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ROLE OF ORGANIZATIONAL CLIMATE IN PROMOTING INNOVATIVE WORK BEHAVIOR: AN EMPIRICAL ASSESSMENT OF BANKING ORGANIZATIONS

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ABSTRACT
Innovative Work Behavior involves intentional creation, introduction and application of new ideas within a work role, group or organization, in order to improve the overall organizational performance. In organizational context, Organizational climate is reported as an essential factor that affects the individual's innovative behavior as well as organization or team level innovation. The present study aims to study the impact of organizational climate on shaping the innovative work behavior at an individual level as well on organizational level among the employees of the Jammu and Kashmir bank. Results of regression analysis showed that the organizational climate has a significant positive impact on Innovative Work behavior of employees. Further, findings revealed that the demographic characteristics of employees such as age and gender don't significantly influence their Innovative Work behavior.

Keywords: Innovative work behavior (IWB), Organizational climate, J&K Bank

INTRODUCTION
Organizations, in the face of globalization and rapid technological advancements, encounter challenges like varying customer demands and increased competition. Organizations have recently been facing pressures and challenges, highlighted in the lack of available resources, the multiplicity of objectives, the low levels of productivity, increasing societal needs, the low level of satisfaction of beneficiaries and employees, etc. To ensure the survival and continuity in the light of the rapid changes and to maintain a competitive edge, organizations requires dynamic changes and need to bring innovation in their product, service; introduce new technology, new managerial or administrative practices and bringing changes in all the other elements of the organization. To build an innovative workplace employees are heavily relied upon and must bring innovations in their processes, methods and operations (Ramamoorthy et al., 2005). In the present scenario, organizations shouldn't confine innovation to research and development professionals and should encourage and develop the innovative potential of all of their employees for long-term success. Innovative Work Behavior (IWB) is described as the intentional creation, introduction and application of new ideas within a work role, group or organization, in order to benefit performance (Janssen, 2000). It helps to develop new and creative ideas and to encompass their implementation.

Individual innovativeness, in organizational context, is supported and significantly influenced by the resource factors and climate of the organization (Sundgern et al., 2005; Axtell et al., 2000). The climate of the organization is assumed by the employees through organization's practices and procedures, which in turn formulate and shape their priorities. To encourage and promote the innovation in an organization, scholars had empirically proven the capability of organizational climate to develop innovative work behavior of employees (Amabile et al. 1996 & Hunter et.al, 2007). Solomon et al. (2004) found organizational climate to be an essential factor that affects the individual's innovative behavior.

The present study aims to empirically test and measure the relationship between innovative work behavior and organizational climate in context of financial institutions. The justification of the present study lies in the fact that the current theoretical understanding of the consequences of organizational climate is largely based on the studies conducted in western contexts lacking evidence in Asian perspective (Sellgren et al., 2008).

LITERATURE REVIEW
In the face of globalization and rapid technological advancements, Organizations are facing the challenges of varying customer demands and increased competition. To encounter these challenges and to maintain a long-term competitive advantage, organizations need to encourage and develop the innovative potential of all of their employees and promote innovative work behavior (IWB). In a competitive business environment characterized by reduced product lifecycles, rapid technological changes, tremendous emphasis is given to price, quality and customer satisfaction; pushing for a competitive strategy, having an increased focus on innovation (Leifer et al., 2001). Modern organizations are pressurized to transform their current state into preferred future state in order to stay relevant and achieve a sustainable competitive advantage. This transformation is facilitated through psychological processes, creativity and innovation. The concept of innovation, for the first time in management was coined by Schumpeter (1934), describing innovation process as creation of new brand, products, services

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and processes. Every innovation process goes through three stages; namely, Generation of ideas (production of new ideas and improvement of the recent ones); harvesting ideas (gathering, examining and evaluating the ideas); developing and implementing the ideas (study, testing, enhancement and development of the ideas and implementing them). Organizations need to promote innovative work behavior (IWB) among their employees in order to meet the challenges of globalization and to remain competitive.

INNOVATIVE WORK BEHAVIOUR

Innovative work behavior is a comparatively new dimension of research in the field of innovation which has emerged in recent years. The intension of innovative behavior is to generate innovative output and benefit to the organization. Employee's behaviors aimed towards making new products, processes and services are included in innovative work behavior (Scott and Bruce, 1994). IWB is more applied in nature as it is to result in innovative output. The two concepts of creativity and IWB are thought to be overlapped and used interchangeably by many researchers (De Jong, 2006). IWB is defined by De Jong (2006) as "Individuals' behavior directed towards the initiation and intentional introduction of new and useful ideas, processes, products or procedure within a work role, group or organization." IWB is individual's future oriented and self initiated behavior. These actions are aimed at changing or bringing improvement in one's current situation (Janssen, 2000).

ORGANISATIONAL CLIMATE

Organizational climate imitates shared beliefs of the members and psychological meanings they give to the environment in order to make sense out of it (Schneider and Reichers, 1983). It also portrays perception of the work situation, characteristics of the organization and the nature of employee's relationship with other people on job. Organizational climate is the frequent patterns of behavior, attitudes and feelings, which are displayed in the daily environment of the organization and the individuals of the organization experience and understand it (Isaksen and Lauer, 1999). Organizational climate influences business processes like problem solving, decision making, communication, cooperation, controlling and other internal, psychological processes like learning, creation, motivation or commitment. Innovativeness at organizational level is highly influenced by organization's environment or climate (De Jong, 2006). Organizational climate has a pronounced impact on innovation (Ekvall and Ryhammar, 1999). Hunter et al. (2007) carried out a comprehensive meta-analysis demonstrating that the climate dimensions like Positive interpersonal exchange, Intellectual stimulation, Positive supervisor relations, Autonomy, Participation, Mission clarity, and Product emphasis are some of the most important dimensions that predict innovation in employees. Solomon et al. (2004) argued that organizational climate fosters IWB. A crux of the above stated research studies indicate that the perception of employees of work climate plays a major role in their readiness to innovate.

In the view of preceding literature review, it can be hypothesized that organizational climate has a significant impact on innovative work behavior.

OBJECTIVES OF THE STUDY

In light of the domain for research, the main objectives of the study are

1. To determine the impact of organizational climate and innovative work behavior.
2. To evaluate the influence of demographic characteristics like gender and age on IWB of employees of the sample organization.

RESEARCH DESIGN & METHODOLOGY

The sample

The sample of the study consisted of the managerial and non managerial employees from the different branches of Jammu and Kashmir bank located in the Kashmir region. A total of 150 questionnaires were administered to the potential respondents chosen, out of which 119 usable responses were received, for a final response rate of 79 percent.

Measures

The instruments for IWB and organizational climate were adopted in the study after validation through pre-testing in pilot study. IWB was measured by adopted instrument from Zaman (2006). The scale consisted of 22 items rated on five point likert scale (1= strongly disagree to 5= strongly agree). The Cronbach alpha coefficient of the scale was 0.79. Organizational climate was measured terms of six dimensions namely autonomy, involvement, integration, supervisory support, training and clarity of organizational goals by Organizational climate measure (OCM) developed by Patterson et al. (2005). The dimensions of organizational climate consisting of 5 items each were rated on five point likert scale (1= strongly disagree to 5= strongly agree). The

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Cronbach alpha coefficients of the five subscales of organizational climate in the present study were 0.78, 0.68, 0.72, 0.70 and 0.82 respectively.

RESULTS

Descriptive statistics including mean and standard deviation of all scales and subscales were calculated. Table 1 shows the mean and standard deviations of all the variables in the study. The mean score of innovative work behavior is 3.59 with a standard deviation of 0.57 whereas mean score of organizational climate is reported to be 4.03 with a standard deviation of 0.63. The mean scores depict that the perception of employees regarding the two variables under study i.e. IWB and organizational climate is fairly positive. The results depict that employees perceive a healthy climate exists in the sample organization and the work behavior of employees is fairly innovative. The reliability of the results is supported by the lower values of standard deviations Indicating that the responses do not show much variability.

Table-1: Descriptive Statistics (N=119)

Variable	Mean Score	Standard deviation
Innovative work behavior	3.59	0.57
Organizational climate	4.03	0.63

The correlation matrix in Table 2 reveals that IWB has highly significant positive relation with all the subscales of organizational climate. The matrix also shows that IWB has significant positive correlation with overall organizational climate ($r = 0.472$, $p < 0.05$). The results of regression analysis in Table 3 show that organizational climate has a significant positive impact on IWB. The value of R2 = 0.47 shows that 47% variance is explained by independent variable (organizational climate) in dependent variable (IWB).

Table-2: Correlation matrix of all variables (N=119)

Constructs		Innovative Work Behavior
Autonomy	Pearson Correlation	.464*
	Sig. (2-tailed)	.000
Involvement	Pearson Correlation	.360*
	Sig. (2-tailed)	.023
Supervisors Support	Pearson Correlation	.333*
	Sig. (2-tailed)	.020
Training	Pearson Correlation	.388*
	Sig. (2-tailed)	.013
Clarity Of Organizational Goals	Pearson Correlation	.498*
	Sig. (2-tailed)	.010
Organizational Climate	Pearson Correlation	.572*
	Sig. (2-tailed)	.012

* Correlation is significant at the 0.05 level (2-tailed).

Table-3: Regression analysis for Organizational Climate with Innovative Work Behavior (N=119)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.572[a]	.467*	.393	.24441

* Regression is significant at the 0.01 level.

Tables 4 and 5 depict the evaluation of impact of the demographic factors like gender and age on the innovative work behavior (IWB). Table 4 shows the results of t test depicting that the gender doesn't significantly influence the IWB of employees in the sample organization.

Table-4: Independent Samples Test

	Levene's Test for Equality of Variances		t-test for Equality of Means			
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference
Innovative work Behavior	.227	.634	.300	117	.765	.03136

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Table 5: Shows the results of ANOVA, summarizing that respondents of different age groups do not significantly differ in their scores on IWB.

Table-5: ANOVA (Age group wise)

		Sum of Squares	Df	Mean Square	F	Sig.
Innovative work Behavior	Between Groups	5.512	2	2.756	.873	.421

CONCLUSIONS

The purpose of the study was to investigate the relationship between organizational climate and innovative work behavior. Findings revealed results in the expected direction and a positive correlation was reported between innovative work behavior and organizational climate. The results of regression analysis showed that independent variable organizational climate explained 47% variance in dependent variable IWB. Further, findings revealed that the demographic characteristics of employees such as age and gender don't significantly influence the IWB.

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A STUDY ON THE EFFECT OF SILVER NANO COLLOIDAL SOLUTION ON THE EFFICIENCY OF DYE SENSITIZED SOLAR CELL (DSSC)

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ABSTRACT
In the present work, two DSSCs were fabricated using TiO2 nanoparticles incorporated with nano-colloidal Silver as photoanodes. The synthesized nanoparticles were characterized by SEM, XRD. The effect of silver on the efficiency was studied and found that there was an enhancement of ~25% due to surface plasmon resonance (SPR) effect by using J-V Characteristic measurements.

Keywords: Dye Sensitized Solar Cell (DSSC), Nanoparticles, Photoanodes, Surface plasmon resonance (SPR).

I. INTRODUCTION

In the day-to-day life, demand for energy increases. This causes the reduction of energy sources like fossil fuels, natural gas etc., which are non-renewable. The usage of non-renewable energy sources emits toxic gases which affect the environment. To fulfill the energy demand and to save the environment by reducing the pollution researchers are looking towards clean and eco- friendly technologies using renewable energy sources.

Dye-Sensitized Solar Cell (DSSC) belongs to a group of thin film solar cells. It works on the principle of photosynthesis in plants.

II. EXPERIMENTAL PROCEDURE

A. Materials

Ethanol, Titanium Tetra Iso Propoxide (TTIP), Silver Nitrate, Trisodium Citrate, Iodine, Potassium Iodide, Triton X 100, Glacial Acetic acid. All the chemicals used were of analytical grade.

B. Synthesis of TiO2 nanoparticles

Ethanol (150 ml) and 3.75 ml of deionized water were added and stirred for half an hour till the formation of a homogeneous solution. 9 ml of TTIP was added dropwise into the homogeneous mixture. The reaction mixture was kept under agitation for 4 hours at 85˚C under magnetic stirring. Later, the sample was dried in a hot air oven at 60˚C for 30 min and calcined in a muffle furnace for 3 hours at 400˚C to yield the anatase TiO2 phase which was synthesized early as reported.

C. Synthesis of Ag nanoparticles

Silver nitrate (AgNO3) and trisodium citrate (Na3C6H5O7) were used as precursors for the preparation of silver nanoparticles by using chemical reduction method. 50 ml of 0.001 M AgNO3 solution was heated to boil. To this solution, 5 ml of 1% Na3C6H5O7 was added drop by drop and stirred continuously while heating until the change of colour was observed. Then it was removed from the heating device and stirred until it cooled to room temperature which was synthesized early as reported.

D. Synthesis of Electrolyte

0.127 gm of Iodine (I2) was added to 10 ml of ethylene glycol. After that 0.83 gm of Potassium Iodide was added and sonicated for 30 min for homogeneous mixing which was synthesized early as reported.

E. Preparation of Electrodes

0.2 gm of TiO2 powder was ground for 30 min. Subsequently, 12 drops of glacial acetic acid, one drop of PEG-600 and sufficient amount of ethanol were added until the mixture became a creamy paste. Ag nano-colloidal solution was added to the paste and grounded for 15 min. This mixture was coated onto Fluorine-doped Tin Oxide (FTO) glass restricting the cell active area 1cm2. The coated FTO glass was heated up to 450oc for

20 min. The dried FTO plates were immersed in Ruthenium dye for 8 hrs then the FTO plates were removed and washed with ethanol to remove the excess amount of dye. This forms the photoanode.

III. RESULTS AND DISCUSSION

A. SEM

SEM was used to study the surface morphology. Synthesized TiO2 nanoparticles were characterized by SEM and the results obtained are shown in Figure 1.

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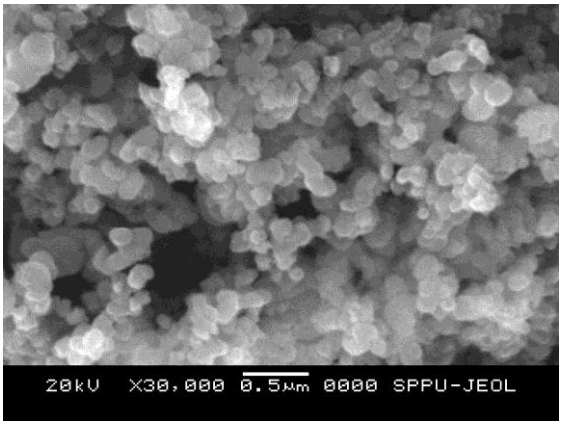

Figure-1: SEM image of TiO2 nanoparticles

It was observed that TiO2 nanoparticles were agglomerated and having a spherical shape.

B. XRD

XRD was used to find the crystallinity. Figure 2 shows the XRD of TiO2 nanoparticles having peaks at 2θ = 25o, 38o, 48o, 55o and 64o which matches with JCPDS No. 19-152-6932 confirming the TiO2 in tetragonal anatase phase.

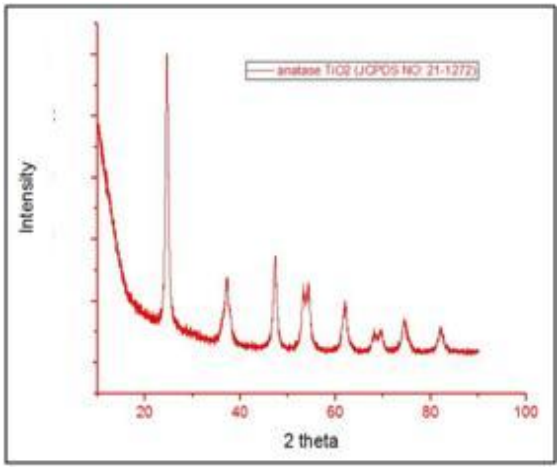

Figure-2: XRD of TiO2 nanoparticles

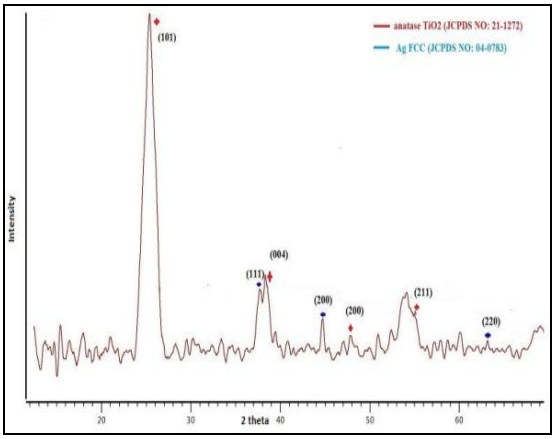

Figure-3: XRD of Ag incorporated TiO2 nanoparticles

Figure 3 shows the XRD of Ag incorporated TiO2 nanoparticles having peaks at 2θ= 25o, 38o, 48o, and 55o matches with JCPDS No.21-1272 which confirms the tetragonal TiO2 anatase phase. The peaks at 2θ = 37o, 45o and 64o matches with JCPDS No. 04-0783 which confirms the presence of Ag in FCC structure.

C. Performance Evaluation

Performance of DSSCs fabricated with TiO2 nanoparticles, and TiO2 incorporated with Ag nanoparticles were evaluated under simulated solar

AM 1.5 G irradiation and the results were shown in Figure 4. and Figure 5 respectively

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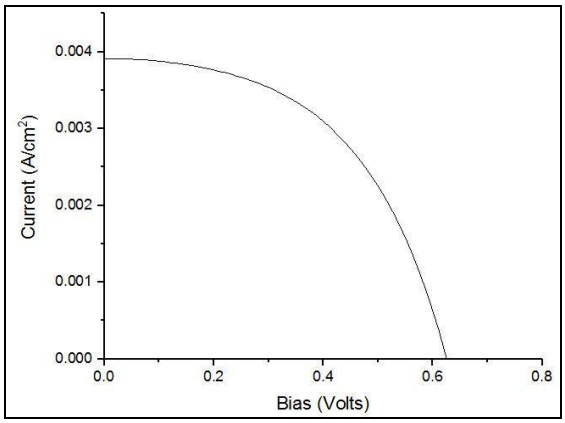

Figure-4: J-V Characteristics of DSSC fabricated with TiO2 nanoparticles

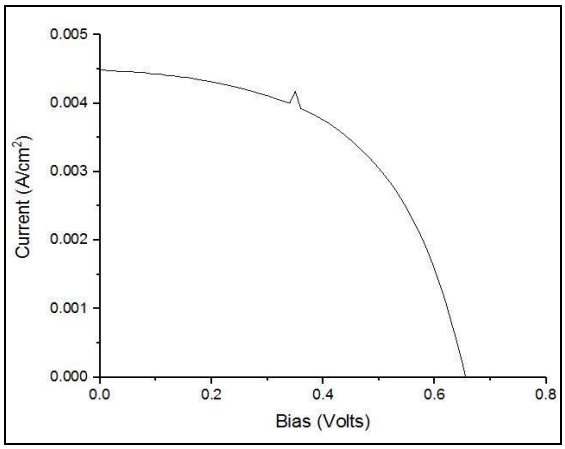

Figure-5: J-V Characteristics of DSSC fabricated with TiO2 incorporated with Ag nanoparticles

The efficiency of DSSC fabricated with TiO2 incorporated with Ag nanoparticles shows high performance with an efficiency of 1.9481% compared to DSSC with TiO2 nanoparticles with an efficiency of 1.5563%. The parameters were summarized in Table 1.

DSSC	VOC (Volts)	JSC (mA/cm^2)	Fill-Factor (FF)	Efficiency (η%)
TiO_2	0. 62553	3. 9096	0. 5091	1. 5563
TiO_2-Ag	0. 65576	4. 4804	0. 53044	1.9481

IV. CONCLUSION

DSSCs were fabricated with TiO2 nanoparticles and with Ag nanoparticles incorporated into TiO2 respectively using Ruthenium as a dye. It was observed that addition of Ag enhanced the performance of DSSC by 25%.

V. ACKNOWLEDGEMENT

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AN ECONOMIC ANALYSIS OF BHILWARA URBAN COOPERATIVE BANK OF RAJASTHAN

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ABSTRACT
Urban Co-operative Banks (UCBs) are the back bone of banking system and contribute for growth of the nation. The progress of UCBs in India support the progress of banking system in India as they operate in urban and semi-urban areas and have immense potential to deliver services in areas where both the state and private sector have failed. The present study intends to analyze the financial performance and the growth potential of Bhilwara Urban Cooperative Bank of Rajasthan and it is certainly learning for the other urban cooperative banks in the Rajasthan. The study is mainly supported by secondary data which has been collected from the annual reports of Bhilwara Urban Cooperative Bank, data from annual reports of The Rajasthan Urban Co-operative Banks Federation Ltd, journals and magazines.

The progress of the bank can be analyzed and judged by various parameters such as Share capital, Net profit, Deposits, Advances, and Working capital, which reveals that there has been growth of the bank in said region over a period of five years, i.e., FY 2009-10 to 2013-14.

Keywords: Urban Co-operative bank (UCB), Share capital, Net profit, Deposits, Advances, and Working capital.

INTRODUCTION

The term Urban Co-operative Banks (UCBs), though not formally defined, refers to primary co-operative banks located in urban and semi-urban areas. These are organized with the objective of promoting thrift and self-help among the middle class / lower middle-class population and providing credit facilities to the people with small means in the urban / semi-urban areas. Regulated by the Reserve Bank of India, they are governed by the Banking Regulations Act, 1949 and the Banking Laws (Co-operative Societies) Act, 1965. The basic characteristics of these banks are - (a) Registered under respective State Co-operative Societies Acts; (b) Dual Control System, i.e., governed by Co-operative Societies Act and RBI; (c) Owned and controlled by their members, who democratically elect the board of directors; (d) Members usually have equal voting rights, according to the co-operative principle of "one person, one vote"; (e) Restricted area of operation; (f) No listing / no trading of shares; (g) Strong in helping financially weaker section, etc.

OBJECTIVES OF THE STUDY

1. To study the growth and performance of the Urban Co-operative Bank.
2. To suggest suitable measures to improve the financial health of the bank.

METHODOLOGY AND DATA SOURCE

The study is mainly supported by secondary data which has been collected from the annual reports of the bank and annual reports of The Rajasthan Urban Co-operative Banks Federation Ltd and journals and magazines.

Period of Study

The study covers a period of five financial years, ranging from FY 2009-10 to 2013-14, has been taken up as the time frame for the study.

Tools used for the study

Mean, Standard deviation (SD), Coefficient of Variation (CV), Trend, Incremental Growth and Correlation Coefficient are used as a tool to analyze the financial performance of the bank.

RESULTS AND ANALYSIS

1. Share Capital

Share capital is one of the important compound of owned fund and every bank should make an attempt to improve share capital position in every year. The urban cooperative banks follow the concept share linkage to the loan and it also provides additional share to the members at the time of lending. The details of Share capital position has been presented in Table No.1

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Table-1: Growth of Share Capital in Bhilwara Urban Cooperative Bank

Year	Share Capital (Rs. In Lakhs)	Trend %	Incremental Growth %
2009-10	331.78	-	-
2010-11	391.98	18.14%	18.14%
2011-12	434.70	31.02%	10.90%
2012-13	513.88	54.89%	18.21%
2013-14	643.47	93.94%	25.22%

Mean- 463.162; SD- 220.40; CV- 47.59

The above table reveals that the share capital has shown a positive growth during the period under study.

2. Deposits

The deposits mobilized by the bank may be classified as Fixed deposits, Saving bank deposits, Current deposits and Recurring deposits. The below table highlights the total deposits mobilized by the bank and it has made steady progress during the period under study.

Table-2: Growth of Deposits in Bhilwara Urban Cooperative Bank

Year	Deposits (Rs. In Lakhs)	Trend %	Incremental Growth %
2009-10	11,023.19	-	-
2010-11	12,289.30	11.49%	11.49%
2011-12	14,589.36	32.35%	18.72%
2012-13	17,366.45	57.54%	19.04%
2013-14	18,201.56	65.12%	4.81

Mean-14693.97; SD-5075.87; CV-34.54

3. Working Capital

The working capital is considered as life blood of any organization. The Urban Cooperative banks adopt different methods to determine the working capital. The below table highlights the that the working capital has increased during the period under study.

Table-3: Growth of Working Capital in Bhilwara Urban Cooperative Bank

Year	Working Capital (Rs. In Lakhs)	Trend %	Incremental Growth %
2009-10	13,197.05	-	-
2010-11	14,904.27	12.94%	12.94%
2011-12	17,142.79	29.90%	15.02%
2012-13	19,844.93	50.37%	15.76%
2013-14	21,267.06	61.15%	7.17%

Mean-17271.22; SD- 5706.36; CV-33.04

4. Advances

The advances made by the bank can be classified in three categories and it include Short term loans, Medium term Loans and Long-term loan. The below table shows advances made by the customer and it has made constant progress during the period of study.

Table-4: Growth of Advances in Bhilwara Urban Cooperative Bank

Year	Advances (Rs. In Lakhs)	Trend %	Incremental Growth %
2009-10	3,894.72	-	-
2010-11	5,047.89	29.61%	29.61%
2011-12	5,740.34	47.39%	13.72%
2012-13	6,355.88	63.19%	10.72%
2013-14	8,003.94	105.51%	25.93%

Mean- 5808.55; SD- 2905.66; CV-50.02

5. Net Profit

Profit is the yardstick to measure the managerial efficiency of the bank. The bank is continuously earning profit and the below table reflects that it has shown positive growth during the study period. Among the five year period highest per cent could be observed during the year 2013-14.

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Table-5: Growth of Net Profit in Bhilwara Urban Cooperative Bank

Year	Net Profit (Rs. In Lakhs)	Trend %	Incremental Growth %
2009-10	101.72	-	-
2010-11	144.78	42.33%	42.33%
2011-12	119.13	17.12%	-17.72%
2012-13	73.38	-27.86%	-38.40%
2013-14	237.12	133.11%	223.14%

Mean- 135.226; SD-95.74 ; CV-70.81

6. Investment

Table-6: Growth of Investment in Bhilwara Urban Cooperative Bank

Year	Investment (Rs. In Lakhs)	Trend %	Incremental Growth %
2009-10	1823.45	-	-
2010-11	3347.85	84%	84%
2011-12	3548.21	95%	5.98%
2012-13	4414.86	142%	24.42%
2013-14	4663.62	156%	5.63%

Mean- 3559.60; SD- 2008.30; CV-56.42

7. Quantitative Variables and Profitability of the Bhilwara Urban Cooperative Bank

In the present study, an attempt has been made to analyze the extent of influence of various economic variables on the profitability of Bhilwara UCB by using the Co-efficient of correlation. The below table shows that all the variables and profits were in an increasing trend during the study period except profit for the year 2011-12 and 2012-13. Correlation is the relationship between the two variables. As per table below Correlation is establish between Interest Earned and Net Profit. Value of Co-efficient of correlation (r) is 0.45, which shows that there is positive Correlation between Interest Earned and Net Profit.

Table-7: (Rs. In Lakhs)

Year	Interest Earned	Interest Paid	Operating Expenses	Net Profit
2009-10	1344.80	1089.99	120.88	101.72
2010-11	1544.48	1116.42	388.07	144.78
2011-12	1803.95	1365.33	388.73	119.13
2012-13	2642.36	2269.09	266.79	73.38
2013-14	2981.81	2380.14	315.67	237.12

CONCLUSION

The Bhilwara UCB have expanded over the past 5 years from 2009 to 2014 both in terms of their presence as well as business but with an increasing trend in their growth rate. The capital base of the bank is getting strengthened year over year thereby reducing their dependency on external funds. The share capital and deposits has made a positive growth during the period under study. The advances made by the bank has made positive trend and it will pave way. Deposits have made steady progress during the period under study.

The bank is continuously earning profit except profit for the year 2011-12 and 2012-13 there is down fall. There is positive Correlation between interest earned and profitability.

SUGGESTIONS

- UCBs should plan to introduce new schemes and do promotional campaigning for attracting new customers while satisfying the requirements of existing customers. Increase in growth rate of customer base will help UCBs in increasing the growth of deposits as well as and advances, leading to increase in interest income.
- UCBs should upgrade their technology and adopt modern methods of banking like internet banking, ATMs, etc. to face competition with commercial banks.
- For improving their profitability, UCBs have to concentrate on controlling expenses and diversifying their areas of operations.
- The bank should make necessary attempts to bring innovation and creativity particularly for women and senior citizens.

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AGE, GROWTH AND POPULATION STRUCTURE OF *CIRRHINUS MRIGALA* (HAM. 1822) IN LARGE RESERVOIR (VALLABHSAGAR), GUJARAT

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ABSTRACT
In present note age, growth and population structure was described on the basis of scale and it was undertaken during March to August 2013 in large reservoir (Vallabhsagar) of Gujarat. Result depicts that age groups fish varied from 1+ to 6+ and the mean lengths 15.600-46.951 (27.079), 23.243-50.549 (38.182), 25.568-60.545 (46.788), 38.182-67.464 (53.303), 55.061-67.826 (62.829) and 60.857-78.720 (71.395) cm with growth increment 27.079, 10.890, 8.606, 6.515, 9.526 and 8.566 cm were observed for respective age groups. The exploitation pattern 39.29% for 1+, 21.43% for 2+, 15.71% for 3+, 10.00% for 4+, 7.14% for 5+ and 6.43% for 6+ age classes which shows that exploitation pattern of fish was high at early age fish stock than higher age classes. It was concluded that in exploitation 60.714 % by 1+ to 2+ and 39.286 % by 4+ to 9+ age class which seems that in the catch younger fishes was more which was not good sign for natural stocking of studied fish in the Vallabhsagar reservoir.

