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Use of PGRR for the Improvement of Growth, Yield and Nutrients of Horsegram

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ABSTRACT

Plant growth promoting rhizobacteria (PGPR) are a group of beneficial bacteria that actively colonize rhizosphere and plant roots, besides enhancing plant growth. Phosphate-solubilizing and N-fixing bacteria were isolated from rhizospheric soil and root nodules of horsegram [*Macrotyloma uniflorum* (Lam.) Verdc.]. Isolated bacteria were screened for their efficiency. Solubilization of phosphate in broth was highest with strain D5 (2012), whereas D55 demonstrated the highest nitrogenase activity, response to indole acetic acid and siderophore production. The isolates D55 (2012) and D55 were identified as *Bacillus* and *Rhizobium*, respectively, using biochemical and molecular methods. Seeds of horsegram were subjected to four different treatments. Under pot conditions, the treatments were : (i) seeds inoculated with *Rhizobium* (T_1), (ii) seeds inoculated with *Bacillus* and soil supplemented with 50 g of tri-calcium phosphate per pot (T_2), (iii) seeds inoculated with *Bacillus* (T_3) and (iv) control (T_4). Treatments T_1, T_2 and T_3 significantly improved growth, yield, chlorophyll content, total protein content of seeds and nutrient uptake by plants, over the control. The seed yield increased by 105.39, 73.33 and 76.47% in T_1, T_2 and T_3, respectively, over the control. Compared with the control, in treated plants, maturation period in horsegram was shortened by 15 days, which suggested that rhizobacteria could be used as potent bio-fertilizers. Treatment of seeds and soil with *Rhizobium* culture proved better than that with *Bacillus*.

Key words : IAA, horsegram, n-fixing bacteria, nitrogenase, PGPR, PSB

INTRODUCTION

Deficiency in nitrogen limits plant growth, as it is a major component of proteins, hormones, chlorophyll, vitamins and enzymes. Inoculation with plant growth-promoting rhizobacteria (PGPR) helps fix atmospheric nitrogen through two mechanisms : symbiotic and non-symbiotic, and has beneficial effects on plant growth (Gupta *et al.,* 2015). Besides nitrogen, phosphorus is also an important nutrient that plays a significant role in plant growth and development. It is involved in important activities, such as cell division, photosynthesis, breakdown of sugars, and nutrient uptake and transport (Gouda *et al.,* 2018). There is a large amount of organic and inorganic phosphorus present in nature. 90-95% phosphorus present is in the insoluble, immobilized, or precipitated forms; therefore, it is difficult for plants to absorb it (Gouda *et al.*, 2018). About 70% of phosphate fertilizers are converted into insoluble complexes, such as calcium phosphate, aluminum phosphate and iron phosphate, which get precipitated and adsorbed to the soil surface. Therefore, even after a frequent use of chemical fertilizers, phosphorus (P) is regarded as a limiting nutrient in agricultural soils. Phosphate-solubilizing bacteria are known to convert insoluble soil P to soluble P, which is enabled by secretion of organic acids, chelation and ion exchange, thus making P available to plants (Gupta *et al.*, 2015; Singh, 2018).

The PGPR are a group of beneficial bacteria that actively colonize the roots and rhizosphere and stimulate plant growth directly or indirectly (Gouda *et al.*, 2018). Indirect stimulation of plant growth includes a variety of mechanisms by which the bacteria prevent phyto-pathogens

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from inhibiting plant growth and development (Gupta *et al.,* 2015). Direct stimulation may include providing plants with fixed nitrogen, phytohormones, siderophores, soluble phosphate and 1-aminocyclopropane-1-carboxylate (ACC) deaminase enzyme that can lower the levels of ethylene in plants (Gupta *et al.,* 2015).

Rhizobia are symbiotic bacterial partners that form nitrogen-fixing nodules in legumes. These bacteria share characteristics with PGPR, infect and colonize the roots and produce a large number of molecules, such as auxins, cytokines, gibberellins abscisic acid, lumichrome and, riboflavin that promote plant growth and increase yield (Dakora *et a*l., 2015). Various species of *Bacillus* have been studied for the promotion of plant growth. Phosphate-solubilizing *Bacilli* can solubilize insoluble phosphates in the soil by secreting various types of organic acids that lower the pH in the rhizosphere, besides producing phytohormones, such as indole acetic acid (IAA) (Saxena *et al.,* 2015; Zahid *et al.,* 2015; Sharma *et al.,* 2019). Horsegram is an important grain legume and fodder crop cultivated in dry areas of India as well as in Sri Lanka, Burma, Malaysia, Africa, Australia and West Indies (Duke, 2012). Sprouts of horsegram are being increasingly included in the human diet, as raw seeds are a rich source of polyphenols, flavonoids and protein. Moreover, horsegram also possesses the ability to scavenge free radicals (Tiwari *et al.*, 2013). Use of horsegram seeds has also been shown to be effective in dissolving kidney stones in human patients (Sharma *et al.*, 2019). However, the information on the effect of PGPR on growth of horsegram is quite scanty (Kala *et al.*, 2011; Singh *et al.,* 2013). Their potential as bio-fertilizer needs to be assessed to promote organic farming as well as to enhance crop production. The limited information on the performance of horsegram using *Rhizobium* and *Chryseobacterium* species warrants the need to explore other species of PGPR that may enhance both plant growth and yield of horsegram. Therefore, we wanted to identify the PGPR that colonize the rhizosphere and roots of horsegram, besides assessing their effect on overall performance of the crop. The aim of this investigation was to isolate niche-based novel strains of rhizobacteria from horsegram and to test their efficacy as biofertilizers. Our additional objective was to evaluate the effect of efficient strains on growth, yield, chlorophyll content, nutrient uptake by different plant parts, and proteins in seeds of horsegram.

MATERIALS AND METHODS

Phosphate-solubilizing bacteria (PSB) were isolated from the rhizosphere of horsegram grown in Bhimtal (29°21′N, 79°24′E; 1346 m above mean sea level). Soil samples were collected from different sections of the rhizosphere of horsegram from a depth of 10-15 cm and mixed thoroughly to make composite samples. Serially diluted soil samples were placed on selective Pikovskaya medium (Pikovskaya, 1948). The PSB were visually identified from the formation of a clear halo zone around their colonies after four days of incubation at 28±2°C. Six strains of PSB were isolated and screened for phosphate solubilization following the method of Subba Rao (1993). Isolates that formed a comparatively larger zone of solubilization were further tested in liquid medium containing $Ca_3(PO_4)_2$ as an insoluble source of phosphorus at a concentration of 5 g/l. Isolates were grown in 20 ml liquid medium at 28±2°C for 24 h. After 24-h growth, 100 µl of culture was transferred to a 250 ml flask containing 100 ml medium, whereas the controls were inoculated with 100 µl of broth without the inoculum. Three Erlenmeyer flasks per isolate were incubated over a rotatory shaker at 28±2°C for 10 days. Samples were collected from each flask at intervals of 2, 4, 6, 8 and 10 days. Soluble phosphorus and pH were determined in the spent medium collected on said days as per Subba Rao (1993). Organic acids produced by an efficient PSB were analyzed via gas chromatography (GC-2010 Plus, Columbia, Maryland, USA) equipped with a hydrogen flame ionization detector (FID). Organic acids were identified by comparing the retention time of the standards (Sigma, Aldrich, St. Louis, Missouri, USA).

Symbiotic N_2-fixing bacteria were isolated from the fresh root nodules of horsegram using yeast extract mannitol agar (YEMA). Plates were incubated at 28±2°C for 3-7 days. Isolated typical single colonies were sub-cultured on freshly prepared YEMA plates to obtain pure cultures. Isolated four strains were confirmed as *Rhizobium* via Congo red dye absorption test,

ketolactose test, growth on bromothymol blue (BTB) and growth on glucose peptone agar (Subba Rao, 2006). Nitrogen fixation of all four strains was quantified by measuring the ethylene production using acetylene reduction assay (ARA). Ethylene was analyzed via gas chromatography (GC) (GC-2010 Plus, Shimazdu) using the Rtx® 1MS column equipped with a flame ionization detector (Detector Channel 1 FID). The GC was conducted at an oven temperature of 60°C, injector temperature of 150°C and detector temperature of 160°C. The flow of N_2 and H_2 gases, and air, was maintained at 30.0, 40.0 and 400.0 ml/min, respectively. A 2 µl sample of ethylene gas was injected and the area of ethylene was calculated against the standard ethylene (Sigma-Aldrich, St. Louis, Missouri, USA). Strains were also analyzed for IAA using Salkowaski reagent (Gordon and Weber, 1951). Experiment for the analysis of IAA from each strain was conducted in triplicates. The mean IAA value of triplicates for each isolate was calculated. Quantitative estimation of IAA was made by spectroscopic absorbance measurements at a wavelength of 535 nm. Siderophore production by all four N-fixing isolates was tested by chrome azurol S (CAS) assay (Schwyn and Neilands, 1987). The strains were spread across YEM agar and incubated at 28°C for 48 h. After incubation, a thin layer of CAS reagent in 0.7% agar was spread on the bacterial growth and plates were again incubated at 28°C for 24 h.

Total genomic DNA was isolated from the efficient strain of PSB and N-fixing bacteria, following the method of Sambrook and Russell (2001) with slight modifications in centrifugation speed (5000 rpm at 4° for one hour). Denaturation of the template was carried out at 95°C for 5 min, followed by 30 cycles at 95°C for 60s, 58°C for 90 s and 72°C for 120 s and a final extension of 10 min at 72°C. Amplified PCR products were resolved on 1% agarose gel and visualized under UV light. The nucleotide sequence of the purified DNA was obtained by outsourcing to Eurofins (Luxembourg, Germany). Sequence analysis was carried out using NCBI ORF finder program (http://www.ncbi.nlm.nih.gov/gorf/gorf.html). Partial 16SrRNA gene sequences of the isolated PSB and N-fixing strains were submitted to NCBI, Gene Bank database.

Pot Experiments

For pot experiments, the seeds of horsegram variety 'VLG-15' were obtained from Vivekananda Parvatiya Krishi Anusandhan Sansthan, Almora, India. Seeds were surface-sterilized by immersing in 0.1% solution of $HgCl_2$ for 3 min and rinsed with sterile distilled water three times. Seeds were soaked for 3 h in respective broths containing 3×10^6 colony forming units/ml of *Rhizobium* and *Bacillus* as per the treatments, whereas the seeds for control treatment were soaked in sterile broth. Earthen pots containing equal proportions of farm yard manure and soil (1:1 ratio) were used for sowing seeds. Treated seeds were sown at 12 spots; each spot contained four seeds and 1 ml of efficient inoculum, either *Bacillus* or *Rhizobium*, was placed around each seed. Ten days after sowing, thinning was done and only 12 seedlings per pot were retained. There were 48 replicates for each treatment. Four treatments included : seeds inoculated with N-fixing bacteria (T_1), seeds inoculated with PSB and soil supplemented with 50 g tri-calcium phosphate (TCP) per pot (T_2), seeds inoculated with PSB (T_3) and seeds treated with broth without bacterial strain served as control (T_4). Among different treatments, the treated and control plants were examined for growth parameters (root and shoot length; fresh and dry weight of plants and number of primary branches per plant) at 30 and 120 days after sowing (DAS). From each treatment, including control, eight plants were randomly selected for recording data on nodules/plant, agronomic traits (grain weight/plant, number of seeds/pod, number of pods/plant, pod length and 1000-seed weight) and biochemical parameters (nutrient concentration in different plant parts and protein content of seeds) at the time of harvest (120 DAS). Eight plants were randomly selected from each treatment to record the data on number of days required after sowing for first flowering and pod maturation.

Chlorophyll a and b, and total chlorophyll in leaves were determined at 30 DAS. Fresh leaf discs (500 mg) were cut and placed in a test tube containing 10 ml of N, N-dimethyl formamide (DMF) and stored for 24 h at 4°C. The absorbance was read at 647 and 666 nm (Labomed, Inc., Los Angeles, CA, USA) with DMF as blank, as per Moran and Porath (1980).

Nitrogen (N) and phosphorus (P) in soil and plant samples were determined at 120 DAS. Soil used for all treatments, including control, was regarded as zero-day soil (T_0). Soil samples were collected at the time of harvesting from the rhizosphere in different treatments dried at room temperature and passed through a 2.0 mm sieve (Olsen *et al.*, 1989; Subbiah and Asifa, 1956). The leaf, stem and root samples were decontaminated by washing in a 0.2% mild detergent solution, followed by treatment with 0.1N hydrochloric acid (HCl), and finally washing twice in distilled water (Bhargava and Raghupathi, 1993). Samples were air-dried and powdered separately and passed through a 5.0 mm sieve to obtain homogeneous samples. Nitrogen in plant samples was estimated via the Kjeldahl method and phosphorus was determined spectrophotometrically using the vanadomolybdophosphoric acid method (Bhargawa and Raghupathi, 1993). Total protein content was estimated in fresh seeds following the Bradford method (Bradford, 1976). Data were subjected to analysis of variance (ANOVA) using Crop Stat program for Windows (7.2.2007.2 module), developed by the Biometrics Unit, IRRI, Philippines. To declare differences among treatment means as significant, 5% probability level was used.

RESULTS AND DISCUSSION

In Pikovskaya medium, PSB formed a discrete halo zone around the colonies. From the rhizosphere of horsegram, six strains were isolated and these cultures solubilized phosphate to different degrees. Among six isolates, phosphate-solubilizing efficiency was more than 3.9 and 4.5 fold in G8 and D5 (2012), respectively. In solution, phosphate solubilization by G8 and D5 (2012) was significantly higher ($P \leq 0.01$) than that of the control. In G8, phosphate solubilization was highest on the eighth day (632.7 µl/l), whereas in D5 (2012), it was highest on the sixth day (791.7 µl/l) (Fig. 1). A sharp reduction in pH of the solution on the second day (from 5.57 to 3.79) was observed, with a gradual decrease up to 10 days (Fig. 2). D5 (2012) demonstrated the best phosphate solubilization ability in the medium. Therefore, it was used as inoculums in horsegram to test its efficiency. Efficient strain D5 (2012) was further tested for acid production, as it produced both volatile and

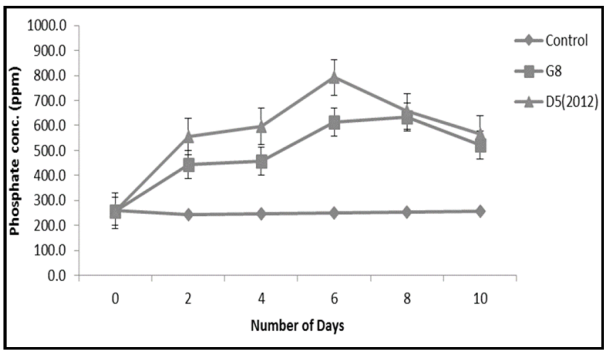


Fig. 1. Estimation of phosphate solubilized by G8 and D5 (2012) strains in Pikovskaya broth.

non-volatile organic acids. These were identified by GC, comparing the retention time of standards viz., propionic, lactic and citric acids. The retention time of strain D5 (2012) by GC analysis demonstrated the presence of both volatile (propionic) and non-volatile (lactic) organic acids.

Four strains, MR-1, MR-2, MR-3 and D55 were isolated from the root nodules of horsegram. Since *Agrobacterium* spp. are common root-nodule contaminants, along with *Rhizobium* spp., 3-ketolactose test was performed to test for the presence of *Agrobacterium*. The reaction involved the oxidation of lactose to form 3-ketolactose. Presence of *Agrobacterium* spp. was diagnosed using this test. All isolates were not able to oxidize lactose and gave a negative test, indicating the absence of *Agrobacterium* sp. as a contaminant. Isolates did not absorb Congo red dye when grown on YEMA plates. All strains were allowed to grow on YEMA medium enriched with bromothymol blue (BTB) (25 µg/ml). The appearance of moist and gummy colonies with surrounding medium was yellow on account of acid production, which indicated that they might be *Rhizobium*. Further, isolates

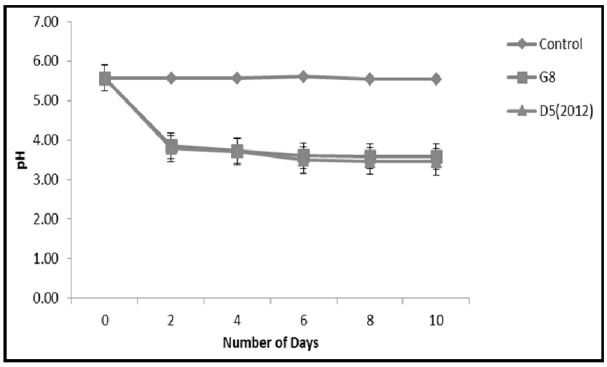


Fig. 2. Lowering of the pH of the medium due to secretion of organic acids by G8 and D5 (2012) strains in Pikovskaya broth.

were streaked on glucose peptone agar plates and no colonies were observed, as growth of *Rhizobia* is not supported by this medium. All four N-fixing isolates were analyzed for measuring the reduction of acetylene via acetylene reduction assay (ARA), as described in Materials and Methods. Among the four isolates, D55 showed the highest level of nitrogenase activity, whereas MR-2 had the least activity (Fig. 3). All N-fixing strains were also analyzed to determine the IAA production. Among the four strains, D55 exhibited the highest production of IAA after 48 h of incubation, whereas MR-2 produced the lowest amount of IAA (Fig. 3). Of the four N-fixing isolates screened for siderophore production on CAS agar, three strains (D55, MR-3 and MR-1) showed yellow-orange coloured halo around the colonies. A larger halo was formed around D55

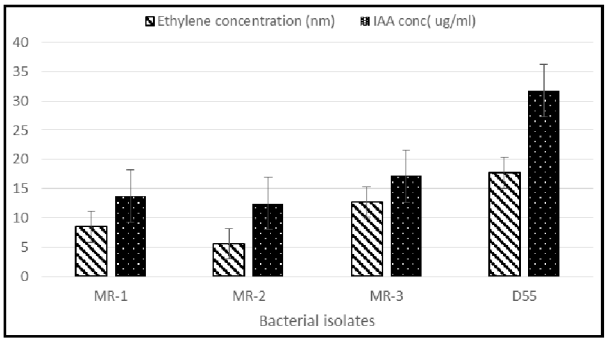
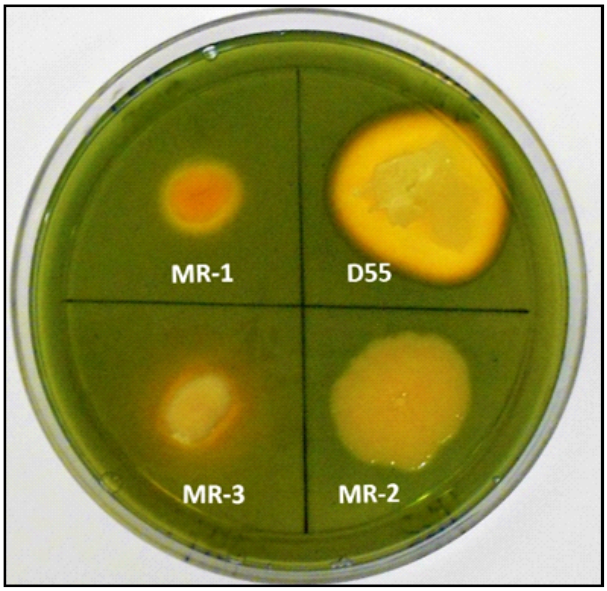


Fig. 3. Indole acetic acid (IAA) production and acetylene reduction assay of N-fixing strains isolated from the root nodules of horsegram.



Supplementary Figure : N-fixing strains isolated from the root nodules showing halo around colonies resulting from siderophore production on CAS (chrome azurol S) agar.

colonies than around MR-1 and MR-3 strains after 24 h of incubation (Supplementary Fig.). On the basis of nitrogenase activity, and IAA and siderophore production, D55 was selected as an efficient N-fixing strain for the bacterization of horsegram seeds. Molecular characterization revealed that D5 (2012) (Accession No. JQ796784) resembled *Bacillus* sp. (Khatri *et al.*, 2016) and D55 resembled *Rhizobium* sp. (Accession No. JQ780058).

Plant Growth Promotion

Seeds and soil treated with efficient strains D5 (2012) and D55 were evaluated for different growth parameters and yield attributes of horsegram. Effects of *Rhizobium* (T_1), *Bacillus* + TCP (T_2) and *Bacillus* (T_3) with respect to growth (root and shoot length; fresh and dry weight; number of primary branches/plant and nodules/plant) are summarized in Table 1 and yield related parameters (number of pods/ plant; number of seeds/pod; pod length, seed weight/plant and 1000-seed weight) are provided in Table 2. The number of days required for first flowering and maturation of pods are presented in Table 2. Influence of different treatments (T_1, T_2 and T_3) on chlorophyll content in leaves, nutrient concentration in different plant parts and protein content in seeds are given in Table 3. Physico-chemical properties of the soil collected from the rhizosphere of treated (T_1, T_2 and T_3) and non-treated (T_4) plants are given in Table 4.

All treatments showed non-significant differences for root length, except T_3, where root length was significantly higher than that of the control at 30 DAS. All treatments significantly improved shoot length; the best treatment was T_1 followed by T_2 and T_3 (Table 1). There was a significant increase (2.0-3.0 fold) in fresh and dry weight of plants in T_1, T_2 and T_3 treatments as compared with the control (Table 1). At 30 DAS, treatment T_3 produced the largest fresh weight; whereas at 120 DAS fresh weight was highest with T_1. The same trend was observed for dry weight. The plant dry weight was increased by 206.8, 115.9 and 113.6% in T_1, T_2 and T_3 treatments, respectively, over the control.

In all treatments, the number of branches was significantly higher than that of the control (Table 1). Among the treatments, T_3 exhibited

Table 1. Effect of different treatments on growth characteristics of horsegram

Treatment	DAS	T_1	T_2	T_3	T_4	SE (N=8)	P	5% LSD
Root length (cm)	30	14.25	14.25	20.25*	14.75	0.7961	£0.05	2.34
	120	34.93	49.95	24.63	25.41	12.8133	£0.05	37.7
Shoot length (cm)	30	56.40*	45.50*	41.5*	29.40	1.3829	£0.05	4.1
	120	64.61*	51.57*	50.32*	37.61	1.5291	£0.05	4.5
Fresh weight (g)	30	14.86*	12.32*	18.98*	6.99	0.8499	£0.05	2.50
	120	70.90*	55.60*	57.3*	25.9	1.6049	£0.05	4.72
Dry weight (g)	30	3.150*	3.22*	3.89*	1.24	0.1633	£0.05	0.48
	120	13.50*	9.50*	9.4*	4.4	0.371584	£0.05	1.1
No. of primary branches	30	8.30*	8.00*	11.3*	5.3	0.4091	£0.05	1.2
	120	14.30*	15.0*	20.8*	8.3	0.610547	£0.05	1.8
No. of nodules	30	19.00*	10.1*	7.6	5.8	1.0641	£0.05	3.1

*Significant at P=0.05 level.

the largest effect and number of branches was nearly the same in T_1 and T_2 treatments. Root nodules were counted at the time of harvesting (at 120 DAS). Data presented in Table 2 revealed that T_1 and T_2 treatments significantly influenced the formation of nodules. The largest number of nodules was produced by T_1 (3.5 fold higher than the control).

The fewest number of days required for first flowering was 49.2 DAS in T_1, followed by 55.5 DAS in T_2 and 55.7 DAS in T_3. The number of days required for first flowering was significantly less only in treatment T_1 as compared with the control (Table 2). All treatments significantly reduced the number of days required for first-pod ripening. First-pod ripening duration was 76.5 DAS (T_1), 76.6 DAS (T_2), 77.5 DAS (T_3) and 92.1 DAS (T_4) (Table 2). All inoculation treatments (T_1, T_2 and T_3) improved all attributes significantly ($P \leq 0.01$) in relation to the control (Table 2). Pods per plant were significantly higher in all treatments, but highest number of pods was obtained with T_1, whereas the number of pods was same in T_2 and T_3. Pod length, number of seeds per pod and 1000 seed weight showed a similar trend ($T_1 > T_2 > T_3$). The values for these characters were highest following bacterization of seeds with *Rhizobium* (T_1), followed by T_2 and T_3. Data recorded on seed weight per plant indicated that all the treatments had a positive influence on this trait and trend was $T_1 > T_3 > T_2$. The seed yield increase was 105.39, 73.33 and 76.47% in T_1, T_2 and T_3, respectively, over the control. The highest production was obtained with T_1 treatment, which was almost double to that of the control (Table 2).

Nutrient Analyses

Physico-chemical properties of the soil are presented in Table 4. Conductivity significantly decreased in all treatments, including the control, as compared with the zero-day soil (T_0). The pH, nitrogen (N) and phosphorus (P) contents of all the soil samples increased significantly after seed sowing. Further, pH and concentration of nutrients (N and P) were higher in T_1, T_2 and T_3 treatments as compared with T_4 (control). Nutrient status of plant parts improved as a result of the treatment of soil and seeds with rhizobacteria. The N and P contents of roots, stems and leaves were significantly higher

Table 2. Effect of different treatments on yield and yield related characteristics of horsegram

Treatment	T_1	T_2	T_3	T_4	SE (N=8)	P	5% LSD
Grain weight per plant (g)	18.699*	15.780*	16066*	9.104	0.359345	£0.05	1.057
1000-seed weight (g)	28.724*	26.774*	25.998*	24.456	0.36678	£0.05	0.490
No. of seeds/pod	6.375*	6.250*	5.875*	4.875	0.166481	£0.05	0.490
Pod length (cm)	7.183*	6.708*	6.529*	5.389	0.10454	£0.05	0.307
No. of pods/plant	73.250*	65.125*	65.125*	52.750	1.32597	£0.05	3.900
DAS 1st pod maturity	76.500*	76.625*	77.500*	92.125	1.04902	£0.05	3.085
DAS for 1st flowering	49.250*	55.500	55.750	56.500	1.19647	£0.05	3.519

*Significant at P=0.05 level.

