश्लेषण से स्पष्ट है कि उक्त मध्यमानों में अन्तर के टी–अनुपात का मान 3.02 है जो स्वतंत्रांश 48 पर 0.05 सार्थकता स्तर के लिए द्वि पुच्छीय परीक्षण हेतु सारणी मान 2.01 से अधिक है, अतः 0.05 सार्थकता स्तर पर सार्थक है। परिणामतः शून्य परिकल्पना अस्वीकृत की जाती है।

प्रस्तुत उद्देश्य की पूर्ति हेतु प्राकल्पित किया गया था कि *सामान्य एवं विशिष्ट विद्यार्थियों के शैक्षिक समायोजन क्षमता में अन्तर है* जो कि सार्थकता स्तर 0.05 पर स्वीकृत की जाती है तथा शून्य परिकल्पना *सामान्य एवं दिव्यांग विद्यार्थियों के शैक्षिक समायोजन क्षमता में अन्तर नही है,* निरस्त की जाती है तथा परिणामतः कहा जा सकता है कि समान्य विद्यार्थियों में शैक्षिक समायोजन क्षमता विशिष्ट विद्यार्थियों की अपेक्षा उच्च पाया गया अर्थात् दोनों में सार्थक अन्तर पाया गया।

1.4   सामान्य एवं विशिष्ट विद्यार्थियों के सम्पूर्ण समायोजन क्षमता का तुलनात्मक अध्ययन करना।

H1.4 =   सामान्य एवं विशिष्ट विद्यार्थियों के सम्पूर्ण समायोजन क्षमता में सार्थक अन्तर है।

H1.04 =   सामान्य एवं विशिष्ट विद्यार्थियों के सम्पूर्ण समायोजन क्षमता में कोई सार्थक अन्तर नहीं है।

तालिका सं0 4

सामान्य एवं विशिष्ट विद्यार्थियों के सम्पूर्ण समायोजन क्षमता का मध्यमान, मानक विचलन एवं टी–अनुपात

क्र0 सं0	समूह	संख्या (N)	मध्यमान (M)	मानक विचलन (SD)	मध्यमानों का अन्तर (M1-M2)	मानक त्रुटि (SED)	टी–अनुपात (t-value)	सार्थकता स्तर एवं सारिणी मान	परिणाम
1	विशिष्ट विद्यार्थियों विद्यार्थी	25	27.32	3.05					
2	समान्य विद्यार्थियों विद्यार्थी	25	34.88	8.00	7.56	1.74	4.33	0.05 (2.01)	0.05 सार्थकता स्तर पर सार्थक

तालिका 4.4 के अवलोकन से स्पष्ट है कि सामान्य एवं विशिष्ट विद्यार्थियों के सम्पूर्ण समायोजन क्षमता का मध्यमान क्रमशः 27.32 एवं 34.88 है और मानक विचलन क्रमशः 3.05 तथा 8.00 है। तालिका के विश्लेषण से स्पष्ट है कि उक्त मध्यमानों में अन्तर के टी–अनुपात का मान 4.33 है जो स्वतंत्रांश 48 पर 0.05 सार्थकता स्तर के लिए द्वि पुच्छीय परीक्षण हेतु सारणी मान 2.01 से अधिक है, अतः 0.05 सार्थकता स्तर पर सार्थक है। परिणामतः शून्य परिकल्पना अस्वीकृत की जाती है।

प्रस्तुत उद्देश्य की पूर्ति हेतु प्राकल्पित किया गया था कि *सामान्य एवं विशिष्ट विद्यार्थियों के सम्पूर्ण समायोजन क्षमता में अन्तर है* जो कि सार्थकता स्तर 0.05 पर स्वीकृत की जाती है तथा शून्य परिकल्पना *सामान्य एवं विशिष्ट विद्यार्थियों के सम्पूर्ण समायोजन क्षमता में अन्तर नही है,* निरस्त की जाती है तथा परिणामतः कहा जा सकता है कि समान्य विद्यार्थियों में सम्पूर्ण समायोजन क्षमता विशिष्ट विद्यार्थियों की अपेक्षा उच्च पाया गया अर्थात् दोनों में सार्थक अन्तर पाया गया।

शोध निष्कर्ष :

प्राप्त संख्यिकी प्रदत्तों के विश्लेषण के पश्चात निम्न निष्कर्ष प्राप्त हुये।

➢ समान्य विद्यार्थियों में संवेगात्मक समायोजन क्षमता विशिष्ट विद्यार्थियों की अपेक्षा उच्च पाया गया अर्थात् दोनों में सार्थक अन्तर पाया गया।

➢ समान्य विद्यार्थियों में सामाजिक समायोजन क्षमता विशिष्ट विद्यार्थियों की अपेक्षा उच्च पाया गया अर्थात् दोनों में सार्थक अन्तर पाया गया।

➢ समान्य विद्यार्थियों में शैक्षिक समायोजन क्षमता विशिष्ट विद्यार्थियों की अपेक्षा उच्च पाया गया अर्थात् दोनों में सार्थक अन्तर पाया गया।

➢ समान्य विद्यार्थियों में सम्पूर्ण समायोजन क्षमता विशिष्ट विद्यार्थियों की अपेक्षा उच्च पाया गया अर्थात् दोनों में सार्थक अन्तर पाया गया।

➢ समान्य विद्यार्थियों में शैक्षिक निष्पत्ति विशिष्ट विद्यार्थियों की अपेक्षा उच्च पाया गया अर्थात् दोनों में सार्थक अन्तर पाया गया।

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माध्यमिक स्तर पर अध्ययनरत् सामान्य एवं आरक्षित वर्ग के विद्यार्थियों की अध्ययन आदत का उनके शैक्षिक उपलब्धि पर प्रभाव का अध्ययन

उदय चन्द चौहान एवं के० के० तिवारी

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शोध-सारांश

अध्ययनकर्त्ता द्वारा माध्यमिक स्तर पर अध्ययनरत् सामान्य एवं आरक्षित वर्ग के विद्यार्थियों की अध्ययन आदत का उनके शैक्षिक उपलब्धि पर प्रभाव का अध्ययन किया गया है। अध्ययन में वर्णनात्मक अनुसंधान के अन्तर्गत सर्वेक्षण विधि का प्रयोग किया गया है। प्रस्तुत अध्ययन में बलिया जिले के अन्तर्गत माध्यमिक स्तर पर अध्ययनरत कक्षा 11 के विद्यार्थियों को जनसंख्या के रूप में शामिल किया गया है। प्रस्तुत अध्ययन कार्य हेतु अध्ययनकर्त्ता ने सबसे पहले बलिया के जिले के 17 विकास खण्डों में से नगरा विकास खण्ड को चयन किया गया। प्रस्तुत अध्ययन में न्यादर्श के चयन का आधार उद्देश्यानुसार न्यादर्शन विधि से किया गया। जिसमें 10 माध्यमिक विद्यालयों के 11वीं कक्षा से 400 छात्र-छात्राओं का चयन किया। 400 विद्यार्थियों में से 200 सामान्य एवं 200 आरक्षित वर्ग के छात्र-छात्राओं को लिया गया है। प्रस्तुत अध्ययन हेतु एम0 मुखोपाध्याय एवं डी0एन0 सनसनवाल द्वारा निर्मित 'अध्ययन आदत परिसूची' एवं विद्यार्थियों की शैक्षिक उपलब्धि के मापन के लिए प्रतिदर्श के रूप में चयनित प्रत्येक विद्याश्ः॰ी के माध्यमिक शिक्षा परिषद, प्रयागराज (उ0प्र0) द्वारा आयोजित कक्षा 10वीं के वार्षिक परीक्षा में प्राप्त कुल प्राप्तांक को लिया गया है। प्रस्तुत शोध अध्ययन में आँकड़ों की गणना के लिए माइक्रोसॉफ्ट एक्सल का प्रयोग किया गया है। आँकड़ों के विश्लेषण के लिए सांख्यिकी के रूप में प्रसरण विधि (एनोवा), मध्यमान, मानक त्रुटि एवं टी-टेस्ट का प्रयोग किया गया। शोध के लिए निर्धारित शून्य परिकल्पनाओं की 0.05 स्तर पर सार्थकता के परीक्षण के लिए सी0आर0 परीक्षण का प्रयोग किया गया है। अध्ययन के निष्कर्ष में पाया गया कि- माध्यमिक स्तर पर अध्ययनरत् सामान्य एवं आरक्षित वर्ग के विद्यार्थियों की अध्ययन आदत का उनके शैक्षिक उपलब्धि पर प्रभाव सार्थक प्रभाव है।

मुख्य शब्द- *माध्यमिक, सामान्य, आरक्षित, अध्ययन आदत, शैक्षिक उपलब्धि, प्रभाव, प्रसरण मान, टी-अनुपात।*

प्रस्तावना-

उच्च शिक्षा मनुष्य और सामाजिक कल्याण के उत्थान में महत्वपूर्ण भूमिका निभाती है। हमारे संविधान में भारत को प्रजातांत्रिक, न्यायपूर्ण, सामाजिक रूप से सचेत और मानवीय राष्ट्र जहाँ सभी के लिए न्याय, स्वतंत्रता, समानता एवं बंधुत्व की भावना की परिकल्पना की गई है। एक राष्ट्र के आर्थिक विकास और आजीविकाओं को स्थायित्व देने भी उच्च शिक्षा की महत्वपूर्ण योगदान होता है। जैसे-जैसे भारत ज्ञान आधारित समाज एवं अर्थव्यवस्थाओं की ओर बढ़ता जायेगा। वैसे-वैसे युवा पीढ़ी उच्च शिक्षा की ओर अग्रसर होगी।

शैक्षिक उपलब्धि को प्रभावित करने वाले कारकों में अध्ययन आदत भी एक कारक है। विद्यार्थी को ऐसे ज्ञान को प्राप्त करने और ऐसी आदतों के निर्माण करने में सहायता देती है जो नवीन परिस्थितियों का सामना करने, नवीन विचारों का निर्माण करने और जीवन को सफल और सम्पन्न बनाने की क्षमता प्रदान करता है। आदत हमारे जीवन में बहुत ही उपयोगी है। अच्छी आदतें हमारे जीवन को जितना सहज व सरल बनाती है उतना ही बुरी आदतें जीवन के लिए समस्याएँ खड़ी कर देती है। अच्छी संगत में रहने से अच्छी आदतों का विकास होता है।

शैक्षिक उपलब्धि से तात्पर्य विद्यार्थियों द्वारा अर्जित ज्ञान, बोध, कौशल, अनुप्रयोग आदि योग्यताओं की मात्रात्मक अभिव्यक्ति है। शिक्षण-अधिगम प्रक्रिया के माध्यम से विद्यार्थी अपनी विभिन्न बौद्धिक योग्यताओं का विकास करते हैं। मनुष्य अपने जीवन में विभिन्न प्रकार का ज्ञान कौशल प्राप्त करता है। इस ज्ञान तथा कौशल में कितनी दक्षता मनुष्य ने प्राप्त की है, इसका पता उस ज्ञान और कौशल के उपलब्धि परीक्षण से चलता है।

वास्तव में अध्ययन की आदत उन सभी व्यक्तियों की एक बहुत ही महत्वपूर्ण विशेषता है जो शिक्षित हो रहे हैं विद्यार्थियों की उच्च शैक्षिक उपलब्धि के लिए। अध्ययन की आदत जितनी महत्वपूर्ण है, उतनी ही उनके खाली समय के उपयोगी उपयोग के लिए भी महत्वपूर्ण है। जबकि कोई किसी व्यक्ति के जीवन में एक डेल्टा बिन्दु का अनुमान लगा सकता है। अध्ययन की आदतें एक निश्चित उम्र तक तय हो जाती है। समभवत: ऐसे पैटर्न केवल अध्ययन सेट, ड्रिलिंग आदि जैसे व्यवहारों में ही तय हो जाते हैं। गुप्त व्यवहार, जैसे एकाग्रता, जीवन के प्रत्येक महत्वपूर्ण परिवर्तन के साथ समझ, कार्य अभिविन्यास बदलता है। इसलिए स्कूली विद्यार्थियों, कालेज के छात्रों, शिक्षकों और कामकाजी वयस्कों की अध्ययन आदतों का मूल्यांकन अलग-अलग होना चाहिए।

अध्ययन की आदत से अभिप्राय अध्ययन के निरंतर अभ्यास से है जो कार्य हमें पहले कठिन जान पड़ता है, वह सीखने के बाद आसान हो जाता है। हम उसे जितना अधिक दोहरातें हे, वह उतना ही ज्यादा आसान होता चला जाता है। अध्ययन और आदत का आपस में गहरा सम्बन्ध है। आदत किसी को बहुत मजबूत और किसी को बहुत कमजोर बनाती है। सामान्यतरू ऐसा देखने को मिलता है कि दो समान योग्यताधारी छात्रों के परीक्षण परिणाम में अन्तर –ष्टिगोचर होता है। ऐसा दोनों के अध्ययन आदत में भिन्नता के कारण होता है। छात्रों में व्यक्तिगत विकास के भावी जीवन के निर्माण के लिए यह आवश्यक है कि उनमें अध्ययन के आदत के गुण को विकसित किया जाये।

जब कोई मनुष्य किसी काम को अपनी स्वेच्छा या अस्वेच्छा से दोहराता या करता है तो कुछ समय व कुछ प्रयत्नों के बाद उस मनुष्य में वह काम बिना किसी प्रयत्न के स्वत: संचालित होने लगती है। बार-बार दोहराये गये कामों के इस प्रकार के परिणाम को आदत कहते हैं। अतरू आदत एक प्रकार का अर्जित व्यवहार है, जिसमें किसी क्रिया के करने का ढंग निहित रहता है। मनुष्य के द्वारा जीवन में किये जाने वाले ज्यादातर काम उसकी आदतों पर निर्भर करता है। उदाहरण- खाने-पीने के ढंग, उठने-बैठने, कपड़ा पहनने का ढंग, चलने का तरीका आदि मनुष्य विशेष की आदतों के अनुसार होता है। अर्थात् आदत मनुष्य के स्वचालित व्यवहार होते हैं। आगे चलकर आदत मनुष्य का स्वभाव बन जाता है।

अध्ययन आदत एक ओर जहाँ विद्यार्थियों के व्यक्तित्व के विकास के लिए आवश्यक है तो वहीं दूसरी ओर उनके भावी जीवन में निर्माण में आवश्यक है। भिन्न-भिन्न छात्रों में भिन्न-भिन्न विषयों के प्रति भिन्न-भिन्न नजरिया होता है। यदि विषय रोचक है तो उसके प्रति छात्रों का –ष्टिकोण सकारात्मक होता है। लेकिन यदि विषय नीरस व अरोचक है तो छात्रों का –ष्टिकोण नकारात्मक होता है और छात्रों में उस विषय के प्रति अध्ययन से विमुख होते जाते हैं।