Keywords: Mrigal, Age, Growth, exploitation pattern and Vallabhsagar

Cirrhinus mrigala (Ham., 1822) is belongs to Cyprinidae family and locally known as 'Nain' or 'Mrigal'. It is widely distributed in inland water of Indian subcontinent and forms remarkable contribution in inland fishery of India (Jhingran, 1952) and having commercial significance due to aquaculture potential (Mayank, 2014). Age and growth are the important biological attributes which provide the life counts such as life span, mortality, sexual maturity, harvestable size, stock composition, etc. which helps to fishery management (Robinsson and Motta, 2002). For fishes, age is the numerical expression of the time duration of life whereas the growth is change in body size between two points or increasing in mass (DeVries and Frie, 1996 and Zafar et al., 2003). Bhatt et al. (2000 & 2004) and Nautiyal and Negi (2004) were studied age and growth of different fishes whereas it was described for Indian majors by Jain (2000) from Siliser reservoir, Alwar (Rajasthan), Ujjania (2003) in different water bodies of southern Rajasthan, Bhatia and Dua (2004) from Harike wetland, India, Verma et al. (2008) from Rana Pratap Sagar, Rajasthan, Raghav (2009) from reservoirs of Chattisgarh and Ujjania and Soni (2018) from Vallbhsagar reservoir, Gujarat. The population structure of fish is represents the ratio of different age classes in population at given time (Nikolskii, 1980) similarly it was elucidated by Mayank (2013), Mayank et al. (2015), Khan (2017) and Khan et al. (2017) for *Cirrhinus mrigala.* In this paper the attempt was made by the author to conduct such study for commercially important fish *Chirrhinus mrigala* in large reservoir (Vallabhsagar) of Gujarat.

In the present paper age of the fish was determined by the scale and 5-6 scales were randomly collected from fish specimen in paper envelop with keynote information like, total length in cm, standard length in cm, weight in gm, date of collection fish species etc. during March to August 2013 form the large reservoir (Vallabhsagar) of Gujarat which is situated on 73^0 32' 25" to 78^0 36' 30" East longitudes and 20^0 5' 0" to 22^0 52' 30" North latitudes.

Scales were soaked with 1 % KOH solution for 5-10 minute and wash with tap water by rubbing of fingertip to remove mucous, clean scales were used to read the scale radius (S) and radius of each annuli (S_1, S_2, S_3 S_4 …. $S_{n.}$) by 4P scale reader (Ujjania et al., 2014). The back calculation of length at previously formed annuli was determined to follow the Bagenal and Tesch (1978):

$$Ln = a + \frac{Sn}{S} \times (L-a)$$

The percentage of contributing age class or population structure was analyzed to follow the Odum (1971).

The result depicts that 6 growth rings were appeared on the scale which denotes that fish population belong 6 age groups (Fig. 1) and 15.600-46.951 (27.079), 23.243-50.549 (38.182), 25.568-60.545 (46.788), 38.182-67.464 (53.303), 55.061-67.826 (62.829) and 60.857-78.720 (71.395) cm length were observed respectively (Table 1). Similarly, Kamal (1969) reported 7 growth rings of *C. mrigala* respectively from the river Yamuna, Ujjania (2003) recorded 6, 7 and 6 age groups in mrigal of Mahi Bajaj Sagar, Surwania Dam and Aasan pond respectively, Ujjania (2010) reported 6 age groups in catla from Assan pond situated in southern Rajasthan,

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Mayank and Tyagi (2013) recorded 10 age classes in mrigal from Yamuna river, Khan (2017) reported 8 rings on the scale of Indian major carp (*Cirrhinus mrigala*) from tributary of Ganga river. The increment in growth was 27.079, 10.890, 8.606, 6.515, 9.526 and 8.566 cm for every age group which depicts that maximum growth was at initial stage of life and minimum growth at later stage of life. Similar findings for growth rate and trend in mrigal were reported by Ujjania (2003), Sarang et al. (2009) and Ujjania and Soni (2018).

The population structure of mrigal in large reservoir was 39.29%, 21.43%, 15.71%, 10.00%, 7.14 and 6.43% for age class 1+ to 6+ respectively in catch. These result shows that maximum exploitation (39.29%) was recorded in 1+ age while it was minimum (6.43%) in 6+ age class (Fig. 2). It is also observed that early age fish was more exploited than higher age classes which contributed 60.714 % by 1+ to 2+ age class while rest 39.286 % by 3+ to 6+ age class. Kamal (1969) recorded lower and middle age groups of *C. mrigala* were highly exploited from the Yamuna river at Allahabad. The age groups 2+ to 4+ accounted for 73% in *Tor putitora* in foothill section of the river Ganga (Bhatt et al., 2000). Seth and Katiha (2001) also reported lower and middle size groups were highly exploited in *Aorichthys seenghala* from the rivers. Nautiyal and Negi, (2004) studied age structure of *Barilius bendelisis* and found 94.12% in 0+ and 1+ age groups. Imran et al (2015) reported that the 1+ age group was dominated in *Cyprinus carpio* from the Yamuna river at Allahabad while Khan (2017) reported that 3+ age group of mrigal was dominated in tributary of Ganga river.

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Table-1: Age structure and growth pattern of mrigal

Age group	Observations	Population contribution (%)	Total length (cm)	
			Minimum - Maximum (Mean)	Growth rate
1+	55	39.286	15.600 - 46.951 (27.079)	27.079
2+	30	21.429	23.243 - 50.549 (38.182)	10.890
3+	22	15.714	25.568 - 60.545 (46.788)	8.606
4+	14	10.000	38.182 - 67.464 (53.303)	6.515
5+	10	7.143	55.061 - 67.826 (62.829)	9.526
6+	9	6.429	60.857 - 78.720 (71.395)	8.566
Pooled	140	100.000	15.600 - 78.720 (49.929)	

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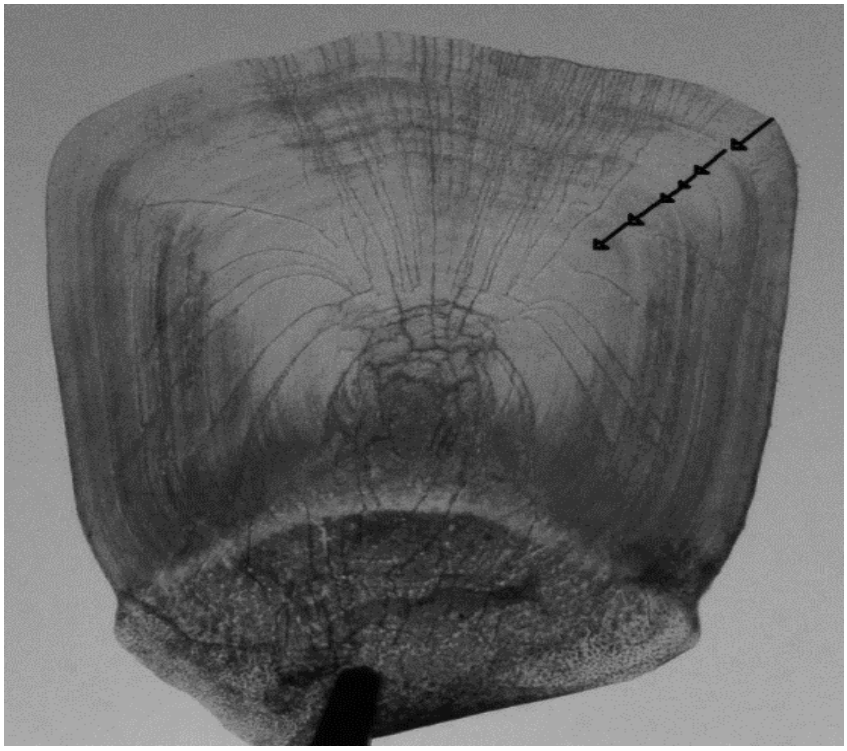

Figure-1: Growth rings on key scale of mrigal

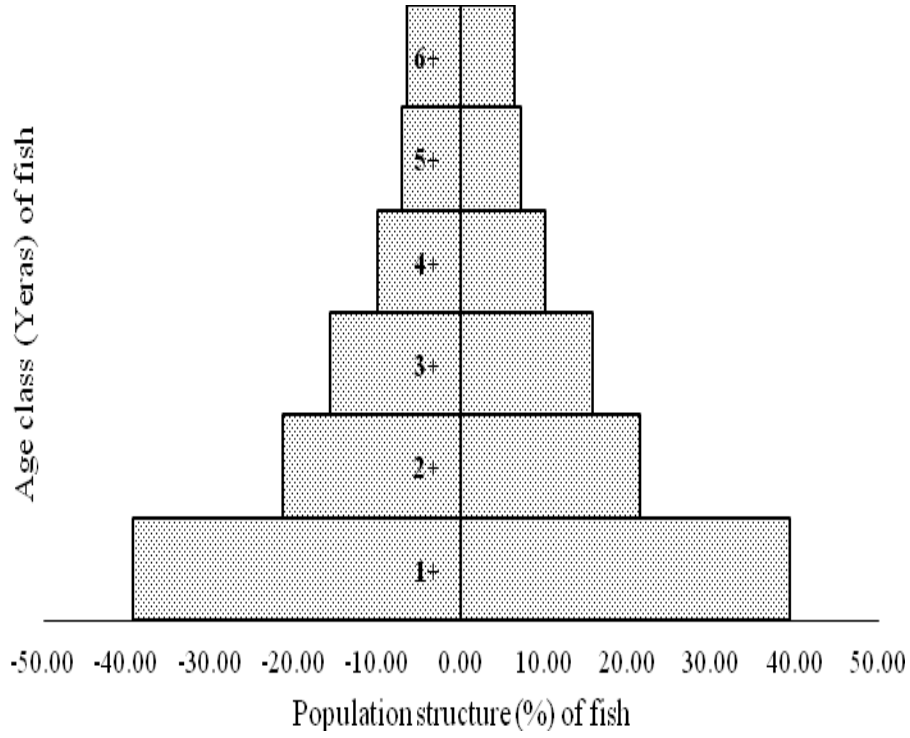

Figure-2: Population structure of mrigal in exploitation

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GREEN INFRASTRUCTURE: ROLE AND CHALLENGES IN URBAN AREAS

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ABSTRACT
Population in the urban areas experience much higher temperature than the residents of the rural areas because of heat production due to the grey structures. These grey structures also have the tendency to retain the heat for a longer time such that these concrete jungles release heat waves during the night also; this makes the situation worse for the population. Not only grey areas, the pollution from automobiles and industries also promotes the problem. Green infrastructure is viewed as the linkage that is linking the urban precincts to natural areas. This paper revolves around the planning of green infrastructure in urban atmospheres how it can be the key to combat the climatic changes and energy uses in the day to day life.

Index Terms: Green infrastructure, Urban Environment, Heat islands, Adaptive planning.

INTRODUCTION
Urban areas being the centre of the development has to focus on its infrastructure to fulfil the infrastructural needs of people to lead hygienic and healthy life. Since the development has been at a hasty pace the requirement of the upgraded infrastructure is never-ending. To meet these infrastructure requirements which includes the housing, water sewerage, drainage, transportation to name but a few; most ignored infrastructure is the one which is highly compromised and overlooked is the Green Infrastructure, which is the base on which all the above-said infrastructure is laid and constructed. Green infrastructure has been catchy word and area of concern for the policy makers, bureaucrats, and technician because the public health condition is deteriorating due to overdevelopment and lack of green spaces and green areas and the landscaping along the paths and city avenues. Green infrastructure includes various elements from green building to green avenues/ neighbourhood leading to Greener cities and regions.

SIGNIFICANCE OF STUDY
Since the industrial revolution we unaware started moving from green infrastructure to grey infrastructure(focuses on built-up development vertically i.e. structures, buildings, monuments as well as horizontally includes roads). This paper concentrates on unparalleled benefits of green infrastructure in Modern smarter cities. The role GI plays in enhancing the environment and saving the nature, making the cities cleaner and aesthetically greener. Also, it discusses various elements pertaining to the construction of buildings and planning of the neighbourhoods with integrated development of cities. Those elements will be prime movers of making the green infrastructure.

LITERATURE REVIEW
Definitions of various authors
Green infrastructure is the physical environment within and between our cities, towns and villages. It is a network of multi-functional open spaces, including formal parks, gardens, woodlands, green corridors, waterways, street trees and open countryside. It comprises all environmental resources, and thus a green infrastructure approach also contributes towards sustainable resource management. (Davies & Roe, November 2015).

"Green infrastructure is a strategically planned and managed network of wilderness, parks, greenways, conservation easements, and working lands with conservation value that supports native species, maintains natural ecological processes, sustains air and water resources, and contributes to the health and quality of life for America's communities and people" (Benedict & McMahon, 2006)

Green Infrastructure is a term that is appearing more and more frequently in land conservation and development discussions across the country and around the world. Green infrastructure means different things to different people depending on the context in which it is used. For example, some people refer to trees in urban areas as green infrastructure because of the 'green' benefits they provide, while others use Green Infrastructure to refer to engineered structures (such water treatment facilities or green roofs) that are designed to be environmentally friendly (Benedict & McMahon, 2002).

HISTORY OF THE WORD "GREEN INFRASTRUCTURE"
The term itself was first coined in Florida in 1994 in a report to the governor on land conservation strategies and was intended to reflect the notion that natural systems are equally, if not more important, components of our "infrastructure." Since it is generally accepted that we have to plan for grey infrastructure, the idea of also

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planning to conserve or restore our natural resources, or "green infrastructure," helped people to recognize its importance to community planning.

WHY DO WE NEED TO PLAN FOR GREEN INFRASTRUCTURE?

Green infrastructure benefits the society in manifold ways. These benefits impact directly and indirectly impacting social, environmental/physical and even, economic needs. some of them have been listed below :

1. Visual impact: The area close to nature outshines the grey and built areas of the city. The beautifully landscaped avenues with green lot lots and beautiful centred park catch the eye of the viewer and appeals aesthetic in the springs
2. Human health: Living in greener environs help the being to accelerate the health through walking, cycling etc. to destress themselves and providing more spaces for leisure and recreation.
3. Education: Green infrastructure helps the individual to learn about various trees and species of the birds, insects and animals through photography, bird watching or from using the plantation for medicinal uses.
4. Food production: green spaces provides foods grains, cereals, fruits, vegetables, medicinal plants from the distribution of orchids, gardens, agricultural farms etc.
5. Transport: reduced pollution and safer pathways and encourage walking and cycling paths helps the commuters to have a different opinion and increases access to greener streets and makes travelling reliable.
6. Economics: Each and every element is more or less related to the monetary value. The higher would be the greener area in the neighbourhood more will be the demand of the area, therefore, higher would be the rates. Otherwise, areas which are more connected to nature attracts higher tourists thus increasing investments in the region.
7. Climate control: Landscaped areas, green spaces help to moderate the effect of heat islands in high development; also, improves the quality of air.
8. Sustainable urban drainage: It coordinates the surface runoff and uses it for groundwater recharging and collection for irrigation purposes. Moreover, the rainwater overflows are additionally overseen through rooftop change of structures.
9. Pollution control: barring aesthetic prons of green infrastructure the plunging of pollution is the obvious aftereffect is controlling the pollution levels and restricting the detrimental impacts of gases, odours and aerosols.
10. Energy efficiency: Landscape trees and green infrastructural spaces lowers the energy requirements through the creation of the minor climatic conditions and lowering the temperature/ heat levels of the area.
11. Biodiversity: Expanding the biodiversity from creation and arranging of spaces prospers the territories as natural life breeds in zones rich in greenery.

Table-1: Examples of the services provided to humans and wildlife by green infrastructure. (Dover, 2015)

Aspect	Attributes	Examples	Impact
Visual	Aesthetics, screening	Improved visual environment	Social impact
Human health	Exercise(walking, running, green gym), pollution, abatement, de-stressing, socialisation, recreation	Reduced cost to health providers through reduced admissions; improved mental health; faster recovery	Social impact
Education	Study and experience of wildlife, schools, ranger services, volunteering	Formal and informal education, skills through volunteering, hobbies (photography, bird watching, etc)	Social impact
Food Production	Allotments, gardens, orchards, roofs, walls	Improved diet, community bonding, education, biodiversity, exercise.	Social and Economical
Transport	Alternative movement corridor for cyclists and pedestrians	Reduces road congestion, safer routes, reduced pollution exposure, more relaxed setting,	Physical impact
Economics	Property prices, inward investment, tourism, improved	Improved staff morale, reduced sick leave, improved staff retention, attracts	Economic impact

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	business/ shopping environment	business; units let faster and fewer voids	
Climate control	Reduced heat mortality, heat island, and wind; improved air circulation and climate change mitigation	Provides shade against UV-related cancer, cardiovascular mortality, heatstroke, etc; reduces air and surface temperature, freshens the air	Physical impact
Sustainable urban drainage	Reduced runoff, flash flooding	Reduces risk, economic losses, trauma and distress, processing costs	Physical impact
Pollution control	Water, light, noise, air pollution (particulates, gases and aerosols, odours)	Removes PM_{10} and below from air; and absorbs nitrogen oxides, ozone, volatile organic chemicals; acts as a heavy metal sink	Physical impact
Energy efficiency	Reduces air conditioning and heat costs	Insulates building, provides shelter against drafts and shades windows.	Physical impact
Biodiversity	Wildlife habitat, wildlife corridors and stepping stones	Provides breeding habitat, food and other resources; promotes dispersal; reduces extinction risks	Physical

APPROACHES TO GREEN INFRASTRUCTURE FROM SPOT PLANNING TO CITY PLANNING

Green Spots/Buildings

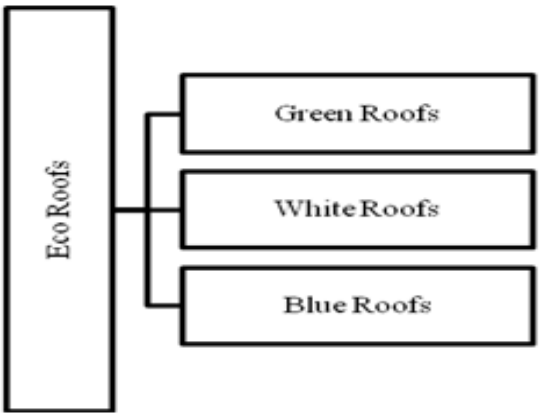

Figure-1: Types of Roofs

We have been extending our buildings from the horizontal type of construction to the vertical styles because of having a shortage of the spaces in the urban areas, therefore, the concept of Eco-Roofs is gaining attention. There are three main types of eco-roofs: Green roofs (vegetated), white roofs (cooling), and blue roofs (water managing) (Foster, Lowe, & Winkelman, February 2011). According to the report, the benefits which are related to eco-roofs includes

a) Conservation of water
b) Management of quality of water
c) Absorption of the pollution level through dropping carbon content
d) Reduction in Power consumption
e) Visually pleasant.
f) Temperature reduction.

Green Roofs

The rooftop vegetation acts as a major temperature reduction agent. It can reduce the temperature of the building from50 percent to 80 percent, thus reducing the energy consumption of the buildings, similarly, if there are clusters of buildings having green roofs in a neighbourhood .it can mitigate the heat island impact.

Method: Covering the roofs partially or completely with local vegetation which can be grown in 3-15 inch of soil, sand or grave planted in a waterproof membrane

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Benefits: numerous benefits can be drawn out from vegetated roofs namingly; protection of UV rays, regulation of summer temperature, protection from wind, reduction in annual stormwater runoff and many more

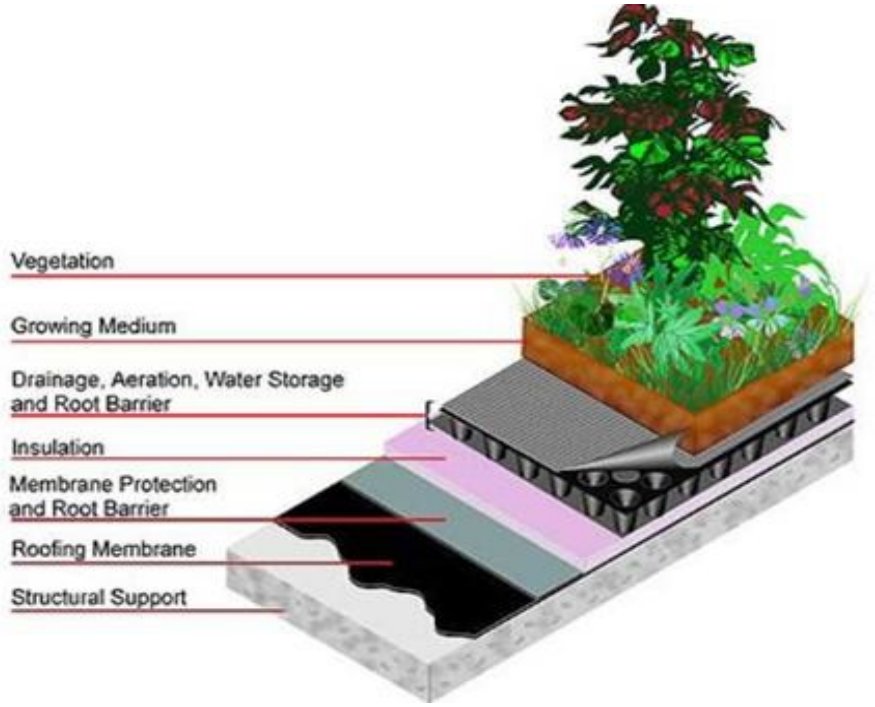

Figure-2: Section of Green Roof (Source: Heatusa.com)

White Roofs

On the other hand, white roofs are heat reflectance which combats the increasing temperature of the building by reflecting 80 percent of sun rays falling on the building.

Method: The use of white vinyl roofs in the construction of the building or any traditional/local white material available. The other way is to paint the flat roofs into white, such that it does not penetrates the hot waves and helps to cut down the energy requirements.

Benefits: Reduction in the total energy usage of the building, cost-effective method of construction.

Figure-3: White Roof (Source: Earth Rangers center)

Blue Roofs

It is the most effective and efficient way of managing to stormwater. They are called the blue roofs as they preserve the rainwater runoffs incompetent ways which can be further used for non-potable purposes like gardening, car washing, floor cleaning to name but a few.

Method: by using the simple and traditional methods like the usage of gutter storage systems, downspout valves in the terraces instead of the vegetation. These methods help to take the water into the storage tanks or either can be used for groundwater recharging.

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Benefits: saves more than 50 percent of the water that is falling on the roofs. moreover, less maintenance is required as compared to the green roofs, decreases the dependency on the pure water resources for irrigation purposes.

Figure-4: An Example of blue roof in Philadelphia, (Source: pwdplanreview.org)

GREEN CLUSTERS/NEIGHBOURHOODS

Community parks and green spaces

Community parks and green spaces in the neighbourhood areas are considered as the boon because of several benefits that they offer firstly, they are the only green spaces in the concrete jungles that are close to nature. Secondly, they combat the impact of heat island by lowering the temperature of the surrounding areas; thirdly, they provide the open spaces for leisure time to residents of the neighbourhood and act as a prime promoter of community engagements. lastly, they improve the air quality and also helps in penetration of rainwater into the ground. Moreover, these areas connect urban spaces with natural areas.

Landscaped Walkways/Pedestrian Spaces

Well landscaped pedestrian spaces have been lacking in most of the non-standardised urban areas. Beautifully planned urban spaces encourage the commuters to shift from motorised automobiles to non-motorised thus saving the energy as well as the environment. furthermore, these spaces also add to the aesthetical value of the place which further has many social and economic benefits. well, oriented walkways also help in flood protection and hold the soil during erosion.

Owing to the scarcity of water and limited annual waterfall, green spaces have been created by planting native deciduous trees in strategic 'ecological corridors' alongside buildings. This has a dual impact: first, it provides a cooling effect through emerging local micro-climates during the summer (during the winter the trees do not limit the sunlight absorption of buildings); and, secondly, it saves on the amount of water used for irrigation, as most of the native plant species require little watering and are adapted to the local climatic conditions. This concept is also referred to as 'xeroscaping'. (Town and Country Planning Association, September 2008)

Cleaner and Greener Energy Sources

The use of renewable energy sources like Geo-Thermal energy, solar energy, wind energy, tidal energy is the need of the hour. Most of the conventional energy sources from the coal and petroleum and other byproducts of the fossil fuels have degraded the cities and are the cause of the various environmental and health problems including the emerging diseases are the also the aftereffects of them. The various protocols and the international initiatives are there but it cannot be effective unless and until the approach for the same has not been done from the micro level that is neighborhood level or the village level. Each city has to identify the alternate sources of energy so that the reliability from the pollutant sources could be decreased.

Green Transport system

Pollution from the vehicles is the key contributors to the increasing pollution levels in the metro cities of the world. Increasing ownership of private vehicles and dependency on fossil fuels for the running of the vehicles are principal factors in making the situation more worse in these cities. The solution of the problem lies in the Green mobility options. The use of cycles and pedestrian paths for small movements, use of fast and reliable public transportation for longer routes. Green alleys and close to nature pathways and cycle tracks with the safety of the commuters, various resting and relaxing infrastructure for children and on these tracks can lead to a

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shift of modes thus decreasing the load on the environment. The changing of the fuel of public transportation modes

GREEN CITIES

Agricultural Practice and Land Use Management

When we talk about the green infrastructure for Greener, environment-friendly cities, the role of the agricultural spaces is unmatched. Barring from the food grains/vegetables and fruits, the other role that they play in the protection of the environment is significant.the agricultural lands are mainly semi-natural patches that represent the last remnants of nature in metropolitan areas. As part of the Agricultural and green infrastructure, they provide ecosystem services, such as purification of air and water, mitigation of floods and droughts, regeneration of soil fertility. farmlands and woods & shrubs play an important role in controlling evaporation processes and mitigating urban pollution inside highly urbanized settlements (Privitera & Rosa, 2013) . The efficient implementation of the developmental plans with consideration to the green spaces makes the city thriving.

Rejuvenating Available Land Based Water Resources

Land-based water resources cover rivers and their tributaries, lakes, ponds etc. These water resources help in creating the microclimatic conditions to mitigate the heat island impacts in the cities. therefore, Within an urban region water features can have a positive influence on the microclimate of the surrounding regions when the natural cooling coming from the evaporation will be required in the hot sunny days. The more chances of water availability generally improve evaporation, and the related lift of latent heat offers an extra daytime cooling influence. Water bodies work as the cooling source of the microclimate of surrounding region. The temperature of the air above and near water body is different from the temperature of the land because the water has a different system of cooling and heating. Water bodies are believed to be the best radiation absorbers, but on the other hand, they provide a very small thermal response.These spaces should be managed properly with beautiful trees and landscaped with required infrastructure, they could act like the places of leisure and recreation even for the residents and tourist spots.Despite from this if we kept on polluting our water resources by dumping solid wastes and waste generated from factories, this situation is going to be worse day by day.

Regional Parks and Forest Reserves

The ecology of forests and regional parks have experienced radical changes due to fast pace human activities of exploitation of nature’s reserve. The cities are facing the dire impacts of cutting of the trees and disturbing the biodiversity. The industrial activities that persist on forests are impacting the ecosystem by overutilization of these resources. Moreover, the pollution activities and waste disposal have added to the problem. (Hans-Peter Kahle, 2004)

Every city is designated with forest covers and regional level parks, but the paced development and increasing demand of the spaces in cities have led to cutting down of the forests and reducing the size of the regional parks. This has some long-lasting impacts on the health as the forest take the most of carbon from the cities thus reducing the lateral aftermath.

CONCLUSION

Changing of climate is intricately associated with increasing urban agglomerations; along with people it also carries various problems like increasing population, increased need for accommodation, transportation needs, sanitation, water demand and many more.

Each and every facility comes up at a cost of nature and its products. Cities, on the other hand, are much distant from nature in terms of natural reserves and forest covers and habitats. Since industrialization the problems and diseases have increased manifolds; therefore, there is a need for rejuvenating the cities and making them more resilient to sustainability through Green Infrastructure.

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A STUDY OF IT SERVICE MARKETING OPPORTUNITIES FOR INCREASING OF IT SERVICES CUSTOMERS WITH REFERENCE TO SELECTED IT FIRMS OPERATING IN PUNE CITY

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ABSTRACT
In this paper we try to prioritize the importance of all indices of marketing opportunities, segmentation strategies, target markets and present some costumer-oriented guidelines. For attaining to research goals, we codify some hypotheses, and for data collection, we use library and questionnaire method. Statistical population is the costumers of IT services. For statistical investigation of service marketing and its impact on increasing of IT services costumers, we utilize Z-test (one-tailed). The obtained statistical results indicate that the relationship between existing variables is meaningful; then we identify the hierarchical order of factors related to service marketing opportunities, segmentation strategies and important indices.

Keywords: Marketing, Service Marketing, IT Services, Marketing opportunities, Costumers

I. INTRODUCTION

1.1 Services: The Concept

A service is any act or performance that one party can offer to another that is essentially intangible & does not result in the ownership of anything. its production may or may not tied to a physical product.

All industrial and economic activities are divided into three, namely, primary, secondary and tertiary. Primary activities include agriculture, fishing, forestry, mining etc. Secondary activities consist of manufacturing, processing, construction etc. Tertiary activities comprise of services, distribution etc.

Services form a major part of economic activities and the world today is dominated by the service sector.

The service sector is enormously large and varied. It includes banking, transportation, insurance, communication, education, employment, healthcare, Legal service, accounting, tourism, hospitality and information technology services. Some of the services are provided on a nonprofit basis, for example, education and healthcare, while others are provided on a commercial basis such as hotels, professional consultants, solicitors etc.

"Services are activities, benefits or satisfaction which are offered for sale, are provided in connection with sale of goods.

"Services can also be defined as action of organization that maintains and improves the well being and functioning of people."

1.2 Anatomy of Services Marketing

The service sector is enormously large and varied. It includes banking, transportation, insurance, communication, education, employment, healthcare, Legal service, accounting, tourism, hospitality and information technology services. Some of the services are provided on a nonprofit basis, for example, education and healthcare, while others are provided on a commercial basis such as hotels, professional consultants, solicitors etc.

The following facts make it clear that the application of modern marketing principles by service generating organisations would pave avenues for qualitative and quantitative transformation:

- Increase in the Disposable Income
- Increasing Specialization
- Changing Lifestyles
- Professional Excellence
- Information Explosion
- Sophistication in Market
- Increasing Governmental Activities

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1.3 About It Industry and It Services

The term 'Information Technology' (IT), as defined by the Information Technology Association of America (ITAA) is the "study, design, development, implementation, support or management of computer-based information systems, particularly software applications and computer hardware." India IT market consists of all the companies that use computer and computer software to convert, store, protect process, transmits and retrieves information or data.

An IT services approach provides the foundation for addressing many of the challenges facing IT organizations today as companies grow in size and scale, the market is likely to see larger IT services deals with more sophisticated deal engagement practices.