Table 3. Physico-chemical properties of the soil collected of rhizosphere of different treatments

Soil sample	EC (ms/cm)	pH	N (kg/ha)	P (kg/ha)
T_1	0.200*	7.20*	519.3*	508.30*
T_2	0.223*	6.70*	489.9*	550.93*
T_3	0.430*	7.10*	489.5*	458.43*
T_4	0.687*	6.76*	370.4*	329.20*
T_0	1.090	6.30	263.3	310.10
SE (N=8)	0.0198466	0.0859587	4.45765	2.03327
P	£0.05	£0.05	£0.05	£0.05
5% LSD	0.065	0.28	14.54	6.63

*Significant at P=0.05 level.

(P≤0.01) in all treatments than those in the control, except P concentration in stems with T_2 treatment (P≤0.05) (Table 3).Total protein content in seeds significantly increased in all three treatments. Compared with the control, protein content in seeds increased by 31.8, 25.4 and 26.8% in treatments T_1, T_2 and T_3, respectively. Best results for nutrients and protein content were obtained with T_1 treatment (*Rhizobium*). There was a significant increase (2.6 to 4.7 fold) in chlorophyll content of all treatments over the control (Table 4). Chlorophyll content was highest in T_1 and lowest in T_2 treatment.

Studies exist that support the finding that seed treatment or soil inoculation with PSB promotes plant growth under field conditions (Jha *et al.,* 2012; Singh *et al.*, 2013). There are reports where *Bacillus* sp. with the ability to solubilize phosphate and act as growth promoters has been isolated from the rhizosphere of various plant species (Saxena *et al.,* 2015; Bilal Rahmounea *et al.,* 2017; Gouda *et al.* 2018). Reduction in pH, which is indicative of acidification of the culture medium, suggested that phosphate had been solubilized. Isolated strain of PSB (*Bacillus*) produced non-volatile lactic acid and volatile propionic acid, which might be responsible for the solubilization of insoluble phosphorus. Zahid *et al.* (2015) also showed a drop in pH of the culture broth with increased level of soluble orthophosphate, which indicated the significance of organic acid production in the solubilization process. The PSB have been shown to excrete organic acids, which dissolve phosphatic minerals or chelate cationic partners of the phosphate ions and directly release phosphorus in the soil (Singh, 2018).

The bacterization of seeds with *Bacillus* sp. used in this study was capable of enhancing plant growth, yield, chlorophyll content and nutrient (N and P) uptake in different plant parts and total protein content in seeds to a great extent. Under pot culture, the positive influence of *Bacillus* on plant growth suggested that the strain was an efficient rhizosphere colonizer and that there was a strong relationship between root colonization, P uptake and growth promotion. These findings are in agreement with those of Singh *et al.* (2013), who reported positive effect of PSB (*Chryseobacterium* sp. PSR10) on agronomic parameters, chlorophyll content, nitrate reductase activity and phosphorus content of horsegram in both sterilized and unsterilized soils. The present study revealed that the *Bacillus* sp. performed very well both in

Table 4. Effect of different treatments on nutrient concentration (120 DAS) and chlorophyll content (30 DAS) in horsegram

Treatment	T_1	T_2	T_3	T_4	SE (N=3)	P	5% LSD
Nutrients (%)							
Nitrogen							
Leaves	3.72*	3.16*	3.38*	2.98	0.0119	£0.05	0.041
Stem	3.59*	3.02*	3.16*	2.72	0.0392876	£0.05	0.13
Roots	3.08*	2.79*	2.99*	2.19	0.036119	£0.05	0.12
Phosphorus							
Leaves	0.38*	0.32*	0.35*	0.25	0.0081	£0.05	0.03
Stem	0.24*	0.21	0.26*	0.18	0.061285	£0.05	0.06
Roots	0.19*	0.15*	0.20*	0.11	0.012909	£0.05	0.04
Chlorophyll (mg/g FW)							
Chlorophyll a	4.72*	3.50*	3.73*	2.31	0.233482	£0.05	0.81
Chlorophyll b	5.09*	2.73*	2.82*	1.02	0.196253	£0.05	0.68
Total	4.51*	2.458	2.53*	0.94	0.0167412	£0.05	0.58

*Significant at P=0.05 level.

presence and absence of TCP, as evidenced by the enhanced growth and yield of horsegram. Improvement by T_2 and T_3 treatments was identical for certain characters e. g. dry weight of plant, number of pods per plant and DAS for first flowering. Treatment T_3 was better than T_2 in increasing number of branches, grain weight/plant, nutrient concentration (N and P) in plant parts, chlorophyll content of leaves and total protein in seeds. Number of root nodules per plant, shoot length, 1000-seed weight, number of seeds per pod and pod length were higher for treatments where PSB were inoculated with TCP (T_2) than for PSB inoculation without TCP (T_3). These findings support the observations of Jha *et al.* (2012), who demonstrated improvement in growth and nutrient uptake in mung bean after single and dual inoculation of PSB with and without TCP in P-deficient soils. Our results corresponded with those of Saxena *et al.* (2015), who showed a significant increase in chlorophyll content, pods per plant, pod weight and yield of chickpea following individual and combined inoculation of *Bacillus* sp. RM-2 and *Aspergillus awamori* S-36. Among all treatments, bacterization of seeds with *Bacillus* (T_3) showed the highest concentration of P in stem and root samples; in soil samples, P was the highest in T_2 treatment (*Bacillus*+TCP). The increase in available P might be attributable to the activities of introduced PSB, which might have dissolved chemically fixed inorganic phosphate compounds. This might be attributed to increased amount of soluble P in the soil and to greater uptake of P by the plants.

The results of this investigation indicate that N_2-fixing bacteria positively affected all parameters of horsegram as a two-to three-fold increase was recorded and T_1 was found to be the best treatment. This direct growth-promotive effect has been shown to involve plant growth regulators, such as indole-3-acetic acid and cytokines (Reviewed in Gouda *et al.*, 2018, Sharma *et al.*, 2019). Improvement in growth (shoot length, biomass, number of primary branches and root nodules), yield (grain weight per plant, 1000-seed weight, number of seeds per pod and number of pods per plant), chlorophyll content and nutrients (N, P and total protein) could be attributable to better colonization of roots by *Rhizobium*. Namvar *et al.* (2011) observed a positive influence of seed inoculation with *Rhizobium* and inorganic nitrogen fertilization on agronomic (plant height, number of primary and secondary branches, number of pods per plant, number of grains per plant, grain and biological yield) and physiological traits (chlorophyll and protein content in grains) of chickpea. The results of the present study are also in close conformity with the findings of Bejandi *et al.* (2012), who observed that seed inoculation of chickpea with *Rhizobium* had a positive effect on emergence percentage, plant height, nodulation, maturity time, pods per plant, grain yield, chlorophyll content and seed protein. Nitrogenous compounds resulting from N_2-fixation are moved from root nodules and translocated to the leaves where they are catabolized and used for the biosynthesis of chlorophyll and proteins essential for photosynthesis (Bejandi *et al.,* 2012). Among all treatments, inoculation of soil and seeds with *Rhizobium* exhibited the highest concentration of N in the soil and different plant parts, and the same treatment influenced protein content of seeds the most. Nitrogenase enzymes, which occur in N_2-fixing bacteria, are capable of fixing atmospheric nitrogen. The biological fixation of nitrogen into ammonia makes it available for synthesis of nucleotides, DNA, RNA, amino acids and proteins.

According to Brear *et al.* (2013) legumes, which develop a symbiosis with *Rhizobium*, have increased demand for iron and it is required for the synthesis of leghemoglobin and nitrogenase. Deficiencies in iron can affect initiation and development of the nodule. In this way, there is a relationship between siderophore production and efficiency of nitrogen fixation by rhizobia. In this study, we observed a bigger halo around the colonies of D55 because siderophore production corresponded with higher nitrogenase activity of isolate. Both strains isolated from the rhizosphere and root nodules of horsegram can stimulate protein accumulation in seeds of horsegram. Our findings indicate that isolated rhizobacteria had competitive ability to survive and affect the growth of inoculated plants in the presence of indigenous micro-flora in unsterilized soil.

CONCLUSION

The use of PGPR to improve the soil fertility and yield of important crops is a significant alternative to chemical fertilizers in sustainable agricultural production. Pot experiments have demonstrated that D5 (2012) (*Bacillus*) and D55 (*Rhizobium*) strains could be used effectively as PGPR with legumes. The application of these rhizobacteria proved to be highly effective in inducing variability in almost all growth, agronomic and physiological traits of horsegram. To the best of our knowledge, this is the first report on the effect of *Bacillus* and *Rhizobium* on the overall growth of horsegram. We have tested these strains on a non-leguminous crop (*Setaria italica*) as well and their inoculation improved overall performance of the crop (Khatri *et al.,* 2016). Thus, there is much scope for the development of possible bio-inoculants for nutrient-poor soils to enhance production and nutritive value of crops, and fertility of soil, especially nitrogen and phosphorus.

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STUDY OF VARIOUS METHODS FOR FOOD PRESERVATION AND THE CHALLENGES FACED BY INDUSTRIES

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ABSTRACT

To perpetuate the quality of the food in order to attain the paramount boon and sustenance values there are various food preservation techniques. Some of the main targets of food preservation are to produce value-added food products, to improve food variation in the diet and to improve agriculture planning. The primary reason of food spoilage is due to the broad range of biochemical and chemical reactions. There are some conventional and fundamental techniques of food preservation like chilling, drying, pasteurization and freezing in order to slow down or hamper the chemical reactions and deterioration of food products by microbes. In the past years, such techniques to encounter food spoilage have deliberately transformed to multidisciplinary science. Some advanced technologies such as high-pressure technology, hurdle technology and irradiation are broadly used to preserve food products. This review focuses mainly on the methods, applications of various food preservation methods and have illustrated several chemical, physical and microbial aspects that are responsible for spoilage of food items. In this review, we have encountered the challenges of food preservation that are faced by the food industry and have mentioned few advanced techniques based on such challenges.

Keywords : food preservation, freezing, pasteurization, pickling, canning, sugaring, vacuum packing

Introduction

Foods are essential components that are consumed for nutritious means. The origin of foods is primarily from the plants or animals and it comprises of moisture, carbohydrate, lipid, minerals, protein and organic components. The deterioration of food is mainly due to physical, chemical and microbial actions. The texture, color, edibility and nutritional values of foods are vulnerable to spoilage (Rahman MS, 2007). It is necessary to preserve food products in order to maintain the quality of the food for a longer duration. Food preservation is generally defined as the techniques or processes initiated to retain external and internal aspects that may lead to food spoilage. The prime aim of food preservation is to enhance the shelf life of the food products by preserving the texture, color, flavor and its nutritional values.

The background of food preservation during the ancient times when the primordial group of mankind acknowledged the need of preserving the food items after the hunt of an animal, that was not adept to consume at a time. The first and foremost step during the ancient times was to learn and enhance the techniques of food preservation to increase the shelf life of the food. The primary techniques for preserving food products used by mankind from various cultures are mostly the same (Nummer BA, 2002). Traditional methods of food preservation include freezing, canning, refrigeration, pickling, sugaring, fermentation, chilling, drying, pasteurization, whereas modern methods of preserving

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food products are freeze-drying, vacuum packing, pasteurization and pascalization. In the interdisciplinary science, the technology or methods for food preservation has been updated to new techniques namely hurdle technology, irradiation and high-pressure technology (Blum D., 2012 and Freedman D. H., 2011). The food preservation process comprises of growing, harvesting, processing, packaging and distributing of food items. Therefore, an advanced techniques would be beneficial for preserving food products during the processing and production phases.

Food preservation process is to control or improve the quality of the food by inhibiting the growth of microbes that causes food borne diseases, to evade rancidity (oxidation of fats) and to sustain the nutritional values, flavor, color and texture of the food (Sancho-Madriz M. F., 2003 and Lianou A., et al., 2016). The microbes, enzymes and chemicals found in the food mainly leads to the deterioration of the food items. During the transportation of the organic food and food products from one location to another often causes spoilage of food, reduces morphological attraction and decreases the nutritional benefits of the food. Hence, it is necessary to focus on preserving the food for a longer duration, and also to maintain the color, texture, stability, taste and morphological attraction (Sharif, ZIM et al., 2017).

In conventional method, the microbes are wiped out or killed by boiling the food and to reduce the water content, sugar is added to the food product to inhibit re-growth of microbes, and the food is sealed in a air tight container to avoid contamination. The International Agency for Research on Cancer accredited by the WHO (2015) announced that the use of salt, fermentation, smoking and curing in processed meat forms carcinogens in the meat.

Several conventional and modern techniques for preserving food have been illustrated in this review that are considered to lower food poisoning and other diseases (Fig. 1). In the present time, food preservation plays an important role in fulfilling the shelf life of food products and in some developing countries food preserved are often obtained during shortage if food.

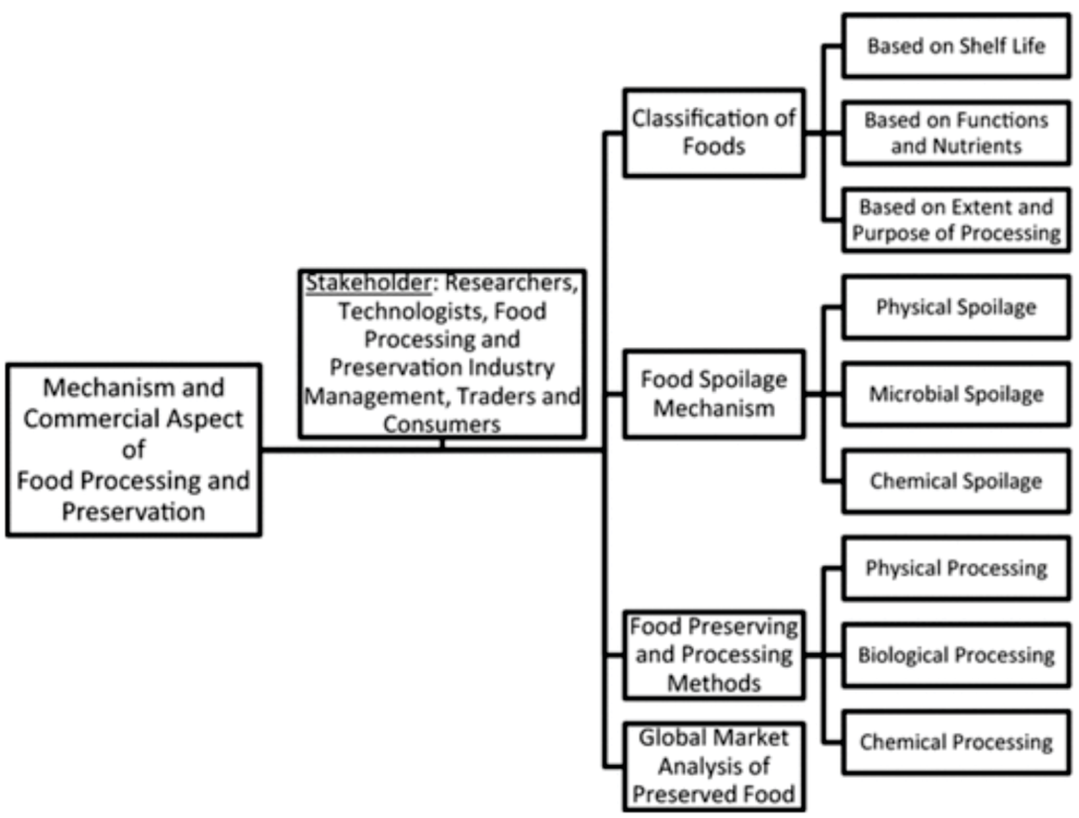

Fig. 1: Flow chart of commercial aspects of food processing and preservation (Amit et al., 2017)

Classification of foods

Foods are widely classified based on the shelf life, nutrient value, processing and functions.

1. Based on shelf life

Food deterioration is a natural occurring process in which the food product slowly loses its texture, color, flavor, edibility and nutrient values. Consuming spoilage foods often leads to health illness, and in some cases it may cause death. Based on the shelf life, food products are categorized as perishable, semi-perishable and non-perishable (Doyle MP, 2009).

i. **Perishable foods:** The shelf life of the food items vary between days to around three weeks. For examples: meats, eggs, milk and dairy products, sea-foods.

ii. **Semi-perishable foods:** The shelf life of such foods have a longer duration for about six months. For examples: cheeses, potatoes.

iii. **Non-perishable foods:** Foods classified under non-perishable category have an infinite shelf life such as processed foods. These types of food products can be kept for several years. For example: Nuts, canned fruits, dry beans, mayonnaise, peanut butter.

2. Based on nutrient values

On the basis of the nutritional values, foods can be categorized into :

i. Protein rich foods.
ii. Carbohydrate rich foods.
iii. Minerals and vitamin rich foods.
iv. Fat rich foods.

To sustain the food products, it is necessary to enhance the preservation techniques for prolonged use of the food and also in concern to the commercial supply. Various conventional preservation methods are available such as drying (to reduce the moisture content), foods stored in vinegar (food items stored under acidic conditions inhibits the microbial growth). In some cases, due to improper preservation of food products, millions of vegetables and fruits undergoes deterioration and are not available for consumption during the off season. In concern to this, even meat and fish are preserved also known as processed foods

Microorganisms such as bacteria, yeasts and fungi causes food spoilage making it unhealthy for consumption. The primary reasons of deterioration of food because of the chemical and physical changes in the food products are:

1. Presence of microbes like bacteria, moulds, and yeats.
2. The enzymatic process that naturally appear in the food items.

There are also some non-enzymatic reactions that occurs in the food such as mechanical injury (rodents and insects) and oxidation process. To improve food security and availability of food various food preservation methods are used over the years.

Significance of food preservation

1. Boost the shelf life of the food.
2. Availability and consumption of seasonal foods.
3. Stability in the cost of the food items.
4. Enhances the quality of the food.
5. Maintains the flavor and texture of the food.
6. Stores the nutritious values present in the food.
7. Maintains the original food color.

During the preservation process, a preservative agent is required such as sugar, salt, vinegar.

Fundamental of food preservation

1. Interruption of microbial decomposition

i. By evading microbes in order to prevent contamination in the food.
ii. Elimination of microbes from the food through membrane filtration.
iii. Blockage of microorganisms activity through dehydration, refrigeration, chemical preservative agents.
iv. Killing the microbes through boiling or irradiation.

2. Detention of self decomposition food product

i. Inactivation of the enzyme activity (blanching).
ii. Preventing the chemical reactions such as antioxidant activity.

Few points based on the research about food preservation

Roman et al., (2009) reported about advanced technologies of food preservation that comprises of pulse electric field processing, high pressure processing, cool

plasma, UV light processing, and thermal processing. Malhotra et al., (2015) reported about antimicrobial packaging of food products that included technologies related to packaging and antimicrobial applications. Sadat Kamal Amit et al. (2017) mentioned about the mechanism and commercial conditions of food processing and preservation. Harry E. Goresline (1959) studied about microbes that were present in the food and also reported about certainty of storage food. Sharif et al (2017) reviewed about the longevity of the preserved food.

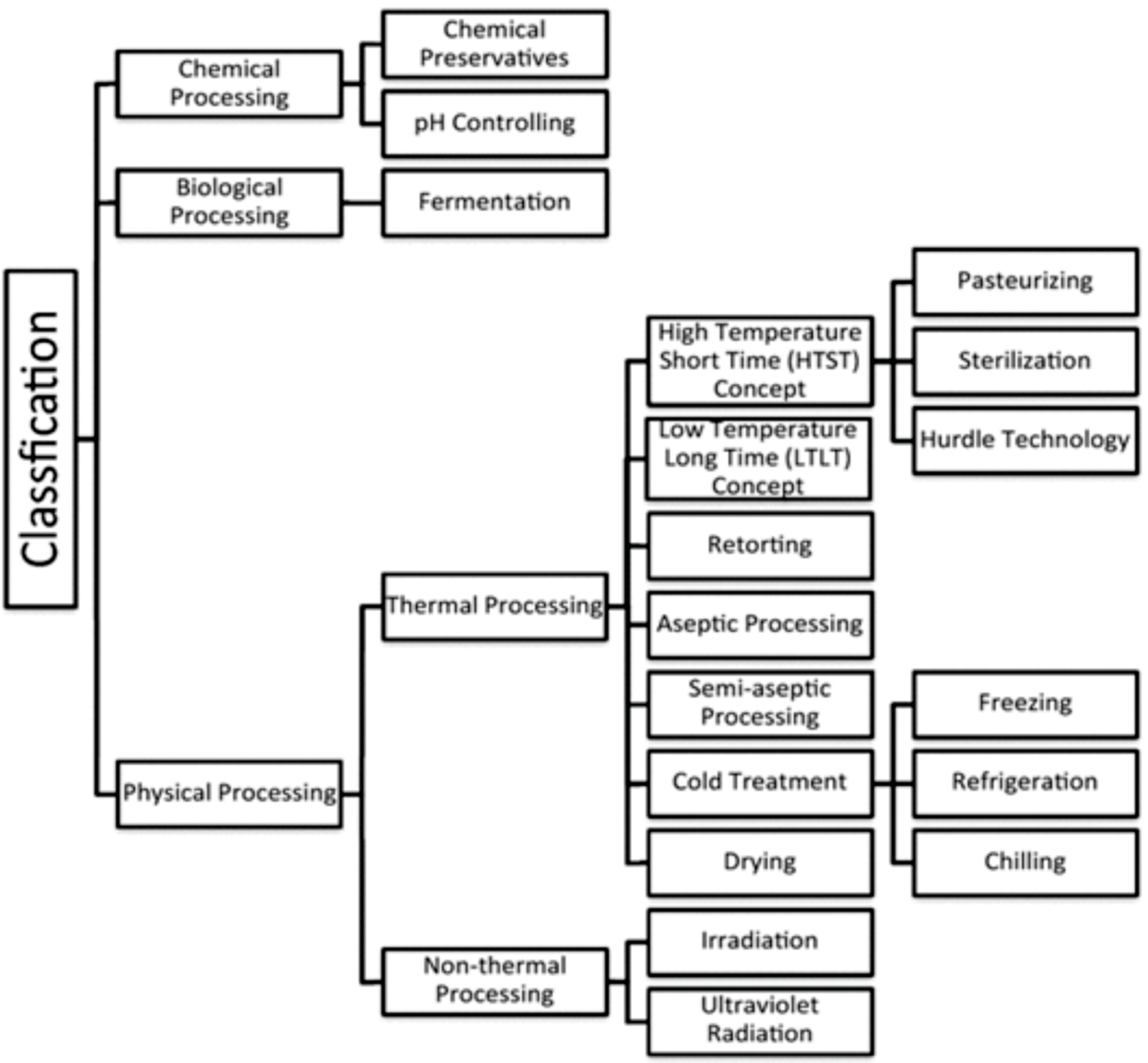

Fig. 2: Flow chart of classification of food preservation (Ohlsson T., 2002, Karel M., 2003 and Drake MA et al., 2008).

Methods of Food Preservation

These are the procedure that are used to prevent food from spoilage and can increase the shelf life. Fig. 2 shows different methods of food production that are discussed below:

1. Drying

Drying is the one of the effective methods for preserving food. During the drying process, the moisture

content in the food is reduced thus preventing the development of the microbes. Both wind and sun are used for drying and applications like Freeze drying, spray drying, household broiler are used. Natural occurring fruits such as apricots, grapes, apples are few foods the are preserved using the drying technique.

2. Freezing

In this method, the food is stored for a long period and temperatures vary between -10°C to -80°C. During the freezing period, most microbes cannot survive, but in case any microbe that survived could not multiply. Food products in such conditions are required to heat above 75 °C. In most countries, food preserved by freezing technique is usually for long term storage. Some processed foods namely waffles made from potatoes are stored in freezer but the potato tubers (raw material) are kept in a cold room between 0°C to 10°C.

3. Smoking

Smoke acts as an antimicrobial and cancer preventing agent and usually fishes and meats are smoked and then consumed. Some smoking methods includes cold smoking, hot smoking, smoke preparing and smoke cooking.

4. Pickling and salting

These are called food preservation methods, salting which is also called curing that eliminates dampness from nourishments like meat it draws moisture from meat through osmosis. Pickling is a food preservation method for edible antimicrobial liquid, there are two types of pickling chemical pickling and fermentation pickling. During pickling food is protected in brackish water (with salt arrangement) or marinated in vinegar (with acidic corrosive) and in Asia, oil is used to protect nourishments. Salt executes and restrains development of microorganisms at fixation rate of 20%. Compound pickling and aging pickling are different strategies for pickling. For expanding timespan of usability in business pickles sodium benzoate or EDTA (Ethylenediaminetetraacetic acid) is added.

5. Sugaring

It is a process of dehydrating food (desiccating) then pack it with pure sugar. Sugar is utilized in syrup structure to save natural products or in solidified structure. Another utilization is for coated organic product that gets shallow covering of sugar syrup. The fruits or food material to be preserved are cooked in liquid sugar or raw sugar until being crystallized and the resultant food is dried and preserved. Sugar is similarly utilized with liquor to safeguard extravagance nourishments like organic product in cognac (kind of brandy).

6. Canning and packaging

Canning and packaging imply fixing prepared food in sterile jugs and jars. The compartment is bubbled and these slaughters or debilitates microorganisms. Nourishments are cooked for different lengths or time. Once the cane or bottle is opened the food can again be deteriorated or spoiled.

