

Physicochemical evaluation of stem bark of *Careya arborea* Roxb.

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Abstract:

The current study includes physicochemical analysis of the bark of *Careya arborea* Roxb. employing established methods to investigate the authentic plant material adequately for its traditional claims. Total ash, sulphated ash, water insoluble ash, acid insoluble ash, loss on drying, water soluble and alcohol soluble extractive values, organoleptic features, and fluorescence studies were determined by physicochemical assessment. The total ash value (13.43 %) is greater than the sulphated ash value (9.49%). Furthermore, the water soluble extractive value of (17.04 %) demonstrated that water enters the cells of the bark, making it a superior extractive than alcohol, which had an extractive value of (9.32 %). This research will aid in the creation of an appropriate monograph, assessing the variety and pureness of a raw medicine, and establishing pharmacopoeal criteria for *Careya arborea* Roxb. The study discovered different identities for the crude pharmaceuticals, which will be important for identification and control in order to depreciate the raw meds.

Index Terms: *Careya arborea* Roxb., physicochemical, organoleptic, fluorescence analysis.

I. INTRODUCTION

India has one of the most ancient, diversified, and rich cultural traditions related with the usage of medicinal herbs. Plants have been employed widely as medicine for the treatment of numerous illnesses throughout history of mankind, and this

tendency continues to this day. According to the World Health Organization, plant-based medications are used by 75–80 % of the worldwide people. All plants may not be as beneficial as advertised, or they may have more medicinal characteristics than those previously known. To examine and explore the precise standardisation of such medicinally essential plants, competent scientific understanding is necessary [1]. Indigenous knowledge provides a fundamental knowledge of plant therapeutic characteristics. The detection of active chemicals in medicinal plants and their purification is a primary key for the development of novel medications.

Careya arborea Roxb. belongs to the Lecythidaceae family. It is a mid-sized deciduous tree that typically grow approximately 15–20 metres. *Careya arborea* Roxb. is also known as Kumbhi, Kalindi and Padmaka. It is widely available in Australia, India, Bangladesh, Sri Lanka, Pakistan, China, Vietnam, and Myanmar. It may also be found in Kerala, Karnataka, Jammu and Kashmir, West Bengal, Madhya Pradesh, Chhattisgarh, and Tamil Nadu in India. The bark is dark grey in colour and is frequently removed in thin strips [2]. The wood has a medium texture, sturdy, weighty, and robust. The sapwood is white, whereas the heartwood is reddish. The barks of *Careya arborea* Roxb. is used in constipation, diarrhoea, snake bite, asthma, dental problems, skin diseases, small pox, fever, cold and cough. It has a diversity of pharmacological properties, including antioxidant, anti-diabetic, anticancer, anti-inflammatory, hepatoprotective, antiulcer, antipyretic, antimicrobial, antibacterial, antidiarrheal, anticoagulant, analgesic, and antitumor [3-18]. This study employed physicochemical inquiry, organoleptic qualities, and fluorescence analysis to identify the dry form of the medicine and limit adulteration.

II. MATERIAL AND METHODS

A. Collection and identification:

The barks of *Careya arborea* Roxb. were collected from Madanpur (Pamgarh), District Janjgir-Champa, Chhattisgarh, India, in March 2020. The gathered plant material were taxonomically verified and confirmed by BSI Allahabad, Uttar Pradesh, India.

B. Sample preparation:

The collected barks were cleaned, rinsed, and shade dried in the room. The dried barks were taken to a grinder machine and ground into a coarse powder. This coarse powder was saved in a cleaned, tight glass vials and used for analysis.

C. Determination of physicochemical parameters:

The several physico-chemical profiles e.g. total ash, sulphated ash, water soluble ash, acid in-soluble ash, water soluble and alcohol soluble extractive values, loss on drying, organoleptic properties, and fluorescence analysis were performed using standard procedure [19-21].

D. Total Ash Value:

Approximately 5 grams of coarsely powdered of samples was burned in a crucible at 450 °C until carbon-free. Then it was cooled and weighed. The ash percentage was calculated with reference to the air-dried plant material.

E. Sulfated Ash value:

In the crucible, 5 gm of coarsely powdered plant material was added and gently ignited until completely burnt. After cooling, the residue was soaked in 1 ml of H₂SO₄, carefully heated until no white vapours escaped, and then incinerated at a high temperature (800 °C) until all black particles vanished. Allowing the crucible to cool before adding a few drops (1ml) of H₂SO₄ and heating it. Then it was ignited, cooled, and weighed. The process was repeated until the difference between two successive weighings was less than 0.5 mg.

F. Water Soluble Ash Value:

The ash was rinsed from the crucible into a 100 ml beaker with 20 ml chloroform water, heated for a few minutes (5 min.), and filtered through filter paper. After twice being rinsed with worm water, the residue was burnt to ash, cooled, and weighed. The weight of ash was subtracted from the weight of insoluble materials. The water soluble ash is represented by the weight difference. The water-soluble ash percentage was calculated using the air-dried plant sample as a reference.

G. Acid insoluble ash value:

The ash was rinsed from the crucible in to a 100 ml beaker using 20 ml hydrochloric acid. After bioling for a few minutes (5 minutes) over a Bunsen burner, it was filtered through an ashless filter paper. The residue was soaked two times in worm water before being burnt to ash, dried in desiccators, and weighed. The residue was weighed, and the acid insoluble ash of the sample was calculated using air-dried plant material as a reference.

H. Water soluble extractive value:

5 gram of roughly powdered sample was placed in a conical flask, 100 ml of distilled water was added, the conical flask was shaken frequently for an extended period (five hours), and the sample was filtered with filter paper. The filtrate was vaporised in a water bath to dryness, the residue was dried at 100 °C, weighed, and the water soluble extractive value percentage was measured using air-dried plant material as a reference.

I. Alcohol soluble extractive value:

5 grams of roughly powdered material were mixed with 100 ml of 80% ethyl alcohol, shaken frequently for an extended period (six hours), set aside for 18-24 hours, and filtered with filter paper. Then, 25 ml of the filtrate was vaporised in a water bath to dryness, the residue was dried at 100 °C, weighed, and the alcohol soluble extractive value percentage was measured using air-dried plant material as a reference.

J. Loss on Drying:

5 grams of coarsely powdered plant material were poured onto a tarred and evaporated plate. This was weighed after 5 hours of drying at 105°C. We weighed and dried at one-hour intervals until we obtained a constant weight. When the difference between two successive weights after drying for 20-30 minutes and cooling in a desiccator was less than 0.1 gm, the weight was considered as a constant weight.

K. Organoleptic analysis:

Organoleptic analysis is used to determine the taste, texture, colour, and odour of a sample. The bark of *Careya arborea* Roxb was tested for organoleptic properties. **Table 2** summarises the findings of the organoleptic examination. The results showed that *Careya arborea* Roxb. had no influence on the organoleptic qualities.

L. Fluorescence analysis:

Fluorescence analyses were performed on coarsely powdered samples with various reagents and examined under visible light and UV spectrum at 254 and 360 nm wavelengths for possible coloration. These analyses are

completed using standard procedures [22-23]. In this study, the barks of *Careya arborea* were treated with several chemical reagents, e.g. sodium hydroxide, ammonia, picric acid, petroleum ether, hydrochloric acid, sulfuric acid, and potassium hydroxide, etc.

III. RESULTS AND DISCUSSION

The physico-chemical characteristics are mostly employed to determine drug purity and quality. The findings of the physicochemical parameters of the bark of *Careya arborea* Roxb. are shown in Table 1 and fig. 1.

Table I: Physicochemical analysis of Bark of *C. arborea* Roxb.

S. N.	Parameter	Value (% w/w)
1	Total ash	13.43
2	Sulfated ash	9.49
3	Water soluble ash	2.87
4	Acid insoluble ash	1.20
5	Water soluble extractive value	17.04
6	Alcohol soluble extractive value	9.32
7	Loss on drying	14.79

The ash value of a medicine indicates the amount of earthy materials, inorganic content, or other contaminants present with the medicine. The ash values of coarsely powdered bark indicated a high proportion of total ash (13.43%) and sulphated ash (9.49%), but a relatively low percentage of water soluble ash (2.87%) and acid insoluble ash (1.20%). The extractive values indicates the chemical components contained in the medicine and may be used to identify exhausted or contaminated medicines [24-25]. According to the findings, coarsely powdered bark has a larger water soluble extractive value (17.04%) than alcohol soluble extractive value (9.32%).

Table: II Organoleptic properties of bark of *C. arborea* Roxb.

S. N.	Description	As bark form	As powder form
1	Color	Dark Brown	Pinkish Brown
2	Odor	None	None
3	Taste	Astringent	Astringent
4	Shape	Curved	Coarse Powder
5	Surface	Wrinkled	No Wrinkled

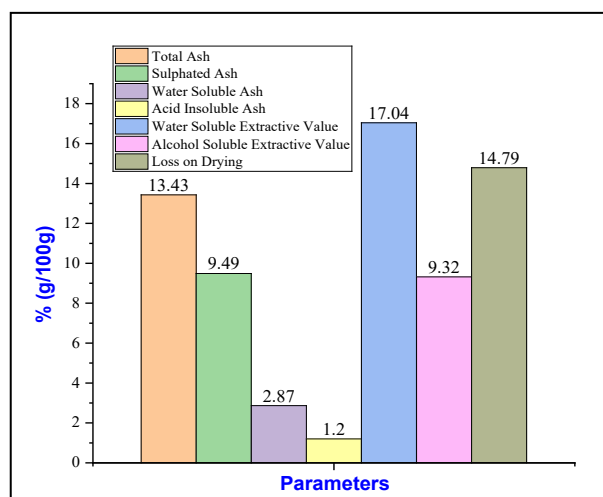


Fig.1: Physicochemical analysis of bark of *C. arborea* Roxb

Table: III Fluorescence analysis of bark of *C. arborea* Roxb.

S.N.	Powdered drug + Reagents	Visible / Day light	UV 254 nm(short)	UV 365 nm (long)
1	Powdered drug	Pinkish grey	Brown	Blackish Brown
2	Powdered drug + NaOH	Rusty Brown	Dark Brown	Reddish Brown
3	Powdered drug + NH ₃	Light Brown	Pale Brown	Light Brown
4	Powdered drug + Picric acid	Yellowish Brown	Yellowish Brown	Brown
5	Powdered drug + Pet. Ether	Light Brown	Greenish Brown	Light Brown
6	Powdered drug + HCl	Reddish Brown	Brown	Brown
7	Powdered drug + H ₂ SO ₄	Black	Black	Brownish Black
8	Powdered drug +50% HCl	Light Brown	Greenish Brown	Brown
9	Powdered drug + 50% H ₂ SO ₄	Yellowish Brown	Dark Brown	Yellowish Brown
10	Powdered drug + 50% KOH	Reddish Brown	Brown	Reddish Brown

Extractive values are valuable for evaluating a crude drug because they provide information about the nature of the chemical constituents contained in it and may be used to predict the chemical constituents soluble in that particular solvent used for extraction. The percentages of moisture contained (loss on drying) in the barks of *Careya arborea*

Roxb. are also evaluated and shown in Table I and Fig.I. Findings from organoleptic and fluorescence assays are shown in Tables II and III respectively. The results revealed that *Careya arborea* Roxb. had no effect on organoleptic qualities. The fluorescence study provides information on the sample drug's probable colour in the ultraviolet and visible light spectrums. The fluorescence analysis findings of *Careya arborea* Roxb. are given in Table III.

IV. CONCLUSIONS

Careya arborea Roxb. plays a significantly key in the Ayurvedic and Unani systems of holistic health and herbal therapy. The bark sections of *Careya arborea* Roxb. were carefully studied for their physicochemical features in order to assess their quality, safety, and standardisation for use in the latest research. The current study's findings will give data that will aid in the accurate identification and authenticity of these therapeutic herbs, as well as in preventing their adulteration. More study is being conducted on the separation, purification, and characterisation of therapeutically active chemicals from aqueous extract, which might then be submitted to pharmacological examination to determine the specific mechanism of action.

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Study on behavior of fly ash with Phosphor at low dose

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Abstract: Fly ash generated during the combustion of coal for energy production which is an industrial waste product and considered as an hazardous environmental pollutant. Since environmental issues caused by fly ash across the whole world thus considerable research work has been taken on this waste material globally. In this paper we studied thermoluminescence (TL) properties of $\text{CaSO}_4\text{:Dy}$ doped with sieved fly ash synthesized by solid state reaction technique. The powder is exposed to gamma irradiation ranging from 1000 mR to 4000 mR and the source of radiation is ^{137}Cs . The highest glow curve peak is ranging between 250 °C to 270 °C in cases of different doses. Kinetic parameters of the fly ash mixed dysprosium doped calcium sulphate is being calculated using Glow Curve Deconvolution (GCD) method, Chen's Peak Shape method, Initial Rise (IR) method.

Index Terms: Solid State Reaction Method, Cs-137, Kinetic parameters.

I. INTRODUCTION

Fly ash is a byproduct of burning pulverized coal in electric power generating plants. During combustion, mineral impurities in the coal (clay, feldspar, quartz, and shale) fuse in suspension and float out of the combustion chamber with the exhaust gases. As the fused material rises, it cools and solidifies into spherical glassy particles called fly ash [1]. There are numerous advantages of fly ash utilization such as energy-saving, protection of environment and agriculture. In construction it can also partly replace cement.

Thermoluminescence is one of the processes in thermally stimulated phenomena of light from an insulator/semi-conductor following a previous absorption of energy from ionizing radiation including γ -rays, X-rays, β -particles, α -particles, protons, neutrons and energetic ions [2]. In general, TL is the phenomenon of light emission when radiation is incident on a material; some of its energy may be absorbed and re-emitted as light with longer wavelength. Low dose and high dose phosphor is characterized by thermoluminescence (TL) emission which is utilized in medical and environmental radiation dosimetry. In general, TLD materials exhibit high concentration of traps, negligible fading and simple trap distribution in highly efficient TL phosphors.

II. MATERIALS AND METHOD

Calcium Sulphate CaSO_4 is the material used in this work to test its ability in radiation absorption in order to make radiation protection by mixing Calcium Sulphate doped with dysprosium with fly ash collected from National Super Thermal Power Station, Korba. It is primarily used in the manufacture of Plaster of Paris for industrial applications. The novelty in this work is related to the use of fly ash as radiation protection material with Calcium Sulphate by examining its thermo luminescence properties.

$\text{CaSO}_4\text{:Dy}$ phosphor mixed with fly ash using solid state reaction method. Then the powder is converted into pallet form and exposed to γ - radiation source of ^{137}Cs [3]. Dose is ranging from 1000 mR to 4000 mR. TL glow curves of γ - ray irradiated samples were obtained using a Nucleonix

1009I TL reader in the temperature range of 20 °C to 300 °C with a heating rate of 5 °C /sec.

The measurement of the dose is also validated by the calculation of TL kinetic parameters using Chen's peak shape method, Initial Rise method, GCD method [3].

III. RESULT ANALYSIS AND DISCUSSION

A. XRD Analysis:

The XRD properties of the samples were obtained using a Bruker D2 Phaser diffractometer. The value for 2θ in a range from 10° to 80° is taken with an increment of 0.01° per sec. The continuous X-ray emitted between scan range of 9.99 to 79.99 with scan step size 0.02° . The XRD patterns are shown in the Figure (1) which suggests hkl values (0, 0, 0). Orthorhombic crystalline phase is indicated by planes of $\text{CaSO}_4\text{:Dy}$. Only some major peaks are observed due to the mixing of fly ash in the $\text{CaSO}_4\text{:Dy}$ Phosphor.

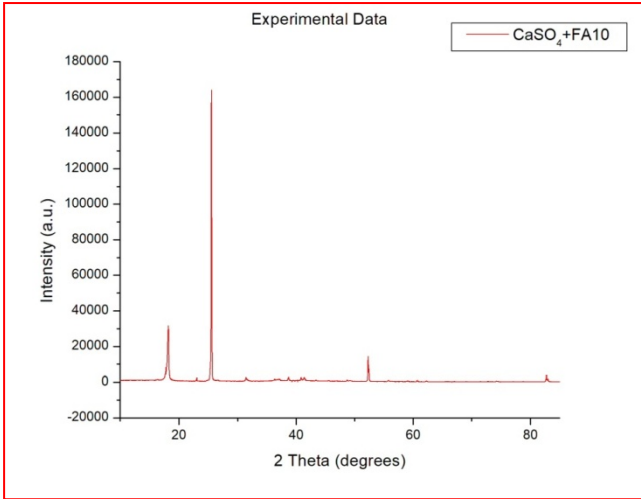


Figure (1): XRD of sample $\text{CaSO}_4\text{:Dy}$ phosphor mixed with fly ash

B. Thermo-luminescence Glow Curve Analysis:

The TL glow curve of $\text{CaSO}_4\text{:Dy}$ phosphor mixed with 10 % fly ash shows the variation of glow peaks level with variation in dose level as indicated in Figure (2). Optimum peak is observed between 250 °C to 300 °C for all the doses [4]. The highest peak is obtained for 4000 mR dose but the TL response for 1000 mR dose is prominent as it is more closer to the 10 value of intensity in arbitrary units. We can see that the TL peak for 3000 mR dose is nearby 22 a.u. while the intensity of 2000 mR exposed sample is very low nearby 8 in arbitrary units. As such we can see

that the 1000 mR dose is having intensity nearby 9 a.u. which is more analogous with that of Phosphor.

Figure (3) shows that individual TL response and glow curve peak of 10 % fly ash doped with $\text{CaSO}_4\text{:Dy}$ phosphor.

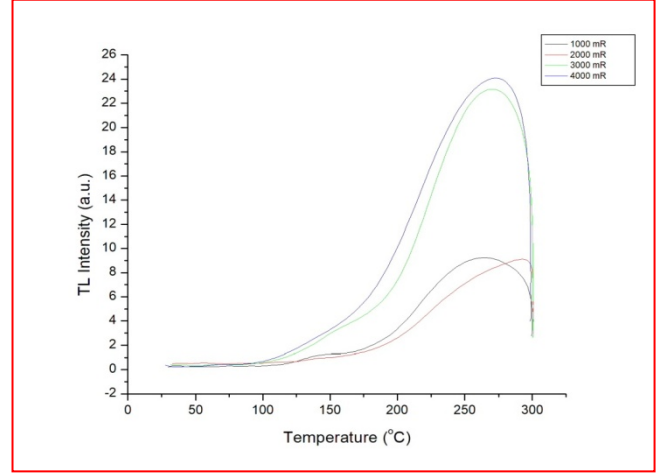


Figure (2): TL glow curve of $\text{CaSO}_4\text{:Dy} + \text{FA}$ in range from 1000 – 4000 mR

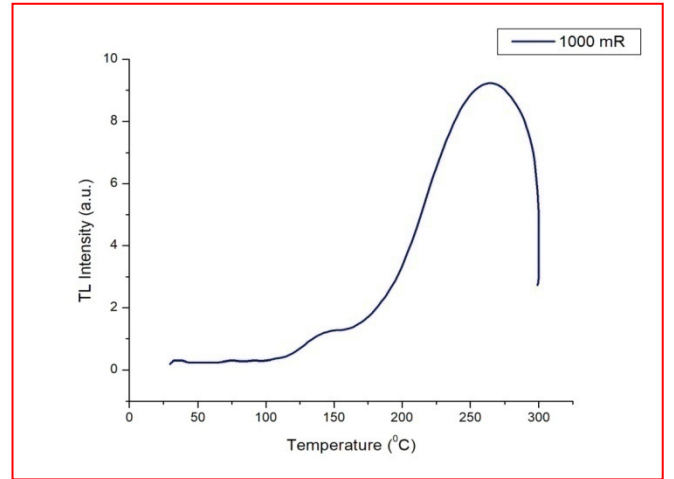


Figure (3): TL glow curve of $\text{CaSO}_4\text{:Dy} + \text{FA}$ at 1000 mR

C. Analysis of Kinetic Parameter:

The Kinetic parameters of 10 % fly ash mixed $\text{CaSO}_4\text{:Dy}$ Phosphor is estimated by various methods. The methods we are using are Chen's Peak Shape (CPS) method, Initial Rise (IR) method, Glow Curve Deconvolution (GCD) method [5, 6, 7, 8]. The summary of results from various methods is displayed in the table below:

Table I: Kinetic Parameters for 10 % fly ash mixed $\text{CaSO}_4\text{:Dy}$ Phosphor

Methods	Peak Temperature (°C)	Order of Kinetics (b)	Activation Energy (E _A)	Frequency Factor (S)
GCD	265.8	3	0.42	5.46 x 10 ⁴
IR	265.8	-	0.36	-
Chen's Peak	265.8	1.43	0.63	5.22x10 ⁶

IV. CONCLUSION

In the thermo-luminescence study of fly ash mixed with CaSO₄: Dy Phosphor we have concluded that the sample exposed to 1000 mR radiation of ¹³⁷Cs is in analogy with that of pure phosphor. Other samples at 2000 mR, 3000 mR and 4000 mR are less analogous with phosphor in TL response. Also kinetic parameters estimated from various methods (Table 1) indicates that the activation energy of the tested sample are very much closer/identical to each other which suggested the fact that the fly ash mixed phosphor material has good TL response and can be utilized for dosimetric applications at low dose range.

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A review of Hybrid Machine Learning Techniques in Medical Diagnosing

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Abstract: Disease diagnosis using machine learning helps to perform predictive analysis or pattern recognition on large data. Hybridized techniques with feature subset selection to hybrid classifier can enhance the accuracy in the disease diagnosis and also help to identify appropriate and relevant treatments for disease patients. In this paper, we present a review study of all the researches that uses various Hybrid ML approaches employed in the diagnosis and prognosis of various diseases. The predictions model discussed here are based on various supervised hybridized ML techniques. We then analyze the other factors on which the results of the diagnostic model depend such as data size, data sample, quality, feature selection, etc. If we

consider all these factors with different classifiers, then we are able to develop a highly accurate diagnostic system. Thus, this work presents a comprehensive overview of various techniques used for classification systems. Also, the performances of various Machine Learning techniques and hybridized machine techniques in various health domains. This study also helps to analyze the appropriate technique to develop a health care diagnosis system for various diseases.

Index Terms: Machine learning, Support Vector Machine (SVM), Bayesian network (BN), Artificial Neural network (ANN), Health care data.

I. INTRODUCTION

All the healthcare organizations across the world store healthcare data in electronic format. The storage of such type of data is increased at a very rapid rate. Due to the continuous increase in the size of data in biomedical and healthcare, there is a need for accurate analysis of medical benefits, early disease detection, patient care, and community services. In the present day, the core issue is the intersection of machine learning and healthcare. ML methods have become a popular tool for medical researchers. These techniques can discover and identify patterns and relationships between them. Now, the Machine learning techniques are

able to predict future outcomes of any dataset very effectively. We here, present a review of studies that make use of these methods for the diagnosis and prognosis of many diseases. In addition, we discuss the types of ML methods being used, the types of data they integrate, the overall performance of each proposed while we also discuss the pros and cons of various techniques.

Machine learning systems can be used to develop the knowledge bases used by expert systems [38, 39]. Given a set of clinical cases that act as examples, a machine learning system can produce a systematic description of those clinical that uniquely characterize the clinical conditions. The

single technique shows the expected level of accuracy while integrating different machine learning techniques gives better results and treatment. Different predictive models were developed by using machine learning techniques originating from different research fields by researchers and helping to give the best solution. The performance of models varies from one data to another data, and inconsistency of data is due to missing value and noise. The accuracy of the machine learning classification algorithm is an important concern for researchers to measure how often the algorithm classifies a data point correctly in order to develop the appropriate and best methods for disease diagnosis.

Hybrid machine learning systems combine different machine learning models for accurate and effective prediction. Since each method in machine learning works differently and exploits a different part of problem space, so their combination or integration usually gives better performance than individual ones [30].

II. HYBRID MACHINE LEARNING MODELS AND METHODS

Different methods in machine learning explore different hypothesis spaces, use different search strategies, and are appropriate for different types of problems [25]. The implementation of HPM shown in Fig.1 shows the detailed architecture of the proposed hybrid model. In this system, after preprocessing activities, we integrate different classifier or clustering techniques such as Naïve Bayes, SVM, and K-means, etc. for the hybrid model. A classification process in the machine learning techniques helps to predict the class label values for any instance in the dataset. It is also comparable to clustering in that it also segments information retrieval into a distinct segment called classes [30]. Machine learning methods for learning hybrid models can use combined models or hybrid

ensembles or both. After evaluating and assessing the results and accuracy, we find the predicted model.

A. Significance of Hybrid Machine Learning and feature selection in Health Care

Disease identification and diagnosis of ailments is at the forefront of machine language. Machine learning techniques help to perform predictive analysis or pattern recognition on large data sets also; it plays a crucial role in the design of expert systems in medical diagnosis [17].

A model with suitable and relevant parameters reduces the chances of misclassifying and provides greater accuracy to the overall system. Therefore, feature selection plays an important role in classification. A correct selection of features can lead to an improvement for further learning. Ensembles of features selection can be used to maintain stability, giving more accurate, robust, and stable features. It can be applied in different scenarios. It is also one of the recent focusing researches in the field of machine learning. Feature selection and optimization are essential processes for any type of data for further process and transformation. Single technology ensures the expected level of accuracy while integrating different machine learning techniques to give better results and treatment. So, now a day's hybridization techniques become a great virtue to analyze disease cases. These techniques can be used on disease datasets to improve redundant, noisy, and insignificant features. Hybrid machine learning systems combine different machine learning models. Since each method in machine learning works differently and exploits a different part of problem space, so their combination or integration usually gives better performance than individual ones [18].