पूर्व अध्ययनों में अध्ययन आदत का शैक्षिक उपलब्धि पर प्रभाव सम्बन्धित अध्ययनों के निष्कर्षों से ज्ञात होता है जिसमें **अर्चना (2011)** के परिणाम, आदतों पर उच्च और निम्न शैक्षिक उपलब्धि के बीच एक महत्वपूर्ण अन्तर है। सिंह, सुरेश कुमार (2013) के परिणाम, **स्ववित्तपोषित माध्यमिक विद्यालयों के छात्रों की अध्ययन आदतों एवं अध्ययन अभिवृत्ति का उनकी शैक्षिक उपलब्धि पर सार्थक प्रभाव होता है।** नाराहारी एवं तिवारी **(2015) के अध्ययन परिणाम,** सरकारी विद्यालयों में अध्ययनरत् किशोरावस्था के विद्यार्थियों को शैक्षिक परामर्श का उनके अध्ययन आदत से उच्च धनात्मक सहसम्बन्ध पाया गया। लिंग पर शैक्षिक परामर्श का धनात्मक प्रभाव पड़ता है। **विजय, संत (2017)** के वर्तमान अध्ययन का अर्थ है कि ध्यन आदत का छात्र-छात्राओं के शैक्षिक उपलब्धि पर सार्थक प्रभाव पाया गया। **कुमार, श्रवण (2018)** के अध्ययन परिणाम, अध्ययन आदत का छात्र-छात्राओं के शैक्षिक उपलब्धि पर सार्थक प्रभाव पाया गया।

समस्या कथन-

माध्यमिक स्तर पर अध्ययनरत् सामान्य एवं आरक्षित वर्ग के विद्यार्थियों की अध्ययन आदत का उनके शैक्षिक उपलब्धि पर प्रभाव का अध्ययन।

अध्ययन का उद्देश्य-

अध्ययन में निम्नलिखित उद्देश्यों का अध्ययन किया गया है-

1. सामान्य वर्ग के विद्यार्थियों की शैक्षिक उपलब्धि पर अध्ययन आदत के प्रभाव का अध्ययन करना।

2. आरक्षित वर्ग के विद्यार्थियों की शैक्षिक उपलब्धि पर अध्ययन आदत के प्रभाव का अध्ययन करना।

परिकल्पना-

उद्देश्यों के आधार पर निम्नलिखित परिकल्पनाओं का परीक्षण किया गया है-

1.   सामान्य वर्ग के विद्यार्थियों की शैक्षिक उपलब्धि एवं अध्ययन आदत के प्राप्तांकों के मध्यमानों के मध्य सार्थक अन्तर नहीं है।

2.   आरक्षित वर्ग के विद्यार्थियों की शैक्षिक उपलब्धि एवं अध्ययन आदत के प्राप्तांकों के मध्यमानों के मध्य सार्थक अन्तर नहीं है।

अध्ययन विधि-

प्रस्तुत शोध अध्ययन में माध्यमिक स्तर पर अध्ययनरत सामान्य एवं आरक्षित वर्ग के विद्यार्थियों की शैक्षिक उपलब्धि पर अध्ययन आदत के प्रभाव का अध्ययन करने का प्रयास किया है। प्रस्तुत अध्ययन में वर्णनात्मक अनुसंधान के अन्तर्गत सर्वेक्षण विधि का प्रयोग किया गया है।

जनसंख्या-

प्रस्तुत अध्ययन में बलिया जिले के अन्तर्गत माध्यमिक स्तर पर अध्ययनरत कक्षा 11 के विद्यार्थियों को जनसंख्या के रूप में शामिल किया गया है।

न्यादर्श एवं न्यादर्श चयन की विधि-

प्रस्तुत अध्ययन कार्य हेतु अध्ययनकर्त्ता ने सबसे पहले बलिया के जिले के 17 विकास खण्डों में से नगरा विकास खण्ड को चयन किया गया। प्रस्तुत अध्ययन में न्यादर्श के चयन का आधार उद्देश्यानुसार न्यादर्शन विधि से किया गया। जिसमें 10 माध्यमिक विद्यालयों के 11वीं कक्षा से 400 छात्र-छात्राओं का चयन किया। 400 विद्यार्थियों में से 200 सामान्य एवं 200 आरक्षित वर्ग के छात्र-छात्राओं को लिया गया है।

प्रयुक्त उपकरण-

प्रस्तुत अध्ययन हेतु एम. मुखोपाध्याय एवं डी.एन. सनसनवाल द्वारा निर्मित 'अध्ययन आदत प्रश्नावली' एवं विद्यार्थियों की शैक्षिक उपलब्धि के मापन के लिए प्रतिदर्श के रूप में चयनित प्रत्येक विद्यार्थी के माध्यमिक शिक्षा परिषद, प्रयागराज (उ0प्र0) द्वारा आयोजित कक्षा 10वीं के वार्षिक परीक्षा में प्राप्त कुल प्राप्तांक को लिया गया है।

सांख्यिकीय विश्लेषण

प्रस्तुत शोध अध्ययन में आँकड़ों की गणना के लिए माइक्रोसॉफ्ट एक्सल का प्रयोग किया गया है। आँकड़ों के विश्लेषण के लिए सांख्यिकी के रूप में प्रसरण विधि (एनोवा), मध्यमान, मानक त्रुटि एवं टी-टेस्ट का प्रयोग किया गया। शोध के लिए निर्धारित शून्य परिकल्पनाओं की 0.05 स्तर पर सार्थकता के परीक्षण के लिए सी0आर0 परीक्षण का प्रयोग किया गया है।

आँकड़ों का विश्लेषण एवं व्याख्या-

1.   सामान्य वर्ग के विद्यार्थियों की शैक्षिक उपलब्धि पर अध्ययन आदत के प्रभाव का अध्ययन -
        उद्देश्य के आधार पर उत्तम अध्ययन आदत, मध्यम अध्ययन आदत एवं खराब अध्ययन आदत वाले सामान्य वर्ग के विद्यार्थियों की शैक्षिक उपलब्धि के प्राप्तांकों के मध्यमानों के मध्य सार्थक अन्तर नहीं है।

सारणी - 1

उत्तम अध्ययन आदत, मध्यम अध्ययन आदत एवं खराब अध्ययन आदत वाले सामान्य वर्ग के विद्यार्थियों की शैक्षिक उपलब्धि

क्र.सं.	अध्ययन आदत	विद्यार्थियों की सं0	प्रतिशत	शैक्षिक उपलब्धि
1.	उत्तम अध्ययन आदत	48	24.00%	72.03
2.	मध्यम अध्ययन आदत	142	71.00%	65.55
3.	खराब अध्ययन आदत	10	5.00%	63.15
	योग	200	100.00%	66.98

स्रोत	स्वातंत्र्य कोटि (df)	वाह्य वर्ग योग (SS)	आन्तरिक वर्ग योग (MS)	प्रसरण मान (F)	सारणी मान (Table Value)
समूहों के मध्य	2	1665.23	832.61		
समूहों के अन्दर	197	10501.38	53.31	15.62	.05(2,197)=3.04
कुल	199	12166.60	885.92		

सामान्य वर्ग के विद्यार्थियों की शैक्षिक उपलब्धि पर अध्ययन आदत के प्रभाव का अध्ययन हेतु तीन वर्गों में उत्तम, मध्यम एवं खराब अध्ययन आदत वाले विद्यार्थियों को विभाजित कर अध्ययन करने पर पाया गया कि 24.00:% उत्तम अध्ययन आदत वाले विद्याश्र ाेी की शैक्षिक उपलब्धि का मध्यमान 72.03:, 71.00:% मध्यम अध्ययन आदत वाले विद्यार्थियों की शैक्षिक उपलब्धि का मध्यमान 65.55: तथा 5.00:% खराब अध्ययन आदत वाले विद्यार्थियों की शैक्षिक उपलब्धि का मध्यमान 63.15: पाये गये। तीनों अध्ययन आदत वाले विद्यार्थियों की शैक्षिक उपलब्धि के मध्य प्रसरण-मान 15.62 पाया गया जो क्रान्तिक मान में 0.05 सार्थकता स्तर पर दिये गये मान 3.04 से अधिक है। अत: 0.05 सार्थकता स्तर पर शून्य परिकल्पना निरस्त की जाती है। अत: कह सकते हैं कि सामान्य वर्ग के विद्यार्थियों की शैक्षिक उपलब्धि पर अध्ययन आदत का सार्थक प्रभाव है।

अत: सामान्य वर्ग के विद्यार्थियों की शैक्षिक उपलब्धि पर अध्ययन आदत के प्रभाव के आधार पर उत्तम अध्ययन आदत, मध्यम अध्ययन आदत एवं खराब अध्ययन आदत वाले सामान्य वर्ग के विद्यार्थियों की शैक्षिक उपलब्धि में अन्तर को निम्नवत् दर्शाया गया है-

सारणी-1.1

उत्तम अध्ययन आदत एवं मध्यम अध्ययन आदत वाले सामान्य वर्ग के विद्यार्थियों की शैक्षिक उपलब्धि के मध्य अन्तर का टी-मान

क्र.सं.	चर	न्यादर्श (N)	मध्यमान (M)	मानक त्रुटि (σ_D)	मध्यमान का अन्तर (D)	टी-मान (t-Value)
1.	उत्तम अध्ययन आदत	48	72.03			
2.	मध्यम अध्ययन आदत	142	65.55	1.22	6.49	5.32

0.05 सार्थक स्तर पर सार्थक

उत्तम अध्ययन आदत एवं मध्यम अध्ययन आदत वाले सामान्य वर्ग के विद्यार्थियों की शैक्षिक उपलब्धि का मध्यमान क्रमश: 72.03 एवं 65.55 है। दोनों मध्यमानों के अन्तर का मान 6.49 तथा मानक त्रुटि 1.22 है जबकि दोनों मध्यमानों के अन्तर का टी-मान 5.32 है जो कि 0.05 सार्थकता स्तर पर क्रान्तिक मान 1.97 से अधिक है। अत: उत्तम अध्ययन आदत एवं मध्यम अध्ययन आदत वाले सामान्य वर्ग के विद्यार्थियों की शैक्षिक उपलब्धि में सार्थक अन्तर है। अत: उत्तम अध्ययन आदत वाले सामान्य वर्ग के विद्यार्थियों की शैक्षिक उपलब्धि मध्यम अध्ययन आदत वाले विद्यार्थियों की अपेक्षा अधिक है।

<div align="center">

सारणी-1.2

उत्तम अध्ययन आदत एवं खराब अध्ययन आदत वाले सामान्य वर्ग के विद्यार्थियों की शैक्षिक उपलब्धि के मध्य अन्तर का टी-मान

</div>

क्र.सं.	चर	न्यादर्श (N)	मध्यमान (M)	मानक त्रुटि (σ_D)	मध्यमान का अन्तर (D)	टी-मान (t-Value)
1.	उत्तम अध्ययन आदत	48	72.03	2.54	8.88	3.50
2.	खराब अध्ययन आदत	10	63.15			

0.05 सार्थक स्तर पर सार्थक

उत्तम अध्ययन आदत एवं खराब अध्ययन आदत वाले सामान्य वर्ग के विद्यार्थियों की शैक्षिक उपलब्धि का मध्यमान क्रमश: 72.03 एवं 63.15 है। दोनों मध्यमानों के अन्तर का मान 8.88 तथा मानक त्रुटि 2.54 है जबकि दोनों मध्यमानों के अन्तर का टी-मान 3.50 है जो कि 0.05 सार्थकता स्तर पर क्रान्तिक मान 2.01 से अधिक है। अत: उत्तम अध्ययन आदत एवं खराब अध्ययन आदत वाले सामान्य वर्ग के विद्यार्थियों की शैक्षिक उपलब्धि में सार्थक अन्तर है। अत: उत्तम अध्ययन आदत वाले सामान्य वर्ग के विद्यार्थियों की शैक्षिक उपलब्धि खराब अध्ययन आदत वाले विद्यार्थियों की अपेक्षा अधिक है।
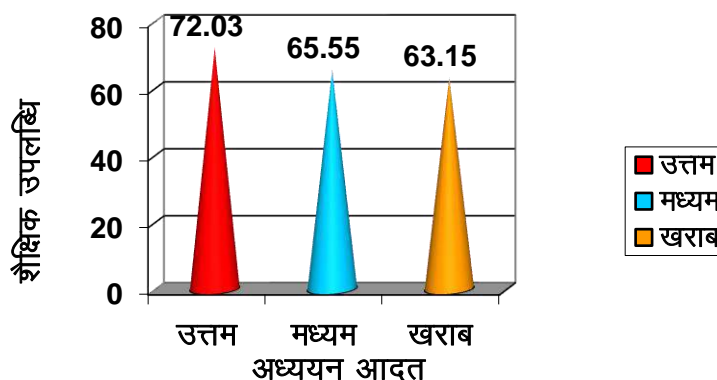
<div align="center">

सारणी-1.3

मध्यम अध्ययन आदत एवं खराब अध्ययन आदत वाले सामान्य वर्ग के विद्यार्थियों की शैक्षिक उपलब्धि के मध्य अन्तर का टी-मान

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क्र.सं.	चर	न्यादर्श (N)	मध्यमान (M)	मानक त्रुटि (σ_D)	मध्यमान का अन्तर (D)	टी-मान (t-Value)
1.	मध्यम अध्ययन आदत	142	65.55	2.39	2.40	1.00
2.	खराब अध्ययन आदत	10	63.15			

0.05 सार्थक स्तर पर असार्थक

मध्यम अध्ययन आदत एवं खराब अध्ययन आदत वाले सामान्य वर्ग के विद्यार्थियों की शैक्षिक उपलब्धि का मध्यमान क्रमश: 65.55 एवं 63.15 है। दोनों मध्यमानों के अन्तर का मान 2.40 तथा मानक त्रुटि 2.39 है जबकि दोनों मध्यमानों के अन्तर का टी-मान 1.00 है जो कि 0.05 सार्थकता स्तर पर क्रान्तिक मान 1.98 से कम है। अत: मध्यम अध्ययन आदत एवं खराब अध्ययन आदत वाले सामान्य वर्ग के विद्यार्थियों की शैक्षिक उपलब्धि में सार्थक अन्तर नहीं है। अत: मध्यम अध्ययन आदत एवं खराब अध्ययन आदत वाले विद्यार्थियों में समान शैक्षिक उपलब्धि है।

ग्राफ-1 उत्तम अध्ययन आदत, मध्यम अध्ययन आदत एवं खराब अध्ययन आदत वाले सामान्य वर्ग के विद्यार्थियों की शैक्षिक उपलब्धि के मध्यमानों का ग्राफीय निरूपण

2.   आरक्षित वर्ग के विद्यार्थियों की शैक्षिक उपलब्धि पर अध्ययन आदत के प्रभाव का अध्ययन -

उद्देश्य के आधार पर उत्तम अध्ययन आदत, मध्यम अध्ययन आदत एवं खराब अध्ययन आदत वाले आरक्षित वर्ग के विद्यार्थियों की शैक्षिक उपलब्धि के प्राप्तांकों के मध्यमानों के मध्य सार्थक अन्तर नहीं है।

सारणी - 2

उत्तम अध्ययन आदत, मध्यम अध्ययन आदत एवं खराब अध्ययन आदत वाले आरक्षित वर्ग के विद्यार्थियों की शैक्षिक उपलब्धि