7. Pulsed Electric Field Processing

Pulsed Electric Field Processing is another method for food preservation in which short pulses of electricity is used for inactivating microorganisms and have the tendency to cause vey less damaging effect on food quality and provides high quality food to consumers. This technology find to be more superior than traditional thermal methods as it reduces harmful changes in properties of food.

8. High Pressure Food Preservation

High pressure food protection is a strategy that squeezes nourishments inside a vessel by applying 70,000 pounds for each square inch or a greater amount of weight. This incapacitates microorganisms and forestalls deterioration; however, food holds its appearance, surface, and flavor.

CHALLENGES

Food processing industries are facing various challenges which are as follows:

Insufficient Infrastructure Facilities :

As per the review the insufficient infrastructure that is that the biggest block in increasing the food process industry, including investment and exports i.e. long and disjointed offer chain, inadequate cold storage and repositing facilities and transportation. It lacks modern supplying infrastructure includes supplying parks, integrated cold chain, last mile connectivity, dependence on road over rail, tailored transportation, RFIDs and

barcoding as a technical enhancement and government support which is much needed.

Absence of policy and laws on food processing sector :

There is no comprehensive national level policy on food processing which contains tax breaks for this sector and can adopt several measures in terms of promotion, legislation. The review shows this is the second most important issue hampering Industry's growth. Food industry in India is ruled by different acts instead of one comprehensive act at state level as well as central level this led to illogicality and discrepancy in food sector regulation. The review identified food safety laws is the third important factor hindering food Industry's growth.

Lack of training in the food processing workplace :

According to survey done by FICCI it is showed that the lack of adequately trained employees and staff impacting the Indian food business because they did not match the specific skills required for a particular task in the food processing industry which result to low rates of production, low quality food products.

Top Challenges that are faced by the food processing industries :

- Insufficient infrastructural facilities
- Comprehensive national level policy on food processing sector
- Food safety Laws
- Discrepancy in central and state policies
- Accessibility of skilled manpower

Apart from the above major challenges hindering the growth of food industries, the respondents also identified constraints in raw material production, taxation, access to credit, processing plants with outdated technologies, lack of applied research etc. as other major challenges for the growth of food processing industries.

Conclusion

Since the center Ages, process of food preservation is applied all around the world. It is believed by ancient people that if any dirty garments are left in an exceedingly corner, there is a possibility for the growth of rats therein place. In these times, individuals failed to knew concerning germs or microorganism for particular disease caused by food. Today, germs and microorganism area unit wide referred to as unsafe and hugely risky. Individuals are highly dependent on refrigerators and freezers in our day to day life. Various ancient ways were defined to preserve meats, fruits, and vegetables for a protracted time, and these are the process to keep them off from microorganism. Once experiencing the processes of food preservation, it absolutely was discovered that it's a fun, enjoyable, and funky method. It absolutely was learned that specific or acceptable utensils and cookery "machines" might improve food quality and period by many procedures.

There is a significant change in food processing industries over the past few years. Along with this, food packaging is equally important for keeping the food fresh and suitable for eating. Primarily industries faces various problems during food processing but they overcome through numerous outstanding approaches by following proper laws and orders.

If the suitable instrumentality is employed, the outcomes will also be in purest form and can be utilized by consumer without any health problems. Food preservation is essentially the appliance of sanitation, hygiene, cleanliness within the food to avoid its contamination with microorganism. By non-time overwhelming and easy steps, one can enrich the flavour of foods, maintain them clean, and build them last longer.

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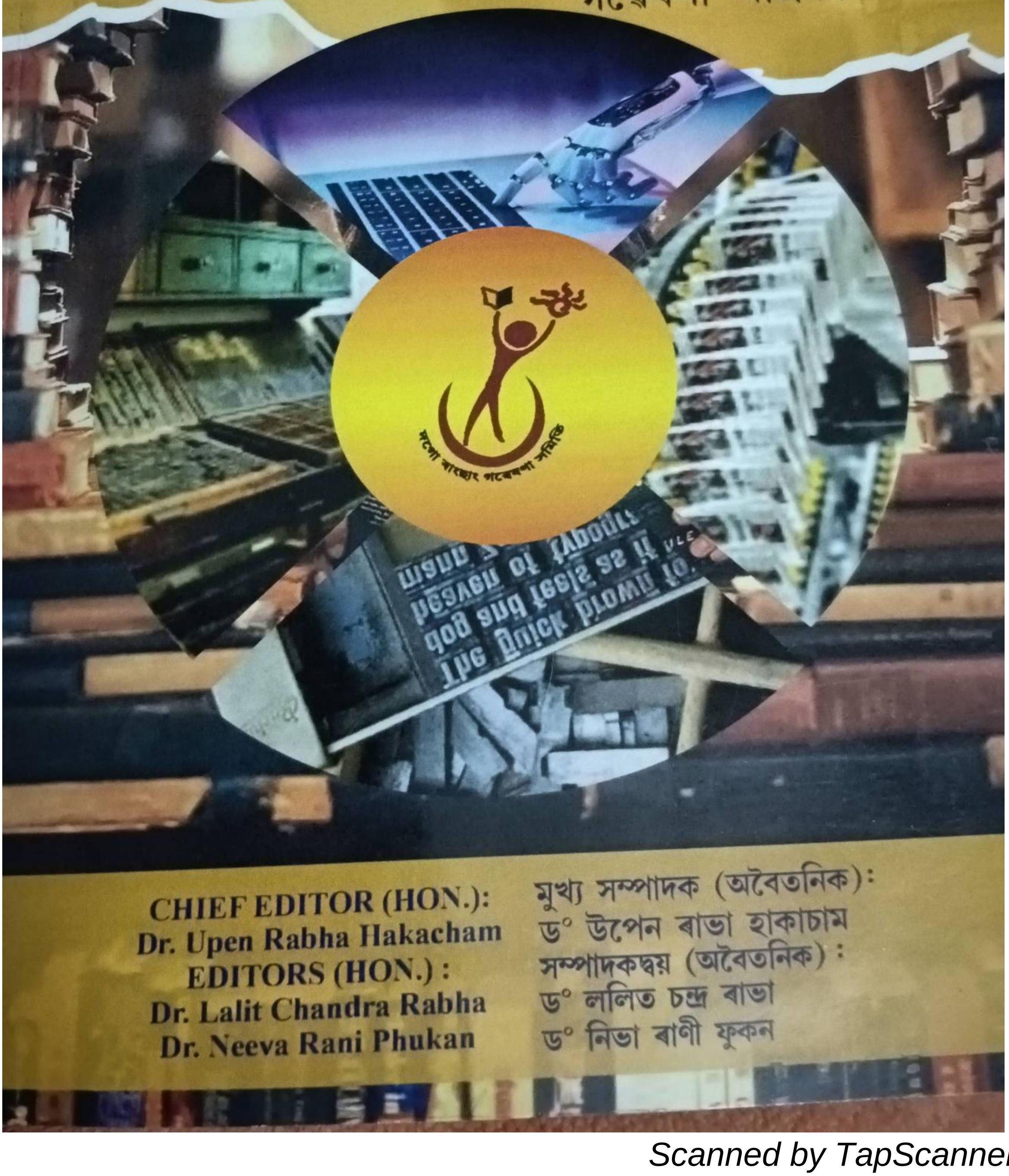

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STUDENTS SATISFACTION WITH ONLINE LEARNING DURING COVID 19 "A CASE STUDY OF GOVT COLLEGES IN NAIN ITAL DISTRICT"

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ABSTRACT
Study is attempt to the measure the satisfaction level of the students with online classes during COVID 19. A qualitative survey was conducted on 252 students from different government under graduate and post graduate colleges of Nainital district. Result is showing most of the students are enjoying online classes but a large group of the student are unsatisfied and facing many problems in online learning.

KEY WORDS Economy, Connectivity, Online learning, Pandemic, Satisfaction, Students.

INTRODUCTION

The knockdown of the corona virus shook the global economy, due to which developed countries as well as developing countries could not escape from being affected. Covering the intensity of this epidemic, it has been named the global epidemic. Strict steps were taken in its prevention measures not only in foreign countries but also in India. To prevent it from spreading, the strategy of lockdown was adopted by all the countries, due to which people no need to get out of their home except the essential services. It was the beginning of year 2020 when deadly virus spread all over the world and badly affected to the world economy and education system is also one of the parts of this impact, various decision were taken by the government in India to prevent the spread of this death-causing virus in the students, as well as to keep the study of this students going on uninterruptedly. The ministry of education introduced various online programme for the all level students namely; E-pathsala, E-P.G.pathsala, Diksha, NROER, Swayam Swayam prabha etc. The Uttarakhand government also made a concerted effort to run online classes and all colleges, universities were directed for this. In the state, an attempt was made to teach classes to students through various medium and mobile apps, in which the main tools are; Google class room, Google meet, Zoom app, MS team,webex app, whatsapp, Youtube,Facebook and Mail etc.

Table 1 Total number of students enrolled in Government colleges of the Nainital district

S.N.	NAME OF THE COLLEGE	NUMBER OF STUDENTS	Percentages
1	MBPG COLLEGE,HALDWANI	10517	53.58
2	GOVT .GIRLS P.G.COLLEGE ,HALDWANI	2192	11.17
3.	LBS GOVT. DEGREE COLLEGE ,HALDUCHOR	1174	5.98
4.	GOVT.DEGREE COLLEGE , BETALGHAT	240	1.29
5.	GOVT,DEGREE COLLEGE , DOSHAPANI	153	0.78
6.	GOVT.DEGREE COLLEGE ,KOTABAGH	182	0.93
7.	GOVT.P.G.COLLEGE, RAMNAGR	4428	22.56
8	GOVT DEGREE COLLEGE,MALDHANCHAUR	307	1.57
9.	GOVT.DEGREE COLLEGE,PATLOT	271	1.38
10.	GOVT.DEGREE COLLEGES,KICCHA	165	0.85
	Total	19629	100.00

Sources; Kumaoun university, Nainital

OBJECTIVES

Following objectives were set up for the study;

- To measure the satisfaction level of the students.
- To know the problem of the students with online classes.

- Which one is better online
- Economically impact of the online classes.
- Impact on environment of online classes.

METHODOLOGY

The total collected samples were 252 in number out of 350. Total number of questionnaires distributed to the students for sample collection but only 252 students gave their responses and didn't gave response. A qualitative survey was conducted on 252 students from different under graduate and post graduate colleges of Nainital district affiliated to the Kumoan University. Due to the territory of Nainital district being divided into plains and hilly areas, this district was selected for the convenience of study, so that the representation of the hill and plains areas could be achieved under the results, because there is a variation in the network as well as other facilities in the hilly area and the plain area. The demographic of the respondents are given below in the table.

Table 2 Demographic Profile of the Respondents

S.N.	Detail		Frequency	Percentage	
1	Gender	Male	118	46.82	100.00
		Female	134	53.18	
2.	Area	Rural	110	43.65	100.00
		Urban	142	56.35	
3	Course	Post Graduation	56	22.22	100.00
		Under Graduation	196	77.78	
	Stream	Arts	101	40.08	100.00
		Commerce	87	34.52	
		Science	64	25.40	
	Medium	Hindi	73	28.97	100.00
		English	62	24.60	
		Hindi & English	117	46.43	

Sources : Primary data

The Responds of students were collected by using a questionnaire on online learning during COVID-19 outbreak that consists of two sections, first section comprised of demographic information of Respondents and second section related to their experiences of online learning during this period. In this questionnaire both open ended and closed questions were ask for the study. The study was done between October 2020 to December 2020 because by this time the students have understood the concept of online learning. This questionnaire was made available to the students with the help of whatsapp group, personal whatsapp number, email and friends.

The questionnaire consisted of various questions about online learning and used 05 point Likert scale. Following is the table 3 showing score of each point of Likert scale:

Table-3

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

RESEARCH QUESTIONS

The following research questions were asked through Questionnaire from students to get research objectives:

- How much you satisfied with online learning during COVID 19?
- Which one you used for online learning ; whatsapp /youtube/ facebbook/ zoom/google class room/ othor?
- Which one you used for online learning; Laptop/Computer/I pad/tab/smart phone /simple mobile phone/any other?
- How much time you spend on online learning?

- Have you any experience about online learning before this?
- What is easiest mode of learning online or offline?
- What problem you faced during online learning?
- How much distance you covered to reach your college?
- How much you spend last year on copies and pen during offline learning?
- Which means of transport usually by used to reach the college?

RESULT AND DISCUSSION

The total collected samples were 252 in number out of 350. Total number of questionnaire 350 distributed to the students for sample collection but only 252 students gave their responses rest didn't gave response. To examine the experiences and responses of the students concerning online learning and to find out the answers to stated research questions, the findings are presented in the following tables;

Table 4 Satisfaction level of the students with online learning during COVID 19

Variable	Gender	Total	Gender wise distribution	Percentage of Gender wise distribution	Total Percentage
Satisfied	Male	130	44	33.85	51.58
	Female		86	66.15	
Unsatisfied	Male	109	66	60.55	43.26
	Female		43	39.45	
Not clear	Male	13	8	61.53	5.16
	Female		5	38.47	
Total n			252		100.00

Sources: Primary data

In Table 4, the analysis of response received at the level of satisfaction of online learning from students has been done. Analysis clears that a large group 51.58 is satisfied with online learning, but it cannot be ignored that a large group 43.56 is also unsatisfied, poor connectivity, lack of group reading, lack of interaction and lack of smart phones can also be attributed to this. Therefore, it is clear from the analysis that the trend of students has increased towards online learning, but due to various problems, most students are also deprived.

Table 5 Application of learning used by the students for online learning during COVID 19

S.N.	Learning with	N	Percentage
1	Google meet	34	13.49
2	Google classroom	19	7.55
3	MS team	-	-
4	Mail	23	9.13
5	Whatsapp	66	26.19
6	Youtube	59	23.41
7	Zoom	51	20.23
	Total	252	100.00

Sources: Primary data

The details of the main applications used for online learning in Covid 19 are given in Table 5. From the above analysis it appears that online learning has been mainly based on WhatsApp, YouTube and Zoom, other apps have not been very popular in it.

Table 6 Medium used used by the students for online learning during COVID 19

S.N.	Used for online learning	N	Percentage
1	Computer	19	7.53
2	I pad	3	1.19
3	Laptop	44	17.46
4	Smartphone	111	44.07
5	Simple phone	61	24.21

6	Tablet	7	2.77
7	Others	7	2.77
		252	100.00

Sources: Primary data

Table 6 analysis the mediums used by students for online learning. It is clear from the above table that smart phones have been used by most of the students for online learning, which is 44.07 percent, after the smart phone, the number of users of the normal phone is more and 17 percent students also used the laptop for this.

Table 7 Time spent by the students for online learning during COVID 19

S.N.	Times spend by the students	0-1 hrs	2-3hrs	3 hrs and above	Total
1	Male	58	45	15	118
2	Female	23	87	24	134
	Total	81	132	39	252

Table 7 shows the time spent by the students in online learning and 132 out of 252 are spending 2 to 3 hrs for online learning , 81 students spend less than 1 hrs and 39 students had spent more than 3 hrs for online learning. If we analysis this table on the basis of gender, then it is clear that female students have spent more time in online learning than in male.

Sources: Primary data

Table 8 Experience of online learning by the students before COVID 19

S.N.	Gender	Experience		Total
		Yes	No	
1	Male	19	99	118
2	Female	23	111	134
	Total	42	210	252

Sources: Primary data

Before world pandemic, online learning was not very familiar amongst the students but after the outbreak of covid 19 offline learning shifted to the online learning. Table 8 is related the experiences of the students with online learning. 42 students accepted that they are still engage with online learning before covid 19, but 210 students have never done online learning. It is clear that online learning was the new experience for most students and they were enlightened.

Table 9 Easiest mode of learning online or offline

S.N.	Gender	Online	Offline	Total
1	Male	57	61`	118
2	Female	79	55	134
	Total	136	116	252

Sources: Primary data

Table 9 expressed the alternative option between the online learning and offline learning. Largest group of the respondents gave their opinion in the support of online learning, but 116 students out of 252 not support to the online learning, causes might be poor connectivity and lack of interaction.

Table 10 Problems faced while online learning

S.N.	Gender	Connectivity	Interaction	Technical	Difficult to understand without chalk and board	Total
1	Male	29	17	7	65	118
2	Female	38	23	17	56	134
	Total	67	40	24	121	252

Sources: Primary data

Table 10 is related to the problems faced by the students with online learning . It is clear from the above analysis that 121 students were faced the difficulty to attend the online learning because uneasiness with online leaning. A large group of the students also unsatisfied with online learning.

Table 11 Distance covered by students while offline learning

S.N.	Gender	0-5KM	5-10KM	10-20KM	20 KM and above	Total
1	Male	69	21	15	13	118
2	Female	76	24	22	12	134
	Total	145	45	27	25	252

Sources: Primary data

Table 11 shows the distance of the college from the student's home because data has been collected from hill and plane area. In the hill area of the Nainital district many students covered above 10 km distance from the their home, because higher education institutions are not established nearby. This study also clarifies how much online learning has affected the economics of students, because of the reason that almost all students go to college and did come back home were expenses in the form of charges of transportation and petrol, but due to online learning, they got saved. It is clear from the above analysis that 107 students reach college by covering at least 10 km distance from their home. Above analysis also clear that online learning put positive impact on the environment because many fuel based vehicle didn't run during this time .

Table 12 Expenditure per month on stationary while offline learning

S.N.	Gender	Rs.0-100	Rs.100-200	Rs.200-300	Rs300 and Above	Total
1	Male	87	25	4	2	118
2	Female	101	26	6	1	134
	Total	188	51	10	3	252

Sources: Primary data

The purpose of this question was how much students have saved as stationery in online learning. The analysis of table 12 shows that the expenditure of most students was below 100 rupees and the expenditure of some students was above 200 rupees. If we look at the other side of this, it is clear that most parents have to purchase smart phones for their children, which had a higher cost along with this, the cost of their recharge is also increased. Lowes demand of stationary also put positive impact on the environment because decreasing demand saved tree and locked factories , hence in the form of saving tree and closed factories stopped carbon dioxide and environment benefited .

Table 13 Means of transport used by students to reach college while offline learning

S.N.	Gender	Bus	Share taxi/max	Own car	Two wheelers	walk	Total
1	Male	23	42	5	20	28	118
2	Female	27	47	1	17	42	134
	Total	50	89	6	37	70	252

Sources: Primary data

This question also analysis the economic impact of online learning on students. A careful look at table 13 shows that only 70 students out of 252 students come on foot to come to the college, which is only 27.77 percent. Whereas 72.23 students need some means to come to college. It is clear from this that due to online learning, the students have saved the expenditure on these resources, but if we talk about other effects, so many such people became unemployed which were based on these, in which rickshaws,e- rikshaw and autorikhsaw etc. were the main ones. As mentioned earlier, online learning was encouraged due to lockdown and the vehicle either did not move and if it did, did not emit much less than normal, due to which the carbon dioxide was not emitted which has a favorable impact on the environment.

CONCLUSION

Since the beginning of 2020, the impact of this global pandemic had hit the whole world, which led to the concept development of work from home, by the way, this concept is not new, in foreign countries and multinational companies, and it is already exists. The study attempts to measure student satisfaction, and it is clear from the above analysis that most students are enjoying online learning. Where students get to learn new ways of learning and the same, and on them, the carriage and stationary also reduces the economic feast. The same where there is a positive impact on one side, there is also a negative impact. In the above analysis, it is clear that a large group of students is

not satisfied. Students have also faced a lot of problems during online learning, out of whi connectivity, lack of smartphone, inability of the phone to do it, lack of interaction etc. Expe of online learning has been beneficial for the students of plane and urban areas, but the exp was not much for the students of hill and rural areas, mainly due to poor network, lack of ne lack of mobile phone, not being able to use the phone, not understanding the application and all the applications in english, etc. As mentioned earlier, online learning was encouraged lockdown and the vehicle either did not move and if it did, did not emit much less than norma to which the carbon dioxide was not emitted which has a favorable impact on the environment. If we look at the impact of online learning on other people which is based on these, then comes to the fact that its negative economic impact on those people, who were based on su rickshaw, auto rickshaw, electronic rickshaw, stationery shop keeper, tea canteen etc.
So it can be said in conclusion that online learning is being enjoyed by a large section of student but there is also a group of students who are facing different problems and are not able to take advantage of online learning.

SUGGESTION

The most important requirement for online learning is to fix the network and solve the problem of network in rural and hill area, along with this; subsidy should be given to smartphones/tablet for p students. To simplify online learning for everyone, the price of data should be reduce as so low tha even a normal student could use it. Now as the situation is becoming normal, it can be beneficial to do both online learning and offline learning.

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FOREIGN DIRECT INVESTMENT: IT'S IMPACT & SIGNIFICANCE ON ECONOMIC GROWTH IN INDIA

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Abstract
The FDI inflow to India registered a growth of around 2.6% of its national GDP for fiscal year 2019-20. With strategic FDI policy changes, India has received an exciting corpus of foreign direct investment in the recent past. Even spreading the Covid-19 pandemic when more or less most of the world's economies were suffering as restrictions had to be imposed on various economic activities, such as a halt in civil aviation, a stalled international supply chain, factory shutdowns, physical movement restrictions, and so on and so forth in most countries worldwide. It has also had a very bad effect on FDI. The share of the world's most successful foreign investment countries (USA, Japan, Germany, UK, France, etc.) has also decreased due to the Covid-19 pandemic. According to a UN, UNCTAD Report 'Investment Trend Monitor' Jan. 2021, the Global FDI in 2020 fell by 41%. The drop was concentrated in developed countries, where it fell by 69%. At the same time, FDI inflows to India reached a historic high, with the highest ever total FDI inflow of US $81.72 billion during FY2020-21. FDI inflow is often recognised as an important component of economic growth, particularly for developing economies. To cater to the financial requirements for sectoral growth in India, FDI guidelines have been revised and liberalized. Thus, the study has attempted to examine the impact of FDI on the economic growth of India. Because investment is a major component for economic growth. Through this study it has been attempted to correlate FDI with three important components: GDP, Consumer Price Index (CPI) or inflation rate, and Foreign Exchange Rate. Multiple regression analysis techniques were used to analyse the data, and the study reveals it has a positive impact on economic growth.
Keywords: FDI, FDI Policy, Economic Growth, Multiple Regression Model, FDI analysis.

Introduction

Foreign Direct Investment is an important monetary source for economic development in India (FDI India, 2021). It is allowed for most of the activities of different sectors, but, a few sectors, like atomic energy, lottery business, Chit funds, Nidhi companies, railway operations etc. are the cases where overseas investment is prohibited. According to the consolidated FDI Policy of India for 2020, a non-resident can invest under the provisions stipulated in the policy document only in those sectors which are not prohibited; either through 'Direct Route', also called 'Automatic Route' or through 'Government Route', whatever the case may be. The term "Automatic Route" refers to when foreign investors are no longer required to take approval for investment up to a specified limit for the sector or activity from the concerned ministries or Foreign Investment Promotion Board (FIPB) or Government of India. Non-resident investors can invest directly in India, either on their own or through joint ventures in virtually all the sectors as per FDI policy terms, except in a very small list of activities wherein foreign investment is prohibited. The most important change in India's FDI policy in 2020 is that "an entity of a country that shares its land border with India or an investor who is a citizen of such country may only invest through the Government Route." However, these restrictions were already in action for Pakistan and Bangladesh.

Recently, FDI has proved a big game-changer. Thus, it has now been recognized as a crucial driver of economic growth. Increased employment opportunities, increased export opportunities, competitive market, human resource development, and so on are some of the major advantages that an FDI recipient country enjoys. Since the inception of the New Economic Policy in 1991, the liberalized business environment has consistently worked to make India an investor-friendly nation and project to a position of one of the fastest-growing economies in the world (FDI India, 2021). FDI

is a non-debt financial resource ensuring benefits in several ways; along with capital investment and technology transfer (Shukla, 2013), it is capable of improving the host country's component of Balance of Payment capital account Balance (Rahman, 2016). FDI plays a crucial role in the economic growth of the recipient country through the mobilization of resources as it increases employment opportunities in the competitive global economy. Today, besides the developing countries, the developed nations have embarked on economic strategies to attract the FDI inflow, as Sustainable Developmental Goals (SDG) can be achieved. The USA ranks first with a $246 Billion FDI inflow in 2019 among the world's top 20 host economies (UNCATD, World Investment Report 2020). India is one of the most appealing countries in South Asia for foreign investment. India has been ranked (9th in terms of FDI inflow for 2019 by UNCTAD) among the top attractive destinations for inbound investments globally. Host countries are taking different initiatives to promote the FDI inflow and set up an FDI friendly environment. Today, FDI is considered an essential tool for the growth of less developed economies in global business. To encompass the shortage of domestic capital required for economic progress, FDI is the best-suited way (Ibrahim, 2014).

According to a UN report, during the FY 2019-20, the spread of the COVID-19 pandemic has brought down global FDI by 41% whereas, FDI inflow to India registered an increase of 13% (World Investment Report 2020). As per the Balance of Payments and International Investment Position Manual, Sixth Edition (BPM6) of the International Monetary Fund (IMF), Foreign Direct Investment (FDI) is a 'category of cross-border investment associated with a resident in one economy having control or a significant degree of influence on the management of an enterprise that is resident in another economy.' Further, in the case of FDI, the investor's purpose is to gain an effective voice in the management of the enterprise (RBI).