B. REVIEW LITERATURE OF HYBRID MACHINE LEARNING TECHNIQUES:

The study of disease diagnosis has become very popular and one of the most challenging jobs of the researcher. Thus, most of the researchers are still now have been focusing on developing the best and appropriate methods for the Health care system which will give more strong results. An extensive search was conducted [25, 26, 27] relevant to the use of machine learning techniques in various diseases used for recurrence and survivability prediction. However, the accurate prediction of a disease outcome is one of the most challenging tasks for physicians.

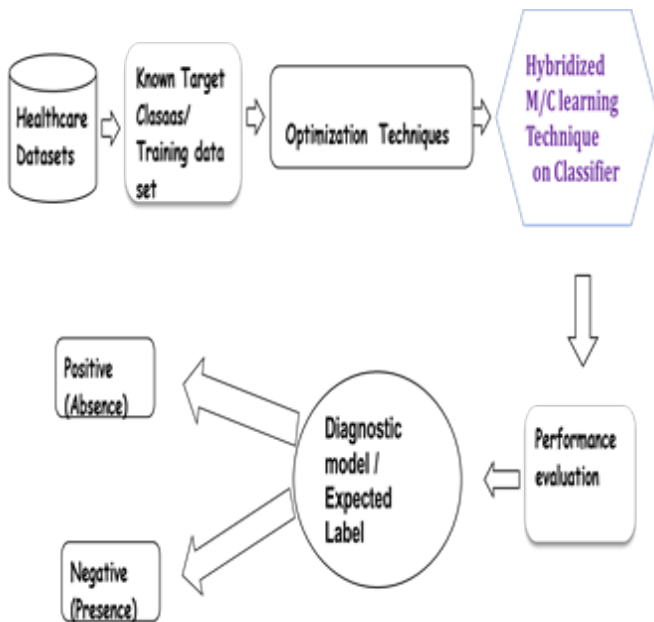


Fig 1. The architecture of Hybridized Machine Learning Technique

As a result, machine learning methods have become popular tools for medical researchers. But now a day's hybridized methods are also used by researchers so as to improve the accuracy rate and for better results [39]. The literature contains many studies which have been implemented using hybrid structures. A hybrid model based on clustering followed by classification was presented in Ref. [30] for the prediction of type-2 diabetes. The proposed model used K means clustering and a C4.5 classification algorithm with K-fold cross-

validation for prediction. With the hybrid approach, the model obtained promising results with the classification accuracy of 92.38% which can very helpful for the physicians for making effective clinical decisions related to diabetes. In the future, we can work on developing more refined models for the diagnosis of diseases.

A hybrid intelligible model was proposed in Ref. [3] using support vector machines for the prediction of diabetes. The key aspect was the proposed rules extracted from the SVM. High prediction accuracy was obtained which would greatly help in medical diagnosis.

Another model used for the prediction of heart and diabetes diseases [40] using ANN and Fuzzy Neural Network. The datasets are Pima Indians diabetes and Cleveland heart disease. In order to evaluate the performance of the proposed method accuracy, sensitivity, and specificity performance measures that are used commonly in medical classification studies were used. The classification accuracies of these datasets were obtained by K-fold cross-validation. The proposed method achieved accuracy values of 84.24% and 86.8% for the Pima Indians diabetes dataset and Cleveland heart disease dataset, respectively. It has been observed that these results are one of the best results compared with results obtained from related previous studies and reported on the UCI websites. Many researchers worked on optimized classifiers to remove irrelevant features and insignificant instances to increase prediction accuracy.

Hybrid genetic algorithm adopted to find a subset of features that are most relevant to the classification task [12]. Two stages of inner and outer optimizations cooperate with each other and achieve high global predictive accuracy as well as high local search efficiency. Proposal of two-stage hybrid feature selection algorithms adopted [40]

Support Vector Machines (SVM) as a classification tool, and the extended Sequential Forward Search (SFS), Sequential Forward Floating Search (SFFS), and Sequential Backward Floating Search (SBFS), respectively, as search strategies, and the generalized F-score (GF) to evaluate the importance of each feature. Proposal of a hybrid evolutionary algorithm using endocrine-based PSO and Artificial Bee Colony algorithm (ABC) for the selection of optimal feature subsets [19]. The Hybrid method improves the prediction accuracy of the classification algorithm with a reduced number of features.

III. PERFORMANCE METRICS USED IN MEDICAL DIAGNOSIS SYSTEMS

There exist different metrics in medical diagnosis systems to measure the performance of the classification methods like sensitivity, precision, F-measure, accuracy and specificity, recall. These performance metrics are generally used to analyze the performances and accuracy of different models.

A. Accuracy:

This is defined as the ratio of appropriately classified data to overall classified data.

$$Accuracy = (TP + TN) / (TP + FP + TN + FN)$$

In above equation

TP = True Positive

TN = True Negative

FP = False Positive

FN = False Negative

B. Sensitivity (Recall or True positive rate):

Recall is how many relevant items are selected. It is a ratio of true positive to the sum of true positive and false negative. In medical diagnosis, test sensitivity (Recall) is the ability of a test to correctly identify those with the disease (true positive rate). If the test is highly Recall and the test

result is negative you can be nearly certain that they don't have the disease.

$$Recall = True\ positives / (true\ positive + false\ negative)$$

C. Specificity (True negative rate):

Specificity (SP) is calculated as the number of correct negative predictions divided by the total number of negatives. It is also called true negative rate (TNR).

$$Specificity = true\ negatives / (true\ negatives + false\ positives)$$

D. Precision:

Precision is how many selected items are relevant. It is a ratio of true positive to the sum of true positive and false positive. Test specificity (Precision) is the test's ability to correctly recognize those that do not have a disease (true negative rate). If the test output for an extremely precise test is positive users can be nearly certain that they actually have the disease.

$$Precision = true\ positive / (true\ positive + false\ positives)$$

E. False Positive Rate:

False positive rate is defined as the number of incorrect negative predictions divided by the total number of negatives. It is defined as:

$$FPR = False\ positive / (true\ negative + false\ positive)$$

F. F-measure:

The F-measure of the system is defined as the weighted harmonic mean of its precision and recall, that is

$$F = (2 * Precision * Recall) / (Precision + Recall)$$

IV. DISCUSSION

In the present review, we systematically reviewed the literature and researches that used hybrid classifiers for the diagnosis and prognosis of various diseases. From all the above reviews we

found that the result or accuracy of any diagnostic system not only depends on various classifiers, but it also affects data size, data quality, data sample taken, preprocessing activity for reducing the dimensions, etc. After a brief description of the hybrid ML techniques and the concept of the data preprocessing methods, we analyze that feature selection techniques and the classification algorithms are better than other techniques. It provides accurate results concerning the prediction outcomes. Table II shows the various methodologies used for the diagnosis of diseases that uses the hybridized method of machine learning. Many integrating ML algorithm as well as hybridized feature selection algorithm has been proposed to overcome and compensate for the deficiency of a single algorithm. Author used PSO with Bagged DT and compared the performance of other classifier algorithms and found that merging of multiple technologies gave improved results and accuracy [22]. Similarly, others hybrid classifiers described in Table-II used various integrated technology of different disease datasets. The aim of this study is to conduct a systematic review of all the applications of machine learning, data mining techniques, and tools in the field of CKD and other diseases also. A wide range of tools and techniques were employed here and gave different results but the researchers focused point concentrated on improving the results by using multiple technologies. Obviously, hybrid models can improve the accuracy rate as compared to individual ones.

Among the most common applied ML algorithms relevant to the prediction outcomes of various diseases are SVM and ANN classifiers were widely used. So, from the above researches, it is clear that whatever techniques we are using, the most important is a type of dataset. However, the choice

of the most appropriate algorithm depends on many parameters including the types of data collected; the size of data samples, the time limitations as well as prediction type of prediction outcomes. Table-I illustrates the literature review of the last ten years. It should be noted that almost all of the works presented here, performing validation tests for estimating the performance of their learning algorithm.

Table I: Recent Research review for different diseases using Hybrid classifier

Datasets	Methodology	Results
Breast cancer (2015)	FNN+KNN	99.14% (using cross-fold validation)
Diabetes (2017)	LR+ANFS	88.05%
Diabetes+ Heart diseases	ANN+FNN	84.24% & 86.5%
Artery disease (2016)	MLP+MLR+FURIA+D T	88.4%\
Heart diseases (2014)	CFS+MLP	82.22%
Medical datasets (2015)	EBPSO+ABC (SVM for optimal feature subset)	98.49
Breast cancer (2016)	GA+KNN	99%
Heart disease (2008)	GA+BPN	Better accuracy

Key: FNN –Fuzzy Neural Network

LR-Logistic Regression

MLP- Multilevel Perceptron

MLR- Multilevel Regression

CFS- Correlation based feature subset

EBSPO-Endocrine based particle swarm optimization

ABC- Artificial Bee Colony algorithm

KNN- K-Nearest Neighbour.

Table II: The summarized methodology gives a brief overview of related work based on hybridization.

Publications	Classifier used	Methodology used	Results	Demerits/Future scope
Karegowda et al. [17] (2011)	Genetic Algorithm and BPN	The Hybrid model with the integration of Genetic algorithm and BPN to diagnose diabetes mellitus	The results showed that the proposed approach has put performed the BPN approach without GA optimization, giving high classification accuracy.	Only classification accuracy is considered. The method also considers other performance metrics like specificity, recall, precision, F-measure.
Patil et al. [30] (2010)	C4.5 algorithm	Building a predictive model using a hybrid approach	Gave classification accuracy of 92.38 which can be very helpful for the physicians for effective decision-making related to diabetes	This system not using any feature selection technique to remove redundant features. Feature selection could have increased the classification accuracy. The proposed system is limited to only NN for finding the best method for classifying.
Mohebian et al. [22] (2017)	Particle swarm optimization (PSO) with Bagged DT	Hybrid Computer-aided Diagnosis System using optimized ensemble Learning	Performance was assessed using holdout and 4-fold cross-validation. Three classifiers namely SVM, DT, and MLP were used for comparison. Accuracy was 86%.	The output of the classification system is not fuzzy. It will be useful to add risk assessment to the algorithm and report the risk of recurrence which is the focus of future activity.
Ramazani [31] (2018)	Logistic regression and NN based fuzzy inference system	A Hybrid intelligent system with a missing value for imputation	Classification accuracy 88.05. Orthogonal transformational for reducing dimensions.	Enhances the performances by comparison with other methods.
Sahan et al [34] (2007).	<i>FUZZY LOGIC + K-NN</i>	A Hybrid method for breast cancer disease.	Obtained a classification accuracy of 99.14%, which is the highest one reached so far. The classification accuracy obtained via 10-fold cross validation.	To use for other disease datasets.
H.R Marateb (2014)	Fuzzy rule + PSO	A Hybrid DM model to predict CAD	accuracy of the proposed fuzzy classifier system with feature extraction was 92%	--
V. Miscovic [25] (2014)	Hybrid classification models for DT	Different M/c Learning method	Comparative prediction of different algorithm	--
A.Sengur [33] (2008)	AIS+FUZZY KNN	Use of AIS-based fuzzy k-NN methodology for the diagnosis of heart aortic and mitral valve disorders.	The proposed hybrid system produced much more accurate results than the ANN and SVM methods. The Accuracy obtained with the proposed method 96.9%	
L. Verma [37] (2016)	CFS+ PSO +K-means	Novel hybrid method using CFS selection with PSO and K- means clustering algorithms. Supervised algorithms such as MLP, MLR, FURIA, and C4.5.	MLR achieves the highest prediction accuracy of 88.4 %. Tested this approach on benchmarked Cleveland heart disease data as well.	
Humour et al. [15] (2008)	FNN+ ANN	A hybrid neural network that includes an artificial neural network (ANN) and a fuzzy neural network (FNN).	Obtained by k-fold cross-validation and achieved accuracy values 84.24% and 86.8% for Pima Indians diabetes and Cleveland heart disease dataset, respectively.	To extract rules from trained hybrid neural networks. Extracted rules are thought to be used for diagnosing new patients.

V. CONCLUSIONS

In this review, we discussed the concepts of Machine Learning and we outlined the various hybridized ML techniques and their accuracy results found by the researchers. Also, most of the studies that have been proposed focus on the development of predictive models using Hybridized techniques and algorithms using supervised and unsupervised algorithms. Based on the analysis of their results, it has been found that if we consider other important factors with hybridized classifier then we are able to develop a high diagnostic model.

Future implementation

In the future, we can implement different clustering and classification algorithms for different healthcare datasets and compare the accuracy between different available systems for finding the best-integrated system. The extension of this work is the implementation of deep learning because deep learning provides higher-quality performance than machine learning.

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A Specific study of impact of banking service on customer satisfaction of Punjab National Bank and HDFC Bank

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Abstract: Indian economy development depends on many aspects. Our Indian economy run by money and money is the most important aspect of every sector. Money work in the economy system is like blood. As bloods is working in human body and circulate in body similarly in Indian economy banking sector is work like blood circulation of money. Transfer of money, deposit and withdrawal is impossible without banks. Bank is ribcage of economic system of India. In present era banking sector upgrade the level of service and improve service quality day-by day. Customer loyalty depends on service quality. Customer's satisfaction in the banking sector represents the good quality of service, due to the importance of customer satisfaction in the banking. Banking sector scenario has been changed drastically due to globalization, privatization and liberalization. The focuses of bank are shifting from profit maximization to increasing the level of satisfaction of customer. Banks understand the need of customer and its perception towards available service and fill the gap between customer's expectation and customer perception of the banking service. Banking sector are one of the core sector. Banks maintain service quality on the basis of different dimensions of service quality. Banks maintain

the level of quality of service provided. To fulfil customer's requirement and make them satisfy, banks modify their strategies and increasing focus on key factors such as quality of service. Retention of the customers in any organization signifies their fulfilment of expectation regarding service and it relate to a performance. The service qualities of banks become an important aspect of customer satisfaction. It has been proven by long term retention of customers service quality capture more customers. In this research paper, researcher represent impact of banking services on customers and a specific study between HDFC bank and Punjab national Bank in India. Here researcher objective is to study the Indian banking sector services and its impact on customer satisfaction.

Index Terms: Banking sector, service quality, Customer satisfaction and banking.

I. INTRODUCTION

Banks are the financial institution where money is deposited and withdrawn by the common people. Bank lend the money at fix rate of interest, this is how, working capital works. Bank recovers its financial cost through interest and maintenance charges. The service provided by banks have a

deep impact on the common customer, to increase the customer satisfaction level, the bank adopts various methods and improvise its banking service quality. Financial institutions are obstructed by law to repay the deposits and borrowings as and when they fall due for repayment and this amount is converted as assets, bank have to ensure all the time that all the assets are relatable in the form of liquid and can be fully recovered to meet the liability when need arises. In banks if any income is not recovered or earned on any advance it is treated as a non-performing assets where all accrual income stops and performance of banks can be low. Banking service of financial institutions play a very important role in the performance of the bank and that is why it is very important to maintain service quality reflect the long term retention of the customers and force the customer to stay with the financial institution for long time. In the present research paper a comparative study has been done between two banks, Punjab National bank and HDFC bank which expresses the impact of Banking services on the customers and shows that the satisfaction level of the customers.

II. REVIEW OF LITERATURE

In a study the author [1] has examined the service quality which depends on delivery of services failures, bad service quality make customers dissatisfied. The concept of management service includes employees too.

In a study [2] it has been searched by the author that such design structure of service which is provided to customer is called service product. The service product is intangible in nature and cannot be measure in units.

According to the author's research [3] author signifies that production management jobs and service industry make different impact on

customer's satisfaction level and it is difficult to manage as compare to service industry to manufacturing industry.

In a study the author [4-7] has examined service quality depends on delivery of service and it is characterized by the connection to the part of execution, the administration need to think about the development of service screening and the fulfilment level of customers expectations and execution of service delivery influence service quality and customer satisfaction.

It is understood from the above studies that service quality play important role. It is very necessary to maintain service quality, product of the service quality should be good and to meet the customer's expectations and the delivery of the services should be good and quality full.

III. OBJECTIVE OF THE STUDY

- To identify the impact of banking service on customer satisfaction of PNB and HDFC bank.
- To study the banking service quality of selected banks
- To analyze the effectiveness of banking services on customer's satisfaction of the selected banks.

IV. RESEARCH METHODOLOGY

There is need to describe the research methodology because right design and correct methodology represent the purity, accuracy, adequacy and reliability of research. Research methodology tells the logic behind the research.

A. Research design:

Research design ensures the minimization of bias and maximization of the reliability of research. This research is specific study based on selected bank which make the research specific and clear, by making specific type of study data to be

collected on banking service and procedure to be used purposefully.

B. Data Collection Method:

The collection of data begins after the research problem. There are two types of data for research purpose, primary data and secondary data. Primary data is main tool to gather data and it is direct approach. In primary data collection data collected through interview and observation of customer behaviour. Researcher also used secondary data which already collected by someone else. Some of the secondary data is available on banking website of both selected bank in the form of annual reports.

C. Method of Data Analysis:

For measuring various type of dimensions of banking service quality and analyzing the collected data and efficiently to draw sound conclusion some statistical tools technique used. Collected data represented in the form of table, graph etc. Graphical method is used for data representation and MS-Excel is used to analyze data.

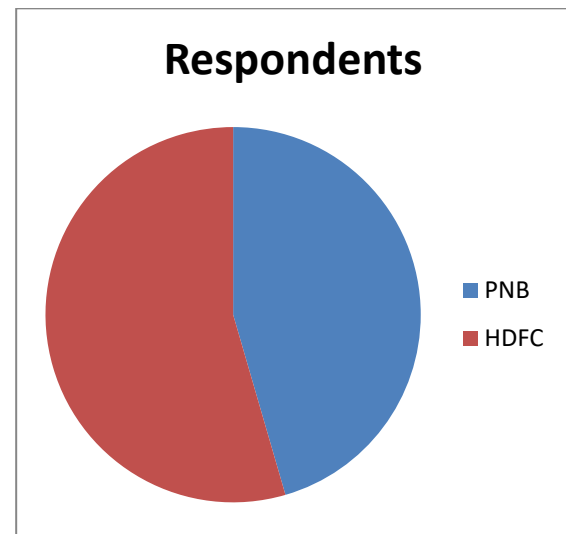
V. DATA ANALYSIS

Data analysis is the discussion of the objective study and represents the discussion and results on the basis of collected data.

Table 1: Demographic Profile Analysis
Bank Name

Bank Name	Frequency	%	Valid
Punjab National Bank	98	45.5	45.5
HDFC Bank	117	54.5	54.5

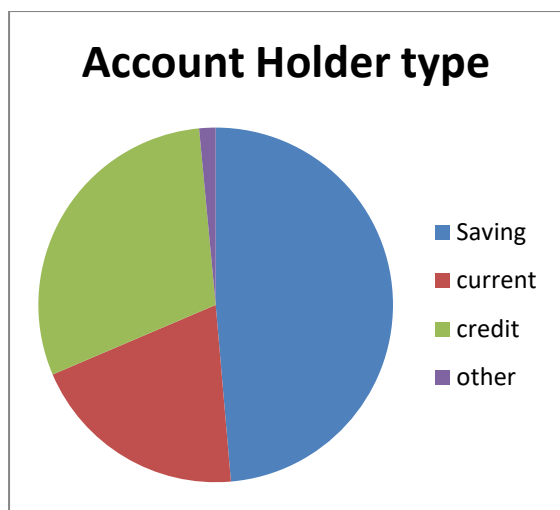
	215	100	100
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Discussion: The above table represent the targeted population of the research, whole populations is 215 from Punjab National Bank 98 (45.5%), 117 from HDFC Bank (54.5%), customer have voluntarily participated in the study.

Table 2
Account Holder Type (Punjab National Bank & HDFC Bank)

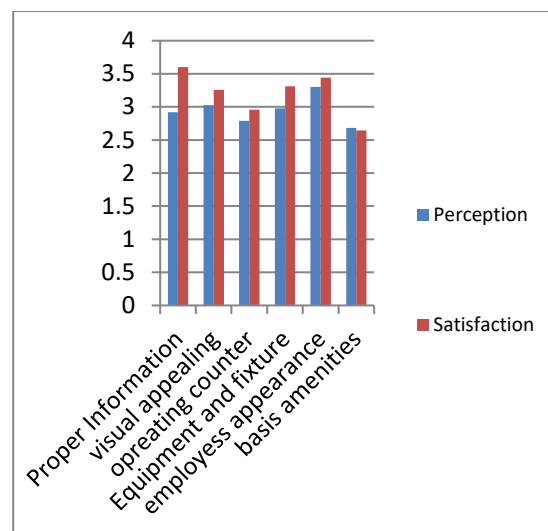
Account	Frequency	%	Valid Percentage
Saving	84	39	39
Current	34	16	16
Credit	52	24	24
Other	45	21	21
Total	215	100	100



Discussion: The above table represents that the respondents of the selected population for the study and hold various type of accounts 39 % saving, 16% current A/c, 24 % Credit and other 21%, voluntarily participated in the study.

Table 3
Physical Facilities

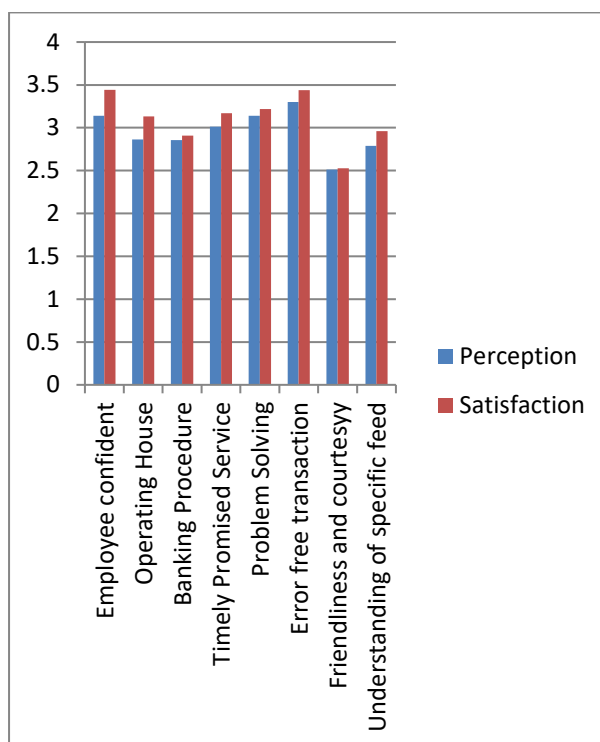
S.N.	Physical Facilities @ N= 215, Mean	Banking service Perception	Satisfaction
1.	Proper Information	2.9212	3.6021
2.	Visually Appealing	3.0263	3.2554
3.	Operating Counter	2.7876	2.9594
4.	Equipment and Fixtures	2.9761	3.3126
5.	Employees Appearance	3.3007	3.4391
6.	Basic Amenities	2.6802	2.6420



Discussion: In this study it is concluded that higher value of mean signifies most adequate available service perceived by the customer and lower value mean shows less adequate available service, the table state that proper information 2.92, visually appealing 3.02, operating counter 2.78, equipment and fixtures 2.97 and basic amenities 2.68. In this study it is concluded that higher value of mean shows the high satisfaction customers with available banking service and lower value of mean shows less satisfactory services provided by selected banks.

Table 4
Service quality factors

S.N.	Service Quality Factors @ N=215	Banking Service Perception	Satisfaction
1	Employee confident	3.1405	3.4415
2	Operating House	2.8640	3.1313
3	Banking Procedure	2.8544	2.908
4	Timely promised service	3.0119	3.1695
5	Problem Solving	3.1408	3.2172
6	Error free transaction	3.3007	3.4391
7	Friendliness and courtesy	2.5131	2.5274
8	Understanding of specific feed	2.7876	2.9594

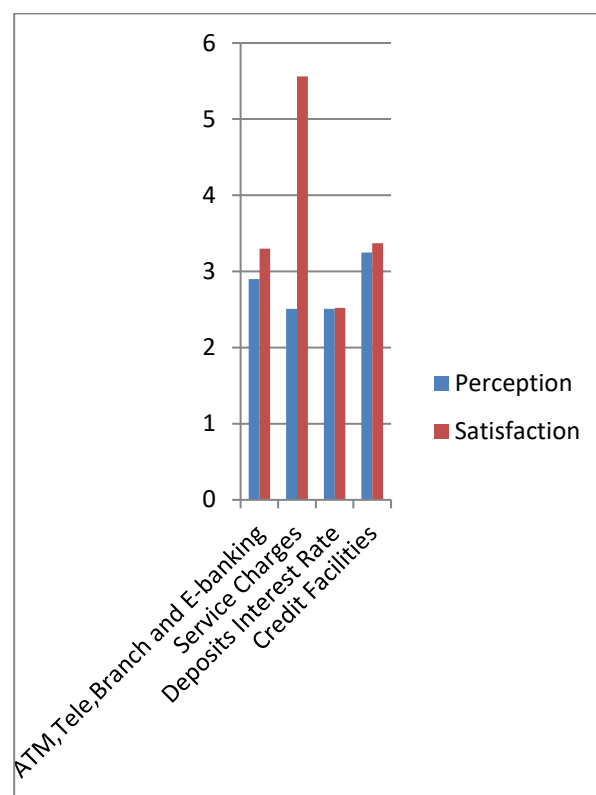


Discussion: In this study it is concluded that higher value of mean show most adequate available service perceived by the customers and lower value of mean shows less adequate available service. The description of above table shows that employee confidence (3.14), is the most adequate available service followed by error- free transaction (3.30), problem solving (3.14), timely promised service (3.01) , Operating hours (2.86), Banking Procedure(2.85) and friendliness (2.51) perceived by the Punjab national bank and HDFC bank.