क्र.सं.	अध्ययन आदत	विद्यार्थियों की सं0	प्रतिशत	शैक्षिक उपलब्धि
1.	उत्तम अध्ययन आदत	36	18.00%	66.11
2.	मध्यम अध्ययन आदत	130	65.00%	59.76
3.	खराब अध्ययन आदत	34	17.00%	57.14
	योग	200	100.00%	60.46

स्रोत	स्वातंत्रय कोटि (df)	वाह्य वर्ग योग (SS)	आन्तरिक वर्ग योग (MS)	प्रसरण मान (F)	सारणी मान (Table Value)
समूहों के मध्य	2	1587.38	793.69		
समूहों के अन्दर	197	12580.55	63.86	12.43	.05(2,197)=3.04
कुल	199	14167.93	857.55		

आरक्षित वर्ग के विद्यार्थियों की शैक्षिक उपलब्धि पर अध्ययन आदत के प्रभाव का अध्ययन हेतु तीन वर्गों में उत्तम, मध्यम एवं खराब अध्ययन आदत वाले विद्यार्थियों को विभाजित कर अध्ययन करने पर

पाया गया कि 18.00%: उत्तम अध्ययन आदत वाले विद्यार्थियों की शैक्षिक उपलब्धि का मध्यमान 66.11:, 65.00:% मध्यम अध्ययन आदत वाले विद्यार्थियों की शैक्षिक उपलब्धि का मध्यमान 59.76: तथा 17.00%: खराब अध्ययन आदत वाले विद्यार्थियों की शैक्षिक उपलब्धि का मध्यमान 57.14: पाये गये। तीनों अध्ययन आदत वाले विद्यार्थियों की शैक्षिक उपलब्धि के मध्य प्रसरण-मान 12.43 पाया गया जो क्रान्तिक मान में 0.05 सार्थकता स्तर पर दिये गये मान 3.04 से अधिक है। अत: 0.05 सार्थकता स्तर पर शून्य परिकल्पना निरस्त की जाती है। अत: कह सकते हैं कि आरक्षित वर्ग के विद्यार्थियों की शैक्षिक उपलब्धि पर अध्ययन आदत का सार्थक प्रभाव है।

अत: आरक्षित वर्ग के विद्यार्थियों की शैक्षिक उपलब्धि पर अध्ययन आदत के प्रभाव के आधार पर उत्तम अध्ययन आदत, मध्यम अध्ययन आदत एवं खराब अध्ययन आदत वाले आरक्षित वर्ग के विद्यार्थियों की शैक्षिक उपलब्धि में अन्तर को निम्नवत् दर्शाया गया है-

सारणी-2.1
उत्तम अध्ययन आदत एवं मध्यम अध्ययन आदत वाले आरक्षित वर्ग के विद्यार्थियों की शैक्षिक उपलब्धि के मध्य अन्तर का टी-मान

क्र.सं.	चर	न्यादर्श (N)	मध्यमान (M)	मानक त्रुटि (σ_D)	मध्यमान का अन्तर (D)	टी-मान (t-Value)
1.	उत्तम अध्ययन आदत	36	66.11	1.51	6.35	4.22
2.	मध्यम अध्ययन आदत	130	59.76			

0.05 सार्थक स्तर पर सार्थक

उत्तम अध्ययन आदत एवं मध्यम अध्ययन आदत वाले आरक्षित वर्ग के विद्यार्थियों की शैक्षिक उपलब्धि का मध्यमान क्रमश: 66.11 एवं 59.76 है। दोनों मध्यमानों के अन्तर का मान 6.35 तथा मानक त्रुटि 1.51 है जबकि दोनों मध्यमानों के अन्तर का टी-मान 4.22 है जो कि 0.05 सार्थकता स्तर पर क्रान्तिक मान 1.98 से अधिक है। अत: उत्तम अध्ययन आदत एवं मध्यम अध्ययन आदत वाले आरक्षित वर्ग के विद्यार्थियों की शैक्षिक उपलब्धि में सार्थक अन्तर है। अत: उत्तम अध्ययन आदत वाले आरक्षित वर्ग के विद्यार्थियों की शैक्षिक उपलब्धि मध्यम अध्ययन आदत वाले विद्यार्थियों की अपेक्षा अधिक है।
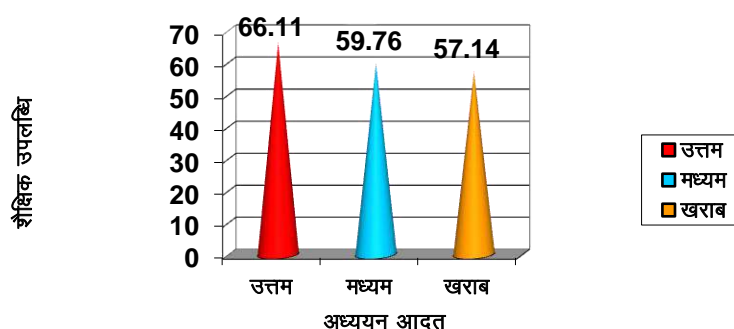
सारणी-2.2
उत्तम अध्ययन आदत एवं खराब अध्ययन आदत वाले आरक्षित वर्ग के विद्यार्थियों की शैक्षिक उपलब्धि के मध्य अन्तर का टी-मान

क्र.सं.	चर	न्यादर्श (N)	मध्यमान (M)	मानक त्रुटि (σ_D)	मध्यमान का अन्तर (D)	टी-मान (t-Value)
1.	उत्तम अध्ययन आदत	36	66.11	1.91	8.97	4.69
2.	खराब अध्ययन आदत	34	57.14			

0.05 सार्थक स्तर पर सार्थक

उत्तम अध्ययन आदत एवं खराब अध्ययन आदत वाले आरक्षित वर्ग के विद्यार्थियों की शैक्षिक उपलब्धि का मध्यमान क्रमश: 66.11 एवं 57.14 है। दोनों मध्यमानों के अन्तर का मान 8.97 तथा मानक त्रुटि 1.91 है जबकि दोनों मध्यमानों के अन्तर का टी-मान 4.69 है जो कि 0.05 सार्थकता स्तर पर क्रान्तिक मान 2.00 से अधिक है। अत: उत्तम अध्ययन आदत एवं खराब अध्ययन आदत वाले आरक्षित वर्ग के विद्यार्थियों की शैक्षिक उपलब्धि में सार्थक अन्तर है। अत: उत्तम अध्ययन आदत वाले आरक्षित वर्ग के विद्यार्थियों की शैक्षिक उपलब्धि खराब अध्ययन आदत वाले विद्यार्थियों की अपेक्षा अधिक है।

<div align="center">

सारणी-2.3

मध्यम अध्ययन आदत एवं खराब अध्ययन आदत वाले आरक्षित वर्ग के विद्यार्थियों की शैक्षिक उपलब्धि के मध्य अन्तर का टी-मान

</div>

क्र.सं.	चर	न्यादर्श (N)	मध्यमान (M)	मानक त्रुटि (σ_D)	मध्यमान का अन्तर (D)	टी-मान (t-Value)
1.	मध्यम अध्ययन आदत	130	59.76	1.54	2.62	1.70
2.	खराब अध्ययन आदत	34	57.14			

0.05 सार्थक स्तर पर असार्थक

मध्यम अध्ययन आदत एवं खराब अध्ययन आदत वाले आरक्षित वर्ग के विद्यार्थियों की शैक्षिक उपलब्धि का मध्यमान क्रमश: 59.76 एवं 57.14 है। दोनों मध्यमानों के अन्तर का मान 2.62 तथा मानक त्रुटि 1.54 है जबकि दोनों मध्यमानों के अन्तर का टी-मान 1.70 है जो कि 0.05 सार्थकता स्तर पर क्रान्तिक मान 1.98 से कम है। अत: मध्यम अध्ययन आदत एवं खराब अध्ययन आदत वाले आरक्षित वर्ग के विद्यार्थियों की शैक्षिक उपलब्धि में सार्थक अन्तर नहीं है। अत: मध्यम अध्ययन आदत एवं खराब अध्ययन आदत वाले विद्यार्थियों में समान शैक्षिक उपलब्धि है।

ग्राफ-2 उत्तम अध्ययन आदत, मध्यम अध्ययन आदत एवं खराब अध्ययन आदत वाले आरक्षित वर्ग के विद्यार्थियों की शैक्षिक उपलब्धि के मध्यमानों का ग्राफीय निरूपण

निष्कर्ष-

अध्ययनकर्त्ता द्वारा अपने समस्या कथन के आधार पर बनाये गये उद्देश्यों से निम्नलिखित निष्कर्ष प्राप्त हुये-

- उत्तम अध्ययन आदत वाले सामान्य वर्ग के विद्यार्थियों की शैक्षिक उपलब्धि मध्यम अध्ययन आदत वाले विद्यार्थियों की अपेक्षा अधिक है।

- उत्तम अध्ययन आदत वाले सामान्य वर्ग के विद्यार्थियों की शैक्षिक उपलब्धि खराब अध्ययन आदत वाले विद्यार्थियों की अपेक्षा अधिक है।

- मध्यम अध्ययन आदत एवं खराब अध्ययन आदत वाले विद्यार्थियों में समान शैक्षिक उपलब्धि है।

निष्कर्षत: सामान्य वर्ग के विद्यार्थियों की शैक्षिक उपलब्धि पर अध्ययन आदत का सार्थक प्रभाव है।

- उत्तम अध्ययन आदत वाले आरक्षित वर्ग के विद्यार्थियों की शैक्षिक उपलब्धि मध्यम अध्ययन आदत वाले विद्यार्थियों की अपेक्षा अधिक है।

- उत्तम अध्ययन आदत वाले आरक्षित वर्ग के विद्यार्थियों की शैक्षिक उपलब्धि खराब अध्ययन आदत वाले विद्यार्थियों की अपेक्षा अधिक है।

- मध्यम अध्ययन आदत एवं खराब अध्ययन आदत वाले विद्यार्थियों में समान शैक्षिक उपलब्धि है।

निष्कर्षत: आरक्षित वर्ग के विद्यार्थियों की शैक्षिक उपलब्धि पर अध्ययन आदत का सार्थक प्रभाव है।

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विकासखण्ड बहादुरपुर में कृषि उत्पादकता का एक भौगोलिक विश्लेषण

अमित कुमार एवं मीता रतावा तिवारी

भूगोल विभाग, नेहरू ग्राम भारती (मानित् विश्वविद्यालय)
कोटवा–जमुनीपुर, दुबावल, प्रयागराज

सारांश

कृषि उत्पादकता से तात्पर्य किसी क्षेत्र विशेष में प्रति हेक्टेयर उत्पादन से है। कृषि उत्पादकता को प्रति इकाई कृषि क्षेत्र, प्रति कृषि श्रमिक अथवा प्रति इकाई निवेश (वित्तीय मूल्य) पर कुल कृषि उत्पादन के रूप में व्यक्त किया जाता है। इन्हें पृथक तौर पर भूमि उत्पादकता, श्रम उत्पादकता एवं पूंजी उत्पादकता भी कहा जाता है। कृषि उत्पादकता कृषि फार्म में प्रयुक्त सकल आगतों के सूचकांक का कुल कृषि उत्पादन सूचकों का अनुपात है। कृषि उत्पादकता में मिट्टी, जलवायु, कृषि तकनीक, पूंजी एवं उर्वरकों का विशेष महत्व होता है। कुछ क्षेत्रों में अधिक उर्वरकों के प्रयोग से भी अनूकूल उत्पादन नहीं प्राप्त हो पाता है। यहाँ मिट्टी की जाँच आवश्यक होती है जिससे मृदा में जिस अनुपात में सिंचाई और उर्वरकों की आवश्यकता हो उसी अनुपात में उनका प्रयोग किया जा सके। कृषि उत्पादकता को बनाये रखने के लिए फसलों में अन्तराल तथा मिट्टी में विद्यमान पोषक तत्वों की नियमित जाँच आवश्यक होती है। कृषि उत्पादकता बढ़ाने में भौतिक कारकों, उन्नतशील बीजों, सिंचाई के साधनों, उर्वरकों, मशीनीकरण, कृषकों की कुशलता, पूँजी एवं नवीन तकनीकों का विशेष महत्व है। कृषि उत्पादकता के परिवर्ती प्रतिरूप से अतीत के कृषि विकास का आकलन किया जा सकता है। वर्ष 1991–2021 में कृषि उत्पादकता परिवर्तन के अध्ययन से स्पष्ट होता है कि सर्वाधिक धनात्मक फसल परिवर्तन बाजरा (10.89 प्रतिशत) में हुआ है। इसके बाद गेहूँ (6.29 प्रतिशत), चारा (खरीफ) (1.19 प्रतिशत), उर्द (0.40 प्रतिशत), चावल (खरीफ) (0.28 प्रतिशत), मूंग (0.28 प्रतिशत), आलू (0.28 प्रतिशत), तिल (0.28 प्रतिशत) एवं सनई (0.28 प्रतिशत) है। वहीं सर्वाधिक ऋणात्मक फसल परिवर्तन चना (–5.61 प्रतिशत) में हुआ है। इसके बाद जौ (–4.10 प्रतिशत), अरहर (–3.81 प्रतिशत), ज्वार (–2.79 प्रतिशत), मटर (–2.23 प्रतिशत), गन्ना (–0.53 प्रतिशत) एवं सरसों (–0.37 प्रतिशत) का है।

संकेत शब्द– *कृषि उत्पादकता, हेक्टेयर, उन्नतशील बीज, उर्वरक, मशीनीकरण, पूँजी एवं नवीन तकनीक।*

भूमिका

भूमि संसाधन उपभोग में कृषि उत्पादकता का अध्ययन कृषि स्तर के क्षेत्रीय स्वरूप को समझने के लिए आवश्यक है। इसके द्वारा क्षेत्रों का विश्लेषण करके जनसंख्या एवं उसके पोषण स्तर में पायी जाने वाली विषमताएँ को दूर किया जा सकता है, प्रायः कृषि क्षमता

तथा कृषि उत्पादकता को समान अर्थों में प्रयुक्त किया जा सकता है किन्तु मिट्टियों की उर्वरता या क्षमता को उनकी उत्पादकता का पर्याय मानना उचित नहीं है, क्योंकि उर्वर होने पर भी भौतिक दशाओं के कारण कम उत्पादक हो सकती है। जैसा कि प्रायः जल के क्षेत्रों में देखा जा सकता है। इसी प्रकार मरुस्थलीय मिट्टियाँ उर्वर हो सकती है, किन्तु जल के अभाव में उनकी उत्पादकता न्यून हो जाती है। "उत्पादकता उत्पादन की वह मात्रा है, जो प्रति हेक्टेयर इकाई क्षेत्र से प्राप्त होती है।" दूसरे शब्दों में यह कहा जा सकता है कि उत्पादकता प्रति हेक्टेयर लब्धि या उपज की घोतक है, जबकि उर्वरता मिट्टियों की वहनीय शक्ति, जिसके आधार पर उत्पादन की मात्रा घटती–बढ़ती रहती है। इस प्रकार उत्पादकता तथा उर्वरता में घनिष्ठ सम्बन्ध पाया जाता है।