India's Business Environment and International Alliances

India is an emerging economy and the largest democracy in the world. It is the 5th largest economy in the world based on GDP (US $3.05 trillion) and third-largest by Purchasing Power Parity (PPP). Besides, it is the second most populated country with a dependency ratio of 48.26% to 15-64 years of working age (2021 estimate) (according to UN DESA Population Division). In India too there is a mixed economy, the coexistence of features of both socialisms as well as capitalism in most of the economic activities work together for economic development. The New Economic Policy came into force in 1991 to get the Indian economy reformed. As a result, the economic outlook has changed from agriculturally-based to a manufacturing-based economy (Burange & Ranadive, 2012). This economic transformation from an agriculture base to industrial dominance has created increased employment opportunities through mass production. It has a reasonably favourable pro-business environment aiming to attract multinational companies (MNCs) (Ramachandran, 2000). Now, India is the 18th largest exporting economy in the world (FDI India, 2021). Internationally, India is a member of many economic and social forums as one of the founding members of the UN, ADB, G-20, BRICKS, etc., are known as the locus of the world's developed and emerging nations. Besides, regionally, it is a member of SAARC, BIMSTEC, etc. Thus, India has pursued the 'Neighbourhood First Policy' as well as the 'Look East Policy' to maintain a better global strategic relationship. Furthermore, India is a country that has good international relations and is known for peace in the world.

It has been highlighted through many pieces of literature that a solid infrastructural base and economic growth are in close relation to each other. Because infrastructure is a foundation stone on which the entire economic activities of any economy rely. India is a country of unity in diversity. The diversity may be social, economic, regional, environmental, and many others. The second highly populated nation, India, geographically spread from coastal areas to the high mountains of the trans-Himalaya. The Indian economy is deeply rooted in its Small and Medium Enterprises (MSMEs). It comprises of organized as well as semi-organized and in some cases even unorganized too. India is a country that has the oldest stock exchanges (BSE-1875) in Asia. According to a World Bank report, BSE ranks eighth in protecting minority investors (FDI India, 2021), India's large domestic consumer

base, focused rural development, increased government expenditure on social infrastructure development, improved Law and Order, an educated populace, motivated youths, the coexistence of organized and unorganized industrial setups, good international relations, a sound governance system, a progressive private sector, natural resource wealth, and a diverse cultural heritage altogether take India ahead in the journey of self-reliance.

According to the World Bank released the Doing Business Report (DBR), 2020 on 24th October 2019. India ranks 63 among 190 countries (77 in the DBR 2019) and has improved its ranking for the third consecutive year (India, 2021). Furthermore, for host countries to receive increased foreign investment, several other factors, in addition to an investment-friendly environment, are equally important, such as bilateral relations with the top investing countries, host countries' political stability, foreign diplomacy, the role of foreign embassies, international treaties, status of the Law & Order, socio-economic status (as literacy ratio, sex ratio, living standard, etc.). FDI trends supply pivotal information for policymakers, particularly in developing economies, where development prospects are often tied to inflows of foreign investment (Vujanovica, Casellab, & Bolwijn, 2021).

Objectives of the Study

The study was undertaken to accomplish twin objectives-

i. To analyse the FDI inflow in different activities and sectors with respect to investing countries, and corpus of receipt over the period.
ii. To examine the impact of FDI on economic growth in India.

Review of Literature

So many studies have been conducted concerning FDI and Economic Growth, nationally and internationally. Some of the studies have been reviewed as below.

Abbas, Akbar, Nasir, Ullah (2011), investigates the impact of FDI on the GDP of SAARC countries. They examined time-series data (2001-2010) and developed a multivariable regression model to test the significance. In the case of all SAARC countries, except the Maldives, it showed a positive relationship between foreign direct investment and GDP, while consumer price index (inflation) and GDP had a negative relation.

Ibrahim & Muthusamy (2014), FDI plays a crucial role in developing economies. With the help of an increasing trend of FDI inflows, India's exports have increased every year. It indicates that as FDI inflow to a country keeps on growing, exports will also increase. Besides, FDI has a close relation with GDP. The data analysis reveals that when the FDI growth rate was highest in 2006-07 (159.12%), the Indian GDP growth rate was also high (16.60%) simultaneously. It is also evident that with the increasing trend of the inflow of FDI, the reserve for foreign exchange has also been raised. With the accumulation of foreign reserves by way of exporting goods and services through an increasing FDI inflow, India would be able to manage its current account deficit. In conclusion, the study suggests that we should encourage industries to attract and welcome more foreign investment to fulfil the optimum economic developmental goals.

Sarbu & Carp (2015), in their study found that FDI had a positive effect on the economic growth of Romania for the period of analysis from 2000-2013. Due to financial and economic liberalisation, the role of FDI has changed significantly in the past few decades. Although the impact of FDI on emerging economies may differ from one country to another, it will depend on various factors, including economic conditions and the perception attributed to FDI in strategic developmental planning. **Vyas, Abhishek Vijaykumar (2015),** found that Mauritius has emerged as the top investor country in India, owing to India's Double Taxation Avoidance Agreement (DTAA) with Mauritius, as well as the fact that most foreign countries prefer to invest in the service sector.

Zafar, Hmedat, & Ahmed (2017), in their work, have articulated that financial integration through FDI has played a very important role in the economic growth of the host countries. To encounter with global competition, most of the Asian Countries welcomed FDI, probably India with its conservative approach was found latecomer to join the FDI. The government of India has amended the policies of FDI from time to time so that, through bringing other activities having potential into

the net of FDI, sustainable development can be achieved. According to the study, FDI has a positive relationship with economic growth. The policy changes have been thoroughly implemented, and as a result, India has benefited from increased employment opportunities, increased productivity, and high purchasing power in its pursuit of economic growth.

The study conducted by Sokang, Khun (2018), reveals that FDI has a positive impact on the economic growth of Cambodia, both in the long run and in the short run. Furthermore, it suggests the government should bring reforms to the domestic markets. As a result, the increasing inflow of FDI can accelerate the pace of economic growth. Jana, Sahu, and Pandey (2019), attempted to correlate the sector-specific analysis of FDI inflows with India's economic growth, and the study found that FDI inflows were non-contributive to agricultural output growth. At the same time, FDI inflows have been found to be beneficial to the manufacturing sector. It is true that the Indian economy is predominantly an agrarian economy, so to ensure sustainable economic growth in India, the primary sector needs to be revived in order to attract and absorb more FDI.

Research Methodology

A quantitative analysis will be performed to arrive at the conclusions. Secondary data sources have been used to accomplish the study objectives. An increase in real GDP represents the economic growth of an economy. The study analyses time series data for the twenty years from FY2000-01 to FY2019-20 to test the hypothesized predictors of FDI and economic growth. To test the relationship between economic growth and FDI, a multiple regression model has been used. The study examines data on three independent variables: FDI inflows, the Consumer Price Index (CPI) or inflation rate, and the Foreign Exchange Rate, which were collected and compiled from a database published by the World Bank and the Government of India. Thus, the following multiple linear regression model has been developed to test the significance of these three independent variables on India's economic growth (GDP)-

$$GDP = \beta_1 FDI + \beta_2 CPI + \beta_3 EXR + \varepsilon$$

Where- GDP = Gross Domestic Product

$\beta_1, \beta_2, \beta_3$ = Regression Coefficients

CPI = Consumer Price Index (inflation)

EXR = Foreign Exchange Rate (y-o-y change)

ε = Standard Error

FDI Governance and Policy Framework in India

Policies and policymakers have a very significant role in FDI. Developed countries do not compete for FDI. On the other hand, developing economies with the help of foreign investments are able to increase tax revenue, export growth, better forex reserve, and greater job opportunities through the introduction of fresh capital into the economy by way of FDI (Saigal, 2015). Foreign investment is necessary not only to supplement the domestic capital shortage but also to secure scientific, technical, and industrial knowledge (Ibrahim, 2014).

FDI Investment Routs

Currently, in India, FDI can be made through two diverse routes—first the Automatic Route and second the Government Route. For a concise view of FDI inflow to India, it may be categorized into three categories mentioned in Table No.1.

Table: 1: A summary of some Activities/Sector wise FDI Description through Prescribed Routes

Categories	Descriptions	Broad Sector/Activities
Category-1	Sectors in which FDI is permitted up to 100% under ***Automatic Route***	Agriculture & Animal Husbandry (100%), Plantation Sector (100%), Mining, Petroleum and Natural Gas (100%), Broadcasting carriage services (100%) (i.e., DTH, cable networks, mobile TV etc.), Civil Aviation (100%), Airports (100%), Helicopter services, construction development projects (100%), Industrial

		parks (100%), E-commerce activities (100%), Railway infrastructure, Infrastructure companies in securities market (49%), Insurance and Pension (49%), White Level ATM Operator (100%) Pharmaceutical: greenfield (100%).
Category-2	Sectors in which FDI is permitted up to 100% under ***Government Route***	Mining (100%) (separation of titanium bearing minerals and ores), Broadcasting content services (up to 49%) printing of technical & scientific magazines (100%). Petroleum refining by PSU (49% Automatic), Satellite establishment (100%) Broadcasting content services (FM radio, news channels 49%), uploading news through digital media (26%), Print Media (publishing newspapers, publishing Indian editions of foreign Magazines 26%), Multi brand retail trading (51%), Public sector banking (20%).
Category-3	*Sectors in which FDI is permitted up to a certain limit through both the **Automatic Route, and Government Route** subject to applicable laws/regulations, security, and other conditions.*	Defence (up to 74% Automatic, Govt. Route beyond 74%), Air Transport Services (Automatic up to 49% Govt. beyond 49%), Private Security Agencies (49% Automatic, Govt beyond 49 up to 74%), Private sector banking (Automatic up to 49%, Govt. route beyond 49% to 74%), Pharmaceutical: brownfield (Automatic up to 74% Govt. route beyond 74%).

Compiled from the Consolidated India FDI policy 2020, Department for Promotion of Industry and Internal Trade, GoI.

Following a brief examination of India's FDI Policy, it is clear that the majority of sectors and activities are covered by the automatic route, which means that foreign investors are no longer required to obtain government approval prior to making such investments. Thus, there is no interference by the government in most of the areas for FDI. Other than this, eligible foreign investors can easily invest in other categories covering almost every sector of the Indian economy after fulfilling the stipulated investment conditions.

FDI Inflow Trends in India

To analyse the FDI inflow in India, it has been divided into the following subheadings-

i. Most Investing Countries in India
ii. Most FDI Attractive Sectors in India
iii. Most FDI Receiving States in India
iv. Inflow trend of FDI in India

i. *Most Investing Countries in India-* The global flow of FDI is highly uneven, as most developing economies are looking for increasing foreign investments, particularly in Equity, to meet the capital requirement shortage. Thus, this shortage of capital requirement makes it attractive for countries with a surplus to invest in (Madan, 2014). Table No. 2 shows FDI equity inflow from the top ten investing countries to India for the last twenty years.

Table: 2 :FDI Equity inflow form top-10 Investing Countries

Amount in Rupees Crores (in US$ Million)

Ranks	Name	2018-19 (Apr-Mar)	2019-20 (Apr-Mar)	2020-21 (Apr-Dec) (Current Year)	Cumulative inflow (2000-20)	%age to Equity FDI inflow to Current Year (Apr.-Dec.)
1	Mauritius	57,139	57,785	25,903	821,844	9%*

2	Singapore	112,362	103,615	116,812	726,373	29%*
3	USA	22,335	29,850	95,246	271,468	23%*
4	Netherlands	27,036	46,071	18,251	226,573	5%
5	Japan	20,556	22,774	7,699	203,805	2%
6	UK	9,352	10,041	13,685	164,096	4%
7	Germany	6,187	3,467	3,617	72,561	1%
8	Cyprus	2,134	6,449	1,668	59,661	0.5%
9	UAE	6,356	2,393	29,149	[illegible]2	8%
10	Cayman Islands	7,147	26,397	18,842	68,[illegible]9	5%
Total inflow from all Countries		309,867 ($44,366)	353,558 ($49,977)	383,055 ($51,470)	3,115,[illegible]9 ($521,789)	-

Source-Fact Sheet on FDI from April, 2000 to December, 2020 (DPII)

**Percentage data for Ranks 1,2 and 3 are for FY 2020-21(Apr- March) while other data for the FY 2020-21 is (Apr.- Dec.) only.*

The Indian start-up ecosystem has flourished in recent years, and as a result, despite the spread of the Covid-19 pandemic during FY2020-21, India succeeded in attracting its highest ever total FDI inflow of US $81.72 billion, a growth of 9.85% from the previous year mark. FDI equity inflow recorded a growth of 34.50% during 2015-16 from US $29.74 billion to US $40.00 billion. According to a report by MoCI, Govt of India, in terms of top investor countries, 'Singapore' is at the apex with 29%, followed by the U.S.A (23%), Mauritius (9%), and UAE (8%) of total FDI inflow for the FY 2020-21.

ii. *Most FDI Attractive Sectors in India-* According to the sector-wise composition of India's GDP in 2020-21, the tertiary sector, also known as the service sector, contributes 54.18%, the secondary sector, known as the manufacturing sector, 25.92%, and the primary sector, or the agriculture sector, 19.90%. However, the share of the agriculture sector has improved by 3.4% growth from last year's figure of 17.76% to total GDP in 2019-20 (Economic Survey 2020-21, Vol.2). This sectoral pattern of contribution to national GDP is also replicated with FDI inflow.

Table: 3:Statement of Sector-wise/ Years -wise FDI Equity Inflow from Jan., 2000 to Dec., 2020

(figures Rounded off in Rs. Million)

Sector	2000-2016 (Jan-Dec)	2017 (Jan-Dec)	2018 (Jan-Dec)	2019 (Jan-Dec)	2020 (Jan-Dec)	Total
Service	3,016,406	374,125	591,992	639,527	383,908	5,005,958
Computer Software & Hardware	1,244,380	457,018	417,332	546,171	1,910,913	4,575,814
Telecommunication	1,300,088	394,293	162,113	324,084	37,689	2,218,267
Trading	823,818	169,281	343,735	348,458	235,129	1,920,482
Construction Development	1,145,958	24,964	15,617	32,348	41,015	1,259,902
Automobile Industry	918,453	122,506	167,627	212,534	111,160	15,32,280
Infrastructure	573,074	194,124	140,883	125,808	579,477	16,13,366
Total	17,311,529	2,827,680	2,906,952	3,346,126	4,786,039	31,178,325

Source: Ministry of Commerce and Industry, DPIIT Trade, FDI Newsletter Vol. XXIX No. 3-Jan., 2021

As per Table-3, the service sector is the highest FDI receiving sector. Foreign investors have recently preferred the Computer Software and Hardware sector, which is emerging as the most promising sector. During the calendar 2020, about 44% of total FDI inflow come through this sector only. FDI in manufacturing and especially in the service sector, has greater potential to create a favourable impact on the growth of the respective sectors (Jana, Sahu, & Pandey, 2019). After liberalisation, the sectoral landscape of the Indian economy has changed and has restructured from agricultural to manufacturing. The following Table-4 represents the very recent sector-wise outlook of FDI inflow.

Table:4 : Sector-wise outlook of FDI inflow

(figures in US$ million)

Ranks	Sector	FDI Equity inflows During 2020-21 (April, 20 to Dec. 20)	%age share to total FDI equity inflows (April, 20 to Dec. 20)
1	Computer Software and Hardware	24,385	44%*
2	Construction (Infrastructure) Activities	7,149	13%*
3	Services Sector	3,857	8%*
4	Trading	2,141	4%
5	Retail Trading	1,319	3%

Source: DPITT, FDI Newsletter Vol. XXIX No. 3 Jan., 2021

**Percentage data for Ranks 1,2 and 3 are for FY 2020-21(Apr.-Mar.) while other data for the FY 2020-21 is (Apr.- Dec.) only.*

As reported by DPIIT for FY 2020-21, Computer Software & Hardware has emerged as the top sector during FY 2020-21 with around 44% share of the total FDI Equity inflow followed by Construction (Infrastructure) Activities (13%) and Services Sector (8%) respectively.

iii. *Most FDI Receiving States/ Districts in India-* FDI inflow is heavily concentrated in a few states in India. As per Table-6, more than 70% of the total FDI inflow during 2020-21 was focused on three districts in India-Ahmedabad 35.80%, Mumbai 23.44%, and Bangalore 12.60%. While Gujrat (37%), Maharashtra (27%), Karnataka (13%), Delhi (8%) are the states constituted in the top rung (Madan, 2014) that together accounted for more than 70% of total FDI equity inflow in India during 2020-21. Jharkhand (4.01%), Haryana (2.19%), Telangana (1.90%) are the states to have a fair share of FDI inflow. States like West Bengal (0.81%), Utter Pradesh (0.80%) are the ones that managed to get around 1% of the total FDI inflow. The remaining states like Bihar, Rajasthan, Andhra Pradesh, Himachal Pradesh, Uttarakhand, and North-Eastern states attracted a negligible share (< 0.50%) of FDI inflow during the year 2020-21. Below, Table-6 represents the list of states attracting the most FDI equity inflow during FY 2020-21.

Table: 5 :Share of Top 5 States Attracting Highest FDI Equity Inflow

(figures in US$ million)

Ranks	State (Districts Name)	FDI Equity inflows During 2020-21 (April, 20 to Dec. 20)	%age share to total FDI equity inflows (April, 20 to Dec. 20)1
1	Gujrat (Ahmedabad 35.80%)	21,239	37%*
2	Maharashtra (Mumbai 23.44%)	13,637	27%*
3	Karnataka (Bangalore 12.60%)	6,371	13%*
4	Delhi	4,220	8%
5	Tamil Nadu (Kancheepuram 1.19%)	1,678	3%

*Source: DPITT, FDI Newsletter Vol. XXIX No. 3 Jan., 2021 *Percentage data for Ranks 1,2 and 3 are for FY 2020-21(Apr- March) while other data for the FY 2020-21 is (Apr.- Dec.) only*

iv. *FDI Inflow Trends in India-* Since the implementation of the New Economic Policy in 1991, India has seen an increase in FDI inflows. A drastic change to India's FDI inflow took place in 2006-2007, with a total FDI equity inflow of US $15,585 million and a total FDI inflow of $22,826 million registering a 155% increase, and again in 2007-08, with a 53% increase in total FDI inflow and a FDI equity inflow of close to US $25 thousand. Again, in 2008-09, it registered consecutive growth, and this time it was 20% and received a sum of $31,364 million FDI in equity. But, in 2009-10 and 2010-11, the FDI inflow decreased to 10% and 8% respectively, and again in 2012-13 it showed a negative growth of 26%, and the FDI inflow amounted to the US $21,825 million. But, since 2012-13, the FDI inflows in Equity have never come down at their previous year's mark and have followed an increasing trend. (figure-1 below)

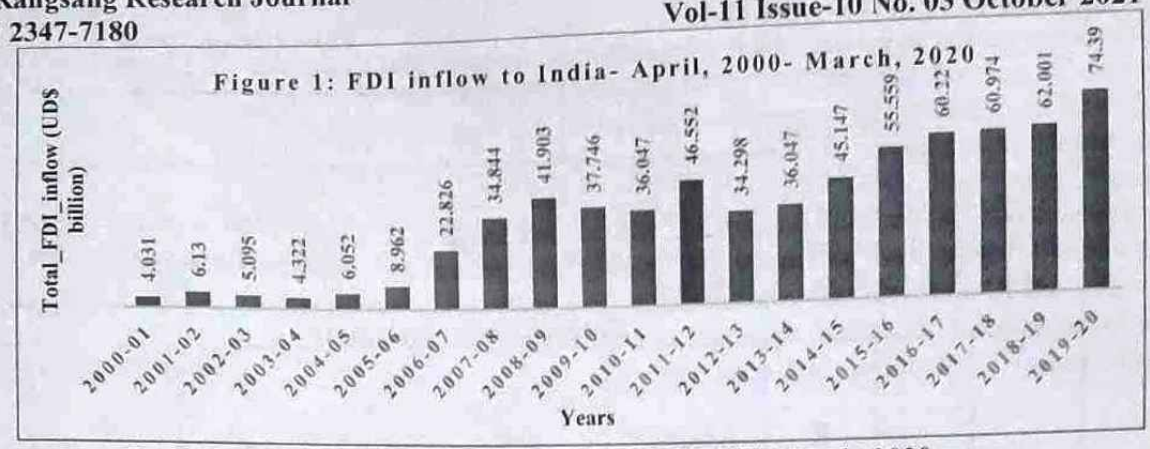

Fig. No-1 FDI inflow trend to India from April, 2000-March, 2020.

India's current performance under the policy reforms in Jun. 2017 than Aug. 2017 has resulted in increased FDI inflow. According to the FDI statistics released by the DPIIT, GOI, it is possible to conclude that India is a preferred investment destination across the world. According to the analysis of the below table-6, India has attracted the highest ever total FDI inflow of US $81.72 billion during the fiscal year 2020-21, which is approximately 10% higher than the previous fiscal year 2019-20 (the US $74.39 billion). The FDI equity inflow grew by 19.33% in FY 2020-21 (the US $59.64 billion) compared to the previous year FY 2019-20 (the US $49.98 billion).

Table: 6 :FDI Equity and total FDI inflow in last five years and the current FY

(Amount in US$ billion)

Year	FDI Equity inflow	Growth	Total FDI inflow	Growth
2014-15	29.74	-	45.15	-
2015-16	40.00	34.50%	55.56	23.06%
2016-17	43.48	8.70%	60.22	8.39%
2017-18	44.86	3.17%	60.97	1.25%
2018-19	44.37	-1.09%	62.00	1.69%
2019-20	49.98	12.64%	74.39	19.98%
2020-21	59.64	**19.33%**	81.72	**9.85%**

Source: Annual Report 2020-21, Govt. of India, MoCI, DPIIT, New Delhi.

Data Analysis and Findings

i. *Descriptive Statistics*- The study examines Time Series Data from FY2000-01 to FY2019-20 for the dependent variable GDP as well as the independent variables FDI, CPI, and year-over-year change in Foreign Exchange Rate. The minimum GDP during the study period is US $468.39 million and the maximum is US $2868.93. The average total FDI inflow is $34.16 million, the average inflation rate is 6.43%, and the average year over year change in the Foreign Exchange Rate is 2.68%.

Table: 7 Descriptive Statistics

	Minimum	Maximum	Mean	Std. Deviation
GDP	468.39	2868.93	1507.9595	787.61572
FDI	4.03	74.39	34.1573	22.46199
CPI	2.49	11.99	6.4276	2.78414
ExchangeRate	-11.14	14.11	2.6819	6.39053

iii. *Corelation Matrix*- The correlation matrix below in Table-8 shows there is a high positive relationship between foreign Direct Investment and Economic Growth, i.e., GDP.

Table: 8 Correlations Matrix

	GDP	FDI	CPI	ExchangeRate
GDP	1			

FDI	.957**	1		
CPI	0.247	0.297	1	
ExchangeRate	0.171	0.185	0.342	1

**. Correlation is significant at the 0.01 level (2-tailed).

iv. *Multiple Regression Analysis*- Multiple regression model is being used to check the linear relationship between FDI inflow and economic growth in Indian economy over the last twenty years. The findings are as follows.

Table:9 Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.958[a]	0.918	0.902	246.07959	0.918	59.547	3	16	0.000

a. Predictors: (Constant), ExchangeRate, FDI, CPI.

The R^2 value of 91.8% (Table-9), also known as coefficient of determination, indicates a very good level of prediction.

The *F-ratio* in the ANOVA table (Table: 10) represents the overall Regression Model is a good fit for the data. It shows that the independent variables i.e., FDI, CPI & Foreign Exchange Rate are statistically significant (the calculated value of F is greater than its critical value) to predict the dependent variable economic growth (GDP). $F(3,16) = 59.547$. $P < .0005$ (i.e., the regression model is a good fit for the data).

Table: 10 ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	10817549.394	3	3605849.798	59.547	<.001[b]
	Residual	968882.613	16	60555.163		
	Total	11786432.007	19			

a. Dependent Variable: GDP b. Predictors: (Constant), ExchangeRate, FDI. CPI.

v. *Estimated model coefficients*- Unstandardized coefficients indicate how much the dependent variable (GDP) changes with one independent variable when other independent variables are held constant. The unstandardized coefficient 'B' for FDI is equal to 33.97 (Table: 11). This means that a unit increase in FDI results in a 33.974 unit increase in GDP; a unit increase in the foreign exchange rate (y-o-y growth) results in only a 0.807 unit increase in GDP; and a unit increase in CPI (inflation) results in a 12.292 unit decrease in GDP.

Table: 11 Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	424.360	152.220		2.788	0.013
	FDI	33.974	2.644	0.969	12.849	0.000
	CPI	-12.292	22.304	-0.043	-0.551	0.589
	ExchangeRate	0.807	9.441	0.007	0.086	0.933

a. Dependent Variable: GDP

Conclusions and Recommendations

This empirical study agrees with previous studies on the impact of FDI on economic growth in many other developing countries, such as those conducted by Khun Sokang (2018) in Cambodia, Shiv Shankar Jana et al (2019) in India, Zulan Dhar (2013) in Bangladesh, Qaiser Abbas et al (2011) on SAARC countries, Maria-Raona Sarbu & Lenuta Carp (2015) on Romania. These studies show that

India, by liberalizing its FDI policy, has become an iconic nation for having an investor-friendly environment through the inception of the Make-in-India campaign and ensuring an ease of doing business atmosphere that has all proved India to be successful in drawing the attention of leading global investors. After analysing the last 20 years of data dealing with FDI, we can say, along with growing FDI inflows, India has received funds for more than 60 sectors/activities. The magnitude of FDI, on the other hand, varies greatly. The service sector and manufacturing sectors are good enough in the game, but the primary sector is far behind. The primary sector requires more attention because it still employs a sizable portion of the population. Thus, agriculture is the backbone of the Indian economy and probably has to be taken care of seriously. Although India has been a popular destination for foreign investors in recent years, FDI could have been more productive if it had also been good in the primary sector at the same time.

