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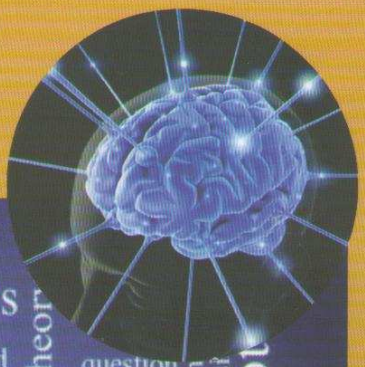

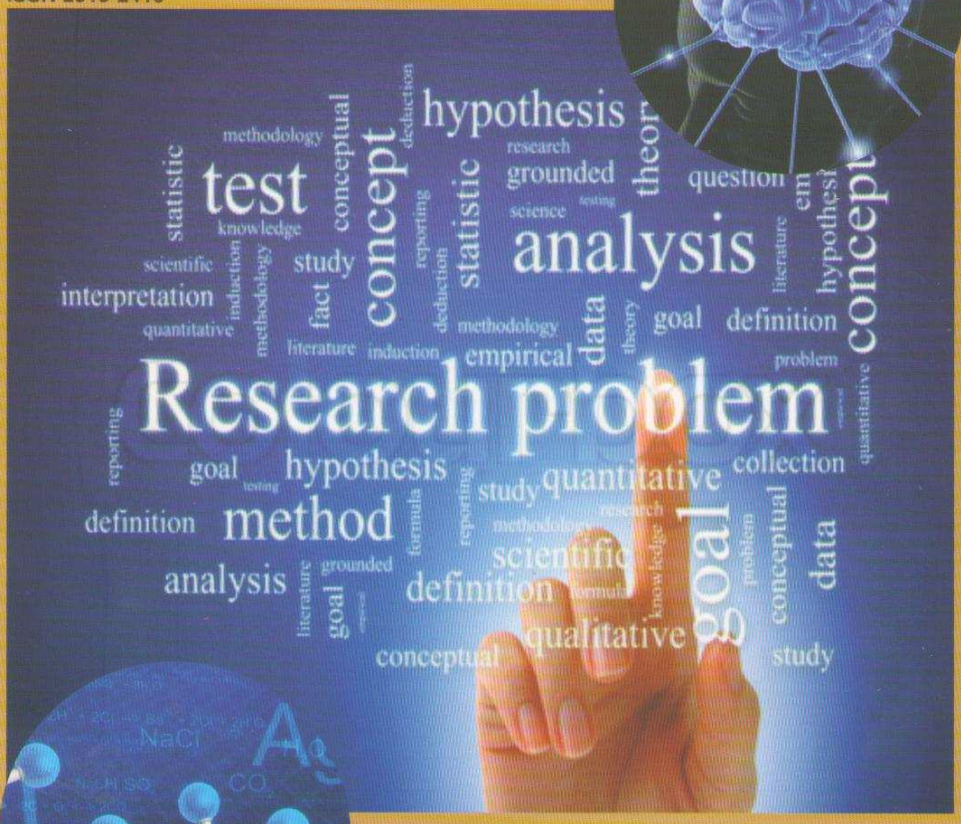

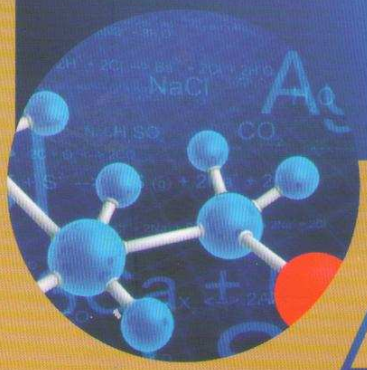

AVISHKAR

Solapur University Research Journal

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PREFACE

It is indeed a great privilege to write on this happy occassion on "Avishkar – Solapur University Research Journal"; which is dedicated to the research work of undergraduate and postgraduate students. The idea is to provide a platform to researchers from all disciplines of knowledge viz. languages, social sciences, natural sciences, engineering, technology, education, etc. to publish their research work and inculcate the spirit of research, high integrity, ethics and creative abilities in our students.

The Solapur University; one of the youngest Universities situated on a sprawling 517 acre campus, was established by the provisions of the Maharashtra University Act 1994 by converting the three departments namely Physics, Chemistry and Geology; functioning as P.G. Centre of the then Shivaji University. The University aims for the holistic development of the students with a motto of "Vidya Sampannatta." Since, I joined as Vice-Chancellor of Solapur University on 11th December, 2012, I have been busy toying with the idea of making university a pioneering institute for higher education both in terms of teaching/learning and Research. Both are important dimensions of education which can determine the fate of nation when we are facing new challenges with micro and macro implications. Solapur University has placed it's bet on the education of youth as it is the best possible investment in it's human resource for a society/country.

In order to promote excellence in study and research and to ensure equitable development we encourage and equip the aspiring students to succeed in their studies. The University offers all it's P.G. courses based on the Choice Based Credit System (CBCS) from the academic year 2009 onwards; and the University provides a platform for enhanced research interaction with various research and academic institutions; the faculty and students to get publications in top ranked journals.

I am happy to share with you that we are working on changes to gear for new challenges in future education discourse; by developing young talented and skilled human resource of University itself in diverse fields. The University
imparts education and conducts research through three arms namely, 17 study & Research departments of 7 Schools on the University campus; 125 affiliated Colleges located within the jurisdictional area of the University (Solapur district), & P. G. Extension centres at various colleges. In addition, the University has established specialized centres for conducting high end research in the frontier areas of Science & Technology and also for conducting extensional activities.

In order to deliver lectures and presenting thoughts through multiple technology platforms and pathways, even the teaching fraternity will have to relearn, reengage and retrain themselves for the immediate future. I understand that Solapur University need to reinvent itself as enabler of society rather than mere gatekeeper of higher education by focusing on new technologies and cutting edge thinking.

My heartiest congratulation to all researchers, Editorial Team and Best Wishes for your ambitions, plans and hopes to make this Avishkar Solapur University Journal a better publication. We have made every attempt to provide current and actualistic information about R and D of this University in this journal and I am sure reading this would be an informative and a rewarding experience.

Prof. (Dr.) N. N. Maldar
Vice-Chancellor

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PREDICTION OF SURVIVAL OF BURN PATIENT USING RADIAL BASIS FUNCTION NETWORK

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Abstract

The purpose of the present work is to develop a biomedical expert system using radial basis function network (RBFN) for prediction of survival of burn patient and evaluate the performance of the system by varying the spread constant of radial basis function (RBF). Orthogonal least square learning (OLS) algorithm is used for designing of radial basis function network. Twenty three factors, those influence the survival of burn patient such as age, sex, delay in admission, size of burn for different body parts are used as input for RBFN, output being survival or death. Retrospective data of 306 patients is used for an RBFN system training and testing using MATLAB platform. The result is compared by varying the spread constant of radial basis function.

Keywords : ANN, RBFN, neural network

Introduction

Burn is a complex medical problem through out the world with dire consequences both to the patients and society. In India it is a major cause of death next to road traffic accidents. In the previous study, a three layer feedforward artificial neural network (ANN) with 23 input factors trained with standard Gradient Descent Backpropagation and Levenberge-Marquardt algorithm was used for the prediction of survival of burn patient [1,2,3]. In the present work, we have developed a prediction system using radial basis function network (RBFN) with same number of input factor, where output being survival or death[4].

RBFNs have found popularity in pattern classification in areas such as speech recognition and prediction, phoneme recognition, and face recognition[5]. The RBFN can be regarded as a special two-layer network which is linear in parameter by fixing all RBF centers and nonlinearities in the hidden layer. Thus the hidden layer performs a fixed nonlinear transformation with no adjustable parameters and it maps the input space onto new space. The output layer then implements a liner combiner on this new space and the only adjustable parameters are the weights of this linear combiner. These parameters can therefore be determined using linear least square method[6,7].

The performance of an RBFN critically depends upon the chosen centers. In practice the centers are often chosen to be subset of the data. The OLS method can be employed as a forward regression procedure to select suitable set of centers (regresses) from a large set of candidate. At each step of the regression, the increment to the explained variance of the desired output is maximized. Furthermore oversize and ill conditioning problems occurring frequently in random -

selection of centers can automatically be avoided. This rational approach provides an efficient learning algorithm for fitting adequate networks[4,6].

Materials and Methods

RBFN is used for prediction of survival of burn patients i.e. survival or death. The use of this model will help the clinical people to better identify the risk group and provide treatment accordingly, at various burn centers[2,4].

A. Data Preparation

Many studies have analyzed the important factors which influence survival. In order to obtain better results, following 23 influencing factors have been considered for the present study[1,2]. These factors are decided after rigorous discussion with medical experts.

1. Age of the patient
2. Sex of the patient
3. Delay in admission to the hospital.
4. Cause of burn
5. Inhalational burn
6. Co- morbidities
7. Method of dressing
8. Type of admission
9. Way of burn
10. RT feeding
11. Positive pus culture
12. Positive blood culture
13. Protein supplementation
14. Type of line
15. Operation
16. Size of the burn (%) for eight different parts of the body.

The total body surface of a patient is divided into following eight parts by Wallace's Rule of Nine[1,2].

Table 1 : Distribution of Human Body in Eight Parts

Sr. No.	Body Part	Max. Size (%)
1	Head,Face, Neck	9
2	Chest, Abdomen	18
3	Back	18
4	Genetelia	1
5	Left upper limb	9
6	Right upper limb	9
7	Left lower limb	18
8	Right lower limb	18

Retrospective data for 306 burn patients is collected from Solapur Burn Care Center, Solapur which is a leading medical center in Solapur for treatment of burn patients and research. The whole data set is divided randomly into two parts [1]. Training set (153 samples) [2]. Testing set (153 samples). Each data sample has two parts input and output. Input consists of 23 values corresponding to each input factor. These input values are normalized in the range of 0 to 1. Output is 0 for survival and 1 for death of a patient.

B. RBFN Architecture

The prediction system is implemented by RBFN as shown in Fig.1[4,5]. The input layer consists of total 25 neurons. Input factor of type with two possible values or with a continuous normalized value in the range of 0 to 1 are input using 1 neuron. Factors with 3 or 4 possible values are input with 2 neurons. The output layer has only one neuron whose output is either 1(death) or 0 (survival). Hidden layer neurons are chosen equal to training data sample[1,2].

The inputs of RBFN are directly connected to each basis function and the output of the activation functions are then weighted and summed. RBFN take non-linear input spaces and output linear activation outputs through a single hidden layer[5,7].

Using inherent nonlinear approximation properties, RBFN are built to have the capability to model very complex patterns, which are unique centroids (means), spreads (standard deviations from means), and activation functions. As with multilayer perceptron (MLPs), weights are adjusted during training but in addition, the spreads and centers of each cluster are also updated. For feature spaces in 2 dimensions a circular cluster is formed for RBFs 3-dimensional spaces result in spherical clusters for RBFs; dimensions greater than 3 results in hyperspheres[6,7].

RBFN also have faster learning capacity, are easier to implement, less complex in structure, and computationally more efficient than MLPs5[,7].

C. Radial Basis Activation Function

A radial basis function (RBF) is a real-valued function whose value depends only on the distance from the origin, so that

$$\phi(\mathbf{x}) = \phi(\|\mathbf{x}\|)$$

Or alternatively on the distance from some other point c, called a center, so that

$$\phi(\mathbf{x}, \mathbf{c}) = \phi(\|\mathbf{x} - \mathbf{c}\|)$$

Any function φ that satisfies the property $\phi(\mathbf{x}) = \phi(\|\mathbf{x}\|)$ is a radial function. The norm is usually Euclidean distance, although other distance functions are also possible. Sums of radial basis functions are typically used to approximate given functions. This approximation process can also be interpreted as a simple kind of neural network[4].

There are several forms of the radial basis function, however, the most common chosen is a Gaussian function.

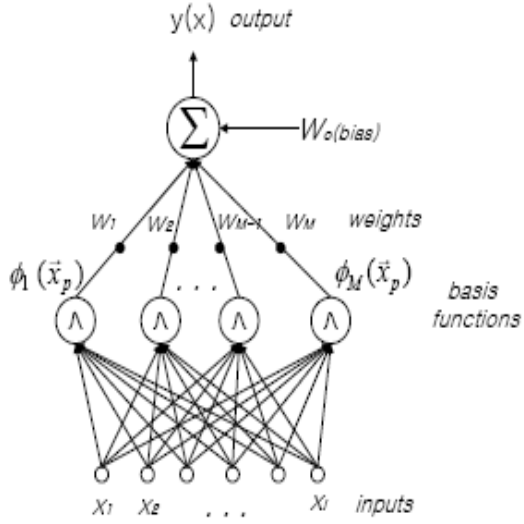

Figure 1. Basic RBFN

$$\phi(r) = e^{-(\varepsilon r)^2} \quad \text{(where } r = \|\mathbf{x} - \mathbf{x}_i\|\text{)}$$

Where 'r' represents distance (radius) from a center and 'ε' is the spread constant[4].

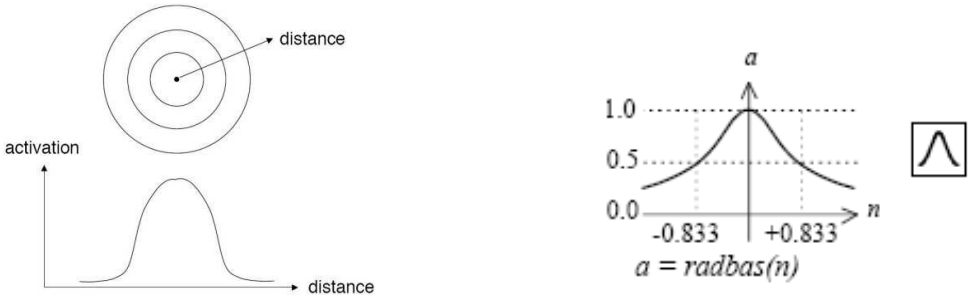

Figure. 2. Radial basis function

Hence samples located at large distances from the mean (cluster centers) will fail to activate a particular basis function while maximum activation is achieved by data samples closest to a cluster's mean. Each cluster has its own Gaussian distribution, mean, and spread.

In the present work, we will study the effect of the variation of spread constant over the output of the RBFN.

D. RBFN Training

Supervised learning is used to train the RBFN[4,7]. The following parameters are determined by the training process:

1. The number of neurons in the hidden layer.
2. The coordinates of the center of each hidden-layer RBF function.

3. The weights applied to the RBF function outputs as they are passed to the summation layer.

The training of RBFN is carried for various value of the spread constant of RBF function. The RBFN model is implemented over Neural Network Toolbox (NN Tool) of Matlab.

E. RBFN Testing

The trained RBFN is tested over the 153 samples. Depending on minimum testing errors better RBFN architecture is chosen. This RBFN architecture can be used for prediction.

EXPERIMENTAL RESULTS

Input Neurons: 25 Output Neuron: 1

Hidden layer Neurons (Radial basis neurons): 153

Goal : 0.0

Training Set: 153 samples Testing Set: 153 samples

Table 2 : RBFN Evaluation by Varying Spread Constant of RBF

No.	Spread Constant	Testing Error	No.	Spread Constant	Testing Error
1	0.1	81	14	1.4	16
2	0.2	81	15	1.5	16
3	0.3	80	16	1.6	16
4	0.4	72	17	1.7	15
5	0.5	71	18	1.8	15
6	0.6	67	19	1.9	15
7	0.7	51	20	2.0	15
8	0.8	41	21	2.5	15
9	0.9	28	22	2.6	16
10	1.0	19	23	2.7	17
11	1.1	12	24	2.8	17
12	1.2	12	25	2.9	17
13	1.3	13	26	3.0	18

For the RBFN architectures with spread constant 1.1 and 1.2 of RBF found the best result. Only 12 out of 153 testing samples are misclassified.

Discussion

Table 2 shows how the spread constant affects the design process for radial basis networks. From Table.2. following observations have been made.

1. Too small spread constant (0.1 to 0.6) results in a solution that does not generalize the RBFN architecture.

2. If the spread constant of RBF is too large (1.4 to 3.0), the radial basis neurons will output large values (near 1.0) for all the inputs used to design the network. If all the radial basis neurons always output 1, any information presented to the network becomes lost.
3. Spread constant of RBF in the range of 1.1 to 1.3 generalize the RBFN architecture sufficiently.

In this way the selection of spread constant of RBF plays important role in the RBFN system designing.

Conclusion

In the present study, RBFN network trained with the supervised learning algorithm is used to predict survival of burn patients. Twenty three vital influencing factors are input to an RBFN, survival or death as an output. The system performance is evaluated by varying the spread constant of RBF. We conclude that we have to choose the spread constant of RBF larger than the distance between adjacent input vectors, so as to get good generalization, but smaller than the distance across the whole input space. For proposed work that would mean picking a spread constant greater than 0.9, and less than 1.4.

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GRAPH THEORETICAL APPROACHES FOR IMAGE SEGMENTATION

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Abstract

In this paper we have presented a brief study on the importance of discrete mathematics in computer science. Also our main focus in this study is the applications of graph theory in image processing, in particular image segmentation. The graph theoretical method is a highly efficient and cost effective way to perform image segmentation. Segmentation subdivides an image into its constitute regions or objects. The level to which the subdivision is carried out depends on the problem being solved. Medical imaging is one of the most attractive research topics in image processing. Modern research in image segmentation has highlighted the prospective of graph based techniques for medical applications. The centre of attention should be on the study of properties of minimal spanning trees, shortest paths trees and minimal cuts and we revisit these notions for image segmentation purposes.

Keywords: Discrete mathematics, Logic, Reasoning, Image Processing, Image Segmentation, Graph theory, Graphs, Cycles, Graph Cuts**.**

Introduction

Discrete Mathematics is the branch of mathematics which deals with the study of discrete objects like integers, peoples, houses, birds, etc. Digital computers are based on discrete “atoms” (bits) i.e., information is stored and manipulated by computers in a discrete fashion. 0101101…. . Therefore, both a computer’s structure (circuits) and operations (execution of algorithms) can be described by discrete mathematics. It is an excellent tool for improving reasoning and problem--solving skills. Concepts from discrete mathematics are useful for describing objects and problems algorithmically and analyze the time and space complexity of computer algorithms and programming languages. Some of the useful tools of discrete mathematics are logic, set theory, functions and relations, number theory, combinatorics, sequences, group theory, graph theory, trees. Logic is basis of Arithmetic Logic Unit (ALU). Logic is crucial to IF statements, AND, OR, NOT logic gates, implementation of quantifiers, Looping, Database Query Languages, SQL, and much more. Logic deals with methods of reasoning which is important for conducting proofs and program verification. It gives the foundation to the logic programming such as Prolog and Lisp. Set theory provides the fundamental idea of collection of well defined discrete objects. Number theory has many applications in computer science such as hashing function, generation of pseudo random numbers and public key system. Relations of two discrete objects can be expressed in an ordered pair (a, b) while executing a program, comparisons are made, and based on the result different

tasks are performed. A relational database stores the information such as online booking of tickets, hospital's database etc. An application of combinatorics plays a major role in the analysis of algorithms. For example average number of times that a portion of algorithm is executed among many possible data sets. Tree is data structure that represents hierarchical relations between data items and so on[1,2].

