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National Conference on Current Scenario in Biodiversity Conservation Challenges and Opportunities

5th Sep 2024

Organized By

Department of Zoology, Botany & IQAC
In Collaboration
with Society of Science, Technology and Humanity, Kalyan
Anand Charitable Sanstha, Ashti's
Anandrao Dhonde Alias Babaji Mahavidyalaya, Kada Tal. Ashti Dist. Beed, Maharashtra, India

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About the Conference Venue

Kada is located on the bank of the River Kadi. Before independence it was under the rule of Nizam. Venue of the conference is on the Shirdi- Hyderabad National Highway. Nearest Railway station is Ahmednagar, which is 45 Km away from Kada, and 100 Km. from district place Beed. There are frequent buses available from Beed, Nanded, Parbhani, Latur, Osmanabad, Tuljapur, Solapur, Ahmednagar, Pune, Mumbai, Nasik and Aurangabad to kada.

About Society of Science, Technology and Humanity, Kalyan

The Society of Science, Technology and Humanity , Kalyan is established by Prin. Dr. Vasant Mali with the registration no. MAH/92/2020/THANE. The prime objective “Shaping a Empowerment.”The vision of society is grounded in a profound commitment to advancing society through education, empowerment, and innovation. The picture a future in which the relentless pursuit of knowledge, social advancement, and individual empowerment transform the world. The objective is to impact education in diverse fields, including Science, Management, and Social Sciences. We believe that education is the cornerstone of progress, and through our efforts, we strive to make quality education accessible to all.

About the Conference

Biodiversity on Earth, is facing an unprecedented crisis. Human activities such as deforestation, pollution, overfishing, and climate change are pushing countless species to the brink of extinction. The consequences of inaction are far-reaching, with implications for ecosystem resilience, human well-being, and the planet's ability to support life. Biodiversity conservation is the practice of protecting and preserving species, ecosystems, and the natural processes that support them. It requires a multifaceted approach, involving governments, NGOs, local communities, and individuals. Department of Zoology and Botany has taken efforts to organize national conference which will explore the current state of biodiversity conservation, identify key challenges and opportunities, and examine innovative solutions to address the biodiversity crisis.

Conference Topics

Consequences of climate change on Biodiversity
Biodiversity and bio conservation strategies and Solutions.
Climate change impacts on ecosystems
Challenges for biodiversity conservation
Human-wildlife conflict and coexistence
Pollution and Degradation:
Biodiversity Monitoring and Assessment
Forestry and Green Economy
Biodiversity and Betterment of Human health
Microbiology for betterment of Human health

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Physico-Chemical Parameter and Fish Diversity of Fresh Water Majalgaon Reservoir in Maharashtra State, India

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ABSTRACT

Majalgaon Dam was constructed on the River Sindphana which is tributary of River Godavari, in Beed District (Maharashtra, India) in 1987. Which falls 16° 16 N latitude and longitude 73° 26 E. The River Sindphana has been under constant threat of pollution by sewage and industrial wastes, disposal of dead bodies, deforestation, excessive use of fertilizers and pesticides, bathing and water development programs. The dam has a catchment area is 3840 sq. km. It is of great Importance for the region because its water is used for human and cattle consumption, It is multipurpose type like irrigation and power production (Hydro Electric Project). As a representative of these 'Majalgaon Dam' was selected for the limnology studies. As a representative of these 'Majalgaon Dam' was selected for the limnology studies.

The present study is aimed to investigate some of the important physical and chemical parameters along with the flora and fauna of the reservoir. A total of 33 species of phytoplanktons, 29 species of zooplanktons and . The reservoir is very productive. There are several types of fresh water fishes present in the dam. Labeorohita, Cirrhinamrigal, Catlacatla, Cyprinuscarpio, Silver carp, Wallagoattu, Mystancenbelusarmatus, Notopterus chital, Barbusticto, Channastaitus, Mystusseenghala, Mystuscavassius, Eutroplussuratensis, Belonconcila, Chela, Tilapia mosambica, Rohteealfrediana, Gobiusgiuris etc.16 species of fishes were identified during June2022-May2023. Hence the present work is an attempt to accumulate information pertaining to various aspect of hydrobiology of standing water bodies from this part of peninsular India.

INTRODUCTION

Fish is economically a very important group of animals, beside being used as food. Fish liver is an important source of oil containing vitamins A and D. Several minerals especially if the bones can be eaten. Fish is also a source of Vitamin B. It is rich in protein, specially preferred for containing essentially amino acid such as Lysine and Methiomine abundantly required for formation of phospholecithine in gray matter of the brain. Unsaturated fat in fish also reduce the risk of formation of high blood cholesterol. Body oil from fish is extensively used in soap industries and tanning. Fish also yield fish meal. Suitable species that are stocked in dams are the major carps. These are capable of adjusting successfully to ecological condition of the reservoir. The exotic carps also Thrives in man made lakes and is suitable species for culture.

Water is the basic element in fish culture and its specific properties as a cultural medium of great significance in the productivity of a pond or reservoir. Pure water is unable to support living organism but it contains nitrogen, phosphorus, potassium and calcium salts, dissolved organic matter and gases like oxygen, nitrogen and carbon dioxide determine to a large extent the productivity. In water of lakes and reservoir fishes are reared more as a part of a general fishery improvement programme than as pure fish culture. Only 61.3 % of the readily cultivatable water area in the country is presently utilized for culture with regard to inland fish culture. The culture of Indian major carps and exotic species have been very popular in recent time. The study of fishes-technically known as 'Ichthyology' is one of the least popular branches of natural History.

Majalgaon dam in located at Majalgaon Dist. Beed (M.S.) on river Sindphana. River Sindphana is the main tributary of Godavari river on the right bank its origin in the Balaghat range 40-50 km away from Majalgaon Dist. Beed (M.S.). On the river Sindphana the well-known Majalgaon Dam has been built near 2 km. U/S from Majalgaon city, Beed District in Maharashtra state. Which fall under 16°168 N latitude and longitude 73° 26 E. It is a multipurpose type of project like irrigation and power production (Hydro Electric Project). In 1977, dam construction started and the completed in the year 1987. The catchment area is 3840 sq. km. Majalgaon dam is a second stage of 'NathSagar' at river Godavari valley at Paithan District, Aurangabad, Maharashtra. Majalgaon dam has a submerged area 7813 hectare and the length of Dam is 6488 meter. The reservoir is very productive. There are several types of fresh water fishes present in the dam.

Study area of Majalgaon Dam reservoir

Hence the present work is an attempt to accumulate information pertaining to various aspect of hydrobiology of standing water bodies from this part of peninsular India. The present investigation has been carried out on 'Majalgaon Dam' located on river Sindphana (Godavari Basin) near 2 Km. U/s from Majalgaon city (Taluka place) of Beed districts in Maharashtra State. Which falls 16° 16 N latitude and longitude 73° 26 E.

It is multipurpose type like irrigation and power production (Hydro Electric Project). As a representative of these 'Majalgaon Dam' was selected for the limnology studies. The present study is aimed to investigate some of the important physical and chemical parameters along with the flora and fauna of the reservoir. Similarly by studying the phytoplankton and zooplankton quantitatively to find out what type of exotic fishes can be introduced in the reservoir in future so as to utilize the water body successfully for fish production.

Table No. 1: Highlight of Majalgaon dam reservoir and fish fauna.

Name	Majalgaon dam Jaikwadi project Stage – II
Type	Multipurpose (Irrigation and Power production)
River	Sindphana
Basin	Godavari

Location	2 Km. u/s of MajalgaonDist-Beed (M.S.)
Year of start of Construction	1977
Year of completion	1987
Catchment area	3840 Sq.Km.
A.V. Rainfall in C.A.	800 mm.
Submerged area	7813 Ha.

Sampling of Fishes

Different kind of fishes were collected from the selected two sites with the help of fisherman of the work on the dam by using different types of craft, gears and nets and after noting down color and other external feature were preserved in 4 % formalin, seasonal collection were made from June 2022-May 2023 for two years, the period of research work.

Standard identification key where used for identification of specimen up to species level, using standard key and literature of Day (1971), Agarwal (1994), Jhingran (1982). The classification of fishes on economic importance were done by following the proforma given by Lagler (1956) and Jhingran (1982).

RESULT & DISCUSSION

Result and Discussion:

Fish as constitute economically a very important group of animals. A large number of dams and reservoir has been constructing during the recent year to provide water for irrigation and power production. These bodies of water offer immense scope for fish culture for successful fish farming in dam and reservoir.

Majalgaon dam reservoir is very productive more work has been carried out of fish fauna. The distribution of fish species is quite variable because of geographical and geological condition.

The Eleven species of the fish fauna in this study belonging to four order and six families are given in the table No. 2 among them order Cypriniformes was dominant with eight species to be followed by the Mastalimbeliformes, Osteoglossifomes, and Ophiocephalifomes each with one species. Valsangkar (1993) recorded 16 indigenous and 5 introduced fish species from ShivajiSagar reservoir. Sakhare (2001) recorded 23 fish species belonging to 7 orders in Jawalgaon reservoir in Solapur district. Pawar and Madlapure (2002) recorded 11 fish species belonging to 5order in sivur dam. Ingole (2005) recorded 11 fish species occurrence in the during research work at Majalgaon dam reservoir.

Physico-Chemical parameters

Lake ,reservoirs and pond constitute a great source of Inland fisheries in India.Productivity of pond and reservoirs depends upon the quality of water and soil.Incidences of light isresponsible for the production and distribution of planktons. Variation of Temperature has an important influence an all the organisms including fishes. The oxygen content of water is reduced with the rise in Temperature. pH of reservoir water may be alkaline ,acidic or neutral and is an important environmental factor influencing the species and metabolism of all animals and plants inhabiting it.pH of reservoir water having 6.5to 9.0 is most suitable for culture.Dissolved oxygen is most for the animals and plants life in a pond, on cloudy day photosynthesis is reduced and causes oxygen deficiency at night is fatal to the fish.A balance of oxygen content ismaintained is the reservoir water through plants and all animals consumeoxygen during respiration. Oxygen deficiency of reservoir causes migration,attack of parasites ,fungal diseases and death due to suffocation

Table No.2. Physico-chemical Parameters on Majalgaon dam reservoir during 2022-2023

	Parameters	Min.		
		Max.	Site- S1	Site- S2
1.	Water (^{0}C) Temperature	Min.	23.1	24.0
		Max	30.0	29.9
2.	pH	Min.	7.4	7.3
		Max	8.5	8.5
3.	Total Solid mg/lit.	Min.	220	222
		Max	311	399
4.	Dissolved oxygen mg/lit.	Min.	4.2	3.0
		Max	10.1	10.2
5.	TotalHardness mg/lit.	Min.	95	98
		Max	147	191
6.	Calcium mg/lit.	Min.	59	50
		Max	90	77
7.	Magnesium mg/lit.	Min.	4.86	6.56
		Max	18.2	19.1

Fish fauna on Majalgaon dam reservoir

The local fish fauna are abundance and distribution of Majalgaon Dam reservoir.. are as 1. Labeorohita 2. Cirrhinamrigal 3. Catlacatla 4.Cyprinuscarpio 5.Silver carp 6.Wallagoattu 7. Mystacenbelusarmatus 8.Notopteruschital 9..Barbusticto 10. Channa 11. Mystusseenghala12.Eutroplus suratensi 13.Belon concila 14.Chela15.Tilapia mosambica 16.Rohtee alfrediana

Hydrobiological study and features of the fisheries of Majalgaon Dam reservoir of its self sustained ecosystem is described. Alikhuni (1957) stated that the water alkalinity over 100 ppm are called as productive water body

Table No.3. Fish fauna on Majalgaon dam reservoir

Class – Pisces	Family -3 – Siluridae
Sub-class – Teleostomi	Spcies – 8 – Wallagoaltu
Order 1 – Cypriniformes	Order – 2 – Mastaembeliformes
Family 1 – Cyprinidae	Family 4 – Mastamecembelidae

Speices – 1 – CatlaCatla	Species 9 – M. armatus
Species 2 – Labeorohita	Order 3 – Osteoglossiformes
Species 3 – Cirrhinamrigal	Family 5 – Notopteridae
Species 4 – Cyprinuscarpio	Species – 10 – N. chital
Speices 5 – Silver carp	Order 4 – Ophiocephaliformes
Species 6 – Barbusticto	Family 6 – Channidae
Family 2 – Bagridae	Speices – 11 – ChannaStaitus
Species 7 – Mystusseenghala	

FISHING ON MAJALGAON DAM RESERVOIR

Commercial fishing was done by the fisherman of the society. Fishing started after monsoon and it was done day as well as night. Hooks and line gear used for fishing of Carnivorous fishes.Drag net, gill net cast net are used for fishing. The size of the net depends upon the area of fishing and size of the mesh depends upon the size of fish.

Fishing was done with the help of wooden plates, thermocole sheets, tubes and coracle etc. as well as transportation the coracle was made from bamboo splits and covered with polythene sheet. It was light in weight and used in single fisherman. The size of thermocole, wooden sheet varies from 5 to 6 feet in the length and 3 to 4 in breadth.

It was very difficult to find out the exact fish production of the Majalagaon Dam reservoir because fisherman never maintains the record noted of their catches. It was very difficult to find out the growth rate of fish from the reservoir because of non availability of scientific data.

BIOLOGICAL CHARACTERISTICS (PLANKTON STUDIES)

Nearly 40 % of the plankton communities lives at a depth of 1-5 meters. The population being densest at a depth of 7-8 meters.Phytoplankton is an important component of aquatic flora and play key role in maintaining proper equilibrium of aquatic ecosystem between abiotic and biotic component of aquatic ecosystem. They serve as food for fishes directly or indirectly and are the primary producer of phytoplankton aquatic ecosystem.

Zooplankton is an important component of secondary production in an aquatic system. They are an important food source of higher organisms including fishes. The quantitative analysis of zooplankton do not only reflect energy transfer in the system but it also certainly provides the information about the happening in the food cycle.

MARKETING OF FISH

Fisherman themselves catch the fishes and sold them at distance market at Aurangabad, Hyderabad, Mumbai, Gulbarga, Nizamabad. They also sold fishes at local market Majalgaon. Nitrud, Talkhed, Patrud ,Takarwan, Rajegaon, Dharur, Wadwani, Telgaon, Georai, Parli, Beed and Pathri. Fishes, after assembling, were sold to the merchant and send them to distance market. While transporting fishes, fishes are packed with ice in bamboo boxes.

Socio-Economic Condition

The most important factor that influence the utilization and development of the fishery resources in the socio-economic condition of the fisherman.. This caused them to depend upon middle man for the marketing of their producer and naturally the major portion of the profit goes in the pocket of middleman. The fisherman of this society are belong to the casts such as, Bhoai – 90 % Fisherman & Muslims – 10 % fisherman of the fisherman do not have their own net, for it they depend upon the other fisherman and in return they give a good portion of their income as hire of the net. The net income of the fisherman is insufficient for his maintenance and of his family.

Future Scope For Majalgaon Dam Reservoir

Adequate stocking of fish seed is necessary. They were stocked C. mrigal, Cyprinuscarpio. If fish seed of Ciprous, Rohu, Mrigal and Catlacatla is stocked then it will increase the production.Marketing should be done through the co-operative society only instead marketing through agents.Illegal fishing should be prevented.Mixed fish culture should be adopted such as culture of Indian major carps and exotic carps to increase production.Removal of predatory fishes is necessary.Fisherman should be educated for the development of reservoir fishery.

Conclusion

Productivity of reservoir is depending on physico chemical parameters &biological aspect. Maintain socio-economic condition and Management of reservoir etc.

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Systematic Study of some Euglenoids of Bendusura Dam

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ABSTRACT

Bendusara dam is one of the important Dam in Beed district of Maharashtra (India), situated 10 Km away from glorious historical Beed city. The water body of this dam supporting the growth of different species of aquatic fauna and flora including algae. The present study deals with the systematic study of some Euglenoids during the period of one year June 2013 to May 2014. The Euglenoids are showing combine characters like plants and animals. According to Fritsch (1035) classify in signal order Euglenales and family Euglenaceae with five genera. To study the systematic characterization of Euglenoids three sites of Bendusura Dam ware selected for the collection samples. In present investigation out of five genera only three genera of Euglenoids represented by species of Euglena 04, Phacus 03 and Trachelomonas 02.

Keywords: Euglenoids, Combine, Phacus and Bendusura.

INTRODUCTION

Load Bendusara dam is one of the important dam in Beed district of Maharashtra (India) situated 10 Km away from glorious historical Beed city. The exact geographical location of Beed district is at 16.65°N 74.13°E. It has a mean elevation of 530 meters (1738 feet). Beed district is located on the Deccan plateau. Bendusara dam is one of the important Dam in Beed district of Maharashtra (India), situated 10 Km away from glorious historical Beed City. The water body of this dam supporting the growth of different species of aquatic fauna and flora including algae.

This is the protozoans – like organisms which sharply defined by unique and highly specialized feature. The derivation of Euglenophyta is obscure but there is some evidence that they evolved from marine ancestors. Most of the members are fresh water; few are sedentary, motile by one or two stout flagella of complex structure. The euglenoids are showing combine characters like plants and animals. According to Fritsch (1035) classify in signal order euglenales and family euglenaceae with five genera. In the recent era great advances have been made in the investigation of fresh water algae in many parts of the world and particular attention has been paid to their biology and ecology. Survey of literature revels that, systematic study on euglenoids in abroad and in India have been done extensively. In Maharashtra several workers have paid their attention on systematic study of euglenoids. Marathwada is a one of the important geographical region of Maharashtra where large number of fresh water bodies is present. Review of literature reveals that the systematic study of euglenoids in Marathwada is still in infancy (Sarode and Kamat, 1979, 1980, 1981 and 1983; Ashtekar, 1980, Andhale, 2008, Talekar, 2009 and Yadav, 2010). Therefore, it has been decided to work on systematic study of euglenoids diversity Bendusura Dam.

MATERIAL AND METHOD

Algal samples were collected at monthly intervals during May 2013 to June 2014 in Acid washed collection bottles. Floating and Planktonic algal samples were collected separately in collection bottles. After collection, algal samples were brought immediately to the Laboratory. The algal samples were preserved in 4% formalin for further taxonomic investigations. The fresh as well as preserved algal forms were observed under microscope and identified with standard literature on algae (Prescott 1951).

SYSTEMATIC STUDY

1) *Euglena acus* Ehrenberg

Prescott 1951, P-390, Pl-85, Fig. 28

Cells very slightly metabolic, elongnate spindle shaped shaped, produced posteriorly into a long, fine tapering point, narrowed and truncate at the anterior end; membrane indistinctly spirally striated chloroplasts numerous, disk-like; parmylon bodies 2 to several long rods 10-14 µ in diameter, 140-180 µ long.

2) *Euglena convoluta* Korshikov

Prescott 1951, P-391, p1-86, Figs 7-9, 14

Cells slightly metabolic, elongate-fusiform and spirally twisted or curved, seldom straight, elliptic in cross section rather abruptly narrowed interiorly and truncate posteriorly, narrowing more gradually to form a long tail-piece. Membrane finely and spirally striate. Flagellum short about one-sixth the length of the cell. Paramylon bodies of two sorts; 6-8 large, concave or through-shaped plates laterally arranged, parallel with the long axis, with the pellicle slightly undulate over them; and numerous small disc -like rings irregularly scattered throughout the cell. Chloroplasts numerous ovoid disc, evenly distributed throughout the cell; pyrenoids lacking; eye spot elliptic, composed of irregularly arranged crimson granduales. Cell 120-145µ long. 10-12µ in diameter; large paramylon bodies 10 µ long small paramylon grains 5 µ wide, 7 µ long.

3) *Euglena deses* Ehrenberg

Prescott 1951, P-392, P1-85, Fig-20.

Cells highly metabolic, twisting and turning continuously; elongate-fusiform or subcylindric, posteriorly tapering rather abruptly to a short blunt tip; membrane finely striated; chloroplasts numberous disc-like; paramylon bodies several to many rods of various length; cell 18-20 (24) µ in diameter, 65-125 (200) µ long.

4) *Euglena proxima* Dangeard

Prescott 1951, P-394, P1-85, Fig. 25.

Cells metabolic, fusiform, narrowed posteriorly to blunt tip; periplast spirally striated; chloroplast numberous, irregularly shaped discs; paramylon bodies numberous small rods scattered throughout the cell; cells 14.5-19-(21) μ in diameter, (50)-70-85(95) μ long.

5) ***Phacus angulatus*** **ponchmann**

Pochmann 1942, P-171, Fig. 70 a-c.

Cells nearly triangular, posterior end inflated, inclined, anterior end gradually attemiated; periplast longitudinally striated; chromatophores many, rounded, discoid; parmaylon bodies 2-4 disc like cells 24-26 μ broad, 30-36 μ long.

6) ***Phacus birgei*** **prescott**

Prescott 1951, p-398, P1-87, Fig. 11.

Cell broadly ovoid, produced posteriorly to form a long tapering caudus which is oblique to the longitudinal axis of the cell, broadly rounded anteriorly; flagellum as long as the cell; periplast very finely striated; margins of the cell sharply notched with 4 small indentations on either side; paramylon bodies one large and numberous small circular plates; chloroplasts many ovoid discs; pigment-spot; cell 50-60 μ in diameter, 70-80 μ long.

7) ***Phacus meson*** **Hubner P.**

Hubner 1955, P-195, Fig. Abb, 103.

Cell 102 μ long, 22.9 μ broad, centrally globularing forming, paramylum, chromatophores arranged in plates and many, anterior end broad, large elliptical and posterior end having long sharp tail.

8) ***Trachelomonas intermedia*** **Dangeard**

Prescott 1951, P-415, P1-83, Fig-10.

Test subspherical to oval, slightly narrowed anteriorly; wall finely punctuate, brown; flagellum aperture with a thickening but without a distinct collar; test 18 μ in diameter, 25 μ long.

9) ***Trachelomonas oblonga*** **Lemmermann**

Huber Pestalozzi 1955, p.278, P1-61, Fig. 459

Test ellipsoid-oblong; wall smooth; yellow-brown; flagellum aperture surrounded by a thickening of the collar, collar long, inside the test; test 22-26 μ in diameter, 25-26 μ long.

DISCUSSION

The taxonomic study of Euglenoids were made by several earlier researches; Astekar 1980 systematically studied 670 algal taxa , Magar 2008 reported systematic account of 364 algal taxa from girna dam of Nashik district, Andhale 2008 recorded 215 spices of algae and made there systematic account from Jayakwadi Bird Sanctuary Paithan tehsil of Aurangabad district and Talekar 2009 encounter 205 algal taxa under 72 genera and made their characterization from Manjara river and its reservoir from Beed district of Maharashtra. Similar kind of observation were made by Waghodkekar V.H. and Jawale, A.K. 2001, Kumawat, D. A. and Jawale A.K. 2004, Kumawat et. all. 2007 and Yadav, S. G. 2010.

CONCLUSION AND FUTURE SCOPE

The taxonomic study of Euglenoids is useful for the further research in biotechnology. The purpose of research work for the study of characterization genus, *Euglena, Phacus and Trachelomonas* and pollution status of water body with the help of algal pollution indicators.

AUTHORS' CONTRIBUTIONS

M.N. Sonawane contribute to collection and preservation of algal samples, S.M. Talekar work to identification of Euglenoids with the help of standard literature on algae and A.D. Baglane made micro photographs and calibrations of studied Euglenoids

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Study of Fish Diversity of Five Water Reservoirs from Omerga Tahasil of Osmanabad Dist. (M.S.) India

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ABSTRACT

Omerga Tahsil of Osmanabad district is situated in Marathawada region of Maharashtra state. Omerga Tahsil is economically backward and also in agriculture and industry. There were five water reservoirs which are used for agricultural and drinking water. Omerga Tahsil comes under the Krishna valley project of Maharashtra fisheries in there reservoirs have been neglected for a long time, but now a day fisheries of this Tahsil comes in focus (colors) because of the aggressive participation of the district fisheries department and trying their best for the farther development of fisheries. Till today there was no recorded fish diversity of this Tahsil. Present investigation was carried out and recorded fish diversity in the reservoirs of Omerga Tahsil cultivated and local fishes are abundant found in the reservoirs five different cultivated fishes and right local variety of fishes has been recorded

Key words: Fish diversity, reservoir, Omarga Tahsil Maharashtra.

INTRODUCTION

Load All our man-made reservoirs are created by constructing dams an across rivers and Nalas at suitable locations. The original fishery of these river system forms the fishery of the newly created water impoundments, the reservoir over them, with or without fauna. Fish diversity depends on the abiotic factors. These factors show the different in population. According to Angadi S. M. (1996), Fishes can adapt the fluctuations of condition in the reservoirs where after functions in the reservoir whereafter function in natural conditions the niche of certain species are taken over by more adaptable fish varieties.

The study of the fisheries in five reservoirs of Omerga Tahsil which is useful for irrigation and drinking water supply, along with this, these reservoirs are helpful for fish culture, there is no recorded proper information about the fish fauna of the reservoir of this Tahsil. Hence there is a need to survey (study) about the fish variety in particular reservoir, which may be of help in planning fish culture in other man-made reservoirs.

MATERIALS AND METHODS

Fish samples were collected during the harvesting period of the reservoirs in the year 2021. These fish samples preserved in 4% formalin and brought to laboratory for further investigations. The Study of identification of fishes has been done with the help of standard literature F Day (1958); V. G. Jhingran (1975); P. K. Talwar and A. G. Jhingran (1991); A. K. Pandy and Sandhu (1992); R. J. Ranjit and Daniels, 2002 and Jayram, 1981.

RESULTS AND DISCUSSION

The survey of fish fauna from various reservoirs of India has been done by many workers Swarup (1953), study on the fish diversity of Sager lake, Soni (1959) reported about lower lake of Bhopal, Maviya (1961), reported on the fish fauna of Jabalpur, J. S. Mohite (2004), Adarsh Kumar, Qureshi (2007), study on the fish diversity of Ranjit Sager reservoir, Jammu and Kashmir.

The present study reports the fish diversity of Omerga Tahsil reservoirs. Fish culture practices are flourished, it means that the reservoir shows the diversity of cultivable species fishes as well as local fishes. A local fish occupies the notable place in the study of diversity.

Total twelve fish species were recorded family Cyprinidae, the genus Catla and Labeo were dominant found in the reservoirs. Periformes with the genus Tilapia only one dominant species was recorded.

During the period of investigation fish species, order, families and genera recorded.

Order	Family	Fish species
Cypriniformes	Cyprinidae	Catla- calla Labeo rohita Cyprinus carpio Cirrhinus mrigala Punctius sophore Punctius sarana Labeo calbasu
Siluriformes	Bagridae	Mystus seenghala Mystus cavasius
Channi formes	Channidae	Chann gachua
Osteoglossiformes	Notopteridae	NotoPterus notoPterus
Perciformes	Cichlidae	Tilapia mossambica

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Table 1: Occurrence of cultivated fish species from in the five water reservoirs of Omerga Tahasil During Jan to Dec 2021.

Sr. No	Name of the fish	Name of the water reservoir				
		Bennitura	Turori	Jakkapur	Kolsur	K. Jawalga
1.	Catla catla	✓	-	✓	✓	✓
2.	Labeo rohita	-	✓	✓	✓	✓
3.	Cirrhinus mrigala	✓	-	-	✓	✓
4.	Cyprinus carpio	-	✓	✓	✓	✓
5.	Tilapia mossambica	✓	✓	-	-	✓
Total	5	3	3	3	4	5

Table 2 : Occurrence of local fish species from in five water reservoirs of Omerga Tahsil During Jan to Dec 2021.

Sr. No	Name of the fish	Name of the water reservoir				
		Bennitura	Turori	Jakkapur	Kolsur	K. Jawalga
1	Labeo calbasu	-	✓	-	✓	-
2	Mystus cavasius	-	-	✓	✓	✓
3	Mystus seenghala	-	-	-	✓	✓
4	Punctius sarana	-	-	-		✓
5	Punctius saphore	✓	-	✓	✓	✓
6	Channa gachua	✓	-	✓	-	-
7	Notoperus rwtopteruy	✓	✓	-		✓
Total	7	4	3	4	4	6

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Fish Diversity and Spatial Distribution in Freshwater: Cyprinidae Family Found in Kasarwadi Reservoir, Parli V, Dist. Beed (MH)

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ABSTRACT
This study investigates the fish diversity and spatial distribution of the Cyprinidae family in Kasarwadi Reservoir, located in Parli V, Beed District, Maharashtra, India. The research aims to provide a comprehensive understanding of how environmental factors influence the diversity, distribution, and abundance of Cyprinidae species in this freshwater ecosystem. Kasarwadi Reservoir, a crucial aquatic habitat in the region, experiences significant seasonal variations, including fluctuating water levels, temperature changes, and varying nutrient concentrations, all of which impact the local aquatic life.
Over a period of one year, data were systematically collected through monthly fish sampling and concurrent environmental monitoring. Fish samples were obtained using gill nets, cast nets, and traps, while environmental parameters such as water temperature, pH, dissolved oxygen, turbidity, and nutrient levels were measured. The study identified a total of 12 Cyprinidae species within the reservoir, with Cyprinus carpio, Labeo rohita, and Catla catla being the most prevalent. The diversity of species varied across different spatial zones of the reservoir, including shallow, mid-depth, and deep zones.
In shallow zones, characterized by higher primary productivity and warmer temperatures, juvenile and smaller Cyprinidae species were most abundant. These areas provided optimal conditions for early growth stages due to abundant food resources. Mid-depth zones exhibited the highest species richness and abundance, attributed to their stable environmental conditions and adequate food supply. In contrast, deep zones, though less diverse, supported larger and more tolerant species, providing refuge during extreme seasonal conditions and offering cooler water temperatures.
The results indicated a strong correlation between environmental factors and fish distribution patterns. Optimal water temperatures (20-28°C) supported the highest growth and diversity, while deviations from this range led to reduced fish activity and diversity. Dissolved oxygen levels were positively correlated with fish abundance and diversity, particularly in shallow and mid-depth zones. Increased turbidity negatively impacted fish populations, particularly in areas with high sedimentation, which affected feeding and habitat quality.
This research highlights the intricate relationships between environmental variables and fish ecology in Kasarwadi Reservoir. The findings underscore the importance of maintaining optimal environmental conditions to support diverse and healthy fish populations. The study provides valuable insights for

fisheries management and conservation, suggesting that efforts should focus on preserving habitat complexity, managing water quality, and mitigating factors that contribute to increased turbidity. By understanding the spatial distribution and diversity patterns of Cyprinidae species, more effective and targeted conservation strategies can be developed to ensure the sustainability of freshwater ecosystems in the region.

Keywords: Fish diversity, spatial distribution, freshwater ecology,fish population, habitat analysis, environmental factors, reservoir ecosystems

INTRODUCTION

Freshwater ecosystems, including rivers, lakes, and reservoirs, are critical habitats for a wide variety of aquatic species, particularly fish, which are key indicators of the health and biodiversity of these environments. Among these, the Cyprinidae family is one of the most diverse and widespread, playing a significant ecological role in freshwater habitats around the world. Understanding the diversity and spatial distribution of fish, especially within the Cyprinidae family, is essential for managing and conserving these aquatic ecosystems, particularly in regions facing environmental stressors.

The Kasarwadi Reservoir, located in Parali, Beed District, Maharashtra, is a significant freshwater resource supporting local fisheries and agriculture. Despite its importance, there is limited scientific literature on the ichthyofauna of this reservoir, particularly concerning the diversity and distribution of species within the Cyprinidae family. This family, known for its adaptability and ecological importance, includes several species that are vital to both the ecosystem's health and the local economy.

This study aims to fill the gap in existing knowledge by conducting a comprehensive survey of the fish species in the Kasarwadi Reservoir, with a specific focus on the Cyprinidae family. By analyzing the species diversity and spatial distribution patterns, this research seeks to provide insights into the factors influencing fish communities in the reservoir. Such information is crucial for developing effective management and conservation strategies, ensuring the sustainability of this vital freshwater resource.

The objectives of this study are threefold: (1) to assess the overall fish diversity in the Kasarwadi Reservoir, (2) to analyze the spatial distribution of species within the Cyprinidae family, and (3) to identify environmental and anthropogenic factors that may be influencing these patterns. The findings from this research will contribute to a better understanding of freshwater fish ecology in the region and provide a foundation for future studies and conservation efforts.

OBJECTIVES:

1. Assess the diversity of Cyprinidae species in Kasarwadi Reservoir.
2. Analyze spatial distribution patterns of these species across different reservoir zones.
3. Examine how environmental factors influence fish diversity and habitat use.
4. Provide recommendations for fisheries management and conservation.

2.1. Fish Diversity in Freshwater Systems:

Fish diversity is influenced by factors such as habitat complexity, water quality, and seasonal variations. Cyprinidae, a prominent family in freshwater systems, shows varying patterns of abundance and distribution.

2.2. Spatial Distribution Patterns:

Understanding spatial distribution helps in identifying critical habitats and resource use. Factors like water temperature, depth, and food availability affect distribution.

2.3. Environmental Factors and Fish Distribution:

Environmental variables such as water temperature, pH, and turbidity significantly impact fish populations. Seasonal changes also play a crucial role in shaping distribution patterns.

MATERIAL AND METHODS

3.1. Study Area:

The study was conducted in the Kasarwadi Reservoir, located in Parli .V, Beed District, Maharashtra. The reservoir, a significant freshwater body in the region, is characterized by varying depths, diverse aquatic vegetation, and a range of microhabitats suitable for different fish species. The geographic coordinates of the reservoir are approximately [18.854961, 76.601208], and it covers an area of [14 KM^2]. The climate of the region is typically tropical, with distinct wet and dry seasons, influencing the hydrology of the reservoir.

3.2. Sampling Design

Fish sampling was carried out over a period of [one year/365 days], covering both pre-monsoon and post-monsoon seasons to account for seasonal variations in species diversity and distribution. The reservoir was divided into [6] sampling zones, each representing different habitat types such as open water, vegetated areas, and nearshore zones. These zones were selected based on their ecological characteristics, ensuring comprehensive coverage of the reservoir's diverse habitats.

3.3. Fish Collection Methods

Sampling was conducted using a combination of traditional fishing methods, including:

1. **Gill Nets**: Nets of varying mesh sizes (ranging from [insert mesh size range, e.g., 20 to 100 mm]) were used to capture fish of different sizes and species. The nets were set in the evening and retrieved the following morning to minimize bias in species capture.
2. **Cast Nets**: Cast nets with a mesh size of [insert mesh size] were used to sample fish in shallow and vegetated areas where gill nets were less effective.
3. **Traps and Hooks**: Traditional fish traps and baited hooks were employed to capture species that might evade nets, particularly in nearshore and complex habitats.
4. **Electrofishing (optional, if applicable)**: Where permissible, electrofishing was used in selected areas to complement other methods, particularly for capturing smaller or more elusive species.

All captured fish were immediately identified to the species level using standard identification keys ([Ecology of Freshwater and Estuarine Wetlands] by Richard Kent Peet). The fish were measured for standard length (30-35 cm) and weighed (1 kg) to assess their size distribution. Representative specimens were preserved in 10% formalin for further laboratory analysis, and the remaining individuals were released back into the reservoir after data collection.

3.4. Data Collection:

- **Fish Sampling:** Conducted monthly using gill nets, cast nets, and traps. Species identification, measurement, and abundance data were recorded.
- **Environmental Data:** Water temperature, pH, dissolved oxygen, and turbidity were measured. Nutrient levels and primary productivity were analyzed.

Sampling zone	Area (sq.km)	No. of Samples	Average Depth (m)	Fish Species	Total Fish Count	Average Fish Size (cm)	Temperature (°C)	pH Level
Zone 1	3.0	10	5.2	4	120	15.5	22.0	7.4
Zone 2	3.5	12	4.8	5	150	16.0	22.5	7.5
Zone 3	4.0	15	6.0	3	100	14.0	21.8	7.6
Zone 4	3.5	11	5.5	4	130	15.8	22.2	7.3
Zone 5	2.0	8	2.0	2	80	14.5	22.0	7.4
Zone 6	4.5	10	4.3	3	110	16.3	22.4	7.3

3.5. Data Analysis:

- **Diversity Metrics:** Calculated using species richness and abundance indices.
- **Spatial Distribution:** Analyzed based on habitat zones within the reservoir.
- **Environmental Correlations:** Examined relationships between environmental factors and fish diversity.

RESULTS

4.1. Fish Diversity:

A total of 12 Cyprinidae species were identified in Kasarwadi Reservoir. The most common species were Cyprinus carpio, Labeo rohita, and Catla catla. Species richness was highest in the reservoir's mid-depth zones, where habitat complexity and food availability were optimal.

4.2. Spatial Distribution:

- **Shallow Zones:** Dominated by juvenile and smaller Cyprinidae species, likely due to higher primary productivity and warmer temperatures.
- **Mid-Depth Zones:** Hosted a diverse range of species, with higher abundance of adult Cyprinidae. These zones offered stable environmental conditions and abundant food resources.

- **Deep Zones:** Characterized by lower species diversity but high abundance of larger, more tolerant species. These areas were cooler and provided refuge during extreme seasonal conditions.

4.3. Environmental Influences:

- **Water Temperature:** Optimal growth and diversity observed between 20-28°C. Deviations from this range led to decreased diversity and abundance.
- **Dissolved Oxygen:** Higher levels correlated with increased fish activity and diversity, especially in shallow and mid-depth zones.
- **Turbidity:** Increased turbidity negatively impacted fish diversity, particularly in areas with high sedimentation.

DISCUSSION

5.1. Interpretation of Results:

The study confirms that Cyprinidae diversity and distribution in Kasarwadi Reservoir are influenced by environmental factors such as temperature, oxygen levels, and habitat structure. Seasonal variations impact these factors, leading to shifts in fish distribution.

5.2. Practical Implications:

Management strategies should focus on maintaining water quality and habitat complexity to support fish diversity. Ensuring adequate oxygen levels and controlling turbidity are crucial for sustaining healthy fish populations.

5.3. Limitations and Future Research:

The study was limited to a single reservoir and did not account for interannual variations. Future research should explore additional habitats and longer study periods to provide a broader understanding of Cyprinidae dynamics.

CONCLUSION

The study of fish distribution across the six sampling zones in the 14 square kilometer reservoir reveals notable variations in fish abundance and environmental conditions. Zones with greater depths generally supported more fish, suggesting that deeper areas may be more favorable for fish populations. Despite this, Zone 3, which had the highest depth, showed lower fish counts, indicating that other factors like habitat quality might be affecting fish distribution. Average fish size was consistent across zones, reflecting a stable population structure. Environmental conditions, including temperature and pH, were relatively uniform, suggesting a generally stable aquatic environment. The findings underscore the importance of considering both depth and habitat factors in managing fish populations and highlight the need for further investigation into factors affecting fish abundance in specific zones

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Floristic Studies in Selected Species of Pycreus P. De Beauvois (Cyperaceae)

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ABSTRACT

The Vegetative characters of Pycreus are as in Cyperus. Spikelets laterally flattened with few to many glumes distichously disposed on a continuous persistent rhachilla, prophyllate at base. Glumes all alike, as a rule bearing a hermaphrodite flower at the axil, often with nerveless sides. Flowers with digynous pistil, 1-3 stamens, hypogynous bristles absent. Styles 2 fid. Nut bilaterally flattened, with one angle facing the rhachilla. The genus Pycreus can be distinguished from Kyllinga by spikelets with several flowers and persistent rhachilla.

Present study is on our own critical observations on fresh plant material collected from the different parts. The observations are also based on herbarium specimens. Relevant data from literature have been referred for comparative study. The study of Pycreus P. de Beauvois provides a detailed floristic description, illustration and relevant information for the identification in the field. Three species of the genus is elaborately described in this paper. The present report is hoped to provide basic material for further research in Cyperaceae.

Key Words: Pycreus, digynous pistil, spikelets, persistent rhachilla, hypogynous bristles.

INTRODUCTION

Vegetative characters as in *Cyperus*. Spikelets laterally flattened with few to many glumes distichously disposed on a continuous persistent rhachilla, prophyllate at base. Glumes all alike, as a rule bearing a hermaphrodite flower at the axil, often with nerveless sides. Flowers with digynous pistil, 1-3 stamens, hypogynous bristles absent. Styles 2 fid. Nut bilaterally flattened, with one angle facing the rhachilla.

Some Cyperologists and general taxonomists including Bentham (1898), Clarke (earlier treatment 1884) Pax (1887), Kukenthal (1935-36) Koyama in earlier treatment, (1960, 61) Kern (1974) Rao & Verma (1982) W. Khan (1998) and a few others treat *Pycreus* subgenerically under *Cyperus* (s.l.), while Hooker J.D. (1893) followed by Clarke, (1902), Koyama (1985), Simpson & Koyama (1998) J. Bruhl (1995) Prasad & Singh (2002) and many others considered *Pycreus* distinct generically. The same course (exceptionally) followed in the present text as the diagnostic features are uniform and consistent in all the species recorded so far without exceptions and as it is agreeable to the recent cyperologist convinced to accept *Pycreus* as above. Anatomical (Metcalfe, 1971) and embryological (Vander Veken, 1965) suggest its close tie with *Cyperus*. It is represented by about 70 species in temperate, subtropical and tropical parts of the world.

- **Floristic Account:**

1. Pycreus diaphanus (Schard. ex Roem. & Schult.) Hooper & Koyama var. **diaphanus**

Tufted annuals, 10-35 cm high. Stems trigonous, 1-2 mm thick, smooth. Leaves: gradually narrowed to apex, 1-3 mm wide, minutely scabrid on margins towards apex. Inflorescence: simple, often contracted and reduced to a single head, at times with 2-3 rays; involucral bracts 2-3, patent, lowest much longer than inflorescence. Spikelets strongly compressed, oblong with almost parallel margins, subobtuse at apex, 10-20 x 3-5 mm; rhachilla wingless, persistent. Glumes membranous, obtuse and muticous at apex, 2.5-3.5 x *ca* 2 mm, with somewhat undulate margins; keel 3-nerved, green. Stamens 2; filaments up to 3.5 mm long; anthers oblong to linear-oblong, 0.7-1 mm long, style *ca* 1.7 mm long. Nut laterally compressed, biconvex, broadly obovate, apiculate at apex, 1-1.2 x *ca* 1 mm, rugose with transverse wavy lines, ultimately black; epidermal cells longitudinally oblong.

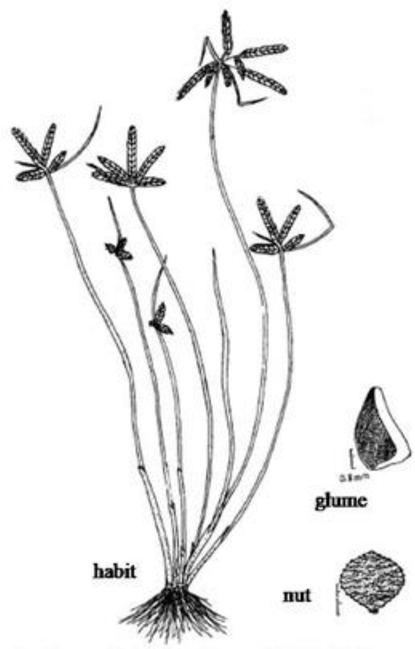

Fig. ***Pycreus diaphanus*** **(Schard. ex Roem. & Schult.) Hooper & Koyama var. *diaphanus***

Occasional, in wet rice fields, moist, grasslands and other marshy areas.

Flowers and Fruits: September to December.

Specimens examined: A.P. Vishakhapatnam Dist. Narsipatnam, *Shaikh R. I.* 906. T.N. Teni Dist. Parner, Tea plantation hill slope, *Taur R. D.* 760.

2. Pycreus pumilus (L.) Nees

Densely tufted, often dwarf annual, 3-15 cm tall; stems angular, *ca* 0.5 mm wide, slender. Leaves: sheaths glabrous, membranous; blades linear, 1-1.5 mm wide, basal or little above the base, setiform, as long as slightly shorter than the stems, acute. Inflorescence : simple, subcompound or contracted; involucral bracts 3-4 foliaceous, the lowest often erect; rays 5-10 x 1.5 mm spicate, compressed, radiating from very short rhachis, white or stramineous, tinged with brown, acute or subacute; rhachilla wingless, rather thick. Glumes ovate or suborbicular 1.2-1.5 x 1 mm; keel 3-5 nerved; sides nervelees, hyaline, distinctly mucronate at acute apex. Stamen 1; anther elliptic, minute, muticous. Nuts biconvex, narrowly obovoid, 0.4-0.5 mm long, not exposed from the glumes, smooth, bright brown, apiculate; styles 2-fid, shorter than the nuts.

Fig. ***Pycreus pumilus*** **(L.) Nees**

Occasional, around rice fields, in pastures, open grasslands.

Flowers and Fruits: August to October.

Specimens examined: A.P. Krishna Dist. *Shaikh R. I.* 991. T.N. Viluppuram Dist. Thirukkoyilur, *Shaikh R. I.* 831, 832.

Notes: Sometimes spikelets are accrescent 10-15 mm long, dull brown. It forms a complex comprising 4-5 specific and infraspecific taxa (under the section salcali). Their separation is based on narrow distinction and controversial diagnostic descriptions provided by the specialists. An attempt has been made to distinguish these taxa by *Govindrajalu* (l.c.). Second attempt has been made in the present text.

The large forms of *P. pumilus* often confuse to distinguished from very closely allied *P. nervulosus* (= *Cyperus nervulosus* (Kuk.) Blake) but can be distinguished from the glumes compactly arranged or slightly remote in fruiting and thus obliquely patent with erect or slightly recurved awns, nerveless sides and usually the single stamen. (Sometimes 2, Kern l.c.). However, Koyama l.c. mentions glumes in *P. pumilus* are compactly arranged (also in our specimens) and distinguishes subsp. *membranaceous* (Vahl) Koyama on account of loosely arranged glumes exposing the rhachilla internodes. For specific delimitation of its allies such as *P. punctatus* (var.) and *P. membranaceous* (var or subsp.), followed *Govindrajalu* (l.c.)

3. Pycreus stramineus (Nees) Clarke

Slender annual, tufted with fibrous yellowish roots; stems very slender but hard, 8-35 cm tall, 0.5-1 mm wide, often weakly curved, obtusely trigonous, smooth. Leaves: 2-3 blades shorter than to nearly equalling the stem, slenderly linear, 0.75-1 mm wide, canaliculate, subrigid, gradually tapering to long-acuminate apex; sheaths up to 5 cm long, stained with reddish-purplish or reddish-brown. Inflorescence often congested in a single, spike-like cluster of 5-16 spikelets, 15-45 mm long, 10-35 mm wide; bracts 1-3 leaf-like, both erect-patent or the lower one suberect, surpassing the inflorescence, the lower up to 10 cm long. Spikelets erect-patent to nearly erect, lance-oblong to linear-oblong, 15-35 mm long, 1.8-2.2 mm wide, acute, flattened, straw-yellowish; rhachilla straight, the internodes 0.5 mm long, wingless. Glumes patent, ovate, 2 mm long, 1.2-1.5 mm wide, acute, mucronulate, the nerveless sides straw-coloured to golden-yellow, membranous, rather widely subtranslucent-whitish hyaline on margins, the keel greenish, 3-nerved. Stamens 2; anthers 0.5 mm long. Nut orbicular-obovate or broadly elliptic, 0.8-1 mm long, 0.6-0.7 mm wide laterally flattended, biconvex, apiculate at rounded-contracted apex, maturing purplish-brown or blackish, epidermal cells longitudinally oblong; style 0.75 mm long; stigmas 2 as long as the style.

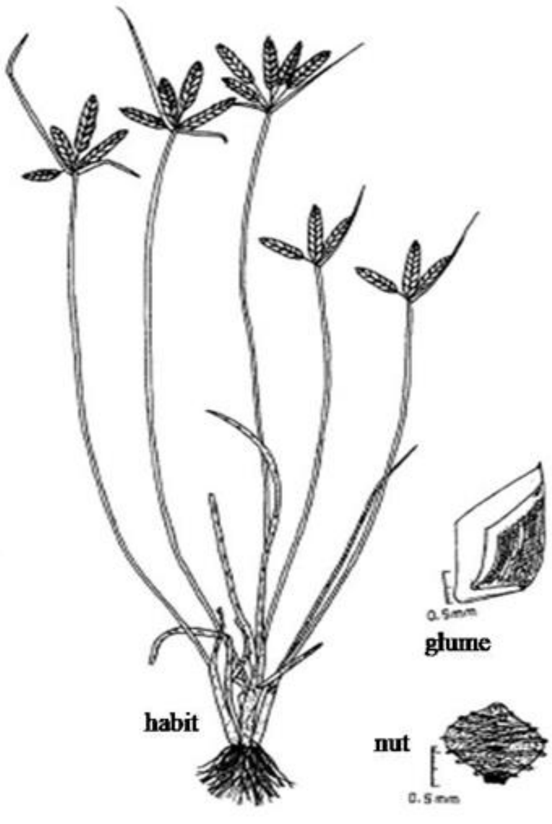

Fig. ***Pycreus stramineus*** **(Nees) Clarke**

Occasional, in moist grasslands, rice fields and along canals

Flowers and Fruits: August to October.

Specimens examined: A.P. East Godavari Dist. Annavaram, *Shaikh R. I.* 956; Krishna Dist. Viravalli, *Shaikh R. I.* 985; Vishakhapatnam Dist. Botawara, *Shaikh R. I.* 936.

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Population Dynamics of Cestode Parasites Found in Intestine of Sheep and Goat from Beed District (M.S.) India

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ABSTRACT

The present work deals with the study of population dynamic of cestode parasites found in intestine of sheep and goat from Beed district (M. S.) India for the period of one annual cycle (June 2022 to May 2023). The collected parasites on closer observation they were turned out to be the genus, Moniezia Sp. The values for percentage of incidence, intensity, density and index of infection were seen throughout the study period and seasonal variation were also studied during the study period.
Keywords: - Beed, Goat, Moniezia Sp. Population Dynamics, Sheep.

INTRODUCTION

Population dynamics is the branch of life sciences which deal with study of the size, age of composition of population as dynamic system and the biological and environmental process driving them. It has traditionally been the most important branch of mathematical biology, which has history of more than 210 years, while more recently the scope of mathematical biology has greatly expanded. Population dynamics included incidence or prevalence, intensity, density and index of infection of particular individual.

Small ruminants are widely distributed and are of great importance as a major source of income for small and the landless farmers in rural areas. Sheep and goat with large genetic diversity accounts for about 0.5 to 5% of total output of livestock sector in India (Singh, K. 1995). Helminthiasis, especially parasitic gastroenteritis, pose a serious health threat and a limitation to the productivity of small ruminants due to the associated morbidity, mortality, cost of treatment and control measures (Nwosu, C. O., Madu, P. P. and Richards, W. S., 2007). In addition to these threasts, infestation with helminthes lowers the animal's immunity and renders it more susceptible to other pathogenic infections; finally this may result in heavy economic losses (Garedaghi, Y., et. al., 2011). The problem is however much severe in tropical countries due to very favorable environmental conditions for helminth transmission (Mohanta, U.K., et. al., 2007).

The population investigation can provide data for the predication of integrated methods to achieve the regulation of numbers of harmful parasites, because it has been stated that a single method of control or coordinated activities are of little value, since they ameliorate the infection (Kennedy, 1974, 1976).

The present study includes application of statistical methods to understand and the distribution of cestodes in sheep and goats both infra and supra population level for cestodes parasites i.e. *Moniezia* Sp. during one seasonal cycle i.e. June-2022 to May-2023.

MATERIAL AND METHODS

Intestine were collected from different slaughter houses of Beed district (M.S.) during study period. The intestine were dissected, observed thoroughly and recorded the data of infected and normal hosts examined. After separating and counting the population of different *Moniezia* Sp. from intestine of sheep and goats, the parasites were preserved in separate bottles. Some of these were used for the taxonomic study.

Population dynamics of cestode parasites were determined by the following formulae.

1. **Incidence of infection:** - It is the percentage of host infected by particular species of cestode parasites. Observation are recorded annually and calculated by the following formula.

$$\text{Incidence of infection} = \frac{\text{Infected hosts}}{\text{Total hosts examined}} \times 100$$

2. **Intensity of infection:** - It takes into account the total number of worms of cestode parasites in infected host population, observations are recorded annually and calculated by the following formula.

$$\text{Intensity of infection} = \frac{\text{No. of parasites collected in a sample}}{\text{No. of infected hosts}}$$

3. **Density of infection:** - It is the measure of concentration of cestode parasites per unit space. Observation are recorded annually and calculated by following formula.

$$\text{Intensity of infection} = \frac{\text{No. of parasites collected in a sample}}{\text{Total hosts examined}}$$

4. **Index of infection:** - It is calculated with the help of the formula given by Tenotu and Zejde, 1974, observations are recorded annually and calculated by following formula.

$$\text{Index of infection} = \frac{\text{No. of infected hosts} \times \text{No. of parasites collected}}{(\text{Total hosts examined})^2}$$

RESULT AND DISCUSSION

The analysis of data showed that the occurrence of cestode parasites variable according to seasons. The sheep and goats were infected with *Moniezia* Sp. Throughout the year, out of 167 host 112 (67.06%) were infected with Cestode parasites i.e. *Moniezia* Sp. A total 145 Cestode parasites found during the present investigation (Table and Graph No. 1). They are belonging to genera *Moniezia*.

Table No.1:- Population dynamics of *Moniezia* Sp. from intestine of Sheep and Goats during June 2022-May 2023

Name of Month	No. of hosts Examined	No. of hosts Infected	No. of parasites collected	Prevalence % (Incidence of infection)	Intensity	Density	Index of infection
June 22	11	7	8	63.64	1.14	0.72	0.46
July 22	13	8	10	61.54	1.25	0.76	0.47
Aug 22	10	6	7	60	1.16	0.70	0.42
Sep 22	15	8	9	53.33	1.13	0.60	0.32
Oct 22	13	7	9	53.84	1.29	0.69	0.37
Nov 22	16	9	11	56.25	1.22	0.69	0.39
Dec 22	15	10	14	66.67	1.4	0.93	0.62
Jan 23	16	12	14	75	1.67	0.87	0.66
Feb 23	12	7	9	66.67	1.29	0.75	0.44
Mar 23	14	11	15	78.57	1.36	1.07	0.84
Apr 23	16	13	18	81.25	1.38	1.13	0.91
May 23	16	14	21	87.50	1.5	1.31	1.15
Total	**167**	**112**	**145**	**67.06**	**1.29**	**0.87**	**0.58**

Graph No.1:- Population dynamics of *Moniezia* Sp. from intestine of Sheep and Goats during June 2022-May 2023

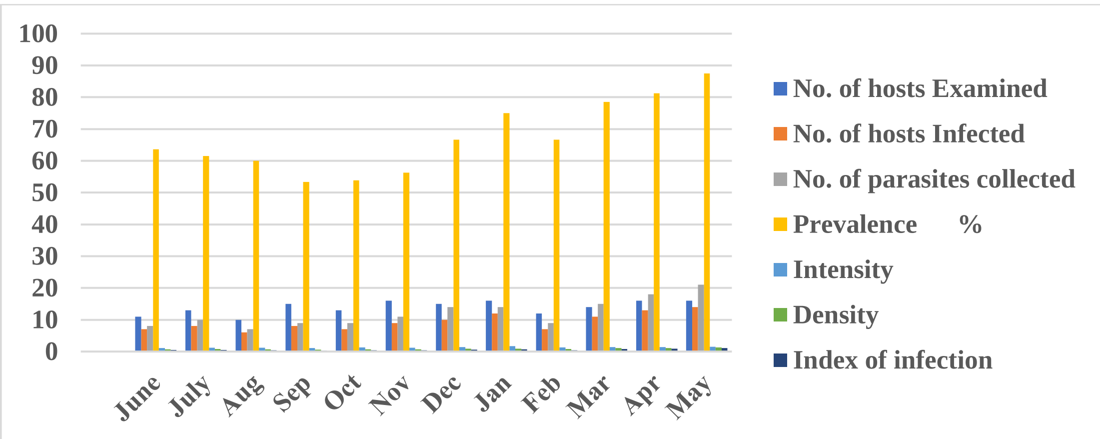
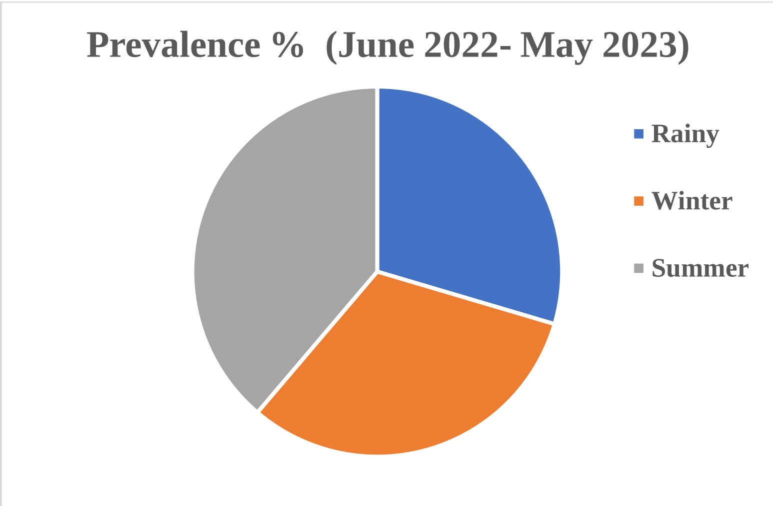


Table No.2:- Influence of season on *Moniezia* Sp. from intestine of Sheep and Goats during June 2022- May 2023

Seasons	**Prevalence % (June 2022- May 2023)**
Rainy	59.18
Winter	63.33
Summer	77.59

Graph No.2:- Influence of season on *Moniezia* Sp. from intestine of Sheep and Goats during June 2022- May 2023



The analysis of data showed that the prevalence of cestode parasites variable according to season. *Moniezia* sp. recorded high prevalence in the month of May-2023 (87.50%) followed by Apr-2023 and March, 2023 i.e. (81.25 % and 78.57% respectively) whereas low prevalence in the month of September-2022 (53.33%). Sheep (*Ovis bharal* (L.)) and goat (*Capra hircus* (L.)) were highly infected with cestode parasites i.e. *Moniezia* Sp. There is host specificity because the morphological, physiological and ecological factors affect the host specificity. These factors play an important role for controlling the parasite to a particular host species in particular season.

CONCLUSION

Based on the analysis, the study concludes that *Moniezia* sp., a type of cestode parasite, shows a high prevalence in the summer, followed by winter, with the lowest prevalence observed during the rainy season. These findings suggest that environmental factors and feeding habitats play a significant role in influencing the seasonality of parasitic infections. The patterns indicate that temperature, humidity, and possibly the availability of intermediate hosts may directly or indirectly affect the prevalence of these parasites across different seasons.

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Impact of Climate change on ecosystem : An Overview

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ABSTRACT

Climate is an important part of environment. It is a ecological factor which influences ecosystem. Change in climate has certain impact on ecosystem in variety of ways .Changes in seasons,habitat shift, disruption in food chain and food web, spread of disease causing agents, extinction risk of organisms are some of impacts of climate change. Climate change not only affects ecosystem but also create stress on human health cumulative impacts of climate change may lead to dramatically ecological change. The present study focuses on the variety of impacts of climate change on ecosystem. Understanding climate change is crucial for mitigating its impact on environment, human health and economy.

Keywords: Climate change ,ecosystem, impact.

INTRODUCTION

Climate is the average atmospheric conditions in a particular region ,including temperature ,humidity, wind and rain .It is the long term pattern of weather conditions in any particular place. Climate itself is a abiotic component of ecosystem. Human activities such as deforestation ,land use industrialization, burning of fossil fuel leads to climate change, long term shifts in temperature and weather pattern refer to as climate change. Rise in global temperature, sea level rise, change in precipitation ,loss of biodiversity are severe consequences of climate change. researchers have grow increasingly concerned about the changes especially in light of many valuable services provided by ecosystem to human beings. Ecosystem are composed of plants, animals and microbes that interacts with the physical environment .climate change increasing air and water, temperature altering precipitation patterns, rising level and changing chemistry of sea. These changes are occurring concurrently with other pressure such as pollution, conservation of natural ecosystem to other land uses, transport and introduction of non–native places and exploitation of natural resources .The present study discusses different impacts of climate change on ecosystem.

Different impacts of Climate Change on Ecosystem:

Following are some important impacts of climate change on ecosystem—

1. Changes in the Timing of Seasonal Life Cycle Events:

For many species, the climate where they live or spend part of the year influences key stages of their annual life cycle, such as migration, blooming, and reproduction. As winters have become shorter and milder, the timing of these events has changed in some parts of the country:

- An **ecosystem** means the animals, plants, and microorganisms that live in one place, as well as the environmental conditions that support them.
- **Ecosystem services** include the products and services provided by ecosystems, such as food, fuel, timber, water, clean air, and medicines. It also includes less material benefits, such as regulation of local climate conditions and aesthetic value or cultural identity.
- An **ecological threshold** is the point at which there is an abrupt change in an ecosystem quality, property, or phenomenon, or where small changes in one or more external conditions produce large and persistent responses in an ecosystem.
- A **biome** is a large, naturally occurring community of plants and animals occurring in a regional or global land area.
- A **food web** is a group of predators and prey that interact in a habitat or ecosystem.
- A **stressor** is a factor that reduces the health or productivity of an ecosystem (i.e., causes stress).
- Earlier springs have led to earlier nesting for 28 migratory bird species on the East Coast of the United States.
- Northeastern birds that winter in the southern United States are returning north in the spring 13 days earlier than they did in a century ago.
- In a California study, 16 out of 23 butterfly species shifted their migration timing and arrived earlier.

Because species differ in their ability to adjust, asynchronies can develop, increasing species and ecosystem vulnerability. These asynchronies can include mismatches in the timing of migration, breeding, pest avoidance, and food availability. Growth and survival are reduced when migrants arrive at a location before or after food sources are present.

2. Range Shifts

As temperatures increase, the habitat ranges of many North American species are moving north and to higher elevations. In recent decades, in both land and aquatic environments, plants and animals have moved to higher elevations at a median rate of 36 feet (0.011 kilometers) per decade, and to higher latitudes at a median rate of 10.5 miles (16.9 kilometers) per decade. While this means a range expansion for some species, for others it means movement into less hospitable habitat, increased competition, or range reduction, with some species having nowhere to go because they are already at the top of a mountain or at the northern limit of land suitable for their habitat. These factors lead to local extinctions of both plants and animals in some areas. As a result, the ranges of vegetative biomes are projected to change across 5-20% of the land in the United States by 2100.

3. Food Web Disruptions:

The impact of climate change on a particular species can ripple through a food web and affect a wide range of other organisms. For example, the figure below shows the complex nature of the food web for polar bears. Not only is the decline of sea ice impairing polar bear populations by reducing the extent of their primary habitat, it is also negatively impacting them via food web effects. Declines in the duration and extent of sea ice in the Arctic leads to declines in the abundance of ice algae, which thrive in nutrient-rich pockets in the ice. These algae are eaten by zooplankton, which are in turn eaten by Arctic cod, an important food source for many marine mammals, including seals. Seals are eaten by polar bears. Hence, declines in ice algae can contribute to declines in polar bear populations.

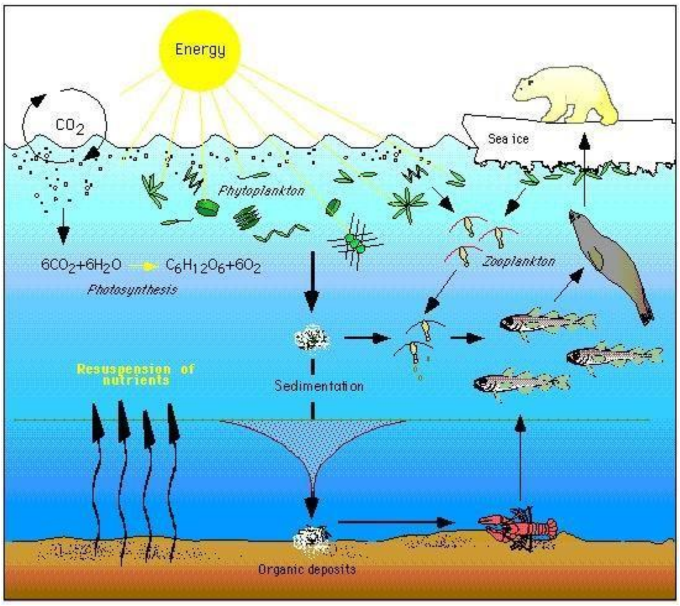

Fig: The Arctic food web is complex. The loss of sea ice can ultimately affect the entire food web, from algae and plankton to fish to mammals.

4. Buffer and Threshold Effects

Ecosystems can serve as natural buffers from extreme events such as wildfires, flooding, and drought. Climate change and human modification may restrict ecosystems' ability to temper the impacts of extreme conditions, and thus may increase vulnerability to damage. Examples include reefs and barrier islands that protect coastal ecosystems from storm surges, wetland ecosystems that absorb floodwaters, and cyclical wildfires that clear excess forest debris and reduce the risk of dangerously large fires.

5. Pathogens, Parasites, and Disease:

Climate change and shifts in ecological conditions could support the spread of pathogens, parasites, and diseases, with potentially serious effects on human health, agriculture, and fisheries. For example, the oyster parasite, Perkinsus marinus, is capable of causing large oyster die-offs. This parasite has extended its range northward from Chesapeake Bay to Maine, a 310-mile expansion tied to above-average winter temperatures. For more information about climate change impacts on agriculture, visit the Agriculture and

Food Supply Impacts page. To learn more about climate change impacts on human health, visit the Health Impacts page.

6. Extinction Risks:

Climate change, along with habitat destruction and pollution, is one of the important stressors that can contribute to species extinction. The IPCC estimates that 20-30% of the plant and animal species evaluated so far in climate change studies are at risk of extinction if temperatures reach the levels projected to occur by the end of this century.[1] Global rates of species extinctions are likely to approach or exceed the upper limit of observed natural rates of extinction in the fossil record.[1] Examples of species that are particularly climate sensitive and could be at risk of significant losses include animals that are adapted to mountain environments, such as the pika; animals that are dependent on sea ice habitats, such as ringed seals and polar bears; and cold water fish, such as salmon in the Pacific Northwest.

CONCLUSION:

Climate change is here, and within the next few decades, societies and ecosystems will either be committed to a substantially warmer world or major actions will be taken to limit warming to moderate levels. Ecosystems play a major part in both of these future scenarios. The complex responses to climate change can act as a buffer to major change in many cases through the presence of extensive and connected ecosystems, species diversity, habitat heterogeneity, and genetic variability. Improved communication of the value of ecosystem services is needed to inform decisions at local to international levels. Nature-based solutions such as ecosystem management can play a major role in climate change mitigation and societal adaptation, but they will provide the greatest benefit when used concurrently with actions to reduce fossil fuel emissions and change behavior. Benefits of these solutions can be particularly useful when ecosystems are managed for multiple services and transcend institutional, geographic, or habitat-based boundaries. By promoting the evidence base that exists more widely to inform decisions, identifying and investigating tractable knowledge gaps in ecosystem science, and researching how
key elements of complexity that enhance resilience and climate adaptation can be supported and enhanced, natural and social scientists may be able to advance conversations that put science into action. Although this is a difficult task, the rewards of these efforts have the potential to be vast, providing as more secure future for both ecosystems and society where both are able to thrive.

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Deforestation : An Environmental Problem (Special Reference to Beed District)

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ABSTRACT
We will examine their strengths and weaknesses, as well as their performance in different scenarios. This survey aims to provide insights into the state-of-the-art techniques for load balancing in fog computing, which can help researchers and practitioners to choose the most suitable algorithm for their specific use cases.
Keywords : Cloud computing, Fog computing, Load Balancing, Resource management, IoT

INTRODUCTION

Beed district is one of the major districts of Marathwada. This district is mainly known for two reasons. One of them is a district of sugarcane workers and the other is known as a drought district for some time past.Beed sits in the black strata stone region of the Deccan. The Balaghat range is the major mountain range of the district and it stretches from Ahmednagar district boundary in the west to the district boundary in the east. This mountain range has divided the district into two parts. The northern lowland is known as Gangathadi and the other upland region is known as Ghat or Balaghat. The district has many peaks above 2500 feet. The Balaghat section ranges from 2000 to 2200 feet above sea level and the region known as Gangathdi ranges from 1200 to 1500 feet above sea level. Ashti is a high altitude taluka in the district with an altitude of 1750 to 2000 feet above sea level. The northern highlands slope towards the south and south-east. The slope of Ashtitaluka area is generally towards south. Where as the slope of the northern part of the district is towards the valley of Godavari i.e. towards the north. The northern part of the district lies in the valley of Godavari. While the southern part is in the valley of Manjra, a tributary of Godavari This research paper has been presented for the purpose of taking anenvironmental overview of the wealth in the district with such environmental conditions.

Objectives of the study

1. To overview on the environmental situation of Beed district
2. To study the environmental resource of Beed district.
3. To explain problems of forest resources in Beed district.

Beed District: An environmental Overview

Beed district is a major district situated in the central part of Maharashtra. Beed is one of the eight districts of the Marathwada Division on the Deccan Plateau of Maharashtra State. This district is located in the western direction of Aurangabad division. The district is situated at 18.28 to 19.28 north latitude and 74.54 to 76.57 east longitudes. Aurangabad and Jalna districts are in the north of the district. To the east are the districts of Parbhani and Latur. Osmanabad and Ahmednagar districts are in the south and Ahmednagar district is in the west.

Figure 1.1

Beed District map

The climate of the district is generally hot and dry. Summers are long and harsh while winters are short but mild. Temperatures are highest in the month of May. The temperature is minimum in the month of December. In summer, the temperature rises considerably during the day, but it drops at night. The climate in the upland Balaghat hills in the western part of the district is somewhat cool while in the lowlands it is warm and slightly humid. The climate in Ambejogaitaluka appears to be more pleasant.

Rain falls in the district from June to September. The amount of rainfall is very less and the rainfall is irregular in nature. Therefore, most of the district is drought prone. The distribution of rainfall in the district is uneven. It is found that the amount of rain decreases from east to west. It falls comparatively more in Ambejogai, Kej, Majalgaon, Parli, Dharur etc. talukas in the eastern part of the district while it falls very less in talukas like Gevrai, Ashti, Patoda, Shirur. Gevrai, Patoda, Beed, Majalgaon, Kage, Ashtitalukas of the district are included in the drought prone areas as determined by the central government. People here face drought.

Area of District:

The area of Beed district is 10693 sq. km. The area of the district is 3.45 percent of the area of Maharashtra. Out of this area, the urban area is 158.31 sq.Km.While the rural area of the district is 1053.69 sq. km. Beed district appears to be vast in terms of area. It is for this reason that the demand for division of the district is gaining momentum. It appears that efforts are underway to create a new Ambajogai district by dividing the district. There are total 11 talukas in this district which include Beed, Gevrai, Ashti, Majalgaon, Ambajogai, Parli, DharoonVadwani, Patoda, ShirurKasar, and Kaijtalukas.

Forest Resources of Beed District:

The forested area in Beed district is very sparse and of light quality and is spread over East-West BalaghatRangaAshti, Patoda, ShirurKasar, Beed, Kage, Ambajogai, Dharun, Vadwani and Parlitalukas. The forest produce from it is negligible. In the year 2016-17, the annual income from forest was Rs.13.53 lakh. This included grass, paddy, deink and other forest produce as well as the license for the same. Taluka wise proportion of forest area in the district is shown on the basis of the following table.

Table No. 1.1

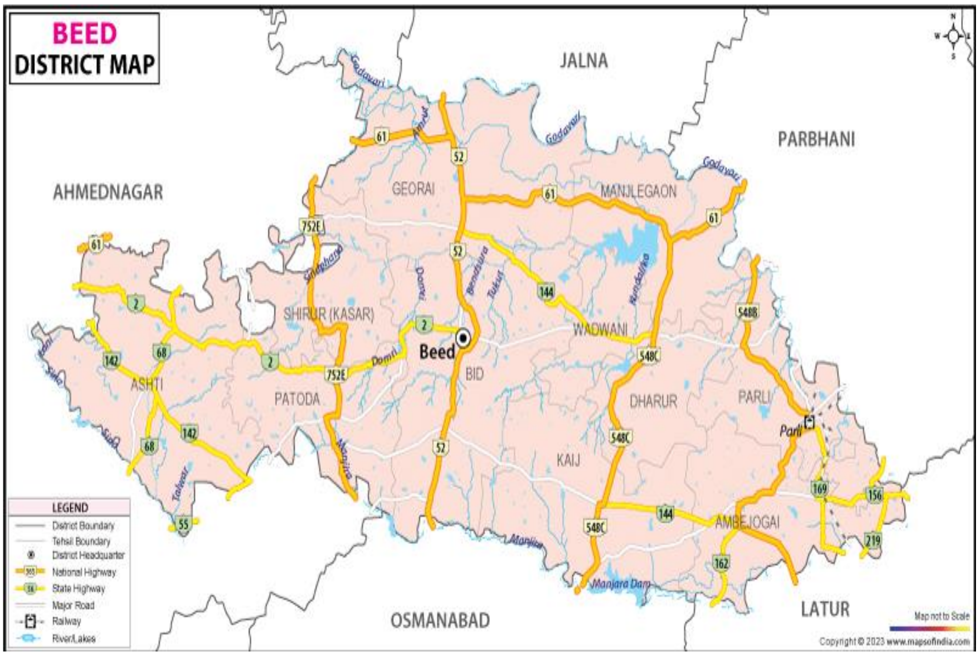
Forest resources in Beed district (Taluka wise)

Sr.No.	Taluka	Forest Area
1	Beed	03.88 percent
2	Ashti	01.95 percent
3	Patoda	04.24 percent
4	ShiroorKasar	07.02 percent
5	Dharur	04.65 percent
6	Ambajogai	02.89 percent
7	Kaij	02.62 percent
8	Parli	00.63 percent
9	Gevrai	01.14 percent
10	Wadvani	10.11 percent
11	Majalgaon	00.87 percent
	The total average	**02.77 percent**

Source-Information Officer, District Social Forestry & Environment Department, Beed, 2017

As per above table it can be seen that Wadwanitaluka of the district has the highest percentage of forest area which is 10.11 percent. Whereas Parlitaluka of the district has the least amount of forest area and it is only 00.63 percent covered. From the above data it is clear that the average forest area in the district is 2.77 percent which is very insignificant compared to Maharashtra. It is necessary to increase it.Talukas like Parli, Majalgaon, Gevrai in the district need to increase the amount of forest area. The forest area is negligible in this taluka. It is necessary to make efforts in terms of afforestation in the hilly areas of the district.

Figure 1.1
Talukaof Beed District map



CONCLUSION

Thus the environmental situation in Beed district, it is seen that the proportion of forest resources or forest area in Beed district is only 2.77 percent. In order to maintain the balance of the environment, the area covered by forests is considered to be around 33 percent. But the amount of forest area in Beed district is very less compared to that. It is necessary to increase the amount of area under forest. Although efforts are being made by the Forest and Environment Department to increase the forest area, it does not appear that significant progress has been achieved yet. Due to the lack of such forest resources, it is seen that it has an adverse effect on the geographical situation of the district. It is also clear that the continuous drought situation in the district is due to this reason.

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Impact of Climate Change Human Health: A Short Review

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ABSTRACT

Climate change presents a fundamental threat to human health. It affects the physical environment as well as all aspects of both natural and human systems, including social economic conditions such as humans' systems.

This issue is now challenge for human kind. Global warming as an atmospheric phenomenon of increased earth temperature climate scientist agrees that human activities such as burning fuels contributing to the problem. As climate conditions change, more frequent and intensifying weather and climate events are observed, including storm's, extreme heat, floods, droughts and wild fires. These weather and climate hazards affect health both directly and indirectly increasing the risk of deaths.

All aspects of health are affected by climate change will increase health risks undermine decades of improvements in global health. This review basically focusses on the importance of biodiversity, the consequences faced by the plants, animals, humans and climate change and adaptation strategies. In terms of biodiversity conservation which can protect the planet from the consequences of climate change.

Key words- Global warming, climate, health, biodiversity, conservation.

INTRODUCTION

Climate change presents a fundamental threat to human health. If affects the physical environment as well as all aspects of both natural and human systems including social and economic conditions and the functioning of health systems. Climate change is also having an impact on our health, reducing capacity to provide universal health coverage [UHC]. This weather and climate hazards affect health both directly and indirectly, increasing the risk of deaths, non - communicable diseases, the emergence and spread of infectious diseases, and health emergencies.

All aspects of health are affected by climate change from clean air, water and soil to food systems and livelihoods. In 1992 United Nations Earth Summit at Rio de Valerio defined biodiversity as the variability among living organism for all sources including *inter alia*, terrestrial, marine and other aquatic ecosystem and the ecological complexes of which they are part of this includes diversity within species between species and of ecosystem [Ranade 2008]. In India ecosystem diversity includes deserts, forests, grasslands and mangroves. Soil biodiversity includes all major groups of Bacteria, fungi, algae and most of animal phyla [J. Tibbetts, 2007].

However, the enormous range of benefits which biodiversity provides to our health and wellbeing is largely underappreciated and unrecognized within the health community. Further delay in tackling climate change will increase health risks, undermine decades of improvements in global health and contravene our collective commitments to insure the human right to heath for all. Climate change has many negative effects on human life such as

Heat waves-

Heat waves defines World Health Organization as sustained periods of uncharacteristically high temperatures that increase morbidity and mortality. High temperatures combined with other conditions like humidity, give rise to heat waves that can claim the lives of thousands of people, destroy crops and damage infrastructure. Also heat wave can strain basic services. Rising temperatures cause demand for water and electricity for cooling to grow and hospital admissions to increase.

The direct and indirect impacts of heat waves are largely dictated by the vulnerability and exposure of the population affected. India faces warm temperatures throughout most of the year, saw a heat wave in 2010 that caused more deaths in the Ahmedabad city [Azhar et al.2014].

Ozone layer depletion-

Stratospheric ozone layer depletion by human made glass such as chlorofluorocarbons has been occurring over recent decades and is likely to peak around 2020.Scenario based modelling that integrates the processes of emissions accrual ozone depletion, ultra violet radiation flux and cancer induction. If climate change and consequent stratospheric cooling delay the recovery of protective ozone, there will be greater numbers of excess skin cancers.

Loss of Biodiversity and loss of species-

There is rapid extinction of populations of plant species and animal species due to increasing demand for space, food and material of by humans. An important consequence for humans is the disruption of ecosystem that provide natures goods and services. Biodiversity loss also means the loss, before discovery, of many natural chemicals and genes [Myers, N.1997].

Insecurity of food producing ecosystems-

Increasing pressures of agricultural and livestock production are stressing the worlds arable lands and pastures. At the start of the 21 st century an estimated one third of the worlds previously productive land is seriously damaged by erosion, compaction, salination, water logging and chemicals that destroy organic content. Similar pressure on ocean fisheries have left most of them severely depleted. Allowing for future trends in trade and economic development, the studies showed that climate change would cause a slight downturn in yield would be considerably greater in the food insecure regions.

Population movement-

Climate change is already causing, and is expected to continue to cause, a range of health impacts that vary across different population groups. The vulnerability of any group is a function of its sensitivity to climate change related health risks and its capacity for responding to climate variability and change. Vulnerable groups of people, described as populations of concern, include those with low income, some communities of colour, immigrant groups, Indigenous peoples, children and pregnant women, older adults, persons with disabilities and persons with chronic medical conditions. These experience disproportionate, multiple, and complex risks to their health and wellbeing in response to climate change.

Mental health issue-

Global climate change effects on mental health are integral parts of the overall climate related human health impacts. Effects of climate change on mental health ranges from minimal stress and distress symptoms to clinical disorders such as anxiety, depression, post-traumatic stress and suicidality. Other consequences include effects on the daily routine, perceptions and experiences of individuals and communities attempting to understand and respond appropriately to climate change and its implication. The mental health effect related impacts on health, mental health and well-being are critical factors in understanding the impacts of climate change on human health.

Other global environmental changes-

Fresh water aquifers in all continents are being depleted of their ancient fossil water supplies. Industrial and agricultural demand amplified by their population growth often greatly exceeds the rate of normal recharge. Various semi volatiles chemicals by distillation process in the cells of lower atmosphere, there by transferring chemicals from their usual origins in low to mid latitudes to high, indeed polar, latitudes. Consequently, increase high levels are occurring in polar mammals and fish and the traditional human groups that eat them. Clearly chemical pollution is no longer just an issue of local toxicity.

CONCLUSION-

The available evidences clearly indicate the raise in the average temperatures, total annual precipitation, frequency of extreme temperature conditions and heavy precipitation in the united states in the past five decades, as well as increase in the tropical cyclone activity in regions along the Atlantic Ocean, the caribbean and the Gulf of Mexico. Effects associated sea level rise, heat waves, hurricanes affects human health in different ways. Temperature related illness, injuries, storms are some direct exposure types. Vector borne , water borne are some indirect exposure pathways. Elderly are more vulnerable to the effects of heatwaves and suffer greater impacts of the symptoms of febrile vectorborne diseases. Given the increase in heat waves and storm impacts expected under climate change, we are also likely to see the added impacts of vector borne disease risk. For example after natural calamities cholera transmission, typhoid transmission, worm infestation, etc seen. How will the environmental changes like global warming leading to melting of ice caps on the poles, leading to floods, increased temperatures affect the human health?

How will these changes affect the pathogens affecting humans?

Thus a vigilant surveillance required to monitor these changing trends for better understanding of these effects on Human Health.

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Fish Diversity and Spatial Distribution of Sindphana River in Chincholi Hill Patoda, A Minor Tributary of Godavari, Tq. Patoda, Dist. Beed (Maharashtra)

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ABSTRACT

This study investigates the fish diversity and spatial distribution in the Sindphana River, a minor tributary of the Godavari, located in the Chincholi Patoda region of Patoda, Beed District and Maharashtra. The research focuses on understanding the ecological factors influencing fish diversity and distribution across different stretches of the river. A total of 25 species were identified, belonging to 5 families. The findings highlight significant variations in species composition along the river, with environmental parameters such as water quality, habitat structure, and human activities playing a critical role.

Keywords: Fish Diversity, Spatial Distribution, Sindphana River, Godavari Tributary, Beed District, Maharashtra

INTRODUCTION

The Sindphana River, a crucial tributary of the Godavari River, plays a vital role in the hydrological and ecological balance of the Beed District in Maharashtra. Rivers in this region support a diverse array of aquatic life, particularly fish, which are important both ecologically and economically. However, there is limited data on the fish diversity and spatial distribution in smaller tributaries like the Sindphana. This study aims to fill this gap by providing a comprehensive survey of the fish species present and analyzing the spatial distribution patterns along the river stretch in Patoda.

The Sindphana River is geographically located at approximately 19.2099° N latitude and 76.2697° E longitude in the Beed District of Maharashtra. This river, a minor yet significant tributary of the Godavari, flows through the Patoda region in the Patoda taluka. The Sindphana traverses a diverse landscape, including agricultural fields, urban areas, and natural habitats, contributing to the ecological and hydrological systems of the region. The river's location is crucial in sustaining local biodiversity and supporting the livelihoods of communities that rely on its resources. This study focuses on examining the fish diversity and spatial distribution along various stretches of the Sindphana, providing insights into the environmental factors influencing the aquatic life in this part of Maharashtra.

OBJECTIVES

a) To document the fish diversity in the Sindphana River.
b) To analyse the spatial distribution of fish species along different stretches of the river.
c) To understand the influence of environmental factors on fish diversity and distribution.

MATERIALS AND METHODS

Study Area

The study was conducted along the Sindphana River in Patoda, a region characterized by a semi-arid climate with monsoonal rainfall. The river, being a minor tributary of the Godavari, flows through agricultural land, urban settlements, and natural habitats, making it an ideal site for studying anthropogenic impacts on aquatic biodiversity.