Table 5
Service Products

Service Product @ n=215 mean	Perception	Satisfaction
ATM, Tele, Branch and E-Banking	2.9	3.3
Service Charges	2.51	5.56
Deposits Interest Rate	2.51	2.52

Credit Facilities	3.25	3.37
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Discussion: In this study it concluded that higher value of means shows most adequate available service. From the above table it stated that ATM, Branch and e- banking services (2.98), Service charges 2.51, Deposits Interest rates.

VI. RESULT & DISCUSSION

The study concluded that reliability and validity analysis of the data collected. The findings of data collected signified that there is impact of banking services on customers. The relationship of banking sector and customers enhance the level of customers. The demographic profile indicates that banks have numerous varieties of customers which belong to different age group, income, education and banking service. It is concluded that data is sufficient to see the impact of banking services. The study finds that in the banking sector service provided by employees is error free, transactions

are more satisfactory. The study shows that the credit facilities followed by ATM, Tele, branch, E-Banking are most satisfactory service of the bank and rate of interest on deposits are least customer satisfactory services rendered by the bank. It's found that customer of HDFC banks are more satisfactory as compare to Punjab national bank. Punjab national Bank's customer is most satisfactory for deposit type of services and least satisfied with regular type service. HDFC banks customers are most satisfied of e-banking and regular services and least satisfied for long term deposit scheme service rendered by the bank.

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ईमेल – Sapnanamdeo1312@gmail.com

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छत्तीसगढ़ राज्य सौंदर्य से परिपूर्ण है यहां पर्यटन विकास उद्योग की अत्यधिक संभावनाएं हैं। छत्तीसगढ़ जहां एक ओर प्राकृतिक ऐतिहासिक और सांस्कृतिक धरोहरों से संपन्न है वहीं दूसरी ओर कला और संस्कृति की दृष्टि से इसकी ख्याति देश भर में है। यहां की आध्यात्मिक धार्मिक तथा सांस्कृतिक केन्द्रों की विविधता ने पर्यटन की दृष्टि से पूरे देश का ध्यान खींचा है। केन्द्रीय स्थिति के कारण छत्तीसगढ़ पर्यटन की दृष्टि से देश के एक अच्छे केन्द्र के रूप में उभर सकता है। वि. व. में पर्यटन सर्वाधिक रोजगार उपलब्ध कराने वाले क्षेत्रों में से एक है। इसके माध्यम से लोगों को न केवल रोजगार के बेहतर अवसर प्राप्त होते हैं। पर्यटन के दौरान पर्यटक वहीं की विशिष्ट हस्तशिल्प भी क्रय करते हैं, जिसका लाभ शिल्पकारों को मिलता है और स्थानीय दुकानदारों को मिलता है। छत्तीसगढ़ का हस्तशिल्प सुन्दर एवं आकर्षक है जिनकी मांग देश विदेशों में बढ़ी है। पर्यटन के साथ हस्तशिल्प एवं सांस्कृतिक विशिष्टताओं को जोड़कर बढ़ावा देने की जरूरत है। पर्यटकों की संख्या बढ़ाना हमारा ध्येय होना चाहिए और इसके लिए हमें महत्वाकांक्षी बनने की जरूरत है। वहीं यहां धार्मिक तथा पुरातात्विक सहित पर्यटन के सभी आयाम मौजूद हैं। एक ओर जहां कलकल करती नदियां हैं। विश्व का सबसे बड़ा जलप्रपात चित्रकूट विश्व की सबसे बड़ी नाट्यशाला सीताबेंगरा है वहीं सिहावा में महानदी का उदगम चम्पारण्य में महाप्रभु वल्लभाचार्य की जन्मस्थली तथा राजिम में नदियों का त्रिवेणी संगम है। यह ऐतिहासिक महत्व रखता है। जैसे कि सिरपुर कई ऐसे प्राकृतिक दृश्य एवं जलस्रोत मूर्तियां एवं दर्शनीय स्थल हैं जो अभी भी उजागर नहीं हो पाये हैं छत्तीसगढ़ के पर्यटन स्थलों की फोटो प्रदर्शनी पर्यटन पर आधारित हमें ऐसे स्थलों की चिन्हांकित कर वहां पर्यटन को बढ़ावा देने के प्रयास किये जा रहे हैं। प्रदेश के पर्यटन को लाभ लेने की जरूरत है। देश की तो आमदनी ही पर्यटन पर

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छत्तीसगढ़ राज्य में राष्ट्रीय स्तर पर पर्यटन स्थल विद्यमान हैं। राज्य में जो राष्ट्रीय पर्यटन के अन्तर्गत क्षेत्र घोषित किया गया है। राज्य में राष्ट्रीय पर्यटन स्थल हैं और राष्ट्रीय अभ्यारण स्थल हैं, जो पर्यटन के क्षेत्र में इनका बड़ा विकास है। यहाँ देश-विदेश से लोग इस प्रमुख पर्यटन स्थल को देखने के लिए आया करते हैं। ये प्रमुख राष्ट्रीय पर्यटन स्थल हैं, भारत के पर्यटन मानचित्र पर छत्तीसगढ़ एक उभरता हुआ राज्य है। छत्तीसगढ़ का प्राकृतिक सौंदर्य विलक्षण है। यह के प्राकृतिक धार्मिक आध्यात्मिक और सांस्कृतिक महत्व के स्थल पर्यटकों को स्वाभाविक रूप से आकर्षित करते हैं। छत्तीसगढ़ सांस्कृतिक रूप में भी समृद्ध राज्य है। छत्तीसगढ़ राज्य में पर्यटन के विकास के लिए राज्य निर्माण के बाद से बहुत तेजी से काम हुए हैं। छत्तीसगढ़ अपने आप में पर्यटन के क्षेत्र में समृद्धि की ओर बढ़ता हुआ राज्य है। यहां पुरातात्विक धार्मिक ऐतिहासिक, औद्योगिक केन्द्र प्राकृतिक सौंदर्य राष्ट्रीय उद्यान एवं वन्य प्राणी अभ्यारण्य के साथ-साथ गौरवशाली आदिम संस्कृति का अद्वितीय उदाहरण देखने को मिलता है, छत्तीसगढ़ की अर्थव्यवस्था में पर्यटन उद्योग है। राज्य में समस्त प्रकार के पर्यटन स्थल प्रचुर मात्रा में अवस्थित हैं तथा इनके विकास और विस्तार की आवश्यकता है। पर्यटन उद्योग में इतिहास का महत्व पर्यटन किसी यात्रा को कहते हैं जो घूमने के लिए की जाती है। अक्सर हम सभी अपनी रोज की जिंदगी से बोर हो जाते हैं। अपनी रोज की जिंदगी से बाहर निकलने के लिए लोग पर्यटन पर जाते हैं। इसमें मनोरंजन और आनन्द मिलता है। साथ ही देश दुनिया की नई जानकारी भी मिलती है। पर्यटन

विकास पर्यटन एक बड़ा उद्योग है। यह कई क्षेत्रों में रोजगार के अवसर सृजित करता है साथ ही अर्थव्यवस्था को तेजी से बढ़ाने में मदद करता है। इसके महत्व अनुमान केवल इस तथ्य से ही लगाया जा सकता है कि विश्व भर में पर्यटकों की संख्या बहुतायत रूप में देखी जा सकती है।

II. 'v/; ;u d mġ' ;:

अध्ययन क्षेत्र में पर्यटन विकास उद्योग एवं संभावनाओं का अध्ययन करना।

छत्तीसगढ़ में पर्यटन क्षेत्र के विकास के लिए नीतिगत सुझाव प्रस्तुत करना।

III. 'kk/k ifjdYiuk:

इस अध्ययन के लिए निम्नांकित परिकल्पनाओं का निर्माण किया गया है।

- i. छत्तीसगढ़ में पर्यटन विकास उद्योग एवं संभावनाओं को ज्ञात करना।
- ii. छत्तीसगढ़ में पर्यटन क्षेत्र के विकास के लिए नीतिगत सुझाव प्रस्तुत करना।

IV. 'kk/k fof/k r= %

प्रस्तुत अध्ययन में अवलोकनात्मक व विश्लेषणात्मक विधि का तन्त्रों का प्रयोग करते हुए सर्वप्रथम क्षेत्रीय भ्रमण कर अवलोकन के आधार पर पर्यटन एवं मनोरंजन के साधनों तथा स्थलों की पहचान की गई, तत्पश्चात उनका स्थानीय कला उद्योग का विश्लेषण कर उनको मानचित्र के माध्यम से दर्शाने व विकसित करने हेतु रूपरेखा तैयार की गई।

A. आर्थिक विकास:

छत्तीसगढ़ पर्यटन उद्योग और रोजगार सृजन का एक सशक्त माध्यम माना जाता है। पर्यटन क्षेत्र देश के शीर्ष उद्योगों में से एक है। इसका महत्व आर्थिक विकास और विशेष तौर पर देश के दूरदराज के क्षेत्रों में रोजगार सृजन के एक माध्यम के रूप में महत्वपूर्ण है। पर्यटन को उद्योग के रूप में चलाने के लिए क्या किया जाना चाहिए।

B. पर्यटन उद्योग के विकास में बढ़ते

कदम:

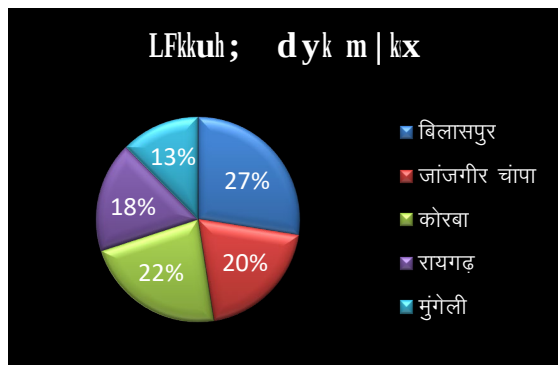
पर्यटन में साधनों के विकास के साथ बढ़ते कदम है। पर्यटन उद्योग की भागीदारी है। इससे नए-नए रोजगार उपलब्ध हो रहे हैं। नई योजना के अंतर्गत देश के छोटे हवाई अड्डों का विकास किया जा रहा है, जिससे देश में आंतरिक हवाई सफर आम नागरिकों की

पहुंच में आ गया है। पर्यटन उद्योग का महत्व और देश की प्रगति में उसके योगदान का महत्व परिलक्षित होता है। भारत की हजारों वर्ष पुरानी परंपरा, रोमांचक इतिहास, वैविध्यपूर्ण भूगोल एवं अनोखे प्राकृतिक सौंदर्य के कारण देश की प्रगति में पर्यटन उद्योग की हिस्सेदारी निःसंदेह उल्लेखनीय होगी। भारतीय अर्थव्यवस्था को मजबूती देने वाले इस उद्योग का विकास किस तरह होता गया, यह देखने योग्य है। लगभग 50 वर्ष पूर्व भारत में पर्यटन तीर्थयात्रा तक सीमित था। भारतीय परंपरा के अनुसार प्रत्येक परिवार की एक कुलदेवता होता है और कहीं जाए या ना जाए, परंतु इस कुलदेवता के दर्शन के लिए लोग अवश्य जाया करते थे। इसके अलावा बारह ज्योतिर्लिंगों (जो उत्तर भारत से लेकर दक्षिण भारत तक फैले हैं) की यात्रा, चार धाम यात्रा (गंगोत्री-यमुनोत्री-केदारनाथ-बद्रीनाथ) एवं काशी यात्रा का भी अत्यधिक महत्व था। भारत में आंतरिक पर्यटन का दायरा यही तक सीमित था। विदेशी पर्यटक मुख्यतः ताजमहल, राजस्थान के किलों-रजवाड़ों का सौंदर्य देखने आते थे। इसी प्रकार छत्तीसगढ़ की बिलासपुर संभाग के विभिन्न जिलों में भी पर्यटन में साधनों के विकास के साथ बढ़ते कदम देखने को मिलता है जैसे— औद्योगिक संरचना के दृष्टिकोण से प्रदेश में कार्यरत इंजीनियरिंग तथा फ़ैरोएलाय उद्योग की संख्या 44 है, बिलासपुर में 1 तथा रायगढ़ में 1 इकाई कार्यरत है। खाद्य आधारित उद्योग की संख्या 28 है, रायगढ़ में 1 तथा बिलासपुर में 1 इकाई कार्यरत है। रासायनिक उद्योग के अन्तर्गत प्रदेश में 18 इकाइयाँ कार्यरत हैं बिलासपुर में 2 इकाइयाँ स्थापित हैं। सीमेंट उद्योग के अन्तर्गत 13 इकाइयाँ कार्यरत हैं, जांजगीर चांपा में 2, तथा रायगढ़ में 2 इकाई स्थापित हैं। वनोपज आधारित उद्योगों के अन्तर्गत 11 इकाइयाँ कार्यरत हैं, जिनमें से रायगढ़ में 4, बिलासपुर तथा जांजगीर चांपा में 1—1 इकाई स्थापित हैं लौह इस्पात उद्योग की संख्या 9 है, रायगढ़ में 2, बिलासपुर में 1 तथा जांजगीर चांपा में 1 इकाई स्थापित है। विस्फोटक पदार्थ उत्पादक इकाइयाँ मुख्यतः कोरबा में स्थित हैं, इन इकाइयाँ की संख्या 3 है। वस्त्र उद्योग मुख्यतः रायपुर में स्थापित है इन इकाइयाँ की संख्या 3 है। एल्युमिनियम उद्योग एक मात्र कोरबा जिले में स्थापित है। पुरानी परंपरा, रोमांचक इतिहास, एवं अनोखे प्राकृतिक सौंदर्य के कारण छत्तीसगढ़ की बिलासपुर की प्रगति में पर्यटन तीर्थस्थल की उद्योग विकास, की रूप रेखा का बदलते दृश्यों का चित्रण और नयी नयी योजनाओं से अवगत कर पर्यटन स्थल को रोजगार के रूप में नये आयामों को परिचित कराता है [3-6]

de kd	ft yk	m kx	ifl?n i;Vu LFky @efnj
1	बिलासपुर	कोसा, जूट, बीड़ी, पेपर मील उद्योग	dkuu iUMkj] Atk ikd] भाक्ति पीठ आदिशक्ति रतनपुर महामाया मंदिर, मल्हार, तालागांव, खूटोघाट जलाशय,
2	जांजगीर चांपा	कोसा, पेपर मिल	pngf luh noh ef nj] शिवरीनारायण,
3	कोरबा	कोसा, एल्युमिनियम	सुपर थर्मल पॉवर स्टेशन, भारत एल्युमिनियम कम्पनी लिमिटेड बाल्को, कोसगईगढ़, केन्दई जलप्रपात, तुम्माण, बांगों जलाशय
4	रायगढ़	कोसा, जूट एस्ट्रोबोर्ड	
5	मुंगेली	लघु उद्योग से संबंधित विभिन्न कार्यों का शुरुआत किया जा सकता है और बड़े उद्योग के लिये योजनाओं की रूपरेखा तैयारी कि जा सकती है	

स्थानीय कला उद्योग से प्रभावित आँकड़ा प्रतिशत हैं।

rkfydk & 01



y[klf p=&01

क्रमोंक	जिला	पर्यटक संख्या	मूर्ति कला उद्योग	वास्तु कला उद्योग	कुल संख्या	कुल प्रतिशत
1	बिलासपुर	20	11	6	17	85 प्रतिशत
2	जांजगीर चांपा	20	8	4	12	60 प्रतिशत
3	कोरबा	20	9	6	15	75 प्रतिशत
4	रायगढ़	20	7	4	11	55 प्रतिशत
5	मुंगेली	20	5	3	8	40 प्रतिशत

v. io lfo/kvk dk vHkko:

पूर्व में पर्यटन के अनुकूल सुविधाओं का भी अभाव था। धीरे-धीरे यह स्थिति बदलने लगी। तीर्थयात्रा के साथ स्थल दर्शन भी छत्तीसगढ़ पर्यटकों को रास आने लगा। हवाई सेवाएं भी नहीं थी।

पर्यटन स्थल बिलासपुर, मुंगेली, जांजगीर, चांपा, कोरबा वा रायगढ़ जैसे ऐतिहासिक स्थलों तक ही देशांतरगत पर्यटन सीमित था। धीरे-धीरे नागरिकों की मानसिकता बदलती गई और साल में कम से कम एक बार सपरिवार पर्यटन की इच्छा को साकार रूप दिया जाने लगा। इससे रेलवे आरक्षण जैसा कठिन एवं तकलीफदेह काम आसानी से होने लगा। बैंकों में भी इसके उपयोग के कारण एक स्थान से दूसरे स्थान में पैसे भेजना आसान हो गया।

इससे पर्यटन उद्योग को बड़े पैमाने पर प्रोत्साहन मिला एवं भारतीय पर्यटन क्षेत्र का स्वरूप ही बदल गया। स्थल दर्शन तक सीमित पर्यटन के अनेक अलग-अलग प्रकार सामने आने लगे। इनमें साहसी पर्यटन, वन्य जीव पर्यटन, महोत्सव पर्यटन, व्यंजन पर्यटन, धरोहर पर्यटन जैसे अनेक प्रकार हैं।

पर्यटन के लाभ हैं तो नुकसान भी हैं। विशेषतः पर्यावरण पर पड़नेवाला हानिकारक प्रभाव। पर्यावरण पर होने वाला प्रतिकूल परिणाम और स्थानीय लोगों के शोषण को रोका जाना चाहिए। जैसे पर्यावरण की दृष्टि से संवेदनशील स्थानों पर लागू प्लास्टिक बंदी, स्थानीय कला-कलाकारों को बढ़ावा देने के लिए आरंभ शासकीय दुकानों से प्राप्त फायदों को उस राज्य तक पहुंचाने की आवश्यकता की ओर ध्यान दिया जाना आवश्यक है। पर्यटन बढ़ेगा तो देश भी संपन्न और सुदृढ़ होगा इसमें कोई संदेह नहीं है।

पर्यटन क्षेत्र देश के शीर्ष सेवा उद्योगों में से एक है। इसका महत्व आर्थिक विकास और विशेष तौर पर देश के दूरदराज के क्षेत्रों में रोजगार सृजन के एक माध्यम के रूप में महत्वपूर्ण है। बिलासपुर भारत के छत्तीसगढ़ राज्य का एक जिला है। इसका मुख्यालय बिलासपुर है जो राज्य की राजधानी नया रायपुर से 92 किलोमीटर उत्तर में स्थित है तथा प्रशासनिक एवं शहरी दोनों क्षेत्रों में राज्य का दूसरा सबसे प्रमुख एवं बड़ा शहर है। छत्तीसगढ़ राज्य का उच्च न्यायालय भी इसी शहर में स्थित है। बिलासपुर सुगंधित दूबराज चावल की किस्म के लिए भी प्रसिद्ध है। इसके अलावा यहाँ हथकरघा उद्योग से निर्मित कोसे की साड़ियाँ भी देशभर में विख्यात है। बिलासपुर सांस्कृतिक रूप से भी समृद्ध है और यहाँ की संस्कृति अनेक विविधताओं एवं रंगों को समाहित किये हुए है। [1-2]

VI. vkthfodk] vkfFkd iHkko ,o lkLÑfrd iHkko:

पर्यटन उद्योग पर महामारी के प्रभाव के कारण स्तर पर प्रकृति और सांस्कृतिक संरक्षण से संबंधित प्रयासों पर भी नकारात्मक प्रभाव पड़ता है।

पर्यटन उद्योग महिलाओं, ग्रामीण समुदायों और अन्य वंचित समूहों के लिए सदैव से ही आय का एक प्रमुख स्रोत रहा है, ऐसे में इस उद्योग पर महामारी के प्रभाव के कारण इन लोगों के समक्ष भी आजीविका का संकट उत्पन्न हो गया है। पर्यटन उद्योग पर महामारी के प्रभाव के कारण सांस्कृतिक क्षेत्र में विरासत संरक्षण के प्रयासों और समुदायों, विशेष रूप से स्वदेशी लोगों और जातीय समूहों के सांस्कृतिक और सामाजिक ताने-बाने पर काफी दबाव पड़ता है। उदाहरण के लिए हस्तशिल्प उत्पादों और कढ़ाई-बुनाई से संबंधित उत्पादों के बाजार बंद होने के कारण ग्रामीण लोगों खासतौर पर स्वदेशी महिलाओं के राजस्व पर काफी प्रभाव पड़ा है। पर्यटन संस्कृति कैसे बढ़ावा देने और परस्पर संवाद तथा समझ को विकसित करने हेतु प्रमुख वाहनों में से एक है, किंतु महामारी के प्रभाव के कारण सांस्कृतिक आदान-प्रदान और संवाद में स्थिरता आ गई है।

VII. i;Vu m|kx:

पर्यटन और उद्योग का भारतीय अर्थव्यवस्था पर काफी व्यापक प्रभाव पड़ता है और ये उद्योग भारतीय अर्थव्यवस्था के विकास में महत्वपूर्ण भूमिका अदा करता है। विशेषज्ञों का मानना है कि यह क्षेत्र लाखों लोगों को गुणवत्तापूर्ण रोजगार प्रदान करने में सक्षम है, जो कि भारत जैसे देश के लिए काफी महत्वपूर्ण है।

i;Vu m|kx l: lcf/kr lEl;k,|

- tfVy if0;k & छत्तीसगढ़ में आने वाले अधिकांश पर्यटक और आगंतुक करने की प्रक्रिया को काफी बोझिल और जटिल मानते हैं। महामारी के दौरान की यह प्रक्रिया और भी अधिक जटिल हो गई है।
- voljpk vkj dufDVfoVh & कमी और अपर्याप्त कनेक्टिविटी के कारण कई बार पर्यटकों को कुछ विरासत पर जाने के लिए कठिनाइयों का सामना करना पड़ता है।
- dk'ky dh deh & पर्यटन और आतिथ्य क्षेत्र के लिए पर्याप्त रूप से प्रशिक्षित व्यक्तियों की कम संख्या छत्तीसगढ़ के पर्यटन उद्योग के लिए एक बड़ी चुनौती है, जिसके कारण छत्तीसगढ़ आने वाले पर्यटकों को अनुभव प्रदान करना मुश्किल हो जाता है।
- i;Vd lj{kk & छत्तीसगढ़ में आने वाले जिला एवं अन्य राज्य पर्यटकों को प्रायः लूट और चोरी आदि का सामना करना पड़ता था, जिसके कारण उनके मन में छत्तीसगढ़ और देश की कानून-व्यवस्था को लेकर एक नकारात्मक छवि उत्पन्न होती है।

VIII. l|>ko:

- महामारी की समाप्ति के बाद सरकार को विरासत स्थलों की स्वच्छता के विषय पर विशेष ध्यान देना होगा ताकि भारतीय विरासत स्थलों की ओर पर्यटकों का ध्यान आकर्षित किया जा सके। साथ ही सरकार घरेलू पर्यटन उद्योग को भी प्रोत्साहित करना चाहिए।
- पर्यटन स्थलों के अवसरचनना विकास और उनकी कनेक्टिविटी पर ध्यान दिया जाना आवश्यक है ताकि यात्रियों को किसी भी पर्यटन स्थल पर जाने में कठिनाई का सामना न करना पड़े।
- साथ-ही-साथ पर्यटन क्षेत्र में कार्य करने के लिए व्यापक स्तर पर लोगों को प्रशिक्षण दिये जाने की आवश्यकता है, ताकि पर्यटकों को विश्व स्तरीय सुविधाएँ प्रदान की जा सकें।
- पर्यटन स्थलों पर किसी भी प्रकार की स्वास्थ्य चुनौतियों से निपटने हेतु बेहतर स्वास्थ्य अवसरचनना को विकसित करना चाहिए।

Infllkr Kku

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Study of Customer Satisfaction & Repurchase through e-Commerce Portals in respect of Hemunagar Block of Bilaspur city in State of Chhattisgarh

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Abstract :

When trade & commerce is carried over the internet such scenario is known as e-commerce, i.e. electronic commerce, which means providing services over the digital dais. Services covered under this ambit may vary from purchase or sale of goods & services, payment or receiving of bills, promoting, advertising etc. E-commerce allows its consumers to exchange products on digital basis. In India digital market in recent trends has shown drastic increase and its going to increase further in coming years. At present e-commerce is in, B2B or B2C or C2C or C2B form.

E-commerce had made business so convenient that everything is available at the tip of the finger 24x7. Due to such convenience a lot of time is saved, and there is easy payment and return policies. But we know every coin has two faces and so is the case with e-commerce, it has a few limitations such as no internet – no business scenario, long procedure for product return, there are many cyber threats because online trade requires a lot of personal information, such as credit card details, personal mobile number and address. Sharing of such information carries the vulnerability of data leakage. Hence it is advised to use trustable sites for online shopping. In today's fast moving era, e-commerce is a boon for a consumer since due to shortage of time one can carry business activities anywhere anytime. This research paper studies about the customer satisfaction and retention towards online shopping. In recent days online shopping is growing day by

day. It is not just confined to urban areas but also spreads to rural areas. For the purpose of this study I have chosen 3 digital platforms, viz. Snapdeal, Amazon, and Flipkart. In order to collect data a questionnaire is being made and the result is based on analysis of data being received in form of responses to the questionnaire.

Index Terms: E-commerce, customer satisfaction, repurchase, online shopping, digital platform.