Graph Theoretical Approaches for Image Segmentation

Image segmentation is very fundamental problem in computer science. In spite of several years of research, generalized solution to image segmentation problem is still a very tough task because segmentation is inherently ill-posed. Among different segmentation methods, graph theoretical approaches have many good features in practical applications. It organizes the image elements into mathematically well defined structures, making the formulation of image segmentation problem more desirable and the computation more efficient. Graph partitioning methods can effectively be used for image segmentation. In these methods, the image is modeled as a weighted, undirected graph. Usually a pixel or a group of pixels are associated with nodes and edge weights define the (dis)similarity between the neighbourhood pixels. The graph (image) is then partitioned according to a criterion designed to model "good" clusters. Each partition of the nodes (pixels) output from these algorithms are considered an object segment in the image. Some popular algorithms of this category are normalized cuts,[3] random walker,[4] minimum cut,[5] isoperimetric partitioning[6] and minimum spanning tree-based segmentation.

Applications and Objectives

Discrete Mathematics provides mathematical foundation for different Computer Science subjects such as Networking, Database, Image Processing, Compilers and Interpreters, Software Engineering, Computer Architecture Operating Systems, Security, Advanced Algorithms and Data Structures, Graphics and Animation, Artificial Intelligence and will continue to grow. However our main focus in this study is applications of Discrete Mathematics in image processing[7] in particular the applications of Graph Theory in Image Segmentation. These techniques are considered to be one of the most efficient segmentation techniques which are mainly used as time and space efficient methods for real time applications[8].

Segmentation subdivides an image into it's constitute regions or objects. The level to which the subdivision is carried depends on the problem being solved. That is, segmentation should stop when the objects of interests in an application have been isolated. Image segmentation algorithms generally are based on one of two basic properties of intensity values: discontinuity and similarity[9]. Following are the two different graph based image segmentation techniques found in the literature.

The Graph Based Image Segmentation

In this paper, we conduct a systematic survey of graph theoretical methods for image segmentation; the problem is modeled as partitioning a graph into several sub-graphs such that each of sub-graph represents a meaningful region or object of interest in the image. Image segmentation is a classical and fundamental problem in image processing. It is the process of partition an image into its many disjoint subsets such that each subset represents a meaningful part of the image. The quality of segmentation output heavily depends on the performance of the whole vision system. A very large amount of literature on image segmentation has been published over the past decades. Some of them have achieved good success, and hence became popular in a variety of applications, such as medical image processing[10,11,12], object tracking[13, 14], recognition[15,16], image reconstruction[17,18] and so on.

The graph based image segmentation is based on selecting edges from a graph, where each pixel corresponds to a node in the graph. Weights on each edge measure the dissimilarity between pixels. The segmentation algorithm defines the boundaries between regions by comparing two quantities – Intensity differences across the boundary and Intensity difference between neighboring pixels within each region[19]. From the above survey we have the following algorithm on graph based image segmentation.

Algorithm:

Step 1. The input is a graph G = (V, E), where V are the n vertices and E are m edges. Each edge has a corresponding weight, which is a measure of dissimilarity between adjacent pixels.

Step 2. Perform the segmentation such that each component C ϵ S corresponds to a connected component in a graph G' = (V; E'), where E' ϵ E.

Step 3. If the weight of the edge connecting two vertices in adjacent components is small compared to the internal difference of both the components, then merge the two components, otherwise do nothing.

Step 4. Repeat Step 3 for q = 1, 2... m.

Step 5. Return S^m, the components after the final iteration.

Where $S= \{s^1, s^2 \ldots s^k\}$ is dis-joint set which contains divided segments of an image.

Image Segmentation using Graph Cuts

Graph cuts are segmentation techniques that divide the image into two parts, called "object" and "background". The minimum cut of the graph will determine the energy function to be minimized either locally or globally. Interactive segmentation requires a user to indicate certain pixels to be part of object or background. This is the hard constraints imposed by the user which provide clues on the parts that needed to be segmented[20]. From the above literature survey we have the following algorithm on graph cuts.

Graph Cuts Algorithm

Step 1: Start

Step 2: Load and read the image

Step 3: Signify the image as a graph by defining nodes (vertices) and edges

Step 4: Classify datacost (boundary term) and smoothcost (region term)

Step 5: Locating datacost and smoothcost

Step 6: Computation of energy Optimization

Step 7: End.

The most important part in this algorithm is defining datacost and smoothcost. These two parameters affect the most the result of Segmentation.

Scope

The Graph Based Image Segmentation is a highly efficient and cost effective way to perform image segmentation. The threshold values and the number of minimum vertices that should be present so that a component can be considered as an image segment play an important

role in determining the segmentation. The algorithm is highly efficient but it had not been effectively implemented in the project to see the effectiveness of the graph based image segmentation. Medical imaging is one of the most active research topics in image processing. The numerous applications and the huge amount of medical image data need complex software that combine high level graphical user interfaces as well as robust and fast interactive image analysis tools. Modern research in image segmentation has highlighted the prospective of graph based techniques for medical applications[9]. These new tools have generated a great interest in the imaging community. The focus should be on the study of properties of minimal spanning trees, shortest paths trees and minimal cuts and we revisit these notions for image segmentation purposes.

Among the old image segmentation techniques, many successful techniques benefit from mapping the image elements onto a graph. The segmentation problem is then solved by the efficient tools from graph theory. One of the advantages of formulating the segmentation on a graph is that it might not require discretization by virtue of purely combinatorial operators and thus incur no discretization errors. In spite of the huge amount of efforts dedicated to image segmentation, a small amount of work has been done to review the works in this field. The problem is generally modeled in term of partitioning a graph into several sub-graphs. The graph is then partitioned according to these criteria such that each partition is considered as an object segment in the image. In these methods, fixed thresholds and local measures are usually used for computing the segmentation results, while global properties of segmentation are tough to guarantee.

The result of image segmentation is a set of segments that collectively unite the entire image, or a set of contours extracted from the image. The pixels in a region are similar with respect to some characteristic or computed property, such as color, intensity, or texture. Adjacent regions are significantly different with respect to the same characteristic(s).[1] When applied to a stack of images, typical in medical imaging, the resulting contours after image segmentation can be used to create 3D reconstructions with the help of interpolation algorithms like Marching cubes.

Conclusion

This is a brief survey of importance of Discrete Mathematics in Computer Science, in particular the importance of Discrete Mathematics in image processing i.e., the applications of Graph Theory in Image Segmentation. Segmentation algorithm is highly efficient but it had not been perfectly executed in the work to see the effectiveness of the graph based image segmentation. The centre of attention should be on the study of properties of minimal spanning trees, shortest paths trees and minimal cuts and we revisited these notions for image segmentation purposes. In order to use Discrete Mathematics in Computer Science effectively especially in Medical Image Processing we need to develop new tools, and close interaction between researchers from two fields. We need to make researchers from both fields conversant to the issues, problems, and challenges of problems arising from the tree of life, engage biological and mathematical scientists together to define the plan and develop the tools of this field.

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INFLUENCE OF MICROORGANISMS IN PRODUCTION OF VERMICOMPOST FROM WATER HYACINTH WEED

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Keywords: vermicompost, water hyacinth weed, microorganisms, earthworms, Sambhaji tank

Introduction

Solapur city is one of the major cities from Western Maharashtra. It is located at 17^0 40 N latitude and 75^0 54 E longitude. Solapur is famous for the textile industries. The city is enriched by two fresh water bodies namely Sambhaji tank and Siddeshwar tank. Sambhaji tank was considered as the breeding place for migratory birds. In the recent past due to urbanization and beautification of the tank for the recreational purpose, and due to the encroachment of nearby colonies, lots of domestic waste enter into the tank. In addition to this, the Sambhaji tank is also a home place for regular laundry place of washermen activities which results in the release of enormous amount of various chemicals into the water body. During the festival days the Sambhaji tank is also being used for various idols immersions directly. All these activities result in enrichment of nutrients' increase in pollution level due to release of unwanted chemicals and increase in the level of pathogenic bacteria through domestic sewage.

In the present investigation an attempt has been made to recycle the solid waste which is being dumped on the banks of Sambhaji tank, Solapur following with proper and scientific decomposition methods after manual method. It is established that organisms which decompose organic matter use carbon as a main source of energy and simultaneously nitrogen for constructing the cell structure[12].

Water hyacinth, an aquatic weed (*Eichhornia crassipes*), is a major threat to this fresh water body. There is a blanket of invasion of water hyacinth on the surface of the Sambhaji tank which results in a breeding place for all the disease born vectors. These activities induce the eutrophication of water body. Concurrent efforts are being made by various government and non-government organizations to eradicate the dreadful weed by manually removing the weed without much success conclusive results. The best method for converting this water hyacinth weed into useful product is by vermicomposting with the help of earthworms. The C:N ratio is an important parameter which determines the quality of the vermicompost.

If the C: N ratio is around 20, both these components are available to the organisms to its maximum extent. When the high carbon content material is added to the soil, the bacterial population increases enormously taking out soil nitrogen which otherwise would be available to the plants [13].

If a material with low carbon content is added to the soil, it prevents competition for nitrogen between growing plants and microorganisms. It is well established that after decomposition, the compost is considered to be if only there is no further anaerobic activity, heat generation and low C:N ratio or poor availability of carbon which can be used for agricultural soil[3].

The objectives of our study are to convert fresh water weed, water hyacinth into a valuable and organic rich vermicompost and to prevent land filling by weed as a solid waste, to prepare vermicompost that depends solely on microbial decomposition and to understand the role of microbial population in enriching the

vermicompost. Therefore in the present study we have used water hyacinth as organic raw material and converted it into the microbial rich vermicompost.

(a) Invasion of Sambhaji Tank, Solapur by Water Hyacinth

(b) Blockage for boading

(c) Dumping of Water Hyacinth

Figure 1 : Photograph of the site (a), (b), (c)

Materials and Methods

1. Experimental design –

- The dumped water hyacinth was collected from Sambhaji tank, Solapur in Aug 2010.The plants as a whole were initially kept in a heap for 15 days and spread to sun-dry for 20 days.
- Two drums of 20 L capacity with holes on lower side were taken for the experimentation.

2. Preparation of compost samples

- All the experiments were carried out by using pot culture.
- Initial compost mixture was prepared by addition of dried water hyacinth (50%) with one week old cow dung (50%) as T1.
- In another pot a mixture of dried water hyacinth (100 parts) and also with decomposed culture (10 parts) was prepared as T2.
- The two pots were closed with a lid and kept under cool and shady place which enable the faster growth of microbes under prevailing condition. The mixture was turned over after every 10 – 15 days upside down for a duration of two months.
- Moisture was also maintained by sprinkling water every week.

3. Physico-chemical and biological analysis

- The C: N ratio and macronutrients such as Nitrogen, Phosphorous and Potassium were tested for both the initial samples (Fresh water hyacinth, dried water hyacinth, cow dung) as well as of vermicompost.
- pH was also measured intermittently .
- Organic carbon was determined by using rapid titration method[4].
- Nitrogen was estimated by microkjeldhal method[5].
- Phosphorous was determined by Vandomolybdic acid yellow color method described by Anderson and Ingram[6].
- Potassium was determined by flame photometry method.

Microbial population studies

Total number of fungi, actinomycetes and bacteria in initial and vermicompost were estimated by spread plate method[7]. Samples were serially diluted up to 10^5 cfu/g.

The various nutrient media used for microbial analysis

- Nutrient agar media for Bacterial growth,
- Sabouraud Dextrose agar-fungal growth,
- Pikovskayas media for Phosphate solubilising bacteria,
- Benet's agar for Actinomycetes,
- Ashbys mannitol agar for Azotobacter[11].

Results and Discussion

Results are presented in figure 2 (plates 1 to 7) The photographs of the site are shown in figure 1. In the present study it was observed that there is a variation in C: N ratio from the organic raw material used for converting into vermicompost. The C: N ratio in freshly isolated water hyacinth was 17.5 whereas in dried water hyacinth it was 14.02. For further decomposition process cow dung was water hyacinth with known proportions. The C:N ratio of cow dung was 34.7 whereas when the cow dung is mixed with water hyacinth material the C:N

ratio was found to be 14.72. When water hyacinth was mixed with decomposing culture the C: N ratio was 8.05. The nitrogen content was found to be more in the vermicompost produced from water hyacinth + cow dung (T1) . The phosphorous content was 0.9% in T1 and 0.1% in T2. The potassium content was 3% in T1 and 1.2% in T2. pH of T1and T2 was 6.8 and 7.1 respectively. Temperature was 29^0C in T1 and 30^0C in T2.

Microbial studies revealed increasing count in fungal, bacterial, actinomycetes, phosphate solubilising bacteria and azobacters in vermicompost as compared with the initial raw substrates (water hyacinth and cow dung). Bacterial count was more and uncountable in both T1 and T2 treatments. Fungal count was increased to $18x10^{-5}$ cfu/g in T1 and $10x10^{-5}$ cfu/g in T2. Actinomycetes count was increased in T1 $20x10^{-5}$ cfu/g and $10x10^{-5}$ cfu/g in T2. Phophate solubilising bacteria was $08x10^{-5}$ cfu/g in T1 and $05x10^{-5}$ cfug in T2. Azobacter count was seen to be $13.2x10^{-5}$ cfu/g in T1 and $10x10^{-5}$ cfu in T2. There was overall enhancement of all the microoraganisms in vermicompost produced from water hyacinth treated with cow dung.

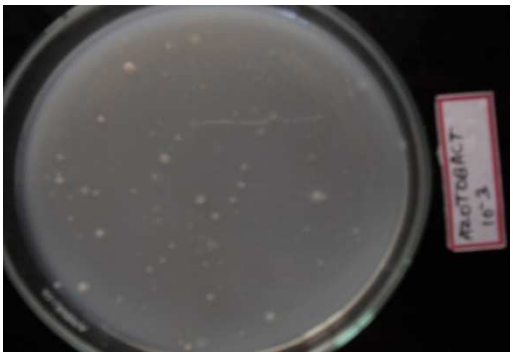
The completion of vermicompost and maturation can be determined by its C: N ratio. According to Morais et al. the completion of vermicompost process 78. Many studies showed that there was a decrease in C: N ratio as compared to its original substrate[9,17]. In the present study there was a reduction in C: N ratio from water hyacinth + Cow dung and water hyacinth + decomposing culture as compared to raw material. The lower value of C:N ratio indicates the completion of vermicompost. Compost is the product of aerobic process during which microorganisms play an important role. An increase in N,P,K value of vermicompost as compared to its raw substrate and decrease in pH found in the present study are in agreement with earlier reports[1,8]of the effects of stocking density and feeding behavior of earthworms on biosolids stated that due to conversion of nitrogen and phosphorous into nitrites and nitrates and orthophosphates, during decomposition organic matter leads to increase in macro nutrients.

Soil bacteria are an important source of nutrients for earthworms[11] and also protein requirement earthworms is fulfilled by these microorganisms[12,16]. Edwards et al reported an increased count of fungi, bacteria and actinomycetes as compared to the soil[11]. The increase in microbial count and growth may be attributed towards ingestion of these microorganisms along with organic wastes by earthworms which provide suitable environment and substrate to feed for microbial organisms[13]. The microbial population present in vermicompost included *Bacillus spp, Azotobacters , Rhizobium, Aspergillus, Penicillium, Pseudomonas ,Enterobacters ,Mucor spp etc* .It is further suggested that microorganisms play a vital role in production of vermicompost produced through water hyacinth.

Conclusion

Disposal of solid waste can be done by means of vermicomposting rather than going for land filling, or incineration. Our study suggests that the solid waste management of water hyacinth can be recycled in an ecofriendly and economically profitable manner by using the advanced vermicomposting method. Higher microbial population was observed from vermicompost as compared to initial samples .This suggests that micro organisms greatly influence the vermicompost production by increase their number. The products can be used in the agriculture fields to enrich the soil and more semi arid lands can come up for agriculture usage. Further studies are required to understand individual microbial species role in enhancing nutrient values of the vermicompost.

1.Bacterial growth on Nutrient Agar



2. Azatobacter Growth on Ashbys Mannitol Agar

3.PSB Growth on Pikovskayas Medium

4.Fungal Gr owth on SDA

5.Microbes under microscope stained by Grams stain

Figure 2 -Images of microbial cultures of the dilution 10^{-5} cfu/g

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POPULATION AND BREEDING STATUS OF AVIFAUNA IN A HIGHLY FRAGMENTED GRASSLAND PATCH NEAR SOLAPUR, MAHARASHTRA

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Abstract

The avifauna in a patch of one square kilometer area near Solapur city was surveyed for one year between July 2010 and July 2011 to assess the preliminary impact of anthropogenic activities on the population and breeding status. Baseline information on the impact of such changes on grassland ecosystem is lacking, making it difficult to prepare a sustainable management plan for the grassland ecosystem. A total of 944 birds belonging to 65 species were recorded with a mean value of 14.52 birds. Nine ground nesting bird species were recorded with a total of 75 nests and 119 juveniles with a mean value of 8.33 nests and 13.22 juveniles during one year study period. Out of 65 species 57 were resident and 08 were migratory. The residential status of birds showed 05 general feeding categories based on predominant mode of feeding. The highest number of species belonged to insectivorous category with 32 birds followed by granivorous (13), omnivorous (09), carnivorous (08), frugivorous (02) and Nectarivorous (01) respectively. The high population of insectivorous, carnivorous and omnivorous birds suggests their significance as pest and insect population controllers in the grassland and agricultural ecosystems. The breeding of Eurasian thick-knee was reported for the first time from Solapur city. Urbanization, agriculture and poaching activities were found to be putting continuous pressures on ground nesting birds. There are no recent reports of Indian bustard (*Ardeotis nigriceps*) from this area indicating negative impact of urbanization and unsustainable forestry practices. This information can be used to assess, track and construct models for predicting possible effects of expanding urbanization and anthropogenic activities on the avifauna in the grassland ecosystem for the effective conservation.

Keywords : Urbanization, avifauna, grassland ecosystem, Solapur, Maharashtra

Introduction

Solapur district is situated on the Southeast fringe of Maharashtra state and lies entirely in the rivers Bhima and Seena basins. The grassland ecosystem contains a diverse assemblage of resident and migratory birds that use the area for nesting, foraging, wintering and molting purposes. The avifaunal community includes several species that use grassland and thorn forest as their breeding ground. The breeding season of majority of birds starts with approaching summer season. Ground nesting birds in this region are vulnerable to human disturbance as farmers, poachers, cattles and visitors can access the nest sites during the breeding season. Repeated disturbance during breeding season can result in reduced productivity and total abandonment, Temporary nest desertation and increased predation on eggs and hatchlings.

Altered incubation and foraging schedules ultimately affect breeding success and sometimes disturbance may even cause failure of whole colony due to inability to initiate nesting[1, 2, 3,.]

An annotated checklist of birds of western Maharashtra including Solapur district was compiled by many workers[4, 5, 6, 7.] This study was undertaken to investigate the possible impact of anthropogenic disturbance in a grassland patch with previous records of critically endangered Indian bustard (*Ardeotis nigiceps*) in the surrounding areas. In view of this recent change our investigation focused on population and breeding status of some native and migratory birds, their microhabitat preferences, nesting and danger to ground nesting avifauna. This study explores for the first time the detailed breeding biology of lark species from this area.