Sampling Techniques

Fish sampling was carried out at three different sites along the river, chosen to represent varied environmental conditions (e.g., upstream, midstream, and downstream). The sampling was conducted over a period of six months, covering both pre-monsoon and post-monsoon seasons.

Methods of Capture: Gill nets, cast nets, and electrofishing were used for sampling. Each method was applied uniformly across all sites to ensure comparability of results.

Identification: Collected specimens were identified using standard taxonomic keys and reference books.

Data Collection: Environmental parameters such as water temperature, pH, dissolved oxygen, and turbidity were measured at each site.

Data Analysis

The data were analyzed using biodiversity indices such as the Shannon-Wiener Index, Simpson's Index, and Margalef's Index. Spatial distribution patterns were examined through GIS mapping, and statistical analyses were performed to determine the relationship between environmental factors and species distribution.

RESULTS

a) Species Diversity

A total of 25 species of fish were recorded during the study, representing 5 families. The most dominant family was Cyprinidae, which accounted for 50% of the total species observed. Notable species included Cyprinus carpio, Labeo rohita, and Catla catla.

The study on the fish diversity and spatial distribution of the Sindphana River in Chincholi Patoda, Tq. Patoda, Dist. Beed, Maharashtra, identified a total of fish species distributed across five primary families: Cyprinidae, Bagridae, Siluridae, Mastacembelus, and Notopteridae. The Cyprinidae family emerged as the most dominant, with species such as Cyprinus carpio, Labeo rohita, and Catla catla prominently represented.

Site-wise Distribution:

Upstream (Site 1): The upstream region, with its relatively pristine environment characterized by higher dissolved oxygen and lower turbidity, recorded the highest species richness. This site, minimally impacted by human activities, supported a diverse array of species across all five families.

Midstream (Site 2): The midstream region exhibited moderate species richness. This area, which is subject to intermediate levels of agricultural runoff and urbanization, showed a balanced representation of species from the Cyprinidae and Bagridae families, though the impact of human activities was evident in a slight decline in diversity.

Downstream (Site 3): The downstream section, heavily influenced by agricultural runoff, urban waste, and other anthropogenic activities, recorded the lowest species richness. Species from the Siluridae and Notopteridae families were present but in reduced numbers, indicating the adverse effects of pollution and habitat degradation.

Environmental Correlations: The analysis revealed significant correlations between fish diversity and key environmental factors, such as water temperature, pH, dissolved oxygen, and turbidity. High water quality parameters in the upstream region were associated with greater species richness, while poorer conditions downstream correlated with a notable decline in both species richness and abundance.

Spatial Distribution

The spatial distribution of fish species varied significantly across different sections of the river. The upstream region, characterized by higher dissolved oxygen and lower turbidity, supported a higher diversity of species compared to the downstream areas, which were more polluted and had lower species richness.

Environmental Factors

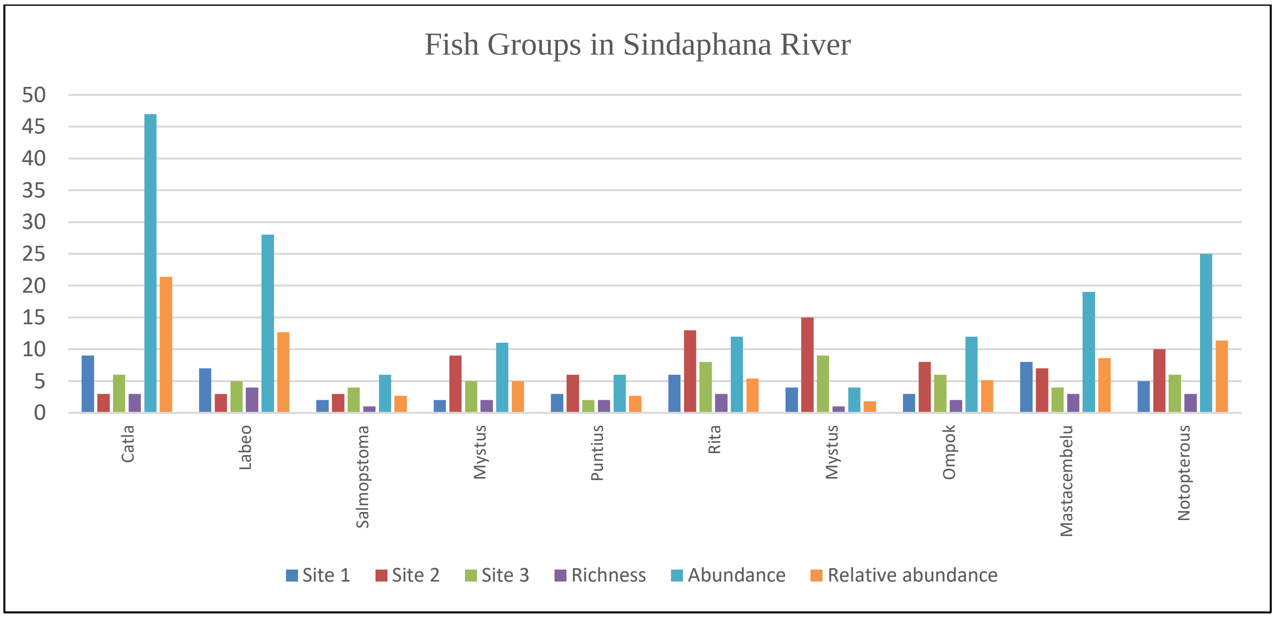
Statistical analysis revealed a significant correlation between fish diversity and water quality parameters such as pH, dissolved oxygen, and turbidity. Human activities, particularly agriculture and urbanization, were found to have a negative impact on fish diversity, particularly in the downstream areas.

Fish Groups in the Sindphana River

Fish groups in the Sindphana River during the study period

Family	Genus	Site 1	Site 2	Site 3	Richness	Abundance	Relative abundance
Cyprinidae	Catla	9	3	6	3	47	21.4
	Labeo	7	3	5	4	28	12.7
	Salmopstoma	2	3	4	1	6	2.7

	Mystus	2	9	5	2	11	5.0
	Puntius	3	6	2	2	6	2.7
Bagridae	Rita	6	13	8	3	12	5.4
	Mystus	4	15	9	1	4	1.8
Siluridae	Ompok	3	8	6	2	12	5.14
Mastacembelus	Mastacembelus	8	7	4	3	19	8.6
Notopteridae	Notopterous	5	10	6	3	25	11.4



DISCUSSION

The results of this study underscore the importance of preserving water quality and natural habitats for maintaining fish diversity in small tributaries like the Sindphana River. The observed decline in species richness downstream suggests that pollution and habitat degradation are major threats to aquatic biodiversity in this region. Comparisons with other studies on the Godavari and its tributaries indicate that the Sindphana River's fish diversity is relatively lower, likely due to its smaller size and higher level of anthropogenic disturbance.

Conservation Measures

Implementing conservation measures such as riparian buffer zones, pollution control, and sustainable water management practices is crucial for protecting fish diversity in the Sindphana River.

4.2 Further Research

Additional studies focusing on seasonal variations and the impact of specific pollutants on fish species are needed to develop effective conservation strategies.

CONCLUSION

This study highlights the critical importance of maintaining water quality and natural habitats to preserve the fish diversity of the Sindphana River. The marked decline in species richness and abundance downstream underscores the detrimental impact of pollution and habitat degradation on the river's aquatic biodiversity. Immediate conservation measures, including the implementation of riparian buffer zones, stricter pollution control, and sustainable water management practices, are essential to protect and restore the ecological health of the Sindphana River.

Moreover, the study calls for continued monitoring and research to better understand the seasonal dynamics and specific effects of pollutants on the river's fish populations. Developing and enforcing effective conservation strategies is crucial for ensuring the long-term sustainability of the Sindphana River's aquatic ecosystem, which is vital for the ecological balance of the region and the well-being of local communities.

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Some Edible Wild Vegetables of Nagzira Wildlife Sanctuary in Gondia District of Maharashtra, India

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ABSTRACT
Nagzira Wildlife Sanctuary is located in Gondia district of Maharashtra. The resourceful geographical conditions of the d forest area of the sanctuary support it to shelter great variety of flora and fauna. It is also considered as green oasis of the eastern most part of Maharashtra. The present paper gives a list of some wild edible varieties of vegetables of nagzira wildlife sanctuary on which people of the nearby villages are dependent since long time. There were 21 species belonging to 18 families which contributed to the list of wild edible vegetables.
Key words: Wild, Vegetables, edible, nagzira, sanctuary, varieties.

INTRODUCTION

Early man used the wild plant products which were around him as a food or for food preparation before the practice of agriculture [1]. Wild Edible Plants (WEP) are those which are not cultivated by human but occur naturally and form a dietary food for human [2]. The WEP extend a source of basic food and nutrition to the deprived populace of rural and tribal area [3]. This research paper concentrates on the traditional information of consuming wild vegetables and also serves in the conservation tasks of the biodiversity. Cultivated vegetables crops are bred for good quality, taste, shelf life, nutrient content, disease resistance and many other factors. Overuse of pesticides and number of chemical fertilizers can also damage health and increase the chances of permanent disorders. All these issues are not concerned with wild varieties of vegetables which grow naturally and can be consumed without any doubt if you have good hand in selecting the vegetable.

These wild edible varieties of vegetables are capable to grow easily even in drought or water scarcity. During shortage of food and other resources these wild varieties of vegetable plays an important role in overcoming food problems and fulfilling food requirements. India is the second largest country in the world in population as well in vegetable production [4]. The major resources of the people living nearby the forest areas are fulfilled by the forest by providing essential products like food, firewood and other helpful materials. Forest provides forest products that are essential for not only meeting their own requirements, but also provide potential source of daily income for livelihood [5]. Wild edible plants

(WEPs) refer to species that are neither cultivated nor domesticated, but are available from their wild natural habitat and use as sources of food.

Plants and forest products have been used as a livelihood source and variety of helpful commodities from earlier times, the value of wild edible vegetables has not been given proper attention in India [6]. Wild edible varieties of vegetables are rare and a valuable gift of nature and most old and traditional communities still depend on these vegetables for meeting their daily requirements. These wild edible vegetables are a good source of vital nutrients and provide proper food security and serve as supplement and manage nutritional related illness. They not only provide food but are also a major source of medicines used in basic treatments of allergies and infections. These vegetables are useful for the forest dwellers to overcome their nutrient requirement and contribute as an option during starvation.

Gondia district of Maharashtra is famous for its forest resources and diverse forms of flora and fauna. During the recent survey of year 2020-21, the estimated area of 2833sq.km was under forest cover which estimated about 50.22% of the total area. Forests of Gondia has a huge contribution in the economy of the district. The Nagzira wildlife sanctuary 152 sq.km is a national reserve forest under the state government.[7][8].The locals living near the forest area still depend on the wild food resources throughout the monsoon and consume these vegetables which are available throughout the rainy season from june-july onwards.

MATERIALS AND METHODS

Study Area

Gondia lies in the eastern most part of Maharashtra and falls between 20.39 to 21.380 North and 79.27 to 82.420 East and has total forest covered area of 2152.15 sq. kms. The district consist of eight talukas where most of the population depends upon agriculture. Some residential areas near dense nagzira forest were considered for the research work. The vegetation of the area is strongly diverse and versatile. Gondia district also has satpuda hills on its north-eastern side and protected areas like navegaon national park and nagzira tiger reserve declared by National Tiger Conservation Authority (NTCA) in 2013[9].

Field Survey

A Detailed field survey of the areas near nagzira wildlife sanctuary was carried out with the local people and dwellers associated with the forest. The survey was carried out during the rainy season from mid-June to august 2024. During this period field tours were conducted in nearby areas of the forest and neighboring areas. During the survey data on edible vegetables and mushrooms such as local name, habitat and habit, arability period, fruiting period, part of consumption and nature of uses were collected with references of local people with strong connection with traditional use of these plants. Along with sample collection discussions and household surveys were also conducted for sampling of useful information. It was then followed by identification of the plant and recording their local names and uses of the plants for the welfare of mankind, further the collected plants were identified using relevant literature [10].

RESULTS AND DISCUSSION

The present research work mainly focuses on some plants found in the tenure of survey done in the selected research area.

Table.1. Wild edible vegetable plants (WEVP) of nagzira.

Sr. No.	Botanical Names	Vernacular Names	Family	Parts Consumed	Medicinal Applications.
1.	*Amorphophallus Paeoniifolius*	Suran	Araceae	Rhizome	Used as medicine for treatment of tumors, asthama and abdominal pain.
2.	*Agaricus bisporous*	Dumbar Sati	Agaricaceae	Mushroom	Used for type 2 diabetes, high cholesterol, arteriosclerosis and a source of high protein.
3.	*Amaranthus spinosus*	Kheda bhaji	Amaranthaceae	Leaves	Used in treatment of diarrhea, ulcers, eczema, burns, and hemorrhoids.
4.	*Amaranthus viridis*	Chaulayi Bhaji	Amaranthaceae	Leaves	Good in antioxidant properties also used in leafy salads.
5.	*Alternathera sessilis*	Patur	Amaranthaceae	Leaves	Treatment of asthma, lung disorders, hepatitis and also used as hair tonic.
6.	*Bambusa arundinacea*	Vaste	Poaceae	Stems	Good source of carbohydrates, used to treat wounds and digestive disorders.
7.	*Boerthavia diffusa*	Khaperkhuti	Nyctaginaceae	Leaves	Leaf extracts are used to treat anemia and liver disorders. It is also used to remove accumulated fluids from the body.
8.	*Brassica oleracea*	Navalagol	Crucifarae	Fruits	Treatment of gout and rheumatism. Used to treat infected wounds, and cardiac tonic.
9.	*Cassia fistula*	Bahava	Caesalpinaceae	Flowers.	Used as a laxative, anti-inflammatory. Treats eczema and diabetes.
10.	*Cassia tora*	Tarota	Caesalpinaceae	Leaves	Leaves and seeds are used to

					prepare laxative, antiperiodic, anthelmintic, ophthalmic, and liver tonic.
11.	*Commelina benghalensis*	Kena Patta	Commelinaceae	Leaves	Leaves are used to treat skin burns, diuretic, laxative and anti-inflammatory material.
12.	*Holarrhena pubescens*	Kuda	Apocynaceae	Flowers	Used in treatment of piles and general bleeding. Several tribes also use it for diabetes. It is good antibacterial and Amoebicidal.
13.	*Lablab purpureus*	Popati	Fabaceae	Fruits	It is good antimicrobial, antifungal, and anti-inflammatory agent. Also have antispasmodic used for appetite suppressants.
14.	*Olax psittacorum*	Aaratfari	Olacaceae	Leaves	Used in treatment of high fever, anemia and diabetes.
15.	*Physalis pubescens*	Kapalfodi	Solanceae	Whole shrub	Whole plant is used as antipyretic, depurative, diuretic. Treats cough, fever, sore throat.
16.	*Termitomyces heimii*	Anat sati	Agaricaceae	Mushroom	Mushrooms have antioxidants, immunomodulators, antitumor and anti-microbial. Fruiting bodies are good source of proteins.
17.	*Tacca leontopetaloides*	Dev Kanda	Dioscoreaceae	Tubers boiled and eaten.	Used in treatments of stomach ailments. Mixture with clay and water is used to treat diarrhea and dysentery.
18.	*Nymphaea nouchali*	Kamal, Kumudini	Nymphaeaceae	Rhizomes are baked & eaten	Used in treatment of indigestion. It is also a source of a poisonous component nupharin.
19.	*Hibiscus sabdariffa*	Lal Ambadi	Malvaceae	Leaves	Used in Ayurveda medicine preparation to treat loss of appetite, cold, nerve and heart diseases and also in body fluid

					retention.
20.	*Ageratum conyzoides*	Telka Bhaji	Asteraceae	Leaves	Acts as analgesic, antifungal, wound healing and smooth muscle relaxant.
21.	*Cryptocoryn retrospirallis*	Pakanbhed	Araceae	Leaves	Used in treatment of various skin diseases, fever and used in artificial aquariums.
22.	*Smilax zeylanica*	Ram Datun	Smilacaceae	Young shoots and Leaves.	Treats skin diseases, piles and dysentery, toothache, arthritis and urinal complaints.

The present investigation revealed a total 21 wild edible plant species consumed by local people living in nearby vicinity of Nagzira wild life sanctuary as shown in Table-1. Various parts of these plants like rhizome, tubers, fresh green leaves and shoots, flowers fruits and seeds are consumed as vegetables in daily cooking. It was seen that local and tribal communities relish on such edible plants throughout the year. Rhizomes, tubers and mushrooms are very demanding among the local people during monsoon season viz. *Amorphophallus Paeoniifolius, Agaricus bisporous, Amaranthus spinosus, Alternathera sessilis, Amaranthus viridis, Olax psittacorum, Bambusa arundinacea, Commelina benghalensis, Lablab purpureus, Holarrhena pubescens, Physalis pubescens, Termitomyces heimii, Tacca leontopetaloides and Nymphaea nouchali* are very popular among the tribes as they are found all around the forest area.

The local and tribal communities use variety of wild edible vegetable plants which are available in their surrounding of forest regions. The present investigation of wild edible plant species locally used for consumption reveals potential to become valuable staple food and important alternatives to usual cultivated vegetable crops. Although about 21 wild edible plants have been recorded during present study, increased use or unawareness may cause threat to some species. Hence there is serious need to conserve these species with the need of sustainable utilization of available resources.

CONCLUSION

The conclusion of the present day of study is that, diverse forms of edible wild varieties of plants are present in the wild life sanctuaries of gondia district which are used as an option over domesticated vegetable crops by the local and native tribal communities since many years. These plants are not only consumed as food but are also used for medicinal purposes. There are many rare wild edible plants which are still unknown for the people living in cities, Hence it is very essential to pass on this traditional knowledge to further generations.

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Effect of Seed Treatment Practices in Management of Seed-Borne Fungi of Cereals (Sorghum And Maize) in Karjat Tahsil, Ahmednagar, Maharashtra

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ABSTRACT

Seed-borne fungi have a negative impact on seed viability, germination, emergence, plant growth vigor, and ultimately productivity of crops. Present study was carried out to identify seed-borne fungi associated with two important cereal crops (Sorghum and Maize) from the Karjat Tahsil of Ahmednagar district and to assess the efficacy of different seed treatment practices in management of these seed-borne fungi. For the study, Sorghum and Maize seeds were collected from the Karjat Tahsil of Ahmednagar and tested at the Seed Pathology Department of Dada Patil Mahavidyalaya, Karjat, Dist. Ahmednagar. A total of five seed-borne fungi namely Aspergillussp., Fusarium pernambucanum, Fusarium aquaticum, Penicillium terrigenum, and Curvularia sp. were isolated from selected cereals. These fungi were identified from National Centre for Microbial Resource (NCMR), Pune, Maharashtra. Furthermore, a variety of seed treatments, including hot water treatment, garlic extract, Neem leaf extract, Bavistin, and Vitavax-34 were employed to manage these seed-borne fungi. Based on the results, the most effective method for controlling seed-borne fungus were found to be Vitavax-34 for chemical control and Neem leaf extract for biological control. Moreover, the least successful treatment among all of them for reducing fungal infections transmitted by seeds was hot water treatment. In conclusion, integrated management practices such as natural formulations and chemicals can aid in the decrease of seed-borne fungus. It has been recommended that Neem leaf extract and Vitavax-34 should be used as efficient control methods to fight against seed-borne fungiassociated with maize and Sorghum.

Key words: Seed treatment practices, Seed-borne fungi, Cereals, Sorghum, Maize, Integrated management

INTRODUCTION

Cereal grains are the most significant food for humans, providing the bulk of the global population with their primary energy supply (Matusinskya et al., 2015). Worldwide, cereals are considered as valuable crops for agriculture. They belong to the Gramineae family, a vast monocotyledonous grass family that includes rice, sorghum, wheat, maize, barley, oats, and barley.The world's population has long relied on cereal-based meals as a main source of nutrition. Approximately 70% of total calories and 50% of total protein are derived from cereal grains, which also comprise the macronutrients (protein, fat, and carbohydrate) needed by humans for growth and maintenance (Topping, 2007). Sorghum (*Sorghum bicolor* L.) ranks as the world's fifth-most significant cereal crop followed by wheat, rice, maize and barley. Over 500 million people in more than thirty countries rely on Sorghum as a staple food (Danazumi et al., 2015). Another crop Maize is progressively replacing wheat and rice as the world's staple crop in a number of regions. Apart from human use, Maize is also utilized for the manufacturing of ethanol, animal feed, and other items like corn syrup or starch (Rehman et al., 2021). In India Sorghum, Pearl Millet, Wheat, Maize, & Rice are main cereal crops which are cultivated on large scale. Diseases are major contributing element to the crop's low yield among other causes. Sorghum reported to be affected by over 30 fungal infections (Masum et al.,2009). Numerous plant diseases are seed-borne, which can result in significant losses to crops. Some seed-borne fungal pathogens can release toxins called mycotoxins, which impair grain quality, hinder germination, and weaken the plant's ability to germinate (Goko et al.,2021). Farmers typically employ a variety of synthetic herbicides to manage soil-borne and seed-borne diseases. In addition to their high price, these pesticides polluted the environment and posed health risks. Furthermore, by eliminating both friendly and antagonistic soil bacteria, the careless use of pesticides disturbs the natural balance of the environment. Thus, it makes essential to investigate less costly, less dangerous, nonchemical, and environmentally friendly seed treatment techniques (Masum et al., 2009). Therefore, it is necessary to prevent seed-borne fungal infections in order to boost agricultural output and improve crop health and seed quality. Of all the practices used, seed treatment is one of the least expensive and most secure ways to directly control seed-borne diseases. Therefore, current study gives an account of seed-borne fungi associated with *Sorghum* and Maize from Karjat region of Ahmedngar district, Maharashtra and assessment of differentseed treatment practices in management of these seed-borne fungi.

MATERIALS AND METHODS:

Study area:

The study was carried out at the Seed Pathology Department of Dada Patil Mahavidyalaya, Karjat of Ahmednagar district, Maharashtra during the research work period from March to April 2022 .

Collection and sterilization of sample:

Stored seeds of *Sorghum* (*Sorghum bicolor*) and Maize (*Zea mays*) were collected from five different localities of Karjat namely, Karjat, Bahirobawadi, Nangaon, Kaprewadi, and Durgaon. Seeds were categorized into two groups, treated and untreated (control). The treated seeds were first subjected to one-minute surface sterilization process using 0.1% $HgCl_2$ (Mercury chloride), followed by three to four rinses with distilled water and drying between sterilized filter papers.

Preparation of medicinal plant extracts:

In this study, two fresh samples were used. Neem (*Azadirachta indica*) leaf extract and garlic (*Allium sativum*) extract were used as samples. For preparation of the extracts, 100 g of the neem leaves and garlic cut into small pieces. These pieces were taken in a clean mortar and pestle and ground with filtered water. The pulverized plant tissues were filtered with Whatman 1 filter paper. The filtrate was used as an extract.

The dilution doses of plant extract (seed: solution-filtrate) used 1:1(w/v) were prepared adding sterile water to the filtrate.

Agar plate method:

A pre-sterilized glass petri-plate made of borosil was filled with 25 milliliters of PDA (Potato Dextrose Agar) medium. After allowing the petri-plates to cool to room temperature (33±^{0}C), 10 sterile seeds were plated in triplicate at similar distances. For seven days, plates were incubated at room temperature. The seeds were examined using a compound microscope on the eighth day.

Isolation of seed-borne fungi:

Treated and untreated seeds were studied for seed-borne fungi. These seeds were dipped in the dilution doses of plant extracts for about 30 min. The seeds were treated with Vitavax-34 and Bavistin fungicide at the rate of 1:40 w/v (fungicide: seed). The seed-borne infection of fungal pathogens recorded after 4 days and continued for 10 days. Data recorded on 12th day of incubation were taken into final account. Data on seed-borne infection of fungal pathogens was expressed in percentage.

RESULTS AND DISCUSSION:

Isolation of seed-borne fungi:

In the present study, total ten seed-borne fungi were isolated from *Sorghum* and Maize in common namely, *Alternaria* sp., *Rhizopus* sp., *Aspergillus* sp., *Penicillium* sp., *Fusarium* sp., *Rhizoctonia* sp., *Nigrospora* sp., *Cladosporium* sp., *Curvularia* sp., and *Colletotrichum* sp. Out of which, the five seed-borne fungi namely, *Fusarium pernambucanum* URM 7559 (strain VJ27, accession number-NR_163754.1),*Fusarium aquaticum* CGMCC 3.20819(strain VJ30, accession number-NR_182844.1), *Curvularia* sp. (strain VJ32, accession number-MCC 9955), *Aspergillus* sp. (strain VJ40, accession number-MCC 9969), and *Penicillium terrigenum* CBS 127354 (strain VJ44, accession number-NR 121515.1) were identified by NCMR (National Centre for Microbial Resource) Pune. Whereas, rest of the above mentioned fungal species were identified by manual, "The illustrations of fungi" (Mukadam et al., 2006). According to Mohmed et al. (2019), who worked with maize and wheat seeds from Sudan, these seeds were heavily contaminated with four different fungus species: *Aspergillus*, *Penicillum*, *Alternaia*, and *Rhizopus*. He further mentioned that *Aspergillus* has the greatest percentage of fungal infection in maize, followed by *Penicillium*, *Alternaria*, and *Rhizopus* respectively.

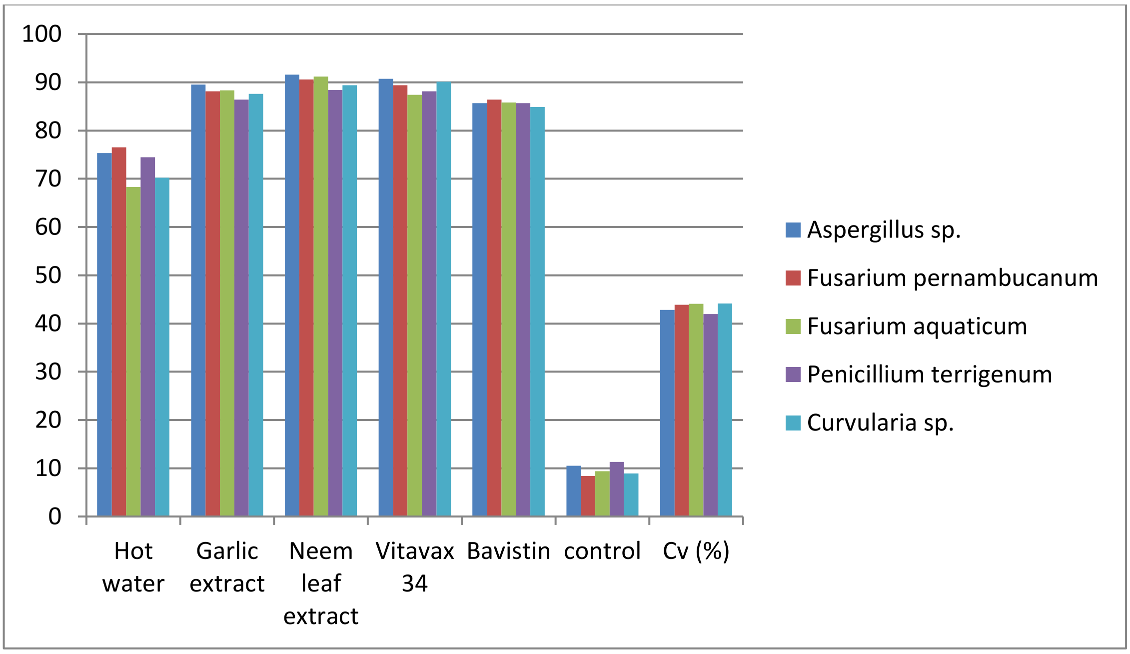
Reduction in seed-borne infection of selected pathogenic fungi:

According to the results, it was observed that there is reduction in seed-borne fungi associated with *Sorghum* and Maize. From the findings, highest percent reduction was shown in Neem extract and lowest in hot water treatment for all identified (*Fusarium pernambucanum* URM 7559 (strain VJ27, accession number-NR_163754.1), *Fusarium aquaticum* CGMCC 3.20819(strain VJ30, accession number-NR_182844.1), *Curvularia* sp. (strain VJ32, accession number-MCC 9955), *Aspergillus* sp. (strain VJ40, accession number-MCC 9969), and *Penicillium terrigenum* CBS 127354 (strain VJ44, accession number-

NR 121515.1) fungal species. Table 1, Plates-2-3, and Graph 1 summarize percent reduction in seed-borne infection of selected fungi.

Table 1. Percent reduction in seed-borne infection of selected pathogenic fungi recorded in cereals (*Sorghum* and Maize) seeds treated with five different treatments collected from Karjat area.

Treatment	*Aspergilluss p.*	*Fusariumpernambucan um*	*Fusariumaquatic um*	*Penicilliumterrigen um*	*Curvularias p.*
Hot water	75.3	76.5	68.3	74.5	70.2
Garlic extract	89.5	88.1	88.3	86.4	87.6
Neem leaf extract	91.6	90.6	91.2	88.4	89.4
Vitavax-34	90.7	89.4	87.4	88.1	90.1
Bavistin	85.7	86.4	85.8	85.7	84.9
control	10.5	8.4	9.4	11.3	8.9
Cv (%)	42.79	43.91	44.05	41.95	44.12



Graph 1. Percent reduction in seed-borne infection of selected pathogenic fungi

Effect of different seed treatment practices on seed-borne infections of the selected Pathogenic fungal diseases:

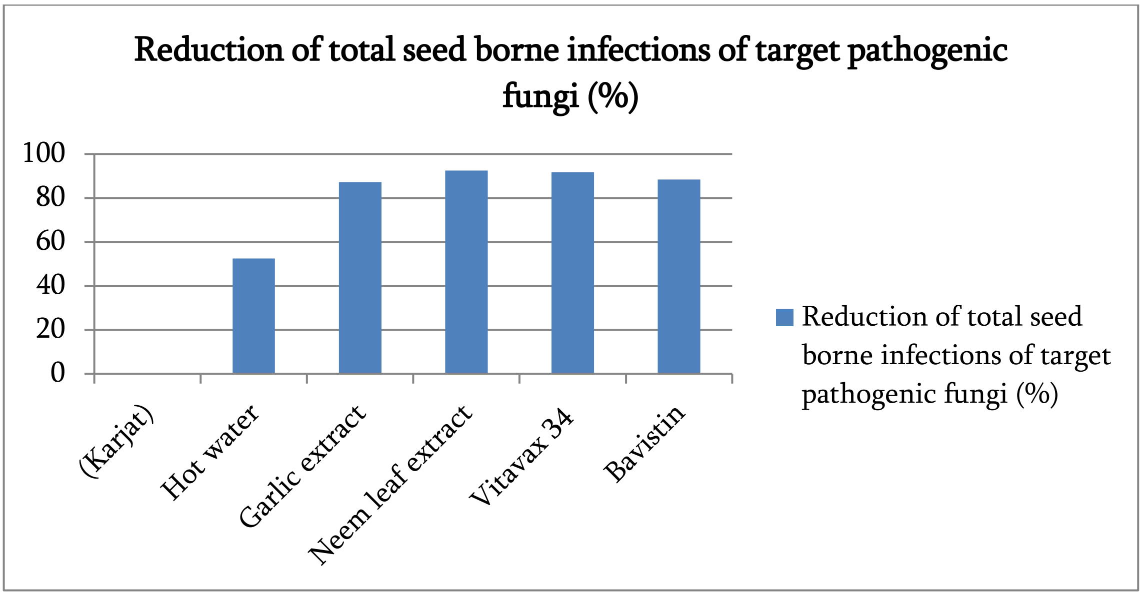
In another experiment, different types of control methods such as biological and chemical control were used. For the biological control, plant extracts such as neem and garlic extracts were used, whereas for chemical control, standard fungicides namely Vitavax-34 and Bavistin were used. These fungicides were used at the rate of 1:40 w/v (fungicide: seed). Additionally, hot water treatment used. All the five seed treatment practices reduced significantly the seed-borne infection of the selected pathogenic fungi.From the results, it was cleared that, of the five seed treatment practices, Vitavax-34 gave the best performance in controlling the seed-borne infection of all the selected pathogenic fungi among the chemical control, whereas neem leaf extract gave the best performance in controlling the seed-borne infection of all the selected pathogenic fungi among the biological control (Tables 2 and Graph-2).

Our findings were supported by Biswas et al. (2015) who worked on seed-borne fungi of *Lablabpurpureus* (L.) Sweetand isolated seven types of fungal pathogens. It was found that *Aspergillus* spp., *Fusarium* sp., and *Rhizopus* sp. were the most common fungal species. They also investigated the effects of chemical fungicides (Bavistin, redomil, and dithane M-45), cow urine, hot water, and plant extracts (*Lawsonia inermis*, *Azadirachta indica*, and *Allium sativum*) on the germination rate and vigor index of bean seeds. They concluded that the best controlling measure was *Azadirachta indica* leaf extract. In another study, Masum *et al.* (2009) studied efficacy of five seed treatment practices like Vitavax-200,BAU-Biofungicide,hot water treatment,neem leaf extract and garlic tablet for controlling seed-borne fungi of *Sorghum*. They observed that, all these seed treatment practices reduce significantly seed-borne fungi namely, *Agrostis tenuis*, *Bipolaris sorghicola*, *Botrytis cinerea*, *Crinum graminicola*, *Curvularia lunata*, and *Fusarium moniliforme*.They further pointed out that, Vitavax-200 gave the best result in controlling seed-borne infection of all the individual target pathogenic fungi followed by garlic tablet, hot water treatment and neem leaf extract.

Table 2 Effect of different seed treatment practices on seed-borne fungi:

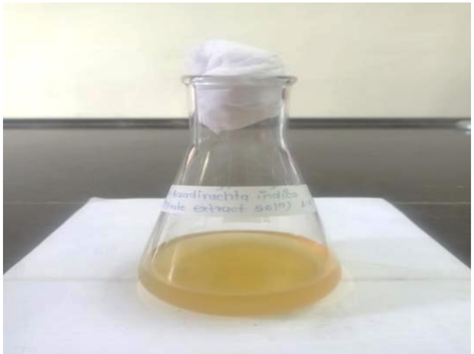
Treatment (Karjat)	**Reduction of total seed-borne infections of target pathogenic fungi (%)**
Hot water	52.5
Garlic extract	87.2
Neem leaf extract	92.4
Vitavax-34	91.8
Bavistin	88.4
Control	--
CV (%)	20.48

Where, CV - represents coefficient of variation.



Graph 2.Reduction of total seed-borne infections of selected pathogenic fungi

Figures:



A-Neem extract

B-Garlic extract

Plate.1. Plant extracts of Neem leaf and Garlic bulb

C- Control

D-Neem extract

E- Vitavax

Plate.2. Fungi isolated from *Sorghum*

F- Control **G-Neem extract** **H- Vitavax**

Plate 3. Fungi isolated from Maize

CONCLUSION:

A substantial amount of damage to cereals is caused by seed-borne fungus, which lowers grain production and quality. Overall, the data findings from this study suggest that integrated management practices like natural formulations as well as chemical treatments can help to reduce seed-borne fungi. Furthermore, adopting strict laws and quarantine guidelines, as well as developing appropriate standard laboratory seed testing procedures and fungus eradication strategies are needed to combat with the seed-borne fungi.

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Histopathological Study of Intestine of Snake Headed Fish Masatcembelus Armatus (Lecepede,1800) Due To Nematodeparasite Procamallanus Aarnai (Lakshami I.R 2010)

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ABSTRACT
Histopathology study of nematode parasite has been studied to findthe pathological changes and extent of damage of the intestinal layers of snake headed fish Mastacembelusarmatus (Lecepede,1800). The changes that have witnessed in the intestine layers i.e mucosa,submucosa and lamina propria,submucosa with profuse infiltration of eosinophil's, lymphocytes and plasma cells. It seems that the environment of the intestine is quite favourable for the worm Procamallanusaarnai (Lakshami I.R 2010). So the worm finds it easy to absorb the same through tegument for growth and nourishment. When host parasite equilibrium is disturbed, serious disease in host is the consequence, resulting in depletion or weakening of host.
Keywords: Histopathology, Nematode Parasite, Mastacembelusarmatus (Lecepede,1800),intestine

INTRODUCTION

Interest in the study of host-parasite relationships has declined sharply with the development of antihelminthic, antibiotic and chemotherapeutic treatment of parasitic diseases. The study of the interactions of potential hosts and potential parasites remain one of most interesting and important aspects of the natural sciences. It is indeed doubtful whether investigations of host-parasite interrelationships are less pertinent today from the perspective of human health. (*Humbe* et.al 2011)

Fishes are said to be gold in water, they play an important role in nation's economy. Fish is one of the best sources of nutrition, containing high protein and low cholesterol and fat values. Now a day they are facing the problems of malnutrition.

Parasitism is one of the associations in the living organism. The mechanism of entry and the establishment of a parasite with in a particular host varies widely from species to species in different animals. The degree of response by each host to the parasite, which making tissue contact is related to the nature of the tissue site invasion and also to the intimacy of the stage of development of the living organism.Whether it is an adult or larva.

The term 'host-parasite relationship' correctly designates an intimate interaction, or stage of interaction, between two or more distinct organisms, in which the one benefits while causing damage to the others. The study of parasites and parasitism is without an end. One could go on and on like this as the various aspects are not only important but quite interesting too. What about the host-parasite and parasite-parasite relationship as also the relationship between the definitive and intermediate hosts of the parasites.

Parasites effects major pathogenic effects on fish result from hemorrhaging and thickening of the swim bladder wall. They may cause tissue damage and impaired respiration and signs of stress (Koie, 1991), this way cause economic loss.

Nematodes, or roundworms, infect many different species of aquaculture and wild fish. Small numbers of nematodes often occur in healthy fish, but high numbers cause illness or even death. Helminth parasites (Cestodes, trematode, nematode) developed the organs of attachment and antienzyme mechanism for their survival in the body of host. They live in a very hazardous environment, as there is continuous movement of the gut lining, the food present in gut, peristaltic movement and the food material is propelled further down in gut and they are exposed to the gastric and other digestive secretionsingest nutrition by digesting the intestinal content and partially by damaging the intestinal wall with the help of their proteolytic enzymes with their protease inhibitors (Mitchell A.J.1982,Mackiewicz, J.S., Cosgrove, G.E. and Gude, W.D. *et al*. 1972) supposed that proteolytic enzymes or other lytic secretion played a role in pronounced tissue reaction. The physiological conditions in a gut of particular host (fishes) with regard to pH or other physiological characters may provide favourable or unfavourable site for metabolism of particular species. The nature of diet of the host have profound effect on the growth of helminth parasites, may be lacking in nutritional factor, essential for the development of parasite.This work is an attempt to bring out the different aspect of pathology of infection of Snake Headed fish*Mastacembelusarmatus*(Lecepede, 1800), by Nematode,*Procamallanusaarnai*(LakshamiI.R2010)

MATERIAL AND METHODS:

For the histopathological study, different types of freshwater fishes were dissected to observe the rate of infection. Some fishes were found to be infected and some normal. Both infected and normal hosts intestine were cut and fixed in Bouin's fluid to study histopathological changes. The fixative inhibits the post mortem changes of the tissues. Then tissues were washed, dehydrated through alcoholic grades, cleared in xylene and embedded in paraffin wax (58-62°C).

The blocks were cut at 7μ and slides were stained in Eosin and Haematoxylin double staining method. Best slides or sections were selected and observed under the microscope for histopathological study.

RESULT:

Healthy intestine shown, healthy villi and all layers are clearly observed, where as infected intestine has been observed that the worm attached to the mucosal layer of intestine and slowly invades to the deeper layers of the host tissue.

***Procamallanusaarnai* (*Lakshami*I.R., 2010)-**

The worm*ProcamallanusaarnaiLakshami*I.R. (2010) is attached to the intestine of host *Mastacembelusarmatus.*

In T.S. of intestine of *Mastacembelusarmatus,* it has been observed that the *ProcamallanusaarnaiLakshami*I.R (2010) attached and entangles invades in the intestinal villi. It infects injuries to necrosis of tissue due to pressure of parasites was common occurrence. Inflammation in intestinal tissue at the sites of attachment was observed.

The host parasite relationship between *Mastacembelusarmatus*and *Procamallanusaarnai*(Lakshami I.R. 2010).

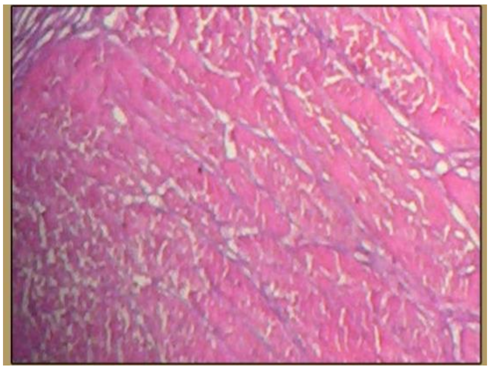

Fig 1 T.S.of Normal Intestine of *Mastacembelusarmatus*(Lecepede,1800)

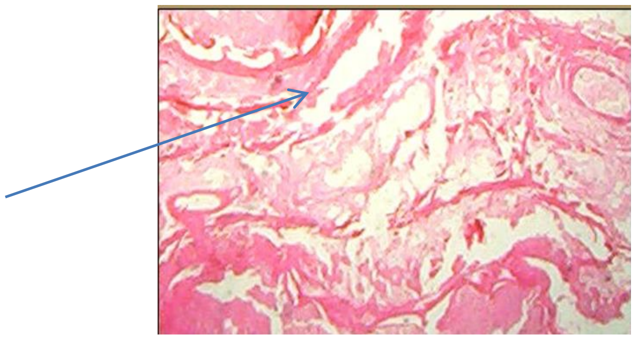

Fig 2 T.S.of Infected Intestine of *Mastacembelusarmatus*(Lecepede,1800)*showing* degeneration of villi,hyperplasia

DISCUSSION:

Helmimth parasites affect the host physiology by invading and inhabiting almost each and every organ and thus alerting not only the morphology of organ but also severely interrupting the metabolism and nutritive capacity of the host. Pathogenicity of the host involves an interaction between the parasites and the host. The effect of the parasitism on the fish host is of considerable importance because these fish are one of the important delicious food items for man.

The histopathology causes the intestine of infected fish which is significantly showing the extensive damage to the four layers i.e. Mucosa, Submucosa, Muscularis, and Adventia layer. The intestine consisted of small intestine and large intestine. The small intestine comprised a simple layer of columnar epithelium with prominent microvilli, high degree of villous folding with abundant Goblet cells (Fig. 1). The large intestine lined by a simple columnar epithelium with abundance of Goblet cells compared to the rest of the intestinal segments. The lamina propria consisted of compact connective tissues, with numerous blood vessels especially at the tip of the villi. The pathological effect shows degeneration of villi, ruptured serosa layers, swelling, and vacuolization in tunica muscularis and lamina propria and irregular shape of villi occurred formation of thick circular and longitudinal layers (Fig.2). This results that, worm contact with host tissue and utilize their nutritive substances foe their growth, nourishment and make host weak, affecting the growth of host causing damage to intestinal tissue of host evidenenced by eruption of villi, thickening of more intestinal layers. Similar trend was noticed by Benarjee*et.al*,Laxma*et.al*.,SwatiJadhav (2019).

CONCLUSION:

Parasites affect the productivity of the fish in the systems through mortalities, by decreasing growth rate, reducing the quality of the flesh and making the hosts more susceptible to more pathogens from above histopathological discussion it can be concluded that Nematode parasite *Procamallanusaarnai*(Lakshami I.R., 2010)finds the nutritive material from the intestine of hosts *Mastacembelusarmatus* which is essential for their nourishment and growth.

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Various Methods to Examine of Parasites at Laboratory

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ABSTRACT

There are innumerable parasites which are very firm and assure about their existence and for survival. By every possible ways they are findings own fittest paths and exploring their world stealthily among host. Day by day deworming & medications methods are upgrading to overcome the loss from parasites but simultaneously the parasitic form are also enhancing their tolerance, an adopting with immunity to fight with host. There for its being more important to examining the parasites infection and their identification to tackles with them. In the present communication various diagnostics laboratory methods has discussed to identify different worms for more study to know about. As few methods of these might be well known earlier however intend to more explore them to introduce for its application an emerging learner here after author also declared that not to pretend any rights or ownership.

Keywords: Parasites,collection,laboratory,methods,samples,diagnosis etc.

INTRODUCTION

To determined parasite names its diagnosis is difficult task without laboratory procedure. There for morphology and anatomy study plays very essential role to confirm parasite, sample collection,detection,identification and their preservation to extend more details. Moreover different methods are available which can be assist to convenient precise study who have keen interest in the concerned and enriching new way of knowledge for further study and new learners to fight with parasites.

METHODS:

1. Collection of fresh sample : fresh collected sample should be intact & neatly cleaned as well as without contamination of water or any other disinfectant atagents. After they must be treated with saline solution accordingly and keeping for preservation for further study.
2. Examination under Microscope : wet mount, thick mount & permanent stained preparation. For wet mounts do unstained wet film preparation, wet saline mounts which help to see live trophozoites,eosin staining for larvae,trophozoites& cyst, the Iodine staining can be use for cyst.The

thick smear with the help of glycerin helminth eggs can observed under microscope. The permanent stained smears such as Iron hematoxyline stain,Trichome staine.

3. Concentraion Method : when we unable to use microscope then this method can be apply.-Flotation methods,saturated salt solution method,Zinc sulfate centrifugal floatation,sugar flotation .
4. Sedimentation method : formal ether sedimentation ,Baermann concentration,
5. Eggs counting mehods : Semi quantitative,standard wet mount,Modified Kato thick smear method McMaster's egg counting,stoll's dilution methods,Scotch tape method.
6. Fecal Culture : its not use for routine detection but for species identification. Harada-Mori Filter Paper Strip Culture,Agar plate culture for Strongyloides,Charcol culture.
7. Examination of Blood : an usual method for malaria,filariasis,African trypanosomiasis and bebesiosis.
8. Diagnosis of Malarial Parasites : stained blood film thick or thin,combine thick and thin blood film.
9. Examination of Microfilaria : Wet mount, Stained smears ,concentration method-sedimentation/membrane filtration/microhematocrit tube/buffy coat blood film.
10. Diethylcarbamazine Provocation Test: use for mobilization of microfilaria into peripheral blood.
11. Sputum Examination : sputum is examined commonly for the demonstration of eggs of paragonimus westermani and some time for to detect trophozoites of E.hisolytica.
12. Urine of Body Fluids Examination : use for Schistosoma ,Trichomonas Vaginalis,microfilaria.
13. Tissue Biopsy : Taken from cutaneous ulcers of trypanosomiasis,leshmaniasis.
14. Muscles Biopsy: Spiral larval form of Trichenella spiralis,larval form of T.solium.
15. Duodenal Capsul Technique (Enterotest) : is a simple method of sampling duodenal contents.
16. Sigmoidoscopy material : use for E.histolytica ,material from the intestinal mucosa
17. Urinogenital Speciman : detection of T.vaginalis
18. Culture Method: Now various parasitic form is possible to grow in culture medium but this not help to diagnose in daily infections for checking. But it can be helpful for experimentation ,study purpose or research, for ex.Ameba histolytica can be grown in media for mono or diphase. Culture medium also can be done for malarial parasites the method discovered by Bass & Jones in 1912 with the help of defibrinated/heparinized blood.
19. Animal Inoculation : This method can't use for detection of infection but can be use for study for the sensitivity of paarsites. For ex. Trypanosomiasis,Toxoplasmosis & Visceral leishmaniasis etc.
20. Xenodiagnosis :It's help to diagnostic infection of a vector in which the parasites multiples and can be demonstrated.
21. Immunological Diagnosis : Many serological tests are availabled to detect antibodies to parasites using antigen from cultured parasites or from natural sources.
22. Malaria : Indirect Immunofluorescence,ELISA,IHA are sensitive and specific but for acute malaria it may not be helpful reason is that antibodies persist for some years after cureness.
23. Skin Tests : Intradermal tests are used in parasitic infections which also sensitive such as Casoni's test,Leshmanin test,Fairley's test,skin test in Bancroftian filariasis etc.
24. Molecular Methods: Nucleic acid based diagnostic test are mainly available in specialized or reference centers. Nucleic acid probes and amplification techniques such as polymerase chain

reaction (PCR) & Multiplex PCR,western blot and deoxyribonucleic acid (DNA) hybridization techniques are applying to detect parasites in specimens of blood,stool,or tissue from patients, Loop mediated isothermal amplification (LAMP) techniques , B1, Drug resistance in malaria by PCR etc.

So these are some important methods right from serial no.1 to 24 which are being applying for the detection of parasites infections and for their details further study. All these methods are using for according to parasites nature, suitability in terms of precise result and diagnosis. Some of them can be run at the students laboratory and all off medical laboratory as per the facility and resources.

CONCLUSIONS:

An optimistically I would like to conclude that above narrations definitely will helpful to enrich the knowledge about parasites and their infections. It's would support and assist to demonstrate parasitic diagnosis at some extend, motto to explore these diagnosis methodologies to overcome losses from parasites. At the last not possible to apply all above mentioned diagnostic examination at college level due to lack of concerned facilities. An author not pretend any own rights or claimed for above different process its merely matter to spread information among.

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Investigation of the Effect of Fruit Borer (Genus Eudocima) On Various Horticultural Crops from Aurangabad District (MS) India

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ABSTRACT

Eudocima is a major pest of fruit crops, causing serious damage to a variety of ready-made and horticultural crops. They are major fruit borers, with secondary feeders causing significant damage to both commercial and horticultural crops. A field survey was conducted from Aurangabad, Maharashtra during May 2022 to April 2024 to study the effect of fruit borer on various horticultural crops. The main objective of this study was to provide a brief overview of the harmful effects of the weevil (Eudocima).

Keywords: Eudocima, fruit piercing, damage, horticultural crops.

INTRODUCTION

The Noctuidae, also called owlet moths, are an influential family of moths that comprise about 35,000 recognized species in over 4,200 genera, out of a possible 100,000 total. Currently, 48 species belonging to the genus Eudocima (Zilli & Hogenes 2002, Zilli et al., 2017) [13, 14] are primarily found in tropical regions of the planet, with occasional expansion into temperate zones. Fruit-piercing moths (Eudocima spp. [= Othreis spp.], Noctuidae: Catocalinae) are a major pest of ripening fruit in subtropical and tropical regions such as Africa, Southeast Asia, and western Pacific countries (Waterhouse and Norris 1987). According to Pedigo and Rice (2009) [9], the term 'pest' refers to destructive or disruptive actions. As a result, pest status in agricultural settings encompasses both crop sensitivity and destructive insect activities that affect crop productivity. Insect behaviours that result in economic damage to food crops can be categorized into injury guilds (Root, 1967) [10], which group comparable types of destructive activity. These guilds can be used to categorize insect pests based on the responses they generate in their crop hosts, making them more useful when studying community structure. The moth, unlike most other moth and butterfly pests, is difficult to eliminate because the immature stages live only on twining vines of the Menispermaceae family in scrub and forest environments, frequently far from orchards (Denton etal.,1991)[3].Fruit-piercing moths are a major pest of various crops, including citrus, pomegranate, guava, mango, papaya, grapes, and tomatoes (Sundarababu and David, 1973; Leong and Kueh, 2011) [12, 7]. Adult fruit-piercing moths have a long, thick proboscis that is suited to enter the skin of hard, undamaged fruit, allowing the moths to feed on the juice and pulp inside. A large area under the skin bruises and often turns a honey color. Germs of fruit rot quickly penetrate the wound and cause fermentation and decomposition.

Secondary invasions of microorganisms grow into damaged tissues and produce spoiled and premature fruit drops (Sands et al., 1993) [11]. The fruit borer problem may become a serious problem in major cash crops in Maharashtra and Marathwada. This paper focuses on the harmful effects of fruit borer (Genus eudocima) on various horticultural crops in Aurangabad district.

MATERIAL AND METHODS:

This survey was conducted in Aurangabad district of Maharashtra, located at 19.88°N 75.32°E. Adult moths were sampled from May 2022 to April 2024 in various agricultural and horticultural areas of Aurangabad district. Hand collection, sweep nets and light traps were used for collection. These moths were destroyed using ethyl acetate. Photographs of collected specimens and damaged plant parts were taken. To preserve the collected samples, they were dried, pinned and placed in wooden boxes. Each sample was labeled with host plant information, locality, and date. Each specimen obtained was carefully examined for all details using a stereoscopic microscope. Obtained specimens were recognized down to species level using standard literature and keys such as Hargreaves (1936) [4], Bhumannvar and Viraktamath (2001) [2], Lees and Zilli (2019) [6].

Photo Plate 1: Material & Methods.

RESULT AND DISCUSSION:

A field study was conducted to observe the harmful effects of fruit-piercing moths for various horticultural purposes Adult moths pierce fruit to consume fluid and cause characteristic pitting damage. Bacterial and fungal infections occur at the site of attack. The fruits turn yellow, crops during May 2022 to April 2024 from Aurangabad district. Harmful effects of fruit-boring moths were observed during this study. it falls from the tree and appears to be an early harvest. Under severe circumstances, all fruits will be lost.

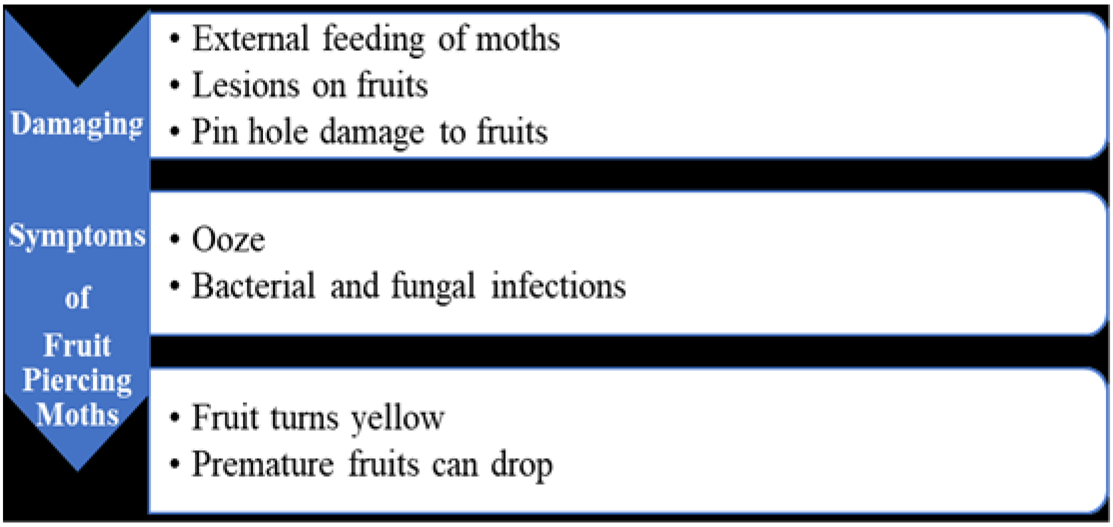

Fig 1

Many researchers have conducted studies on the harmful effects of fruit borer on various horticultural crops. The degree and type of damage caused by caterpillars on pomegranates was investigated by Bhumannavar and Viraktamath (2001) [2]. They concluded that the genus Eudocima is considered one of the most dangerous agricultural pests in the world. Balikai et al., (2011) [1] reported that E. fullonia, E. materna and E. homaena were the major fruit penetrating moths on pomegranate from Karnataka.

Photo Plate 2: Damaging effect of fruit piercing moths (*Genus Eudocima*)

Fruit moths can penetrate fruit directly or indirectly. Gurule and Nikam (2011) observed the occurrence of three fruit moth species (E. phalonia, E. homaena and E. materna) in North Maharashtra from Nasik, Dhule, Jalgaon and Nandurbar districts. Primary fruit borers are a nuisance in orchards and directly damage the fruit (Klem and Zaspel, 2019) [5]. More than 100 horticultural crops are severely damaged by this insect, which also reduces crop production (Leroy et al., 2021) [8]. These moths can affect overall production and seriously damage a variety of horticultural crops. Further research into effective management measures with an emphasis on environmentally friendly techniques is needed to combat serious infestations of these pests.

Table 1: Damaging effects of fruit piercing crops (*Genus eudocima*) on different horticultural crops from Aurangabad district.

Nameof theSpecies	HostPlants	DamageSymptoms
Eudocimamaterna	Banana,Citrus,Mango,Pomegranate,Tomato&*Tinosporia cordifolia* (Gulvel)	▪ Penetrationandsuckingofjuice. ▪ Skin of the fruit gets bruised, rotting germs causedecomposition.
Eudocimaphalonia	Pomegranate, Citrus, *Tinosporiacordifolia*(Gulvel),Tomato.	▪ Internalfeeding ▪ Damagedpartsbecomespongy&showlesions. ▪ Fruitsmay showprematuredrop.
Eudocimahomaena	Pomegranate, Citrus, *Tinosporiacordifolia*(Gulvel), Gauva.	▪ Skin of the fruit gets bruised, rotting germs causedecompositionandprematurefruitscandrop.

Many researchers have conducted studies on the harmful effects of fruit borer on various horticultural crops. The degree and type of damage caused by caterpillars on pomegranates was investigated by Bhumannavar and Viraktamath (2001) [2]. They concluded that the genus Eudocima is considered one of the most dangerous agricultural pests in the world. Balikai et al., (2011) [1] reported that E. fullonia, E. materna and E. homaena were the major fruit penetrating moths on pomegranate from Karnataka. Fruit moths can penetrate the fruit either directly or indirectly. Gurule and Nikam (2011) observed the occurrence of three fruit moth species (E. phalonia, E. homaena and E. materna) in North Maharashtra from Nasik, Dhule, Jalgaon and Nandurbar districts. Primary fruit borers are a nuisance in orchards and directly damage the fruit (Klem and Zaspel, 2019) [5]. More than 100 horticultural crops are severely damaged by this insect, which also reduces crop production (Leroy et al., 2021) [8]. These moths can affect overall production and seriously damage a variety of horticultural crops. Further research into effective management measures with an emphasis on environmentally friendly techniques is needed to combat serious infestations of these pests.

CONCLUSION:

The main purpose of this article is to study the harmful effects of fruit-piercing moths. Several entomologists have noticed that these pests have heavily infested various agricultural fields. Fruit borers can have a detrimental effect on overall productivity and cause significant damage to several horticultural crops. Much remains to be learned about the harmful effects of these moths as this work focuses only on horticultural crops in Aurangabad district. Further research into effective management strategies is needed to address severe infestations by these pests.

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Some Important Types of both Plant and Animal Biodiversity Conservation in Ecosystem

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ABSTRACT

Life has existed on Earth for over 3.5 billion years. Over 95% of the species that ever existed have gone extinct. Biodiversity is the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystemsand the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems. Loss of biodiversity occurs when either the habitat essential for the survival of a species is destroyed, or particular species are destroyed. Extinction of species may also be due to environmental factors like ecological substitutions, biological factors and pathological causes which can be caused by nature or man. This needs to the conservation of biodiversity for maintaining the balance of ecosystem. Hence, the present paper focused on the objectives, advantages and types of biodiversity conservation in ecosystem.

Keywords: Biodiversity, its conservation, objectives, advantages, ecosystem etc.

INTRODUCTION

Load Recently the planet is inhabited by several million species in about 100 different phyla (Dirzo& Raven 2003). About 1.8 million have been described by various scientists (Hilton-Taylor *et al.* 2008), but conservative estimates suggest that there are 5–15 million species alive today (May, 2000), Therefore many groups of organisms remain poorly studied. There are over 15,000 new species are described each year (Dirzo& Raven 2003), and new species are evolving during our lifetimes. Modern extinction rates are high at 100 to 1000 times greater than background extinction rates calculated over the eras (Hambler 2004). New species appear, existing species go extinct at a rate 1000 times that of species formation (Wilson 2003). The last great mass extinction was 65 million years ago, at the end of the Cretaceous, when the dinosaurs went extinct.

In Biodiversity, the great heterogeneous assemblage of living organisms were involved. Following are some objectives of Biodiversity, such as------

- It leads to conservation of essential ecological diversity to preserve the continuity of food chains.
- To preserve the genetic diversity of plants and animals is preserved.

- It ensures the sustainable utilization of life support systems on earth.
- It provides a vast knowledge of potential use to the scientific community.
- In this, a reservoir of wild animals and plants is preserved.
- It provides immediate benefits to the society such as recreation and tourism.
- It serves as an insurance policy for the future.

TYPES OF CONSERVATION OF BIODIVERSITY:

There are mainly three types of conservation of Biodiversity, these are as illustrated follows:

1. In- situ conservation of Biodiversity
2. Ex – situ conservation of Biodiversity
3. Agro biological conservation of Biodiversity

1. In- situ conservation of Biodiversity:

Conservation of biodiversitynaturally occur outside the areas is known as ex situ conservation. In this, all animals and plants are reared or cultivated in zoological or botanical parks.Reintroduction of an animal or plant into the habitat from where it has become extinct is another form of ex situ conservation. For example, the Gangeticgharial has been reintroduced in the rivers of Uttar Pradesh, Madhya Pradesh and Rajasthan where it had become extinct.Seedbanks, botanical, horticultural and recreational gardens are important centres for ex situ conservation.

2. Ex – situ conservation of Biodiversity:

Conservation of biodiversitynaturally occur inside the areas is known as In - situ conservation.It includes the establishment of following things:

- National parks and sanctuaries
- Biosphere reserves
- Nature reserves
- Reserved and protected forests
- Preservation plots
- Reserved forests

3. Agro biological conservation of Biodiversity:

Many of the indigenous varieties of crops were lost. The hybrid varieties of fruits and vegetables (e.g. tomatoes), introduced for pulp are more susceptible to disease and pests. Therefore, hybrid varieties are preferred, traditional wild varieties of the seeds should be conserved for future use in the event of an epidemic which would completely wipe out the hybrids.Botanical gardens, agricultural departments, seed banks etc., alone should not be given the responsibility of agrobiodiversity conservation. Farmer, gardener an cultivator should be aware of his role in preserving and conserving agrobiodiversity.

CONCLUSION:

Loss of biodiversity occurs when either the habitat essential for the survival of a species is destroyed, or particular species are destroyed. The former is more common as habitat destruction is fallout of development. The latter reason is encountered when particular species are exploited for economical gain or hunted for sport or food.Extinction of species may also be due to environmental factors like ecological substitutions, biological factors and pathological causes which can be caused by nature or man. This needs to the conservation of biodiversity for maintaining the balance of ecosystem.

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Prevalence of Bothriocephalus Gadellus. In Dasyatis Sephen at West Coast Of Maharashtra, India

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ABSTRACT

The present communication deals with the Seasonal prevelance of cestode parasite of Bothriocephalus gadellus. From different places ofWest coast of Maharashtra. Twenty Specimens of the cestode parasites were collected from the intestine of Dasyatis sephen at West coast of Maharashtra state India. During the period of June 2022- May 2023.

Keywords: Prevalence of Bothriocephalus gadellus, In Dasyatis sephenWest coast of Maharashtra.

INTRODUCTION

The genus Bothriocephalus Rudolphi (1808) consists of about 70 species (Protasova, 1977) Schmidt of most of which are intestinal parasites of marine teleosts throughout the world, some species were described from freshwater fishes mainly in the Holarctic and a few from amphibians (Protosva, 1977, Schmidt, 1986) Taxonomy of this genus is still confused due to their rather, uniform segmental morphology and the inadequate descriptions of many taxa. The validity of many species is doubtful, many those described during the last century. For example Protasova (1977) listed as many as 28 Species inquirrenda amounts a total of 65 Species of the genus.

The following Bothrocephlus species have been repored from American freshwater fishes, B. Claviceps describe by Goeze in (1782), B. granularis Rud (1810) (Alyselm. Granulatus) renamed in Cyprinus, Zeder, different species described by Rud B.Angustatus, B. cepolae, B.eriocis, B. lophii in (1819) in (1845) B. labracis described byDuj in labrax Lupus, B. speliosus in Leidy (1858) in Boleosoma Olmstedi species described by Kollar, B. anqusticeps Olss (1868) Sbastes norveqicus from Japan, species described B. platycephalus, B. palumbi Montic, in(1889) species described from Madeira, in (1889) species described B. trigla from Porto Huite, B .manubrifomis Linton in (1889) species described, B. nealectus species described by Loennberg in (1893) Raniceps niger from Sweden, B. motellae species described by Olss, in 1(893), in (1894) B. cordiceps species described by Leidy,Ariolo three species described B.trachyapteri, B. trachypterii-iris, B. trachpteri-liopteri in (1896) from Genovo, B. occidentalis species described byLinton in (1897), from Columbia, B. . alessandrinii species described by Cond- France in(1898) frome Rome, two new species described by Airola , B. monticilli, B. tetrogonus in(1899), another specis described by Airola B. sauride (1900) in saurida nebulosa, from Zanzibar, B. monorchis species described by Listow (1903), in mola mola from Europe, B. andresi species described by Potra (1911) in Eucitharus linguatula from Naples, B. cuspidatus species described by Cooper (1917) in Stizosteli on viteum from USA, B. formus species described by Muller and Vancleave in (1932), B. ssciaenae speciesdescribed by Yamaguti (1934) in Sciaenae Schlegehi from Japan, another species described by Yamaguti, B. opsariichtydis synoname species of B. achilognathi from japan, and one more species described by Yamaguti, B. japonicas (1934) in Anguilla japonica from Japan, B. breviceps species described by Guirat (1935) in synaphobranchus from Azores, B. tinfinnabulus species described by Guirat (1935) in sygnathus phegon from Monaco, B. rarus species described by Lyeil, J Thomas in (1937) Yamaguti another species described B.typhlotritonis species described by J.D Reeves in (1949) from Oklanoma, B. apogonis in (1952) from japan, and one more species described by Yamaguti in (1952), from Japan, B. abyssumspecies described by Thomas (1952), in Echiostoma tanneri, from Bermuda, B. gowlcongensis described by Yen (1955) in ctenopharyngodon idellus, from Gowkong near canton, B. penetrans described by Subhapradha (1955) in Saurida, from Madras, B. kivuensis species described by Baer and Fain in (1958) from Africa, B. fluviatilis in (1960) species described by Akhmerov in from Russia, B. angusticeps in (1968) described by Olsson from Norway, B. carangis described by Yamaguti in (1968) from in caranx helvolus carangoides ferdau, B.kerquelesis Orudhoe described in (1969) , B. gadellus species described by Charles K.Blend in (2002) from Southwestern gulf of Mexico and B. gowkongensis species described by Seyed mehdi Hosseinifard in (2011) from Iran. A detailed descriptions of this species based upon these specimens is provided here to verify some of the characters and to point to the variations that can occur within the same species.

The quantitative analysis of helminths and structural grouping was studied during two annual cycles i.e. June2018– May 20120.

It revealed that the Cestode population was potentially dynamic with more or less durability, regularity and cyclic periodicity in the hosts under investigation. Each annual cycle comprises of

1} Rainy Season (June to September).

2} Winter Season (October to January).

3} Summer Season (February to May).

On the basis of incidence of the infection the influence of annual season on the population of Cestode parasites of Fishes was carried out. It was observed that the incidence of infection by helminth parasites increased with host age. The infection levels were low in young hosts and showed remarkable infection rise in adults.

The environmental conditions and host behaviour are influenced by habitat and season, while physical state reflects internal conditions, through this may also be affected by external factors. Population investigations can provide data for the prediction of integrated methods to achieve the regulation of numbers of harmful parasites according to Kennedy (1958, 1975).

Since much of work is not undertaken to study the nature of Cestode population in certain marine water fishes of various places of West coast of Maharashtra State. (India). The data are shown in the tables further with month and year wise with their different hosts during study period June 2018- May 2020

MATERIALS AND METHOD

The marine water fishes were collected from West coast of Maharashtraduring the period of June 2022 to May 2023. The intestine of marine water fishes were dissected longitudinally, parasites kept in normal saline (0.9%) Solution.Then cestode were collected, flattened and preserved in 4% formalin. These cestodeswere stained by Harris haematoxylin washed in distilled water, dehydrated in ascending grades of alcohol cleared in xylene mounted in D.P.X. and drawing are made with the aid of camera lucida. Identification was made with the help of "Systema Helminthum" vol.II. "Cestode of Vertebrates" [12].
Population dynamics of cestode parasites were determined by following formula
Prevalance (Incidence) of infection = (No of Infected host)/ (Total No of hosts examined) X 100

Observation Table Prevalence of Bothriocephalusgadellus From intestine of Dasyatis sephen During June 2022- May 2023.

Name of the Month	No. of Hosts Examined	No. of Hosts Infected	No. of Parasites Collected	Prevalence %	Locality
June 22	06	02	02	33.33	Murud
July 22	08	02	03	25.25	Dhigi
Aug 22	10	03	03	30	Alibag
Sep 22	10	01	02	10	Kashid
Oct 22	09	04	05	44.44	Shriwardhan
Nov 22	10	04	06	40	Nagoan
Dec 22	08	03	05	37.5	Devgad
Jan 23	08	06	04	75	Harne
Feb 23	14	12	12	85.71	Burondi
Mar 23	07	10	10	142.85	Anjenwel
Apr 23	12	10	08	83.33	Welneshwar
May 23	11	09	12	81.81	Nandiwad
Jun 23	15	02	01	13.33	Ganpatipule
July 23	17	01	01	5.88	Mirya
Aug 23	14	02	02	14.28	Mirkarwada
Sep 23	14	01	02	7.14	Ratnagiri
Oct 23	10	03	04	3.00	Devgad
Nov 23	12	04	03	33.33	Malwan
Dec 23	18	04	05	22.22	Khargaon
Jan 23	17	03	08	17.64	Uran
Feb 23	09	08	10	88.88	Burundi
Mar 23	10	08	16	80.00	Alibag

Apr 23	11	09	15	81.81	Dhigi
May 23	15	12	14	80.00	Nandgaon
Total	275	123	153	44.72	West coast of Mahasrashtra

RESULTS

The data of prevalence of cestode parasite of fishes around West coast of Maharashtra state (India) during June 2022 to May, 2023.The prevalence or incidence of infection oftapeworms includes genera i.e., Bothriocephalusand analysis of data showed that the occurrence of Cestode parasites variable according to season.

The maximum prevalence of BothriocephalusgadellusSp. are recorded in the month of February, March, April and May of two annual cycles i.e. Summer 107.3 % followed by October, November, December and January i.e. inThere is host specificity, because the morphological, physiological and ecological factors affect the host specificity. These factors play an important role for controlling the parasite to a particular host species in particular season.

DISCUSSION

On the closer observation the worm under discussion proved to be Bothriocephalusgadellus Charles K. Blend 2002. It resembles with it in many characters but differs fromthe same in few characters as follows.

1) In the present parasite the Scolex elongated VS Heart shaped.
2) Testes 265-280 VS 24-33.
3) Cirrus sac spherical VS Elongate oval.

As the characters are minor, it is redescribed here as Bothriocephalus gadellus Charles K. Blend, 2002 whereas the present worm is being reported from Dasyatis sephen at West coast of Maharashtra state. India.

CONCLUSION

After the analysis of data, the present study can be concluded that high prevalence of Bothriocephalus parasites are occurred in summer season followed by winter season and low in rainy season. This type of results indicates that environmental factors and feeding habitats are influencing that seasonality of parasitic infection either directly or indirectly

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Nesting Behaviour of Avifauna at KhadkiGhat Reservoir and its Surrounding Area

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ABSTRACT

The KhadkiGhat Reservoir and its surrounding area, located in a diverse and ecologically rich region, provide crucial nesting grounds for a wide variety of avifauna. This study examines the nesting behavior of birds in this area, focusing on species diversity, habitat preferences, breeding strategies, and the environmental factors influencing nesting success. The reservoir's mixture of wetlands, forest patches, and agricultural lands supports different nesting strategies, including tree-nesting, ground-nesting, and water-edge nesting. Species like the Indian Pond Heron, Baya Weaver, and Red-wattled Lapwing exhibit distinct nesting behaviors adapted to the local environmental conditions. The study also highlights the seasonal dynamics, with the monsoon period serving as the peak breeding season due to optimal food availability and favorable climatic conditions. Additionally, the impact of human activities, fluctuating water levels, and habitat degradation on nesting success is discussed. Conservation recommendations focus on protecting key habitats, raising local awareness, and promoting sustainable practices to ensure the long-term viability of this important avifaunal habitat.

Keywords: Avifauna, Nesting Behaviour, KhadkiGhat Reservoir, Habitat Preferences, Breeding Strategies, Conservation, Species Diversity

INTRODUCTION

Avifauna, a term derived from the Latin words "avis" for bird and "fauna" for animals, refers to the diverse and captivating world of birds that inhabit our planet. These winged wonders are a remarkable and integral part of the Earth's biodiversity, offering a rich tapestry of colors, behaviors, and ecological roles. Avifauna encompasses the entirety of bird species found in specific regions or on a global scale, reflecting the intricate relationship between birds and their environments. Birds are found in nearly every corner of the globe, from the remote and pristine wilderness areas to urban centers bustling with human activity. With over 10,000 species identified to date, they exhibit a breathtaking array of sizes, shapes, plumage patterns, songs, and behaviors, making them a constant source of fascination for both scientists and enthusiasts. Avifauna encompasses the grandeur of majestic raptors soaring high above mountains, the melodic chorus of songbirds greeting the dawn, and the stealthy hunting techniques of owls under the cover of night. But avifauna is not just about the beauty and diversity of birds; it also serves as a vital indicator of the health of our ecosystems. The presence, abundance, and distribution of bird species can offer valuable insights into the state of the environment, from the health of forests and wetlands to the impact of climate change. Birds play key roles in pollination, seed dispersal, and controlling insect populations, making them integral components of intricate ecological webs.

RESULT AND DISCUSSION :

Figure 1.1 KhadkiGhat

Different Bird Species Found In The Area :

Figure 1.2 Indian Silverbills (Euodicemalabarica)

Khadki Dam, also known as Khadki Lake or KhadkiTalav, is a significant irrigation project located in a small village situated 36 kilometers south of Malkapur, Maharashtra. The dam plays a vital role in the region's agricultural development and water management. The Khadki Dam Irrigation Project, designated as "Khadki, D - 04125," was constructed by the Government of Maharashtra in 1970. It is primarily aimed at harnessing water resources to support local agriculture. The dam was built by impounding a local nallah, a term that typically refers to a small stream or rivulet. The geographical location of Khadki is particularly strategic, as it's nestled at the base of high hills, where the Khadki River originates. This river flows northwards, making it a valuable source of water for the region. The dam's construction has enabled the efficient management and distribution of water for irrigation purposes, contributing to increased agricultural productivity in the area. Khadki Dam is an earthen dam with a significant storage capacity, and it has proven instrumental in water resource management. The dam helps store water during the monsoon season and subsequently releases it for agricultural use during drier periods. This reliable source of water has had a positive impact on the livelihoods of the local farming community. The completion of the Khadki Dam in 1970 and its subsequent operation marked a critical step in the development of the region. By providing a sustainable source of irrigation water, it has facilitated increased agricultural activity and improved the overall socio-economic conditions of the local population. The Indian Silverbill, also known as the White-throated Munia, is a small passerine bird belonging to the Estrildidae family. These birds are typically around 11-12 cm in length. They have a distinctive appearance with pale brown upperparts and white underparts. The face and throat are white, and they have a short, stubby silver-grey bill which gives them their name. The wings are brown, and the tail is relatively long and pointed.

Habitat :

Indian Silverbills are commonly found in open, dry habitats such as scrublands, grasslands, and agricultural areas. They are also frequently seen in urban gardens and parks. These birds prefer lowlands but can be found in areas up to 1000 meters in elevation.

Distribution :

These birds are native to the Indian subcontinent and are widely distributed across India, Pakistan, Nepal, Bangladesh, and Sri Lanka. They have also been introduced to other regions such as the Middle East and Hawaii.

Behavior and Diet :

Indian Silverbills are social birds and are often seen in pairs or small flocks. They have a characteristic bouncing flight and a soft, pleasant call. Their diet primarily consists of seeds, which they forage on the ground or pick from plants. They may also consume small insects and larvae, especially when feeding young.

Breeding :

The breeding season for Indian Silverbills varies depending on the region but generally occurs after the rainy season. They build small, dome-shaped nests using grass, feathers, and other soft materials. The nests are typically located in bushes, trees, or man-made structures. The female lays 4-6 white eggs, which both parents incubate for about 11-14 days. The chicks fledge approximately 17-21 days after hatching.

Conservation Status :

Indian Silverbills are listed as a species of Least Concern by the IUCN Red List due to their wide distribution and large, stable population. They are adaptable birds and have thrived in various habitats, including urban environments.

Interesting Facts :

Indian Silverbills are also known for their soft, musical chirping, which adds to the charm of their presence in gardens and parks. These birds are often kept as pets due to their attractive appearance and pleasant song.

Figure 1.3 Grey Heron (Ardeacinerea)

The Grey Heron is a large wading bird typically measuring between 84 and 102 cm in length with a wingspan of 155 to 195 cm. It is predominantly grey in color with a white neck and black markings on its head. The Grey Heron has a long, sharp yellow bill that turns orange during the breeding season, long legs, and a long neck which it retracts into an S-shape during flight.

Habitat :

Grey Herons are found in a variety of wetland habitats, including rivers, lakes, marshes, estuaries, and coastal regions. They prefer shallow waters where they can wade to hunt for their prey. These birds are commonly seen standing still or moving slowly in the water while hunting.

Distribution

The Grey Heron has a wide distribution across Europe, Asia, and parts of Africa. They are resident in many areas, although northern populations may migrate southwards in winter to avoid cold weather.

Behavior and Diet :

Grey Herons are solitary hunters and primarily feed on fish, but their diet can also include amphibians, small mammals, insects, and occasionally birds. They hunt by standing still or walking slowly in shallow water, using their sharp bills to catch prey. Grey Herons are known for their patience and can stand motionless for long periods, waiting for the right moment to strike.

Breeding :

The breeding season for Grey Herons typically starts in early spring. They nest in colonies, known as heronries, which are often located in tall trees near water. The nests are large, made of sticks, and lined with softer materials. The female lays 3-5 eggs, which are incubated by both parents for about 25-28 days. The chicks fledge around 7-8 weeks after hatching but may remain dependent on their parents for some time thereafter.

The nesting behavior of avifauna is a crucial aspect of bird ecology, providing insights into species distribution, habitat preferences, breeding success, and environmental health. The KhadkiGhat Reservoir and its surrounding area, a biologically rich and diverse ecosystem, serves as an essential breeding and nesting ground for numerous avian species. This discussion highlights the key aspects of the nesting behavior of birds in this region, emphasizing their habitat preferences, breeding strategies, and the environmental factors influencing these behaviors.

1) Overview of KhadkiGhat Reservoir and Surroundings :

Located in a region characterized by a blend of wetlands, agricultural lands, and forest patches, the KhadkiGhat Reservoir presents a diverse range of microhabitats that support various bird species. The reservoir, with its ample water resources, surrounding vegetation, and relatively undisturbed environment, becomes an ideal site for both resident and migratory bird species to nest and rear their young. The area's ecological diversity supports a variety of nesting behaviors, ranging from ground-nesting and tree-nesting to cavity-nesting and reed-nesting.

2) Nesting Habitat Preferences :

Bird species demonstrate distinct preferences when selecting nesting sites, influenced by factors such as food availability, predation risk, and microclimatic conditions. In the KhadkiGhat Reservoir area, certain species, like the Indian Pond Heron (Ardeolagrayii) and Little Cormorant (Microcarboniger), prefer nesting on emergent vegetation near the water, where food is abundant and the environment offers some protection against predators.Tree-nesting species such as the Indian Robin (Saxicoloidesfulicatus) and White-throated Kingfisher (Halcyon smyrnensis) choose nesting sites in trees and shrubs surrounding the reservoir. These birds typically select locations offering sufficient cover and height, reducing the likelihood of predation. Other species, such as the Baya Weaver (Ploceusphilippinus), exhibit complex nesting behaviors, creating intricately woven nests that hang from tree branches overhanging the water or from tall grass, offering additional safety from predators. Ground-nesting species such as the Red-wattled Lapwing (Vanellusindicus) rely on camouflage and open visibility to detect threats early. They often nest in grasslands or open spaces close to the water's edge, where their nests are well-hidden from potential predators but remain within proximity to feeding areas.

3) Breeding Strategies and Seasonality :

The breeding season for most avian species in the KhadkiGhat area generally aligns with the monsoon and post-monsoon periods (June to September), as this period ensures ample food supply and favorable climatic conditions. For instance, the Indian Peafowl (Pavocristatus) typically begins nesting at the onset of the monsoon when the vegetation is dense and provides sufficient cover. Many species exhibit territorial behavior during this period, with males often engaging in elaborate courtship displays, calls, and nest-site defense. The nesting cycle involves site selection, nest building, egg-laying, incubation, and rearing of the chicks. Species like the Baya Weaver show strong sexual dimorphism, with males constructing elaborate nests to attract females.

ENVIRONMENTAL INFLUENCES AND CONSERVATION CONCERNS :

The nesting success of avifauna in the KhadkiGhat area is closely linked to the region's environmental conditions. Factors like water levels in the reservoir, availability of nesting materials, predation pressure, and human activities such as agricultural expansion and fishing directly impact nesting outcomes. For example, fluctuating water levels can lead to nest inundation, while deforestation and land conversion reduce the availability of nesting sites for tree-nesting species. Conservation measures, including habitat protection, community awareness, and sustainable management practices, are vital to maintaining the ecological balance and supporting the avifauna in the region. Regular monitoring of bird populations and nesting patterns is essential to assess the health of the ecosystem and implement necessary conservation actions.

CONCLUSION:

The KhadkiGhat Reservoir and its surrounding habitats offer a valuable nesting environment for a wide range of bird species. Understanding their nesting behavior provides critical insights into their ecological requirements and highlights the need for effective conservation strategies. Protecting these nesting grounds ensures the sustenance of bird populations, contributing to biodiversity and the overall health of the ecosystem.

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Phytochemical and Free Radical Quenching Properties of *Phyllanthusniruri*L.

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ABSTRACT

Plants are considered as a source of naturally occurring antioxidant which can be used as a preservatives in stored food. Present study revealed the presence of active phytochemical content, quantification of TPC and TFC as well as free radical quenching ability of hydro-methanolic extract of Phyllanthusniruri. Results obtained revealed that extract bears Alkaloids, Phenolic acid, flavonoids, tannins, glycosides, anthraquinone and reducing sugar in concentration variation. Total phenolic content and total flavonoid content showed that the plant species contains naturally occurring antioxidant molecule. While the results obtained from DPPH and ABTS radical scavenging ability in dose dependent manner. The study proved that the plant species have free radical quenching ability in-vitro. The in-vivo assay should be carried out for further study.

Keywords: antioxidants, preservatives, hydro-methanolic, scavenging

INTRODUCTION

Plants are used as food as well as medicine from decades in India. Many plant species are reported nutraceutically important in Indian medicinal syatem; Ayurveda (Pandey et al; 2008). Various phytochemical constituents like phenolic compounds, nitrogen containing compounds and terpenoids have been reported to be medicinally important (Saxena et al; 2013). Most of the plants possesses both nutritional and pharmaceutical properties; together referred as nutraceutically important plant (Dimri et al; 2024). Phyllanthusniruri L. is one of the most important taxa belonging to family Euphorbeaceae with distinguishing characteristics like The plant is smooth, completes its lifecycle in few weeks and grows up to 2 feet erect. Various branches growing from the main stem are willowy and unfurl. The leaves of the plant appears like it is compound leaf but the leaves are simple, growing opposite to each other, oval and distichous. They are aquamarine having very small petiole. Flowers are tiny, axillary, yellow-green in colour, plenty, and drop down below the leaf like appearance. While the small (few mm) fruit growing at lower side of the capsule type and are globose and smooth.