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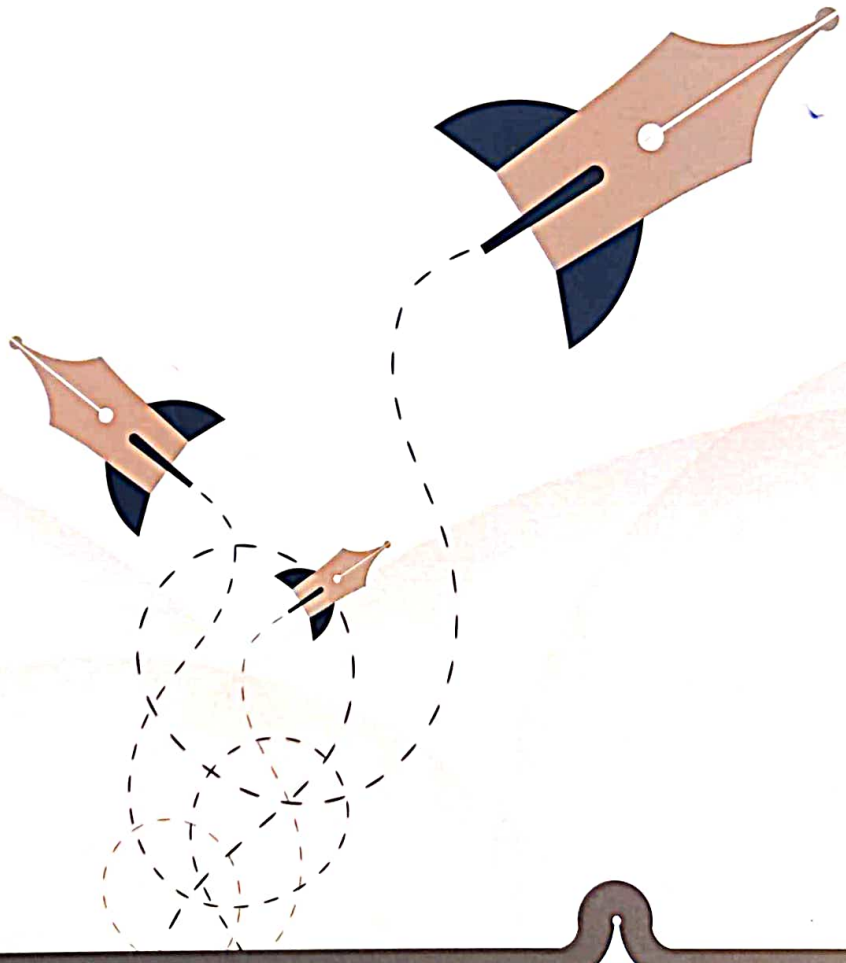

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ECO-FRIENDLY STATUS, RELIGIOUS DISTINCTION, AND SOCIO-CULTURAL SIGNIFICANCE OF BINSAR MAHADEV SHRINE 'MAHADEV OF DUDHATOLI' IN CENTRAL HIMALAYA, UTTARAKHAND, INDIA

Bhawana Juyal*
Dr. Pankaj Priyadarshi**

ABSTRACT

The subject of the present study is the hieratic shrine, **Binsar Mahadev**, situated in the Dudhatoli landscape of Uttarakhand. This mythological Shiva temple is ascertained in the middle of the rich temperate forest region of the Central Himalayas. The temple falls in the Pauri Garhwal district at Thalisain, Patti Chauthan. Its architecture is similar to Katyur's style. Idols of Lord Hargauri, Ganesha, Mahishasur Mardini, Lakshmi-Narayana, Shiva family, breastfeeding Kartikaiya, booted Surya, Anantanaga, Hanuman, brothers of Binsar Mahadev - Heet and Ghantakarna, Sahastra Linga, etc. are seated in the temple, with many mythological symbols. In this holy temple, the entire Devasthan is worshipped instead of any particular idol. There are also other religious places around the temple such asChhachori (the court of Devsabha), Brahmadhungi, and the small temple of Bhagawati/Deeva Mata. Due to the dilapidation of the temple, a restoration program is launched by BKTC (Badrinath Kedarnath Temple Committee). After the renovation, the temple would include the four Dhams of Uttarakhand. The study aims to highlight the facts related to the temple and the Dudhatoli landscape, as well as to relate Mahadev Shiva as an ecologist of Dudhatoli.

Keywords : Dudhatoli landscape, Binsar Mahadev, Brahmadhungi, Shiva as an ecologist.

Dudhatoli : An Introduction

The holy temple, **Binsar Mahadev** falls in the Dudhatoli landscape in Lesser Himalaya. It is stretched in the Chamoli, Pauri Garhwal, and partially in the Almora district of Uttarakhand. The region is situated in the south of Main Central Thrust, and north of North Almora Thrust (Joshi, et al., 2016). Two major tectonic features are controlling the litho-stratigraphy and morphology of the zone (Goswami & Pant, 2008). It forms an elevated plateau with the highest altitude reaching more than 3114 meters above mean sea level. The mountain range is located between the latitudes 30° 0.993' to 30° 03.764' N and longitudes 79° 09.724' to 79° 12.040' E, covering an area of 3,843 h. and 493 km^2 (Chauniyal & Dutta, 2018). Climatologically the region falls in Sub-Alpine to Moist Alpine(Jayal T. , 2014) in the north with distinguished forest types. It originates five rivers of environmental importance named Western Ramganga, Vino/Vinod, Atagad, Eastern Nayar, and Western Nayar (Jayal & Chuniyal, 2015). Along with this, Dudhatoli is the breeding ground of many birds,and animals and also the mother of various species of medicinal plants and timber *(Table 1)*.

Table 1. List of various plants including medicinal plants and timber in the Dudhatoli landscape.

Vernacular Name	Scientific Name	Life Form	Uses
Burans	Rhododendron arboretum	Tree	Timber/Medicinal
Deodar	Cedrus deodara	Tree	Timber/Medicinal

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Silver Fir	Abies alba	Tree	Timber
Spruce	Picea	Tree	Timber
Timoor	Zanthoxylum armatum	Shrub	Medicinal
Kilmora	Berberis asiatica	Herb	Medicinal
Utees	Alnus nepalensis	Tree	Medicinal/firewood
Banj	Quercus leucotrichophora	Tree	Timber
Kharsu	Quercus semecarpifolia	Tree	Timber
Ratanjot	Geranium wallichianum	Herb	Medicinal
Akhrot	Juglans regia	Tree	Timber/Medicinal
Neelkanthi	Ajuga parviflora benth	Herb	Medicinal
Kaphal	Myrica esculenta	Tree	Medicinal
Dev Ringal	Thamnocalamusfalconeri	Grass	Handicraft
Chir	Pinus roxburghii	Tree	Timber

Source: Adapted from(Sharma, Butola, Ghildiyal, & Gairola, 2013).

In July 2014, the construction work of the assembly building of Uttarakhand started at Bharadisain in the Gairsain block of Chamoli District. On March 4, 2020, Chief Minister Trivendra Singh Rawat declared it the summer capital of Uttarakhand (Mittal, 2020). According to Hem Gairola, a person well-versed with Van Panchayat, in 1912, the Forest Department issued a title list,and herders of this region were allotted land for making temporary cattle shelters for seasonal grazing in the pasture locally known as Kharak. 99 Kharaks of 800 breeders are currently present in Dudhatoli. The thick, luscious and juicy grass of this landscape produces plenty of good quality milk. This gave the region its name Dudhatoli **'Doodh-ki-Tauli'** *(Cauldron of milk).*

Objectives of the Study

The chief objective of the present research paper is to bring light to the facts based on historical, archaeological, environmental,religious, cultural, and folk beliefs related to the Dudhatoli landscape, especially the mythological shrine Binsar Mahadev. It analyzes the known facts and conducts its critical study based on new knowledge.

Material and Methods

***Study Area** (figure:1)*

The geographical location of Binsar Mahadev temple is between 30°0'59.51" north latitude and 70°9'43.58" east longitude. The height of the temple is about 2821 meters(Jha, 1996) above mean sea level. There are two routes to reach the Binsar Mahadev temple. The first one passes through the Thalisain block of Pauri Garhwal district. The second route passes through Deghat from Jainal in Almora district on 'State Highway Number 12' or 'Bhatraujkhan-Ganai-Chaukhutia road'. Both the routes arecovered with rich evergreen forests.

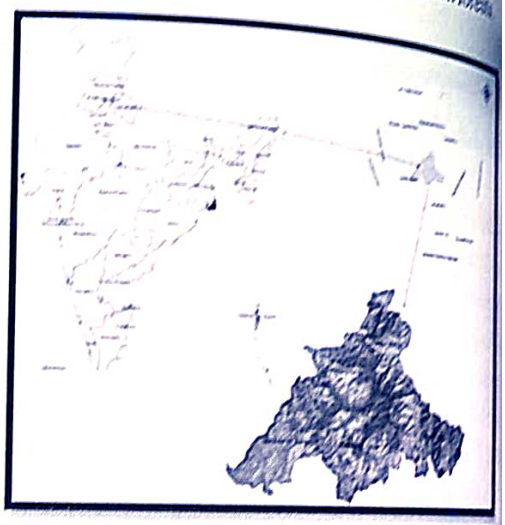

Figure:1 Map of the study area.
Source: Adapted from (Kala, Bhavsar, Kumar, Roy, & Rawat, 2018).

The present research article is based on both primary and secondary data. Secondary data has been compiled through related literature, thesis, research papers, websites, etc. The researcher anthologizedthe primary data with a survey of various historical sites of Binsar Mahadev templeand Dudhatoli landscape and

interviews with concerned persons of the region. Appropriate use of historical analysis and exploratory methods are used to evaluate the data, material, and information received.

Field Notes

Binsar Mahadev (Cauhana) or Bindeshwar Mahadev temple is one of the ancient holy temples of Uttarakhand *(figure:2)*. It provides blissful peace in the captivating shade of nature. Temple is located in a dense forest area covered by more than a hundred years old deodar trees. There is a huge stone idol of Ganesha before the entrance of the temple on the right side. Devotees enter the temple after walking a little further on the right from the main gate is the entrance to the ancient shrine. There is an indecipherable petrograph on the same wall. It is the local belief that it was written by Vishwakarma *(figure:3)*.

Figure:2 Binsar Mahadev temple.

There are three huge stone idols of Ganesha around the Shrine *(figure:4)*. A mythological Shivaling is also at the pylon. According to Babaji, every time Shivaling surfaces during digging around the temple, even after many years. Many idols in a dilapidated state are re-posited in the temple complex. It is believed all these idols are set to be ruined when the Gorkha kings of Nepal invaded Garhwal.

Figure 4 : The idol of Ganesha before the pylon.

Figure : 3 Inscription by Vishwakarma.

Lord Hargauri, Ganesha, Mahishasur Mardini, Lakshmi-Narayana, Shiva family, breastfeeding Kartikaiya, booted Surya, Anantanaga, Hanuman, brothers of Bindeshwar Mahadev - Heet and Ghantakarna (Maithani, 2004), and many other idols are seated in the womb chamber. A **'Sahastra Linga'** is also seated at Binsar Mahadev, received similar from sites such as Jageshwar, Bageshwar, Baijnath, Khunt, and others(Joshi M. M., 2017). There is a small hermitage on the right side of the shrine, in which the sages and saints reside. Presently, saint Shree Sitaram Babaji has been practicing meditation here since 2016. There exists a Dharmshala at a distance of about 100 meters from the temple, which has been built for the night stay of the devotees and visitors.

In the temple courtyard, three streams flow inside a mythical bathhouse. These streams get out from inside three beautiful sculptures of lion faces. It is assumed that

there was a pool of cold water under the main temple in ancient times. It has been covered now. According to a local belief, 2 Km away from the temple complex, the water of the pool originates in a spring near the village Sundergaon. The getting of rice and other grains that have fallen in the pool, at this place reveals the truth of this fact.

Every year on the Ekadashi that falls after Diwali a fair begins with a grand Jatra in this temple. On the occasion of the annual fair, the devotees donate the bull (Nandi). Childless women execute "Thad Dee" *(Standing in water all night with a burning lamp in hand)* at night. In the morning, after the ablution of **Pooranmasi Snan**, all the devotees go back to their homes.

There are many legends associated with the construction of this temple such as Vishwakarma built the temple, in due course of their exile the Pandavas built the temple in one night and established Bhairavanath here, the temple was built by Maharaja Prithvi in the 9th or 10th century in memory of his father Maharaja Bindu. Hence, the temple is also known as Bindeshwar, etc. The whole shrine is constructed with stone apart from a wooden canopy. It is a beautiful example of Pagoda elegance. Its architecture is similar to the Katyuri style. Babaji apprised the fact that many times the shrine has been inspected by the Archaeological Department, but no accurate particulars acknowledged about the fabrication of the temple.

Binsar Mahadev is an incarnation of Lord Shiva. The main idol is headless hence the temple's name is Binsar Mahadev. In the local parlance, Binsar derives its name from Binsar Bela (*Brahma Muhurta*). A mythical platform built on a mound about half a kilometer from the temple is called Chhachori, the "Court of Dev Sabha" used to be held in this complex in ancient times. Above the village of Daida, a giant rock named Brahmadhungi is found which is 460 meters in circumference. There is also a small shrine of Deeva Mata on it. It is believed that the Pandavas constructed the Binsar Mahadev temple in one night. Bhima was entrusted with the responsibility of collecting the rock for construction. In the last quarter of the night started, he left this rock here, since then this rock has been here. According to another folktale, Brahma himself placed this rock here, hence this place started to be called Brahmadhungi.

Babaji told that Brahmadhungi is where the first and last rays of sunrise and sunset fall. The main Dudhatoli mountain is at a distance of 12 km from here. When the weather is clear, the eastern Himalayas of Garhwal, the western Himalayas of Nepal, the entire Chauthan belt, and some parts of the Lohba belt, Chandpur belt, Badhan belt, and Ranikhet are visible from here. Kodiabagarh, the Samadhi of Veer Chandra Singh Garhwali, is near Bindeshwar Mahadev. On June 12, a cultural fair is held here in his memory every year.

Mahadev of Dudhatoli, as an Ecologist of the region

The author observes that due to the temple of Lord Shiva, the plethora of biodiversity is conserved in and around the temple complex. Summarizing all the legends, one can say that Lord Shiva in a true sense is a conservationist. In 2016, 3rd-7th January, the **103rd Indian Science Congress** was held in Karnataka at the University of Mysore. The chairman of MP PURC,AK Pandey presented a paper entitled **Lord Shiva as a great environmentalist in the world**. In this paper, he reveals Shiva as the most eco-friendly person to have incarnated on earth(Sengupta, 2019). The nature of Shiva and the methods of His worship described in ancient texts encourage environmental protection and promotion of biodiversity (Mishra & Rout, 2020)

Table: 2 Natural resources and products related to Shiva.

Vernacular Name	Botanical Name	Uses	Life Form
Kailash Parvat	-	Abode of Shiva	Mountain
Ganga	-	Ornament	Water
Vasuki Naag	-	Ornament	Reptile
Ardh Chandra	-	Ornament	Moon of the earth

Rudraksha	Elacocarpus ganitrus	Ornament	Tree
Nandi	Bos taurus	Vehicle of Shiva	Animal
Bhang	Cannabis sativa	Rituals	Herb
Dhatura	Datura stramonium	Rituals	Herb
Bilwa	Aegle marmelos	Rituals	Tree
Chandan	Santalum album	Rituals	Tree
Arka	Calotropis gigantea	Rituals	Shrub
Doorva	Cynodondactylon	Rituals	Grass
Kesar	Crocus sativus	Rituals	Perennial plant
Shahad	-	Rituals	Bee product
Badri	Zizyphusmauritiana	Rituals	Shrub or thorny tree
Dugdha	-	Rituals	Animal product

Whither Shiva's love for flora and fauna creates a sense of entity, on the other side, the tiger's blister and pyre ash draped over the body symbolize mortality.Thus, Shiva concatenates human beings to become ecologically susceptive.

Conclusion

The origin of five rivers and various species of flora and fauna make the Dudhatoli landscape environmentally important. It would be more appropriate to call the Dudhatoli landscape a zone of abundant ecological diversity than the Pamir.There are many scenic religious places around Binsar Mahadev and Dudhatoli landscape. Despite it, this place is not much developed. The roads leading to the temple should be made easy without harming nature. Rest houses and refreshments should be arranged on the pedestrian route.This will make such a long journey easier for the devotees and visitors. Dharmshalas should be constructed for the night stay of the devotees. The participation of traders in the annual fair should be ensured to give grandeur to the fair.In the light of the above-stated references or findings, it is proposed that the temple complex of Binsar Mahadev be included as the fifth Dham of Uttarakhand to promote tourism and boost the local economy.

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अब तक आयोजित समस्त विश्व हिन्दी सम्मेलन

डाक टिकिट : 1988

विश्व हिन्दी सम्मेलन

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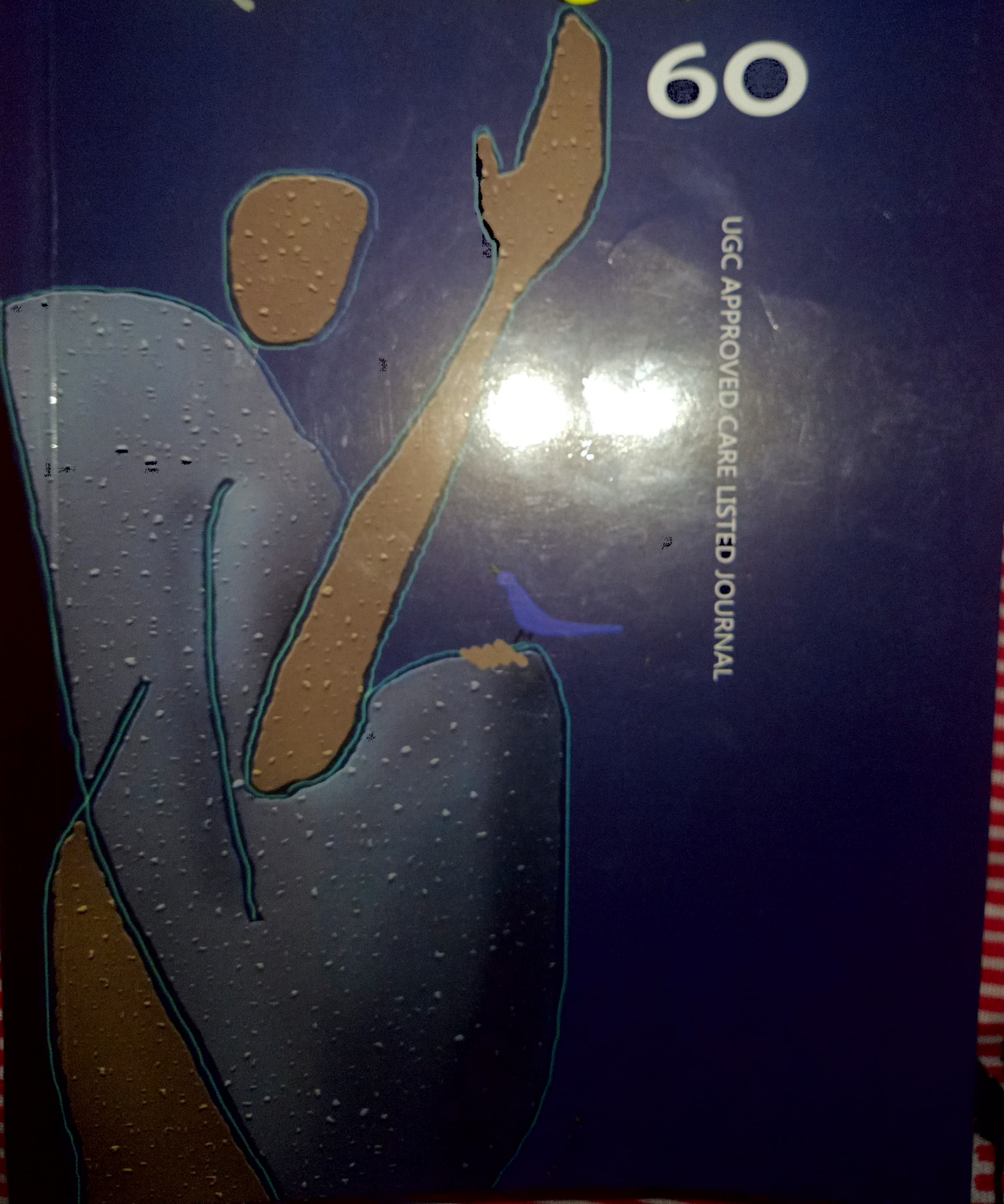

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शुल्क

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भारत-नेपाल संबंध : नृजातीय, आध्यात्मिक व सांस्कृतिक अतीत के दर्पण से

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राजकीय महाविद्यालय, जैंती, अल्मोड़ा

भारत के जिन एशियाई देशों के साथ सहस्त्राब्दियों से घनिष्ठ संबंध रहे हैं उनमें नेपाल सर्वाधिक महत्त्वपूर्ण देश है। प्रागैतिहासिककाल से नेपाल व भारत के संबंध रहे हैं। प्राकृतिक व भौगोलिक अवस्तिथि ने भारत व नेपाल को जो एकात्मकता प्रदान की है वही एकात्मकता दोनों देशों के नृजातीय, आध्यात्मिक एवं सांस्कृतिक इतिहास में परिलक्षित होती है। समान जातीय समूह, सामाजिक व्यवस्था, रीति-रिवाज, खान-पान, रहन-सहन, समान देवी-देवताओं की संकल्पना, धार्मिक विश्वास व मान्यताएँ, कर्मकांड, पूजा-पद्धति भारत-नेपाल साम्यता को प्रमाणित करते है; जो आदियुग से लेकर वर्तमान तक प्रवाहमान हैं। रक्त संबंध, भाषाई इतिहास, साहित्यिक एवं अभिलेखीय स्रोतों में उत्कीर्णित तथ्य, विभिन्न देवी-देवताओं को समर्पित देवालय व उनके प्रति अटूट आस्था का भाव दोनों देशों के निवासियों में उभयनिष्ठ है। यह उभयनिष्ठता दोनों जगह एक ही समाज को दिखाती है जिससे राजनीतिक सीमाएँ भी लुप्त होती प्रतीत होती हैं।

आज भले ही समय के साथ भारत एवं नेपाल की अलग-अलग भौगोलिक एवं राजनीतिक सीमा उन्हें दो अलग-अलग देश ठहराती हों परंतु जब हम दोनों देशों के अतीत के पन्ने पलटते हैं तो दोनों के मध्य आत्मिक तत्त्व में समानता दिखाई देती है। दोनों देश अपनी नृजातीय, आध्यात्मिक तथा सांस्कृतिक समानता के दृष्टिगत सहोदर भाई से प्रतीत होते हैं। वैसे भी प्राचीनकाल से ही भारत अपने सीमावर्ती पड़ोसी राज्यों के प्रति सौहार्द्रता का भाव रखता आया है जिसका उद्धरण हमारी भरतीय संस्कृति के मूलाधार वेदादि ग्रंथों तथा परवर्ती नीत्यादि ग्रंथों से मिलता है। पड़ोसी राज्यों के साथ आपसी संबंधों के विषय में संस्कृत के महान नीतिकार आचार्य शुक्र ने शुक्रनीति सार में विवेचन करते हुए कहा है-'स्वसमीपतरं राज्यं नान्यस्माद ग्राहयेत कचित।'[1] (अर्थात् पड़ोसी राज्य या उसकी संपत्ति को किसी भी प्रकार ग्रहण करना उचित नहीं है।) इससे आशय है कि किसी शक्तिशाली व समृद्ध राज्य को अपने पड़ोसी राज्य के प्रत्येक पक्ष यथा सामाजिक, सांस्कृतिक, आर्थिक, राजनीतिक आदि की प्रत्येक दृष्टिकोण से रक्षा करने का यत्न करना चाहिए। नेपाल की लगभग 1850 किमी सीमा उत्तरप्रदेश, उत्तराखंड, सिक्किम, बंगाल व बिहार से लगी है जो स्वतंत्र रूप से दोनों देशों के नागरिकों के लिए खुली है। पूर्व में हिमालय से विंध्याचल के बीच का भूभाग आर्यावर्त कहा जाता था। उस समय नेपाल भी इसी आर्यावर्त का हिस्सा था। कैलाश पर्वत के रूप में महादेव के निवास स्थान तथा माँ भगवती पार्वती और सीता माता का पितृगृह होने का गौरव अपने में समेटे हुए, कल-कल बहती गंगा, यमुना, सिंध, ब्रह्मपुत्र की जलधारा से सिंचित तथा

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अनेक हिंदू बौद्ध धर्म के देवालयों से सुशोभित यह क्षेत्र, अनेक सिद्ध-योगियों के तपस्थलों से मंडित नेपाल चिरकाल से हिंदू धर्म, संस्कृति और सभ्यता का भारतवर्ष की तरह एक केंद्र रहा है।[2]