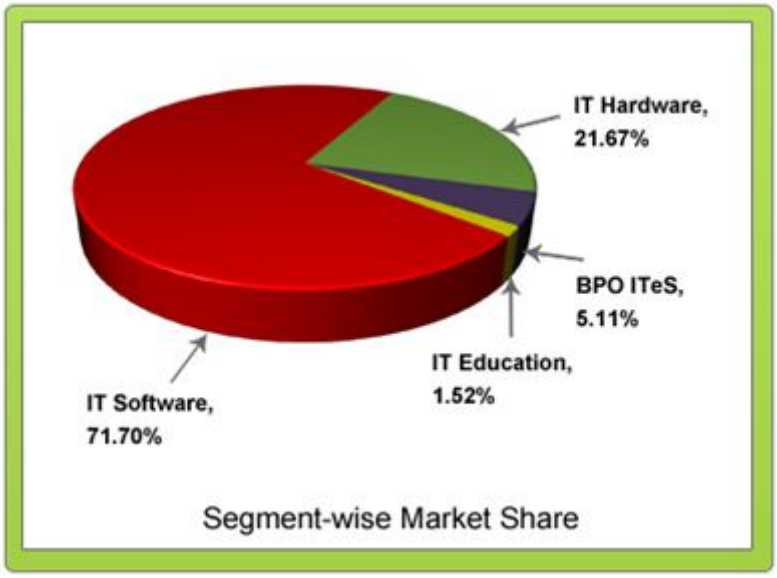
India's IT services market offers significant opportunities for IT services providers because of the increasing needs and wants of IT buyers.

1.4 Study of IT Service Market

An IT services approach provides the foundation for addressing many of the challenges facing IT organizations today as companies grow in size and scale, the market is likely to see larger IT services deals with more sophisticated deal engagement practices.

India's IT services market offers significant opportunities for IT services providers because of the increasing needs and wants of IT buyers.

Segment wise Market Share



1.5 Global Market Fluctuations Affecting the Indian IT Sectors

The Indian IT sector had been growing by leaps and bounces in the last decade of the 20th century.

The growth in the IT sector has been steadily creating jobs for people, creating global opportunities, raising the standard of living and contributing the growth of the GDP.

But there is another side of this fairy-tale story. Constant market fluctuations and variable market conditions in the western countries has a direct effect on the functioning in the IT sector.

Marketing is creative movement with a focus on profit that is marketing makes presenting the service more profitable, so marketing is a movement; it is a sequence of activities and events which happen one after another. IT organizations must pay more attention to marketing of IT Services in the global scenario.

Client Approaches for it Services

- RFP (Request For Proposal)
- ENGAGEMENT MANAGER
- REPEAT BUSINESS
- RECOMMEDATION
- BRAND NAME

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II. REVIEW OF LITERATURE

McGoldrick and Greenland (1994) while pointing out the challenges facing the financial services industry, argues that it is necessary to develop and implement successful marketing programmes to create and foster a customer orientation. The trend since the early 1990s, however, has been towards more streamlined business structures through rationalisation to produce greater efficiency and higher profitability in a saturated market with intense competition. Marketing strategies are aimed at retaining customers through high levels of client satisfaction by providing quality services to meet their changing needs over time and attracting new customers.

Randeep Sudan, Seth Ayers, Philippe Dongier, Siou Chew Kuek, Arturo Muente Kunigami, Christine Zhen-Wei Qiang, Sandra Sargent (2011) in their article The Global Opportunity in IT-Based Services stated that Advances in information technology (IT) and global connectivity, combined with waves of economic liberalization, have given impetus to a new dimension of globalization: cross-border trade in services. The services sector has been growing steadily and already accounts for 70 percent of employment and 73 percent of gross domestic product (GDP) in developed countries and for 35 percent of employment and 51 percent of GDP in developing countries (UNCTAD 2008). As infrastructure and skills improve in developing countries, cross-border trade in services is expected to continue to expand.

III. RESEARCH METHODOLOGY

3.1 Research Goal

- To find out the role and need of IT services in the present scenario of services marketing.
- To analyze segmentation strategies, target markets and client behavior towards IT services with global perspective.

3.2 Research Hypothesis

There is a relationship between applying marketing orientation and increasing the customers of IT services.

3.3 Research Method

According to the goal research method is in descriptive-inferential mode, because it is trying to describe and establish the relationship between different causes. We have used library and surveying methods for collecting information. For this reason we use questionnaire. 200 questionnaires were distributed randomly among the customers of 10 selected IT firms operating in Pune and the degree of their satisfaction from the 7 elements of service marketing mix was assessed.

IV. DATA ANALYSIS AND INTERPRETATION

4.1 Data Analysis

The process of data analysis as a step of scientific method constitutes the basis of every research through which all activities related to research are controlled and guided from its beginning to its end. Statistical analysis is performed in two descriptive and inferential parts. We use descriptive analysis for summarizing the collected data and for more identification of research population; but we use inferential analysis for analyzing the information in sample data and for assessing the uncertainty in inferences. In descriptive part first we draw frequency table and statistical graphs for general characteristics (gender, age, marital status, and education) and somehow describe the samples. Then we draw tables of frequency distribution for the related questions in which we present frequency of answers to each question with its mean, mode and standard deviation. In inferential analysis for approval or rejection of hypotheses distinctively, we compare observed mean and theoretical one by Z-test (one-tailed). If the observed mean (the mean from studied samples for each hypothesis) is meaningfully bigger than the theoretical mean we can accept that the hypothesis is acceptable. In this research the major tool is questionnaire. Research hypotheses are tested with regard to answers from 200 subjects who were clients of 10 selected IT firms operating in Pune. We codify respondents' opinions according to the following codes in a way that Likert's structure is acceptable for the questionnaire: 5-point scale where "1" refers to very low, "2" refers to low, "3" refers to medium "4" refers to high and "5" refers to very high.

Table No-1: Elements of customized of services

Sr. No.	Elements of Customized Marketing of Services
1.1	Client orientation
1.2	Competitor orientation
1.3	Strategic orientation
1.4	Integrated marketing organisation
1.5	Inter-functional coordination

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4.2 Descriptive Analysis

H1: There is a relationship between applying marketing orientation and increasing the customers of IT services.

Table No-2: DESCRIPTIVE ANALYSIS

Sr. No.	Mean	SD	Hypothesized Mean	Z test (One -tailed)	P Value	Result (H_0)
1.1	4.47	0.50	3.00	29.31	0.00	Rejected
1.2	3.16	0.85	3.00	1.88	0.02	Rejected
1.3	3.31	0.75	3.00	4.14	0.00	Rejected
1.4	3.61	0.89	3.00	6.88	0.00	Rejected
1.5	4.05	0.70	3.00	14.96	0.00	Rejected

According to descriptions and the results of Table No. 2, we interpret hypotheses analysis as following:

1.1 H0 is rejected in the error level of 5 percent. That is, the observed mean is not ≤ 3 and since practical mean is bigger than theoretical mean i.e. 3, therefore we can conclude that the observed mean is meaningfully bigger than 3. On the other hand the researcher's hypothesis is acceptable at the error level of five percent. Thus, we can claim that the Client orientation is effective in increasing the customers of IT services.

1.2 H0 is rejected in the error level of 5 percent. That is, the observed mean is not ≤ 3 and since practical mean is bigger than theoretical mean i.e. 3, therefore we can conclude that the observed mean is meaningfully bigger than 3. On the other hand the researcher's hypothesis is acceptable at the error level of five percent. Thus, we can claim that the Competitor orientation is effective in increasing the customers of IT services.

1.3 H0 is rejected in the error level of 5 percent. That is, the observed mean is not ≤ 3 and since practical mean is bigger than theoretical mean i.e. 3, therefore we can conclude that the observed mean is meaningfully bigger than 3. On the other hand the researcher's hypothesis is acceptable at the error level of five percent. Thus, we can claim that the Strategic orientation is effective in increasing the customers of IT services.

1.4 H0 is rejected in the error level of 5 percent. That is, the observed mean is not ≤ 3 and since practical mean is bigger than theoretical mean i.e. 3, therefore we can conclude that the observed mean is meaningfully bigger than 3. On the other hand the researcher's hypothesis is acceptable at the error level of five percent. Thus, we can claim that the integrated marketing orientation is effective in increasing the customers of IT services.

1.5 H0 is rejected in the error level of 5 percent. That is, the observed mean is not ≤ 3 and since practical mean is bigger than theoretical mean i.e. 3, therefore we can conclude that the observed mean is meaningfully bigger than 3. On the other hand the researcher's hypothesis is acceptable at the error level of five percent. Thus, we can claim that the Inter functional coordination is effective in increasing the customers of IT services.

V. FINDINGS

1. Technological changes is the important factor which contributes most to the growth of IT services and increasing opportunities is the second important factor which contributes most to the growth of IT services.
2. All the respondents agree that there is competition in the field of IT services. Many of the respondent's state that there is severe competition but some state that the competition is moderate.
3. The study reveals that most of the IT firms recognize the need for adopting marketing in IT services. It indicates that IT firms are generally proactive to marketing because of the multifarious benefits it offers to them. It is seen that marketing is now increasingly being applied by many IT firms for excelling competition.
4. From the study it is found that out of respondents who consider marketing as necessary, Some state that marketing is necessary for the growth of firms, but only few firms account it for long-term survival and for facing competition.
5. All the IT organizations have identifying potential market for their organization.
6. From the study it is stated that majority of the IT firms practice market segmentation.
7. The study reveals that many respondents is practicing market segmentation, some firms practice market segmentation on the basis of Function or service, and some firms practice market segmentation on the basis of Demographic or client.
8. From the analysis it can be concluded that Quality of the service and Reasonableness of fees of the IT firms are the important criteria for selection of IT service provider by clients.

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VI. CONCLUSION

Therefore, it is concluded that "the process related to presenting services to customers is effective in increasing the customers for IT services." The study reveals that IT firms assign more importance to the services offered to clients, its contents, quality and timely execution. The competition among IT services organizations will bring greater professionalism and better quality of services. The biggest and the most important challenge of the IT firms will be the marketing of their services. IT firms will find it increasingly difficult to carve a niche for their services and retain their existing market share. In the changing world of today IT firms need strategic outlook towards marketing to convince their clients to buy more and remain loyal to the firms.

VII. RECOMMENDATIONS

1. The firm must accept marketing as an inevitable function of management and an important means for achieving organizational objectives.
2. Being a service the IT organization needs a service –orientation and it must create a service culture within the organization.
3. The firm must induct service personnel who are motivated by a spirit of service to the client.
4. The marketing-orientation must be reflected throughout the activities of the firm.
5. The IT organization needs a marketing organization responsive to client needs and wants.
6. The marketing organization must develop systems and procedures for optimum service delivery and maximum client satisfaction.
7. The overall marketing strategy must be formulated on the basis of the behavioral profile of the clients.
8. Offer their existing services to new market segment (penetration strategies).
9. Build client loyalty through client relationship management (retention strategy).

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CRITICAL REVIEW OF CUSTOMER SATISFACTION MEASUREMENT AND PREFERENCES IN TELECOM INDUSTRY

Dr. Prachi Bansal

ABSTRACT

The telecom sector of India operated by BSNL and MTNL is facing an acute competitive pressure after 1995 deregulation. And they are now struggling with complicated issues of added technologies, value added service and constant innovations. The customers are joining to quit in short periods, as can be seen, they are losing around 24% customers each year. The ultimate CRM goal is to offer a comprehensive software application suite to improve productivity, revenue, mainly customer loyalty and satisfaction by synchronizing, and managing customer interactions at various touch points like customer contact center, special website, distribution channels, the internet automation contacts, field organization. This research review critically explores the CRM strategies of the Indian telecom industry to pursue in this rapidly changing business scenario of extremely competitive environment, and studies the measures of service quality and customer satisfaction. Also, the e-CRM concept provides telecom companies to conduct interactive, personalized, relevant communication with their customers by electronic and traditional channels to integrate all the e-business applications. By this way, the company can provide new opportunities to understand customer needs, economies, and to reach new customers, offering value adding services in real time, so as to achieve effective e-CRM complicated task. CRM application is critical to business, but its concept and value is not properly understood. This paper reviews its implications, applications as to how CRM and e-CRM can effectively progress to find e-marketing solution to the existing business database and marketing practices.

1. TELECOM SECTOR IN INDIA AND CUSTOMER RELATIONSHIP MANAGEMENT (CRM)

Until 1995, the Indian government held the monopoly of the telecom sector, which was considered as the basic and a major infrastructure (Telecom India Daily, 2008). Possessing a telephone was measured as a luxury item, when the new connection waiting time stretched several months. Hence, the level of Tele-density in India was abysmally low. Due to liberalization, the new telecom sectors were launched and private operators entered. Since then, various government bodies, and TRAI - Telecom Regulatory Authority of India, the industry regulator, ensured that telephony be effortlessly available to everyone. A brief telecom timeline policy evolution is explained below (Prabhu et al., 2014).

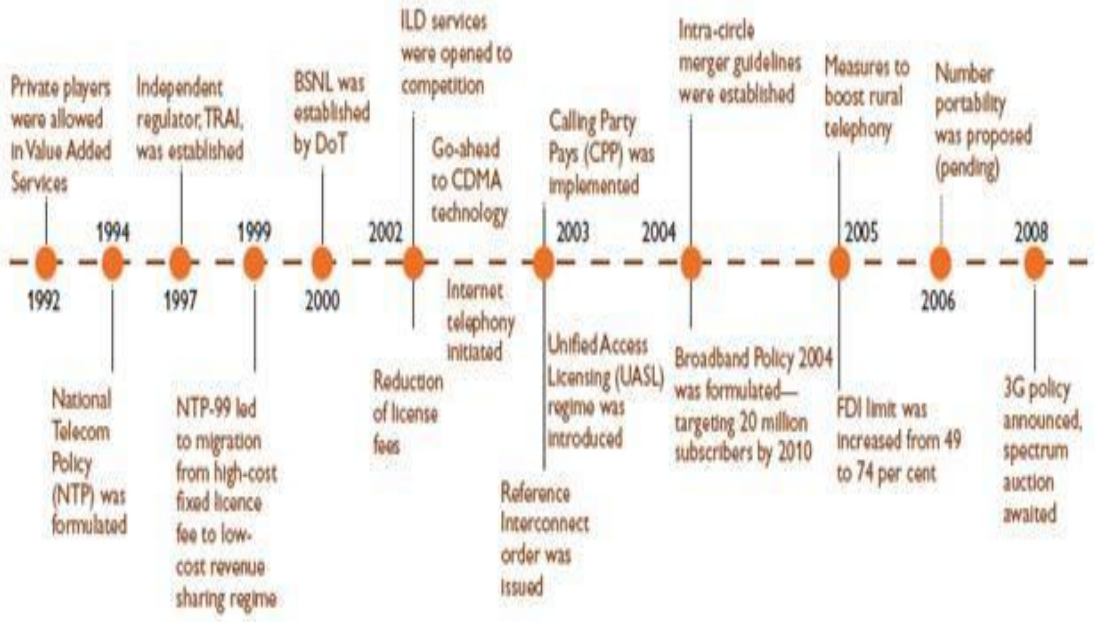

Figure: Indian telecom timeline policy evolution (Prabhu et al., 2014).

CRM - Customer Relationship Management always bond invisible threads, and they cultivate the essence and the real meaning of life. Only the customer relationship in the society and organization help in linking relationships, to build an exclusive bond between customers and organizations (Agrawal & Rastogi, 2009).

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The Indian telecom sector is currently facing an acute competitive difficulties after deregulation. Several major developments and growth started taking place after 2000. Under these conditions, the providers of telecom services started struggling with very complicated issues concerning advances in value added services, new technologies, because of constant innovations. Many telecom service industries got impacted due to this churning and blending phenomenon, with customers quitting and joining the new sector instantly. As per the recent survey, this kind of 2% churning every month, the operator loses 24% customers each year. As a result the telecom industry got affected considerably due to shifting of customers to the new telecom sector due to various reasons. The telecom sector CRM ultimate goal is to offer an appropriate software application package to increase customer satisfaction, productivity and revenue, by coordinating, synchronizing, and managing customer interaction level at every touch point including customer contact center, field organization, web, and distribution channels. This review paper is to highlight the marketing strategies applied by Indian telecom industries to enhance Customer Relationship to pursue the prevailing highly competitive and rapidly changing telecom environment, the effectiveness of customer satisfaction and service quality offered to them and satisfaction of customers (Mohammed, 2013).

In the past two decades, the Indian government vision of cellular telephony has moved ahead to achieve this vision of government. In fact, the telephone connection target of 500 million was reached in September 2009 (Telecom Talk, 2009). Moreover, from the 509.5 million prevailing telephones in India, the mobile phone subscribers formed a remarkable 92.5% (TRAI, 2009). The urban region customers of cellular subscribers have largely benefitted by increased selection with a diverse choice of operators, with respective reduced call rates (Prabhu et al., 2014).

The transition from the growth phase to maturity phase, and imminent advanced technology associated with MNP and 3G regulatory policies, there were changes, the QoS issued new plans and added telecom towers everywhere, and the government agencies provided proper planning with a long term, forward safety approach and better policy decisions (Ray, 2007).

2. EVALUATING THE EFFECTIVENESS OF CRM IMPLEMENTATION IN INDIAN TELECOM INDUSTRY

The concept of CRM is recently known as highly popular buzzword in the marketing field as a software derived automation component, is in fact, materialized from the back-office shadows of the ERP - Enterprise Resource Planning software market. Yet, its value and applicability is not completely understood well. The basic CRM constituents are technology, people, and processes. Only by significant knowledge of our customers, can help serve them effectively so as to keep them contented and loyal forever. This forms the prime theme of CRM - Customer Relationship Management. However, simply by understanding the CRM, meaning, the purpose is not served. The CRM can imply a business philosophy, apprehended as business strategy, inferred as a business process, or applied as a technological tool. As a business philosophy, as stated by Ryals & Knox (2001), CRM generates customer retention, relationship orientation, and improved customer value creation using process management. Making its use as the business strategy, CRM is basically a customer centered activity, applying the business strategy aimed to enhance customer loyalty and satisfaction by providing more customized and responsive services (Croteau & Li, 2003). CRM is highly aggregated, macro-level system that includes various sub-processes, like an identification of prospects and creation of customer education and knowledge (Srivastava et al., 1999).

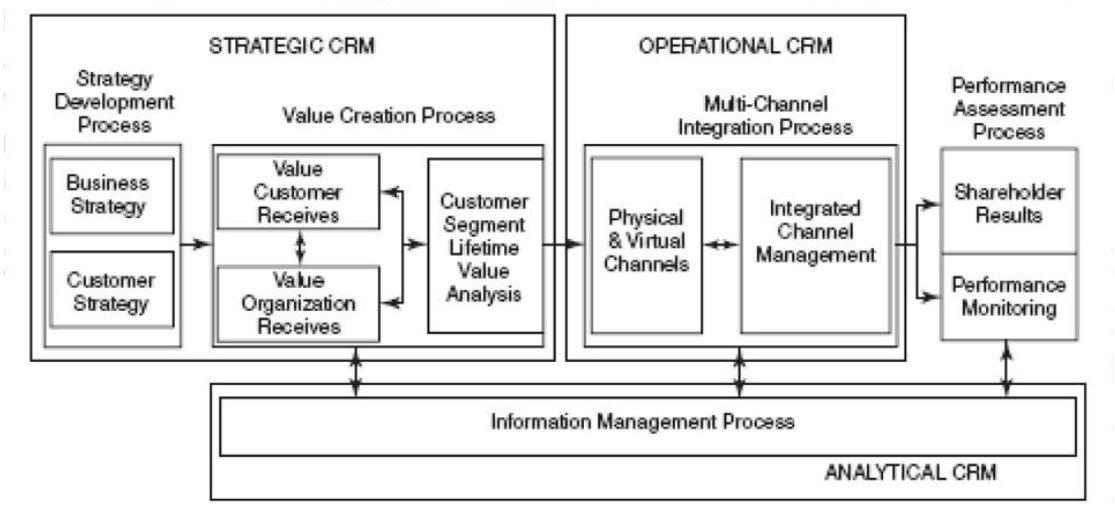

Figure: The connection between CRM processes and forms (Rababah et al., 2011).

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The advanced technology of CRM helps organizations to cultivate and promote nearer relationship with the customers. The more agreeable CRM meanings generate (i) Different to various scholars and researchers with diverse academic backgrounds; (ii) Is yet an emerging trend to align with various needs that require more studies and time to arrive at consensus; (iii) The CRM multidisciplinary nature combines marketing, management, and service disciplines. However, the conception of CRM can also be derived from a balancing perspective, to state that CRM creates a policy, philosophy, and it coordinates a better strategy intervened by various sets of IT - Information Technologies to focus on generating two way effective communication with customers, by which, the organization can obtain an in depth knowledge of their wants, needs, and buying patterns. Furthermore, CRM cultivates a customer-specific culture and strategy by which, more products are created to acquire and enhance the profitability by retaining more customers enabled by the application of IT.

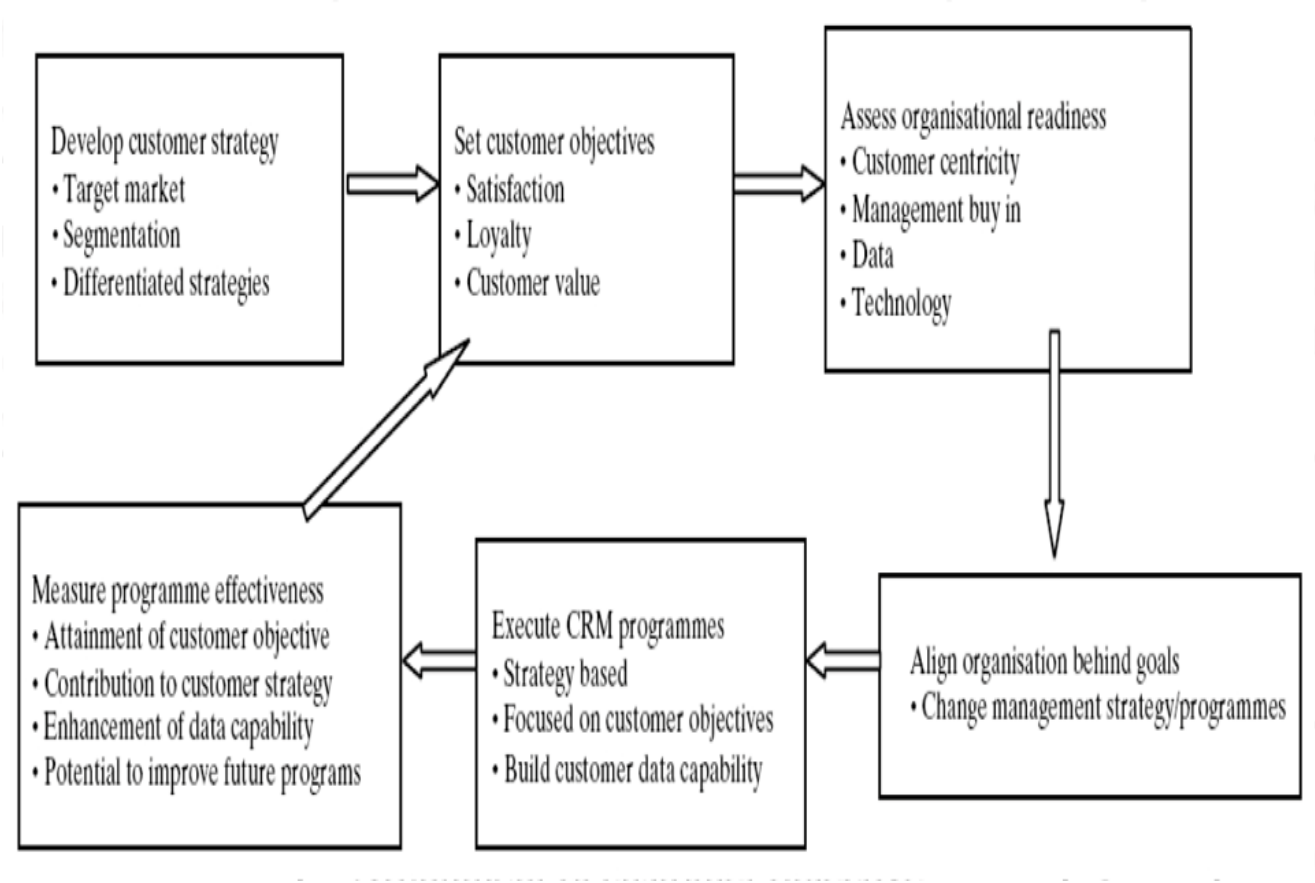

Figure: CRM Processing Model (Rababah et al., 2011).

CRM helps achieve additional benefits for both the customers and the organization. Hence, it drives an increased awareness of CRM notion, and the need for critical and extensive investigation of various elements and components of program initiatives. There are three major pillars of CRM; processes, people, and technology. In general, the CRM implementation, failure rate is very high. To give an example, in 2001 the CRM failure rate was projected at 54% to 76%. Furthermore, around 70% CRM projects were resulted in loss or showed no major performance improvement in the company (Zhang, et al., 2006). Hence, the CRM programs need to have an (i) the efficient management to transform the business processes to improve; (ii) The systematic business process alignment with IT operations; and (iii) The clear understanding of CRM procedures. The major CRM application failures are due to (i) Inaccurate re-engineering, business procedures; (ii) Not properly defining business processes before CRM implementation; (iii) The problems to measure CRM deployment effectiveness. Therefore, the focus of this paper is on the CRM process element (Adebanjo, 2006).

3. CRITICALLY ANALYZE THE CUSTOMER PREFERENCE AND SATISFACTION IN TELECOM SECTOR IN INDIA

The Telecom sectors consistently try to satisfy customers, and expect them to return to buy more, and also tell other people regarding their experiences, as they are prepared to pay a premium value for doing transactions with a known supplier they fully trust. Statistics indicate that the cost of maintaining the old customer is mere one tenth of captivating a new one. Hence, by conducting a proper customer satisfaction study can provide a proper ways to measure where the company stands from the customer loyalty point of view (Finnegan & Currie, 2010).

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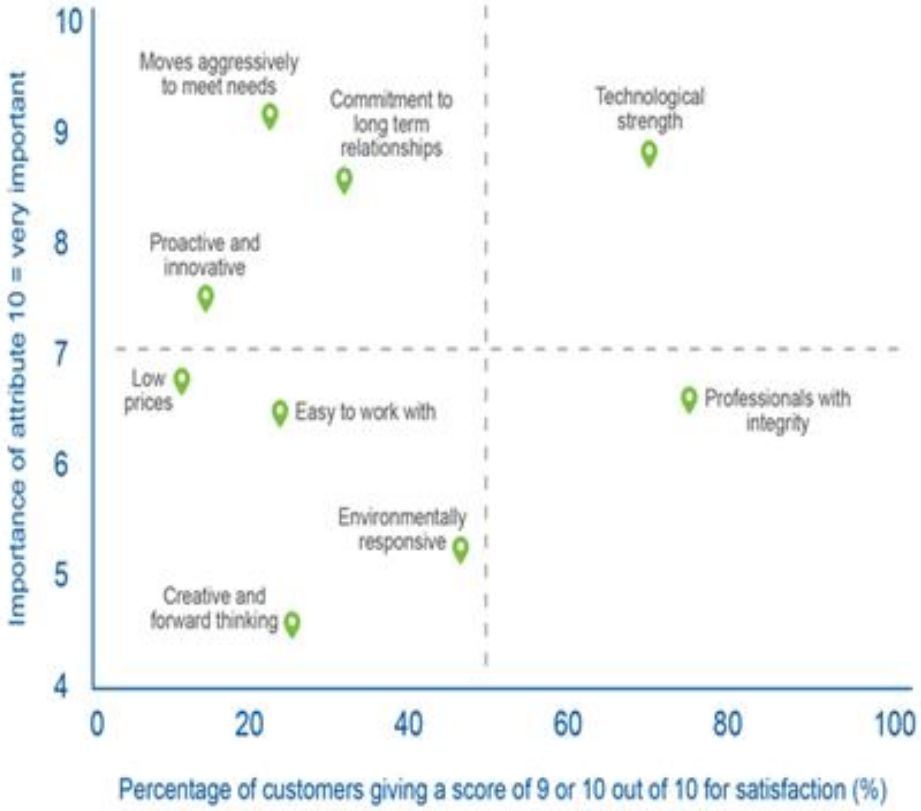

Figure: Indicating where the customer satisfaction level needs to be improved (Hague & Hague, 2017).

Therefore, some companies fail to satisfy customers instead of customers get satisfied? When a customer buys a product, they expect the product to be appropriate for their needs and correct for the price. To get the satisfaction of buying and using the product, the customer pays the price and the money for. In the course of time, the satisfaction bar turns higher every day, while the complications in our life keep increasing the stress levels. The companies therefore strive to achieve high scores of customer satisfaction by delighting them, while the environment becomes more difficult due to an intense competition.

Figure: Customer loyalty & satisfaction effects (Hague & Hague, 2017).

A market traders constantly press their finger to measure the pulse level of customer satisfaction. Understanding the customer by keeping the direct touch with them shows where the system goes wrong or where it is rightly done. This kind of informal feedback becomes beneficial and worthwhile, however, it turns difficult to manage and control. Therefore, the customer survey is vital to justify, track and measure the level of customer satisfaction (Finnegan & Currie, 2010).

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The five steps to customer satisfaction: Spotting the gap; Redefining the segmentation and processing; Redefining the proposition of the Customer Value; Generating an action plan; Measure and review of satisfaction levels of customers.

Figure: Customer satisfaction and improvement stages (Hague & Hague, 2017).

The program to develop customer satisfaction is not simply concerned with getting the customer survey, but it offers the measure to indicate where more attention is needed in several business aspects as preferred by customers. Mostly, the major and long lasting product quality developments require the basic company transformation, possibly involving staff development and training for a cultural change. The procedures and results have to be financially viable and beneficial with higher market contribution with reputation, stronger brand awareness, premium prices, less customer churn, and happy staff (Hague & Hague, 2017).

4. ECRM, CUSTOMER LOYALTY & SATISFACTION: A COMPREHENSIVE REVIEW STUDY

The e-customer relationship management, e-CRM is the most recent technique most of the companies applying to enhance and improve their marketing abilities, skills and automation capabilities. The procedure integrates the science, technology and marketing aspects of the business elements. Thus the e-CRM encompasses every aspect of the customer needs to provide an elaborate online transaction with experience in the entire business cycles of Pre-During and After purchase (Alhaiou, Irani & Ali, 2012).