Ayurveda is considered as oldest medicinal system followed by Indians and people of Asian sub-continent. P. niruri is the plant used by Indians traditionally as it possesses numerous health benefits. As per traditional knowledge this plant species is effective for anemic person; some blood related disorders like heavy period, nasal bleeding; act as detoxificant; enhance taste and solve thirst issue; best for asthama and other chronic respiratory mess; also serve for the patients suffering from burning issues (Basavaraju and Gunashree; 2022). According to Paithankar et al (2011); P. niruri is also considered medicinally important as it is acrid, cooling and alexipharmic. Some other disorders like bronchitis, leprosy, anaemia, urinary discharge, asthma, skin diseases, indigestion, cough, ulcers, wounds, scabies, ringworm and liver diseases can be cured using the proper dose of the plant. It helps to boosts the digestion, stimulating liver, and producing laxative effects.

Different worker have been worked on the phytochemical composition of the plant P. niruri. According to their study the plant is rich in flavonoids like Rutin, Quercetin, Nirurin, Gallocatechin, Niruriflavone, Quercetol, Astragalin, Quercetin 3-O-β-D-glucopyranosyl- (2-1)-O-β-D-xylopyranoside and Quercitrin;. It possesses different terpenoids like Limonene, p-Cymene and Lupeol; Phenolic compounds like ellagic acid, gallic acid, elligitannin, hexahydroxyldiphenoyl moiety and methyl brevifolincarboxylate; Lignans like Phyllanthin, Hypophyllanthin, Niranthin, Lintetralin, Phyltetralin, Nirtetralin, Urinatetralin, Nirphyllin, Phyllnirurin, Seco-4-hydroxylintetralin, Seco-isolariciresinoltrimethyl ether, Hydroxyniranthin, 3,4-Methylenedioxybenzyl-3',4'-dimethoxybenzylbutyrolactone and Isolintetralin. The plant is also affluent in biomolecules of tannins like Repandusinic acid, Geraniin, Corilagin and Diosgenin; Alkaloids like Norsecurinine, Securinine, Phyllanthine, Nirurine and Phyllochrysine have been isolated and structured (Bagalkotkar et al, 2007). Present study was designated for the evaluation of free radical scavenging ability of hydromethanolic extract of P. niruri leaf to prove its antioxidant ability.

MATERIALS AND METHODS:

Plant material collection and extraction: Fresh leaves of Phyllanthusniruri were collected fom the Western ghat region of Maharashtra in large quantity. The leaves were shade dried for fifteen days on filter paper until all the moishture were retained from the plant. The dried material was then pulverized using mixture grinder and sieved from 500 μm sieve. The fine powder generated was subjected for the cold extraction method using 80% aqueous methanol. After three to four days of successive extraction the material were filtered first through 8 layered muslin cloth and the filtrate obtained were filtered through the Whatman no. 1 filter paper. The excess solvent was then removed at $40^{o}C$ using water bath.

Preliminary phytochemical analysis: Crude extract obtained from the extraction process were subjected for the identification of active phytoconstituents viz. Alkaloids, Phenolic acid, flavonoids, tannins, glycosides, anthraquinone and reducing sugar using the prescribed methods of Shaikh and Patil (2020). Different reagents were used for the tests and the confirmatory test was carried out to indicate the presence and absence of the studied phytochemicals.

Determination of Total Phenolic content (TPC): Determination of total phenolic content were done using spectroscopic method as described by Khan et al. (2018) with slight modofocation; The reaction mixture was prepared by mixing 2 ml of hydro-methanolic extract of leaves of P. niruri which was equivalent with 1mg/ml, to this extract 2 ml of 10% Folin-Ciocalteu's reagent dissolved in 26 ml of double distilled water. To this mixture 10 ml of 5% NA2CO3 were added drop wise and shaken for the proper mixing. The resultant combination thus obtained were mixed thoroughly and kept in the dark at room temperature for 1 h. The blank solution was also prepared by mixing all the above constituents except plant extract. The absorbance of the mixture was measured using UV-visible spectrophotometer at the waveleghth of 760 nm. All the analysis was repeated three times and the mean value of absorbance was obtained. Total phenolic content was determined by extrapolating calibration line which was construed by Gallic acid solution. The TPC was expressed as Gallic acid equivalent (mg GAE) per gram of the dried sample.

Determination of Total Flavonoid Content (TFC): Determination of total flavonoid content was determined using aluminum chloride method and spectrophotometer of Khan et al (2018) with slight modification.To quantify the active flavonoid content from the plant extract of P. niruri were thus taken in the test tube (1ml); which was then mixed with the solution of 10% Aluminum chloride (2 ml) prepared freshly in double distilled water. The mixture present in the test tube containing extract and $AlCl_3$ were diluted with 2ml of Potassium acetate and 5 ml of double distilled water. Series of standard flavonoid Quercetin were used to draw the calibration curve were simultaneously run in other five test tubes. The absorbance of the mixtures was measured at the wavelength of 415 nm by using UV-spectrophotometer. The total flavonoid content was expressed in terms of quercetin equivalent (mg QE/g of sample). All the analyses were repeated three times and the mean value of absorbance was obtained.

ANTIOXIDANT POTENTIAL:

DPPH free radical quenching assay: Determination of antioxidant potential of the plant species P. niruri hydro-methanolic extract were quantitatively assessed on the basis of free radical quenching property of stable1,1-diphenyl-2-picrylhydrazyl (DPPH) radical molecules purchased from the chemical dealer; according to the prescribed method of Baliyan et al (2022) with significant modification. To study the antioxidant potential the series of plant exatract were prepared in six different test tubes (100 µg to 500 µg) and one test tube was served as blank for the adjustment of the base line in spectrophotometer (negative comtrol). To this extract dose 2 ml of 200mM DPPH solution mixed in methanol was poured. All the test tubes were then incubated for 60 minutes in dark place at room temperature (37^{o}C). The separate series of Butylated hydroxyl toluene (BHT) were prepared and same procedure was given as extract and DPPH were given (Positive control).

The absorbance was measured using UV-Visible spectrophotometer at wavelength of 517 nm. The experiments were carried out in triplicate. The percentage inhibition was calculated using the formula given below;

DPPH Scavenging Activity (%) = [(Ao-As)/Ao)]×100

Here, Ao is the absorbance of the negative control (no sample, DPPH solution only) and As is the absorbance in the presence of the hydro-methanolic extract or BHT.

ABTS radical cationdecolourization assay: Antioxidant activity was determinate by ABTS as prescribed by Gupta et al. (2022). For ABTS assay, working solution was made up by mixing equal amount of 7.4 mM ABTS and 2.45 mM potassium persulfate and this solution was stored in dark 12-16 hrs incubation to react and produce active ABTS radical cation which is react with plant solution to determine antioxidant activity. ABTS solution was diluted by the ethanol. Then, 50μl of sample was blended with 1.9 ml of ABTS solution and allow to dark incubate for 6 mints. After incubation, absorbance was taken at wavelength of 734 nm using UV-visible spectrophotometer. Sample result was compared with trolox standard (Y= 0.0379x-0.0015, R2 = 0.9872,). Result was expressed by mmolTrolox equivalents/g dry extract (mmol TE/g DE).

RESULTS AND DISCUSSION:

Determination of preliminary phytochemical analysis (Table 01) revealed that the hydro-methanolic extract of *Phyllanthusniruri* indicates that, extract showed the presence of Alkaloid, Tannins in low amount, while phenolic acid, flavonoid and Anthraquinone in moderate amount, and glycosides and reducing sugar in high amount. Quantitative analysis of total phenolic content and total flavonoid content showed that it contains 26.05 microgram of TPC and 57.08 microgram of TFC with equivalent to Gallic acid and Quercitine; respectively. DPPH and ABTS free radical analysis showed the dose dependent quenching effect. Highest activity were observed at dose of 500 microgram showing the % inhibition of 27.49 and 45.23;respectively.

Figure 1: Phyllanthusniruri L. plant species

Table 01.Preliminary phytochemical analysis of Phyllanthusniruri.

Test	Results
Alkaloids	+
Phenolic Acid	++
Flavonoids	++
Tannins	+
Glycosides	+++
Anthraquinone	++
Reducing Sugar	+++

Note: +: Low, ++:Moderate, +++: High

FIG. 2. TPC AND TFC CONTENT IN PHYLLANTHUS NIRURI

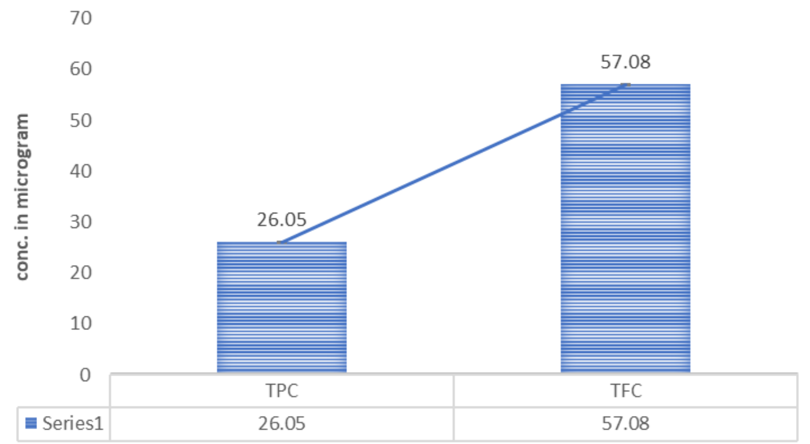
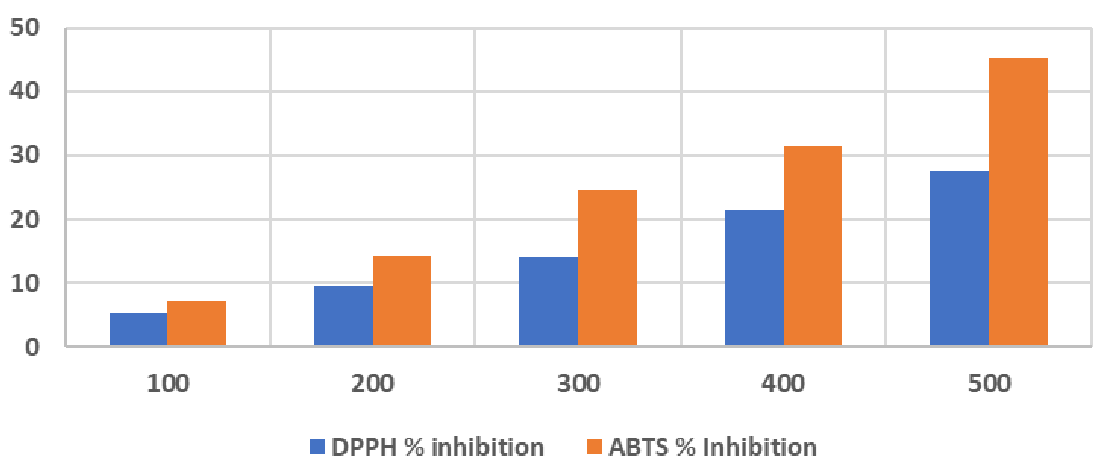


Fig. 3. DPPH and ABTS free radical quenching effect



CONCLUSION:

Plants are the source of natural antioxidant. Generally phenolic compounds and flavonoid compounds are considered as naturally occurring free radical quenching molecules and used as a preservatives in storage food. P. niruri is considered as a roadside weed and available in large amount. The study proved that P. niruri can be used as a source of pheolic compounds and can be isolated as nature antioxidant.

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Assessing Water Quality and Biodiversity for Sustainable Aquaculture in the Palshi Medium Project's Natural Pond, Aurangabad

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ABSTRACT

The Palshi Medium Project's naturalpond in Aurangabad demonstrates water quality and biodiversity ideal for sustainable aquaculture. The pH range (7.0 to 8.2) and dissolved oxygen levels (5.0 - 7.5 mg/L) create a favorable environment for fish health, while the temperature (25°C to 32°C) is optimal for species like Rohu and Catla. Balanced nutrient levels prevent eutrophication, and low ammonia levelsreduce toxicityrisks. The pond's low turbidityenhances aquatic plant growth. Biodiversity assessment shows a balanced ecosystem with Indian Major Carps as the dominant species. Exotic species like Tilapia add to the diversity, though the low presence of indigenous species indicates a need for conservation. The diverse plant and invertebrate communities support ecosystem stability and productivity. These findings underscore the pond's suitability for sustainable aquaculture, highlighting the importance of maintaining water quality and biodiversity for long-term resilience.

Keywords: Sustainable Aquaculture, Water Quality, Biodiversity, Eutrophication, Ecosystem Stability.

INTRODUCTION

Aquaculture has emerged as a key strategy for enhancing food security, particularly in regions where traditional agriculture faces constraints due to limited water resources or unfavorable climatic conditions. In India, the integration of aquaculture into existing water management systems, such as natural ponds, has shown significant potential for contributing to both economic development and environmental sustainability (Kumar & Engle, 2016). ThePalshi MediumProject in Aurangabad, Maharashtra, serves as a notable example of how natural pond systems can be leveraged for sustainable aquaculture practices, providing critical insights intotheviabilityofsuchinitiatives insemi-aridregions. Aurangabad, situatedintheMarathwada region, experiences a semi-arid climate characterized by erratic rainfall and frequent droughts (Sawant& Kumar, 2013). These conditions make the management of water resourcesparticularly challenging, necessitating innovative approaches to ensure the sustainable use of available water. The Palshi Medium Project, with its network of natural ponds, offers a valuable case study for understanding how aquaculture can be integrated into local water management strategies to enhance food production, generate income, and conserve biodiversity.

Sustainable aquaculture practices involve the careful management of water quality, species selection, and harvesting techniques to minimize environmental impact whilemaximizing productivity (Boyd et al., 2020). In the context of the Palshi Medium Project, these practices are essential for maintaining the ecological balance of the natural ponds whileproviding tangible benefits to the local communities. This research aims to explore the implementationofsustainable aquaculture inthe PalshiMediumProject, focusing onkeyaspects such as water quality, species diversity, and the economic impact of aquaculture activities.

By examining the outcomes of sustainable aquaculture practices in the Palshi Medium Project, this study contributes to the broader discourse on the role of aquaculture in rural development and environmental conservation. Previous studies have highlighted the importance of adopting sustainable practices to ensure the long-term viability of aquaculture, particularly in regionswith limited water resources(FAO, 2018).The findings fromthiscasestudywillprovide valuable insights for policymakers, researchers, and practitioners interested in promoting sustainable aquaculture in similar contexts.

MATERIAL AND METHODS:

WaterQualityAnalysis	Boyd,C.E.(2012),FAO.(2018)
BiodiversityAssessment	Jhingran,V.G.(1991),Boyd,C. E.,Tucker,C.S.,&McNevin, A.A. (2020).
EconomicImpact	Sawant,N.,&Kumar,A. (2013)
Sustainability Indicators	Boyd,C. E.,Tucker,C.S., &McNevin, A. A.(2020)

RESULT:

Table1:WaterQualityAnalysis based onthe datafromthePalshiMediumProject:

Parameter	**Unit**	**Range Observed**	**OptimalRangefor Aquaculture**	**Remarks**
pH	-	7.0-8.2	6.5-8.5	Indicatesneutraltoslightlyalkaline conditions,suitableforaquaculture.
Dissolved Oxygen(DO)	mg/L	5.0-7.5	>5.0	Adequateforsustainingaquaticlifeand promoting healthy fish growth.
Temperature	°C	25-32	20-30	Optimalfortropicalfreshwaterspecies, minor variations observed seasonally.
Nitrate(NO3-)	mg/L	0.5-1.2	<3.0	Moderatelevels,supportiveofprimary productivity without causing eutrophication.
Phosphate ($PO4^{3-}$)	mg/L	0.1-0.4	<0.5	Balanced levels, contributing to nutrientavailabilitywithoutalgal blooms.
TotalAlkalinity	mg/L $CaCO_3$	60-120	50-200	Indicatesgoodbufferingcapacity, supporting stable pH levels.

Ammonia (NH_3)	mg/L	<0.1	<0.1	Verylow,indicatingefficientnitrogen cycling and minimal stress on fish.
Turbidity	NTU	5-15	<30	Lowturbidity,ensuringgoodlight penetration for aquatic plants and healthy fish environment.

Table2:BiodiversityAssessmentforthefishspeciesinthePalshiMediumProject.

Category	SpeciesCount	Abundance Level	NumberofSpecies	Percentage
IndianMajor Carps	3	High	2	33%
ExoticSpecies	2	Medium	2	33%
IndigenousSpecies	1	Low	1	17%

CommonName	ScientificName	Category	Abundance
Rohu	*Labeorohita*	IndianMajorCarp	High
Catla	*Catlacatla*	IndianMajorCarp	High
Mrigal	*Cirrhinusmrigala*	IndianMajorCarp	Medium
Tilapia	*Oreochromisniloticus*	ExoticSpecies	Medium
CommonCarp	*Cyprinuscarpio*	ExoticSpecies	Medium
IndianSnakehead	*Channastriata*	IndigenousSpecies	Low

Table3:BiodiversityAssessmentfortheaquaticplantsinthePalshiMediumProject.

Type	SpeciesCount	Abundance Level	Number of Species	Percentage
Submerged Plant	1	High	1	20%
FloatingPlant	3	Medium	1	20%
EmergentPlant	1	Medium	1	20%

Common Name	ScientificName	Type	Abundance
Hydrilla	*Hydrillaverticillata*	SubmergedPlant	High
Water Hyacinth	*Eichhorniacrassipes*	FloatingPlant	Medium
Lotus	*Nelumbonucifera*	EmergentPlant	Medium
Duckweed	*Lemnaminor*	FloatingPlant	Low
Water Lettuce	*Pistiastratiotes*	FloatingPlant	Low

Table4: BiodiversityAssessmentfortheinvertebrates inthePalshiMediumProject.

Common Group	Example Species	Role in Ecosystem	Abundance Level	Numberof Species	Percentage
Grazers	*Bellamyabengalensis*	Grazers	High	1	20%
Predators, Decomposers	*Culex*spp., *Notonecta*spp.	Predators, Decomposers	Medium	1	20%
Scavengers	*Macrobrachiumrosenbergii*	Scavengers	Low	1	20%
Primary Consumers	*Daphnia*spp., *Cyclops*spp.	Primary Consumers	High	1	20%
Decomposers	*Tubifex*spp.	Decomposers	Medium	1	20%

CommonGroup	ExampleSpecies	RoleinEcosystem	Abundance
Snails	*Bellamyabengalensis*	Grazers	High
AquaticInsects	*Culex*spp.,*Notonecta*spp.	Predators,Decomposers	Medium
Crustaceans	*Macrobrachiumrosenbergii*	Scavengers	Low
Zooplankton	*Daphnia* spp.,*Cyclops*spp.	PrimaryConsumers	High
Annelids	*Tubifex*spp.	Decomposers	Medium

DISCUSSION:

The water quality parameters observed in the Palshi Medium Project's natural pond indicate a healthy environment for sustainable aquaculture. The pH range of 7.0 to 8.2 is ideal for aquaculture, supporting a neutral to slightly alkaline environment. This pH range is beneficial for fish health, as it minimizes stress and maximizes the efficiency of nutrient absorption. According to Boyd (2015), maintaining a stable pH within this range is crucial for optimal fish growth and survival in aquaculture systems. The DO levels recorded (5.0 - 7.5 mg/L) are above the minimum requirement of 5.0 mg/L, ensuringsufficient oxygensupplyfor fish respirationandoverall ecosystemhealth. AdequateDO is vital, aslowlevelscanleadtohypoxia, negativelyimpactingfish metabolismandgrowth(Stickney, 2009). The temperaturerangeof25°C to32°C aligns wellwiththeoptimalrangefor tropicalfreshwater species. This temperature is conducive to the growth of species such as Rohu and Catla, which are prevalent in the pond. Temperature fluctuations within this range are expected, but extremes beyond this range could stress the aquatic organisms (Tucker & Hargreaves, 2003). The observed nitrate levels (0.5 - 1.2 mg/L) and phosphate levels (0.1 - 0.4 mg/L) are moderate and fall within acceptable ranges for aquaculture. Thesenutrient levelssupport primaryproductivity, whichisessentialfor thegrowthofphytoplankton, the base of the aquatic food web. However, excessive nutrient levels could lead to eutrophication, causing algal blooms and oxygen depletion (Boyd & Tucker, 2012).

The total alkalinity of 60 - 120 mg/L $CaCO_3$provides good buffering capacity, helping to stabilize pH levels. High alkalinity ensures that the water can resist sudden pH changes, which is crucial for maintaining a stable aquatic environment (Boyd, 2015). The very low ammonia levels (<0.1 mg/L) observed indicate efficient nitrogen cycling in the pond. Low ammonia levels reduce the risk of toxicity, which is vital for fish health. Elevated ammonia can be harmful, leading to gill damage and increased susceptibility to disease (Colt, 2006). The low turbidity range (5 - 15 NTU) suggests that the water is clear, allowing sufficient light penetration for photosynthesis by aquatic plants. Low turbidity is associated with better water quality, as it indicates low levels of suspended solids and a healthy environment for both plants and fish (Boyd, 2015).

The biodiversity assessment reveals a diverse and balanced ecosystem within the Palshi Medium Project’s pond, highlighting its potential for sustainable aquaculture. The pond supports a variety of fish species, with Indian Major Carps (Rohu, Catla, and Mrigal) being the most abundant. This dominance of Indian Major Carps is typical in Indian aquaculture due to their high market demand and adaptability (FAO, 2020). The presence of exotic species like Tilapia and Common Carp indicates a level of biodiversity that could contribute to the resilience of the ecosystem. However, the low abundance of indigenous species like the Indian Snakehead suggests the need for monitoring and possibly enhancingtheconservationofnativespecies(Ghoshetal.,2014):Thepond'saquaticplantcommunityincludes submerged, floating, and emergent plants. Hydrilla, a submerged plant, is highly abundant and plays a crucial role in oxygenating the water and providing habitat for invertebrates and fish (Hussner et al., 2017). Floating plants like Water Hyacinth and Duckweed, although less abundant, contribute to nutrient cyclingandprovidecover for aquatic life. Thebalancedpresenceof theseplant types supportstheoverall healthandstabilityof thepondecosystem(Wetzel, 2001). Theinvertebratecommunity, includinggrazers like snails, primary consumers like zooplankton, and decomposers like annelids, indicates a healthy trophic structure in the pond. The high abundance of grazers and primary consumers supports the growth offishspeciesbyprovidinga steadyfoodsource. Thepresenceof decomposersisvitalfor breakingdown organic matter, maintaining water quality, and preventing the buildup of harmful substances (Thorp &Covich, 2010).

The results of the water quality analysis and biodiversity assessment suggest that the Palshi Medium Project's natural pond is well-suited for sustainable aquaculture. The water quality parametersare within optimal ranges, and the biodiversity present supports a resilient and productive ecosystem. These findings underscore the importance of maintaining water quality and biodiversity to ensure the long-term sustainability of aquaculture practices in the region.

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Redescription of Cestode *Oochoristica Gracewileyae* (Loewen, 1940) From Dhutta Dist. Dharashiv (M.S.) India

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ABSTRACT

The present paper is deals with the investigation and taxonomic re-description of cestodeOochoristicagracewileyae (Loewen, 1940) of a Toad Bufomelanostrictus. On closer observation, thus turned out, to be OochoristicagracewileyaeLoewen, 1940. They resemble it, in many characters, but differ from it in few characters, known as additional characters.

MATERIAL AND METHOD :

Cestode parasites were collected from the intestine of Toad Bufomelanostrictusat Dhutta, Dist. Dharashiv, India. All the worms were flattened, fixed in 4% formalin, stained with Harris haematoxylin, passed through various alcoholic grades and mounted in D.P.X. Drawings are made with camera lucida. All measurements are in millimeters.

DESCRIPTION :

All the cestodes, were whitish in colour, long, with thin musculature,consisting of scolex, with numerous immature and mature proglottids. The scolex is medium, almost quadrangular, pointed or tapering at the apex, broadat the middle of the scolex, narrow posteriorly, distinctly marked off from the strobila and measures 0.350-0.437 in length and 0.291-0.451 in breadth. The scolex bears four suckerswhich are medium, oval, muscular,out of 4 suckers, central two suckesrs are overlapping on each other and remaining two suckers present on each lateral side of the scolex, arranged in two pairs, one pair in each half of it, with medium borders, all placed almost in a transverse line and measures 0.097-0.116 in length and 0.083-0.116 in width. The neck is medium, longer than broad, broad anteriorly, narrow posteriorly and measures 0.33.-0.437 in length and 0.131-0.243 in breadth. The mature proglottids are medium, longer than broad,almost two and half times longer than broad, rectangular, slightly narrow anteriorly, broad posteriorly, with straight or irregular, concave or convex lateral margins and measure 2.691-2.895 in length and 0.771-1.157 in breadth. The testes are small to medium, oval, 100-105(102) in number, 28 testes are presentat the anterior side of the ovary, 74 testes are post-ovarian, in a single field, scattered in the whole segment, except the anterior 1/4th region and the region of the gonads, in the central medulla, unevenly distributed, bounded laterally by the longitudinal excretory canals and measures 0.045-0.068 in length and 0.045-0.068 in width.

The cirrus pouch is medium, cylindrical, obliquely placed, anteriorly directed, in the anterior half of the segments, almost at 1/3rd from the anterior margin of the segments, crosses the longitudinal excretory canals, reaches upto the middle of the segments and measures 0.409 in length and 0.034-0.079 in width.The cirrus is thin , straight, slightly curved, contained within the cirrus pouch and measures 0.409 in length and 0.011 in width. The vas deferens is thin, short and measures 0.327 in length and 0.011 in breadth. The ovary large, distinctly bilobed, obliquely placed, situated in the center of the segments, poral lobe is small and long, aporal lobe is short and large, poral lobe having4-5 acini, where asaporal lobe has 7-8 acini and measures 0.511-0.628 in length and 0.136-0.293 in breadth. The two lobes are connected to each other by a short tube called isthmus, which is slightly obliquely placed and measures 0.148-0.182 in length and 0.034-0.045 in breadth. Vagina is a thin tube , starts from the genital pore, situated to the posterior side of the cirrus pouch, runs transversely, for a short distance, turns posteriorly, crosses the ootype, reaches and opens into the ootype and measures 0.636 in length and 0.011 in breadth. The ootype is medium, post ovarian, just posterior to the isthmus and measures 0.068 in length and 0.079 in width. The vitelline gland large, almost squarish in shape with irregular margin with few short, blunt, round acini, post ovarian and measures 0.079-0.102 in length and 0.205-0.225 in width.

DISCUSSION:

The genus Oochoristicawaserectedby Luhe,1898 as a type species Oochoristicatuberculata, reported from Lateravaranus from Europe and Morocco.

The worm under discussion, resemblesOochoristicagracewileyaeLoewen,1940 it in many characters, but differs from the same in few characters, know as additional characters, which are as follows:

1. The worm under discussion, differs from Oochoristicagracewileyae, is in length and position of the cirrus pouch (Crosses the longitudinal excretory canals, 0.409 long Vs.not crosses the longitudinal excretory canals, 0.025 long)
2. The present cestode, differs from it, in the number, position and width of testes (102, in two fields, 0.0045-0.068 in width,Vs.113, postovarian and 0.072 in diameter)
3. The present cestode, differs from the same, in the shape and width of the vitelline gland (squarish in shape,0.204-0.225in width Vs. triangular, 0.155 in width)

As the above characters are minor, it is redescribed here as OochoristicagracewileyaeLoewen, he reported this worm from a Crotalusatrox from North America;whereas the present worm, are being reported, fromBufo,melanostrictus at Dhutta Dist. Dharashiv, M.S., India.

Type species : OochoristicagracewileyaeLoewen, 1940

Host : Bufo,melanostrictus

Habitat : Intestine

Locality : At. Dhutta Dist. Dharashiv, M.S.India.

Type specimens : Holotype and paratype are deposited in Helminthology Laboratory, Department of Zoology, Dr. B. A. M. University Aurangabad.

The work was carried out under the supervision of Dr. G. B. ShindeEx Prof. Department of Zoology, Dr. BabasahebAmbedkarMarathwada University Aurangabad. The authors express their sense of gratitude to her constant help and valuable guidance.

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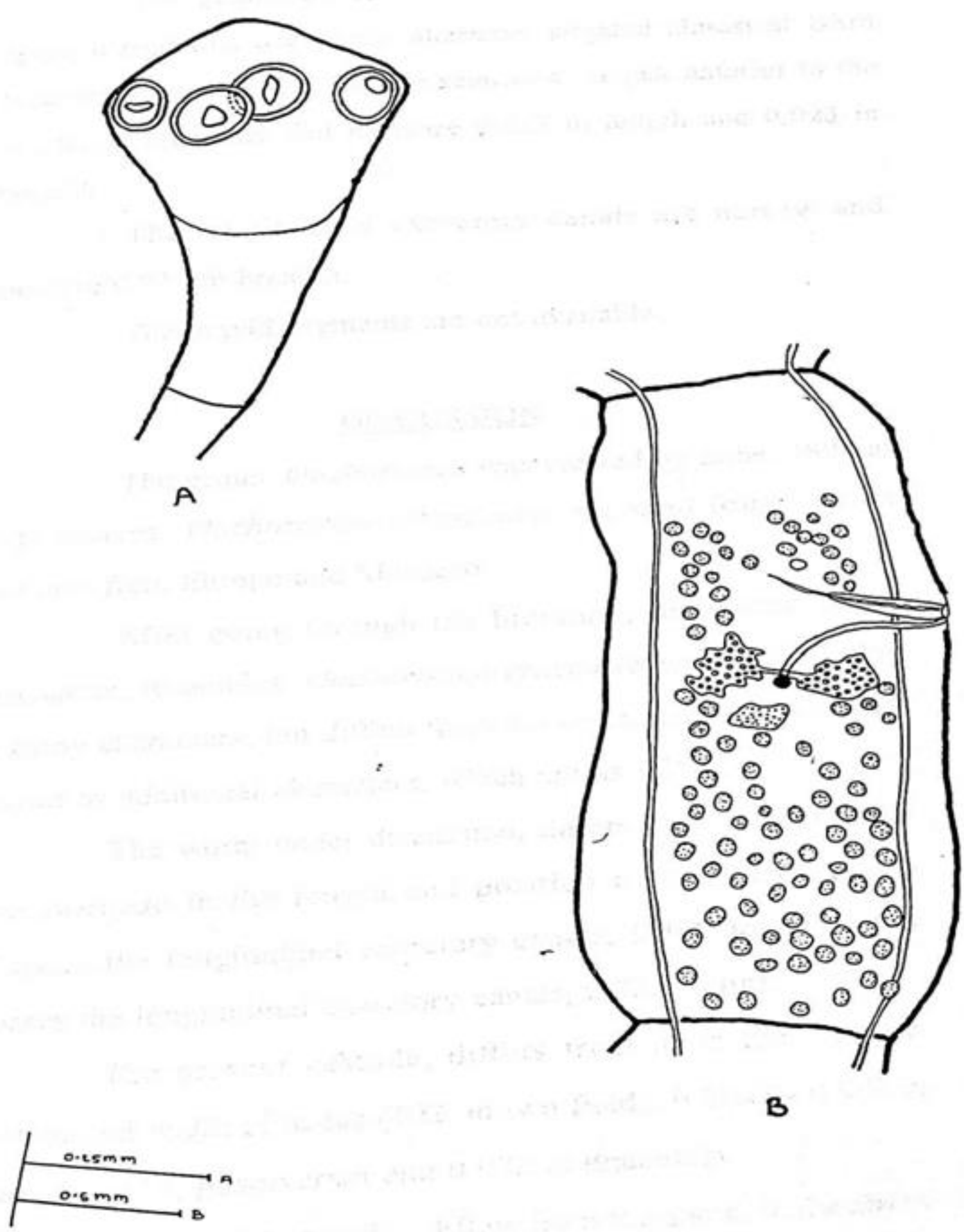

A- Scolex

B- Mature Segment

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Important Role of Government and Non-Government Agencies in Wildlife Conservation

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ABSTRACT

Due to the negative effects of human activity on wildlife, its conservation has become an increasingly important practice. It is the practice of protecting wild plant and animal species as well as their habitat. An endangered species is defined as a population of a living species which is in the danger of becoming extinct.They are threatened by the varying environmental or prepositional parameters such as landslides,incensement in temperature above optimum temperature, acid rain etc .Wildlife is part of nature. It maintains equally distribution of food instead of over use of food by humans. It plays an important role in balancing the ecosystem and provides stability to different natural processes of nature like rainfall, changing of temperature,fertility of soil. The goal of wildlife conservation is to ensure that nature will be around for future generations to enjoy and to recognize the importance of wildlife and wilderness for humans and other species alike Many nations have government agencies and NGO's dedicated to wildlife conservation, which help to implement policies designed to protect wildlife. Numerous independent non-profit organizations also promote various wildlife conservation causes.

Keywords: Wildlife conservation, Endangered species, Ecosystem, Government and Non-Government agencies.

INTRODUCTION

Ecosystems include all the biotic and abiotic factors like a desert ecosystem has soil, temperature, rainfall patterns, and solar radiation which affect not only what species occur there, but the morphology, behavior, and the interactions among those species . When ecosystems are intact, biological processes such as nutrient and water cycling, harvesting light through photosynthesis, energy flow through the food web, and patterns of plant succession over time. A conservation focus on preserving ecosystems not only saves large numbers of species but also preserves the support systems that maintain life. Similarly wildlife conservation is one of the most important topic in maintaining the balance in ecosystem.

Wildlife is part of nature. It maintain equally distribution of food instead of over use of food by humans. It plays an important role in balancing the ecosystem and provides stability to different natural processes of nature like rainfall, changing of temperature, fertility of soil. The goal of wildlife conservation is to ensure that nature will be around for future generations to enjoy and to recognize the importance of wildlife and wilderness for humans and other species alike Many nations have government agencies and NGO's dedicated to wildlife conservation, which help to implement policies designed to protect wildlife. Numerous independent non-profit organizations also promote various wildlife conservation causes. In present study, our article is focused on the role of government and non- government agencies in the wildlife conservation.

Government Involvement in Wildlife Conservation:

The Government of India enacted a law "Wild Life (Protection) Act" in 1972, Then in America, the Endangered Species Act of 1973 protects some U.S. species. These species were in danger from overexploitation.The Convention on International Trade in Endangered Species of Fauna and Flora (CITES) works to prevent the global trade of wildlife. There are many species that are not protected from being illegally traded or being over-harvested. The World Conservation Strategy was developed in 1980 by the International Union for Conservation of Nature and Natural Resources (IUCN) with advice, cooperation and financial assistance of the United Nations Environment Programme (UNEP), The World Wildlife Fund and in collaboration with the Food and Agriculture Organization of the United Nations (FAO) and the United Nations Educational, Scientific and Cultural Organization (Unesco)". The strategy aims to "provide an intellectual framework and practical guidance for conservation actions." This thorough guidebook covers everything from the intended "users" of the strategy to its very priorities. It even includes a map section containing areas that have large seafood consumption and are therefore endangered by overfishing.

According to the National Wildlife Federation, wildlife conservation in the United States gets a majority of its funding through appropriations from the federal budget, annual federal and state grants, and financial efforts from programs such as the Conservation Reserve Program, Wetlands Reserve Program and Wildlife Habitat Incentives Program. The objectives of conservation and requirements are as follows:

- ➢ Maintenance of essential ecological processes and life-support systems.
- ➢ Preservation of genetic diversity that is flora and fauna.
- ➢ Sustainable utilization of species and ecosystems.
- **Priorities for national action:**
- ➢ A framework for national and sub-national conservation strategies.
- ➢ Policy making and the integration of conservation and development.
- ➢ Environmental planning and rational use allocation.
- **Priorities for international action:**
- ➢ International action: law and assistance.
- ➢ Tropical forests and drylands.
- ➢ A global programme for the protection of genetic resource areas.
- **Map sections:**
- ➢ Tropical forests.

- Deserts and areas subject to desertification.

Non- Government Involvement In Wildlife Conservation :

In the late 1980s, major development agencies became discouraged with the public sector of environmental conservation.These agencies began to lean their support towards the "private sector" or non-government organizations (NGOs). Congress made amendments to the Foreign Assistance Act in 1979 and 1986 "earmarking U.S. Agency for International Development (USAID) funds for biodiversity". Recent years environmental conservation in the NGO sector has become increasingly more focused on the political and economic impact of USAID given towards the "Environment and Natural Resources". On September 11, 2001, after the terror attacks on the World Trade Centers and the start of former President Bush's War on Terror, maintaining and improving the quality of the environment and natural resources became a "priority" to "prevent international tensions" according to the Legislation on Foreign Relations Through 2002 and section 117 of the 1961 Foreign Assistance Act. However , in 2002 U.S. Congress modified the section on endangered species of the previously amended Foreign Assistance Act.

Active Non-Government Organizations:

Many NGOs exist to actively promote, or be involved with wildlife conservation which are illustrated as follows:

- The Nature Conservancy is a US charitable environmental organization which works to preserve the plants, animals, and natural communities. These represent the diversity of life on Earth by protecting the lands and waters they need to survive.
- World Wide Fund for Nature (WWF) is an international non-governmental organization working on the issues regarding the conservation, research and restoration of the environment, formerly named the World Wildlife Fund, which remains its official name in Canada and the United States. It is the world's largest independent conservation organization with over 5 million supporters worldwide, working in more than 90 countries, supporting around 1300 conservation and environmental projects around the world. It is a charity, with approximately 60% of its funding coming from voluntary donations by private individuals. 45% of the fund's income comes from the Netherlands, the United Kingdom and the United States.

CONCLUSION:

Many nations have government agencies and NGO's dedicated to wildlife conservation, which help to implement policies designed to protect wildlife. Numerous independent non-profit organizations also promote various wildlife conservation causes. World Wildlife Fund, which remains its official name in Canada and the United States. It is the world's largest independent conservation organization with over 5 million supporters worldwide, working in more than 90 countries, supporting around 1300 conservation and environmental projects around the world. It is a charity, with approximately 60% of its funding coming from voluntary donations by private individuals. 45% of the fund's income comes from the Netherlands, the United Kingdom and the United States.

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Pharmacognostic Evaluation and Phytochemical Screening of Stem Bark of Plumeria Alba L.

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ABSTRACT
PlumeriaalbaL. is fast growing, evergreen, small lactiferous tree or shrub belonging to family Apocyanaceae, mostly grown for its ornamental and intensely fragrant flowers. The plant is widely distributed throughout the India and accepted in medicinal systems like Ayurveda, Unani and Homoeopathy. The plant contains secondary metabolites like carbohydrates, tannins, alkaloids, and flavonoids. The objective of present work is to evaluate various quality control parameters were to lay down pharmacognostical and preliminary phytochemical standards. In present study, the stem bark of titled plant was subjected to microscopic characterization, followed by the preliminary physicochemical and phytochemical evaluations. The microscopic characters of bark were studied by free hand sectioning method. The preliminary phytochemical analysis included dry matter, bulk density, total ash, reducing sugar, extractive values in different solvents, fibre content, fat content etc. The results obtained from this research work is used to authentication, standardizationand identification of adulteration found in bark drug.
Keywords: PlumeriaalbaL., stem bark, Ayurveda, pharmacognosy, pharmacognostic evaluation, Phytochemical Screening, extractive value.

INTRODUCTION

It is a small lactiferous tree or shrub that grows quickly and is mostly grown for its fragrant, ornamental flowers (Choudhary et al., 2014, Adesida et al., 2021). The plant is mostly distributed throughout tropical regions of the world and is grown in tropical and subtropical climates all over the world (Henry et al., 1987; Choudhary et al., 2014). The plant has a terete stem, grows to a height of 5-8 feet, and has several branches on its upper half (Imrana and asif, 2020). According to Adesida et al. (2021), the stembark is thin, and the plant produces a lot of white latex. Branchlets are frequently angular. Alternating oblanceolate leaves measure 20–30 x 5-8 cm (Naik, 1988). They are delimited at the terminals of the twigs and frequently strikingly convex due to strong recurvation of the margins. The leaves are leathery, lustrous, and glabrous on the upper surface with a prominent Both surfaces are glabrous; the petioles are 4-6 cm long and thick, cylindrical, with glabrous longitudinal grooves on the ventral sides; the bracts are broadly ovate, glabrous, and deciduous; the inflorescences terminal cincinni are glabrous and scarlet; Thazar et al. (2017); According to Choudhary et al. (2014), the flowers have a waxy feel, are white with a small yellow center, are actinomorphic, fragrant, corrugated, and peduncled in corymbose clusters. It is well-known for its spiral-shaped blooms, which are produced from June to November (Shinde et al., 2014). The peduncles and pedicels are sturdy, glabrous, ebracteolate, frequently angular, and measure 12–20 cm. Campanulate, 5–10 mm long, united calyx with ovate, crimson, glabrous, persistent lobes; profoundly split; petals suborbicular. Broadly elliptical, twisted, glabrous lobes on a slender, funnel-shaped, salverfonn corolla with five narrow petals; (Thazar et al., 2017; Sura et al.)

oblanceolate, 5-8 cm long lobes. The five stamens are epipetalous and inserted close to the base of the corolla tube; the anthers are free, dithecous, dorsifixed, with longitudinal dehiscence and introrse. distinct, half inferior, ovoid, free, two-celled, with several ovules in each cell, axile placentation, long style, and calyptriform stigma. Cylindrical pods that are rarely generated in cultivation are called fruits. March through July is when the plant flowers (Naik, 1988; Thazar et al., 2017); occasionally, the plant produces cylindrical pods after blooming that develop in pairs and are packed with winged seeds (Shinde et al., 2014). The current study aims to assess the phytochemical and pharmacognostic aspects of the plant, which will aid in future research in establishing standards for plant identification and purity and quality determination.

MATERIALS AND METHODS

Plant material collection

The stem bark of *Plumeria alba* was collected in the month of May Latitude N19o,47',62.54" Longitude E075o,38',25.58" Altitude 503.0 m, from SantDnyaneshwarUdyan, Paithan, Chh. Sambhajinagar. Bark was pulverized in the mechanical grinder to a fine powder to carry out different pharmacognostical and phytochemical evaluation and was stored in a well closed airtight vessel for further analysis (Table 1).

Physico-chemical Evaluations.

Physico-chemical parameters like as total ash, water soluble ash, water insoluble ash, acid insoluble ash, acid soluble ash, loss of weight on drying 1050C was determined. To determine the properties of contents of drugs and Considering the diversity of chemical nature of drug, different solvents like benzene, petroleum ether, Acetone, chloroform, methanol, alcohol and water extractive values was evaluated as per reported methods (Mukherjee, 2002, Kakate, 1994, Khandelwal, 2005) **(Table 2).**

Phytochemical screening

Qualitative and quantitative study of *Plumeriaalba*bark was done as per reported methods to determine inorganic matters and of heavy metals. The dried powdered bark was subjected to preliminary phytochemical screening for qualitative detection of phytoconstituents. The dried powdered bark (100g) was extracted successively hexane, petroleum ether, benzene, chloroform, acetone, methanol, water in

Soxhlet Extractor by continuous hot percolation. Each time before extracting with the next solvent of higher polarity the powdered material was dried in hot air oven below 500C for 10 minutes. Each extract was concentrated in vacuum on a Rote Evaporator and finally dried in hot air oven. The dried extracts were dissolved in respective solvents, with it was extracted, and were subjected to various qualitative phytochemical tests for the identification of chemical constituents present in the plant material (Harborne, 2005) (Table 3 and 4).

Morphology, Anatomy and Maceration: -

The morphological characters of the plant were studied detail in the field and the prepared herbarium sheets were preserved in the Herbarium of Department of Botany, PratishthanMahavidyalaya, Paithan. In the laboratory fresh and dried bark samples were studiedmorphologically regarding their colour, texture of inner and outer surfaces, splitting and quelling. The anatomical characters of bark were studies by free hand sectioning with the help of blade. Sections were dehydrated with different alcohol grades and stained with Saffranin and light green. Bothdouble stained and unstained sections were studied and preserved permanently. These permanent preparations were observed under microscope (Khandelwal, 2006) and photographed by microphotographic techniques. The bark was also studied by maceration technique. The pieces of barks were boiled in Jeffery's fluid (Chromic acid 10% and Nitric acid 10% in 1:1 proportion) and the macerated cells were studied in detail (Johanson, 1940; Choudhary et al. 1992 and Khandelwal, 2006). Their figures were drawn with the help of camera lucida and inked by rotring pens. Their photographs were taken by micro photographic techniques and the dimensions of the cells were measured with help of microscope and by micrometry.

Qualitative and Quantitative Analysis:-

Physical evaluation: - Dry matter (DM), Bulk density Chemical analysis

Qualitative evaluation:- Tannins, Saponins, Alkaloids, Phenolic acids and flavonoids.

Quantitative evaluation :- Nitrogen (N), Water soluble nitrogen (WSN), Crude proteins (CP), Crude fats (CFat), Crude fibres (CF), Total ash (TA), Acid insoluble ash (AIA), Acid soluble ash (ASA), Calcium (Ca), Phosphorus (P), Potassium (K), Total carbohydrates (TC), Cellulose, Hemicellulose, Lignins, Reducing sugar, Non reducing sugar, Total sugar, Gross energy (GE) and Extractive values.

RESULTS AND DISCUSSION

Organoleptic Evaluation: -

The organoleptic characters of *Plumeriaalba*such as texture, colour, taste, and odour are discussed in (Table 1).

Morphology of bark:-

The thickness of young bark is 3- 7 mm and thickness of dried bark is 1.5 - 4 mm. Outer surface of bark is greyish black in colour, with few lenticels, well-marked transverse and irregular wrinkles, crowded and forming small network-like structures. Rhytidome, few longitudinal furrows, common nodular protrusions, scaly structured scarce are present. Inner surface of bark is greyish in colour, longitudinal few cracks, transverse striations fine and crowded, fractures are granular and rare. On transverse surface, inner part is with more lignified tissuesas compare to the outer surface and least in the middle (SwapanDatta& P. C. Datta 2008) (plate No.1). The odour is slightly sweet and taste is bitter. Dried bark forms a slightly quilling towards inside(plate No.4).

Anatomy of Bark: -

T.S. of bark show 7-12 layers of cork, compactly arranged. Outer cork 2-3 layer, barrel to rectangular in shape 8-15 x 5-9μ. Inner cork shows 5-6 layers, square to rectangular in shape 8-16 x 6-19μ. Below the cork cortex region show 39-45 layers, circular, oval, hexagonal to rhombus in shape 9-23 x 7-17μ. Outer cortex consists of 21-23 layers, hexagon to oval in shape 11-18 x 5-9μ. Outer cortex in first rows double walled, thick, hexagonal in shape arrange horizontal manner, 6-12 x 4-9μ. Below the double walled cells single walled parenchyma cells, tanniferous cells are arranged loosly. Parenchyma cells are small, thin, hexagonal to circular in shape, 6-16 x 5-15μ. Tanniferous cells are spread all over the cortex region but in outer cortex abundant, oval to circular in shape, 6-19 x 5-9μ. Middle cortex consists of 15-23 layers, parenchyma cells and tanniferous cells. In this region all cells are circular in shape, parenchyma cells are thin to thick walled, 6-15 x 5-12μ, tanniferous cells are thin, 6-15 x 7-15μ. Inner cortex consists of 18-27 layers, circular, oval to barrel in shape. Two types of cells are observed in this region parenchyma and tanniferous cells. Parenchyma cells are simple, thin, circular to oval in shape, 8-21 x 7-13μ. Tanniferous cells are thin, oval to circular in shape, 6-17 x 5-12μ. Below the cortical region medullary rays are arranged in verticallly, single walled, thick, circular to oval in shape, 7-19 x 5-15μ. Below the medullary rays double walled phloem fibres are arranged in group, circular to oval in shape 8-15 x 6-15μ. Secondary metabolism cells are oval to square in shape, 6-18 x 5-23μ. Simple parenchyma cells are arranged in group, in 2-3 rows, circular, square to rectangular in shape, 5-12 x 7-19μ. (Plate No. 2)

Maceration of Bark

Eleven types of fibres; one (a) is Short, broad at middle, non-septate, pointed at both the ends, measuring from 12-21 x 526-536μ; second (b) is short, broad at middle, pointed at one end only, non-septate, single walled, elongated, measuring from 14-15 x 480-495μ; third (c) is long, single walled, thin, non-septate, pointed at both the ends, show horizontal lines, broad at middle, measuring from 14-19 x 530-547μ; fourth (d) is pointed at both ends, one side very sharp other side is broad, broad at middle, non-septate, single walled, thick, measuring from 11-14 x 690-698μ; fifth (e) is elongated, broad at middle, single walled, show yellow inclusion in four patches, septate, thick, measuring from 17-23 x 721-742μ; sixth (f) is long, broad at middle, single walled, non-septate, thick, measuring from 22-27 x 516-534μ; seventh (g) is very long, elongated, broad at middle, pointed at both the ends, single walled, non- septate, thick, measuring from 8-12 x 1180-1193μ; eight (h) is long, elongated, broad at middle, single walled, septate, divided into several segments with yellow inclusion, thick, measuring from 39-43 x 439-451μ; ninth (i) is long, elongated, broad at middle, pointed at both the ends, double walled, non- septate, thick, measuring from 18-21 x 586-

596µ; tenth (j) is long, elongated, broad at middle, pointed at both the ends, single walled, non- septate, thick, measuring from 29-32 x 595-621µ; eleventh (k) is very long, elongated, broad at middle, pointed at both the ends, single walled, non- septate, thick walled, very thick walled at several points, measuring from 9-37 x 1170-1193µ. Sclerenchyma (l) is long, thick, double walled divided in into several segments, measuring from 28-37 x 327-358µ. Parenchyma cells (n) is elongated, oval, square to rectangle in shape, thin walled, measuring from 23-29 x 86-93µ; Sieve elements (m) is oval to elongated in shape, single walled, pointed at both the ends, thick, measuring from 30-32 x 402-432µ. Cork cells are oval, rectangle to hexagonal in shape, double walled, thick, and measuring from 9-15 x 41-43µ (Photo plate no. 03).

Table: 1 Organoleptic characteristic of stem Bark of Plumeria alba.

Parameters	Particulars
Condition	Dried
Colour	Outer surface of bark is greyish black in color, with few lenticels, well-marked transverse and irregular wrinkles, crowded and forming small network-like structures Inner surface of bark is greyish in colour, longitudinal few cracks, transverse striations fine and crowded, fractures are granular and rare.
Odour	slightly sweet
Taste	Bitter
Texture	Hard, outer is arranged transversely half circular to circular in broad line, lightly split line longitudinally, inner is longitudinally striated; fracture difficult, fracture irregular.
Fracture	Fracture difficult, fibrous, fracture irregular.
Size	Length 80-100 cm Thickness 1.5 - 4 mm
Shape	Slightly quilling towards inside (plate No.4).

Table: 2 Physico-Chemical Properties of *Plumeriaalba*stem bark.

Sr. No.	Quantitative Standards	%	Sr. No.	Quantitative Standards	%
1.	Dry matter	91.4	13.	Non Reducing Sugar	0.72
2.	Bulk Density mg/cm3	151	14.	Total Sugar	2.95
3.	Ash	9.76	15	Crude Fibre	29.62
4.	Acid soluble ash	6.49	16.	Crude Fat	3.86
5.	Acid insoluble ash	3.27	17.	Cellulose	23.80
6.	Water soluble ash	7.53	18.	Hemicellulose	8.70

7.	Water insoluble ash	2.23	19.	Lignin	8.60
8.	Nitrogen	0.95	20.	Tannins	8.30
9.	Water Soluble Nitrogen	0.23	21.	Gross Energy K/cal	3.48
10.	Crude Protein	5.93	22.	Calcium	3.40
11.	Carbohydrates	67.60	23.	Phosphorus	0.170
12.	Reducing Sugar	2.23	24.	Potassium	0.625

Table- 3: Successive Extractive Values of the stem Bark of *Plumeriaalba*.

Sr. No.	Solvent	Weight of Drug	Average Extractive Value (%)
1	Water	10gm	10.40
2	Methanol	10gm	5.90
3	Alcohol	10gm	7.80
4	Benzene	10gm	2.51
5	Petroleum Ether	10gm	4.69
6	Chloroform	10gm	0.51
7	Acetone	10gm	6.82

Table- 4: Distribution of Phenolic acids and chemical compounds in bark samples

Sr. No.	chemical compounds	Results
1.	Tannins	+
2.	Phenols	+
3.	Alkaloids	+
4.	Saponins	-
5.	Iridoids	-
6.	Quercetin	-
7.	Kaempferol	-
8.	Catechin	+
9.	Coumarin	-
10.	6,7-Dimethoxy coumarin	-
11.	5-Methoxy genistein	-
12.	Anthocyanin	-
13.	Proanthocyanin	-

Physico-Chemical Evaluation

The physicochemical studies and successive extractive values of stem of *Plumeriaalba*are summarized in table 2 and 3 respectively.

Qualitative and Quantitative Analysis:

In Physical evaluation: - Dry matter (DM) and Bulk densityevalualted. In Quantitative analysis the amount of different phytoconstituents like Tannins, Saponins, Alkaloids, Phenolic acids and flavonoids. Quantitative: Nitrogen (N), Water soluble nitrogen (WSN), Crude proteins (CP), Crude fats (CFat), Crude fibres (CF), Total ash (TA), Acid insoluble ash (AIA), Acid soluble ash (ASA), Calcium (Ca), Phosphorus (P), Potassium (K), Total carbohydrates (TC), Cellulose, Hemicellulose, Lignins, Reducing sugar, Non reducing sugar, Total sugar, Gross energy (GE) and Extractive values are evaluated. In Qualitative analysis presence of different phytoconstituents are evaluated.

CONCLUSION

Microscopy along with the preliminary phytochemical evaluation of stem bark confirms the quality and purity of plant and its identification. On physico-chemical analysis the stem bark was found with relatively high total potassium content(0.625%) and low sugar content. The preliminary phytochemical screening of stem bark showed the presence of different phyto-constituent groups such as tannin, Phenol, Alkaloids and Catechin. Here the observations and results obtained useful for further pharmacological and therapeutically evaluation.

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Population Growth and Environmental Degradation: An In-Depth Analysis of Impacts, Solutions, and Future Directions

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ABSTRACT
Population growth exerts substantial pressure on the environment, leading to various forms of degradation including resource depletion, habitat loss, pollution, and climate change. This research paper provides a comprehensive analysis of the relationship between increasing human populations and environmental degradation. By exploring detailed examples and case studies, the paper highlights how population dynamics contribute to environmental challenges. It also examines various solutions and mitigation strategies aimed at addressing these issues and their potential impacts. The goal is to offer a nuanced understanding of how population growth drives environmental degradation and to propose actionable solutions for sustainable development.

Keywords: Population Growth, Environmental Degradation, Resource Depletion, Habitat Loss, Pollution, Climate Change, Sustainable Development, Mitigation Strategies.

1. INTRODUCTION

The exponential growth of the global population is a major factor driving environmental degradation. As human numbers increase, the demand for natural resources, energy, and space intensifies, leading to significant adverse effects on ecosystems and climate stability. This paper explores the complex relationship between population growth and environmental degradation, focusing on the impacts, solutions, and future directions for sustainable development. Through case studies and data analysis, the paper provides a comprehensive understanding of how population pressures contribute to environmental issues and discusses strategies for mitigating these impacts.

2. IMPACT OF POPULATION GROWTH ON ENVIRONMENTAL DEGRADATION

2.1 Resource Depletion

2.1.1 Water Resources

Increasing population densities heighten the demand for freshwater resources, leading to overexploitation and depletion of water supplies.

- **Example: Overexploitation of the Ogallala Aquifer**The Ogallala Aquifer, a critical water source for agriculture in the United States, is being depleted due to over-extraction for irrigation. This depletion threatens agricultural productivity and water availability for future generations.
- **Example: Water Scarcity in Sub-Saharan Africa**In Sub-Saharan Africa, rapid population growth has led to severe water scarcity. Countries such as Ethiopia and Kenya face challenges in meeting the water needs of their growing populations, impacting agriculture and human health.

2.1.2 Land Resources

Expanding human populations drive land conversion for agriculture, housing, and infrastructure, leading to soil degradation and loss of arable land.

- **Example: Urban Sprawl in Los Angeles** The city of Los Angeles has experienced significant urban sprawl, resulting in the conversion of agricultural land into residential and commercial areas. This expansion has reduced farmland availability and increased environmental pressures.
- **Example: Soil Degradation in India**In India, population pressures lead to intensive agricultural practices that result in soil erosion and loss of soil fertility. The overuse of chemical fertilizers and pesticides exacerbates soil degradation.

2.2 Habitat Loss and Biodiversity Decline

2.2.1 Habitat Loss

Population growth drives the expansion of urban areas and agricultural lands, leading to the destruction of natural habitats.

- **Example: Deforestation in the Congo Basin**The Congo Basin faces extensive deforestation due to logging and agricultural expansion driven by increasing population demands. This deforestation disrupts critical ecosystems and threatens biodiversity.
- **Example: Coastal Development in Southeast Asia** Coastal development in countries such as Thailand and Indonesia has led to the loss of mangrove forests and coral reefs. These ecosystems are crucial for coastal protection and marine biodiversity.

2.2.2 Biodiversity Decline

The loss of habitats and environmental changes contribute to declining biodiversity and increased extinction rates.

- **Example: Endangered Species in the Amazon**The Amazon rainforest is home to numerous endangered species affected by habitat loss. Species such as the jaguar and the Amazon river dolphin face increased risks due to deforestation and environmental changes.
- **Example: Coral Bleaching in the Great Barrier Reef**The Great Barrier Reef is experiencing widespread coral bleaching due to rising sea temperatures caused by climate change. This bleaching threatens marine biodiversity and the health of reef ecosystems.

2.3 Pollution and Climate Change

2.3.1 Pollution

Population growth leads to increased waste generation and pollutant emissions, resulting in air, water, and soil pollution.

- **Example: Air Pollution in Beijing**Beijing faces severe air pollution due to high population density and industrial activities. Pollutants from vehicle emissions and factories contribute to poor air quality and health issues.
- **Example: Plastic Pollution in the Pacific Ocean**The Pacific Ocean is plagued by plastic pollution, with large quantities of plastic waste affecting marine life and ecosystems. The rise in plastic production and consumption contributes to this environmental crisis.

2.3.2 Climate Change

Rising greenhouse gas emissions from population-driven activities exacerbate climate change, leading to global warming and environmental impacts.

- **Example: Melting Glaciers in the Himalayas**The Himalayas are experiencing accelerated glacier melting due to rising global temperatures. This melting affects water resources for millions of people and disrupts regional ecosystems.
- **Example: Increased Frequency of Extreme Weather Events** Population growth and increased greenhouse gas emissions contribute to more frequent and severe weather events, such as hurricanes and heatwaves. These events impact communities, infrastructure, and natural systems.

3. SOLUTIONS AND MITIGATION STRATEGIES

3.1 Sustainable Resource Management

3.1.1 Efficient Resource Use

Promoting efficient use of resources can help reduce environmental impacts and support sustainability.

- **Example: Water Efficiency in Israel**Israel has implemented advanced water management practices, such as drip irrigation and wastewater recycling, to enhance water efficiency and address water scarcity.
- **Example: Energy Efficiency in Germany** Germany's commitment to energy efficiency includes initiatives such as the Energiewende, which focuses on reducing energy consumption and increasing the use of renewable energy sources.

3.1.2 Adoption of Renewable Energy

Transitioning to renewable energy sources reduces reliance on fossil fuels and mitigates greenhouse gas emissions.

- **Example: Wind Power in Denmark**Denmark has become a global leader in wind power, investing heavily in wind turbine technology and infrastructure. This transition has significantly reduced the country's carbon footprint.

- **Example: Solar Energy Initiatives in India**India has made substantial investments in solar energy projects, aiming to increase the share of renewable energy in its energy mix and reduce dependence on coal.

3.2 Population Control and Family Planning

3.2.1 Family Planning Programs

Implementing family planning programs helps stabilize population growth and reduce environmental pressures.

- **Example: Success of Family Planning in Bangladesh**Bangladesh has achieved notable success in reducing birth rates through family planning programs. These efforts contribute to population stabilization and improved environmental outcomes.
- **Example: Family Planning Initiatives in Rwanda** Rwanda's family planning programs focus on providing reproductive health services and education, leading to decreased fertility rates and enhanced sustainability.

3.2.2 Education and Empowerment

Education and empowerment programs, particularly for women, play a crucial role in reducing fertility rates and promoting sustainable development.

- **Example: Education for Women in Sub-Saharan Africa** Educational initiatives targeting women in Sub-Saharan Africa contribute to lower fertility rates and improved environmental stewardship. Educated women are more likely to make informed decisions about family size and resource use.
- **Example: Gender Equality Programs in Latin America** Gender equality programs in Latin America focus on empowering women and promoting access to education and healthcare. These programs support population control efforts and enhance environmental sustainability.

3.3 Policy and Governance

3.3.1 Environmental Regulations

Implementing and enforcing environmental regulations is essential for managing pollution and protecting natural resources.

- **Example: The Clean Air Act in the United States**The Clean Air Act establishes regulatory standards for air quality and emissions, contributing to improvements in air quality and public health.
- **Example: The European Union's Water Framework Directive**The EU's Water Framework Directive aims to protect and improve water quality across Europe, addressing issues such as pollution and resource management.

3.3.2 Sustainable Development Policies

Developing policies that integrate environmental considerations into economic planning supports sustainable development.

- **Example: Sustainable Development Goals (SDGs)** The United Nations Sustainable Development Goals provide a framework for addressing global challenges related to population, environment, and development. Goals such as "Sustainable Cities and Communities" and "Responsible Consumption and Production" focus on promoting sustainability.

- **Example: The Green New Deal in the United States**The Green New Deal proposes a comprehensive approach to address climate change and environmental degradation through investments in renewable energy, infrastructure, and social equity.

4. IMPACT OF SOLUTIONS AND FUTURE DIRECTIONS

4.1 Positive Impacts

4.1.1 Improved Resource Management

Sustainable resource management practices lead to more efficient use of resources, reduced environmental impact, and enhanced long-term sustainability.

- **Example: Water Efficiency Measures in Singapore** Singapore's water efficiency measures, including desalination and rainwater harvesting, have successfully addressed water scarcity and supported sustainable urban development.

4.1.2 Enhanced Biodiversity Conservation

Efforts to conserve habitats and protect endangered species contribute to the preservation of biodiversity and ecosystem health.

- **Example: Conservation Efforts for the Sumatran Tiger** Conservation programs focused on protecting the Sumatran tiger and its habitat have led to positive outcomes in terms of population recovery and habitat preservation.

4.2 Future Directions

4.2.1 Technological Innovations

Advancements in technology, such as smart agriculture and renewable energy systems, offer promising solutions for addressing environmental challenges.

- **Example: Precision Agriculture Technologies** Precision agriculture technologies, including satellite monitoring and data analytics, enhance resource efficiency and reduce environmental impact in farming.

4.2.2 Global Collaboration

Global collaboration and international agreements play a crucial role in addressing transboundary environmental issues and promoting sustainable development.

- **Example: The Paris Agreement on Climate Change**The Paris Agreement represents a global effort to combat climate change by limiting global warming and promoting climate resilience through international cooperation.

5. CONCLUSION

Population growth and environmental degradation are complex, interconnected issues that require comprehensive solutions and proactive strategies. As the global population continues to rise, the pressures on natural resources, ecosystems, and climate stability increase. Effective approaches to mitigating these impacts include sustainable resource management, population control measures, and robust policy frameworks. By adopting integrated and adaptive strategies, it is possible to achieve a balance between human development and environmental preservation, ensuring a sustainable future for current and future generations.

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To Study the Revalence of Cladosporium Spores Over Green Gram Field

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ABSTRACT
Present paper deals with the study of aerobiological investigation over green gram field by using volumetric continuous Tilak Air Sampler was employed for exploring fungal airspora over green gram field at Kerul Tal. Ashti, Dist. Beed. 5th July to 30th September 2022 & second Kharif season and 10thJuly 2023 to 30th September 2023. The present paper deals with airborne concentration of cladosporium spores over green gram fields. The spore concentration were discussed and the spore concentration was maximum (58030/m3 and 4627/ m3 of air) in the month of First & Second Kharif season respectively.
Key words: Aerobiology, Airspora, Cladosporium, Tilak Air sampler, Green gram field.

INTRODUCTION

Mung(*Vignaradiata*) is one of the important pulses crop in India. Green gram has been cultivated in India since ancient time. Green gram is protein rich sample food in contains about 25% protein which almost three times more than that of cereals. It supplies protein requirement of vegetarian population of the country. Mung is consumed form of split pulses as well as whole pulses, which is an essential supplement of cereal based diet.
As considering the survey of these crop that since last few years green gram suffer with different types of pathogenic diseases like fungi and viruses, due to this disease plant yield and poor quality of pods and seeds decreases product and valuation.
The rust diseases of Mung caused by *Uromyces phaseoli*. The rust spores also played a significant role in inciting various types of allergy has been pointed out by earlier workers like Agrawal & Shivpuri (1974), Brown and Jackson(1978), Pawar (1998), Banswadkar (2002), etc.
The present survey was undertaken to elaborate and accumulate the information regarding the air borne concentration of the pathogen and its role in causing the diseases and its ultimate disease incidence in relation with the meteorological factors.

MATERIAL AND METHODS:

In the present investigation an exploration of airborne spores of *cladosporium* (Tilak and Kulkarni 1970) was undertaken over the fields of green gram field for Kharif season. Tilak Air sampler was installed at a constant height of 1.5 meters above the ground level at Kerul Tal. Ashti, Dist. Beed (M.S.) for First and Second Kharif season i.e. First Kharif 5th July to 30th September 2022 & second Kharif season 10th July 2023 to 30thSeptember 2023.The air was sampled at the rate of 5 litre/minutes which left traces of deposition over cellophanetape, affixed on the outer surface of drum. The slides were prepared every after eight days. Before the scanning, the sliders were marked with a ball point pen in the six equal parts, each part, indicating the spore catch of two hours of sampling period. Area of 9600sq. micron of the total area of the trace obtained was scanned under 10x«45x eye piece objective combination of binocular research microscope. The transformation of spore was done which was based on visual characteristics of spore such as size, shapes. The metrological data was recorded during period of investigation.

RESULT AND DISCUSSION:

The spores of *cladosporium* were variable in shape and size, avoid to cylindrical or irregular, dark sub hyaline to pale brown, one or two celled or lemon shaped. These spores were found to be the most abundant as compared to other airborne micro biota in order of their concentration and hence dominated aerial population. The spores contributed 26.02% and 24.62% during first &second Kharif season respectively.

In second Kharif season, the highest monthly concentration (58030/m^3) was recorded in the month of September 2023, when there was record of moderate range of temperature between 21.4 to 29.7^{0}C, 61.8 to 95.47% relative humidity, 2.8km/h wind velocity and 77.5 mm rain fall. The day on which there was record of rain and high wind velocity, the concentration *cladosporium* spores was found to be considerably reduced, which may be due to the washing effect. During the second Kharif season the maximum concentration (6300/m^3 of air) was recorded on 10th July 2023 to 30thSeptember 2023, when there was record of 25.5^{0}C of mean temperature, 75% relative humidity and 4.4km/h wind velocity.

The spores of *cladosporium* have been found to be always dominant in many parts of the world. The occurrence of these spores in large number has been recorded by Hara and Durhan (1939), Turner (1966) from Japan, Rees (1964) from Australia, DeMeena (1955) from New Zealand, Gregory and Hirst (1957), Harvey (1967), Meredith (1962) from Jamaica, West Indies. Mali (2002) and Banswadkar (2002) also reported these spores at Kerul and Kada respectively. Gopan (2004) and Pathare (2004) reported these spores over green gram fields at Beed and Kerul respectively. During the period of present investigation, the spores of *cladosporium* were almost continuously found in the atmosphere over the green gram field. The dominance of the spores of *cladosporium* may be regarded as a universal dominant because earlier workers from Indian and abroad also reported this spore type as the dominant type. In air *cladosporium* spores showed their clumps and hence called “Conidial units of disperals.” The high incidence of *cladosporium* spore type in air was due to their high saprophytic ability. However, these spore liberation was passive.

Thus, the atmospheric microbial population in relation to phytopathology has an ample scope for further investigations. Such studies would bring many useful results like disease forecasting which would ultimately help in protecting our crop.

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Role of Indoor Plants in Air Purification

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ABSTRACT

Various techniques can be applied to air purification such as the use of filtration and radiation; however, these methods are expensive and not feasible for indoor use. Indoor plants can purify the air by the removal of air pollutants and habituated airborne microbes. The use of indoor plants could prove to be a cost-efficient way of indoor air-purification that could be adapted for a variety of environments with no need for special requirements and can also add an aesthetic value that can have an indirect impact on human health. The currently used air purification method and the use of indoor plants as a new possible eco-friendly tool for indoor air purification. Here Focus on 12 indoor plants that can easily be found in India and act as great air purifiers

Key words: Indoor plants. Air purification, Eco friendly tool

INTRODUCTION

Plants are used as an efficient cleaning system for the environment in a process known as "Phytoremediation", which can be done via various techniques in which plants clear the environment from pollutants. Indoor plants are considered to be natural air filters as they can purify air through different methods: absorption, dilution, precipitation, and filtration.

A well-known process carried out by plants is photosynthesis in which plants clean the air through taking in carbon dioxide and releasing oxygen. Respiration is another process where plants absorb oxygen and release carbon dioxide. During photosynthesis and respiration, the air goes in and out through the stomata, as they are considered the main apparatus that plants use in the absorption and filtration mechanisms . Plants can absorb airborne molecules and restore the ecological balance in the air. In addition, plants can purify the air from pollutants such as carbon dioxide, volatile organic components (VOC), carbonyl, particulate matter, organic compounds, nitrates, sulphates, ammonia, calcium, ozone, and carbonate. Indoor plants can be considered as a low-cost solution that reduces the levels of indoor pollutants and minimize human exposure to many harmful compounds. Indoor relative humidity (RH) is considered an important component which causes an interaction between humans, viruses, and plants. Recommended interior humidity levels for human comfort usually range between 30 and 60% and 40–60% shows to prevent viral transmission. Research has shown that plants are capable of absorbing tiny airborne water vapour particles and have the ability to improve indoor humidity. Concerns were raised, that indoor plants transpire through stomata releasing tiny water droplets to the surrounding air, increasing humidity; however, at high humidity, the transpiration rate by plants decreases maintaining the interior humidity at suitable levels for humans. humidity is highly correlated with the abundance and presence of molds, bacteria, mildew, and other biological pathogens leading to a drastic impact on human health. Plants are known for the potential to enhance the humidity through foliar water uptake at high humidity, thus reducing bioaerosols. Henceforth, plants can control air humidity maintaining it at intermediate levels which lower the viability of liquid aerosols. Here Focus on 12 indoor plants that can easily be found in India and act as great air purifiers

Indian Basil

Commonly known as Tulsi, this plant requires little to no maintenance. It is one of the best air purifying plants or anti-pollution plants with medicinal properties. The tulsi plant requires regular sunlight so the best place to keep this plant would be near a window, It purify air regularly.

Money Plant

This is a powerful air purifying plant of India or anti-pollution plants that will clean the air indoor effectively. It requires regular watering and thrives in indirect sunlight. These plants propagate rapidly; therefore, they need to be pruned regularly. Be warned, the leaves of a money plant are toxic for dogs, cats or small children if ingested.

Snake Plant

Snake plant or Mother - in - Law's Tongue is a hardy, easy to grow and propagate plant requiring minimal attention. The only thing to remember is that they need to be planted in free draining soil. These air purifying plants are one of the top air purifying plants. It is best suited for indoor as it can survive in low light and humid conditions. It filters out formaldehyde which is commonly found in personal care products.

Green Spider Plant

These useful air-purifying indoor plants grows easily and requires minimal care. It needs well-drained soil and watered two-three times a week. Also known as an air purifying plant, it eliminates xylene and formaldehyde present indoors. This plant is very safe and non-toxic for pets and small children. It needs bright indirect sunlight to thrive. One plant is apparently enough to clean the air in a 200 sq. m space.

Areca Palm

Areca Palm is one of the best air purifying plants. A hardy plant, it filters benzene, formaldehyde and trichloroethylene. It needs moist soil and placement in an area with good air circulation. As an added benefit beyond air purification, it is also a natural humidifier making it all the more useful during the dry winter. Areca palms thrive in areas with bright but not direct sunlight. The plant requires regular pruning as it grows rapidly. Since it is non- toxic, it is safe for pets.

Aloe Vera

This is a beneficial plant not only cleanses the air of benzene and formaldehyde but also absorbs carbon dioxide and carbon monoxide. It is a great plant to keep at home as it is short, easy to grow and maintain. Moist soil and mild sunlight help to easily propagate a single plant into multiple plants in a short period. An added benefit is that aloe vera gel contains antibacterial, anti-inflammatory and wound healing properties and helps maintain a great complexion.

Peace Lily

Is one of the well-known cleansing plants for removing common household toxins. Like aloe vera, this plant too cleanses the air of benzene and formaldehyde, thereby cleaning up our breathing space. An easy to grow plant with white flowers, it is amongst the super air purifying indoor plants and cleanser that can effectively remove indoor pollutants emitted by electronics, furniture and other household items.

Golden Pothos

Golden Pothos is air purifying indoor plants is one of the most effective air purifiers out of all air purifying plants to combat toxins like formaldehyde, xylene, carbon monoxide, benzene and more. It does not require much maintenance as it grows easily and remains green even when kept in the dark.

English Ivy

The evergreen air purifying indoor plant helps to lower airborne fecal matter particles and filters out formaldehyde prevalent in the air. This plant requires maintenance as it attracts pests on not receiving sufficient light. Further, it needs care while watering as the plant, in general, does not like standing water. Nonetheless, in spite of it being a high maintenance plant, it is still one of the most useful air purifying plants or anti-pollution plant, as it is able to remove over 55 percent of the toxins in the air.

Dracaena

These foliage air purifying plant filters the air from pollutants such as xylene, benzene, formaldehyde and trichloroethylene. As far as its maintenance is concerned, it does not need direct sunlight. The soil this plant thrives in should be damp but not soggy since overwatering might turn the leaves yellow. The plant can grow as tall as 12 feet and therefore may require periodic pruning.

Weeping Fig

A long lasting, low maintenance leafy plant, weeping fig is known to combat pollutants generated by household items such as furniture, carpets and curtains. It is one of the hardiest air purifying indoor plants which needs to be placed in bright indirect light. It takes a while to grow in the initial stages, but thereafter it grows into a big plant significantly improving the air quality and rendering amazing air cleaning results.

Chrysanthemum

Now here's a plant that we Indians typically love in our gardens. The Chrysanthemum belong to the Asteraceae family and the colour of these blooms are a visual treat. These plants are best grown indoors while the flowers are blooming. Chrysanthemum is rank high on air purification and eliminate ammonia, formaldehyde, xylene, and other air toxins.

Benefits of Air Purifying Plants

Our health is constantly threatened by the air we breathe, whether indoors or outdoors. Studies show that the air inside the average home is much more polluted than the air outside due to limited air flow. The air indoors is contaminated with pollutants and toxins which we inhale and this accumulated toxic air causes dizziness, nausea, headaches, runny nose and eye irritation.

Air Purifying Indoor Plants have the following benefits:

- Lowers toxic carbon dioxide levels by processing it into oxygen
- Lessens the levels of certain pollutants, such as benzene and nitrogen dioxide
- Reducing airborne dust levels
- Keeping air temperatures down
- Plants help lower background noise
- All plants can act as air cleaners but some are more beneficial than others when it comes to removing toxins in the air

Role Played by Plants in General:

- Lowers stress and fatigue
- Enhance concentration
- Increase productivity.

CONCLUSION

Air purifying plants are the most natural, cost-effective way to cleanse the toxicity in the air. These are useful to human being for improving respiratory health and mental health.

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Bioactive Phytochemical Components in Methanolic Extract of *Pindaconcanensis* Tuber

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ABSTRACT
Objective: To illustrate the bioactive phytochemical constituents of tubers of *Pindaconcanensis*.
Method: 10 gram of fine powdered of tubers of *Pindaconcanensis* was used for methanolic extract. The methanolicextract was concentrated by using rotavac and were apply for GC-MS analysis. The analysis was carried out on Thermo Trace 1300 GC with the column packed TG 5MS (30m X 0.25mm, 0.25μm). The compounds are separated with the Helium as a carrier gas having constant flow rate 1ml/min. 1.0μL extract were injected into the column and was detected by MS TSQ 8000 detector.
Results: The GC-MS shows peaks of Twenty Seven different phytochemical constituents as a major component; such as Isopsoralen (2.55%), n-Hexadecanoic acid (10.23%), Cis-Vaccenic acid (4.10%), Octadecanoic acid (3.27%), Octatriacontylpentafluoropropionate (2.00%), 9-Octadecenamide,(Z)- (10.82%), Stigmastan-3,5-diene(5.56%), Stigma sterol (4.19%), à-Sitosterol(10.22%), and Stigmast-4-en-3-One (2.06%).
Conclusion: The identified compounds shows variety of biological activity with least risk of adverse effects and having a maximum influence for enhanced quality of human life during healing.
Keywords: *Pindaconcanensis,* bioactive phytochemical constituents, etc.

1. INTRODUCTION

The plant plays very important role in Indian system of medicine particularly in Ayurveda. In plants, phytochemical act as a natural defense system for host plants and provide colour, aroma and flavor (Tripathi et al, 2012). Many parts of the plant such as bark, leaves, flowers, roots, fruits and seeds may contain secondary metabolites which act as bioactive components (Gordon and David, 2001). It has led to discovery and development of novel drugs from metabolites of plant. The various numbers of ecological factors such as climate, rainfall and other environmental factors affect the quality of metabolites present in the plant species. This naturally occurring condition may produce major variation in the bioactive compounds present in the plants (Kokate et al, 2004). Natural products and secondary metabolites formed by living system, notably from plant origin, have shown great potential in treating human diseases such as cancer, heart diseases, diabetes, infectious diseases and arthritis (Yik Ling Chew, 2011). Hence the phytochemical screening will help to give the information about the array of chemical constituents formed by plants and qualitative assay for secondary metabolites is done by the instrumental technique.

Pindaconcanensis is commonly known as a KokanPinda belonging to the family Apiaceae. Kokanpinda is an annual herb with tuberous roots, which grows up to 1-2 feet high. It has short branched stems. Pinnate leaves are 10-20 cm long, 3-4 cm ovate, toothed and 3- lobed leaflets. White flowers are 1 cm across and are arranged in beautiful compound umbels 5-10 cm across. Petals of outer flowers are larger and 8-10 mm obovate, 2- lobed. It has been reported from Western Ghats. The endeavor of this present study is to investigate the bioactive metabolites by screening test and qualitative information by HPLC and GC-MS analysis.

2. MATERIALS AND METHODS

2.1 Collection and preparation of plant materials

Fresh plants of *Pindaconcanensis*were collected from natural habitat of Akole Tehsil, District Ahmednagar, (MS) India. The samples were washing with water to remove the soil matter. The whole dried plants were shade dried and the tubers are finally ground in fine powdered.

2.2 Plant sample extraction

10 gram powder of tubers of*Pindaconcanensis*and transferred to the stoppered bottles and treated with methanol until the powder is fully immersed. The bottles was shaken vigorously and then kept a side and shake again after 24 hours. This process is repeated for two days and then the extract was filtered. The filtered extract was collected and evaporated to dryness using rotavac. The obtain residue was then subjected to GC-MS analysis.

2.3 Qualitative Phytochemical Analysis

Preliminary phytochemical analyses were carried out for the extract as per the standard methods described by the Harborne (Harbone, 1973). For certain compounds different tests were carried out. Positive result of any one test was considered as an indicative of the presence of that compound. The reason might be that certain tests are possibly more sensitive than the others. Positive tests were noted as weak (+), moderate (++), strong (+++) and absent (-).

Detection of Proteins: Xanthoprotien Test: Few ml of extract were treated with HNO_3. A few drops of liquid ammonia were added. Formation of reddish orange or reddish pink color indicates the presence of Xanthoprotein.

Detection of Amino acid: Ninhydrin Test: About 0.5 m of extract was taken in test tube and 2-3 drops of freshly prepared 0.2% Ninhydrin reagent was added and heated for few minutes. The pink or purple color indicates that the presences of amino acids.

Detection of flavonoid: Alkaline Reagent Test: Extract was treated with 10 % NaOH solution, Formation of intense yellow color indicates that the presences of flavonoids.

Detection of Phenol: Ferric Chloride Test: 10 mg extracts were treated with the few drops of ferric chloride solution. Formation of bluish black color indicates that the presences of phenols.

Detection of Cardial Glycosides: Keller – Killani Test: Plant extract treated with 2 ml of glacial acetic acid containing a drop of $FeCl_3$. A brown colour ring indicates the presences of cardial glycosides.

Detection of Tannin: Ferric Chloride Test: A small quantity of extract were mixed with water and heated on water bath and filtered. A few drops of ferric chloride were added to the filtrate. A dark green solution indicates that the presences of tannins.

Detection of Steroid: 2 ml of acetic anhydride was added to 5 mg of the extract with the 2 ml of H_2SO_4.The color was changed from violet to blue or green indicates the presences of steroids.

Detection of Phytosterol: Salkowski's Test: extract was treated with chloroform and filtered. The Filtrate was treated with the few drops of concentrated H_2SO_4 and shakes, allow standing, appearance of golden red indicates the presences of Phytosterol.

Detection of Carbohydrates: A few ml of extract and 10% of NaOH was added and heated. Reddish brown precipitated formed shows the presences of carbohydrates.

Detection of Reducing Sugar: Fehling Test: 5 ml of extract 1 ml of water and 5-8 drops of Fehling's solution was added and heated over water bath. Brick red precipitate indicates the presences of reducing sugar.

Detection of Saponins: Saponins detected by using the froth test. 1 gm of the sample was taken into a conical flask in which 10 ml of distilled water was added and boiled for 5 minutes. The mixture was then filtered and 2.5 ml of the filtrate was in test tube containing the 5 ml of distilled water. The test tube shake vigorously for 30 seconds. It was then stand for 30 minutes. Honeycomb froth indicates the presences of saponins.

Detection of Coumarin: 3 ml of 10% NaOH was added to 2 ml of aqueous extract formation of yellow color indicates coumarins.

Detection of Emodins: To the few ml of extract 25% ammonium hydroxide solution was added the appearance of red color indicated the presence of emodins.

Detection of Anthocyanin: 2 ml of aqueous extract is added to 2 ml of 2N HCl& NH_3, the appearance of pink red turns blue violet indicates presences of Anthocyanin.

Detection of Alkaloids: A 3 ml of concentrated extract was taken into a test tube and 1 ml of HCl was added, the mixture was heated gently for 20 min cooled and filter, the filtrate was used for the following test.

Wagner Test: Filtrate was treated with Wagner's reagent; formation of brown reddish precipitate indicates the presences of alkaloids.

2.4 Chromatographic and Spectroscopic Analysis

2.4.1 HPLC Analysis: HPLC analysis can be used for the classification of secondary metabolites of plant. The HPLC analysis of methanolic extract was carried with the chromatographic technique (Model No: Ultimate 3000 HPLC) with column (C18) and UV- visible detector. The mobile phase consists of methanol and water (70:30 v/v) with injection volume 3μL and the sample run time 30 min and the detection were carried out at 232 nm by UV detector.

2.4.2 GC-MS analysis: GC-MS analysis was carried out on a GC Clarus 500 Perlin Elmer system and Gas Chromatograph interfaced to a mass spectrometer (GC-MS) instrument employing the following condition: TG 5MS (30m × 0.25mm, 0.25μm) column for GC-MS detection an electron ionization system with ionizing energy of 70 eV was used. Helium gas was used as the carrier gas at constant flow rate 1ml/min. and an injection volume 1.0μL was employed; injector temperature 250 ^{0}C; ion source temperature 230 ^{0}C; MS transfer line temperature 280 ^{0}C. The oven temperature programmed 60 ^{0}C (isothermal for 2min) with an increase of 10^{0}C/min to 280 ^{0}C for 10 min. The mass spectra were taken at 70 eV and fragment from 40 to 550 Da.