I. INTRODUCTION

Sale of produced goods and services as per requirement by division of work has become an elongated process in today's market. In this process all commercial organizations and their financial auxiliaries have become a part of this process. Use of technology & internet in commercial sector is the new normal in this era. The literal meaning of e-commerce is use of technology and internet in commercial sector. For example consumers use e-commerce for the purpose of sale-purchase, exchange of information, e-banking etc. The use of technology and internet is made to maximize customer satisfaction and organizational profit. How big is the customer base of an e-commerce? Whether the customer received expected goods and services? Are the consumers aware of the detailing of e-commerce? These are a few factors affecting the consumer base of e-commerce and the growth and evaluation e-commerce platform itself. Growth of e-commerce gives a large benefit to consumers such as, exchange of goods and services good be done anywhere according to the will & wish of consumer , due to which they are not required to

visit the market, which in turn saves time labor and cost of the consumer. Apart from sales and purchase, option for payment of bills is also available in e-commerce. Anyone and everyone could take the services of e-commerce if that person has correct knowledge of e-commerce, in that case it would be more convenient for him/her. The commercial sectors had provided an opportunity to uplift the traditional trading method to e-commerce by use of internet, electronics and information technology. It provided a digital atmosphere to the consumer [1-6]. Many electronic services have been inculcated in this spectrum viz. *Electronic Fund Transfer (EFT)*, *e-mail*, *Electronic Bulletin Board (EBB)*, *Electronic Data Interchange (EDI)* etc. These services make trade and commerce more convenient, easy and fast, updated, connect business to business and directly benefit the customer. Any business's success is known by its customer loyalty and customer satisfaction. To make more profits e-commerce providers must ensure customer retention, so that both consumer and service provider reap out its benefits.

II. OBJECTIVES OF STUDY

1. To find the effect of quality of online services on customer satisfaction.
2. To find the effect of quality of online services on repurchase of goods and services by online medium.
3. To study the customer satisfaction in online sale and purchase.
4. To study repurchasing attitude of consumer in online trade.
5. To study the relation between quality of e-services and customer satisfaction.

III. HYPOTHESIS

1. Online shopping service has a positive impact on customer satisfaction.
2. Online shopping service influences consumer for repurchase.
3. Customer satisfaction influences them for repurchase from online portals.
4. Online shopping service establishes a relation between customer satisfactions and repurchase.

IV. LITERATURE REVIEW

Effect of e-commerce on customer is such a subject which requires attention of researchers since the

quantum of online shopping in today's world is quite high. People have shortage of time due to which they prefer online shopping which not only saves their time but also provides many options to compare with. The one which suits them best they choose that option. Online shopping is the newest way to procure goods and services. Many researchers have presented their views in this regarding this topic. These studies are compiled to prepare a literature review. Literature reviews of previous studies are as follows:

Effect of quality of e-commerce on customer satisfaction, trust and loyalty: An Introduction (March 2015)

In this research paper a demand for verification perception of tourists in Malaysia about quality of e-commerce is being raised. Hotel website affects customer satisfaction and loyalty [8].

Behavior of consumer towards online shopping: Empherical study about Dhaka (2018)

In this study customers didn't have credit cards so to gain trust of consumers management continues cash on delivery in its distribution system also management should send optional products to the consumer. So that customer gets option to choose and the organization takes competitive advantage [9].

Study of relation between e-commerce website quality and purchase decision (2020)

In this study 5 qualities of e-commerce is researched viz. website design, trust ability, accountability, trust and personalization [10-13].

Effect of e-service (online food ordering portal) quality on customer satisfaction and customer loyalty with respect to Bilaspur Chhattisgarh (Dr. Amita Pandey & Dr. Abhishek Kumar Pathak)

In this study it was found that Bilaspur has a trend of online food ordering and its growing day by day and customers are satisfied.

V. PROBLEMS & CHALLENGES

1. To collect data without asking for any personal detail of the consumer related to online shopping.

2. The study is based on primary data, and data collection was quite difficult.
3. Scope of the study is limited.

VI. RESEARCH METHODOLOGY

For the purpose of study data is collected by means of questionnaire sent through google forms. To which every respondent has responded. Non probability sampling method is being used to select samples for the data. Respondent belong to different age groups and different literacy levels.

VII. COMPILATION OF DATA

Data could be compiled by two methods:-

A. Primary source:

Such facts which are being collected by the researcher for the very first time completely from beginning. Such data is also known as raw data. Primary data is collected by schedules, questionnaires & over viewing. I have collected the required data by means of questionnaire.

B. Secondary source:

By this method of data compilation a researcher uses the pre existing data collected by some other researcher or institute which is collected and published. Few such sources are research papers, articles, biographies, materials available in Shodhganga, magazines, documents etc.

VIII. ANALYSIS OF DATA

On basis of primary data analysis regarding customer satisfaction and repurchasing attitude of customer with regard to online shopping is done. Collected results are shown by pie charts. Following results have come up on basis of analysis:-

1. Out of 60 respondents 57 uses online shopping methods and 3 don't prefer online shopping.

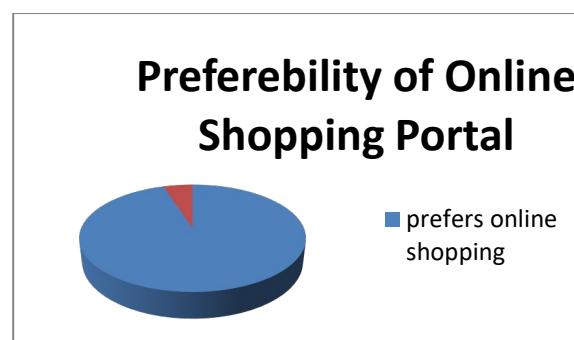


Figure 1

Source: Primary Source

2. On analysis of data it was found that, 32 respondent uses Flipkart, 15 uses Amazon, 10 uses Snapdeal for online shopping.

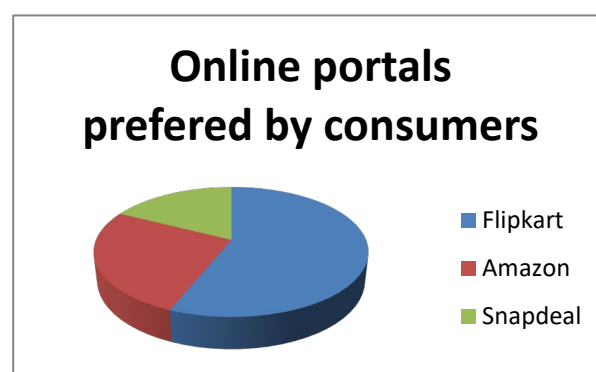


Figure 2

Source: Primary Source

3. On analysis of data it is discovered that 44 respondents prefer to pay for goods and services then and there. 13 respondents choose to pay later.

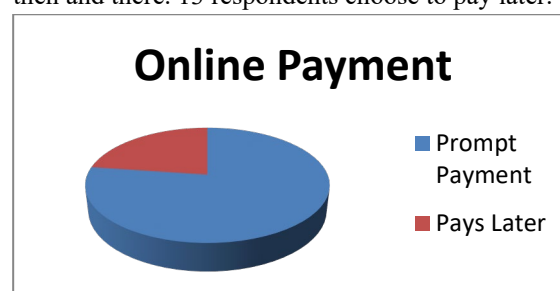


Figure 3

Source: Primary Source

4. On analysis of data, it is being observed that out of 57 respondents, 40 respondents receive on time

delivery and 17 respondents rarely receive goods on time.



Figure 4

Source: Primary Source

5. Out of 57 respondents who use online shopping services 45 respondents are satisfied with the services, 10 aren't satisfied with the services and 2 are indifferent in this regard.



Figure 5

Source: Primary Source

6. Out of 57 respondents who use online shopping services, 49 are satisfied with product quality and 8 are not satisfied.



Figure 6

Source: Primary Source

7. Out of 57 respondents using online services for shopping 50 said that their grievance is being solved in no time, 11 said sometimes its quick, & 6 said that it's always takes time.

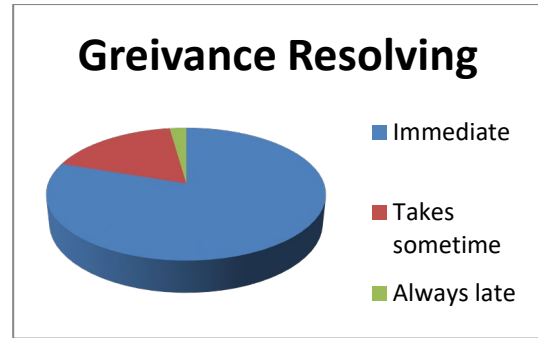


Figure7

Source: Primary Source

8. On analysis of primary data so collected it was observed that 25 respondents said they get the benefits of offers whereas 22 said they didn't get benefits of offers.

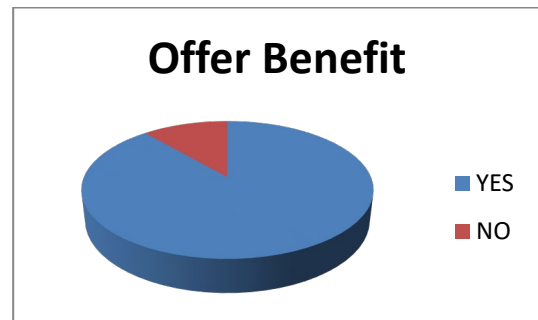


Figure 8

Source: Primary Source

9. On data analysis it was observed that out of 57 respondents who uses online shopping service, 50 respondents always uses same website, 12 said that they sometimes prefer the same, & 5 said they never do so.

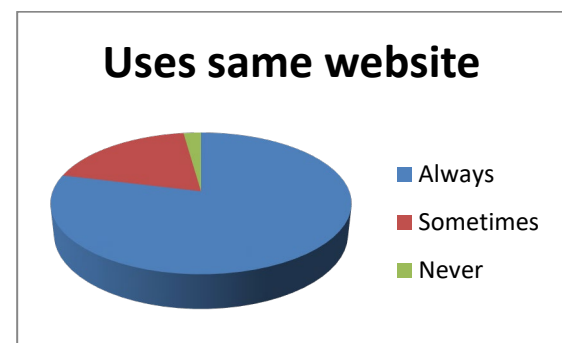


Figure 9

Source: Primary Source

IX. OUTCOME & CONCLUSION

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Above mentioned study shows that as rest of the world there is a trend of online shopping in India and also in Hemunagar block of Bilaspur district in the state of Chhattisgarh and also this trend is rapidly increasing day by day. Not only in rural areas but in also urban areas, residents use online shopping services. It is all possible because of internet. As a human body can't survive without blood so is the case with e-commerce without internet. Coverage of e-commerce is increasing rapidly in rural areas, and it will continue to increase in future since everyone prefers online shopping in today's era. The rural customers are satisfies with the service and also shows the repurchasing attitude.

SUGGESTIONS

1. The quality of online shopping services should be appreciated.
2. Distribution channels should be elongated.
3. The lag time for making the goods available to customer should be decreased.
4. Quality of product is to be improved.

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Determination of antimicrobial potential of aqueous and ethanolic extracts of ten ethnomedicinal plants of Seoni district, Madhya Pradesh against *S. aureus* and *E. coli*.

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Abstract:

The present research study was aimed to study the antibacterial potential of ten selected medicinal plants against skin infections causing bacterial species like *Escherichia coli* and *Staphylococcus aureus*. Aqueous and ethanolic extracts of ten selected (*Catharanthus roseus*, *Hibiscus rosasinensis*, *Allium sativum* Linn., *Zingiber officinale* Rocs., *Curcuma longa* Linn., *Azadirachta indica*, *Murrayakoenigii* Linn., *Terminalia bellirica* (Gaertn) Roxb., *Terminalia catappa* Linn. and *Ocimum sanctum*) ethnomedicinal plants were extracted using soxhlet extraction method. The antibacterial activity was performed using disc diffusion method and determination of Minimum Inhibitory concentration (MIC) and Minimum bactericidal concentration (MBC). It was observed that *C. longa* showed the highest activity against *S. aureus* and *E. coli* followed by *C. roseus*, *catappa*, *M. koenigii* and *H. rosasinensis*.

Index Terms: Ethnomedicinal plants, Skin infections, Ethanolic extract, antibacterial activity.

I. INTRODUCTION

Ethnomedicinal plants have potential medicinal properties that are used in traditional medicinal

system to cure many diseases [1]. It is also safe for people of all age groups. Recently, the use of medicinal plants is increasing effectively and researchers throughout the world are working on the inhibition effects of locally available ethnomedicinal plants against human pathogenic bacteria [2].

Seoni is located in the state of Madhya Pradesh with enriched rich biological diversity. Most of the population of the district comprises of Gond, Korku, Kol, Sahariya tribes [3]. The tribal population mostly depends on forests for their food, shelter and medicinal needs. The lifestyle of the tribal population makes them prone to various skin diseases and skin infections, these infections are generally caused by common bacterial species like *Staphylococcus aureus*, *Escherichia coli*, *Staphylococcus epidermis*, *Pseudomonas aeruginosa*. In most cases antibiotics are taken to cure skin diseases and infections however, long term use of antibiotics is not safe for health and also develops antibiotic resistance [4].

Ethnomedicinal plants are widely used for medicinal purposes and show better healing compared to conventional medicines [5]. Many studies have been reported showcasing the antimicrobial activity of alcoholic and aqueous extracts of ethnomedicinal plants against pathogenic micro-organisms. Author reported the

antimicrobial study of leaf extract of *Acanthus ilicifolius* [6] against *Staphylococcus epidermis* (*S. epidermis*), *Streptococcus pyogenes* (*S. pyogenes*), *Pseudomonas aeruginosa* (*P. aeruginosa*), *Lactobacillus plantarum* (*L. plantarum*), *Candida albicans* (*C. albicans*) and *Trichophyton rubrum* using agar well diffusion, MIC and MBC methods. It was found that methanolic and acetone extracts of the plant depicted efficient activity against *S. epidermis* and *L. plantarum*. Author studied the antimicrobial efficacy of selected medicinal plant extract (*Houttuynia cordata* Thunb., *Tiliacora triandra* (Colebr.) Diels, *Gynemmainodorum* (Lour.) Decne and *Gynuraprocbumbens* (Lour.) Merr using the agar well diffusion, MIC and MBC method [7]. Alcoholic and aqueous extracts of the plant species were selected for the study. It was concluded that the ethanolic extract of *Houttuynia cordata* showed highest antimicrobial activity against *S. aureus* with MIC 15.63mg/ml and MBC 31.25 and 62.50mg/ml. Similarly, ethanolic extract of *Tiliacora triandra* and *radepicted* highest inhibitory activity against *P. aeruginosa* at MIC 7.81mg/ml and MBC 125 mg/ml.

Author performed the antibacterial study of methanolic extracts of three medicinal plants [4] (*Lawsonia inermis*, *Azadirachta indica*, and *Achyranthes aspera*) against *Staphylococcus aureus*, *Streptococcus pyogenes*, *Escherichia coli*, *Klebsiella pneumoniae*, *Pseudomonas aeruginosa*, *Shewanella alage*, methicillin-resistant *S. aureus* ATCC®43300TM, *Staphylococcus aureus* ATCC25923, *Escherichia coli* ATCC25922, *Klebsiella pneumonia* ATCC700603, and *Pseudomonas aeruginosa* ATCC37853 using agar well diffusion, MIC and MBC method. The methanolic extract of *L. inermis* was observed to be highly efficient against all the tested bacterial species, also methanolic extract of *A. indica*

showed antimicrobial activity at higher concentrations. All the three plants extracts depicted highest activity against *S. pyogenes* and in comparative study methanolic extract of *L. inermis* was observed to be most efficient followed by *A. indica* extract and *A. aspera*. According to the above mentioned studies, medicinal plant show prominent antibacterial activity however, some locally available traditional medicinal plants are less known for their activity due to lack of study, in the present study we report the investigation of antibacterial activity of ethanolic and aqueous extracts of ten ethnomedicinal plants against two pathogenic bacterial species. The results of the above study can be further used for the commercial application of these medicinal plants.

II. MATERIALS AND METHODS

A. Extraction of Aqueous and ethanolic extracts of Medicinal plants Collection of plant materials and processing:

Ten plant species (Sadapushpa- *Catharanthus roseus* (Leaves), Gudhal- *Hibiscus rosasinensis* (Leaves, Flowers), Lasun- *Allium sativum* Linn. (bulb), Adrak- *Zingiber officinale* Rocs. (Root), Haldi- *Curcuma longa* Linn. (Root), Neem- *Azadirachta indica* (Leaves, Bark), MeethiNeem- *Murrayakoenigii* Linn (Leaves), Baheda- *Terminalia bellirica* (Gaertn) Roxb (Fruit), JungliBadam- *Terminalia catappa* Linn (Leaves) and Tulsi- *Ocimum sanctum* (Leaves)) were selected for the study. The plant parts were washed thoroughly under tap water to avoid dust and any unwanted material. The dust free plant parts were allowed to dry under shade in the laboratory for 15 days. The dried plant parts were then powdered using electric blender. The fine powder obtained was sieved through strainer and used for extraction.

B. Extraction of aqueous and ethanolic extracts:

Aqueous extracts of all the plant samples were prepared by boiling ten grams of the powdered sample in 20 ml of distilled water for 5 minutes. After cooling the aqueous extracts were filtered using Whatman filter paper and stored until further use. For extraction of ethanolic extract, ten gram of powdered sample was mixed with 80% ethanol and 20% distilled water and soxhlet extracted overnight. The ethanolic extracts were evaporated in vacuum under reduced pressure and stored in sterile bottles until screening.

C. Determination of antimicrobial activity

3.5.1 Media:

Nutrient broth (M002) procured from Himedia® Pvt. Ltd. Mumbai and Mueller Hinton Agar (M173) procured from Himedia® Pvt. Ltd. Mumbai were used for the study.

D. Test Organism:

The test organism gram negative organism, *Escherichia coli* and gram positive organism, *Staphylococcus aureus* were procured from the District hospital Seoni and used for checking antimicrobial activity using disc diffusion method.

E. Determination of antimicrobial activity:

Determination of the antimicrobial activity of the aqueous and ethanolic extracts was performed using disc diffusion method [8]. For testing the antimicrobial activity sterile discs of Whatman filter paper (number 1) were impregnated with 20µl of aqueous extract, ethanolic extract each and distilled water was used as control. A 24 hour broth culture of the test organism was prepared and spread on the surface of sterile Mueller Hinton Agar plates. The impregnated discs with respective samples were then placed on the inoculated surface of the agar plates (maximum of 6 discs per plate including negative control). Further, the agar plates were incubated at 37°C for 24hr. Antimicrobial

activity of each sample against the test species was measured by growth free “zone of inhibition” near the respective discs. The assay was performed in triplicate.

F. Determination of Minimum Inhibitory Concentration (MIC):

Minimum inhibitory concentration (MIC) and minimum bactericidal concentration (MBC) were used for evaluation of ethanolic extract of selected plants (Wayne, 2006). MIC of ethanolic extracts was performed by two-fold serial dilution. Test tubes were numbered one to ten consecutively and nine test tubes were filled with 2ml of nutrient broth. Into test tube 1 and 2, 2ml solution of 100 mg/ml of silver nanoparticles was added and mixed thoroughly with culture medium. Then, 2ml of the content of test tube 2 was added to test tube 3 and mixed completely. The test tubes were serially diluted in similar manner up to test tube 10. At the end, 2 ml content of test tube 10 was discarded. Next, 0.1ml of 1×10^5 cfu/ml of respective bacterial suspension was added to test tubes. The test tubes were incubated at 37°C for 24 hrs. The MIC was calculated as the lowest concentration at which bacterial growth was inhibited. Similarly, the MBC of the bacterial cultures was performed by transferring one loopful of each of the MIC test tube to fresh nutrient broth test tubes and incubated at 37°C for 24 hrs.

III. RESULTS AND DISCUSSION

The antimicrobial activity of ten selected plant species including Sadapushpa- *Catharanthus roseus* (Leaves), Gudhal- *Hibiscus rosasinensis* (Leaves, Flowers), Lasun- *Allium sativum* Linn. (bulb), Adrak- *Zingiber officinale* Rocs. (Root), Haldi- *Curcuma longa* Linn. (Root), Neem- *Azadirachta indica* (Leaves, Bark), MeethiNeem- *Murrayakoenigii* Linn (Leaves), Baheda- *Terminalia bellirica* (Gaertn) Roxb (Fruit),

JungliBadam- *Terminaliacatappa* Linn (Leaves) and Tulsi- *Ocimum sanctum* (Leaves) were checked for their antimicrobial activity against *S. aureus* and *E. coli* using the disc diffusion method. In the study *C. longa* and *C. roseus* were found to be highly active against both the test organisms followed by *A. sativum*, *T. catappa* and *H. rosasinensis*. Most of the plant species were found to show profound activity against gram-positive bacteria compared to gram- negative bacteria. **Table I** and **Figure I** show the antibacterial potential of the selected plant extracts. The ethanolic extract of the test plants was found to be more efficient compared to the aqueous extract (**Graph I and II**).

Table I: Antibacterial activity of selected medicinal plants

S. N	Plant Samples	Zone of Inhibition (In mm)			
		<i>S. aureus</i> (Gram +ve organism)		<i>E. coli</i> (Gram -ve organism)	
		Aqueous	Ethanollic	Aqueous	Ethanollic
1	<i>Murrayakoenigii</i> Linn	9mm	13 mm	NZ	NZ
2	<i>Allium Sativum</i> linn.	NZ	NZ	12 mm	17mm
3	<i>Zingiberofficinale</i> rocs.	NZ	NZ	NZ	NZ
	<i>Catharanthus roseus</i>	12mm	16 mm	10 mm	14mm
4	<i>Curcuma longa</i> linn	17mm	22 mm	NZ	NZ
5	<i>Azadirachtaindica</i>	10mm	15 mm	7 mm	13mm
6	<i>Hibiscus rosasinensis</i>	7mm	13 mm	NZ	NZ
7	<i>Ocimum sanctum</i>	NZ	NZ	NZ	NZ
8	<i>Terminaliabelirica</i>	NZ	NZ	NZ	NZ
10	<i>Terminaliacatappa</i> Linn	8mm	12 mm	7 mm	12mm

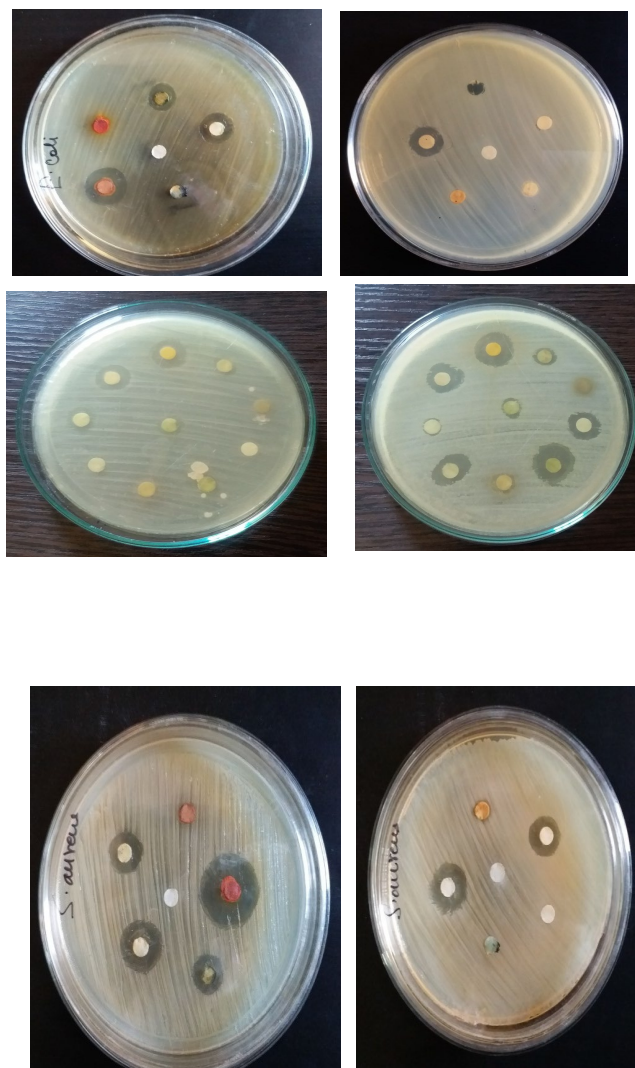
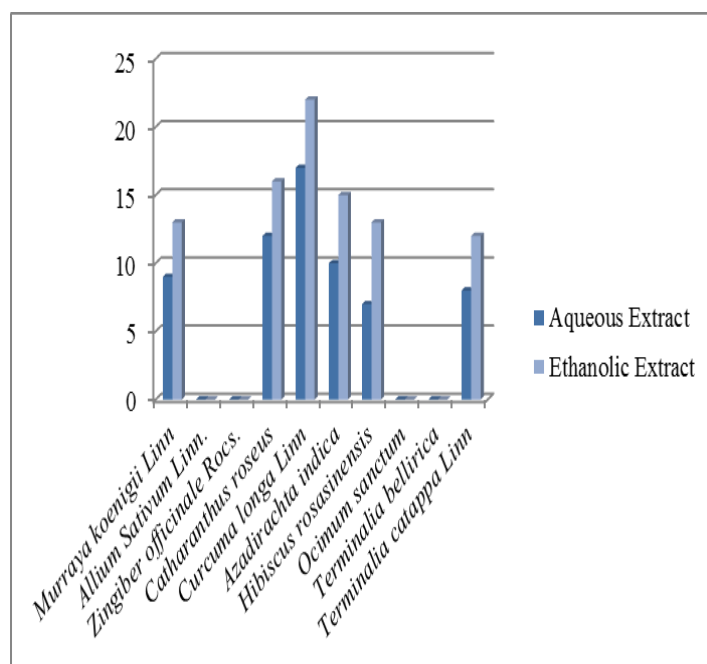


Figure I: Antibacterial activity against S.aureus and E.coli

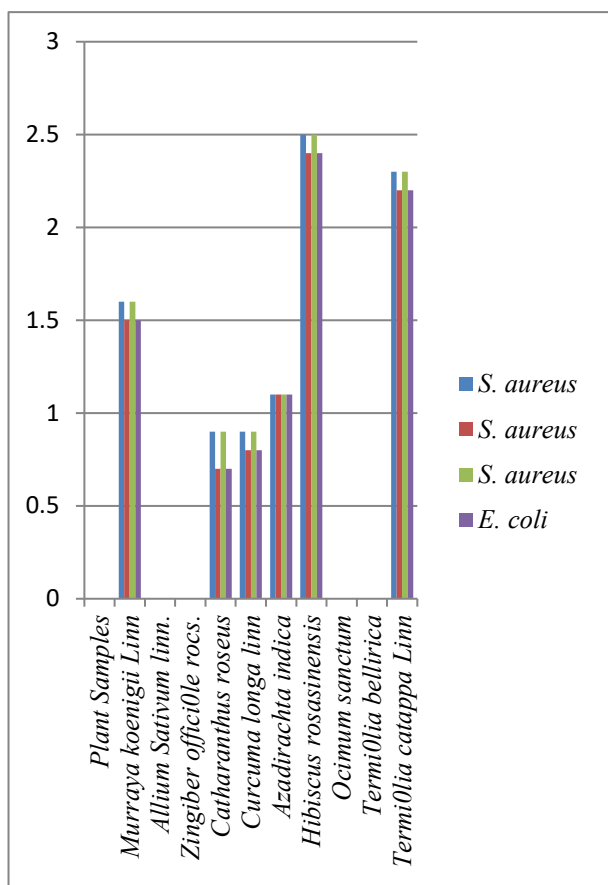
The ethanolic extracts of the selected plants (*Catharanthus roseus*, *Hibiscus rosasinensis*, *Allium sativum* Linn., *Zingiberofficinale* Rocs., *Curcuma longa* Linn., *Azadirachtaindica*, *Murrayakoenigii* Linn., *Terminaliabelirica* (Gaertn) Roxb., *Terminaliacatappa* Linn. and *Ocimum sanctum*) were used to check MIC and MBC values of the extracts (**Table II**).