अनेक भारतीय धार्मिक साहित्यिक ग्रंथों में नेपाल का उल्लेख मिलता है। स्कंदपुराण में भारतवर्ष के नौ खंड और बहत्तर विभेद बताए गए हैं। डॉ॰ दिनेशचंद्र सरकार ने इनमें से पच्चीस क्षेत्रों के नाम तथा ग्रामों की संख्या के अंतर्गत 'नेपाल' का उल्लेख किया है। पौराणिक ग्रंथों जैसे अथर्व परिशिष्ट, स्कंदपुराण के नागर खंड (102/16), सह्याद्रि खंड (39/9), रेवाखंड, देवीपुराण, गरुणपुराण (80/2), अरिष्टनेमि पुराणांतर्गत जैन हरिवंश (11/12), वृहन्नीलतंत्र, वाराहीतंत्र, वाराहमिहिर की वृहत्संहिता, हेमचंद्र के रथविरावलीचरित में नेपाल का सामान्य वर्णन पाया जाता है।[3] त्रेता युग में जनकपुरी के राजा क्षीरध्वज द्वारा अपनी पुत्री सीता का विवाह अयोध्या के राजकुमार राम व उनके छोटे भाई कुशध्वज द्वारा अपनी पुत्री उर्मिला का विवाह राम के छोटे भाई लक्ष्मण से किया जाना सर्वविदित है। कहा जाता है कि अशोक की एक पुत्री ने नेपाल के किसी कुलीन पुरुष के साथ विवाह किया था।[4] 'पर्वतीय वंशावली' के अनुसार लिच्छवी राजा वृषदेव की पुत्री कुमारदेवी का विवाह गुप्त शासक चंद्रगुप्त से हुआ। रोटी-बेटी की इस पवित्र परंपरा ने भी दोनों देशों के मध्य सामाजिक एवं सांस्कृतिक संबंधों को सुदृढ़ किया।

वास्तव में भारत नेपाल के मध्य सांस्कृतिक आदान-प्रदान का प्रारंभ मगध राज्य की स्थापना के साथ हुआ।[5] सेल्युकस निकेटर के विरुद्ध नेपाल ने चंद्रगुप्त मौर्य को सैनिक सहायता दी। सम्राट अशोक ने यहाँ रुमीनदेई लेख लिखवाया था। पौराणिक आख्यानों से ज्ञात होता है कि 400-300 ई॰पू॰ में किरात वंशी राजा त्थुड् के समय सम्राट अशोक नेपाल गए थे।[6] लिच्छवी वंश के राज्य काल में दोनों देशों के संबंध और सुदृढ़ हुए। लिच्छवी कुल की कुमारदेवी से ही गुप्त सम्राट समुद्रगुप्त उत्पन्न हुए थे। इसकी जानकारी प्रयाग प्रशस्ति में मिलती है जिसमें समुद्रगुप्त को 'लिच्छविदौहित्र'[7] नाम से संबोधित किया गया है। प्रयाग प्रशस्ति से पता चलता है कि गुप्त युग में भारत व नेपाल के अच्छे संबंध थे। लिच्छवी राजाओं ने ब्राह्मीलिपि व संस्कृत भाषा में लेख उत्कीर्णित करवाए जिन पर अंकित भारतीय संवत् तथा मास, तिथि आदि उनके भारत प्रेम का परिचायक है। 1017 ई॰ में मल्लवंशी राजा आनंदमल्ल के समय राजा नान्यदेव ने दक्षिण कर्नाटका से नायेरा क्षत्रियों की सेना के साथ नेपाल पर अधिकार कर लिया। जब नेपाल का ठाकुरी वंश अपने अंतिम दिनों में था तब मुहम्मद बिन तुगलक के आक्रमण के समय भयभीत होकर लगभग 1335 ई॰ में अयोध्या के सूर्यवंशी राजा हरिसिंह देव ने नेपाल में शरण ली। राजा हरिसिंह देव को वहाँ के अधिवासियों ने देवी तुलजा भवानी की आज्ञा से अपना राज्य सौंप दिया था।[8] संक्षेप में आर्थिक राजनीतिक संघर्षों में सबल शत्रु से बचाव हेतु जो पक्ष नेपाल की उपत्यका में शरण लेता था। वह अपने साथ भारतीय संस्कृति के तत्त्व भी ले गया, जो नेपाल के आर्यीकरण में सहायक हुआ।[9]

मोटे तौर पर नेपाल भौगोलिक दृष्टि से तीन भागों में विभाजित है—ऊँचा पर्वतीय हिमाच्छादित भाग, पर्वतों के निचले भाग उपत्यका तथा तीसरा तराई भाग। तीनों ही भागों में विभिन्न जातियाँ निवास करती हैं जो प्राचीन भारतीय संस्कृति से मेल खाती हुई उनका विस्तार प्रतीत होती हैं। यहाँ राई जिन्हें किराती भी कहा जाता है इनकी भारतीयता असंदिग्ध है क्योंकि इनके धर्मग्रंथों के नाम वैदिक ग्रंथों के समान ही हैं जैसे गोपत (वैदिक गोपथ ब्राह्मण), सतपत (शतपथ ब्राह्मण) आदि।[10] गोरखा, मगर तथा गुरूंग हिंदू हैं। गोरखाओं का संबंध चित्तौड़ के राजाओं से बताया जाता है जो 13वीं शती में बाहरी आक्रांताओं के भय से नेपाल बस गए थे। यह जाति वैदिक धर्म के अनुयायी

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सनातनी हिंदुओं की ही एक शाखा है। मगर जाति के रीति-रिवाज लगभग मध्य युग में भारतीय जाति के प्रवेश के बाद दीर्घकालिक अंतर्संबंधों के कारण हिंदू रीति-रिवाजों जैसे हो गए हैं। नेपाल के बर्फीले हिमालयी क्षेत्र की गुरुंग जाति में कुछ शैवभक्त तो कुछ बौद्ध मतानुयायी हैं। यह जाति भगवान शिव को अपना प्रवर्तक मानती है। नेपाल के उत्तरी भाग भोट क्षेत्र में भोटिया, शेरपा तथा तमांग जाति के लोग हैं। ये शिवभक्त हैं व इनमें से कुछ बौद्ध मतानुयायी भी हैं। तमांग मूलतः बौद्ध हैं परंतु भाषा, आचार व रीति-रिवाजों की दृष्टि से वे हिंदुओं की तरह हैं। नेवार एक अन्य महत्त्वपूर्ण जाति है जिसका मूल दक्षिण भारत के नैयरों से बताया जाता है।[11] इनमें वर्ण व्यवस्था पाई जाती है जो भारतीयता को प्रमाणित करती है।

नेपाल के दक्षिणी भाग का मैदानी क्षेत्र मधेश या तराई कहलाता है। यहाँ मधेशी व थारू जाति बड़ी संख्या में है। मैथिली, थारू, अवधी, भोजपुरी एवं अन्य भाषाएँ बोलने वाले नेपाली मधेशी समुदाय का बिहार व पूर्वी उत्तरप्रदेश के साथ सांस्कृतिक एवं नृजातीय संबंध रहा है। थारू जाति के रीति-रिवाज, रहन-सहन में भारतीयता की छाप स्पष्ट दिखाई देती है। लिंबू जाति स्वयं को काशी नगरी से संबद्ध बताती है। इन्हें खंबू भी कहा जाता है। ये हिंदू व बौद्ध दोनों धर्मों को मानती हैं। यह जाति हजारों वर्षों से नेपाल में भारतीय संस्कृति की पोषक व संरक्षक है। लेप्चा बौद्ध धर्म को मानते हैं। शरबा/ शेरपा हिंदू धर्म केओ मानते हैं। खस जो आज स्वयं को छत्री या छेत्री कहते हैं, हिंदू धर्म के अनुयायी हैं। नेपाल से लेकर पश्चिम गिलगित तथा दक्षिण पश्चिम में गढ़वाल कुमायूँ तक इनके वंशज फैले हैं। स्पष्ट है कि हिंदू रीति-रिवाजों को अपने-आपमें समाए हुए नेपाल के निवासियों में जातीय, धार्मिक व सांस्कृतिक एकात्मकता दृष्टिगोचर होती है।

भारतीय एवं नेपाली अभिलेख, धार्मिक-साहित्यिक स्रोत, देवी-देवताओं को समर्पित देवालय समान देवी-देवताओं की संकल्पना एवं उपासना पद्धति को प्रकट करते हैं। बौद्ध धर्म के प्रवर्तक महात्मा बुद्ध का जन्म नेपाल के लुंबिनी में तो महापरिनिर्वाण भारत के कुशीनगर में हुआ। नेपाल के किरात राजा जिस्तेदास्ती के समय महात्मा बुद्ध के उपदेश सुनकर समस्त किरात जाति बौद्ध हो गई। नेपाल में किरात वंश के उदय के साथ ही वहाँ बौद्ध धर्म का उदय हुआ। ऐसे ही भारत के चक्रवर्ती सम्राट अशोक ने न केवल बौद्ध धर्म अपनाया बल्कि देश-विदेश तक में लोकप्रिय बना दिया। काठमांडू से लगभग बीस मील दूर 'नामुरा' नामक स्थान पर 'शुच्छाग्र' नामक स्तूप है जिसे बुद्ध की नेपाल यात्रा का स्मारक माना जाता है। लिच्छवी राजा वसंतदेव ने नेपाल में भगवान अवलोकितेश्वर/ मतस्येंद्रनाथ की पूजा आरंभ की।[12] आज भी मतस्येंद्रनाथ यात्रा नेपाल में महोत्सव के रूप में मनाई जाती है। अकेले पाटन क्षेत्र में लगभग 1300 चैत्य हैं जिनमें से स्वयंभू चैत्य, स्वस्ति चैत्य, अशोक चैत्य, नागार्जुन चैत्य आदि प्रमुख हैं। एक समय में बद्रीनाथ का प्रसिद्ध मंदिर भी बौद्ध तीर्थ के रूप में विख्यात था। यह तिब्बत, नेपाल व भारत का संयुक्त तीर्थस्थल था। भारत में शैवधर्म बहुत प्राचीन है। मोहनजोदड़ो से प्राप्त योगी की मूर्ति की साम्यता भगवान शिव से स्थापित की गई। ऋग्वेद में भगवान शिव का उल्लेख मिलता है। मेगस्थनीज ने ई॰ पू॰ चौथी शती में शैवमत का उल्लेख किया है तथा शिव को 'डाइनोसस' नाम से संबोधित किया है। प्राचीन भारतीय इतिहास के अनेक राजाओं द्वारा मुद्राओं पर भगवान शिव के वाहन वृषभ, त्रिशूल आदि का अंकन मिलता है। दक्षिण के अनेक राजाओं जैसे राष्ट्रकूट राजा कृष्ण द्वितीय द्वारा एलोरा के कैलाश मंदिर, चोल शासक राजराज प्रथम द्वारा राजराजेश्वर का शिव मंदिर बनाया गया।

ऐसे ही नेपाल में सर्वप्रथम प्रवेश करने वाली किरात जाति किरातेश्वर के रूप में भगवान

शिव को पूजती थी। नेपाली अभिलेखों में भी शिव तत्त्व की प्रधानता दिखाई देती है। आर गनौली नामक इटालियन विद्वान ने नेपाल से लगभग 89 संस्कृत अभिलेखों[13] को संग्रहित कर प्रकाशित किया। ये सभी अभिलेख शिव के लिंग रूप, विष्णु, इंद्र, उमा, लक्ष्मी की प्रतिमा स्थापित करने के संदर्भ में हैं। नेपाल में 400 ई॰ में पशुपतिनाथ मंदिर स्थापित किया गया जो आज भी भारतीय हिंदू मतावलंबियों के लिए पूर्ण आस्था का केंद्र है। इस मंदिर की स्थापना के संबंध में किंवदंती है कि भगवान शिव वाराणसी में अन्य देवताएँ को छोड़कर बागमती नदी के किनारे स्तिथ मृगस्थली में चिंकारे का रूप धारण कर चले गए थे और बहुत खोजने पर पशुपतिनाथ मंदिर में चतुर्मुख लिंग के रूप में प्रकट हुए। कालांतर में नेपाल के सोमवंशी राजा निमि के वंशज राजा पशुप्रेक्ष पशुपतिनाथ मंदिर का जीर्णोद्धार करवाया और इस प्रयोजन हेतु काशी से मिट्टी मँगवाई। मल्ल राजाओं के समय में भारत नेपाल के बौद्धिक सांस्कृतिक आदान-प्रदान की परंपरा विशेष रूप से आगे बढ़ी। राजा यक्षमल्ल या जयमल्ल के समय में दक्षिण भारत के महाराष्ट्रीय ब्राह्मणों को पशुपतिनाथ मंदिर में पूजा व सेवा का अधिकार दिया गया। इसके समय में नेपाल में शैव मत का व्यापक प्रचार-प्रसार हुआ। पशुपतिनाथ मंदिर को 12 ज्योतिर्लिंगों में से एक उत्तराखंड के केदारनाथ का आधा भाग माना जाता है जिससे इसकी शक्ति और महत्त्व और अधिक बढ़ जाता है।

शिव के साथ शक्ति की संकल्पना जुड़ी हुई है। अब तक ज्ञात प्राचीनतम नगरीय हड़प्पा सभ्यता में मातृदेवी सर्वाधिक पूजनीय थीं। उषा, अरण्यानी अनेक देवियों का उल्लेख ऋग्वेद में मिलता है। कालांतर में अर्धनारीश्वर के रूप में शिव एवं शक्ति की साथ-साथ उपासना आरंभ हुई। इसी क्रम में शाक्त संप्रदाय का उदय हुआ और अनेक रूपों में देवी को पूजा जाने लगा। देवी को समर्पित देवालयों की स्थापना हुई। नेपाली अभिलेखीय साक्ष्यों से देवी उमा, लक्ष्मी को पूजे जाने के साक्ष्य मिलते हैं। नेपाल के प्रसिद्ध देवी मंदिर जनकपुर का जानकी मंदिर, महामाया गुजरेश्वरी/ गुह्येश्वरी मंदिर जो पशुपतिनाथ मंदिर से थोड़ा दूर है, वज्रयोगिनी मंदिर जिसे हिंदू व बौद्ध समाज समान रूप से मानता है, पोखरा का गंडकी मुक्तिनाथ मंदिर, महादेवी शक्तिपीठ, दंतकाली आदि हैं।

मौर्योत्तरकाल में भागवत/ वैष्णव धर्म का उद्भव हुआ। वासुदेव का प्राचीन उल्लेख पाणिनि के अष्टाध्यायी में मिलता है। गुप्तकाल में अनेक शिव एवं वैष्णव मंदिरों का निर्माण किया गया। नेपाल में राजा मानदेव के द्वारा 467 ई॰ में बैसाख मास के शुक्ल पक्ष की द्वितीया को भगवान विष्णु की प्रतिमा स्थापित की गई।[14] भादगाँव के मल्लवंशी राजाओं ने भीमसेनदेव का मंदिर, जगतप्रकाश नारायण चौक में गरुण मूर्ति, महादेव एवं नारायण के मंदिर का निर्माण कराया। नेपाल का बुदानिकांथा मंदिर विष्णु भगवान को समर्पित मंदिर है जिसमें विष्णु भगवान शयन मुद्रा में हैं, चंगूनारायन मंदिर, भक्तपुर, काठमांडू में भगवान विष्णु के साथ शेषनाग की प्रतिमा भी है।

नेपाली समाज में जन्माष्टमी, भैयादूज, राखीपूर्णिमा, माघी पूर्णिमा, गणेश चतुर्थी, बसंतोत्सव, भैयादूज, दशहरा/दुर्गोत्सव, दीपावली उसी हर्षोल्लास के साथ मनाया जाता है जिस हर्ष और उल्लास के साथ हिंदू बौद्ध भारतीय समाज इन तीज त्यौहार को मनाता है। इसके अतिरिक्त नारायण पूजा, भगवान बुद्ध को समर्पित स्वयंभू मेला, कृष्ण यात्रा, पंचलिंग भैरव यात्रा, भैरवी यात्रा आदि प्रमुख यात्राएँ हैं जो नेपाल का हिंदू बौद्ध समाज बहुत बढ़-चढ़कर मनाता है। नेपाली समाज में भारतीय संस्कृति जड़ों तक इतना गहरे समावेशित हैं कि नेपाल आज भी वृहत सांस्कृतिक भारत का ही अंग लगता है।

संदर्भ

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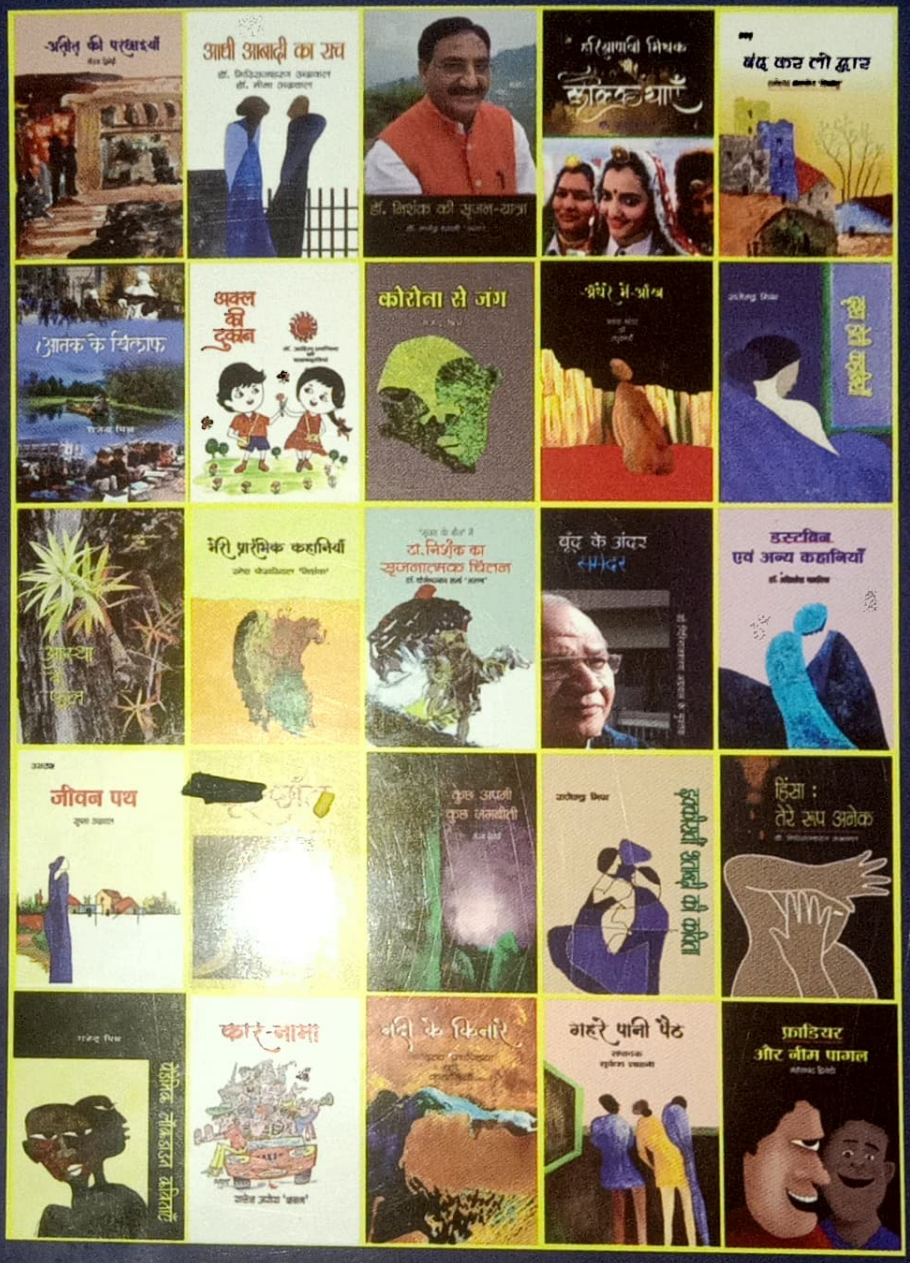

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विषय-सूची

हिन्दी उपन्यासों में किन्नर विमर्श

–डॉ० सुमन फुलारा

२१वीं सदी में हमारे समाज में किन्नरोंसे ज्यादा अभिशप्त कोई दूसरा समुदाय नहीं हो सकता। हिन्दी साहित्य में अब तक ज्यादातर विमर्श–स्त्री विमर्श, दलित विमर्श, आदिवासी विमर्श पर होते मिल जायेंगे, लेकिन यह एक विरल कोशिश ही मानी जायेगी जब इस द्वैध की सरहद समाप्त हो और उपन्यास का कथ्य शुरू हो। समाज में किन्नरों को विभिन्न क्षेत्रों में अलग-अलग नामों से पुकारा जाता है। हिजड़े, छक्का, अली, खुसरो आदि कई नामों से पुकारा जाता है। किन्नर दुनिया के हर देश व कोने में हैं। बेचन शर्मा उग्र की कहानियों में जिन लौंडेबाज का जिक्र किया जाता है, वह किन्नर ही है। महाभारत के शिखण्डी किन्नर हैं। अर्जुन ने भी अज्ञातवास में एक साल किन्नर रूप धारण करके ही बिताया था। हिन्दी साहित्य में किन्नरों के लिए जागरूकता फैलाने का काम शुरू हो गया है। निराला जी ने अपने उपन्यास 'कुल्ली भाट' में समलैंगिक विमर्श को दिखाया था, वही नीरजा माधव के उपन्यास 'यमदीप' (२००९) में मानवी और आनन्दकुमार के माध्यम से किन्नरों से जुड़े ऐतिहासिक सन्दर्भों को रेखांकित किया है। शिवप्रसाद सिंह की 'हाववृत्ति' तथा 'बिन्दा महाराज' जैसी कहानियों के पात्र किन्नर ही हैं जो समाज में जूझ रहे हैं। वृन्दावनलाल वर्मा के एकांकी 'नीलकण्ठ' का भी इस श्रेणी में उल्लेख किया जा सकता है। २०११ में प्रदीप सौरभ का चर्चित उपन्यास 'तीसरी ताली' में गौतम अपने बेटे विनीत को लोगों की दृष्टि से कुछ दिनों तक तो बचा के रखता है लेकिन सामाजिक अवहेलना के कारण उसे बच्चे को त्यागना पड़ता है।

किन्नर समुदाय अपने दैनिक संघर्ष में इस तरह फँसा हुआ है कि उसके पास न तो शिक्षा है और न ही रोजगार की उचित व्यवस्था। इसके बावजूद एक-दो किन्नर आत्मकथाएँ भी आ रहे हैं, जो सचमुच एक प्रशंसनीय और क्रान्तिकारी पहल मानी जानी चाहिए। आज किन्नर अपनी उपस्थिति विभिन्न व्यवसाय और सामाजिक कार्यों और राजनीतिक में दर्ज करा रहे हैं एवं साहित्य भी इन सब को सामने लाने का कार्य कर रहा है। किन्नर नाम लेते ही लोगों के जेहन में एक अजीब सी भावना पैदा हो जाती है। जब किसी परिवार में बच्चा अपने अपूर्ण जननांगों के साथ जन्म लेता है तो उस परिवार में खुशी के बदले मातम मनाया जाता है। उसका सिर्फ एक ही कारण है वह हिजड़ों के प्रति गलत धारणा। सार्वजनिक स्थानों, बस अड्डे, रेल के डिब्बों, स्टेशन या चौराहों पर किन्नरों के व्यवहार से त्रस्त व्यक्ति उनकी मानव अधिकारों के बारे में सोचना तो दूर उनको देखते ही फटकार लगा देते हैं।

मुख्यत: किन्नर के चार प्रकार माने जाते हैं बचुरा, नीलिमा, मनसा और हंसा। वास्तविक हिजड़े बचुरा को माना जाता है, जो जन्म से न स्त्री होते हैं न पुरुष। नीलिमा में वे हिजड़े आते हैं जो किसी

परिस्थितिवश स्वयं को हिजड़ा समझने लगते हैं। मनसा हिजड़े में वह हिजड़े आते हैं जो मानसिक तौर पर स्वयं को हिजड़ा समझने लगते हैं। हंसा कोटी में उन हिजड़ों को शामिल किया जाता है जो किसी यौन अक्षमता की वजह से स्वयं को हिजड़ा समझने लगते हैं। वस्तुतः हिजड़ा रूप में जन्म लेने में एक बच्ची का कोई कसूर नहीं होता, वह भी ईश्वर की सृष्टि ही होती है, लेकिन विडम्बना यह है कि इनके स्वयं के परिवार वालों को भी इन्हें त्यागने पर विवश होना पड़ता है।

'यमदीप' उपन्यास जो नीरजा माधव द्वारा रचित है, किन्नर समुदाय के अन्तरंग जीवन की मार्मिक गाथा को प्रस्तुत करता है। साथ ही स्त्री विमर्श का भिन्न आख्यान भी प्रस्तुत करता है। 'यमदीप' उपन्यास में नन्दरानी की माँ अपने बच्चे को पढ़ाना चाहती है जिससे कि वह अपने पैरों पर खड़ा हो सके, लेकिन तीव्र बुद्धि का होनेपर भी वह अपने लायक और होनहार बेटी की सहायता नहीं कर पाती नन्दरानी की माँ से कहा जाता है "माता किसी स्कूल में आज तक हिजड़े को पढ़ते-लिखते देखा है? किसी कुर्सी पर हिजड़ा बैठा है? मास्टरी में, पुलिस में, कलेक्ट्री में, किसी में भी अरे! उसकी दुनिया यही है, माता जी कोई आगे नहीं आएगा कि हिजड़ों को पढ़ाओ, लिखवाओ, नौकरी दो, जैसे कुछ जातियों के लिए सरकार कर रही है।"[१] नीरजा माधव द्वारा दर्शाया गया है कि आठवीं कक्षा तक पहुँचते हुए उसमें स्त्री योजित शरीरांग के साथ दाढ़ी, मूछें भी आ जाते हैं तथा कुछ समय बाद उसको समाज के डर से हिजड़ों की बस्ती में जाना पड़ता है और नन्दरानी से वह नाज बीबी बन जाती है। लेखक ने यमदीप उपन्यास में किन्नरों की ज्ञात, अज्ञात सभी अनछुए पहलुओं को बड़ी बेबाकी से पाठकों के सामने प्रस्तुत किया है। उपन्यास का पात्र महताब किन्नर गुरु है वह अपने चेलों को लेकर चिन्तित रहते हैं और नाजबीबी को समझाते हैं कि अप्राकृतिक तरीकों से पैसे कमाना गलत है।