Methodology

Study site

Study was conducted in one sq. km. area (Fig. 1) of unprotected grassland 07 kms south of Solapur city (site17^{0}36'50.14"N and 75^{0}53'01.32"E). The region lies in Biogeographic Zone 6 (Deccan peninsula), Province 6B (Chhota Nagpur) in India[8.] The plateau is at an average elevation of 470 m above sea level. The soil type in this area is predominantly laterite and black volcanic, basaltic type. The terrain shows general undulating pattern with hills having gentle slopes. The average temperatures vary between 15^0 C in winter to 44^0 C in summer. The average rainfall in this region is between 600-635 mm, with humidity averaging at 60%. The vegetation of the area is classified as Type 6 -Tropical Thorn Forest, Subgroup 6A/C1 – Southern Tropical Thorn Forest[9.] The region is dominated with *Acacia, Mimosae* and *Zizyphus*. The canopy height averages between 6 m to 12 m. The region has extensive patches of grassland with intervening bare grounds covered with exposed rocks and stones.

Survey Methodology

Monthly surveys were conducted from July 2010- July 2011 to record the population trends of birds. Surveys were carried between 07:30 to 11:30 during morning hours using point counts. Point count consisted undertaking a 10-minute count of all terrestrial birds seen or heard in a radial distance of 50 m from the center. All surveys were performed on clear days with clear visibility. The counts of breeding pairs of birds was performed during breeding season which normally extends from late February till late October, with peaks in the months of March-May. Birds were identified using 7 x 35 DPS I Olympus binocular. Breeding birds were counted using digital photographs of incubating birds, eggs and juveniles taken with digital cameras with zoom

lenses (SONY DSC H2 and NIKON P100) from a distance of 20-50 m. without intentionally disturbing the bird. The population & breeding status of birds is based on one year data (Table 1).

Results and Discussion

A total of 65 bird species belonging to 30 families were recorded. The ratio of resident to migratory bird species was observed to be 87.69**:**12.31. Insectivorous group dominated with 49 % species followed by granivorous (20 %), Omnivorous (14 %), Carnivorous (12 %), Frugivorous (3 %), and nectarivorous (2 %) (Table.2 and Fig. 2). A total of 09 ground nesting bird species were recorded. Yellow Wattled-lapwing with 28 nests and 46 Juveniles and Ashy-crowned Sparrow Lark with 26 nests and 11 juveniles dominated the breeding area (Table 3, Fig. 3). Only one nest was observed of Eurasian Thick-knee (*Burhinus oedicnemus*) and is probably the first breeding record from Solapur city. The breeding cycle of ground nesting birds begins from last week of February and extends till the end of October. The breeding cycle occurs in phases starting with Ashy Crowned Sparrow Lark (*Eremopteryx grisea*) and Chestnut-bellied Sandgrouse (*Pterocles exustus*) followed by Rufous Tailed Lark (*Ammomanes phoenicurus*), Yellowed-Wattled Lapwing (*Vanellus malabaricus*), Indian Courser (*Cursorius coromandelicus*) and Green Bee-Eater (*Merops orientalis*). The breeding activity of Indian Bush Lark (*Mirafra cantillans*) and the Sykes's lark coincides with the onset of monsoon in the month of June and July and extends till the end of October with reducing incidences of sighting of nest. We failed to sight the nests of Chestnut-bellied Sandgrouse and Indian Courser, but the juveniles and sub adults of both species were noted during our study.

The present investigation emphasizes the need to focus and conduct a detailed long term study on the impact of urbanization on the avifauna to understand in more details the neglected avifauna from grassland ecosystem. Species like Indian bustard require very small grassland patches for their daily movement for feeding, mating display and breeding purposes. Some threatened migratory species of birds such as pallied harrier (*Circus macrourus*) and Montagu's Harrier (*Circus pygarus*) were also reported in the study area and the recent data suggests a decreasing population trend for these species. Our results suggest that even small patches of grassland are faunal repositories and play significant role in the dynamics of ecosystem and hence, they need to be protected for sustainable conservation of grassland ecosystem.

Conclusion

The study area is under unprecedented burden of urbanization activities. The grassland patch regularly experiences incidences of human induced fire during summer season. The poaching and predator pressure is also high as it is easier for the predators and poachers to sight the breeding birds. The original soil pattern of the study site is modified by the rodents. We have recorded more than 40 large earthen holes of bandicoot rat, making the soil unfit for the original grassland used by ground nesting birds for the breeding and nesting purposes. With continued modifications the area may lose its microhabitat value, ultimately affecting the population and breeding ecology of grassland birds in future. The study site had previous records of Critically Endangered Indian Bustard (*Ardeotis nigriceps*) but there are no recent records clearly indicating negative impact on avifauna. Our study clearly shows that some medium and small sized birds congregate in small patches if suitable habitat features are available. In our study the lapwings, coursers, Eurasian Thick Knee, and many lark species breed successfully even under high anthropogenic pressures. Larks are more sensitive to disturbance and suffer maximum nest predation and loss of egg and juveniles. This study clearly shows that some species adapt very well with changing habitat features while some bird species like great Indian Bustards get immediately affected and never show any signs of return to the disturbed habitat site. The small suitable grassland patches may provide breeding sites for many ground nesting birds but the intra and inter-specific competition which they are exposed also puts lot of pressure and determines their breeding success which needs further detailed investigation.

Table.1. The average number of each bird species, no. of nest, juveniles, their feeding habits and residential status recorded during one year study period from July 2009 to July 2010. (Abb.:- C-Carnivorous, F- Frugivorous, I-Insectivorous, G- Granivorous, N- Nectarivorous, R- Resident, M-Migratory).

Common Name	Mean number of birds cited in a year	No. of Nests	No. of Juveniles	Food Habits	Residential Status
Grey Francolin	12	0	0	O	R
Common Quail	20	0	0	O	R
Rock Bush Quail	35	0	0	O	R
Indian Peafowl	05	0	0	O	R
Coppersmith Barbet	4	0	0	O	R

Indian Grey Hornbill	6	0	0	F	R
Common Hoopoe	4	0	0	I	R
White Throated Kingfisher	3	0	0	I	R
Green Bee-eater	34	15	37	I	R
Pied Cuckoo	3	0	0	I	R
Asian Koel	4	0	0	I	R
Lesser Koucal	6	0	0	I	R
Rose Ringed Parakeet	6	0	0	F	R
Spotted Owlet	8	0	0	C	R
Indian Nightjar	4	0	0	I	R
Rock Pigeon	57	0	0	G	R
Laughing Dove	22	0	0	G	R
Eurasian Collared Dove	11	0	0	G	R
Chestnut-bellied Sandgrouse	28	0	8	O	R
Indian Courser	27	0	2	I	R
Eurasian Thick-knee	2	1	0	I	R
Yellow-wattled Lapwing	69	28	46	I	R
Red-wattled Lapwing	22	2	3	I	R
Black-shouldered Kite	5	0	0	C	R
Black Kite	2	0	0	C	R
Pallied Harrier	3	0	0	C	M
Montagu’s Harrier	2	0	0	C	M
Shikra	4	0	0	C	R
Short-toed Snake Eagle	1	0	0	C	R
Common Kestrel	1	0	0	C	R
Cattle Egret	29	0	0	I	R
Indian Pond Heron	12	0	0	I	R
Black Ibis	8	0	0	I	R
Wooly-necked Stork	2	0	0	O	R
Bay-backed Shrike	4	0	0	I	R
Long-tailed Shrike	8	0	0	I	R

House Crow	6	0	0	O	R
Large Billed Crow	2	0	0	O	R
Eurasian Golden Oriole	7	0	0	I	R
Black Drongo	27	0	0	I	R
Common Iora	8	0	0	I	R
Indian Robin	5	0	0	I	R
Common Stone Chat	8	0	0	I	M
Pied Bushchat	12	0	0	I	R
Brown Rock-chat	6	0	0	I	R
Brahminy Starling	9	0	0	I	R
Common Myna	18	0	0	I	R
Red-vented Bulbul	25	0	0	I	R
Plain Prinia	16	0	0	I	R
Ashy Prinia	22	0	0	I	R
Common Tailor Bird	8	0	0	I	R
Large-grey Babbler	33	0	0	I	R
Indian Bush Lark	14	2	4	G	R
Ashy-crowned Sparrow Lark	64	26	11	G	R
Rufous-tailed Lark	14	0	2	G	R
Sykes’s lark	12	1	1	G	R
Purple Sunbird	8	0	0	N	R
House Sparrow	26	0	0	G	R
Yellow Wagtail	17	0	0	I	M
Paddy-field Pipit	2	0	0	I	R
Baya Weaver	17	0	0	G	R
Indian Silverbill	32	0	0	G	R
Scaly-breasted Munia	13	0	0	G	R
Black-headed Bunting	22	0	0	G	M
Red-headed Bunting	18	0	0	G	M

Table 2: The status of ground nesting birds.

Ground Nesting Bird Species	**Nest no.**	**No. of Juveniles (Juv.) / sub adults**
Green Bee-eater	15	37
Eurasian Thick-knee	1	0
Yellow-wattled Lapwing	28	46
Red-wattled Lapwing	2	3
Indian Bushlark	2	4
Ashy-crowned Sparrow Lark	26	11
Sykes's Lark	1	1
Sandgrouse	0	12
Indian Courser	0	5

Table 3: The feeding habits of birds recorded from study site:

Feeding Habit	**No. of Birds**	**Percentage (%)**
Carnivorous (C)	08	12.3
Frugivorous (F)	02	3.07
Omnivorous (O)	09	13.84
Granivorous (G)	13	20
Insectivorous (I)	32	49.2
Nectarivorous (N)	01	1.53
Total	**65**	**100%**

Figure 1. Map of Study Site

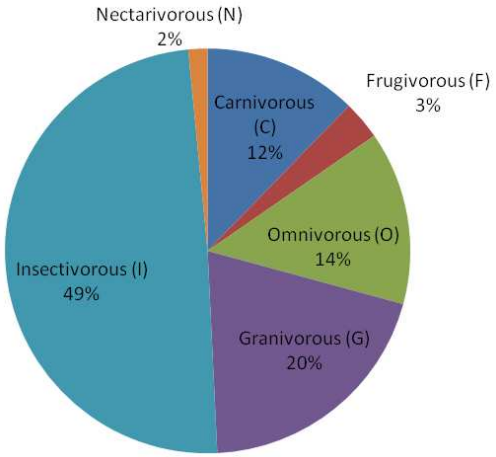

Figure 2: Percentage classification of avifauna from study sites based on feeding habits

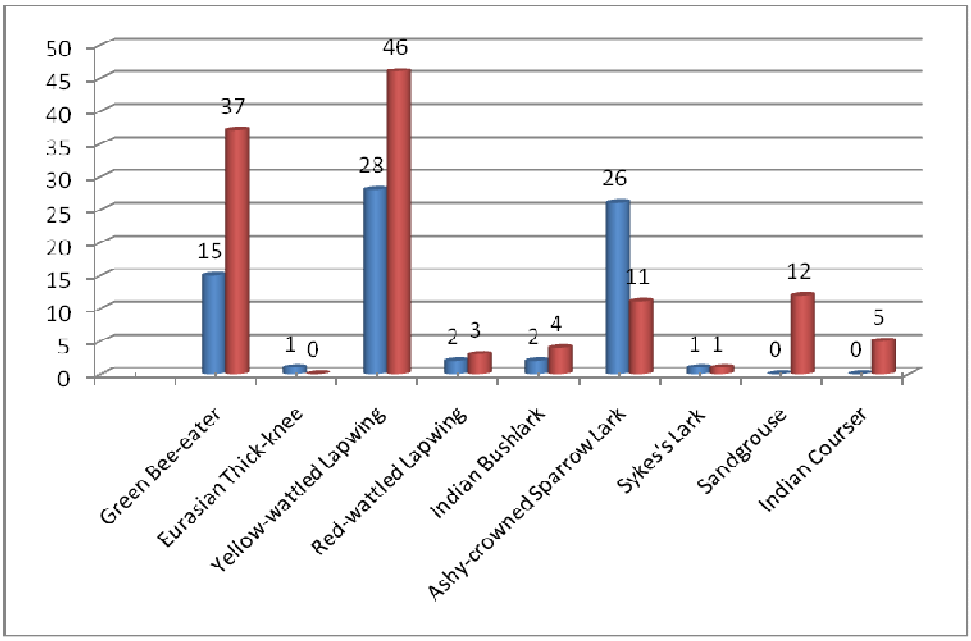

Figure 3: Breeding status of avifauna from study site showing no. of nest and juveniles

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DIVERSITY OF BEETLES (INSECTA: COLEOPTERA) IN AND AROUND AMBA RESERVE FOREST, WESTERN GHAT, KOLHAPUR

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Abstract

In the present communication, concerted efforts were made to study diversity of beetles in and around Amba Reserve Forest of Kolhapur District Maharashtra. Incidentally, the study region is a part of Western Ghats which is included in hottest hotspots of the world. During the present surveys and collection a total of 152 species distributed over 101 genera belonging to 25 families of beetles were recorded. The Shannon-Weaver (2.29) and Simpson Diversity Indices (0.79) revealed rich diversity and abundance in the region under study.

Keywords: beetles, diversity, Amba Reserve Forest, Western Ghats

Introduction

Arthropods and insects in particular, are the most species rich group of organisms on the planet. They dominate every major terrestrial biome and are responsible for many essential ecosystem processes[1]. Order Coleoptera is enormously rich in species and wide spread in many terrestrial and freshwater environments throughout the world. Almost all biologists are well familiar that beetles are the most diverse in all animal groups, with 3,50,000 described species[2] and approximately 15,088 species were recorded from India[3].

With reference to Coleoptera, excellent faunal treatises have been prepared by Horn who described fifteen new species from Kerala[4], by Gahan[5] and Fowler[6] on Cicindelidae describing fifteen species. Jacoby[7] as well as Maulik[8] described thirty one and sixteen species of Chrysomelidae beetles, respectively. Stebbing[9] and Beeson[10] made an excellent treatment of economically important Coleoptera of the Indian sub continent. ZSI (1986) had undertaken four faunistic explorations in Silent Valley National Park wherein one hundred twenty eight species of Coleoptera have been recorded including ten new species[11]. Pearson and Ghorpade made emphasis on geographical distribution and ecological history of tiger beetles of the Indian subcontinent[12]. The biological value that insects provide by means of ecological services has been estimated at 57 billion US dollar per year in USA alone[13]. On the other hand, in the faunal surveys of Western Ghats, importance has been given on vertebrate diversity and their endemism related aspects only. According to Kunte *et al*[14]., our knowledge regarding invertebrate diversity in Western Ghats is very little, 330 species of butterflies were reported,

with 37 endemic species from Western Ghats. Beside this, according to Mathew and Rahamthulla[15], our knowledge on the insect diversity of Indian forests is largely based on earlier studies of pioneer workers like Hampson. Although, a series of revisionary studies have been subsequently carried out from different geographical regions, no exhaustive survey has so far been carried out specifically from the various forests. This is true particularly with regard to Western Ghats region which is noted for its richness in biodiversity.

Therefore, keeping in the mind above facts, in the present study intensive and extensive efforts were made to study beetle diversity of Amba Reserve Forest of Kolhapur District.

Materials and Methods

The present study was conducted for three years (2007-2009). Surveys and collection was done in morning (08.00-10.00 am) and evening (04.30-07.00 pm) at one month interval. Ground dwelling beetles were collected with the help of pit fall trap method[16]. As per need sweep net method was also utilized. In few instances beetles were handpicked. Scarabaeid beetles were collected as per the method of Lolage and Patil[17]. To achieve holistic profile of the beetles collection and preservation was done as per[18] ZSI[17] and Gadagkar *et al.*[19]. Identification was done with available literature[4,5,7,8,20-22]. All members of scarabaeidae were got identified from Dr. V. V. Ramamurthy, Scientist, IARI, New Delhi. The classification adopted by Brues and Melander[23] with slight modification suggested by Gillot[24] is followed in the present study.

Data Analysis

For calculating the diversity indices Shannon-Weaver Index[25] and Simpson Index[26] formulae were used.

1. Shannon-Weiner Index

$$H = -\sum_{i=1}^{S} p_i \ln p_i$$

Where,

Pi is the proportion of the ‘ith’ species in the community,

‘S’ is the total number of species,

‘ln’ is the log with base ‘e’ [27].

2. Simpson Index

$$D = \sum_{i=1}^{S} \frac{n_i(n_i - 1)}{N(N-1)}$$

Where, n is total number of organisms of a particular species,

N is the total number of organisms of all species

Study Region

Amba Reserved Forest

Amba Reserved Forest ($15^0$43' to $17^0$10' north and longitude $73^0$40' to $74^0$42' east and 691.3 meters above Mean Sea Level) is situated between North-West directions of Kolhapur District. It is a tropical semi evergreen forest of Western Ghats. The geographical area is 318.16 ha. The average annual rainfall is 6000 mm. Temperature of this region during summer, winter and rainy Season ranges from 25-38^{0}C, 10-30^{0}C and 15-30^{0}C, respectively. Red brown soil is observed in the study region.

Results and Discussion

During the present surveys and collection in all 152 species distributed over 101 genera belonging to 25 families of beetles were recorded. Out of 152 species 134 are common (* marked) and remaining 18 are rare (** marked). Family Scarabaeidae was found to be dominant with 65 species whereas family Cerambycidae ranked second with 18 species. Families Curculionidae and Chrysomelidae contained 11 and 7 species respectively, whereas families Tenebrionidae, Histeridae and Buprestidae contained 5 species each. Remaining families contained 1-4 species (Table 1). Shannon-Weaver Index registered 2.29 whereas calculated Simpson Index was 0.79. Both the values have reflected diversity and abundance of beetles in the region under study.

From the listed number of species, 15 species are predators (! marked), 2 species were found damaging to the fruits (+ marked), 2 species can be utilized for drug production (# marked), 19 species are leaf eaters (## marked), 2 species are leaf rollers (@ marked), 11 species are stem and root borers and bark feeders (• marked) and 4 species are sap suckers and flower feeders (¥ marked).

The results of the present study (152 species of 101 genera belonging to 25 families) are in agreement with Kazmi and Ramamurthy[3] who encountered 99 species belonging to 60 genera under 13 families of Coleoptera from Thar desert of Rajasthan. Chandra[28] enlisted 94 species of scarabaeid beetles from Madhya Pradesh. In the present study 65 species of Scarabaeids were enlisted. Kalaichelvan and Verma[29] surveyed and collected 95 species of leaf beetles from Bhilai-Durg, Central India whereas present survey revealed 19 species of leaf eaters. Tara *et*

al.[30], recorded 9 species of weevils from Samba District (J & K) while present inventory contained 11 species of weevils. Feroz and Tara[31] conducted faunal survey of families Carabidae and Tenebrionidae and reported 4 and 3 species each from Kargil of J & K. The present study also showed similar trend of both families.

Conclusions

The data revealed will be addition to our knowledge of insect biodiversity of Western Ghats. It also provides baseline data for upcoming researchers and gives wide scope for further study.

Table 1 : List of Beetles collected from Amba Reserve Forest Western Ghats region of Kolhapur District

Order: Coleoptera
Family: Cicindellidae
1. Cicindela sexpunctata Fabricius*!
Family: Carabidae
1. *Anthea sexguttata* Fabricius**!
2. *Chloenius sp.* **!
3. *Eudema sp.* **!
4. *Morio sp.* **!
Family: Dytiscidae
1. *Cybister confuses* Sharp*!
2. *Cybister tripunctatus* Oliver*!
Family: Gyrinidae
1. *Dinutes indicus* *
Family: Hydrophilidae
1. *Copelatus indicus* Sharp*!
2. *Hydrophilus olivaceous* **!
3. *Sandracottus dejeani**!
Family: Staphylinidae
1. *Staphylinus sp.* *
Family: Histeridae
1. *Hister bipustulatus* Schrank*!
2. *Hister Javanus**!
3. *Hister lutarius**!
4. *Hister melanarius* Emery*!
5. *Hister sp.* *!