Table II: MIC and MBC values of selected medicinal plants

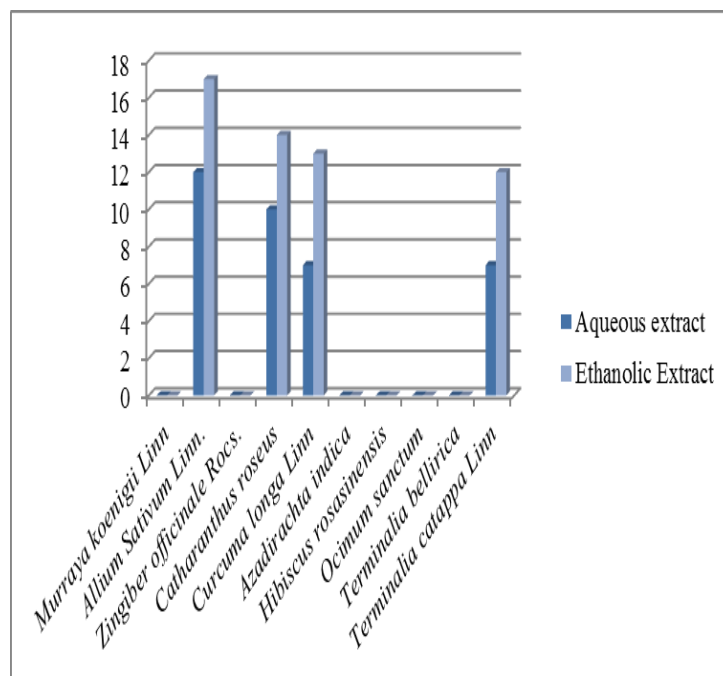
S. N	Plant Samples	<i>S. aureus</i>		<i>E. coli</i>	
		MIC	MBC	MIC	MBC
1	<i>Murrayakoeni gii Linn</i>	1.6µg/ml	1.5µg/ml	1.6µg/ml	1.5µg/ml
2	<i>Allium Sativumlinn.</i>	NA	NA	NA	NA
3	<i>Zingiberoffici nale rocs.</i>	NA	NA	NA	NA
	<i>Catharanthus roseus</i>	0.9 µg/ml	0.7µg/ml	0.9 µg/ml	0.7µg/ml
4	<i>Curcuma longa linn</i>	0.9 µg/ml	0.8µg/ml	0.9 µg/ml	0.8µg/ml
5	<i>Azadirachtain dica</i>	1.1µg/ml	1.1µg/ml	1.1µg/ml	1.1µg/ml
6	<i>Hibiscus rosasinensis</i>	2.5µg/ml	2.4µg/ml	2.5µg/ml	2.4µg/ml
7	<i>Ocimum sanctum</i>	NA	NA	NA	NA
8	<i>Terminaliabel lirica</i>	NA	NA	NA	NA
10	<i>Terminaliacat appa Linn</i>	2.3µg/ml	2.2µg/ml	2.3µg/ml	2.2µg/ml



Graph I: Determination of antimicrobial activity of aqueous and ethanolic plant extracts against *S. aureus*.



Graph III: Determination of MIC and MBC values



Graph II: Determination of antimicrobial activity of aqueous and ethanolic plant extracts against *E. coli*.

The ethanolic extracts of *C. longa* and *C. roseus* showed least MIC value against values 0.9 µg/ml and 0.9 µg/ml against *S. aureus* and *E. coli* while, *A. indica* and *T. catappa* showed MIC value of 1.1 µg/ml and 2.3 µg/ml against *S. aureus* and *E. coli*. Also, ethanolic extracts of *M. koengii* and *H. rosasinensis* 1.6 µg/ml and 2.5 µg/ml against *S. aureus* and *E. coli* respectively. Other plant species including *A. sativum*, *Z. officinalis*, *O. sanctum* and *T. bellirica* did not show any activity (**Graph III**). The least MBC value was observed to be 0.8 µg/ml and 0.7 µg/ml against *S. aureus* and *E. coli* in ethanolic extracts of *C. longa* and *C. roseus*.

According to the results of the antimicrobial activity of the aqueous and the ethanolic plant extracts, it was observed that the plant extracts showed higher activity against the gram positive bacteria compared to the gram negative bacteria. This difference in the antibacterial activity is basically due to the difference in the cell wall structure of gram positive and gram negative bacterial species.

IV. CONCLUSION

The present study gives an insight of the antibacterial potential of ethnomedicinal plants which are traditionally used to heal various skin diseases and skin infections. The antimicrobial activity of the plant extracts of the ethnomedicinal plants will further determine their commercial application in several other medicinal and pharmaceutical industries. Further studies and data is required for the commercial application of traditional ethnomedicinal plants.

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Ethnobotanical Survey of Medicinal Plants in Mahuatoli of Jashpur District

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Abstract: The study was conducted to record the traditional uses and the utilization pattern of medicinal plants in Mahuatoli of Jashpur district. Medicinal plants have been disserved to be very effectual in the ministration of various ailments. Ethnobotanical plant species are reported in which parts of plants are used in various diseases. These plants are used in various ailments like skin disease, asthma, blood pressure, and malaria. The present paper deals with plant species belonging to trees, herbs, and shrubs. The purpose of the present investigation was to survey the Ethnobotanical perspective of Medicinal Plants situated in Mahuatoli of Jashpur District, to focus on the traditional medicinal plants used by local communities to treat human diseases, and the documentation of medicinal plants used to treat various human diseases in the study area. The findings revealed that a total of twenty Ethnobotanical plants were distributed in the study area which belongs to fifteen different families.

Index Terms: Ethnobotanical, medicinal plants, Traditional knowledge, Mahuatoli, Jashpur district.

I. INTRODUCTION

The role of meditational plant species in ancient health applications has attracted researchers-eye towards the ethnomedicines [1, 2, 3]. The use of plant species as traditional medicines provides a real substitute in healthcare services for rural communities of developing countries [1]. Presently, the research on the traditional uses of plant species has conquered the scientific community. Therefore, the present study was done to document the traditional knowledge of local communities of Mahuatoli in the Jashpur district on medicinal uses of surrounding plant diversity [4,5,6]. Thus, the study was initiated with the documentation of twenty traditional medicinal plants knowledge accumulated by the local communities of the Jashpur district.

II. MATERIALS AND METHODS

A. Study Area:

The Jashpur district lies within the north-eastern corner of the state of Chhattisgarh and is connected to the border of Jharkhand and Odisha. It is a Reserve Forest and covers the Sanna, Bagicha, and Narayanpur region, and the map of



Jashpur district is represented Fig. I. This space is named the higher staircase and is climbed through incorporates a wide selection of minerals found are igneous matter. The three-climate issue i.e., rain, temperature, and their combination in conjunction with variations, thanks to the season too.

Fig. I: Map of Jashpur District

B. Ethnobotanical data collection:

The Ethnobotanical data were collected by means of present data capture through questionnaires and open interviews. The questionnaire was designed to focus on the local names of plants and the parts of the plant used. The botanical name, local name, habit, parts used, family, and ethnobotanical use of some ancient healers were tabulated. These healers were abreast of the analysis team that they were unwilling to break the information concerning bound to the medicinal plants and its properties of that they thought-about to be terribly powerful.

C. Ethnobotanical analysis:

The ethnobotanical data i.e., botanical name, local name, habit, parts used, family, and ethnobotanical uses, were entered and summarized using descriptive methods. The preferred

ranking system was employed for very essential medicinal plants used to treat stomachache.

III. RESULT AND DISCUSSION

The plant parts most commonly used were roots, leaves, bark, whole plant, and flowers. The most commonly used plant forms herbs (5), tree (4), shrub (11) is shown in Table I. Plant families i.e., Acanthaceae and Rubiaceae have been represented herbs and shrubs were a total of 6 (Table II). Plant families i.e., Asphodelaceae, Caricaceae, Moraceae, Rutaceae, and Solanaceae have been represented as herbs and shrubs were a total of 17 (Table II).

The medicinal plants recorded in the target area belonged to the families viz., Acanthaceae, Asphodelaceae, Rutaceae, Caricaceae, Apocynaceae, Solanaceae, Campanulaceae, Amaryllidaceae, Euphorbiaceae, Moraceae, Rubiaceae, Verbenaceae, Fabaceae, and Lythraceae (Table I.). Herbs were used most frequently (23.5%) for the treatment of ailments such as diabetes, stomach problems, gonorrhea, toothache, and hypertension [1,4,5,6,7,8]. The present investigation identified the serious threats to ethnobotanical plants. The study also evaluated that how local people manage medicinal plants and this will help to understand the best conservation strategies [9]. Earlier several studies have been carried out to evaluate certain indigenous plant communities especially from tribal regions [1,4,5,6,8,9]. These healers were privy by the analysis team and they found that the local communities were unwilling to tell info regarding bound medicative plants and their properties. The choice of the use for a specific plant form is based on the knowledge that is passed on from one generation

to offspring. The mode (%) of the preparation of ethnobotanical plants forms i.e., herb, shrub, and tree were recorded 12.6, 40.8, and 14.8 respectively, used by the people of Mahuatoli in Jashpur district (Fig.II). Hence, these comprise 68.2 % of the total preparation. During the present assessment of ethnomedicinal plants, a total of 36 plants were observed, among them 20 plant species were documented as per their ethanomedicinal applicability in the study area (Table I and Table II).

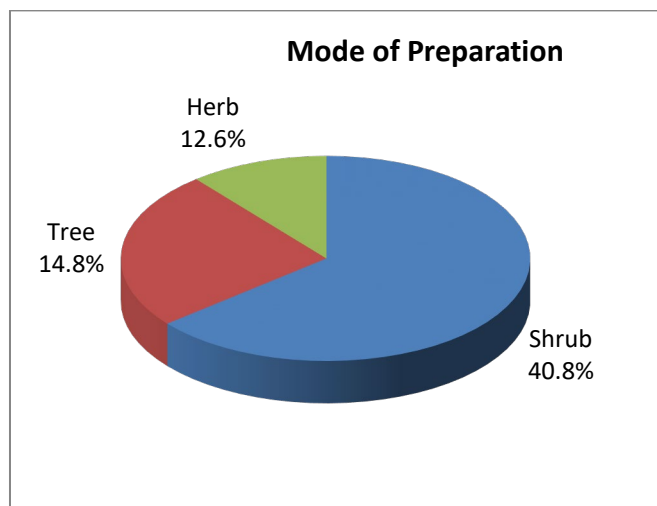


Fig II: Mode of preparation of the ethnobotanical plants used by the people of Mahuatoli in Jashpur district

TABLE I: ETHNOBOTANICAL OBSERVATION OF PLANTS SPECIES IN MAHUATOLI OF JASHPUR DISTRICT

S. No.	Botanical Name	Local Name	Habit	Parts Used	Family	Ethnobotanical Uses
1	<i>Andrographis paniculata</i>	Chiretta	Herb	Stem, leaf, and root	Acanthaceae	Chiretta herb is utilized by individuals as a tonic in Fever, constipation, symptom, loss of craving, intestinal worms, skin diseases, and cancer.
2	<i>Aloe vera</i>	Ghritkumari	Shrub	Leaf	Asphodelaceae	It has been employed in delicate fever, wounds and burns, gastrointestinal disorders, diabetes, sexual vitality and fertility, cancer immunity modulation, AIDS, and numerous skin diseases [1,5].
3	<i>Aegle mormelos</i>	Bael	Tree	Leaf and fruit	Rutaceae	The seasoner healthful preparation of bael is used to treat chronic diarrhea, dysentery, peptic ulcers, laxative for astringency, and metastasis ailments. The leaves of these fruits and alternative components have medicinal values [1,5].
4	<i>Carica papaya</i>	Papita	Shrub	Leaf and fruit	Caricaceae	Papaya contains several biologically active compounds. Fruit, leaves, latex, and stem are accustomed to treat roundworm, diarrhea, swelling of the lungs, stoppage of elimination, blindness, cardiac arrhythmia, mycosis, and baldness [1,5].
5	<i>Catharanthus roseus</i>	Sadabahar	Shrub	Leaf and flower	Apocynaceae	Sadabahar has long been employed in Ayurveda and Chinese medicines and is alleged to be a time-tested seasoner treatment for managing conditions like polygenic disease, infection, sore throats, and cancer.
6	<i>Capsicum annum</i>	Mirchi	Shrub	Fruit and leaf	Solanaceae	Capsicum is used locally to treat pain related to degenerative arthritis, shingles, atrophic arthritis, post-herpetic, neuralgia, neuralgia, diabetes, neuropathy, fibromyalgia, and back pain.

7	<i>Campanula latifolia</i>	Giant bellflower	Herb	Root and flower	Campanulaceae	Use for all inflammation of the mouth and throat. Herb extract is utilized in wounds or cut healing.
8	<i>Crinum latifolium</i>	Sudarshan	Herb	Leaf and tuber	Amaryllidaceae	Used within the treatment of the many painful diseases in Ayurveda. Sudarshan is helpful in ear pain, joint pain, and hemorrhoids.
9	<i>Datura metel</i>	Moonflower	Herb	Leaf, flower, and fruit	Solanaceae	The seeds of Datura are analgesic anthelmintic and anti-inflammatory and widely used in the treatment of stomach aches and viscus pain that results from worm infestation ache and fever from inflammation.
10	<i>Euphorbia hirta</i>	Dugdhika	Herb	Leaf, flower, and stem	Euphorbiaceae	<i>Euphorbia hirta</i> is used historically for feminine disorders, respiratory ailments (cough, rhinitis, and asthma), worm infestations in kids, pimples, and biological process drawbacks.
11	<i>Euphorbia milii</i>	Christ plant	Shrub	Flower and leaf	Euphorbiaceae	Euphorbia milii possesses antifungal and antinociceptive properties, acts as a natural molluscicide, will curb the unfold of schistosomiasis.
12	<i>Ficus bengalensis</i>	Bargad	Tree	Bark, root, seed, and leaf	Moraceae	It helps manage glucose levels by increasing internal secretion because of its inhibitor properties. Its antioxidants additionally help in reducing sterol levels.
13	<i>Ficus religiosa</i>	Peepal	Tree	Leaf, bark, seed, and fruit	Moraceae	Every part of the peepal tree- the leaf, bark, shoot, seeds, and fruit have many healthful advantages. and lots of alternative diseases. from ancient amount.
14	<i>Ixora coccinea</i>	Jungle geranium	Shrub	Flower, root, stem, and leaf	Rubiaceae	It is employed as an astringent to treat infectious disease and infectious disease. associate degree infusion of the leaves or flowers of many species is suggested by the doctors to treat fever, headache, and pain.
15	<i>Jatropha curcas</i>	Ratanjot	Shrub	Root and leaf	Euphorbiaceae	Roots have medicinal properties and are wont to cure wounds, fever, and diseases, whereas Ratanjot oil is popularly used as a toilet article.
16	<i>Lantana camara</i>	Putus	Shrub	Leaf, root, and flower	Verbenaceae	Leaves are used for treating protozoal infection, chickenpox, respiratory disease swelling, tumor, high-pressure level, sores, fevers, colds, and measles.
17	<i>Punica granatum</i>	Anar	Shrub	Fruit, flower, root, and leaf	Lythraceae	The pomegranate has been employed in natural and medical aid to treat sore throats coughs urinary infections biological process disorders skin disorders inflammatory disease and expel tapeworms.
18	<i>Rauvolfia serpentina</i>	Sarpagandha	Shrub	Root and leaf	Apocynaceae	Effectively lowers high Blood Pressure (BP). The derivatives of the root of sarpgandha are used to manage the symptoms of cardiovascular disease naturally.
19	<i>Senna tora</i>	Chakramarda	Shrub	Root, seed, and leaf	Fabaceae	It has been used for treating skin diseases like infectious disease, ringworm, cutaneous sensation, and skin disorder and additionally for snakebites. alternative healthful provisions from the leaves of this plant balm are ready for inflammatory disease.

20	<i>Tamarindus indica</i>	Imli	Tree	Seed, fruit, and flower	Fabaceae	It's partly dried fruit is employed to form drugs. The seeds of Imli are employed in constipation liver, bladder issues, abdomen disorders, and extract of seeds is employed as watch drops for dry eyes.
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TABLE II: FAMILIES OF ETHNOBOTANICAL PLANTS WITH HABIT IN MAHUATOLI OF JASHPUR DISTRICT

S. No.	Family	Total plant species	Herb	Shrub	Tree
1.	Acanthaceae	3	2	1	-
2.	Asphodelaceae	3	2	-	1
3.	Rutaceae	3	2	-	1
4.	Caricaceae	4	1	-	3
5.	Apocynaceae	2	-	2	-
6.	Campanulaceae	1	-	-	1
7.	Amaryllidaceae	2	2	-	-
8.	Solanaceae	4	2	-	2
9.	Euphorbiaceae	2	-	2	
10.	Moraceae	3	2	-	1
11.	Rubiaceae	3	1	2	-
12.	Verbenaceae	3	3	-	-
13.	Lythraceae	1	1	-	-
14.	Fabaceae	2	-	-	2
Total		36	18	07	11

IV. CONCLUSION

There is a clear ought to document content on healthful plant usage before it becomes lost for future generations This study has revealed the

variety of plants that are good for health and used by the standard healers of the Mahuatoli in Jashpur

space for the treatment of assorted human ailments. The result of the study divulges that the worth plants in terms of health benefit and their usages.

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Fish Fauna Diversity of Kantoor Dam, Rajendragram, Anuppur District, Madhya Pradesh, India

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Abstract: This study on fish diversity of Kantoor Dam was carried out from May 2019 to April 2020. Fresh water fish diversity of Rajendragram Reservoir is poorly studied. There is no proper documentation on fresh water fish resources of Rajendragram Reservoir of Anuppur Dist. This study aims to prepare data base of fishes found in Anuppur. Fishes are the unique creature of animal world. It is one of the good sources of protein and it is able to combat problem of nutrition. Total 31 Species were recorded from Kantoor Dam.

Index Terms: Fish Fauna, Kantoor Dam, Rajendragram, Anuppur Dist., Madhya Pradesh, India.

I. INTRODUCTION

My study area is Kantoor Dam, Sarhara Kona, Rajendragram, Anuppur Dist., Madhya Pradesh, India. Fish is one of the most important sources of animal diet. Fish is a valuable source of protein and occupied significant position of socio-economical fabric of South Asian countries. India has rich biological heritage that qualifies it as one of the twelve mega diversity nation of the world [1]. There are about 2,546 species of Fishes (about 11% of the world species) found in Indian waters Central India harbor a wide. Variety of fresh water fishes in its diverse water resources such as streams, rivers, reservoirs sub-terrain aquatic ecosystem, traditional lakes and domestic ponds. Reservoir paly a very important role in geo-chemical cycling an influence chemical composition and material transfer of the river

system [2]. They are of high elological, economic and recreational importance [3]. Study of fish fauna in Madhya Pradesh started with the work [4]. Later several workers studied the fish fauna of Madhya Pradesh which includes this work [5-18].

II. STUDYAREA

Kantoor Dam is situated in a rural area of Rajendragram Anuppur District. Madhya Pradesh. The Dam is constructed in 1991.

III. Material and Method

The fishes were collected from Kantoor Dam, Rajendragram Anuppur Dist., and from local fisher man generally use many types of nets like Gill nets, Cast nets, Drag nets etc. Fishes were preserved in 10% formalin solution and identified with the help of standard key and book. This study was conducted between May 2019 to April 2020. The fishes were identified [19-22].

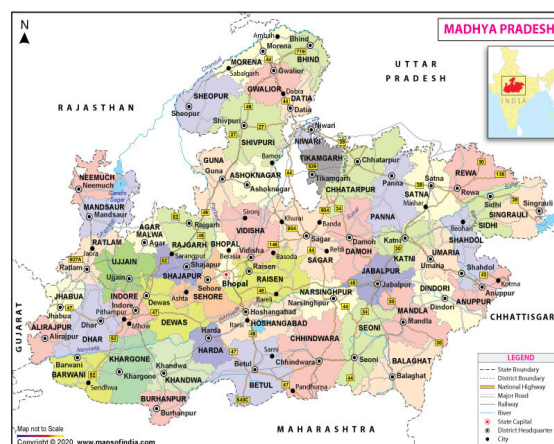


Figure .01

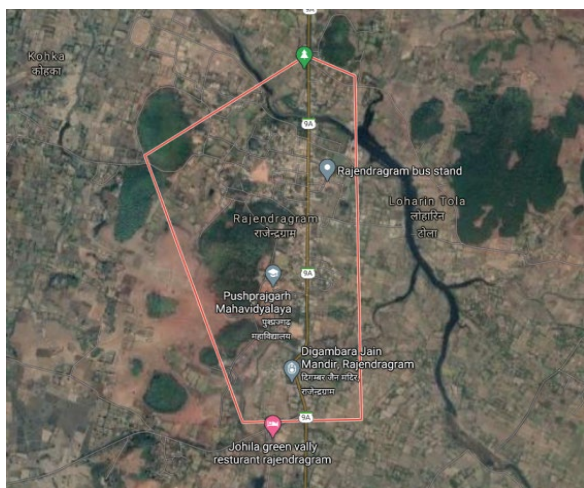


Figure .02

IV. RESULT AND DISCUSSION

The present investigation of fish diversity of Kantoor Dam of Rajendragram Dist. A total number of 31 species of fishes belonging to 3 orders and 8 families. Were recorded fishes belong Cypriniformes was dominates the order group in the fish diversity in the Kantoor dam. Fishes found in Kantoor Dam are edible an importance source of protein.

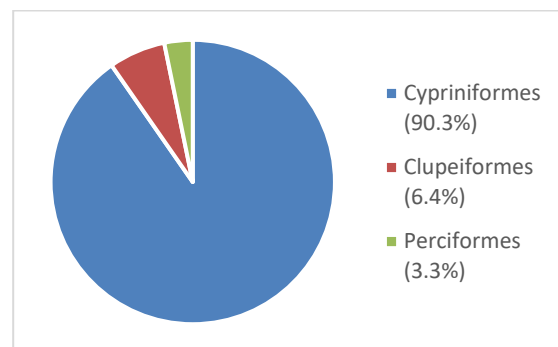


Figure. 03

Table I: Order wise fish species in Kantoor Dam.

S. No.	Order	No. of Fish Species
1.	Cypriniformes	28
2.	Clupeiformes	2
3.	Perciformes	1
	Total No.	31

Table II: List of fish fauna recorded from the Kantoor Dam with local name.