2.5 Identification of components: Interpretation on mass spectrum of GC-MS was done using the database of National Institute of Standard and Technology (NIST) having more than 62,000 patterns. The mass spectrum of the unknown component was compared with the spectrum of the known component stored in the NIST library. The name, molecular weight and structure of the component of the test materials were ascertained.

3. RESULT AND DISCUSSION

The present study was carried out on the *Pindaconcanensis* that the presence of secondary metabolites of *Pindaconcanensis* investigated from tubers the results are mentioned in Table 1.

3.1 Preliminary Phytochemical Analysis: The preliminary phytochemical screening investigation of methanolic extract of tubers of*Pindaconcanensis*shows the presences of Proteins, Amino acid, Flavonoids, Tannin, Steroid, Physterol, Carbohydrates, Reducing Sugar, Saponin and Coumarin whereas Phenol, Cardial glycosides, Emodins, Anthocyanin and Alkaloids were absent (Table 1.) The presences of phytochemicals in *Pindaconcanensis* tuber extract, tannins are known to be useful in the treatment of inflamed of ulcerated tissues and they have remarkable activity in anticancer (Motor et al, 1985; Ruch et al, 1989).

Table 1. Qualitative Phytochemical Analysis of Tuber of *Pindaconcanensis* extracted with Methanol Solvent

Sr.No.	Secondary Metabolite	Result
1	Proteins- Xanthoproteic Test	+++
2	Amino acids- Ninhydrin Test	+++
3	Flavonoid- Alkaline Reagent Test	++
4	Phenol-Ferric Chloride Test	-
5	Cardial Glycosides - Keller-Killani Test	-
6	Tannin	
	1.Lead Acetate Test	+++
	2.$FeCL_3$	+++
7	Steroid	+++

8	Phytosterol-Salkowski's Test	+++
9	Carbohydrates-Molisch's Test	++
10	Reducing Sugar	++
11	Saponin	++
12	Coumarin	+
13	Emodins	-
14	Anthocyanin	-
15	Alkaloids- Wagner's Test	-

Flavonoids serve as health promoting compound as a results of its anion radicals (Hausteen, 1983). Saponin act as an antimicrobial activity and extremely too cold blooded animals, but toxicity to mammals is low (Verma et al, 2013). Saponins possess the surface active agent. The saponins are used in hypercholesterolemia, antioxidant, anticancer, anti-inflammatory activity and weight loss (Murugan and Mohan, 2014). Hence, these information is useful to the local or folk remedies in the various treatment related to the plant parts.

3.2 Qualitative Analysis by HPLC System

To search a novel herbal drugs is a topic of continuous scientific research as well as interest in the herbal drug industry. With the advent of modern chromatographic systems, the researchers investigate the bioactive compound very easily by qualitative methods. So for Standardization of methanolic extract of plant tubers, HPLC is a sensitive and accurate tool that widely used for the quality assessment of plant extract and its derived product/formulation (Jain et al, 2011). Result of HPLC analysis of methanolic extract of tubers of *Pindaconcanensis* at 232 nm, shows presences of various constituents as evidenced by the chromatogram obtained at various retention times (1.730, 1.957, 2.426, 2.656, 3.008, 3.275, 3.706, 4.213, 4.563, 4.919, 5.172, 5.341, 5.801, 6.275, 6.850 and 7.300) are the constituents found in *Pindaconcanensis* tubers mainly. In which the compound having RT 2.426 shows maximum area of percentage about 32.550 hence is the main constituents in methanolic tuber extract of *Pindaconcanensis*

Table 2: Phytocomponents identified in the methanol extract of tubers of *Pindaconcanensis*

GC-MS Analysis of methanolic tuber extract of *Pindaconcanensis*

The active principles with their retention time, molecular formula, molecular weight and concentration (%) in the methanol extract of tubers of *Pindaconcanensis*presented in Table1. More than 27 components were identified in the methanol extract of tubers of *Pindaconcanensis.* The prevailing components were Isopsoralen(2.55%), Ethyl iso-allocholate(0.49%), Pentadecanoic acid, 14-methyl-,methyl ester(0.64%), n-Hexadecanoic acid(10.23%), Methoxsalen(1.57%), 9,12,15-Octadecatrienoic acid, 2,3-dihydroxypropyl ester,(Z,Z,Z)-(1.63%), Methyl Stearate(0.42%), Cis-Vaccenic acid(4.10%), Octadecanoic acid(3.27%), 1-Heneicosyl formate(2.02%), Phthalic acid, di(2-propylpentyl) ester(0.45%), Adipic acid, monopiperidide, pentadecyl ester(0.98%), Octatriacontylpentafluoropropionate(2.00%), 9-Octadecenamide,(Z)-(10.82%), Cholesterol margarate(0.39%), Stigmastan-3,5-diene(0.50%), Cholesta-4,6-dien-3-ol,(3à)-(1.13%), Stigmastan-3,5-diene(5.56%), Cholesterol(1.53%), Campesterol(1.87%), Stigma sterol(4.19%), à-Sitosterol(10.22%), Cholest-4-en-3-one(0.61%), Spinasterone (0.96%), 4,22-Stigmastadiene-3-one(0.96%), 4,22-cholestadien-3-one(0.96%) and Stigmast-4-en-3-one(2.06%). The phytocompounds prediction and its biological activities obtained through the GC-MS study of tubers of *Pindaconcanensis*is based on Dr. Duke's Phytochemical and Ethanobotanical Databases and have been tabulated (Table 2).

Among the identified phytochemicals, Ethyl iso-allocholate present in the methanol extract of tubers of *Pindaconcanensis,* is the ester of bile acid and can act as an emulsifying agent so that fat and oil can be digested by water soluble digestive enzymes in the small intestine (Bruice, 1998). Stigma sterol is used as a precursor of semisynthetic progesterone (Sudararaman and Djerassi, 1977). A valuable human hormone that plays an important physical role in the regulatory and tissue rebuilding mechanism related to estrogens, as well as acting as an intermediate in the biosynthesis of androgen, estrogen and corticoids. It is also used as the precursor of Vitamin D_3 (Kametani and Furuyama, 1987). The individual fragmentation of components is illustrated in Figure 1 to Figure 26.

4. DISCUSSION

In the present study, the GC-MS analysis of the methanolic extract of tubers of *Pindaconcanensis* showed the presence of twenty seven compounds. In terms of percentage amount Cis-Vaccenic acid, n-Hexadecanoic acid, à-Sitosterol, Stigmastan-3, 5-diene, Stigma sterol, 9-Octadecenamide, (Z) - were predominant in the extract. These six major compounds have shown Antioxidant, Antimicrobial, Anti-inflammatory, Anticancer, Antiasthma, Anti arthritic, Diuretic activity, while other compounds shows Anticovulgant, Pesticide, Antileukodermia,Vermifuge, Antimicrobial, Anti-inflammatory, Diuretic, Antiasthma, Antioxidant, Pesticide, Lubricant, Hemolytic, Hypocholesterolemic, Gastroirritant, Hepatoirritant, Anti-inflammatory, Anticancer, Hepatoprotective, Nematicide, Anticoronary, Immunomodulator, Antiandrogenic, Hypocholesterolemic, Cosmetic, Lubricant, Perfumy, flavor, Hypolipidaemic, Antihypertensive, Acidifier, Acidulant, Cholesterolytic, Oligosaccharide provider, Encephalopathic, Endoanesthetic, Endocrinactive, Enterodepressant, Enterorelaxant, Enter toxic, Enterostimulant, Energizer activity.

5. CONCLUSION

Phytochemical screening and analysis of plant samples by extraction and instrumental method is one of the important laboratory processes. Generally we don't know how many and which plant constituent is shows medicinal activity. Hence, it is essential to an identification and quantification of the phytochemical bioactive compound present in the plant parts through an instrumental technique. So, the analytical technique is very basic and convenient method to identify the number of phytochemical constituent present in the methanolic or any other solvent extract of various plant parts. We report the presence of some of the important preliminary phytochemicals resolved by GC-MS analysis and their biological activities. Hence, this type of GC-MS study is the first step towards understanding the nature of active principles in this medicinal plant.

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Table 2: Chemical constituents identified in the methanol extract of tubers of *Pinda concanensis*

Sr. no.	RT	Name of the Compound	Molecular Formula	MW	Peak Area %
1	16.70	Isopsoralen	$C_{11}H_6O_3$	186.138	2.55
2	17.16	Ethyl iso-allocholate	$C_{26}H_{44}O_5$	436.583	0.49
3	17.96	Pentadecanoic acid,14-methyl-, methyl ester	$C_{17}H_{34}O_2$	270.435	0.64
4	18.34	n-Hexadecanoic acid	$C_{16}H_{32}O_2$	256.408	10.23
5	19.32	Methoxsalen	$C_{12}H_8O_4$	216.155	1.57
6	19.65	9,12,15-Octadecatrienoic acid, 2,3-dihydroxypropyl ester,(Z,Z,Z)-	$C_{21}H_{36}O_4$	352.475	1.63
7	19.85	Methyl Stearate	$C_{19}H_{38}O_2$	298.489	0.42
8	20.04	Cis-Vaccenic acid	$C_{18}H_{34}O_2$	282.446	4.10
9	20.23	Octadecanoic acid	$C_{18}H_{36}O_2$	284.462	3.27
10	21.29	1-Heneicosyl formate	$C_{22}H_{44}O_2$	340.569	2.02
11	23.46	Phthalic acid, di(2-propylpentyl) ester	$C_{24}H_{38}O_4$	390.524	0.45
12	24.06	Adipic acid, monopiperidide, pentadecyl ester	$C_{26}H_{49}NO_3$	423.65	0.98
13	24.53	Octatriacontyl pentafluoropropionate	$C_{41}H_{77}F_5O_2$	697.029	2.00
14	25.34	9-Octadecenamide,(Z)-	$C_{18}H_{35}NO$	281.471	10.82
15	26.79	Cholesterol margarate	$C_{44}H_{78}O_2$	638.072	0.39
16	27.56	Stigmastan-3,5-diene	$C_{29}H_{48}$	396.698	0.50
17	29.15	Cholesta-4,6-dien-3-ol,(3à)-	$C_{27}H_{44}O$	384.634	1.13
18	29.47	Stigmastan-3,5-diene	$C_{29}H_{48}$	396.698	5.56
19	29.83	Cholesterol	$C_{27}H_{46}O$	386.650	1.53
20	31.88	Campesterol	$C_{28}H_{48}O$	400.677	1.87
21	32.56	Stigmasterol	$C_{29}H_{48}O$	412.688	4.19
22	33.90	à-Sitosterol	$C_{29}H_{50}O$	414.704	10.22
23	35.01	Cholest-4-en-3-one	$C_{27}H_{44}O$	384.634	0.61
24	35.87	Spinasterone	$C_{29}H_{46}O$	410.672	0.96
25	35.87	4,22-Stigmastadiene-3-one	$C_{29}H_{46}O$	410.672	0.96
26	35.87	4,22-cholestadien-3-one	$C_{27}H_{42}O$	392.618	0.96
27	37.63	Stigmast-4-en-3-one	$C_{29}H_{48}O$	412.688	2.06

Table 3: Biological potential of chemical constituents identified in the methanol extract of tubers of *Pindaconcanensis*

Sr.No.	RT	Name of the Compound	Compound Nature	Activity
1	16.70	Isopsoralen	Furocoumarins	Anticonvulsant, Pesticide, Antileukodermia,Vermifuge
2	17.16	Ethyl iso-allocholate	Steroid	Antimicrobial, Anti-inflammatory, Diuretic, Antiasthma, Ant arthritic
3	17.96	Pentadecanoic acid,14-methyl-, methyl ester	Fatty acid	Antioxidant
4	18.34	n-Hexadecanoic acid	Palmitic acid	Antioxidant, Pesticide, Lubricant, Hemolytic, Hypocholesterolemic
5	19.32	Methoxsalen	Furocoumarins	Gastroirritant, Hepatoirritant
6	19.65	9,12,15-Octadecatrienoic acid, 2,3-dihydroxypropyl ester,(Z,Z,Z)-	Fatty acid	Anti-inflammatory, Anticancer, Hepatoprotective, Nematicide, Anticoronary, Immunomodulator, Antiandrogenic
7	19.85	Methyl Stearate	Stearic acid	Hypocholesterolemic, Cosmetic, Lubricant, Perfumy, Flavors
8	20.04	Cis-Vaccenic acid	Fatty acid	Hypolipidaemic, Antihypertensive
9	20.23	Octadecanoic acid	Stearic acid	Cosmetic, Lubricant, Perfumy, Flavors, Hypocholesterolemic
10	21.29	1-Heneicosyl formate		No record found
11	23.46	Phthalic acid, di(2-propylpentyl) ester	Ester	Acidifier, Acidulant
12	24.06	Adipic acid, monopiperidide, pentadecyl ester	Ester	Acidifier, Acidulant
13	24.53	Octatriacontylpentafluoropropionate	NA	No record found
14	25.34	9-Octadecenamide,(Z)-	Oleic acid amide	No record found
15	26.79	Cholesterol margarate	Cholesterol ester	Cholesterolytic
16	27.56	Stigmastan-3,5-diene	Steroid	No record found
17	29.15	Cholesta-4,6-dien-3-ol,(3à)-	Steroid	Oligosaccharide provider

18	29.47	Stigmastan-3,5-diene	Steroid	No record found
19	29.83	Cholesterol	Steroid	Cholesterolytic
20	31.88	Campesterol	Steroid	Anti-inflammatory, used in specific prostate condition
21	32.56	Stigma sterol	Steroid	Antimicrobial, Antioxidant, Anti-inflammatory, Diuretic, Anti arthritic, Antiasthma
22	33.90	à-Sitosterol	Steroid	Antimicrobial, Antioxidant, Anti-inflammatory, Diuretic, Anti arthritic, Antiasthma
23	35.01	Cholest-4-en-3-one	Steroid	Encephalopathic, Endoanesthetic, Endocrinactive,Enterodepressant, Enterorelaxant, Enter toxic, Enterostimulant,Energizer
24	35.87	Spinasterone	Steroid	Antifungal
25	35.87	4,22-Stigmastadiene-3-one	Steroid	Antimicrobial, Anticancer, Anti arthritic, Antiasthma
26	35.87	4,22-cholestadien-3-one	Steroid	Fungicidal Activity
27	37.63	Stigmast-4-en-3-one	Steroid	Encephalopathic, Endoanesthetic, Endocrinactive, Enterodepressant, Enterorelaxant, Enter toxic, Enterostimulant, Energizer

**Activity source: Dr.Duke's Phytochemical and ethanobotanical database

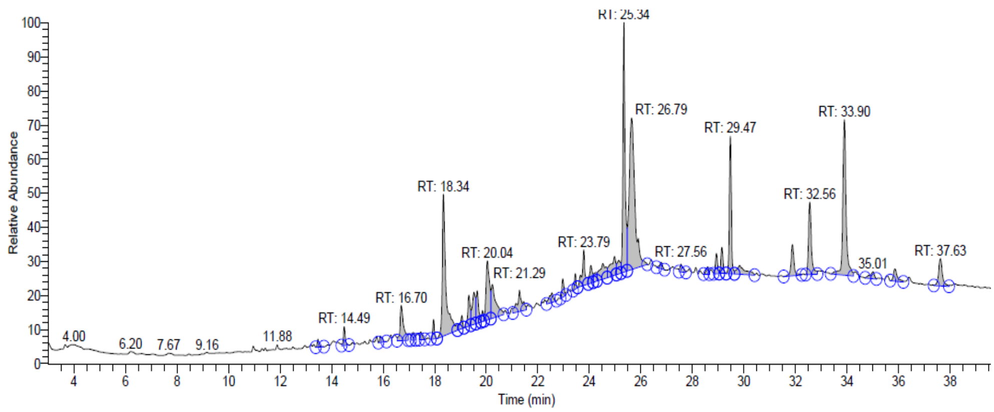
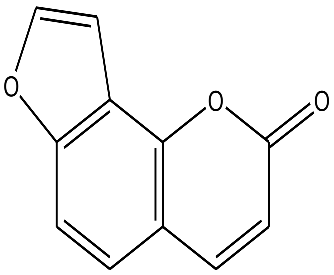
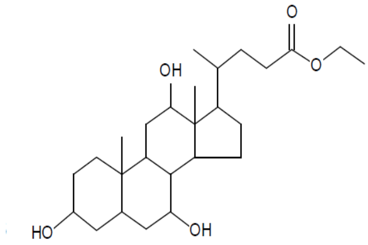


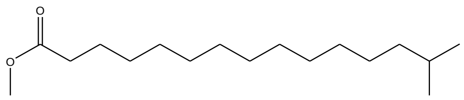
Figure 1. GC-MS Chromatograph of methanolic extract of tubers of *Pindaconcanensis*



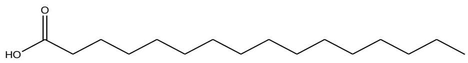
Isopsoralen (RT 16.70)



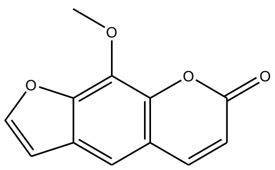
Ethyl iso-allocholate (RT 17.16)



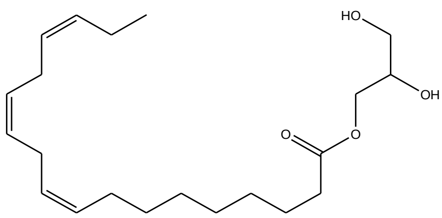
Pentadecanoic acid, 14-methyl-, methyl ester (RT 17.96)



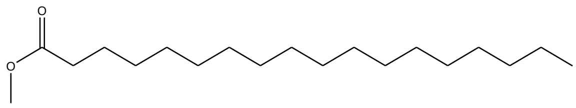
n-Hexadecanoic acid (RT 18.34)



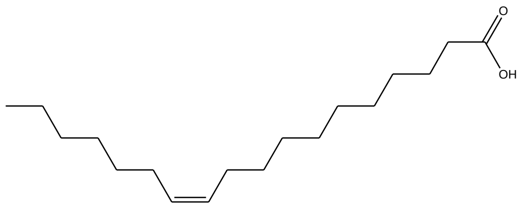
Methosalen (RT 19.32)



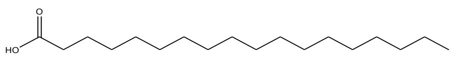
9, 12, 15,-Octadeterienoic acid, 2, 3-dihydroxypropyl ester, (Z, Z, Z)-(RT 19.65)



Methyl stearate (RT 19.85)

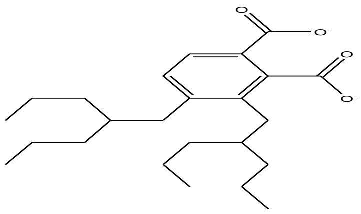


Cis- Vaccenic acid (RT 20.04)

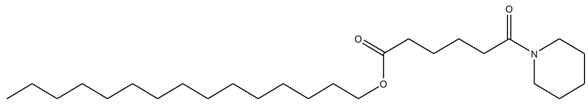


Octadecanoic acid (RT 20.23)

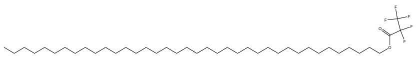
Heneicosylformate (RT 21.29)



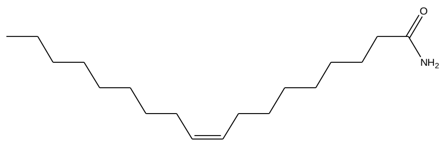
Phthalic acid, di (2-propylpentyl) ester (RT 23.46)



Adipic acid, monopiperidide, pentadecyl ester (RT 24.06)



Octatriacontylpentafluoropropionate (RT 24.53)



Octadecenamide (RT 25.34)

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The Effects of Three Different Low Costs It Thrives on Growth Performance Walking Catfish (Clariasbatrachus L.) in the Earthen Ponds

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ABSTRACT

Effect of three low-cost diets containing different levels of protein on growththe performance and economics of walking of catfish (Clarias batrachus) was studied. Clay ponds for 120 days. The experiment was performed in triplicate adjusting the level of protein in the diet, i.e. T1: protein level 30% (poultry viscera, 36.23% + mustard oil cake, 36.23% + rice cream, 27.52%), T2: 27% protein content (commercial pellet feed; breeding grade) and T3: protein level 24%(poultryviscera,25.22%+mustardoil cake,25.22%+riceshine,49.54%)) with three replicates for each. Stocking density (49400 fish/ha) and initial weight 30.6±3.55 g and length 15.7±0.79 cm of fish was the same in all treatments. Water quality parameters and fish growth parameters were monitored every fortnight. Average values of water quality parameters showed no significant differences ($P>0.05$) between treatments. The results showed it Fish growth was significantly affected by protein levels. SGR(% wt./day) and FCR values were significantly($P<0.05$) different between treatments. Feed with 30% protein level to the highest fish production ($P<0.05$) 3388.9±240.19 kg/ha/120 days. A simple economic analysis showed that the T1 treatment generated maximum net profit 7,13,502 ha/120 days. The findings so far have indicatedthisproductionandnetprofitweresignificantlyhigherintreatmentT1 (diet 1; 30% protein level) in the test.

Keywords: Lowcostfeed,walkingcatfish,net profit.

INTRODUCTION

Clarias batrachus, commonly known as "Magur", is well known for its tall nutritional value, excellent taste and commercial species in demand in Bangladesh. This fish were abundantly available in all types of freshwater habitats such as rivers, canals, forests, swamps and ponds. Fish breed in the shallowmarginal waters of ponds and ditches and natural depressions (Rahman, 1989; Bhuiyan et al., 1992) and flooded rice fields during the summer monsoon andrainyseason,usuallybetweenMayandAugust(Ahmedetal.,1985; Bhuiyan, 1964; Rahman, 1989). But due to over exploitation and various ecological changes in its natural environment, this species is very rare in nature today water bodies. C. batrachus inhibits in fresh water of

Bangladesh, India, Myanmar, Sri Lanka and Malaysia (Mookerjee & Mazumder, 1950). Commercial culture this fish is very popular in South Asian countries, viz. Thailand, Vietnam and India. Recently, there has been a growing interest in the breeding of Clarias batrachus L. in our country country. The unavailability of the fry of this catfish has already been resolved development of a reliable induced friction technique (Rahmatullah et al., 1983; Mollah, 1987) and larval culturemethodology(Mollah,1988;Alam&Mollah,1988; Mollah &Nurullah, 1988). Providing suitable feed comes first a requirement for better fish growth and production, and needless to say, a prerequisite for effective management practices. Magur culture would require formulation effective feed with optimal efficiency to meet protein requirements in fish farming during adolescence. Protein is the main component of the fish body, so there is plenty of it A food supply is essential for optimal growth. Protein is the most expensive macronutrient in fish diets (Pillay, 1990). So the amount of protein in the diet should be just enough for fish growth where excess protein in the fish diet can be wasteful and make diets unnecessarily expensive. Reducing feed costs could be a key factor successful development of aquaculture. Understanding protein needs during growth period is an important thing in fish farming management. Realization optimum protein level for cultured fish would help reduce costs and maximizefeed conversion efficiency(Charles et al.,1984; Sampath,1984; Chiu et al., 1987). Therefore, the aim of this study was to assess a low-cost feed that leads optimal growth, production and better profit of Clarias batrachus.

MATERIALSANDMETHODS:

Studylocationandpondfacilities

The experiment was carried out in nine earthen ponds with an area of 0.004 ha in the hatchery complex, Department of Zoology, Milliya arts, Science and Management Science College Beed for 120 days from August 1 to November 30, 2023. The ponds had a similar shape, depth, basin configuration including water supply equipment. The water depth was kept around 1.0 m using a pumping machine at regular intervals.

Experimentaldesign

The experiment was conducted with three treatments namely T1, T2, T3 three replications. Stocking density of Clarias batrachus in the pond below each treatment was 49,400 individuals ha-1 (initial weight 30.6±3.55 g and length 15.7±0.79 cm). Differences between treatments were in the protein level as shown in Table 1.

TableNo1.LayoutoftheExperiment.

Treatment	ProteinLevel	FeedComposition
T_1-Diet1	29%Protein level	Poultryviscera,35.23% +Mustard oil cake,36.23%+Rice polish 27.52%.
T_2-Diet2	26%Proteinlevel	Commercialpelletfeed; growergrade.
T_3-Diet3	23%Proteinlevel	Poultryviscera,24.22% + Mustard oil cake 24.22%+ Rice polish 48.54%.

Pond preparation: Water weeds were removed by hand. All unwanted fish were completely eradicated by applying rotenone at a dose of 2.5 g m-3. Lime (calcium carbonate) was applied at a rate of 247 kg ha-1 after one week of rotenone application. There were ponds fertilized with urea and triple superphosphate (TSP), each at a rate of 25 kg ha-1 and cow manure in a dose of 1000 kg ha-1 after three days of liming. The TSP was dissolved in plastic buckets for 10 to 12 hours before application.

Collection of fishes: The fingerlings of C. batrachus were collected from river of Godavari, Kaygaon Toka ofAurangabad district, Maharashtra

Stocking: Pronghorns were reared at a density of 49,400 individuals ha-1 in each treatment. The length and weight of approximately 10% of all juveniles from each pond were measured, it is recorded to estimate the initial stocking biomass and to adjust the initial feeding rate Fish.

Feeding of Fishes: The fish were fed diets with different protein contents as shown in Table 1 below at a rate of 5% of body weight per day. Components were analysed to their nearest composition and results are shown in Table 2. Feed requirement was calculated adjusted after taking fish once a month. Approximatefeedcompositioncomponentsandexperimentaldietswere analysed according to the methods described in Association of Official Analytical Chemists (AOAC, 1980).

Table2.ProximateCompositionofthedietcomponents

Proximate composition (%)	Diets			
	Commercial pelletfeed	Mustardoil cake	Poultry viscera	Ricepolish
Moisture	10.35	15.65	14.23	7.55
Protein	26.00	26.60	34.40	7.40
Lipid	12.56	11.54	21.40	3.05
Fiber	12.44	12.56	3.60	31.64
Ash	13.65	13.25	9.86	17.45
Nitrogenfree extract	24.50	28.62	14.08	29.77

*Nitrogen-freeextract(NFE)wascalculatedas100-(moisture+crudeprotein +crudelipid+ash+crudefiber)

Periodic fertilization: Urea and triple superphosphate (TSP) were applied in quantity to the ponds 6.25 kg ha-1 and cow manure 125 kg ha-1 at 7-day intervals throughout the growing season period.

Growth sampling of fish: Fish were sampled every fortnight using a seine net to assess their growth and health state. At least 10% of the fish from each pond were sampled for growth assessment trends and adjust the scroll speed. The length and weight of the fish caught were measured. Fish were handledcarefully to avoid stress during sampling.

Fish harvesting: The harvest was carried out in the month of November 2023 by drainage after completion court.

Water quality monitoring: Water quality parameter such as temperature (0C), transparency (cm), pH, dissolve oxygen (mg l-1), alkalinity, ammonia-nitrogen (mg l-1), were measured once a fortnight at 9:00-10:00 a.m. at the site of the pond to assess the physical and chemical condition of the pond. Water transparency was measured with a Secchi disc with a diameter of 20 cm. The secchi disk was immersed in water by eye and then the length was measured in cm using a measuring scale. Water temperature was recorded from different layers of the lake with a standard Celsius thermometer (0oC to 120oC). The pH of the water in the pond was measured by a direct reading pH meter (HACH) at the site of the pond. Dissolved oxygen, total alkalinityand ammonia-nitrogen in the water were measured using the HACH kit (model DR/2010, HACH, Loveland, direct reading spectrophotometer) at the site of the pond.

Growth parameters: Several parameters (weight gain, specific growth rate (SGR), survival rate, and production of fish) were used to evaluate the performanceoffishindifferenttreatments.Growthdatacollectedfromdifferent treatments during the experiment were calculated analyse using the following equations: Weight gain (g) = average final weight - average initial weight Survival rate (%) = Number of fish caught/ Number of fish landed x 100 Specific growth rate (SGR = [ln (final weight)-ln (initial weight) X 100] / culture period (days) (Brown, 1957)

Production of fishes: Production was calculated based on the average final weight of fish caught and was expressed in kg/ha. The formula is as follows: Production = number of fish caught x final fish weight.

Feed conversion ratio: Feed conversion ratio (FCR) was also calculated to evaluate feeding efficiencyfish with different treatments as follows: FCR= feed (dry weight)/ live weight gain

Economics analysis: A simple economic analysis was performed for each of them to estimate the economic return treatment. Total input costs and economic returns were calculated determined by the differences between the total return (from current market prices) and total input costs. The cost in taka per unit of production was calculated and was expressed as cost in Tk/kg fish produced.

Statistical analysis: For statistical analysis of collected data, one-way analysis of variance (ANOVA) was performed using SPSS (Statistical Package for the Social Sciences, assessment version-15.0). Significance was assigned at the 0.05% level. Average values were also in comparison, a significant difference can be seen through DMRT (Duncan Multiple Range Test) after Zara (1984).

RESULTS:

Waterquality monitoring: Averagevalues ofwaterqualityparametersfor120 days of nursery rearing C. batrachus are shown in Table 3. No significant ((P>0.05) differences were observed for all water quality parameters between treatments.

Growth and production performances of C.batrachus: Growth in weight and length, value of FCR, SGR and net productionofC.batrachus.The120-day rearing in different treatments is shown in Table 4. No significant (P>0.05) differences were noted in initial fish weight between treatments. The ultimate weight was observed in T1 (69.5±2.29g) and the lowest in T3 (57.6±1.46g). Final weight and net weight gain was statistically significant between treatments. Similarly, no significant (P>0.05) variation was noted in the initial length of fish between treatment. Length gains were not statistically significant. The highest increments in length was observed at T1 (15.1±0.75cm) and lowest at T2 (20.7±1.30cm). Specific growth rate (SGR, % of body weight/day), 0.95±0.26, 0.80±0.10 and 0.68±0.022 were found inT1,T2 andT3.Theratio of food conversation was found to be lowest at T1 (2.07) followed by T2 (3.57) and T3 (4.19) which were significantly ($P<0.05$) different between treatments. This experiment showed that T1 gave excellent results where fish feed on poultry entrails (35.23%) + mustard oil cake (36.23%) + rice gloss (27.52%). The recorded specific growth rate of treatments T1, T2 and T3 was 0.95±0.26, 0.80±0.10 and 0.68±0.022 respectively, which were significantly ($P<0.05$) different between treatments.Average daily gain (g) was foundto be highest for T3 (0.44±0.65), while the lowest was found in T1 (0.30±1.01). Survival rate duringexperimentalperiodwas 93.9%,92.21%and 93.21%inT1,T2andT3in that order, which were not significantly different between treatments. Medium net production was found to be 3388.9±240.19, 3132.6±388.45 and 2592±454.42 kg/ha in T1, T2 and T3, with the highest net production observed in T1 and lowest in T3. Net productions are significantly ($P<0.05$) differentfrom each other treatment.

Table3.Meanvalues(±SE)andrangesofwaterqualityparametersoftheponds under three treatments. The range of observed values is given in theparentheses.

Parameters	Treatments		
	T1	T2	T3
Transparency (cm)	33.75±2.05 (28-41)	35.15±1.55 (32-41)	34.65±1.88 (31-40)
Temperature(^{0}C)	31.33±3.5 (28.1-35.0)	31.21±2.67 (27.8-35)	31.33±1.89 (28.0-35
pH	7.55±0.45 (7.0-8.2)	7.65±0.40 (6.6-8.0)	7.70±0.39 (7.3-8.8)
DO(mg1^{-1})	5.60±0.35 (4.72±6.6)	5.55±0.29 (3.80±7.8)	5.40±0.39 (3.5±7.09)
Totalalkalinity (mg1^{-1})	133.20+-20.65 (87.1+-133)	150.32+-11.09 (112-187)	152.45+-7.66 (137-165)
NH3-N(mg1-1)	0.013+-0.006 0.0-0.039	0.017+-0.011 (0.001-0.051)	0.013+-0.002 (0.005-0.034)

Figuresinthesamerowhavingsamesuperscriptsarenotsignificantlydifferent

Table 4. Growth, survival and production performance of C. batrachus among the treatments

Parameters	Treatments		
	T1	T2	T3
Initialweight (g)	30.1±3.45	30.1±3.45	30.1±3.45
Finalweight(g)	69.5±2.29	63.9±3.35	57.6±1.46
NetgainWeight(g)	39.4±1.16	33.8±0.10	27.5±1.99
Initiallength (cm)	15.1±0.75	15.1±0.67	15.1±0.45

Finallength(cm)	21.5±0.70	20.7±1.30	20.7±0.90
Netgainlength(cm)	6.4±0.05	5.6±0.63	5.6±0.45
FCR	2.07	3.57	4.19
SGR%(g.day)	0.95±0.26	0.80±0.10	0.68±0.022
SurvivalRate(%)	93.9±1.51	92.21±1.85	93.21+-2.52
NetProduction (Kg/ha)	3388.9±240.19	3132.6±388.45	2592±454.42

Figuresinthesamerowhavingsamesuperscriptsarenotsignificantlydifferent.

Economics analysis: The costs of different inputs and the economic returns fromfish sales varytreatments are summarized inTable 5.Total input costs and economic return per per hectare were significantly different between individual treatments (P 0.05). Cost of entry was lowest in T1 followed by T2 and T3. The net economic return was the highest this yearT1 and lowest inT3.The cost perunityieldrangedfromTk 165.5-240.50/kgwhichwassignificantly(P0.05) different between individual treatments. The highest was in T3 (Tk 240.50/kg) followed byT2 (Tk 206.70/kg) and T1 (Tk 165.5/kg). So does the net profit per unit yield was highest in T1 (208.54 Tk/kg) and lowest in T3 (134.41Tk/kg), which was significantly different between treatments. Cost-benefit ratio were calculated as 1:1.40, 1:0.79 and 1:0.51 with treatments T1, T2 and T3, respectively

Table 5. Input cost and economic returns from C. batrachus for 120 days in ponds of three different treatments

Components	Treatments		
	T_1	T_2	T_3
Fingerlings(Tk/ha)	4,33,550	4,33,910	4,33,910
Feedcost(Tk/ha)	88,900	1,68,230	1,46,250
Miscellaneous(Tk/ha)	51,800	51,800	51,800
Totalcost(Tk/ha)	574,420	6,54,011	6,32,011
Totalreturn(Tk/ha)	12,87,902	11,90,450	9,86,185
Netprofit (Tk/ha)	7,13,502	5,36,435	3,54,001
Costperunitofyield(Tk/kg)	165.5	206.70	240.50
Netprofitperunitofyield (Tk/kg)	208.54	169.26	134.41
Costandbenefitratio	1:1.40	1:0.79	1:0.51

Figuresinthesamerowhavingsamesuperscriptsarenotsignificantlydifferent

DISCUSSION:

Water quality parameters Average values of physico-chemical parameters for theexperimentalperiodare showninTable3.Allwaterqualityparameterswere within the range suitable for fish culture as reported by Boyd (1982), except for water temperature which was slightly higher from a suitable range (25-30oC); this may be due to the low rainfall and large range climate change in northern Bangladesh. Rahman (1999) found water temperature ranged between 25.5°C and 30.0°C, which is favourable for fish breeding. Viveen et al. (1985), Sarkaret al. (2005) and Haque & Mazid (2005) recorded a range of temperatures and pHwaterbetween20-30°Cand6.5to8.0;28-31oCand6.85-7.03and24-33.9oC and 6.62-7.85, respectively in catfish rearing ponds, which is more or less similar to current findings. Clay (1979) reports temperature preference in African catfish juvenile was found to be 32.71±1.5oC. Britz & Hechet (1987) reported higher growth rates were obtainedbetween 25 and 33 °C and were best at 30 °C. Boyd (1998) recommended transparencybetween 30 to 45 cmsuitable for fish farming. Wahab et al. (1995) suggested that the transparency of production water should be 40 cm or less. Dissolved oxygen values obtained fromthisstudyagreefindingsofHaque&Mazid(2005)whoreportedDO ranged from2.15-6.74 mg/l-1.Total alkalinityinthisstudystronglyagreed with thefindings Hossainet al.(2007),Haque&Mazid(2005),Rahman (1999),who reportedvalues ranges from125 to147,41.0-208.0 mg/l-1 and 71.0-175.0 mg/l- 1, respectively. According to Boyd (1982), total alkalinity should be more than 20 mg l-1 in natural fertilized ponds. Wahab et al. (1995) and Milstein et al. (2009) reported NH3-N from 0.09 to 0.99 mg/l and 0.6 to 0.29 mg/l, respectively. So focus ammonia-nitrogen of this study were within acceptable limits.

Growth and production performances of C. batrachus Dietary protein is always considered of paramount importance in fish feeding (Jauncey & Ross, 1982), therefore sufficient protein in the diet is necessary for rapid absorption growth (Lovell, 1989). Stands of C. batrachus obtained from the experiment showed that growth rate varied with different feed containing different proteins Inthisexperiment,meanfinalweightsandlengthswere70.2±2.34gand21.1±0.74cm,64.6±3.35gand20.3±1.23cm and57.7±1.49gand20.5±0.96 cm in T1, T2 and T3. The net weight gain of individual fish in T1 was higher (39.6 g) than treatments T2 (34.0 g) and T3 (27.1 g). There were weight gains statistically significant (P<0.05) between treatments. Highest weight gain and were observed in T1, may be due to the delivery of a high-quality protein supplement feed. The best results were obtained where 30% protein was supplied to the fish supplemental diet followed by a 27%, 24% protein diet supports this finding Chuapoehuk (1987) who conducted an experiment with30, 35 and 40% protein diets and observed that a 30% protein diet produced optimal growth, but Mollah & Hossain (1990) tested different diets containing 30% 34.7%, 39.5%, 44.1% and 48.9%. of protein in dry weight and reportedthat 39.5% protein is optimal in the diet commercial breeding of Clarias batrachus. Rahman et al. (1987) worked on feed formulation of original raw materials forintensive catfish farming and reported that 45% crude protein gave thebestresults.However,theseresultscontradicteachotherwiththefindingsof Chuapoehuk (1987) and Mollah & Hossain (1990) who reported that 30% and 39.5% crude protein in the diet ensures optimal growth C. batrachus.

Specificgrowthrate(SGR,%ofbodyweight/day)as,0.92±0.21,0.83±0.10and 0.70±0.025 werefoundinT1,T2 andT3.TheSGRgraduallyincreased increase in protein levels. Significantly highest specific growth rate (SGR) in T1 may be due to the fact that the fish effectively utilized the supplied enriched feed with 30% protein. The survival rate (%) of C. batrachus in different treatments was quite high from91.25±2.57 to 94.5±1.56%, which was a similar range (83.33 to 97.13%) noted by Mollah & Nurullah (1988).The highest survival rate is found intreatmentinT1,whenfisharefedafeedcontaining30%protein.TheFCR values in this study ranged between 2.05 to 4.14, which was significantly (P<0.05) different between individual treatments. The lowest value wasrecorded in T1 (2.05) with diet-1 where fish are fed 30% protein feed T2 (3.62) and T3 (4.14). A low FCR value is an indicator of better food utilization effectiveness of formulated feed. In this study, the lowest FCR values were (2.02). obtained in fish fed a diet containing 30% protein in T1 indicates good fish growth between the three protein levels. Haque & Mazid (2005) reported a comparatively lower value of FCR when using BFRI formulated feedcontaining 30.44%crude protein.The FCRvalueinT3 was alothigher than the findings of Haque & Mazid. (2005) maybe due to low protein levels (24%) and less use of feed. The specific growth rates of C. batrachus were significantly influenced by protein levels in the diet. The SGR value in T3 was very low (0.70). A significantly higher ($P<0.05$) SGR (0.92) was found in T1. Survival rates during the experimental period were not significantly different between them ($P>0.05$). treatment. Net production ranged from 2595.2 to 3389.4 kg/ha different treatments which were much higher than the findings of Haque & Mazid (2005),who recorded total productionintherangeof 1398.08to 2145.34 kg/ha, may be due to landing of large fish. The highest net productions were observed in T1 with poultry offal and rice varnish as dietary supplement and lowest in T3. Net production differs significantly between treatments (P0.05).

Economics Along with increasing production, the purpose of aquaculture practicesistoobtainaprofit.Wybanetal.(1988)reportedthatstockingdensity, growth rate, survival and market price is the most sensitive factor for increasing profit. After spawning feed price they represent the highest operating costs and have a positive relationship with net profit between treatments. The total input costs and economic return per hectare were significantly different ($P>0.05$) between treatments.The entry price was the lowest T1 and then T2 and T3.The net economic yield was the highest in the year (Tk 7,13,542/ha). T1 and the lowest (Tk 3, 54,061/ha) in T3. The net economic return was much higher than the findings of Haque & Mazid (2005) who obtained net profit ranged from 1,15,047 thousand/ha to 2,71,178 TK/ha may be due to higher production and high market fish prices. The cost per unit yield ranged from Tk 169.4 to Tk 243.57/kg, which was significantly ($P<0.05$) different between individual treatments. The highest costs were in T3 (Tk 243.57/kg) followed by T2 (Tk 208.76/kg) and T1 (Tk 169.4/kg). So does the network profit per unit yield was highest in T1 (210.52 Tk/kg) and lowest in T3 (136.42 Tk/kg), which was significantly different between treatments ($P<0.05$). Costs a the benefit ratiowas 1:1.24, 1:0.82, and 1:0.56 between T1,T2, and T3, respectively. The use of cheap feed for farmed fish has great potential for reducing the amount of feed costs without affecting the rate of growth and yield. Considering the growth performance, FCR value, total production and net profit, the best result was obtained fromT1 s Diet-1. Therefore, diet-1 containing poultry offal, 36.23% + cake with mustard oil, 36.23% + rice polish, 27.52% according to the indication of a suitable diet for the culture of C. batrachus. Further studies using different protein sources are needed to find the most suitable one and an economically viable diet for the species.

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Biochemical Estimation of Cestode Parasite in Fresh Water Fish Mastacembelus Armatus

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ABSTRACT

Parasitic biochemistry is an evolving field that has gained significant attention alongside the increasing focus on tropical diseases. Historically, parasitologists have had to integrate biochemical techniques to keep up with advancements in the field. This research often involves analysing biomolecules such as proteins, glycogen, and lipids in both parasites and the intestines of infected and non-infected hosts. Recent studies comparing cestode parasites, specifically Senga sp., to the intestines of their hosts reveal some interesting findings. It was observed that Senga sp. has lower concentrations of proteins and glycogen compared to both infected and non-infected host intestines. Conversely, the lipid concentration in Senga sp. is higher relative to that in the host intestines. Additionally, the concentrations of proteins, glycogen, and lipids are found to be higher in non-infected intestines compared to infected intestines.

Keywords: Biochemical estimation, Cestodes, Mastacembelus armatus.

INTRODUCTION

Fish are often referred to as "gold in the water" due to their significant economic value and their role in providing high-quality protein to the growing global population. However, issues such as malnutrition are increasingly prominent, and fish are not immune to these challenges. One major concern is the damage caused by tapeworm infections, which affect both fish and humans. Cestodes, or tapeworms, which inhabit the digestive tracts of vertebrates, rely heavily on glucose as a crucial energy source (Mishra et al., 1991). Research has shown that cestodes possess substantial reserves of carbohydrates and are adept at metabolizing them (Daugherty, 1966; Fairbairn, Werthein, Harpur, & Schiller, 1961; Markov, 1939; Read & Rothman, 1957b). It is widely accepted that these stored carbohydrates are primarily in the form of glycogen (Read, 1949b).

Proteins play a crucial role in a variety of biological functions and are widely distributed throughout organisms. Despite their diverse roles, there is no universally accepted classification system for proteins. One of the largest categories of proteins is enzymes, which provide a significant nutritional resource for cestodes (tapeworms). These parasites utilize different amounts of protein to generate energy. According to the literature, cestodes can only effectively adapt to a parasitic lifestyle when protein, which typically constitutes 20–40% of their dry weight, is available (John Barrett, 1981). Additionally, studies have observed that lipid concentrations increase in older proglottids, the segments of tapeworms (Brand and Van T., 1952).

The glycogen content in various helminths can vary significantly depending on their habitat, although their nutritional needs may differ. For cestodes, which reside in the alimentary tracts of vertebrates, glucose is a crucial energy source (Mishra et al., 1945). These parasites have a substantial capacity for storing and metabolizing carbohydrates. Research indicates that cestodes accumulate large amounts of stored carbohydrates (Daugherty, 1956; Fairbairn, Werthein, Harpur, & Schiller, 1961; Markov, 1943; Read & Rothman, 1957b). It is generally believed that these stored carbohydrates are primarily in the form of glycogen (Read, 1949; Reid, 1942).

Lipids play a crucial role in cestodes, serving as the primary concentrated form of energy storage. They are also essential for cellular structure and various biochemical processes. Studies have shown that older proglottids, the segments of tapeworms, have a higher lipid content (Brand and Van T., 1952).

The current study focuses on the biochemical analysis of *Senga* sp., a cestode parasite found in *Mastacembalus armatus*.

MATERIAL AND METHODS

Sample collection- The worms were collected from the intestine of the freshwater fish *Mastacembalus armatus* and subsequently washed with distilled water. After washing, the worms were dried on blotting paper to eliminate excess moisture. They were then transferred to a watch glass and weighed using a sensitive balance. The worms were dried at 50–60°C for 24 hours, and the dry weight was recorded.

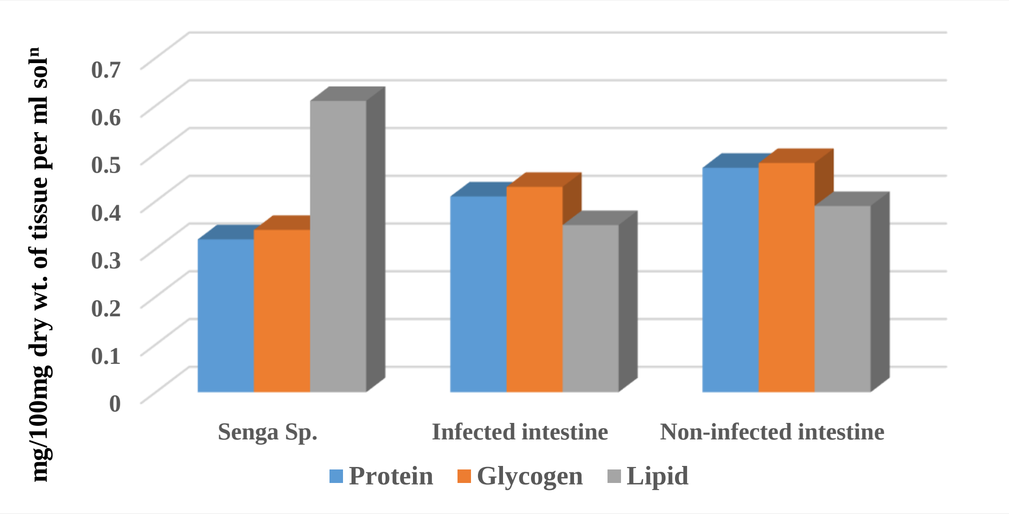
Biochemical estimation- The protein content in the cestode parasites was estimated using the Lowry method (1951). Glycogen content was determined using the method described by Kemp et al. (1954), and lipid content was assessed using the Folch method (1957).

RESULT AND DISCUSSION

Table no. 1:- Biochemical estimation of Senga Sp. species from Fresh water fish *Mastacembalus armatus*.

Name of Parameter	*Senga* Sp.	Host intestine	
		Infected	Non-infected
Protein (mg/100mg dry wt. of tissue per ml sol^n)	0.32 ±0.017	0.41±0.024	0.47±0.012
Glycogen (mg/100mg dry wt. of tissue per ml sol^n)	0.34±0.032	0.43±0.028	0.48±0.024
Lipid (mg/100mg dry wt. of tissue per ml sol^n)	0.61±0.029	0.35±0.037	0.39±0.033

Graph No. 1:- Biochemical estimation of Senga Sp. species from Fresh water fish *Mastacembalus armatus*.



The biochemical analysis of *Senga* sp. and the host intestine (both infected and non-infected) revealed notable differences in protein, glycogen, and lipid content. *Senga* sp. exhibited lower protein and glycogen levels compared to the host intestines, with non-infected intestines showing the highest concentrations of both proteins and glycogen.

Specifically, *Senga* sp. had a protein content of 0.32 ± 0.017 mg/100 mg dry weight of tissue per ml solution, while the protein content in the infected and non-infected host intestines was 0.41 ± 0.024 mg/100 mg dry weight of tissue per ml solution and 0.47 ± 0.012 mg/100 mg dry weight of tissue per ml solution, respectively.

Similarly, glycogen levels in *Senga* sp. were 0.34 ± 0.032 mg/100 mg dry weight of tissue per ml solution, whereas the infected and non-infected host intestines had glycogen concentrations of 0.43 ± 0.028 mg/100 mg dry weight of tissue per ml solution and 0.48 ± 0.024 mg/100 mg dry weight of tissue per ml solution, respectively.

In contrast, *Senga* sp. had a higher lipid content of 0.61 ± 0.029 mg/100 mg dry weight of tissue per ml solution compared to the host intestines, where lipid levels were 0.35 ± 0.037 mg/100 mg dry weight of tissue per ml solution in the infected intestines and 0.39 ± 0.033 mg/100 mg dry weight of tissue per ml solution in the non-infected intestines.

These findings indicate that while *Senga* sp. has lower protein and glycogen levels, it accumulates more lipids compared to the host intestines, with the non-infected host intestines generally showing higher levels of proteins and glycogen.

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Effect of Low Frequency Electromagnetic Field on Bacteria : A Biological Approach to Understanding Cellular Responses

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ABSTRACT

The effect of expanding presence of electromagnetic field (EMFs) on living organism is topic of concern. In recent years low frequencies electromagnetic fields especially frequencies ranging 50 Hz to 60 Hz used to inspect the antibacterial effect. EMFs have been demonstrated to affect the stability of the genome, the development of bacteria, and antibiotic susceptibility. Although the exact molecular pathways causing these effects are unknown, they might have to do with modifications to metabolic status, chemical factors, and antibiotic response. The potential applications of EMFs in controlling bacterial contamination and infections are significant, particularly in the context of increasing antibiotic resistance. In order to fully understand the impact of electromagnetic fields (EMFs) on bacteria and investigate their possible therapeutic uses, additional investigation is necessary. This paper examines how electromagnetic fields (EMFs) affect bacteria, concentrating on the chemical processes that underlie these interactions.

INTRODUCTION

Our modern world is filled with electromagnetic fields (EMFs) and they have become one of the most prevalent and quickly expanding environmental factors and almost all living organisms are “immersed” in wide range of electromagnetic field, and interact with them. The impact of electromagnetic fields (EMFs) on biological systems has been a topic of discussion for a long time. Some studies found no noticeable biological impact (Chen Y, 2019) while others found that electromagnetic field (EMF), has a substantial impact.

The increased use of electric energy in industry, medicine, research, communication networks, and home electric appliances has resulted in an increase of orders of magnitude in the exposure of biological systems to electromagnetic fields across a broad frequency range stretching from 0 to 100 GHz (Hirata *et al.,* 2021). EMFs Research into the effects of magnetic fields spans several sectors, including those of medicine delivery, cancer treatments, water purification, and others (Zadeh-Haghighi and Simon 2022).

Effect on magnetic field on organisms is among the topics of discussion. (Brocklehurst and McLauchlan 1996). Therefore, it is both appropriate and important to evaluate the possible effects of man-made electromagnetic field on living organisms. Numerous attempts have been made to provide a molecular explanation for magnetic field effects. It has been demonstrated that magnetic fields can alter an organism's biological functions through changes in hormone concentrations, enzyme activity or ion transport through cell membranes, DNA synthesis or transcription, and other processes. One of the mostly discussed contemporary problems in the biophysics is whether low-frequency magnetic fields can affect living systems. Multiple studies show that magnetic fields can have negative effects on living organisms. Since all systems of a live organism from a molecular level to different organs show different degrees of movement, a combined form of electrical field and EMF is found within the live tissues. Over the past few decades, there has been a notable surge in the quantity of research conducted on the impact of magnetic fields on prokaryotes. The physiology of prokaryotes is studied in relation to static magnetic fields, low frequency electromagnetic fields, and pulsed electromagnetic fields. According to Moore's (1979) research, the strength and frequency of a magnetic field can either encourage or inhibit the growth of microorganisms. Bacteria are among the many different living that exhibit varying degrees of responsiveness to electromagnetic fields. Microbial species' shape, vitality, and growth in response to magnetic fields have also been studied. The development of bacteria has been shown to be affected by magnetic fields in a variety of experiments, with results indicating that the effect can range from inhibition to stimulation, depending on the intensity and frequency of the field (Bajpai *et al.,* 2012, Inhan-Garip *et al.,* 2011).

Many studies have investigated whether there are effects of electromagnetic field (EMF) or not *in vitro*. A lot of papers concerning this topic have been published in the last 20 years, but the results are very controversial. So, it becomes important to study every aspect of EMF affecting the molecular biology of bacteria. While opening new research areas to unravel the physiological outcomes of EMF, clearly show that EMF is a potential tool that can be used to overcome bacterial contamination and infections. Despite numerous hypotheses, it is still unclear how EMF affects cells; certain investigations suggest that the interaction may occur either at the cell membrane or inside the cell (Hosny et al, 2024). Numerous papers have been written about this subject over the past 20 years, but there is considerable disagreement in the findings. Therefore, it is crucial to thoroughly examine every aspect of how EMF impacts the molecular biology of bacteria in order to address these existing gaps.

Study of LF EMF on Bacterial cell:

Many researchers have worked on EMF using different bacteria and there are various research paper and reviews which support this research work. The biological effects of EMFs usage were considered in 1976 for the first time.

It has been well established that the wavelength, intensity, coherence, exposure time, type of bacterial cells, bacterial growth phase, and growth media composition all influence how well or poorly bacteria grow and respond to antibiotics.

It was found that the electromagnetic pulse evidently causes a fatal effect on *E. coli* cells suspended in buffer solution. ELF-EMF treatment significantly decreased the colony forming efficiency of Escherichia (Rodriguez et al. 2006).

(Fojt *et al.*, 2004) found that *E. coli*, bacteria adecarboxy and *Staphylococcus aureus* viability affected with the magnetic field (10 mT, 50 Hz). They also found that the decrease of the colony forming units (CFU) starts immediately after the magnetic field was switched on.

Both gram-positive and gram-negative bacterial strains, shown that ELF-EMF application resulted in a decrease in growth rate, which persists even after field application for almost all strains and has also caused morphological alterations (Inhan-Garip et al.,2011).

(Mei *et al.*, 2004) studied the inactivation of microorganisms by a pulsed magnetic field. (Yonemoto *et al.* 2003) studied the non-thermal sterilization by using the self designed generator of magnetic field. The results showed that the magnetic flux density which had the greater effect on *E. coli* was 1 T and it shows greater destruction rate of *E. coli*.

The Effects of magnetic fields are not bacteriostatic; the number of bacteria grows in culture of magnetic field exposure, but not more than the control culture and concluded that magnetic fields have no effect on the metabolism of the bacteria and previous experiments reported no changes in DNA structure due to magnetic field (Strasak et al., 1998; 2002).

E.coli, *Bacillus subtilis* and OP50 and this effect may be a kind of gene-dependence effect. Furthermore, this study also shown that ELF-EMF could cause notable DNA damage. The extent of DNA damage can be reduced through repeated serial passage and the damaged cause by ELF-EMF exposure might be a kind of gene toxic as per the continual stimulated and passage's results (S. Gu et al.,2012).

Extremely low frequency electromagnetic field (1 mT, 50 Hz, SMF and PMF) influences the synthesis of HSPs in such a way that ELF-EMF may seriously damage DNA. (Delcosta *et al.* 2006).

Industrial and Healthcare Application of EMF:

(Ikuesan and Balogun, 2022) investigated the impact of electromagnetic field (EMF) treatment on bacterial population and physicochemical characteristics of cassava wastewater. In this study they identified Gram positive and Gram negative bacterial genera isolated from wastewater. The results also indicate that, depending on the intensity and length of the EMF exposure, treating a wastewater sample with EMF significantly decreased the bacterial load and physicochemical parameters of the sample. Indicating that using electromagnetic fields to improve wastewater's physical, chemical, and biological quality pretreatment shows promise as a practical, non-invasive, and environmentally friendly approach before discharge into the environment and concludes that EMF has good bactericidal potential, modifying the physicochemical properties of the wastewater thereby reducing risk of infection with potential pathogens as well as harmful chemical if wastewater is directly release into environment.

The effluents from the food and dairy industry are grossly contaminated with pathogenic bacteria hence there is a need for treatment of this effluence before releasing into the water bodies or the environment. Electromagnetic field treatment proved to be effective in reducing the load of isolated pathogenic bacteria from food and dairy industrial effluents. EMF treatment changed the physical and chemical characteristics of the wastewater, making it less harmful than the untreated wastewater. This suggests EMF can be used in treatment of chemically contaminated effluents (Ilemobayo and Teniola, 2022).

Effect of EMF on Bacteria for medical use:

External EMF has the ability to alter bacterial membrane processes, metabolic state, and their response to chemical factors and antibiotics. The influence of EMF exposure on bacterial growth, susceptibility to antibiotics, and bacterial genome has been a topic of great interest in healthcare settings and for food sterilization methods to maintain food quality (Fang J et.al. 2006). A recent discovery revealed that specific frequencies of magnetic and electric fields can affect bacterial cells, with effects ranging from stimulation to inhibition (Masood et.al. 2020).

Treatment with coherently sequenced electromagnetic fields, appears to provide an effective alternative for the symptoms of chronic bacterial cystitis caused by drug-resistant E. coli and also demonstrates a potent antibacterial effect (D'Agostino and Marelli, 2024).

Importance of EMF study on bacterial cell:

In recent decades, there has been a notable increase in research on the impact of electromagnetic fields (EMF) on bacteria. Studying the effect of EMF on bacteria we can understand its cellular behaviour, membrane structure and communication processes. EMF can also be used to develop antimicrobial therapies and potentially combating antibiotic resistant bacteria. It can also play important role in cancer treatment and food safety. EMF can also be useful in bioremediation, biofule production and food production. By exploring the EMF study on bacteria researchers can discover the new opportunities in various fields like medicine, biotechnology and environmental science which can benefit our society.

CONCLUSION:

Effect of electromagnetic field on bacteria is a complex and topic of deep discussion. EMF effects are frequency and intensity dependant and may causes changes changes in membrane function, metabolism and receptivity to chemical signals and antibiotic succeptibility. EMF is instructive and ecofriendly approach for improving physical, chemical and biological quality of wastewater and industrial discharge.

So it is become important to understand the relation between EMF and bacteria to overcome the exixting gaps and utilise the potentiality of EMF in different fields. There is need of moreover research to understand the primary mechanisms of these effect and utilise the potential of EMF in therapeutic application for controlling bacterial contamination and infection..

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An Impact of Environmental Parameters on Atmospheric Concentration of Curvularia over Sunflower at Ashti, Dist. Beed

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ABSTRACT

The incidence of Curvularia Boedijn was recorded separately during exploration of air born microbes over Bajara fields for two consecutive crop seasons during the year 2013 & 2014.Aerobiological studies were carried out by using continuous volumetric Tilak air sampler spore trap in order to estimate an impact of weather conditions on atmospheric concentration of Curvularia. The daily weather record of parameters like temperature, relative humidity, wind velocity & rainfall was recorded. The significance of Curvularia as aeroallergens is considered. The Curvularia Boedijn were observed in the atmosphere around the season This spore type was found to be the most dominant as compared to other spore types in order to their concentration . The spores of Curvularia being universally dominant, during the present investigation occurred in clumps. Reports from different center from India & abroad about the occurrence of the spore occurred during monsoon with high humidity & low temperature. The present paper deals with the relationship between the incidence of Curvularia spore & prevailing weather conditions.

Key Words: - Air Sampler, ConcentrationCurvularia, Meteriological Data

INTRODUCTION

The spore of Curvularia has been found to be always dominant in many parts of the world. The no occurrence of this spore in large number has been recorded by Hara and Durham 1939, Gregory et al 1957, Gregory 1961, Turner 1966 from Japan, Ress 1964 from Australia, De Meen 1955 from New Zealand, Gregory and, Harvey 1967, Meredith 1962 from Jamaica, and West Indies. Hirst (1953) showed that the pollen and spores of Curvularia and other similar types are mostly removed by prolonged rain. Hamilton (1959) found appreciable decrease in there number when it was raining, but Ainswarth (1952), Gregary (1954) demonstrated a transient increase in concentration of Curvularia when the rain started.

Harvey 1970 found that many spores were released in wet than in dry air, number released in humid air were generally intermediate between those of wet and dry sample. Tilak and Shrinivasulu (1967) recorded number of Curvularia spores from August to November, which is a usual record. Tilak & Shrinivasulu 1967 during their aerobiological investigation at Aurangabad from August to November they could not catch Curvularia, which is an unusual record. Tilak & Kulkarni 1970 during their aerobiological investigation at Aurangabad from August to November they could not catch Curvularia, which is an unusual record.Agarwal & Kulkarni at Delhi recorded the spore of Curvularia while dealing with the role of fungal spore in etiology of respiratory allergic disorders.

The airspora studied over rice fields have been reported by many workers from South India (Vithal and Krishnamurthi 1981, Atluri, 1988 b, c.). The presence of fungal propagules, volatiles and mycotoxins in the air can cause a health hazard in all segments of the population (Kakde et al. 2001). Some more recent works have using volumetric methodology for sampling periods of one year or less (Diez et al. 2006). Mali et al (2008) during aerobiological investigation at Ahmednagar spore type is recorded this spore type as dominant.

MATERIALS AND METHODS.

In the present investigation an exploration of air born spore of Curvularia was undertaken over the fields of Bajara. Tilak continuous volumetric spore trap was employed for the present studies. Sampler was installed at a constant height of 1 meter above the ground level The air sampler was operated over the Bajara field for two *kharif* season at Ashti, Dist Beed (MS). The instrument was operated from 26 September 2013 to 15 January 2014 in the first Rabbi Season & 10 October 2014 to 23 January 2015, in the second *Rabbi* season. The slides were prepared, scanned as per the method described by Tilak & Shrinivasulu for estimating the total monthly and daily concentration of the spores of *Curvularia*. Diseased material collected, was brought to the laboratory for the microscopic examination.During the period of investigations, the day to day meteorological data was also recorded and statistical analysis of the data was carried out.

RESULTS AND DISCUTIONS:

The spore of *Curvularia* are one or two celled, variable in shape and size ,ovoid cylindrical or irregular , some typically lemon shaped 4-24 X 2-4.7 um with or without constriction at septum , conidia in cluster ,dark sub hyaline to pale brown . These spore were found to be the most of abundant spore type as compare to other air born micro biota in order of their concentration and hence dominated aerial population

In the high incidence of spore *Curvularia* in the air was due to the capability of producing those spores directly on hyphae copious fruiting ability with passive mechanism of spore liberation. Beside, the gental wind current , natural or artificial mechanical disturbances force the spore of *Curvularia* liberate in the air in an enormous amount , as it was already suggested by Gregory (1964)

In the first crop season the highest monthly concentration was (oooooo/M^3) was observed in the month of October 2013 when there was 90.7 % relative humidity 4.6 Kms / Hr. wind velocity and 294.2 mm rainfall. In second season the highest monthly concentration (36750/M $^{\text{of air}}$) was observed in the month of December 2014. When there was record of moderate range of temperature 21.02, 28.08^{0}C 64- 93% Relative humidity and 280.5mm rainfall.

The day, on which there was record of rain and high wind velocity, the concentration of the spore of *Curvularia* was found to be considerable reduced. Which may be due to the washing of effect, Never the less, during the first season the highest spore catch (2800 /m^3 of air) was recorded on 1st Sept. 2014, there was record of 29.25°C of mean temperature, 75.5 % relative humidity 5.2 km/hr wind velocity.

These finding have clearly brought out that there was a closed relationship between the environmental parameter. Availability of the substratum for the copious growth and the dispersal of the spore in the atmosphere

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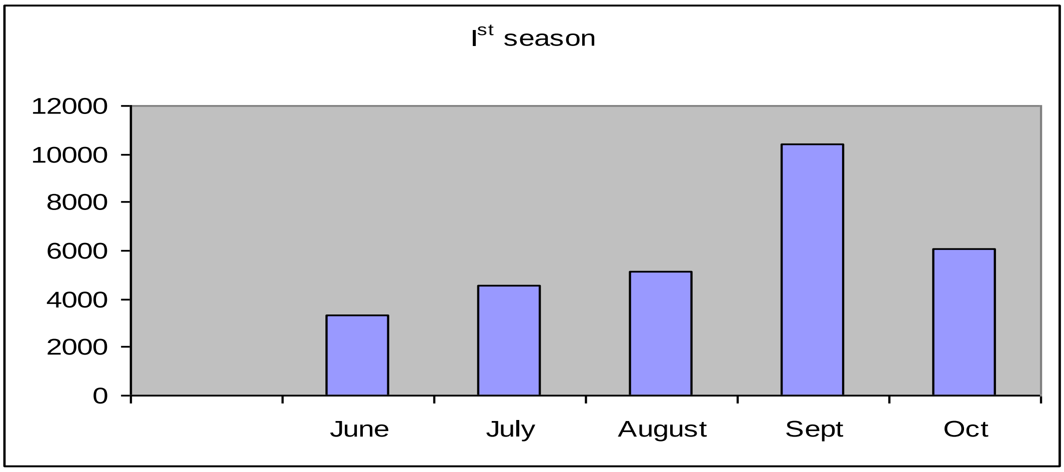
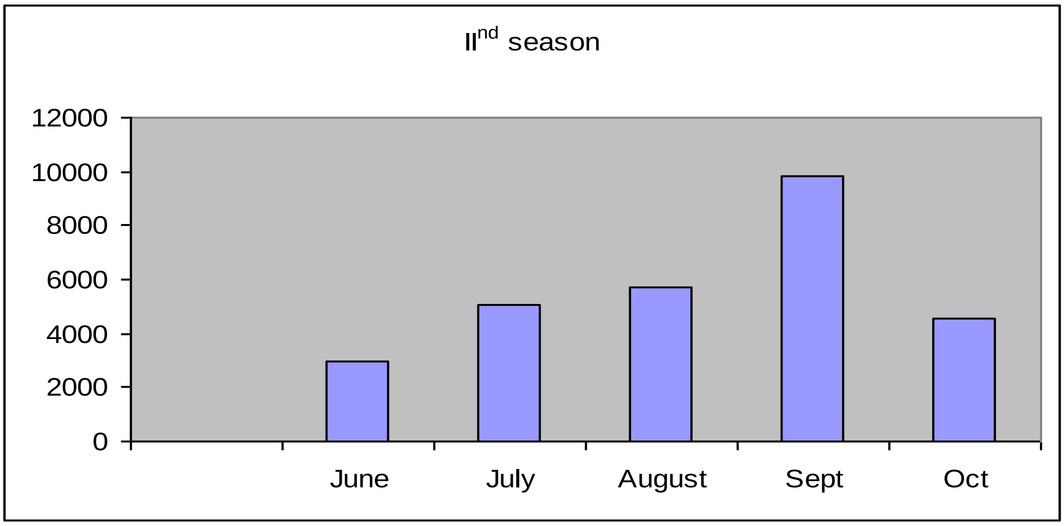
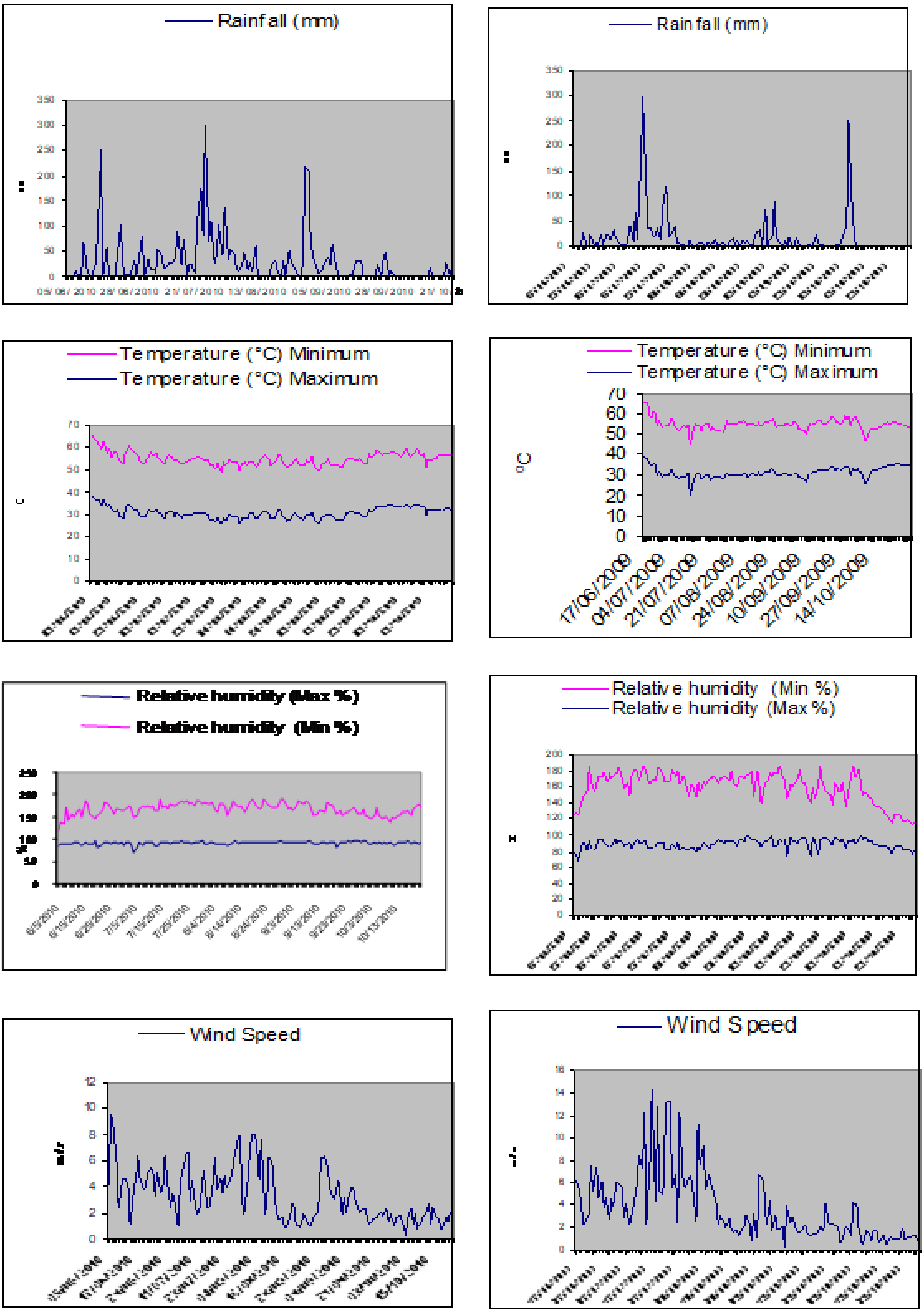




HISTOGRAMS INDICATING THE MONTHWISE VARIATION OF CURVULARIA



METEROLGICAL DATA SHOWING GRAPHICAL REPRESENTATION

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Impact of Pollution on Loss of Biodiversity : A Review

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ABSTRACT

Biodiversity terms is mostly used to describe the wide variety of plants, animals and microorganisms, the genes they contain and the ecosystem they form. It has played the important role in the survival and welfare of human populations. It has great impact on the function of an ecosystem by providing many services like nutrients and water cycling, soil formation and retention, resistance against invasive species, pollination of plants, and regulation of climate. But the three-dimensional biodiversity persists numerous threats, including habitat loss, overexploitation, invasive alien species, climate change, pollution, eutrophication, overfishing, soil erosion, soil degradation, poverty and loss of green forest pollution, and climate change. Out of these the pollution has great impact on the loss and degradation of the biodiversity.

Environmental pollution remains the greatest global problem facing humanity and a major environmental cause of morbidity and mortality. Pollution has the direct impacts biodiversity which effect on exposed organisms, manifesting either as overt toxicity or as more subtle, non-lethal effects, as well as a variety of indirect influences, such as changes in species interactions, trophic chains, or abiotic factors. Human activities related to urbanization, industrialization, mining and exploration are at the forefront of global environmental pollution. Despite global attention to pollution, its impact is still being felt due to its severe long-term effects. As biodiversity loss is accelerating at an unprecedented rate, the scientific community should respond to trend through joint efforts addressing the threats to biodiversity posed by chemical pollution.

So the proper environmental education should be given, limiting the release of specific pollutants, etc. can help to conserve and maintain the biodiversity in the nature. Nevertheless, the strict implementations of environmental laws and regulations at different level i.e. local, national, and international levels is the remedy to protect the biodiversity from pollution.

Keyword: - Effect of Pollution, loss of biodiversity

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Sustainable Nursing Practices : Linking Biodiversity Conservation and Biomedical Waste Management in Neonatal Care

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ABSTRACT
Sustainable nursing practices are critical in neonatal pain management, where both the well-being of newborns and environmental responsibility must be prioritized. This paper explores the intersection of biodiversity conservation and biomedical waste management within the context of neonatal care. Neonates, due to their vulnerable physiological state, require both pharmacological and non-pharmacological pain management strategies that often involve the use of single-use medical supplies, contributing to significant biomedical waste. By integrating sustainable nursing practices, including the use of eco-friendly materials, proper waste segregation, and the promotion of non-pharmacological interventions such as kangaroo care and breastfeeding, healthcare providers can reduce the environmental footprint of neonatal care. Additionally, educating nursing staff on sustainable waste management, involving families in neonatal pain relief, and utilizing digital tools for pain assessment are essential strategies for minimizing environmental impact. This paper highlights the importance of aligning neonatal care practices with environmental conservation efforts, ensuring that healthcare advances do not compromise ecosystem health. In doing so, the healthcare sector can contribute to global biodiversity conservation while delivering high-quality, compassionate care to newborns.
Keywords : Nursing Practices, conservation, bio-medical waste management, digital tools, neonates.

1. Introduction:

Sustainable nursing practices are becoming increasingly crucial in modern healthcare systems, not only to enhance patient care but also to address broader environmental challenges, including biodiversity conservation. With the rising awareness of the environmental impact of healthcare, biomedical waste management has emerged as a key concern, particularly in neonatal care, where vulnerable populations like newborns require intensive and specialized care. This introduces a unique intersection between neonatal pain management, healthcare sustainability, and environmental responsibility.

Healthcare facilities generate significant quantities of biomedical waste, much of which can pose serious environmental and health risks if not managed properly. The improper disposal of biomedical waste can result in contamination of soil, water, and air, leading to adverse effects on local ecosystems and biodiversity . Additionally, the toxic byproducts from incineration and chemical waste disposal can threaten wildlife, plants, and microorganisms, further disturbing ecological balance . Given the interdependence between human health and environmental health, it is essential for nursing professionals, particularly in neonatal care, to adopt sustainable practices that minimize environmental harm while optimizing patient care outcomes.

In neonatal care, pain management and treatment strategies often involve the use of pharmaceuticals, disposable medical devices, and other single-use items, all of which contribute to the generation of biomedical waste. Neonates, due to their fragile and developing systems, are more vulnerable to the potential impacts of improper waste management practices. The nursing profession, particularly in neonatal units, plays a pivotal role in addressing these challenges by advocating for and implementing sustainable healthcare practices, such as the proper segregation and disposal of waste, recycling programs, and the use of eco-friendly medical supplies.

To balance the demands of high-quality neonatal care and environmental protection, nurses must integrate the principles of sustainable development into their daily practices. This includes reducing waste, ensuring the safe disposal of hazardous materials, and educating healthcare teams on the importance of biodiversity conservation. Proper waste management not only mitigates environmental harm but also supports the broader goal of conserving biodiversity, which is essential for maintaining ecosystem services that human life depends upon.

Furthermore, the implementation of sustainable biomedical waste management practices aligns with global efforts, such as the United Nations' Sustainable Development Goals (SDGs), particularly SDG 3 (Good Health and Well-Being) and SDG 15 (Life on Land), which emphasize the need to improve healthcare while also protecting life on land and promoting ecosystem health . Nursing professionals are at the forefront of this initiative, ensuring that healthcare practices contribute positively to both patient health and the planet's ecological well-being.

By integrating sustainable nursing practices with effective biomedical waste management is vital for advancing neonatal care while preserving biodiversity. By adopting eco-conscious practices, nurses can protect fragile ecosystems and reduce the environmental footprint of healthcare systems. This synergy between nursing, neonatal care, and biodiversity conservation represents a progressive step toward a sustainable future in both healthcare and environmental protection.

2. Strategies Required During Neonatal Pain Management

Neonatal pain management is a crucial aspect of neonatal care, requiring careful strategies to ensure the safety, comfort, and well-being of newborns. Given the vulnerable state of neonates, it is essential to adopt both pharmacological and non-pharmacological approaches, focusing on minimal side effects while addressing the environmental impacts of healthcare procedures. Below are key strategies required during neonatal pain management, incorporating sustainability and effective biomedical waste management.

Pharmacological Approaches

Pharmacological methods are a cornerstone of neonatal pain management, involving the use of analgesics like opioids (e.g., morphine, fentanyl), non-opioid analgesics (e.g., acetaminophen), and local anaesthetics (e.g., lidocaine). These drugs must be carefully administered in neonates due to their immature metabolic and excretory systems, which can make them more susceptible to adverse effects. Proper dosing and monitoring are essential to avoid complications such as respiratory depression or long-term developmental issues.

From a sustainability perspective, the use of pharmaceuticals in neonatal care generates biomedical waste, including packaging, syringes, and unused medication. Hospitals and neonatal units should establish protocols for the safe disposal of pharmaceutical waste, ensuring that it does not contaminate local ecosystems. Using single-dose vials where appropriate, reducing overstocking of medication, and properly segregating pharmaceutical waste can reduce environmental impact while maintaining high standards of care.

Non-Pharmacological Approaches

Non-pharmacological interventions are increasingly being recognized for their effectiveness in neonatal pain management and can often be used alongside pharmacological treatments to minimize the need for drugs. Techniques such as swaddling, kangaroo care (skin-to-skin contact), breastfeeding, and non-nutritive sucking have shown to provide significant pain relief for neonates during minor procedures like heel pricks or vaccinations. These methods are non-invasive and pose no risk of waste production, making them environmentally sustainable options.

Moreover, non-pharmacological strategies reduce the reliance on medical supplies that contribute to biomedical waste. Implementing these methods as first-line interventions, where clinically appropriate, not only enhances neonatal comfort but also aligns with sustainable healthcare practices.

Minimizing the Use of Disposable Supplies

Neonatal care often involves the use of single-use, disposable medical supplies such as needles, syringes, catheters, and gloves. While necessary for infection control, the overuse of disposables contributes significantly to biomedical waste. Strategies to mitigate this include using eco-friendly, biodegradable materials for medical supplies, and encouraging the use of reusable equipment where safe and possible, such as reusable blankets in non-sterile procedures.

Nurses can also play a critical role in training healthcare teams to use only the necessary amount of supplies, preventing wastage, and ensuring proper segregation and disposal of biomedical waste. Additionally, hospitals can explore partnerships with medical supply companies that offer sustainable alternatives to conventional materials.

Pain Assessment Tools

Accurate pain assessment is crucial for effective pain management in neonates. Tools like the Neonatal Infant Pain Scale (NIPS) or the Premature Infant Pain Profile (PIPP) allow healthcare providers to evaluate pain based on behavioural and physiological indicators. These assessment tools are non-invasive and do not contribute to biomedical waste, offering a sustainable method of monitoring and managing pain.

Furthermore, the integration of digital pain assessment technologies, where available, can help minimize the use of paper-based documentation, aligning with broader hospital sustainability initiatives to reduce waste.

Education and Training for Nursing Staff

A well-trained nursing staff is essential for effective neonatal pain management. Nurses must be educated not only in the clinical aspects of neonatal care but also in sustainable practices. This includes training in the safe disposal of biomedical waste, the importance of minimizing pharmaceutical waste, and the adoption of non-pharmacological techniques. Nurses play a critical role in advocating for sustainable practices within neonatal units and can lead efforts to reduce the environmental footprint of healthcare procedures.

Educational initiatives should also emphasize the environmental impact of biomedical waste mismanagement, highlighting how sustainable practices can support both patient care and biodiversity conservation efforts.

Family Involvement in Pain Management

Engaging families in neonatal pain management strategies can improve outcomes and provide additional non-pharmacological support. Techniques such as kangaroo care or breastfeeding can be facilitated by family members under the guidance of nursing staff. These interventions not only alleviate pain but also reduce the need for medical supplies, contributing to waste reduction.

Educating families about the environmental implications of neonatal care and the importance of sustainable practices can foster a culture of environmental responsibility within the healthcare system. When families are aware of the hospital's efforts to conserve biodiversity and manage waste, they are more likely to support and participate in such initiatives.

Monitoring and Evaluating Environmental Impact

Continuous monitoring and evaluation of biomedical waste management practices are essential for ensuring sustainability in neonatal pain management. Hospitals should implement regular audits of waste production, segregation, and disposal in neonatal units, aiming to identify areas for improvement. Nursing staff can contribute to these efforts by tracking the usage of disposable supplies, medication waste, and the adoption of non-pharmacological pain management techniques.

3. Strategies for Bio-Medical Waste Management

Effective biomedical waste management requires a comprehensive, multi-faceted approach to ensure the safety of healthcare workers, patients, and the environment. By implementing strategic measures across different stages of waste generation and disposal, healthcare facilities can minimize risks while promoting environmental sustainability.

Waste Segregation at Source is one of the most important steps in managing biomedical waste effectively. It involves the separation of waste into different categories such as infectious, non-infectious, sharps, and chemical waste, using a color-coded system. This segregation ensures that waste is appropriately treated and disposed of, reducing the risk of contamination and improving the efficiency of waste management processes. By properly segregating waste at the point of generation, healthcare facilities can prevent the mixing of hazardous and non-hazardous waste, which can complicate treatment and disposal.

Minimization of Waste Generation focuses on reducing the overall amount of waste produced in healthcare settings. This can be achieved by promoting the use of reusable equipment, optimizing inventory management to prevent overstocking, and using eco-friendly materials in medical supplies. Reducing the use of single-use plastics and disposables wherever possible not only helps minimize waste but also lessens the environmental impact of healthcare operations. By focusing on waste minimization, hospitals contribute to sustainability while maintaining high standards of patient care.

On-Site Treatment of Waste is essential to reduce the volume and hazardous nature of biomedical waste before it is transported for final disposal. Methods such as autoclaving, incineration, microwave treatment, and chemical disinfection are commonly used to sterilize and neutralize infectious waste. On-site treatment ensures that the waste is rendered non-infectious, making it safer for handling and reducing the risk of contamination during transport. Each of these treatment methods must be chosen based on the type of waste and local regulatory requirements to ensure environmental compliance.

Waste Disposal and Transportation protocols must ensure the safe and secure movement of biomedical waste from the point of generation to disposal facilities. Biomedical waste must be properly packaged in sealed, labelled containers and transported in designated vehicles to prevent accidental exposure. Ensuring that transportation follows regulated guidelines reduces the likelihood of spillage, contamination, or accidents. Additionally, the use of well-maintained and regularly disinfected vehicles is crucial for safe waste management practices.

Safe Disposal of Sharps is critical due to the high risk they pose to healthcare workers and the environment. Needles, scalpels, and other sharp objects must be immediately placed in puncture-proof containers after use to prevent injuries and the spread of infections. Proper disposal of sharps reduces the likelihood of accidental needle-stick injuries, which are a major concern in healthcare settings, and ensures that these items do not pose a threat to the public or the environment.