यह सच है कि हिजड़ा बच्चा सबसे पहले उपेक्षा और तिरस्कार अपने ही परिवार से पाता है। इस उपन्यास की नायिका नाज बीबी हैं। उपन्यास का पूरा कथानक नाज बीबी के इर्द-गिर्द घूमता दिखाई देताहै। नीरजा माधव ने उपन्यास में दर्शाया है कि हिजड़े प्रसव पीड़ा में तड़पती औरतों की सहायता करते हैं तथा औरत के मर जाने पर हिजड़े उस बच्ची को भी पालते हैं। नाज बीबी जब उस बच्ची का दाखिला कराने स्कूल जाती हैं तब वहाँ छात्रों और अध्यापिका के बीच कानाफूसी शुरू हो जातीहै। नाज बीबी कहती हैं "जब हम धन्धे पर नहीं होते, बहन जी तो इस तरह का मजाक हमारे सीने में गाली की तरह लगताहै। हम आसमान से तो नहीं टपकते हैं न? आप ही की तरह किसी माँ की कोख से जन्में हैं। हाड़-मांस का शरीर लिए। हमें तो अपने आप दुःख होता है इस जीवन पर। आप लोग भी दुखी कर देते हैं।"[२] उपन्यास में हिजड़ों की पीड़ा, उनकी वेदना को अनेक स्थलों पर प्रकट किया है चमेली कहती है "तन को भगवान ने आधा टुकड़ा बनाया है कि किसी लायक नहीं रहे और पेट? पेट तो नहीं बन्द करके भेजा। वह तो खुला ही है रोज भरो खाली करो।"[३] हिजड़े मजबूरन लूट-पाट करते हैं, वेश्यावृत्ति करते हैं किन्तु उनकी असली वजह उन्हें रोजगार न मिलता है। लेखक ने उपन्यास के माध्यम से यही समझाने का प्रयास किया है कि यदि हम किन्नरों की अपेक्षा करने की बजाय उन्हें रोजगार के साधन उपलब्ध

कराने में उनकी मदद करें तो वह भी स्वतन्त्र रूप से सम्मान परक जीवन-यापन कर पायेंगे। नीरजा माधव उपन्यास के माध्यम से यही सन्देश देना चाहते हैं कि आज आवश्यकता हिजड़ों को समझने की है, उन्हें अपनाने की है। परिवार को भी चाहिए कि वह नन्दरानी की तरह लैंगिक विकलांग बच्चे को घर से निष्कासित न करें बल्कि उसे अच्छी शिक्षा दें। यदि समाज में माता-पिता किसी मानसिक रोगी, किसी विकलांग या अन्य रोग से ग्रसित बच्चे को अपना सकते हैं तो किन्नर बालक को क्यों नहीं? किन्नर समुदाय भी अनेकों रीति-रिवाजों के साथ प्रचलित है। जिस तरह हिन्दू परिवारों में परिवार का एक मुखिया होता है, उसी प्रकार हिजड़ों का भी एक मुखिया होती है। वह अपने डेरे के हिजड़ों की पूरी दिन की कमाई लेता है और डेरे का पूरा खर्च भी उठाता है। गुरु के स्थान को गुरुधाम बोला जाता है गुरु ही अपने चेलों को नाचना, बधाई आदि सिखाता है। तारा कहती है "किन्नर समाज में सात घर होते हैं जिसका मुखिया नायक होता है जो गुरु नियुक्त करता है। गुरु का महत्त्वपूर्ण स्थान होता है। किन्नर चाहे वह हिन्दू के घर पैदा हुआ हो, मुस्लिमया अन्यकिसी धर्म में किन्नर समाज मेंसम्मिलित हो, वह सभी एक पंथ के गामी बन जाते हैं जो स्व-अर्जित आय का निर्धारित हिस्सा अपने गुरु के चरणों में ईमानदारी के साथ रखते हैं। विवाद की स्थिति में गुरु द्वारा दिये गये आदेश का पालन सभी का परम कर्त्तव्य होता है।"[४]

चित्रा मुद्गल का उपन्यास पोस्ट बॉक्स नम्बर २०३ नाला सोपारा २०१८ में प्रकाशित, जिसमें चित्रा जी ने किन्नरों के दर्द को पत्रों के माध्यम से पाठकों तक पहुँचाने का प्रयास किया है। लेखिका ने इस उपन्यास में एक माँ के द्वारा अपने पुत्र को हिजड़ों से दूर रखने की पूरी कोशिश की है किन्तु वह बाद में असफल व निराश हो जाती है। उपन्यास का प्रमुख पात्र विनोद उर्फ बिन्नी है, जिसे बाद में बिमली के नाम से जाना जाता है। विनोद पढ़ने लिखने में बहुत ही होशियार है लेकिन उसके अधूरेपन ने उसकी पढ़ाई को अवरुद्ध कर दिया है। एक रोज अचानक विनोद के घर चम्पाबाई नाम की किन्नर उसे लेने आती है लेकिन बिन्नी की माँ बड़ी होशियारी से बिन्नी को बाथरूम के अन्दर छुपा देती है और चम्पाबाई के सामने अपने छोटे बेटे मंजूर को खड़ा कर देती है। यह सच है कि कोई भी माँ इतनी निर्दयी नहीं हो सकती कि वह अपने बच्चों को अपने से अलग भेज दें लेकिन बिन्नी फिर भी अपने पत्रों से अपनी माँ को ताना मारता है "तूने मेरी बा, तूने और पप्पा ने मिलकर मुझे कसाईयों के हाथ मासूम बकरी-सा सौंप दिया।"[५]

एक इन्सान के जीवन में रिश्ते-नाते बहुत ही महत्त्व रखते हैं चाहे वह एक किन्नर हो या फिर एक साधारण बच्चा। सभी अपनों के लिए तड़पते हैं। ऐसी स्थिति में उस बच्चे को घर से बेघर कर दिया जाये और दर-दर की ठोकरें खाने के लिए छोड़ दिया जाये तो वह आतंकित ही होगा, और दूसरों को भी आतंकित ही करेगा, इसलिए बिन्नी अपनी माँ को उतना ही दोषी मानता है जितने परिवार केअन्य सदस्यों। "जिन नरक में तूने और पप्पा ने धकेला है मुझे वह एक अन्धा कुआँ है, जिसमें सिर्फ साँप-बिच्छू रहते हैं। साँप बिच्छू बनकर वह पैदा नहीं हुए होंगे बस इस कुएँ ने उन्हें आदमी नहीं रहने दिया।"[६] हमारे

वर्तमान समय में हिजड़ों की दयनीय स्थिति बनी हुई है। लोगों का नजरिया इनके प्रति अभी भी खराब ही है। समाज के लोग ना तो इन्हें अपने बीच बुलाना पसन्द करते हैं और ना ही कोई सामाजिक सम्पर्क रखना चाहते हैं। बिन्नी को जब अपने परिवार से ही उपेक्षाएँ मिलने लगती हैं तो वो खुद से खिन्न हो जाता है और एक पत्र के माध्यम से अपनी माँ से पूछता है "तूने मेरे जन्मते ही मनुष्य के इस तीसरे रूप को देख लिया था न बा! उसी समय खत्म कर देना था न बा मुझे! तू किस मोह में पड़ गई थी बोल?"[७]

कहा जाता है कि बच्चा जब तक रोएगा नहीं तब तक माँ भी बच्चे को दूध नहीं पिलाती। यह बात सही है कि जब बात हक की आती है तो हमें अपने हक को छीन लेना चाहिए। सरकार के निरन्तर प्रयास करते रहने से भी इन लोगों की स्थिति में सुधार नहीं आ सकता है। वजह उनकी खुद की मानसिकता ही है। प्रत्येक समुदाय अपने संगठन को मजबूत करने के लिए इसमें सदस्यों की संख्या में इजाफा करता है किन्तु किन्नर वर्ग को यह सोच बदलनी होगी कि जिस नरक में वे लोग जी रहे हैं, वहाँ वे स्वयं भी दूसरे बच्चों को लाने का प्रयास न करें एवं अपनी एक अनोखी पहचान बनाएँ। "यह भीतर से खोखले और डरे हुए लोगों की जमाते हैं। ये चाहते हैं कि जिस विशेष परिभाषा से उन्हें मण्डित किया गया है उसी रूप में सही, उनकी भी एक संगतिं उपस्थित समाज में बने। उनकी ताकत में इजाफा हो, घूमते फिरते हैं, जननांग विकलांगों को, इसलिए कहीं से कोई टोह मिल जाए।"[८]

आज हमारे भारतीय साहित्य में किन्नरों की समस्या एक सामाजिक समस्या के रूप में सामने आ रही है। वह अपने हक के लिए लड़ रहे हैं। राजनीति में और चुनाव में भाग लेने का अधिकार उन्हें मिल चुका है। समाजमें जीते जी उन्हें बहुत से यातनाएँ सहनी पड़ती है। भारतीय समाज एक साहित्य में तृतीय लिंग विमर्श, किन्नर विमर्श के बारे में केवल जानकारी ही नहीं देती बल्कि उनके उत्थान की दिशा में महत्त्वपूर्ण विमर्श सुझाती हैं। विनोद उर्फ बिन्नी की नजर में तो वह आरक्षण देने वाली प्रक्रिया भी एक खेल लगती हैं और वह इसका विरोध भी खुलेआम करता है और कहता है, उन्हें अलग से इस रूप में चिह्नित करना घोर अमानवीय कृत्य है। किन्नर चाहे जिस भी वर्ग की सन्तान हो, चाहे जिस जाति-बिरादरी समुदाय से सम्बन्धित हो, उसी जाति-वर्ग के अनुसार उन्हें अपना सामान्य जीवन जीने की सुविधा मिलनी चाहिए। अगर भी आरक्षित श्रेणी के माता-पिता की सन्तान हैं तो वे उस आरक्षितश्रेणी को प्राप्त होने वाली सुविधाओं की हकदार हैं।"[९]

हिन्दी साहित्य में किन्नर समाज पर अधिक मात्रा में लेखन कार्य नहीं किया गया है किन्तु जितना भी साहित्य लिखा जा रहा है उन सभी से इनको सम्मान की दरकार रही है। यह लोग भी अपनी मूलभूत आवश्यकताओं, अधिकारों और सामान्य लोगों की तरह जीवन यापन करने की आकांक्षा रखते हैं। २००९ में नीरजा माधव के 'यमदीप' महेन्द्र भीष्म का 'किन्नर कथा', २०११ में प्रदीप सौरभ का उपन्यास 'तीसरी ताली', निर्मल भुराड़िया का प्रसिद्ध उपन्यास 'गुलाम मण्डी' २०११ में आ चुका था एवं २०१६ का चर्चा में रहा चित्रामुद्गल का उपन्यास 'पोस्ट बॉक्स नम्बर २०३ नाला सोपारा' जिसे २०१८ का साहित्य अकादमी पुरस्कार से भी नवाजा गया है इससे यह अन्दाजा लगाया जा सकता है कि आज

समाज में लोगों का नजरिया बदल रहा है इन उपन्यासों की कथावस्तु किन्नर समाज के मनुष्य होने का प्रमाण प्रस्तुत करती हैं और समाज में उनकी निर्धारित भूमिकाओं की कड़ी आलोचना करती हैं। उपन्यास कहीं न कहीं हमारे समाज को हिजड़ों की पीड़ा, दुख दर्द से जीवन जीने की विभीषिका और भयंकर त्रासद स्थिति से अवगत कराते हैं।

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पता:-
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A STUDY ON AWARENESS ABOUT FINTECH SERVICES IN BANKING SECTOR (With special reference to Govt. P.G. College Ranikhet)

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Abstract: Banking Sector is swiftly adopting new technologies to satisfy customers need by providing them new products and schemes. Digital India Campaign by the Government in 2015 is the beginning of India's digital economy which enables the Indian banking sector to adopt latest technologies to simplify the banking system. Digitalization in today's world becomes a need of hour in all sectors for any successful economy and development of society. The main objective behind this paper is to examine and analyze the awareness about Fintech in banking sector and different innovative technology in banking sector. For this study both primary and secondary data has been used. This will also focus on challenges and opportunities in banking sector.

Keywords: Digitalization, Fintech, Banking, Innovative and Customers.

Introduction

With the emergence of new technology the banking sector is rapidly adopting new to technologies to draw the attention of customers towards attractive bank products and various schemes. Indian banking system follows global banks but today India works on one agenda that is to provide banking services in time bound manner with latest technologies. In simple term Fintech means to provide financial services by using latest technology like Artificial Intelligence, Specialized Software, Big Data and smart phones to understand the customer needs.From decades Indian banking system follows traditional way of functioning. Fintech are now modifying the role by providing digital technologies in an economically feasible manner. The use of smart phones for mobile banking investing in digital currencies are some examples of technologies that offer financial services to general public .The use of different apps for cashless transactions, Adhaar Card, KYC are some of technology that accelerates the growth of digitization of banking in India. India has highest Fintech adoption rate globally of 87% which is significantly higher than the global average of 64%[1].

24.57% CAGR of Fintech market size in 2005	25% Growth in number of deals from 2021 H1 as compared to 2018 H1
37% CAGR in growth in Digital payments transactions from F19-21	29% Highest Expected ROI On Fintech payments globally

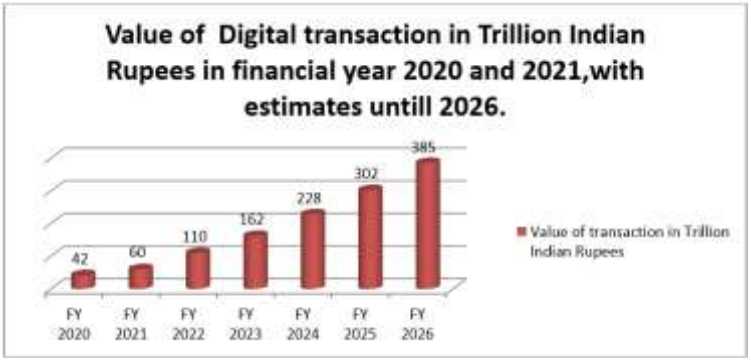
Source: Investia.gov.in.

Initiatives by Government for Fintech Revolutions

- Jan Dhan Yojna has been aimed at increasing financial inclusion in India by helping in new bank account for benefitting direct benefits transfer and accessibility of financial services.
- Financial Literacy is the possession of the set of skills and knowledge that allows an individual to make informed and effective decisions with all of their financial resources.
- E-RUPI is seamless one –time payment mechanism enable users to redeem the voucher without a card, digital payments app or internet banking access, at the merchants accepting UPI E –Prepaid vouchers.
- India Stack is aimed at building public platform to promote public and private digital initiatives.
- ADHAAR Enabled Payment System allows individuals to conduct financial transactions on a Micro-ATM by furnishing their ADHAAR number and verifying it with the help of finger print.

New Age Innovations

- Robotic Process Automation: with robotic process automation bankers can make quick, large scale and quality decisions by predicting customers' actions. It does repetitive tasks without human intervention in a more efficient manner.
- Cloud Computing :Cloud Computing is an important instrument in delivering services and helps bank in finding new business opportunities and access to new distribution channels. It also secures online payments, digital money transfers, wallet payments etc.
- Cyber Security: with the increase use of technology in banking, cyber risks are also rising with the increase use of technology in banking, cyber risks are also raising. Banks are becoming more alert concerning about cyber security.
- Biometrics: Through biometrics customers can pay within seconds by simply verifying their identity through their finger and faces.
- Wearable Smart watch: These give customers a unique digital payments experience. A rapid rise in their usage amongst the Millenial and Gen-Z generation will surely revolutionize the digital Payment arena.
- Zero Trust Security Model: Banks and customers are losing their trust in old IT models. Zero trust security models are the way to deal with the growing cyber risk. It ensures strict adherence to the user and device authentication across network without relying on implied trust.



Source: www.statista.com

The data given above shows the value of digital transaction in Trillion Indian Rupees in financial Year 2021 and 2021, with estimates until 2026.Ith shows that there is a continuous increase in digital transactions in 2021 it was 42 which rose to 60 in 2021. In further year there is a continuous increment in number of digital transactions. This shows that in future customers will switch to cashless transactions which will help in making India digitally empowered.

Objectives –

The objective of the Study

Primary Objective to study the relationship between demographic variables with awareness and knowledge about financial technology among students of higher educational institutes in Govt.P.G.College Ranikhet (SSJ University Almora

1) To study awareness about fintech in the banking sector.
2) To study the impact of different age groups on fintech services
3) To suggest opportunities and threats in fintech services.
4) To give suggestions for betterment.

Review of Literature

P.Krishna Priya, K. Anusha (2019) Fintech Issues and Challenges in India the article focuses on the basic types of financial technologies and their functions and also discusses the opportunities

and challenges it has in the Indian business environment. Observing the pace of fin techs' emergence, the fact that India has enormous entrepreneurial potential cannot be denied. Around 1500 FinTech start-up firms are operating in India, and of these, nearly half were started in the past two years. Both technically and financially the fintech firms need to be groomed well. We can see a majority of successful start-ups in the payments space and it is expected the same with the other financial segments as well. The Fintech industry needs to be encouraged further with different initiatives by the governmentand other regulatory bodies

Dr.P.Rajeswari, Dr.C.Vijai (2021) - Fintech Industry in India: The Revolutionized Finance Sector This research paper analyses the Fintech Adoption, Fintech News Network, Indian Fintech Industry Structure, Fintech Start-up in India, and Fintech Trends in India. This study provided an overview of the Indian Fintech Industry, and government-supporting initiatives in the fintech industry their performance in today's scenario. Fintech offers consumers faster financial services and products. Therefore, the fintech industry development is necessary for both the global and Indian financial sectors. Fintech technologies that are developing shortly in the financial sector

Kavyashree M,(2021)-Fintech Industry in India: The Digital Transformation of Financial Services The world is changing rapidly with the advancement in technology. Its impact can be seen in the financial sector as well. Money is also increasingly becoming digital or electronic with the advent of e-wallets and mobile wallets. The word 'FinTech' is an amalgamation of financial services and information technology. Emerging as a term referring to the technology used by large financial institutions, it has expanded to include technological innovation in the financial sector, including innovations in financial literacy and education, retail banking, investments, etc. However, the interlink age of financial services and technology has a long history with three different eras. The first is the analog Context second is the digitalization of finance in the late twentieth century and the presentera of digital transformation. We analyze the FinTech industry in India and the future of financial services.

Malini A, Dileep G Menon (2017) The goal of the paper is to identify ten important innovative solutions in the banking sector and analyze them in the context of assumptions of the paradigm of relationships and features of product orientation related to technology. Banking is a rapidly changing industry. The biggest paradigm shift that has occurred is thedigitalization of banks which aim at providing customers with a broad scope of benefits. Technology-based innovations will be the key determinant in offering diversified and customized banking services to their varied customer portfolios, at a reduced cost. Even if it is convergent with the assumptions of the paradigm of relationships, it should be indicatedthat some banking products are based on advanced solutions that may surpass real market demands. We examine the development of technology in the banking sector.

Khurana N (2018)- A Study of Impact of Financial Technology on Banking Sector in India. Traditional Banks and Financial Institutions have noticed technology as the potential to empower business propositions, rather than originating new business propositions themselves. Financial Technology (FinTech) Companies however are modifying that role by gratifying digital technologies to establish new business propositions and target new market segments which precedent were not possible. Even, RBI is enabling the development of the Fintech sector to multiply the reach of banking services for the unbanked population. FinTech is progressively becoming a foremost center of attraction for all the key stakeholders in the India Financial Services industry – Regulators, Traditional Banks, NBFCs, Payment Banks, Investors, Payment Service Providers, Broking, and Wealth Management Companies, Insurance providers, and pure-play FinTech players. So, the impetus of this paper is to confer on various facets of Fintech in India

Kukreja G, Bahl D, Gupta R- This chapter covers the development, opportunities, and challenges of financial sectors because of new technologies in India. This chapter throws the light on opportunities that emerged because of demographic dividend, high penetration, access to the latest and affordable technology, affordable cost of smart phones, and Government policies such as

Digital India, Startup India, Make in India, and so on. Lastly, this chapter portrays the untapped potential of Fintech in India.

Kavuri, A. S., & Milne, A (2018) new financial technologies (Fintech) have erupted around the world. Consequently, there has been a considerable increase in the academic literature on Fintech over the last five years. Research tends to be scantily connected with no coherent research agenda. Sign - cant research gaps and important questions remain. There is much work to be done before this area becomes an established academic discipline.

Thakor, A. V (2019) this paper is a review of Fintech and its interaction with banking. Included in Fintech are innovations in payment systems (including crypto currencies), credit markets (including P2P lending), and insurance, with block chain-assisted smart contracts playing a role. Allen et. Al (2020) Fintech, particularly the block chain, has the potential to be disruptive to financial systems and intermediation. Our aim in this paper is to provide a comprehensive Fintech literature survey with relevant research studies and policy discussion around the various aspects of Fintech.

Anjan V. Thakor This paper is a review of the literature on Fintech and its interaction withbanking. Included in Fintech are innovations in payment systems (including crypto currencies), credit markets (including P2P lending), and insurance, with Block chain-assisted smart contracts playing a role.

Goswami S, Sharma R.B., Chouhan V (2022) this paper investigates the critical success factors influencing the adoption of disruptive financial technology for financial inclusion in rural India. Present research empirically measures the impact of technology in promoting entrepreneurship in under-developed regions for future adoption of financial technology inrural areas.

Fintech in India A global growth story **Joint publication by KPMG in India and NASSCOM** 10,000 Start-ups focus through this report is on the seven key themes, which are creating transformational waves across the financial ecosystem in India. These fintech Themes serve a dual purpose. While they help financial institutions renovate their back-end processes and provide a competitive edge, they also offer customers a smooth user experience, unexplored value-added services, and an interactive marketplace. Some of thesethemes such as next-generation payments and financial inclusion are quite mature in India in terms of fintech start-up ecosystems, government regulations, and steps taken by the incumbent market participants. While P2P lending, Robo advisory, Bank in a Box, security, and biometrics are striding fast towards mass-market implementation, blockchain has just marked its entry with a promising future in the financial services arena.

Allen et. al (2020) FinTech, blockchain, in particular, has a great potential to be disruptive to financial systems and intermediation. This Research paper aims to provide a comprehensive Fintech literature survey with relevant research studies and policy discussion around the various aspects of Fintech.

Sullivan B. Winesett (May 2019) FinTech continues to grow in the banking sector, it is important to understand the strategies of startups from both a traditional bank perspective and the perspective of startups themselves. By understanding the risks and advantages that affect both sides in different parts of the world, the two can decide the best way to continueoperations into the future.

Ms.K.Alameleu (1996) suggested that banks should become technology friendly by investing in technology a bank can carve a niche for itself. Well-furnished premises are a must for the satisfaction of both employees and customers. Professionalized. Well-trained and motivated employees will improve the marketability of a bank.'"

Leblanc G (1990) studied customer motivations towards the use and nonuse of an Automated Teller Machine (ATM) for customers of a financial institution. An analysis of results based on demographic variables revealed significant differences between users and nonusers in terms of education only. Results also show that the convenient accessibility of a financial institution and avoidance of waiting lines is the principal reasons for using the automated teller.

Goel M (2013) Technology had changed the way people obtain financial services. It has also

saved time and money allowing people to conduct banking efficiently. Technology has helped banking transform from bulk paper and waste to paperless communication and means of transferring funds. The technology evolved includes telephone banking (telephonetechnology), credit cards, debit cards (money transfer technology), electronic money, and automatic teller machines.

IMF Working Papers, Yoke Wang Tok and Dyna Heng (2022) These findings imply that Fintech alone may not be sufficient to close the gender gap in access to financial services. Fintech development may need to be complemented with targeted policy initiatives aimed at addressing the gender gap directly, and at changing attitudes and social norms across demographics. This paper draws three conclusions. First, Fintech has a positive correlation with financial inclusion, and the correlation is greater when digital financial inclusion measures are used as compared to traditional measures. Second, Fintechhas played a positive role in bridging the digital access gap between rural and rich-poor populations. Third, Fintech does not correlate with the gender digital gap.

Jagpat M.(2018) The banking landscape is changing. In new wave. Technology is revolutionizing. The way customers interact. Interact with their finance. From social. Mobile capabilities. Banks are Reconsidering. There way. Doing business to offer a better customer experience and remain competitive. By looking at the scenario, exiting now in India. One can find that people are now taking more and more advantages of the digitalization in case of banking. Traditionally, banking practice used to focus on protectingposts, rather than understanding how best to delight its customers in recent. In recent times, banks are keen to become more customers centric with the help of digitalization. Indian banks are now not only getting more customers but also delivering Top-notch Service As efficiency counts as well.

Vasiljeva and Lukanova (2016) state that "FinTech is an industry-oriented toward arranging financial services for private individuals and industries to provide customer- oriented solutions most efficiently and at the lowest cost possible, ensuring this viainnovation and technology"

Dr. Disha Mehta (2021) this paper focuses on customers' responses concerning adoption, inclination, and attitude toward FinTech technologies. Research has been supported by a survey from a wide variety of retail customers of financial products and services, and also based on a thorough assessment of the literature. Key research gaps have been covered withquestions that could form the basis of academic study on fintech in India as less number ofusers of FinTech are there as of now and people like to access financial services through mobile. Customers are interested in using FinTech services like Robo advisors and online lending. FinTech should work on these services where other financial services are not up tothe mark. Fast services, easy accessibility, and cheap service are the major factors contributing to the use of FinTech by customers.