The e-CRM, Customer Loyalty & Satisfaction form a comprehensive model, that explains the e-CRM feature effects for various e-loyalty levels at many transaction cycle adoption phases. The self- directed empirical study survey found that this kind of research demonstrates the entire e-CRM features, which generate a strong influence on e-satisfaction. In turn, it creates a remarkable effect on e-loyalty, with a mediating role played by e-satisfaction clearly marked in this model. There are practical consequences, where the empirical results demonstrate a certain managerial role implying successful developments executing e-CRM strategy. As per Alhaiou et al. (2012) every stage of e-CRM transaction maintains pre-service; during the service; post-service features to help strengthen the internet relationships and that increases the overall levels of customer satisfaction.

Figure: Pre purchase (Alhaiou, Irani & Ali, 2012).

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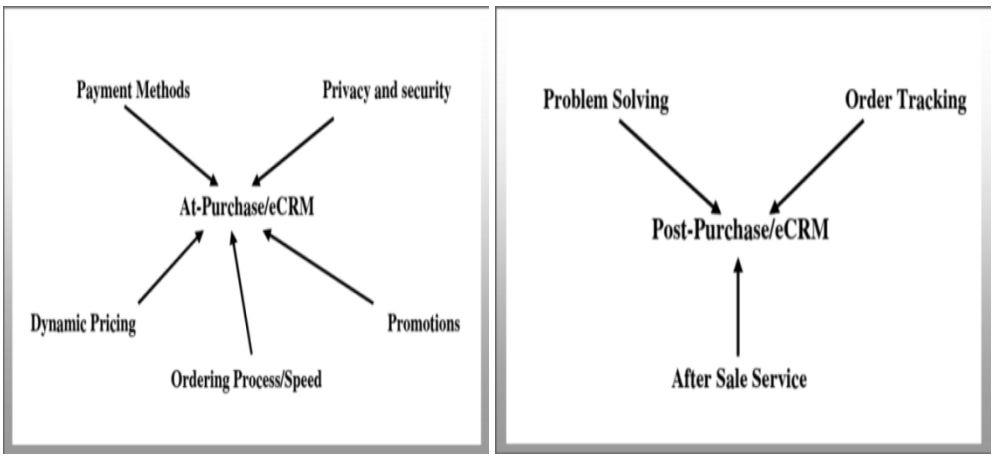
The online electronic transactions cover three stages of online purchasing and services offered. They are pre-product sale and service for the information search, at the services offered for sale and after sale service (Ismail and Hsieh (2009). As per Alhaiou et al. (2012), every e-CRM transaction phase has definite features like pre-service, during, and after sales service, and they help strengthen the online relationship over the internet, and that also helps to increase an overall level of customer satisfaction. Hence, these e-transaction features, sales and service cycle are often applied to understand, examine and maintain the connection between e-Customer; e-CRM; e-Loyalty; and e-Satisfaction.



Figures: During and After purchase (Alhaiou, Irani & Ali, 2012).

Any organization, therefore, can gather additional information regarding all their valued customers, by using the methods of customized alerts and packages sent and delivered information as per the needs of every individual customer (Lun, et al., 2008).

5. THE IMPACT OF CRM ON CUSTOMER LOYALTY & SATISFACTION

The CRM - Customer Relationship Management is mainly to increase the customer base, satisfy their needs and enhance their buying and product satisfaction so as to generate the customer loyalty. CRM includes the conceptual philosophy and uses the combination of relationship building with customers along with highly technological based marketing to impact the sales and satisfaction so as to gain loyalty of customers (Heidari & Najjari, 2015).

Thus, CRM formats a sequence integrating various practices for the whole organization to adopt, maintain, so as to improve the customer base. There are several systematic reviews and empirical researches were conducted from various journal and conference sources, gathering papers, covered for the year 2006 to 2016. The results are varied from the industries, CRM classification, publication trends, conducted in different countries. The results obtained were bifurcated into three dimensions, and they are often used in every study that involve the applications and influences generated by CRM on the customer loyalty and satisfaction along with their SQ - Service Quality (SQ); SA - Service Access; and HC - Handling Complaints. These specific factors are observed to create a definite effect on the levels of customer loyalty and customer satisfaction. The customer satisfaction and loyalty cannot be underestimated or denied, because the happy customers provide free advertising and product promotion for the company. It is further debated that by preserving and maintaining the existing customers is very easy compared to finding new customers (Ogunnaike et al., 2014).

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6. CRITICAL REVIEW OF CUSTOMER SATISFACTION MEASUREMENT AND PREFERENCES IN TELECOM INDUSTRY

Retention of Customers is the most valuable process to convince the present customers of their importance and value for the organization, as they continue to use proper services of the organization, by not thinking to defect to other competitors. In the Telecom sectors, due to extremely high competition, implementing proper procedure of customer retention commences with the initial communication, connection, and dealings with the customers, and that needs to continue throughout the business lifetime. The telecom service provider's ability to retain their prevailing customers not simply depend on their services provided by them, but further continue their efforts to serve them in a more systematic and improved manner. In the telecom business, retention of old customers is extremely important and it is the most arduous and onerous mission for the company. When we understand that the retaining cost of customers is very low compared to fascinating and drawing new customers. Hence, every company should direct their focus and efforts to channelize their time, money and energy to retain the existing customers, while conducting an immaculate marketing strategy to acquire new ones. Increase in uncertainty and complexity in the present business environment, while the new entrants are constantly intensifying the global level competition, all the telecom service providing sectors in India should strive to serve their customers more effectively gain their confidence; loyalty and satisfaction in a most improved manner (Terblanche & Boshoff, 2010).

Customer retention is extremely difficult if the number of competitor starts increasing, like in telecom service sectors and industries, as the fierce competition can grab most of the business by providing attractive sales and services. The rate of customer attrition in insurance and banking industries is comparatively low, due to high exit barriers. However, the attrition rate in the service providers and industrial sectors like telecom becomes relatively large due to less switching over costs. To reduce the churning of customers merely by 1% means million dollar loss to the company. Hence, the strategy to retain the customers with effective methods is very crucial and valuable for the long lasting survival effect and for the further industry growth. Therefore, CRM has turned out to be the most viable strategy to enhance, diverse and promote all the business complications presently existing and new emerging in all the global business situations. As per Ramakrishnan (2006), CRM is the most effective application of processes, and from the technology point of view, the infrastructure needs to capture, analyze and share all the facets and attributes of customer understanding and relationship with the company in a more symbolic manner (Sarkar, 2017).

7. CONCLUSION

The Indian telecom was managed by the state owned BSNL and MTNL, and they had the absolute authority, giving rise to corruption and dishonesty. The Landline phones used to control and rule the Indian telecom region. There were very few Mobile phones used by only elite segment and ultra rich families. The telephone call charges remained extremely high and that kept the normal people away from the telecom service. Only after the economic liberalization, the most advanced and technologically improved telephonic services started flooding by private as well as foreign investors entering the Indian economy in every possible sector, including the telecom sector. The fierce competition was created, resulting in an idyllic diffusion model of the of new and advanced telecom services in every segment, triggering a high scale telecom revolution in India, and India became the 2nd biggest telecom global market with above one billion telephone customers. Therefore, today, in this fierce telephone marketing competition, when the mobile phones dominated the Indian telecom sector entirely, the use of landline phones has almost become an extinct class. The application of CRM has become the most vital part of the marketing strategy by providing the lowest tariff, along with several value added services, customer level demand creation, gaining loyalty and satisfaction, introducing new and technically advanced mobile phones, with additional facilities and services have virtually turned out to be the inseparable fraction of our lives. Moreover, the introduction of smart phones together with 3G and 4G services entering India, there is a rapid move towards another revolution in the ever growing Indian telecom zone (International journal for innovative research in multidisciplinary field, 2016).

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ASSESSMENT OF GROUNDWATER QUALITY OF SANGANER TEHSIL, JAIPUR CITY, RAJASTHAN

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ABSTRACT
The current study was conducted to assess the quality of groundwater of Sanganer Tehsil of Jaipur City (Rajasthan), India. For the study, Samples from 26 villages were collected from publically used hand pumps and bore wells. The samples underwent Bacteriological examination as well as Physio- Chemical analysis of parameters which included Chlorides, Fluorides, Nitrates and Totally Dissolved Solids. When compared to the Bureau of Indian Standard (BIS) norms for potable water, the results unveiled that the water of many villages was not potable. Water of many villages failed the guidelines for bacteriological quality and required treatment to be used as drinking water.

Keywords: Groundwater quality, Sanganer Tehsil, Bacteriological examination, Chemical analysis

INTRODUCTION
Water is the most abundant compound on the surface of Earth and it is also the most abundant compound in the human body. Water is essential for human beings to survive. Major sources of water are surface water and groundwater. Groundwater is an important natural source of water which is used all over the world and it is the most commonly used source of water too. Groundwater is used in the fields of irrigation, industries and for domestic purpose. Groundwater quality depends on the quality of discharged water, atmosphere, surface water, and on geochemical processes held on sub-surface [1]. Rajasthan is known to be a dry and semi-arid area. Due to insufficiency of surface water, majority of the population in the state, have to rely on groundwater sources. In a lot of areas, groundwater is the sole source for water which is to be used for drinking.

Jaipur is the capital & largest city of Rajasthan in northern India. It is the tenth most populous district of India & spreads over area of 11,152 km^2. It has 13 subdivision and among those Sanganer (Longitude: 75° 46' E Latitude: 26° 49' N; shown in Fig.1) is a big subdivision of Jaipur. It covers an area of 635.5 km^2 [2]. Jaipur is highly dependent on groundwater for daily use water supply. Due to urbanization, agricultural & domestic waste, the groundwater quality has deteriorated immensely which has led to the spread of many fatal diseases. Hence, this study is designed to assess the quality of groundwater of Sanganer Tehsil and to make the people aware of the kind water they are using.

Fig.-1: Map of Sanganer Tehsil

METHODOLOGY
For the study, groundwater samples from hand pumps and tube wells of 26 villages in the North-Western part of Sanganer were collected in the winter period from December 20, 2017 to February 20, 2018. The samples were collected in sterile plastic bottles and were tested for Bacteriological presence and for chemicals such as Fluoride, Nitrates, Chlorides and Total Dissolved Solids (TDS) according to the methods approved by APHA (2012).

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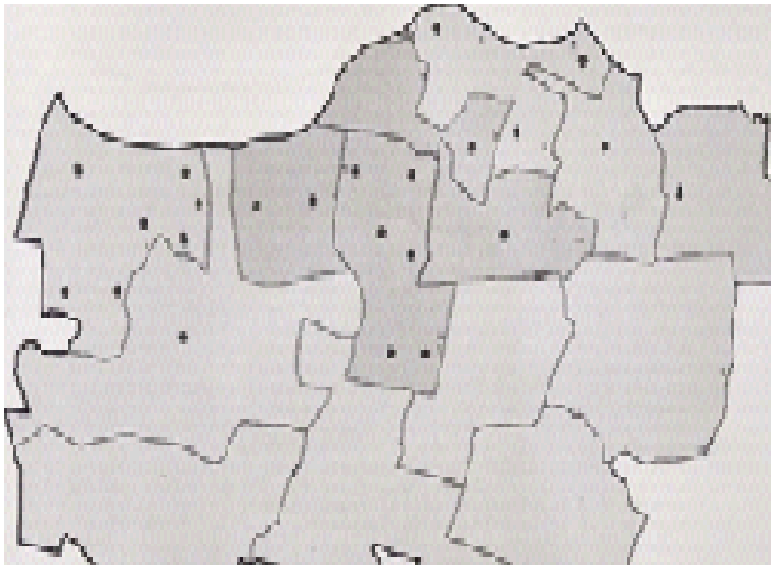

Fig. -2 : Map Showing Sampling Stations in Sanganer Tehsil

RESULTS AND DISCUSSION

All achieved results are compared with that of standard permissible limits recommended by B.I.S. i.e. Bureau of Indian Standard, I.C.M.R. i.e. the Indian Council of Medical Research and W.H.O. or the World Health Organization as shown in Table-1. The resulting values of the tests for water quality parameters in the groundwater samples collected from Sanganer are presented in Table-2.

TABLE-1 : RECOMMENDED STANDARDS FOR POTABLE WATER

S.No.	Parameters	BIS (2012)	ICMR (1975)	WHO (2003)
1	Fluoride (mg/l)	1.5	1.5	1.5
2	Nitrate (mg/l)	45	50	50
3	Chloride (mg/l)	1000	200	250
4	TDS (mg/l)	2000	500	-
5	Bacteriological Presence	Nil	-	Nil

A. Fluoride

Fluoride an important life elements to the health of humans and crucial for normal mineralization of bones and for the formation of dental enamel with presence of lesser quantity, but at a higher quantity i.e. more than 1.5 mg/l might cause harmful effects on human health. Fluorosis is a kind of disease caused by immoderate concentration of fluoride in drinking water. Fluoride existence in groundwater can be attributed to geological reasons. Fluoride is present innately in water resources. Generally, majority of groundwater sources have excessive fluoride concentrations when compared to surface water sources. Fluoride enters into soil via weathering of rocks, precipitation and impure water, mainly from fertilizers and waste run-off. Drinking water is a sizeable source to the daily fluoride intake. The enamel fluorosis is spotting of enamel that is forever present once a child's teeth are created. It is explained as a harmful effect caused by interference of fluoride with ameloblasts in the developing tooth, emerging in a disturbance of the process of formation of enamel making it ever more porous.

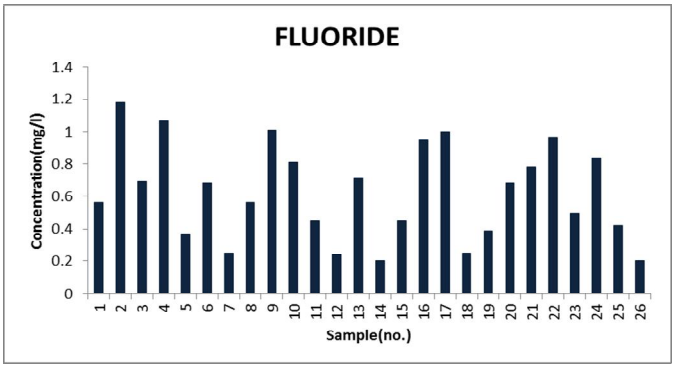

Fig.-3: Fluoride Concentration in Various Samples

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Fluoride weakens bones and increases the risk of fractures. People exposed to around 4 mg/l of fluoride through drinking water over their lifespan are likely to have an increase in bone fractures over those subjected to 1 mg/l. There are multiple endocrine effects of fluoride exposure which includes earlier sexual maturity, reduced thyroid function and Type 2 diabetes. Fig. 3 shows concentration of fluoride in different samples as per sample numbers in Table-2.

Fluoride concentration of the area studied varies from 0.20 mg/l to 1.18 mg/l. The most Fluoride concentration was recorded at Begas (Sample 2, Fig.3) and the least was at Garedo Ki Dhani (Sample 14, Fig.3) and Narwariya (Sample 26, Fig.3).

B. **Nitrate**

Nitrate exposure has toxic biological effects hence, it is considered to be a contaminant in the drinking water which is mostly sourced from the ground. High concentrations of nitrate can cause methemoglobinemia. It is a blood disease which causes infant cyanosis, or blue-baby syndrome. Methaemoglobin presumably forms in the intestinal tract of infants when nitrite ion is formed from nitrate ion by the bacteria. One nitrite molecule then reacts with two molecules of haemoglobin to form methaemoglobin. In acidic mediums, like in the stomach, this reaction takes place quite quickly. The modified form of blood protein blocks the blood cells from taking in oxygen which leads to prolonged suffocation of the infant which could be lethal. Also, diseases such as Alzheimer's disease, vascular dementia, multiple sclerosis can happen in human beings due to excess of Nitrate consumption. Nitrate contamination also promotes Eutrophication of water bodies. Mostly, Man-made sources cause the concentration of nitrate to increase towards a hazardous level. Human and animal sewage disposal sites; waste from industries related to processing of food, munitions are a few sources of potential Nitrate contamination of groundwater. Recently, it has come to attention that vacant manure storage facilities can be more dangerous to groundwater than completely full ones. The concentration of nitrate in groundwater is also related to rainfall. Where there is low rainfall, the concentration happens to be greater because the dilution effect decreases. Fig.4 shows concentration of nitrate in different samples as per sample numbers in Table-2. In the area studied, the Nitrate concentration varies from 14.26 mg/l in Gopalpura (Sample 25, Fig.4) to 58.986 mg/l in Thikariya (Sample 6, Fig.4).

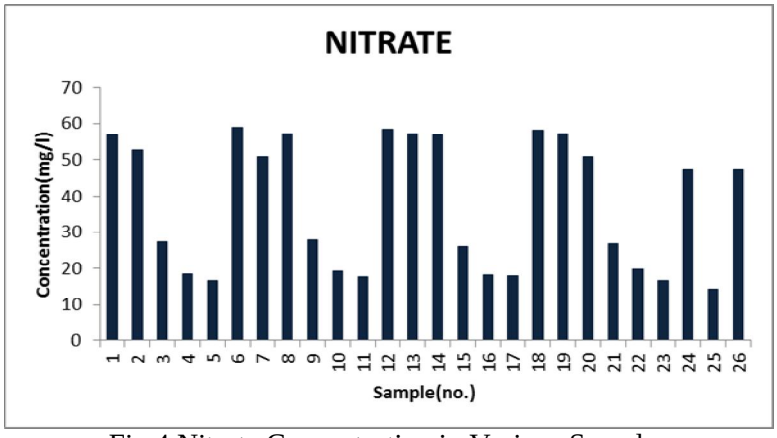

Fig.4 Nitrate Concentration in Various Samples

TABLE-2 RESULTS OF GROUNDWATER SAMPLES ANALYSIS COLLECTED FROM VARIOUS PLACES IN SANGANER TEHSIL OF JAIPUR CITY

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SAMPLE.NO.	VILLAGE NAME	FLUORIDE (mg/l)	NITRATE (mg/l)	CHLORIDE (mg/l)	TDS (mg/l)	BACTERIOLOGICAL PRESENCE
1	DEHMI KALAN	0.56	56.93	144.79	267.66	A
2	BEGAS	1.18	52.75	99.85	340.99	A
3	DEHMI KHURD	0.69	27.29	314.98	364	P
4	RIICO IND. AREA	1.07	18.534	339.84	1820	A
5	SANJHARIYA	0.37	16.792	351	580	P
6	THIKARIYA	0.68	58.986	376.25	580.447	P
7	AWANIYA	0.25	50.898	316.55	384.65	A
8	ACHANCHUKYA	0.56	57.144	335.52	391.025	A
9	HARCHANDPURA @ DEOLIYA	1.01	27.696	318.55	395.512	A
10	CHORASYA KI DHANI	0.81	19.236	405.355	1858.974	A
11	SITAPURA BAS SANJHARIYA	0.45	17.734	156.7	288.46	P
12	SARANGPURA	0.24	58.516	343.51	576.99	P
13	KODAR	0.71	57.162	339.521	423.076	A
14	GAREDO KI DHANI	0.2	56.896	329.535	391.025	A
15	HARDHYANPURA	0.45	26.126	355	378.205	A
16	DHANI	0.95	18.234	294.58	1903.842	A
17	BALMUKUNDPURA @ NADA	1	18.048	157.77	310.256	P
18	NANGAL BAR GOOJRAN@PHAGODIYAWALA	0.25	58.07	324.5	606.41	A
19	KUMAWAT KI DHANI	0.39	56.968	333.52	392.564	A
20	BARH AWANIYA	0.68	50.876	333.52	416.636	A
21	RAMPURA WAS DEOLIYA	0.78	26.67	355.535	391.025	P
22	HASAMPURA	0.97	19.76	479.89	1955.128	A
23	PRITHVISINGHPURA @ NAIWALA	0.5	16.806	145.79	294.87	P
24	CHIROTA	0.84	47.15	84	563	A
25	GOPALPURA	0.42	14.26	184	609	P
26	NARWARIYA	0.2	47.324	1064	1750	A

**A=Absent; P=Present*

C. Chloride

Chlorides are extensively scattered in nature as salts of calcium ($CaCl_2$), potassium (KCl), and sodium (NaCl). NaCl is mostly applied in producing industrial chemicals such as chlorine, caustic soda, sodium hypochlorite, and sodium chlorite. NaCl, $CaCl_2$, and MgCl are widely used in ice and snow control. KCl finds its use in the production of fertilizers. The process of weathering makes chlorides leach from multiple rocks into water and soil. The chloride ion is very mobile and is transported to oceans or closed basins.

Chloride enters groundwater and surface water from both natural and Man-made sources, such as run-off with road de-icing salts, the use of chemical fertilizers, septic tank and industrial effluents, landfill leachates, animal feeds, irrigation drainage, and seawater intrusion in coastal places. About 88% of chloride presence in humans is extra-cellular and it promotes the osmotic activity of bodily fluids. A normal adult human contains almost 81.7 gram of chloride. On account of a sum of obligatory loss of chloride of around 530 mg/day, an intake for adults of about 9 milligram of chloride per kilogram of body the weight is suggested. As far as children of up to 18 years of age are concerned, a daily intake of 45 milligram of chloride is deemed to be enough. An intake of 1 gram of NaCl per kg of body weight was reported to have fatal consequences in a 9-week old child. Chloride noxiousness hasn't been seen in human beings except in the special case of damaged NaCl metabolism, for e.g., in congestive heart failure. Fig.5 shows the concentration of chloride in different samples as per sample number in Table-2. In the studied area, the range of Chlorides was from 84 mg/l which was found in Chirota (Sample 24, Fig.5) to 1064 mg/l found in Narwariya (Sample 26, Fig.5).

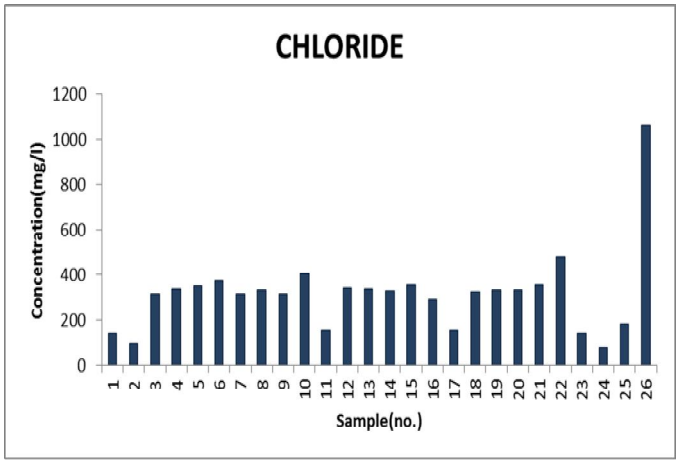

Fig. -5: Chloride Concentration in Various Samples

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C. **Total Dissolved Solids**

Total Dissolved Solids (TDS) are the total amount of mobile charged ions, including minerals, salts or metals dissolved in a given volume of water. Total Dissolved Solids are related directly to quality and purity of water and purification systems of water and affects everything that consumes, lives in, or uses water, whether inorganic or organic. Dissolved solids refer to any salts, metals, minerals, anions or cations which may be dissolved in water. This includes anything present in water other than suspended solids and the pure water molecule. Generally, the TDS concentration is the sum of the anions and cations in the water. Some dissolved solids come from sources which are organic such as leaves, plankton, silt, sewage and industrial waste. Sources other than these come from runoff from urban areas, fertilizers and pesticides used on lawns and farms and road salts used on street during the winter. A source for Dissolved solids are also inorganic materials such as rocks and air that has calcium bicarbonate, sulphur, nitrogen, iron, phosphorous and other minerals. Most of the aforementioned materials form salts, which are compounds that have both a non-metal and a metal. Salts usually dissolve in water forming ions. Ions are particles that have a negative or positive charge. High Totally Dissolved Solids result in unpleasant taste which could be metallic, salty or bitter. It could also indicate the presence of harmful minerals. High TDS also indicates Hard water, which causes scale building up in valves and pipes, reducing performance. Fig.6 shows the concentration of TDS in different samples as per sample numbers in Table-2. In the study area, the highest TDS of 1955.128 mg/l was found in Hasampura (Sample 22, Fig.6) and the lowest TDS of 267.66 mg/l was found in Dehmi Kalan (Sample1, Fig.6).

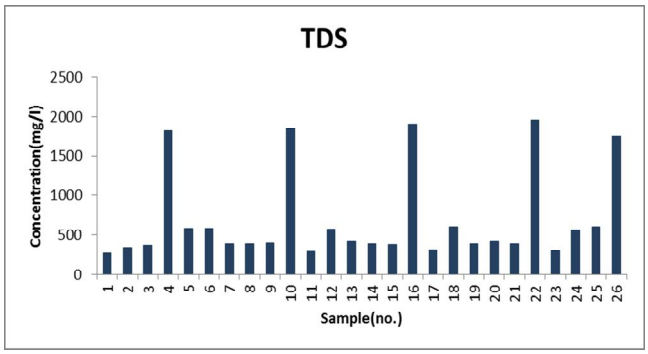

Fig.-6 :TDS Concentration in Various Samples

E. Bacteriological Presence

Total coliforms are a group of bacteria that are most commonly found in the environment, for example in vegetation or soil, also in the intestines of mammals which also includes humans. Total coliform bacteria aren't tenable to cause illnesses, but their existence shows that the water supply may be unguarded from pollution by even more toxic microbes. Escherichia coli which is also called E.coli is one part of the total coliform bacteria group bacteria that is discovered only in the intestines of mammals, including human beings. E.coli when found in water shows recent faecal pollution and may show the likely existence of illness-generating microbes, like bacteria, viruses, as well as parasites. Some strains of E.coli such E.coli 0157:H7, may induce diseases but not all E.coli bacteria are hazardous. Drinking water which contains coliform bacteria ups the possibility of catching a water-borne disease. A confirmed result for faecal coliform or E. coli presence in samples is a severe breach of standards for potable water. Faecal coliform bacteria live chiefly in guts and faeces of warm-blooded animals. Faecal coliforms are thought of as a better signal of animal waste or human waste pollution than total coliforms. E. coli is a kind of faecal coliform. Its presence is known to be the foremost indication of faecal contamination and that more microbes may be available. Insufficient attention to the treatment of supplied water, the manure of animals, and septic tanks are great originators of coliforms in groundwater and drinking water. The existence of microbes in groundwater deeply relies upon geological parameters such as flow pathways and mechanisms, sunlight, pH, temperature, and properties of soil. The sort, size, and activity of the microbes' group are also essential components that dictate terms of transport of microbes.

The diagnosis of coliform bacteria could be a sign of existence of a life form that may cause illnesses, including toxic strains of coliforms, parasites such as Cryptosporidium or Giardia, and bacteria which are non-coliform. These beings can cause diseases from intestinal infections, dysentery, and gastroenteritis to hepatitis, typhoid fever, cholera, and many other diseases. Intestinal infections and dysentery are generally considered small health issues in otherwise healthy adults. However, such problems may be deadly to infants, the old and to those who are already sick. The indications of water-borne illness are: fever, abdominal cramps, nausea, vomiting, headaches, fatigue, maybe jaundice, and diarrhoea. These symptoms might lead to severe malnutrition, dehydration, kidney failure, and in some cases death.

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When found in drinking water, the existence of coliform generally indicates insufficient water treatment, complications or unknown oozing within the system of water distribution, and/or pollution due to seepage from septic tank seepage and livestock affairs. Almost 35% of all the sampling sites' groundwater was contaminated by coliforms as revealed by the study.

CONCLUSIONS

After study of analytical data of groundwater of Sanganer Tehsil, Jaipur, Rajasthan for the chemicals such Fluoride, Chloride, Nitrate and TDS and also Bacteriological Examination, it is noted that Fluoride concentrations are all under permissible range of 1.5 mg/l as per BIS and WHO. Nitrate concentrations of almost 50% of the villages exceed the permissible amount. As per BIS, Chloride concentration is under permissible limit for all villages, so is the amount of TDS. It is alarming to see that almost 35% of the groundwater sources are contaminated with bacteria and immediate action should be taken to rectify this [3], [4].

When it comes to nitrate levels in groundwater, the foremost advice to avert risk of health is to get wells checked frequently and reduction of use of fertilizers on fields. The excess of nitrogen-full fertilizers to the soil in truth kills biota that helps to supply the soil with nitrogen, which can be used by the plants. By using lesser quantity of fertilizers, these crops could still be as high-yielding as the crops grown under highly fertilized soils, because of much healthier and suitable surroundings for the micro-organisms. If farmers use a huge amount of fertilizer at the start then they are forced to use increased amounts each following year. Using moderate to low quantities at the beginning gives the farmer a chance to avoid being caught up into this vicious cycle. Also, most of the above mentioned ways of prevention can be used to help bring down nitrate leaching from the soil into the groundwater.

Slurry stores and concrete lagoon pits can highly lessen the levels of nitrate concentration. By evading over-irrigation of a field, both turf grass managers and farmers can help to control nitrate leaching into the groundwater. Nitrate clean-up from the polluted waters isn't a simple task. So far, the most efficient and widespread method for dismissal is ion exchange model FGA-60N 30,000 grain whole house nitrate unit. Most of the other processes are either in the exploratory stage or not as extensively used. Nitrate is not treated while still in the aquifer and is most effectively removed in a plant. While it can't be fully dismissed from groundwater, the use of methods of treatment such as ion exchange and the use of preventative measures, will help in lowering nitrates to biologically safe levels [5], [6].

Chloride presence higher than about 250 mg/litre may cause water to attain a taste, but the threshold is up to the associated cations. Consumers though can become used to concentrations more than 250 mg/litre. There is no health based standard concentration value for chloride in drinking water [7]. To reduce TDS, RO which stands for reverse osmosis forces water against a semi-permeable membrane under very high pressure that makes water molecules pass through while removing most pollutants. Reverse Osmosis is the most in-depth technique of large scale water purification available. Distillation is another method available for water purification. Water vapour is produced by boiling the water. The water vapour condenses back into liquid form after rising to a cooled surface where it is collected. As the dissolved solids do not generally vaporize, they stay in the boiling solution [8]. Methods to remove bacteria from water can are disinfection and/or filtration. Even though only filtration cannot be sufficient in fully ousting bacteria, it does increase the output of disinfection by removing sediments that may contain bacteria. Methods of disinfection include iodization, chlorination, ozonation, ultraviolet light and methods such as steam sterilization or boiling which are physical methods [9], [10].