अध्ययन क्षेत्र

अध्ययन क्षेत्र विकासखण्ड बहादुरपुर उत्तर प्रदेश राज्य के जनपद इलाहाबाद के मध्य भाग में स्थित है, जिसका आधार दक्षिण की तरफ है। विकासखण्ड बहादुरपुर का भौगोलिक विस्तार $25^0 9'$ उत्तरी अक्षांश से $25^0 31'$ उत्तरी अक्षांश और $81^0 53'$ पूर्वी देशान्तर से $82^0 4'$ पूर्वी देशान्तर के मध्य स्थित है। अध्ययन क्षेत्र पूर्व से पश्चिम की तुलना में उत्तर से दक्षिण में अधिक विस्तृत है। पूर्व से पश्चिम इसकी लम्बाई 19.5 किमी0 तथा उत्तर से दक्षिण इसकी चौड़ाई 20.5 किमी0 है। सर्वेयर जनरल ऑफ इण्डिया के अनुसार कुल भौगोलिक क्षेत्रफल 264.66 वर्ग किमी0 है। वही राजस्व अभिलेख के आधार पर 290 वर्ग किमी0 बताया गया है। जनपद इलाहाबाद के विकासखण्ड बहादुरपुर के क्षेत्रफल में अन्तर का मुख्य कारण गंगा नदी के बहाव क्षेत्र में परिवर्तन का होना है। पश्चिमी तथा दक्षिणी भाग में गंगा नदी द्वारा इस विकासखण्ड की सीमा का निर्धारण होता है। पूर्वी सीमा तहसील हंडिया एवं पूर्वोत्तर में विकासखण्ड फूलपुर, उत्तर में बहरिया विकासखण्ड द्वारा सीमा का निर्धारण होता है। अध्ययन क्षेत्र में प्रशासनिक इकाई एक महत्वपूर्ण बिन्दु है जो शोधकार्य में अध्ययन क्षेत्र की मुख्य पहचान प्रस्तुत करती है, जिसका अध्ययन आवश्यक होता है। प्रशासनिक दृष्टि से यह विकासखण्ड 18 न्यायपंचायत (मलावाखुर्द, कनिहार, देवरिया लीलापुरकला, शेरडीह, बलरामपुर, कोटवा, मेंडुवा, कटियारी, चकिया, अन्दावा, सहसों, सुदनीकला, सरायलाहुरपुर, बनी, छिवैया, हवेलिया, ककरा, चक हिनौता) में विभक्त है। विकासखण्ड का मुख्यालय हनुमानगंज है जो सरायलाहुरपुर न्यायपंचायत के अन्तर्गत आता है। इसमें कुल 198 गाँव है जिनमें आबाद गाँवों की संख्या 157 और गैर आबाद गाँवों की संख्या 41 है जिसमें कुल परिवारों की संख्या 47388 है तथा कुल जनसंख्या 295501 है जिसमें पुरुष जनसंख्या 155410 एवं स्त्री जनसंख्या 140091 है (जनगणना पुस्किा, 2011)। यहां से जनपद मुख्यालय की दूरी 21 किमी0 है।

आंकड़ा स्रोत एवं विधितंत्र

इस अध्ययन में विकासखण्ड बहादुरपुर को मूल इकाई माना गया है। प्रस्तुत शोध पत्र में आंकड़ों एवं सूचनाओं के संग्रहण के लिए जिला सांख्यिकीय पत्रिका से प्राप्त द्वितीयक आंकड़ों का प्रयोग किया गया है। कृषि उत्पादकता के परिवर्तन की प्रकृति को समझने के लिए 1991, 2001, 2011 एवं 2021 के आंकड़ों का प्रयोग किया गया है। परिवर्तन को समझने के लिए 30 वर्षों के आंकड़ों का विश्लेषण करते हुए परिवर्तन के सकारात्मक एवं नकारात्मक पहलुओं को बताया गया है।

शोध पत्र का उद्देश्य

1. बहादुरपुर विकासखण्ड में कृषि उत्पादकता का दो समयावधि वर्ष 1991 एवं 2021 में हो रहे परिवर्तन का अध्ययन करना।
2. आधुनिक कृषि के तरीको का उपयोग कर कृषि उत्पादकता को बढ़ाने के लिए कृषकों को प्रोत्साहित किया जाय।

कृषि उत्पादकता

प्रो0 स्टैम्प के अनुसार किसी क्षेत्र की कृषि उत्पादकता वहाँ की जलवायु एवं अन्य प्राकृतिक तत्वों तथा कृषि क्षमता की देन है। इस प्रकार किसी क्षेत्र की कृषि उत्पादकता उस क्षेत्र विशेष की कृषि गहनता एवं कृषि कुशलता पर निर्भर करती है। यदि इस कार्य कुशलता में कमी आती है तो उत्पादकता भी कम हो जाती है इसलिए कुशलता का गहन सम्बन्ध कृषि उत्पादकता से है (तिवारी, 2007)। कृषि उत्पादकता के निर्धारण में विभिन्न विद्वानों ने अलग–अलग कारकों को आधार मानकर अध्ययन किया है। इस क्षेत्र में प्रमुख रूप से एम0 जी0 केण्डल (1939), एल0 डी0 स्टैम्प (1958), एम0 शफी (1960 तथा 1972), सप्रे एवं देश पाण्डेय (1964), एस0 एस0 भाटिया, जी0 इनेडी, जसवीर सिंह एवं माजिद हुसैन आदि विद्वानों ने महत्वपूर्ण भूमिका निभाई है।

प्रो0 जसवीर सिंह ने भूमिवहन क्षमता के आधार पर उत्पादकता निर्धारित किया है जिसमें प्रत्येक फसल का प्रति एकड़ उत्पादन, उत्पादन क्षेत्र, प्रत्येक फसल की कैलोरी मात्रा आदि को आधार माना गया है। खाद्यान्न, दलहन तिलहन फसलों का कृषि क्षमता के निर्धारण में गणना आवश्यक है। प्रत्येक इकाई क्षेत्र की वहन क्षमता की गणना हेतु निम्न सूत्र का प्रयोग किया गयाः–

$$Iac = \frac{Cpe}{Cpr} \times 100$$

जहां–

Iac = इकाई की कृषि क्षमता का सूचकांक

Cpe = इकाई में जनसंख्या के रुप में वहन क्षमता

Cpr = सम्पूर्ण क्षेत्र की औसत वहन क्षमता

एक ही प्रदेश के भिन्न–भिन्न भागों में कृषि उत्पादकता में भिन्नता पायी जाती है इसलिए उन कारणों का अलग–अलग विश्लेषण करना आवश्यक है जिससे अध्ययन क्षेत्र के विभिन्न भागों का संतुलित विकास किया जा सके। अध्ययन क्षेत्र में बढ़ती जनसंख्या की पूर्ति के लिए कृषि उत्पादकता में वृद्धि करना आवश्यक है। बढ़ती जनसंख्या के कारण कृषि जोतों का आकार छोटा होता जा रहा है जिससे कृषि उत्पादकता भी प्रभावित हो रही है। गाँवों में एक ही कृषक परिवार की भूमि अलग–अलग हिस्सों में पायी जाती है जिससे उत्पादकता की सही माप नहीं संभव हो पाती है। प्रमुख फसलों के उत्पादन के आधार पर ही अनुमान किया जाता है।

कृषि उत्पादकता के सम्बन्ध में प्रो0 वी0 के0 आर0 वी0 का मत भौतिक अवधारणा से था। कृषि उत्पादकता का दो विभिन्न पहलुओं से परिभाषित किया जा सकता है– एक तो प्रति एकड़ उत्पादकता जिसे भूमि उत्पादकता भी कहते हैं, दूसरे को प्रति श्रमिक

नियोजन या श्रम उत्पादकता। अतः कृषि उत्पादकता को मुख्य तीन बिन्दुओं की दृष्टि से देखा जा सकता है, यथा भूमि, श्रम एवं पूंजी (मौर्या, 2017)।

कृषि उत्पादकता को प्रभावित करने वाले कारक

किसी भी क्षेत्र के अलग–अलग भागों में अलग–अलग कृषि उत्पादकता पायी जाती है जिसके लिए भौतिक तथा मानवीय कारक उत्तरदायी होते हैं।

(क). भौतिक कारक

1. उच्चावच और कृषि उत्पादकता

2. मृदा और कृषि उत्पादकता

3. जलवायु और कृषि उत्पादकता

(ख). सामाजिक कारक

(ग). आर्थिक कारक

(घ). राजनीतिक कारक

(क). भौतिक कारक

1. उच्चावच और कृषि उत्पादकता

उच्चावच कृषि उत्पादकता को प्रत्यक्ष रूप से प्रभावित करता है। नदियों के निक्षेप से निर्मित मैदानी भाग समतल एवं जलोढ़ मिट्टी से निर्मित होते हैं यहाँ मन्द ढाल होने के कारण मिट्टी में विभिन्न प्रकार के खनिज तत्व संग्रहीत रहते हैं। यही कारण है कि सर्वाधिक कृषि उत्पादकता मैदानी क्षेत्रों में पायी जाती है। रबी, खरीफ एवं जायद की तीन–तीन फसलें मैदानी भागों में उगायी जाती हैं। भरपूर फसल उत्पादन के कारण मैदानी भागों में जनसंख्या का बसाव भी अधिक पाया जाता है। इसके विपरीत पठारी भाग, मरुस्थलीय भाग, पर्वतीय क्षेत्र एवं दलदलीय क्षेत्र में न केवल कृषि–कार्य करना कठिन होता है बल्कि उत्पादन भी बहुत कम होता है। मरुस्थलीय भाग में जल का अभाव होता है। पर्वतीय भाग में जल उपलब्ध होता है किन्तु धरातल ऊबड़–खाबड़ होता है और भूमि पथरीली होती है। असमान धरातलीय भाग में हम चाह करके भी उन्नतशील बीजों का प्रयोग नही कर पाते हैं। इससे यह स्पष्ट हो जाता है कि कृषि उत्पादकता को प्रभावित करने में उच्चावच की महत्त्वपूर्ण भूमिका होती है।

2. मृदा और कृषि उत्पादकता

कृषि का सर्वाधिक महत्त्वपूर्ण भौतिक कारक मृदा है। मृदा की बनावट, रंग, कणों का आकार और उर्वरक तत्वों की उपलब्धता कृषि उत्पादकता को प्रत्यक्ष और परोक्ष रूप से सर्वाधिक प्रभावित करते हैं। मृदा की उर्वरता एवं क्षमता के आधार पर कृषि उत्पादकता सुनिश्चित होती है। मृदा में कार्बनिक पदार्थ, अकार्बनिक पदार्थ, वायु व जल चार तत्वों की प्रधानता होती है, जिनके आपसी सामंजस्य से प्रत्यक्ष या अप्रत्यक्ष रूप से कृषि उत्पादकता प्रभावित होती है। अतः मृदा कृषि उत्पादकता को प्रभावित करती है। भूगोलवेत्ता थामन ने विश्व की मृदा पर आधारित कृषि उत्पादकता का मानचित्र तैयार किया, जिसमें उन्होंने मृदा को निम्न तीन कृषि उत्पादकता की श्रेणियों में वर्गीकृत किया है–

i. उच्च कृषि उत्पादकता की मृदा।
ii. मध्यम से न्यून कृषि उत्पादकता की मृदा।
iii. अति न्यून कृषि उत्पादकता की मृदा।

3. जलवायु और कृषि उत्पादकता

जलवायु भौतिक पर्यावरण का एक प्रमुख घटक है जो कृषि को प्रत्यक्ष रूप से प्रभावित करती है। ताप, दाब, आर्द्रता, नमी, हवा आदि जलवायु के तत्व हैं जो कृषि उत्पादकता को प्रत्यक्ष रूप से प्रभावित करते हैं। जहाँ वर्षा पर्याप्त और नियमित रूप से होती है वहाँ धान की उत्पादकता अच्छी होती है। इस तरह से जहाँ सिंचाई के पर्याप्त साधन होते हैं वहाँ रबी की फसल की उत्पादकता अच्छी होती है। अर्द्ध शुष्क जलवायु में धान की उत्पादकता बहुत कम और मोटे अनाजों की उत्पादकता अच्छी होती है। मानव जलवायु के अनुसार ही फसलें उगाता है। अध्ययन क्षेत्र में खरीफ की फसल के अंतर्गत चावल, बाजरा, ज्वार, गन्ना एवं चारा आदि का उत्पादन किया जाता है। रबी की फसल के अंतर्गत गेहूँ, चना, जौ, तिलहन, और दाल आदि का एवं जायद की फसल के अंतर्गत सब्जियों का उत्पादन किया जाता है। ग्रीष्म ऋतु में गर्म और तेज लू द्वारा फसलें झुलसा दी जाती है, जिससे जायद की फसलों की उत्पादकता प्रभावित होती है।

(ख). सामाजिक कारक—

कृषि उत्पादकता भौतिक कारकों के साथ—साथ सामाजिक एवं सांस्कृतिक प्रवृत्तियों से भी प्रभावित होती है जिनका प्रत्यक्ष प्रभाव कृषि पर देखा जाता है। स्टैम्प महोदय ने कृषि को प्रभावित करने वाले कारकों में सामाजिक एवं आर्थिक कारकों को बहुत महत्वपूर्ण माना है।

किसी भी क्षेत्र विशेष की कृषि उत्पादकता वहाँ के मानवीय पहलुओं से भी प्रभावित होती है। इस सन्दर्भ में अध्ययन क्षेत्र भी अछूता नहीं है। सामाजिक कारकों में जनसंख्या की मांग और कृषकों की अभिरूचि कृषि उत्पादकता को प्रभावित करती है। किसान अपनी जरूरत और क्षमता के अनुसार खेतों में लागत लगाता है। गाँवों में मध्य वर्गीय परिवारों के खेतों की उत्पादकता अन्य वर्गों की अपेक्षा अधिक पायी जाती है। सर्वेक्षण के दौरान शोधकर्ता को यह पता चला कि यहाँ खाद्यान्न की खपत अधिक होती है। गेहूँ, चावल, जौ, चना और बाजरा का प्रति हेक्टेयर उत्पादन अधिक है। यही कारण है कि यहाँ का किसान गेहूँ, चावल, जौ, चना और बाजरा के उत्पादन में अधिक रुचि लेते हैं। दूसरी ओर दलहन फसलों के उत्पादन में कृषकों की अभिरुचि कम है और इनकी माँग भी कम होती है।

कृषि उत्पादकता को प्रभावित करने वाले सामाजिक कारकों के अन्तर्गत भूस्वामित्व, भू—जोत का आकार, कृषि पद्धति, कृषकों की आर्थिक स्थिति, उनकी शिक्षा, उनकी जागरूकता, जनचेतना आदि पहलुओं को शामिल करते हैं। अध्ययन क्षेत्र में सर्वेक्षण के दौरान किसानों से हुए साक्षात्कार में यह तत्व उभरकर सामने आया कि जिस भूमि पर कृषक पट्टे के रूप में या रेहन के लिए किसी दूसरे भूस्वामी से प्राप्त करने के उपरान्त कृषि करता है, उसमें कृषि उत्पादकता कम पायी जाती है। जिसका मालिक स्वयं कृषक होता है उसमें बीज, उर्वरक, सिंचाई आदि का सन्तुलित प्रयोग किया जाता है, जिससे कृषि उत्पादकता अधिक हो जाती है। प्रायः छोटे भू—जोत आकार में कृषि यन्त्रों का व्यवस्थित उपयोग नहीं हो पाता है। छोटे भू—जोत के कृषक शाक—सब्जी की खेती करते हैं यही