Family: Lampyridae
1. *Lamprophorus tardus**
Family: Buprestidae
1. *Psiloptera fastuosa* Fabricius*
2. *Psiloptera orientalis* Fabricius*
3. *Psiloptera chrysis* Fabricius*
4. *Sternocera orientalis* Herbs*
5. *Sternocera laevigata* Oliver*
Family: Elateridae
1. *Agrypnus fuscipes* Fabricius*
2. *Melanotus fissilis* Say*
Family: Dermistidae
1. *Trogoderma granarium* Everts*
Family: Nitidulidae
1. *Carpophilus lugubris* Murray*+
Family: Cucujidae
1. *Cryptolestes sp. **
2. *Oryzaephilus surinamensis* Linnaeus*
Family: Coccinellidae
1. *Coccinella septempunctata* Linnaeus*
2. *Coccinella transversalis* Fabricius*
3. *Illieis cincta* Fabricius*
4. *Menochilus sexmaculatus* Fabricius*
5. *Menochilus sp. **
Family: Meloidae
1. *Mylabris postulata* Oliver#
2. *Mylabris sp.*#*
Family: Tenebrionidae
1. *Platynotus belli* Fairmaire*
2. *Platynotus sp. **
3. *Tenebrio molitor* Linnaeus*
Family: Bostrichidae
1. *Rhizopertha dominica* Fabricius*
2. *Rhizopertha sp. **
3. *Sinoxylon atratum* Lesne*
4. *Sinoxylon sp. **

Family: Anobiidae
1. *Lasioderma serricorne* Fabricius*
2. *Stegobium paniceum* Linnaeus*
Family: Scarabaeidae
1. *Adoretus sp.*##
2. *Adoretus sp.*##
3. *Anatona stillata* Burmeister*¥
4. *Anomala bengalensis* Blanchard*##
5. *Anomala dimidiate* Hope. *
6. *Anomala dorsalis* Fabricius*
7. *Anomala lineatopennis* Blanchard*##
8. *Anomala ruficapilla* Burmeister*
9. *Anomala varicolor* Gyllenhal*
10. *Anthracophora crucifera* Oliver*
11. *Aphodius sp.* *
12. *Aphodius sp.* *
13. *Apogonia sp.***##
14. *Bolboceros nigricans* Westwood*
15. *Brahmina crinicollis* Burm. *
16. *Brahmina sp.***##
17. *Cantharcius biramensis* Regan*
18. *Cantharsius pithecus* *
19. *Chiloloba orientalis* D & R*¥
20. *Chironitis arrowi* Janssens*
21. *Clinteria sp.*** ¥
22. *Copris repertus* Walker*
23. *Copris sp.**
24. *Drapanocerus setosus**
25. *Glycyphana horsefieldi* Hope*
26. *Helicopris tyranus* Thomson*
27. *Helicorpis bucephalus* Fabricius*
28. *Holotrichia fissa* Brinske*##
29. *Holotrichia karschi**##
30. *Holotrichia serrata* Fabricius*##
31. *Holotrichia sp.**##
32. *Hybosorus orientalis* Westwood*

33. *Hybosorus sp.* *
34. *Leucopholis lepidophora* Blanchard*
35. *Liatongus rhadamistus* Fabricius*
36. *Maladera sp.* *##
37. *Maladera sp.*##
38. *Maladera sp.*##
39. *Maladera sp.*##
40. *Mimela vernate***
41. *Onitis philemon* Fabricius*
42. *Onitis sp.* *
43. *Onitis sp.* *
44. *Onthophagus acaticollis**
45. *Onthophagus agnus* Scriba*
46. *Onthophagus amplexus* Sharp*
47. *Onthophagus catta* Fabricius*
48. *Onthophagus cervus* Fabricius*
49. *Onthophagus dama* Fabricius*
50. *Onthophagus longicornis* Frey*
51. *Onthophagus nasalis* Arrow*
52. *Onthophagus pectolus* Fabricius*
53. *Onthophagus uniforciatus**
54. *Oryctes rhinoceros* Mac Leay*
55. *Oxycetonia versicolor* Fabricius*¥
56. *Phalops divisus* WieDemann*
57. *Phyllognathus Dionysius* Forster*
58. *Prodoretus sp.**
59. *Rhomborrhina glaberrima* Westwood*##
60. *Rhyniptia indica**
61. *Rhyniptia sp.* *
62. *Scarabaeus sp.**
63. *Sisyphus neglectus* Gory**
64. *Synapsis gelleti* **
65. *Xylotrupes giedon* Linnaeus**
Family: Cerambycidae
1. *Acalolepta nivosa* White**
2. *Acanthophorus serraticornis* Oliver*

3. *Aeolesthes holosericea* Fabricius*•
4. *Batocera numitor* Newman*•
5. *Batocera rubra* Linsley*•
6. *Batocera rufomaculata* DeGeer*•
7. *Cerosterna scabrator* Fabricius*•
8. *Coptops aedificator* Fabricius*•
9. *Glenea multiguttata* Guerin-Meneville**•
10. *Nyphasis apicalis***•
11. *Olenocamptus bilobus* Fabricius*•
12. *Priotyrranus mordax* White**
13. *Pterolophia sp.* *•
14. *Stibara nigricornis* Fabricius**
15. *Stromatium barbatum* Fabricius*
16. *Thylactus angularis* Pascoe**
17. *Xylotrechus subscutellatus* Chevr. *•
18. *Xystocera globosa* Oliver*
Family: Chrysomelidae
1. *Aspidomorpha milliaris* Fabricius*
2. *Aspidomorpha sp.* *
3. *Calopelpa leayana*##*
4. *Coptocycla sexpunctata* Boheman*
5. *Hispa sp.* *
6. *Platypriya andrewesi*##*
7. *Prioptera maculate* Fabricius*
Family: Curculionidae
1. *Apoderus sissu* Voss*@
2. *Apoderus transquebaricus* Fabricius*@
3. *Balanius album*+
4. *Cosmopolites sordidus* Germar*
5. *Crytotrachelus longimanus* Fabricius*
6. *Mylocerus fabrici* Fabricius*##
7. *Mylocerus undecimpustulatus* Faust*##
8. *Rhynchophorus ferrugineus* Olivier*
9. *Sitophilus granaries* Linnaeus*
10. *Sitophilus oryzae* Linnaeus*

11. *Sitophilus zeamais* Motsch*
Family: Bruchidae
1. *Bruchus sp.* *
2. *Bruchidius mackenziei* Kingsolver*
3. *Callosobruchus chinensis* Linnaeus*
4. *Callosobruchus maculates* Fabricius*
Family: Leucanidae
1. *Leucanus sp.* *
Family: Trogosiitidae
1. *Tenebroides mauritanicus* Linnaeus*

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BIODECOLRIZATION OF DIAZO DIRECT DYE CONGO RED BY*FUSARIUM SP.* TSF-01

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Abstract

Azo dyes represent the largest class of synthetic organic colorants listed in the colour index. Many synthetic dyes are toxic, mutagenic or carcinogenic. Congo red is a carcinogenic, recalcitrant and complex diazo direct dye used commonly for the coloration in textile and paper industries. It was selected as model pollutant. The fungal stain *Fusarium sp.* TSF-01 isolated from textile wastewater sludge was screened for decolorization of Congo red. This strain has given 94.97 and 98.09 % decolorization of a recalcitrant dye, Congo red (100 mgL^{-1}) within 3 days at agitation and static condition, respectively. FTIR analysis revealed the degradation of Congo red by this isolate. This study revealed the enormous biodegradation abilities of indigenous microbial flora. *Fusarium sp.* TSF-01 is an efficient strain for the decolorization of azo textile dyes effluents.

Key words: Azo dyes, Congo Red, *Fusarium sp.* TSF-01, biodecolorization, FTIR

Introduction

Manufacture and use of dyes and pigments is a multibillion - dollar industry. The use of these substances is an integral part of almost all manufacturing processes. Dyes are widely used in industries such as textile, rubber, paper, plastic, cosmetic etc. Among these various substrates textile ranks first in usage of dyes for colouration of fiber. Textile industry is one of the most important industries and in the last few decades have generated a high volume of waste water and inturn released into the environment. Strong colour of textile wastewater is most serious problem of textile waste effluent. It is broadcasted that more than 60% of the dyes world production is consumed by textile industries.

Congo red (C.I. Congo red, M.W. 696.67 g mol^{-1} $C_{32}H_{24}N_6O_6S_2.2Na$) is one of the important sulfonated direct diazo dyes. It is a coloured substance having complex chemical structures and has high molecular weight. Chemically, it is sodium salt of benzidinediazo-bis-1-napthylamine-4-sulfonic acid. It is highly soluble in water and persists in the environment, once discharged into a natural aquatic media. Based on data from experimental animal studies the substance is presumed to be toxic. Congo red is benzidine based dye. As such it is expected to metabolize to benzidine which is known to be human carcinogen[1].

Although many physicochemical techniques of decolourization have been developed over the last 20 years, few have been implemented by the textile industries due to their high cost, low efficiency and inapplicability to a wide variety of dyes. A definitive solution of the colour problem of textile effluents would provide a marked competitive advantage for the industrial sector. Since no single process is able to decolorize all textile effluents, a solution for each

situation should be considered, possibly involving a combination of different methods. In recent years number of studies have been focused on some microorganisms capable of decolourizing a wide range of dyes include some bacteria, fungi and algae. The considerable advantages in use of microorganisms for removal of synthetic dyes from industrial effluent includes that the process is relatively inexpensive. It is a simple method. The running cost is low and the end products of complete mineralization are not toxic and ecofriendly.

Over the past decade, many fungal strains have been studied for their abilities to degrade a wide variety of structurally diverse pollutants. Most research on fungal capacities to purify polluted effluents has been performed on a laboratory scale, hence there is a need to extend such research to pilot scale and to apply it to industrial processes[2]. Recently, many studies have also demonstrated that fungi are able to degrade and mineralize a broad spectrum of different dye structures.

Keeping in view, above mentioned facts we have investigated the decolorization and degradation abilities of newly screened strain of *Fusarium sp.*TSF-01 for Congo red. The IR spectrum of Congo red after biological treatment with the tested organism was also studied.

Materials and Methods

Dyes and Chemicals

Congo red ($C_{32}H_{22}N_6Na_2O_6S_2$, M.W. 696.66g/mol) textile synthetic dye was purchased from Hi- Media. Dye solution was prepared by dissolving the dye in distilled water before each experiment. Nutrient media and all other chemicals were obtained from Hi media. Soil samples were collected from the nearby effluent disposal area of textile units located at Sunil Nagar and Neelam Nagar, Akkalkot MIDC, Solapur, MS, India.

1) Isolation of Fungal strains for decolourisation of Congo red

The collected soil samples were used for isolation of fungal strains capable of degrading dye by subjecting it to serial dilutions using sterile D/W. 0.1 ml aliquot from each dilution of 10^{-3} & 10^{-4} was spread inoculated on sterile modified Sabouraud's Dextrose agar plates containing dye with different concentrations (70 mg/L to 110 mg/ L). All plates were incubated at room temperature for 48-72 hours. Dye degradation ability of microorganisms was confirmed by presence of clear zone around the colonies.

2) Decolourisation studies of Congo red

Selected Fungal isolates from the primary screening were further screened at room temperature by using dyes containing modified Sabouraud's broth by shake flask culture

method. A concentration 100 mg/L of the reactive dyes used as final concentration in the study. The selected fungal cultures were inoculated and studied at static and shaking condition for 3 days and decolourising activity was measured on each day.

Measurement of decolourisation (Decolourisation assay)

Congo red decolourising activity was determined by measuring the decrease in the colour intensity as absorbency at 498 nm on each day. Percent decolourisation was calculated as:

$$\% \text{ Decolourisation} = \frac{\text{Initial absorbance} - \text{observed absorbance}}{\text{Initial absorbance}} \times 100$$

3) Biodegradation Analysis

Biodegradation of Congo Red into different metabolites was confirmed by FT-IR analysis[3].

FTIR analysis

Biodegradation of Congo red was monitored by FTIR spectroscopy. The treated Congo red dye was characterized by Fourier Transform Infrared Spectrometer (Perkin Elmer Spectrum 65) and compared with control (before treatment) dye. The samples were mixed with spectroscopically pure KBr in the ratio of 1:100 and pressed to obtain IR- transparent pellet. The pellet was placed in sample holder and the analysis was carried out in the mid IR region of 400-4500 cm^{-1} with 16 scan speed.

4) Identification of promising isolates

Molecular identification was carried out of this isolate based on 18s rRNA sequencing. The phylogenetic tree was constructed by using Neighbour joining method by Kimura – 2 parameter with 1000 replicates in MEGA 4.0.

Results

1) Isolation of fungal strains for the decolourisation of Congo red from soil samples

A total number of 12 fungal isolates were obtained from the collected soil samples for dye decolourisation study.

2) Primary screening of the fungal isolates for decolourisation of Congo red:

TSF-01 showed decolourisation activity and good amount of growth at different concentration of Congo red (70 mg/L to 100 mg/L). It is further seen that 110 mg/L concentration has not supported the growth of TSF-01 and decolourisation. Demonstration of the growth and decolourisation of Congo red at all concentrations used qualified TSF-01 isolate as a right candidate for the secondary screening and 100 mg/L as the final concentration of dye for further study.

3) Decolourisation of Congo red by TSF-01 isolate:

Results of the TSF-01 isolate for decolourisation of Congo red are shown in Figure 1and Table 1. It is seen that at shaking condition, TSF-01 isolate has brought about 94.97% decolourisation of Congo red within 72 hours of incubation period. It is further seen that TSF-01 isolate showed maximum growth and decolourisation upto 100 mg/L concentration of dye. It is also observed that TSF-01 isolate has brought about 98.09 % decolourisation within 72 h of incubation period at static condition. No further significant decolourisation was obtained on further incubation. This indicates that for maximum decolourisation, aeration of the medium is not mandatory. The isolate may be microaerophilc.

Table 1: Results of decolourisation of Direct Red 28 by TSF- 01 isolate at 100 mg/L concentration under Static & Agitation conditions at room temperature.

Isolate TSF-01	**% decolorization on**	**At Shaking condition**	**At static condition**
	1st day	76.43%	87.06%
	2nd day	79.77%	93.75%
	3rd day	94.97%	98.09%

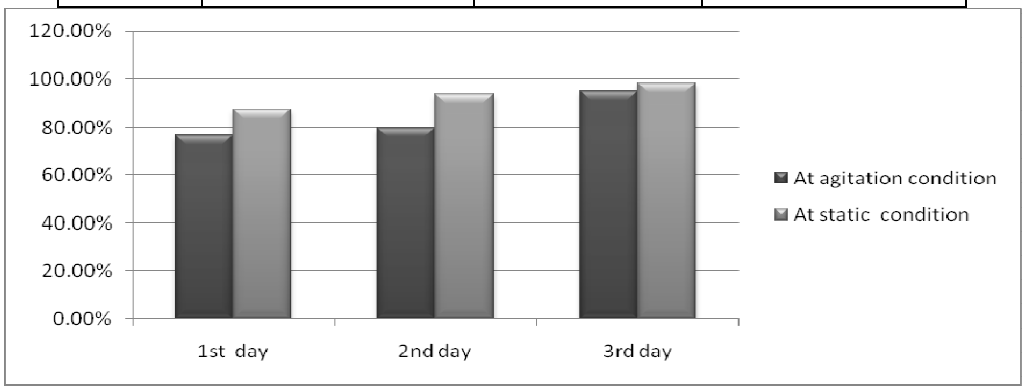


Figure 1: Percent decolourisation of Congo red byTSF-01 isolate at static & shaking condition.

5) Biodegradation analysis

The difference in FTIR spectrum of Congo red and metabolites obtained after its decolourisation revealed its biodegradation. The FTIR spectrum of Congo red showed specific peaks in fingerprint region for unsubstituted and multisubstituted naphthalene or benzene rings. This was supported by the peak at 639.96 cm^{-1} for C – H bending vibration, 644.66 cm^{-1} that corresponds to the C-C bending vibration, 695.28 cm^{-1} for C – H stretching vibrations for disubstituted aromatic compound, 721.09 cm^{-1} for CH_2 bending vibrations, 833.77 cm^{-1} corresponds to *P*- disubstituted ring vibrations, 1062.12 cm^{-1}, 1345.31 cm^{-1} for S = O stretching vibrations of sulfonic acid, 1446.41 cm^{-1} for aromatic C=C stretching vibrations, 1587.66 cm^{-1}

for N=N stretching vibrations, 1611.05 cm^{-1} stretching vibrations of C=C while 3465.09 cm^{-1} for NH stretching of NH_2 group(Figure 2 A).

The FTIR spectrum of metabolites obtained after decolourisation of Congo red showed peaks at 909.33cm^{-1} for C-C stretching vibrations, 1216.25 cm^{-1} for C-N stretching vibrations, 1463.32 cm^{-1} for CH_2 bending, 1673.98 cm^{-1} for C=O stretching vibrations, 2852.97 cm^{-1} for CH_2 symmetrical stretching vibrations and 2923.59 cm^{-1} for CH_2-O asymmetric stretching vibrations as in (Figure 2 B).The absence of peak at 1.587.66 cm^{-1} for N=N stretching vibrations in the FTIR spectrum of metabolites obtained after decolourisation of Congo red indicated the cleavage of azo bond.