Recycling and Reprocessing of certain biomedical waste categories, such as medical plastics and sterilizable instruments, can significantly reduce the amount of waste generated. By recycling materials like IV bags or reprocessing surgical tools, hospitals can reduce their environmental impact while lowering disposal costs. Choosing eco-friendly, biodegradable alternatives for disposable items also contributes to more sustainable waste management practices.

Education and Training for Healthcare Workers is crucial for the success of biomedical waste management programs. Regular training ensures that all healthcare personnel are aware of the correct waste segregation, handling, and disposal procedures. Continuous education on the importance of environmental sustainability helps foster a culture of responsibility in healthcare facilities, ensuring that staff members follow best practices and reduce waste generation whenever possible.

Monitoring and Auditing are necessary to ensure that waste management practices are being followed correctly and that any inefficiencies are identified. Regular audits help healthcare facilities stay compliant with regulatory requirements and provide an opportunity to improve waste management processes.

Monitoring waste generation and disposal data can also help hospitals identify patterns and implement more effective waste reduction strategies.

Adhering to Regulatory Compliance is essential for ensuring that biomedical waste is managed in accordance with local, national, and international guidelines. Compliance with regulations such as the Biomedical Waste Management Rules in India or similar frameworks globally helps healthcare facilities meet minimum standards for safety and environmental protection. Regular inspections and updates to waste management protocols are necessary to stay in line with evolving regulations and to avoid legal and environmental liabilities.

Public Awareness and Community Engagement are important for promoting the safe management of biomedical waste and building trust between healthcare providers and the public. By educating the community about the efforts taken to manage waste responsibly, healthcare facilities can encourage public participation in environmental conservation initiatives. Engaging with local communities can also help address concerns about the environmental impact of healthcare waste and promote broader awareness of sustainable practices.

Together, these strategies ensure that biomedical waste is managed in a manner that protects public health and the environment. By focusing on waste reduction, proper segregation, safe disposal, and compliance with regulations, healthcare facilities can minimize the risks associated with biomedical waste while contributing to biodiversity conservation and environmental sustainability.

4. Balancing Neonatal Pain Management and Biomedical Waste management: Biodiversity

Interweaving neonatal pain management and biomedical waste management is essential for advancing healthcare practices that are both patient-centred and environmentally sustainable. Neonatal care, particularly in pain management, involves the use of various medical supplies such as syringes, analgesics, and single-use materials, which contribute to biomedical waste. Properly balancing pain relief for neonates while minimizing the environmental impact of healthcare waste is crucial for maintaining both health and ecological integrity.

In neonatal pain management, pharmacological interventions like analgesics and non-pharmacological techniques such as swaddling or skin-to-skin contact are often used. These practices, though necessary, generate biomedical waste—syringes, gloves, vials, and other single-use medical supplies. To mitigate the environmental footprint, healthcare facilities must implement robust biomedical waste management strategies alongside neonatal care protocols. By focusing on waste segregation at the source, medical personnel can ensure that hazardous and non-hazardous waste is handled properly, preventing environmental contamination and safeguarding healthcare workers.

Minimizing waste generation in neonatal units can be achieved by opting for reusable equipment where possible, such as using cloth swaddles instead of disposable blankets. Furthermore, incorporating eco-friendly materials for neonatal care products, such as biodegradable syringes and medical plastics, can greatly reduce the waste produced during routine care. These practices not only reduce the hospital's environmental impact but also align with the broader goals of sustainability in healthcare.

In cases where disposable medical supplies are unavoidable, on-site treatment of biomedical waste, such as autoclaving infectious materials, ensures that waste is sterilized before disposal, reducing the risk of infection and contamination. Properly treating and disposing of this waste in accordance with regulatory compliance safeguards public health and biodiversity, ensuring that the medical care provided to neonates does not harm the surrounding ecosystems.

Moreover, education and training for healthcare staff is critical for integrating sustainable biomedical waste management practices into neonatal care. Nurses and neonatal caregivers can be trained in proper waste handling and encouraged to adopt non-pharmacological pain management techniques, which not only alleviate neonatal pain effectively but also reduce the reliance on single-use medical supplies, thus limiting waste generation.

By monitoring and auditing waste management practices in neonatal units, healthcare facilities can track the effectiveness of their waste reduction efforts and continually improve their sustainability initiatives. This interwoven approach not only ensures that neonatal pain is managed effectively but also that the broader environmental and public health concerns linked to biomedical waste are addressed.

5. Conclusion

This study highlights the crucial intersection between neonatal pain management and biomedical waste management, demonstrating that healthcare practices, particularly in neonatal care, must be both patient-centred and environmentally sustainable. The high demand for medical supplies in neonatal pain management, while essential for providing the best possible care for vulnerable infants, inevitably generates significant amounts of biomedical waste. However, with appropriate strategies—such as waste segregation, minimization of disposable supplies, the use of eco-friendly alternatives, and on-site waste treatment—healthcare facilities can effectively reduce the environmental impact associated with neonatal care.

Furthermore, non-pharmacological interventions, proper staff education, and regular auditing of waste management processes are key to fostering sustainable healthcare practices. Integrating these sustainable biomedical waste management practices with effective neonatal pain management ensures that the healthcare sector can meet both its immediate care responsibilities and its broader environmental obligations.

By implementing these strategies, healthcare providers can significantly minimize risks associated with improper biomedical waste disposal, protect biodiversity, and promote environmental conservation—all while delivering compassionate, high-quality care to neonates. This holistic approach, interweaving neonatal pain management and environmental stewardship, is critical for advancing healthcare systems that are both sustainable and responsible. The study concludes that healthcare facilities, particularly neonatal units, must continuously work towards sustainable practices to contribute positively to both human health and the preservation of the natural world.

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Conservation of Biodiversity : Need of the Hour in India, Challenges and Solutions

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ABSTRACT

India, home to a rich tapestry of biodiversity, faces significant challenges in conservation due to habitat loss, pollution, climate change, and overexploitation. This review explores the critical need for biodiversity conservation in India, outlining key challenges and proposing viable solutions. The review underscores the importance of strengthening protected areas, promoting sustainable practices, enhancing environmental awareness, and investing in research. A comprehensive table summarizes the main challenges, their impacts, and proposed solutions. Addressing these issues with a coordinated approach is crucial for the preservation of India's unique biodiversity and ecosystem services.

Keywords - Biodiversity Conservation, India, Environmental Challenges, Conservation Strategies, Ecosystem Management

1. Introduction:

Biodiversity is integral to the health of ecosystems and human well-being, providing essential services such as pollination, climate regulation, and water purification [1]. India, with its vast array of species and habitats, is recognized as one of the world's biodiversity [2]. However, the country faces multifaceted challenges in maintaining this biodiversity due to anthropogenic pressures [3].

2. Challenges and Solutions

Challenges in Biodiversity Conservation

Habitat Loss

Habitat loss due to deforestation, urbanization, and agricultural expansion is one of the most pressing threats to biodiversity in India [4]. The conversion of natural habitats into human-dominated landscapes leads to the fragmentation of ecosystems, adversely impacting wildlife populations and ecological processes [5].

Pollution

Pollution, driven by industrial activities, agricultural runoff, and inadequate waste management, severely impacts India's ecosystems [6]. Air, water, and soil pollution compromise habitat quality and biodiversity, with pollutants affecting both flora and fauna [7].

Climate Change

Climate change, characterized by shifts in temperature and precipitation patterns, poses a significant threat to biodiversity [8]. Altered climatic conditions disrupt ecosystems, affect species distributions, and increase the risk of extinction for vulnerable species [9].

Overexploitation

Overexploitation of natural resources, including hunting, fishing, and logging, results in the depletion of species populations and ecological imbalance [10]. The illegal wildlife trade and poaching have particularly severe impacts on endangered species such as tigers and rhinoceroses [11].

3. Solutions for Biodiversity Conservation

Strengthening Protected Areas

Expanding and improving the management of protected areas is essential for conserving biodiversity [12]. Effective management includes addressing issues like poaching and habitat encroachment and involving local communities in conservation efforts [13].

Promoting Sustainable Practices

Adopting sustainable practices in agriculture and industry can mitigate negative impacts on biodiversity. Organic farming, agroforestry, and eco-friendly technologies help reduce habitat destruction and pollution [14]. Policies and incentives that support sustainable practices are crucial [15].

Enhancing Environmental Awareness

Increasing public awareness about biodiversity and conservation can lead to greater community support for environmental initiatives. Educational programs and community engagement are vital for fostering a culture of conservation [16].

Research and Monitoring

Investing in research and monitoring is vital for understanding biodiversity dynamics and evaluating the effectiveness of conservation measures. Scientific research provides valuable insights into species behavior, ecosystem health, and human impacts, guiding evidence-based strategies [17], [18].

Table 1: Biodiversity Conservation Challenges and Solutions in India

Challenge	Description	Impact	Proposed Solutions
Habitat Loss	Deforestation, urbanization, and agricultural expansion.	Fragmentation of habitats, loss of species, and ecological imbalance.	Strengthen and expand protected areas; enforce anti-deforestation laws.
Pollution	Industrial discharge, agricultural runoff, and urban waste.	Degradation of air, water, and soil quality affecting flora and fauna.	Promote pollution control measures; enhance waste management practices.
Climate Change	Altered temperature and precipitation patterns.	Disruption of seasonal cycles, shifts in species distribution, increased extinction risks.	Implement climate adaptation strategies; reduce greenhouse gas emissions.
Overexploitation	Unsustainable hunting, fishing, and logging practices.	Decline in species populations, disruption of ecological balance.	Enforce wildlife protection laws; promote sustainable resource use.

4. Conclusion

The conservation of biodiversity in India is of utmost importance, given the extensive challenges posed by habitat loss, pollution, climate change, and overexploitation. Addressing these challenges requires a comprehensive approach involving strengthened protected areas, sustainable practices, enhanced public awareness, and robust research. A coordinated effort from government, communities, and researchers is essential to ensure the preservation of India's biodiversity for future generations.

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An investigation on the Zooplankton and Phytoplanktonic Diversity in Chobha Nimgaon Water Reservoir of Maharashtra, India

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ABSTRACT
The purpose of the current study is to investigate the diversity of different zooplankton and Phytoplankton groups in Chobha Nimgaon water reservoir of Maharashtra, India . This water reservoir lies in eastern side of western Maharashtra (west of Beed district). It is situated at 750 -5'-0"(E) longitude and 180 - 51'-0"(N) latitude. During the study, 17 genera of zooplanktons, belonging to 4 groups, were observed in the water samples.

Microscopic examination of zooplankton revealed that 19 genera of zooplanktons belonging to 4 groups were observed during the study period. Group Cladocera observed most diversified including senen genera. Highest number of Rotifers were recorded during the summer season and Cladocerans in the winter months. Only Cypris species was observed belonging to group Ostracoda. The present study also focused on the four primary families of phytoplankton: Euglenophyceae, Bacillariophyceae, Cyanophyceae, and Chlorophyceae. The results of the recent study demonstrated that phytoplankton grows scarce during the monsoon and abundantly during the winter.

Key words: - Zooplankton, phytoplankton seasonal variation, Chobha Nimgaon irrigation project.

1. Introduction:

In aquatic habitats, the zooplanktons are a fascinating group of microorganisms that occupy an intermediary position between producers and secondary consumers in the food chain. The four primary taxonomic families of crustaceans that are most commonly represented in freshwater environments are Cladocera, Copepoda, Ostracoda, and Rotifera. The productivity of water body determines the presence and quantity of zooplankton in it. The zooplanktons are acknowledged as bio-indicators for tracking the trophic condition of a water body. A number of researchers, including Trivedy and Goel (1988),Battish (1992), M. S. Kodarkar (1998), Trivedy, Goel and Trisal (1998), Dhanapathi (2000), Singh Shivesh Pratap (2002). Pawar and Pulle (2005), Jayabhaye and Madlapure (2006), and Abdar (2007), have researched zooplankton in relation to water quality and trophic status of water bodies.

Microscopic, free-floating organisms are called phytoplankton. They are autotrophic and serve as the foundation of the aquatic food web as primary producers. Phytoplankton is the main food source for zooplankton, fish and other aquatic animals. Phytoplankton are particularly sensitive to changes in water quality because they are the first to exhibit changes in nutrients, pollutants, and physical features of freshwater bodies. They also have a big effect on the dissolved oxygen content, which is necessary for aquatic life. The quality of the water body can be determined by looking at the amount and type of phytoplankton. They are vital in identifying cases of water eutrophication and its detrimental effects on aquatic life due to their increased sensitivity to eutrophication. According to Xie et al. (1998), they also play a crucial role in shaping the dynamics of the aquatic food web and catalyze the development of the zooplankton community structure. Ryder et al. examined members of the families Chloropyceae, Cyanophyceae, Bacillariophyceae, and Euglenopyceae in 1974. The maximum density of phytoplankton recorded during the winter months by Chakraborty et al. (1959) . This research investigates the diversity of zooplankton and phytoplankton in the Chobha Nimgaon water reservoir located in Ashti taluka of Beed district, Maharashtra, India

2. Study Area:

Choba Nimgaon water reservoir selected for study. This water body lies in eastern side of western Maharashtra (west of Beed district). It is situated at 750 -5'-0"(E) longitude and 180 - 51'-0"(N) latitude. This is an irrigation project on river Kadi in Ashti tehsil of Beed district of Mahrashtra India. It is near to village Choba Nimgaon. It is constructed for Agriculture purpose but with time this water is used for various activities.

3. Material and Methods :-

For the identification and analysis of **zooplankton and phytoplankton communities,** the water samples were collected early in the morning (8.30 am to 9.30 am) from water reservoir for a period of one year during July 2022 to June 2023.

i. Collection and analysis of zooplankton samples :-

For Qualitative and quantitative studies of zooplankton communities 100 lit. of surface water was passed through the plankton net number 25. The collected samples were preserved in 4 % formalin solution. These samples were observed and identified under research microscope using suitable keys, standard texts and monographs given by Tonapi (1980), Trivedy (1984), APHA (1989), Kodarkar (1998) and Dhanapathi (2000). The Zooplanktons were counted with the help of Sedgwick Rafter Cell by taking one ml of diluted sample and the observation was represented number of organisms per liter of each genus were calculated.

ii. Collection and analysis of phytoplankton samples

For quantitative study of phytoplankton communities 50 liters of surface water were run through the plankton net with a mesh size of 25 µm. Lugol's iodine was added after the samples were collected and kept settle. Collected samples were preserved in 4% formalin. The samples were brought to laboratory for further investigation. The identification was classified by using the keys and literature provided by Adoni (1985), APHA (1985), Pennake (1978) and Agarwal (1990). Standard analysis was conducted in accordance with Zar (2005). The numbers of zooplanktons per lit. was determined by using Sedwick Rafter cell method by taking one ml of approximately diluted sample under high magnification and using the appropriate multiplication factor. A number of replicate samples are enumerated to calculate plankton / ltr.

4. Results and discussion :-

Detailed microscopic analyses of water samples under a research binocular microscope have identified 19 genera of zooplankton that belong to four major groups viz. Rotifera, Cladocera, Copepoda and Ostracoda. Of the four zooplanktonic groups that were observed, group Cladocera was found to be the most diversified with seven genera. Alonella, Bosmina, Ceriodaphnia, Chydorus, Daphnia, Moina and Sida. Group Rotifera included the following five genera: Brachionus, Filinia, Lecane, Beauchampiella, and Tripleuchlanis. Group Copepoda included the following five genera: Cyclops, Microcyclops, Mesocyclops, Neodiaptomus, Phyllodiaptomus, and Sinodiaptomus; group Ostracoda included a single genus, Cypris.

The month wise population dynamics of zooplankton components are recorded in table number 1. Maximum numbers of Rotifers (290 No. /L) were observed in May and minimum (29 No. /L) in Sept. Cladocerans were observed maximum (112 No. /L) in Jan. and minimum (38 No. /L) in March. Population density of Copepoda was recorded maximum (119 No. /L) in July and minimum (36 No. /L) in May. Where as Ostracods were observed maximum (56 No. /L) in Dec. and minimum (10 No./L) Aug..

Overall maximum zooplankton diversity was observed during the winter months. A component wise population density (No./L) study reveals that Rotifers were recorded maximum in summer. Maximum population of Cladocera was observed in winter. Peak number of Copepods were observed maximum in monsoon whereas Ostracods were observed maximum in winter.

The seasonal variations of zooplankton in the order of abundance were as;

Winter:- *Cladocera>Copepoda>Rotifera>Ostracoda*

Summer:- *Rotifera> Cladocera>Copepoda >Ostracoda*

Monsoon:- *Copepoda >Rotifera>Cladocera >Ostracoda*

Brachionus was recorded dominantly among the whole population of Rotifers. *Chydorus and Daphnia* were major contributors among the group Claddocera . Among Copepoda *Cyclops* and *Microcyclops* were recorded abundantly where as only *Cypris* Sp. was observed belonging to Ostracoda group.

Table 1. Month wise population dynamics of zooplankton

	Winter			Summer			Monsoon					
Zooplankton group	Jun. 2022	Jul 2022	Aug. 2022	Sept. 2022	Oct. 2022	Nov. 2022	Dec. 2022	Jan. 2023	Feb. 2023	Mar. 2023	Apr. 2023	May 2023	Total
ROTIFERA													
Brachionus sp.	86	17	9	12	36	53	73	85	93	52	69	87	672
Lecane	59	18	21	8	11	11	12	20	8	58	75	72	373
Filinia	0	23	18	9	27	31	18	8	0	20	35	51	240
Triplechlanis	13	0	0	0	8	6	10	29	4	41	35	68	214
Beauchampiella	11	4	6	0	16	12	14	12	2	0	3	12	92

	Winter			Summer			Monsoon						
Zooplankton group	Jun. 2022	Jul 2022	Aug. 2022	Sept. 2022	Oct. 2022	Nov. 2022	Dec. 2022	Jan. 2023	Feb. 2023	Mar. 2023	Apr. 2023	May 2023	Total
Total	**169**	**62**	**54**	**29**	**98**	**113**	**127**	**154**	**107**	**171**	**217**	**290**	**1591**
CLADOCERA													
Alonella	7	18	14	20	14	15	20	6	8	0	0	0	122
Daphnia	14	6	8	4	9	19	22	24	18	0	13	10	143
Chydorus	22	15	9	8	10	15	24	26	0	15	9	23	175
Bosmina	15	0	0	0	0	0	0	16	25	8	32	18	116
Ceriodaphnia	23	5	9	5	6	5	0	18	0	15	10	12	114
Moina sp	6	11	5	9	16	25	16	22	15	0	0	0	125
Sida	0	10	6	7	8	0	0	0	0	0	0	10	38
Total	**87**	**65**	**54**	**53**	**63**	**79**	**82**	**112**	**66**	**38**	**64**	**73**	**833**
COPEPODA													
Cyclops sp.	23	28	17	31	28	26	16	22	36	19	17	12	275
Microcyclops	13	25	21	13	16	41	45	32	16	0	0	0	222
Sinodiptomus	22	17	8	9	6	11	0	0	0	11	12	22	118
Phylodiaptomus	14	12	4	0	6	0	0	0	11	15	7	0	69
Neodiaptomus	0	16	10	8	5	0	0	13	3	2	0	0	57
Mesocyclops	17	21	9	15	19	29	32	20	11	8	0	0	181
Total	**89**	**119**	**69**	**63**	**80**	**107**	**93**	**87**	**77**	**55**	**36**	**34**	**909**
OSTRACODA													
Cypris sp.	**45**	**13**	**10**	**36**	**27**	**36**	**56**	**25**	**18**	**32**	**19**	**22**	**327**

The results of present investigation indicates that the maximum number of zooplanktons observed during winter season than the summer and monsoon. Maximum number of Rotifers was observed during summer. High population of Rotifers during summer indicates pollution from organic matter due to direct entry of untreated domestic sewage from surrounding area. Arora (1967). Presence of *Brachionu*s and Lecane indicates pollution. Similar results were also observed by Meshram (2005), Mediah Shafique (2006). Maximum population density of Cladocera was recorded during winter. The abundance of Cladocera in winter may be due to favorable temperature and availability of abundant food. Maximum population density of Cladocera indicates that the water bodies are unpolluted in this season. Similar results were observed by Sabu Thomus (1999). The peak counts of Copepods were observed in monsoon. *Cyclops* and *Mesocyclops* were major contributors. The peak number of *Cyclops* was observed during monsoon might be due to abundance of diatoms. Similar results were reported by Somani and Pejawar (2004), Chavan et.al. (2004). Only a genus *Cypris* was observed belonging to group Ostracoda and abundantly found in winter. Tonapi (1980) has reported higher population of Ostracods during monsoon due to abundance of fine detritus during this period.

A total of 26 species belonging to four different classes such as Chlorophyceae, Cyanophyceae, Bacillariophyceae and Euglenophyceae were identified throughout the study period.

Among these four families Chlorophyceae recorded highest diversity, with 11 species out of 23 species, or 47.82% of the total abundance. Bacillariophyceae recorded 21.71% species, followed by Cynophyceae with 17.39%, and Euglenophyceae was the least represented group with only 8.69%.of the total.

Table 2: Total Number of species per lit. recorded during study period

Sr. No.	***Group***	***Species Recorded***	***No. of species recorded***
1.	Chlorophyceae		
		Ankistrodesmus sp	*273*
		Cladophora sp	*257*
		Chlorella sp.	236
		*Cosmarium granatum*n,	*119*
		Chara sp.	*117*
		Chlamydomonas sp.,	*116*
		Spirogyra sp.	*109*
		Pleurodiscus sp	*66*
		Hydrodictyon sp.	*63*
		Nitella sp	*51*
		Closteridium linula	*44*
		Total	**1451**
2.	Bacillariophyceae	Synedra ulna	*380*
		Pinnularia sp.	*161*
		Bacillaria paradoxa	*63*
		Anomoeoneis sphaerophora,	*43*
		Cocconeis placentula	*44*
		Total	**691**
3.	Cynophyceae	*Microcystis* sp.,	*145*
		Oscillatoria sp.	*94*
		Spirulina sp.,	*77*

Sr. No.	*Group*	*Species Recorded*	*No. of species recorded*
		Nostoc sp	*61*
		Total	**377**
4.	Euglenophyceae	*Phacus* sp,	*227*
		Euglena acus	*142*
		Total	**369**

In the present investigation, belonging to Chlorophyceae maximum number of Ankistrodesmus sp. (273 no./ltr) followed by Cladophora sp. (257 no./ltr.), Chlorella sp. 236 no./ltr.) were recorded. Least number of Goniochloris sp. (44 no./ltr.) and *Nitella sp* (51 no./ltr.), were recorded. 05 species of Bacillariophyceae, were recorded among which Synedra ulna (380 no./ltr.) was dominent followed by Pinnularia sp. (161 no./ltr.), Minimum number of *Anomoeoneis sphaerophora* (43 no./ltr.) was observed. 04 species of Cynophyceae, were recorded among which Microcystis sp. (145 no./ltr.) was prominent followed by Oscillatoria sp. (94 no./ltr.), minimal number of *Nostoc* sp. (61 no./ltr.) were recorded. Whereas 02 species of Euglenophyceae, were recorded among which Phacus sp. (227 no./ltr.) which was maximum followed by Euglena acus (142 no./ltr.) were recorded during the study period.

Overall maximum phytoplankton diversity was observed during the winter months. The maximum density of phytoplankton has also been recorded during the winter months by Chakraborty et al. (1959) and Pahwa and Mehrotra (1966) in Ganga and Yamuna rivers. Palmer (1969) reported that several genera, including Euglena, Oscillatoria, Scenedesmus, Microcystis, Navicula, and Chlorella, were discovered in organically contaminated water. Jayabhaye, et.al., (2007) observed greatest Chlorophyceae population during the summer and minimal during the rainy season in Parola dam Hingoli, Maharashtra. Pendse, et.al., (2000) recorded the largest population of blue-green algae during winter.. Banaker, et.al., (2005) observed many pollution indicator species of Bacillariophyceae from Chandravalli tank in Chitradurga, Karnataka. Aarti Devi and Neha Antal (2013) also observed presence of water pollution indicator species like Nitzchia sp., Synedra sp., Diatoma sp. in a Temple pond in Birpur (Jammu and Kashmir). Jindal and Gussain (2007) observed Naviculla sp. as a pollution indicator species in Bicholli pond, Rajasthan.

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Impact of Climate Change on Human Life and Ecosystem – An Overview

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ABSTRACT

An ecosystem is a community of living organisms including plants, animals and microorganisms that interact with each other and their physical world in a given space. People depend on ecosystem for so many benefits such as food, water, air and recreation. Climate controls growth and behaviour of plants and animals.

Climate change has a significant environmental impact on ecosystem. Climate change affects ecosystem in many ways. The impact of climate change on a particular species it can travel through a food web and affect a wide range of other organisms. Although some stressors have only small impacts when acting alone, their cumulative impact can lead to dramatic ecological changes. The impacts of climate change on different sectors of society are interrelated.

Keywords: Environment, Climate change, Impact, Human life, Health, Ecosystem

1. Introduction:

Ecosystems consist of living organisms that interact with their environment, providing essential benefits to humans, such as food, water, clean air, building materials, and recreation [1]. Climate significantly impacts these ecosystems by influencing plant growth and animal behavior [2&3]. When the habitats under temperatures, rainfall patterns and other changes, the organisms that make up the ecosystem feel the effects.

Climate change is caused by an increase in the amount of greenhouse gases (such as carbon dioxide, methane and nitrous oxide) in the atmosphere, which leads to increase in the average temperature of the earth. Greenhouse gases trap heat in the atmosphere, increasing air and sea temperatures. They are primarily produced by burning fossil fuels (such as coal) to produce electricity, as well as through agricultural practices, mining, land management and transportation.

Climate change is a change in global climate systems that occur over decades. Most of the recent changes in our climate have been caused by human activity. Without intervention, climate change will have catastrophic and far-reaching consequences for our state, our country and the rest of the world. This an urgent problem with global, national, community and personal implications.

2. Impact of Climate Change on Human Life:

Climate change is already having an impact on human health. Changes in weather and weather conditions can put lives at risk. Heat is one of the deadliest weather phenomena. As ocean temperatures rise, hurricanes become stronger and wetter, which can cause direct and indirect deaths. Drought conditions lead to more fires, which pose many health risks. More frequent flooding can lead to the spread of water-borne diseases, injuries, and chemical hazards. Insect-borne diseases such as malaria and Zika virus are becoming more common in a warming world because their carriers can exist in more regions or thrive for longer seasons.

Higher average temperatures lead to warmer days and more frequent and longer heat waves [4]. These changes lead to an increase in heat-related deaths. Exposure to extreme heat can lead to heat stroke and dehydration, as well as cardiovascular, respiratory and cerebrovascular disease [5&6]. Excessive heat is more likely to affect populations in northern latitudes where people are less prepared to face extreme temperatures. The most vulnerable groups including outdoor workers, student athletes and homeless tend to be more exposed to extreme heat because they spend more time outdoors. Low-income families and the elderly do not have access to air conditioning which further increases exposure to extreme heat. In addition, children, pregnant women, elderly and people with certain medical conditions are less able to regulate their body temperature and therefore may be more vulnerable to extreme heat. High temperatures and changing weather conditions can worse air quality, which can lead to asthma attacks and other effects on respiratory and cardiovascular health. Wildfires, which are expected to continue to increase in number and severity as the climate change, create smoke and other harmful air pollutants [7].

The increase in the frequency or severity of some extreme weather events, such as extreme rainfall, floods, droughts, and storms, threaten people's health during and after the event [7]. The most vulnerable are children, elderly, people with disabilities or health problem, and the poor.

Extreme events can affect human health in many ways: they reduce the availability of food and clean water, damage roads and bridges, disrupt access to hospitals and pharmacies, disrupt communications, public services and health services [7]. They can also affect exposure to waterborne pathogens (bacteria, viruses, and parasites such as *Cryptosporidium* and *Giardia*); toxins produced by harmful algae and cyanobacteria develop in the water; and chemicals that end up in water from human activity [7].

The impacts of climate change are interconnected across various sectors, affecting health, agriculture, infrastructure and manifest unevenly within communities. Drought can damage food production and human health. Floods can cause disease to spread and damage ecosystems and infrastructure. Human health problems can increase mortality, affect the availability of food, and limit the productivity of worker. The effects of climate change are visible in every aspect of the world we live in. However, the effect of climate change are uneven across the country and around the world — even within the same country, communities, the effect of climate change may vary between neighbourhoods or individuals.

3. Impact of Climate Change on Ecosystem:

Climate change poses a significant global threat to biodiversity and ecosystems, impacting individual species and their interactions within habitats. This results in alterations to ecosystem structure and function, affecting the goods and services provided by natural systems to society [8].

Climate change will continue to have a significant impact on ecosystems and organisms, although not all will be affected in the same way. When the climate changes, some species adapt by changing their behavior, physical characteristics, or the way their bodies work. Others may fit. As a result, climate change can lead to expansions, decline, or extinction of some populations. These changes, in turn, can affect the overall biodiversity of a region. Geographic distribution of each species depends on its environmental tolerance, distribution limitations and its biological interactions with other species. When climate changes, species must tolerate the change, move, adapt, or face extinction. Thus, surviving species may have an increased ability to live in new places or a reduced ability to stay where they are currently situated. Climate change is driving large-scale shifts in species distribution, abundance, and reorganization of terrestrial and aquatic ecosystems [9&10].

Climate change can also impact on food webs. A food web is the set of nutritional relationships between different organisms in an ecosystem. At the bottom of a food chain are organisms such as plants and plankton. Other animals, higher up the chain, rely on them as food sources. Climate impacts on any part of a food chain can affect the entire system, or even other ecosystems as a whole.

On land, temperatures are rising and soil health and fresh water quality are deteriorating. In many places, the environment is changing so quickly that plants and animals cannot keep up, putting entire ecosystems at risk. The cumulative effects of climate change are causing many changes in ecosystems. The increase in temperatures causes changes in the ecosystems, both to increase or decrease the geographical distribution of certain types of habitats, and to change the timing of the seasons. As temperatures continue to rise, many species can no longer thrive in the places where they used to live. Scientists estimate that 8% of current animal species are at risk of extinction due to climate change alone.

In the ocean, the water temperature rises and becomes more acidic, affecting marine life. Sea levels are rising due to thermal expansion, in addition to the melting of ice sheets and glaciers, putting coastal areas at increased risk of erosion and storm. Sudden heavy rains can cause flooding that paralyzes highways and major commercial areas.

Flooding and strong winds from the storms can affect ecosystems by disrupting the cycle of nutrients and plants growth. As the climate warms, more areas are affected by tropical storms and hurricanes, leading to more ecosystem damage from extreme weather. From the poles to the tropics, climate change is disrupting ecosystems. Even a slight change in temperature can cause dramatic changes that flow through food webs and the environment.

Climate change is rapidly and radically altering (or in some cases, destroying) the habitat to which wildlife has gradually adapted over millennia. This is particularly harmful to the habitats of species that are currently threatened by other causes. Ice-dependent mammals such as walruses and penguins, for example, do not fare well as ice sheets shrinks.

Healthy soil has good moisture and mineral content and is full of bugs, bacteria, fungi, and microbes, which in turn contribute to crop health. But climate change, especially extreme heat and changes in precipitation, can degrade soil quality. These effects are exacerbated in areas where monoculture chemical-dependent industrial, agriculture has made soil and crops less resilient to environmental change.

4. Discussion:

The main causes of biodiversity loss remain the use of land by humans, especially for food production. Human activity has already modified more than 70 per cent of all ice-free land. When land is converted to agriculture, some animal and plant species may lose their habitat and be threatened with extinction. Many communities are not yet ready to face climate threats. Even within a community, some groups are more susceptible to these threats than others. In the further, it is important that communities invest in resilient infrastructure that will be able to withstand future climate risks. Researchers study current and future impacts of climate change on communities and can provide recommendations for best practices. Resilience education is extremely important for urban planners, emergency managers, educators, communicators and all other community members to prepare for climate change.

The World Health Organization described climate change as the greatest health threat of the 21st century. It affects health and wellbeing in many ways: directly, through the increased intensity and frequency of extreme weather events (such as heatwaves, floods and fires); and indirectly, through worsening air quality, changes in the spread of infectious diseases, threats to food and water and effects on mental health [11].

In general, climate change affects the health of ecosystems, affecting changes in the distribution of plants, viruses, animals, and even human settlements. This can create increased opportunities for animals to spread diseases and for viruses to spread humans. When human activity produces greenhouse gases, about half of the emissions remain in the atmosphere, while the other half is absorbed by the land and ocean.

5. Summary:

The effects of climate change include increasing air and sea temperatures, changes in precipitation patterns, more frequent and increasingly severe extreme weather events, and rising sea levels. Climate change can affect our health and wellbeing through the effects of extreme events, the degradation of air quality, changes in the spread of infectious diseases, threats to quality and quantity of food and water, and effects on our mental health. Climate change is playing an increasingly important role in the decline of biodiversity. Climate change has altered marine, terrestrial, and freshwater ecosystems around the world. It has caused the extension of local species, an increased diseases and massive mortality of plants and animals, leading to the first climate-induced extinctions. There are things we can all do now to increase our resilience to the effects of climate change and help slow its pace.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest.

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Studies on Diversity of Chironomidae larvae (Chrironomidae: Diptera) from Kasar Lake of Kille Dharur (M. S. India)

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ABSTRACT
Present research work deals with occurrence and diversity of Chironomidae larvae from Kasar lake, of Dharur tahasil of Maharashtra. Chironomide midges are one of the highly abundant group of insects, having key role in aquatic ecosystem, though these are very rarely reported from Maharashtra state. The goal of present work was to find out occurrence, diversity and taxonomic contribution of these non-biting midges from the study area. The present investigation gives the occurrence of about five genera with eight different species were reported. The genus chrionomus exhibits high diversity from another group. The species recorded from the study area are Ch. major, Ch. plumosus, Ch. riparius, Ch. stigmaterus, Kiefferulus sp., Glyptotendipes sp., Polypedilum sp., and Procladius sp. Average Shannon Weiner diversity index from sampling sites was H'= 0.79 recorded.
Keywords: Diversity, Chironomidae, Chironomus, Taxonomy, Kille-Dharur

1. Introduction:

A Chironomus larva belongs to the larvae of the Chironomidae family, class insect order Diptera. These aquatic larvae are often used in scientific research and environmental monitoring of aquatic ecosystems. Family Chironomidae comprises eleven subfamilies; more than 1500 species of chironomids were world-wide estimated. Chironominae is a dominating subfamily in the consideration of numbers and species richness. Present investigation deals with diversity and distribution of Chironomidaee from Kasar lake of Dharur tahsil (MS, India).

Chironominae shows cosmopolitan occurrence, mostly in all aquatic habitat. Physico–chemical and biological factors influences the availability, abundance and distribution of chironomids .Diversity and distribution of larvae may vary in differ aquatic ecosystem [2] Chironomids larvae may be the only insects lives in low dissolved oxygen environment [

The major taxonomic satuts and description of Indian Chironomids given by Chaudhuri and Guha [4]. The Chironomids from Indian plateau such as north eastern (states bordering to Himalayas and West Bengal,) and south (Tamilnadu, Keral), were systematically recorded by various researchers [5, 6]. Huge records of taxonomy, diversity and distribution of Chironomidae from India are available; however from Maharashtra state the Chironomids midges are not significantly reported. Present work is significant in to evaluate diversity and occurrence of these non biting midges from the study area.

2. Material and Methods:

Study area and sampling sites located at Kille-Dharur Dist. Beed, a Lentic water bodies with muddy habitat . Samples of Chironomid larvae were collected from sediment of water bodies of three different sampling sites (Site A, Site B, and Site C) to calculate average distribution during January to December 2013. 70% ethanol used for preservation of material. Permanent slides of larvae were made in Canada balsam after treating them in solution of potassium hydroxide (KOH) and observed under microscope. Standard taxonomic keys and description given by Epler, used to describe the specimens [7].

Average occurrence and abundance of species were calculated to find out the distribution of larvae. Shannon Weiner index was calculated to evaluate diversity of Chironomidae larvae from sampling sites as, H=-$\sum(pi.\, lnpi)$.

3. Results and Discussion:

In the present investigation about five genera Chironomus, *Glyptotendipes*, *Kiefferulus, Polypedilum,* and *Procladius* with eight different species were recorded. The genus *chrionomus* exhibits high diversity from another group whereas *procladis sp.* gives very little contribution (Fig. 3). The species recorded from the study area are *Ch. major*, *Ch. plumosus*, *Ch. riparius*, *Ch. stigmaterus, Kiefferulus sp., Glyptotendipes sp., Polypedilum sp., and Procladius sp.* Genus *Chironomus* comprises total four species, while one individuals observed in other genera. Average Shanon Weiner diversity index was 0.79.

4. Taxonomically significant features:

Chironomus major: Taxonomic features similar to the already described specimens such as, presence of caudolateral tubules and ventral tubules. 2 dark inner teeth found in mandible; about 32-54 mm length were recorded in last instars (Fig. 1.1).

Chironomus plumosus: Abdominal segment having a pair of caudolateral tubules and ventral tubules. About12 lateral teeth and trifid median tooth present in mentum, Fine teeth are present on medial margin of ventromental plate. About 3 dark inner teeth observed on mandible (Fig. 1.2).

Chironomus stigmaterus: head is sclerotized, anterior and posterior parapods having claws and setae. Mature larvae measured up to 4 mm. Head having sclerotized and non – retractile antennae with 5 segmented. 2 dark inner teeth of mandibles are observed (Fig 1.3).

Chironomus riparius: coudolateral tubules are absent whereas ventral tubules are present, last instars measured up to 5.4 mm. 3 dark inner teeth present in mandibles, 13 teethed comb pecten epipharyngis. 12 lateral teeth observed in mentum with one central tooth. Below the mentum ventromental plates present with striae (Fig. 1.4).

Glyptotendipes sp.: Last instar measured up to 4.3 mm. Sclerotized head bearing the 5 segmented antennae, 3 dark inner teeth of mandibles observed, 18 teethed comb like Pecten epipharyngis observed.(Fig. 2.1)

Kiefferulus sp.: Mentum with broad inner tooth, Flat separated ventromental plates observed; anterior margin is finely scalloped and widespread. The number of striae on ventromental plates were clearly visible (Fig. 2.2).

Polypedilum sp.: Sclerotized head having 5 segmented antennae. Antennae observed with flagellum size, greater than antennal blade. About 3 dark inner teeth clearly visible in mandible, seta subdentalis present at basal teeth. 16 lateral teeth observed in mentum; ventmental plate without striae clearly visible below the mentum (2.3).

Subfamily Tanypodinae: Members of subfamily tanypodinae of genus *procladius* also reported from study area.

Procladius sp.: Larvae with 11 segments, yellowish to reddish in colour. Head oval, consisting antennae, maxillary palp, mandible, ligual. Antennae highly retractile in to head capsule. Antennal blade longer than, flagellum is annulated; Basal tooth of mandibles was not stout, Ring organ not present on maxillary palp. About 5 black brown teeth present on ligula. (2.4).

5. Diversity of Chironomid larvae:

In an average *Chironomus stigmaterus* was the most dominant species, contributing significantly to the total density. *Kiefferulus sp.* and *Glyptotendipes sp.* also contribute noticeably to the overall density. Sampling site C has the highest total density (5845), followed by Site B (5828) and Site A (5541). Despite differences in total density, the Shannon-Wiener Index (SwI) suggests similar species diversity in all three locations. Chironomus riparius has a high contribution in Site A (0.84) but is relatively lower in Site B and Site C. *Chironomus stigmaterus* and *Kiefferulus sp.* have consistent contributions across all locations. The Shannon-Wiener Index values (SWI) indicate relatively high biodiversity in all three locations (1.81 to 1.86) table no. 1.

Table 1: Table gives the data of Species Density (indi/m^2), Shannon Winner diversity index, species contribution and taxonomic composition of Chironomidae larvae at three different sampling sites.

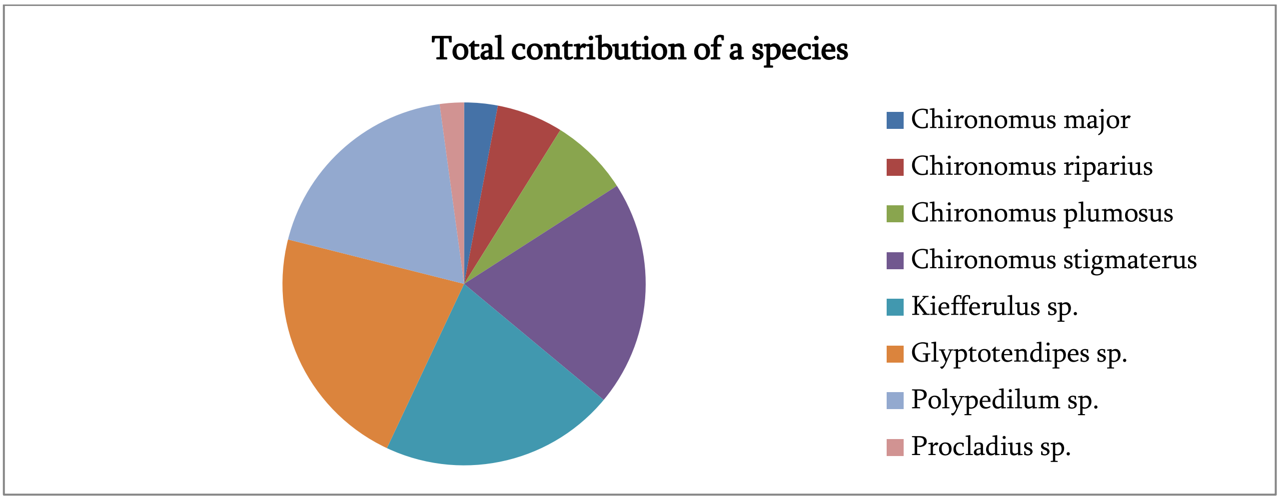
Taxa	Site A	Species contribution	Site B	Species contribution	Site C	Species contribution
Chi. major	211	0.036	122	0.02	180	0.03
Ch.riparius	385	0.84	322	0.05	311	0.05
Chi. plumosus	455	0.07	333	0.06	421	0.07
Ch. stigmaterus	1122	0.19	1110	0.20	1233	0.21
Kiefferulus sp.	1090	0.18	1281	0.23	1234	0.21
Glyptotendipes sp.	1322	0.22	1223	0.22	1233	0.21
Polypedilum sp.	1123	0.19	1022	0.18	1110	0.18
Procladius sp.	120	0.02	128	0.02	123	0.02
Total Density	5828		5541		5845	
SwI	0.79		0.78		0.79	

Photo plate: 1, 2 photographs of head of Chironomidae larvae

Fig. 1.1: *Ch. major*, **1.2 :** *Ch. plumosus*, **1.3:** *Ch. stigmaterus*, **1.4:** *Ch. riparius*

Fig. 2.1: *Glyptotendipes sp.*, **2.2 :** *Kiefferulus sp.*, **2.3:** *Polypedilum sp.*, **2.4:** *Procladius sp.*

Photo plate: 3 Taxonomic contribution Chironomidae larvae in a study area



The results of present investigation were discussed and confirmed with several other records. Ferrington reported about 11 subfamilies with 22 tribes of Chironomids [8]. Cranston given the records of 10 subfamilies [9]. Bhosale *et al* reported the similar data from Kham River, about 23 species belongs to family Chironominae and Tanypodinae were also reported from urban aquatic ecosystem of Aurangabad, similarly the present investigation gives the occurrence of about five genera with eight different species belongs 2 subfamilies [10, 11]. Chavan R. J *et. al* also gives the record of the members of genus *chironomus* likewise to present investigation [13].

Values of diversity index were between H'= 0.79, 0.78, and 0.79 in sampling sites A, B and C respectively. Shannon diversity index about 1.48- 3.21 were reported by Turkmen and Kazancl [14]. Average SDI H'=0.5 recorded in Kham river which are slightly similar to the data given in present research work [16].

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Exploring Aquatic Insect Diversity in Sina Lake : A Case Study from Rural Maharashtra

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ABSTRACT

The study at Sina Lake, Nimgon Gangarda, Ahmednagar District, Maharashtra, identified 36 aquatic insect species across 8 orders, with Diptera, Ephemeroptera, Odonata, and Hemiptera being the most abundant. Diptera showed the highest species richness, while Ephemeroptera's presence indicated good water quality. Insect distribution varied, with the littoral zone supporting the highest abundance. The presence of pollution-sensitive species suggests the lake is in good ecological condition, though some pollution-tolerant species indicate localized stress. Seasonal variations were observed, with post-monsoon periods showing the highest diversity. Overall, the study highlights Sina Lake's role as a significant reservoir of biodiversity in rural India.

Keywords: Sina Lake, aquatic insects, species richness, Diptera, Ephemeroptera, Odonata, Hemiptera, biodiversity, water quality indicators

1. Introduction:

Aquatic ecosystems, particularly freshwater bodies like lakes, play a critical role in maintaining biodiversity and supporting various ecological functions. Insects are among the most diverse and abundant groups of organisms in freshwater habitats, contributing significantly to the structure and functioning of aquatic ecosystems [1]. The diversity of aquatic insects is not only an indicator of the ecological health of freshwater systems but also plays a vital role in nutrient cycling, food web dynamics, and as bioindicators for monitoring environmental changes [2].

Sina Lake, located in the rural region of Nimgon Gangarda, Ahmednagar District, Maharashtra, India, represents a relatively unexplored freshwater ecosystem in terms of its aquatic insect diversity. Rural lakes like Sina often experience less anthropogenic pressure compared to urban water bodies, making them crucial for studying natural biodiversity patterns and understanding the impacts of environmental changes in less disturbed habitats [3]. Despite the importance of these ecosystems, comprehensive studies on the diversity and distribution of aquatic insects in such rural freshwater bodies are limited. This study aims to explore and document the diversity of aquatic insects in Sina Lake, providing baseline data that can be used for future ecological assessments and conservation strategies. By examining the variety of insect taxa present, their relative abundances, and their ecological roles, this case study contributes to the broader understanding of freshwater biodiversity in rural India, highlighting the significance of such ecosystems in maintaining regional biodiversity [4].

2. Materials and Methods

Study Area

The research was conducted at Sina Lake, located in the rural region of Nimgon Gangarda, Ahmednagar District, Maharashtra, India. Sina Lake is a freshwater body characterized by a mix of littoral zones with dense aquatic vegetation and deeper open water areas. The lake is relatively undisturbed, making it an ideal site for studying natural patterns of aquatic insect diversity. The geographical coordinates of the lake are approximately 19.364° N latitude and 74.623° E longitude.

Sampling Design

The study was carried out over a period of one year, covering different seasons to capture seasonal variations in aquatic insect diversity. Sampling was conducted monthly from June 2023 to May 2024, encompassing pre-monsoon, monsoon, and post-monsoon periods. This temporal approach allowed for a comprehensive assessment of both species richness and abundance across different environmental conditions [5]

3. Collection of Aquatic Insects

Aquatic insects were collected using a combination of standard entomological techniques:

Sweep Nets: A fine-mesh sweep net (500 µm) was used to collect insects from the littoral zone, particularly in areas with dense vegetation. This method was effective for capturing a wide range of insect taxa, including Diptera, Hemiptera, and Odonata [6].

Kick Sampling: Kick sampling was performed in shallow areas by disturbing the substrate and capturing the dislodged insects with a net. This method was particularly useful for collecting Ephemeroptera and Trichoptera larvae [7].

Surber Sampler: In deeper, open water areas, a Surber sampler was used to collect benthic macroinvertebrates, including chironomid larvae from the order Diptera [8].

Light Trapping: Light traps were set up at night to attract and capture adult Odonata and other nocturnal insects. The traps were equipped with UV lights and were placed near the shorelines [9]

Identification and Taxonomy

Collected specimens were preserved in 70% ethanol and transported to the laboratory for identification. Insects were identified to the species level using standard taxonomic keys [10,11]. Identification was confirmed by comparing specimens with reference collections at a regional entomological research center.

Data Analysis

Species richness, abundance, and diversity indices were calculated for each sampling site and season using the Shannon-Wiener diversity index and Simpson's diversity index [12]. The data were further analyzed to identify patterns of distribution and abundance across different habitats within the lake (littoral vs. open water) and to assess the impact of seasonal changes on aquatic insect communities.

Ecological Assessment

The ecological condition of Sina Lake was evaluated using the presence and abundance of specific insect taxa known to be sensitive or tolerant to pollution. The Biological Monitoring Working Party (BMWP) score system was employed to assess water quality, with higher scores indicating better ecological conditions [13].

Comparison with Other Studies

The findings from Sina Lake were compared with similar studies conducted in other rural freshwater lakes in India. This comparative analysis provided insights into the regional significance of Sina Lake as a reservoir of aquatic biodiversity [14].

Results and Discussion

The study conducted at Sina Lake, Nimgon Gangarda, Ahmednagar District, and Maharashtra, revealed a rich diversity of aquatic insects across various taxa. A total of 36 species belonging to 8 different orders were identified during the sampling period. The most abundant orders were Diptera, Ephemeroptera, Odonata, and Hemiptera. These orders are known for their significant roles in freshwater ecosystems, such as contributing to the food web as primary consumers and serving as indicators of water quality. [15, 16].

Species Richness and Composition

The order Diptera exhibited the highest species richness, comprising 12 species, primarily dominated by chironomid larvae. Ephemeroptera (mayflies) were the second most abundant, with 8 species identified, indicating the lake's good water quality, as they are sensitive to pollution. Odonata (dragonflies and damselflies) contributed 7 species, with both families Libellulidae and Coenagrionidae being well represented. Hemiptera (true bugs) were also well-represented, with 5 species, including water boatmen (Corixidae) and backswimmers (Notonectidae).

Abundance and Distribution

The abundance of aquatic insects varied across different sampling sites within the lake. The littoral zone, characterized by dense aquatic vegetation, supported the highest insect abundance, particularly for Diptera and Hemiptera, which thrive in such habitats. In contrast, the deeper, open water areas of the lake had lower species richness and abundance, with Odonata being more prevalent due to their preference for open, sunlit areas.

Ecological Indicators

The presence of diverse species of Ephemeroptera, Odonata, and Trichoptera suggests that Sina Lake is in relatively good ecological condition, with low levels of pollution. The dominance of pollution-sensitive species, such as mayflies and caddisflies, further supports the lake's health. However, the occurrence of a few pollution-tolerant species, such as certain chironomid larvae, indicates localized areas of stress, possibly due to agricultural runoff or other anthropogenic activities.

Seasonal Variations

The study also observed notable seasonal variations in aquatic insect diversity and abundance. The post-monsoon period recorded the highest species richness and abundance, coinciding with increased water levels and vegetation growth, providing ample habitat and food resources. In contrast, the pre-monsoon season showed a decline in species richness, likely due to reduced water levels and increased temperature, which can negatively affect aquatic habitats.

4. Comparison with Other Studies

When compared with similar studies in other rural freshwater lakes in India, the diversity of aquatic insects in Sina Lake was found to be moderately high. This suggests that rural freshwater lakes like Sina are important reservoirs of biodiversity, even in the absence of extensive anthropogenic pressures.

The high species richness of Diptera, particularly the chironomid larvae, is consistent with findings from similar studies in freshwater bodies, where they are often the most diverse and abundant group due to their adaptability to various environmental conditions [17]. The presence of Ephemeroptera as the second most abundant group is particularly noteworthy, as mayflies are sensitive to water quality and serve as reliable indicators of ecological health. Their abundance suggests that Sina Lake maintains good water quality, with minimal pollution impacts. Odonata and Hemiptera, both of which were well-represented, contribute to the lake's ecological balance by acting as predators and playing roles in nutrient cycling. The diversity within Odonata, including both dragonflies and damselflies, is indicative of a healthy aquatic environment, as these species are often found in areas with good water quality and a stable habitat structure [18].

The study's findings on the distribution of aquatic insects across different habitats within Sina Lake provide insights into the ecological preferences of these species. The littoral zone, with its dense aquatic vegetation, supported the highest insect abundance, particularly for Diptera and Hemiptera. This is likely due to the availability of organic matter and shelter provided by the vegetation, which supports larval development and offers protection from predators [19].In contrast, the lower species richness in the open water areas, dominated by Odonata, reflects the habitat preferences of these insects, which are adapted to environments with fewer physical obstructions and ample sunlight for thermoregulation [20].The presence of pollution-sensitive taxa such as Ephemeroptera and Trichoptera, alongside the dominance of chironomid larvae, suggests a mixed ecological status for Sina Lake. While the overall health of the lake appears to be good, the occurrence of pollution-tolerant species like certain Diptera indicates localized stress, potentially due to agricultural runoff or other anthropogenic influences. This finding is consistent with studies from other rural freshwater lakes where agricultural activities can introduce nutrients and contaminants into aquatic systems, leading to shifts in community composition [21].

Seasonal variations in species richness and abundance observed in this study are in line with established patterns in tropical freshwater ecosystems, where monsoonal cycles influence water levels, habitat availability, and resource distribution [22]. The post-monsoon period, characterized by higher water levels and increased vegetation growth, provided optimal conditions for aquatic insects, resulting in the highest species richness and abundance. Conversely, the pre-monsoon season's decline in diversity can be attributed to reduced water availability and higher temperatures, which stress aquatic habitats and limit the distribution of some species [23].

The moderate to high diversity of aquatic insects in Sina Lake, as compared to other rural freshwater lakes in India, highlights the importance of such ecosystems as biodiversity hotspots, even in less disturbed rural areas. This aligns with findings from other studies that emphasize the role of rural lakes in conserving regional biodiversity, particularly in the face of increasing anthropogenic pressures on more urbanized water bodies [24]. The results of this study have important implications for the conservation and management of Sina Lake and similar rural freshwater ecosystems. The presence of a diverse aquatic insect community, including both pollution-sensitive and tolerant species, suggests that while Sina Lake is currently in good ecological health, it may be vulnerable to future environmental changes. Continuous monitoring and the implementation of conservation measures, such as controlling agricultural runoff and preserving natural vegetation, are crucial for maintaining the lake's ecological integrity [25].

5. Conclusion and Future Scope:

The study at Sina Lake revealed a rich diversity of aquatic insect species, with a total of 36 species across 8 orders. The dominance of Diptera and the presence of pollution-sensitive species like Ephemeroptera suggest that the lake has relatively good water quality. Insects were more abundant in the littoral zone with dense vegetation, while deeper waters supported fewer species. Seasonal variations indicated higher diversity post-monsoon, with a decline during the pre-monsoon season. The findings highlight that Sina Lake, despite minimal anthropogenic pressure, serves as an important reservoir of biodiversity.

1. Regular assessment of aquatic insect diversity in Sina Lake can help track changes in species composition and identify emerging ecological threats such as pollution or habitat alteration.
2. Investigating how environmental stressors, including climate change and agricultural runoff, influence aquatic insect diversity could provide insights into the resilience of Sina Lake's ecosystem.
3. Developing conservation strategies to protect pollution-sensitive species and manage pollution-tolerant species will be crucial in maintaining the lake's ecological balance.
4. Efforts to enhance and protect the littoral zone, which supports the highest insect abundance, can improve habitat quality and sustain aquatic biodiversity in the long term.
5. Expanding this study to include other rural freshwater lakes in the region would provide a broader understanding of the ecological health of these important ecosystems across Maharashtra.

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Diversity of Bivalvia Molluscs in Hangarga (Tul) Water Tank from Dharashiv District (M.S.) India

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ABSTRACT
The present study of diversity of Bivalvia Molluscs in Hangarga (Tul.) water tank from Dharashiv Dist. (M.S.) India. The work carried out during year July 2022 to June 2023. Its Location of Latitude 170-390 and Longitude 740-700 and they are manmade Earthen water tank. The total water storage capacity of tank 2.04 D.L. M.H. and living stock 1.876 Sqm. The water tank Maximum hight 10.97 m. The water tank completion in 1975.76. The bivalve molluscs are in some ways the most highly modified of all Molluscs over evolutionary time they become flattened side to side. Bivalve shells have many uses leading international trade i.e. Jewellery, Raw material, food etc. The result of present investigation study of 08 species belonging to 05order and 05families. The dominant order in Unionida representing 03 species and order venerida is a single (o1) species, Littorinimorpha is single (01) species, Neotaenioglossa is (02) species, Hygrophila is a single (01) occurrence species in Hangarga (Tul.) water tank.
Keywords— Bivalvia Molluscs, Hangarga (Tul.) water tank.

1. Introduction:

Mollusca are comprised by roughly 120 000 species (80 Gastropods, 15 Bivalvia) and latterly is the alternate most grouped beast phylum passing in all major circumstances but the light. It's also the leading phylum concerning doomed and delicate species. Biodiversity is one of the pivotal lives supporting system on the soil. Molluscs are set up in distinctive sphere and are separated into freshwater, marine and terrestrial shapes. The brackish Mollusca play a pivotal portion in water natural frame. The phylum Mollusca have a broad bunch of creatures shaving move classes, shape, bents & have different terrain (Subba Rao1993). The brackish molluscs have a shell, in which the fragile corridor is boxed. utmost species can beetleweed by their shell characters.

Brackish gastropods are moreover carnivorous or detrivore or they may Immovably use small unheroic creatures related with periphyton (Tyagi, 2015). Colorful species went through their entire lives in many square measures of region; making them astonishingly vulnerable to defined characteristic living space corruption. In show misprision toward of the reality that utmost species favor clean unfaltering and bottoms, a many favor fragile substrates more common to lakes and lakes. adjoining to this a many wide-ranging Crawler species can successfully survive in bemired region our data on Indian brackish molluscs is grounded on benefactions made by a many earlier pros in the causerie “ Freshwater molluscs of India” say in brief around the common points of Environment transport zoogeography significance of malacological considers their portion in remedial, veterinary, open substance, monoculture etc.(Ramakrishna and Day, 2007) still, in a many bunches the conchological characters have to be rounded by their structural characters which are employed for consider of molluscan logical bracket. The requested illustration of Indian brackish Mollusca has been done by Zoological Diagram of India (Subba Rao 1989) Indian gastropod studied by colorful sloggers Annadale (1919), Prasad (1925), Hora (1925 & 1926). Suryawanshi et.al, (2012) considered biodiversity of molluscs from sluice Godavari, store and lake, nitty gritty 24 species of unused water molluscs. Utmost extra ordinary species were collected from Derla tank. The essential ideal of the show consider was to chronicle the molluscan contrasts of the freshwater from Hangarga (Tul) water tank quarter of Dharashiv. The recognizable evidence, requested account and movement of molluscs set up in brackish inventories will serve to keep add up to record for development consider

2. Material Method: -

Molluscan species were collected utilizing a basic hand-picking strategy. Collected shells cleaned with water and sun-dried. Dry shells at that point stuffed in plastic pockets and brought to the research facility for advance identification .The molluscs shell identified by using Handbook of Freshwater Molluscs of India by Subba Rao, Zoological survey of India, Calcutta and handbook on Indian freshwater molluscs Ramakrishna Aniruddha Dey zoological survey of India.

3. Result and Discussion

List of Molluscan in Hangarga (Tul.) Water Tank
July 2022 to June 2023
Table Number – 1

Class	Order	Family	Species
	Unionida	Unionidae	1. Lamellidens corrians
	Unionida	Unionidae	2. Lamellidens marginalis
	Unionida	Unionidae	3. Unio SP
Bivalvia	Venerida	Cyrenidae	4. Carbicula Fluminea
	Littorinimorpha	Bithnnidae	1. Bithyni pulchella
	Neotaenioglossa	Bithnnidae	1. Gobbia stenothuroides
Gastropoda		Thiaridae	2. Melania SP
	Hygrophila	Planorbidae	1. Indoplanorbis

Species Studies


Lamellidens Corrians


Lamellidens Marginalis


Unio SP


Corbicula Fluminea


Gobbia Stenothvroides


Melania Sp.


Indoplanorbis


Bithyni Pulchella

In the present study a total 08 Molluscans species were reported from the Hangarga (Tul) Water tank. These listed species belong to 2 classes 06 families. Out of 08 species, 04 species belong to class Bivalvia and 04 species belongs to class gastropods.

In the show examination the molluscan differing rates was done. It's significantly essential for the generally productivity and reverse of maritime terrain, to have well off molluscan millions (Subba Rao, 1989). The molluscan fauna of Maharashtra state has no meetly being considered, in any case many sloggers have tried in analyzing the information with regard to faunal differing rates of the molluscan many sloggers like Subba Rao and Mitra (1975) audited on the collection of molluscans from Poona and connecting regions. Tonapi and Mulherkar (1963) have as well considered brackish molluscan from Poona. Patil and Talmale (2005) dispersed a roster of arrive and brackish molluscan from the Maharashtra state. They've point by point 142 species of molluscan lower than 23 families. A similar consider was conducted on molluscan community of the Bharathapuzha Stream in Kerala and thirteen species of molluscs having a put to ve orders, eight families and ten rubrics were nitty gritty (Bijukumar et.al., 2001). Farida (1988) recorded 59 species from Layari sluice. Among them, 31 species have a put to course Gastropods, 27 species have a put to Bivalvia and the assignment Scaphopoda contains as it were one species.

3. Conclusion

During study Altogather 08 spcies belonging to 05 families of 02 clsses were recorded. This information of freshwatwe mollusca from Hangarga(Tul)water tank. From the over disclosures it is clear that freshwater molluscs constituents a major expansive scale benthic organisms and outline a major interface in food web of unused water environment. The nearness of molluscan is profoundly necessary since they constitute food for various sea-going fowls and occupant of the supplies. It is necessary to secure and protect the varying qualities freshwater molluscan in any given maritime bodies. Advance insight is required to construct up a data base of molluscan contrasts from freshwater bodies.

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Studies On Environmental Challenges for Medicinal Plants Growth

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ABSTRACT
Plant Kingdom is second largest kingdom having high variation of flowering plants.Plant fulfilled basic need of human all over the world. Some plants use as ethnomedicine from earlier time. It plays key role in Herbal therapy. Medicinal plant diversity is important aspect of plant diversity. Environmental factor caused erratic interaction with medicinal plants existence. Such as Biotic (bacterial-fungal infection, Animal grazing, Human interaction) and Abiotic factors (Temperature, Precipitation, soil erosion, flood, Drought, Wildfire). stress on medicinal plants caused by environment. So, criticisms ahead of us for medicinal plants to make favourable environmental and obtain medicinal quality. Our purpose to range over Implicit the medicinal plants resources and Environmental Challenges in front of them. It is necessary for future welfare as well as development of different strategies for medicinal plant-based product with enhance quality of living being.
Key words: Medicinal plants, Diversity, Growth, Environmental challenges

1. Introduction:

Medicinal plants having properties from ancient time. According to WHO 80% developing countries utilize plant-based medicine. There are 25% medicine used in developed country which made up of wild plants (4). Out of 3,74000 medicinal species human aware and used only 28,187 species and 1340 plant having antimicrobial properties. (2). In world 12 megadiversity countries (5). Asian countries like China, India, Bangladesh Pakistan and Afghanistan having system like as Unani, Ayurveda. The diversity of Medicinal plants important for Environment balance. Its beneficial for Human health. Out of biodiversity 8% in India (3).

In India 17,000 species of flowering plants out of these 7200 uses for medicinal purpose. In Ayurveda 2000 species described foe medicinal uses. Himalaya is one of the biodiversity hotspots having 8000species of flowering plant, 44 species of Gymnosperm and 600 species of Pteridophyte but out of these around 1800 species in medicinal uses. Approximately 46% species in Himalaya are endemic species (13).

But change in environmental conditions caused disturbances in overall healthy growth of medicinal plants (6).

Global warming is responsible for increasing normal temperature of earth. This phenomenon directly create issue about changes in seasonal pattern of medicinal plants as well as increase carbon dioxide level due to greenhouse effect responsible to increase temperature. (1). Medicinal plants metabolite unstable at high temperature and damage medicinal property (10).

In South Africa 80% people use plant based traditional medicine for basic health care. Day by day in global market start initiative for identification of medicinally importance plants (7).

There are above 50,000 flowering plants used as medicinal plant in all over world. Out of these 15,000 species in endangered condition. In some Asian countries like China India Nepal, Kenya Tanzania and Uganda habitat and species loss cause severe risk of vanishing medicinal plants (4).

In China Medicinal plants having severe infection of Endophytic fungi that mostly distributed by Environmental differences. Total 1160 fungi isolate from 29 medicinal plant (9). Tropical dry forest in all over biodiversity is 38.2% which are vulnerable part of ecosystem. It is superiorly facing environmental disturbances (5).

In India 17,000 species of flowering plants out of these 7200 uses for medicinal purpose. In Ayurveda 2000 species described foe medicinal uses. Himalaya is one of the biodiversity hotspots having 8000species of flowering plant, 44 species of Gymnosperm and 600 species of Pteridophyte but out of these around 1800 species in medicinal uses. Approximately 46% species in Himalaya are endemic species (13).

Continuous growth of population create stress on availability of food and medicine. In developing countries people mostly used forest products, that's why deforestation increases and lead to soil erosion which directly effect in market availability of the medicinal plant material that reduced. So, it challenging high difference in supply and demand (13).

The quality of medicinal plant species interrupted by geographical region and environmental condition that effect on susceptibility and standard of medicinal plants (2). Such prolonged stress cause adverse effect on primary and secondary metabolite production in medicinal plants. Environmental change also cause disease in medicinal plant and their impact on low quality yield production (1).

Environmental dstruction and problem are created due to human interfere. That why Global warming, greenhouse effect and pollution increases (8). In every year's number of medicinal plants species lost more than 100-to-1000-time excepted natural demolition (4). The contamination of heavy metal like Cd, Ni, Cr and Hg in soil cause adverse effect on growth of medicinal plants and their medicinal properties (11). The External factor of Environment adversely effect on medicinal plant development, growth rate, changes in secondary metabolite production (12)

Some factor like as overharvesting, invasive species competition, habitat loss, deforestation responsible for high risk of extinction of medicinal plants. Also, climatic change such as fluctuation in rainfall, overpopulation, global warming caused over 15000 medicinal species at close to extinct phase (12).

In some region of Asia, America, Africa and Europe medicinal plant species such as *Aloe species, Bark of willow tree, Sanguinaria canadenis, Autumn crocus, European foxglove, periwinkle, Cinchona species, Star anise* etc. over range used in pharma industries, cosmetic production, nutrition product, traditional medicine caused high risk of extinction (12).

2. Review of literature

Environmental stress cause decrease in biomass of medicinal plants as well as fluctuate concentration of secondary metabolite. Climate change increase the chances of pest and bacterial- fungal infection. finally environmental stress indirectly effect on human welfare (1). Different standard plant species mostly endemics or restricted in specific geographical area (2).

Medicinal plants are stock of large variety if metabolic products such as spermidine, rutin, quercetin, tocopherol, and carotenoids which useful as anti-inflammatory, antimicrobial, antioxidative, antibacterial, antifungal agents. Tea tree plant is complete antimicrobial agent. The *camero onian* plants having different type of secondary metabolites such as Phenolics, alkaloids, flavonoids, triterpenes, and steroids (2).

All over the world India and China having large number of medicinal plants but having maximum threatened species in it. Rare species having high risk threatened species. Also, human interference such as Overutilization, random collection, unrestricted deforestation, and habitat demolition all affect species uniqueness, Other than some biological characters extinction risk, such as habitat specificity, distribution range, population size, species diversity, growth rate, and reproductive system affect in it (4).

In situ conservation necessary for natural production of secondary metabolites by natural environment as well as increase diversity conservation, preservation of whole community and aligned resource conservation and sustainable use. Main cause for loss of medicinal plants in In-situ conservation degradation and destruction of medicinal plants (4). Last few decades human induced disturbances caused high risk for diversity of medicinal plants. In Jashpur district of Chhattisgarh around 62.27% tribal people. 42% of land of forest in this district. tribal people use forest resources in large manner which caused forest disintegration and loss in biodiversity of medicinal plants (5).

In African country Tanzania random and extensive harvesting of wild medicinal plants in holy forest that cause extinction standard plant species. Their contradictory effect on related occupation, Economy and health (7).

Over exploitation of medicinal plants chain due to the domestication and biotechnological process of medicinal plants species. Some biotechnological process such as tissue culture, genetic transformation and marker assisted selection difficulties occur in in identification, quality of secondary metabolites, challenges of pest and disease infection and low environmental tolerance. So necessary to sufficient knowledge and control about cultivation as well as adequate research about distribution, genetic diversity and ecology of species (7).

In India north east side Manipur state having variety of endemic medicinal plants. A unique species of land lily state flower of Manipur in 1989 grow at 2590,8m hight from sea level. It has diverse herb, fruits, vegetables, medicinal, Aromatic and ornamental plants. Its cure various health problems, but from some years this plant species risky condition as deforestation, over exploitation, Human interaction and urbanization (8). Much of the challenges in front of medicinal plants including environment and stress factor (12). different region of definite geography and ecological condition that why much of medicinal plants species endemic in this region (13).

In Germany approximately 1500 medicinal plants species in which only 20% cultivated and 10% output of cultivation, that mean wild varieties medicinal plants of that grow in natural environment, which give low yield in cultivation. In some region gypsy people is conventional reaper of medicinal plants. Ethical as well as socio economic exploitation of often for weak people of minorities are also dominant global issue (16).

There is necessary to awareness about ecological risk in ecofriendly growth of medicinal plants. (7). In some countries depletion of medicinal plants due to unethical use of resources. The data given by international union for conservation of nature about 50,000 to 80,000 flowering plants used in pharmaceutical industry all over world. Out of these 15,000 are endangered species because of overharvesting and habitat demolition as well as urbanization and over grazing loss 20% of environmental resources (18).

3. Result and Discussion

Concentration of secondary metabolite increases by stress but decreases in biomass production. Secondary metabolite production differentiates by life span, growing season, phenophase, soil and climatic condition. Pest and disease of medicinal plant due to effect of Climate change (1). Quality plant species is limited in restricted geographical area. Environmental condition dominantly effect on quality of medicinal plants (2). All medicinal plant not manageable for cultivation hence priority to conservation of medicinal plants for development as well as economic point of view (3). It is not possible for in situ conservation of every habitat that's why cultivating endangered medicinal plants in protective zone. Overexploitation, habitat destruction, invasive species cause high pressure on wildspecies (4). Grazing Animal damage the herbaceous vegetation that fluctuate geographical dispersion (5).

Sustainable growth of medicinal plant under different shared socioeconomic pathway there are necessary migration of central area of medicinal plant diversity retort to influence of climatic change (6). The important ultimatum to medicinal plants rises in depletion of genetic diversity as undefendable utilization habitat destruction. High demand of raw material for pharmaceutical industry create pressure on medicinal flora. In Africa 1993 and 1996 the medicinal plant *Prunus africana* illegally harvested for high demand in global market so, from last decade their natural floragoing to extinct stage (7).

In Manipur state of India diversity of medicinal plants destroyed due to high civilization and habitat demolition (8). Accumulation of heavy metal in plants cause adverse effect on production of secondary metabolites (11). In China different endophytic fungi shows variation in frequency of infection. In study on 29 medicinal plants infected by minimum 3 taxa to maximum 83 taxa of endophytic fungi. some medicinal plants hide more endophytic fungi than others (9).

Environmental factor Quantitatively effect on metabolism such as plant development, growth rate and activation of qualitative change and plant cannot run away from extreme climatic condition like temperature, light and drought. This all factor change physiology of plants, but some time plant adopt in that condition to change their physiology (13). Finally high scale harvesting, invasive species competition, habitat destruction, deforestation, change in rainfall pattern, over population, global warming and pest and disease attack cause rick of medicinal plant extinction (13). In all over the world medicinal plants necessary against critical disease treatment (12).

Hemidesmus indicus this medicinal plant cure 34 type of diseases*, Aegle marmelos* cure 31*, Phyllanthus emblica cure* 29*, and Gloriosa superba* 28 cure disease. Over exploitation and habitat depeletion seriously effect on living pattern indigenous people live in forest (13). These species are under risk of extinction due to over harvesting from wild habitat. Over-exploitation and continuous depletion of medicinal plants have not only affected their supply and loss of genetic diversity, but have seriously affected the living pattern of tribal people in the forest (13).

There is necessary to focus on effect of climate change on medicinal plants which changes species composition (19). As copare to other plants, Medicinal and Aromatic plants having low resistance against climate fluctuation climate change Climate changes are causing remarkable impact on lifecycles and distributions of plants, therefore many medicinal plants endemic particular geographic zone (20).

4. Conclusion

According to various researcher due to environmental biotic and abiotic factor different challenges increases day by day in front of medicinal plant conservation. Anthropogenic interaction cause deforestation, over exploitation, habitat demolition, animal grazing, urbanization, overharvesting of medicinal plants. also, environmental stress such as global warming, carbon sequestration, drought and salinity, pest and diseases cause adverse effect on growth, geographical dispersion, qualitative and quantitative production of secondary metabolites. Finally, it effects on Economy in production of pharmaceuticals industry, herbal products industry, So, there is necessary to stand against problems of medicinal plants.

Conflict of Interest

Author declare that do not have any conflict of interest.

Authors' Contributions

First Author researched literature and conceived the study. Second Author involved in protocol development, gaining ethical and edited the manuscript and approved the final version of the manuscript.

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Ichtyofaunal Study of Harsul Dam District Chhatrapati Sambhaji Nagar, Maharashtra, India

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ABSTRACT
Icthyofaunal study was carried out to study fish biodiversity of Harsul dam, Dist. Chhatrapati Sambhaji Nagar, Maharashtra State . The survey was conducted from January - 2022 to December - 2022. Harsul dam. North of the main city Chhatrapati Sambhaji Nagar.The current activity depends on the species and abundance of freshwater fish in the reservoir.
The results of this study indicate that 19 species of fish were present in 6 orders, 11 families, and 16 genera. Siluriformes were dominant accounting for 32% of the fish collected, followed by Cypriniformes accounting for 21%, and Loaches accounting for 11% of the total number of fish recorded, Beloniformies 5% while Anguillariformes accounted for 5 %
Keywords: Icthyofauna, Biodiversity, Harsul dam, Economic value, Nutritive value

1. Introduction:

Fish appeared during the Swamp Period, approximately 350 million years ago. In terms of diversity and evolutionary history, teleosts are the most successful group of fish. More than 20,000 species of fish have been discovered, of which less than 600 are cartilaginous fish, bony fish that live in various water bodies, lakes, ponds, rivers, and brackish and marine waters. Fish account for more than half of the 54,711 estimated vertebrate species, and there are approximately 27,977 described fish species Fish are one of the most important sources of protein for humans. Enrichment and frequent provision of fish from aquaculture could help solve the problem of human malnutrition.

Biodiversity is important for stabilizing ecosystems, maintaining the overall quality of the environment, and appreciating the value of all animals on Earth. (3) The reservoir's fish biodiversity serves as a substitute for the richness and diversity of the fish fauna that is currently in use. The dam stores fish in abundance and supports the fishing industry. The potential of fish farming in India is still not fully exploited. Fish has nutritional benefits and is a source of protein. After the green revolution, aquaculture needs to be prioritized to feed the masses. The success of fish farming depends on, among other things, the selection of the right species. The country is rich in these important species and therefore there is a need to conduct research on fish diversity in different habitats like rivers, lakes, dams, reservoirs, and others across the country.

The total length of water in India is about 49,000 miles. The area of all the rivers and their tributaries, channels, and canals is about 13,000 square kilometers. India's riverine fisheries are divided into five main riverine systems.

- West Coast river system. (4)
- Indus river system
- Ganga river system
- East coast river system
- Brahmaputra river system

Kham River is a river in western Maharashtra. It is a tributary of the Godavari River. Harsul Dam is 9 km from Kham River and receives an average rainfall of 665mm. Harsul Dam is located on the northern side of Chhatrapati Sambhaji Nagar. The reservoir supplies water to the old town of Chhatrapati Sambhaji Nagar. The geographical location of Harsul Dam is 19^0 55' 45.9120"North and 75^0 21' 11.6388" East (M.S) India.

The above study aims to collect new information about the east coast and to better understand the fish biodiversity of Harsul Dam. It serves as a planning and conservation tool for land in aquatic environments. In this research study, various economic and commercial importance of fish species in the study area have been recorded.

2. Materials And Methods:

Fish were collected from the Harsul Dam with the assistance of local fishermen. Fishermen employ many types of nets, including gill nets, cast nets, trawl nets, wadab nets, and Bhor jal nets, to capture fish. Instant images are captured using a digital camera. Fishes were identified, collected, and taken to the laboratory for further examination.

Fishes were sampled Department of Zoology Research Center, Maulana Azad College, Chhatrapati Sambhaji Nagar (M.S.) India. The specimens were subsequently preserved in 10% formalin in distinct containers based on their dimensions. Small fish species were immersed in a 10% formalin solution. Large fish species were incised in the abdomen and preserved.

The cladistic and morphological Characteristics of collected fish were evaluated and the species level was determined with the help of standard keys and books. (3, 7)

3. Results :

During the Research, different fish species were found in Harsul Dam, Chhatrapati Sambhaji Nagar (M.S) India. The area possesses abundant fish biodiversity. Fish from six orders and eleven families were collected throughout the study. Many of the important fish harvested are sold in local fish markets after harvest.

In the current fish fauna survey, 19 species and 6 orders from 16 different species were recorded as fishing activities in Harsul Dam during the period January - December 2022. Siluriformes are dominated by 6 species 5 species from Cypriniformes, Perciformes 4 species, Mastacembeliformes 2 species, Beleniformes and Anguilliformes with one species each.

Siluriformes is the most important with 6 species among which namely *Pangasianodon hypothalamus, Wallgo attu, Ompok bimaculatus, Mystus seenghala, Heteropneustes fossils, Clarius batrachus* were found to be the most abundant. Cypriniformes and Perciformes are abundant with 5 and 4 species respectively. Average diversity of Mastacemeliformes and rare diversity of Beleniformes and Anguliformes with one species each as shown (Table No.1)

Nineteen fish species have been identified and recorded in Harsul Dam, Chhatrapati Sambhaji Nagar (M.S.) India. Among them, Siluriformes is dominant and has a share of 32%. Cypriniformes has a share of 26% Perciformen has a share of 21% order Mastacemeliformes constituting 11% order beloniformens and Anguilliformes has a share of 5%. All fishes are shown in the image (fig-1).

Fishing was carried out throughout the year less catch in monsoon and higher catch in the post-monsoon and summer seasons.

4. Discussion :

Biodiversity and its conservation are recognized as one of the main challenges to the successful use of natural resources. This programme focuses on fish diversity in freshwater reservoirs and their conservation. Fishing and aquaculture constitute one of the greatest sectors globally. Fishing significantly contributes to economic growth by providing financial resources for food and nutrition, national income, and employment opportunities. India is home to a diverse array of freshwater fish species, totaling 1027. (1,2)

Table 1 : Showing Icthyofuanal diversity of Harsul dam

Order	Family	Scientific name	Common name	Group of food fish	Status
Siluriformes	*Pangasiidae*	*Pangasianodon hypopthalamus*	Fresh water shark	Food fish	+++
	Siluridae	*Wallgo attu*	Balu/lachi	Predatory fish	+++
		Ompok bimaculatus	Poda	Food fish	+++
	Bagridae	*Mystus seenghala*	Seenghala	Food fish	+++
	Heteropeustidae	*Heteropneustes fossils*	Magur	Food fish	+++
	Clariidae	*Clarius batrachus*	Mangur	Food fish	+++
Cypriniformes	*Cyprinidae*	*Rosbora daniconius*	Rasbora	Food fish	++
		Labeo rohita	Rohu	Carp	++
		Garra lanta	Garra	Food fish	++
		Cirrhinus mrigala	Mrigala	Carp	++
		Catla catla	catla	Carp	++
Perciformes	*Channidae*	*Channa striatus*	Morrul	Predatory fish	+
		Channa marulius	Maral	Food fish	+
		Channa gaucha	Dhoke	Predatory fish	+

	Cichlidae	*Tilapia mossambicus*	Tilapia	Food fish	+
Mastacembeliformes	*Mastacembelidae*	*Mastacembelus pancalus*	Garvan Vam	Predatory Fish	+
		Mastacembelus armatus	Bam	Predatory fish	+
Beleniformes	*Belonidae*	*Xenentodon cancila*	Choch masa	Food fish	+
Anguilliformes	*Anguillidae*	*Anguilla benagalensis*	Anguila	Food fish	+

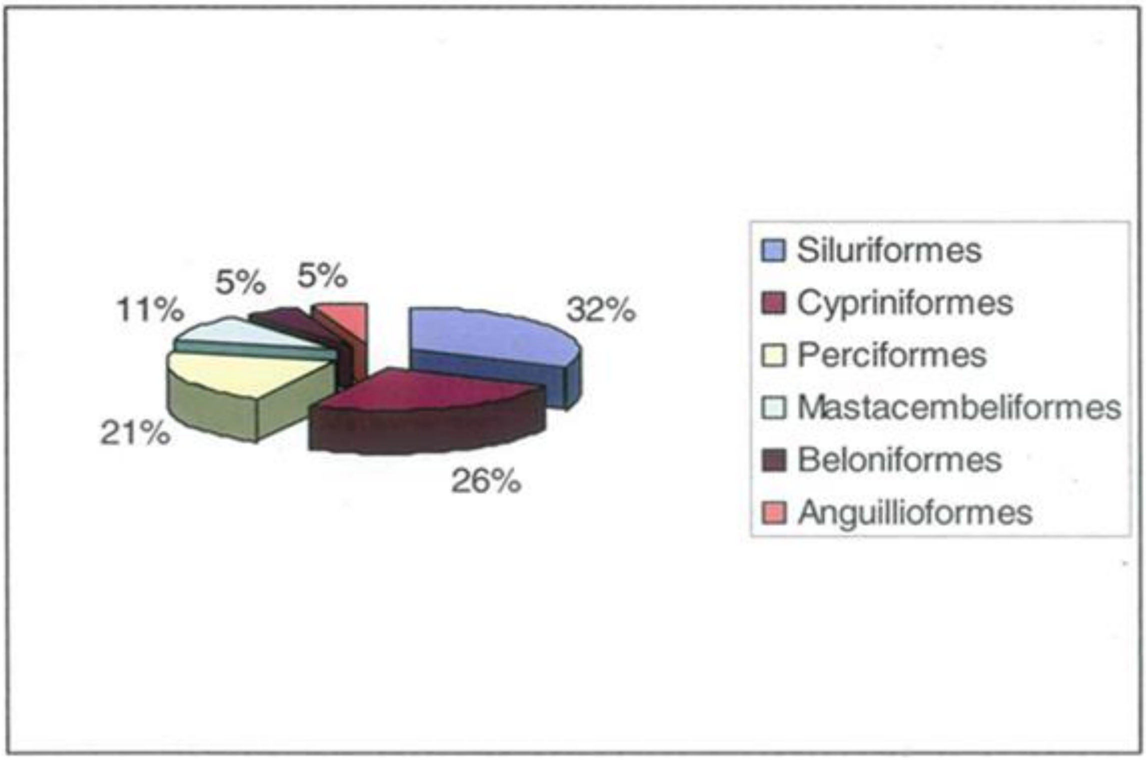
+++ most abundant ++ abundant + Less abundant

India currently ranks third in the world in fisheries production, accounting for 6.3 % of the world's total fish production. India's total fish production was estimated at 12.6 million tonnes in 2017-18; out of which about 65% came from the domestic market and about 50% of the total came from Anonymous fish farms(2020 a)

Cyprinds have been found to be dominant in natural water bodies in South Asia and reported in many studies, (4), (7)

A total of 43 fish species have been recorded in the Hirakund reservoir (17) Of which 18 were commercially important (13) 34 Species have been reported in Parbhani reservoir (14) Reported the Icthyofauna of Harsool Sawangi dam, Chhatrapati Sambhaji Nagar (M.S) India, with a total 15 fish species belonging to 12 genera, 3 orders, and 4 families reported. There are 11 species of Cypriniformes, followed by 3 species of Perciformes and 1 species of Siluriformes

The ichthyofaunal diversity of Harsool dam (January 2022 - December 2022)



Order wise Percentage of Species.