S No.	Name of Fish Species	Order	Family	Genus	Common Name
1	<i>Labeorohita</i>	Cypriniformes	Cyprinidae	Labeo	Rohu
2	<i>Labeogonius</i>	Cypriniformes	Cyprinidae	Labeo	Kursi
3	<i>Labeocalbasu</i>	Cypriniformes	Cyprinidae	Labeo	Calbasu
4	<i>Labeobata</i>	Cypriniformes	Cyprinidae	Labeo	Bata
5	<i>Catla catla</i>	Cypriniformes	Cyprinidae	Catla	Catla
6	<i>Cirrhinus mrigala</i>	Cypriniformes	Cyprinidae	Cirrhinus	Mrigla
7	<i>Cyprinus carpio</i>	Cypriniformes	Cyprinidae	Cyprinus	Common Carp
8	<i>Cirrhinus reba</i>	Cypriniformes	Cyprinidae	Cirrhinus	Reba
9	<i>Esomus danricus</i>	Cypriniformes	Cyprinidae	Esomus	Dandia
10	<i>Puntius chola</i>	Cypriniformes	Cyprinidae	Puntius	Kotri
11	<i>Puntius ticto</i>	Cypriniformes	Cyprinidae	Puntius	Sidhri
12	<i>Puntius sophore</i>	Cypriniformes	Cyprinidae	Puntius	Kotri
13	<i>Puntius sarana</i>	Cypriniformes	Cyprinidae	Puntius	Sarana
14	<i>Oxygaster bacaila</i>	Cypriniformes	Cyprinidae	Oxygaster	Sarangi
15	<i>Ctenopharyngodon idella</i>	Cypriniformes	Cyprinidae	Ctenopharyngodon	Grass carp
16	<i>Clarias batrachus</i>	Cypriniformes	Cyprinidae	Clarius	Mongri
17	<i>Hypophthalmichthys molitrix</i>	Cypriniformes	Cyprinidae	Hypophthalmichthys	Silver carp
18	<i>Salmostoma bacaila</i>	Cypriniformes	Cyprinidae	Salmostoma	Chal
19	<i>Tor tor</i>	Cypriniformes	Cyprinidae	Tor	Mahseer
20	<i>Ompok bimaculatus</i>	Cypriniformes	Siluridae	Ompok	Paniha
21	<i>Wallago attu</i>	Cypriniformes	Siluridae	Wallago	Padhani
22	<i>Mystus seenghala</i>	Cypriniformes	Bagridae	Mystus	Seenghala
23	<i>Mystus cavasius</i>	Cypriniformes	Bagridae	Mystus	Bade Tengana
24	<i>Mystus tengara</i>	Cypriniformes	Bagridae	Mystus	Tengana
25	<i>Mystus aor</i>	Cypriniformes	Bagridae	Mystus	Bade Tengana
26	<i>Rita rita</i>	Cypriniformes	Bagridae	Rita	Kokia
27	<i>Bagarius bagarius</i>	Cypriniformes	Sisoridae	Bagarius	Rechha
28	<i>Heteropneustes fossilis</i>	Cypriniformes	Saccobranchidae	Heteropneustes	Singhi
29	<i>Notopterus notopterus</i>	Clupeiformes	Notopteridae	Notopterus	Phalia
30	<i>Gudusia chapra</i>	Clupeiformes	Clupeidae	Gudusia	Suhia
31	<i>Oreochromis mossambicus</i>	Perciformes	Cichlidae	Tilapia	Tilapia

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Screening for the production and characterization of L-asparaginase from Endophytic fungi

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Abstract: L-asparaginase (EC 3.5.11. L-asparagine amidohydrolase) is first enzyme, studied very intensively in human beings with regard to its anti-tumor potential against tumor of lymphoid precursor, acute lymphoblastic leukemia (ALL). The current drugs are suffering from many side effects like immune suppression, infertility, secondary neoplasm. The immunogenic complications associated with its present microbial sources *Escherichia coli*; *Erwinia carotovora* limits its medicinal frontier. So there exists a need of switching to novel natural sources to serve as non-immunogenic and better production sources of L-asparaginase. In the present study, four cultures of fungal endophytes viz. TSF-1, TSF-2, TSF-3 and TSF-4 selected on the basis of primary and secondary screening was carried on with L-asparagine as a sole carbon and nitrogen source and phenol red as pH indicator. The maximum protein content was observed to be present in TSF-2 i.e. 2.727 mg /mL and possessed maximum activity of 6.054 Units/ml. Sample was separated by SDS-PAGE, stained by silver staining, showed a single band with molecular weight of approximately ~45kDa

Index Terms: L-asparaginase, fungal endophytes, acute lymphoblastic leukemia

I. INTRODUCTION

L-asparaginase (IUPAC: L-asparagine aminohydrolase, E.C. 3.5.1.1) belongs to amidase group that hydrolyses the amide bond in L-asparagine to L-aspartic acid and ammonia [1]. L-asparaginase is an effective antineoplastic agent, used in the Acute Lymphoblastic Leukemia (ALL) chemotherapy [2]. The enzyme is widely distributed and is found in animals, plants as well as microorganisms. In recent times L-

asparaginase of bacterial origin is used in treatment of ALL. But, in 60% of patients these came up with serious clinical complications such as hypersensitivity reactions, toxicity and instability. Fungal endophytes are group of diverse, polyphyletic microorganisms which are an integral part of the plant micro biome, that internally reside within plants without causing any noticeable infections and live in mutualistic association with plants for part of their life [3]. The rationale behind studying Endophytic fungi is due to the fact that they are potential source of unexplored novel drugs. Fungal endophytes have been recognized as repository of novel secondary metabolites [4]. Asparaginase derived from *Mucor* sp. and *Aspergillus terreus*, isolated from decomposing vegetable substrate was reported to be non-toxic and possessed myelo-suppressive and immunosuppressive activity [5]. The first and most important benefit is fungal L-asparaginases are non-immunogenic as they are phylogenetically related and post-translational modifications are present in their system, being the eukaryotic microbes and residing inside the plant body so the stability issues are also tackled. The presence of extracellular L- asparaginases in fungi also paved the ways into depth investigations of this enzyme among the various genera of fungi [6]. L-asparaginase production throughout the world is carried out mainly by submerged fermentation (SF). This technique however, has many dis-advantages. It is cost intensive and has low product concentration. In addition, it generates excess of effluents and consequently needs handling and disposal of large volumes of waste water during downstream processing [7]. In recent years, the production of enzymes by solid state fermentation (SSF) has

emerged. It offers many advantages including high product concentration, less risk of bacterial contamination, ease of product extraction [8], simple cultivation equipment, low energy requirements and less waste water generation and less environmental concerns regarding the disposal of solid waste [9]. This study orange peel used as substrate due to easily availability and has all carbon source for production of enzyme.

II. MATERIALS AND METHODS

A. Collection of Plant Samples and Surface sterilization:

In the preset study two plants viz. *Azadirachta indica*, *Ocimum sanctum*, recommended for medicine and readily available in field and garden at Bilaspur C.G. and each mature and healthy leaf and stem were used for isolation of endophytic fungi. The samples were brought to the laboratory in sterile bags and processed immediately to reduce the risk of contamination. The healthy plant parts were washed with distilled water and cut into small pieces. Then tissue pieces were rinsed in 2.5% sodium hypochlorite for 15 min followed by washing in sterile distilled water for 5 min. Surface was sterilized with 75% ethanol for 5 min then rinse in sterile water for three times [10].

B. Isolation of endophytic fungi on Potato Dextrose Agar (PDA) Media:

Finally the pieces were transferred to dishes of isolation media, potato dextrose agar. There are four strains of endophytic fungi were obtained which was screened for L-asparaginase assay.

C. Screening for L-asparaginase producers:

Primary screening of four endophytic fungi was done for L-asparaginase production on Modified Czapek Dox (MCD) agar pH 6.8. The plates were then kept at $28 \pm 2^\circ\text{C}$ for 5-7 days. The composition of the MCD agar media is L-asparagine (10g/L), Glucose(2.0g/L), Potassium di-hydrogen phosphate (KH_2PO_4) (1.52g/L), Ferrous sulphate ($\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$) (0.01g/L), Magnesium sulphate ($\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$)(0.52g/L), Potassium chloride (KCl) (0.52g/L), Zink Sulphate ($\text{ZnSO}_4 \cdot 7\text{H}_2\text{O}$) (0.001g/L), Copper Nitrate ($\text{CuNO}_3 \cdot 3\text{H}_2\text{O}$) (0.001g/L), Agar (20g/L), (Patil M.P., Patil R.H. and Maheshwari V.L., 2012). Secondary screening for L-asparaginase producers on Modified Czapek

Dox's medium was supplemented with 0.3 mL of 2.5% phenol red dye prepared in ethanol at pH 6.5 with L-asparagine incorporated in the medium for evaluation of L-asparaginase activity. L-asparagine acts as sole carbon and nitrogen source. All the positive fungal isolates were grown on L- asparagine agar plates for 7 days at 28°C . The color change from yellow to pink was observed [11].

D. Enzyme production under Solid state fermentation:

The production of L-asparaginase by endophytic fungi under solid state fermentation was performed using orange peel as substrate. Fermentation was conducted in 100 - 250mL conical flasks containing 10 g of solid substrate, separately. Solid substrate was moisture with 10mL distilled water and autoclaved at 121°C , 15 psi for 15 min. Then after cooling 10 6- 108 spores or cells were counted in hemocytometer and 3mL of inoculum was added to each flask under aseptic condition. Then incubate at 30°C for 7 days [12]. Enzymes were extracted by adding 20 mL phosphate buffer in all fermented flask and shaken them at 150 rpm for 2 hours. Then filtered separately with what Mann filter paper, then centrifuged at 12000 rpm for 20 min. After centrifugation supernatant was used as crude enzyme.

E. L-asparaginase assay:

The activity of L-asparaginase was determined by estimating the amount of NH_3 liberated from asparagine during L-asparaginase catalysis using Nessler's reagent. For L-asparaginase determination the reaction mixture composed of 0.5 M phosphate buffer (pH 6.8), 0.4 M L-asparagine and enzyme sample, which incubated for 30 min at 37°C . The reaction was stopped by the addition of 0.5 ml of 1.5 M trichloroacetic acid solution and the liberated ammonia was coupled with Nessler's reagent and quantitatively determined spectrophotometrically at 436 nm [13].

F. Purification of L-asparaginase:

The purification of L-asparaginase was carried out by salting out method using ammonium sulphate. Solid ammonium sulphate was added to the homogenate to reach a saturation of 70%. The mixture was left overnight at 4°C and then centrifuged at 10,000 rpm for 20 min at 4°C . The precipitate obtained was dialysed and the supernatant was raised to 80% saturation with solid ammonium sulphate. The precipitate collected after each of the 70%, and 80% saturation steps

were dissolved in minimum volume of 50mM Tris-HCl buffer (pH 8.6) and dialyzed overnight at 4°C against the same buffer [14]. The ammonium sulphate fraction showing the highest enzyme activity was further purified by ion exchange chromatography. Four gram of DEAE cellulose were mixed with 500 mL of 0.02 M Tris HCl an equilibration buffer. the mixture was left for one hour and the buffer was poured off with the small particle in the column. The column was [15] dialyzed sample was then loaded on a pre-equilibrated DEAE-cellulose column chromatography (2.6 x 20 cm), and washed with 0.02 M Tris HCl (pH 8.0) buffer. The proteins were eluted with a discontinuous gradient of NaCl (0.1 – 0.25 M) prepared in the same buffer. The flow rate was maintained at 0.5mL/min. with a fraction volume of 5mL. The fraction eluted at each NaCl concentration were separately pooled and tested for protein and L-asparaginase activity determination as mentioned before. The active fractions were used for testing purity by Poly Acrylamide Gel Electrophoresis (PAGE) [15].

Detection of proteins by silver staining for SDS-PAGE protein samples:

SDS-PAGE is used for characterizing proteins and for molecular weight identification. SDS-PAGE system includes: a tank, lid with power cables, electrode assembly, and cell buffer dam, casting strands, casting frames, combs and glass plates. It is carried under denaturing conditions as SDS is used to give uniform negative charge to the protein [16].

III. RESULTS AND DISCUSSION

A. Isolation of Endophytic fungi and their pure culture:

Ocimum sanctum was selected for the isolation of endophytic fungi. Total four fungal endophytes were isolated (figure I) and maintained on modified Czapek Dox medium. Endophytic fungal were observed under microscope (figure II).

B. Qualitative screening assay for L-asparaginase:

To find the activity of L- asparaginase by quantifying the amount of ammonia released, Standard curve of Ammonia was constructed viz. equation obtained was $Y = 0.2426x + 0.0655$ with $R^2 = 0.982$, (Graph 2). Then, from this graph the

Four endophytic cultures were subjected for preliminary screening in order to assess their potential to utilize L-asparagine as a nitrogen source. The isolates when grown on modified czapek dox agar medium with phenol red as a pH indicator were selected on the basis of their ability to convert yellow plates to pink under alkaline conditions. The changed colour indicated the accumulation of ammonia which resulted as L-asparagine converted to L-aspartic acid in figure III. All four Endophytic fungi cultures were found to be positive for extracellular L-asparaginase production. Whereas, one isolates of endophytic fungi TSF-2 positive cultures exhibited promising L-asparaginase production and rest were very slow producers being active after 4-7 days. TSF-2 found to exhibit highest activity, as pink color intensity was found to be maximum (Figure III) followed by TSF-1, TSF-3 and TSF-4 was the slowest L-asparaginase producer among all the selected positive isolates. Table I represents the list of fungal endophytes along with their host plant, the part of host plant from where they are collected, place of sampling and their ability as L- asparaginase producers or L- asparaginase non-producers.

C. Enzyme production:

Enzyme production was carried out under Solid state fermentation using orange peel as a substrate. Each flask has 10g of substrate and moisture with 10 mL water and autoclaved. Inoculum was added to each flask and incubated for 6-7days.

After incubation phosphate buffer added to the flask and shaken at 150rpm for 1-2hrs. Crude enzymes were extracted followed by filtration and centrifugation. Crude enzymes were then checked for total protein content and Enzyme activity. The maximum protein content was observed to be present in TSF-2 i.e. 2.727 mg/mL. The protein estimation of all the isolates was done by Lowry's method as the amount of protein obtained is important for further findings. Amount of protein in test samples was calculated by using the correlation equation obtained by BSA standard curve in graph 1. The total protein content obtained per ml of culture filtrate was shown in table II.

D. Quantitative estimation of asparaginase by Nesslerization:

ammonia released in the test sample was calculated using following equation:

Finally, activity of the L- asparaginase from test fungal isolates was calculated in (Units/ml) using the formula as

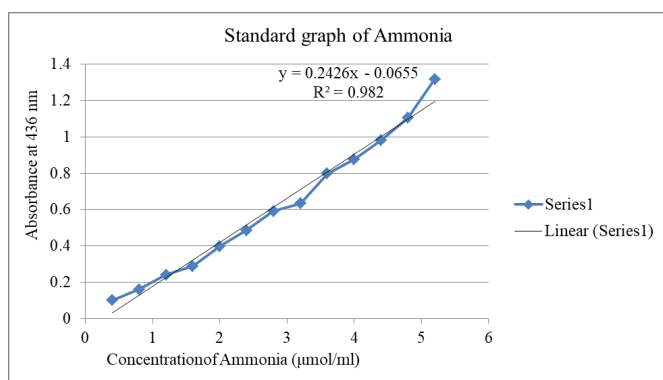
mentioned previously. In fungal endophyte the crude protein of TSF2 possessed maximum activity of 6.054 Units/ml and the lowest activity was observed in TSF-1 i.e. 5.282 Units/ml (table III).

E. Purification of Crude enzyme:

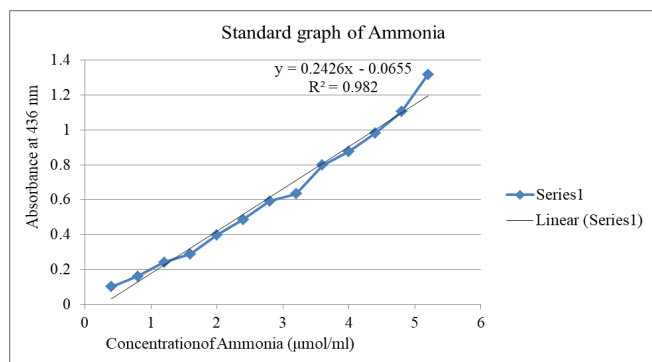
The crude enzyme which shows highest L- asparaginase activity was further purified after large scale production. The purification of L- asparaginase was carried out by salting out method using ammonium sulphate and ion exchange chromatography by using DEAE cellulose column.

F. Detection of proteins in SDS-PAGE:

Molecular weight of partially purified enzymes was determined using SDS-PAGE. In lane 1 standard molecular weight markers i.e. Crymotrypsinogen A (24kDa), Ova albumin (45kDa) and BSA (67kDa) and lane 2 protein samples of TSF-2 were loaded. SDS-PAGE of protein sample of TSF-2 gives a single band with molecular weight of approximately ~45kDa showing in figure 4.



Graph 1: Standard cure for Bovine serum albumin



Graph 2: Showing standard curve of Ammonia

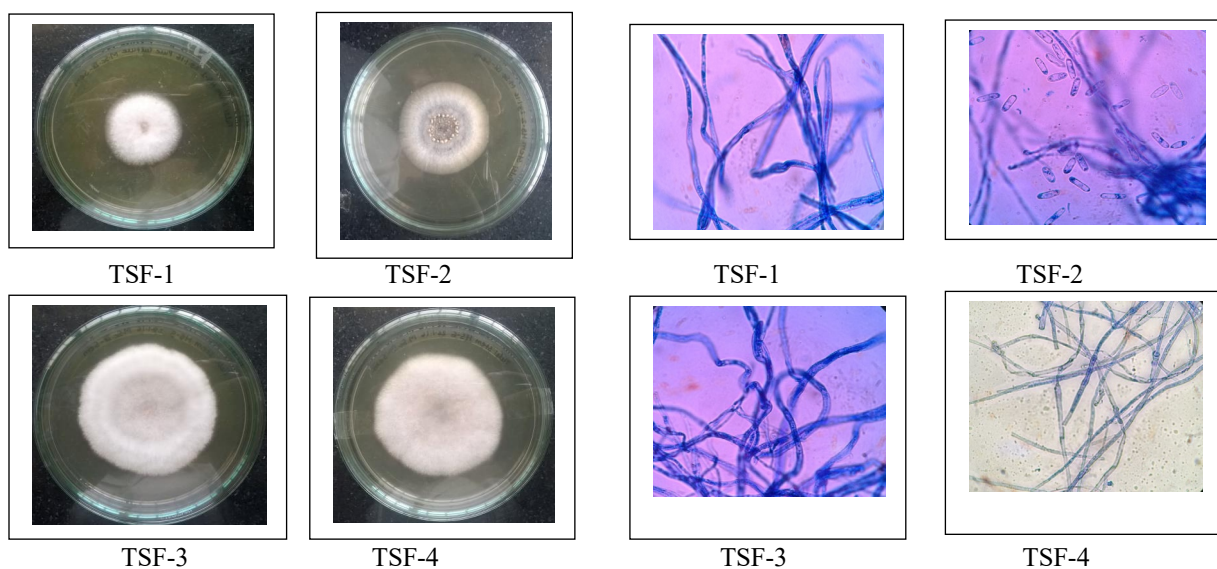


Fig. I: Pure culture of Endophytic fungi

Fig II: Microscopic view of Endophytic fungi

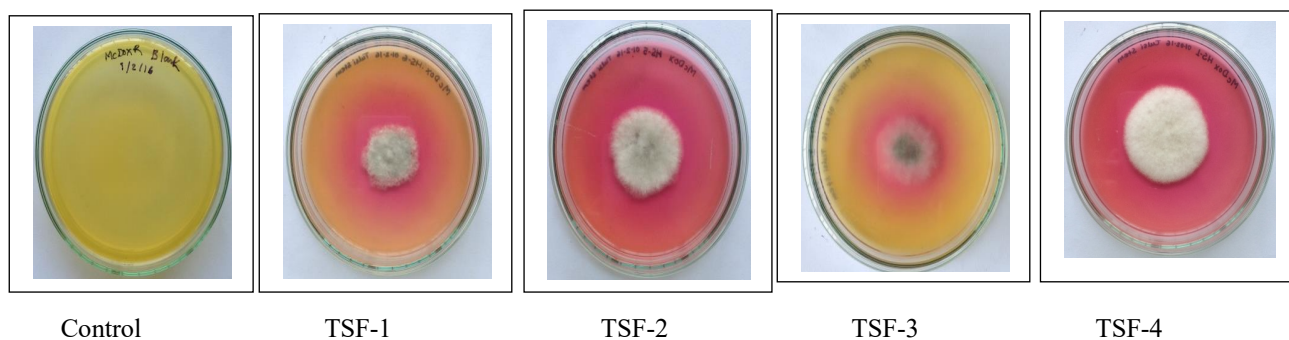


Fig III: Screening of endophytic fungi on MCD using phenol red indicator.

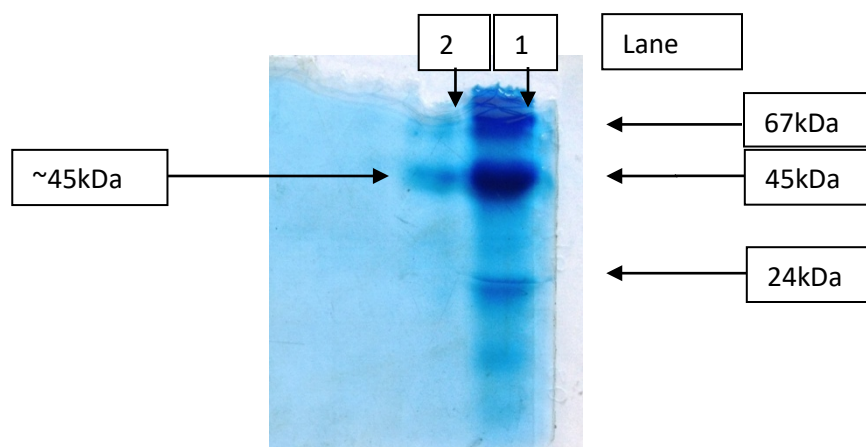


Fig IV: Showing SDS PAGE gel electrophoresis

Table I: Screening of L-asparaginase producers endophytic fungi on MCD agar plates

S. No.	Culture Code	Plant part	Host Plant	Place of Sampling	Enzyme activity after 5 Days
1.	TSF-1	Stem	<i>Ocimum sanctum</i>	Koni, Bilaspur C.G.	+
2.	TSF-2	Stem	<i>Ocimum sanctum</i>	Koni, Bilaspur C.G.	+
3.	TSF-3	Stem	<i>Ocimum sanctum</i>	Koni, Bilaspur C.G.	+
4.	TSF-4	Stem	<i>Ocimum sanctum</i>	Koni, Bilaspur C.G.	+

Table II: Showing protein content of selected endophytic fungi

S. No.	Culture Code	O.D. (at 660nm)	Protein Amount (mg/mL)
1.	TSF-1	1.655	2.532
2.	TSF-2	1.786	2.727
3.	TSF-3	1.246	1.925
4.	TSF-4	1.142	1.770

Table III: Shows the activity of the L- asparaginase of endophytic fungi

S. No.	Culture Code	O.D. (at 436nm)	Enzyme activity U/mL
1.	TSF-1	0.894	5.282
2.	TSF-2	1.034	6.054
3.	TSF-3	0.949	5.586
4.	TSF-4	0.956	5.625

IV. CONCLUSION

The current study describes that beside bacteria, actinomycetes, algae and other known eukaryotic sources; Endophytic fungi are the micro-organisms which can be proved to be better source of L- asparaginase with lower immunogenic response. Out of four endophytic fungi from medical plants of bilaspur, Chhattisgar, India TSF-2 (isolated from

Ocimum sanctum stem) exhibited maximum potential of L- asparaginase production.

Further profound enzyme kinetics studies, purification and testing of its anti-tumor potential are desired to compare with existing commercial L- asparaginase producers.