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WATER QUALITY ANALYSIS OF RAILWAY STATIONS OF JAIPUR CITY

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ABSTRACT
Water is most important natural resource. It is the basic need of all human beings. Ground water is the main natural resource for drinking but place for place like Jaipur mainly depends on the surface water. Jaipur is a popular tourist destination in India and serves as a gateway to other tourist destinations in Rajasthan, so huge amount of people travels in Jaipur. As Railways being the largest transportation mode in India, More than 300 trains daily passes from Jaipur Junction, Gandhinagar, Durgapura and Jagatpura railway station and thousands of passengers drink the water from public water supply of railway station. Therefore water quality must be checked. For this purpose the samples were collected in the month of September and October, 2017. Over the due course of time various parameters regarding the water quality were analysed and the Indian Standards: 10500 (BIS) were referred in order to check the acceptability of water. At last, Water Quality Index (WQI) is calculated for the six parameters i.e. pH, Hardness, Chloride, Alkalinity, TDS and Turbidity of different railway station. Most of the parameters were found to be in the desirable range for drinking water but total hardness and TDS indicates the poor water quality. The results show the water of all the four railway stations is poor according to the developed water quality index when the desirable limit of contaminants taken into consideration during the development of WQI.

Keywords: WQI, Railway station, Water Quality Parameters, IS 10500.

I. INTRODUCTION
Water is an important component for life. There are many uses such as transportation, fisheries, agricultural and industry purpose but the most important use is for drinking purpose. Water quality ensures the efficient use of the water for the different purposes. Day by day, water is getting polluted due to the different anthropogenic activities. As well as the quality and quantity of water also changes from place to place depending on the type and nature of rocks and soil of water bearing strata [1].

Now a days, the maximum population of India takes railway as their primary transportation. Indian railway is the fourth largest railway network in the world. There are more than 7000 stations all over India and more than 8 billion passengers travel across the country in a year. So maximum passengers depends on the water which is available in the stations. This drinking water in the stations is supplied by the municipal water department. In Jaipur, the drinking water is supplied from the Bisalpur dam which is treated and brought to the required destinations and then it is stored in the tanks. The important factor of the supplied water is the quality. The drinking water should meet the water quality standards.

In this paper, the water quality analysis of 4 different railway stations of Jaipur has been conducted and compared with Indian Standard 10500 to check the acceptability of water for drinking purpose. The Water Quality Index is the best way to communicate information about the quality of water to common people. It comprises of an equation which convert the large amount of data into a single number. The main objective of water quality index is to describe water quality at regional, national or international scales so that it can be classified within regulatory standards for various intended purposes such as potable water, agricultural and industrial water uses [2].

II. AREA OF STUDY
Jaipur, the pink city is situated at 26.9° N 75.8° E in the state of Rajasthan, India. According to census 2011 city has a population of 3.1 million.

Fig-1: location of railway station in Jaipur

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The areas under investigation are four major railway stations in Jaipur city namely Jaipur Junction, Gandhinagar station, Jagatpura station and Durgapura station and tap water is taken as sample from each staions. Fig. 1 shows the location of railway station in Jaipur.

III. METHODOLOGY

In this study, water sample was collected from each platform of four railway stations. Total 9 samples were collected in a single sampling. The sampling was performed in 4 slots in15 days of interval. The total numbers of collected samples were 36. The samples were collected in PVC bottles and stored in refrigerator at 4 °C for testing in the laboratory. Table 1 shows the abbreviation of railway stations.

Table-1: Abbreviations of the railway station

Sr. No.	Abbreviations	Full Form
1	JJ	JAIPUR JUNCTION
2	JP	JAGATPURA JUNCTION
3	DP	DURGAPURA JUNCTION
4	GN	GANDHI NAGAR JUNCTION

The tests were conducted on 8 water quality parameters i.e., pH, acidity, alkalinity, electrical conductivity, chloride, TDS and turbidity. After the analysis of result, Water Quality Index (WQI) has been developed according to Batabyal et al, 2015 [3]. The tests were conducted as per APHA [4] and results compared to the standard value provided in IS: 10500 [5].

IV. RESULTS & DISCUSSION

The collected samples were analysed for the water quality parameters which are discussed in this section.

Alkalinity

The determination of alkalinity of water is necessary for controlling the corrosion and to calculate the amount of lime and soda needed for water softening for boiler. Alkalinity of a sample of water is due to the presence of OH– (hydroxide ion), HCO3– (bicarbonate ion) and carbonate ion or the mixture of two ions present in water sample. The water sample collected from the Jaipur Junction has alkalinity around 440 mg/L , in contrast to that the alkalinity of water at station Gandhinagar was found to be 415 mg/L and at Durgapura station it was 369 mg/L and at Jagatpura station it is was 305 mg/L and it is within the range.

Hardness

The Hardness of water sample collected from the Jaipur Junction was found to be 760 mg/L in contrast to that the Hardness of water at Gandhinagar station was found to be 340 mg/L. At Durgapura station it was 308 mg/L and at Jagatpura station it is was 368 mg/L. It is observed that the hardness of Jaipur Junction crosses the limit of the IS standards. Hardness is caused due to salts of calcium and magnesium. If calcium is more then it may cause kidney stone, hypertension and stroke and if magnesium is excess then it causes bowel problem [6]. The solution to this problem may be to clean the pipes of the supplying systems. This will reduce the effect to some extent.

Chloride

The water sample collected from the Jaipur Junction has chloride concentration in the range of 124 to 158 mg/L, in contrast to that the chloride content of water at station Gandhinagar was found to be 158 mg/L and at Durgapura station it was 124 mg/L and at Jagatpura station it is was 158mg/L. So the values are within the range.

Total Dissolved Solid

The TDS of water sample of Jaipur junction was 3200 mg/L as CaCO3 which is higher than the permissible limit. The TDS of other stations are 1400 mg/L, 800 mg/L and 1400 mg/L at Durgapura, Jagatpura and Gandinagar station respectively. High TDS causes coronary heart disease, cardiovascular disease [6]. The problem is due to high value of hardness in that water.

Acidity

The results obtained from the test was found to be 38 mg/L, 68 mg/L, 132 mg/L and 156 mg/L at Jagatpura station, Gandhinagar station, Jaipur junction and Durgapura station respectively.

pH

The water sample collected from the stations was found to be neutral with pH recorded as 7.4, 7.5, 7.8, 7.5 in Jaipur Junction, Gandhinagar station, Jagatpura station and Durgapura station respectively. The results were found to be in range.

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Electrical Conductivity
The electrical conductivity of Jaipur Junction, Gandhinagar station, Durgapura station and Jagatpura station are 1952 µs, 920 µs, 756 µs and 960 µs respectively.

Turbidity
The turbidity of the water sample was found to be 0, 0, 1, 0 at Jaipur junction, Gandhinagar station, Durgapura station and Jagatpura station respectively. It shows physical appearance of the water.

After the analysis of result Water Quality Index (WQI) has been developed.

The WQI was calculated in 3 steps

a) Each of the 6 parameters (pH, total hardness, chloride, alkalinity, TDS and turbidity) is assigned a weight (wi) according to their importance in the water quality assessment. The weights are assigned from 1 to 5 based on their significance in the water evaluation.

b) The relative weight (Wi) of the chemical parameter is calculated from the following equation:

$$Wi = wi / (\sum ni=1\ wi)$$

Where,
Wi = Relative weight,

wi = Weight of each parameter, and

n = Number of parameters.

c) A quality rating scale (qi) for each parameter is assigned by dividing its concentration in each water sample by its respective standard according to guidelines [5], and the result is multiplied by 100:

$$qi = (Ci/Si) \times 100$$

Where,
qi = quality rating,

Ci = concentration of each chemical parameter in each water sample in mg/L, and

Si = Indian drinking water standard for each chemical parameter in mg/L (the value of desirable limit is taken).

For computing WQI, the sub index (SI) is first determined for each chemical parameter, as given below:

$$SI = Wi \times qi$$

$$WQI = \sum SIi\text{-}n$$

The WQI values are classified into five categories

1. Excellent Water (WQI < 50)
2. Good Water (WQI 50-100)
3. Poor Water (WQI 100-200)
4. Very poor water (WQI 200-300)
5. Water not suitable for drinking (WQI > 300)

Table-2: Relative weight of water quality parameters

Chemical parameters	Indian Standard	Weight (w_i)	Relative weight(W_i)
Acidity	-	-	-
Alkalinity	200	1	0.052
Chloride	250	4	0.210
Electrical Conductivity	-	-	-
Hardness	300	3	0.157
pH	6.5-8.5	5	0.263
Turbidity	1	2	0.105
Total Dissolved Solid	500	4	0.210
		$\sum w_i = 19$	$\sum W_i = 1.000$

Table 2 shows the weight of water quality parameters assigned by author as per relative importance of parameters. The calculated value of WQI of Jaipur Junction, Gandhi nagar, Jagatpura station and Durgapura station 233, 140, 115, and 142 respectively, which shows that the Jaipur junction is in the “very poor water”

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category and others are in the "poor water" category. According to Bahera et al., 2004 [7], WQI value more than 100 is unhealthy for drinking purpose. For proper understanding the results are converted in Water Quality Index and shown graphically (Fig. 2). The result shows that there is need of improvement of water quality for the all the stations are required as they have poor quality of water

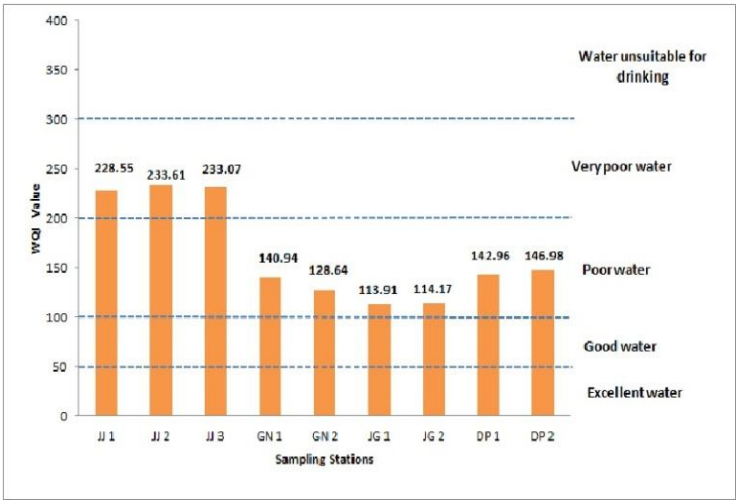

Fig-2: WQI value of different station

V. CONCLUSIONS

The present study was conducted to analyse the water quality of different railway stations of Jaipur City. The results shows that the chemical parameters like pH, chloride, turbidity and acidity of all the railway stations of Jaipur is within the desirable limit. While the hardness at Jaipur Junction is higher than its normal limit and the observed value is 750 mg/L. The values of alkalinity have a maximum value of 440 mg/L at Jaipur junction and a minimum value of 305 mg/L at Jagatpura junction. Electrical conductivity varies from minimum of 858 µs at Durgapura station to a maximum of 1958 µs at Jaipur junction. The results of TDS of different sample shows a maximum value of 3200 mg/L as CaCO3 at Jaipur junction and a minimum value of 800 mg/L as CaCO3 at Jagatpura station . The value of Jaipur junction crosses the permissible limit.

This study may provide a sufficient quantity of data that is available in order to facilitate water quality analysis of railway station. The data is also useful to the government of Jaipur, the Ministry of Drinking Water Supply, in order to take measures to safeguard public water supplies provided at the railway station.

VI. FUTURE SCOPE

This test can be performed by increasing the parameters of the water quality; this will give more accurate results of WQI. The stations can also be increased so that all the areas of the city can be covered mainly the stations in the villages.

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ENVIRONMENTAL IMPACT OVER BRIDGE FOUNDATIONS

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ABSTRACT
Effects of Environmental conditions are one of the most challenging and tedious task and the designer would encounter extreme problems in the foundation of bridges if the environmental status are not kept in views. The most crucial factor that may control the design of bridges over water is environmental conditions rather than ground condition unlike the design of bridge foundation on land which is govern by ground condition discarding the environmental factors leads to the collapse of bridges environmental factors that can influence the life expectancy of the bridge ; environmental conditions such as earthquakes distortion of buildings by wind speed, soil rigidity and other factors are being demonstrated as these factors must be taken in considerance. Therefore, it is considerably significant to understand the environmental conditions that over bridge design such as soil factor, calamity factors, land type, light affecting the arena. In this paper the review of 15 papers are described with their all aspects in the area of civil engineering.

Keywords: Tedious task, encounter, discarding, expectancy, calamity, bridge foundation.

1. INTRODUCTION

The fast growth of populations has created new needs for mobility and increased the demands for constructing efficient bridges. The growth in bridge construction has been very progressive in many countries around the world over the last decades. Many great bridges have been built successfully while others has not, Thus, building on an extensive knowledge to design, plan, construct and manage efficient bridge construction will contribute to mobility that is safe and reliable with a minimum impact on the environment. In spite the fact that bridge construction has experienced positive development trends compared to the past years.

The interrelation of effectiveness parameters, geographical areas, time span and disciplines are monitories below is the stat for the survey in different geographical view of site or in different geographical arenas.

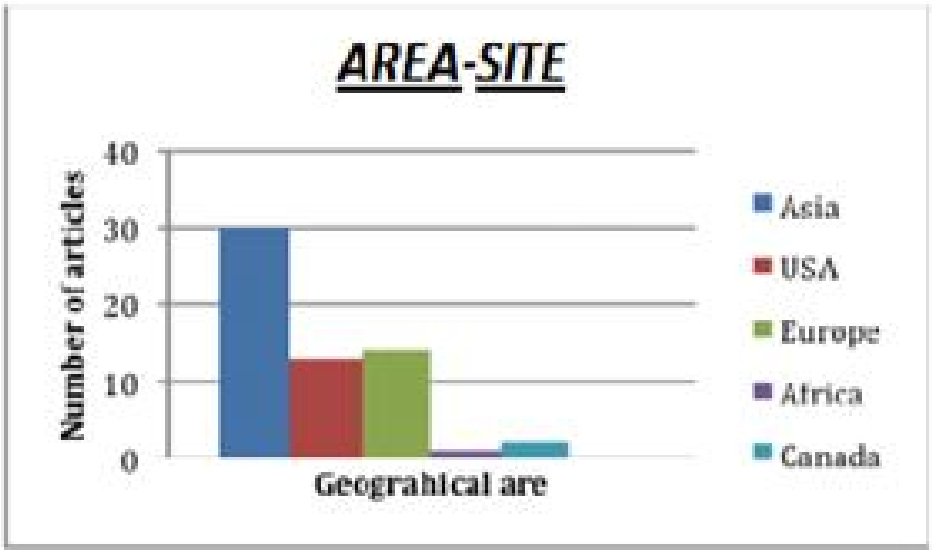

Figure-1: Continental Geographic area

As it has been mentioned, several researchers who viewed different sites represented that are involved in the bridge construction processes. Also there are several effectiveness were considered by these researchers. It is amazed to see if this has any influence on the successful bridge construction. On the other hand, in order to draw a holistic view over that, it is initially important to analytic judgment these parameters more critically with regard to their geographical differences

II. PROBLEM STATEMENT

There are several natural factors which also affects the bridge formation like landscape, river valleys, soil rigidity and sunlight.

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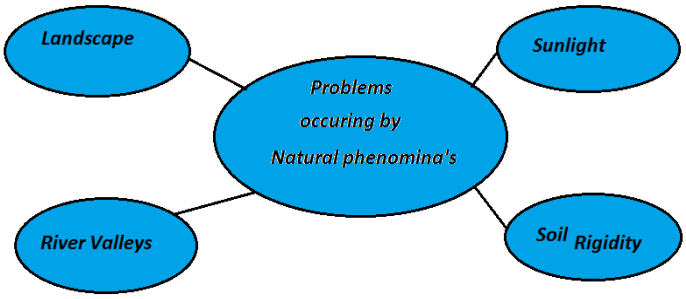

Figure-2: Problems in bridge foundation

A. Landscape

A landscape is the visible features of an area of land, its landforms and how they integrate with natural or man-made features, A landscape includes the physical elements of geophysically defined landforms such as (ice-capped) mountains, hills, water bodies such as rivers, lakes, ponds and the sea, living elements of land cover including indigenous vegetation, human elements including different forms of land use, buildings and structures, and transitory elements such as lighting and weather conditions. Regional differences are also very important in considering landscape needs. Irrigation is often the major concern in terms of management and the expense of repairs and upgrades. In markets with expensive land, not enough room for trees is an important consideration.

B. Sunlight

Cold weather can affect construction adversely; hence it is always advisable to take initial and important precautions to combat these effects. It is advisable to follow the building codes Perhaps the most critical factor in construction operations carried out in cold weather is ensuring that mortar and grout get adequate heat for normal cement hydration. Lower temperatures either completely stop or slow down the process of cement hydration due to lack of heat, which reduces the masonry's bond strength. Frozen masonry units must be melted and dried before implementing them in use. Measure the unit temperature using a metallic surface contact thermometer or flat, instant-read thermometer. It is advisable to heat bricks even when ambient temperatures are above 20 ºF (-6.7 ºC). Preheated brick will have the same absorption characteristics as that laid at normal temperatures.

It is important to protect mortar from freezing temperatures. A frozen mortar mill significantly reduces the compressive strength (concise strength), the bond strength and also decrease the water penetration resistance of masonry. Also, mortar with water content more than six percent of the total volume may be damaged, as the frozen ice may melt to increase its volume thereby reducing its bond strength.

Consider alteration of mortar constituents and proportions within the possible range to reduce the impact of cold weather. Also increasing the sand content can give a stiffer mortar mixture. Using lime content will allow mortar to loss of water easily.

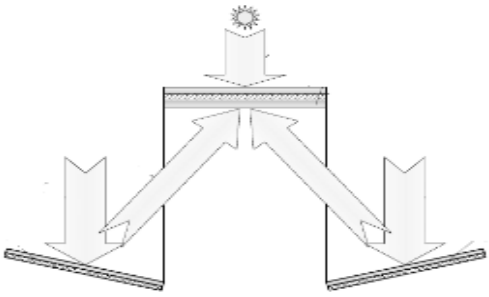

Figure-3: Sunlight

C. Soil Rigidity

When soft to firm, clay can exhibit large settlements under load. These settlements are likely to occur slowly due to clay's poor drainage characteristics. Pore pressures within the clay particle spaces move slowly, leading to long-term consolidation settlement. Regionally, different clays exhibit different and unique properties. Swelling clay exists in many areas (particularly throughout the Prairie Provinces). This clay can shrink or swell upon changes in moisture content. This can lead to subsidence or settlement. Soil heave is also an issue when it comes to clay, and swelling clay in particular, having the potential to push the foundation and the structure above upwards.

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Sandy soil has naturally shifting characteristics; drainage through sandy soil further increases its shifting properties. This poses a clear challenge for any structures being built on this type of soil. Loose sand can be subject to large settlements, and these settlements tend to occur quickly due to the free-draining granular nature of sands. This can pose foundation challenges and loose sand requires densification in order to provide sufficient settlement control and bearing for new structures.

Strength of stress factor for soil with respect to different materials is represented graphically below-

*soil-soil

*soil-concrete

*soil-steel

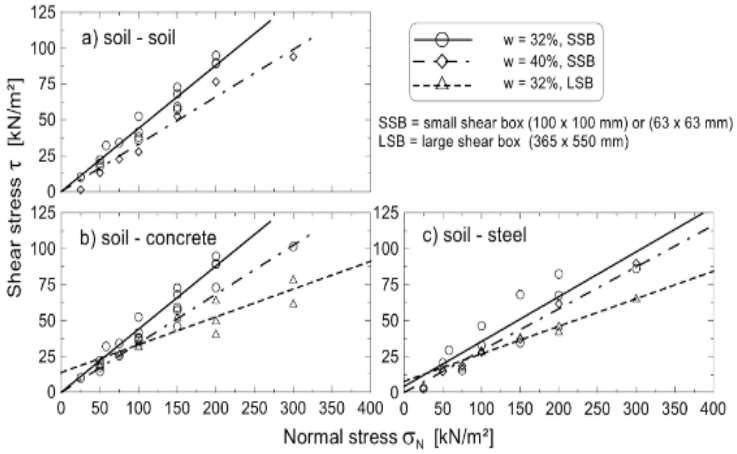

Figure-4: Soil /material strength

D. River Valleys

Rock for river valleys is one of the oldest constructional material known to man, and yet only, till recently very little was known about its structural behavior. The increasing size of loads imposed on rock foundations has caused disastrous failures. In the design of structures to be founded on the rock, it is necessary to recognize that the foundation rock has definite limitations when used as an engineering material.

The structure foundation bearings and grinders may not be visible. Bridges span over gaps in terrain or earth surface ,such as gorges formed due to river valleys and natural cavity in topography.

Below are some types of river valley pictorial views

Figure-5: River valley

I. LITRATURE REVIEW

[Enshassi, et-al, 2009] have studied a pre-feasibility of Construction projects located in the Gaza Strip, Palestine suffer from many problems and complex issues. Consequently, the objective of this paper was to identify the factors affecting the performance of local construction projects; and to elicit perceptions of their relative importance the survey was used to elicit the attitude of owners, consultants, and contractors towards factors affecting the performance of construction projects in the Gaza Strip. The respondents were asked to indicate the level of importance of each of the 63 factors of performance in the Gaza Strip as not important, slightly, moderately, very, and extremely important. The results indicated that the average delay because of closures leading to materials shortage was the most important performance factor, as it has the first rank among all factors from the perspectives of owners, consultants, and contractors. This agreement between all target groups is traced to the difficult political situation from which the Gaza Strip suffers.

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[Rasna Sharmin, et-al, 2014] have presented a The Padma Multipurpose Bridge Design Project comprises a new fixed crossing of the Padma River, of approximately 6.15 km long. In order to complement the construction of the Project, it was mandatory to plan and to develop road, railway, transmission and telecommunication networks to connect with the south western part of the country. The main purpose of this study was to assess the cumulative environmental impact that has been caused by river training, construction and development works. In this paper probable environmental impacts, both positive and negative were properly analyzed which represents a clear picture of the environmental impact scenario of any multipurpose bridge construction with its environmental consequences; there were some environmental impacts on the surrounding of the site. In this study the environmental and energy impact of Padma multipurpose bridge was discussed from where it is clearly seen that it plays an important role to develop and sometimes upgrade the environment. By implementing these useful plan and design it is possible to construct environment friendly infrastructures, protect biodiversity and vegetation and also to the proper control of economy, agriculture, transport and land management. Floods, riverbank erosion, settlement displacement and char livelihoods problems will be minimized, and make the island stable in the right bank of the Padma River.

[E.I. Seiyaboh, et-al, 2013] paper show the inter correlation between an assessment of some aspects of the Environmental Impact of Tombia Bridge Construction across the Nun River was carried out. The construction phase of the Tombia bridge project was observed by this study to have the potential to increase erosion, turbidity, sediment deposition and accumulation levels around and downstream of the project site. Aquatic systems have been impaired, and they continue to deteriorate as a result of human society's action. Despite efforts intended to protect water resources, and some success against certain forms of chemical and organic contamination, the nation's waters continue to decline. The problem has been a failure to see rivers as living systems and a failure to take biological monitoring seriously in management programs. Need of new approach, one that integrates and informs us of the ways our rivers, landscape, society interact and some other environmental impacts, Work should be conducted during the periods that ensured that the fisheries resources were not impacted. A primary goal in this bridge construction project was to develop construction methods that would minimize or alleviate disturbances to the underlying ecosystem as much as possible. The bridge has to be sensitive to the environment, earthquake resistant and meet safety standards.

[Transport Canada, et-al, 2012] In this paper Transport Canada was proposing that a new bridge for the St. Lawrence be built to replace the existing Champlain Bridge in Montreal. Under the requirements of the Canadian Environmental Assessment Act, a federal environmental assessment must be conducted. The act states that the responsible authorities, in this instance Transport Canada, Fisheries and Oceans Canada and Environment Canada, will determine the scope of the project, the environmental components to be examined and the scope of these components in the assessment. This paper tells us that any change that the project may cause in the environment, including any change it may cause

to a listed wildlife species, its critical habitat or the residences of individuals of that species are under Risk Act, any effect of any change referred to-

(i) health and socio-economic conditions,

(ii) physical and cultural heritage,

(iii) the current use of lands and resources for traditional purposes by aboriginal persons,

(iv) any structure, site or thing that is of historical, archaeological, paleontological or architectural significance.

[Maritime Services, et-al, 2015] demonstrate the architecture to construct a pedestrian bridge over Beecroft Road about 50 m south of the Beecroft Road and Copeland Road intersection in Beecroft to improve pedestrian safety and traffic flow.

The proposed pedestrian bridge would consist steel arch structure and would include lifts and stairs on both sides of Bee croft Road. In the proposal it results in the removal of a total of up to 19 trees within Beecroft Public School and Beecroft Village Green. The removed vegetation was considered to be of low to moderate value and which is not part of any endangered ecological community listing.

There were no removals of trees that are mapped as part of the Turpentine–Ironbark Forest community.The proposal not result in a substantial change in the overall landscape character of the local area in which the pedestrian bridge was proposed. The proposal would result in an overall low to moderate visual impact on the landscape character. The proposal's location within a major arterial road corridor ensures the overall character

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of the road environment was maintained. The proposed bridge design was carefully considered the local landscape character in regards to its external appearance and any proposed landscaping.

[Dr. Khalid Mahmood, 2014] have intended to study about the reinforced concrete (RC) with its environmental impacts. It tells us reinforced concrete (RC) is extensively used in the construction of small and large buildings, houses, bridges, storage tanks, dams and numerous other types of structures in Pakistan. Most construction uses cast-in-place concrete and labor-intensive methods. RC Framed structures are designed and constructed for multi-storey buildings.

This paper also tells us about the environmental restraints include aggressive conditions affecting the properties of concrete and/or corrosion of reinforcement. Infrastructural restraints may include the shortage of suitable materials, limited equipment and transport facilities, and limited availability of a skilled workforce. Pakistan has extreme climatic conditions in many regions. For RC construction under extreme climatic conditions, extra precautionary measures need to be taken.

[Ministry of transport and infrastructure, 2014] This paper describe the environmental rational, engineering limitations, operational issues, and a recommended environmental Best Management Practices (BMP).It describes about environmental management of runoff from bridges is addressed under BMPs that protect environmental resources through cost-effective, results-based procedures and performance standards, including the Best Management Practices for Highway Maintenance Activities.

This document provides a results-based methodology to achieve compliance with applicable legislation using the proponent's determination on how to meet the end goal of compliance, rather than prescriptive or formal permitting requirements, It discussed environmental best management practices such as during a bridge design, assess the bridge with the associated roadway in developing an overall environmental mitigation plan.Considering softer treatments to stabilize exposed areas and filter runoff, including establishment of vegetation through seeding, plantings and bioengineering.

Other legislation exists to protect water and aquatic resources, including sensitive fish and wildlife habitats, recreational uses and drinking and agricultural water supplies. This legislation may include provisions under the Water Act, Environmental Management Act, Wildlife Act and Species at Risk Act.

[Environmental agency, 2002] This paper enable the identification of environmental issues and constraints and the avoidance of sensitive areas, thus reducing the need for redesigning and mitigating avoidable impacts at a later stage and identify the potential impacts of bridge and culvert developments on the environment as a whole. In accordance to this Bridge and culvert activities involve the construction of permanent engineering structures across watercourses and larger rivers. The construction of bridges may impact upon the local environment and river dynamics particularly where in stream span supports are required. The construction of culverts may be required to contain the flow of a watercourse and to channel it below or around man-made structures, type of culvert used also depend upon the engineering requirements of the site. Culvert designs may range from steel or concrete slab arranged at the sides of a watercourse, which may or may not be covered, two cylindrical four sided pipes where the stream bed is replaced.

The construction of bridges and culverts are not included as separate development types in the Town and Country Planning by EIA (Environmental Impact Assessment).

EIA states Developers should consult the Regulations for further information on the thresholds applicable to their particular development type, to determine whether a full EIA might be required. Where EIA is required for a particular project, the construction of bridges and culverts must be included in the scoping phase and assessed and discussed in the environmental impact statement. EIA may also be required for any change to or extension of bridge and culvert activities, where the change or extension may have significant adverse effects on the environment. The construction of bridges and culverts and their associated activities may have significant effects on the surrounding environment. A thorough scoping exercise and careful consideration of alternatives are, therefore, of prime importance.

[P.O. Akanni, 2013] demonstrate the architecture study aiming assess to the impact of environmental factors on building project performance in the Delta State, Nigeria. It states that environment interferes with planned progress of construction projects.

The less predictable the environment and the greater its potential effects, the more it must be taken into account in managing the development of construction projects.

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The Niger Delta region comprises six states among which the Delta State seems to have some environmental variables that are different from other geo-political regions in Nigeria and therefore became imperative to assess the impact of these variables on project performances.

According to it the failure of any construction project is mostly related to the performance problems and there are many reasons and factors which are attributed to such problems.

[Bijayinee Panda, et-al, 2014] demonstrate the constructional Study impact of the building construction on the environment during the construction process. The critical factors of the environment have been determined & impact of the construction process on these factors has been analyzed This paper has calculated the weighted average of the necessary scores obtained by these projects during impact analysis & determined the sustainability of each factor.

It tells us that building construction firms in India give less attention to environmental problems arising due to construction process. Increasing cost & time act as the major barriers for construction firm in implementing environment friendly techniques. The important environmental factors affected by the ongoing construction process should be recognized & necessary mitigation measures should be implemented.

The sources of environmental pollution from construction activities are ground movement, noises, solid waste, liquid waste, unsafe gases, dusts and many more. It tells us that environment is immensely affected by the ill effects of such waste productions. Sustainable development is a crucial factor for environment protection in construction process.

Environmental Management System is a necessity for every construction firm [4]. The building construction firms in India should be checked to environmental building standards set by various institutions such as Indian Green Building Council's

Environmental Impact Assessment (EIA) plays a major role in predicting the consequences on environment due to any project. Significant reduction in use of natural resources, increment in usage of renewable resources & application of recycling process are the major areas to be treated with utmost importance in construction process. This paper underlines the impact of the building construction projects on the critical environmental factors during the construction process and the energy consumption is found to be given minimum significance in the building construction projects & needs to be checked in order to enhance the environmental performance of the construction process

[Shiyamini Ratnasabapathy, et-al, 2009] Characterization is determined by the external environment in which it operated. The development and the use of project procurement systems are affected by such environmental factors. These environmental factors influence the industry in various ways thus determining the procurement shares and trends. Therefore, examination of such factors influencing the procurement selection in the construction industry is critical for the successful outcome of a project as well as to the development of the industry.