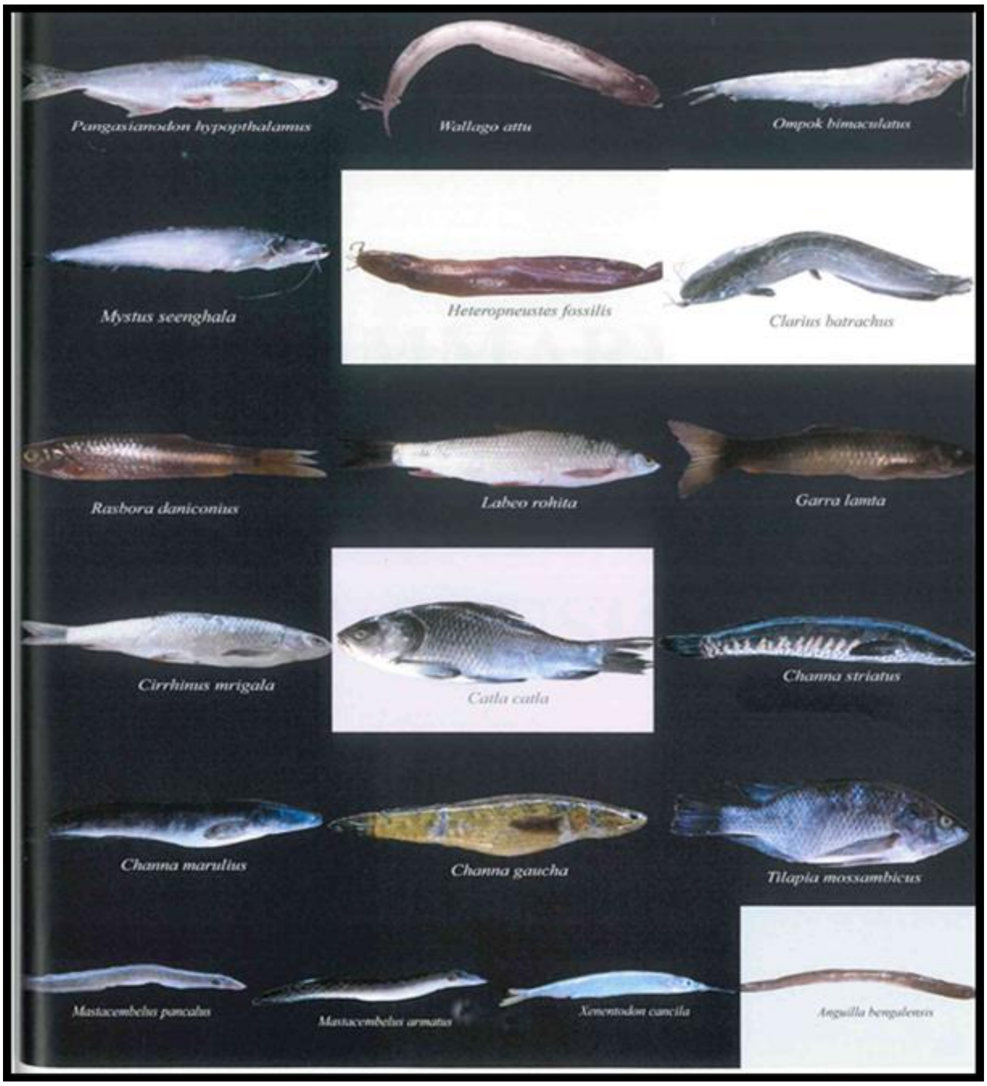


Photo plate 1

5. Conclusion:

As Rathoure and Patel(2020) (5) pointed out, biodiversity is actually comprised of many life forms and systems in the world and conservation programs can help fish to be more productive while ensuring their diverse management. Fish conservation can be implemented in Harsul Dam. The challenges facing biodiversity conservation are complex and interrelated and require coordinated action by governments, businesses, and individuals worldwide to further integrate them into country action plans.

This project has been completed and a strategy has been developed for the future development of fish conservation in Harsul Dam. Accurate data on fish biodiversity on the East Coast was collected to understand fish diversity in the Harsul Dam and to provide tools for winter water conservation planning. Conservation of fish biodiversity is very important because it is not always possible to identify the species that will support the water source.

6. Acknowledgments:

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Population Dynamics of Caryophyllidean Tapeworms in Clarias Batrachus from Jalgaon District (M.S.) India

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ABSTRACT
The present investigation deals with the population dynamics of Caryophyllidean tapeworms in Clarias batrachus from different places of Jalgaon Districts during Jan. 2022 to Dec.2022. Total 124 cestode parasites are recovered from 240 fishes. The collected cestode parasites are including 05 species of the genus Lytocestus (Cohn, 1928). This report summarizes the percentage of incidence, intensity, density and index of infection.
The high prevalence occurs in summer season especially in the month of March to May, while low prevalence occurs in winter season followed by autumn and very less occur in rainy season. The present study indicates the seasonal infection of cestodes Lytocestus in Clarias batrachus.
Keywords: - Caryophyllidean tapeworms, Clarias batrachus, Population dynamics

1. Introduction:

Fishes are important animals in ecosystem. They are useful item of human food as well as the source of income. These edible fishes are known to harbor a number of cestode parasites which cause deterioration in their health, hence their market and nutritive value is affected. Parasite can have a wide range of impact on the ecology of their hosts in terms of health (Atme and Owen, 1967) behavior (Milinski1984, Moore1984) sexual selection (Howard and Minchella, 1990 Watve and Sukmar, 1977) and regulation of the host population (Freeland, 1983). The present investigation deals with population dynamics of Caryophyllidean tapeworms from *Clarias batrachus* for three seasons' i.e. rainy, winter and summer during the year of January, 2022 to December, 2022.

Assessment of infection levels in the host as well as host population provides important information about the success of the parasite life cycle. The severity if its pathogenesity and the effectiveness of host immunity. While studying the parasite age and development rate, the additional information about infection levels proves to reconstruct the recent history by exploring the involvement of the parasites into individual host and population. The current infection rates directly reflect successful parasitic invasion moderated by host defensive response and other behavioural influences such as competition.

Many authors have carried out studies on the helminth parasites and population dynamics of those occurring in piscean hosts and work on different aspects of parasites. The study of population dynamics can be used as the biological basis of method to regulate population of parasites.

2. Materials And Methods

The freshwater fishes including the genus *Clarias batrachus* are collected from fish markets of different places of Jalgaon district. The Caryophyllidean tapeworms were collected, preserved, processed to a permanent slide and identified under a compound microscope; drawings are made with the aid of camera lucida. The identification was made with the help of "Systema Helminthium" vol. II. "Cestode of vertebrates" by Yamaguti S. (1961).

Population dynamics of cestode parasites were determined by following formulae,

1) Incidence of infection = $\dfrac{\text{Infected host X 100}}{\text{Total hosts examined}}$

2) Intensity of ` infection = $\dfrac{\text{No. of parasites collected in a sample}}{\text{No. of infected host}}$

3) Density of infection = $\dfrac{\text{No. of parasites collected in a sample}}{\text{Total host examined}}$

4) Index of infection = $\dfrac{\text{no. of host infected X No. of parasite collected}}{(\text{Total hosts examined})^{2}}$

Table. 1-The values of incidence, intensity, density and index of infection for ***Lytocestus*** sp. In the population of *Clarias batrachus* from Jalgaon district during the period of January 2022 to December 2022.

Name of Month	No. of Host examined	No. of Host infected	Total no. of Parasite collected	Incidence %	Intensity	Density	Index of Infection	Locality
Jan-22	20	7	09	35	1.28	0.45	0.15	Jalgaon
Feb-22	20	6	10	30	1.66	0.05	0.15	Jamner
Mar-22	20	10	22	50	2.2	1.1	0.55	Chalisgaon
Apr-22	20	12	25	60	2.08	1.25	0.75	Bhadgaon
May-22	20	11	24	55	2.18	1.2	0.66	Pachora
Jun-22	20	00	00	00	00	00	00	Bhusawal
Jul-22	20	00	00	00	00	00	00	Jalgaon
Aug-22	20	02	04	10	02	0.2	0.02	Jamner
Sep-22	20	03	06	0.75	02	0.3	0.04	Chalisgaon

Oct-22	20	02	05	10	2.5	0.25	0.02	Bhadgaon
Nov-22	20	04	08	20	02	0.4	0.08	Pachora
Dec-22	20	05	11	25	2.2	0.55	0.13	Bhusawal
Total	240	62	124	25.83	02	0.51	0.13	

Table. 2 - The influence of season on the parasitic infection

Genera	**Seasons**	No. of Host examined	No. of Host infected	Total no. of Parasite collected	**Incidence %**	**Intensity**	**Density**	**Index of infection**
Lytocestus	Rainy	80	05	10	**6.25**	**01**	**0.125**	**0.007**
	Winter	80	18	33	**22.5**	**1.83**	**0.412**	**0.092**
	Summer	80	39	81	**48.75**	**2.07**	**1.012**	**0.493**

Fig.1- The values for the percentage of incidence, intensity, density and index of infection for ***Lytocestus*** sp. of *Clarias batrachus* from Jalgaon district.

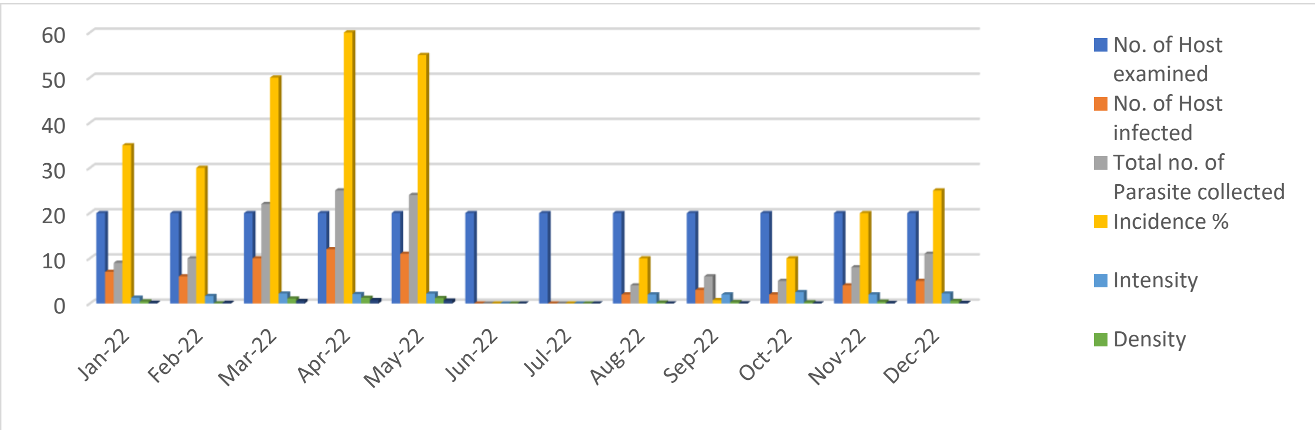
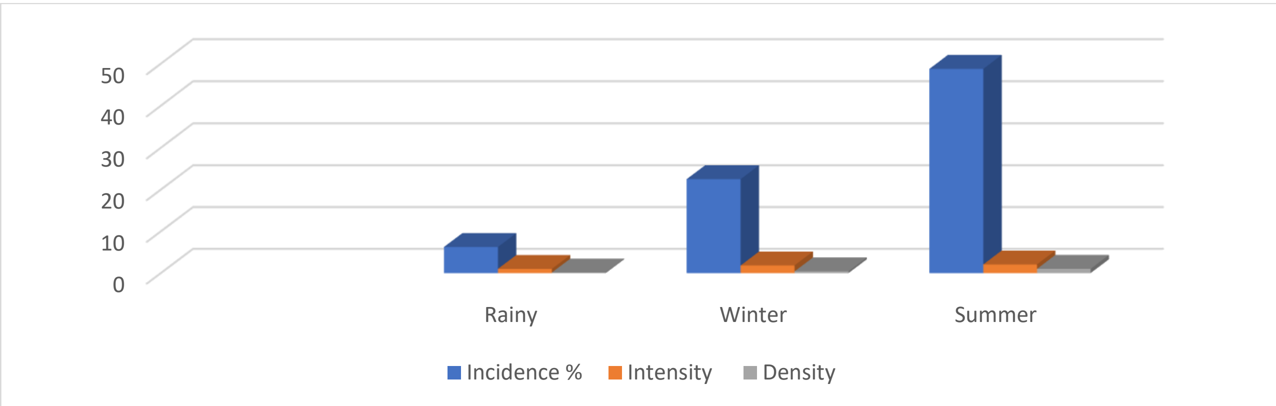


Fig.2- Influence of season on parasitic infection.



3. Results And Discussion

The present investigation indicates that out of 240 freshwater fishes, 62 are infected with Caryophyllidean tapeworms. A total 124, tapeworms are collected, from the genus *Lytocestus* (Cohn, 1908).

The seasonal variations of Caryophyllidean tapeworms show the maximum infection i.e. 81 *Lytocestus* parasites occur in summer seasons followed by, 33 *Lytocestus* parasites in winter season whereas lower infection 10 *Lytocestus* parasites in rainy season. The development of parasites should be needed high temperature and sufficient moisture. Environmental variations are reflected in seasonal difference in the incidence of diseases. Hence high incident occurs in summer season followed by winter season.

The present investigation shows that the occurrence of infection was host specific because the morphological, physiological and ecological factors affect the host specificity. The morphological factors are those which like a parasite with its host at the site of attachment (Agarwal, 2006). The ecological factors mean distribution and environment of the host and physiological factors means the diet and mode of feeding (Kennedy, 1976). Jadhav and Bhure (2006) also explained the distribution of parasites are host specific. This type of result indicates the morphological, physiological and ecological factor affects the distribution of parasites.

4. Conclusion

After the analysis of data, the present study can be concluded that the high infection of *caryophyllidean parasites* (incidence, intensity, density and index of infection) are occurred in summer seasons followed by winter where as low in monsoon season. This type of results indicated that environmental factors and feeding habitat are influencing the seasonality of parasitic infection either directly or indirectly.

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Reproductive Response of Earthworm Polypheretima elongata to Sodium Chloride Exposure

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ABSTRACT
This study investigates the effects of sodium chloride (NaCl) salinity on earthworm survival, behavior, reproduction, and juvenile development. Survival rates declined sharply with increased NaCl, dropping to 20% at 200 mM after 30 days, compared to 100% in the control. Behavioral changes, including increased surface activity and avoidance, were noted at salinities above 100 mM NaCl. Reproductive metrics also suffered: cocoon production fell from an average of 15 to 3 per earthworm at 200 mM NaCl ($p < 0.05$). Cocoon viability and hatching success decreased from 90% and 85% in the control to 40% and 30% at 200 mM NaCl ($p < 0.05$), respectively. Intermediate salinities showed gradual declines, indicating a dose-dependent effect. Juvenile growth was stunted in high salinity conditions, with weight gain reduced from 50 mg to 15 mg over 10 days at 200 mM NaCl. Fewer juveniles reached maturity, highlighting the significant impact of salinity on earthworm populations and ecosystem health.

Key words: Sodium chloride, salinity, earthworms, survival rate, behavior, cocoon production

1. Introduction:

Earthworms play a vital role in soil ecosystems by enhancing soil structure, nutrient cycling, and organic matter decomposition, thus contributing to soil fertility and agricultural productivity (3). Among the various species, *Polypheretima elongata*, a widely distributed earthworm, is particularly noted for its adaptability to diverse environmental conditions (7). Understanding the factors that influence the reproductive success of earthworms is crucial, as their reproductive activity is directly linked to population sustainability and, by extension, soil health. Salinity, primarily in the form of sodium chloride (NaCl), is an environmental stressor that can significantly impact terrestrial and aquatic organisms. Soil salinization, often resulting from natural processes or anthropogenic activities such as irrigation and industrial waste disposal, has emerged as a major environmental concern globally (Rengasamy, 2006). Increased soil salinity can lead to osmotic stress, ion toxicity, and disruption of physiological processes in soil biota, including earthworms (1).

Previous studies have documented the adverse effects of high salinity levels on earthworm survival, growth, and behavior (1&10). However, the specific effects of sodium chloride on the reproductive activity of earthworms, particularly *Polypheretima elongata*, remain underexplored. Reproductive traits, such as cocoon production, hatching success, and juvenile development, are critical indicators of the health and viability of earthworm populations (3). This study aims to investigate the reproductive response of

Polypheretima elongata to varying concentrations of sodium chloride in the soil. By examining key reproductive parameters, this research seeks to elucidate the extent to which NaCl exposure impacts the reproductive success of this species, providing insights into the broader implications of soil salinity on earthworm populations.

2. Experimental Method/Procedure/Design

2.1. Experimental Organism

The earthworm *Polypheretima elongata* was chosen for this study due to its widespread distribution and importance in soil ecosystems. Adult earthworms of uniform size and weight (average 300-400 mg) were collected from a local organic farm and acclimatized in the laboratory for one week before the experiments commenced.

2.2. Soil Preparation and NaCl Treatment

The soil used in the experiments was a loamy mixture, sterilized to remove any existing organisms, and moistened to 60% of its water-holding capacity. Sodium chloride (NaCl) was dissolved in distilled water and mixed thoroughly with the soil to create the desired concentrations: 0 mM (control), 50 mM, 100 mM, and 200 mM NaCl. These concentrations were chosen to simulate a range of salinity levels that could occur in natural and anthropogenically affected soils (12).

2.3. Survival Rate and Behavioral Observations

Twenty earthworms were placed in each of the four treatment groups (0 mM, 50 mM, 100 mM, 200 mM NaCl). Each group was housed in plastic containers (20 cm x 15 cm x 10 cm) containing 1 kg of treated soil. The earthworms were monitored daily for survival over a 30-day period. Dead earthworms were removed and recorded, and survival rates were calculated as a percentage of the initial population. Behavioral changes, such as surface activity and avoidance behavior, were also noted, particularly in the higher salinity groups (1).

2.4. Cocoon Production

To assess reproductive activity, the earthworms were left in their respective soil treatments for 30 days. The number of cocoons produced per earthworm was counted at the end of the exposure period. Each cocoon was carefully extracted from the soil, cleaned, and stored individually in Petri dishes lined with moistened filter paper. The cocoon production was recorded and averaged for each treatment group (2).

2.5. Cocoon Viability and Hatching Success

Cocoons collected from the different NaCl treatments were incubated at 25°C in a controlled environment. Cocoon viability was determined by the number of cocoons that successfully hatched, and hatching success was calculated as the percentage of viable cocoons that produced juveniles. The juveniles were counted and transferred to fresh soil treated with the same NaCl concentration as their respective cocoon origin (9).

2.6. Juvenile Development and Growth

Juvenile earthworms were monitored for growth over a 10-day period following hatching. Weight gain was measured by weighing the juveniles at the start and end of the 10-day period using a precision balance. The average weight gain was calculated for each NaCl concentration. Additionally, the number of juveniles that reached maturity was recorded to assess the long-term effects of salinity on earthworm development (1).

2.7. Statistical Analysis

Data were analyzed using one-way analysis of variance (ANOVA) to determine the significance of the effects of NaCl concentration on survival rate, cocoon production, cocoon viability, hatching success, and juvenile growth. Post-hoc comparisons were performed using Tukey's Honest Significant Difference (HSD) test to identify significant differences between treatment groups. Statistical significance was set at $p < 0.05$ for all tests (15).

3. Results and Discussion

3.1. Survival Rate and Behavior

Earthworms exposed to varying concentrations of sodium chloride (NaCl) demonstrated a clear decrease in survival rates as salinity levels increased. At the highest concentration (200 mM NaCl), only 20% of the earthworms survived after the 30-day exposure period, while the control group (0 mM NaCl) maintained a 100% survival rate throughout the study (Figure 1). Behavioral changes included increased surface activity and avoidance behavior in response to higher salinity, especially at concentrations above 100 mM NaCl. These behaviors are likely a response to the inhospitable conditions, as earthworms attempted to escape osmotic stress. This result aligns with prior research indicating that elevated salinity can be lethal to soil invertebrates by disrupting physiological processes (8 &13).

3.2. Cocoon Production

Reproductive activity, measured by cocoon production, was significantly affected by NaCl exposure. As salinity increased, cocoon production per earthworm declined sharply. In the control group, an average of 15 cocoons were produced per earthworm, while the 200 mM NaCl group produced only 3 cocoons per earthworm a statistically significant reduction ($p < 0.05$) (Table 1). This outcome suggests that salinity impairs reproductive function, consistent with findings from previous studies that highlight how salt stress inhibits reproductive success in earthworms (14).

3.3. Cocoon Viability and Hatching Success

Cocoon viability and hatching success were also compromised by NaCl exposure, showing a dose-dependent response. In the control group, viability was 90%, and the hatching success rate was 85%. However, at 200 mM NaCl, viability decreased to 40%, and hatching success dropped to 30% ($p < 0.05$) (Figure 2). Even intermediate NaCl concentrations (50 mM and 100 mM) led to reduced viability and hatching, signaling that even moderate salinity levels negatively affect earthworm reproduction. These findings align with earlier research indicating that salinity adversely affects the development and survival of earthworm cocoons and juveniles (12).

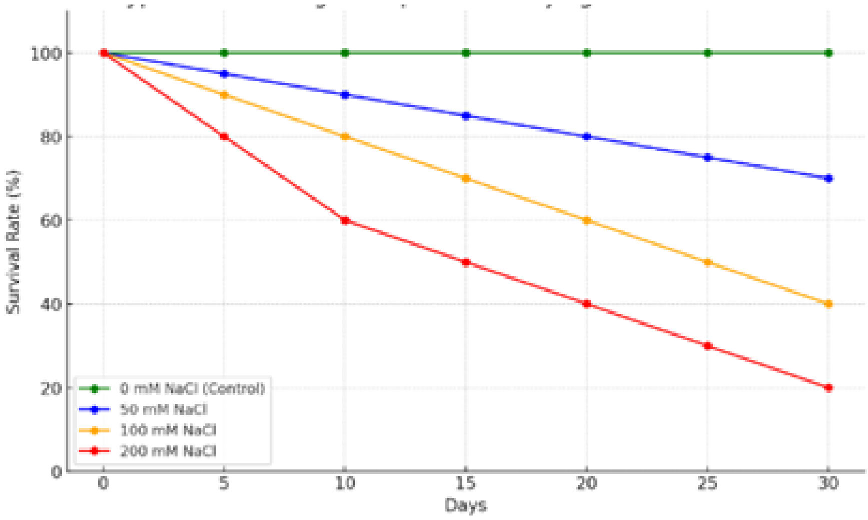
3.4. Juvenile Development and Growth

The growth and development of juveniles hatched from cocoons were significantly impacted by salinity. In the control group, juveniles exhibited normal growth, with an average weight gain of 50 mg over the first 10 days post-hatching. By contrast, juveniles in the 200 mM NaCl group experienced stunted growth, with an average weight gain of only 15 mg (Table 2). Furthermore, the number of juveniles reaching maturity in higher salinity treatments was considerably lower, indicating long-term developmental consequences. This outcome is consistent with previous studies that found salinity stress to impair the growth and overall fitness of juvenile earthworms (7&16).

3.5. Statistical Analysis

The statistical analysis using ANOVA confirmed that NaCl concentration had a significant effect on all measured reproductive parameters survival rate, cocoon production, cocoon viability, hatching success, and juvenile growth ($p < 0.05$). Tukey's HSD post-hoc test revealed significant differences between the control and all NaCl treatment groups. These results provide robust evidence of the adverse effects of salinity on the reproductive success and development of *Polypheretima elongata*.

4. Figures and Tables



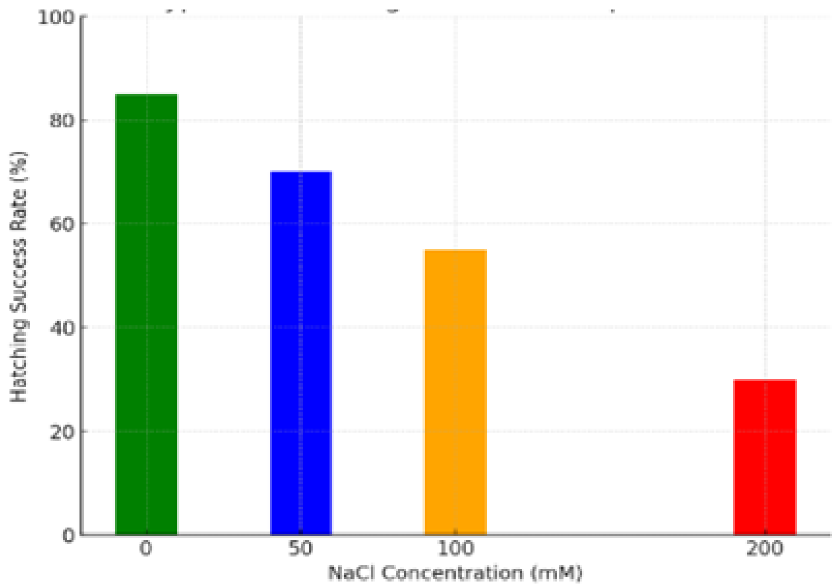


Figure 2: Hatching success rate of *Polypheretima elongata* cocoons exposed to different NaCl concentrations

Table 1: Cocoon production per earthworm at different NaCl concentrations.

NaCl Concentration (mM)	Cocoons per Earthworm
0	15
50	10
100	7
200	3

Table 2: Average weight gain of *Polypheretima elongata* juveniles at various NaCl concentrations.

NaCl Concentration (mM)	Average Weight Gain (mg)
0	50
50	35
100	25
200	15

5. Conclusion and Future Scope:

The study demonstrated the profound negative impact of sodium chloride (NaCl) on the survival, reproductive health, and juvenile development of *Polypheretima elongata*. Increased salinity levels led to a significant decline in earthworm survival, reproductive output (cocoon production, viability, and hatching success), and juvenile growth. The results highlight a clear dose-dependent relationship between salinity and earthworm health, with the highest concentration (200mM NaCl) resulting in the most severe effects. The reduction in cocoon viability, juvenile growth, and overall reproductive success indicates that elevated salinity poses a major threat to the sustainability of earthworm populations in salt-affected soils.

This research underscores the importance of mitigating soil salinity, particularly in agricultural lands where salinization is exacerbated by irrigation practices. Given the critical role of earthworms in soil fertility and ecosystem health, their declining populations due to salinity stress could have broader ecological implications, potentially affecting soil structure, nutrient cycling, and plant growth.

6.Future Scope

Long-Term Impact on Soil Health: Investigating how the decline in earthworm populations due to salinity affects overall soil health and productivity. This could include studies on the impact on soil structure, microbial activity, and nutrient cycling.

Salinity Tolerance in Different Earthworm Species: Expanding the study to other earthworm species to determine whether similar effects of salinity are observed across various species with differing ecological roles.

Mitigation Strategies: Exploring potential strategies to mitigate the effects of soil salinization, such as the use of soil amendments, biochar, or other treatments that can reduce salt stress in soils and support the survival of earthworm populations.

Climate Change and Salinity: Examining the broader implications of climate change on soil salinity, particularly in coastal and arid regions, to develop strategies that can protect soil biodiversity and ensure agricultural sustainability in the face of rising salinity levels.

Rehabilitation of Salt-Affected Soils: Developing sustainable soil management practices to rehabilitate salinity-affected lands, focusing on enhancing soil biodiversity, including earthworm populations, to improve soil fertility and crop productivity.

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Algal Bloom in Aquatic Ecosystem - A Preliminary Survey

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ABSTRACT
Algae are microscopic organism that live in aquatic environments and use photosynthesis to produce energy from sunlight like that plants. Algae can be found in all types of natural waters, including fresh water, salt water, and brackish water. Measuring algae is one of the most crucial aspects of water quality monitoring systems since they are so vital to the aquatic ecosystem and are sensitive to environmental changes. Phytoplankton's are important primary producers in aquatic ecosystem and play integral roles in the cycling of carbon and other elements. The vigorous and massive growth of algae on water surface forms algal blooms. Algal bloom is a rapid increase in the population of algae in fresh water system due to the excessive nutrient enrichment of lake. The accumulation of algae at or near water surface is called algal blooms. It leads to decrease in the oxygen content of the environment as the dissolved oxygen of the water is used by algae growing there and increases the level of carbon dioxide. Numerous negative effects on the social, cultural, economic and environmental spheres may results from the algal blooms.
Keywords: Algal bloom, Aquatic ecosystem, Dissolve oxygen, Phytoplankton

1. Introduction:

The algal bloom describes the rapid accumulation and growth of phytoplankton. these are basic little water plants that float in the liquid, due to the coloration of the water they are also known as the red tides. They are very essential for the aquatic ecosystem. Algal bloom excess, though is a good thing in excess. The excessive amount of algae presents a serious risk to the local population as well as the neighboring plants, animal and humans. Small plants that grow in or near water are referred to as algae. Algal bloom is just overgrowth of algae in one area. Algal blooms are easily identified by the discoloration of the water caused by their colors. The combination of rising water temperature and sunlight causes this natural event. The condition provided by this sunshine are ideal for the growth of small plants.

Algae are very diverse group of organisms so that more than 33 different types of algae can live in a lake. But in lakes, an annual cycle known as algal succession causes changes in the dominant algae species (Kortmann and Henry, 1990). In the spring and early summer, when there is a plenty of light and nutrients available and few creatures are feeding on algae, the population of algae is abundant. In many lakes in Khuldabad region, a clear-water phase phenomena happens near the end of this phase. The tiny edible species that make up the spring algal population. At this point zooplankton grows significantly and quickly eat the algae. Most of the inedible species progressively replace this algal population in the form of colonies, which are frequently encased in a gelatinous sheath. The concentration of all algae is lower in the summer than it is in the spring due to the limited amount of accessible nutrients. A new source of nutrients is created when the lakes stored nutrients are combined with the water column in the late summer and early fall. This allowed for the seasonal re-blooming of the algal population. Algae can survive the winter, but usually only in small amounts because of the reduced amount of sunshine and colder water In Khuldabad region most of the water bodies like that Yesgaon, Pangra, Bani Begum (Dharamtalab) Lake, Khaksar Lake, Talyachiwadi, Parion Ka Talab, Mahismal Talab, Kutluq Lake, Kagzipura Lake and Mombatta lake are available for drinking and irrigation purpose. Numerous negative effects on the social, cultural, economic, and environmental spheres may result from the algal blooms. This study provides a preliminary survey of algal growth in aquatic habitats, including its mechanisms and mitigation techniques in aquatic ecosystems whereas in spite of the growing of human being of ecological, physiological, and functional conditions of eutrophication, a systematic understanding of algal blooms is still lacking (Fig.1).

2. Materials and Methods

Eleven water bodies or lakes located in khuldabad were sampled during the summer season. Samples were collected at the deepest point of each lake during the warmest, sunny and windless during the study. All the samples were collected only from the part of the water column mixed with wind. For thermally stratified lakes, the mixed component was defined as the area between the surface and the thermocline. Which is measured in situ on the day of sampling. This area is typically 0.5m below the surface. Integrated samples were taken from 0.5 m below the surface to 0.5 m above the lake bottom in shallow, non-stratified water bodies. The same procedures were used for the collection of all biological and environmental samples.

3. Results and Discussion

Almost all living things rely on algae for primary energy and nutrients, which makes them vital and necessary for aquatic ecosystem. On the other hand, very high algal bloom can interfere with the regular operation of water bodies and diminish their aesthetic value by lowering water clarity. The accumulation of algae blocks light from reaching the roots of aquatic plants.

Excessive algal growth increases dead algae resulting and decreasing Dissolved Oxygen in water bodies during summer. Dissolved Oxygen absence causes a condition known as anoxia in which the fish are killed. The pH of the water bodies may also rise in areas with high algae concentrations. After photosynthesis process consumes the CO_2, high pH levels are frequently observed in the late afternoon of sunny summers. Due to photosynthetic process coming to an end after sunset, the pH level may decrease noticeably. Since nutrients ultimately set the upper limit of algal biomass and lead to cyanobacteria dominance the needs to be continued focus and management of phosphorus and nitrogen. This requires considering phosphorus and nitrogen as contaminants of aquatic ecosystems (Hallegraeff, F.M.1993 and Binding et.al.2011).

These extreme fluctuation in pH can cause stress on sensitive aquatic species. There is also the concern that excessive amounts of algal material formed based on the reaction with chlorine used in water treatment, produce trihalomethanes as carcinogens. Understanding that algal growth occurs as a results of natural cycles in natural environment is crucial.The algal bloom imposing a negative impact on other organisms through releasing natural toxins and mechanical damage of other organisms. The fundamental physiological role of cyanotoxins within cyanobacteria cells is unclear, yet the answer may provide directions for controlling toxic blooms. The algal bloom is problematic as a result of health and natural algal levels in water bodies (Richardson,1997, Green and Herron, 2001, Barale et al. 2008, Asaeda et.al.2001,Yao, et.al. 2001, Mozgan G. et. al. 2013, Kibria G. 2016 and Philipp A. et.al 2009).

The harmful algal bloom is a type of algal bloom imposing a negative impact on other organisms through releasing natural toxins and mechanical damage of other organisms often associated with large-scale. The harmful algal blooms causes harmful effects to change phytoplankton's in aquatic ecosystem (Mchau et. al.2019). According to studies the numerous algal species thrive in environments with favorable wind and water currents. Harmful algal blooms and overfeeding may be connected in different situations. This happens when nutrients, mostly nitrogen and phosphorus, from sources like lawns and farmland seep into rivers, buys, and the ocean and accumulate at a rate that overfeeds the naturally occurring algae. Natural occurrences such as slow water circulation, abnormally high water temperatures, and extreme weather events like hurricanes, floods and droughts can cause some harmful algal blooms to emerge.

Fig: 1 Algal blooms in Bani Begum Lake Khuldabad

Since most of the lakes and other water bodies are experiencing an increase in the number of nuisance algal blooms. It is clear that reducing the amount of nutrients that leak into lakes and other bodies of water is the greatest strategy to prevent the growth of algae. Water bodies can be treated with chemicals, copper sulfate, and organic synthesis as pesticides to inhibit the growth of algae. Algae cannot grow in water bodies that have calcium compounds bonded to phosphate or aluminum buffer added to them. When it is that these compounds can be used to inhibit the growth of algae, their use must be authorized by the originator that has been approved by the environment. Artificial aeration, biological management, and physical removal are more methods of controlling algae. An aeration mechanism makes phosphorus inert and lessens the effects of an algal bloom by introducing oxygen to water bodies. One kind of biological control instrument that can be used to reduce the amount of algae in water bodies is an algae feeder. Water filtration is one way to physically eliminate algae. This controlling method may be costly and yield inconsistent outcomes. The best regulation is to reduce the amount of nutrients in water bodies before they are raised.

4. Conclusion

Finding strategies for the prevention, prediction and limitation of algal development is crucial as the growing concern regarding the nuisance growth of algae n most lakes and water bodies grows.it is clear that reducing the amount of nutrients that leak into lakes and other bodies of water is the greatest strategy to prevent the growth of algae. Water bodies can be treated with chemicals, copper sulfate and organic synthesis as pesticides to inhibit the growth of algae. Algae may be physically removed by water filtration. This regulating technique might be expensive and produces diverse results. Limiting the amount of nutrients in water bodies before they are raised is the best control strategy. Until they start to cause problems, algae are necessary component of a balanced environment.

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Zooplankton (Moina Macracopa) Dynamics and Their Ecological Significance : Unraveling the Threads of Aquatic Ecosystem Functioning

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ABSTRACT

Zooplankton, encompassing a diverse array of microscopic organisms, bridges the divide between primary producers and higher tropic levels. Their interactions with phytoplankton, bacteria, and other aquatic organisms form a delicate balance that shapes the resilience and productivity of these ecosystems. Understanding the nuanced intricacies of zooplankton dynamics becomes imperative as we seek to decipher the ecological significance embedded within their biochemical composition. In present study total lipid was found maximum (8.94%), the average protein value was found 68.52% and total glycogen was found 19.64% in Moina macracopa. The lipid content of zooplankton is highly variable, ranging from less than 5% to more than 60% of dry weight. In summary, the biochemical composition of zooplankton is highly variable and plays a crucial role in aquatic ecosystem functioning. It is concluded that the experimental species of zooplankton are boon for fishery.

Keywords— Freshwater, zooplankton, carbohydrates, protein and lipids, Moina macracopa

1. Introduction:

Aquatic ecosystems, comprising lakes, rivers, oceans, and estuaries, are intricate tapestries of life where the threads of biodiversity and ecological processes interweave to sustain life. At the heart of these ecosystems, zooplanktons emerge as pivotal actors, playing a central role in mediating energy transfer, nutrient cycling, and trophic interactions. The dynamics of zooplankton populations and their biochemical composition offer a lens through which we can unravel the complex threads that govern the functioning of aquatic ecosystems (3). This research embarks on a journey to explore the multifaceted dimensions of zooplankton dynamics, aiming to unveil the mechanisms that underpin their ecological significance. By delving into the biochemical intricacies of these microscopic organisms, we aim to decipher the clues that hold the key to the functioning of aquatic ecosystems. From lipids and proteins as indicators of energy flow to pigments revealing photosynthetic relationships, this investigation seeks to provide comprehensive insights into the biological tapestry that shapes the aquatic realm. As we embark on this scientific odyssey, the ultimate goal is to contribute to a holistic understanding of zooplankton dynamics and their profound impact on aquatic ecosystems. Through this exploration, we aspire to inform conservation efforts, enhance ecosystem management strategies, and foster a deeper appreciation for the interconnectedness of life within these watery realms. Join us in unraveling the threads that weave the intricate story of zooplankton and their ecological significance in aquatic ecosystems (14).

2. Material and Methods

Biochemical analysis:

Estimation of lipid (4)

Estimation of total proteins (5)

Estimation of glycogen (1)

Statistical analysis: (8)

3. Results and Discussion

In the present study, the biochemical composition of *Moina macracopa* was analyzed, and the total lipid content was found to be 8.94%, protein content 68.52%, and glycogen content 19.64%. These results align with the significant variations observed in the metabolic composition of zooplankton species. Comparatively, the biochemical composition of *Daphnia galeata* reported in other studies indicated lower protein (20.60%) and glycogen (4.2%) levels but a much higher lipid content (44.62%).

The observed variability in biochemical composition highlights species-specific differences driven by feeding habits, metabolic rates, and environmental conditions. Proteins form the bulk of the zooplankton biomass, vital for growth, reproduction, and metabolic reserves. In the case of *Moina macracopa*, the protein content was exceptionally high (68.52%), which may be attributed to its feeding behavior and nutrient availability. Studies have shown that zooplankton feeding on high-quality algae exhibit elevated protein levels, supporting the high protein content found in *Moina macracopa*. In contrast, *Daphnia galeata* exhibited a lower protein percentage, possibly due to differences in diet or habitat.

Lipid content in *Moina macracopa* was found to be relatively low (8.94%) compared to the significantly higher lipid values reported in *Daphnia galeata* (44.62%) and other zooplankton species like *Xestoleberis nitida*, which was found to have 45.65% lipids. The lower lipid content in *Moina macracopa* might be due to its habitat or the environmental conditions it is subjected to, such as temperature and nutrient availability. Lipids, which are crucial for energy storage and structural functions, tend to accumulate more in species from warmer water environments due to higher metabolic demands (7, 2, 11 and 13).

Carbohydrates, represented here by glycogen, are usually the least abundant biochemical component in zooplankton, yet they play a critical role in energy metabolism. *Moina macracopa* exhibited a substantial glycogen content of 19.64%, much higher than *Daphnia galeata*'s 4.2%. Herbivorous species, such as *Moina macracopa*, often display higher glycogen levels, providing them with an energy reserve, especially under nutrient fluctuations.

Recent studies have also highlighted the influence of environmental factors on the biochemical makeup of zooplankton. Variations in water temperature can affect lipid metabolism, with warmer water zooplankton typically exhibiting higher lipid content. Similarly, nutrient enrichment has been found to boost the protein content in certain species, which may explain the higher protein levels in *Moina macracopa*. The ability of zooplankton to alter their biochemical composition in response to changing environmental conditions is critical to their survival and reproduction.

Figures and Tables:

Fig. 1

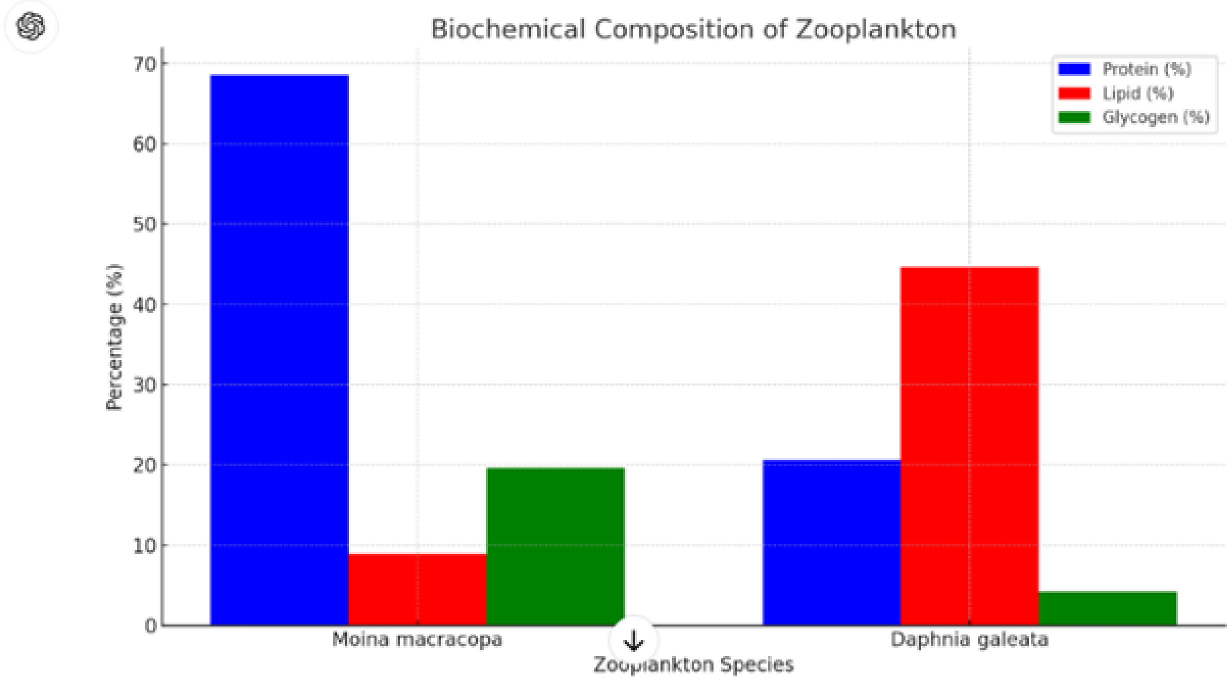

Table 1

Zooplankton	Protein (%)	Lipid (%)	Glycogen (%)
Moina macracopa	68.52	8.94	19.64
Daphnia galeata	20.60	44.62	4.20

4. Conclusion and Future Scope

This study confirms that the biochemical composition of zooplankton is species-specific and is significantly influenced by environmental conditions. The high protein and glycogen content in *Moina macracopa* underscores its adaptive metabolic strategies, while the relatively low lipid content compared to other zooplankton indicates species-specific differences in energy storage mechanisms. Understanding these biochemical variations provides valuable insights into the role of zooplankton in aquatic ecosystems, particularly in terms of their interactions with predators and their contribution to the energy flow within the food web.

This study reveals significant differences in the biochemical composition of *Moina macracopa*, suggesting several areas for future research:

Environmental Impact: Explore how factors like temperature, pH, and nutrient availability influence the biochemical makeup of *Moina macracopa*, with long-term studies across various conditions.

Dietary Influence: Investigate the effects of different food sources on its biochemical composition, particularly protein, lipid, and glycogen levels, which has applications in aquaculture.

Role in Food Webs: Study how biochemical changes in zooplankton affect predators and energy flow, helping assess ecosystem resilience to environmental changes.

Biotechnological Applications: Assess its potential in aquaculture as a protein-rich live feed and explore glycogen use in biotechnological fields like biofuel production.

Comparative Studies: Conduct cross-species research to understand metabolic strategies, aiding in ecological monitoring and conservation, particularly in the face of climate change.

Genomic and Proteomic Analysis: Investigate molecular mechanisms behind its biochemical traits, potentially uncovering genetic factors contributing to metabolic adaptations.

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Consequences of Habitat Loss, Climate Change, Pollution and Population on Biodiversity : A Short Review

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ABSTRACT
Biodiversity conservation is essential to balance ecosystem, healthy human life and ensuring the survival of various species on the globe. As the biodiversity loss is frightening with many species at the risk of extinction as a result of climate change, ecosystem destruction, Pollution, Overpopulation and misuse of natural resources. Loss of biodiversity impacts hazardous and long-term effects on ecosystem. Biodiversity loss is reduction of biological diversity. And conservation provides a framework for understanding and addressing the challenges and techniques of biodiversity preservation.
Keywords: Biodiversity, conservation, Natural Resources, Extinction, Challenges, species, ecosystem

1. Introduction:

Biodiversity is the variety of different forms of life on earth, inclusive of different plants, animals, micro-organisms, the genes contain and the ecosystem they form. It mentions the genetic variation, ecosystem variation, species variation in an area, biome or planet. Regarding to the range of habitats, biotic communities and ecological processes in the ecosystem, biodiversity is crucial in a number of ways contribute to the aesthetic value of the natural habitat, contribution to our material usage through utilitarian values by providing food, fodder, fuel, timber and medicine. The biodiversity we observe is the result of 4.5 billion years of evolution, increasingly determined by humans. Biodiversity creates the web of life that we depend on for food, water, medicine, a stable climate, economic growth, among others. Biodiversity is the support system for every biotic component. Organisms depend on it for the air, food water for survival. Wetlands flora and water reduce global warming by absorbing carbon, while bacteria and fungi break down organic material and fertilize the soil. It has been empirically shown that indigenous species abundance is linked to the health of ecosystems, as is the quality of life for humans. Biodiversity sustain through formation and protection of soil, conservation and purification of water, maintaining hydrological balance, biochemical cycles, and decomposition of pollutants and waste materials.It is crucial for food certainty, economic growth, poverty depletion, and deal with the effects of climate change. Maintenance of biodiversity is important factor to maintain the ecosystem. This paper addresses the strong consequences responsible for biodiversity loss.

2. Factors Affecting Biodiversity:

Habitat Destruction

The falling graph of biodiversity and disturbing changes in the environment are faster than before day by day. Earth's ecosystems have been distorted and altered by human activities and continuously be converted for agricultural and other uses. Important factors affecting biodiversity are habitat alteration, climate change, invasive species overexploitation and pollution. The interrelation between body size and threat is one of the reasons for species extinction. The larger size bird species are threatened by overexploitation, smaller size bird species are threatened by habitat loss or degradation [10]. Body size, was found to be directly and positively correlated with extinction risk across multiple taxa [15], [17],[18]. As a large body size species needs long generation time, late age at maturity and high-reproductive investment per offspring, among other traits, the intrinsic susceptibility to extinction of large-bodied species is more relative to smaller species [2]. Also, on large spatial scales (i.e., continents or larger), there is a negative relationship between species body size and abundance [6]. Hence, the large size species, shows smaller population size and the higher its intrinsic susceptibility to extinction. A large geographic range present a low-extinction risk because the global metapopulation of a species is widespread and, hence, less prone to be affected in its entirety by threat [13] either through direct effects like larger species require more resources and have slower life cycles and therefore respond more slowly to change or simply because larger species tend to be hunted more.

Habitat loss is the threat which indirectly increases the mortality and reduces the natality rates, the trend is non-existent or even reversed [7], [10].while the main factor directly affecting biodiversity loss globally is habitat alteration and destruction. Habitat destruction make entire habitats functionally unsuccessful to support the species present in the habitat. This process results in decreasing biodiversity, when organisms in the habitat are destroyed. Natural habitats are always destroyed by human activities like harvesting natural resources for industry, production and urbanization. Using forest areas for agriculture, changes in the riverine habitat to lacustrine (reservoir) habitat by the construction of hydroelectric projects on the rivers, (mining, logging, urban sprawl, construction of highways are habitat destruction and fragmentation. The grazing process effects on most of the high-altitude grasslands of the Uttarakhand state from migrant and local communities, Areas in which extensive extraction of medicinal herbs shows over exploitation [14].

Climate Change

Species preferred towards some specific environmental locations are usually used across taxa and data are available of that particular trait. Species with lower average temperatures within their range or narrower temperature ranges are especially at risk due to an increasingly warmer climate [4],[8]. While surviving under broad temperature helps to adapt the species necessary flexibility to deal with environmental or climatic change and hence lower their extinction risk [9].

Pollution

Pollution increases consistently and also responsible for disturbed ecosystem and irregular climatic cycles. Organic and inorganic pollutants are one of the most important reasons of biodiversity loss in terrestrial and aquatic ecosystem. Biodiversity is mostly affected by thrermal pollution. Organic pollutants are responsible for eutrophication of water bodies and low oxygen condition in marine ecosystem. Air pollution in urban areas mainly contains nitrous oxide and is also contributing to the global climate change. Industrialization, pollution, and excessive use of pesticides like DDT, oil spills, and acid precipitation consistently and badly harmed the species in their habitats. Use of chemical pesticides decreases the fish-eating birds and falcons. Mortality of ducks, swans and cranes are caused due to lead contamination, as they engulf the shotgun pellets in water bodies. In the Gangetic plains of India, vultures were commonly found and nesting on the trees. The vulture has suffered a 99% population decrease in India [11] and become rare due to poisoning by DDT, used as pesticides. The excessive fall in house sparrow in India is caused due to electromagnetic radiations from cell phones and microwave towers [1].

Population

Increasing human population directly threatened the species in ecosystem. Species in various habitats are affected by human influence [12]. In Greece coastal areas are affected from urbanization and tourism, as a result flowering plants are at risk, while the flora on cliffs and mountain areas under low human pressure are at lower risk of extinction[16]. Plant species having low requirement of nitrogen rich soils are decreasing, due to increased inputs of nitrogen contain fertilizers [12]. Likewise, microhabitat type was a good predictor of extinction risk in some studies due to some microhabitats becoming rarer with increased human pressure[15]. Decreased in the saproxylic beetles feeds on dead wood of large girth in Germany, which results in scarcity of microhabitat[15].Traits under the influence of human population also used in calculating the species under threat [2]. Land area and population density are always used to calculate extinction risk and also extensively found to be relevant for mammals [13].

3. Conclusion & Future Scope

The review undertaken uncovered the impact of human activities on biodiversity loss at different locations (terrestrial, aquatic).Consistently decreased in number of species, endangered species due to various reasons are discussed in this context. One of the biggest tasks in preserving biodiversity is the loss of habitat. Human activities such as deforestation, urbanization, and agriculture have led to the destruction and fragmentation of natural habitats, which had a devastating impact on many species. In future it is crucial to take forward steps for conservation process, use of innovative techniques to control species loss, maintain healthy ecosystem for every living being on globe. Government policies and laws should be strictly implemented to cope up with the environmental issues.

Data Availability

Data used in this context are taken from published research work.

Conflict of Interest

The author have no conflicts of interest to declare.

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Authors' Contributions

Author did literature survey and edited the final precise review article.

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Estimation of Actinomycin Toxicty Due To 72 Hours Treatment in Mortality of Fresh Water Bivalve, Lamellidens Marginalis

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ABSTRACT
The study of Toxicity of aquatic fauna so many chemicals and heavy metals are responsible depletion of immunity. The toxicity of actinomycin drugs is inserted in dose of minimum quantity are useful to the organisms but excess level of dose is harmful to the organisms. But high level of dose is impact for obtaining the all-physiological toxicity. Such as direct impact of nucleic acids, amino acid, carbohydrates. Proteins and fats due to the toxicity of actinomycin in the mortality evaluate calculating the Regression equation for LC10 and LC50 values and graphical representation of Provisional and Regression line for the Lamellidens marginalis exposed to actinomycin for 72 hours treatment. The toxicity study provides the level of safe concentration of toxicant.
Keywords— Mortality, Lamellidens Marginalis, Actinomycin.

1. Introduction:

The actinomycin is the anticancer drug to determine the toxicity of a given cancer therapy is an important end point in clinical trials examining the potential costs and benefits of that therapy. Treatment-related toxicity is conventionally measured with one of several toxicity criteria grading scales, even though the reliability and validity of these scales have not been established. (Michael *et.al.*,1993) determined the reliability of the national cancer institute of Canada clinical trials group expanded toxicity scale and the world health organization standard toxicity scale by use of a clinical simulation of actual patient.

Comprising over 70% of the earth's surface, water is undoubtedly the most precious natural resource that exists on our planet. Without the seemingly invaluable compound compromise of hydrogen and oxygen, the life on earth would be non-existent, it essential for everything on our planet to grow proper. Although we human recognize this fact, we disregard it by polluting our rivers, lakes and oceans. Subsequently, we are slowly but surely harming our planet to the point where organisms are dying at very alarming rate. In addition to innocent organism dying off, our drinking water has become greatly affected as is our ability to use water for recreational purposes. In order to combat water pollution, we must understand the problem and become part of solution. According to the American college dictionary, pollution is defined as, to make foul unclean dirty. Water pollution occurs when a body of water is adversely affected due to addition of large amount of materials to the water. When it is unfit for its intended use, water is considered polluted. Two types of water pollutants exist, point source and non-point source. 95% of all fresh water on earth is ground water. Global environmental collapse is not inevitable. But the developed work with developing world to ensure that new industrialized economics do not add to the world's environmental problems. In order to protect the biotic components, it is necessary to know the impact of toxic compounds on biotic components (Murty, 1986).

Therefore the toxicity evaluation is necessary. The cancer drug chemotherapy for human being utilized drug actinomycin Generally the bivalve was experimental model to the potential impact of pollutants and other drug toxicity to detect safe concentration to determine the greater for aquatic organisms

2. Materials And Methods

Medium sized bivalves, *Lamellidens Marginalis* were collected from the kurla Dam near mahad city, Dist - Raigad M.S. India. The room temperature was 24 ^{0}C –27 ^{0}C. Ten animals were exposed to 10 – 12 different concentrations of actinomycin After 72 hours. Dead bivalves were counted individually. The resulting mortality was noted in the range of 10 to 90 % for each concentration for the duration of 72 hours. The data collected was then analyzed statistically by means of the Probit method on transforming the toxicity curve (% mortality versus log of Conc.) into regression lines (Mortality in Probit / log Conc.) which allows the average medium lethal concentration of LC_{50} to be calculated for 72 hrs.

3. Observation Table

In biochemical aspects the *Lamellidens Marginalis* were sensitive to actinomycin. Toxicity test were conducted for 72 hours by the method described by Finney (1951). The regression equations were obtained for actinomycin the result obtained after toxicity evaluation of actinomycin *Lamellidens Marginalis* on are cited in tables 1. The LC_{10} and LC_{50} values for actinomycin are summarized in table 1. The LC_{10} values for 72 hours exposures to actinomycin are 2.456 ppm respectively. The LC_{50} values for 72 hours exposures to actinomycin are 3.789 ppm respectively.

Table 1. Calculation of Regression equation for LC_{10} & LC_{50} values of *Lamellidens Marginalis* exposed to Actinomycin for 72 hrs.

Conc. of actinomycin in (ppm)	Log of Conc. to base 10 'x'	No. of animal exposed 'n'	Mortality 72 hours 'r'	Percentage mortality p=(100r)/n	Empi-rical probit	Expe-cted probit 'Y'	Weigh-ing coeffic-ient 'w'	weight W=nw	work-ing probit 'y'	Wx	Wy	Wx2	Wxy	Wy2	Improved expected probit y
2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
3.1	0.4	10	2	20 %	4.1	4.1	0.4	4.714	4.1	2.3	19.6	1.3	9.6	81.585	4.15

	914				584	5	714		60	16	11	84	37		3
3.3	0.5185	10	4	40 %	4.7467	4.70	0.6160	6.160	4.747	3.194	29.245	1.656	15.163	138.829	4.735
3.5	0.5441	10	6	60 %	5.2533	5.25	0.6274	6.274	5.253	3.413	32.413	1.857	17.9326	173.303	5.286
3.7	0.5682	10	8	80 %	5.8416	5.8	0.5026	5.026	5.841	2.855	28.557	1.622	16.6805	198.767	5.804
3.9	0.5911	10	9	90 %	6.2816	6.2	0.3703	3.703	6.278	2.188	23.248	1.29	13.7419	145.951	6.296
1.4	0.6128	10	10	100 %	--	--	--	--	--	--	--	--	--	--	--
								SW= 25.878		SWx =13.969	SWy =134..420	SWx2 =7.568	SWxy = 73.1563	SWy2= 738.264	-

Table 2. Regression equations LC_{10} & LC_{50} values of Actinomycin after exposure of *Lamellidens Marginalis* of 72hours.

Sr. No.	Anticancer drug	Period of exposure	Regression equation $Y=\bar{y}+b(X-\bar{x})$	LC_{10} value (ppm)	LC_{50} value (ppm)
1.	Actinomycin	72 hrs	Y= 21.49522X - 6.40932	2.456	3.789

4. Discussion.

The present study Anticancer drug Actinomycin induces change in physiology and survival of aquatic organisms under metabolic stress accomplished because such change differs from anticancer drug to drug species to species and from one experimental condition to another (Shrinivas et. al,.2000). The mortality of aquatic organism due to pollutant increases with increasing in time of exposure period and lethal dose decreases with increasing exposure time (Nimmo and Behner, 1971). The physiological factors also influence the toxicity of the aquatic pollutants. Eisler (1977) found that in static bioassay, temperature influenced the toxicity of pesticide. Moreover, he had also found that different salinity's have little effect on the toxicity of agrochemicals, temperature and pH had greatest effect on toxicity of pollutants. In present research work on toxicity of Actinomycin on Lamellidens Marginalis showed that with increasing time and concentration, mortality rate increases. From this investigation, the exact cause of their death is not known but it is proved that Actinomycin drug brings some changes in physiochemical properties of water and it acts as pollutants against life. The mortality rate is directly proportional to concentration and period of exposure and main cause is its effect on physiological activities. Clearly, the problems associated with water pollution have the capabilities to disrupt the life on our planet to great extent.

5. Results

Toxicity of Nucleic acid is the toxic effect of actinomycin induced nephrotoxicity is well-known side effect of actinomycin. (Hutchinson *et.al.,* 1994). Morphological studies show that mainly the proximal tubule is affected (Dobyan *et.al.*, 1980). The selenium with dose of vitamin E injection may play a role in preventing actinomycin induced nephropathy and cataract formation in cancer patient (Mustafa *et.al,* 2004).

6. Calculation Of Percent Morality:-

Abbots formula (1925) was used for getting the exact morality due to toxicant as below.

P= Om – Cm/100 - Cm x 100 Where, P =Corrected mortality, Om=Observed mortality, Cm=Control mortality. The mortality data obtained in experimental set of bivalves for each dose was calculated by Finney's formula. P= r/n x 100. Where, P=Percentages mortality, r = Mortality observed, n=Number of animals exposed in batch.

i. $x = \dfrac{SWx}{SW} = \dfrac{13.96955}{25.8786} = 0.539823$ $Y = y + b(x - x)$

ii. $y = \dfrac{SWy}{SW} = \dfrac{134.42099}{25.8786} = 5.194291$

$= 5.194291 + 21.4952286\,(x - 0.539823)$

$= 5.194291 + 21.4952286x - 11.603611$

iii. $b = \dfrac{SWxy - \bar{X} . SWy}{SWx^2 - X . SWx}$ $= 21.49522x - 6.40932$

$= \dfrac{73.15638 - 0.539823 \times 134.42099}{7.56866 - 0.539823 \times 13.96555}$

$LC_{10} = \dfrac{3.7184 + (-6.40932)}{21.40932} = 0.4711$ Antilog = 2.959

73.15638 – 72.56354 = ----------------------------- 0.5307 Antilog = 3.394

5.0 – (- 6.40932)

LC_{50} = -- ------------------------ =

21.40932

7.56866 – 7.54108

b = 21.49528644

The mortality data thus obtained was put into empirical probit / log concentration to plot Probit regression lines. The 50% mortality and 10% mortality causing concentration of anticancer drug actinomycin were calculated by this regression line.

7. Calculation Of Regression Line:-

The method described by Finney (1951) and simplified by Busvine was used. The detailed steps carried are given below. The bivalves were exposed for 72 hours to various concentrations of Actinomycin and regression lines and regression equations were calculated. 1) Calculated by using the following equations.

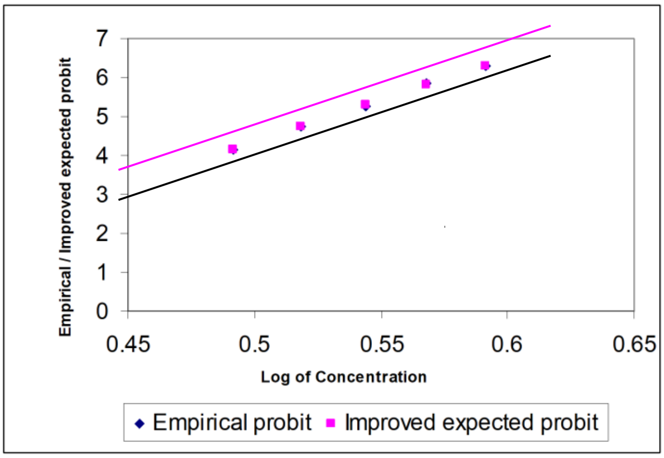
$\bar{x}$ = Swx/ Sw, y $\bar{y}$ = Swy/sw

2) Regression coefficient "b" calculated by formula, b= Swxy - $\bar{x}$. Swy/ Swx² - $\bar{x}$. Swx

The regression equation as Y= $\bar{y}$ + b (x - $\bar{x}$)

CALCULATION OF LC10 and LC_{50} VALUES: -Calculation of LC_{10} and LC_{50} values of Actinomycin calculated from regression equation Y = 3.789 and Y = 5.00 (values from Finney's Table 1. were used to calculate LC_{10} and LC_{50} values in ppm of Actinomycin respectively for 72.hrs.

Fig.1.Provisional & Regression line for *L. Marginalis.* exposed to Actinomycin for 72 hours.



8. CONCLUSION -

The Actinomycin is poisioning and chemical toxicity leads to accumulation of toxins in human tissues and organ causing nutritional dificiencies ,hormonal imbalence and neurological disorders deliberating chronic dose of Actinomycin, toxicity means the depletion rate of antibodies in organisms. Due to the Actinomycin is a anticancer drugs over dose is harmful action of body it is the action inhibit the replication of DNA to the direct impact of inhibit the thymine base pair of deoxy ribose sugar that's condition obtaining the mortality of organism.

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Use of Extracts of Green Alga Cladophora Sp. In Seed Germination of Sorghum and Wheat

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ABSTRACT

Cereal crops Sorghum (Sorghum bicolor (L.) Moench) and Wheat (Triticum aestivum L.) are extensively grown in different parts of India. Algae are reach source of bioactive compounds. These bioactive compounds has definite impact on seed germination and plant growth. Present research work deals with the effects of extracts of green alga Cladophora sp. on seed germination of sorghum and wheat. The alga was collected in bulk and in pure form from Murambi lake located in Ambajogai Tehsil area of Beed District in Maharashtra. Algal extracts were prepared in different solvents such as cold water, hot water, acetone, methanol, ethanol and chloroform. Seeds of sorghum and wheat were treated with cold water and hot water extracts shows highest percentage of seed germination with increase in shoot and root length. Aqueous extracts of Cladophora sp. shows stimulatory effects in seed germination. Use of algae in seed germination is a significant aspect in sustainable agriculture development.

Key words: Algal extracts, seed germination sorghum, wheat.

1. Introduction:

Sorghum (Sorghum bicolor (L.) Moench) and Wheat (Triticum aestivum L.) are important cereal crops and are extensively cultivated in different parts of India. About 50 % of the total area under sorghum cultivation in India is in Maharashtra and the top producer states of this crop are Maharashtra, Karnataka, Andhra Pradesh and Tamilnadu. The leading wheat producing states are Utter Pradesh, Panjab Madhya Pradesh, Gujarat, Maharashtra, West Bengal and Uttrakhand. Uttar Pradesh is the largest producer of wheat in India. In present research use of algal extracts in seed germination of sorghum and wheat have been studied in detail. Algae contains different bioactive compounds such as growth hormones, amino acids, proteins , lipids ,vitamins, antibiotics , pigments , minerals , and enzymes . Bioactive compounds which are present in the algae improves seed germination, seedling development and increase tolerance to environment stress and influences plant growth. Moreover bioactive compounds of algae enhances all physiological reactions that lead to good growth of plants (Fayza and Zenaib ,2008) . Fouly et. al. (1992) and Mahmood (2001) observed that algae contains high percentage of macronutrients, considerable amount of micronutrients and amino acid.

The main objective of present research work was to study effect of extracts of green alga *Cladophora* sp. on seed germination of sorghum and wheat. Extracts of green alga *Cladophora* sp. in different solvents were prepared and tested in seed germination in sorghum and wheat. Sangekar and Jadhav (2023 &2024) studied role of extracts of *Spirogyra* and *Oscillatoria* in seed germination on mung bean and of *Cladophora* in urd bean.

2. Materials And Methods

Collection of algal material and preparation of fine powder: Green alga *Cladophora* is abundantly grows in Murambi lake located in Ambajogai Tahsil area of Beed district of Maharashtra. Alga was collected in bulk and pure form in the month of November 2023. It is identified by microscopic observations and taxonomic investigation. After identification algal material was washed thoroughly with fresh water to remove unwanted impurities, epiphytes and adhering sand particles and mud. Algal material dried in shade at room temperature for four days, followed by oven drying at 40^0C for 8 hours. Dried algal material was grind to a fine powder and stored in air tight bottles.

Preparation of algal extracts in different solvents: Algal extracts in different solvents such as cold water, hot water, acetone, methanol, ethanol and chloroform were prepared. For the preparation of cold water extracts 1 gm of fine algal powder was taken in 100 ml conical flask. 25 ml cool sterile distilled water added to it, flask plugged with cotton and kept it overnight. Next day it has been filtered through Whatman filter paper No.1 and coloured filtrate obtained and used for soaking of seeds. Hot water extracts was obtained by taking 1 gm of fine algal powder in 100 ml conical flask. 50 ml sterile distilled water added to it and boiled for 10 to 15 minutes, cooled it and filtered. Filtrate obtained used for soaking of seeds. Extract in acetone was prepared by taking 1 gm of fine algal powder in 100 ml conical flask. 20 ml acetone added to it and flask was plugged with cotton and kept overnight in cool and dry place. The volume was restored and content were centrifuged to collect maximum supernatant. The content was filtered through Whatman filter paper No.1 and filtrate was allowed to dry at room temperature. 20 ml of sterile distilled water was added to it and used for soaking of seeds. In similar way algal extracts in different solvents were prepared separately.

Treatment of seeds with algal extract: Healthy seeds of sorghum and wheat were obtained from authorised seed distributor. To avoid microbial contamination, selected seeds were surface sterilized with 0.1 % $Hgcl_2$ solution. Surface sterilized 10 seeds were soaked in algal extracts for 4 hours. Seeds soaked in water is served as control. The soaked seeds were placed on moist germinating paper for germination in sterilized petriplates. Percent germination, root length and shoot length of seedlings were measured after 7 days of germination at room temperature.

3. Results And Discussion

Seed of sorghum and wheat treated with extracts of green alga *Cladophora* shows encouraging result. The results have been summarized in Table 1 and Table 2. In sorghum, control seeds showed 90% germination with 8.3 cm and 7.1cm root length. Cold water and hot water extracts showed 100 % seed were germination with 9.8cm and 10.4 cm shoot length and 8.2 cm and 8.6 cm root length respectively .In ethanol extract 10 seeds were germinated with 3.7 cm shoot and 2.6 cm root length .No seed germination was found in acetone, Methanol, and Chloroform extracts. In wheat seed germination, control seed showed 90% germination with 14.6 cm shoot length and and 9.4 cm root length. Cold water extract showed 90% germination with 15.3cm shoot length. And 10.7cm root length. In hot water extract seed germination was 100% with 18.2cm shoot length and 12.6cm root length. Acetone extracts showed 20% seed germination with 4.7cm shoot length and 3.1cm root length. In methanol, ethanol and chloroform extracts seeds were not germinated. Cold water and hot water extracts of *Cladophora* showed stimulatory effects in seed germination of sorghum and wheat with higher shoot and root length. Similar kind of results were obtained by Kamble(2008), Mahadik and Jadhav(2020). Pingle and Abhang (2007) observed that aqueous extracts of *Nostoc* and *Lyngbya* incrases shoot and root length of tomato, chilli and fenugreek. Jadhav and Borkhade (2015) and Jadhav and Mahadik (2022) recorde similar kind of observations while studying effect of algal extracts on seed germination of wheat and sunflower. Recently Sangekar and Jadhav ((2023 and 2024) studied role of extracts of *Oscillatoria* and Spirogyra on mung bean and of *Cladophora* on urd bean .They have reported that aqueous extracts of algae shows stimulatory effects in seed germination with increase in shoot length and root length. Use of aqueous extracts of algae for seed germination is a significant aspects in sustainable agriculture development. From the results it is observed that effective biostimulants can be prepared from algae for seed germination and plant growth. Production of such type of biostumulants is one of the important skill in algal biotechnology, this practice can be commercialized for agricultural entrepreneurship in India.

4. Conclusion

On the basis of overall results, it is concluded that seeds of sorghum and wheat treated with aqueous extracts of *Cladophora* sp. shows stimulatory effects on seed germination with increase in shoot and root length. It is observed that green alga *Cladophora* sp. contains growth promoting compounds especially growth regulators which enhances seeds germination. It is a potential alga for production of effective biostimulants . This ecofriendly practice can be recommended to the farmers for attaining better germination and growth. Use of algae and seed germination and plant growth is one of important aspects of algal biotechnology. Present research work is significant in sustainable agriculture development.

Table 1: Effect of different solvent extracts of *Cladophora* sp. in seed germination of sorghum seeds.

Sr. No.	Solvent used	Percentage of seed germination %	Shoot Length cm	Root Length Cm
1	Cold water	100%	9.8cm	8.2cm
2	Hot water	100%	10.4cm	8.6cm
3	Acetone	00%	00cm	00cm
4	Methanol	00%	00cm	00cm
5	Ethanol	10%	3.7cm	2.6cm
6	Chloroform	00%	00cm	00cm
7	Control	90%	8.3cm	7.1cm

Table 2: Effect of different solvent extracts of *Cladophora* sp. in seed germination of Wheat seeds.

Sr. No.	Solvent used	Percentage of seed germination %	Shoot Length cm	Root Length Cm
1	Cold water	90%	15.3cm	10.7cm
2	Hot water	100%	18.2cm	12.6cm
3	Acetone	20%	4.7cm	3.1cm
4	Methanol	00%	00cm	00cm
5	Ethanol	00%	00cm	00cm
6	Chloroform	00%	00cm	00cm
7	Control	90%	14.6cm	9.4cm

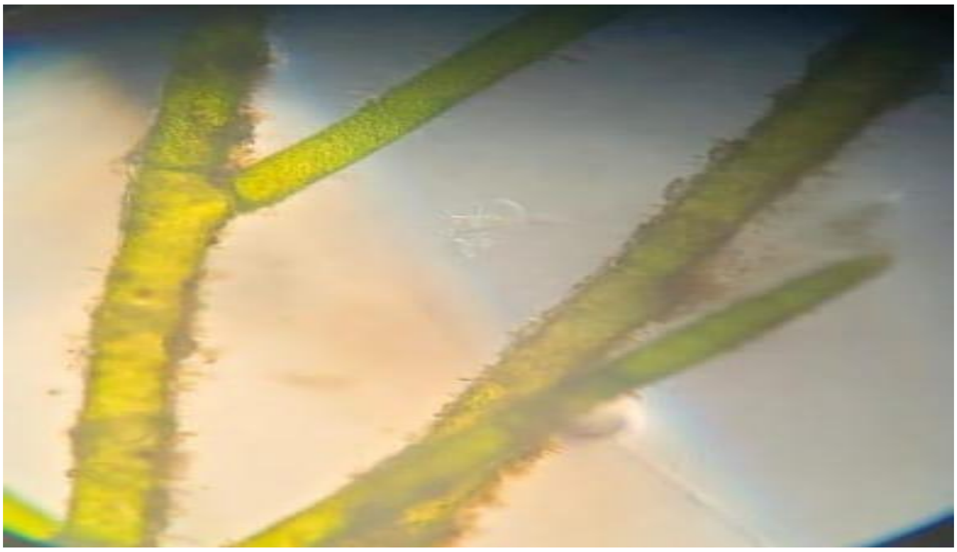

Fig. 1 Microphotograph of green alga *Cladophora* sp.

Fig. 2 - Fine powder of alga *Cladophora* sp.

Fig. 3- Aqueous extracts of *Cladophora* sp. shows stimulatory effects on seed germination of sorghum .

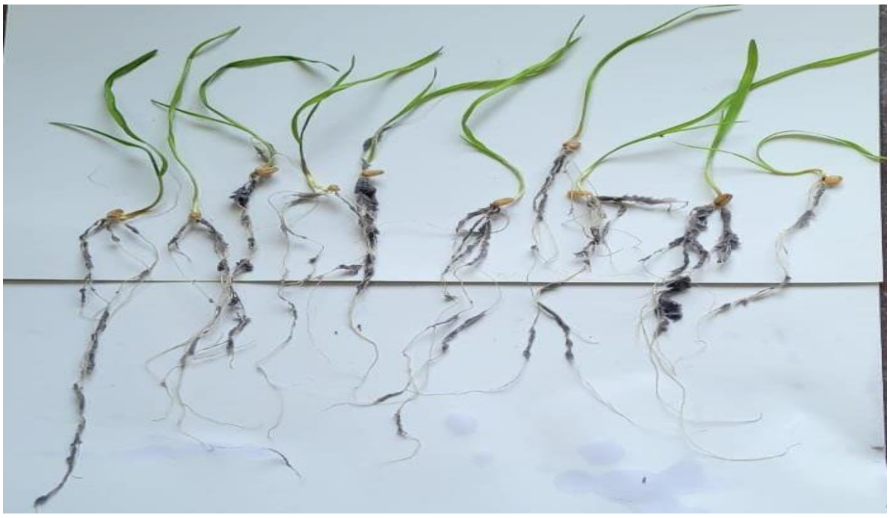

Fig. 4- Aqueous extracts of *Cladophora* sp. shows enhancement in seed germination of wheat.

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Few Species of Cyanphyceae from The Kada Region of Beed District (M.S.)

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ABSTRACT

Ten species from Cyanophyceae family were identified in the current communication. Species of Bacillariophyceae, Euglenophyceae, and Chlorophyceae have been reported by previous authors from the study region. This communication provides a detailed report of the observations in the study area.

Keywords— Cyanophyceae, Kada, Scytonema, Stigonema

1. Introduction:

The Kada region of Maharashtra's Beed district's Ashti tehsil is distinguished by the presence of little bodies of water, including puddles, ponds, and small lakes. In certain locations, the water in these places is flowing, whereas in other places it is stagnant. While some are shallow at back sides, others have deep sides. The water bodies here are shallower and home to a variety of algae and other aquatic plants. In order to look at the variety of algal forms in these water bodies, a survey was carried out in 2019–2020 between October and March.

2. Experimental Method/Procedure/Design

For the current investigation, research on algae from Kada region locales in Beed District, Maharashtra, has been conducted. The observed algal samples were taken from the various water bodies in the area once a month from October 2019 to March 2020. Samples were gathered in collection bottles, transported to the lab, and preserved in 4percent formalin in order to conduct additional taxonomic research. Temporary Mounts of algal specimens had been prepared with appropriate dyes as well as examined under a compound microscope.

The identification of taxa had been conducted utilizing the works of Prasad & Srivastava (1992), Desikachary (1959), Prescott (1951), Prakash B. Jadhavar along with P.B. Papdiwal (2016, 2020), Prakash B. Jadhavar (2023), as well as additional relevant literature.

3. Results and Discussion

i) ***Scytonema arcangelii*** Born. *et* Flah.

Prasad & Srivastava,1992, p 124, pl 14, f 1-3

Elongated, densely interwoven as well as brownish-green filaments, constituting an enlarged thallus that is floccose; measuring 17.5μ in diameter, the sheaths are thick, membranous, colourless, smooth, and occasionally gelatinized at the points of branch emergence; cells are quadrate or else significantly shorter than broad, measuring 5μ in length; the contents of the cell are olive blue-green, homogeneous, devoid of granules as well as gas vacuoles; cells at the ends are spherical; intercalary heterocysts have cylindrical, flattened ends, measuring 10μm in width and 15μm in length; the cell wall is smooth as well as thick.

ii) ***S. bohneri*** Schmidle

Prasad & Srivastava, 1992,p 125, pl 15, f 3

Filaments are elongated, densely intertwined, dark blue-green, forming caespitose free-floating aggregates, with a diameter of 15μ. They are branched, with branches either solitary or geminate, slightly narrower than the main filament, measuring 10μ in width. The sheaths are thick, colourless, and smooth, with a lamellated structure of 2.5μ in thickness. The bluish-green trichomes are not constrained at the cross walls; the cells are rectangular in shape. The contents of the cell are blue-green, homogeneous, devoid of gas vacuoles, having granules dispersed erratically throughout the cell. The terminal cells are bipolar, compressed, ellipsoidal to cylindrical, rounded heterocysts, intercalary, along with flattened or rounded at the terminal, measuring 20μ in length along with 10μ in width, with a smooth as well as thick cell wall.

iii) ***S. "javanicum*** (Kuetz.) Born. ex Born.et. Flah".

Prasad & Srivastava,1992, p 129, pl 19, f 3

Prolonged, flexible, brownish-blue-green colour filaments are densely packed into a cushion-shaped floating mass that has a diameter of 17.5μm. The sheaths are thick, smooth, gelatinous, and lamellated, measuring 2.5μm in thickness. The trichomes are blue-green, and the cells are quadrate or shorter than broad, measuring 7.5μm in length. The contents of the cells are light blue-green, homogeneous, devoid of granules as well as gas vacuoles, having cells with rounded ends. Heterocysts are cylindrical, yellow, bipolar, intercalary, and singular, measuring 27.5μm in length along with 15μm in breadth, with a smooth as well as thick cell wall.

iv) ***S. ocellatum*** "Lyngbye ex. Born. *et* Flah var. ***capitatum*** Ghose

Prasad & Srivastava,1992,p 135, pl 16, f 1"

The densely intertwined, filaments that are dark blue-green, create a cushion-shaped mass that floats freely as well as has a diameter of 15μ. Branching is infrequent, typically presenting as single, short pseudobranches. The sheaths are thick, hyaline, olive-yellow, and transparent, measuring 2.5m in thickness, and become lamellated with age. Olive blue-green in colour, the trichomes are enlarged at the apex as well as are not confined at the cross walls. The cells, measuring 7.5μm in length, are quadrate or else shorter than broad, with homogeneous olive-green contents devoid of granules along with gas vacuoles. Cell ends are rounded. Heterocysts are usually solitary, intercalary, bipolar, cylindrical or else ellipsoidal with flattened or rounded terminals, measuring 10μm in breadth along with 20μm in length. The cell wall is smooth and thick.

v) ***S. simplex*** Bharadwaja

Prasad & Srivastava,1992, p 131, pl 17, f 4

A thick, sparsely branched, pale blue-green thallus is formed of elongated, loosely entangled filaments that are curved irregularly. Typically geminate pseudobranches are there that are overlap each other, with a diameter of 15μ. At maturity, the thick, transparent, yellowish-brown sheaths become lamellated. Olive blue-green in colour, trichomes range in width from 8-9.5µ. They are not restricted at the cross walls nor tapered at bases. Typically, cells in the apical regions are quadrate, while those in other regions are elongated and cylindrical, approximately twice as long as they are broad, measuring 17.5μm in length. Cell contents are blue-green, homogeneous, devoid of granules along with gas vacuoles, and terminal cells have a wide spherical shape. Intercalary heterocysts are bipolar, single, round-ended, extended cylinders, measuring 10μm in width along with 32.5μm in length; their cell walls are smooth and thick.

vi) *"Plectonema radiosum* (Schiederm.) Gomont

Prasad & Srivastava,1992,p 123, pl 14, f 5"

The compactly interwoven filaments form a thallus that is dark blue green, caespitose, cushion alike with extended flexus, with a length of 12.5μ. The lower section sheaths are smooth, thick, colourless, hyaline, as well as lamellated, while The sheaths in the higher parts are thinner, measuring around 2.5μm in thickness. The trichomes are blue-green in colour, in both single as well as geminate forms it is frequently branched, not diminished; the lower parts are unrestrained, whereas the upper parts exhibit distinct constriction at cross walls. Cells are 7.5μ in length and relatively quadrate, are shorter than broad. The contents of the cells are blue-green, homogeneous, with an absence of gas vacuoles along with presence of granules, predominantly located in the direction of the septa. Hormogones are not observed, and the cell wall is thick as well as smooth.

vii) *Gloeotrichia raciborskii* Woloszynska var*. conica* Dixit

Desikachary,1959,p 563, pl 117, f 10

The thallus is soft as well as spherical in shape; the base sheath is dull brown colour; The trichome's base has shorter than broader cells; heterocysts are spherical, measuring 6μ in diameter; spores are elongated, ellipsoidal, as well as exhibit a yellowish hue.

viii) "*Stigonema informe* Kuetz ex Born. *et* Flah

Desikachary,1959, p 613, pl 137,f 2

Expanded, crustaceous" or else occasionally appear as solitary filamentous thallus, that is brown otherwise black in colour; 70μ in width the filaments are prostrate beneath as well as erect above, branched erratically, with branches either flexuous or else rigid, mostly with secondary branches growing from the uppermost layer, that develops into hormogones; trichome exhibiting four to six rows of cells, or occasionally several rows; cells with a width of 15μ.

ix) *Myxosarcina burmensis* Skuja

Desikachary,1959,p 178, pl 32, f 21

Tiny as well as microscopic aquatic plants exhibit a morphology that is rounded& sarcinoid; the cells are predominantly angular or else possess rounded corners, organized in transverse and vertical series, measuring 2.5μ in diameter; coloration is pale blue-green.

x) *M. spectabilis* Geitler

Desikachary,1959, p 178, pl 30, f 4

Distinct, thin, as well as hyaline colonial sheaths are there in the 3-D colonies of the cells, with individual sheaths infrequently observed; contents of the cell are blue-green. Cells measuring 7.5μ in width.

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Study On Introductory Knowledge of Aquaculture

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ABSTRACT
This research is mainly focused on the aquaculture and its benefits or advantages for human society. It also seen that the people are increase in demand of the seafood, fishes and other products of water those are being harvested in water. There are also some issues have been found like the extra use of chemical is being harmful for the fishes and other creatures those are existed in the water. Extra use of chemical is also being the cause of algae and parasites those are affecting the level of oxygen of water and hampering the life of the creature and also creating imbalance in biodiversity of water.
Keywords— Aquaculture, Water Land, Water, Seafood, Fish, Water Creatures

1. Introduction:

Aquaculture can be defined as the farming of aquatic organisms it including fishes, crustaceans and aquatic plants that are needed in financial or commercial production in a controlled environment. It is seen rapid growth in the fisheries sector as the fish's growth is being stacked in the stagnant water [1]. There is an inherited and hazard in aquatic culture to make production. Changes in biodiversity of the lands for aqua production, use of chemicals, damage of nutrition in foods, and growth are the main cause of the destruction of aqua created in water.