उनके पास स्थायी आय का स्रोत है। ये लोग पारिवारिक श्रम के साथ–साथ पूँजी का भी अधिक विनियोग कर लेते हैं, जिससे इनके कृषि क्षेत्र में कृषि उत्पादकता अधिक पायी जाती है। कुछ किसान एक ही प्रजाति के बीज को कई साल तक बोते रहते हैं, जिससे फसल उत्पादकता घटती जाती है। किसानों की नवाचारों के प्रति अनभिज्ञता, उदासीनता आदि भी उत्पादकता को प्रभावित करती है। अध्ययन क्षेत्र में कुछ प्राथमिक कृषि विद्यालय शिक्षकों के साक्षात्कार से ज्ञात हुआ कि वे अपनी कृषि व्यवस्था में आधुनिक तकनीक का उपयोग करते हैं जिससे उत्पादकता अधिक पायी जाती है। दूसरी तरफ कुछ ऐसे किसान भी है जो छोटे–मोटे व्यवसायों में लगे हैं उनकी भू–जोत छोटी है एवं वे नयी कृषि पद्धति का बहुत कम प्रयोग करते हैं, जिससे उनकी खेतों की उत्पादकता कम पायी जाती है।

(ग). आर्थिक कारक

आर्थिक कारक भी कृषि उत्पादकता को प्रभावित करती है। पूँजी, बाजार, यातायात एवं परिवहन की सुविधा, कृषि ऋण, सरकारी अनुदान आदि का भी कृषि उत्पादकता पर प्रभाव पड़ता है। प्रायः देखा गया है कि जिस वर्ष बाजार में समय से उर्वरक उपलब्ध होता है, उस वर्ष उत्पादन अच्छा होता है। यदि बाजार में किसी फसल का दाम अधिक मिलता है तो किसान उस फसल के उत्पादन में अधिक उत्साह दिखाते हैं। कभी–कभी फसल में रोग लग जाता, तो गरीब किसान धन के अभाव में कीटनाशक का छिड़काव नहीं कर पाता है, जिससे पूरी फसल नष्ट हो जाती है। धनाभाव में उन्नतिशील बीजों का प्रयोग न करने से उत्पादकता कम हो जाती है। कभी–कभी मांग से अधिक उत्पादन होने से बाजार में उस वस्तु का मूल्य घट जाता है।

उदाहरणार्थ– किसी वर्ष प्याज का दाम अधिक रहता है, क्योंकि उस वर्ष उत्पादन कम रहता है। यह देख कर किसान अगले वर्ष अधिक क्षेत्रफल पर प्याज बोते हैं, जिससे उत्पादन बढ़ जाता है। लेकिन इस वर्ष प्याज के दाम घट जाते हैं। यह देख कर किसान प्याज को प्रशीतक गृहों में रखते हैं, लेकिन अगले वर्ष भी प्याज के दाम कम ही रहते हैं क्योंकि प्याज की मात्रा बाजार में अधिक रहती है। ऐसी दशा में कृषक को धन की हानि होती है। गन्ने का समर्थन मूल्य जब सरकार बढ़ा देती है, तो किसान गन्ने की कृषि में वृद्धि कर देते हैं, लेकिन तैयार गन्ने की फसल के समय किसानों को अनेकों कठिनाइयाँ झेलनी पड़ती है। कृषक गन्ना मिल की पर्ची हेतु अक्सर परेशान नजर आते हैं। समय से मूल्य का भुगतान न होने से किसान दुःखी होते हैं। फलतः अगले वर्ष गन्ना कम क्षेत्रफल पर बोते हैं।

(घ). राजनीतिक कारक

कृषि क्षेत्र में राजनैतिक कारकों का भी हस्तक्षेप अहम भूमिका निभाता है। लगभग सभी देशों में वहाँ की सरकार द्वारा प्रतिपादित नीतियाँ कृषि को प्रभावित करती हैं। सरकार द्वारा समय–समय पर चलायी गयी कृषि विकास सम्बन्धी योजनाएँ, ऊसर भूमि सुधार योजना, भूमि संरक्षण योजना, मृदा अपरदन, मृदा प्रदूषण, मृदा परीक्षण आदि कार्यक्रम उत्पादकता को प्रभावित करते हैं। यदि सरकारी तन्त्र द्वारा कृषि क्षेत्र को विकसित करने का प्रयास किया जाता है तो किसानों को काफी मदद मिलती है और उत्पादन क्षेत्रों का विकास होता है। रासायनिक खादों की उपलब्धता पूर्णतया सरकारी तन्त्र द्वारा नियन्त्रित होती है जिसमें विद्यमान कमियों के कारण फसल उत्पादकता प्रभावित होती है। उचित मूल्य और भण्डारण के अभाव में किसानों का ध्यान कृषि क्षेत्र से हटने लगता है। इसलिए सरकारी तन्त्र को और अधिक सक्रिय और जिम्मेदारीपूर्ण भूमिका निभानी चाहिए। सरकार

के कृषि नीति से भी कृषि उत्पादकता प्रभावित होती है। उदाहरण के लिए कृषि नीति 2020 का किसान विरोध कर रहे हैं, क्योंकि इस नीति के अनुसार किसान की फसल मंडी से बाहर औने–पौने दामों पर ही बिकेगी और किसानों का भुगतान डूबने का डर रहेगा, जिससे व्यापारी, मुनीम, मजदूर बेरोजगार हो जाएंगे और उनके सामने रोजी–रोटी का संकट उत्पन्न हो जाएगा। ऐसी स्थिति में किसान हतोत्साहित होकर कम फसल बोने लगेगा, जिससे उत्पादकता प्रभावित होगी। कृषि मूल्य निर्धारण, भूमि सुधार, कृषि बीमा, कृषि आयात निर्यात नीति आदि का कृषि उत्पादकता पर सीधा प्रभाव देखा जाता है।

कृषि उत्पाकदता निर्धारण के अन्य कारकों में विद्युत, श्रमशक्ति, उन्नतशील बीजों, कृषि यन्त्रों, रासायनिक उर्वरकों, तकनीकी विकास, सिंचाई सुविधाओं आदि का बड़ा महत्व है। स्वतन्त्रता के पश्चात् कृषि क्षेत्र में जैसे–जैसे कृषि यन्त्रों का विकास, उन्नत किस्म के बीजों, रासायनिक खादों का प्रयोग आदि बढ़ने लगा है जिससे उत्पादकता में वृद्धि हुई है। ट्यूबेल सिंचाई के द्वारा बहुफसली कृषि पर जोर दिया गया है। ट्रैक्टर, हार्वेस्टर एवं परिष्करण आदि के माध्यम से कृषि करना आसान हो गया है। तकनीकी विकास के कारण श्रम, पूंजी और समय की बचत होती है और उत्पादन तथा उत्पादकता में सुधार होता है। कृषि में सतत् तकनीकी विकास की आवश्यकता होती है।

तालिका 1: विकासखण्ड बहादुरपुर में कृषि उत्पादकता, 1991, 2001, 2011 एवं 2021

फसल का नाम	1991		2001		2011		2021	
	उत्पादन (हे0 में)	प्रतिशत	उत्पादन (हे0 में)	प्रतिशत	उत्पादन (हे0 में)	प्रतिशत	उत्पादन (हे0 में)	प्रतिशत
चावल (खरीफ)	4031	21.50	2120	10.72	3802	16.71	4277	21.78
गेहूँ	6894	36.78	8659	43.79	8485	37.29	8456	43.07
जौ	973	5.19	371	1.88	1982	8.71	215	1.09
ज्वार	700	3.73	228	1.15	184	0.81	184	0.94
बाजरा	1523	8.12	4035	20.40	4242	18.64	3732	19.01
उर्द	0	0.00	113	0.57	70	0.31	78	0.40
मूंग	19	0.10	41	0.21	51	0.22	62	0.32
चना	2083	11.11	2377	12.02	2102	9.24	1080	5.50
मटर	547	2.92	328	1.66	235	1.03	135	0.69
अरहर	1446	7.71	651	3.29	946	4.16	766	3.90
लाही / सरसों	103	0.55	39	0.20	30	0.13	36	0.18
तिल	26	0.14	20	0.10	54	0.24	44	0.22
गन्ना	99	0.53	7	0.04	0	0.00	0	0.00
आलू	300	1.60	610	3.08	333	1.46	333	1.70
सनई	1	0.01	8	0.04	7	0.03	3	0.02
चारा (खरीफ)	0	0.00	168	0.85	234	1.03	234	1.19

स्रोत– सांख्यिकीय पत्रिका, विकासखण्ड बहादुरपुर, 1992, 2002, 2012 एवं 2022

उपरोक्त तालिका 1 से स्पष्ट है कि विकासखण्ड में वर्ष 1991 में सर्वाधिक कृषि उत्पादकता वाली फसल गेहूँ (6894 हेक्टेअर क्षेत्र में) है। जो कुल क्षेत्रफल के 36.78 प्रतिशत भाग पर उत्पादित की जाती है। दूसरी फसल के रूप में चावल (4031 हेक्टेअर क्षेत्र में) का स्थान है। जो कुल क्षेत्रफल के 21.50 प्रतिशत भाग पर उत्पादित की जाती है। तीसरी फसल चना (2083 हेक्टेअर क्षेत्र में) है। जो कुल क्षेत्रफल के 11.11 प्रतिशत भाग पर उत्पादित की जाती है। अन्य फसलों के रूप में क्रमशः बाजरा (1523 हेक्टेअर क्षेत्र में) है जो 8.12 प्रतिशत भाग पर, अरहर (1446 हेक्टेअर क्षेत्र में) जो 7.71 प्रतिशत

भाग पर, जौ (973 हेक्टेअर क्षेत्र में) जो 5.19 प्रतिशत भाग पर, ज्वार (700 हेक्टेअर क्षेत्र में) जो 3.73 प्रतिशत भाग पर, मटर (547 हेक्टेअर क्षेत्र में) जो 2.92 प्रतिशत भाग पर, आलू (300 हेक्टेअर क्षेत्र में) जो 1.60 प्रतिशत भाग पर, सरसो (103 हेक्टेअर क्षेत्र में) जो 0.55 प्रतिशत भाग पर, गन्ना (99 हेक्टेअर क्षेत्र में) जो 0.53 प्रतिशत भाग पर, तिल (26 हेक्टेअर क्षेत्र में) जो 0.14 प्रतिशत भाग पर, मूंग (19 हेक्टेअर क्षेत्र में) जो 0.10 प्रतिशत भाग पर, सनई (1 हेक्टेअर क्षेत्र में) जो 0.01 प्रतिशत भाग पर उत्पादित की जाती है।

वर्ष 2001 में भी सर्वाधिक कृषि उत्पादकता वाली फसल गेहूँ (8659 हेक्टेअर क्षेत्र में) है। जो कुल क्षेत्रफल के 43.79 प्रतिशत भाग पर उत्पादित की जाती है। दूसरी फसल के रुप में बाजरा (4035 हेक्टेअर क्षेत्र में) का स्थान है। जो कुल क्षेत्रफल के 20.40 प्रतिशत भाग पर उत्पादित की जाती है। तीसरी फसल चना (2377 हेक्टेअर क्षेत्र में) है। जो कुल क्षेत्रफल के 12.02 प्रतिशत भाग पर उत्पादित की जाती है। चौथी फसल चावल (2120 हेक्टेअर क्षेत्र में) है, जो कुल क्षेत्रफल के 10.72 प्रतिशत भाग पर उत्पादित की जाती है। अन्य फसलों के रुप में क्रमशः अरहर (651 हेक्टेअर क्षेत्र में) जो 3.29 प्रतिशत भाग पर, आलू (610 हेक्टेअर क्षेत्र में) जो 3.08 प्रतिशत भाग पर, जौ (371 हेक्टेअर क्षेत्र में) जो 1.88 प्रतिशत भाग पर, मटर (328 हेक्टेअर क्षेत्र में) जो 1.66 प्रतिशत भाग पर, ज्वार (228 हेक्टेअर क्षेत्र में) जो 1.15 प्रतिशत भाग पर, चारा (खरीफ) (168 हेक्टेअर क्षेत्र में) जो 0.85 प्रतिशत भाग पर, उर्द (113 हेक्टेअर क्षेत्र में) जो 0.57 प्रतिशत भाग पर, मूंग (41 हेक्टेअर क्षेत्र में) जो 0.21 प्रतिशत भाग पर, सरसो (39 हेक्टेअर क्षेत्र में) जो 0.20 प्रतिशत भाग पर, तिल (20 हेक्टेअर क्षेत्र में) जो 0.10 प्रतिशत भाग पर, सनई (8 हेक्टेअर क्षेत्र में) जो 0.04 प्रतिशत भाग पर एवं सबसे कम क्षेत्रफल पर गन्ना (7 हेक्टेअर क्षेत्र में) है, जो 0.04 प्रतिशत भाग पर उत्पादित किया जाता है (तालिका 1)।

वर्ष 2011 में भी सर्वाधिक कृषि उत्पादकता वाली फसल गेहूँ (8485 हेक्टेअर क्षेत्र में) है, जो कुल क्षेत्रफल के 37.29 प्रतिशत भाग पर उत्पादित की जाती है। दूसरी फसल के रुप में बाजरा (4242 हेक्टेअर क्षेत्र में) का स्थान है, जो कुल क्षेत्रफल के 18.64 प्रतिशत भाग पर उत्पादित की जाती है। तीसरी फसल चावल (3802 हेक्टेअर क्षेत्र में) है, जो कुल क्षेत्रफल के 16.71 प्रतिशत भाग पर उत्पादित की जाती है। चौथी फसल चना (2102 हेक्टेअर क्षेत्र में) है, जो कुल क्षेत्रफल के 9.24 प्रतिशत भाग पर उत्पादित की जाती है। वर्ष 2011 की अन्य फसलों में जौ (1982 हेक्टेअर क्षेत्र में) जो 8.71 प्रतिशत भाग पर, अरहर (946 हेक्टेअर क्षेत्र में) जो 4.16 प्रतिशत भाग पर, आलू (333 हेक्टेअर क्षेत्र में) जो 1.46 प्रतिशत भाग पर, मटर (235 हेक्टेअर क्षेत्र में) जो 1.03 प्रतिशत भाग पर, चारा (खरीफ) (234 हेक्टेअर क्षेत्र में) जो 1.03 प्रतिशत भाग पर, ज्वार (184 हेक्टेअर क्षेत्र में) जो 0.81 प्रतिशत भाग पर, उर्द (70 हेक्टेअर क्षेत्र में) जो 0.31 प्रतिशत भाग पर, तिल (54 हेक्टेअर क्षेत्र में) जो 0.24 प्रतिशत भाग पर, मूंग (51 हेक्टेअर क्षेत्र में) जो 0.10 प्रतिशत भाग पर, सरसों (39 हेक्टेअर क्षेत्र में) जो 0.10 प्रतिशत भाग पर एवं सबसे कम क्षेत्रफल पर सनई (7 हेक्टेअर क्षेत्र में) का है जो कुल क्षेत्रफल के 0.03 प्रतिशत भाग पर उत्पादित की जाती है (तालिका 1)।