Tomasz kurczyk (chief digital and transformations officer, AXA)- Financial Literacy and Risk-awareness many of unbanked households are low-income families living in remote, rural areas. As FinTech moves towards a new era, inclusive FinTech – FinTech for financial inclusion – is bridging the banking gap in underserved regions and proving a game-changer for traditional banking. However, once these individuals overcome learning gaps, they can take accountability for their finances, stay aware of their risks, and use money as a tool for economic development. As it those are significant barriers for product adoption and growth, inclusive FinTech companies are vested in experimenting with a variety of strategies to provide financial education, raise risk awareness, and achieve financial inclusion on a large scale.

Saniya Sameer Paddalwar, Dr. Lakshmi.P (2022) The FinTech industry has been a boomin the financial sector of India and will continue to contribute to the growth of the Indian economy in terms of National income, GDP, Employment opportunities, and much more. Due to the Covid-19 Pandemic, the Indian economy had taken a hit, which resulted in the ambiguous contribution of the FinTech industry to the Indian economy. The FinTech industry will continue to grow exponentially over the next five years.

Gozman and Willcocks (2018) - Risk and regulations There's a framework theory for deciding

when to engage strategically with, or avoid Cloud technologies. This helps executives balance the need to innovate with the need to manage compliance risk and then detail emerging effective practices for managing Cloud based innovation on a sustainable basis.

Junger and Mietzner (2019) A household's level of trust and comfort with new technologies, financial literacy, and overall transparency Households with low levels of trust, good financial education, and preference for transparency are characterized by a higher probability of adopting FinTech. In contrast, household price perceptions do not appear to significantly impact switching probability.

Susilo et al (2019) User acceptance It is actually harder to identify the basic role of factors that will contribute to user decisions, especially for applications that they do not have to pay. In other words, we cannot identify user judgment prefer one over than other using the basic Technology Acceptance Model (TAM) model. It is important to find out the other factors to include in the basic model of TAM.

Digital payment adoption in India (2020) this article is A high-quality push towards empowering users (as opposed to extolling product features or generic advantages of digital payments), with specific "how to use" knowledge, helplines for learning as well problem-solving and safeguard features that help the user 'stay safe', can make India race towards being a less-cash society. It is today well past the early adopter stage and the mainstream majority is adopting it. What is even more heartening is that the lower income group is also a part of this movement to digital.

Research Hypothesis

- There is no association between awareness of fintech and gender of respondents.
- There is no association between awareness of fintech and education level of respondents
- There is an association between awareness of fintech and education level of respondents

1.10- Research Methodology

The universe of the study consists of the students of higher educational institutes in Govt.P.G.College Ranikhet (SSJ University Almora) in various age groups. This research study is only based upon descriptive research designs where the researcher has no control over the variables; we can only report what has happened.The proposed study is conducted on the awareness and knowledge among students of higher educational institutes in Govt.P.G.Collage Ranikhet(SSJ University Almora). A convenient sampling method has been used as a sampling design and data is collected from primary sources through survey questionnaires. The type of data is primary data collected through questionnaire.For the present study 100 respondents were selected in Govt.P.G.Collage Ranikhet (SSJ University Almora) various tools and techniques have been used for the analysis by using Chi-Square Test and MS EXCEL.

A self-developed questionnaire was used to gather primary data from 100 respondents.

Table 1.1- Sample design

Criteria	**Categories**	**Frequency**	**%**
Age	a) 16-20	48	48%
	b) 20-25	44	44%
	c) Above 25	8	8%
Gender	a) Male	60	60%
	b) Female	40	40%
Stream	a) Commerce	45	45%
	b) Science	30	30%
	c) Arts	25	25%
Education Level	a) Graduate	60	60%
	b) Post Graduate	40	40%

Results and Discussions

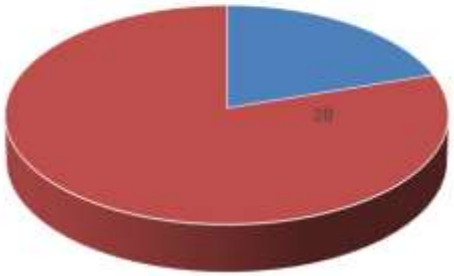
- **Are you familiar with the term FinTech?**

Table - familiar with fintech

Response	Frequency	Percent
Yes	24	24%
No	76	76%
Total	100	100%

The Table shows the frequency of respondents familiar with the term FinTech. According to data 20(20%), respondents were familiar with the term of fintech and 80(80%) respondents were not familiar with the term fintech.

Figure - Familiarity with Fintech



H0 – There is no association between awareness of fintech and gender of respondents.

Table - Observed Frequencies

	Male	Female	Total
Yes	**15 (AB)**	**9 (aB)**	**24 (B)**
No	**39 (Ab)**	**37 (ab)**	**76 (b)**
Total	**54 (A)**	**46 (a)**	**100 (N)**

Table 4.4- Chi-Square Calculation

	fo	Fe	(fo-fe)	(fo-fe)2	$\frac{(fo-fe)^2}{fe}$ [ ]
AB	15	12.96	2.04	4.1616	0.321111
Ab	39	41.04	-2.04	4.1616	0.101404
aB	9	11.04	-2.04	4.1616	0.376957
Ab	37	34.96	2.04	4.1616	0.119039
					$\chi 2$ =0.91851

The calculated value of Chi Square 0.91851 is less than the table value (3.841) at 5% level of significance and 1 degree of freedom. Hence the null hypothesis is accepted and it may be concluded that gender and awareness regarding fintech are not associated.

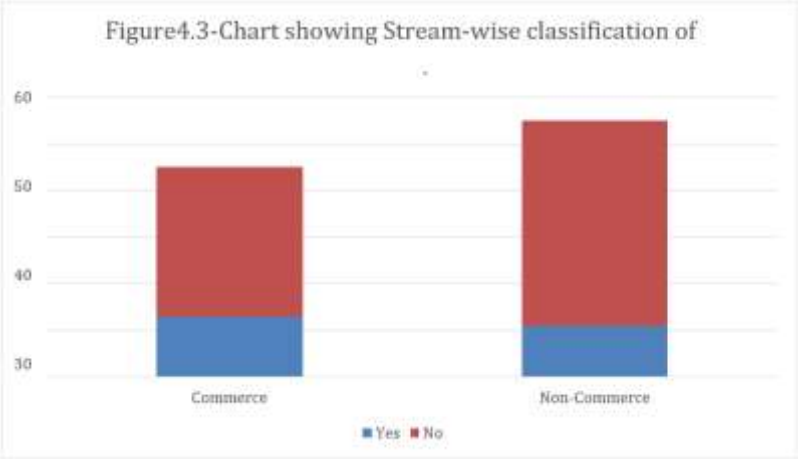
Hypothesis 2

There is no association between awareness of fintech and stream of study ofrespondents

Table - Observed Frequencies

	Commerce	Non- Commerce	Total
Yes	**13**	**11**	**24**
No	**32**	**44**	**76**
Total	**45**	**55**	**100**

Table - Expected frequency



	Male	Female	Total
Yes	**10.8 (AB)**	**13.2(aB)**	**24 (B)**
No	**34.2 (Ab)**	**41.8 (ab)**	**76 (b)**
Total	**45 (A)**	**55 (a)**	**100 (N)**

Chi Square Calculation

	fo	Fe	(fo-fe)	(fo-fe)2	$\frac{(fo-fe)^2}{fe}$ [ ]
AB	13	10.8	2.2	4.84	0.448148
Ab	32	34.2	-2.2	4.84	0.14152
aB	11	13.2	-2.2	4.84	0.366667
ab	44	41.8	2.2	4.84	0.115789
					$\chi 2$ =1.072125

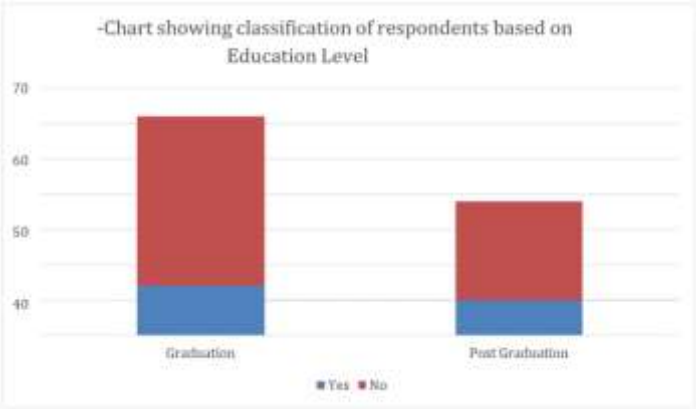
The calculated value of Chi Square 1.072 is less than the table value (3.841) at 5% level of significance and 1 degree of freedom. Hence the null hypothesis is accepted and it may be concluded that stream of study and awareness regarding fintech are not associated.

Hypothesis 3

H0 – There is no association between awareness of fintech and education level ofrespondents

Table - Observed Frequencies

	Graduation	Post-Graduation	Total
Yes	**14**	**10**	**24**
No	**48**	**28**	**76**
Total	**62**	**38**	**100**



Expected frequency

	Male	Female	Total
Yes	**14.88 (AB)**	**9.12(aB)**	**24 (B)**
No	**47.12 (Ab)**	**28.88 (ab)**	**76 (b)**
Total	**62 (A)**	**38 (a)**	**100 (N)**

10 Chi Square Calculation

	fo	Fe	(fo-fe)	(fo-fe)2	$\frac{(fo-fe)^2}{fe}$
AB	14	14.88	-0.88	0.7744	0.052043
Ab	48	47.12	0.88	0.7744	0.016435
aB	10	9.12	0.88	0.7744	0.084912
Ab	28	28.88	-0.88	0.7744	0.026814
					$\chi 2$ =0.180204

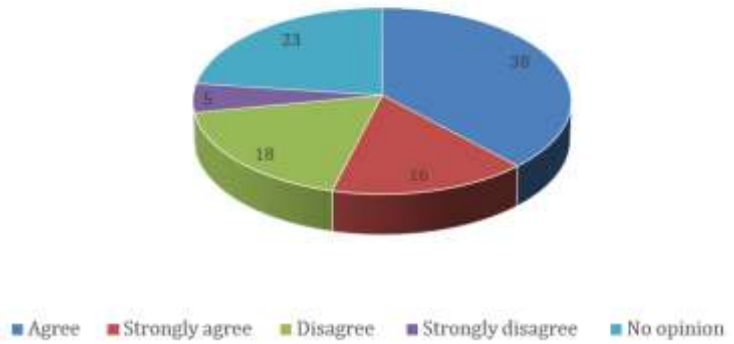
The calculated value of Chi Square 0.1802 is less than the table value (3.841) at 5% level of significance and 1 degree of freedom. Hence the null hypothesis is accepted and it may be concluded that education level and awareness regarding fintech are not associated.

- **Fintech products and services easy to use?**

Table - Easefulness' of Fintech

Response	Frequency	percent
Agree	38	38%
Strongly agree	16	016%
Disagree	18	18%
Strongly disagree	5	5%
No opinion	23	23%
Total	100	100%

Figure 4.5- Easefullnes of Fintech



The table shows the fintech product and services easy to use for respondents. According to data 38(38%), respondents agree to the fintech product and services easy to use, 16(16%) of respondents are strongly agree to the fintech product and services easy to use, 18(18%) of the Respondent disagree to the fintech product and services easy to use,5(5%) of the respondent are strongly disagreed to the fintech product and services easy to use and 23(23%) of the respondentare no opinions.

- **Fintech products and services are beneficial?**

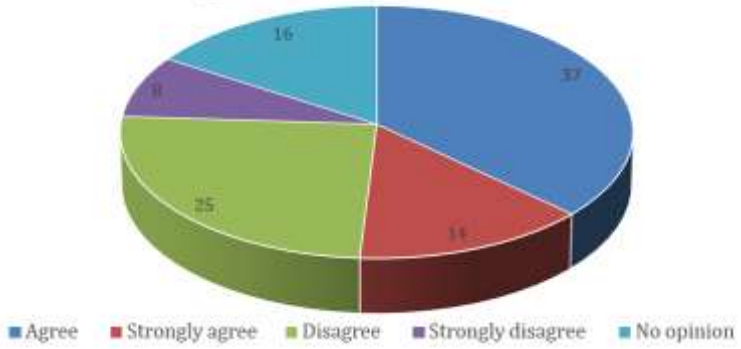
Table - Usefulness of Fintech

Response	Frequency	Percent
Agree	37	37%
Strongly agree	14	14%

Disagree	25	25%
Strongly disagree	8	8%
No opinion	16	16%
Total	100	100%

The table show the fintech product and services are beneficial of the respondents. According tothe data 37(37%) of respondents are agree, 14(14%) respondents are strongly disagreed,25(25%) respondent are disagreed,8(8%) respondents are strongly disagree and16(16%) respondent are no opinion.

Figure 4.6-Usefullnes of Fintech



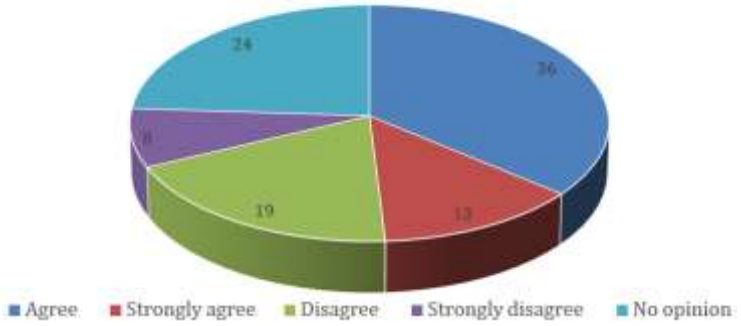
- **Fintech services are better than traditional banking?**

Table - Relative usefulness of Fintech

Response	Frequency	percent
Agree	36	54%
Strongly agree	13	35%
Disagree	19	8%
Strongly disagree	8	3%
No opinion	24	0%
Total	100	100%

The table show the fintech services are better than traditional banking.36(36%) respondents are agree,13(13%) respondents are strongly agree,19(19%) respondents are disagree,8(8%) respondents are strongly disagree and 24(24%) respondent are no opinion.

Figure 4.7-Relative usefulness of Fintech

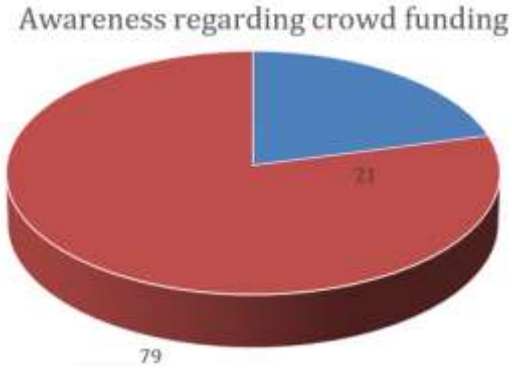


- **Do you Know about crowdfunding?**

Table - Awareness regarding crowdfunding

Response	Frequency	percent
Yes	21	21%
No	79	79%
Total	100	100%

The table show the do you know about crowdfunding. According to the data 21(21%) respondents are yes and 79(79%) respondents are no. the conclude tha data majority of respondent not about crowd funding.



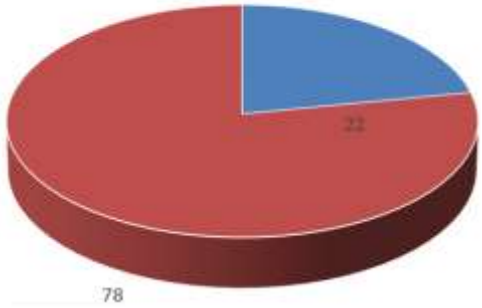
- **Do you Know about artificial intelligence (AI) and its usage in banking and finance?**

Table - Awareness regarding AI

Response	Frequency	percent
Yes	22	22%
No	78	78%
Total	100	100%

The table show Do you know about artificial intelligence and its usage in banking finance. According to the data 22(22%) respondents are response to yes and 78(78%) respondents are response to no.

Figure - Awareness regarding AI



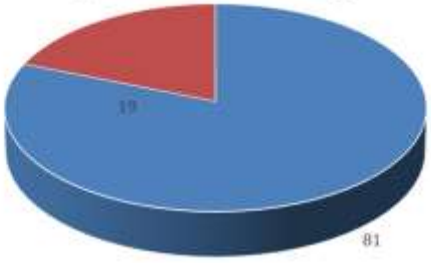
- **Do They have any FinTech apps on their smartphone such as Paytm, PhonePe, Google pay?**

Table - Usage of Fintech Mobile Application

Response	Frequency	percent
Yes	81	81%
No	19	19%
Total	100	100%

Tha table show do they have any fintech apps on their smartphone such as paytm, phonepe, google pay. According to data 81(81%) respondent are response is yes and 19(19%) respondents are response no. tha conclude the data majority of respondent use paytm, phonepe,and google pay

Figure -Usage of Fintech Mobile Applications



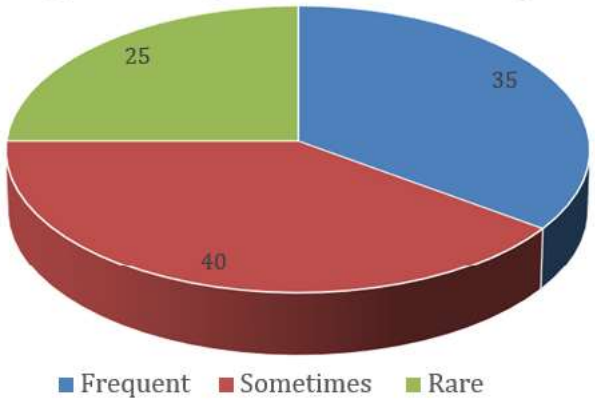
- **How frequently do you use or practice the fintech method in your daily business?**

Table 4.17- Usage of Fintech in daily life

Response	Frequency	Percent
Frequent	35	35%
Sometimes	40	40%
Rare	25	25%
Total	100	100%

The table show is how frequently do you use or practice the fintech method in your daily business. according to data 35(35%) respondents are frequently use fintech ,40(40%) respondents are sometimes use fintech and 25(25%) respondents are rare use fintech.

Figure - Usage of Fintech in Daily life



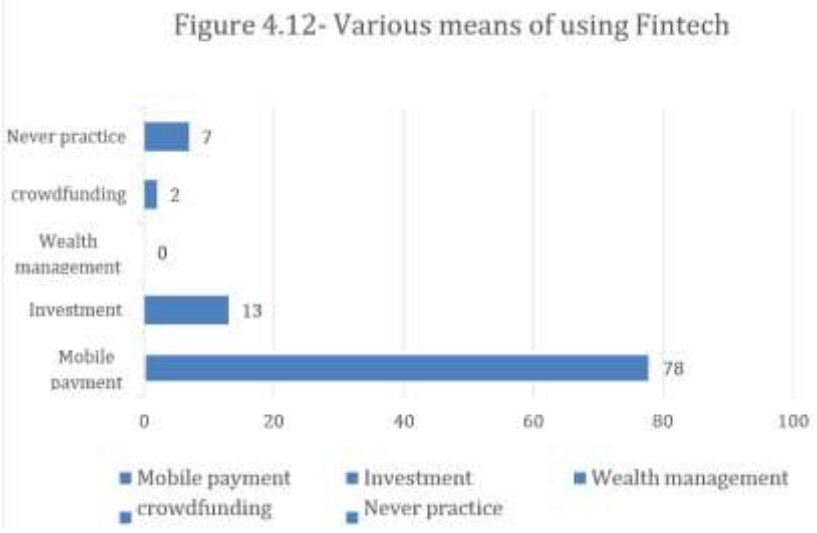
- **If you Ever practiced. Fintech in your daily life, in what Aspect Do you use the most?**

Table - Various means of using fintech

Response	Frequency	Percent
Mobile payment	78	78%
Investment	13	13%
Wealth management	0	0%
Crowdfunding	2	2%
Never practice	7	7%
Total	100	100%

The table show If you ever practiced. Fintech in your daily life, in what Aspect Do you use the most. According to data 78(78%) respondents are practiced mobile payment, 13(13%) respondents are practiced investment ,0(0%) respondents are practiced wealth management, 2(2%) respondents are practiced crowdfunding and 7(7%) respondents are never practice

Figure 4.12- Various means of using Fintech



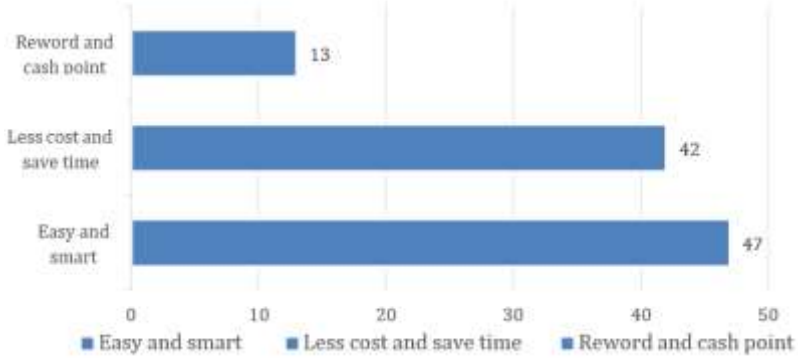
- **What is the influence or attractiveness of using FinTech applications?**

Table 4.19- Reasons for using fintech Mobile Applications

Response	Frequency	Percent
Easy and smart	47	47%
Less cost and save time	42	42%
Reword and cash point	13	13%
Total	100	100%

The table shows the what is the influence or attractiveness of using FinTech. According to data 47(47%) respondents are response to easy and smart, 42(42%) respondents are response to lesscost and save time,13(13%) respondents are response to reword and cash point.

Figure 4.13- Reasons for using Fintech Mobile Applications



- **Why did you not practice the FinTech application?**

Table - Reasons for not using fintech mobile application

Response	Frequency	percent
Lack of knowledge	47	47%
Default and have no internet connectivity	33	33%
No interested to use	8	8%
Other	12	12%
Total	100	100%

The table show the why did you not practice the fintech application. according to data 47(47%) respondents are response to lack of knowledge, 33(33%) respondents are response to default and have no internet connectivity, 8(8%) respondents are response to no interested to use and 12(12%) respondents are response to other.

Conclusions

In present scenario, people go with innovative technology to get their work done in much smarter and faster way. Fintech are emerging as an important tool in providing services at faster rate. The technological revolution taking place throughout the world enable the banking sector to transform it traditional way of functioning. Private Banks and public banks have adopted the technological innovation in their working. The Indian banking sector has evolved but customers have not adopted it completely. There is a need to develop awareness among customers about using these fintech Services. The awareness will improve which will lead to better adoption of new technologies. in coming years the banking sector will grow by providing better facilities with innovative technologies. In conclusion, based on the data collected from the level of understanding and awareness on FinTech practices, the respondents still do not know clearly what FinTech is and aware about it practices especially in the financial transaction services. The data collected from survey questionnaires also showed unsystematic findings from each question to another. Even many students answered that they practiced FinTech mostly in aspect of mobile payment; they

may be confused with the practice of Fintech. This proved that the respondents which are students in Govt.P.G.College Ranikhet (SSJ University) still not aware and lack of knowledge on what FinTech is and how it applies in our daily business especially in financial transactions services. Thus, it is very crucial to give them more understanding on what FinTech is until them able to apply and practice it in their daily business.

In term of level of knowledge on the general rules of FinTech practices, the students mostly notaware and know about its general rules. The data collected also showed their confusion on the rules of financial transactions through FinTech practices. Thus, it is a need to let them know about all this rules regarding the use of FinTech applications in financial transactions services.

Moreover, it is important to increase the high level of awareness and knowledge on financial technologies for both practices and its general rules among students. As a student, the need of following the new trend and development of technology is a priority. This dissertation aims to know how far students in Govt.P.G.College Ranikhet (SSJ university) aware and know about FinTech and its general rules. The results of the study conclude that some students still do not know what FinTech is in detail and are also not able to practice any FinTech applications in their daily business.

➢ SUGGESTIONS

There are several suggestions to overcome the problems. First, encourage students to do financial transactions through Fintech applications in their daily business such as sell and purchase. Govt.P.G.College Ranikhet (SSJ university) has provided a platform to practice FinTech for their payment settlement for financial transactions through FinTech apps, and that is why it should be introduced and strongly let the students aware about it. They may apply their smartphone by installing Fintech Apps and try to use it during pay any foods or beveragesor investment etc.

In order to make it reality, it is very important to give an enough knowledge and education forboth seller and students. The awareness and knowledge about FinTech need to be fully explained to them clearly until they know how to practice it in their daily business. However, the way to deliver the knowledge may be various. The cooperation from the management of university is needed in order to provide an effort towards a paperless transaction such as rules and guidelines on how to practice it. It is also a necessary on the behalf of university to run or set up any seminar, forum and discussion, talk and others to distribute the information and to expose the students about the knowledge of financial technologies and its general rules.

The practical knowledge on how FinTech works also very important. The awareness campaign maybe can help students to practice it in practical way. So that, it will be more understandable and clearable.. It also can be implemented by adding it as a course subject or may be apply in selected subject.

Thus, may all of these suggestions can improve the awareness and knowledge among students. To make a digital campus life become reality, an action must be taken and try to implement it step by step. The government such as the Ministry of Higher Education also plays a major roleto support all the efforts in implementing this suggestion.

Overall, this dissertation has achieved the objectives of the study and provides full information needed to know the level of awareness on FinTech practices among students and its general rules. The researcher realized that using the method of Microsoft Excel for such field might lead to get a better result. It is suggested an interview session with some of the respondents should be conducted in order to know their perceptions and understanding on FinTech practices and its general rules verbally.

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