This paper examine the significant factors influencing the selection of procurement systems from external environment

[Helmut Birnleitner, et-al, 2013] demonstrated the influence of macrro-environmental factors of bridge foundation during construction process the influencing factor that overruled in this paper was the bio-molecular impact on the construction material such as attraction with material water minirality, dryness of air blown through the time interval etc.

It also imparts the decays of the material with the span of time it indulges a concept of self healing concrete which is itself a fabulous concept of building construction.

[NWRL Construction Environmental Management Framework, 2014] it describes about the key legislative of environmental construction, environmental protection and biodiversity referrals ;environmental and sustainability management systems.

Key factors for notice are ground water management implementation, it also focuses on traffic construction the management, construction noises, it describes about the influence of soil quality air quality and also the waste management. The project has the detailed environmental assessments which has been carried out in order to gain the necessary planning approval. These are the Planning Approvals for the project described.

[Ministry of transport and infrastructure, 2014] This paper explains the study on some of those factors which affect the construction process performance such as cost, duration, quality, productivity, client satisfaction,

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health and safety and environmental factors are considered in this project. These factors are identified from literature survey and a questionnaire was prepared and given to site engineers working in various construction companies.

Various factors influencing construction process performance are identified &based on that, a detailed structured questionnaire is prepared such as cost, duration, quality, productivity, client satisfaction, health and safety, environmental factors are considered in this project.

IV. CONCLUSION

In case of every wide range construction project, there are always some environmental impacts on the surrounding of the site This paper is useful in developing projects & enhancing the construction field which has a bright future as these factors are being used in countries like UAE, France & USA. This paper work also helps in increase the number of projects that cannot be performed successfully. By implementing these useful plan and design it is possible to construct environment friendly infrastructures, protect biodiversity and vegetation and also to the proper control of economy, agriculture, transport and land management. Floods, riverbank erosion, settlement displacement and char livelihoods problems will be minimized, and make the island stable. This work will lead to increase in technological trends. Now our main aim is to implement environmental laws for the successful construction of structures.

The primary goal in every bridge construction project should be to develop construction methods that would minimize or alleviate disturbances to the underlying ecosystem as much as possible. The bridge has to be sensitive to the environment, earthquake resistant and meet safety standards.

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STRENGTH CHARACTERISTIC BEHAVIOUR OF STABILIZED SOIL WITH DIFFERENT ADDITIVES: A COMPARATIVE GEOTECHNICAL STUDY

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ABSTRACT
The soil behaviour varies due to its different mineralogical composition. Thereby exhibits uncertain behaviour in different conditions. It is required for soil to be suitable for the construction practices. As the expansive and cohesion-less soils are a kind of problematic. To stabilize such kind of soils and make it suitable for the purpose of construction a varying range of additives are added to the soil which enhance the properties of soil. This alteration depends on the mineralogical composition. The materials like cement, fly ash, lime are added in different percentage to achieve the improved strength behaviour and compressibility characteristics. The waste materials or residual materials like wheat husk, rice husk, sugarcane husk, shredded rubber tyre, woodash etc are added to modify the soil behaviour. The objective of this paper is to study the impact of these additive materials and thereby indicating the potential efficiency of material along with their percentage giving the best result with soil to stabilize it.

Keywords: Soil stabilization, Lime, Cement, Fly ash, wheat husk, rice husk, sugarcane husk, shredded rubber tyre, woodash

INTRODUCTION
Stabilization of soil has become major concern as construction is the key of development. Stabilization means improving the natural properties of soil for more compact profile and withstand heavy loads without deformation in soil profile.Need of soil stabilization occurred due to failure in structures because of deformation in soil grading.

In recent years, various method were introduced keeping environment in concern and utilising waste for stabilizations such as, adding lime (activated and slurry), fly ash, agriculture wastes, rice husk, etc. Tests were conducted such as Atterbergs limit test, Compaction test, Unconfined Compressive strength and durability test, CBR test, swell test,

Lime effects properties such as optimum moisture content, dry density, consistency limits and consolidation. 0-2% of lime content, increase in optimum moisture content of 14-17% and maximum dry density decreases with 1.68 to 1.66g/cc. Upto 2% compression index decreases very sharply and coefficient of consolidation increases. Lime increases the strength of clayey but in slower rate than cement. The shrinkage and swell characteristics of soil decreases remarkably. Slurry of lime is injected with fly ash in the pores and cracks to fill the voids.

In countries where major production of agriculture waste is formed, the waste is utilised for the stabilization of soil grades. Using industrial wastes such as slag, fly ash, sludge ash, and crushed concrete powder in cement and concrete or the waste having large proportion of cementious elements are mixed with soil. It reduces cost of construction and provide stability to soil.

LITERATURE REVIEW
E.A.Basha stabilised the residual soil with rice husk and cement. The properties such as compaction, strength and x-ray diffraction are being tested. In countries where agriculture is major the production of agricultural wastes are also high. These wastes have high proportions of silicates and other minerals in it which is being obtained during growth period of plant. Thermal decomposition of wastes such as rice husk is done to produce fine ash particles. These particles are mixed with lime to obtain binding property. The factors which effect quality of material formed is burning time, temperature, cooling time, grinding conditions. Tests were conducted such as Atterbergs limit test, Compaction test, Unconfined Compressive strength and durability test and CBR test. Through this lots of results is being found. Both additives reduce plasticity of soil, decreases the maximum dry density and increases optimum moisture content in soil. The unconfined compressive strength of soil is of cement stabilised soil increases with increases with addition of rice husk ashes. With addition of lime in soil increase in CBR is observed and addition of rice husk ashes results in decrease of CBR. This shows rice husk ashes alone is not suitable as stabiliser but in combination is significant in enhancing strength as well as CBR.

Optimum amount of cement and rice husk to mixed with soil to stabilise is 6-8% and 10-15% respectively. It helps in reducing cost of construction.

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Jaspal Singh studied the effect of lime on properties of soil. Maximum changes in soil are seen with addition of lime upto 2% beyond that it shows negligible changes in properties. Lime stabilisation is applied in field by the following: the in-situ material is mixed at site, then compacted, soil, lime and water is mixed at plant and hauled back to site for compaction and lime slurry is poured through small drill holes. Tests were done to different soil at areas of settlement by mixing with lime in different proportions. Chemical reactions that occur in lime while lime is added to wet soil i.e., Alteration in absorbed layer characteristics through ion exchange of calcium ions and Cementing action or pozzolanic action. Lime effects the properties such as optimum moisture content, dry density, consistency limits and consolidation. With 0-2% increase of lime content there is increase in optimum moisture content of 14-17% and maximum dry density decreases with 1.68 to 1.66g/cc. Upto 2% of lime compression index decreases very sharply and coefficient of consolidation increases. Liquid limit and Plastic limit increases with increase of lime content upto 2%. Beyond 2% no significant change is observed. Increase in granularity leads to increase in permeability and decrease in compressibility.

Nadgouda, K.A studied the effect of lime stabilization on properties of black cotton soil. Black cotton soil is a major soil type in India. This is mostly found in Bombay, western part of Madhya Pradesh, part of Gujarat, and in some parts of Madras. They are renounced as "Black Cotton Soils" because of the dark brown colour and is favourable for growing cotton. The colour black is due to presence of iron and aluminium compounds. These soils are deficient in nitrogen, phosphoric acid and organic matter but rich in calcium potash and magnesium. Clay is in high percentage and predominantly montmorillonite in structure. It exhibits high swelling and shrinkage properties with change in moisture content due to which it has been a challenge for geotechnical any highway engineering. The factors which impact the nature of expansive soils are initial moisture content, initial dry density, amount and type of clay, Atterbergs limits of the soil, and swell index. Soil stabilisation is to improve natural properties of soil by blending or mixing of commercially available additives to achieve proper gradation, texture, plasticity or act as a binder for cementation of soil. The lime used to stabilize clay improves the workability, increases strength and volume stability. The optimum water content for compaction is also being increased by lime, which is advantageous while dealing with wet soil. Lime increases the strength of clayey but in slower rate than cement. The shrinkage and swell characteristics of soil decreases remarkably. The stabilised layer of lime forms a water resistant barrier by imminent penetration of above gravity water and below capillary moisture.

G.N.Obuzor done investigation soil stabilization with GGBS (Ground Granulated Blast furnace Slag) activated by lime. Using waste material, ground granulated blast furnace slag, gotten from the steel making processes, activated by lime (CaO), in the stabilization of low bearing capacity clay soil (LOC). Durability Index and Unconfined Compressive Strength Test were done on cylinder specimens of measure diameter 50 mm and length 100 mm. Following a proctor compaction test, the composition of Lime and GGBS were used to stabilize LOC at pre-determined moisture content of 23%, 28% and 33%. By replacing lime at increments of 4%, five different mix composition were taken 16% lime-0% GGBS, 12% lime-4% GGBS, 8% lime-8% GGBS, 4% lime-12% GGBS, 0% lime-16% GGBS. To achieve the desired maximum dry density at a constant volume of 0.196 m^3. A thorough investigation of the effectiveness of stabilizing weak soil soaked in water to simulate flooding scenarios. The strength of Lime-GGBS-LOC system increased with reduction in lime content and under harsh conditions of soaking in water for an extended period of 10 days. At 4%L-12%G and 33% binder composition and moisture content the durability was highest although in terms of strength. The highest strength were with 4%L-12%G-LOC stabilized samples after curing of 90 days and unsoaked.

Masashi Kamon examined the potential for burning for industrial waste combine with lime. Lime is added in certain proportions to form a product having cementing characteristics like Ordinary Portland cement. The main agenda of discussion is Contribution of ettringite to strength development. Loam soil can be stabilized for subgrade purpose. The Percentage of main cementious compound is compared to those of OPC. This whole examination is done by incineration elimination method.

Alex Wilkinson did a case study on improvement of problematic soil by lime slurry pressure injection. Transportation industries use LSPI method to improve the geotechnical properties. A hirail rig fitted with three vertical probe are forced to defined depth in subgrade soils, Under a typical hydraulic pressure of 800-1000 KPa, a cementious slurry of lime and fly ash agent is injected and ceases when slurry reaches pressure of 1450 KPa .This pressurized slurry penetrates voids, openings of hydraulic fracture of the soil profiles. A complex network of chemical active slurry is achieved. A slurry composition of 33% quicklime to 66% fly ash, alternatively 43% hydrated lime can also be used with 57% fly ash to get free lime content. Tests such as Swell test, X-ray Diffractometry and Scanning electron microscopy were performed.

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ANALYSIS

The soil here we studied are expansive soil and cohesion less soil (sandy soil).In this paper analytical study is made on the considering weakness of the soil and thereby emphasizing on the materials added to stabilize the soil. For the soil to be stabilized various tests were conducted to improve the index properties and engineering properties. These tests include grain size distribution, consistency limit test, specific gravity, optimum water content and maximum dry density. For identifying the strength behaviour UCS, CBR tests were performed.

A. Methodology

The soil sample which is in the consideration is prepared by collecting the sample from the source and oven dried it. And then different proportion of additive materials are either replaced or added in the soil as per the guidelines followed by the researchers. Then different test were performed on the soil and additive combinations.

B. Materials

The materials studied in this paper are:
Soil- expansive soil, cohesion less soil, clay soil, red soil
Additives- Cement, Lime, fly ash, wheat husk, rice husk, sugarcane husk, shredded rubber tyre, woodash etc are added to modify the soil behaviour.

C. Analytical study

The geotechnical study is made to elucidate the ground improvement method best suited with the additive material and give best results to apply in reference of composition of soil and availability of material. Detailed description is made discussing each of the material and thereby their impact on soil behaviour and alteration in properties.

1) Cement

The soil considered in this case was sandy soil. The cement was used as stabilization additive in varying percentage of 1, 3 and 5 %. On the addition of cement to the soil increase in consistency limits with the increase in quantity of cement was appeared. But the rate of change is not very high but a slight only. On the basis of UCS test it was observed that strength was increased with cement content but it mainly depended on curing period that were 1,3,7 and 14 days . It was observed to increase 3.5 times for 3% addition of cement to the soil.

2) Lime

The soil was black cotton soil the addition of lime to swelling soils is to reduce the potential for swelling upon contact with water. The plastic nature of the soil decreases and the stiffness of the soil increases as the lime content increases. The optimum lime content was found to be within the range of 3 % to 6%.

1) Flyash

The soil here was red soil. The different tests were conducted for improving properties of soil. Flyash obtained from thermal plant was used as it is a waste product. So on the addition of 3,5,6 and 9% flyash to the soil the results were obtained. At 6% flyash Optimum water content increased by 6 % , maximum dry density is increased by 11% , CBR by 80% and strength by 1.2 times of the soil.

2) Wheat husk ash and sugarcane husk ash

The soil under consideration was expansive soil i.e. black cotton soil. The materials selected for the improvement were wheat husk ash and sugarcane husk ash. These are the residual products obtained from agricultural field. As these are generated in huge content so it is quite useful to use them as stabilizers. These were added in proportion 3, 5, 7, 11% to the soil. At 7 % content MDD was increased to 4.5% and OWC by 1.8% and decreased after 7 %. Liquid limit was increased by 8.3% , plastic limit by 9.5%, CBR by 1.2 times and strength according to UCS by 24%. So these are suitable enough to stabilize the soil for embankment purposes.

3) Rice husk

The soil here in this The various index properties test like Specific gravity, Liquid limit test, Plastic limit test, Free swell index and Standard proctor compaction tests were conducted on natural soil and soil with various proportions like 5%, 10%, 20%, 30%, 40%, 50% and 80% of Rice Husk Ash. In case of alluvial soil the liquid limit decreased from a value of 59% to 19.2% for the same quantum of addition of RHA.

The decrease in the free swell Index was from 59% to 13.6%. The shrinkage limit of soil increased to 23.7 and 24.2% respectively for alluvial soil and clay soil from 12% initially for soil. The Maximum dry density increased from 16.39KN/m3 to 20.95kN/m3 in case of addition of 80% RHA to alluvial soil the soil.

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The Optimum moisture content decreased steeply with 80% RHA for clay soil from 17.89% to 13.25% and maximum dry density increased from 16.39kN/m3 to 19.5kN/m3.The unsoaked CBR value in the case of addition of RHA to clay soil increased from 3.2% to 9.3% and the soaked CBR value 2.4% to 4.4%.

4) Shredded rubber tyres

The soil here was clayey soil .The Shredded rubber tyres were added in varying percentage of 4, 6, 8, 10 % but at a value of 8% of amount best results were obtained. CBR is increases about 50% and strength by 66% for the strip size 25 x 50mm.

5) Woodash

The soil here was clayey soil .The woodash added in varying percentage but at optimum value of 10% best results were obtained. CBR is increases about 50% and strength by 67%.

CONCLUSION

1) The soils which basically exhibit uncertainty in behaviour are black cotton soil, collapsible and cohesion less soil.
2) The index properties and engineering properties are improved at a optimum value of any additive at which it gives positive results.
3) The properties of soil are observed to be improved by the addition of 3 % cement to the sandy soil.
4) With the addition of lime of 6% it is best suited to stabilize the soil improving its geotechnical behaviour
5) With the addition of wheat husk ash and sugarcane husk in 7% it can be utilized for the decomposition of agricultural waste and improving soil behaviour.
6) Shredded Rubber type of strip size 25 x 50 mm in amount of 8% when added helps in improving soil strength by generating soil reinforced system.
7) Woodash and flyash are observed to give best results in ground improvement at 6% each. Rice husk give its best results when soil is replaced 80% with it.
8) It can be concluded that it can be best practice to use industrial waste in soil stabilization.

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STUDY ON CONCRETE WITH REPLACEMENT OF FINE AGGREGATES BY OVER BURN MURRUM BRICK

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ABSTRACT
Concrete is the most widely used material in the world of construction. Concrete is used in such a large quantity because it has astonishing property. Fine aggregates usually occupy 26 percentage of the volume of concrete and greatly influence the property of concrete. Use of over burn Murrum bricks in concrete, enhances the strength and reduces the environmental impact caused due to construction waste and also reduces the cost. The main characteristics of a good quality aggregates includes grading, durability, resistance to freeze/thaw action, resistance to sulphates, particle shape and surface texture, abrasion and skid resistance, strength, unit weights and voids, absorption and surface moisture. The main purpose of the research is to study the strength of concrete by using the over burn Murrum bricks as partial replacement with 20%, 30% and 50% by total weight of fine aggregates. The main aim of this research is to make economical and eco-friendly concrete structure.

Keywords: Over burn Murrum bricks, Fine Aggregates, Concrete and Strength of Concrete.

I. INTRODUCTION

Concrete is a versatile construction material and consists of coarse aggregate, fine aggregate, cement, admixtures and premeditated amount of water. Rapid growth in the infrastructure at the global level has made concrete the most widely and commonly used construction material throughout the world. This has created immense pressure on the concrete industry to produce large quantum of concrete to meet the growing demand of infrastructure development. Among the constituent raw materials, the fine aggregate (Natural River sand) which forms around 26% of total volume of the concrete and greatly influence the property of the concrete. Plentiful evidence strongly suggests that sand is becoming increasingly scarce in many regions. In 2010, nations mined about 11 billion tonnes of sand just for construction. Extraction rates were highest in the Asia-Pacific region, followed by Europe and North America. In the United States alone, production and use of construction sand and gravel was valued at $8.9 billion in 2016, and production has increased by 24 percent in the past five years. Extensive sand extraction physically alters rivers and coastal ecosystems, increases suspended sediments and causes erosion. Research shows that sand mining operations are affecting numerous animal species, including fish, dolphins, crustaceans and crocodiles. For example, the gharial – a critically endangered crocodile found in Asian river systems – is increasingly threatened by sand mining, which destroys or erodes sand banks. A recent report by the Water Integrity Network found that sand mining exacerbated the impacts of the 2004 Indian Ocean tsunami in Sri Lanka. To substitute sand as fine aggregate, over burn murrum brick dust can be used. The primary purpose of this paper is to replace fine aggregate (natural sand) with over burn murrum brick so that natural threats due Overexploitation of Natural sand can be controlled.

II. MATERIALS USED

A. Over burn murrum brick

Over-burnt bricks are a waste material which cannot be used in construction directly because of their irregular shape and dark colour. Use of over-burnt bricks helps to preserve natural aggregate source. Over burn murrum brick taken for concrete preparation which pass through 2.36mm sieve size.

B. Fine Aggregates

Natural sand was used as fine aggregate. Fine aggregates are taken for concrete preparation which passes through 2.36mm sieve size.

C. Coarse Aggregates

Course aggregates of size 4.75mm to 12.5mm were used.

D. Cement

Cement used to prepare the specimen was 53 grade Ordinary Portland cement.

E. Water

Portable water available at the university campus was used to prepare concrete which was clean and free from injurious amounts of oils, acids, alkalis, salts, sugar, organic materials or other substances that may be deleterious. Its ph value was 6.5.

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III. MIX DESIGN

As per IS 10262:2009, design mix for M-20 grade of concrete was prepared by replacing fine aggregates by 20%, 30% and 50% of Over Burn Murrum Bricks. One additional concrete was also prepared without Over Burn Murrum Bricks. W/C ratio was 0.42.

IV. MATERIALS TEST RESULT

Table-1: Properties of fine aggregate

S. NO.	PROPERTY	RESULT
1.	Specific Gravity	2.51
2.	Fineness Modulus	2.6
3.	Aggregate water	1.92%
	absorption	

Crushed over burnt bricks of size passing through 20 mm and retaining 12.5 mm was used and reported in Table 2.

Table-2: Properties of crushed over-burn bricks

S. NO.	PROPERTY	RESULT
1.	Specific gravity	2.15
2.	Fineness Modulus	2.6
3.	Water absorption	5.6%

Table-3: Properties of Coarse aggregates

S.NO.	PROPERTY	RESULT
1.	Specific gravity	2.7
2.	Fineness Modulus	7.80
3.	Water absorption	1.5%

Table-4: Properties of Cement

S.NO.	PROPERTY	RESULT
1.	Consistency	31.60%
2.	Initial setting time	30 min.
3.	Final setting time	580 min.

V. TEST RESULTS

Compressive Strength

Compressive strength test were carried out in accordance with IS 516-1959[17] in compressive testing machine .Cube specimens of size (150mm x 150mm x 150mm) were taken. Compressive strength was tested after 7, 21 and 28 days of curing.

The results of Compressive strength of the tests are tabulated below.

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Table-5: Compressive strength Over Burn Murrum Brick Concrete

Mould No.	Type of Mix		Quantity of Materials		Test Performance Day (Day)	Load Applied (KN)	Compressive Strength (N/mm^2)
1.	20% of Over burn Murrum brick	80% of Fine aggregates	Coarse aggregates	4.05 kg	7	290	12.88
			Fine aggregate	1.619 Kg	14	320	17.77
			Over burn murrum bricks	0.406 Kg	28	500	22.22
			Cement	2.025 Kg			
2.	30% of Over burn murrum brick	70% of Fine aggregates	Coarse aggregate	4.05 Kg	7	300	13.33
			Fine aggregate	1.41 Kg	14	330	14.66
			Over burn murrum bricks	0.60 Kg	28		21.77
			Cement	2.025 Kg			
3.	50% of Over burn murrum brick	50% of Fine aggregates	Coarse aggregate	4.05 Kg	7	320	14.22
			Fine aggregate	1.012 Kg	14	390	17.33
			Over burn murrum bricks	1.012 Kg	28	570	25.33
			Cement	2.025 Kg			
4.	0% Over burn murrum brick	100% of Fine aggregates	Coarse aggregate	4.05 Kg	7	240	10.66
			Fine aggregate	2.025 Kg	14	380	16.88
			Over burn murrum bricks	0 Kg	28	420	18.66
			Cement	2.025 Kg			

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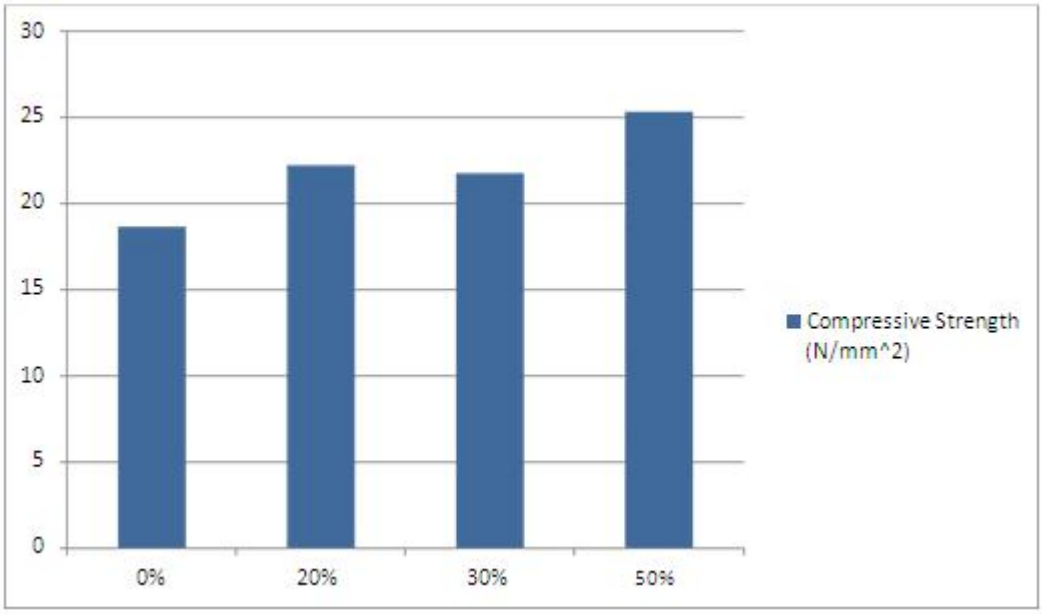

Figure-1: 28th Day Compression Strength

VI. CONCUSION

- The compressive strength of concretes for various percentages of over burn murrum bricks is found.
- The optimum strength while comparing the strengths for different over burn murrum brick sand was observed to be 50%.
- From the study conducted it is observed that the quality of concrete can be improved by replacing the Fine aggregate with over burn murrum brick sand.
- Hence, the use of waste over burn bricks pledge to be a sustainable way of construction by reducing the excess use of naturally available Fine aggregate and is also eco-friendly.

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DEVELOPMENT OF SWAT MODEL FOR KHUSHKHERA-BHIWADI-NEEMRANA INVESTMENT REGION, RAJASTHAN

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ABSTRACT
In India the availability of accurate information of observed runoff is insufficient. However due to water scarcity great emphasis is now placed on preparation of proper watershed management program for conservation and development of land and water management. For the present study, watershed spanning Jaipur and Alwar districts of Rajasthan state of India, with outlet in Khushkhera-Bhiwadi-Neemrana Investment Region (KBNIR) in Rajasthan, under proposed Delhi-Mumbai freight corridor has been selected as the study area for deriving the optimum water use policies. Basic data of the study area were generated with the help of freely available remotely sensed information. Total watershed area is 2995.84 km2, in which 73.27% is agriculture area. The major soil in watershed area is older alluvial soil. On digitization, ArcSWAT created four hundred sixty four hydrological response units by defining unique combinations of the land use, soil cover and slope conditions. By providing all the inputs for model set up, SWAT model was run for the period of thirty five years (1979–2014). Result of actual evapotranspiration and discharge is validated with the output of other modelling exercises of same area. Total average annual surface runoff is calculated to be 94.79 mm out of which highest average monthly runoff is 34.79 mm in the month of July. Total average runoff for the monsoon month is 92.55 mm which is 97.63% of total runoff. Output of this model can be utilized for development of optimum water resource and agricultural management policies of newly development of KBNIR.

Keywords: ArcSWAT, GIS, KBNIR, Runoff.

I. INTRODUCTION
Water is one of the most important natural resource and it moves in time and space consistent with the hydrological cycle. It is therefore essential to create a strategy to optimally utilize this important resource. While considering surface water characteristics, most of the processes act at the watershed level and so it is important to model the watershed [4]. World over watershed modeling is being utilized as a tool to better understand surface and subsurface water movement and the interactions between these water bodies. More importantly, outcome of model allows us to take appropriate decision on use of water resources, water quality, and related hazard issues [6].

Remote Sensing and Geographic Information System (GIS) are emerging as very useful tools for many water related studies. Remote sensing technique with GIS can be used for watershed modeling [13]. Present day watershed modeling tools utilize geospatial technologies and remote sensing extensively for the assessment of both amount and behaviour of watershed and hydrology [19].

The Soil and Water Assessment Tool (SWAT) model [1] is a watershed model that is open source and utilized worldwide for study of a watershed (http://swat.tamu.edu/). It is a continuous, spatially-distributed simulator of hydrological, chemical and microbial processes at the watershed scale and has been developed by USDA Agricultural Research Services as an outcome of their long years of expertise in related area. Many of the modeling processes of SWAT have been derived from earlier models like: Chemicals, Runoff, and Erosion from Agricultural Management Systems (CREAMS) model [8], the Groundwater Loading Effects on Agricultural Management Systems (GLEAMS) model [10], and the Environmental Impact Policy Climate (EPIC) model [8]. However SWAT is more closely linked to the Simulator for Water Resources in Rural Basins (SWRRB) model, which was typically used for simulating sediment and water movement under different soil management practices.

In last few years many researchers have worked on SWAT model, some of them using ArcSWAT plugin on ArcGIS platform. The performance of SWAT has been demonstrated within the context of the North American Prairies [16]. Many studies on SWAT application also report on the hydrologic calibration and validation for stream flow and/or other hydrologic component [11].

In one of the earliest reported application of SWAT model [2] successfully validated surface flow as well as groundwater flow and evapotranspiration in three watersheds in Illinois. In another similar study in a larger watershed in Texas, Santhi [14] successfully validated SWAT model for different water balance component i.e. surface flow and base flow. In another studies in northern Mississippi, Bingner [3] validated SWAT model for

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stream flow in multiple sub basins on daily and annual basis. Srinivasan [17] was successful in validating stream flow in a watershed in Texas using limited period of data. These studies clearly suggest that SWAT is widely and successfully used to model hydrology and pollutant transport in agricultural watersheds.

In the study for evaluation of flow and transport processes, the watershed is divided into homogenous spatial units referred to as hydrologically similar units (HSUs) for classifying the saturated hydraulic conductivity (k) and soil hydrologic classes (FSHCs) [15].

In the present study the surface runoff, lateral discharge water yield and actual evapotranspiration of watershed has been determined by the meteorological, hydro-geological, geomorphological, soil type and land use/ land cover conditions. The dynamic aspect among the above driver variables are the climatic parameters and the land use-land cover conditions.

Since focus of this work was aimed towards modeling and understanding implications of hydrology and in study area, SWAT emerged as a promising choice for this research.

II. STUDY AREA

The study area covers Khushkhera-Bhiwadi-Neemrana Investment Region (KBNIR) in Rajasthan, under proposed Delhi-Mumbai freight corridor located in the Alwar district, Rajasthan state, India (Figure 1). The KBNIR is situated in north east of Rajasthan between 27o54'33"N and 28o03'20' N and 76o24'06"E and 76o35'40"E covering a geographical area of about 162 km2. West part of study area lies in Neemrana block having 130 km2 area out of 162 km2 and rest 32 km2 area lies in East part in Mundawar block. The climate of the KBNIR is semi-arid and very hot in summer and extremely cold in winter. The mean monthly air temperature ranges from 12°C in January up to 35°C in June, with a mean annual air temperature of 25°C. The mean monthly wind speed ranges from 1.88 m/sec in October up to 3.4 m/sec in May, with a mean annual wind speed of 2.38m/sec. The monsoon season is of very short duration. The rainfall during the south-west monsoon constitutes about 82% of the average annual rainfall while generally 586 mm is the annual average rainfall.