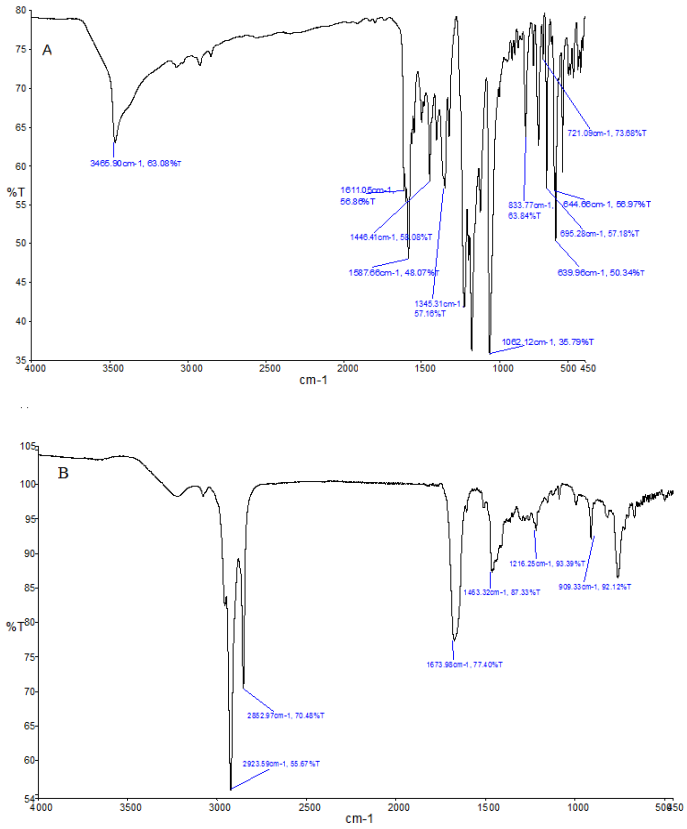


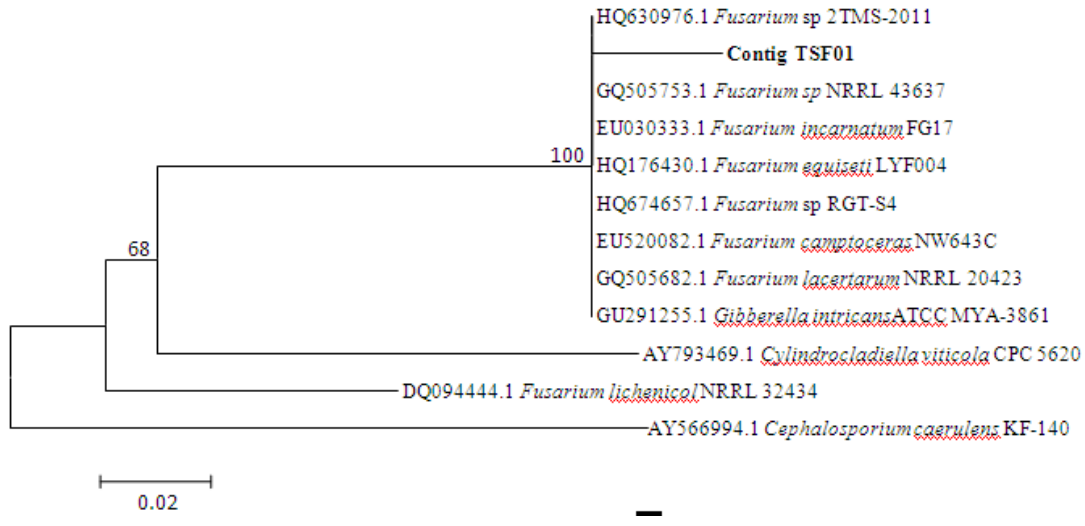
Figure 2: FTIR analyses of Congo red for biodegradation of Congo red By TSF -01 isolate – A) FTIR spectrum of control dye Congo red B) metabolites obtained after decolourisation of Congo red

4) Identification of TSF- 01 studied for decolourisation of Congo red

Molecular identification was carried out of this isolate based on 18s rRNA sequencing. The phylogenetic tree was constructed by using Neighbour joining method by Kimura – 2 parameter with 1000 replicates in MEGA 4.0 (Figure 3). According to sequencing similarities and multiple alignments the isolate TSF-01 was named as *Fusarium* sp.TSF 01. The partial

sequence of 18S rRNA of the isolate TSF-01 has been deposited into GeneBank under accession number HE663239. Figure 3: Phylogenic tree based on ITS region gene sequences showing relationships among strain TSF-01 and the most close type strain species of *Fusarium.* Numbers at nodes indicate percentages of bootstrap support based on a Neighbor-joining analysis of 1,000 resampled datasets. Bar 0.02 substitutions per nucleotide position.

Figure 3 : Partial sequence of of 18S rRNA of the isolate TSF-01



Discussion

Based upon these findings, it can be predicted that fungi present in the vicinity of discharged effluent possess a great potential for the use in bioremediation of textile dyes. Biodecolorization of Congo red by fungi has been investigated by a few authors. Dey *et al.*[4], have reported the Lignin Peroxidase-producing Brown Rot Fungus, *Polyporus ostreiformis*, and its comparative abilities for lignin degradation and dye decolorization and reported only 18.6% lignin from rice straw in 3 weeks but effected 99% decolorization of Congo red dye in 9 days. Shin Kim *et al.*[5], have reported 77% decolorization of Congo red by fungal strain *Pleurotus ostreatus*. Novotny *et al.*[6], have studied biodegradative ability of 103 strains of wood rot fungi. It is worth mentioning, however, that the diazo dye, Congo red appeared to be one of the dyes that was comparatively more resistant to degradation. *Irapex lactus* caused only 58% decolourisation of this dye during 14 days of investigation.The present study has revealed that

isolated *Fusarium sp. TSF-01* has brought about 94.97 % decolorization of 100 mg L^{-1} of Congo red at agitation condition while up to 98.09 % at static condition within 4 days.

Conclusion

The present study indicates that this isolate is an excellent strain for the decolorization of azo textile dyes effluents and it might be a practical alternative in dyeing wastewater treatment.

Acknowledgement

The authors would like to thank University Grant Commission, New Delhi, India for financial assistance through a research project and National Centre for Cell Sciences, University of Pune campus for the 18S rRNA sequencing of the isolate. Our sincere thanks to Principal, Walchand College of Arts and Science, Solapur for providing the Laboratory facilities.

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SEQUENCE ANALYSIS AND ANTIGENIC PREDICTION OF ALPHA AND BETA NEUROTOXIN IN SCORPION

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Abstract

Scorpion venom consists of numerous polypeptides which interfere with the activity of ion channels and modulate their functional properties. Scorpion neurotoxins that act on sodium channel are divided into two major class alpha and beta neurotoxin according to their mode of action and binding properties. The family alpha neurotoxin of *Mesobuthus tumulus* and beta neurotoxin of *Tityus serrulatus are* two toxins that represent distinct pharmacological classes. The study of alpha and beta toxin performed using various *in-silico* tools and technique to determine comparative analysis of the structure, antigensity and pharmacology of scorpion toxins affecting sodium channels sheds a new light on a putative evolutionary mechanism. It may further aid in the prediction of unknown toxic surfaces and perhaps facilitate the design of novel effectors of sodium channels using the highly conserved scorpion toxins.

Keywords: alpha neurotoxin, beta neurotoxin, *In-silico*, antigenic, sodium channel

Introduction

Scorpion venom consists of numerous polypeptides which interfere with the activity of ion channels and modulate their functional properties[1]. Venom polypeptides have different physiological and pharmacological activity[2]. Scorpion venom contains a number of proteins that are responsible for the neurotoxic activity. These proteins are divided into two large classes, depending upon their length. The short neurotoxins (<40 amino acid residues) are active on various potassium channels[3]. On the other hand, the long neurotoxins (60–70 amino acid residues) appear to function by affecting the activation or inactivation of the sodium channel[4]. The long-chain scorpion neurotoxins can be further subdivided into two classes, α and β toxins, on the basis of their effects on the sodium channel[5]. All long-chain neurotoxins have similar tertiary structures, consisting of an alpha helix of 2.5 turns, a three-strand antiparallel sheet, four disulfide bonds, and a conserved hydrophobic surface[6] .

Scorpion venoms contain sets of small basic proteins that are responsible for the neurotoxic activities of the venoms .The various constituents of the venom may act directly or indirectly and individually or synergistically to manifest their effects. Most α and β toxins affect mammalian and insect sodium channels with various affinities. However, two pharmacologically distinct toxin groups, excitatory and depressant, which affect exclusively sodium channels of insects, have been characterized[7]. In addition, differences in the amino acid sequence of each

toxin account for their differences in the function and immunology. These toxins display considerable variations in amino acid composition, but they generally consist of 60-70 amino acids and are cross linked by four disulfide bridges. Here, we study the sequence, structural and antigenic properties of two scorpion toxins to facilitate the design of novel effectors of sodium channels using the highly conserved scorpion toxins.

Materials and Methods

1) Protein Sequence Analysis

The sequences of **Neurotoxin BTN of *Mesobuthus tumulus* (Eastern Indian scorpion)** from alpha neurotoxin family **and Beta-mammal/insect toxin Ts7 of *Tityus serrulatus* (Brazilian scorpion) from beta neurotoxin family were retrieved**[8] from UniProtKB/ Swiss-prot database (http:// www.expasy.org/uniprot).

2) Physicochemical Analysis of Neurotoxins

Physicochemical composition of α and β neurotoxins were analyzed by using ProtParam analysis tool which on Expasy (http: //web. expasy. org/ protparam/). . The parameters like amino acid composition, molecular weight, therotical pI, Instability index, Grand average of hydropathicity were determined and tabulated[9].

3) Prediction of Protein Secondary Structure

The secondary structures of the α and β neurotoxin were predicted by using PSIPRED method[10]. Each residue is assigned values for alpha helix, beta sheet, and coils using a window o to 9 confidence levels.

4) Finding the location in Solvent Accessible Regions

Solvent accessible regions in both α and β neurotoxin was predicted by using PredictProtein prediction server[11]. This may be useful in predicting membrane-spanning domains, potential antigenic sites, and regions that are likely exposed on the protein surface.

5) Prediction of Antigenicity

Antigenicity of both α and β neurotoxin was determined using the Kolaskar and Tongaonkar method[12]. The predictions of the most likely antigenic region with residues, residue number and propensities were analyzed and tabulated. The accuracy of method is about 75% reported.

Results and Discussion

1) Protein Sequence Analysis

Alpha neurotoxin sequence from *Mesobuthus tumulus* **(P60277)** has 64 amino acids and beta neurotoxin sequence from *Tityus serrulatus* **(P15226)** has 84 amino acids sequence retrieved in FASTA format.

2) Physicochemical Composition Analysis

Physicochemical compositions of both α and β neurotoxin are analyzed by using ProtParam analysis tool. The amino acid residue composition analyzed is given in Table 1. As per the table, it is obvious that the molecular weight of β neurotoxin is higher than that of the neurotoxin α , further the theoretical pI illustrates that α neurotoxin is acidic and β neurotoxin being basic in nature. The Instability index calculated categorizes the α toxin as unstable and β as stable one.

Table 1: Amino acid compositions

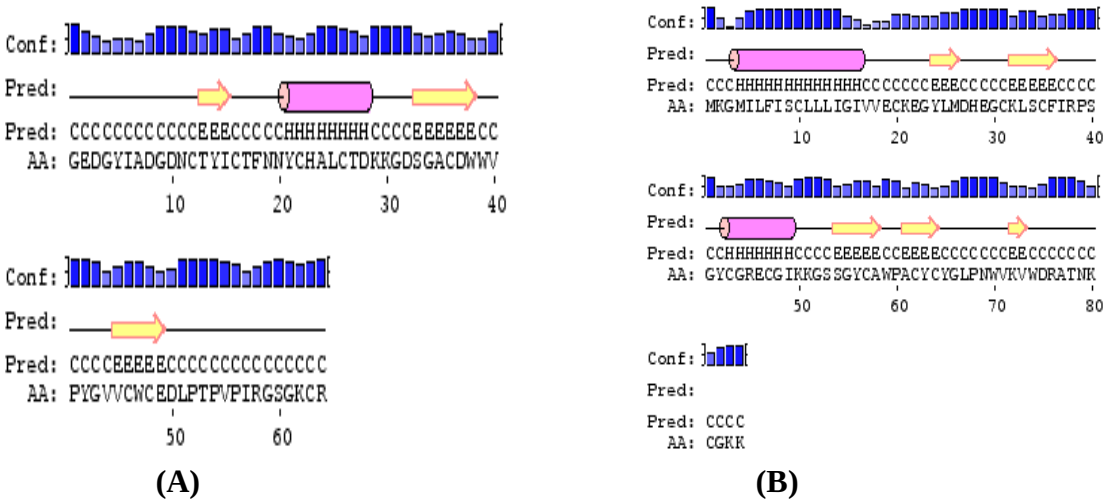
• Amino Acid	• Mesobuthus tumulus(alpha)	• Tityus serrulatus(beta)
• Number of amino acids	• 64	• 84
• Molecular weight	• 7040.8	• 9382.2
• Theoretical pI	• 4.47	• 8.84
• Instability index:	• 53.22(unstable)	• 33.79(stable)
• Grand average of hydropathicity	• -0.339	• 0.110

3) Secondary Structure Prediction

Secondary structure of the α and β neurotoxin is predicted by using PSIPRED method. Each residue is assigned values for alpha helix, beta sheet, and coils using a 0 to 9 confidence level residues was shows in Figure 1 and Figure 2. The numbers under each position are the confidence values for each prediction as calculated by the neural network and PSI –BLAST method. Comparison of secondary structures of α and β neurotoxin are tabulated in Table 2, according to which α neurotoxin has 1 helix, 3 strands and 5 coils region and β neurotoxin is composed of 2 helices,5 strands, 8 coiled regions.

Table 2: Composition of secondary structure by PSIPRED method

• Conformation	• *Mesobuthus tumulus*(alpha)	• *Tityus serrulatus*(beta)
• Helix(H)	• 12.5%(1)	• 23.8%(2)
• Strand(E)	• 21.8%(3)	• 22.6%(5)
• Coil(C)	• 62.5%(5)	• 53.5%(8)



(A) **(B)**

Figure 2: Secondary structure of A) α neurotoxin B) β neurotoxin

4) Finding the Solvent Accessible Region

By using the Predict Protein prediction server Solvent Accessible Region was predicted in both α and β neurotoxin. Solvent accessible region in α and β neurotoxin shows the hydrophobic and hydrophilic nature. A comparison of solvent accessible region β neurotoxin reveals that more buried and less exposed residue than the α neurotoxin .The accessible type such as buried and exposed residues are calculated as shown in Table 3.

Table 3: Composition of Solvent Accessible region in α and β neurotoxin

• Accessible type	• Mesobuthus tumulus(alpha)	• Tityus serrulatus(beta)
• B(buried)	• 23.44	• 34.52
• E(exposed)	• 76.56	• 65.48

5) Prediction of Antigencity

By using Kolaskar and Tongaonkar[12] antigenicity method the antigenic determinants was predicted by finding the area of greatest local hydrophilicity. The antigenic determinant plots of α and β neurotoxins are shown in figure 3 and 4, where x-axis shows sequence number and y-axis shows average antigenic propensity.

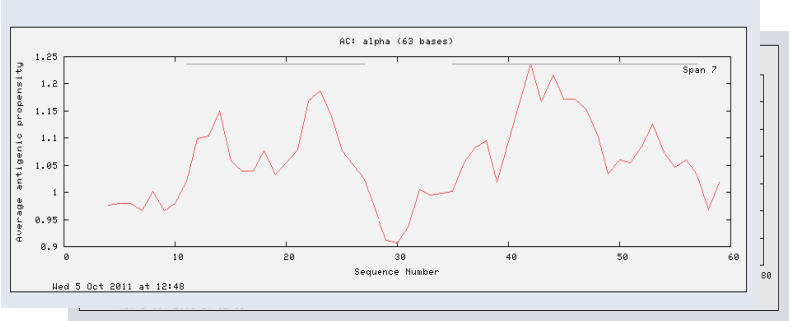


Figure 3: Plot of antigenic determinants of α neurotoxin

The average antigenic propensity of α neurotoxin being 1.0501. There are 2 antigenic determinants in sequence .Table 4 reveals two antigenic determinants at residue position 11-27 and 35-57.

Table 4: Antigenic position and sequence

o	Start Position	Sequence	End Position
	11	NCTYICTFNNYCHALCT	27
	35	ACDWWVPYGVVCWCEDLP TPVPI	57

Figure 4: Plot of antigenic determinants of β neurotoxin

The average antigenic propensity of β neurotoxin is 1.0636. There are 3 antigenic determinants in sequence. The Table 5 signifies there are 3 antigenic determinants in sequence at residue position 4-22, 29-45 and 53-73.

Table 5: Antigenic position and sequence

o	Start Position	Sequence	End Position
	4	MILFISCLLLIGIVVECKE	22
	29	EGCKLSCFIRPSGYCGR	45
	53	SSGYCAWPACYCYGLPN WVKV	73

Summary and Conclusion

The present preliminary investigations were mainly aimed to understand the basic primary and secondary structures of both α and β neurotoxins using various *insilico* tools and techniques. The primary structure illustrates that the α toxin has 64 and β toxin has of 84 amino acids. The secondary structure reveals, α toxin is made up of 1 helix, 3 sheets and 5 coiled regions, where as β comprises 2 helices, 5 sheets and 8 coiled regions, respectively. The physicochemical properties studied, depict that the α toxin is acidic and unstable, while β is basic and stable. Based on the solvent accessible regions, it was found that both the toxins are hydrophilic in nature. Further the antigenicity related studies upholds the fact that the possible number of antigenic determinants on α toxin are two, while β toxin has three potent antigenic determinants. The present work may further put more insights into detailed antigenicity related studies of these toxins, emphasizing their structure function relationship, and can pave a new approach to overcome the toxic effects by immune therapy and vaccine designing.

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ISOLATION AND CHARACTERIZATION OF BACTERIAL ISOLATES FROM THE GUT OF DUNG BEETLE INSECT AND THEIR APPLICATION FOR DEGRADATION OF DICHLORODIPHENYLTRICHLOROETHANE (DDT)

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Abstract

Dung beetles are major component of biological control of dung as well as pests, parasites and mosquitos. In this study, the potential for biodegradation of DDT through enrichment and isolation of DDT biodegraders from digestive system of microflora of dung beetles without a history of prior exposure to DDT was done. Microorganisms grew in minimal media with DDT (100 ppm) as the only carbon source. Twelve bacteria were isolated from DBA (*Xylotrapes giedon*) coded as isolates DBA 1-12 and ten bacteria isolated from DBB (*Chironitis arrowi*) coded as isolates DBB 1-10. The DDT degradation was quantified by the enrichment cultures places degrading DB-A6- 22.2% DB-A8- 30.5%, DB-B6-33.3%, DB-B9 – 69.4% in 14 days. Out of the four isolates that were capable of degrading DDT, the two (DB-B 6 and DB-B9) that degraded the highest amount of DDT were founded-A 6 and DB-A8, these promising DDT degrading isolates were tentatively identified as the Serratia *spp*. while DB-B6 and DB-B9 were identified as the *Bacillus* and *Pseudomonas* spp.

Keywords: Dung beetle, DDT, Biodegradation, *Xylotrapes giedon, Chironitis arrowi* bacterial isolates.

Introduction

Dung beetles (Coleoptera: Scarabaeidae) are a major component of the biological, control of dung, as well as the pests and parasites which use dung as a breeding ground (Fincher 1973). DDT is still one of the first and most commonly used insecticides for indoor residual spraying because of its low cost, high effectiveness, persistence and relative safety to humans[2]. The aim of this research was to isolate and characterize microorganisms that could biodegrade DDT from the microflora of digestive system of dung beetle (*Xylotrapes giedon and chironitis arrowi*). Knowledge of the genetics, physiology and biochemistry of these microbes could further enhance the microbial process to achieve bioremediation of DDT with precision and in a short time. The standard method for isolating microorganisms with the ability to degrade environmental pollutants has not been very successful for the isolation of microorganisms that can mineralize DDT. A novel approach for isolating DDT degrading microorganisms is to screen alternative sources like digestive system of dung beetle.

Materials and Methods

Materials

Live adult dung beetles were collected at Smruti Udyan Solapur, Siddheshwar van vihar Solapur, MS, India between August and September 2011. The captured insects were placed into empty plastic (160mm x 130mm x 130mm) containers.

DDT was obtained from Municipal Corporation. All other chemicals and cultural media were purchased from HiMedia laboratories Pvt. Limited, India. All the solvents and reagents used were of high purity grade.

A **B**

Figure 1 : *Xylotrapes giedon* and B) *Chironitis arrowi*

Methods

1) Collection and maintenance of dung beetle (Coleoptera: Scarabaeidae)

The insects were breed in an insectry room on a plastic (160mm x 130mm x 130mm) containers that were half filled with slightly moist soil and cow dung. After every 3 – 4 days, fresh cow dung was placed in the container. These dung bettle varieties were identified as *Xylotrapes giedon* and *Chironitis arrowi* by referring the record of zoological survey of India, Silent valley National park special issue[3].