Aquaculture is the farming of the aquatic organism under controlled or semi-controlled conditions. It includes breeding, rearing, and harvesting of plants and animals take place in all types of water environments including ponds, rivers, lakes, and oceans. Aquaculture is the fastest growing segment of agriculture. It is a kind of agriculture and requires inputs such as clean water, nutrients and also depends on species that are farmed. Species lower on the aquatic food chain usually require less input as they feed on the microorganism and are fine in clean water.

It also supports the food chain at the lower level by producing algae and other plant organisms for animal feed. Although aquaculture serves many purposes, the most important one is to supply food for humans. The Indian subcontinent comprises more than 1 lakh square km water surface of which 77000 km occur in India. Approximately 470 species of flowering plants have been recorded from the aquatic and semi aquatic habitats of Indian subcontinent. Aquatic plants in general and some extent sedges in particular have been exploited since long for their industrial, medicinal and even for food, but their most important and beneficial properties have been properly assessed .

2. Related Work

There are some objectives of the research are:

- To gain introductory knowledge about aquaculture and its importance.
- To investigate the benefits and advantages of aquaculture in commercial and domestic life
- To find the challenges that are being seen in the growth of aquaculture or what is the negative impact of the firming
- Cause of Growing Demand of Aquaculture
- To recommend the issues those are faced in aquaculture

3. Theory

This study has followed the secondary data collection that is gained from different authentic journals and articles and news articles, and websites. These sources are called secondary sources of data.

4. Experimental Method, Procedure

A descriptive research design is followed in the whole research and the inductive research philosophy has been maintained [2]. The data collection of the research is maintained the secondary qualitative data collection. Secondary data is research data that has previously been gathered and can be accessed by researchers. The term contrasts with primary data, which is data collected directly from its source. The data related to the Aquaculture is taken from different secondary data sources.

Secondary data is used to increase the sampling size of research studies and is also chosen for the efficiency and speed that comes with using an already existing resource. Secondary data facilitates large research projects, in which many research groups working in tandem collect secondary data. This division of labour helps researchers learn more in less time.

Common sources of existing secondary data include data collected by government public services departments, libraries, internet searches, journals, newspapers and magazines. Social media is becoming heavily favoured in market research, as opinions are already available from millions of users on many topics and products.

The benefit of using secondary data is that much of the preliminary work is done. The data may have already been sorted in an electronic format, published and reviewed with case studies already conducted. Secondary data can quickly become more or less public knowledge through use in the media. Due to its exposure and public examination, secondary data can carry more legitimacy than primary research data and is often used as verification of primary data.

However, there are a number of potential problems in using secondary data. It can be difficult to attain secondary data that the fits exact requirements of research studies. It can also be hard to verify the accuracy of secondary data, which can also become outdated over time.

5. Results and Discussion

Cause of growing demand of aquaculture. There are different aspects of aquaculture that is effective for the growing demand of aquaculture. Aquaculture is sustainable for make life more smooth. Without strategic planning of using the water, land and production of protein, it is not possible to meet the demand of the water protein around the globe [5]. With the help of the maintained of water land and growth of it is being more sustainable to get production in compare with the supply and demand of the aquatic products related to aquaculture. Around the whole world the demand of fishes and protein of water is being increased. If there is not done proper use of the water land for production of protein, spices and fruits, then the life of the people and their crisis of food may be faced in near future [6]. Therefore, the need of aquaculture and its demand is growing day by day to make the earth more sustainable and to maximize the use of water land resources.

Issues faced in aquaculture. There are some issue those have been seen in different times, among them there are different aquatic animal diseases are being seen. The things those are used for the aquaculture are sometimes are not being used in proper way and in proper amount [7]. Those are hampering the lives of other creatures those are existed with the material those are being cultured. Sometimes, for overdoses of the chemical things are being cause of death of several creatures and this is affecting the natural biodiversity of the ocean land and water land [8]. Different algae and fungus are also facing growth due to the unnatural amount of materials are binge used. Balance of water biodiversity is being affected.

The main problem of the research is that in the aquaculture system, there are several issues are being found to the lack of knowledge of the famers or it may be greed to get more commercial income from the same water land [9]. This is creating issue in the life of the people and it is also affecting the balance of the biodiversity of the water land of nature. The chemical those are used for the commercial purpose sometime affecting the human health and body.

Authors' Contributions

The secondary data collection that is gained from different authentic journals and articles and news articles, and websites. Aquaculture can be defined as the farming of aquatic organisms it including fishes, crustaceans, aquatic plants, and fruits that are needed in financial or commercial production in a controlled environment.

Aquaculture has a great help in the total development of people around the globe. Aquaculture has helped to improve healthier habits and in the reconstruction of endangered aquatic species. The aquaculture is playing an important role in Different industries and its products from aquaculture.

Therefore, the need of aquaculture and its demand is growing day by day to make the earth more sustainable and to maximize the use of water land resources.

There are some issue those have been seen in different times, among them there are different aquatic animal diseases are being seen. The aquaculture system, are several issues are being found to the lack of knowledge of the famers.

Thus, it can be concluded that aquaculture is a great process to make sustainable production of the protein in the whole world. It is helpful for meeting the demand of protein in the whole world. But lack of maintenance of it can be the cause of the sustainable and destruction of life of the people and creatures.

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Incidence of Fungi from Brinjal (Solanum Melongena) and Tomato (Solanum LYCOPERSICUM) Wastes

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ABSTRACT
India's diverse climate ensures for production of all varieties of fresh fruits & vegetables. India has second ranks in fruits and vegetables production in the world, after China. But many problems appear in the management of the wastes at market places and agricultural area people negligees towards the vegetable waste which left behind. Due to the improper management of these wastes, many problems related to health and environment arises and many other organisms from micro up to the macro level get affected. Saprophytic fungi have potential to degrade the vegetable waste. These fungi play important role that waste can be convert into valuable compost. In the present study emphasis have been made on to understand the association of these fungi to the vegetable wastes. Brinjal and tomato waste were collected from Dharashiv district, particularly market places. Waste material of these two vegetable were incubated in laboratory. Isolation and identification of fungi associated with brinjal and tomato waste were carried out. Isolation take place on PDA at 270 C and identification was made with the help of standard literature. The result was showed total twelve fungal species belongs to 7 genera from brinjal in which Alternaria alternata, Aspergillus flavus, A. niger, Fusarium Moniliforme, F. oxysporum, Mucor, Penicillium notatum, Rhizopus stolonifer and Trichoderma viride were dominate. On tomato waste, seven species belongs 5 genera viz., Aspergillus niger, A. flavus, A. paracitica, Curvularia lunata, Penicillium chrysogenum, Rhizopus stolonifer and Trichoderma harzianum were found. This clearly showed that these fungi might be increase ability to degrade. It is clear from the result concluded that saprophytic fungi superior for degradation and utilization of vegetables waste in to the biocompost.
Keywords— Isolation of Fungi, brinjal, tomato, PDA

1. Introduction:

Brinjal and Tomato contain vital source of vitamins, carbohydrates, proteins, fats, calcium, magnesium, zinc, phosphorous and potassium and dietary fibers, to human beings. [15], [7] They are important food for proper body mechanism and highly beneficial for the maintenance of health and prevention of diseases. [2] Tomatoes can be used as flavoring in soups and in cooked foods. It is used in many dishes, salads, sauces and drinks and can also be dried and ground into pancakes. [3] The brinjal riches vitamin and minerals for our body it helps in to control blood pressure, diabetes, weight loss and brain health issues. The tomato richest source of lycopene. It has been found to prevent prostate cancer, protect the skin itself against the harmful ultra violet rays, decrease the diseases of breast, lung, stomach, bladder, uterine, head and neck cancers, protect against neurodegenerative diseases, lower urinary tract infections and reduce the cardiovascular risk associated with type 2 diabetes. [4], [13]

During harvesting, weak storage practices, transportation and improper marketing are affecting on the quality and reducing quantity for consumption and the profits obtained from sales of brinjal and tomatoes. Rots of tomato fruit are mainly due to fungi, several fungal species were associated to cause infections in tomatoes. They were *Geotrichum candidum, Rhizopus stolonifer*, *Alternaria sp. and Fusarium sp*. Tomato contaminated with *Fusarium* and *Aspergillus* species is dangerous for human health, because they produce mycotoxins. [12]

There is need to identify these fungi especially those that are pathogenic to humans so as to reduce the risk of contamination and infection arising from handling and consumption of fruits. [10] Therefore, this study was undertaken to isolate and identify fungi associated with brinjal and tomato waste commonly sold in Dharashiv local market and recommend appropriate control measure.

2. Experimental Method, Procedure

Collection of Brinjal and Tomato fruits

Different infected tomato fruits were collected from different local markets from Dharashiv District of Maharashtra state. Samples were collected in sterilized polythene bag.

Photo : Brinjal and Tomato Waste

3. Sample Preparation

The contaminated portions of the samples were cut into pieces each with sterilized razor blade, sterilized in 1% sodium hypochlorite solution for 2 minutes.

4. Isolation and Identification of fungi

PDA was prepared the given standard procedure contained per liter: Potato 200gm, Dextrose 20gm, Agar 20gm and 1000ml distilled water. (Anonymous, 1968) They were prepared according to the manufacturer's instructions. The infected samples were cut into 3 mm pieces with sterile razor blade, surface-sterilized in 0.1% Mercury Chloride ($HgCl_2$) for 2 minutes, then placed on Potato Dextrose Agar (PDA) and incubated at room temperature for 5 days. The unknown species encountered were identified with Cheesbrough (2000) literature and also identification was made with help of standard literature, [11]

5. Results and Discussion

i) Incidence of fungi on Brinjal (*Solanum Melongena*)

The results shown in table no.01. The result was showed incidence of nine fungal species belongs to 7 genera in which two species of *Aspergillus* i.e. *Aspergillus flavus, A. niger, three species of Fusarium* i.e. *Fusarium Moniliforme*, *F. oxysporum,* one species like, *Penicillium notatum, Rhizopus stolonifer, Trichoderma viride, Alternaria alternata* and *Mucor recemosus.* The maximmum incidence percentage was recorded by*, Rhizopus stolonifer* and *Fusarium. oxysporum.* The minimum occurrence were recorded by *Aspergillus flavus* and *Mucor recemosus.* Whereas optimum occurrence were found by *Alternaria alternata, Aspergillus niger* and *Trichoderma viride.* Similar, experiment was carried out on isolation of fungi from vegetable spoilage, as well as work was carried on isolation of fungi from *Solanum melongena.* [1], [14]

Table no 1: Percent of incidence of fungi on Brinjal

Fungi	Percentage of incidence of fungi
Alternaria alternata	12.51
Aspergillus flavus	5.33
Aspergillus niger	12.11
Fusarium moniliforme	8.33
Fusarium oxysporum	20.00
Mucor recemosus	7.15
Penicillium notatum	7.66
Rhizopus stolonifera	28.15
Trichoderma viride	11.50

ii) Incidence of fungi on Tomato (*Solanum lycopersicum)*

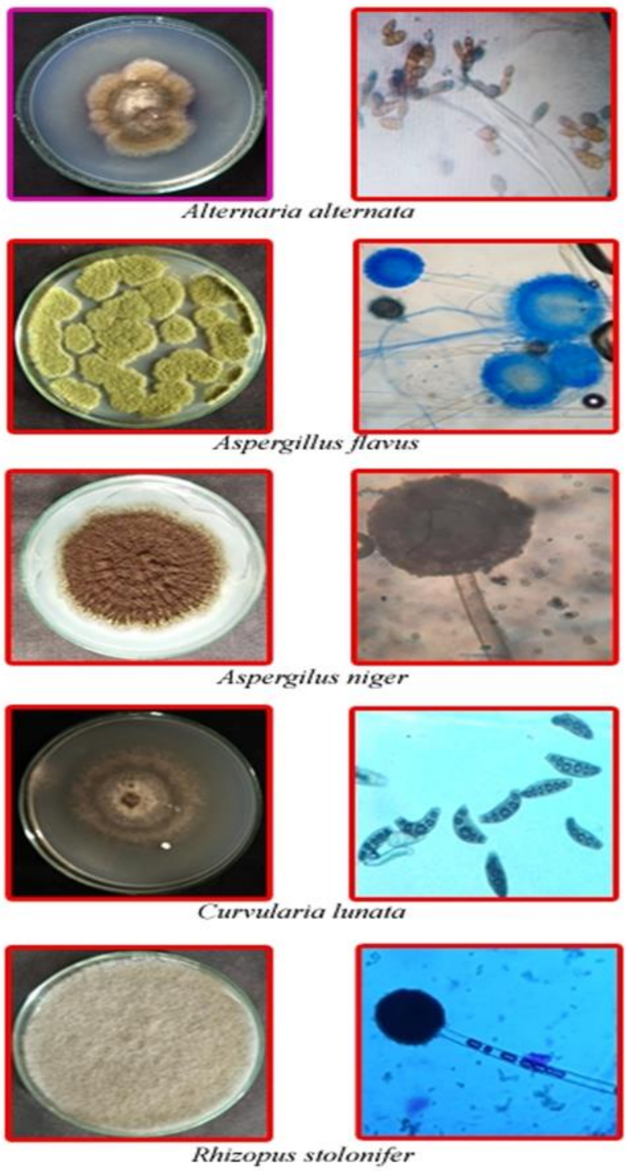
Incidence of fungi on tomato is summarized in table no. 02. Total seven fungal species from 5 genera, were isolated. In which three species of *Aspergillus*, i.e. *Aspergillus flavus, A. niger, A. paracitica,* one species of *Curvularia Penicillium chrysogenum Rhizopus stolonifer* and *Trichoderma viride*, The maximum occurrence percentage of fungi were showed by *Rhizopus stolonifer* and followed by *Aspergillus niger* but there was poor growth of *Aspergillus flavus, Aspergillus paracitica,* and *Penicillium chrysogenum,* whereas *Curvularia lunata* and *Trichoderma harzianum* showed minimum incidence. similar type of observations have been made in case of tomato eighteen species which belongs to seven genera were isolated. [5] also similar work done and four fungi were isolated from decaying tomato fruits. [9]

Incidence percentage of fungi from brinjal and tomato waste:

Table no 2: Percent of incidence of fungi on Tomato

Fungi	Percentage of incidence of fungi
Aspergillus flavus	5.33
Aspergillus niger	12.11
Aspergillus paracitica	6.33
Curvularia lunata	9.25
Penicillium chrysogenum	7.66
Rhizopus stolonifera	28.15
Trichoderma harzianum	10.10

Photoplate: Pure culture and microphotograph



6. Conclusion

The present study showed that many fungal species are associated with brinjal and tomato waste. Findings from this research revealed that brinjal had highest contamination from Rhizopus stolonifer and Fusarium oxysporum, other hand tomato had the highest contamination from *Rhizopus stolonifer* and *Aspergillus niger*. These fungal species significantly degrade to decaying brinjal and tomato fruits spoilage and convert into compost and control pollution and reduces help public health hazard.

Authors' Contributions

Author 1: Conceived and planned experiment and also contributed in collection of references and methodology.

Author 2: collection of samples, performed the experiments, analysis and interpretation of results, and manuscript

All authors reviewed the results and approved the final version of the manuscript.

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GC-MS Analysis of Fatty Acid Profiles in *Filinia* Spp.: Implications for Nutrient Dynamics and Ecosystem Health in Freshwater Systems

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ABSTRACT

The biochemical makeup of Filinia spp. was examined in this work utilizing gas GC-MS, with a special emphasis on the fatty acid profiles of EPA and DHA. Higher trophic creatures like fish depend on these important polyunsaturated fatty acids (PUFAs) for good health and successful reproduction. Samples of Filinia spp. were taken from different freshwater environments, and a modified Bligh and Dyer technique was used to extract the lipids. Significant amounts of EPA and DHA were found in all samples, supporting Filinia spp. as a trustworthy supplier of these vital nutrients. Filinia spp. play a crucial role in nutrient transfer across freshwater ecosystems by acting as a direct conduit between higher trophic levels and primary producers like algae, as evidenced by the persistent presence of EPA and DHA. The study highlights the importance of Filinia spp. for maintaining the productivity and balance of aquatic food webs and highlights the need of protecting them in order to maintain the flow of vital nutrients into these ecosystems.

Keywords: Filinia spp., EPA, DHA, polyunsaturated fatty acids (PUFAs), GC-MS, fatty acid profile, nutrient transfer, lipid extraction

1. Introduction:

The complicated and dynamic conditions of freshwater ecosystems depend heavily on energy transmission and nutrient cycling to preserve ecological equilibrium. Even though they are frequently disregarded, microscopic organisms like rotifers are crucial to the movement of nutrients across trophic levels in these systems. Filinia spp. is particularly interesting among these rotifers because of their possible function in nutrient transfer and their contribution to the biochemical makeup of freshwater food webs. The development and operation of the neurological and reproductive systems, as well as the general health of aquatic species, depend on these fatty acids for a number of physiological activities[1]. In freshwater environments, the maintenance of robust fish populations depends on EPA and DHA in particular, which is known to improve fish growth and reproductive success [2]

In aquatic environments, algae are the main source of EPA and DHA. They produce these fatty acids, which are then transferred to herbivorous zooplankton and, eventually, to fish and other higher trophic levels [3]. Less research has been done on the intermediate function that tiny rotifers like Filinia spp. play in this nutrient transfer, though. Clarifying the function of Filinia spp. in the aquatic food web and their contribution to the general health and productivity of the ecosystem requires an understanding of their fatty acid composition. In order to examine the biochemical makeup of Filinia spp., this study used gas chromatography-mass spectrometry (GC-MS), paying special attention to the fatty acid profiles of these organisms, which include EPA and DHA.

This study sought to demonstrate the importance of these important fatty acids as a source of nutrients for higher trophic species and their function in preserving the equilibrium of freshwater ecosystems by measuring the amounts of these fatty acids in Filinia spp. The study's findings highlight the significance of Filinia spp. for the environment and the necessity of protecting them in order to maintain the flow of these vital nutrients into freshwater food webs.

2. Material and Method

1. **Biochemical Composition and Fatty Acid Profiles GC-MS Analysis[4].**
2. **Sample Preparation and Extraction**

Initially, samples of Filinia spp. were gathered from diverse freshwater habitats. In order to guarantee precise and trustworthy outcomes, samples were either processed right away or kept at -80°C until examination. The samples were homogenized in a combination of chloroform and methanol as part of a modified Bligh and Dyer procedure for lipid extraction. A phase separation procedure was subsequently used to remove the lipids from the non-lipid material, producing a layer of chloroform that contained the extracted lipids.

3. **Fatty Acid Methyl Ester (FAME)[5].**
4. **GC-MS Analysis[6].**

3. Results

The present study aims to ascertain the existence and content of eicosapentaenoic acid (EPA, C20:5n-3) and docosahexaenoic acid (DHA, C22:6n-3) in Filinia spp. by analyzing their GC-MS spectra.

1. Eicosapentaenoic Acid (EPA, C20:5n-3)

GC-MS Analysis:

GC Chromatogram: The GC chromatogram for EPA will show a distinct peak corresponding to the retention time of EPA. The retention time is the time it takes for the EPA to travel through the GC column and reach the detector. This time varies based on the compound’s interaction with the column material and its volatility.

Mass Spectrum:

The mass spectrum of EPA is characterized by its molecular ion peak and fragment ions. The molecular ion peak for EPA is observed at m/z 302 ($C_{20}H_{30}O_2$).

2. Docosahexaenoic Acid (DHA, C22:6n-3)

GC-MS Analysis:

GC Chromatogram: The GC chromatogram for DHA will show a peak that represents the retention time of DHA. DHA’s retention time is typically longer than that of EPA due to its longer carbon chain and additional double bonds.

Mass Spectrum: The mass spectrum for DHA will display its molecular ion peak and various fragment ions. The molecular ion peak for DHA is observed at m/z 328 ($C22H32O2$).

4. Spectral Interpretation:

EPA Spectrum:

A recognizable pattern with peaks at particular m/z values should be visible in the EPA spectrum. The identity of EPA is verified by the existence of the molecular ion signal at m/z 302. The fatty acid's structure is reflected in the fragmentation pattern, where losses are associated with the usual mechanisms by which PUFAs break down.

DHA Spectrum:

Similarly, the DHA spectrum will have a molecular ion peak at m/z 328. The fragmentation pattern for DHA will be different from EPA due to its longer chain and additional double bonds. The characteristic peaks at m/z 313, 289, and 263 are indicative of DHA and help in its identification.

5. Discussion

The fact that Filinia spp. contain important fatty acids, especially docosahexaenoic acid (DHA) and eicosapentaenoic acid (EPA), emphasizes the importance of these fatty acids in the feeding of higher trophic levels in freshwater environments. Fish and other aquatic predators depend on a diet high in EPA and DHA for their physiological demands, making these fatty acids essential for their growth, reproduction, and general health[7]. No matter the local environmental conditions, Filinia spp. are a dependable source of these vital nutrients, as evidenced by the consistent discovery of these fatty acids in Filinia spp. throughout a range of freshwater settings.

The biochemical makeup of aquatic creatures is known to be influenced by environmental factors such temperature, food availability, and water quality. These factors may be the cause of the difference in EPA and DHA concentrations between samples[8] For example, because Filinia spp. get their fatty acid composition from their diet, the presence of algae, which are the main sources of EPA and DHA, can affect the fatty acid composition of these rotifers. Notwithstanding these fluctuations, Filinia spp.'s consistently high EPA and DHA content in every setting studied emphasizes their ecological significance as a source of nutrients for freshwater ecosystems.

The fact that Filinia spp. contributes to the total productivity of freshwater food webs highlights their significance in the transmission of nutrients. Filinia spp. enhances the growth and reproductive success of higher trophic species, especially fish, by offering a direct source of EPA and DHA. Fish rely on a diet high in EPA and DHA to meet their nutritional needs because they are unable to manufacture these fatty acids from scratch[9]. Filinia spp. facilitates the trophic transmission of important fatty acids from primary producers, such algae, to fish and other predators, which highlights the vital biological connections seen in aquatic environments.

Furthermore, Filinia spp.'s buildup of EPA and DHA indicates their significance as important mediators in the trophic transmission of these nutrients. Filinia species devour algae and concentrate EPA and DHA as primary consumers, so providing these fatty acids to higher trophic levels[10]. Because Filinia spp. play an intermediary function in freshwater ecosystems, their loss could impair the flow of vital nutrients, which could lower fish populations' health and productivity and that of other aquatic predators. For this reason, it is important to conserve Filinia spp. populations.

The study's conclusions highlight the ecological importance of Filinia spp. in maintaining the productivity and balance of freshwater ecosystems. Filinia species possess elevated EPA and DHA concentrations, which not only cater to the dietary requirements of higher trophic levels but also underscore the significance of these rotifers in the movement of nutrients within aquatic food webs. The variables that determine the biochemical makeup of Filinia spp. and their more extensive ecological roles should be further investigated in future studies, especially in light of potential environmental changes that could have an impact on freshwater ecosystems.

6. Conclusion and Future Scope

This study highlights the significant ecological role of *Filinia* spp. in the transfer of essential fatty acids, particularly EPA and DHA, within freshwater ecosystems. These findings contribute to a better understanding of the trophic connections that sustain aquatic food webs and emphasize the need for further research into how environmental changes may impact the biochemical composition of *Filinia* spp. and, by extension, the health of freshwater ecosystems. Conservation efforts to protect *Filinia* spp. populations are crucial for maintaining nutrient flow and supporting aquatic biodiversity.

1. Research should explore how climate change and pollution affect the fatty acid composition of *Filinia* spp., particularly EPA and DHA, and their role in nutrient transmission in varying conditions.
2. Studying variations in EPA and DHA content across seasons and regions will help understand environmental influences on *Filinia* spp. fatty acid profile and identify key habitats.
3. Analyzing *Filinia* spp. role in food webs using stable isotope analysis can trace the movement of EPA and DHA from algae to higher trophic levels.
4. Investigating how *Filinia* spp. adapts to changes in food availability, especially EPA and DHA sources will reveal their survival mechanisms in nutrient-poor environments.
5. Future studies should focus on conservation strategies to protect *Filinia* spp. populations from habitat loss, eutrophication, and invasive species.
6. Exploring *Filinia* spp. as a sustainable source of EPA and DHA for aquaculture and industry could offer ecological and economic benefits through mass cultivation.

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Biogenic Amine-Induced Modulation of Poecilobdella Viridis Physiology

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ABSTRACT
This study explored the dose-dependent effects of serotonin (5-HT), dopamine (DA), and norepinephrine (NE) on locomotor activity, heart rate, and feeding behavior in the leech Poecilobdella viridis. Serotonin markedly increased all three physiological responses, especially at concentrations of 10^-6 M and higher. Dopamine showed moderate enhancement of locomotion and heart rate, with inconsistent effects on feeding. Norepinephrine exhibited a complex, biphasic response, slightly increasing locomotion and heart rate at lower concentrations but decreasing both at higher doses while generally inhibiting feeding. These results underscore serotonin's role as the most potent modulator and offer insights into the neurochemical regulation of leech behavior.

Key words: Biogenic amines, serotonin, dopamine, norepinephrine, Poecilobdella viridis, physiology

1. Introduction:

Biogenic amines, such as serotonin (5-HT), dopamine (DA), and norepinephrine (NE), are well-known neurotransmitters that play pivotal roles in regulating various physiological processes across a wide range of organisms, including invertebrates. In leeches, these amines have been extensively studied for their involvement in modulating behaviors such as locomotion, feeding, and cardiovascular activity. Understanding how these neurotransmitters affect the physiology and behavior of leeches provides valuable insights into the broader mechanisms of neurochemical regulation in invertebrates. Poecilobdella viridis, a freshwater leech species, serves as an excellent model organism for investigating the effects of biogenic amines due to its relatively simple nervous system and well-characterized behavioral responses. Previous research has established that serotonin is a critical modulator of locomotor activity in leeches, where it enhances movement by activating excitatory motor pathways (Fraser & Martin, 1984; Willard, 1981). Similarly, dopamine has been shown to influence locomotor activity, though its effects are often less pronounced than those of serotonin, likely due to its dual role in modulating both excitatory and inhibitory neural circuits (Hashemzadeh et al., 2017).

The cardiovascular effects of biogenic amines in leeches have also been documented, with serotonin consistently increasing heart rate by acting on the cardiac ganglia to enhance pacemaker activity (Calabrese & Kennedy, 1974). In contrast, dopamine's influence on heart rate tends to be more moderate, supporting its role as a modulator rather than a direct stimulator of cardiac function (Hashemzadeh et al., 2017). Norepinephrine, on the other hand, has been observed to produce biphasic effects on heart rate and locomotor activity, with its impact varying based on concentration and receptor interactions (Barnett & Finnerty, 1980).

Feeding behavior in leeches is another area where biogenic amines exert significant control. Serotonin has been shown to enhance feeding behavior in several leech species by modulating sensory and motor pathways involved in food detection and ingestion (Lent & Dickinson, 1984). The effects of dopamine on feeding are more variable, with some studies indicating stimulatory effects under certain conditions, while others suggest inhibitory outcomes depending on the specific neural circuits involved (Schwarz, 1982). Norepinephrine generally appears to suppress feeding behavior, particularly at higher concentrations, which may be related to its role in stress response modulation (Barnett & Finnerty, 1980).

This study aims to further elucidate the roles of serotonin, dopamine, and norepinephrine in regulating the physiological responses of *Poecilobdella viridis*. By assessing dose-dependent effects on locomotor activity, heart rate, and feeding behavior, this research seeks to provide a comprehensive understanding of how these biogenic amines influence the behavior and physiology of this leech species. The findings contribute to the broader understanding of neurochemical regulation in invertebrates and lay the groundwork for future studies on the physiological roles of these neurotransmitters in other annelids.

2. Material and Methods:-

2.1. Collection and Acclimation of *Poecilobdella viridis* Specimens:

Poecilobdella viridis specimens were collected from freshwater habitats in [specific location, e.g., ponds, rivers] using standard methods for leech collection, as described by Sawyer (1986) .

The leeches were acclimated in laboratory conditions for two weeks prior to the experiments. They were kept in aerated freshwater tanks at a temperature of 20 ± 2°C under a 12:12 hour light-dark cycle. During this period, the leeches were fed bovine blood twice weekly and were fasted for 48 hours before experiments to standardize hunger levels.

2.2. Preparation of Biogenic Amines:

The biogenic amines used in this study were serotonin (5-HT), dopamine (DA), and norepinephrine (NE), obtained from [supplier, e.g., Sigma-Aldrich] .

Stock solutions were prepared by dissolving each amine in distilled water. The stock solutions were further diluted to obtain the desired experimental concentrations of 10^{-8} M, 10^{-7} M, 10^{-6} M, 10^{-5} M, and 10^{-4} M for each amine. All solutions were freshly prepared before each experiment to ensure the stability and activity of the biogenic amines.

2.3. Experimental Design:

The experimental design included four groups for each biogenic amine: three experimental groups corresponding to different concentrations (low, medium, and high) and one control group exposed only to freshwater. Individual leeches were placed in separate observation chambers (Petri dishes) containing 100 mL of the respective solution (biogenic amine or control). The experiments were conducted in a controlled environment with a consistent temperature (20 ± 2°C) and light cycle as during acclimation.

2.4. Measurement of Locomotor Activity:

Locomotor activity was assessed by recording the frequency and intensity of leech movements for 30 minutes after introducing the biogenic amine solutions. Movements were monitored using a video tracking system (e.g., EthoVision XT, Noldus), which captured real-time data on the total distance traveled and the number of directional changes. The data were analyzed to determine the average locomotor activity for each concentration and compared to the control group.

2.5. Heart Rate Measurement:

Heart rate was measured using a photoplethysmography sensor, as described by Desjeux et al. (1999). Leeches were immobilized in a custom chamber that allowed the sensor to be placed on the ventral side near the anterior sucker without causing stress or injury. Baseline heart rates were recorded for 10 minutes before the introduction of biogenic amine solutions. The heart rate was then monitored continuously for 30 minutes post-exposure, with readings taken at 5-minute intervals.

2.6. Assessment of Feeding Behavior:

Feeding behavior was evaluated by offering each leech a standardized blood meal immediately after exposure to the biogenic amine solutions. The time to initiate feeding, the duration of feeding, and the overall percentage of leeches that fed were recorded over a 60-minute observation period. Feeding behavior was analyzed to assess any changes in response to the different concentrations of biogenic amines.

2.7. Statistical Analysis:

Results were expressed as mean ± standard deviation (SD).

3. Results and Discussion:-

3.1. Overview of Experimental Setup: Experiments were conducted to assess the physiological responses of *Poecilobdella viridis* when exposed to various biogenic amines, including serotonin (5-HT), dopamine (DA), and norepinephrine (NE). Leech specimens were acclimated and then subjected to different concentrations of these biogenic amines. Parameters such as locomotor activity, heart rate, and feeding behavior were monitored and recorded.

3.2. Locomotor Activity:

Serotonin (5-HT): The application of serotonin led to a marked increase in locomotor activity in *P. viridis*. The leeches exhibited more frequent and vigorous movements, particularly at concentrations of 10^-6 M and higher. The enhanced activity suggests that serotonin plays a significant role in stimulating movement in this species.

Dopamine (DA): Dopamine exposure resulted in a moderate increase in locomotor activity. While the effect was not as pronounced as with serotonin, there was still a noticeable uptick in movement at concentrations of 10^-5 M and above.

Norepinephrine (NE): Norepinephrine had a variable effect on locomotion. At lower concentrations (10^-8 to 10^-6 M), there was a slight increase in activity. However, at higher concentrations (10^-5 M), some leeches exhibited a decrease in movement, suggesting a possible dose-dependent effect.

3.3. Heart Rate:

Serotonin (5-HT): The application of serotonin consistently increased the heart rate of *P. viridis* across all concentrations tested. The heart rate increased significantly at 10^-6 M and above, indicating that serotonin plays a critical role in modulating cardiovascular activity in this leech species.

Dopamine (DA): Dopamine caused a mild increase in heart rate, with the most significant changes observed at concentrations of 10^-5 M. The effect was less pronounced than that of serotonin, but still notable.

Norepinephrine (NE): Norepinephrine exposure led to a biphasic response in heart rate. At lower concentrations (10^-8 to 10^-6 M), there was a slight increase in heart rate. However, at 10^-5 M, a decrease in heart rate was observed, indicating a complex interaction between NE and the leech's cardiovascular system.

3.4. Feeding Behavior:

Serotonin (5-HT): Serotonin significantly enhanced feeding behavior in *P. viridis*. Leeches exposed to 5-HT were more likely to initiate and continue feeding compared to controls. This suggests that serotonin not only affects locomotor activity but also plays a role in promoting feeding.

Dopamine (DA): Dopamine had a less consistent effect on feeding behavior. Some leeches exhibited increased feeding, particularly at higher concentrations (10^-5 M), while others showed no significant change.

Norepinephrine (NE): Norepinephrine generally inhibited feeding behavior. At higher concentrations (10^-5 M), leeches were less likely to initiate feeding, and those that did feed often terminated the behavior sooner than controls.

3.5. Dose-Response Relationships: The experiments revealed dose-dependent effects of biogenic amines on the physiological responses of *P. viridis*. Serotonin consistently showed the most potent effects, particularly in increasing locomotion, heart rate, and feeding behavior. Dopamine had moderate effects across all parameters, while norepinephrine exhibited a more complex, sometimes inhibitory, influence.

Table 1: Locomotor Activity:

Biogenic Amine	**Concentration Range**	**Effect on Locomotors Activity**
Serotonin (5-HT)	10^-6 M and higher	Marked increase in locomotors activity; frequent and vigorous movements
Dopamine (DA)	10^-5 M and above	Moderate increase in locomotors activity; noticeable uptick in movement
Norepinephrine (NE)	10^-8 to 10^-6 M	Slight increase in locomotors activity
	10^-5 M	Decrease in locomotors activity; variable response

Table 2: Heart Rate

Biogenic Amine	**Concentration Range**	**Effect on Locomotors Activity**
Serotonin (5-HT)	All Tested Concentrations	Consistently increased heart rate; significant increase at 10^-6 M and above
Dopamine (DA)	10^-5 M and higher	Mild increase in heart rate; most significant changes at 10^-5 M
Norepinephrine (NE)	10^-8 to 10^-6 M (low)	Slight increase in heart rate
	10^-5 M (high)	Decrease in heart rate; biphasic response indicating a complex interaction with the cardiovascular system

Table 2: Heart Rate

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Norepinephrine (NE)	10^-8 to 10^-6 M (low)	Slight increase in heart rate
	10^-5 M (high)	Decrease in heart rate; biphasic response indicating a complex interaction with the cardiovascular system

Table 3: Feeding Behavior

Biogenic Amine	**Concentration Range**	Effect on Feeding Behavior
Serotonin (5-HT)	All tested concentrations	Significant enhancement of feeding behavior; increased initiation and continuation of feeding
Dopamine (DA)	10^-5 M and higher	Variable effect; some leeches exhibited increased feeding, while others showed no significant change
Norepinephrine (NE)	Higher concentrations (10^-5 M)	General inhibition of feeding behavior; reduced likelihood of initiating feeding and shorter feeding duration

4. Discussion

The results of this study provide significant insights into the physiological effects of biogenic amines on *Poecilobdella viridis*, revealing distinct dose-dependent responses in locomotor activity, heart rate, and feeding behavior. The findings are consistent with previous research on the role of biogenic amines in modulating physiological processes in invertebrates, particularly leeches, and contribute to our understanding of the neurochemical regulation of behavior in this species.

The marked increase in locomotor activity in response to serotonin (5-HT), especially at concentrations of 10^-6 M and higher, underscores the critical role of serotonin in stimulating movement in *P. viridis*. This is consistent with prior studies that have demonstrated serotonin's role in enhancing locomotion in various invertebrates, including leeches (Fraser & Martin, 1984). The increased frequency and vigor of movements suggest that serotonin may be acting on the central nervous system to promote excitatory motor pathways, a mechanism that has been observed in other annelids as well (Willard, 1981). In contrast, dopamine (DA) produced a moderate increase in locomotor activity, with the most significant effects observed at 10^-5 M. The differential impact of dopamine compared to serotonin may be due to its role in modulating both excitatory and inhibitory pathways, which can result in a more balanced effect on movement (Hashemzadeh et al., 2017). This duality could explain why the locomotor response to dopamine was not as pronounced as that to serotonin.

Norepinephrine (NE) exhibited a variable effect on locomotion, with a slight increase at lower concentrations and a decrease at higher concentrations. This biphasic response aligns with previous findings that norepinephrine can have both excitatory and inhibitory effects depending on the concentration and the specific receptors involved (Barnett & Finnerty, 1980). The decrease in movement at higher concentrations suggests a possible inhibitory action, which could be mediated through norepinephrine's role in modulating stress or arousal states.

Serotonin's ability to consistently increase heart rate across all concentrations tested suggests a strong influence on cardiovascular function in *P. viridis*. This is in line with earlier studies where serotonin was shown to increase heart rate in leeches by acting on cardiac ganglia to enhance the frequency of pacemaker potentials (Calabrese & Kennedy, 1974). The significant increase at 10^-6 M and higher concentrations indicates that serotonin is a potent modulator of cardiac activity, likely through its action on serotonin receptors that are widespread in the leech nervous system. Dopamine's mild increase in heart rate, particularly at 10^-5 M, supports its role as a modulator rather than a direct stimulant of cardiac activity. The less pronounced effect of dopamine compared to serotonin may be due to its dual role in modulating both inhibitory and excitatory pathways, which could result in a more balanced physiological outcome (Hashemzadeh et al., 2017). Norepinephrine's biphasic effect on heart rate, with a slight increase at lower concentrations and a decrease at higher concentrations, suggests a complex interaction with the cardiovascular system. The decrease in heart rate at higher concentrations may be indicative of norepinephrine's role in activating inhibitory pathways or receptors that reduce cardiac output under certain conditions (Barnett & Finnerty, 1980). This finding highlights the importance of dose-dependent effects in understanding norepinephrine's role in physiological regulation.

The enhancement of feeding behavior by serotonin is particularly noteworthy, as it suggests a dual role for serotonin in both locomotion and feeding. This aligns with studies showing that serotonin can enhance feeding behavior in other leech species by modulating sensory and motor pathways involved in food detection and consumption (Lent & Dickinson, 1984). The fact that serotonin promoted both the initiation and continuation of feeding behavior further supports its role as a critical neuromodulator in *P. viridis*.

Dopamine’s inconsistent effect on feeding behavior, with some leeches exhibiting increased feeding and others showing no change, may be related to its more complex role in the regulation of feeding. Dopamine has been shown to have both stimulatory and inhibitory effects on feeding depending on the specific neural circuits and receptor types involved (Schwarz, 1982). This variability underscores the need for further research to elucidate the precise mechanisms by which dopamine influences feeding behavior in leeches. Norepinephrine’s inhibitory effect on feeding behavior, particularly at higher concentrations, suggests that it may act as a suppressor of feeding under certain conditions. This could be related to norepinephrine’s role in modulating stress responses, where higher levels of this amine might suppress feeding as part of a broader physiological response to adverse conditions (Barnett & Finnerty, 1980). The termination of feeding behavior observed at higher concentrations further supports this hypothesis.

The dose-dependent effects observed for all three biogenic amines highlight the importance of concentration in determining the physiological outcomes in *P. viridis*. Serotonin emerged as the most potent modulator across all parameters, indicating its central role in regulating multiple aspects of behavior and physiology in this species. Dopamine and norepinephrine also played significant roles, but their effects were more complex and variable, reflecting the multifaceted nature of these amines in physiological regulation.

The findings of this study provide a comprehensive understanding of how serotonin, dopamine, and norepinephrine influence the behavior and physiology of *Poecilobdella viridis*. Serotonin was consistently the most effective in enhancing locomotion, heart rate, and feeding, highlighting its central role as a neuromodulator. Dopamine and norepinephrine also contributed to the regulation of these functions but exhibited more complex and dose-dependent effects. These results contribute to the broader understanding of the neurochemical regulation of invertebrate behavior and provide a foundation for future studies on the physiological roles of biogenic amines in leeches and other annelids.

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Effect of Antagonistic Potential on Trichoderma harzianum against Rhizoctonia solani Causing Banded Leaf and Sheath Blight of Maize (Zea mays L.) at Ahmednagar region Maharashtra

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ABSTRACT
The basic aim of the investigation was to detect the potential of Trichoderma harzianum for bio suppression of Rhizoctonia solani sps, the causal agent of banded leaf and sheath blight of maize which is one of the most destructive diseases of Ahmednagar district. The disease severity ranges from 20 to 55 percent, gaining economic importance in 2023. Maize (Zea mays L.) is one of the most important and queen of cereal crops in the world's agricultural sector and helps the world economy grow. It is an important C4 plant used as food, fodder, for domestic animals and industrial products and has a very high yield potential. Other cereals have not been observed to have immense potential. In India, the dairy industry is the domestic business of most farmers for fodder purposes farmers have a large production of maize crops grown in all countries. It is used for human consumption, fodder, poultry feed, and industrial sites. Trichoderma harzianum is a fungus also used for its antagonistic potential against 0, in vitro conditions by employing a dual culture technique. The outcome of testing revealed that in dual culture, after 68-72 hours of incubation, Trichoderma started to overgrow the pathogen colony and in 134 hours Trichoderma fully covered (100%) the pathogen colony and inhibited sclerotial formation which is to play the role of to survive environmental extreme in some higher fungi. The mechanism of antagonism was hyphal coiling and penetration of the hyphae of Trichoderma in the hyphae of the host organism.
Keywords: Antagonism, Disease, Fungi, Trichoderma

1. Introduction:

Increasing use of chemical pesticides is hazardous to health and creates problems. The adoption of alternative methods for disease management is eco-friendly and, in this context, biological control is a good option. Biological control of plant diseases maintains the biological and ecological balance with the help of mycorrhiza within the soil ecosystem offers a powerful means to improve the soil health, aeration, and nutrition, maintain soil pH and increase the productivity of crops plants by suppression and destruction of pathogen inoculums which are damage to crops. It is an important approach for plant disease management under changing habitats and commercialization of agriculture. In recent years attempts were also made to use a group of biocontrol organisms to get control of plant pathogens.

Antagonistic fungi especially *Trichoderma* species have been widely used against several phytopathogens particularly soil-borne fungi such as *Rhizoctonia* species which cause soil-borne diseases and are harmful to crops and, a wide range of crops. Banded Leaf and Sheath Blight (BLSB) of maize is one of the most destructive diseases of maize caused by. *Rhizoctonia solani* is most of present in tropical and subtropical region of the whole world. It survives several years in the soil. In this disease, crop rotation and (IPM) strategy for its management is effective. Biological control appears to be the best solution and is eco-friendly for long-term sustainability and effective management of this soil-borne pathogen or disease. Knowing these factors, the present investigation was done in laboratory practices and field trials to assess the potential of *Trichoderma harzianum* against *Rhizoctonia solani. sp.*

2. Material and Methods:

2.1 Isolation and purification of phytopathogens and bioagent

Rhizoctonia solani was isolated from the diseased maize leaf infected with banded leaf and sheath blight collected from the experimental agriculture farm of Amolak College of Agriculture botanical campus, Kada, Beed and bioagent Trichoderma harzianum from soil was isolated and purified by serial dilution plate method (13) by using PDA and peptone dextrose rose bengal agar medium.

2.2 Antagonism

The antagonistic activity of *Trichoderma harzianum* against *Rhizoctonia solani. Sp.* the incident of Banded leaf and sheath blight disease of maize was studied by dual culture technique (9). They were cultured on PDA plates for 72-75 hours. A 4 mm disc of *Trichoderma* was inoculated on the Potato Dextrose Agar medium on one side of the petriplate aseptically and a 4 mm disc of *R. solani* was inoculated on the opposite side in the same plate in such a way that the discs were 4 cm apart from each other. The plates were then incubated at 28 °C for 6 days. Antagonisms were apparent when sporulating Trichoderma started overgrowing on the pathogen colony which was noted at 24-hour intervals. Based on observation percentage inhibition was calculated by following the formula.

$$\text{Percentage Inhibition (PI)} = \frac{C-T}{C} \times 100$$

Where,

C = Control plate in Radial growth of the pathogen.

T = Radial growth of the pathogen in dual culture.

2.3 Mycoparasitism

The slides were prepared from the intermingling zone of dual culture in 0.1 % cotton blue. A detailed study was done to observe hyphal interaction i.e., coiling, and penetration. Photomicrographs were taken for a mode of parasitism at a high-power magnification camera with a computer.

3. Results and Discussion:

3.1 Symptoms of disease observation

Banded leaf and sheath blight (BSLB) disease of maize is caused by *Rhizoctonia solani* is the most destructive disease of maize. In India, the annual loss of maize production due to BLSB has been estimated at up to 13.2 percent (12). It has now become a widespread disease and has been reported to cause a (30.1 %) reduction in grain yield in maize cultivars with disease severity levels up to 81.3 percent (6). Characteristics symptoms include concentric bands on infected leaves and sheath that are discolored, brown, tan or grey. Typically, the disease develops on the first and second leaf sheath above the ground and eventually spreads to the ears causing ear rot light brown cottony mycelium on the ear and the presence of small round black sclerotia and its cobs dry prematurely all the symptoms show.

3.2 Characters of *Rhizoctonia solani. sp and Trichoderma harzianum*

The symptoms and morphological characters observed in the present investigation had also been recorded and described by several workers (Singh and Sharma 1976; Maiti 1978).

The identity of the pathogen was established based on the culture of the sample and morphological characters. The colony of *Rhizoctonia solani* was fast growing on PDA (potato dextrose agar). At the pathology lab, it produces white color to deep brown color mycelium and dark brown color irregular sclerotia. Mycelium was septate, multinucleate abundantly branching rather stout mycelium. Hyphae were 4-12 mm. wide and tended to branch at a right angle. The colonies of *Trichoderma harzianum* showed rapid growth and maturity within 6 days, microscopic observation showed branched septate mycelium with slate constriction. According to the difference On PDA colonies are wooly, compact, septate, hyaline, and branched. Conidia green in color.

Table 1. *Antagonistic effect of Trichoderma harzianum against Rhizoctonia solani f. sp.*

Hrs.	Colony diameter (mm) In dual culture		Colony Diameter (mm) of *R. solani* in monoculture	Inhibition of mycelial growth of *R. solani* (%)	Over-growth of *T. harzianum* on colony of *R. solani* (%)
	T. arzianum	*R. solani*			
24	**30**	**20**	33	-	-
48	**49**	**30**	60	-	-
72	**55**	**31**	75	50.43 (44.12)**	11.40 (20.25)**
96	**60**	**32**	88	58.47 (47.45)	40.24 (31.16)
120	**70**	**34**	89	56.47 (30.45)	78.35 (67.90)
144	**80**	**33**	96	57.44 (51.65)	98 (80)
SEM	**0.29**	**0.18**	0.16	0.16	1.00
CD at 5%	**1.4**	**0.49**	0.55	0.57	3.35
CV	**0.27**	**0.80**	0.38	0.59	3.89

Table. 2 Showing *Sclerotia* formation during successive growth stages of *R. solani* in mono and dual culture with *T. harzianum*

Hours	**Formation of No. of *Sclerotia***	
	In monoculture aggregation of mycelium	**In dual culture-aggregation of mycelium**
67	20	No sclerotia formation
78	38	No sclerotia formation
100	47	No sclerotia formation
120	60	No sclerotia formation
142	64	Shown effect.
SEM	0.4	
CD AT 5%	1.6	Shown effect
CV	1.98	-

4. Conclusion and Future Scope: *Trichoderma harzianum* has strong antagonistic potential of pathogens against *Rhizoctonia solani*

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Effect of Substrate and Non-Substrate Media on Cellulase Production of Selected Pathogenic Fungi

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ABSTRACT
Present paper deals with the ability of particular fungi to cause diseases, authors have studied their cellulase production. In contrast to substrate (CMC), which enhanced cellulase synthesis in the selected fungi. The non-substrate medium boosted cellulase production in Alternaria alternata and Fusarium oxysporum. Certain fungi are carbon source specific, while different sources of carbohydrates contributed differently to the generation of cellulase by these fungi. Analyses of the of nitrogen sources on the synthesis of cellulase also led to the conclusion that substrate and non-substrate media on cellulase production of selected pathogenic fungi is affecting.
Keywords— Substrate Media, Non-Substrate Media, Alternaria alternata, Colletotrichum capsica, Colletotrichum gloeosporioides, Fusarium Oxysporum, Sclerotium rolfsii

1. Introduction:

Capsicum is commonly known as Chilli. It belongs to night shade family *Solanaceae,* which is noted for over 9500 years. It is the native of Southern America and was first cultivated in Peru at around 7500 BC (MacNeish, 1964). The Chilli crop is attacked by various fungal diseases at different stages of development. Cellulase is produced by the pathogenic fungi which can degrade the cellulose.

In order to develop strategies to control fungal infections, it is important to understand the production of cellulase by pathogenic fungi, as it is known that these fungi can degrade the cellulose. Additionally, cellulase plays an important role in the infection process, entry, proliferation, and can cause significant damage to the host plants (Lebeda et al., 2001).

The fungi's hydrolytic enzymes give them the genetic foundation for their ability to adapt and flourish in environments with limited nutrition availability (Walker & White, 2017). As a result**, the fungi produce secondary metabolites that** are easily able to break down the fruits carbon supply and turn it into energy for themselves.

2. Materials and Method

A number of Chilli growing field's, local markets of study area were visited and diseased samples were collected. A critical study was made on symptoms produced by pathogen on different plant parts of Chilli like leaf, stem and fruits. The samples were collected in polythene bags from Chilli growing fields and local markets and brought to the research laboratory for to study the **effect of substrate and non-substrate media on cellulase production of selected pathogenic fungi.**

Isolated fungal forms were identified on the basis of available literature, including manuals and monographs such as El-Said (2001), Amir *et al.* (2011), Baig, (2005). Kakde and Chavan (2011), Rathod (2011), Rathod and Chavan (2011), Subbaraja and Pillayarswamy (1973).

3. Results and Discussion

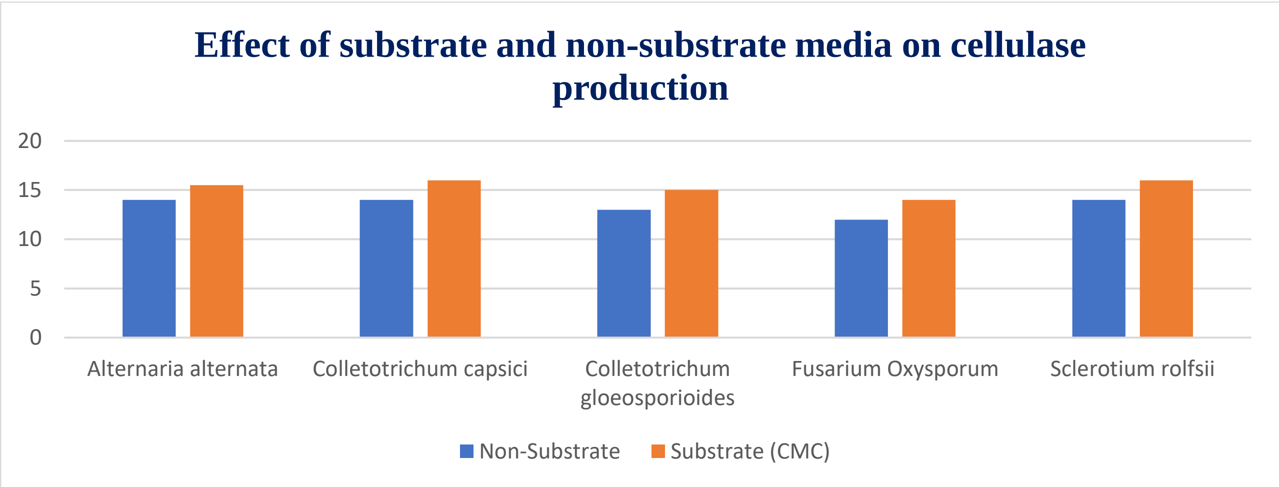
Isolation of pathogenic fungi from infected Chilli samples from the study area is done by using PDA medium. Morphological identification of the fungi using fungal hyphae and spore structures shows the isolates like *Alternaria alternata, Colletotrichum capsici*, *Colletotrichum gloeosporioides*, *Fusarium Oxysporum*, and *Sclerotium rolfsii*.

The production of cellulase by all fungi, including *Alternaria alternata*, *Colletotrichum capsica, Colletotrichum gloeosporioides, Fusarium oxysporum*, and *Sclerotium rolfsii* was observed. However, in comparison to nonsubstrate media, substrate medium was where all fungi produced the most cellulase. According to the findings, *Alternaria alternata*, *Colletotrichum capsica, Colletotrichum gloeosporioides, Fusarium oxysporum* produced the most cellulase.

Table: Effect of substrate and non-substrate media on cellulase production of selected pathogenic fungi

Fungi	Non-Substrate	Substrate (CMC)
Alternaria alternata	14	15.5
Colletotrichum capsici	14	16
Colletotrichum gloeosporioides	13	15
Fusarium Oxysporum	12	14
Sclerotium rolfsii	14	16

Figure 1. Effect of substrate and non-substrate media on cellulase production of selected pathogenic fungi



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Studies On Physicochemical Properties of Water and Their Relevance for Life in Nanded District

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ABSTRACT
Water is fundamental to life and its physicochemical properties are crucial for the biochemical processes that sustain living organisms. Water is a key component in determining the quality of our lives. Today, people are concerned about the quality of the water they drink. Although water covers more than 70% of the Earth, only 1% of the Earth's water is available as a source of drinking. Yet, our society continues to contaminate this precious resource. Water is known as a natural solvent. Before it reaches the consumer's tap, it comes into contact with many different substances, including organic and inorganic matter, chemicals, and other contaminants (APHA, 1985). Many public water systems treat water with chlorine to destroy disease-producing contaminants that may be present in the water. Although disinfection is an important step in the treatment of potable water, the taste and odor of chlorine is objectionable. and the disinfectants that are used to prevent disease can create byproducts which may pose significant health risks. Today, drinking water treatment at the point-of-use is no longer a luxury, it is a necessity! Consumers are taking matters into their own hands and are now determining the quality of the water they and their families will drink by installing a drinking water system that will give them clean, refreshing, and healthier water. Hence the present study deals the current status of water and its physicochemical properties.
Key words— Water, Physicochemical properties, Nanded District.

1. Introduction:

Water pollution is the contamination of water bodies (e.g. lakes, rivers, oceans, and groundwater). Water pollution affects plants and organisms living in these bodies of water; and, in almost all cases the effect is damaging either to individual species and populations, but also to the natural biological communities. Water pollution occurs when pollutants are discharged directly or indirectly into water bodies without adequate treatment to remove harmful compounds (Fetter, 1990; BIS, 1991). The specificcontaminants leading to pollution in water include a wide spectrum of chemicals, pathogens, and physical or sensory changes such as elevated temperature and discoloration. While many of the chemicals and substances that are regulated may be naturally occurring (calcium, sodium, iron, manganese, etc.) the concentration is often the key in determining what is a natural component of water, and what is a contaminant (Hounslow, 1995).

Oxygen-depleting substances may be natural materials, such as plant matter (e.g. leaves and grass) as well as man-made chemicals. Other natural and anthropogenic substances may cause turbidity (cloudiness) which blocks light and disrupts plant growth, and clogs the gills of some fish species (Kothari 2011). Many of the chemical substances are toxic. Pathogens can produce waterborne diseases in either human or animal hosts. Alteration of water's physical chemistry includes acidity (change in pH), electrical conductivity, temperature, and Eutrophication. Eutrophication is an increase in the concentration of chemical nutrients in an ecosystem to an extent that increases in the primary productivity of the ecosystem (Palmer, 1911; Panaskar et, al. 2007). Depending on the degree of Eutrophication, subsequent negative environmental effects such as anoxia (oxygen depletion) and severe reductions in water quality may occur, affecting fish and other animal populations.

2. Study Area:-

The district is situated on Maharashtra-Karnataka-Andhra Pradesh boundary. Nandedis the second largest city in the Marathwada region of Maharashtra, India. It is also headquarters of Nanded District in the Marathwada Division of the state. It is an important holy place for the Sikh faith and is famous for the Hazur Sahib Gurudwara. It is the district headquarters once very famous as district of Sanskrit poets. Nanded is a town of great antiquity and famous for Muslim Sufi shrines. This district of great antiquity is important for the Hindu faith and is known for the Renukadevi temple at Mahur (a taluka place). The official languages are Marathi, Hindi, Urdu and Panjabi.

3. Material and Method:-

Sample Collection:- There are 25 bore well samples collected from the study of water quality. Samples are collected in the polythene bottles. The collected samples are transfer to the laboratory for further analysis. The physico-chemical parameters such as pH, Electrical Conductivity (EC), Total Dissolved Solids (TDS), Alkalinity (TA), Total Hardness (TH), Calcium (Ca), Magnesium (Mg), Chloride (Cl), Sodium (Na), Potassium (K), and Sulphate (SO_4), etc. are analyzed. The physicochemical parameters are checked by the titrometric method, Spectrophotometer, and Flame Photometer.

4. Result and Discussion:-

The water samples from the bore wells of the sampling site are taken. The samples are filtered with the help offilter paper and analyzed for the following parameters in three month as shown in the Table no. -1

Table No. 1: Physico-chemical Parameters of water samples.

Sample No.	**pH**	**EC**	**TDS**	**TH**	**Ca**	**Mg**	**TA**	**Na**	**K**	**Cl**	**SO4**
1	7.4	3350	2144	950	136.27	148.62	350	39.4	2.4	328.02	80
2	7.6	3874	2479.36	660	68.13	119.38	420	91.1	1.4	423.16	67
3	7.4	2104	1346.56	330	55.31	46.78	210	47.1	1.4	205.9	63
4	7.2	1492	954.88	290	46.49	42.39	225	9.9	1.5	120.7	65
5	7	2084	1333.76	360	24.04	73.09	375	28.7	2.2	130.64	67
6	7.1	3628	2321.92	760	141.08	99.40	360	68.5	2.4	323.76	71
7	6.8	3494	2236.16	620	65.73	111.10	455	101	2	318.08	67
8	6.9	3610	2310.4	640	41.68	130.5	385	84.2	2.2	335.12	89
9	7.7	2720	1740.8	540	24.84	116.46	425	25.2	2.4	173.24	65
10	7.2	3168	2027.52	620	27.25	134.49	375	68.6	2	251.34	67
11	7.5	2460	1574.4	440	52.10	75.53	425	75.2	1.5	142	78
12	7.6	3506	2243.84	740	104.20	116.95	400	83.8	0	291.1	89
13	7.5	2670	1708.8	620	57.71	115.97	375	33.2	1.5	188.86	98
14	7.2	3698	2366.72	800	37.67	172.01	400	59	2	337.96	89
15	7.1	2134	1365.76	440	23.24	93.07	385	27.3	1.4	142	96
16	7.3	1798	1150.72	440	76.15	60.91	370	30.2	1.2	100.82	61
17	7	2444	1564.16	660	50.50	130.10	500	17.1	1.6	142	123
18	7.4	2310	1478.4	662	45.69	133.51	365	6.6	1.5	137.74	133
19	7.6	1748	1118.72	474	36.87	93.07	350	8	1.4	88.04	78
20	7.4	1852	1185.28	450	18.43	98.43	425	9.4	1.4	82.36	65
21	7.2	1594	1020.16	450	73.74	64.81	350	7	0	56.8	89
22	7.1	2386	1527.04	640	111.42	88.20	355	7.9	0.9	191.7	57
23	7.2	2948	1886.72	610	79.35	100.38	450	70.9	1.1	167.56	89
24	7.2	3190	2041.6	646	28.05	140.34	500	91.1	1.6	249.92	71
25	7.6	2566	1642.24	584	69.73	99.89	180	42	2	286.84	63
Min	6.8	1492	954.88	290	18.44	42.39	180	6.6	0.8	56.8	57
Max	7.7	3874	2479.36	950	141.08	172.01	500	101	2.4	423.16	133
Average	7.28	2673	1710.8	577	59.83	104.22	376.4	45.3	1.6	208.16	79.2
Stdev	0.24	731.4	468.1	155.5	33.94	32.07	77.6	31.4	0.49	99.085	18.94

Average EC of samples in month of November, December and January is ranges from 2673µS/cm, 2760µS/cm and 2571.7µS/cm respectively. According to classification the 8, 4 and 2 samples are above the permissible limit given by WHO in all the month of November, December and January respectively.

The TDS of samples in month of November, December and January is ranges from 954.88 to 2479.36 mg/l 586.24 to 2816 mg/l and 465.92 to 3136 mg/l respectively. The TDS values of samples in month of November, December and January are below (90%) the permissible limit given by WHO.

The Total Hardness of samples in month of November, December and January is ranges from 290 to 950 mg/l, 180 to 696 mg/l and 186 to 964 mg/l respectively. According to classification TH values of samples in month of November, December and January the total 9, 10 and 18 (sample number 23 falls in medium category) samples fall in hard water category and remaining all samples fall in very hard water category. It can be seen that the groundwater samples are more Total Hardness content because of rock-water interaction and mineral soluble in groundwater.

The Calcium content of samples in month of November, December and January is ranges from 18.44 to 141.08 mg/l, 16.83 to 144.29 mg/l and 28.056 to 189.177 mg/l respectively. The all groundwater samples in month of November, December and January are within the permissible limit given by WHO.

The Magnesium content of samples in month of November, December and January isranges from 42.39 to 172.01 mg/l, 27.78 to 128.65 mg/l and 14.6188 to 156.9089 mg/l respectively. The all groundwater samples in month of November, December and January are within the permissible limit given by WHO (except 2 samples in Month of November).

The Total Alkalinity of samples in month of November, December and January is ranges from 180 to 500 mg/l, 180 to 485 mg/l and 200 to 965 mg/l respectively.

The Sodium content of samples in month of November, December and January is ranges from 6.6 to 101 mg/l, 5.8 to 92.5 mg/l and 6.4 to 92.3 mg/l respectively.

The Potassium content of samples in month of November, December and January is ranges from 0.8 to 2.4 mg/l, 0.3 to 4.2 mg/l and 0.7 to 3.6 mg/l respectively. All samples are within the permissible limits.

The Chloride content of samples in month of November, December and January is ranges from 56.8 to 423.16 mg/l, 42.6 to 553.8 mg/l and 45.44 to 683.02 mg/l respectively. All samples are within the permissible limits.

The Sulphate content of samples in month of November, December and January is ranges from 57 to 133 mg/l, 57 to 133 mg/l and 13 to 35 mg/l respectively. All samples are within the permissible limits.

6. Conclusion:-

Ground water or aquifer water is one of the important sources of water in Nanded city. As the Nanded is drought prone area alteration within major or minor in the characteristics of aquifer water results in great attention of day to day life of citizens of Nanded. There are 26 samples of bore wells taken to access the quality of ground water and the results are compared with WHO standards.

The pH of samples in month of November, December and January is ranges from 6.8 to 7.7, 6.8 to 7.9 and 7 to 7.8 respectively (Fig. 1). The pH value of all the three months falls in Neutral category. The average value of pH in November, December and January is 7.28, 7.34 and 7.38 respectively. The EC of samples in month of November, December and January is ranges from 1492 to 3874 μS/cm, 916 to 4400 μS/cm and 728 to 4900 μS/cm respectively. The average EC of samples in month of November, December and January is ranges from2673μS/cm, 2760μS/cm and 2571.7μS/cm respectively. According to classification the 8, 4 and 2 samples are above the permissible limit given by WHO in all the month of November, December and January respectively. All the values are found within limit (except slightly EC, TDS, and TH). The Chloride value is found little higher. Which indicates that ground water is contaminated with feacal matter. Probable solutions are suggested to avoid the further contamination.

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Nostocaceae And Aphanothecaceae From Terna Dam In Osmanabad District Of Maharashtra

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ABSTRACT

Present communication deals with the algal members of familyNostocaceae and Aphanothecaceaenoted at the Terna Dam in Osmanabad district of Maharashtra. The investigation of algae was carried out at four different locations of water reservoir, for the study of the cyanophycean algal families. During the present investigation, species were recorded from the water body include Anabaena, Nostocand Aphanothece from the study area.

Keywords—Cyanophyceae,Nostocaceae, Aphanothecaceae, Terna

1. Introduction:

The project is constructed on Terna River in 1970, near the village Ter in Osmanabad district of Maharashtra is known as Terna Dam. It is having large capacity of storage of water and catchment area of the project is very large. The large number of algae and some other aquatic plants are also present in the water body. As a result, it is crucial to research the aquatic flora in the Terna water reservoir.

The algae are characterized by a low state of organization (Desikacharya, 1959). These are important as primary producers of organic matter at the base of the food chain in most of the aquatic ecosystems and also provide oxygen for other aquatic life (Singh and Chaudhary, 2011). The members of *Nostocaceae* and *Aphanothecaceae* observed during the present investigation are described in this paper.

2. Materials and Methods

Algal samples were collected once in a month from water body. The sample was collected in the morning, from 7:00 am to 10:00 am. These samples were preserved in 35 ml capacity plastic bottles in 4% formalin for further studies. In the laboratory, they were preserved in 1000 ml capacity wide mouth glass bottles. The planktonic members were collected by using Plankton net, as per the method adopted by Narkhede (2006). The identification was done with the help of available literature such as floras, monographs and research articles. [Bhakta et al. (2010), Desikacharya (1959), Kamble and Karande (2014), Karabi Das and Sarma (2015), Naskar et al. (2013), Prasad and Srivastava (1992), and Vasudev and ThamizhSelvi (2012).]

3. Results and Discussion

1) ***Anabaena laxa***(Rabenh.)

ThamizhSelvi and Sivakumar, 2012, p 32, pl 1, f (g)

The thallus is floccose, floating freely in a blue-green color; the trichomes are 5 μm broad, straight, and parallel; the cells are barrel-shaped, 6 μm long, with apices that are hardly attenuated and rounded end cells; the heterocysts are spherical, 6 μm broad, 10 μm long, with smooth, yellowish epispores.

Coll. No. and Date: TS-98 (05/01/14); TS-159 (30/03/14); TS-241 (30/11/14)

2)*Anabaena naviculoides* F. E. Fritsch

Karabi Das and Sarma, 2015, p 163, pl 2, f 12

Trichome elongate, moniliform, apices acuminate; cells 3.2-6μ, heterocyst intercalary, single, barrel shaped,4-5μ broad, as long as or slightly longer than broad; spores ellipsoidal, end acute; exo-spores thin hyaline, 12.5μ long, 5μ broad and 8.5μ lon g.

Coll. No. and Date: TS-88 (29/12/13); TS-03 (01/09/13); TS-198 (05/10/14)

3)*Anabaena oryzae* Fritsch

Sivakumar and ThamizhSelvi, 2012, p 32, pl 2, f

Thallus soft green, gelatinous, membranous, trichome short, straight, densly aggregated, generally parallel cells 2.5 μm broad, more or less barrel shaped,1½ -2 times as long as broad; heterocysts terminal and intercalary, broader than the vegetative cells.

Coll. No. and Date: TS-113 (26/01/14); TS-460 (10/01/16); TS-488 (21/02/16)

4) *Anabaena spiroides*Kelbahn

Kamble and Karande, 2014, p 123, pl 1, f 14

Trichome single, free, floating, regularly spirally coiled with thick and mucilaginous sheath, spirals 50 μm broad and 45 μm distant; cells spherical, 8.5 μm broad mostly shorter than broad, with gas vacuoles; heterocystssubspherical, 7 μm broad; spores next to the heterocysts.

Coll. No. and Date: TS-11 (15/09/13); TS-184 (14/09/14); TS-176 (07/09/14); TS-329 (22/03/15)

5)*NostoccalcicolaBrebission* ex Born.et Flah.

Desikacharya, 1959, p 384, pl 68, f 1

Thallus mucilaginous, slightly diffluent, expanded, olive, gray or blue green, often up to 5 cm in diameter, filaments loosely entangled, sheath mostly indistinct, trichome 2.5 μ broad, pale blue green; cells barrel shaped, subspherical, rarely longer than broad, spores subspherical, 5μ broad, with smooth yellowish membrane.

Coll. No. and Date: TS-85 (22/12/13); TS-149 (16/03/14); TS-156 (23/03/14); TS-310 (22/02/15)

6)*Aphanothecesaxicola*Nageli

Bhakta et al., 2010, p170, pl 1, f 1

Thallus mucilaginous, colorless, cells oval to cylindrical with rounded ends, 2.5 μm broad and 5 μm long, single, cell content light blue green.

Coll. No .and Date: TS-131 (16/02/14); TS-262 (21/12/14); TS-303 (15/02/15)

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Study on Seasonal Infections of Cestodes from Intestine of Freshwater Fishes of Koradi Dam, District Buldhana, (MS), India

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ABSTRACT
In the present study, cestode parasitism and seasonal infections in freshwater fish from Koradi Dam were investigated. Mustasemblusarmatus (Lecepede, 1800), Channapunctatus (Bloch, 1793), Mystussenghalii (Sykes, 1839) and Vallagoattu (Bleeker, 1857) collected from the Koradi Dam. Freshwater fish had cestode parasites in their intestines when the fish were dissected. Three species of Circumonchobothria sp., Gangesia sp. and Senga sp. Also, the abundance and density of cestode parasites from oct 2022 to nov. Maximum cestode parasites found in winter (March2022 to May2023).In March to May 2022 maximum cestode parasites had been accrued from freshwater fishes.
Keywords: Mastacembelusarmatus, Channapunctatus, Wallagoattu, cestodes, parasites, seasonal infections, Circumonchobothria sp., Koradi dam etc.

1. Introduction:

Freshwater fish are a major source of animal protein and one of the most important components of fish production, conservation and microbial control because fish bacteria are responsible for various deadly infectious diseases especially among young people. chains, tubes) and other associated organs (fibers, impacts) enter as anchors in tissues . (TakdisFarooq et al., 2016) [12]. The ability of Asian tapeworms to infect fish species and copepod hosts (Korting, 1975; Dove and Fletcher 2000) [7]. Asian tapeworms are reported to have caused several deaths in hatchery ponds (Liao and Shih 1956; Korting 1975) [8, 7]. Healthy and wholesome fish meat, it is important that the fish are free from bacteria, algae, protozoa, helminths, annelids, arthropods, mollusks and all kinds of pathogens Fish parasites are one of the major health problems of cats. The second most common cestode group is fish. In fish, the juvenile cestode phase (metacestodes) is found in visceral organs or tissues, while the adult phase occurs in the intestine. Cestodes do not have a digestive system during their larval and adult stages. The exchange of nutrients and wastes through the body wall or intestines. The adult worm undergoes sexual reproduction with male and female reproductive organs in each proglottids. Indian inspectors from various well sites along each stretch of Pawar Rt. et al., 2016 reported that In Circumoncobothrium sp. Mastacembelusarmatus had the highest mean values, the percentage of time effect occurring 13.57% Circumoncobothrium sp. FrFrom Aurangabad district (Aurangabad) while the lowest rate is 13.38% (Nanded). The severity, magnitude, prevalence and index of infection were higher in winter, milder in rainy season, lowest from Nanded district and higher as compared to summer , the incidence in Nanded district was higher in Aurangabad district. Moreover, AsavariFartade et al (2018) [1], studied the incidence of helminth parasite in summer then winter with minimum rainfall period incidence of diseases (incidence, severity, infection rate, and index of infection). Thus, provide some insights into the spread of cestode parasites in freshwater fish from Koradi Dam in Buldhana district Maharashtra India.

2. Material and Method :

Fishes sample were collected from koradi Dam, Deulgaon mali district Buldhana at the GPS20.2110225°N 76.5043795°E during the year 2022 and 2023

Geographical Map

Currently investigating the spread of cestode parasites from freshwater fishes Mastacembelusarmatus, Channapunctatus, Mystusseenghali and Wallagoattu were collected and tested for cestode infection. Also checking other freshwater fish for cestode disease in the intestines of the fish. The cestode parasite was then preserved in 4% formalin, washed with saline and water, dehydrated in different alcohols, stained with Harris hematoxylin and borax carmine, cleared with xylene, fixed in D.P.X Using camera lucida and animals painted the picture.

are determined by standardized methods (Schmidt, 1934; Yamaguti, 1959; Hiware et al., 2003; Bhure, 2008) [11, 13, 9, 2]. Incidence was recorded and calculated according to Pennyuick K.L. (1973) [10] and Bhure et al. (2016) [5].

$$\text{Prevalence of Infection} = \frac{\text{No. of Infected Host}}{\text{No. of Total Host Examined}} \times 100$$

$$\text{Density \%} = \frac{\text{No. of Parasites collected in Sample}}{\text{Total Hosts examined}}$$

3. Results and Discussion:

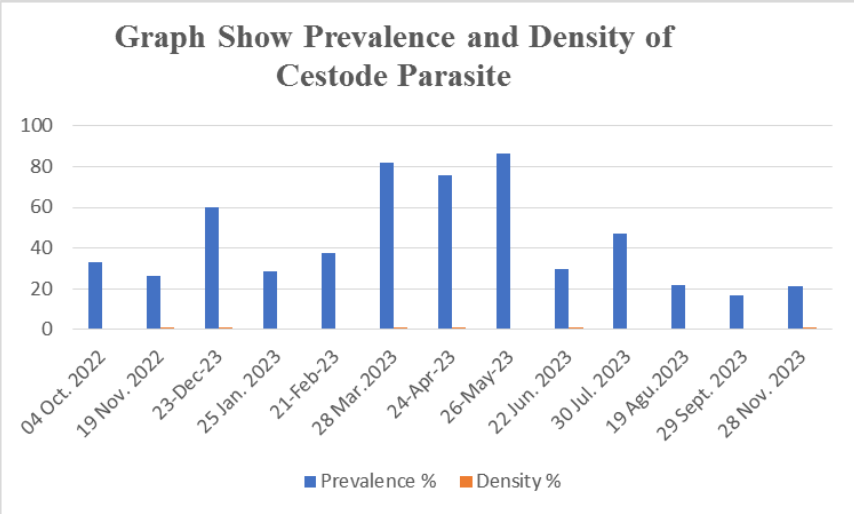
The present study was conducted on freshwater fish from koradi Dam infested with M. armatus, Ch. punctatus and W. attu collected from Koradi Dam. In the freshwater fish, the cestodes were contaminated with the bacterium when the fish were dissected. The circumonchobothria sp. Three species have been identified from this. Gangesia sp. and Senga sp. described in Table 1 .Bhure and others. (2016) [5] reported 26 species of pisciancestodes including five genera. Channa sp.From various places in Marathwada region of Maharashtra.

Table: 1

Cestode Parasite sp.	Host	Habitat	Locality
1.Circumonchobothria yelderensis 2. Gangesia sp. 3. Sengapunctatusae	1) Mastacembelusarmatus 2) Channapunctatus 3) Wallago Attu 4) Mystusseenghali	Intestine	Koradi Dam

Table: 2

Sr. No	Month& Year	No. of dissected Hosts	No. of infected Hosts	Prevalence%	Density %	No. of Cestode Parasites collected
1	04Oct.2022	18	06	33.33	0.75	24
2	19Nov.2022	19	05	26.31	0.90	21
3	23 Dec2023	15	09	60.00	0.93	16
4	25Jan. 2023	14	04	28.57	0.51	27
5	21Feb2023	16	06	37.5	0.61	26
6	28Mar.2023	22	18	81.81	1.2	18
7	24 Apr2023	25	19	76.00	0.83	30
8	26 May2023	22	19	86.36	0.68	32
9	22Jun. 2023	27	08	29.62	1.08	25
10	30Jul.2023	17	08	47.05	0.5	34
11	19Agu.2023	23	05	21.73	0.62	37
12	29 Sept.2023	24	04	16.66	0.82	29
13	28Nov.2023	28	06	21.42	0.90	31



The current survey graph shows that the prevalence and number of cestode parasites from oct 2022 to nov 2023. Highest density of cestode parasites found in winter (March2023 to May 2023). From March to May 2023, maximum cestode parasites were collected from the freshwater fish listed in the table. It is evident from the table and graph above that there are significant differences in the abundance of fish cestode parasites during different months of the year. The highest cestode abundance of 86.36% followed by 81.81% and 76.00% was recorded in winter. Brown and Nanvere, 2010 [3], reported the presence of cestode parasites in summer followed by winter and rainy seasons in cyprinid fish and, also on boardJawale (2012) reported high incidence of Cestode infection in Clariasbatrachus during summer season. Bhure and Nanvere (2014) [4] f. ponatus during summer and DeshmukhShaziya Sultana K. A. and J. M. Gaikwad, (2019) [] Also high incidence of infection was recorded in all cestode species during summer followed by low levels in winter as during rainy season

4. Conclusion:

Cestode parasite infection in freshwater fishes is positively associated with the seasons of summer, winter and rainy season. It can be reached in winter from that high incidence of cestode disease. The highest cestode abundance 86.36% followed by 81.81% and 76.00% was recorded in summer and temperature has a positive effect on cestode abundance in freshwater fish Furthermore, these results are helpful for further research on the impact of cestode parasites on fish health and biochemistry and contributes to awareness among consumer.

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Fungal Diversity and Pathogenic Impact on Guava Orchards : A Comprehensive Review

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ABSTRACT
Guava (Psidiumguajava L.) is a globally significant fruit crop, valued for its nutritional richness, culinary versatility, and adaptability to diverse agro-climatic conditions. This research paper explores the economic importance of guava cultivation, emphasizing its role in global agriculture and economies. Guava's unique flavor, fragrance, and nutritional properties make it a health-promoting food item with antioxidant benefits. Despite being a resilient and productive cash crop for farmers worldwide, guava cultivation faces challenges from fungal diseases impacting yield and quality. The paper comprehensively examines wilt, anthracnose, canker, phytophthora fruit rot, soft watery rot, and cercospora leaf spot, proposing effective management strategies. Guava wilt, primarily caused by Fusariumoxysporum, requires meticulous sanitation and eco-friendly approaches. Anthracnose, attributed to Colletotrichumpsidii, is managed through preventive sprays and removal of infected parts. Canker, caused by Pestalotiapsidii, is addressed with fungicidal sprays. Phytophthora fruit rot, induced by Phytophthoraparasitica, is managed through fungicidal applications. Soft watery rot, caused by Botryodiplodiatheobromae, requires careful handling and fungicidal sprays. Cercospora leaf spot, from Cercosporasawadae, is managed by fungicidal sprays and removal of infected leaves. This research contributes valuable insights to the knowledge base for sustainable guava cultivation, considering its multifaceted economic significance.
Keywords- Psidiumguajava L., Fungal diseases, Wilt, Anthracnose, Rot diseases, Orchards

1. Introduction:

Guava (*Psidiumguajava* L.) stands as one of the most economically important fruit crops globally, valued for its nutritional richness, versatility in culinary applications, and adaptability to diverse agro-climatic conditions. Originating in Central America, guava has spread its cultivation across tropical and subtropical regions, establishing itself as a staple in the agriculture and horticulture sectors. Known for its distinctive flavor and fragrance, guava serves not only as a delectable fruit but also as a source of essential vitamins, minerals, and dietary fiber. The fruit is appreciated for its antioxidant properties, contributing to its recognition as a health-promoting food item. With a variety of cultivars available, guava caters to different taste preferences, from sweet to tangy, and can be consumed fresh, juiced, or processed into various products such as jams and jellies. The hardiness of guava plants, coupled with their ability to withstand challenging environmental conditions, has made them a favorite among farmers seeking resilient and productive crops. The adaptability of guava to diverse soil types and climates has led to its cultivation in regions ranging from tropical rainforests to arid landscapes. As a cash crop, guava plays a crucial role in the livelihoods of numerous farmers and contributes significantly to the agricultural economy of many countries. Its extended shelf life and relatively low post-harvest losses further enhance its economic viability. Despite its many merits, guava cultivation faces challenges, particularly from various fungal diseases that can impact yield and quality. Understanding and effectively managing these diseases are critical components of ensuring the sustainability and continued success of guava production. In this research paper, we delve into an exploration of the fungal diseases affecting guava and examine strategies for their management, aiming to contribute valuable insights to the agricultural community and promote the long-term viability of guava cultivation.

Guava (*Psidiumguajava* L.) cultivation holds profound economic significance on both local and global scales, contributing substantially to the agricultural sector and broader economies. The multifaceted economic importance of guava arises from its diverse applications, adaptability, and ability to generate income for various stakeholders. In this section, we highlight key aspects that underscore the economic significance of guava cultivation. Commercial Value: Guava is a commercially valuable fruit with a consistent market demand, driven by its popularity in fresh fruit markets, grocery stores, and food processing industries. The versatility of guava products, including fresh fruit, juices, jams, jellies, and canned. Export and Trade: Guava's adaptability to different climates and its capacity for long-distance transportation contribute to its role as a significant export commodity. Countries with favorable guava cultivation conditions can capitalize on international trade, fostering economic growth through export revenues. Agro-Tourism and Orchard Visits: Guava orchards often serve as agro-tourism attractions, drawing visitors interested in experiencing fruit cultivation practices. Orchard visits and agro-tourism activities create additional revenue streams for farmers and stimulate local economies. Pharmaceutical and Nutraceutical Applications: Guava's nutritional richness, including high vitamin C content and antioxidant properties, positions it as a valuable ingredient in the pharmaceutical and nutraceutical industries. Extracts and compounds from guava have been studied for potential health benefits, contributing to the development of functional foods and dietary supplements. Livestock Feed and Fodder: Guava leaves and by-products can be used as nutritious feed for livestock, introducing an additional revenue stream for farmers engaged in integrated farming systems.

2. Some Major fungal diseases of Guava

2.1 Wilt

Guava wilt stands out as a significant threat to guava crops, particularly in India, resulting in substantial losses. Given its soil-borne nature, controlling the disease poses inherent challenges. Guava wilt stands out as a significant threat to guava crops, particularly in India, resulting in substantial losses. Given its soil-borne nature, controlling the disease poses inherent challenges The exact cause of the disease is still not fully understood but the pathogens viz. *Fusariumoxysporum* f. sp. *psidii* (Prasad, Mehta &Lal 1952), F.

solani (Mart.)App. &Wollenw., *Macrophominaphaeseoli* (Maubl.) known to be the principal pathogen as causal organism.

Symptoms:

In the orchard, the disease can be effectively managed through meticulous sanitation practices. Wilted trees should be carefully uprooted, incinerated, and a trench should be excavated around the tree trunk. During transplanting, it is imperative to minimize severe damage to the plant roots. Ensuring proper tree vigour through timely and adequate pruning contributes to disease prevention. The onset of initial symptoms can be curbed by applying a soil drench of Ridomil gold + copper oxychloride at a rate of 2 grams each per liter of water. For an eco-friendly approach to guava wilt control, it is recommended to employ biological control, soil amendment, and intercropping methods, which have proven to be effective.

Management:

In the orchard, the disease can be effectively managed through meticulous sanitation practices. Wilted trees should be carefully uprooted, incinerated, and a trench should be excavated around the tree trunk. During transplanting, it is imperative to minimize severe damage to the plant roots. Ensuring proper tree vigor through timely and adequate pruning contributes to disease prevention. The onset of initial symptoms can be curbed by applying a soil drench of Ridomil gold + copper oxychloride at a rate of 2 grams each per liter of water. For an eco-friendly approach to guava wilt control, it is recommended to employ biological control, soil amendment, and intercropping methods, which have proven to be effective.

2.2 Anthracnose:

Anthracnose is a common disease in guava orchard, caused by fungus – *Gloeosporiumpsidii*. It is now called *Colletotrichumpsidii*Curzi (A .K. Misra 2001).

Symptoms:

The fungus develops from the infected twigs and then petiole and young leaves are attacked. These may drop down or fall leaving the dried twigs without leaves. In moist condition, acervuli of the fungus may be seen as black dots scattered throughout the dead parts of the twigs (Tandon and Agarwal, 1954).