वर्ष 2021 में भी सर्वाधिक कृषि उत्पादकता वाली फसल गेहूँ (8456 हेक्टेअर क्षेत्र में) है, जो कुल क्षेत्रफल के 43.07 प्रतिशत भाग पर उत्पादित की जाती है। दूसरी फसल के रुप में चावल (4277 हेक्टेअर क्षेत्र में) का स्थान है, जो कुल क्षेत्रफल के 21.78 प्रतिशत भाग पर उत्पादित की जाती है। तीसरी फसल बाजरा (3732 हेक्टेअर क्षेत्र में) है, जो कुल क्षेत्रफल के 19.01 प्रतिशत भाग पर उत्पादित की जाती है। चौथी फसल चना (1080 हेक्टेअर क्षेत्र में) है, जो कुल क्षेत्रफल के 5.50 प्रतिशत भाग पर उत्पादित की

जाती है। वर्ष 2021 की अन्य फसलों में अरहर (766 हेक्टेअर क्षेत्र में) जो 3.90 प्रतिशत भाग पर, आलू (333 हेक्टेअर क्षेत्र में) जो 1.70 प्रतिशत भाग पर, चारा (खरीफ) (234 हेक्टेअर क्षेत्र में) जो 1.19 प्रतिशत भाग पर, जौ (215 हेक्टेअर क्षेत्र में) जो 1.09 प्रतिशत भाग पर, ज्वार (184 हेक्टेअर क्षेत्र में) जो 0.94 प्रतिशत भाग पर, मटर (135 हेक्टेअर क्षेत्र में) जो 0.69 प्रतिशत भाग पर, उर्द (78 हेक्टेअर क्षेत्र में) जो 0.40 प्रतिशत भाग पर, मूंग (62 हेक्टेअर क्षेत्र में) जो 0.32 प्रतिशत भाग पर, तिल (44 हेक्टेअर क्षेत्र में) जो 0.22 प्रतिशत भाग पर, सरसों (36 हेक्टेअर क्षेत्र में) जो 0.18 प्रतिशत भाग पर एवं सबसे कम क्षेत्रफल पर सनई (3 हेक्टेअर क्षेत्र में) का है जो कुल क्षेत्रफल के 0.02 प्रतिशत भाग पर उत्पादित की जाती है (तालिका 1)।

तालिका 2 : विकासखण्ड बहादुरपुर में कृषि उत्पादकता परिवर्तन, 1991–2021

फसल का नाम	1991		2021		परिवर्तन 1991-2021
	उत्पादन (हे0 में)	प्रतिशत	उत्पादन (हे0 में)	प्रतिशत	प्रतिशत
चावल (खरीफ)	4031	21.50	4277	21.78	0.28
गेहूँ	6894	36.78	8456	43.07	6.29
जौ	973	5.19	215	1.09	-4.1
ज्वार	700	3.73	184	0.94	-2.79
बाजरा	1523	8.12	3732	19.01	10.89
उर्द	0	0.00	78	0.40	0.4
मूंग	19	0.10	62	0.32	0.22
चना	2083	11.11	1080	5.50	-5.61
मटर	547	2.92	135	0.69	-2.23
अरहर	1446	7.71	766	3.90	-3.81
लाही / सरसों	103	0.55	36	0.18	-0.37
तिल	26	0.14	44	0.22	0.08
गन्ना	99	0.53	0	0.00	-0.53
आलू	300	1.60	333	1.70	0.1
सनई	1	0.01	3	0.02	0.01
चारा (खरीफ)	0	0.00	234	1.19	1.19

स्रोत– सांख्यिकीय पत्रिका, विकासखण्ड बहादुरपुर, 1992 एवं 2022

कृषि उत्पादकता
परिवर्तन 1991—2021
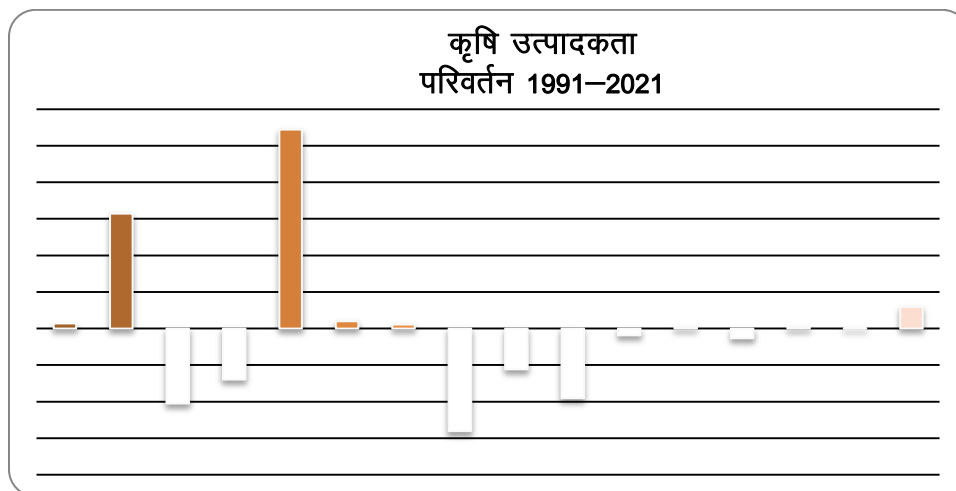
चित्र सं0 1

उपरोक्त तालिका 2 एवं चित्र संख्या 1 से स्पष्ट है कि वर्ष 1991—2021 में कृषि उत्पादकता परिवर्तन के अध्ययन से स्पष्ट होता है कि सर्वाधिक धनात्मक फसल परिवर्तन बाजरा (10.89 प्रतिशत) में हुआ है। इसके बाद गेहूँ (6.29 प्रतिशत), चारा (खरीफ) (1.19 प्रतिशत), उर्द (0.40 प्रतिशत), चावल (खरीफ) (0.28 प्रतिशत), मूंग (0.28 प्रतिशत), आलू (0.28 प्रतिशत), तिल (0.28 प्रतिशत) एवं सनई (0.28 प्रतिशत) है। वहीं सर्वाधिक ऋणात्मक फसल परिवर्तन चना (—5.61 प्रतिशत) में हुआ है। इसके बाद जौ (—4.10 प्रतिशत), अरहर (—3.81 प्रतिशत), ज्वार (—2.79 प्रतिशत), मटर (—2.23 प्रतिशत), गन्ना (—0.53 प्रतिशत) एवं सरसों (—0.37 प्रतिशत) का है।

निष्कर्ष—

विकासखण्ड में वर्ष 1991, 2001, 2011 एवं 2021 में सर्वाधिक गेहूँ की कृषि की जाती है। दूसरी प्रमुख फसल बाजरा है तथा तीसरी प्रमुख फसल चावल है। अध्ययन क्षेत्र के उन क्षेत्रों पर जहाँ सिंचाई के पर्याप्त साधनों का विकास नहीं हो पाया है ऐसे क्षेत्रों की मिट्टियाँ कम उपजाऊ है वहाँ बाजरे की खेती अधिक होती है। अध्ययन क्षेत्र में कृषि उत्पादकता को प्रभावित करने वाले कारकों के अन्तर्गत भूस्वामित्व, भू—जोत का आकार, कृषि पद्धति, कृषकों की आर्थिक स्थिति, उनकी शिक्षा, उनकी जागरूकता, जनचेतना आदि पहलुओं को शामिल करते हैं। यहाँ खेती का कार्य प्राचीन ढंग से देशी हल, कुदाल, खुरपी एवं फावड़े से किया जाता है। छोटे भू—जोत के कृषक शाक—सब्जी की खेती करते हैं यही उनके पास स्थायी आय का स्रोत है।

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माध्यमिक स्तर पर अल्पसंख्यक विद्यार्थियों के समायोजन क्षमता का उनकी शैक्षिक उपलब्धि पर प्रभाव का अध्ययन

मोहम्मद आसिफ एवं प्रमोद मिश्रा

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कोटवा–जमुनीपुर, दुबावल, प्रयागराज (उ0प्र0)

शोध–सारांश

प्रस्तुत अध्ययन माध्यमिक स्तर पर अल्पसंख्यक विद्यार्थियों के समायोजन क्षमता का उनकी शैक्षिक उपलब्धि पर प्रभाव का अध्ययन है। इस अध्ययन में उच्च एवं निम्न समायोजन क्षमता वाले विद्यार्थियों के शैक्षिक उपलब्धि का अध्ययन किया गया है। जिसके अध्ययन में वर्णनात्मक अनुसंधान के अन्तर्गत सर्वेक्षण विधि का प्रयोग किया गया है। प्रस्तुत अध्ययन में 'अम्बेडकरनगर' जिले के माध्यमिक शिक्षा परिषद, प्रयागराज (उ0प्र0) के मान्यता प्राप्त शासकीय एवं अशासकीय सहायता प्राप्त माध्यमिक विद्यालयों में अध्ययनरत् कक्षा–11 के विद्यार्थियों को जनसंख्या के रूप में शामिल किया गया है। जनसंख्या के रूप में अम्बेडकरनगर जिले के माध्यमिक विद्यालयों का चयन यादृच्छिक विधि से किया गया है। उसके उपरान्त विद्यालयों में अध्ययनरत् विद्यार्थियों में से 100 छात्र एवं 100 छात्राओं कुल 200 विद्यार्थियों का चयन उद्देश्यपरक न्यादर्श विधि से किया गया है। प्रस्तुत अध्ययन हेतु डॉ0 ए0के0पी0 सिन्हा एवं डॉ0 आर0पी0 सिंह द्वारा निर्मित 'स्कूल विद्यार्थियों के लिए समायोजन परिसूची' एवं विद्यार्थियों के शैक्षिक उपलब्धि के मापन के लिए प्रतिदर्श के रूप में चयनित प्रत्येक विद्यार्थी के माध्यमिक शिक्षा परिषद, प्रयागराज (उ0प्र0) द्वारा कक्षा 10वीं के वार्षिक परीक्षा में प्राप्त कुल प्राप्तांक को लिया गया है। प्रस्तुत शोध अध्ययन में ऑकड़ों की गणना के लिए माइक्रोसाफ्ट एक्सेल का प्रयोग किया गया है। ऑकड़ों के विश्लेषण के लिए मध्यमान, मानक त्रुटि, टी–टेस्ट एवं पिसर्यन गुणनफल अघूर्ण सह–सम्बन्ध का प्रयोग किया गया है। शोध के लिए निर्धारित शून्य परिकल्पनाओं की 0.05 स्तर पर सार्थकता के परीक्षण के लिए सी0आर0 परीक्षण का प्रयोग किया गया है। प्रस्तुत अध्ययन के निष्कर्ष में पाया गया कि माध्यमिक स्तर पर अल्पसंख्यक विद्यार्थियों की समायोजन क्षमता का उनकी शैक्षिक उपलब्धि पर सार्थक प्रभाव है, अर्थात् उच्च समायोजन क्षमता के विद्यार्थियों की एवं निम्न समायोजन क्षमता के विद्यार्थियों की शैक्षिक उपलब्धि एक–दूसरे से भिन्न है।

मुख्य शब्द– माध्यमिक, अल्पसंख्यक, विद्यार्थियों, समायोजन क्षमता, शैक्षिक उपलब्धि।

प्रस्तावना– जन्म–मृत्यु का चक्र मानव की दृष्टि से अत्यन्त महत्त्वपूर्ण है। वस्तुतः जन्म के उपरान्त मृत्यु तक की सम्पूर्ण अवधि में व्यक्ति शारीरिक तथा मानसिक रूप से स्वस्थ

रहकर वातावरण के साथ अपने समायोजन के लिए निरन्तर प्रयासरत रहता है। निःसंदेह व्यक्ति के सर्वांगीण विकास के लिए स्वास्थ्य के साथ–साथ स्वस्थ मस्तिष्क का होना अत्यन्त आवश्यक है। मानसिक उलझनों से ग्रस्त व्यक्ति प्रायः अपने दैनिक जीवन की विभिन्न परिस्थितियों से उचित समायोजन करने में कठिनाई का अनुभव करते हैं। प्रायः देखा जाता है कि संसार में शारीरिक तथा मानसिक दृष्टि से स्वस्थ तथा सुसमायोजित व्यक्ति ही अपने भौतिक व सामाजिक वातावरण के साथ समायोजन करके उच्च सफलतायें प्राप्त करते हैं। यही कारण है कि व्यक्ति के समायोजन के लिए शारीरिक स्वास्थ्य के समान ही मानसिक स्वास्थ्य की ओर ध्यान देना एक पूर्व शर्त माना जाता है।

समायोजन शब्द वस्तुतः दो शब्दों सम तथा आयोजन से मिलकर बना है। सम का तात्पर्य भली–भाँति, अच्छी तरह से या समान रूप से होता है, जबकि आयोजन का अर्थ अच्छी तरह से व्यवस्था करने से होता है। अतः समायोजन शब्द का अर्थ सुव्यवस्था करने या अच्छे ढंग से व्यवस्था करने से है। दूसरे शब्दों में कह सकते हैं कि समायोजन परिस्थितियों को अनुकूल बनाने की वह प्रक्रिया है जिसमें व्यक्ति की आवश्यकतायें तो पूरी हो जाय परन्तु उसे कोई कुण्ठा, तनाव या मानसिक द्वन्द्व उत्पन्न न होने पाये। निःसंदेह सभी प्राणियों की भाँति मनुष्य को भी अनेक आवश्यकतायें होती हैं। जो व्यक्ति को लक्ष्य प्राप्ति की ओर प्रेरित करती है।

समायोजन जिसे समंजन, सामंजस्य, तालमेल या व्यवस्थापन भी कहा जाता है। लैटिन शब्द एड–जस्टेयर से इसकी उत्पत्ति हुई है जिसका तात्पर्य 'सही की ओर' से है अर्थात् किसी परिस्थिति में तालमेल स्थापित करने हेतु जो उचित हो उसी प्रकार का व्यवहार करना समायोजन है। यह किसी व्यक्ति की स्वयं की क्षमताओं पर विश्वास करने और अपने इच्छित लक्ष्यों को प्राप्त करने के लिए बुनियादी स्तर पर संवेगों को नियंत्रित करने में मदद करता है। इस प्रकार समायोजन बौद्धिक, संवेगात्मक, सामाजिक, भौतिक आयामों के साथ स्व आरम्भ किये गये विकास में सहायता करता है यह उस मनोवैज्ञानिक प्रक्रिया को संदर्भित करता है, जिसके माध्यम से व्यक्ति रोजमर्रा की जीवन की आवश्यकताओं और चुनौतियों का प्रबन्ध या सामना करते हैं। इस प्रकार समायोजन माँगों, बाहरी दुनियाँ के दबावों, जरूरतों और इच्छाओं का सामना करने में सहायता करता है। समायोजन व्यक्ति के द्वारा अपनी परिस्थितियों व आवश्यकताओं के साथ अनुकूल करने की प्रक्रियों का परिणाम होता है। जब व्यक्ति अपनी इच्छाओं, महत्वाकांक्षाओं, आदर्शों आदि के जीवन की वास्तविकताओं को ढालकर अपने तथा वातावरण के मध्य एक संतोषजनक सम्बन्ध स्थापित कर लेता है तब उसे समंजित व्यक्ति कहा जाता है।