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पृष्ठभूमि:— हिन्दी साहित्य जगत में मेहरुन्सि परवेज का नाम सम्माननीय है। मेहरुन्सि परवेज ने मुस्लिम समाज में हिन्दी साहित्य में उच्च कोटि का साहित्य का सृजन किया है। मेहरुन्सि परवेज ने अपनी कहानी व उपन्यासों को बेहद मर्मस्पर्शी ढंग से सहज सरल एवं बोधगम्य भाषा में लिखी है। उनकी रचनाओं में समाज का यथार्थ चित्रण देखने को मिलता है। उन्होंने बस्तर के आदिवासी संस्कृति एवं जनजाति महिलाओं पर भी अपनी कलम चलाई है, उनकी रचनाओं में समाज में महिलाओं की दयनीय स्थिति एवं समाज के द्वारा दिये गए यातनाओं को उजागर किया गया है। [1] मेहरुन्सि परवेज ने बांचड़ा जाति की महिलाओं के उत्थान के लिए अपनी रचनाओं द्वारा विशेष कार्य किया है। उन्होंने बरसों पुरानी चली आ रही वेश्यावृत्ति परम्पराओं को जो महिलाओं के लिए एक अभिशाप था उसको जड़ से उखाड़ने के में उनकी लेखनी सहायक सिद्ध हुई। लेखिका ने अपने साहित्य में को पाश्चात्य एवं आधुनिक परम्पराओं को पात्रों द्वारा प्रस्तुत किया है। पाश्चात्य सभ्यता को छोड़ कर आधुनिकता को अपनाने पर जोर दिया गया है। जिसमें नारी शिक्षा तथा नारी जागृति पर विशेष ध्यान दिया गया है। इनके साहित्य में एक ही औरत हवस, प्यार, शादी इन तीन परिस्थितियों से गुजरती है। पाश्चात सभ्यता की झलक को दिखाने में नये शिल्प पद्धति को समझाया गया है। लेखिका मेहरुन्सि परवेज ने सामाजिक त्रयौहार और संस्कृति को अपने साहित्य में दर्शाया है। [2]

I. ifjp;

मेहरुन्सि परवेज का जन्म 10 दिसंबर 1944 बालाघाट के बहेला गाँव (मध्यप्रदेश) में हुआ था। घर के सदस्य

उन्हें प्यार से नदिया के नाम से भी पुकारते थे। इनको नूरजहां के नाम से भी जाना जाता है। इनका जन्म यात्रा के दौरान हुआ था इसीलिए मौलवी ने इनका नाम मेहरुन्सि परवेज रखा। इनके पिता स्वर्गीय ए.एच.खान मध्य प्रदेश के एक रिटायर्ड डिप्टी कमिश्नर थे। मेहरुन्सि परवेज की मां का नाम शहजादी बेगम था। [3]

साहित्य लेखन का आरम्भ :

मेहरुन्सि परवेज बचपन से लिखने पढ़ने का बहुत शौक था पर वो ये नहीं जानती थी कि इतनी कम उम्र में और इस तरह लिखने की शुरुआत होगी। मेहरुन्सि परवेज का साहित्य लेखन का प्रारम्भ बड़े ही अनोखे व अदभुत ढंग से हुआ। मेहरुन्सि परवेज के पिता जगदलपुर में जज थे मानसिक तनाव के कारण उनका रक्तचाप बढ़ गया था जिस बजह से उनके शरीर का दाहिना हिस्से में लकवा हो गया था जिस बजह से उनको न्यायालय के फैंसले लिखने की समस्या हुई तो उस समय उन्होंने मेहरुन्सि परवेज को अपना सहारा बनाया और मेहरुन्सि परवेज के हाथ में कलम थमा दी थी। वहीं से मेहरुन्सि परवेज का लेखन कार्य प्रारम्भ हुआ। [4] उनकी पहली कहानी **Bikpo h dch** लोकप्रिय सप्ताहिक 'धर्मयुग' में अक्टूबर 1963 में प्रकाशित हुई।

A. मेहरुन्सि परवेज के साहित्य में पाश्चात्य परम्पराओं में नारी की स्थिति :

vk[kk dh ngyht उपन्यास की कथावस्तु बॉझपन के कारण उत्पन्न नारी समस्या की ओर केन्द्रित करती है। तालिया को शमीम के साथ शादी होकर कई साल बीत गये हैं। फिर भी उसके यहाँ बच्चे नहीं थे। नायका के

पिता डिप्टी कलेक्टर के पद से रिटायर हुए थे। उसकी माँ पेशावरी पठान की बेटी थी। तालिया की सहेली जमीला थी तालिया थोड़े दिन आराम के लिए मायके आयी हुई थी। उसी समय उसकी मुलाकात जावेद के साथ होती है। जावेद ज्यादा पढ़ा लिखा नहीं था। उसकी शादी होगई थी और उसके दो बच्चे थे। तालिया की माँ तालीया को माँ बनता देखना चाहती थी। इसीलिए तालिया और जावेद की पहचान कराती और दानो को साथ घूमने जाने का योजना बनाती है। जिस योजना में तालिया की माँ कामयाब हो जाती है और तालिय और जावेद का संबंध जुड़ जाता है। इसी बीच जावेद की पत्नी आ जाती है और उसके सामने दोनों का राज खुल जाता है। जावेद तो तालिया से अपनी पत्नी की जगह पूरी करना चाहता था। पत्नी के आते ही जावेद तालिया से दूर हो जाता है। तालिया मन ही मन बहुत दुखी होती है जिसका कारण वह अपनी माँ को समझती है। तालिया को कोई रास्ता नजर नहीं आता और वह आत्महत्या की शरण लेती है।

इस उपन्यास में लेखिका ने बॉझपन को सामाजिक समस्या के रूप में नायिका की मानसिक स्थिति को चित्रित किया है। शारीरिक संरचना के अनुसार नारी बच्चा पैदा करती है। अगर नारी बच्चा पैदा नहीं करती है। तो समाज उसी को दोसी ठहराता है। यदि पति में भी कोई कमी हो तो भी समाज पत्नी को ही दोषी मानती है। समाज संवेदनशीलता के स्थान पर उसको चित्कारता है। जिस परिस्थिति में नारी के पास आत्महत्या के अलावा कोई रास्ता नहीं बचता है। लेखिका ने इस उपन्यास में परम्पराओं में जकड़ी हुई संवेदनशील मानवीय व्यवहार को मूल संवेदना के रूप में व्यक्त किया है।[5]

m1dk ?kj उपन्यास में लेखिका ने कथावस्तु में पाश्चात्य सभ्यता को पात्रों द्वारा प्रस्तुत किया है। उपन्यास की नायिका ऐलमा का जीवन विपत्तियों से भरा हुआ है। उसका विवाह होता है। पर जब पति को ऐलमा के दमे की बीमारी का पता चलता है। वह उसको तलाक दे देता है। जिसे स्वीकार कर ऐलमा अपने पिता के घर आ जाती है। जहां उसका एक भाई, आण्टी तथा उनकी एक बेटी रेश्मा है। ऐलमा का भाई अपने व्यवसाय की तरक्की के लिए अपनी बहन ऐलमा को अपने बॉस आहूजा को बेच देता है। इस उपन्यास में ऐलमा एक निस्सहाय और कमजोर नारी है।[6]

1ejkx.k उपन्यास का नायक पंडित गोपीलाल नाहर था। सुहासनी उसकी पत्नी थी। गोपीलाल की पत्नी सुहासनी रूप, रंग, गुणों से पूर्ण थी। फिर भी गोपीलाल बूढ़ाजान के प्रेम को पाना चाहता है। उसके साथ संबंध भी जोड़ता है। इसका पता लगते ही उसकी पत्नी दुखी

हो जाती है। घर में नौकर-चाकर, धन-दौलत सब कुछ था पर वह पति के प्यार से वंचित थी। सुहासनी की बहू की स्थिति भी इसी प्रकार उपेक्षित बन जाती है। दोनों पति के प्यार के लिए तरसते-तरसते मृत शैया में सो जाते हैं। इस उपन्यास की कथावस्तु पाश्चात्य सभ्यता पर आधारित है। जहाँ पति को परमेश्वर समझा जाता था।

ctj nigj इस में पाश्चात्य सभ्यता एवं परम्पराओं का निर्वाह करते पति-पत्नी के दाम्पत्य जीवन को प्रकाशित किया गया है इसमें पति-पत्नी के संबंधों में दूरियों को बताया गया है। समाज में एक साथ रहने वाले पति-पत्नी विवशता में बेगाने बन कर रह रहे हैं।

peM dk [kky मेहरुन्सिसा परवेज की यह कहानी पाश्चात्य परम्पराओं पर आधारित है। एक ऐसे परिवार की कहानी है जिसमें पिता अपनी बेटी को ससुराल से इसलिए नहीं बुलाता क्योंकि अगर बेटी घर आयेगी तो उस कपड़े दिलाने पड़ेगे पर लड़की की माता इसी सोच में दमे की बीमारी की शिकार हो जाती है। लड़की का पिता उसे छोड़ कर दूसरी शादी कर लेता है। जब इसका पता बेटी को लगता है तो बेटी अपनी माँ से मिलने आती है तब लड़की कहती है कि अगर लड़की को पिता के घर से कपड़े लाने का रिवाज ही खत्म हो जाये तो कितना अच्छा होता, तभी लड़की की माँ बोलती है। कि अगर माँ की चले तो वह अपने चमड़े का खोल बना कर बेटी को दे दे। यह कहानी मध्यमवर्गी परिवार की है जिसमें आर्थिक तंगी और पाश्चात्य परम्पराओं का उल्लेख किया गया है।

dkuhckV] यह कहानी आदिवासी जीवन और उनके रीति-रिवाजों और परम्पराओं पर आधारित है। जहाँ लड़की का पैदा होना अमीरी का सूचक होता है। आदिवासी जाति में लड़की के जन्म के एक वर्ष के अन्दर ही उसकी शादी कर दी जाती है नहीं तो लड़के को एक वर्ष तक घर जमाई बन कर रहना पड़ता है। इस जाति में अगर किसी पुरुष या किसी नारी का प्रेम संबंध हो जाता है तो वह बहुत ही निंदा का संकेत होता है। इस कहानी की नायिका प्रेम प्रसंग में पड़ जाती है और उसे प्रेम में धोखा मिलता है जिसके कारण वह आत्म हत्या करने की सोचती है लेकिन जब वह आत्म हत्या करने नदी के पास जाती है। तो उसको बचाने वाला उसका प्रेमी होता है। नायिका को लगता है जैसे जंगल में गुम होने वाली कालीबाट उसने खोज लिया है।

vk<uk] लेखिका मेहरुन्सिसा परवेज ने इस कहानी के जरिये बॉछडा जाति के दकियानुसी परम्पराओं की निंदा की है। जिसमें बताया गया है। कि बॉछडा जाति के

नियमानुसार घर की बड़ी बेटी को धंधे पर बिठा दिया जाता है। और उसे वैश्या जीवन जीने के लिए विवश किया जाता है। अगर कोई लड़की यह नहीं करना चाहे तो उसकी मृत्यु कर दी जाती है।[7]

B. मेहरुन्सिा परवेज के साहित्य में आधुनिक सभ्यता की नारी स्थिति :

dkj tk उपन्यास की नायिका नसीमा है, जो अपनी माँ के मरने के बाद हमेशा के लिए अपनी दादी के घर में रहने लगी। उसके जीवन में तीन पीढ़ियों का प्रभाव पड़ता है। वह अपने ददिहाल को छोड़ कर जाना नहीं चाहती फिर भी उसके पिता उसे घर ले जाता है। नसीमा रब्बो आपा की शादी में आई है। रब्बो आपा से अपनी बीती हुई जिन्दगी को याद करती हुई पूछती है कि यह शादी प्रेम-विवाह है क्या। रब्बो आपा खुश हो कर अपनी बेटी के प्रेम-विवाह के बारे में बताती है। शादी के मंडप में रन्नो चक्कर आकर गिर जाती है तो रब्बो खुश हो कर अपनी बेटी के गर्भ की बात नसीमा को सुनाती है। इस बात को सुनते ही नसीमा अपने अतीत में खो जाती है। पूरा उपन्यास नसीमा के अतीत में खो जाने पर आधारित है। यह उपन्यास मुस्लिम जीवन और मुस्लिम संस्कृति पर आधारित है। इस उपन्यास में बाप की बुरी नजर अपनी ही बेटी पर होती है। जिससे माँ को अपनी बेटी की जल्दी ही शादी करनी पड़ती है। इस उपन्यास में एक ही औरत हवस, प्यार, शादी इन तीन परिस्थितियों से गुजरती है। पाश्चात सभ्यता की झलक को दिखाने में नये शिल्प पद्धति को समझाया गया है।[8]

R;kgkj यह कहानी मुस्लिम समाज के त्यौहार और संस्कृति को बताया है कि मुस्लिम समाज का सबसे बड़ा त्यौहार ईद होता है। जिसमें नये कपड़ों का सबसे ज्यादा महत्व होता है। लेकिन इस कहानी की जो मुख्य पात्र है वह कपड़े लेने में असमर्थ है जहाँ अमीरों के लिए यह त्यौहार हर्ष और उल्लास का होता है वहीं गरीबों के लिए यह त्यौहार चिन्ता और निराशा में बदल जाता है इस कहानी में एक माँ अपनी गरीबी को छिपाने की बहुत कोशिश करती है लेकिन यह त्यौहार उसको छिपाने नहीं देता है।

fojku इस कहानी में एक अनोखी प्रेम कहानी को व्यक्त किया है जिसमें एक कुंवारी विधवा को बताया है। जो अपने प्रेमी के मौत के बाद पूरा जीवन कुंवारी विधवा बन कर बिताती है। लेखिका कहती है जहाँ समाज विधवा विवाह पर जोर दे रहा है और विधवा विवाह हो भी रहे हैं वही समाज में कुछ कुंवारी विधवा भी देखने को मिलती है। इस कहानी में लेखिका ने कुंवारी विधवा की मनोस्थिति को व्यक्त किया है।

d;ker vkx;h gl यह कहानी ऐसी नारी की है जो शादी से पूर्व माँ बनने वाली थी और उसकी बजह से वह बेमेल विवाह करके अपना जीवन तबाह कर देती है लेकिन जब यह नौबत उसकी बेटी के जीवन में आता है तो वह समाज का ध्यान न देते हुए सभी परम्पराओं को तोड़ कर अपनी बेटी का साथ देती है। वह अपनी बेटी के मन चाहे लड़के से उसकी शादी करती है। लेखिका लिखती है कि एक नारी पर जो कयामत गुजरी थी ये उसका असर था।[9]

uxh vk[kk okyk jfxLrku] यह कहानी एक बेमेल दाम्पत्य जीवन से है जिस में एक लड़की की शादी विकलांग पुरुष से हो जाती है, और वह पत्नी अपने पति सुख से वंचित रहती है पति के विकलांग और अधिक आयु के होने के कारण वह उसको तलाक दे देती है। और एक ऐसे पुरुष की तलाश करती है जो उसको पति का सुख दे सके, तभी उसको एक पुरुष मिलता है जिसकी पत्नी की मृत्यु हो जाती है

chp dk njoktk इस कहानी में यह समझाया है कि समाज में पुरुष अपनी इच्छा के अनुसार जीवन यापन कर सकता है और साथ ही नारी को भी अपने इशारों पर चलाना चाहता है। लेकिन इस कहानी में लेखिका ने बताया है कि नारी समाज में अकेली जिन्दगी जी सकती है, परिश्रम कर सकती है लेकिन अपने अहम और स्वाभिमान को खोना नहीं चाहती एक बार नारी के अन्दर जब अहम आ जाता है तो वह अन्याय का विरोध भी करती है और अपने अधिकार की भी मांग करती है।[10]

D;ku gh इस कहानी में एक ऐसी माँ को बताया है जो आधुनिक खयालों की है। और प्रेम में धोखा खाई बेटी को आई.पी.एस बनने की प्रेरणा दे कर उसे जीने की राह देती है। बेटी भी आई.पी.एस बन कर अपने बुजदिल प्रेमी को करारा जबाव देती है।

ngjh dh [kkfrj] यह कहानी नारी की असुरक्षा और गरीबी को लेकर है। इस कहानी में बताया गया है कि अमीर घर के पुरुष गरीब नारियों को किस प्रकार प्रताणित करते हैं। और उनको उनके हाल पर छोड़ देते हैं। इस कहानी में एक काका अपने ही बड़े भाई की बेटी का बलात्कार करने के लिए तैयार हो जाता है। लेकिन माँ समान काकी अपने पति की हत्या करके बेटी को बचा लेती है। पर बेटी उस हत्या का जुर्म अपने ऊपर देहरी की खातिर इस लिये लेती है क्योंकि जेल ही एक ऐसी जगह है जहाँ वह सुरक्षित रह सकती है।

मेहरुन्निसा परवेज के साहित्य में पाश्चात्य और आधुनिक संस्कृति और परम्पराओं का अनूठा समायोजन किया है। पाश्चात्य संस्कृति में नारी समाज के कठोर परम्पराओं को मानकर अपना जीवन कष्टप्रद बिताती थी। मेहरुन्निसा परवेज के साहित्य में बताया गया है कि किस प्रकार पुरुष नारी पर अत्याचार करते थे और नारी उन अत्याचारों का झेलती थी। अगर दाम्पत्य जीवन सुखमय नहीं होता था तब भी वह दाम्पत्य जीवन को जीवन भर निभाने के प्रयास करती थी कभी अपने अधिकारों का उपयोग नहीं करती थी। पाश्चात्य संस्कृति में नारी हर रूप में हमेशा हार जाती थी कभी माँ के रूप में, कभी पत्नी के रूप में, कभी बेटी, आदि। अपनी परम्पराओं का भली-भांति पालन करती थी। किन्तु आधुनिक संस्कृति की नारी पाश्चात्य संस्कृति में नारी से सर्वथा भिन्न है। आधुनिक संस्कृति की नारी शिक्षित है और अपने अधिकारों को पहचानती है। और समाज की परवाह एक नियमित अवधि तक ही करती है। जब बात नारी के सम्मान की आती है तो समाज को करारा जवाब भी देती है। आधुनिक नारी पुरुष के कदम से कदम मिला कर चलती है। और अपने अधिकारों के लिए समाज के कानून के सामने अडकर खड़ी हो जाती है। आज की आधुनिक बस्तर के आदिवासी बॉछड़ा जाति की नारी अपने जीवन में व्याप्त संघर्ष को समाज के सामने ला रही हैं एवं स्वावलंबी हो गई हैं। अन्याय के प्रति नारियाँ आवाज उठा रही हैं। पाश्चात्य संस्कृति आधुनिक संस्कृति से सर्वथा भिन्न है। [11]

II. मिलक

उनके साहित्य में जीवन की मूलभूत जीवन की सत्यता है। मेहरुन्निसा परवेज कथा साहित्य में समाज में स्थित अनेकों समस्याओं को अपने तरीके से प्रस्तुत किया है, भारतीय समाज में जीवन के बदलते मूल्य और परिवर्तन के कारण निर्मित समस्याओं को अपनी नई दृष्टि से अपन बदलती परिस्थितियों के अनुरूप परिवार में रागात्मक संबंधों में भी बदलाव आ रहा है उन बदलाव के कारण मेहरुन्निसा परवेज के साहित्य में संतान के प्रति मां-बाप की कठिनता का प्रदर्शन परिवार में माता-पिता के द्वारा उपेक्षित बच्चे, पिता की गैरमौजूदगी, बच्चों का अस्त-व्यस्त जीवन, पिता की गैर जिम्मेदारी, सौतेली मां की निर्दयता का व्यवहार, परिवार में व्यक्तियों का स्वार्थ, परिवारिक संबंधों में अमानवीयता का प्रदर्शन, माता-पिता का स्वार्थ पूर्ण कार्य कलाप, परिवार के प्रति नारी का समर्पण, एवं जीवन का बलिदान आदि को लेखिका ने भली-भांति प्रस्तुत किया है उनकी विभिन्न रचनाएं शिक्षाप्रद एवं मार्गदर्शन करती हैं। [12] पुरुष नारी के बीच की इस

दीवार को तोड़कर पुरुष के समान जीवन जीने की प्रेरणा मेहरुन्निसा परवेज की रचनाओं में देखने को मिलती है। समय के साथ साथ नारी के स्वरूप भी बदल रहे हैं। अन्याय के प्रति विद्रोह करने वाली नारियों का चित्रण सहज और प्रभावी रूप से किया गया है। आदिवासी नारियों को वासना पूर्ति शोषण पर अपनी तूलिका द्वारा समाज में बदलाव लाने का प्रयास मेहरुन्निसा परवेज के साहित्य में नारी के बदलते स्वरूपों का भी चित्रण किया गया है। जैसे नारी के प्रति कानूनी अधिकार, दफ्तरों में पुरुषों के बराबरी का अधिकार आदि। उपन्यास की मूल संवेदना नारी को जागृत करता है। पुराने नियमों को हटा कर नवीन आदेशों को लाना है। पाश्चात्य संस्कृति से आधुनिकता संस्कृति की ओर लाना ही सामाजिक समस्याओं को दूर करने का एक मात्र तरीका माना गया है। जिसमें नारी को शिक्षित करना और नारी को जागृत करना विशेष रूप से चित्रित है।

1. मिलक

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Comparative phytosociological study on the wild edible leafy vegetables found in Banskot and Dongriguda of Bastar district Chhattisgarh

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Abstract:

This paper deals with the phytosociological study of wild edible leafy vegetables of district Bastar Chhattisgarh. In this study many ethnomedicinal plants has been extensively studied during winter season October to February occurred in the year 2018 to 2019 in 2 different villages and weekly village markets of Bastar district. Phytosociological study was conducted in the wild leafy plants of Banskot and Dongriguda. Phytosociological studies of the 2 different sites were conducted for wild leafy vegetable plants with their phytosociological aspects that is %frequency, relative frequency, density, relative

density, abundance, relative abundance as well as importance value index (IVI). It was found in research that among all 18 plants *Corchorus capsularis* and *Cordia subcordata* are the only two wild leafy plant that were present in both sites. The phytosociological study shows that the Maximum IVI of plant *Cleome viscosa* and Minimum IVI of plant *Amaranthus hybridus* are found in Banskot. And Maximum IVI of plant *Brassica campestris* and Minimum IVI of plant *Bauhinia purpurea* are found in Dongriguda.

Index Terms: Phytosociology, Wild leafy vegetables, Ethnomedicinal plants, importance value index, Banskot, Dongriguda.

I. INTRODUCTION

Plants have long been associated with human civilization. As the source of food, plants constitute more than 90% of our food requirements. Wild leafy vegetables occupy important place among food providing plants as these are the most important source of minerals and vitamins. A number of leafy vegetables are used world wide. Nutritionally, these are very much important because they not only provide us the nutrients but also function as roughage in our food [1]. Leafy vegetables not only provide food quantity but also make significant contribution to the population nutrition throughout the year. Moreover, Since the beginning of human civilization man has been using many leafy plants and plant part extract as medicine. Wild leafy vegetables are known as excellent sources of natural antioxidant. The importance of antioxidant constituents of wild edible leafy vegetables has also been established in the maintenance of health. The tribal people of the area use maximum number of leafy plant species for medicinal purpose [2-5].

Being largely associated with mankind food yielding plants have been studied world wide for their various aspects like economic value, growth behavior, biochemical composition, ethnobotanical value etc. phytosociology is an important aspects for the study of economically important plants. This is because phytosociology not only provide in data about the prevalence of species content of an area rather such studies also throw light on the impact of environmental/climatic changes on distribution of indigenous plants. In this regard [6] have mentioned that phytosociology is the study of the characteristics classification, relationship and distribution of plant communities and it is useful to collect such as data to describe the population dynamics of each species studied and how they relate to the other species in the same community. Phytosociological information gathered for understanding the structure and function of the vegetation [7-10]. Such studies also suggest the ways how to protect our biodiversity and also helps in understanding the changes that a particular flora has experienced in the past.

Phytosociological studies of different flora in our country have been made by various workers. Some of them needs to mention are [11] in Kerala, [6] in Khammam district of Telangana and [12] in Uttarakhand etc. However, such studies are few and far between in the state of Chhattisgarh. The only group working in the field of phytosociology and ethnobotany of food plants is being led by [3] in Durg. Bastar of Chhattisgarh is an geographically and geologically important area of the globe but as far as botanical exploration of its flora is concerned, it has large been neglected for centuries. Therefore, the present study has been made about the phytosociology of wild edible leafy vegetables of the area.

In this piece of research work we have tried to study the frequency, relative frequency, density, relative density, abundance, relative abundance as well as importance value index (IVI) of the wild leafy vegetables of district Bastar, Chhattisgarh.

II. MATERIALS AND METHODS

Study Sites: The comparative study was conducted in 2 different villages i.e., Banskot and Dongriguda of Kondagaon district of Bastar, Chhattisgarh. Kondagaon is also the District Headquarter. Kondagaon District has an area of 7768.907 square kilometers. It has population of 5,78,326. Out of the total population, more than 70% are tribal and comprised by Gond, Maria, Muria, Dhruva, Bhatra, Halba etc. The two villages under study have been marked by specific site number for the purpose of phytosociological study. These are on-

Site-1: Banskot

Site-2: Dongriguda

Climatic condition: There are three main climatic seasons are summer, winter and rainy. The winter season starts of November and ends middle of February. The summer season starts from middle of February to May. So, rainy season starts from June to October. In this area climate is tropical and sub humid with annual air temperature of 27.0°C and annual rainfall of 1534 mm. The temperature regime is isohyperthermic whereas moisture regimes are udic and ustic. The soils of Kondagaon district are red sandy, red and brown sandy loam, red and black, skeletal and black. The annual soil temperature is 26.0°C and in summer soil temperature is 29.3°C.

Formula: The following formula were used to compute different phytosociological parameters was

evaluated by analyzing the %Frequency, Density, Abundance, Relative Frequency, Relative Density, Relative Abundance and IVI according to [13-17] and as given below:

$$\% \text{Frequency} = \frac{\text{Total no. of quadrats in which species occurred}}{\text{Total no. of quadrats studies}} \times 100$$

$$\text{Density} = \frac{\text{Total no. of individuals of a species in all the quadrats}}{\text{Total no. of quadrats studied}}$$

$$\text{Abundance} = \frac{\text{Total no. of individuals of the species in all the quadrats}}{\text{Total no. of quadrats in which the species occurred}}$$

$$\text{Relative Frequency} = \frac{\text{Total no. of occurrences of a species in all the quadrats}}{\text{Total no. of occurrences of all species in all quadrats}} \times 100$$

$$\text{Relative Density} = \frac{\text{Total no. of individuals of a species in all the quadrats}}{\text{Total no. of individuals of all species in all quadrats}} \times 100$$

$$\text{Relative Abundance} = \frac{\text{Total basal area of each species in all quadrats}}{\text{Total basal area of all species in all quadrats}} \times 100$$

$$\text{Importance Value Index (IVI)} = \text{Relative Frequency} + \text{Relative Density} + \text{Relative Abundance}$$

III. RESULTS AND DISCUSSIONS

The information given in the species list below has been analyzed in both sites. Species are classified on the basis of the habit. So, the investigations have recorded 18 leafy vegetable plants used by tribal communities and belonging to 15 families. Out of them 13 were herb species, 1 was shrub species, 2 were tree species, 2 were climber species. In my phytosociological study, green colour of the table shows value of plant is maximum while orange colour shows value of plant is minimum. So, the Maximum IVI of plant *Cleome viscosa* and Minimum IVI of plant *Amaranthus hybridus* are found in Banskot. And Maximum IVI of plant *Brassica campestris* and Minimum IVI of plant *Bauhinia purpurea* are found in Dongriguda. The investigations of wild edible leafy plants in all sites have been given below in Table: I.