2) Dissection of the dung beetle sample of *Xylotrapes giedon* and *Chironitis arrowi*

The dissection method of Lemke *et al.*[4], was used with some modifications. A preparation dish filled with wax was sterilized leaving it for 24 hours covered with 70% ethanol. The dish was then placed in a laminar flow cabinet 2 hours prior to dissection to allow the

ethanol to evaporate completely. Steel pins, forceps and scissors were sterilized by autoclaving for 15 minutes at 121ºC. Insect Ringer solution (0.9 g NaCl, 0.02g $CaCl_2$, 0.02g KCl and 0.02g $NaHCO_3$) was prepared and autoclaved for 15 minutes at 121ºC.

The adult dung beetles of both varieties were used for all the experiments and all the dissections were done in a laminar flow cabinet. The beetle was then fixed with steel pins, with the beetle on its sides, in a preparation dish filled with sterile insect ringer solution. After dissection the digestive system of the insects was inoculated in sterile 0.85 % saline to prepare its suspension separately. These prepared suspensions were separately inoculated in 100ml sterile Nutrient broth in 250 ml capacity Erlenmeyer Conical Flasks for the enrichment of the gut microbes. These flasks were labeled as DBA for insect sample of *Xylotrapes giedon* and DBB for *Chironitis arrowi.* These flasks were incubated at room temperature on rotary shaker at 150 rpm, for the enrichment of microorganisms for 24-48 hrs.

Figure 2

Figure 3

Figure 2: Dissected digestive system of *Xylotrapes giedon*
Figure 3: Dissected digestive system of *Chironitis arrowi.*

3) Isolation and characterization of bacteria from the enriched samples

The bacterial isolates were obtained from the enriched, 0.1 ml. serially diluted samples by inoculating it on the sterile Nutrient Agar plates and these were incubated at room temperature for 24 - 48 hrs. After incubation the well isolated colonies based on its morphological characters were separated and preserved at 4^0C for further use. Each isolate was further studied for cultural and biochemical characteristics.

4) Primary screening of the obtained bacterial isolates for the degradation of DDT:

All bacterial isolates were spot inoculated on sterile Omeliansky's Agar containing 100 ppm concentration of DDT as sole carbon source and these plates were incubated at room

temperature for 5-7 days. Upon incubation, culture media showing the growth of the isolates were selected for the biodegradation study of DDT.

5) Biodegradation analysis of the DDT by using screened isolates:

Aliquots of 1.0 ml from actively growing pure culture of each selected isolate were inoculated separately in Omeliansky's broth in which 100 ppm DDT was added and incubated for 14 days at 30°C on rotary shaker at 150 rpm. Uninoculated medium with DDT and inoculated medium without DDT were used as controls. Turbidity and concentrations of DDT were measured after 14 days spectroscopically at 600 nm. Isolates that grew in the medium and reduced the concentration of DDT in the medium were judged to be biodegrading DDT.

6) Identification of promising bacterial isolates:

The bacterial isolates carried out degradation of DDT were tentatively identified from the cultural, Gram nature, motility and biochemical characteristics, according to Bergey's manual of Determinative Bacteriology.

4) RESULTS AND DISCUSSION

Table 1: Results of morphological characteristics of bacterial isolates obtained from DBA sample

Isolate No.	Size	Shape	Colour	Margin	Opacity	Consistancy	Elevation	Gram nature	Motility
DB-A1	1.5cm	Irregular	White	Irregular	Translucent	Smooth	Flat	Gram negative bacilli	Motile
DB-A2	3 mm	Circular	White	Regular	Translucent	Smooth	Convex	Gram negative cocco bacilli	Motile
DB-A3	1 mm	Circular	Creamy yellow	Regular	Translucent	Smooth	Convex	Gram negative cocco bacilli	Motile
DB-A4	6 mm	Circular	White glistening	Regular	Opaque	Moist	Convex	Gram negative cocco bacilli	Motile
DB-A5	2 mm	Circular	Whitish	Regular	Translucent	Smooth	Convex	Gram negative cocco bacilli	Motile
DB-A6	1.2cm	Circular	Cherry red	Regular	Opaque	Sticky	Convex rugose	Gram negative cocco bacilli	Motile
DB-A7	5 mm	Irregular	White	Wavy margin	Translucent	Smooth	Flat	Gram negative bacilli	Motile
DB-A8	6 mm	Irregular	White Faint pink	Regular	Opaque	Moist	Elevated	Gram negative cocco bacilli	Motile
DB-A9	4 mm	Circular	Pale yellow	Regular	Translucent	Moist	Raised	Gram negative bacilli	Motile
DB-A10	4 mm	Irregular	White	Irregular	Translucent	Smooth	Flat	Gram negative cocco bacilli	Motile
DB-A11	8 mm	Circular	Cherry red	Regular	Opaque	Smooth	Convex	Gram negative cocco bacilli	Motile
DB-A12	3 mm	Circular	Cherry red	Regular	Opaque	Smooth	Flat	Gram negative bacilli	Motile

Results:-

1) Isolation of bacterial cultures From *Xylotrapes giedon (*DBA*):*

A total no. of 12 bacterial isolates was obtained in pure culture form from the enriched sample of *Xylotrapes giedon* insect digestive system. All the cultures were studied for colony characters, Gram nature, and motility and biochemical characteristics. Different biochemical tests were carried out for identification of bacteria. These were Catalase test, Phenylalanine deaminase test, Lactose, Sucrose, Maltose, Fructose, Glucose, Mannitol, Indole, Methyl Red test, Voges Prausker Test, Citrate utilization test.

Table 2: Results of biochemical characteristics of bacterial isolates obtained from DBA Sample

Isolate No.	Catalase	Urease	Starch	Gelatin-ase	Nitrate .Reduction Test	Phenylalanine deaminase test	Lactose	sucrose	Maltose	Fructose	Glucose	Mannitol	Indole	Methyl Red test	Voges Prausker Test	Citrate utilization test
DB-A1	+	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-
DB-A2	+	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-
DB-A3	+	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-
DB-A4	+	-	-	-	+	-	-	-	-	-	+	-	-	-	-	-
DB-A5	+	-	-	+	+	-	-	-	-	+	-	-	-	-	-	-
DB-A6	+	-	-	+	+	-	-	+	+	+	+	+	-	+	+	+
DB-A7	+	-	-	-	+	-	-	-	-	+	+	-	-	-	-	-
DB-A8	+	-	-	+	+	+	-	+	+	+	+	+	-	+	+	+
DB-A9	+	-	-	+	+	-	-	+	-	-	-	-	-	-	-	+
DB-A10	+	-	-	-	+-	+	-	+	+	-	+	+	-	-	-	-
DB-A11	+	+	-	+	+	+	-	+	-	+	+	+	-	-	-	-
DB-A12	+	+	-	+	+	+	-	+	+	+	+	+	-	-	-	+

2) Isolation of bacterial cultures From *Chironitis arrowi* (DBB*)*

A total of 10 bacterial isolates was obtained in pure culture form from the enriched sample of *Chironitis arrowi insect* digestive system. All the cultures were studied for colony characters, Gram nature, and motility and biochemical characteristics. All the cultures were studied as ***Xylotrapes giedon.***

Table 3: Results of morphological characteristics of bacterial isolates obtained from DBB

Isolate No.	Size	Shape	Colour	Margin	Opacity	Consistency	Elevation	Gram nature	Motility
DB-B1	1.5cm	Circular	White fluorescent	Irregular	Translucent	Smooth	Flat	Gram negative cocco bacilli	Motile

DB-B2	2 mm	Circular	White	Regular	Translucent	Smooth	Flat	Gram negative cocco bacilli	Motile
DB-B3	1 mm	Circular	White	Regular	Translucent	Moist	Convex	Gram negative bacilli	Motile
DB-B4	6 mm	Circular	Mango yellow mucoid	Regular	Translucent	Moist	Convex	Gram negative bacilli	Motile
DB-B5	3 mm	Circular	Yellowish	Regular	Translucent	Smooth	Convex	Gram negative cocco bacilli	Motile
DB-B6	7mm	Irregular	white	Irregular	opaque	Smooth	Flat	Gram positive thick rods	Motile
DB-B7	5 mm	Circular	White	Regular	Opaque	Smooth	Flat	Gram negative bacilli	Motile
DB-B8	4 mm	Circular	Creamy White	Regular	Translucent	Moist	Flat	Gram negative cocco bacilli	Motile
DB-B9	5 mm	Irregular	Creamy with bluish green pigment	Irregular	Translucent	moist	Convex	Gram negative bacilli	Motile
DB-B10	2 mm	Circular	Whitish mucoid	Regular	Opaque	S Moist	Convex	Gram negative cocco bacilli	Motile

Table 4.4: Results of biochemical characteristics of bacterial isolates obtained from DBB sample.

Isolate No.	**Catalase**	**Urease**	**Starch**	**Gelatin-ase**	**Nitrate .R Test**	**Phenylalanine deaminase**	**Lactose**	**sucrose**	**Maltose**	**Fructose**	**Glucose**	**Mannitol**	**Indole**	**Methyl Red test**	**Voges Prausker Test**	**Citrate utilization test**
DB-B1	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+
DB-B2	+	-	-	-	-	-	-	-	-	+	-	-	-	-	-	+
DB-B3	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+
DB-B4	+	-	+	+	-	-	-	-	-	+	-	-	-	-	-	+
DB-B5	+	-	-	+	+	+	-	-	-	+	-	-	-	-	-	+
DB-B6	+	-	+	+	+	-	-	-	-	-	+	+	-	-	+	+
DB-B7	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+
DB-B8	+	-	-	-	+	-	-	-	-	+	+	+	+	-	-	+
DB-B9	+	-	-	+	-	-	-	-	-	+	-	+	-	-	-	+
DB-B10	+	-	-	-	+	-	-	+	+	+	+	-	-	-	-	+

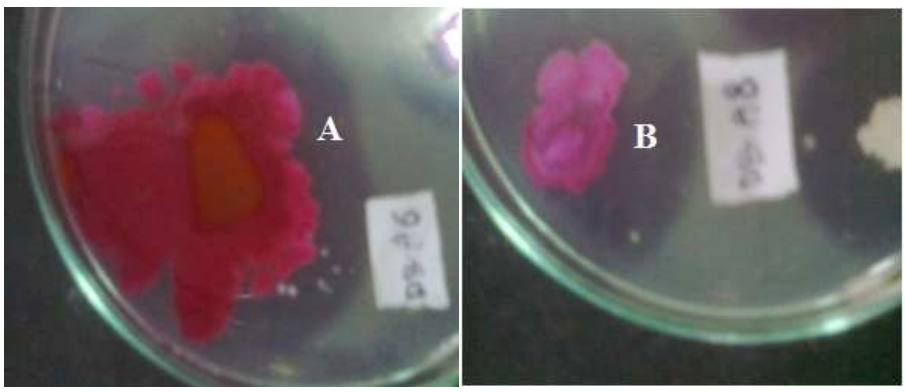

Figure 5- Plate showing the growth and zone of DDT degradation by DBA-6.
Figure 6- Plate showing the growth and zone of DDT degradation by DBA-8.

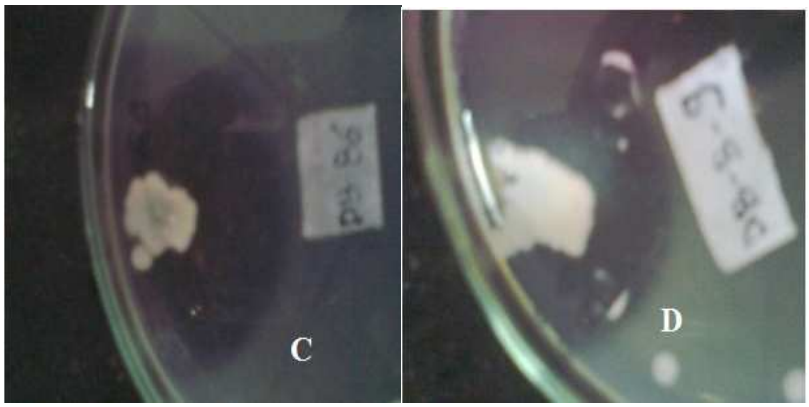

Figure 7 - Plate showing the growth and zone of DDT degradation by DBB-6.

Figure 8 - Plate showing the growth and zone of DDT degradation by DBB-9.

3) Primary screening of the obtained bacterial isolates for the degradation of DDT

In total 22 isolated bacterial cultures from DBA and DBB sample were primarily screened for the growth on Omeliansky's Agar containing 100 ppm DDT powder as sole carbon source. Out of 22 cultures, DBA-6, DBA-8, DBB-6 and DBB-9 have shown growth on the culture media within 4 days of incubation period.

4) Growth and rate of DDT degradation by the enrichment cultures

There were varying growths of the enrichment cultures from inoculated microorganisms. This also translated into differences in DDT degradation. The DDT degradation rate was calculated by measuring O.D. of blank X, O.D. of Test / O.D. of Blank X 100. The enrichment culture from cultivated places had a long lag phase and reached its highest cell mass of 0.56 at OD 600 nm on the 7^{th} day. The DDT degradation was quantified by the enrichment cultures places degrading DB-A6- 22.2% DB-A8- 30.5%, DB-B6-33.3%, DB-B9 – 69.4% in 14 days. Out of the four isolates that were capable of degrading DDT, the two (DB-B 6 and DB-B9) that degraded the highest amount of DDT were found.

5) Identification of promising DDT degrading isolates

DB-A 6 and DB-A8, these promising DDT degrading isolates were tentatively identified as the Serratia spp, while DB-B6 and DB-B9 were identified as the Bacillus and Pseudomonas spp. from the cultural, Gram nature, Motility and Biochemical characteristics, according to Bergey's manual of Determinative Bacteriology.

Discussion

In this study, four DDT biodegrading bacteria were isolated from digestive system of the dung beetle (*Xylotrapes giedon* and *chironitis arrowi).* Previously, DDT metabolizing microbes were isolated from areas where intensive DDT use had occurred[5]. The standard method for isolating microorganisms with the ability to degrade environmental pollutants is to enrich them from areas that were previously exposed to the pollutant. Since their identity has been established, a selective media and optimum growth conditions should be used to test their prevalence in the environment. In this study, a different approach for isolating DDT-degrading microorganisms by screening alternative sources like digestive system of the dung beetle that had no prior exposure to DDT proved successful. This could mean that tropical soils, unpolluted with DDT, contain some microorganisms that can degrade DDT. Juhasz and Naidu[6] proposed that the tri chlorine molecule is responsible for the resistance of DDT to degradation. Degradation of DDT involves two processes[7], the uptake of DDT into the cell and the transformation of DDT in the cell. The rate of uptake into the cells is unlikely to be important as DDT is extremely hydrophobic; rather, the rate at which the chemical is transformed in the cell would be the rate-limiting step. Under reducing conditions, reductive dechlorination is the major mechanism for the microbial conversion of both the o, p'-DDT and p, p'-DDT to DDD[8]. DDD has been identified as one of the major anaerobic transformation products of DDT[9].This shows that under the conditions, DDD was probably the end product hence this was not a complete breakdown of DDT to CO_2 or to non chlorinated compounds like phenylacetic, phenylpropionic and salicylic acids. In various ecosystems, microorganisms cause only modest changes in the DDT molecule[10]. Complete degradation of DDT is possible only through a cometabolic process[11] and that only the first step in the process, the dechlorination of DDT to DDD can take place without an additional substrate, as was the case in this study. The major transformation products, DDD and DDE, are more toxic and recalcitrant than the parent compound. This is of concern as these compounds are metabolized slowly, if at all[9].

Conclusions

Live adult dung beetles were collected at Smruti Udyan Solapur, Siddheshwar van vihar Solapur, MS, India between August and September 2011. The captured insects were placed into empty plastic (160mm x 130mm x 130mm) containers.These dung bettle varieties were identified as *Xylotrapes giedon* and *Chironitis arrowi* by referring to the record of zoological

survey of India, Silent valley National park special issue. A total no. of 10 bacterial isolates was obtained in pure culture form from the enriched sample of *Chironitis arrowi* insect digestive system.

A total no. of 12 bacterial isolates was obtained in pure culture form from the enriched sample of *Xylotrapes giedon* insect digestive system.Four DDT biodegrading bacteria were isolated from digestive system of the dung beetle (*Xylotrapes giedon and chironitis arrowi)* that designated as DB-A6, DB-A8, DB-B6 and DB-B9.

The DDT degradation was quantified by the enrichment cultures places degrading DB-A6- 22.2% DB-A8- 30.5%, DB-B6-33.3%, DB-B9 – 69.4% in 14 days. Out of the four isolates that were capable of degrading DDT, the two (DB-B 6 and DB-B9) that degraded the highest amount of DDT were found. DB-A 6and DB-A8, these promising DDT degrading isolates were tentatively identified as the Serratia *spp*. while DB-B6 and DB-B9 were identified as the *Bacillus* and *Pseudomonas* spp.

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THE EVOLUTION OF BANKING IN INDIA

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Abstract

Banking is today an integral part of our everyday life: At home, at school, at office, at business, on travel everywhere we counter some aspect of banking. The significance of banking in our day to day life is being felt increasingly. What are the institutions, so inevitable in the present day set up? How do they transact? How did the concept emerge? These are some of the simple queries that do not surface in our minds but are lurking deep down. Money plays a dominant role in today's life. Forms of money have evolved from coin to paper currency notes to credit cards. Commercial transactions have increased in content and quantity from simple banker to speculative international trading. Hence the need arose for a third party who will assist smooth banding of transaction, mediate between the seller and buyer, hold custody of money and goods, remit funds and also to collect proceeds. He was the "banker". As the number of such mediators grew there is need to control. Such mediating agencies gave birth to the concept of "banks" and "banking".

With the exception of the extremely wealthy, very few people buy their homes in all-cash transactions. Most of us need a credit in form of loans, to make such a large purchase. In fact, many people need financial support from Bank to fulfil the financial requirement. The world as we know it wouldn't run smoothly without credit and banks to issue it. In this article we'll, explore the birth of this flourishing industry.

Keywords: coin, money, commercial banking, liberalization, nationalization

Evolution of Banking System

The banking history is interesting and reflects evolution in trade and commerce. It also throws light on living style, political and cultural aspects of civilized mankind. The strongest faith of people has always been religion and God. The seat of religion and place of worship were considered safe place for money and valuables. Ancient homes didn't have the benefit of a steel safe, therefore, most wealthy people held accounts at their temples. Numerous people, like priests or temple workers were both devout and honest, always occupied the temples, adding a sense of security. There are records from Greece, Rome, Egypt and Ancient Babylon that suggest temples loaned money out, in addition to keeping it safe. The fact that most temples were also the financial centers of their cities and this is the major reason that they were ransacked during wars. The practice of depositing personal valuables at these places which were also functioning as the treasuries in ancient Babylon against a receipt was perhaps the earliest form of "Banking".

Gradually as the personal possession got evaluated in term of money, in form of coins made of precious metal like gold and silver, these were being deposited in the temple treasuries.

As these coins were commonly accepted form of wealth, 'lending' activity to those who needed it and were prepared to 'borrow' at an interest began. The person who conducted this 'lending' activity was known as the "Banker**"** because of the bench he usually set. It is also observed that the term 'bankrupt' got evolved then as the irate depositors broke the bench and table of the insolvent banker.

With the expansion of trade the concept of banking gained greater ground. The handling of "banking" transcended from individual to groups to companies. Issuing currency was one of the major functions of the banks. The earliest from of money – coins, were a certificate of value stamped on a metal, usually gold, silver, and bronze or any other metal, by an authority, usually the king. With the increasing belief and faith in such authority of their valuation and the necessities of wider trade a substitute to metal was found in paper. The vagaries of monarchial rule led to the issues of currency being vested with the banks since they enjoyed faith, controlled credit and trading. All forms of money were a unit of value and promised to pay the bearer of specified value. Due to failure on account of unwise loans, to rule and organize, a stable banking system arose. The word's earliest bank currency notes were issued in Sweden by stock holms Banco in July 1661.