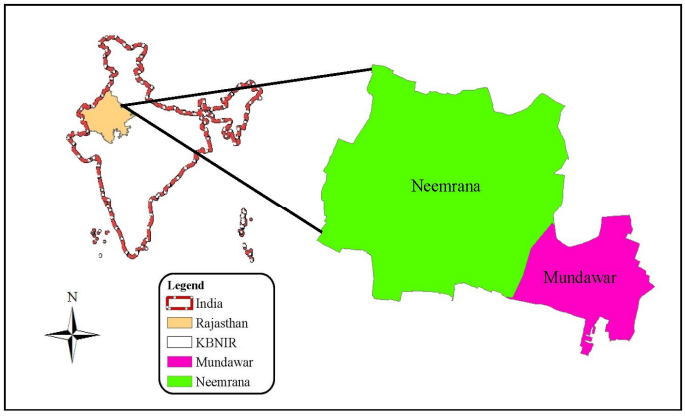

Fig-1: Location map of the study area

The area is covered by unconsolidated formations consisting of sandy clay, clay, silt, kankar and sand etc. of Quaternary age underlain by Delhi and Pre-Delhi group of rocks comprising quartzite, phyllites, schists etc. Pre-Delhi (pre-Aravalli) is the major group of rocks. The soils of the region can broadly be divided in to three classes, viz. Older alluvial soil, red sandy soil and red gravelly soil. Older alluvial soil is found in major part of the KBNIR region including full part of Mundawar tehsil and large part of Neemrana tehsil.

III. METHODOLOGY

SWAT model is data driven and it requires data on topography, land use, soil, climate, etc. Land use/ land cover map for the study region has been created in GIS, based on remote sensing data, verified by Google earth image, field survey data and Survey of India toposheets [18]. Similarly soil data for the study region has also been created from soil map of Survey of India. After geo referenced and changing the projection system map has been converted into raster format, lookup table for three major soils found by field experiments as older alluvial, red sandy and red gravelly soil type has been edited manually in the soil database in ArcSWAT. The necessary soil properties such as each soil type, soil texture, rock fragments, Electric conductivity and Organic Carbon Content required by the SWAT model was extracted from ISRIC soil database (ISRIC,2015) [12]

Drainage map, as shown in Figure 2(b), has been generated by using Digital Elevation Map (DEM) of study area (Figure 2(a)). Figure 2(c) and 2(d) shows the landuse-landcover and soil maps respectively and Table 1 and 2 shows the landuse-lancover and soil distributions in study area respectively.

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SWAT requires weather data such as precipitation, maximum and minimum temperature, solar radiation, relative humidity and wind speed for modelling of various physical processes. Weather data of study area is downloaded from http://globalweather.tamu.edu for dates 01-01-1979 to 31-07-2014.

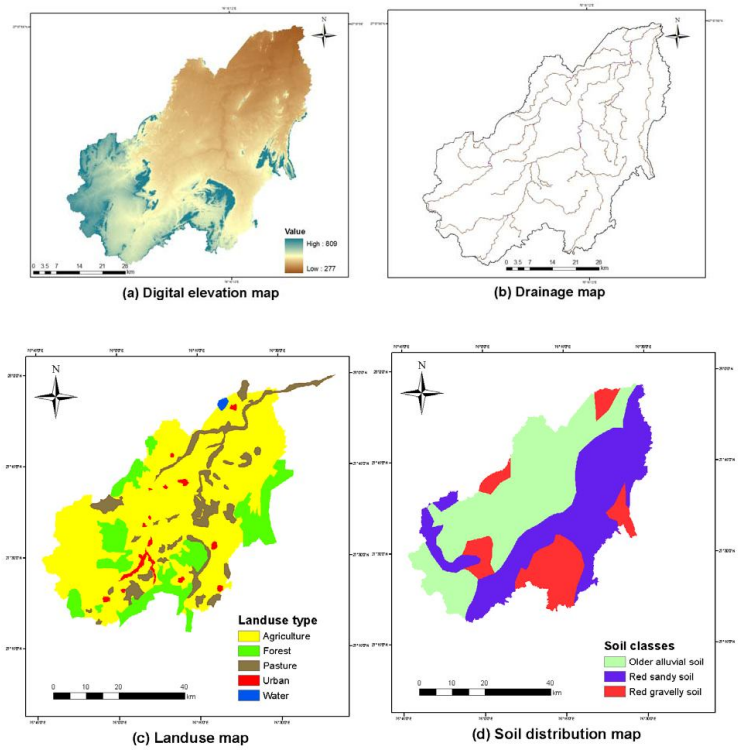

Fig-2: (a) Digital elevation model (b) Drainage network of study area (c) Soil type and distribution map (d) Landuse/landcover map

Table-1: Land use/land cover distribution in watershed

Land Use/Land Cover	Short Name	Area (Ha)	% Watershed area
Pasture	PAST	34211.6	11.4
Agricultural Land	AGRL	219506.9	73.3
Residential Area	URBN	5062.2	1.7
Water bodies	WATR	675.1	0.2
Forest-Deciduous	FRSD	40128.2	13.4

Table-2: Soil distribution in watershed

Soil Type	Watershed Area %	Sand %	Silt %	Clay %	Carbon content (%)	Bulk Density (Mg/m^3)
Older Alluvial Soil	45.2	50	32	18	2.67	1.25
Red Sandy Soil	38.1	63	21	16	4.05	1.65
Red Gravelly Soil	16.7	90	5	5	0.90	1.40

Table-3: Distribution of slope in watershed

Percentage Slope	Area (Ha)	% Watershed Area
0 to 5	117280.7	39.2
5 to 10	103990.1	34.7
>10	78313.2	26.1

A. Model Setup

SWAT model is physically based, computationally efficient, and capable of continuous simulation over long time periods. In present study the SWAT model is being used to estimate runoff of watershed area having outlet in KBNIR area. Aster data was imported in the SWAT project to start watershed delineation. In stream definition, initial stream network and sub-basin outlets were defined. ArcSWAT provides the option of defining streams based on a DEM or importing pre-defined watershed boundaries and streams. In this study stream definition has been defined by using DEM. After that flow direction and accumulation have been calculated (Figure 3).

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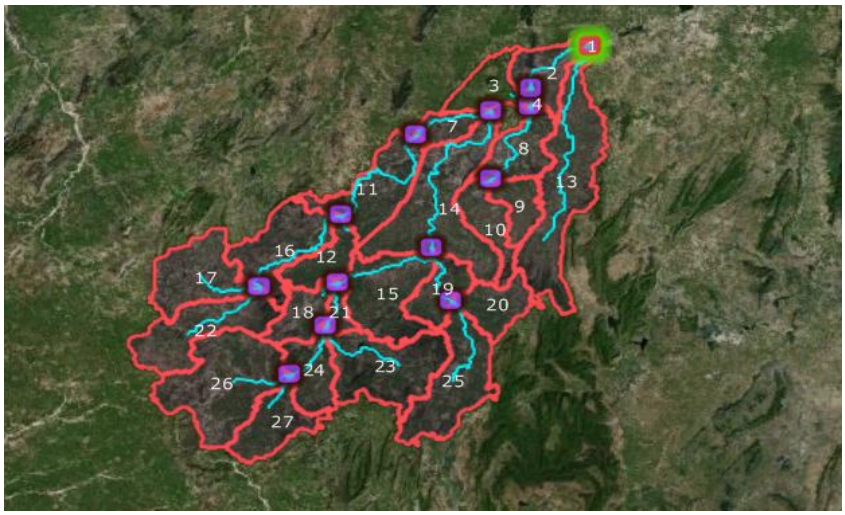

Fig-3: Watershed delineation Graph with SWAT-CUP

Watershed delineation was carried out by defining the outlet point of discharge at the exit point of Sabi River flowing through KBNIR. Next step in the delineation of the watershed was computation of geomorphic parameters. Topographic report was made which contained the rundown and distribution of discrete area surface elevations in the sub-basins in watershed. For every delineated sub-basins, land use and soil data were characterized for modelling of different hydrological and other physical processes [5]. The land-use and soil use data were given as input to the SWAT. There is a two-step process, first land-uses were chosen and then the different soils for each land use were chosen. The lookup table containing various land use and soil classes has been linked as input for defining the number of HRUs in watershed. In first step, various land use units were defined, which had been considered for creating HRUs. The HRU's number is controlled by a threshold value given for each sub-basin. When the area of the threshold was defined as small such as 1%, the model show the residential and road network types in HRU creation which affect the model output in terms of the increase in runoff but when the threshold area was increased then it exclude the residential and road area in HRU creation and thus the runoff decreased sharply.

A threshold of 10% for both land use and soil was used, which deducted any land use that occupied less than 10% of the land in the sub-basin and any soil that represented less than 10% of the land in the sub-basin. According to final HRU report, 464 HRUs are being created within the watershed and sub basin wise HRU report of watershed has been generated. One of primary arrangements of input for simulating the watershed in SWAT is climate data. The daily precipitation records for the period of 1979–2014 were used to develop the climate-input for SWAT (Fig. 4 shows the yearly precipitation in mm). Write input tables menu contains items that allow building database files containing the data needed to generate default input for SWAT. The initial watershed input values have been defined before running the SWAT model. These input values were set automatically based on the watershed delineation and land use \soil \slope characterization.

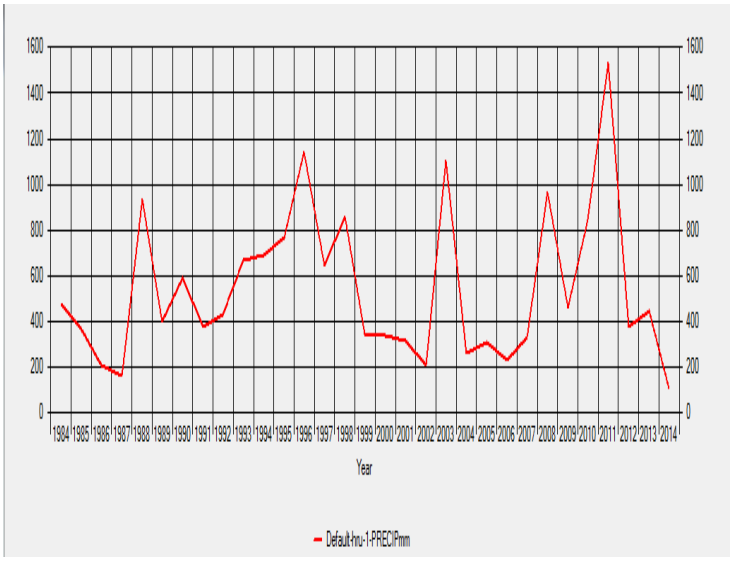

Fig-4: Yearly precipitation in mm

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I. ANALYTICAL FINDINGS

As discussed about data analysis, the total runoff depends on the actual hydrologic condition of each land cover/crops and soil present in the watershed. The impact of each type of land use is considered in the modeling to calculate runoff and sediment load in the basin. After running the SWAT model, average annual basin values of many parameters are shown in Table 4.

Table-4: Average annual basin hydrological values

Precipitation	586.1 mm
Surface runoff	91.5 mm
Lateral flow	95.7 mm
Groundwater (shallow aquifer)	60.2 mm
Groundwater (deep aquifer)	5.3 mm
Deep Aquifer recharge	5.2 mm
Total Aquifer recharge	252.8 mm
Percolation out of soil	104.9 mm
ET	297.1 mm
Total sediment loading	17.1 T/ha

Most of the Output data has been exported after the successful running of the model. Results have been saved in MS Excel and Origin software is used for generation of graphs for Monsoon months (June to September). The precipitation variation, surface flow, lateral flow and water yield graphs are shown in Figures 5, 6, 7 and 8 respectively.

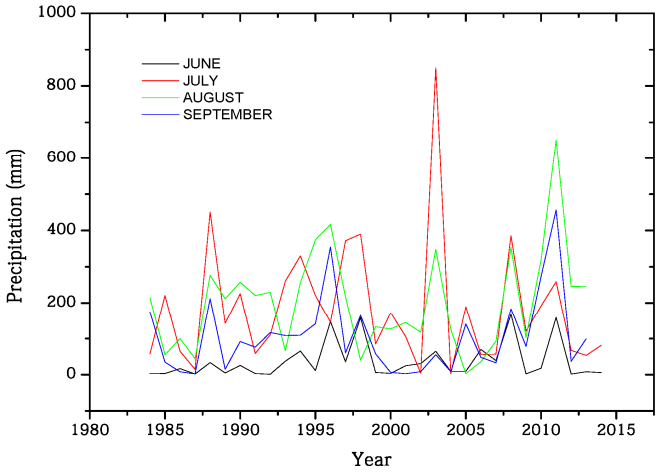

Fig-5: Precipitation (mm) in Monsoon months

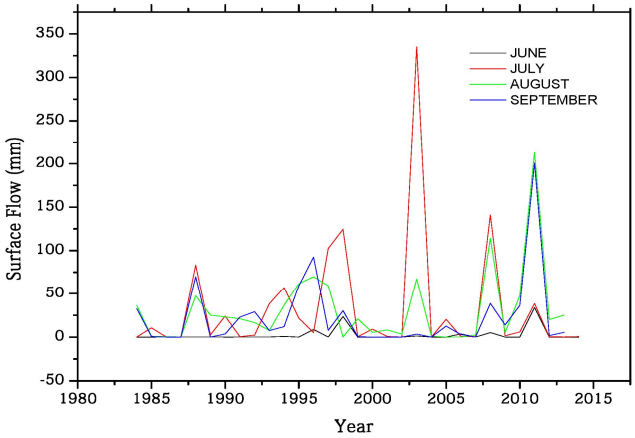

Fig-6: Surface Flow (mm) in Monsoon Months

Figure 9 shows variation of basin parameters over different years whereas Figure 10 shows variation throughout the year of precipitation, surface flow, lateral flow, evapotranspiration and water yield. Evapotranspiration values have been validated with the output of Cropwat model of previous exercises of same area as shown in Figure 11. By reading all the graph it can be seen that August month has highest average value of, surface flow, lateral flow and water yield due to all most part of precipitation occur during July and August Month.

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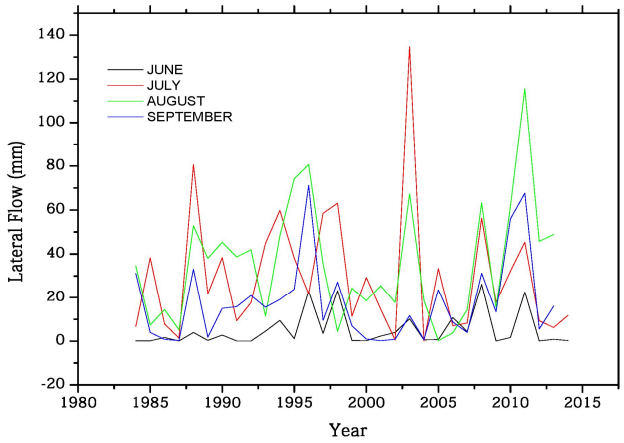

Fig-7: Lateral flow (mm) in Monsoon Months

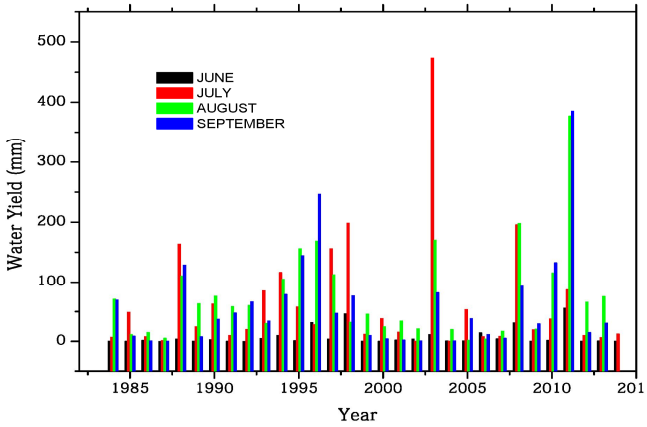

Fig-8: Water yield (mm) in Monsoon Months

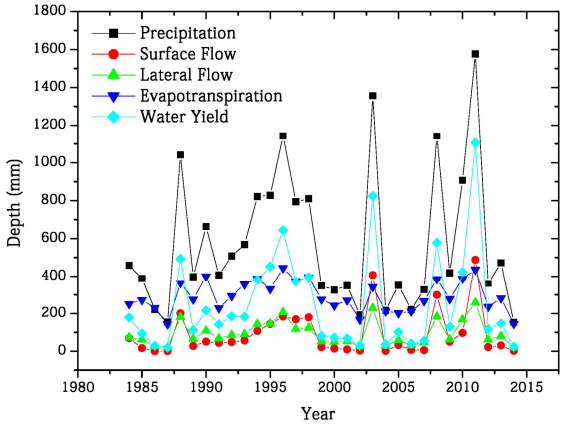

Fig-9: Variation of precipitation, surface flow, lateral flow, evapotranspiration and water yield over different years

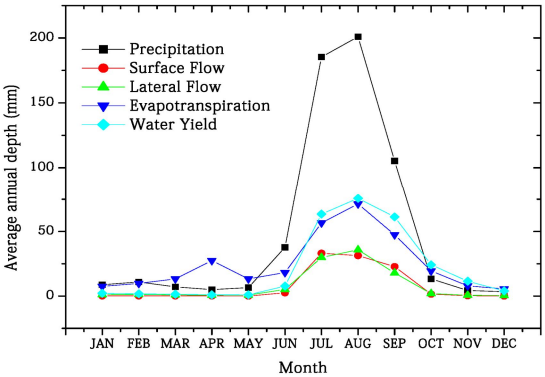

Fig-10: Variation of precipitation, surface flow, lateral flow, evapotranspiration and water yield throughout the year

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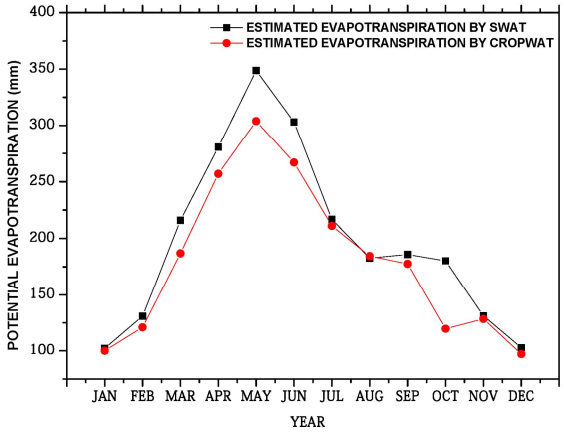

Fig-11: Evapotranspiration

II. CONCLUSIONS

The SWAT Model was validated with estimated evapotranspiration by SWAT to estimated evapotranspiration by Cropwat for data from 1979-2014, and on the basis of validation, it can be said that SWAT model is a reasonably accurate representation of watershed processes (Surface flow, lateral flow and potential evapotranspiration) to within statistically acceptable limits. Models of all types should primarily be judged by a criterion that is based on whether we can make better decisions with the model, or without it. For KBNIR average annual surface runoff is estimated to be 94.79 mm out of which highest monthly runoff is 34.79 mm in the month of July. Total average runoff for the monsoon month is 92.55 mm which is 97.63% of total runoff. The ratio of surface runoff to total flow has been estimated 0.37 and base flow to total flow is 0.63. The sediment yield is highest in September month with total sediment loading of about 17.85 T/HA. Based on SWAT model developed, any agriculture management and landuse-landcover change proposed under KBNIR could be simulated and it's effect on surface runoff and base flow could be ascertained.

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A COMPARATIVE AND ANALYTICAL STUDY ON THE SOIL - STRUCTURE INTERACTION BEHAVIOUR UNDER STATIC AND DYNAMIC LOADING

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ABSTRACT
Soil–structure interaction plays an important role in the behavior of structure under static or dynamic loading. It influences the behavior of soil, as well as the response of pile under loading. The analysis is highly essential for predicting a more accurate structural behavior so as to improve the safety of structures under extreme loading conditions. In this paper the concepts of structure–soil–structure dynamic interaction are introduced , and the research methods were discussed. In view of a few reports, an orderly rundown of the history and status of the structure– soil– structure dynamic communication investigates that considers adjoining structures was proposed as a kind of perspective for analysts. This examination is in the underlying stage, given its many-sided quality and intemperate rearrangements of the model for soil and structures, and ought to be conveyed forward for its centrality. An endeavor is made to compress the dirt structure collaboration and its strategies and their impacts.in this territory of study. The current issues and the future research drift in this field were likewise inspected.

Keywords: *Soil structure interaction, Dynamic loading, static loading, response*

INTRODUCTION
The procedure in which the reaction of the dirt impacts the movement of the structure and movement structure impacts the reaction of the dirt is named as soil structure communication. A large portion of the structural building structures include some sort of auxiliary component with coordinate contact with ground. At the point when the outside powers, for example, quakes, follow up on these frameworks, neither the auxiliary removals nor the ground relocations, are autonomous of each other. The procedure in which the reaction of the dirt impacts the movement of the structure and the movement of the structure impacts the reaction of the dirt is named as soil-structure association (SSI). The smooth admiration of plan range recommends littler seismic reaction with the expanded common time frames and viable damping proportion because of SSI, which is the primary support of the seismic outline codes to diminish the plan base shear when the SSI impact is considered. A similar thought additionally shapes the premise of the present normal seismic outline codes, for example, ASCE 7-10 and ASCE 7-16. Different analysts considered the issues of soil structure communication. The work is in advance to idenftify the impacts and recommending some plan criteria. There are two method for approaches for dynamic investigation are-Direct approach and substructure approach. In coordinate approach, It depends on incorporating the dirt medium in the scientific model created for dynamic investigation. This is regularly done by utilizing limited component discretisation of the domin with proper retaining/transmitting boundaries.In substructure approach, In the substructure approach the SSI issue is separated into three particular parts which likewise shows the essential idea of substructure strategy for soil-structure collaboration examination.

LITERATURE REVIEW
A. According to Ghalimath et al There are two primary issues involved in the phenomenon of soil-structure interaction.1.Kinematic interaction 2.Inertial interaction This paper has presented a proposed methodology for modelling the effects of interaction between soil and building structure. The allowable methods for displaying of soil where broke down for picked structure. There are two approches for displaying of soil–structure association (I) direct approach and (ii) substructure approach. In this paper stiffnesses for both static investigation and dynamic examination were presented.

B. Rahul sawant, At the very beginning one should estimate the importance of SSI and decide whether it should be considered at all. The appropriate response relies upon the dirt information (wave speeds in the dirt, as a matter of first importance), base tangle measure/implant and dormancy of the structure. For common structures regularly SSI can be excluded. 2. In the event that SSI is to be viewed as, one ought to look at whether some straightforward suspicions can be connected. Primary suspicions: homogeneous half-space or a layer underlain by unbending rock as a dirt model, surface base tangle, inflexible base tangle. General suggestion is as per the following. One should begin with the simples t display permitted by models. Just if the outcomes appear to be over traditionalist, one should attempt to go to more refined models, bookkeeping to different particular SSI impacts. 3. SSI impacts are recurrence subordinate. The greater part of impacts are legitimate in a specific recurrence run. Out of this range they may prompt the contrary changes.

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C. Ritu rai,The study has been made to understand the soil structure interaction approach To accurately estimate the response of structure, the impact of soil structure communication is should have been considered affected by both static and dynamic stacking. The powers in superstructure, establishment and soil mass are essentially modified because of the impact of soil structure cooperation. For exact estimation of the outline constrain amounts, the cooperation impact is should have been considered.

D. **Maria I. Todorovska,** done investigation on reviewing the full scale experimental studies of soil structure interaction. It likewise exhibited the work on display tests.It is inferred that checking of tremor reaction in and around structures are experminetal examination techniques in which limit conditions are fulfilled precisely and problesm can be disposed of.

E. **Shreya Thusoo,** analyzed the SSI as it has been broadly settled that the act of accepting a structure being settled at base, prompts net blunders in assessment of its general reaction because of dynamic loadings and overestimations in plan. The degree of these mistakes relies upon various factors; soil write being one of the central point. This paper contemplates the impact of Soil Structure Interaction (SSI) on multistory structures with shifting under-laying soil writes after legitimate approval of the impact of SSI. Investigation for delicate, solid and hardened base soils has been completed, utilizing an effective Finite Element Method (FEM) programming bundle ANSYS v14.5. Results prompt some imperative conclusions with respect to era, redirection and increasing speed reactions. analysis

The soil structure interaction can be studied under certain methodology from the analytical perceptive. Several detailed steps involved even in design criterias.

ANALYSIS

Methodology

At the point when the recurrence of structure is like the recurrence of soil, or in the event that it is equivalent to n times of it which can build the worries in the structure, instance of Resonance will happen. For these sorts of cases Soil Structure Interaction is utilized as a part of detail also, spoke to by changing over the dynamic properties of the structure. Vitality scattering and changes in the vibration methods of the structure is the aftereffect of Soil Structure Interaction. The connection between the major recurrence of both the structure and the ground, on which it is built, is vital in getting pulverization caused by tremors.

Analytical study

Analytical Methods

Analytical methods to predict lateral deflections, rotations and stresses can be assembled under the accompanying four headings:

i. Winkler Approach
ii. P-Y Method
iii. Elastic Continuum approach
iv. Finite Element Method

Effects of type of soil on structures

A structure constructed on soft soil has a delayed fundamental period than the period of the rigid base structure. The energy dissipated into supporting soil through wave propagation and hysteretic action is larger in the case of flexible base structure than that of rigid base structure.

Analytical effects on soil structure interaction under different types of loadings

a) SSI Under Static Loading

Number of studies have been made under static stacking which takes after the impact of soil structure collaboration. In this investigation different amended power amounts have been appeared and impact is considered in a clear way. Less investigations have been done on soil– structure connection impact which consider 3-D space outlines.The studies give us the clear indication that a 2-D frame analysis might overestimate or underrate the actual effect of interaction in space frames. From the studies we can conclude that considering the interaction effect significantly affect the design force quantities. These studies, may be quantitatively approximate, but clearly describe the need for studying the soil–structure interaction to enumerate the real value of force quantities in the structural members, accounting for their 3-D behaviour.

b) SSI Under Dynamic Loading

In designing and analysis of Structures under dynamic loading, structures are generally assumed to be fixed at their bases. When support flexibility is taken into account then the overall stiffness is lessened and period of

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system of structure increases. Change in spectral acceleration is considered with natural period is observed from the response spectrum curve.Seismic response of any structure can be altered by the change in natural period. In addition to this, soil medium imparts damping due to its characteristics. The increasing of natural period and involvement of high damping in soil due to soil structure interaction in structures has been studied. Moreover, the relationship between the supporting soil and the period of vibration of the structure is distinctly important in regard of the seismic response of the structure. Different approaches have been employed in the past to give the solution of Soil-Structure interaction and incorporate the changes according to the studies made.

CONCLUSION

a) To precisely appraise the response of structure, the impact of soil structure interaction is needed to be considered under the affected by both static and dynamic loading.

b) The forces in superstructure, foundation and soil mass are essentially changed because of the impact of soil structure interaction. For precise estimation of the design force quantities, the interaction effect is needed to be considered.

c) Load redistribution significantly modifies the total and differential settlements. Settlements are found more in the non-linear analysis.

d) Numerous investigators analysed the interaction behaviour considering different types of foundations like raft foundation, isolated footing, grid foundation and pile foundation etc.

e) The assumptions taken by the investigators involved the soil mass as homogenous, isotropic and behaving in linear and nonlinear manner in the interaction analysis.

f) A few numbers of works have been conducted considering the soil mass as elasto-plastic, visco-elastic and visco plastic in interaction analyses.

g) The finite element method has turned out to be an extremely helpful method for studying soil-structure interaction effect with meticulousness. In fact, the technique becomes useful to incorporate the effect of material nonlinearity, non-homogeneity and interface modelling of soil and foundation.

h) To perform nonlinear soil-structure interaction analysis, incremental iterative technique is found to be the most appropriate and general one.

i) For practical purpose, Winkler hypothesis should at least be employed instead of carrying out an analysis with fixed base idealization of structures.

j) Soil-structureinteraction may cause extensive increment in seismic base shear of low-rise building frames resting on isolated footings.

k) Time period of all the responses increases while considering Soil-Structure Interaction impacts. The difference in time period of the building for both conditions gets increased as the stiffness of the soil increases from soft to hard

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ISOLATION AND ASSAY OF PROTEASE INHIBITORS FROM PIGEON PEA CULTIVARS AGAINST *HELICOVERPA ARMIGERA*

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ABSTRACT
Helicoverpa armigera is a polyphagous pest damaging different crops leading to decrease in total production. Protease inhibitors (PI) have been extensively studied for development of resistance against insect pest. In present investigation, four varieties of Pigeon pea seeds were collected from "pulses improvement project center MPKV, Rahuri". The H. armigera insects were collected from Chick pea field Loni, Ahmednagar. The Pigeon pea seeds were studied for its inhibitory activity against H. armigeragut proteases to screened out the susceptible as well as resistant Pigeon pea varieties. Each variety (BDN-711, ICPL-87, Vipula and Rajeshwari) was tested against H. armigeragut protease in ratio of 1:3, 1:1 and 3:1. Pigeon pea variety Vipula showed most inhibitory activity against insect gut followed by Rajeshwari, ICPL-87 and BDN-711.

Keywords: Pigeon pea seeds, H. armigera, Protease inhibitors.

INTRODUCTION

Pigeon pea
Pigeon pea (*Cajanuscajan* (L.) Millsp.) is one of the major pulse crops of the semi-arid tropic and sub-tropics consumed as green vegetable and dry seeds as well as split dhal. Seeds and fodder contains approximately 20-22% protein. Seeds are rich in iron, iodine, and essential amino acids like Lycine, Cystine and Arginine. Pigeon pea being a leguminous plant is capable of fixing atmospheric nitrogen and thereby restore lot of nitrogen in the soil.

India is the largest producer with 3.4 million ha, followed by Myanmar (5,80,000 ha). China (60,000 ha) and Nepal (28,000) produces more than 80% of the total production of Pigeon pea. About 95% production of pigeon pea is from south Asia. 90% of which belongs to India. In India, Maharashtra stands first in area, production as well as productivity of Pigeon pea. In several laboratory studies with animals or insect report that the seeds have some anti-nutritional qualities to contain protease inhibitors which inhibit gut protease. The present study has important features like early maturity, determine growth habit, suitable for multiple cropping and well adapted in Maharashtra, which matures in 120-130 days after sowing. But drawbacks are as low yield, susceptibility against pod borer *Helicoverpa armigera*

Protease inhibitors
Protease inhibitors (PI) are molecules that inhibit the function of protease, many naturally occurring PI are proteins. PI have been identified, isolated and purified from different monocotyledon and dicotyledonous plant species. Mostly PI is small proteins that have been found in all plants species investigated thus far, and occur in both reproductive and vegetative tissue. In herbivorous insect, they act by inhibiting protein digestive enzyme in the guts of insect. Hence, the identification of PI having specificities towards different insect gut proteinases with high binding efficiency is necessary for effective inhibition of midgut proteinases of *H. armigera*.