Table I: Ethnomedicinal importance of wild edible leafy plants of both sites:

S.No.	Botanical Name	Local Name	Family	Habit	Medicinal Uses
1	<i>Amaranthus hybridus</i>	Ropa Bhaji	Amaranthaceae	Herb	Intestinal bleeding, diarrhea, excess menstruation.
2	<i>Bauhinia purpurea</i>	Koliaari Bhaji	Caesalpiniaceae	Tree	Piles, diabetes, skin diseases, asthma, dysentery, diarrhea
3	<i>Brassica campestris</i>	Sarso Bhaji	Brassicaceae	Herb	Fever, weakness, menstrual disorder, internal pains
4	<i>Celastrus paniculatus</i>	Peng/Malkangin i Bhaji	Celastraceae	Climber	Leprosy, skin diseases, paralysis, asthma, fever, sharpening the memory
5	<i>Celosia argentea</i>	Siliyari Bhaji	Amaranthaceae	Herb	Snakebites, uterine bleeding, dysentery, diarrhea, hypertension, bloodshot eyes, skin irritation, eczema
6	<i>Cleome viscosa</i>	Balakut/Hurhur Bhaji	Cleomaceae	Herb	Dysentery, wounds, ulcers, herpes, earaches, diarrhea, dysentery, stomach pain, piles
7	<i>Colocasia antiquarum</i>	Kochai Bhaji	Araceae	Herb	Promote menstruation, stomach problems, cysts, knee pain
8	<i>Corchorus capsularis</i>	Budkari Bhaji	Malvaceae	Herb	Stomachache, dysentery, fevers, dyspepsia and liver disorders
9	<i>Cordia subcordata</i>	Bodi Bhaji	Boraginaceae	Climber	The leaves can be used as fodder for livestock, to control blood pressure
10	<i>Costus speciosus</i>	Basey/Kew bhaji	Costaceae	Herb	Head-ache, eye and ear infections, fever, dysentery, snake bite, jaundice, arthritis, leprosy, skin diseases, asthma, bronchitis, nose pain
11	<i>Dolichus lablab</i>	Sem Bhaji	Papilionaceae	Herb	Anti-helminthic, cough, skin diseases
12	<i>Hibiscus cannabinus</i>	Patawa Bhaji	Malvaceae	Shrub	Acidity, coughs, dysentery, blood and throat disorders, stomach pain, anaemia
13	<i>Leucas cephalotes</i>	Gumee Bhaji	Lamiaceae	Herb	Fever, malarial fever, headache, urinary complaints, snake bites, wounds and sores, skin diseases, cold and cough, asthma
14	<i>Oxalis corniculata</i> L.	Awali Bhaji	Oxalidaceae	Herb	The leaf juice is applied to insect chomps, burns and skin eruptions, anthelmintic, astringent, diuretic, febrifuge, stomachic and styptic
15	<i>Phaseolus vulgaris</i>	Barbatti Bhaji	Papilionaceae	Herb	Diuretic especially kidney and heart ailments, diarrhea.
16	<i>Polygonum plebeium</i>	Chanti Bhaji	Polygonaceae	Herb	To control blood pressure
17	<i>Semecarpus anacardium</i>	Bhelva Bhaji	Anacardiaceae	Tree	Fruits, leaves are used for anti-cancer purpose
18	<i>Solanum tuberosum</i>	Aloo Bhaji	Solanaceae	Herb	Burns, corns, cough, cystitis, scurvy, tumors, diuretic

The data of such phytosociological studies made in the above said two sites have been represented in Table-II and Table-III. Data related to the contribution of IVI has been represented through pie charts. Fig. I and Fig. II shows the maximum IVI and

minimum IVI respectively of Banskot area. Similarly, Fig. III and Fig. IV shows the maximum IVI and minimum IVI respectively of Dongriguda area.

Table II: Phytosociological characteristics of leafy vegetables of Banskot

S.No.	Name of Plants	%Frequency	Density	Abundance	Relative Frequency	Relative Density	Relative Abundance	Importance Value Indices
1	<i>Amaranthus hybridus</i>	20	0.4	2	3.7	1.9	6.8	12.4
2	<i>Celastrus paniculatus</i>	40	0.5	1.2	7.4	2.3	4	13.7
3	<i>Celosia argentea</i>	100	5.8	5.8	18.5	27.6	19.7	65.8
4	<i>Cleome viscosa</i>	90	6.4	7.1	16.6	30.4	24.1	71.1
5	<i>Corchorus capsularis</i>	80	1.8	2.2	14.8	8.5	7.4	30.7
6	<i>Cordia subcordata</i>	30	0.7	2.3	5.5	3.3	7.8	16.6
7	<i>Costus speciosus</i>	50	1.3	2.6	9.2	6.1	8.8	24.1
8	<i>Dolicus lablab</i>	70	2.3	3.2	12.9	10.9	10.8	34.6
9	<i>Semecarpus anacardium</i>	60	1.8	3	11.1	8.5	10.2	29.8

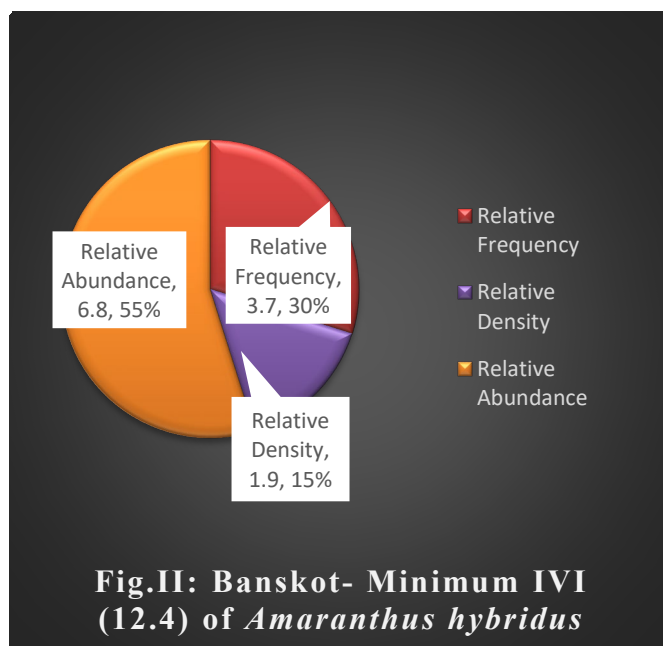
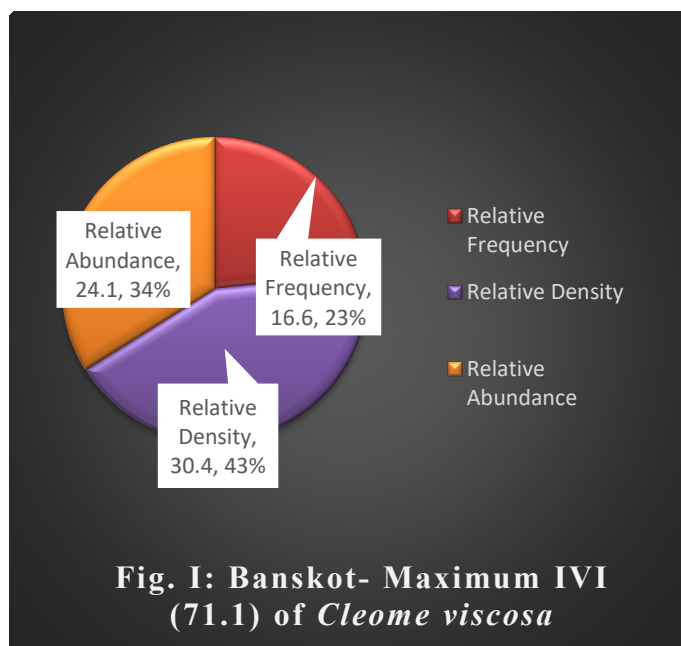
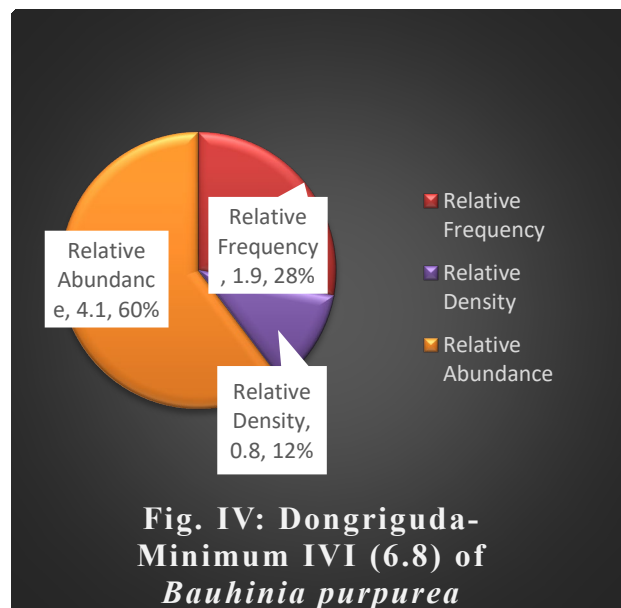
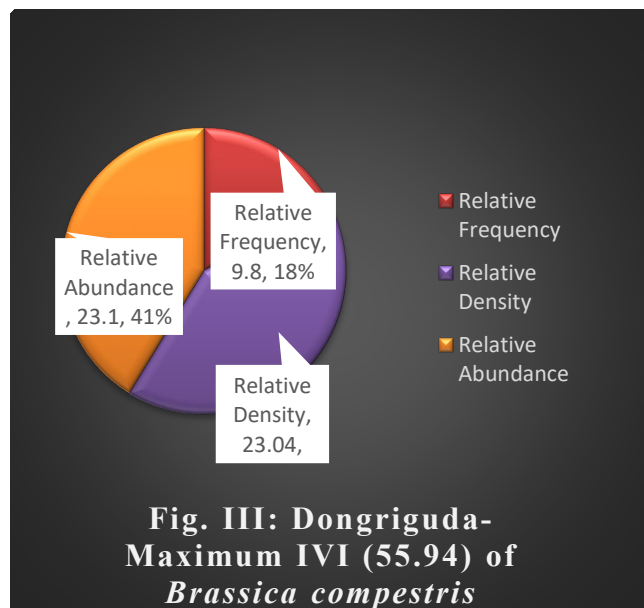


Table III: Phytosociological characteristics of leafy vegetables of Dongriguda

S.No.	Name of Plants	%Frequency	Density	Abundance	Relative Frequency	Relative Density	Relative Abundance	Importance Value Indices
1	<i>Bauhinia purpurea</i>	10	0.2	2	1.9	0.8	4.1	6.8
2	<i>Brassica compestris</i>	50	5.6	11.2	9.8	23.04	23.1	55.94
3	<i>Colocasia antiquarum</i>	60	2.1	3	11.7	8.6	6.2	26.5
4	<i>Corchorus capsularis</i>	40	1.8	4.5	7.8	7.4	9.3	24.5
5	<i>Cordia subcordata</i>	20	0.4	2	3.9	1.6	4.1	9.6
6	<i>Hibiscus cannabinus</i>	60	3.3	5.5	11.7	13.5	11.3	36.5
7	<i>Leucas cephalotes</i>	20	0.9	4.5	3.9	3.7	9.3	16.9
8	<i>Oxalis corniculata</i>	70	4.2	6	13.7	17.2	12.4	43.3
9	<i>Phaseolus vulgaris</i>	70	2.5	3.5	13.7	10.2	7.2	31.1
10	<i>Polygonum plebeium</i>	80	2.3	2.8	15.6	9.4	5.7	30.7
11	<i>Solanum tuberosum</i>	30	1	3.3	5.8	4.1	6.8	16.7



IV. CONCLUSION

The output of the present piece of research reflects the phytosociological and ethnobotanical importance of the leafy vegetables grown wild and cultivated in the area of Kondagaon district of Bastar, Chhattisgarh. The data thus obtained reveal that different sites studied showed different plants having maximum and minimum IVI. Difference in the values of other sociobiological attributes was also observed.

Ethnobotanical importance of the leafy vegetables has also been studied with the help of local people as well

as literature collected. It was concluded that even in this modern age, people of this area of Bastar depend on plants for the treatment of various diseases. The phytochemical study made in future will also throw light and put evidence for their ethnobotanical importance. It can be concluded from the overall study that among all 18 plants *Corchorus capsularis* and *Cordia subcordata* are the only two wild leafy plants that were present in both sites. The phytosociological study shows that the Maximum IVI of plant *Cleome viscosa* and Minimum IVI of plant *Amaranthus hybridus* are found in Bannskot. And Maximum IVI of plant *Brassica compestris* and Minimum IVI of plant *Bauhinia purpurea* are found in Dongriguda.

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Structure and Seasonal Distribution of Rotifers in Kori Dam of Bilaspur Chhattisgarh

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Abstract:

Rotifers play a crucial role in many ecosystems as the fish, aquatic crustaceans and their larvae feed on them. Presence of some rotifer species indicates the pollution level of water body. The aim of the present study was to determine the rotifer population in Kori dam and their seasonal variation. The collection of water samples was done in morning between 9:00AM and 11:00AM at four different sites of Kori dam, Bilaspur Chhattisgarh. The samples were collected by filtering surface water through plankton net which was made up of bolting silk cloth no. 20. The planktons were properly placed on a slide, and then the counting was made under a microscope. A total of 10 rotifers were encountered in different sites of Kori dam. They were identified to be as; *Brachionus angularis*, *Brachionus forficula*, *Brachionus calyciflorus*, *Brachionus caudatus*, *Brachionus diversicornis*, *Cephalodella species*, *Euclanis species*, *Keratella tropica*, *Keratella tecta*, and *Keratella procurva*. Highest number of rotifer composition was recorded in the season of summer (1169 cells/lit), followed by monsoon (937 cells/lit) and the in winter (721 cells/lit). Pollution indicator species from rotifers such as *Keratella* were identified in Kori dam. Abundance of genus of the family Brachionidae i.e. *Keratella tecta*, *Keratella tropica* and of the family Lecanaeidae i.e. *Lecanae species* are indicator of eutrophication. Absence of these rotifer species can be attributed to turbulence generated by the excess water flow during this season.

Index Terms: Rotifers, Kori dam, Seasonal variation.

I. INTRODUCTION

Aquatic ecosystems are the cradle of life on Earth and they are still preconditions of life. All organisms largely contain water and their functions depend on whether aquatic ecosystems regulate the temperature of the atmosphere, produce oxygen and maintain many other processes that are important for ecosystem functioning. Huh. Aquatic ecosystems provide a home to many species, including phytoplankton, zooplankton, aquatic plants, insects, fish, birds, mammals and others. They are organized at multiple levels, ranging from small cells to complete ecosystems, to include communities, populations, species, and genetic levels. Aquatic ecosystems are thus important maintainers of biodiversity. Aquatic biodiversity can be defined as the diversity of life and the ecosystems that make up the world's freshwater, tidal and marine areas and their interactions. This includes freshwater ecosystems, lakes, dams, ponds and reservoirs, rivers and streams, groundwater and wetlands. The banks of streams or riparian areas are also important areas associated with freshwater systems. It also includes marine ecosystems, covering oceans, estuaries, salt marshes, sea grass beds, coral reefs, kelp beds and mangrove forests. Aquatic biodiversity has great economic and aesthetic value and is largely responsible for maintaining and supporting overall environmental health. Man has long depended on aquatic resources for food, drugs and materials as well as for recreational and commercial purposes. Aquatic organisms also rely on great diversity of aquatic habitats and resources for food, materials and breeding grounds. Thus degradation of water quality, depletion of water resources and loss of aquatic biodiversity are key features of the environmental landscape, requiring urgent attention to global and

national scales. Among all freshwater aquatic biota, zooplankton populations are able to reflect the nature and potential of any aquatic systems [1]. Zooplankton serves as indicators of environmental quality in both lakes and rivers. Distribution, species composition and community structure are sensitive to changes in environmental conditions, nutrient enrichment and varying levels of pollution [2]. The abundance of zooplankton in the water body is considered an indicator of productivity. It is closely related to water quality.

If there is any change in the physicochemical properties of the water bodies it brings respective changes in the composition and distribution of zooplanktons. But the bio-monitoring of the water bodies determine the quality of water bodies [3]. There are many reports on the structure and distribution in different parts of India, but there is scarcity of systematic studies in Chhattisgarh, India. So, the present study was aimed to investigate the diversity and seasonal distribution of rotifer assemblage in Kori dam of Bilaspur, Chhattisgarh.

II. MATERIAL AND METHODOLOGY

Kori Dam also known as Ghongha Tank is located 5kms from Kota, Bilaspur. The dam is situated in the foothills of Achanakmar Amarkantak Biosphere Reserve, Bilaspur, Chhattisgarh. The dam is one of the important water resources of the area. The fringe villages of the area use the water of this dam for drinking, cooking, bathing and irrigation purposes. The fringe villages are completely dependent on this dam. The samples for rotifers were collected seasonally from July-2019 to June-2021. Samples were collected from three different sampling sites, viz site 1 (West side), site 2 North side) and site 3 (South side) of the Kori dam in the morning time. Analysis was carried out during the three seasons of the year-summer, monsoon and winter. Collected samples were mixed well and brought to the laboratory for analysis. Water sample of 25 litres was filtered through the plankton net of bolting silk no. 25 of mesh size 63 micron. The filtered zooplankton sample was preserved in 4% formalin [4]. Few drops of glycerine were added to it to prevent hardening of rotifers. All zooplanktons were allowed to settle down at the bottom. Supernatant plankton free water was removed by siphoning with pipette and the sample was reduced to the desired volume of 25 ml. For quantitative estimation of rotifers, 'Sedgewick Rotifer Cell' was used. Number of rotifers in the SR cell was derived from the following formula[5]. Rotifers were identified upto the genus/species level based on the minute morphological details by

observing them under the microscope and using standard identification key as described by Edmondson [6], Sharma & Tonapi [7].

III. RESULTS AND DISCUSSION

The present study was carried out to show the population of rotifers in Kori dam Bilaspur and their seasonal variation. The present investigation aimed to study the diversity and seasonal distribution of rotifer assemblage in Kori dam of Bilaspur, Chhattisgarh. During the study it the rotifers show clear abundances across all the three seasons (Monsoon, Winter and Summer) during July-2019 to June-2021. In addition the distribution of Rotifers was seen across all the sampled sites of Kori dam (Table-I). The present study reported 10 rotifer species at different sites and seasons they include ; *Brachionus angularis*, *Brachionus forficula*, *Brachionus calyciflorus*, *Brachionus caudatus*, *Brachionus diversicornis*, *Cephalodella species*, *Euclanis species*, *Keratella tropica*, *Keratella tecta*, and *Keratella procurva*. In the present study it was observed that the Rotifer species which were found across all the seasons were *Brachionus angularis*, *Brachionus forficula*, *Cephalodella sp.*, *Keratella tropica* (Table-II). The Rotifer species found in monsoon season were also found in either summer season or winter season. Rotifer species which were found in winter only was *Keratella procurva*. Pollution indicator species from rotifers such as *Keratella* were identified. Abundance of genus of the family Brachionidae i.e. *Keratella tecta*, *Keratella tropica* and of the family Lecanidae i.e. *Lecanac species* are indicator of eutrophication [8]. Absence of these rotifer species can be attributed to turbulence generated by the excess water flow during this season [9].

The Seasonal variation in Rotifer composition (cells/lit.) of Kori Dam is provided in Fig-I. Highest number of rotifer composition was recorded in the season of summer (1169 cells/lit), followed by monsoon (937 cells/lit) and the in winter (721 cells/lit).

Since rotifers are diverse group of zooplanktons and act as a major source of food for aquatic organism. The rotifers play a major role in recycling of the nutrients as well as energy transfer to higher trophic levels of an aquatic ecosystem [10]. As it has been reported that the many studies that rotifers are the dominating species of zooplanktons in different water bodies. The variation of the rotifer diversity during different seasons reports the population dynamic and structure of rotifers in Kori dam. In addition the

diversity in the rotifer species also can be correlated with the diversity in the ichthyological biodiversity. In Paranapanema water body 76 species of rotifers were reported [11]. Deshmukh [12] recorded 28 species of

rotifers from Chhattri Lake of Amravati with maximum number of species in summer.

Table I: Different rotifer species and their distribution at different sampling sites of **Kori Dam**, Bilaspur, Chhattisgarh during July 2019 to June 2021(Two years)

ORDER	FAMILY	SPECIES	STATION			
			I	II	III	IV
Rotifera	Brachionidae	<i>Brachionus angularis</i>	+	+	-	-
		<i>Brachionus forficula</i>	+	+	+	-
		<i>Brachionus calyciflorus</i>	+	-	-	+
		<i>Brachionus caudatus</i>	+	+	-	-
		<i>Brachionus diversicornis</i>	-	-	-	+
		<i>Cephalodella</i> sp.	-	-	+	-
		<i>Euclanis</i> sp.	+	-	-	+
		<i>Keratella tropica</i>	+	+	-	+
		<i>Keratella tecta</i>	-	+	+	+
		<i>Keratella procurva</i>	+	-	-	+

Table II: Seasonal variation in rotifer assemblage of **Kori Dam**, Bilaspur, Chhattisgarh during July 2019 to June 2021(Two years)

ORDER	FAMILY	SPECIES	SEASON		
			Monsoon	Winter	Summer
Rotifera	Brachionidae	<i>Brachionus angularis</i>	+	+	+
		<i>Brachionus forficula</i>	+	+	+
		<i>Brachionus calyciflorus</i>	-	-	+
		<i>Brachionus caudatus</i>	+	-	+
		<i>Brachionus diversicornis</i>	+	+	-
		<i>Cephalodella</i> sp.	+	+	+
		<i>Euclanis</i> sp.	-	+	-
		<i>Keratella tropica</i>	+	+	+
		<i>Keratella tecta</i>	+	-	+
		<i>Keratella procurva</i>	-	+	-

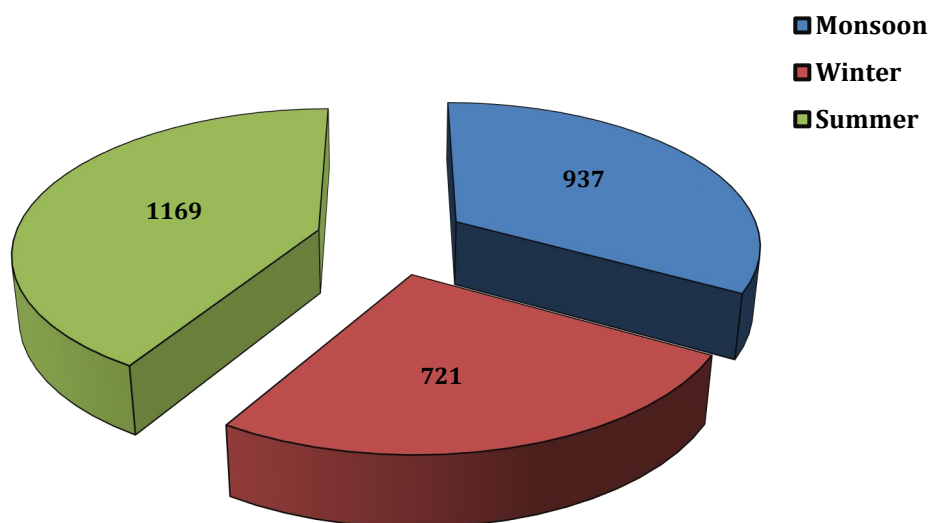


Fig.I: Seasonal variation in Rotifer composition of **Kori Dam**, Bilaspur, Chhattisgarh during July 2019 to June 2021 (cells/lit.)

The higher occurrence of *Brachionus species* and *Keratella species* has been correlated to the great tolerance of these species to the eutrophic environment [13,14]. In the present study both of these species were found in the dam, thus it can be proposed that Kori dam is progressing towards eutrophic state. Seasonally, the number of rotifer in Kori dam was highest during summer, followed by monsoon and lowest during winter. In summer, the factors like water temperature, dissolved oxygen and water pH play a vital role in controlling the density and diversity of rotifers [15,16,17]. Rajkumar [18] found that the number of rotifers was highest during summer followed by monsoon and lowest during winter. The dominance of rotifers in Kori dam can also be attributed to their short development rate and fish predation on large zooplanktons of an aquatic ecosystem.

physicochemical changes in Kori dam and bioclimatic variables to integrate a genus-species specific distribution model, climate change and rotifer distribution, change in land use, habitat fragmentation and anthropogenic contamination.

The rich rotifer diversity in Kori dam reveals the presence of higher content of organic matter. However if the process of organic enrichment remain higher than organic degradation, then the water body could proceed towards acute eutrophic pollution. Since the diversity of zooplanktons especially is not so much high that the adjacent dams of the area, but a mass awareness among the fringe people and tourists is required for proper conservation of these historical perennial freshwater bodies. In addition prior management strategies to conserve this balanced status of the water body are required. Furthermore it's essential to monitor



Plate 1. Observation of Rotifers in a water sample of **Kori** dam.

IV. CONCLUSION

The present contribution of research work provides a wide vision about the occurrence and distribution of rotifer species of Kori dam of Bilaspur Chhattisgarh. The present study revealed 10 species of rotifers in Kori dam. These recorded rotifers show normal distribution across different seasons. The summer season was reported as the most dominating season in terms of rotifer species diversity. Since the occurrence and distribution of rotifer species determine the healthy status of the Kori dam. But still a mass awareness among the fringe people and tourists is required for proper conservation of these historical perennial freshwater bodies.

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CONFLICT OF INTEREST

The author would like to undertake that the above mentioned manuscript has not been published elsewhere, accepted for publication elsewhere or under editorial review for publication elsewhere. The authors declare that they do not have any conflict of interest with the submission of this manuscript.

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