बालक की समायोजन क्षमता उसकी शैक्षिक उपलब्धि को प्रभावित करता है। जो बालक समायोजित रहते हैं उनकी शैक्षिक उपलब्धि का स्तर भी उच्च होता है। यह तभी सम्भव हो पाता है जब उसके व्यक्तित्व के सभी पक्षों यथा–शारीरिक, मानसिक, सामाजिक, संवेगात्मक, नैतिक, शैक्षिक तथा सौन्दर्यात्मक पक्षों का संतुलित विकास हो तथा बालक ठीक तरह से समायोजित हो। इस कार्य में विद्यालय, अभिभावक तथा समाज को महत्त्वपूर्ण भूमिका का निर्वहन करना होगा तभी विद्यार्थी अपने आपसे तथा अपनी परिस्थिति से समायोजित हो सकेगा। कौन सा बालक किस स्तर तक समायोजित है, इसका ज्ञान भी आवश्यक है। इस कार्य हेतु समायोजन क्षमता का आकलन करके विद्यार्थियों के समायोजन स्तर में वृद्धि कर उनके शैक्षिक उपलब्धि को बढ़ाया जा सकता है।

पूर्व अध्ययनों से ज्ञात होता है कि शैक्षिक उपलब्धि पर सामाजिक– आर्थिक स्थिति का सकारात्मक प्रभाव पड़ता है।

वर्मा, अखिलेश (2006) ने अपने शोध कार्य में पाया कि ग्रामीण विद्यार्थी, शहरी विद्यार्थियों की तुलना में अधिक समायोजित, छात्रों की तुलना में छात्राएं अधिक समायोजित, ग्रामीण छात्रों की तुलना में ग्रामीण छात्राएं अधिक समायोजित, शहरी छात्रों की तुलना में शहरी छात्रायें, ग्रामीण छात्रों की तुलना में शहरी छात्रों तथा शहरी छात्राओं की तुलना में ग्रामीण छात्रायें अधिक समायोजित थी।

सेकर एवं लारेंस (2016) ने अपने शोध निष्कर्ष में पाया कि शैक्षिक उपलब्धि के सम्बन्ध में उच्चतर माध्यमिक विद्यालय के छात्रों के संवेगात्मक, सामाजिक और शैक्षिक समायोजन के बीच सार्थक सह–सम्बन्ध पाया गया।

अलम (2018) ने अपने अध्ययन में पाया कि लिंग (छात्र एवं छात्रा) स्थानीय (ग्रामीण एवं शहरी) शैक्षणिक स्ट्रीम (विज्ञान एवं सामाजिक विज्ञान) और स्कूल के प्रकार (सरकारी एवं निजी) में उच्च माध्यमिक स्कूल के छात्रों के समायोजन में सार्थक अन्तर पाया गया।

पाठक, तिवारी एवं पटेल (2018) ने अपने शोध में पाया कि सी0वी0एस0सी0 बोर्ड से पढ़ने वाले किशोरो का राज्य बोर्ड (छत्तीसगढ़) की तुलना में स्वास्थ्य और सामाजिक समायोजन के क्षेत्र में समायोजन का स्तर उच्च था।

अतः अध्ययनकर्ता द्वारा अम्बेडकरनगर जनपद के परिप्रेक्ष्य में अल्पसंख्यक विद्यार्थियों के समायोजन क्षमता का उनकी शैक्षिक उपलब्धि पर प्रभाव का अध्ययन किया गया है।

समस्या कथन–

माध्यमिक स्तर पर अल्पसंख्यक विद्यार्थियों के समायोजन क्षमता का उनकी शैक्षिक उपलब्धि पर प्रभाव का अध्ययन।

अध्ययन का उद्देश्य–

प्रस्तुत अध्ययन में निम्नलिखित उद्देश्यों का अध्ययन किया गयाः–

1.   माध्यमिक स्तर पर उच्च एवं निम्न समायोजन क्षमता वाले अल्पसंख्यक विद्यार्थियों की शैक्षिक उपलब्धि का तुलनात्मक अध्ययन करना।

2.   माध्यमिक स्तर पर अल्पसंख्यक विद्यार्थियों की समायोजन क्षमता उनकी शैक्षिक उपलब्धि के मध्य सह–सम्बन्ध का अध्ययन करना।

परिकल्पना–

उद्देश्यों के आधार पर निम्नलिखित परिकल्पनाओं का परीक्षण किया गया है:–

1.   माध्यमिक स्तर पर उच्च एवं निम्न समायोजन क्षमता वाले अल्पसंख्यक विद्यार्थियों की शैक्षिक उपलब्धि के मध्य कोई सार्थक अन्तर नहीं है।

2.   माध्यमिक स्तर पर अल्पसंख्यक विद्यार्थियों की समायोजन क्षमता तथा उनकी शैक्षिक उपलब्धि में कोई सार्थक सह–सम्बन्ध नहीं है।

शोध प्रविधि–

प्रस्तुत अध्ययन की शोध प्रकृति वर्णनात्मक अनुसंधान है। जिसके अन्तर्गत सर्वेक्षण विधि का प्रयोग किया गया है। जिसमें जनसंख्या के रूप में अम्बेडकरनगर जनपद के

माध्यमिक विद्यालयों में अध्ययनरत् छात्र–छात्राओं को शामिल किया गया है। माध्यमिक विद्यालय का चयन यादृच्छिक विधि से किया गया है। जिसके पश्चात् विद्यालय में अध्ययनरत् 100 छात्र एवं 100 छात्राओं का चयन उद्देश्यपरक न्यादर्श विधि से किया गया है। शोध उपकरण के रूप में डॉ0 ए0के0पी0 सिन्हा एवं डॉ0 आर0पी0 सिंह (2013, 2017) द्वारा निर्मित 'स्कूल विद्यार्थियों के लिए समायोजन परिसूची' एवं शैक्षिक उपलब्धि के रूप में विद्यार्थियों के कक्षा–10वीं के प्राप्तांक को लिया गया है। आँकड़ों के विश्लेषण के लिए मध्यमान, टी–अनुपात एवं सह–सम्बन्ध ज्ञात करने के लिए पियर्सन का गुणनफल आघूर्ण विधि का प्रयोग किया गया है।

आँकड़ों का विश्लेषण एवं व्याख्या–

1. **माध्यमिक स्तर पर उच्च एवं निम्न समायोजन क्षमता वाले अल्पसंख्यक विद्यार्थियों की शैक्षिक उपलब्धि का तुलनात्मक अध्ययन–**

प्रस्तुत अध्ययन में विद्यार्थियों को समायोजन क्षमता के आधार पर उनको दो समूहों (27 प्रतिशत ऊपर के उच्च समूह व 27 प्रतिशत नीचे के निम्न समूह) में विभाजित किया गया है।

<div align="center">

सारणी–1

उच्च एवं निम्न समायोजित विद्यार्थियों की शैक्षिक सम्प्राप्ति सम्बन्धी

सी0आर0 मूल्य विश्लेषण तालिका का तुलनात्मक विवरण

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समूह	संख्या	मध्यमान	मानक विचलन	मानक त्रुटि	सी0आर0 मूल्य	सार्थकता स्तर	परिणाम
उच्च समायोजित विद्यार्थी	54	425.85	47.69	5.95	4.48	0.05 df (268) 1.96	सार्थक
निम्न समायोजित विद्यार्थी	54	399.19	50.18				

आंकलित सी0आर0 मूल्य का मान 4.48 है तो मुक्तांश (df) 268 के 0.05 सार्थकता स्तर पर दिये गये सारणी मूल्य पर 1.96 से सार्थक रूप से अधिक है। इससे यह ज्ञात होता है कि माध्यमिक स्तर पर अल्पसंख्यक विद्यार्थियों के उच्च समायोजित एवं निम्न समायोजित विद्यार्थियों की शैक्षिक उपलब्धि के मध्यमान मूल्य में सार्थक अन्तर है। अतः उच्च समायोजित विद्यार्थियों की शैक्षिक उपलब्धि, निम्न समायोजित विद्यार्थियों की अपेक्षा अधिक पायी गयी है।

2. **माध्यमिक स्तर पर अल्पसंख्यक विद्यार्थियों के समायोजन क्षमता का उनकी शैक्षिक उपलब्धि के मध्य सह–सम्बन्ध का अध्ययन–**

प्रस्तुत अध्ययन में 'माध्यमिक स्तर पर अल्पसंख्यक विद्यार्थियों की समायोजन क्षमता तथा उनकी शैक्षिक उपलब्धि के मध्य सह–सम्बन्ध का अध्ययन' करना था। इस उद्देश्य की प्राप्ति के लिए विद्यार्थियों की समायोजन क्षमता तथा उनकी शैक्षिक उपलब्धि के मध्य सह–सम्बन्ध गुणांक की गणना की गयी।

विद्यार्थियों के सह–सम्बन्ध को ज्ञात करने के लिए पियर्सन गुणनफल आघूर्ण विधि (च्तवकनबज डवउमदज) का प्रयोग किया गया।

<div align="center">

सारणी–2

विद्यार्थियों की समायोजन क्षमता तथा उनकी शैक्षिक सम्प्राप्ति के मध्य सह–सम्बन्ध गुणांक की विश्लेषण तालिका

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चर	संख्या	सह–सम्बन्ध गुणांक	सार्थकता स्तर	परिणाम
समायोजन क्षमता र शैक्षिक उपलब्धि	200	0.244	0.05(0.088) df (498)	सार्थक

उपरोक्त सारणी में यह स्पष्ट है कि विद्यार्थियों की समायोजन क्षमता का शैक्षिक उपलब्धि के मध्य पियर्सन सह–सम्बन्ध गुणांक का मान 0.244 प्राप्त हुआ है जो मुक्तांश (498) के 0.05 सार्थकता स्तर पर (0.088) के सारणीमान से अधिक है जिसके आधार पर शून्य परिकल्पना अस्वीकृत होती है। जिसका तात्पर्य है कि उच्चतर माध्यमिक स्तर पर अध्ययनरत् विद्यार्थियों की समायोजन क्षमता और उनकी शैक्षिक उपलब्धि में धनात्मक सार्थक सह–सम्बन्ध है।

निष्कर्ष–

अध्ययन निम्नलिखित निष्कर्ष प्राप्त हुए–

1.   उच्च समायोजन क्षमता वाले अल्पसंख्यक विद्यार्थियों की शैक्षिक उपलब्धि, निम्न समायोजन क्षमता वले अल्पसंख्यक विद्यार्थियों की अपेक्षा अधिक है।

2.   माध्यमिक स्तर पर अल्पसंख्यक विद्यार्थियों की समायोजन क्षमता तथा उनकी शैक्षिक उपलब्धि के मध्य धनात्मक सार्थक सह–सम्बन्ध है।

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मन्नू भण्डारी का जीवन परिचय एवं रचना–संसार

पुष्पलता पाण्डेय एवं हिमांशु शेखर सिंह

हिन्दी विभाग, नेहरू ग्राम भारती (मानित् विश्वविद्यालय)
कोटवा–जमुनीपुर, दुबावल, प्रयागराज

एक ख्यातनामा लेखक की जीवन संगिनी होने का रोमाँच और एक जिद्दी पति की पत्नी होने का अवसाद, एक तरफ अपनी लेखकीय जरुरतें और दूसरी तरफ एक घर को संभालने का बोझिल दायित्व, एक घुर आम आदमी की तरह जीने की चाह और महान उपलब्धियों के लिए ललकता, आसपास का साहित्यिक वातावरण, ऐसे कई–कई विरोधाभासों के बीच से गुजरते हुए मन्नू जी ने अगर कुछ नहीं टूटने दिया, तो वह है उनकी जिजीविषा, उनकी सादगी, आदमीयत और रचना संकल्प। ऐसे व्यक्तिव से सम्पन्न मन्नू जी का जन्म 3 अप्रैल सन् 1931 ई0 में मध्य प्रदेश के एक आँचलिक क्षेत्र के छोटे से ग्राम भानपुरा में संयुक्त मारवाड़ी परिवार में हुआ था। आपका बचपन का नाम महेन्द्र कुमारी था। आप माता – पिता की पाँचवीं और सबसे छोटी संतान थीं, अतः सब आपको प्यार से 'मन्नू' पुकारते थे और यही नाम साहित्य के क्षेत्र में प्रचलित हो गया। विवाह के पश्चात् भी उन्होंने अपना नाम नहीं बदला और राजेन्द्र यादव से विवाह होने के उपरान्त भी वे 'मन्नू भण्डारी' ही रहीं।

मन्नू जी का जन्म गुलाम भारत में हुआ था। तब देश में स्वाधीनता के लिए संघर्ष हो रहे थे। मन्दसौर और भानपुरा अंग्रेजों के अधिकार में आता था, अतः वहाँ भी स्वाधीनता के लिए संघर्ष चल रहा था। गांधी जी के वैचारिक चेतना आपके गाँव में बनी हुई थी। तद्युगीन 'सत्याग्रह' और 'भारत छोड़ो आन्दोलन' का आपके जीवन पर बहुत गहरा प्रभाव पड़ा।

मन्नू भण्डारी के व्यक्तिव का निर्माण आपकी माता सौ0 अनुपकुंवारि के आजादी के प्रति पूर्ण समर्पित भाव और पिता श्री सुखसम्पत राय भण्डारी के दृढ़ संकल्पित, स्वाभिमानी विचारों से हुआ। आप पर भारतीय परम्परा युक्त पारिवारिक संस्कारों का पूर्ण प्रभाव पड़ा, जो आपके साहित्य में दृष्टिगोचर होता है। आपके कथा–साहित्य में आधुनिक जीवन की जो झलक दृष्टिगोचर होती है, वह समकालीन राजनीतिक और सामाजिक स्थितियों से प्राप्त हुई है। इसी कारण आपके विचारों में तेजस्विता और रूढ़ि–मुक्त होने का साहस और आत्मीयजनों से मिलने की सहजता है।

मन्नू भण्डारी के पिता श्री सुखसम्पत राय जी नागरी प्रचारिणी सभा के हिन्दी पारिभाषिक शब्द के आदिकोश सम्पादकों में से एक थे। राष्ट्रभाषा प्रेम आपके खून में था। अतः हिन्दी भाषा एवं साहित्य उत्थान के लिए आपने कई कार्य किये। आपके पिता गंभीर, सरल, नियमित अध्ययनशील, सहज स्वभाव के थे। पर