History of Banking in India

The story of Indian coinage itself is very vast and fascinating, and also throws tremendous light on the various aspects of life during different periods. The *Rig Veda* speaks only gold, silver copper and bronze and the later *Vedic* texts also mention tin, lead, iron and silver. Recently iron coins were found in very early levels at Attranji Kheri(U.P.) and Pandu Rajar Dhibi (Bengal). A money economy existed in India since the days of Buddha.

In ancient India during the Maurya dynasty (321 to 185 BC), an instrument called adesha was in use, which was an order on a banker desiring him to pay the money of the note to a third person, which corresponds to the definition of a bill of exchange as we understand it today. During the Buddhist period, there was considerable use of these instruments. Merchants in large towns gave letters of credit to one another.

Trade guilds acted as bankers, both receiving deposits and issuing loans. The larger temples served as bankers and in the south the village communities economically advanced

loans to peasants. There were many professional bankers and moneylenders like the sethi, the word literally means “chief”. It has survived in the North India as seth. Small purchases were regularly paid for in cowry shells (varataka), which remained the chief currency of the poor in many parts of India. Indigenous banking grew up in the form of rural money lending with certain individuals using their private funds for this purpose. The scriptures singled out the vaishyas as the principal bankers. The earliest form of Indian Bill of Exchange was called “Hundi”. Exports and import were regulated by barter system.

Kautilya’s Arthasastra mentions about a currency known as panas and even fines paid to courts were made by panas. E. B. Havell in his work: The History of Aryas Rule in India says that Muhammad Tughlaq issued copper coin as counters and by an imperial decree made them pass at the value of gold and silver. The people paid their tribute in copper instead of gold, and they bought all the necessaries and luxuries they desired in the same coin.

However, the Sultan’s tokens were not accepted in counties in which his decree did not run. Soon the whole external trade of Hindustan come to a standstill. When as last the copper tankas had become more worthless than clods, the Sultan in a rage repealed his edict and proclaimed that the treasury would exchange gold coin for his copper ones. As a result of this thousands of men from various quarters who possessed thousand of these copper coins bought them to the treasury and received in exchange gold tankas. The origin of the word "rupee" is found in the Sanskrit *rūpya* "shaped; stamped, impressed; coin" and also from the Sanskrit word "rupa" meaning silver. The standardisation of currency unit as Rupee in largely due to Sher Shah in 1542.

The English traders that came to India in the 17th century could not make much use of the of indigenous bankers, owing to their ignorance of the language as well the inexperience indigenous people of the European trade. Therefore, the English Agency Houses in Calcutta and Bombay began to conduct banking business, besides their commercial business, based on unlimited liability. The Europeans with aptitude of commercial pursuit, who resigned from civil and military services, organized these agency houses.

A type of business organization recognizable as managing agency took form in a period from 1834 to 1847. The primary concern of these agency houses was trade, but they branched out into banking as aside line to facilitate the operations of their main business. The English

agency houses, that began to serve as bankers to the East India Company had no capital of their own, and depended on deposits for their funds. They financed movements of crops, issued paper money and established joint stock banks. Earliest of these was Hindusthan Bank, established by one of the agency houses in Calcutta in 1770.

Banking in India originated in the last decades of the 18th century. The first banks were The General Bank of India, which started in 1786, and Bank of Hindustan, which started in 1790; both are now defunct. The oldest bank in existence in India is the State Bank of India, which originated in the Bank of Calcutta in June 1806, which almost immediately became the Bank of Bengal. This was one of the three presidency banks, the other two being the Bank of Bombay and the Bank of Madras, all three of which were established under charters from the British East India Company. For many years the Presidency banks acted as quasi-central banks, as did their successors. The three banks merged in 1921 to form the Imperial Bank of India, which, upon India's independence, became the State Bank of India.

Indian merchants in Calcutta established the Union Bank in 1839, but it failed in 1848 as a consequence of the economic crisis of 1848-49. The Allahabad Bank, established in 1865 and still functioning today, is the oldest Joint Stock bank in India.

Foreign banks too started to arrive, particularly in Calcutta, in the 1860s. The Comptoire d'Escompte de Paris opened a branch in Calcutta in 1860, and another in Bombay in 1862; branches in Madras and Pondicherry, then a French colony, followed. HSBC established itself in Bengal in 1869. Calcutta was the most active trading port in India, mainly due to the trade of the British Empire, and so became a banking centre.

The next was the Punjab National Bank, established in Lahore in 1895, which has survived to the present and is now one of the largest banks in India. The presidency banks dominated banking in India but there were also some exchange banks and a number of Indian joint stock banks. All these banks operated in different segments of the economy. The exchange banks, mostly owned by Europeans, concentrated on financing foreign trade. Indian joint stock banks were generally undercapitalized and lacked the experience and maturity to compete with the presidency and exchange banks.

Swadeshi Movement

The period between 1906 and 1911, saw the establishment of banks inspired by the Swadeshi movement. The Swadeshi movement inspired local businessmen and political leaders to found banks for the Indian community. A number of banks established then have survived to the present such as Bank of India, Corporation Bank, Indian Bank, Bank of Baroda, Canara Bank and Central Bank of India.

Ammembal Subbarao Pai founded "Canara Bank Hindu Permanent Fund" in1906. Central Bank of India was established in 1911 by Sir Sorabji Pochkhanawala and was the first commercial Indian bank completely owned and managed by Indians. In 1923, it acquired the Tata Industrial Bank.

The fervour of Swadeshi movement lead to establishing of many private banks in Dakshina Kannadaand Udupi district which were unified earlier and known by the name South Canara (South Kanara)district. Four nationalized banks started in this district and also a leading private sector bank. Hence, undivided Dakshina Kannada district is known as "Cradle of Indian Banking".

Development after Freedom

The second milestone in history of Indian banking was India becoming a sovereign republic. The Government of India initiated measures to play an active role in the economic life of the nation, and the Industrial Policy Resolution adopted by the government in 1948 envisaged a mixed economy. This resulted into greater involvement of the state in different segments of the economy including banking and finance. The banking sector also witnessed the benefits; Government took major steps in this Indian Banking Sector Reform after independence.

- First major step in this direction was nationalization of Reserve Bank in 1949.
- Enactment of Banking Regulation Act in 1949
- Reserve Bank of India Scheduled Banks' Regulations, 1951.
- Nationalization of Imperial Bank of India in 1955, with extensive banking facilities on a large scale especially in rural and semi-urban areas.
- Nationalization of SBI subsidiaries in 1959.

Government of India took many banking initiatives. These were aimed to provide banking coverage to all section of the society and every sector of the economy.

The Industrial Credit and Investment Corporation of India Limited (ICICI) was incorporated at the initiative of World Bank, the Government of India and representatives of Indian industry, with the objective of creating a development financial institution for providing medium-term and long-term project financing to Indian businesses.

Nationalization Process

Nationalization of banks in India was an important phenomenon. Despite the provisions, control and regulations of Reserve Bank of India, banks in India except the State Bank of India or SBI, continued to be owned and operated by private persons. By the 1960s, the Indian banking industry had become an important tool to facilitate the development of the Indian economy. At the same time, it had emerged as a large employer, and a debate had ensued about the nationalization of the banking industry. Indira Gandhi, then Prime Minister of India, expressed the intention of the Government of India in the annual conference of the All India Congress Meeting in a paper entitled *"Stray thoughts on Bank Nationalization."* The meeting received the paper with enthusiasm.

Thereafter, her move was swift and sudden. The Government of India issued an ordinance and nationalized the 14 largest commercial banks with effect from the midnight of July 19, 1969. Within two weeks of the issue of the ordinance, the Parliament passed the Banking Companies (Acquisition and Transfer of Undertaking) Bill, and it received the presidential approval on 9 August 1969.

A second dose of nationalization of 6 more commercial banks followed in 1980. The stated reason for the nationalization was to give the government more control of credit delivery. With the second dose of nationalization, the Government of India controlled around 91% of the banking business of India. Later on, in the year 1993, the government merged New Bank of India with Punjab National Bank. It was the only merger between nationalized banks and resulted in the reduction of the number of nationalized banks from 20 to 19. Currently there are 27 nationalized commercial banks.

Economic Liberalization

The second major turning point in this phase was Economic Liberalization in India. After Independence in 1947, India adhered to socialist policies. The extensive regulation was sarcastically dubbed as the "License Raj". The Government of India headed by Narasimha Rao decided to usher in several reforms that are collectively termed as liberalization in the Indian media with Manmohan Singh whom he appointed Finance Minister. Dr. Manmohan Singh, an acclaimed economist, played a central role in implementing these reforms.

In the early 1990s, the then Narasimha Rao government embarked on a policy of liberalization, licensing a small number of private banks. These came to be known as *New Generation tech-savvy banks*, and included Global Trust Bank (the first of such new generation banks to be set up), which later amalgamated with Oriental Bank of Commerce, Axis Bank(earlier as UTI Bank),ICICI Bank and HDFC Bank. This move, along with the rapid growth in the economy of India, revitalized the banking sector in India, which has seen rapid growth with strong contribution from all the three sectors of banks, namely, government banks, private banks and foreign banks.

Currently (2007), banking in India is generally fairly mature in terms of supply, product range and reach-even though reach in rural India still remains a challenge for the private sector and foreign banks. In terms of quality of assets and capital adequacy, Indian banks are considered to have clean, strong and transparent balance sheets relative to other banks in comparable economies in its region. The Reserve Bank of India is an autonomous body, with minimal pressure from the government. The stated policy of the Bank on the Indian Rupee is to manage volatility but without any fixed exchange rate-and this has mostly been true.

With the growth in the Indian economy expected to be strong for quite some time-especially in its services sector-the demand for banking services, especially retail banking, mortgages and investment services are expected to be strong.

Conclusion

Banks have come a long way from the temples of the ancient world, but their basic business practices have not changed. Banks issue credit to people who need it, but demand interest on top of the repayment of the loan. Although history has altered the fine points of the business model, a bank's purpose is to make loans and protect depositors' money. Even if the future takes banks completely off your street corner and onto the internet, or has you shopping for loans across the globe, the banks will still exist to perform this primary function.

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AN OVERVIEW OF THE ECONOMIC LIFE OF SOLAPUR COUNTY DURING THE PESHWA REGIME

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Economics has enjoyed a special status in the life of human beings right from the ancient times. The fundamental needs of man can't be fulfilled without money. To be more precise, the life of a country, a society or a group of people can't be made livable, if there is a scarcity of economic resources. It will not be an exaggeration, if we assert that a firm financial foundation has become a compulsory part of a comfortable life.

It goes without saying that for realizing the goal of economic development there has to be given priority to business and industry. The present paper is an attempt at throwing light on the economic life of Solapur County during the reign of the Peshwa. Solapur, being located on the border of Maharashtra and Karnataka states, sought its progress in the fields of business and transportation. Besides, there would be people periodically visiting Solapur, as the County housed places of religious importance. It is believed that a comprehensive development of Solapur began in the 12^{th} century, which is considered to be the Age of Saint Siddharameshwar.

During the Peshwa regime Solapur was known as a County with progress from business point-of-view. The progress was realized by several factors like- the means of transportation, business families, big and small industries, etc. Solapur County was thus associated with the entire of the then Hindustan. The business transaction would be done by virtue of the river route. Solapur was associated with the cities like Homnabad and Gulbarga among several other cities and towns. The County of Solapur would import food grain, oil and oil seeds from these places. As a result, the Shukrawar Peth in Solapur acquired the status of the biggest market place. The Medieval Period witnessed a domination of the persons belonging to the Komti, Lingayat and Sindhi communities in the field of business in Solapur. Malage, Kalyani, Ghongade, Ligade etc were the major business families in Solapur. The economic transaction would be done through Gadhawal Shikka, Peth Shikka, Khurda and Shivrai Coins. Limaye, Sohoni and More were some of the renowned goldsmiths of the times. The Muslim communities in Aland and Gulbarga had business relations with the Solapur County. The Marwaris and Gujars from Phaltan came to Solapur and their business place is even today called the Phaltan Lane.

In those days Solapur was famous for manufacturing steel products. In addition to this major business, there were other small-scale business persons and craftsmen in Solapur. However, the business in Solapur was not controlled by the local people. Nevertheless, with the development of the Solapur business, there was felt an urgent need of establishing a business centre in the County. Uddhovireshwar[1], the then Officer of the Solapur County along with the influential persons made a request to Shrimant Madhavrao Peshwa for setting up a business centre in Solapur. As a consequence, a market place named Madhav Peth was set up in Solapur in Shake 1689 i.e. in the year 1768[2]. The place was later known as Mangalwar Peth, as the weekly business would be done on every Tuesday. It was also known for marketing old goods. The Peshwa Madhavrao awarded the Yeri family the responsibility of maintaining the market place with an exchange of Rs 200 [3]. The family was allowed accommodation too.

The Eleven Honours of the Joshi Family

1. Ganesh Pujan 2. Ghatka and Lagna Patrika 3. Punyavachana 4. Nadichya Shela 5. Simant Pujan and Lagna Khandani 6. Mandava Khobaryachi 7. Varshapratipada Panchang Pujan 8. Vijayadashami Shammi Pujan 9. Mastakabhishek 10. Patshudrakela 11. Holi Pujan and Veeda Dakshana are the honours given to the Joshi family by the Madhavrao Peshwa. There are also included the names of the Peshwa officers in Solapur County: Malhar Gundo Mahajan, Jagdev Shete, Krushnaji Dadaji Daftardar, etc[4]. The honours attributed to the Joshi family show the spiritual, religious and economic situation of the times.

The business during the Peshwa period included the transaction of rice, silk, cloth, malmal, chintz and others. As a result, Yeola and Solapur became the industrial zones[5]. The major business centres during this time in Maharashtra were- Paithan, Maheshwar, Nagpur, Solapur, Barhanpur, Khambayat, Jalna, Ashti, Shahagad, etc[6].

The Handloom Industry in Solapur

It was the time when every house-hold in Solapur would have a handloom and the weaving activity. The handloom business was dominated by the Momin and Khetri people. Solapur County was known for the manufacturing of dhotis and chaddars. Today, the Solapur chaddars are famous both nationally and internationally. The dhotis manufactured in Solapur were of Nagpuri and Chandwadi dothis' quality.

In addition to the handloom industry Solapur was also known for metalwork, gold-smithy, ivory work, wood work, pottery and tanning business. This gives a hint to the condition of the industrial development during the Peshwa Period. Due to the historical and religious background, Solapur enjoyed a special advantage favouring business and industry[7]. The development of business and industry in Solapur gave rise to various commercial centres like: Pachcha Peth, Shaniwar Peth and other such places.

Establishment of New Peth at Dahiwadi

On 14th October 1781 Madhavrao Peshwa issued orders to the feudal officer of Sangola for setting up a New Peth in Dahiwadi, as Sangola had been commercially associated with Solapur[8]. The political stability during the Peshwa Period gave a favourable atmosphere for the development of the handloom industry in Solapur. In the region of Maharashtra Solapur was at the top in the production of saris, chaddars, towels and dhotis. Girasappa Nirali, a Solapuri dealer in saris, was reputed all over Maharashtra[9].

Means of Transportation

For the development of business, the means of transportation play a decisive role. During the Peshwa regime there was no scarcity of the means of transportation. The available means of transportation were mainly bullock carts, herds of bulls and camels, donkeys, horse-driven carriages. Thus, Solapur was connected to places like Pandharpur, Tembhurni, Karmala, Belgaum, Sangola, Miraj, Satara, Hyderabad, Bijapur, Indapur, Aurangabad, etc[10].

The Solapur County was famous for the production jowar. The increasing demand for jowar cultivated in Solapur from different places of India automatically contributed to the development of business in the County. The need of monetary capital, which would decide the development of business, was satisfied by the money-lenders of Solapur. Wani, Marwari, Gujar, Shete, Sohoni, Mantri, Limaye, Chati, Homnabadkar families were involved in the money-lending business[11]. Solapur was in the leading position in the cloth industry. The soft dhotis were a special feature of the weaving industry of Solapur[12].

The following table shows the prices of various kinds of cloth during the Peshwa Period (1751)[13]:

Table 1: Variety of prices of cloth in Solapur

Sr. No.	Variety of Cloth	Price
01	Kinkam	175
02	Patka	40
03	Hamru	20
04	Gajni	25
05	Patav	30
06	Paithani	50
07	Makhmal	25
08	Lehanga	75
09	Ilacha	125
10	Parancha	75
11	Bapta	50

Table 2: The Prices of Goods in Solapur (1742)

Sr. No.	Type of Commodity	Price for One Item	Quantity
01	Coal	12	One Khandi
02	Oil	01	Five Shers
03	Beetle Nuts	01	Five Payalis
04	Ghee	01	One and Three Quarters Payalis
05	Catechu	01	Five Payalis
06	Tobacco	01	Five and a half Payalis
07	Yarn	01	Two Payalis
08	Jaggery	01	Three and a quarter Payalis
09	Hemp	01	Half Man
10	Rice	01	Two and a half Payalis
11	Salt	$3^{1/2}$	One Man
12	Toor Dal	01	Two Payalis
13	Wheat	01	Two Payalis
14	Jowar	16	One Khandi
15	Urid Dal	01	Two Payalis

Table 3

Sr. No.	Commodity	Price in Rupees
01	Cotton	22 to 29 for Eight Mans
02	Beetle Nuts	36 for Eight Mans
03	Ghee	4 to 6 for One Man
04	Indigo	50 to 56 for One Man
05	Jowar	01 for 36 to 40 Shers
06	Sweet Oil	12 to 16 for One Man
07	Khaadi	15 to 16 for Eight Mans
08	Bagalkot Dhoti	12 Annas Two-Pieces
09	Fire Wood	6 to 8 Annas for One Cartload

The above data show the prices of the commodities during the rule of the Peshwa[14]. The price of rice in the year 1720 was a rupee for eighteen and a half shers, whereas in the year 1756 the price of rice was a rupee for eighteen shers. Thus, the prices of the commodities would change[15]. The Peshwa had imposed the Octroi on the salable commodities for controlling the business transaction[16].

The above research gives an understanding of the economic life in the Solapur County during the Peshwa Period.

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A SUCCESSFUL EXPERIMENT OF DEVELOPING AUTO –LEARNING AMONG THE LEARNERS OF ENGLISH LITERATURE

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Abstract

These are the days of innovative practices in teaching and learning process. He is the best teacher who teaches less is the old proverb but a need of the hour today. The learners today in the world of mobile mania are lethargic towards learning but the life demands them to be the lifelong learners. Frustration and disappointment are the common features of the teaching field. The experimenter of an innovative activity, ***A Successful Experiment of Developing Auto –learning among the learners of English Literature*** was frustrated with the unproductive degrees the learners get by the present rote system of studying English literature. The researcher played the role of a mentor collected all the academic tools the learners have then he empowered them for the **auto learning** which borne the sweet fruit of the learners pursing the subject passionately. Such experiments need love and affection for the learners and the teacher should be ready to run extra mile to bring the learners to the class.