*H. armigera*larvae have an alkaline gut, which can produce major and minor serine proteinases that are able to overcome the native PI of its host plants. The PI enter in the insect digestive tract along with the food and block the protein digestion, and hence, starving the insect for amino acid and energy, resulting in retardation of growth and development.

Insect *H. armigera*
Helicoverpaarmigera is a polyphagous omnivorus pest. It is found on more than 300 plant species including major economic crop plants i.e. pigeon pea, chick pea, cotton, groundnut, okra etc. Insect have cosmopolitan status. *H. Armigera*is polyphagous insect, it means capable of feeding on a diverse plant species (Sharma, 2001).

The present study was conducted to evaluate the *in vitro* analysis of the pigeon pea PI against the *Helicoverpa* gut protease (HGPs) from local pigeon pea cultivars. Pigeon pea and chick pea the host plant for *H. armigera*produces seven isoforms of Trypsin inhibitors (TIs), but HGPs degraded these TIs (Giri*et al.*, 1998). Insect, predominantly larvae of Lepidoptera and Coleoptera, claim more than 13 % share of crop losses (Gatehouse and Hilder, 1994).

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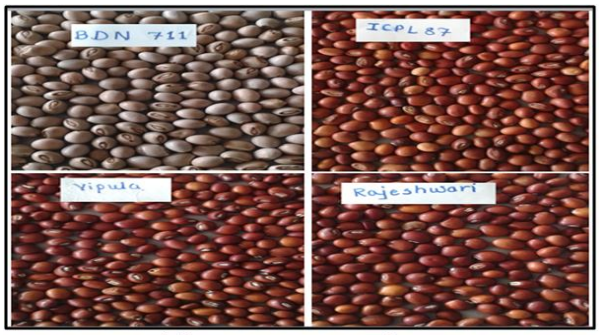
MATERIALS AND METHODS

Collection of plant material and insect

Different varieties of pigeon pea seeds were collected from "Pulses Improvement Project Centre" MPKV, Rahuri Dist. Ahmednagar.

Insects (*H.armigera*) were collected from chick pea field, Loni, District-Ahmednagar, early in the morning and brought in the laboratory.



Pigeon pea seeds

H. armigera

Isolation and Extraction of Pigeon pea seeds

Different varieties of pigeon pea were taken; BDN-711, ICPL-87, Vipula, Rajeshwari and washed with double distilled water and air dried. After drying the seeds were grinded in fine powder separately. The seed powder was defatted with hexane. Defatted seed powder was used for extraction. Seed powder extracted in 1:10 proportion with 1 % PVP in D/W and kept it overnight for extraction. The supernatant (seed extract) was collected and centrifuged at 4000 rpm for 20 min. at 4^0 C. After centrifugation the supernatant was collected and used as source of PI.

Isolation of *H. armigera*

Raring of insect: - Raring of insect was done on artificial diet in the laboratory.

Dissection of insect:- 70 % ethanol was prepared. Surface area, wax tray was sterilized by using 70 % ethanol. Insects were gently dipped in 70 % ethanol. Insects were dissected carefully. The gut of insect was removed and collected in a sterile test tube. Cold condition (4^0C) was maintained throughout the procedure. Insect guts were stored at -80^0 C.

Extraction of HGPs: - Insect guts were weighed. Crushed in mortar and pestle by using 0.1 M Glycine buffer (pH 9.6) with 1:6 ratio. Finely crushed slurry was taken in centrifuge tube and centrifuged the sample at 4000 rpm for 20 min. at 4^0 C. Supernatant was taken in another test tube and stored it in deep freezer at 4^0 C.

Estimation of protein :- Protein estimation of insect gut extract and seed powder was carried out by alkaline method (Lowery, *et al.*, 1951).

Interaction of *H. armigera* gut protease with different Pigeon pea seeds extract

Dot Blot Assay for enzyme activity:- Dot Blot Assay was done by X-ray film method.10 µl of enzyme was kept on X-ray film.10 µl of 0.1 M Glycine buffer was also kept on X-ray film as a control. Spot were incubated for 10 min. on X-ray film. The film was washed with warm water.

Detection of PI by Dot Blot Method (Kachole and Pichare, 1994).:- X-ray film method was used for the detection of PI activity. Glycine buffer (pH 9.6) was prepared. Three varying concentrations of the enzyme and inhibitors 1:3, 1:1 and 3:1 were prepared. The volume of the reaction mixture was adjusted with 0.1 M glycine buffer for *H. armigera*gut proteinases. The final volume was made upto 40 µl.10 µl reaction mixtures was taken and then spotted onto a strip of X-ray film. Spots were incubated for 10 min. on X-ray film depending on their activity. The reverse side of the film was cleared with protein and the film was scanned. When the inhibitor was present, the protein did not degrade on the X-ray film. Whereas, if inhibitor was absent, a cleared zone formed at the site of sample application on the X-ray film. The reverse side of the film was cleared with protein and the film scanned.

SDS-PAGE Electrophoresis:- SDS-PAGE electrophoresis was carried out.

Temperature and pH stability:- Enzyme activity on X-ray film was conducted with different temperature for detection of optimum temperature for enzyme activity. Temperature was checked from 30 to 40^0 C. The optimum activity was recorded at 37^0 C. The optimum pH was 9.6.

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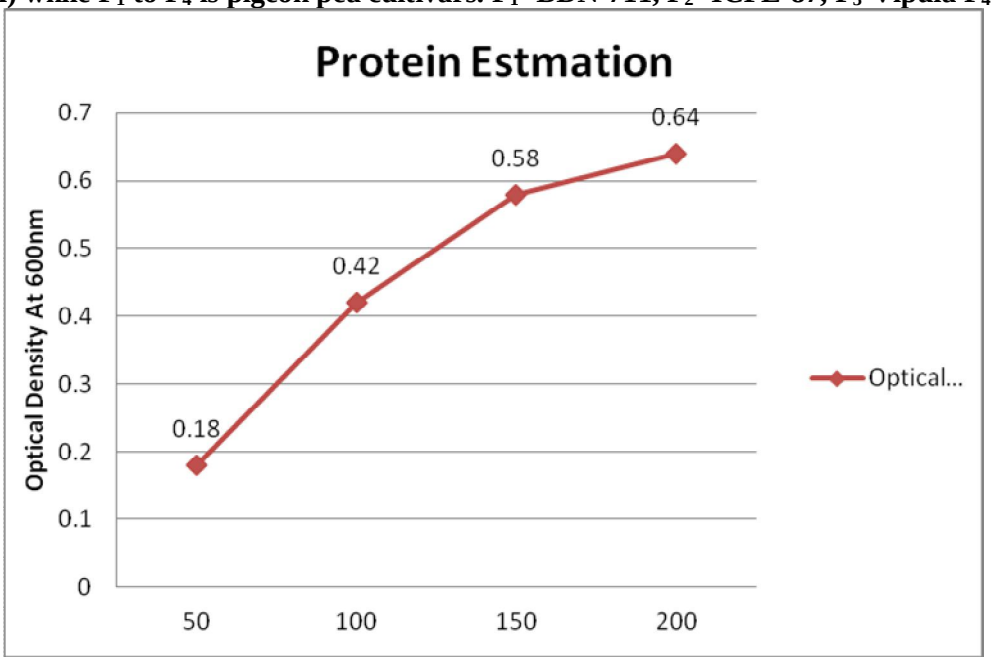
RESULT

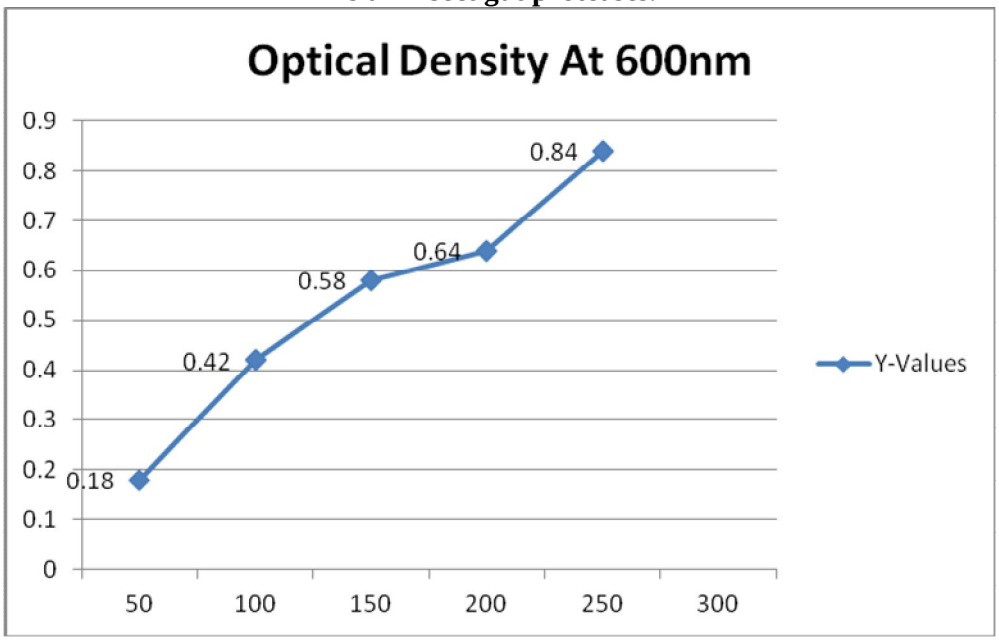
Protein estimation

A standard protocol given by Lowry, *et al*., (1951) was followed for the estimation of protein.

Graph No-1: Estimation of protein from pigeon pea cultivars. In the figure S_1 to S_5 point is standard solution (BSA) while P_1 to P_4 is pigeon pea cultivars. P_1- BDN-711, P_2- ICPL-87, P_3-Vipula P_4-Rajeshwari.



Graph No-2: Estimation of protein from *H. armigera* gut. In the figure S_1 to S_5 point is a standard and G_1 is an insect gut proteases.



Dot Blot Assay

Enzyme activity

Dot blot assay was done by X-ray film method for the enzyme activity.

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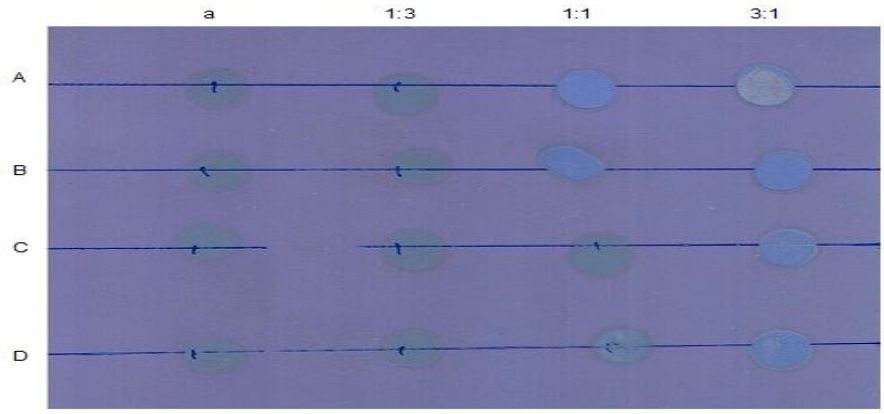
Dot Blot Assay for enzyme activity by X-ray film method.

A. Enzyme (insect gut protease), B. Control (0.1 M Glycine buffer, pH 9.6).

Detection of PI



Detection of PI against *H. Armigera*by Dot Blot Method. Three different concentrations (µl) of enzyme and inhibitors (1:3), (1:1) and (3:1) were used for screening of plant PI. The faint gray spot indicate total inhibition of enzyme, while dark transparent spot indicate no inhibition. (A) BDN-711, (B) ICPL-87, (C) Vipula, (D) Rajeshwari. (a) Denoted by pure PI.

DISCUSSION

H. armigera (Lepidoptera: Noctuidae) is one of the most important pests of cereals, legumes, vegetables, fruit crops. The levels of resistance to *H. armigera* in field crops are low to moderate, and therefore, there is need to identify species/cultivars with different mechanisms of resistance to this pest. Therefore, the present studies were carried out to detect proteases involved in digestion of food in the *H. Armigera* midgut and to identify potent protease inhibitors, which could be deployed in the commercial cultivars through genetic engineering to increase the levels, and diversify the basis of resistance to the pest.

The present investigation was undertaken for study of detection of protease inhibitor from Pigeon pea crop plant against *H. armigera* and inactive isoforms of digestive enzyme secreted in the gut and their activation by active forms of midgut proteinase. Pigeon pea seeds were extracted and supernatant was used as a source of PI as well as the *H. armigera*gut extract was used as an enzyme. Proteins were successfully estimated by lowery's method.

Dot Blot method developed by Pichare and Kachole (1994) was used for screening of Pigeon pea plant PI. Trypsin, chymotrypsin and HaGPs activity or inhibition was detected by dot blot assay method. Detection of PI was observed by mixing various Conc. of enzyme and protease inhibitor and spotted on X-ray film. Detection of PI from Pigeon pea seeds against *H. armigera* was successfully observed. Trypsin, chymotrypsin and HaGP inhibitory profiles in Pigeon pea plant PI were detected in seed extract of the sample run on denaturing gel and visualised by staining and destaining. But the results were not observed.

SUMMERY AND CONCLUSION

The present investigation was undertaken for study of assay of PI from Pigeon pea seed cultivars against *H. armigera.* Raring of insect was successfully done on artificial diet in the laboratory by Armes method. The dissection of HGPs was done for the enzyme. Extraction of *H. armigera* gut protease and Pigeon pea cultivars were successfully done for Enzyme and PI respectively. In the study, the protein estimation was done from *H. Armigera* gut and Pigeon pea cultivars. Total four varieties of Pigeon pea cultivars were used for the assay of PI against *H. armigera.* In the present study, Interaction of *H. armigera* gut protease with different Pigeon pea cultivar extract was studied. The inhibitory activity was successfully observed for Pigeon pea cultivars against *H. Armigera* on the X- ray film.

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NEW AVIAN CESTODE OF THE FAMILY THYSANOSOMIDAE (FUHRMANN, 1907) FROM AURANGABD DISTRICT (M.S.) INDIA

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ABSTRACT
The present communication deals with a new species of the genus Mogheia alii, Sp. Nov. from Turdoides malcolmi at District Aurangabad (M.S.) India. The worm comes closer to all the known species of the genus Mogheia in general topography of organs but differs due to scolex large, oval in shape. The suckers are large, four in numbers, oval in shape. Neck is absent. Scolex is followed by indistinct segmentation. Mature segments ten times broader than long, testes six in numbers, cirrus pouch small, cylindrical in shape, obliquely placed. Cirrus straight, thin tube. Vas deferens thin, curved tube , extends beyond the middle of the segment. Vagina, wide tube, posterior to cirrus pouch, genital pores small, round in shape. Ovary large, oval in shape, placed in poral half of the segment, ootype medium, round in shape.

Keywords: Aurangabad, Mogheia alii, Turdoides malcolmi.

INTRODUCTION

The genus *Mogheia* was erected by Lopez-Neyra in 1944.Moghe,1933 synonymised it as Baeria from the intestine and gizzard of *Turdoides somervillei* in India. The following species are added to the genus:

1. *M. orbiuterina,* Moghe, 1933.
2. *M. megaparuterina,* Capoor and Shrivastava, 1966.
3. *M. bayamegaparuterina,* Capoor, 1967.
4. *M. asturi,* Gaikwad and Shinde, 1981.
5. *M. copsychi,* Gupta and Sinha, 1984.
6. *M. oriole,* Gupta and Sinha, 1984.
7. *M. govindi,* Shinde et.al., 1986.
8. *M. parbhaniensis,* Shinde et.al., 1986.
9. *M. guptai,* Gupta and Parmar, 1988.
10. *M. caudatusae,* Sonune, et.al., 1990.
11. *M. turdoides,* Sonune, et.al., 1990.
12. *M. domesticus,* Jadhav et.al.,1990.
13. *M. hydrabadensis,* Jadhav et.al.,1994.
14. *M. passeri,* Kadam, et.al.,1999.
15. *M. turdoidesi,* Shinde et.al.,2000.
16. *M. laturensis,* Pawar and Shinde, 2002.
17. *M. passerae,* V.B. Garad and Sanjay S.Nanware, 2006
18. *M. ausae,* Gore et.al., 2008.
19. *M. yasini,* Shah Shabbir Ahmed Yasin, 2010.
20. *M. shahadensis,* Shah Shabbir Ahmed Yasin, 2010.
21. *M. pycnonotusae,* M.N. Kolpuke et al., 2012.
22. *M. domestica,* R. M. Dhondge et al., 2012.

The genus *Mogheia* is the sole representative of the family Thysanosomidae from birds. Later on no species is added to this genus. The present communication deals with new species *Mogheia alli,* Sp. Nov. collected from *Turdoides malcolmi* at Aurangabad, Maharashtra India.

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MATERIALS AND METHODS

Five cestode parasites were collected from the large grey babbler, at Aurangabad (M.S.) India in the month of September, 1986. The cestodes were fixed in 4% formalin. Few of these were stained with Harris Haematoxylin and prepared whole mount slides in D.P.X. Drawings are made with camera lucida. All the measurements are in mm. The parasites were identified according to keys of Yamaguti.

DESCRIPTION

Five cestode parasites were collected from the intestine of a large grey babbler, at Aurangabad (M.S.) India, in the month of September, 1986. The worms are small to medium in size, with large scolex, without neck and with numerous immature, mature and gravid segments. Proglottides are narrower than the scolex.

The scolex is large in size transversely elongated, oval in shape, with four muscular suckers, without rostellum and rostellar hooks and measures 0.215 to 0.412 in length and 0.921 to 1.115 in width. The suckers are measure 0.191 to 0.265 in length and 0.241 to 0.315 in width. The neck is absent.

The mature segments are broder than long, almost ten times broader than long, posterior segments are narrower than the anterior segments. Each segment has a single set of genitalia measures 0.097 in length and 0.994 in width. The testes are six in number, oval to round in shape, medium in size, placed in anti-poral half of the segment, arranged almost in a transverse line and measure 0.033 to 0.048 in diameter. The cirrus pouch is small in size, cylindrical in shape, obliquely placed, in the posterior half of the segment and measures 0.048 in legth and 0.009 to 0.019 in width. The cirrus is a straight, thin tube, contained within the cirrus pouch and measures 0.048 in length and 0.0004 in width. The vas-deferens is a thin, curved tube, extends beyond the middle of the segments runs parellel to the anterior margin of the segment and measures 0.629 in length and 0.004 in width.
The ovary is large, a single mass, with irregular margins, oval in shape, placed in poral half of the segment, on median line and measures 0.145 to 0.175 in length and 0.019 to 0.072 in width. The vagina is a wide tube, posterior to cirrus pouch, runs parellel to vas-deferens, takes a turn to the posterior side, reaches and opens into the ootype and measures 0.388 in length and 0.004 to 0.009 in width. The ootype is medium in size, round in shape postero-ventral to the ovary and measures 0.024 in diameter.

The vitelline gland is medium in size, a single mass, round to oval in shape, situated postero-lateral to the ovary and measures 0.029 to 0.039 in length and 0.038 to 0.067 in width.

The genital pore are small in size, round in shape, marginal, irregularly alternate and measure 0.009 in diameter.

The gravid segments are broader than long, almost thrice broader than long, with a single par-uterine organ in each segment and measure 0.215 to 0.241 in length and 0.750 to 0.800 in width. The uterus forms a single, round par-uterine organ, which is large in size touching anterior and posterior margins of the segments, round in shape, contains numerous eggs and measures 0.215 in diameter. The eggs are oval in shape and measure 0.004 to 0.009 in diameter.

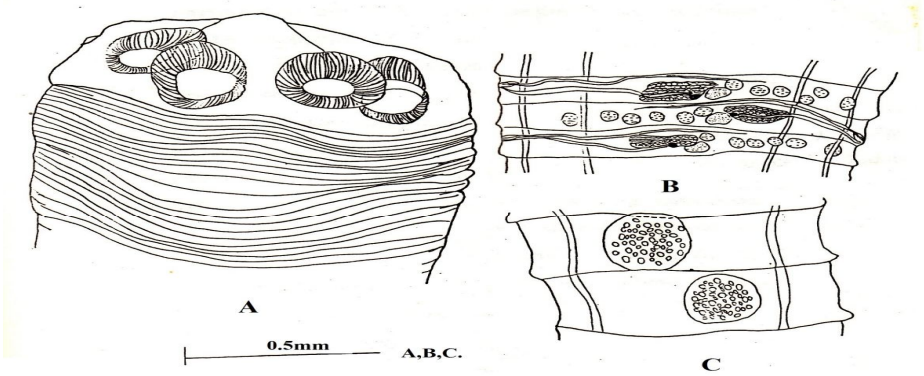

Fig. *Mogheia alii,* Sp. Nov.

DISCUSSION

The genus *Mogheia* was erected by Lopez-Neyra in 1944, as type species *Mogheia orbiuterina* (Moghe, 1933) from *Turdoides somervillei*, India. Later on the following species are added to the genus:

1. It is differ from *M. orbiuterina,* Moghe, 1933 which is having large, roughly square scolex; testes 9, rounded, situated beyond the ovary, on the poral half of the segments; cirrus pouch small, hardly reaching upto longitudinal excretory canals; receptaculum seminis small; paruterine organ small, almost circular, with large uterus, eggs 3 to 4 in number and found in *Turdoides somervillei.*

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2. The present cestode differs from *M. megaparuterina*, Capoor and Shrivastava, 1966 which is having large, globular scolex; testes 17 to 28, follicular,oblong, encircling the ovary; cirrus pouch short, elliptical, reaching upto the longitudinal excretory canals; receptaculum seminis present postero lateral to ovary; paruterine organ round, sac like, at poral side of uterus, anterior to uterus and projects upto the middle of succeeding segments, eggs numerous, rounded and filling the uterus.

3. The present tapeworm differs from *M. beyamegaparuterina*, Capoor, 1967 which is having small, almost quadrangular scolex; testes 4, situated laterally and aporal to ovary, in the central medulla; ovary roughly oval and found in *Ploceus phillippines.*

4. The present parasites differ from *M. asturi*, Gaikwad and Shinde, 1981 which is having large, almost rounded scolex; 16 – 18 testes, situated lateral and anterior to ovary in the central medulla; ovary small, oval, in posterior half of the segment; cirrus pouch small, saccular, extends slightly beyond the longitudinal excretory canals; paruterine organ very big, oval, transversely situated, containing numerous eggs and found in *Astur badin.*

5. The present form differs from *M. copsychi*, Gupta and Sinha, 1984 by having 10 -13 testes, situated on aporal side of the ovary and found in *Copsychus saularis*.

6. The present form differs from *M. oriole*, Gupta and Sinha, 1984 in having the scolex squarish, testes 5-7 numbers situated on poral and aporal side of the ovary and vagina in between excretory canals.

7. The present parasite differs from *M. govindi*, Shinde et.al., 1986 in which the scolex small quadrangular, testes 4 in numbers, aporal, situated in line; cirrus pouch small, at the middle of the segments and ovary compact oval, in poral half of the segment

8. The worm under discussion, differs from *M. parbhaniensis*, Shinde et.al., 1986 by having 5 testes, round, on poral side of the ovary; ovary compact, round, with a cap of uterus; cirrus pouch small, elongated, at 1/3 from anterior margin of the segments and found in *Passer domesticus.*

9. The present cestode differs from *M. guptai*, Gupta and Parmar, 1988 which is having receptaculum seminis large; paruterine organ small, uterus attached to the posterior end of the paruterine organ and found in *Argya caudatus.*

10. The present parasite differs from *M. caudatusae*, Sonune, et.al., 1990, in having scolex globular,testes thirty one, ovary compact, cirrus pouch small, oval and obliquely placed.

11. The present cestode differs from *M. turdoides*, Sonune, et.al., 1990, in having scolex quadrangular, testes ten in number. Ovary is a single mass, cirrus pouch elongated. Gravid segment eight times broader than long, paruterine organ large, oval and contained eggs.

12. The present form differs from *M. domesticus*, Jadhav et.al.,1990 which is having testes 22, ovary medium and triangular; vagina anterior to cirrus pouch and found in *Passer domesticus*.

13. The present form differs from *M. hydrabadensis*, Jadhav et.al.,1994, in having scolex small, cylindrical, not distinctly marked off from neck, suckers small, rounded to oval, four in number, equidistantly placed, neck short, mature segments 4-5 times broader than long, with convex lateral borders, testes five in numbers, small, rounded, three on poral and two on aporal side, cirrus pouch oval, sub-quarticular, obliquely placed, in anterior ¼ of the segment, cirrus coiled, unarmed, vas deferens long, slightly curved, ovary cresent shaped, vagina starts from genital atrium, placed obliquely, ootype small, rounded, placed near posterolateral margin of ovary, genital pores medium, oval, marginally placed and uterus large, oval, modified as an uterine cap, highly muscular.

14. The present parasite differs from *M. passeri*, Kadam, et.al.,1999, in having scolex large, massive, quadrangular, testes seven in numbers, ovary situated in the poral half near posterior margin of the segment, cirrus pouch cylindrical, elongated, marginal. Receptaculum seminis absent, paruterine organ large, sac like proximally and narrow distinctly.

15. The present worm differs from *M. turdoidesi*, Shinde et.al.,2000 in having scolex small, roughly squrish in shape, testes 20-24 in numbers, small, runs into lateral groups, cirrus pouch medium, oval. Ovary medium, oval to rounded, in single mass, situated in the centre, vagina medium, anterior to cirrus pouch, paruterine organ in each segment, large, oval, with numerous eggs.

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16. The present cestode differs from *M. laturensis*, Pawar and Shinde, 2002 in having scolex small, squarish; testes 12-15; ovary triangular; cirrus pouch oval and spindle shaped; vagina medium; genital pore regularly alternate and found in *Passer domesticus.*

17. The present specimen differs from *M. passerae,* V.B. Garad and Sanjay S. Nanware, 2006 due to quadrangular scolex, indistinctly marked off from strobilla, suckers four in numbers, rounded in shape. Neck is long. Mature segments seven times broader than long with convex lateral margin. Testes 14 in numbers, oval, situated in two lateral fields, seven aporal and seven in poral region. Cirrus pouch elongated, cirrus thin, curved, vas deferens short and coiled. Ovary compact, oval, ootype postero-ventral to ovary.

18. The present tapeworm differs from M.ausae, Gore et.al., 2008 in having scolex some what rectangular, muscular, suckers four, broad, oval, arranged in two pairs, short and wide neck, mature proglottids four times broader than long, testes 14-16 in numbers, rounded in shape, cirrus pouch oval, above centre of segment, transversely placed, cirrus small, straight within the cirrus pouch, ovary medium, bilobed, genital pores small, rounded, regularly alternate.

19. The present cestodes differs from *M. yasini,* Shah Shabbir Ahmed Yasin, 2010 in having Scolex is fairly large, Roughly quadrangular, with rostellum and rostellar hooks, sucker four in number, large, oval in shape, neck absent, mature segment highly muscular crowded together, broader than long, almost six time broader then long, testes ten in number, round in shape, present antiporal side, the cirrus pouch is cylindrical at ½ from anterior margin of the same, cirrus thin, straight or slightly curved, vas-deference is very thin, runs in zigzag, curves, ovary medium size, poral half of segment, bean shaped, vagina thin, receptaculum seminis elongated, ootype small, oval, genital atrium medium, genital pore small, oval, vitelline gland medium, oval in shape and found in *Turdoides malcomi.*

20. The present cestodes differs from *M. shahadensis*, Shah Shabbir Ahmed Yasin, 2010 is having Scolex fairly large, oval, blunt antereriorly, without rostellar hooks, sucker four in number, large, prominent, oval, arranged two pairs, neck absent, mature segments almost three and half times broader than long, testes five in number, small and large, oval in shape, preovarian, arranged two lines, in central medulla, poral side two in number and antiporal side three in number, cirrus pouch big, oval, cirrus is wide, slightly coiled, vas-deference thin, ovary indistinctly biolobed, large, near the posterior margin of segment, ovarian lobes are almost cylindrical, vagina short distance from genital pore, receptaculum seminis obliquely placed, curved, ootype small, round, anterior to the isthmus, genital atrium medium, oval, genital pore medium, oval, vitelline gland medium, almost oval, postovarian and found in *Turdoides malcomi.*

21. The present cestodes differs from *M. pycnonotusae,* M.N. Kolpuke et al., 2012 is having Scolex medium, roughly quadrangular, without rostellum and rostellar hooks; four medium oval suckers. Testes 7-9, small, rounded, situated in antiporal side; cirrus pouch medium, cylindrical and elongated, oval; cirrus very thin, slightly coiled; ovary small, oval, compact single mass; vagina thin tube, long, posterior to cirrus pouch; receptacalum seminis small, spindle shaped; ootype small and round; uterus small, oval, highly muscular with fibrous cap; vitelline gland small and oval; genital pores medium, oval, marginal, irregularly alternate and found in *Pycnonotus cafe.*

22. The present cestodes differs from *M. domestica*, R. M. Dhondge et al., 2012 is having suckers are large, four in numbers, rounded to oval. Scolex is followed by long neck, followed by indistinct segmentation. Mature segments broader than long, testes 08 in numbers, cirrus pouch small, elongated, marginally placed cirrus straight protrusible and forms vas deferens reaches up to the middle of the segment. Vagina, thin tube, runs transversely, posterior to cirrus pouch, genital pores small, oval in shape. Seminal receptacle is thin tube, open into ootype, ovary medium, bean or fan shaped, situated towards middle of the segment in the poral half, ootype small, compact, oval in shape and found in *Passer domesticus*.

The above noted characters are valid enough, to accommodate these worms into a new species and hence the name *Mogheia alii*, Sp. Nov. is proposed after Dr. Syed Mehedi Alii, Ex-Professor and Head, Department of Zoology, Dr. Babasahed Ambedkar Marathwada University, Aurangabad, who has contributed so much in our knowledge of Helminthology.

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8. Decision of the Editorial Board regarding selection/rejection of the articles will be final.

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