साथ ही गुस्सैल थे, वे नियम या आचरण के प्रतिकूल जरा–सी बात पर नाराज हो उठते थे। आप स्वभिमानी पुरूष थे। यद्यपि आपकी आर्थिक स्थिति अच्छी नहीं थी। तब भी आप एक सत्याग्रही के रूप में आगे आये। आप का देशप्रेम अवर्णनीय है, वे सत्याग्रहियों की सहायता भी हमेशा करते थे। वे अपने समय के समाज सुधारक आदर्शवादी व्यक्ति थे। उन्होंने अपनी बच्चियों को राजनैतिक एवं सामाजिक कार्यों में सक्रिय होने की प्रेरणा ही नहीं दी, अपितु उन्हें उसमें लगाये रखा। इसी कारण वे घर गृहस्थी के कार्यों से प्रायः दूर ही रहीं। लाडली पुत्री होने के कारण मन्नू जी में विद्रोह भावना में सबसे अधिक प्रस्तफुटित हुई हैं। तथा यहाँ इस कथन का कुछ भी खंडन–मंडन न कर इतना तो हम भी स्वीकार करेंगे कि मन्नू जी के व्यक्तित्व पर उनके पिता के व्यक्तित्व का सर्वाधिक प्रभाव पड़ा है। स्वयं मन्नू जी के शब्दों में, "होश सँभालने के बाद से ही जिन पिता जी से किसी न किसी बात पर हमेशा मेरी टक्कर होती रहती थी, वे तो न जाने कितने रूपों में मुझमें हैं कहीं कुंठाओं के रूप में, कहीं प्रतिक्रिया के रूप में, तो कहीं प्रतिच्छाया के रूप में। केवल बाहरी भिन्नता के आधार पर अपनी परम्पराओं और रूढ़ियों को नकारने वालों को क्या सचमुच इस बात का बिलकुल एहसास नहीं होता कि उनका आसन्न अतीत किस कदर उनके भीतर जड़ जमाए बैठा रहता है। समय का प्रवाह भले ही हमें विपरीत दिशाओं में बहाकर ले जाए स्थितियों का दबाव भले ही हमारा रूप बदल दे, हमें पूरी तरह उससे मुक्त तो नहीं कर सकता।"[1]

वास्तव में मन्नू जी ने जिस मारवाड़ी परिवार में जन्म लिया, वह राजस्थान का अत्यन्त रूढ़िग्रस्त परिवार था, परन्तु श्री सुखसंपत राय भण्डारी के आर्य समाजी एवं समाज सुधारक होने के कारण इनकी संतान को व्याप्त रूढ़ियों के अंधानुकरण से पर्याप्त स्वतंत्रता प्राप्त हो गयी और लड़कों की भाँति लड़कियों की भी शिक्षा प्राप्त करने के लिए किसी प्रकार का बंधन नहीं था। मन्नू जी के शब्दों में, षपिता की आजादी की सीमा यहीं तक थी कि उनकी उपस्थिति में घर में आए लोगों के बीच उठूं बैठूं जानूँ–समझूँ। हाथ उठा–उठाकर नारे लगाती। हड़तालें करवाती, लड़कों के साथ शहर की सड़कें नापती, लड़की को अपनी सारी आधुनिकता के बावजूद बर्दाश्त करना उनके लिए मुश्किल हो रहा था। तो किसी की दी हुई आजादी के दायरे में चलना मेरे लिए, जब से रंगों में लहू की जगह लावा बहता तो सारे निषेध, सारी वर्जनाएँ और सारा भय कैसे ध्वस्त हो जाता है, यह तभी जाना और अपने क्रोध से सबको थरथरा देने वाले पिता जी से टक्कर लेने का जो सिलसिला तब शुरू हुआ था, राजेन्द्र से शादी की, तब तक वह चलता ही रहा।[2] साथ ही मन्नू को बचपन से ही अपने घर में ढ़ेर सारी पुस्तकों का पत्र–पत्रिकाओं के साथ–साथ लम्बी–लम्बी राजनीतिक सामाजिक चर्चाओं को सुनने का अवसर भी प्राप्त हुआ और इन सबका उनके व्यक्तित्व निर्माण में पर्याप्त योग रहा है।

वस्तुतः मन्नू जी की प्ररम्भिक शिक्षा अजमेर के सावित्री स्कूल में हुई और कहा जाता है कि नवीं दसवीं कथा से ही उनमें नेतृत्व करने की अभिलाषा उत्पन्न हो गयी थी। जब देश के राष्ट्रीय आन्दोलन के प्रति उनमें पर्याप्त रूझान भी रहा है। अनीता राजकपूर के कथन से मन्नू जी के विद्यार्थी जीवन की स्मृति जागृत होती है– ''उनके हृदय में स्वतंत्रता की ऐसी ज्वाला भड़की कि वे रोज सुबह होते

ही जूलूस निकालती, नारे लगाती और धुँआधार भाषण देतीं।''[3] अजमेर में इंटरमीडिएट की परीक्षा उत्तीर्ण करने के उपरान्त मन्नू जी को अपने परिवार के कुछ वरिष्ठ सदस्यों के पास कोलकाता आना पड़ गया और कलकत्ता विश्वविद्यालय से ही उन्होंने व्यक्तिगत (प्राइवेट) छात्र के रूप 1949 ई0 में बी0ए0 की परीक्षा उत्तीर्ण की। यद्यपि बी0ए0 में उन्होंने हिन्दी विषय का अध्ययन नहीं किया था, परन्तु सन् 1952 में काशी विश्वविद्यालय से एक व्यक्तिगत (प्राइवेट) छात्र के रूप में हिन्दी में एम0ए0 की परीक्षा उत्तीर्ण की तथा बिना किसी की सहायता लिए इस परीक्षा में प्रशंसनीय अंक प्राप्त किये।

एम0ए0 की परीक्षा उत्तीर्ण करने के उपरान्त मन्नू जी कोलकाता के एक विद्यालय में अध्यापन कार्य करने लगीं। कोलकाता में अध्यापन के दौरान मन्नू भण्डारी का परिचय प्रसिद्ध साहित्यकार राजेन्द्र यादव जी से हुआ। प्रथम परिचय के बारे में बताते हुए राजेन्द्र ही कहते हैं– ''कोलकाता के बालीगंज शिक्षा सदन में मन्नू भण्डारी लाइब्रेरी के लिए पुस्तकों की सूची तैयार कर रही थी यहाँ उनसे मेरा पहला परिचय हुआ।''[4] उन दिनों राजेन्द्र यादव साहित्य के क्षेत्र में पूरी तरह अपना सिक्का जमा चुके थे, जबकि मन्नू जी ने लेखन के क्षेत्र में अपना पहला कदम रखा था। मन्नू भण्डारी पहला कहानी संग्रह 'मैं हार गयी' प्रकाशित हुआ था। ''मैं हार गयी इस कहानी द्वारा मन्नू का साहित्य – जगत में आगमन हुआ। 'कहानी' पत्रिका के सम्पादक श्री भैरव प्रसाद गुप्त जी ने उनकी यह कहानी छपवाकर उन्हें प्रेरित किया। पाठकों के प्रशंसनीय पत्रों के कारण मन्नू जी साहित्य क्षेत्र में आगे बढ़ती ही गयीं।''[5] स्वभावगत सौम्यता होने के कारण उक्त परिचय घनिष्ठता में परिवर्तित होकर धीरे–धीरे प्रणय भावना में पल्लवित होकर 1959 में कोलकाता में विवाह के रूप में पुष्पित हुआ। मन्नू जी के पिता ने इस विवाह का विरोध किया। राजेन्द्र जी के शब्दों में, ''मन्नू जी के पिता को यह रिश्ता स्वीकार न था। वे जाति से जैन थे और उनके जैन संस्कार बेटी मून्न भण्डारी का व्याह क्षत्रिय (राजेन्द्र) से करवा देने के पक्ष में नहीं थे। उन्होंने इसका बड़ा विरोध किया। अपने निर्णय पर मैं और मन्नू अड़े थे, अतः हमें रजिस्टर मैरिज करनी पड़ी। 22 नवम्बर, 1959 ई0 को हम दोनों कानूनन विवाहबद्ध हुए।''[6]

मन्नू जी के जीजा जी, दीदी जी तथा भगवती प्रसाद जी ने उनके विवाह में भाग लेकर सक्रिय सहयोग दिया। छठें दशक के प्रारम्भ में आपके पिता श्री सुख संपत राय जी का देहान्त कैंसर से हो गया। मन्नू जी के मनों–साहित्य पर इस का गहरा असर हुआ। मन्नू जी के अपने पिता जी के प्रति असीम प्रेम था। इसी कारण उन्होंने अपना पहला कहानी संग्रह पिता जी को अर्पित करते हुए लिखा है– ''जिन्होंने मेरी किसी भी इच्छा पर कभी अंकुश नहीं लगाया, पिता जी को अर्पित है।''[7]

वस्तुतः सन् 1964 में श्री राजेन्द्र यादव और श्रीमती मन्नू भण्डारी कोलकाता छोड़कर दिल्ली आ गये तथा मित्रों के सहयोग से राजेन्द्र यादव जी ने 'अक्षर प्रकाशन प्राइवेट लिमिटेड' नामक प्रकाशन संस्था की स्थापना कर उत्साहपूर्वक प्रकाशन कार्य प्रारम्भ किया। मन्नू जी मिरांडा हाउस दिल्ली विश्वविद्यालय के हिन्दी विभाग में प्राध्यापिका नियुक्त हो गयीं। राजेन्द्र यादवजी से विवाह होने के पश्चात् मन्नू जी का लेखन तथा अध्यापन और अधिक निखर आया,

''यादवजी के अनुभवों और सुझावों ने मन्नू जी के लेखन में नई चमक उत्पन्न की।''[8]

मन्नू जी का ऊँचे साहित्यकारों से परिचय हुआ, ''मन्नू जी की इस परिवार में सत्येन्द्र, शरद, मोहन राकेश, कमलेश्वर आदि लोग देवर– जेष्ठ के रूप में प्राप्त हुए।''[9]

सन् 1961 ई0 के लगभग कलकत्ता में ही मन्नू जी ने एक पुत्री को जन्म दिया। रचना, मन्नू जी की प्यारी पुत्री है, वे रचना को प्यार से टिंकू पुकारती हैं तथा उसे वे अपना मित्र ही अधिक मानती हैं। सम्प्रति मन्नू भण्डारी साहित्यिक क्षेत्र में अपनी श्रेष्ठता बना चुकी हैं। उन्हें रचनाओं पर पुरस्कार मिले हैं तथा एक साहित्यकार के रूप में वे सम्मान प्राप्त कर चुकी हैं। वे स्वार्थ से रहित, स्वाभिमानी स्वानुभूत वाली महिला हैं। उनके कथा साहित्य में उनके व्यक्तित्व की स्पष्ट झलक मिलती है।

आपको निम्नलिखित पुरस्कारों से अलंकृत किया गया–

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2. भारतीय भाषा–परिषद, कलकत्ता, 1982 ई0
3. कलाकुंज सम्मान, दिल्ली, 1982 ई0
4. भारतीय संस्कृति संसद कथा समारोह, कलकत्ता, 1983 ई0
5. विहार राज्य भाषा परिषद, 1991 ई0
6. राजस्थान संगीत नाटक अकादमी, 2001–2002 ई0
7. महाराष्ट्र राज्य हिन्दी साहित्य अकादमी, 2004 ई0
8. हिन्दी अकादमी, दिल्ली शलाका सम्मान, 2006 – 2007 ई0
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कृतित्व :

''यह सही है कि मन्नू भण्डारी ने जो काम किया, तन्मयता, गहरी संलग्नता और ईमानदारी से किया, चाहे अध्यापन का काम रहा हो या लेखन का। यह भी सही है कि उन्होंने कम किन्तु क्लासिक लिखा। गद्य रूपों पर ही उन्होंने अपनी लेखनी चलायी। कविता से उन्हें परहेज है। इस बारे में उनका कथन है, ''जहाँ तक कविता का प्रश्न है, उसमें मेरी गति एकदम नहीं है। पर यह तो मेरी अपनी अक्षमता और सीमा है, कविता की निरर्थकता कत्तई नहीं।''[10]

मन्नू भण्डारी की साहित्यिक चेतना का परिचय इस प्रकार है–

कहानी संग्रह :

मन्नू भण्डारी के पाँच कहानी संग्रह प्रकाशित हो चुके हैं–

1. **मैं हार गई :** यह कहानी संग्रह सन् 1957 ई0 में प्रकाशित हुआ। कुल 12 कहानियाँ संग्रहीत हैं। कहानियों का क्रम इस प्रकार है– ईसा के घर इंसान, गीत का चुम्बन, जीती बाजी की हार, अभिनेता, एक कमजोर लड़की की कहानी, सयानी बुआ, दीवार, बच्चे और बरसात, श्मशान, पंडित गजाधर शास्त्री, कील और कसक, दो कलकार, मैं हार गई।

2. **तीन निगाहों की एक तस्वीर :** यह कहानी संग्रह सन् 1959 ई0 में प्रकाशित हुआ, जिसमें कुल 8 कहानियाँ संग्रहीत हैं। कहानियों का क्रम इस प्रकार है–

तीन निगाहों की एक तस्वीर, अकेली, अनचाही गहराइयाँ, खोटे सिक्के, घुटन, हार, चश्में, मजबूरी।

3. **यही सच है :** मन्नू जी द्वारा लिखित संग्रह सन् 1966 ई0 में प्रकाशित हुआ, जिसमें 8 कहानियाँ संग्रहीत हैं, जिनका क्रम इस प्रकार है– क्षय, तीसरा आदमी, नशा, सजा, नकली हारे, इन्कम टैक्स और नींद, रानी माँ का चबूतरा, यही सच है।

4. **एक प्लेट सैलाब :** इस चौथे कहानी संग्रह में 9 कहानियाँ हैं। यह कहानी संग्रह सन् 1968 ई0 में प्रकाशित हुआ। कहानियों का क्रम इस प्रकार है– नई नौकरी, बंद दरवाजों के साथ, एक प्लेट सैलाब, छत बनाने वाले, एक बार और संख्या के पार, बाँहों का घेरा, कमरे – कमरा और कमरे, ऊँचाई।

5. **त्रिशंकु :** मन्नू जी के इस पाँचवें कहानी संग्रह का प्रकाशन सन् 1978 ई0 में हुआ, जिसमें कुल 9 कहानियाँ संग्रहित हैं। कहानियों का क्रम इस प्रकार है– आते आते यायावर, दरार भरने की दरार, स्त्री सुबोधिनी, शायद, त्रिशंकु, रेत की दीवार, तीसरा हिस्सा, अलगाव, एखाने आकाश नाई।

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- Mishra, A.S. and Nautiyal, P. (2011) Factors governing longitudinal variation in benthic macroinvertebrate fauna of a small Vindhyan river in central highland ecoregion (Central India). *Tropical Ecology,* 52 (1): 103-112

- Vollenweider, R.A., Munawar, M. and Stadelmann, P. (1974). A comparative review of phytoplankton and primary production in the Laurentian Great Lakes. *Journal of Fisheries Research Board of Canada* 31(5), 739–762.

Book reference: Ojha R. P. & Dubey G.P. Ayurveda and Brain Ageing, CCRAS, AYUSH, Govt. of India 2008.

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