Introduction

An enthusiastic teacher, (*forgetting the statement, he is the best teacher who teaches less*!) of any subject is a big hurdle in the way of the learning experience of the students. The teachers of English literature overenthusiastically provide literally everything: summary in mother tongue, readymade answers, possible questions etc and kill the curiosity and the creativity of the learners. As a result, the discipline is losing its charm without the involvement of the learners. *BBC Teaching English* of the British Council invited and published the blogs on the topic: **Have BA and MA literature courses lost their charm in India?** The responses are fully positive that it has lost it. The response from one of the members of ELTeCSISL, Vijayasingh Rajput(2010) from Solar International School, Rajasthan holds *BA/MA English literature is really losing importance among the young generation. Though we may display a data proving that millions of youngsters opt for English literature in colleges, actually the graduates do not gain anything significant from such qualifications- there are students from regional medium background who graduate with English literature without being, able to speak English properly.* Totally, the study of English literature moves around the examination performance of the learner forgetting the very objectives of its study. The learners have grown fully dependents. The researcher a witness to the worsening picture year after year since last twenty- four years has made an experiment at the classroom level to make the study meaningful. This paper is a presentation of that experience to share it with the students and the teachers of English literature.

Present Scenario

In the Preamble of UGC Model Curriculum for English (2001) for Honors and MA students it is clearly stated that the students should have a serious interest in the discipline and be able to employ the advanced language skills, critical understanding and human values derived from it in the future lives and careers. Hence, such programs should at appropriately graded levels, include literary history, critical theories and concepts, the history and structure of English language and general linguistics. They should take account of the cultural, historical, and social background of the texts and concepts studied and the context of other literatures and cultures. They should also allow scope to develop advanced functional and applied skills in the English language. This may be particularly necessary at the BA honors level, after which large number of students may be expected to branch out various professions employing such skills.

Job satisfaction in the classes of English literature is almost a forgotten fact due to different reasons like the lethargic learners without aptitude for the study of literature, ill equipped libraries and the over enthusiastic teachers. The objective of the learners behind opting this discipline to develop their linguistic competency itself is a mockery of study of literature. They are far away from the objectives of studying humanity, enjoying the ambiguous meaning of literature, exploring cultures and beliefs, better understanding of history, finding the emotional power of the words and inculcating values. In addition, the learners of the most creative literature are ill equipped even with the basic tools of dictionaries and the textbooks. Majority of the learners rarely turn up to the classes once they complete the admission procedure. They thoroughly depend on the notes dictated by the teachers or those available in the market and reproduce them in the written examinations before getting the degree of special English. The examiners assessing the answer scripts helplessly assign the marks to the borrowed answers. The learners aspiring to be teachers, technical writers, creative writers, scriptwriters, or the staffs at a call centre are so ill equipped that they are literally unfit for the career they aspire.

The Concept of Auto learning

Wikipedia explains the concept of auto didacticism as auto learning or learning on one's own. It is one facet of learning which complements the formal learning. Many auto learners seek instructions and guidance from the expert and teachers. (Ironically, the learners of English

literature thoroughly depending on the guides and bazaar notes and getting first class degrees are in one-way the auto learners only!) The researcher takes this concept of playing the role of a facilitator, the much-needed new concept of a teacher today. Playing the role of a mentor by understanding the learner academically and providing him the equipments and the ideas to pursue the discipline systematically and passionately to get a meaningful degree with skills is making one an auto learner.

The Experiment

As the former president of India, Dr Abdul Kalam somewhere says, "frustration leads to creativity" the frustrated researcher with the objective of full job satisfaction and self-actualization went for the experiment of developing auto learnership among the students. The researcher decided to go beyond the role of a teacher and play the role of a mentor so the additional academic information of the learner was collected under **English Proficiency Development Plan 2011-12.** The information included the academic background of the family to know the exposure of the learner to English language and literature. Secondly, the mass media reach of the learner was considered because they have the major contribution in development of English language skills. Thirdly, the information about the study tools like the dictionary, the grammar books, and reading material the learner possessed was considered. Then the learner's access to internet connectivity was also considered. Finally, the information about the problems faced by the learner and the support needed from the mentor was taken into consideration. This information was collected from the students from all three faculties learning English language and literature but the researcher concentrated on the students pursuing English literature at BA II and BA III.

The Observations

The academic profile of the learners aspiring to be the human resource of the nation dreaming global leadership was not quite encouraging. First, he noticed that the learners had not read quality literature even from their mother tongue. In addition to that, many had no passion for literature still they had opted for the English literature. What's more, the learners aspiring to be the graduates in English literature were ill equipped, even with the basic needs like a standard dictionary. Majority of the learners belonging to the bellow the middle class were not in position to afford the costly study material. Above all, they were found lethargic, thinking that their

future as graduates in Arts was bleak. As a result, low morale was commonly noticed among the learners.

The Activities

The researcher noticed the challenge of developing the language proficiency and literary test among the lethargic and ill-equipped learners with the pure objective of job satisfaction. First, he introduced the reading material in the form of old magazines and journals from the library with the cooperation of the librarian. The researcher convenienced the learners about the importance of English news from All India Radio and the timings of the broadcasting were also given. The techniques of effective listening to radio and writing the diary were also introduced. The researcher motivated the parents in the parent- teacher- meetings to create the congenial atmosphere for learning by providing the basic tools required. The learners were trained in the effective reading of newspapers and keeping note of the living language. The activity ***what I read*** was run in which the learners presented the matter they read and liked in the previous week. The learners were motivated to study the poem on their own on the model of the poem studied in the class. The students were convinced to buy the original texts and read them. The mentor taught the learners the technique of preparing their own notes. The process of learning literature was made more pleasurable with the creative activity like ***conversion*** in which the learners changed the literary form of the text. For example, a poem into dialogue or the essay was converted in to a scene and they were presented in the class.

The Outcome

The researcher witnessed the success, with the gradual growth of love for literature among the learners. Most of the learners bought the original texts and read them. It was heartwarming to see the learners finding the translated copies of the texts for further pleasure. What's more, the learners started to cross the boundaries of studying one text and finding pleasure in reading the other books of the same author. The auto learning enhanced self-respect and the moral of the learners. The researcher has not fulfilled in motivating all the learners but he is happy to see majority of them pursuing the study independently. The experimenter feels partially successful because the teacher always feels like a mother who thinks that her baby is still half fed so he is unsatisfied.

The Scope and limitations of the Experiment

Scope

This experiment may be applied to any discipline and the job satisfaction from the teaching field could be extracted. This habit of self-learning is the core skill of the present globalization skills of lifelong learning which the teacher is bound to develop among his learners to make them the independent learners. The activity being a matter of classroom activity does not require the formalities of permission etc. from the superiors. It is a matter of pleasure to the teacher to see his learners growing self-dependents, the sign of big success in future. The teacher has the scope for the further experiments like collaborative learning

Limitations

This experiment needs inborn love of the teacher for his profession, students and he should be ready to run extra mile. Another limitation is the poor response from some careless learners who may discourage the sincere efforts of the teacher.

Conclusion

Arts faculty programs covered **36.39**% of the total enrolment of the Indian higher education for the academic year 2010-11. (UGC updating 2012) There is no scope for the doubt that study of English literature covers its major part of Arts faculty. There may be hardly any centre of higher education that does not have the department of English. English literature is a legacy that the British rulers could not take with them. It is enriched by the thoughts of enlightenment and the creativity of the all time creative writers like Shakespeare. The literature has the universality in its appeal, the much-required food for the globalization era. Let us experiment to make its charm regained and the learners back in the benches.

QUALITY IN TEACHER EDUCATION PROGRAMME: NEED OF THE DAY

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Introduction

Nowadays everyone is complaining about the quality of education and for this all are blaming the teacher community. The parents, students, social leaders expect improvement and enhancement in quality of education by maintaining and improving the quality of teachers. The society has decided some norms to describe the qualities of Ideal Teacher which can be applied as milestones for achieving quality of teachers.

As we know the quality of education depends not only on the infrastructure, curriculum, its aims and objectives but it also depends on the human capitals that are students and teachers. Therefore for assuring quality of education, one must assure the quality of its human capitals that are students and teachers.

Referring to these facts, the researcher has made this attempt to study the present teacher education programme.

Objectives of the Study

1) To assess the present scenario of teacher education programme regarding the professional development of the teacher.
2) To find out the effectiveness of the present teacher education programme for preparing the teachers of 21st century.
3) To find out the problems, drawbacks and deficiencies in the present teacher education programme.
4) To suggest possible means for modernising teacher education programme to prepare the teachers of 21st century.

Scope and Limitations of the Research

1) The scope of research is teacher education programme i.e. B.Ed. programme.
2) The study is limited upto teacher education programme(TEP) in Solapur University of Maharashtra state

Methodology

Survey method was used to study the present scenario of teacher education programme, its drawbacks .The views and opinions of teacher educators, principals and researchers were obtained with the help of questionnaire and interview.

Sample

1) 20 teacher educators throughout the Solapur University were selected for the study.
2) 10 Ph.D. researchers throughout the Solapur University were selected.
3) 5 principals of B.Ed. colleges throughout the solapur University were selected.

Analysis

1) 40% of teacher educators find the present admission criteria as completely inappropriate while 60% teacher educators consider is as relevant but there is scope for improvement.
2) The main reform suggested by the all principals and teacher educators is the assessment regarding the outlook towards the profession which is not done today.
3) 80% teacher educators insist that the teacher educators need to be oriented properly.
4) 100% teacher educators & principals agree that content knowledge provided through TEP is not relevant for the 21st century.
5) 70% researchers & 80% teacher educators are of the opinion that there is a distinct gap between theory and practice.
6) 60% researchers and principals consider that the communication skills, technological skills and competencies are not adequately and properly nurtured through TEP.
7) 100% researchers, 90% principals insist on the need of global benchmarking regarding skills and competencies in TEP. Necessity of effective programme for the development of communication skills, technological skills and competencies is also seen as an essential measure.
8) All principals suggested that vital solutions are sincere efforts to promote ideal work culture in TEP, commitment and feeling of accountability among the teacher educators for trainees to follow and sincere efforts made to promote positive attitude and self belief among the trainees.
9) All principals and teacher educators think that the present TEP is not providing scope for the emotional development of trainees

10) 90% teacher educators think that enough freedom for teacher educators, interlinking among the institutions, regular updating and upgrading of curriculum and license system for teacher educators are the vital solutions.

Findings

1) Many of them find the present admission criteria as completely inappropriate while majority of them consider is as relevant but there is scope for improvement.
2) The main reform suggested by the maximum respondents is the assessment regarding the outlook towards the profession which is not done today.
3) Most of them insist that the teacher educators need to be oriented properly.
4) Almost all of them agree that content knowledge provided through TEP is not relevant for the 21st century.
5) Majority of them are of the opinion that there is a distinct gap between theory and practice.
6) Many of them consider that the communication skills, technological skills and competencies are not adequately and properly nurtured through TEP.
7) All of them insist on the need of global benchmarking regarding skills and competencies in TEP. Necessity of effective programme for the development of communication skills, technological skills and competencies is also seen as an essential measure.
8) Suggested vital solutions are sincere efforts to promote ideal work culture in TEP, commitment and feeling of accountability among the teacher educators for trainees to follow and sincere efforts made to promote positive attitude and self belief among the trainees.
9) All of them think that the present TEP is not providing scope for the emotional development of trainees
10) Majority of them think that enough freedom for teacher educators, interlinking among the institutions, regular updating and upgrading of curriculum and license system for teacher educators are the vital solutions.

Conclusion

In developing the nation teachers are the most crucial component of the entire social system. The responsibility of preparing quality assured teacher lies on the teacher education system.

But the present TEP is caged in the conventional theory oriented exam centred approach with improper evaluation system and negligence towards all round development of the teacher TEP has to modernise by bringing practical oriented approach. Teacher educators must come ahead and initiate the modernisation by promoting ideal work culture .

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EFFECTIVE TEACHING LEARNING THROUGH CLASSROOM SEMINARS: A CASE STUDY

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Abstract

Education is a continuous process in life of the human being since birth. Higher education provides necessary skills and training required for the future career of an individual. Not only that, it provides the required trained human resource for the economy. Universities and colleges are the main institutes which provide the facilities of higher education where the teaching and learning process is mostly lecturing in the classrooms. Students are expected to update themselves with self-study. However, it has been noted that most of the students ask for ready notes or depend on the likely questions and guides. Some topics in the syllabus are monotonous, descriptive in the nature. The teacher has to make these topics more interesting with some or the other method. The researcher arranged classroom seminars for the final year UG students as an experiment. This method proved fruitful to the learners and provider of job satisfaction to the researcher. Through this paper the researcher plans to share the practice with the teachers and the learners to make the study of geography interesting and effective.

Keywords : learning, education, teaching, seminar

Introduction

In a broad, general sense, education means the aims and habits of a group of people; lives on from one generation to the next. It occurs through any experience that has a formative effect on the way a person thinks, feels or acts. While in a narrow sense, education is the formal process by which society transmits deliberately its accumulated knowledge, skills, customs and values to next generation. The constitution of United Nations, European convention on human rights and also the Constitution of India have recognized 'A right to education' for everyone.

Presently we are using various schooling systems, which involve institutionalized teaching and learning in relation to a curriculum, with predetermined purpose of the schools in the system. These include from preschool to secondary schools. Higher education is called as tertiary schools or post secondary education, which is the non compulsory education level. It includes undergraduate, post graduate, as well as vocational education and training. Colleges and universities are the main institutions which provide the tertiary education; and so are known as tertiary institutes.

Higher education involves work towards a degree level or foundation degree qualification. In most of the developed countries nearly 50 percent of population now enters in higher education at some time in their lives. In case of India, nearly 14.5 percent of population enters in to higher education as per the 2011 Census. Thus, higher education is important to the

national economics, as a significant industry in its own right and a source of trained and educated personnel for rest of the economy. When we talk about higher education, teaching and learning processes are the integral parts of it. Apart from informal, formal, non-formal, rote and episodic learning, meaningful learning is important. It refers to the concept that the learned knowledge is fully understood by the individual and that the individual knows how that specific fact relates to the other stored facts. Not only is that tangential or self educating more effective.

Teaching and Learning in Geography

There are various methods of teaching and learning, e.g. lecturing, pupil team learning, peer team learning, seminars etc. apart from the traditional methods of classroom teaching. In Geography, the classroom teaching is supplemented by use of wall maps, models, instruments also. At the degree level, other techniques like field survey are used for the students offering special geography.

Problems Faced by the Students

The lecturing method is mostly used at the degree level classes, as the number of students is also large. Very few students get the practice of preparing notes while the lecture is going on. Most of the students cannot write very fast. A degree level student rarely purchases the reference books, as there is no textbook as such like the languages. This is true for both the rich and poor students. Therefore, they have to depend on the notes. The result is they lose interest in the topic and further in the subject. At last, the students prefer to use the “Guides” or the “Likely Question Books” as an alternative for the notes. It may further lead to the malpractices at the time of examination.

Problems Faced by Teachers

In an undergraduate class, mostly lecturing method is used. It is supplemented with drawing of diagrams, charts or figures on the black board. There are certain topics in the syllabus, which are more descriptive, monotonous and hence may become uninteresting to the students. Students may ask ready notes for such topics and it is a fact that some teachers do give readymade notes. Some teachers use the same notes for years together. This results in to the loss of “dialog” or the interaction which is very much important for both the teachers and the students. Some students do come to the class regularly but others come only occasionally to

collect notes from their classmates. The repeated absence in the class results in to loss of interest to teach as well as to learn, from both the sides.

Here, the role of a teacher is very important. If the students do not show interest, the teacher has to change the method of teaching and make the topic interesting. He has to motivate the students to be attentive in the class, as well as to prepare their own notes. They should develop the habit of using the library on their own. It does not mean that there will be no teaching in the class.

The method of 'seminar' is helpful for both the student and the teacher. It helps to develop healthy atmosphere between the steckholders and the teachers.

The Concept of Seminars

To make a topic interesting and increase the involvement of the students, "Seminars" are conducted. This is a widely used method in American, Canadian and European Universities. Seminar is a form of academic instruction at an institution. Nowadays it is used in other universities as well as for commercial events in various fields apart from higher education. It brings together small groups for focusing on one particular topic or subject. Every one present is supposed to take active part in the following discussions. It familiarizes the students with the selected topic more extensively. It allows them to interact with the practical problems which are faced during research work. It is an informal method of teaching.

The word 'seminar' is derived from the Latin word '***seminariam'*** which means "seed plots". Seminars are conducted in the classroom of undergraduate classes.

A Case Study

As a student of Post Graduate class, I had to deliver a seminar in each semester, for each paper, compulsorily. It helped me a lot when I entered in this field of education and research. Therefore, I decided to apply the method of seminars to make the process of teaching –learning more effective and interesting. The method of seminar is being used for last 6 years at the undergraduate class. The final year students is a small group; about fifty, generally. It becomes possible to conduct the seminars in the class for such a small group.

Objectives

1] Encouragement for Self-study

2] Encouragement for reading reference books

3] Use of computer and internet facilities for updating the knowledge.

4] Presentation skills are developed along with self confidence

5] Teaching and learning becomes a happy experience for both teacher and student.

6] Job satisfaction through the happy experience

Selection of Topic from the Syllabus

1] Agriculture 2] Mineral Resources 3] Power Resources 4] Bio Resources 5] Transport and communication 6] Trade.

The Procedure

1] A topic is allotted to the student from the syllabus as per his/her choice or interest. At least fifteen days are given for preparation of the topic. The date of seminar is fixed on the same day of allotment.

2] Necessary books and articles, list of reference books is provided to the students as per their requirement from the library. Students go to the library and search the required material, data and prepare their own notes. They also use the internet facility.

3] The collected information, data is checked and rearranged by the teacher. Now it is ready for the final seminar.

4] The student delivers the seminar in the class. Use of maps, diagrams, charts along with the blackboard is allowed for explaining the topic. If a student wishes to use power point, it is also allowed.

5] After presentation, the topic is open for discussion. Questions are asked by the students and they are answered by the seminary. If necessary, the teacher interferes and takes part in the discussion.

6] The details of the topic and other related information which is not included in the seminar is further given by the teacher. On an average, twenty minutes are available for one student. The duration of time may change.

10] The notes prepared by the student are further circulated in the class.

Results

1] Students take keen interest in the topic which is selected by them.

2] Teachers provide helping hand for reference books and collection of information from the library. Students have to handle various books to get relevant information.

3] The student has to prepare his own notes from the reference books. The classmates help each other for this library work. Thus the classroom interaction is enhanced.

4] Use of wall maps, atlases helps them to remember the necessary points from the maps. The maps are self explanatory. The student develops the habit of referring the maps whenever they need.

5] The presentation skills are improved. Once a successful seminar is delivered, one can see the pleasure of self confidence on their face. The skill of presentation and the habit of collecting references are much more important for the future career of the students.

6] Some students ask permission for another seminar and another topic. The second seminar is always with improved confidence and improved quality.

7] There are students from rural background. They do hesitate to take part in the discussions or even answer a question in the class. After encouragement from the teachers and their classmates, they participate in the seminar wholeheartedly. They are very much delighted after a successful maiden delivery of a seminar.

8] The students participate with open mind in further group discussions and other seminars. They come forward with their queries, doubt, and questions to be clarified. Some questions may not be related with the syllabus.

Conclusion

There are various methods of teaching and learning but participative learning is the preferred method today. The learners become familiar with the presentation skills as well as the skills necessary for the research work. With the help of the seminars, it is possible to see the gradual changes taking place in the approach of the students. The classroom atmosphere becomes more academic. The students are encouraged to go to the library and read the books more frequently. The teacher also gets more involved in the work; which further results in to greater job satisfaction.

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