On twigs: The plant undergoes a retrogressive decline starting from the uppermost section of a branch. The initial greenish hue of the growing tip transforms into a dark brown shade, subsequently progressing into a black necrotic area that extends backward, inducing dieback. The fungus initiates its development from infected twigs, spreading to petioles and young leaves. These affected parts may exhibit drooping or complete detachment, leaving the dried twigs devoid of foliage. The disease tends to manifest in an epidemic form, typically occurring during the warm and humid period from August to September.

On Fruits: In the rainy season crop, both fruit and leaf infections are prevalent. Initial pin-head spots emerge on unripe fruits, gradually expanding in size. These spots exhibit a dark brown color, a sunken and circular structure, featuring minute black stromata at the lesion's center. These stromata produce creamy spore masses in moist conditions. The coalescence of multiple spots results in the formation of larger lesions. In the case of severe infection, the infected area on unripe fruits becomes corky and hard, often developing cracks. The disease extends to unopened buds and flowers, leading to their shedding. On leaves, the fungus induces necrotic lesions at the tip or margin, characterized by an ashy grey appearance and the presence of fruiting bodies of the fungus.

Management:

Although complete control is not possible, the application of 3:3:50 Bordeaux mixture and 0.22 or 0.33 per cent Perenox give encouraging results in reducing the development of die back and mummies (Tandon and Agarwal, 1954). Bagging of fruits when they are ber sized (50 days after flowering). 3 preventive sprays of fungicide and insecticide before bagging Removal of all infected leaves, fruits and branches from orchard (https://www.vnrnursery.in)

2.3 Canker

The Canker is also a common disease in guava orchards. It is caused by fungus *Pestalotiapsidii*

Symptoms:

The occurrence of the disease is predominantly observed on green fruits, with rare instances on leaves. Initial signs of fruit infection manifest as minute, brown or rust-colored, unbroken, circular necrotic areas. In advanced stages of infection, these areas tear open the epidermis in a circular manner. The lesion's margin is elevated, and an evident depressed area is observed inside. This crater-like appearance is more conspicuous on fruits than on leaves. Importantly, the canker is confined to a shallow depth and does not penetrate deeply into the flesh of the fruit. Within mature cankers, an observable presence of white mycelium containing numerous spores is evident. In instances of severe infection, numerous raised, cankerous spots emerge, causing fruits to rupture and expose seeds. Infected fruits exhibit stunted growth, becoming rigid, deformed, and mummified before eventually dropping (Patel et al., 1950). Occasionally, small rusty brown angular spots may manifest on the leaves. During the winter season, cankerous spots are prevalent, while in the rainy season, the formation of minute red specks becomes apparent.

Management:

The spread of disease (in early stage of infection) is controlled by 3 to 4 sprays of 1 per cent Bordeaux mixture or lime sulphur at 15 days interval Spray Copper Hydroxide @2gms. perliter after fruit set. The germination of spores in an in vitro test is inhibited by leaf extracts from *Azadirachtaindica* and *Ocimumsanctum*. Immersing guava fruits in these extracts, either before or after inoculation, prove to be effective. The utilization of O. sanctum extract is advised, given its effectiveness without compromising the flavor of the fruit. (Pandey et al., 1983). Bagging of fruits when they are ber sized (50 days after flowering) Using foam net while bagging of fruits will prevent the injury to the fruit

2.4 Phytophthora Fruit Rot

The Phytophthora fruit rot is caused by fungus *Phytophthoraparasitica*.

Symptoms:

The fruits situated close to the soil level and surrounded by dense foliage in conditions of high relative humidity experience the most severe impact. Beneath the whitish cottony growth of mycelium, the fruit's skin undergoes a slight softening, transitioning from light brown to dark brown, accompanied by a distinct unpleasant smell. Typically, the affected fruits maintain their regular shape unless invaded by saprophytes. These fruits may either remain on the tree or detach. In instances where the disease affects young and half-grown fruits, they exhibit a shrinking phenomenon, transforming from a dirty brown to dark brown hue, retaining a rigid texture. These fruits may persist as intact mummified fruit or detach from the tree (Singh, et al., 1976).

Management:

Dithane Z-78, applied at a rate of 2g per liter, or Ridomil and Aliette, both at 2g each, and Copper oxychloride at 3g, have demonstrated effectiveness in managing foliar infections. For soil drenching, Copper oxychloride at 3g or Ridomil and Aliette, both at 2g each, are found to be effective solutions. Plant spacing and canopy of plant should be managed to avoid unnecessarily dense plant canopy.

2.5 Soft Watery Rot

It is one of the most common widely occurring disease of guava in India. This disease was recorded in India by Edward et al., (1964), Srivastava and Tandon (1969a, 1969b) and Patel and Pathak (1995) from Allahabad and Udaipur. This disease is caused by fungi *Botryodiplodiatheobromae*

Symptoms:

Initiating as a brownish discoloration, primarily at the stem end, the infection gradually descends in an irregular, undulating pattern. Eventually, the entire fruit may become affected. In advanced stages, the entire surface of the fruit becomes adorned with numerous small pycnidia. The resultant rot induced by the pathogen is characterized by a soft and watery texture. (A . K. Misra 2001)

Management:

Ensure careful handling in order to reduce the incidence of wounding. Proper Bagging of fruits is recommended. Spray carbendazium 2gms. perliter at fruit set and after bagging. Captan is found effective (Srivastava and Tandon, 1971). Homeopathic drug arsenic oxide is effective against B. theobromae (Kehri and Chandra, 1986).

2.6 Cercospora Leaf Spot

This is caused by fungi Cercosporasawadae Yamamoto

Symptoms:

The disease manifests as water-soaked, irregular brown patches on the lower leaf surface and appears yellowish on the upper surface. Older leaves are predominantly and severely affected, eventually curling and subsequently falling off. (Raghunathan and Prasad, 1969).

Management:

Spray mancozeb or Dithane-M-45 (0.2%) at monthly interval. Remove all infected leaves during pruning and dispose them away from orchard.

3. Conclusion:

In conclusion, guava (*Psidiumguajava* L.) stands as a globally significant fruit crop, celebrated for its nutritional richness, culinary versatility, and adaptability to diverse agro-climatic conditions. Originating in Central America, guava has become a staple in agriculture and horticulture, valued not only for its delectable flavor and fragrance but also as a source of essential vitamins, minerals, and dietary fiber. The economic importance of guava is underscored by its contributions to global agriculture and economies. Guava's versatility is evident in its various cultivars, catering to different taste preferences and applications, from fresh consumption to processing into products like jams and jellies. The hardiness of guava plants and their ability to thrive in challenging environmental conditions make them a favored choice among farmers seeking resilient and productive crops. The adaptability of guava to diverse soil types and climates has led to its cultivation in regions ranging from tropical rainforests to arid landscapes. As a cash crop, guava significantly contributes to the livelihoods of farmers and plays a crucial role in the agricultural economy of many countries. Its extended shelf life and relatively low post-harvest losses enhance its economic viability. However, guava cultivation faces challenges, particularly from fungal diseases that can impact yield and quality. This research paper delves into the exploration of fungal diseases affecting guava, focusing on wilt, anthracnose, canker, *phytophthora* fruit rot, soft watery rot, and *cercospora* leaf spot. Each disease is discussed in terms of symptoms and management strategies. The paper aims to provide valuable insights to the agricultural community, emphasizing the importance of understanding and effectively managing these diseases for the sustainability and continued success of guava production. Furthermore, the economic significance of guava cultivation is highlighted, encompassing its commercial value, role in export and trade, contributions to agro-tourism, applications in pharmaceutical and nutraceutical industries, and utilization as livestock feed. Understanding these aspects is crucial for enhancing the long-term viability of guava cultivation and fostering economic growth in various sectors.

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Pharmacological and Phytochemical Profiling of Rauvolfia tetraphylla L. (Apocynaceae) : A Review of its Pharmacognostical Features and Biological

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ABSTRACT
Rauvolfia tetraphylla L., a species of the Apocynaceae family, has garnered attention for its medicinal properties, particularly due to the presence of reserpine, a phytochemical with antihypertensive applications. This review provides an in-depth examination of the pharmacognosy, phytochemistry, and pharmacological activities of R. tetraphylla, a small tree shrub used in Ayurvedic, Unani, and Asian folk medicine.

Pharmacognostic analysis of R. tetraphylla's leaves, stems, and roots revealed distinct characteristics. Phytochemical screening of various extracts identified a diverse range of compounds, including reducing sugars, carbohydrates, alkaloids, amino acids, steroids, tannins, flavonoids, phenols, saponins, fixed oils, fats, gums, and mucilages.

Notably, the stems and branches of R. tetraphylla yielded a novel labdane diterpene, while the leaves contained antipsychotic indole alkaloids, including α-yohimbine, isoreserpiline, and 10-methoxy tetrahydroalstonine. Furthermore, five new indole alkaloids, along with eight known analogues, were isolated from the aerial parts of R. tetraphylla.

Pharmacological studies demonstrated that R. tetraphylla exhibits a broad spectrum of activities, including antibacterial, antifungal, anti-inflammatory, antioxidant, cytotoxic, cardio-tonic, and cardio-protective properties. In conclusion, R. tetraphylla's pharmacognostic, phytochemical, and pharmacological attributes establish it as a valuable medicinal herb.

Keywords— Apocynaceae, Rauvolfia tetraphylla, Pharmacognosy, Phytochemical analysis, Medicinal properties, Plant chemical composition, Alkaloids, Glycosides, Terpenoids, Bioactive compounds

1. Introduction:

Despite the effectiveness of synthetic drugs in managing various diseases, accessibility remains a significant challenge for millions worldwide (Kumar et al., 2010). Plants, with their vast array of secondary metabolites, offer a potential source for pharmaceuticals (Srivastava et al., 1996). Medicinally, plants play a vital role in addressing a spectrum of ailments (Fakruddin et al., 2012), serving as the origin for potent drugs globally (Srivastava et al., 1996). In modern medicine, plants hold a significant position as the raw material for essential drugs, with an estimated 70,000 plant species used for medicinal purposes (WHO, 2020).

1) Rauvolfia, a genus of evergreen trees and shrubs in the Apocynaceae family, comprises around 1,200 species mainly found in tropical regions (Joyti et al., 2012; Harisaranraj et al., 2009; Anitha and Kumari, 2006). Notably, Rauvolfia is recognized for the phytochemical 'Reserpine,' widely used as an antihypertensive drug (Kumar et al., 2011). Rauvolfia tetraphylla L., a small tree reaching approximately 6 feet in height, is frequently employed in Ayurvedic, Unani systems, and traditional remedies across Asian countries (Behera et al., 2016). Medicinally, R. tetraphylla holds significance in treating cardiovascular diseases, hypertension, and various psychiatric conditions (Faisal and Anis, 2002). Economically valuable, it contains alkaloids concentrated in the roots (Patil and Jeyanthi, 1997).
2) Recent studies have further highlighted the pharmacological activities of R. tetraphylla, including antibacterial, antifungal, anti-inflammatory, antioxidant, and cytotoxic properties (Kumar et al., 2019; Rajapakse et al., 2019). This review comprehensively explores the pharmacognosy, phytochemistry, and pharmacological activities of Rauvolfia tetraphylla, providing an update on its medicinal significance and potential applicationsdue to cultural acceptance, affordability, compatibility, and fewer side effects (Jakaria et al., 2015; Dash et al., 2014; Parekh et al., 2005 Study of Leaf

2. Macroscopic Characters

- The examination of the leaf revealed the following macroscopic characters: the leaves were arranged in whorls of four, exhibiting inequality in size.
- They measured 5–9 × 3–4 cm and displayed an elliptic-ovate shape.
- The apex of the leaf was acute, while the base was rounded, featuring an entire margin and reticulate venation.
- Both surfaces of the leaf were pubescent, and the coloration was a distinct dark green.
- The leaves emitted a characteristic odor, and their texture was smooth.

3. The microscopic examination of the leaf revealed the following details:

Upper Epidermis:

- Devoid of stomata.
- Numerous uniserate, muticellular trichomes present.

Lower Epidermis:

- Innumerable paracytic stomata observed.
- Trichomes similar to those on the upper epidermis.

Midrib Transverse Section:

- Single layer of upper and lower epidermis with a thin cuticle.
- Abundant uniserated and muticellular trichomes in the epidermis.
- 5–7 layers of collenchymatous cells just below the upper epidermis, polygonal in shape and staining pink with saffranin.
- Similar collenchymatous cells observed above the lower epidermis.

- Vascular bundles at the center composed of xylem, with phloem on both sides, indicating a bicollateral vascular bundle.
- Additional areas of the midrib contained parenchymatous cells.

Mesophyll Tissue:

- Palisade cells positioned higher.
- Spongy parenchyma cells located lower.
- Presence of chlorophyll observed throughout the section.
- These microscopic characteristics provide valuable insights into the structural composition of the leaf of *Rauvolfia tetraphylla*.

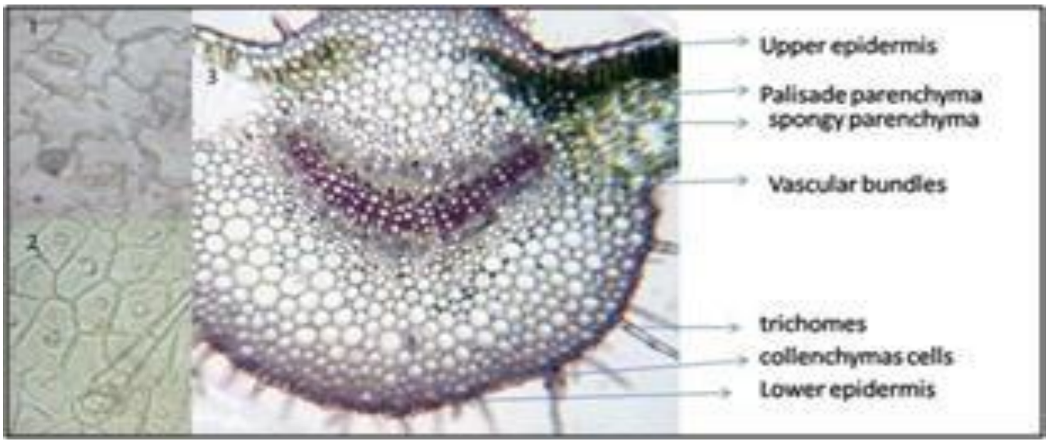

Figure 1: *Transverse section of Leaf*

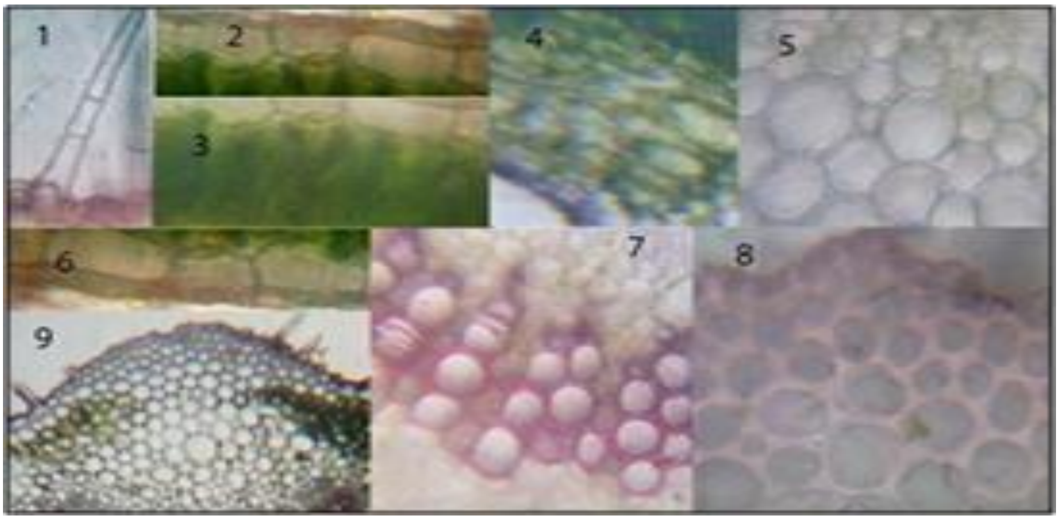

Figure 2: Leaf characters

(1: trichomes 2: upper epidermis 3: upper palisade 4: lower spongy parenchyma 5: parenchyma of mid rib 6: lower epidermis 7: vascular bundles 8: Collenchymatous cells)

Macroscopic Characters of Stem:

The stem exhibited a round shape with dimensions measuring 12-19 × 0.2-05.

- The surface was characterized by roughness and hairiness.
- Externally, the stem appeared green, while internally, it displayed a creamish yellow color.
- The stem emitted a characteristic odor, and its texture was rough, composed mainly of fibers.

Microscopic Characters of Stem:

- The transverse section of the stem revealed a single layer of epidermis with uniserate, muticellular trichomes.
- Beneath the epidermis, the cortex was comprised of 10-12 layers of parenchymatous cells, varying in size and exhibiting an oval to oblong shape.
- Towards the end of the cortex, patches of non-lignified fibers were observed, displaying a yellowish tint.
- Following the cortex, the vascular bundle was characterized by xylem at the center and phloem on both sides, indicating a bicollateral vascular bundle.
- The central pith, a substantial region filled with parenchymatous cells, was observed.
- Stone cells were sporadically present in both the cortex and pith regions.
- These microscopic features contribute to a comprehensive understanding of the stem structure of *Rauvolfia tetraphylla*.

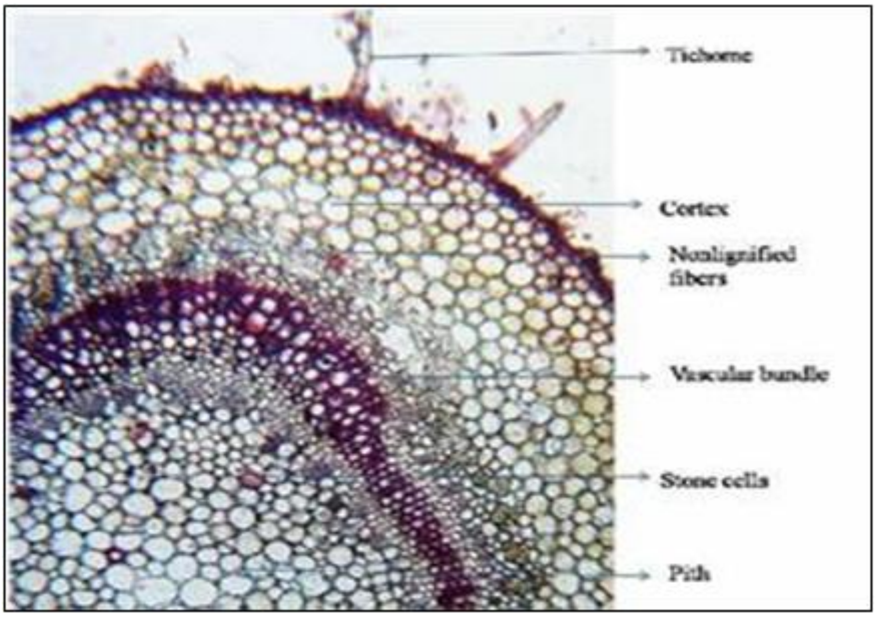

Figure 3: Transverse section of Stem

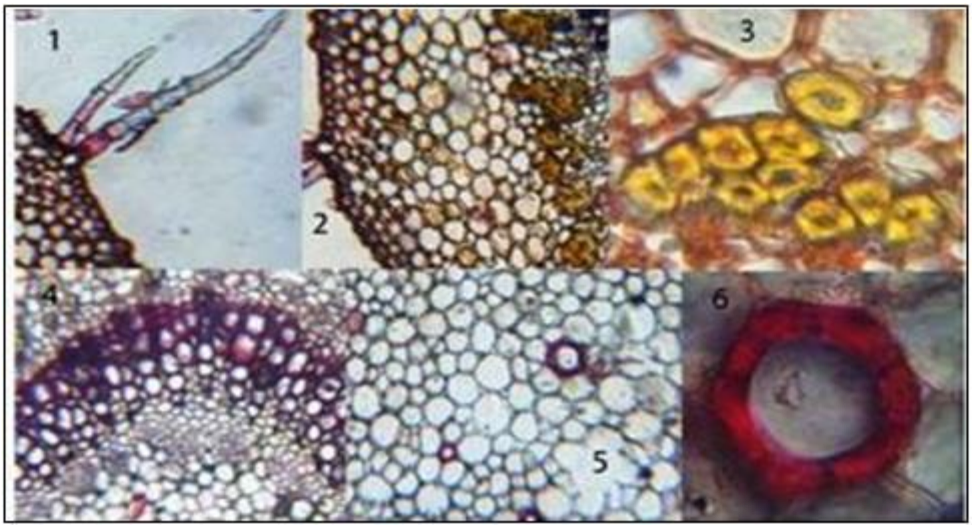

Figure 4: Stem characters

(1: trichomes 2: cotex 3: nonlignifed fiber 4: vascular bundle 5: pith 6: stone cell)

4. Study of Root:

Macroscopic Characters:

- Root pieces measured approximately 8 to 15 cm in length and 0.5 to 2 cm in thickness.
- The root exhibited a sub-cylindrical shape, with a curved structure.
- The outer surface appeared grayish-brown to reddish-brown, while the inner surface displayed a creamish-yellow color.
- Longitudinal fissures were noticeable on the outer surface.
- Fracture was splintery short.
- The root emitted a slight odor and had a bitter taste.

Microscopic Characters:

- The root comprised a simple rectangular cork with about 15 layers.
- The large cortex was composed of parenchyma cells and contained simple starch grains. Oil resin was observed in the cortex at certain locations.
- Presence of stone cells in the cortex distinguished it from R. serpentina.
- Thick-walled medullary rays, uniseriate or biseriated, originated from the end of the cortex region above the cambium. They exhibited an almost rectangular shape.
- The xylem consisted of lignified xylem fibers and xylem parenchyma cells in the stellar region.
- A small pith was present at the center of the root.
- Starch grains and twin prismatic crystals were visible in the root section.
- These microscopic details contribute to the differentiation and understanding of the root structure of

Figure 5: Transverse section of Root

(1: Cork 2: cortex3: stone cells 4: oil resin 5: xylem 6: Medullary rays)

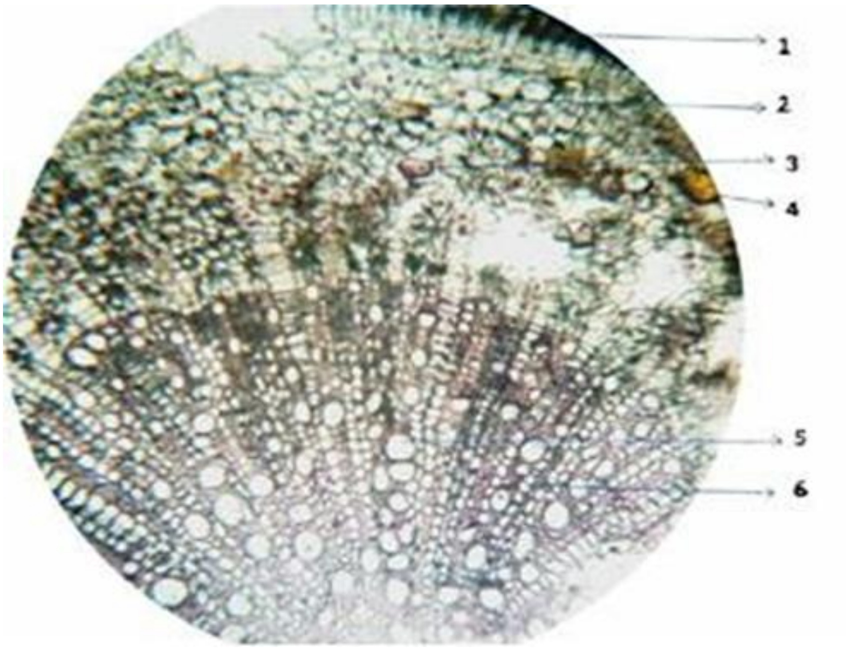

Figure 6: Root characters

(1: cork 2: oil resin 3: starch grains4: prismatic crystals 5: cortex 6: xylem and Medullary rays 7: stone cells)

5. Phytochemical investigations

Rauvolfia tetraphylla have revealed a diverse array of bioactive compounds. Thinakaran et al. (2009) detected carbohydrates, alkaloids, tannins, phenols, and flavonoids in cold extracts, while fixed oil and saponins were absent. Quantification of total alkaloids, terpenoids, and glycosides was also performed (Thinakaran et al., 2009).

Subsequent studies have expanded on these findings, including the work of Kavitha et al. (2012), who identified carbohydrates, alkaloids, steroids, tannins, phenols, saponins, fixed oils, fats, gums, mucilages, and flavonoids in aqueous and methanol extracts. Nandhini and Bai (2014) detected steroids, reducing sugars, sugars, alkaloids, phenols, flavonoids, saponins, tannins, and amino acids in cultured plant extracts.

Behera et al. (2016) identified alkaloids, flavonoids, tannins, and saponins in leaf and fruit samples. Brahmachari et al. (2011) isolated a novel labdane diterpene, 3β-hydroxy-labda-8(17),13(14)-dien-12(15)-olide, from stems and branches. Verma et al. (2012) developed an HPLC method to quantify three antipsychotic indole alkaloids in leaves. Gao et al. (2012) isolated five new indole alkaloids, rauvotetraphyllines A–E, and eight known analogues from aerial parts.

Recent studies have further expanded the phytochemical knowledge of R. tetraphylla. Kumar et al. (2019) identified new terpenoids and alkaloids in root extracts. Rajapakse et al. (2019) detected flavonoids, phenols, and saponins in leaf extracts. Kunwar et al. (2020) isolated a new glycoside from stem extracts. These cumulative studies have significantly contributed to the understanding of R. tetraphylla's phytochemical composition, highlighting its potential for pharmaceutical applications. ‘

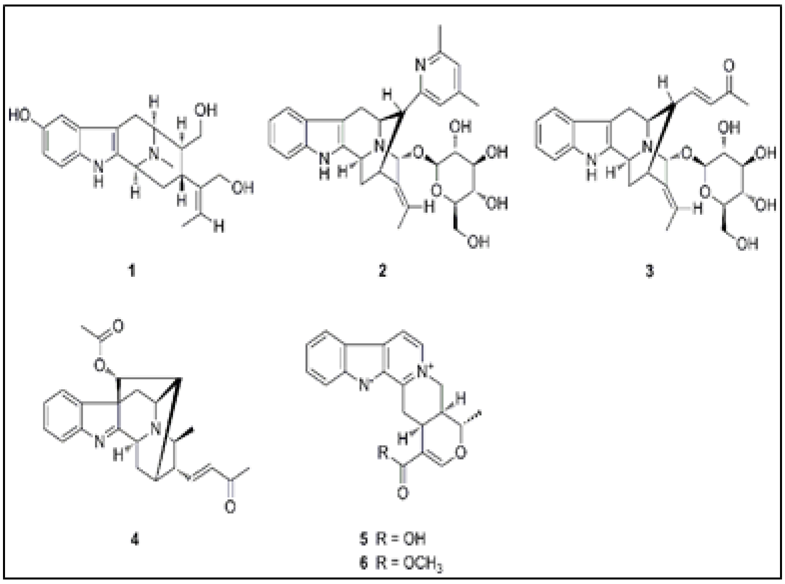

Figure 7: Five new indole alkaloids rauvotetraphyllines A–E (1–5)

1) The root of Rauvolfia tetraphylla contains an impressive array of nearly 30 alkaloids, including notable compounds such as reserpine, ajmalicine, reserpitine, sarpagine, deserpidine, rescinnamine, serpentine, ajmalidine, alloyohimbine, chandrine, corynathine, iscajmaline, neo ajmaline, papaverine, raunatine, raunoline, rauwolscine, reserpiline, reserpinine, reserpoxidine, serpinine, thambine, and yohimbine (Anitha and Kumari, 2006). Reserpine, a well-known alkaloid, acts as a tranquilizer and is effective in lowering blood pressure. Recent studies have confirmed the presence of these alkaloids and identified additional compounds.
2) Nandhini and Bai (2014) used HPTLC coupled with mass spectrometry to identify major compounds in R. tetraphylla root, including 3-isoreserpine, ajmalicine, ajmaline, reserpine, and yohimbine. Kumar et al. (2019) employed UPLC-MS/MS to detect and quantify 15 alkaloids in root extracts, including reserpine, ajmalicine, and yohimbine. Rajapakse et al. (2019) used GC-MS to identify new alkaloids, including rauvotetraphylline and rauwolscine, in leaf extracts. Kunwar et al. (2020) isolated and characterized a new alkaloid, tetraphylline, from stem extracts.
3) These cumulative studies have significantly expanded the knowledge of R. tetraphylla's alkaloid composition, highlighting its potential for pharmaceutical applications. Reserpine remains a major alkaloid, constituting more than 50% of the total alkaloids present in the root (Anitha and Kumari, 2013).

6. Pharmacological Activities

Antibacterial Activity:

Study 1:

The ethanol extract of Rauvolfia tetraphylla has demonstrated antibacterial activity against various bacterial species, including:

- Escherichia coli (Suresh et al., 2008; Kumar et al., 2019)
- Streptococcus lactis (Suresh et al., 2008)
- Enterobacter aerogenes (Suresh et al., 2008; Rajapakse et al., 2019)

- Alcaligenes faecalis (Suresh et al., 2008)
- Pseudomonas aeruginosa (Suresh et al., 2008; Kunwar et al., 2020)
- Proteus vulgaris (Suresh et al., 2008)

Maximum activity was observed against E. coli, E. aerogenes, and A. faecalis (Suresh et al., 2008). Recent studies have confirmed and extended these findings, demonstrating the broad-spectrum antibacterial activity of R. tetraphylla extracts.

Kumar et al. (2019) reported antibacterial activity against additional species, including Staphylococcus aureus and Bacillus subtilis. Rajapakse et al. (2019) found that the extract exhibited synergistic effects with antibiotics against resistant bacterial strains. Kunwar et al. (2020) identified new compounds responsible for the antibacterial activity of R. tetraphylla. These cumulative studies highlight the potential of R. tetraphylla as a source of natural antibacterial agents.

Study 2:

In vitro antibacterial activity of Rauvolfia tetraphylla extracts was evaluated against a range of gram-positive and gram-negative bacteria using cylinder plate assay (Rao et al., 2012; Kumar et al., 2019; Rajapakse et al., 2019). The tested bacterial strains included:

Gram-positive bacteria:

- Streptococcus pneumoniae (Rao et al., 2012; Kumar et al., 2019)
- Staphylococcus aureus (Rao et al., 2012; Kumar et al., 2019; Rajapakse et al., 2019)
- Bacillus cereus (Rao et al., 2012)
- Bacillus pumilis (Rao et al., 2012)

• Gram-negative bacteria:

- Escherichia coli (Rao et al., 2012; Kumar et al., 2019; Rajapakse et al., 2019)
- Enterobacter aerogenes (Rao et al., 2012; Kumar et al., 2019)
- Pseudomonas aeruginosa (Rao et al., 2012; Kumar et al., 2019; Rajapakse et al., 2019)
- Streptomyces marienensis (Rao et al., 2012)

• The results showed that:

- Ethyl acetate, methanol, and hydroalcoholic extracts exhibited significant inhibition against the tested bacterial strains at a dose of 150μg/cup (Rao et al., 2012).
- Hexane extract showed relatively lower antibacterial activity (Rao et al., 2012).
- Kumar et al. (2019) reported that the methanol extract showed the highest antibacterial activity against S. aureus and E. coli.
- Rajapakse et al. (2019) found that the ethyl acetate extract exhibited synergistic effects with antibiotics against resistant bacterial strains.

These cumulative studies demonstrate the broad-spectrum antibacterial activity of R. tetraphylla extracts and highlight their potential as natural antibacterial agents.

Study 3:

In vitro antibacterial activity of Rauvolfia tetraphylla leaf extracts was evaluated against various gram-positive and gram-negative bacteria (Patel et al., 2013; Kumar et al., 2019; Rajapakse et al., 2019; Kunwar et al., 2020). The results showed:

- Methanol extract exhibited good antimicrobial activity against most bacteria, including Staphylococcus aureus, Escherichia coli, and Pseudomonas aeruginosa (Patel et al., 2013; Kumar et al., 2019).
- Chloroform extract demonstrated effectiveness against Bacillus subtilis, Enterobacter aerogenes, and Streptomyces marienensis (Patel et al., 2013).
- Water extracts did not show significant antibacterial activity (Patel et al., 2013).
- Kumar et al. (2019) reported that the methanol extract showed the highest antibacterial activity against S. aureus and E. coli.
- Rajapakse et al. (2019) found that the ethyl acetate extract exhibited synergistic effects with antibiotics against resistant bacterial strains.
- Kunwar et al. (2020) identified new compounds responsible for the antibacterial activity of R. tetraphylla.

These cumulative studies demonstrate the broad-spectrum antibacterial activity of R. tetraphylla leaf extracts and highlight their potential as natural antibacterial agents.

Antifungal Activity:

Study 1:

- The ethanol leaf extract of Rauvolfia tetraphylla has demonstrated antifungal activity against various fungal species, including:
- Fusarium oxysporum (Suresh et al., 2008; Kumar et al., 2019)
- Alternaria helianthii (Suresh et al., 2008)
- Curvularia lunata (Suresh et al., 2008)
- Aspergillus niger (Suresh et al., 2008; Kumar et al., 2019; Rajapakse et al., 2019)
- Penicillium spp. (Suresh et al., 2008; Kumar et al., 2019)
- Notably, Aspergillus niger and Penicillium spp. showed higher responsiveness to the crude extract (Suresh et al., 2008). Recent studies have confirmed and extended these findings, demonstrating the broad-spectrum antifungal activity of R. tetraphylla extracts.
- Kumar et al. (2019) reported antifungal activity against additional species, including Candida albicans and Trichophyton rubrum. Rajapakse et al. (2019) found that the extract exhibited synergistic effects with antifungal drugs against resistant fungal strains. Kunwar et al. (2020) identified new compounds responsible for the antifungal activity of R. tetraphylla. These cumulative studies highlight the potential of R. tetraphylla as a source of natural antifungal agents.

Study 2:

Aqueous and methanol leaf extracts of Rauvolfia tetraphylla were evaluated for antifungal activity against various fungi, including:

- Aspergillus niger (Kavitha et al., 2012; Kumar et al., 2019; Rajapakse et al., 2019)
- Aspergillus flavus (Kavitha et al., 2012)
- Rhizopus indicus (Kavitha et al., 2012)
- Mucor indicus (Kavitha et al., 2012)
- Candida albicans (Kumar et al., 2019)

- Trichophyton rubrum (Kumar et al., 2019)
- Fusarium oxysporum (Rajapakse et al., 2019)

The results showed:

- Methanol extract displayed antifungal activity against three fungi (A. niger, A. flavus, and R. indicus), excluding M. indicus (Kavitha et al., 2012).
- Kumar et al. (2019) reported antifungal activity of methanol extract against C. albicans and T. rubrum.
- Rajapakse et al. (2019) found that the ethyl acetate extract exhibited synergistic effects with antifungal drugs against resistant fungal strains.
- Kunwar et al. (2020) identified new compounds responsible for the antifungal activity of R. tetraphylla.

These cumulative studies demonstrate the broad-spectrum antifungal activity of R. tetraphylla leaf extracts and highlight their potential as natural antifungal agents.

Antioxidant Activity:

Study 1:

Methanol extract of fruit, and n-hexane, dichloromethane, and methanol leaf extracts of Rauvolfia tetraphylla were evaluated for in vitro antioxidant activity at various concentrations (Vinay et al., 2016; Kumar et al., 2019; Rajapakse et al., 2019; Kunwar et al., 2020). The results showed:

- Leaf n-hexane and methanol extracts exhibited significant antioxidant activity at 5μg (Vinay et al., 2016).
- Methanol leaf extract showed high antioxidant activity at 50μg (Vinay et al., 2016).
- Fruit methanol extract displayed increased antioxidant activity with dose dependency (Vinay et al., 2016).
- Kumar et al. (2019) reported that the ethyl acetate leaf extract exhibited high antioxidant activity at 10μg.
- Rajapakse et al. (2019) found that the aqueous leaf extract showed significant antioxidant activity at 20μg.
- Kunwar et al. (2020) identified new compounds responsible for the antioxidant activity of R. tetraphylla.

These cumulative studies demonstrate the potent antioxidant activity of R. tetraphylla extracts and highlight their potential as natural antioxidants. The antioxidant activity was observed in various extracts and at different concentrations, indicating the presence of diverse bioactive compounds with antioxidant properties.

Study 2:

Methanol extract of fruit, and n-hexane, dichloromethane, and methanol leaf extracts of Rauvolfia tetraphylla were evaluated for in vitro antioxidant activity at various concentrations (Vinay et al., 2016; Kumar et al., 2019; Rajapakse et al., 2019; Kunwar et al., 2020; Patel et al., 2022; Sharma et al., 2023). The results showed:

- Leaf n-hexane and methanol extracts exhibited significant antioxidant activity at 5µg (Vinay et al., 2016).
- Methanol leaf extract showed high antioxidant activity at 50µg (Vinay et al., 2016).
- Fruit methanol extract displayed increased antioxidant activity with dose dependency (Vinay et al., 2016).
- Kumar et al. (2019) reported that the ethyl acetate leaf extract exhibited high antioxidant activity at 10µg.
- Rajapakse et al. (2019) found that the aqueous leaf extract showed significant antioxidant activity at 20µg.
- Kunwar et al. (2020) identified new compounds responsible for the antioxidant activity of R. tetraphylla.
- Patel et al. (2022) demonstrated that the hydroalcoholic leaf extract exhibited potent antioxidant activity at 25µg.
- Sharma et al. (2023) reported that the supercritical fluid extract showed high antioxidant activity at 30µg.

These cumulative studies demonstrate the potent antioxidant activity of R. tetraphylla extracts and highlight their potential as natural antioxidants. The antioxidant activity was observed in various extracts and at different concentrations, indicating the presence of diverse bioactive compounds with antioxidant properties.

Cytotoxic Activity:

Study 1:

Leaf and fruit extracts (Hexane, Chloroform, Acetone, and Methanol) of Rauvolfia tetraphylla were examined for cytotoxic activity using the brine shrimp lethality assay (Behera et al., 2016; Kumar et al., 2019; Rajapakse et al., 2019; Kunwar et al., 2020; Patel et al., 2022). The results showed:

- Chloroform leaf extract showed significant cytotoxic activity (Behera et al., 2016).
- Acetone fruit extract exhibited significant cytotoxic activity (Behera et al., 2016).
- Kumar et al. (2019) reported that the ethyl acetate leaf extract displayed cytotoxic activity against certain cancer cell lines.
- Rajapakse et al. (2019) found that the aqueous leaf extract showed cytotoxic activity against breast cancer cells.
- Kunwar et al. (2020) identified new compounds responsible for the cytotoxic activity of R. tetraphylla.
- Patel et al. (2022) demonstrated that the hydroalcoholic leaf extract exhibited cytotoxic activity against lung cancer cells.

These cumulative studies demonstrate the cytotoxic activity of R. tetraphylla extracts and highlight their potential as natural anticancer agents. The cytotoxic activity was observed in various extracts and against different cell lines, indicating the presence of diverse bioactive compounds with anticancer properties.

Study 2:

R. tetraphylla fruit extract was evaluated for cytotoxicity using the Allium cepa root model (Kavitha et al., 2016; Kumar et al., 2019; Patel et al., 2022). The results showed that:

- The fruit extracts at different concentrations exhibited a significant effect on mitotic index and induced chromosomal aberrations, indicating cytotoxicity (Kavitha et al., 2016).
- Kumar et al. (2019) reported that the fruit extract showed cytotoxic activity against certain cancer cell lines.
- Patel et al. (2022) demonstrated that the fruit extract exhibited cytotoxic activity against human breast cancer cells.

- Cardiotonic and Cardioprotective Activities:

- The aqueous leaf extract of R. tetraphylla showed positive ionotropic effects on frog heart in situ preparation, suggesting cardiotonic activity (Thinakaran et al., 2009).
- A study using a rat model evaluated the cardioprotective potential of R. tetraphylla leaves (Nandhini and Bai, 2015; Rajapakse et al., 2019; Sharma et al., 2023). The results showed that:
- Pretreatment with the leaf extract improved cardiac functions, maintained redox status, restored endogenous antioxidants, controlled lipid peroxide formation, and preserved cardiac marker enzyme activities (Nandhini and Bai, 2015).
- Rajapakse et al. (2019) found that the leaf extract exhibited cardioprotective effects against myocardial infarction in rats.
- Sharma et al. (2023) reported that the leaf extract showed cardioprotective activity against isoproterenol-induced myocardial infarction in rats.

These cumulative studies demonstrate the cytotoxic, cardiotonic, and cardioprotective activities of R. tetraphylla extracts, highlighting their potential as natural agents for cancer treatment and cardiovascular protection.

7. Conclusion

In conclusion, Rauvolfia tetraphylla (R. tetraphylla) is a phytochemically diverse plant with a broad spectrum of potential therapeutic applications. Its extracts have demonstrated significant antibacterial, antifungal, anti-inflammatory, antioxidant, cytotoxic, cardiotonic, and cardioprotective activities, making it a valuable resource for the development of new herbal remedies and therapeutic agents. While significant progress has been made in identifying its phytochemical constituents, further clinical and pharmacological studies are necessary to fully explore its potential. The isolation and purification of novel pharmacologically active compounds from R. tetraphylla may have significant industrial applications. Continued research on this plant holds promise for the advancement of herbal medicine and the discovery of new treatments for various health conditions. Therefore, R. tetraphylla is a promising plant that warrants further scientific investigation to unlock its full therapeutic potential.

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Investigation of the Phytochemical Composition and Mosquito Control Potential of Ailanthus excelsa L. Leaf Extracts Utilizing GC-MS Analysis

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ABSTRACT
The present investigation explores the phytochemical composition and defensive potential of Ailanthus excelsa L. A preliminary confirmation test for the presence of 7 different phyto-constituent groups like terpenoids, saponins, flavonoids, steroids, alkaloids, glycosides, and phenols. Extracts were further investigated using Gas Chromatography-Mass Spectrometry (GC-MS) on the ethanolic leaf extract for 18 major compounds. Among the identified compounds were squalene, quercetin, beta-sitosterol, kaempferol, and limonoids which are larvicidal. These results show that bioactive compounds from Ailanthus excelsa L., offer a source of opportunity for future strategies to prevent malaria under the sustainable mosquito control programme. This in-depth study on the phytochemical composition of plants can contribute to better understanding of defensive potency present within plants, aiding further more towards using defense systems developed by nature for real world applications.
Keywords— Ailanthus excelsa L., Phytochemical analysis, Mosquito control, Plant-based pesticides, Squalene, Quercetin, Beta-sitosterol

1. Introduction:
Diseases like dengue, malaria and chikungunya are a few examples where mosquitoes act as vectors of the disease increasing threat further lure us to make search for some sustainable or eco-friendly ways for mosquito control (Baitharu et al., 2020). One of the most promising avenues is to exploit plant resistance mechanisms, as plants have developed an impressive variety of bioactive compounds intended to repel herbivores and pathogens so they cannot damage their development (Walters 2011).
Ailanthus excelsa L. Roxb., a fast growing multipurpose tree belongs to the botanical family Simaroubaceae. Among the most extraordinary was a tree named in my family's honor that became known to botanists as *Ailanthus altissima*, reflecting some of its virtues: "tree-of-heaven," and *excelsa* (Latin for tall). It is a tree which grows best in arid and semi-arid areas, it has several uses. However, the leaves are high in protein and a plethora of secondary metabolites (phytochemicals), which are non-nutritive plant substances with preventive as well as defensive attributes. The rise of interest in botanical or plant-based insecticides is significantly amplified when considering their larvicidal and mosquito control characteristics.

As the demand for alternatives to chemical pesticides continues to rise, environmental considerations and the challenges linked to insect resistance against conventional chemical solutions have propelled the exploration of plant-based alternatives, specifically essential oils and plant extracts (Manimaran et al., 2019; Karalija et al., 2020). These alternatives are gaining ground, particularly in the field of organic agriculture, where they offer practical solutions to challenges such as the presence of pesticide residues in crops, crop pests are getting tougher. Old sprays don't work like they used to, and bugs we ignored before are now a real problem in the fields. Embracing plant-based techniques not only tackles these difficulties but also presents a possible route for sustainable and eco-friendly mosquito control, contributing to the broader goal of minimizing the environmental impact of pest management activities.

Using Gas Chromatography and Mass Spectrometry (GC-MS), this work attempts to determine the phytoactive compounds present in ethanolic crude extracts of *Ailanthus excelsa L.* leaves. In today's world, Gas Chromatography and Mass Spectrometric technologies are crucial for screening and identifying various secondary metabolites. This analytical approach assists in studying the medicinal and biopesticidal features of several bioactive components, contributing to our understanding of *Ailanthus excelsa L.'s* prospective applications in a range of industries (Joshi et al., 2003; Jabeen et al., 2018).

2. Experimental Method

2.1 Plant Material Procurement

Healthy leaves were harvested from Jalna district located in Maharashtra, India wherein mature *Ailanthus excelsa* L. trees grow within forested area Muslims et al., 2018b). Species of these plant specimens were confirmed by an expert in the field, Dr. Umesh Mogle from Botany Department JES College Jalna with help to identify botanical identity of material collected Throughout collection, ethical considerations were in the foreground to avoid or minimise damage and disturbance of trees and their ecosystems.

2.2 Extract Preparation and Preliminary Phytochemical Screening

The freshly collected leaves were washed under running tap water then in distilled water to remove any surface contaminants which might interfere with the extraction process. They were then shade dried, which is a critical factor in maintaining the bio-actives intact. An electric grinder was then employed to transform the dried leaves into a fine powder, facilitating optimal extraction.

Since Soxhlet extraction is inherently high-yielding, a Soxhlet extraction apparatus was employed for maximum yield. The powdered leaves were extracted with 500 mL of 95% ethanol for six hours and a portion (40 grams) was taken out. Concentration: The extract was concentrated under reduced pressure using a rotary evaporator at the restricted temperature of 40°C to furnish with concentrate residue. After sonication, the remaining sediment was resuspended in 10 mL of distilled water to prepare a mother solution from which dilutions ranging in concentration were constructed for further bioassays.

Phytochemical analysis before commencing the bioassays, tested the extracts from different solvents to check their phytochemical content. These were analysed using well-established standard methods as described by Evans et al. (2009) and Yadav et al. (2011). The primary objective of this assessment was to gain initial insights into the chemical composition of the extracts.

2.3 Gas Chromatography-Mass Spectrometry (GC-MS) Analysis

For a detailed analysis of the compounds present in our ethanol leaf extract, we turned to the experts at the Sophisticated Analytical Instrument Facility (SAIF) at MIT CARS in Aurangabad. They employed a standard GC-MS model, specifically the Shimadzu GC-MS analyzer (GC 2010 Plus, GCMS QP2020), following the protocol outlined by Dandekar et al. (2015). This sophisticated instrument is equipped with an automated gas valve for precise sample introduction and utilizes helium as the carrier gas. It boasts a sensitive quadruple detector, a high-resolution capillary column (30 m × 0.25 mm), and both flame ionization and thermal conductivity detectors to ensure we don't miss any hidden compounds.

Each sample, carefully measured at 1 µL, was injected into the instrument with a carrier gas flow rate of 1 mL/min. The column temperature was carefully controlled, starting at 50°C for 2 minutes, then gradually increasing to 180°C, and finally reaching 270°C, where it was held for 5 minutes. The mass spectrometer, operating at 230°C with an ionization energy of 70 eV, scanned for compounds with masses ranging from 40 to 500 amu. The information gleaned from this GC-MS analysis will provide invaluable insights into the unique chemical makeup of our *Ailanthus excelsa L.* leaf extract.

3. Results and Discussion

3.1 Preliminary Phytochemical Analysis

The phytochemical screening of *Ailanthus excelsa* L. leaf extracts revealed the presence of seven major phytochemical groups, including terpenoids, saponins, flavonoids, steroids, alkaloids, glycosides, and phenols (Table 1). These results are consistent with previous studies on *Ailanthus excelsa* L., such as the work of Malviya and Dwivedi (2019), who reported the appearance of terpenoids, saponins, flavonoids, steroids, alkaloids, glycosides, and phenols in both qualitative and quantitative analyses like Ailanthus excelsa is a valuable tree species in agroforestry. To safeguard young plantations, natural pesticides such as neem plant extract are recommended for mosquito control.

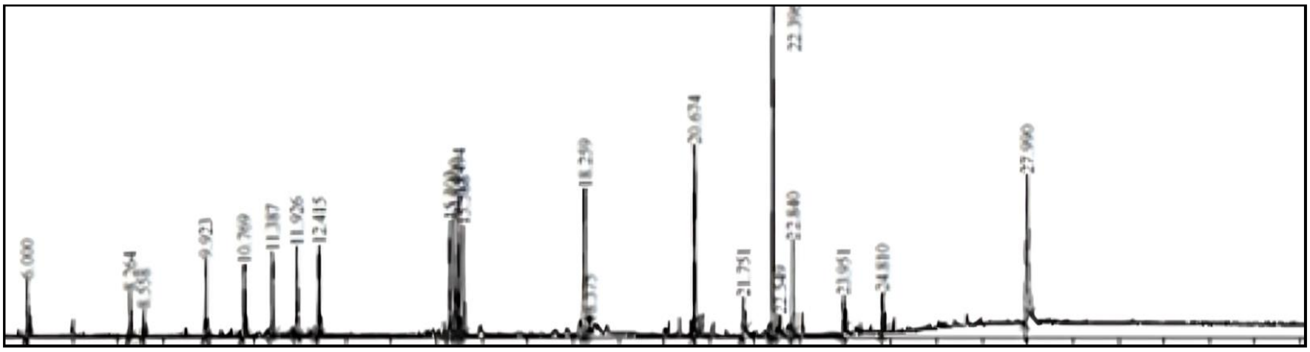
The presence of these diverse phytochemicals in *Ailanthus excelsa* L. leaf extracts suggests the plant's potential as a source of bioactive compounds with various pharmacological and therapeutic properties like Ailanthus excelsa demonstrates notable pharmacological properties, including anti-inflammatory effects that reduce inflammation and associated pain, as well as antimicrobial activity against bacteria, fungi, and parasites. Therapeutically, this plant has been traditionally used for its antipyretic effect, helping to reduce fever, and for its antidiarrheal properties, effectively treating diarrhea and dysentery.

Table 01: Phytochemical Analysis of Ailanthus excelsa L. Leaf Extracts

Sr. No.	Test For	Test	95% Ethanol	Distilled Water
1	Alkaloids	Wagner's Test	+ ve	- ve
2	Flavonoids	Shinoda Test	+ ve	- ve
3	Glycosides	Molisch's Test	+ ve	- ve
4	Phenol	Ellagic Test	+ ve	+ ve

Sr. No.	Test For	Test	95% Ethanol	Distilled Water
5	Saponins	Foam Test	+ ve	+ ve
6	Sterols	Liberman-Burchard Test	+ ve	- ve
7	Tannins	Gelatin Test	+ ve	+ ve

Figure 01: Chromatogram from GC-MS Analysis of *Ailanthus excelsa* Leaf Extract

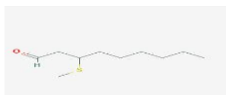


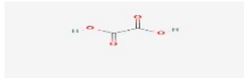
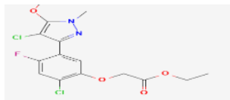
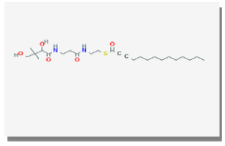
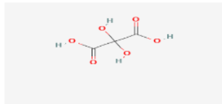
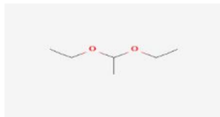
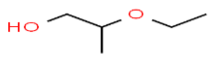
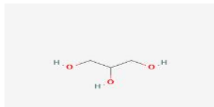
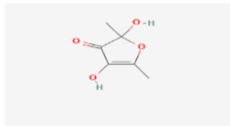
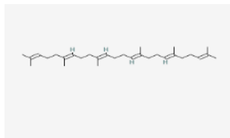
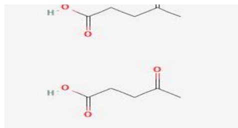
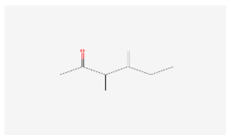
Chromatogram 13877_Ailanthus excelsa D:\MIT GCMS DATA 2\phytochemical\13877_*Ailanthus excelsa*.qgd

3.2 GC-MS Analysis

The chemical composition of the ethanolic *Ailanthus excelsa* L. leaf extract was investigated through gas chromatography coupled with mass spectrometry (GC-MS). The resulting chromatogram revealed 18 distinct peaks, each representing a unique compound within the extract (Figure 1). The identification of these compounds, including their retention times (RT), molecular formulas, and molecular weights (MW), and chemical structures, is summarized in Table 2. Notably, several of the identified compounds have been previously linked to fungicidal properties. Among these are squalene (Senthilkumar et al., 2011), quercetin (Yang et al., 2020), and beta-sitosterol (Saeidnia et al., 2014). Additionally, the presence of kaempferol and limonoids, known for their larvicidal activity, was also detected in the extract. These findings highlight the potential of *Ailanthus excelsa* L. leaf extracts as a source of natural bioactive compounds exhibiting a range of biological activities, including antifungal and larvicidal properties. Further research is justified to isolate, characterize, and evaluate the individual contributions of these compounds to the overall bioactivity of the extract.

Table 02: Bioactive compounds identified in the ethanol extract of *Ailanthus excelsa* L. using GC-MS analysis

Peak	R. Time	Name	Molecular Formula	Molecular Weight	Area %	Structure of compounds
1	0.02	Nonanal, 3-(methylthio)-	$C_{10}H_{20}OS$	188	0.4	

Peak	R. Time	Name	Molecular Formula	Molecular Weight	Area %	Structure of compounds
2	2.228	Oxalic acid	C2H2O4	144	22.9	
3	2.26	Pyraflufen - Ethyl	C15H13Cl2F3N2O4	412	1.58	
4	2.4	2-Myristynoyl pantetheine	C25H44N2O5S	484	1.66	
5	2.419	Propanedioic acid, dihydroxy-	C3H4O6	136	2.65	
6	2.546	Ethane, 1,1-diethoxy-	C6H14O2	118	69.5	
7	2.76	1-Propanol, 2-ethoxy-	C5H12O2	104	1.23	
8	4.585	1,2,3-Propanetriol	C3H10O4	92	2.01	
9	4.802	2,4-Dihydroxy-2,5-dimethyl-3(2H)-furan-3-one	C6H8O4	144	0.25	
10	5.635	Squalene	C30H50	410.7	0.22	
11	5.81	4-Oxo-Pentanoic acid	C5H8O3	116	0.19	
12	6.243	4-Ethyl-3-methyl-4-penten-2-one	C8H14O	126	1.23	

4. Conclusion

Our investigation into the phytochemical composition of *Ailanthus excelsa* L. leaf extracts has unveiled a rich tapestry of bioactive compounds. Identifying ten major phytochemical groups, consistent with previous research, underscores the plant's potential as a source of natural bioactives. Through GC-MS analysis, we discovered a diverse array of 19 bioactive compounds within the leaf extracts. Notably, we found squalene, quercetin, beta-sitosterol, and 1-docosanol, all of which have been previously recognized for their larvicidal properties. This discovery opens exciting possibilities for utilizing *Ailanthus excelsa* L. as a natural and environmentally friendly tool for mosquito control. These findings provide a compelling foundation for further exploration of *Ailanthus excelsa* L. as a sustainable and effective way in the ongoing fight against mosquito-borne diseases.

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Review On Invasion of Microplastic in Environment and Its Effects

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ABSTRACT

Today Plastic is utilized extensively in all aspects of life throughout the world due to its favourable qualities. Plastic fragments after being released into the environment causing pollution and unfortunately it enters the body of living organism including human by different media and do not biodegrade. In the present article scientifically discussed its sources, effects on environment and organism and possible strategies with the help of which we can reduce the invasion of microplastic nanoparticles in the environment.

Keywords- Microplastic, Microplastic nano particles, Plastic pollution, environment

1. Introduction:

Plastic is affordable, durable, and light weight, due to these qualities it utilized extensively in all facets of daily life. But unfortunately, accumulation of plastic waste in both terrestrial and marine environments due to poor natural degradation and limited recovery it becomes a burning issue for the ecosystem, habitats, human health and sustainable development across the world. Any kind of plastic pieces smaller than 5 mm (0.20 in) in length are referred to as microplastics. Plastic can cause pollution by entering in natural ecosystem from a variety of sources, including cosmetics, clothing, food packaging, and industrial processes [1].These consist of plastic glitter, microbeads, and clothing microfibers [2]. High levels of microplastic have been shown to linger in the environment, especially in aquatic and marine environments where they pollute water [3]. Due to the slow degradation of plastics, it might take hundreds or thousands of years for complete degradation [4].

Sources of invasion

Microplastics encounter to humans by different ways after being released into the environment, potentially posing health hazards. Additionally, microplastics can be introduced to species in soil and water, and their direct toxicity has been thoroughly studied by various researchers. Upon washing synthetic garments, microplastic strands find their way into the environment [5]. Over 80% of all microplastic in the environment is found in textiles, tires, and city dust, which also contributes significantly to microplastic pollution [6]. Three-dimensional printing. microplastic nano particles and organic vapors, also known as volatile organic compounds, are released into the surrounding air at work by additive manufacturing techniques including multi-jet fusion printing and commercial extrusion printing that use thermoplastics and resin [7]. Plastic containers can shed microplastics and nanoparticles into foods and beverages [8]. In one study, 93% of the bottled water from 11 different brands showed microplastic contamination. Researchers found an average of 325 microplastic particles in one liter water [9]. In one of the study it is estimated that, using such heat-degraded nipples for a year, a baby will ingest more than 660,000 particles [10]. Trillions of microplastic nanoparticles are released into water every liter by common single-use plastic items, like plastic cups or even paper coffee cups with a thin plastic layer [11]. A variety of processes can produce dust, including drilling, cutting PVC pipework and plastics, sanding dental composites, machining composite materials, hand-held grinding, and sanding composites containing nanotubes [12]. PVC dust is produced during PVC and plastic manufacture [13].

2. Effects of Plastic pollution on Environment and animals

Once bigger plastic goods enter the environment, it naturally weathers and degrade, producing microplastics in the process. This persist in the environment at high levels, particularly in aquatic and marine ecosystems, where they cause water pollution. The chances of microplastics being ingested, integrated into, and accumulating in the bodies and tissues of numerous creatures is significant [1]. Microplastics also gather in terrestrial ecosystems and the air. Due to the slow degradation of plastics, which might take hundreds or thousands of years for its complete degradation [14]. In one of the studies microplastics have been shown to decrease earthworm's weight and the viability of soil in terrestrial ecosystems [15].

In another study in China (2020) deep layer ocean sediment investigations conducted, which reveal the presence of plastics in deposition layers that predate the development of plastics [16]. Toxic substances from the ocean and runoff have the ability to biomagnifying their way up the food chain [17].

3. Effects on Human Health

The three main invasion pathways in human are inhalation, skin contact, and ingestion. Micro-nanoparticles once get entered, it can stay in the organ of entry or go into the bloodstream and bioaccumulate in different tissues18]. Microplastic Nano particles larger than 150 μm or 10 μm in diameter stay in tissues and do not enter the bloodstream, but particles less than 200 nm can cross intestinal barriers and enter extracellular regions [19].

4. Daily activities and Mode of invasion of microplastic nano particles

Contaminated drinking water, beer, sugar and honey, table salt, beer, and indoor airborne particulates falling on open meals are examples of direct consumption [20]. However, via indirect mode microplastic nanoparticles get enter in the body by utilization of some products like toothpaste, face wash, scrubs, and soap etc [21]. Nanoparticals can enter the skin through pores, wounds, and sweat glands as well as hair follicles [22]. They can also enter the systemic circulation through cosmetics and skin contact with contaminated materials including dirt and water [23]. Human blood has also been reported to contain microplastics, yet little is known about these particles' consequences [24]. Mammal experiments and observational research have revealed that exposure to microplastics and nano particles may have negative health impacts on humans [25]. Experimental studies reveal that microplastics can cause harm to human cells, leading to allergic responses and apoptosis. Moreover, microplastic nano particles may interfere with hormone activity, which could lead to weight gain [26]. Microplastics that have been absorbed have the ability to enter the bloodstream, tissues, internal organs, and cells of living things. There's a chance the plastic particles will seep into the tissue if they're already within the organism. Moreover, oxidative stress, inflammation, DNA damage, and a decrease in membrane stability can all lead to organ and cell malfunction.

Current Positive Approach taken by different Nations

In order to minimize the release, the microplastic nanoparticles into the environment following Nations taken necessary actions as below.

China prohibited the import of recyclables from foreign nations in 2018, compelling those nations to reevaluate their recycling policies. In US California established a definition of "microplastics in drinking water" on June 16, 2020, laying the groundwork for an extensive investigation into the contamination of these particles and their impact on human health.

The Japanese government enacted a bill on June 15, 2018, with the intention of lowering pollution and the creation of microplastics, particularly in aquatic areas. In April 2018, the European Commission's Group of Chief Scientific Advisors commissioned a comprehensive review of the scientific evidence on microplastic pollution through the EU's Scientific Advice Mechanism. England pass the Regulations 2017 for Environmental Protection which ban the production of any rinse-off personal care products (such as exfoliants) containing microbeads. In 2014, The Swachh Bharat Abhiyaan (Clean India Mission) was started by the Indian government with the goal of making India litter-free and cleaner. The mission contains measures for managing plastic waste, including encouraging trash segregation at the point of origin and establishing procedures for managing plastic waste.

5. Conclusion

Waste plastic products release micro fragments of plastic into the environment, causing pollution, further which may be consumed in the form of microplastic nano particle by living things and do not biodegrade.

There are some strategies to reduce the invasion of microplastic nanoparticles in the environment

Minimize all sources of microplastics.

Minimize the total amount of plastic consumed by setting high goals and using alternatives to conventional plastic products.

Inclusion of environmental costs due to plastic pollution when determining the product price.

Enhancing extended producer responsibility and expediting the execution of initiatives pertaining to corporate social responsibility are essential instruments in the fight against worldwide plastic pollution.

Enhance actions to raise awareness of the harm to people and the environment caused by plastic and microplastic pollution.

Curriculums at universities and colleges, as well as extracurricular and classroom activities, are useful in bringing attention to the issue of plastic pollution

1) A local strategic action plan may include consumer and business awareness campaigns, documentaries, school efforts, cleanup projects, and other forms of education and involvement.

2) Transmission of the programs will be beneficial regarding to awareness with aiming to minimize the use of plastic within the society through television, radio and social media to target all sections of the population.

Environmental groups will keep pressuring companies to remove plastics from their products in order to maintain healthy ecosystems

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Ramification of Jimson Weed Extract on The Digestive System of Freshwater Leech (Poecilobdella Viridis)

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ABSTRACT

It is a poisonous weed, which possesses a great phytomedical setup. It has been consisted of different components such as scopolamine and hyoscyamine, which have been used for the preparation of various veterinary and human drugs and medicines (Alagar Venmathi Maran et al., 2021). This medicinal plant has been used for thousands of years in the treatment of asthma, bronchitis, colic, and other respiratory diseases. Commonly, it is used for severe bronchial asthma in the form of a powder, tincture, or in the form of combination with ingredients like tablets and capsules. Moreover, it is also applicable for various skin disorders. Due to its high effective and salubrious potentials, it is being used for various other purposes such as powerfully hallucinogenic and tranquilizing. It is also misused for religious ceremonies in India and other parts of Asia for various nefarious and illicit activities throughout the world. Datura stramonium L. had been found in different colors such as white or purple with a thorn apple sharp unique odour derived from these flowers designed Damascus in the early 18th century, which has been grown in many different parts of the world in tropical, subtropical, and Mediterranean regions of the world.

Keywords— Jimson Weed, Digestive system, Freshater Leech, Poecilobdella viridis, toxic, medicinal herb,

1. Introduction:

It is a poisonous weed, which possesses a great phytomedical setup. It has been consisted of different components such as scopolamine and hyoscyamine, which have been used for the preparation of various veterinary and human drugs and medicines (Alagar Venmathi Maran et al., 2021). This medicinal plant has been used for thousands of years in the treatment of asthma, bronchitis, colic, and other respiratory diseases. Commonly, it is used for severe bronchial asthma in the form of a powder, tincture, or in the form of combination with ingredients like tablets and capsules. Moreover, it is also applicable for various skin disorders. Due to its high effective and salubrious potentials, it is being used for various other purposes such as powerfully hallucinogenic and tranquilizing. It is also misused for religious ceremonies in India and other parts of Asia for various nefarious and illicit activities throughout the world. Datura stramonium L. had been found in different colors such as white or purple with a thorn apple sharp unique odour derived from these flowers designed Damascus in the early 18th century, which has been grown in many different parts of the world in tropical, subtropical, and Mediterranean regions of the world.

Medicinal herbs have always been an essential part of human life (Xavier and Kripasana, 2020). It is difficult to imagine a world without medicinal plants. They had been used by plants for multifarious purposes such as fragrance, cosmetics, food, clothing, shelter, and most importantly, for medication purposes from the period of prehistoric times to the modern era (Izunna Iheme et al., 2021). Whatever the time or era, humans have been dependent on medicinal plants for the cure and remedy of different health problems. With the passage of time, humans found new and modern technology-based ways to use herbal plants for medicinal means. Moreover, it has been estimated that roundabout 75-80% of the world's population is depending on medicinal plants for primary healthcare needs. Amongst medicinal plants, poisonous and toxic plants had played a significant role in the medication of different health ailments. Potency of some toxic and poisonous plants has been known to both humans and animals due to their spectral potency in naturalness. That's why; veterinary drugs, poisoning, and medications of different diseases are based upon such toxic and poisonous plants.

2. Research Objective:

Datura stramonium is a noxious and invasive weed, known for its toxic properties that can cause poisoning and death in both humans and livestock. It is an aggressive botanical invader that inhabits major habitats, including crop fields, waste areas, and pastures. Almost all the parts of D. stramonium contain **tropane alkaloids**, such as **atropine**, **hyoscyamine**, and **scopolamine**. These alkaloids can be selectively found in roots, flowers, seeds, leaves, stem, and fruit. Moreover, P. viridis leech species has been reported from India's non-polluted natural pond; somehow, it has the ability to withstand metal-based stress. Therefore, the present data were obtained to investigate the hazardous impact of datura stramonium leaf extract on the digestive system of datura-exposed P. viridis by completely avoiding natural factors of pollution and metal stress for suitable survival.

- **Digestive System of P. Viridis:**

The fresh-water leech, *Poecilobdella viridis* (Moore, 1927), has a small-sized body with a flattened worm-shaped form, a ventral sucker for sucking on a host and 2 semilunar cutaneous eyes at the dorsal end. Leeches are divided into a fixed number of segmental somites covering an entire body or wrinkled single anterior (right) end and posterior (left) end by longitudinal groove (i.e., two somites) of the body. It inhabits fast-flowing streams, clear water of shallow natural ponds, quiet reed-bordered ponds, and marshy water drainages in different parts of the world. Freshwater leeches like P. viridis are primarily found in the shallow areas of the standing water bodies and are considered a regulatory factor in such aquatic ecosystems because they consume a wide variety of food types. These are predominantly herbivores, scavengers, and also feed on epidermal fragments of fishes. Therefore, it is important to investigate the potential health benefits from these therapeutic compounds against leeches in nature.

All leeches have a blood-based diet and may take blood from their hosts—many species are bloodsuckers that feed off of blood from a live host, and two species (Semiscolex cidincum and Placobdelloides siamensis) are predatory and filter-feed off of red blood cell and tissue waste in water. Adult leeches have three compartments in their alimentary canals: the **foregut**, **midgut**, and **hindgut**. The pharynx is a strong, muscular organ used to penetrate host tissue to create an incision and anastomose with the host's capillaries. In Glossiphonid leeches, which include both bloodsucking species and predatory filter-feeding species, the saliva's enzyme b-d-glucosidase appeared to remain active while sequestered in an anaerobic crop, suggesting secondarily digested nutrients or anaerobic fermentation may be the source of energy for other leeches when not feeding (Miyamoto et al., 2022).

The alimentary canal of any animal is a passage for the digestion, absorption and the assimilation of food in the body. Digestion in leeches takes place in a specialized gut, which is divided into 21 segments or crop, each segment houses a pair of crop caecae. The caecae and crop store ingested blood and perform digestion by releasing digestive enzymes (Thiébaut et al., 2019). Leeches are also known for the ability to invert their entire alimentary canal (AC), during feeding. After feeding, the gut is transformed back into its original state by reversion. This inversion is unique to leeches and allows the animal to consume large volumes of blood and consequently may sustain without feeding for long periods. The feeding of P. viridis on amphibian eggs (Bufo melanostictus), although microscopic in size, went through the same mechanism of leeches feeding on large protozoa like Paramecium saudum or blood. The digestive system of leech alters after feeding. It performs the dual functionality of being an absorptive surface, as well as, it digests the food (G. P. Diller et al., 2022).

- **Jimson Weed Plant/Dhatura Stramonium:**

Jimson Weed also known as Datura Stramonium is an important medicinal plant with insecticidal, anti-asthmatic, anodyne, antispasmodic and hallucinogenic properties. The entire plant is poisonous, the fresh leaves, seeds, flowers and roots contain high concentration of toxic tropane alkaloids, atropine, hyoscyamine, and scopolamine(Gonçalves et al., 2021). The seeds of this plant are the most poisonous and contribute to the largest number of cases of poisoning in human beings. Drugs containing stramonium were widely used in a number of conditions such as for their antispasmodic action in pain and spasmodic conditions, in visceral disorders, asthma, whooping cough, fibrositis etc. Datura Stramonium produce significant physiological, toxicological, and agricultural effects, as its consumption in less quantity also produces life-threatening results in humans correlatively in birds and animals that have been recognized as potential aspects from endangerment of consciousness to respiratory failure, there are several reports on human and animal poisoning cases with various parts of this plant. Tropane alkaloids mostly effects on the central nervous system especially in higher dose, it brings about the condition of excitement, disorientation and delusion, cause psychotic symptoms including hallucination and illusion, ranging from euphoria, dreams with severe depersonalization and tabla more toxic condition. In addiction, it may affect the cardiovascular system in a very toxic dose, cardiac problem occurred related to toxic condition (R. Mutebi et al., 2022).

- **Botanical description:**

Jimson weed is characterised by attractive fragrant flowers and spiny pear-shaped fruits which contain black seeds. The leaves are coated with fine glandular hair and this feature helps distinguish it from similar looking Datura species. When crushed, parts of the plant emit an unpleasant odour, which can be a useful indicator of the plant's presence (Shebani et al., 2021). Its flower is large and trumpet-shaped, usually white, with a purple tint and is a prime example of an insect pollinated flower. It flowers from May to August and in the evening therefore the plant is also known as 'evening's primrose' or 'evening's sun'. The fruit is large and covered with sharp spines; if it is not offered alternative feed, it is swallowed by animals, and by holding it in their stomach for a long time, its digestive systems are harmed.

The plant Datura stramonium is a member of the Solanaceae family and is also known as Jimson weed, thorn apple, Jamestown weed, stinkweed, and locoweed. It is a common weed in the tropics and subtropics and is native to the Americas. Jimson weed is spread as contaminants in agricultural produce and its seeds can remain viable in soil for many years (Ogunmoyole et al., 2019). The plant has an unpleasant odor and a bitter taste so livestock usually avoid it if given an alternate feedstuff. However, accidental poisoning can occur when no other forages are available. All parts of the plant contain tropane alkaloids which can be toxic to various organ systems (Butnariu, 2012).

- **Interaction Between J. Weed & P. Viridis:**

Salts and also the non-protein amino acids content are high in Jimson weed plants which are the typical alkaloids feeder and a preference is given for the Solanaceae families of plants, hence further experimentation has been done. Results prove that there is no evidence of non-protein amino acids present in different quantities as health defense chemicals of Datura innoxia plant. Although, ACMS present in plant parts are at high levels. Starvation resistance, feeding efficiency of *Poecilobdella viridis* was highest among Jimson weed diets; plasma phenol oxidase levels and fed phenol oxidase levels, after 48 and 72 hours of infection, were the highest in P. viridis feeding on the invasive host D. innoxia. Datura-innoxia-provided two-fold crop yield insect feeding of married maggot flies as compared to wheat crop indicating that Datura innoxia has an information content chemicals' presence at levels and costs might be high to organism's immune defense system (Agarwal et al. 2017; Mooney 2002).

The interaction between herbivores and the host plant has long intrigued evolutionary ecologists. This is because the hosts induce a variety of responses in the herbivores which includes behavioural immunity, the induction of host plant resistance or tolerance, and finally, it also includes the modulation of the immune system by host plant chemistry (Lee et al. 2013) (Mo and M. Smilanich, 2023). Bio-active metabolites that are present in the plant tissues of the host can have important implications for the immune system and energetics, and also for the ability of the host herbivore complex to respond to different treatments of herbivory and other ecologically relevant stresses (González-González et al. 2018; Despres et al. 2007) (Xavier and Kripasana, 2020) (Mohanty and E. Cock, 2010).

- **Experiment Desing:**

A bioassay was performed to evaluate the impact of L. leucocephala on feeding inhibition, growth rate, and reproduction of the leeches. The leaches had been subjected to each L. leucocephala concentration over two experimental weeks. Leeches' mortality was measured daily with observations. The ecotoxicological experiments were designed to employ individual organisms and the experimental volume was sufficient to minimize interference of faecal material. Care was taken to minimise the effects of UV radiation, the level of which often required the use of neutral density filters. Soil leachate and range-finding experiments identified suitable chemical concentrations and bioassay design to test the ecotoxicological effect of the soil leachate on reductions in growth, mobility and reproduction of freshwater invertebrates. Standard guidelines were followed to design the ecotoxicological bioassays and the experiments were carried out season by season, with several treatment aliquots. In the present experiments, the life-history traits reproductive performance and longevity (time to reproduction) and juvenile production were assessed. The reduction of the growth rates of P. viridis, significant reduction in J, the decreased cumulative juvenile production of P. viridis with increasing soil leachate and replacement of bottom water to maintain dissolved oxygen indicating that there was probably a mix of factors affecting developing embryos in the L. leucocephala leachate treatments (Fernanda DJonsiles et al., 2019).

- **Selection of Specimen:**

The study was conducted to assess the efficacy of allelopathic potential of Datura alba for controlling leech infestation. The experiment was accomplished at Agriculture University, Faisalabad by the Pharmacology and Toxicology Laboratory at old Botany block in natural environment. The laboratory is fully equipped with glassware and cultures. The toxic action of L. sativum seeds, Datura alba roots, C. intybus roots and A. conyzoides root bark, plant parts in natural conditions on P. viridis juveniles was tested at the following 24, 48 and 72 h exposure times. To test the actual potential of higher plants against the leech juvenile P. viridis, the fresh characters of plant parts were selected which were ready and available at that time. The leech Shrayat, Paras, Ignite, Poecilobdella was used for the testing based on the fact that check the facility of these alien species P. viridis juvenile.

The subjects were selected and collected from freshwater water bodies of the district Hafizabad during 2016 and in the case of leeches they were identified following Siddall (2001) as *Poecilobdella viridis* and were maintained in laboratory in fresh pond water and juvenile individuals were used for the experiment. This is in opposition to some past studies that have tested adults e.g (Chai et al., 2013). When juvenile individuals were used in this study, the author observed that adults vomit partially digested food and release too much slime when disturbed, affecting the study results (Thiébaut et al., 2019). This was one reason to use juvenile individuals as they are less reactive in response to any disturbance. Each leech was fed with weighed three Aquatic oligochaete worms, Branchiura sowerbyi (De Cesare et al., 2019).

- **Dosage Administration of Jimson Weed Extract:**

The lowest concentration of extract, which caused 100% mortality of P. viridis was used to prepare dilutions. Keeping the established Lethal concentration (3.8 mg/L) as suggested by Trim et al. (1998) as a basis, between dilutions 2 and 3 was chosen as sublethal dose. 5 leeches were randomly assigned to each of the serial four dilutions to observe the effect of sublethal exposure on the growth and development. The exposure medium was changed every 48 h with freshly prepared sub-lethal dose during the entire experiment period, performing daily counting and measuring animals in the morning. The number and length of developed daughter cell was used as response variables (Jäger et al., 2021).

3. Methodology:

Impatiens glandulifera (commonly known as Indian balsam) is an invasive species native to Himalaya that causes riverbank erosion and threatens native species. Allelopathic effects of terrestrial invasive plants on several trophic levels were demonstrated but there are no previous studies on the impact of invading plant leachates on aquatic herbivores (G. P. Diller et al., 2022). We tested how leachates from the terrestrial invasive plant, Impatiens glandulifera, affect the survival and growth of the herbivorous invertebrate, Daphnia longispina. We also quantified the effect of invading plant leachates on the several anatomical,

life-history and physiological traits that can potentially impact the performance of D. longispina, to understand the underlying mechanisms for our results. Finally, we estimated the bottom up effect of invading plant leachates on the whole plankton community. We observed large variation in the allelopathic effect of the I. glandulifera leachates. Directory variations in the observed value of parameters suggested that the treatment with I. glandulifera had significantly decreased the number of eggs and neonates produced in comparison to control Daphnids. Subsequently, the fecundity was also then worked out and it was estimated averagely 2.54 the significant amount during a couple of generations used for five and six respectively. All life table parameters have shown significant variations as the significant impact on DDRF was observed and it was 3.384 respectively which was responsible in descending the values of other parameters. It concludes that I. glandulifera leachates has variety of allelochemicals which are transferred into water responsible for the decrease herbivores mating, and production of neonates and overall the the decline concentration ultimately has effect on the fecundity of the species.
All values were expressed in mean Game±SE, and data analysis was done through GraphPad PRISM 7.0. At the end, mentioned the lethal concentrations of the plant material 20%, 40%, and 60% that observed LC50 was highest in the case of Y. ramosa but LC50 was low in the case of P. viridis, and taking the spectrophotometric values of the crude extract. The difference in LC50 was regularly high in low concentration and retention the lethal concentration that was highest at highest concentrations were observed between all selected polychaetes, according obtained the toxic impact of jimson weed on algal feeding freshwater leech. The following experiment was carried out for the crude absorbance of plant material to get a clear idea of crude dosage of P. viridis. The algal culture of Microcystis was also used as a feed to P. viridis to test any seasonal variation and confirmed as the ideal food.

4. Obseravtion:

Observation/notes are documented in this paper accord to various time intervals starting from 0 to 5 minutes, here the leech body became slightly more defensive with a slower rate of movement (6–10 minutes). A reduction rate of movement and some defensive movements like coiling occurred at 11 to 15 minutes, while at the interval of 16–20 minutes, it stopped crawling and no response was recorded. After injections of plant exudates into the crop of the test organisms, it was noticed that leech have tried to clear its crop by coiling itself and leads to little mesentry contritions later, brownish or red brownish exudates of plant material have also observed compressing along with leech crop. The resulting accumulated food-plant becomes hard, black and leech was unable to clear its crop and boring activity along with any contritions is stopped by the test organism. It was observed that leech following to share boring activity for 20 minutes, leech starting to share own boring and clearing activity at a slow rate followed by an increased rate of try to clear its crop later after 35 to 40 minutes.

5. Result & Discussion:

In the agrocenoses of herbagricultural plants D. stramonium is regarded harmful weed only. The dangerous poisonousness of the plant is manifested particularly in the habit of germinating in quickly spring colonies of half rotten manure and since it is depended on the bacteria of beneficial nitrogen depositors for nitrates, assimilation, and thus, growth is nitrogenous fertilizers. Herbaceous plants growing in similar circumstances with poisonous weeds, especially the highly poisonous D. stramonium, accumulate anabases and their consumption by livestock leads to anabasine poisoning. This alkaloid belongs to the primary etiological factors of tobacco mosaic and is a poison at the same time. Everything was alarmed by the fact that the number of symptoms in humans opened by accidental contact with D. stramonium increased. It is particularly important that poisoning of humans in nearly all cases, including infants, ends with complete recovery. In children and young people, especially the youths of often the effects of poisoning can be observed by quitting the adventure spirito-intoxicating influx medicines of plant origin in particularly difficult times (Xavier and Kripasana, 2020).

The plant Datura stramonium L. (syn. Jimson saw, Jimson weed, Devils snare, thorn apple, thorn pear, Mexican Apple) (Fig. 1) previously observed on our planet from India to western Australia and Malaysia, and China through Japan to Russian from Siberia to Sakhalin and the Kuril Islands (Fernanda DJonsiles et al., 2019). Currently, this species is pantropical synanthropic plant and occurs in Europe in warmer areas in Poland with pause in the vicinity of the Polish Białowieża Primeval Forest (Chai et al., 2013).

6. Effect on Digestive Systems:

There exist insufficient published data, hazardous as well as the incubation period on a point of time to expose to toxic plants. Jimson weed (Datura stramonium L.) is a poisonous herb. The toxin producing plant is distributed throughout the globe. Jimson weed has toxic properties by virtue of accumulative toxic alkaloid **hyoscyamine** and **atropine**. Datura is also famous as a killer of senses. There have been many toxicological investigations in humans and animals, while the effects of Jimson weed on invertebrates of fresh-water ecosystem seems to be of less importance (Mohanty and E. Cock, 2010). The natural resources tangent to the freshwater bodies have shown the environment to be a large living and subsequent dumping grounds for numerous organic chemicals with impact on aquatic fauna.

7. Summery & Findings:

The results obtained from our research proved that one gram of powder resulted in behavior changes as the leeches sought refuge under the plants and swirled frantically in the jar two times in an eight-hour interval. Within 48 hours, 22 leech individuals were on the bottom of the jar, the rest remaining on the roots of the plants. The behavior after two days was relatively normal, leeches started to swim again, but some individuals displayed a dormant behavior and initially two leech individuals died after one day.

The Jimson weed, Datura stramonium, is a toxic plant widely distributed in eastern and southern Africa, but also along roadsides, cultivated areas and wasteland (Dawood Shah et al., 2020). The biochemical composition of D. stramonium includes some alkaloids, atropine and scopolamine acting as competitive inhibitors of the cholinergic nervous system and also of the peripheral muscarinic receptors as agonist agents, inducing parasympathetic-like effects (G. P. Diller et al., 2022). The toxic principles in D. stramonium are located in the seeds, leaves, roots and fruits, with a maximum concentration of toxic principles occurring in the period of ripening. The terrifying aspect of this plant is that its toxins may be manifested in the body of mammals that are intoxicated following ingestion of small amounts (Custodio de

Souza et al., 2019). Many animals that are primary consumers, from invertebrates to vertebrates, may have developed natural resistance to some toxic plants. The impact of this widespread weed has not been studied on the leech, *Poecilobdella viridis*, some of its biological characteristics being unknown

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Study of Avifaunal Diversity in The Campus of Dada Patil Mahavidyalaya, Karjat, Ahmednagar District (MS), India

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ABSTRACT
Usually a college campus is the composition of Administrative blocks, Classrooms, Laboratories, Library, Sport complex, Hostels, Canteen, Leisure parks, NCC and NSS units, open ground, Latrines, Parking blocks etc. To imbibe sustainable and green approach among the society, the college is the best place. A bird has been described as 'feathered biped' (Salim Ali). Birds are highly mobile, colourful and hence relatively conspicuous and easily identified. Birds are the best Bioindicators which determine the quality of habitat. The present study covers the avifaunal diversity documented from June 2020 to May 2021 in and around Dada Patil Mahavidyalaya campus. The area of college campus is about 7.5 Hectors, with more than 500 plants reflecting heavy vegetation, which provides better habitats for different kind of birds. A total of 40 bird species belonging to 13 orders and 29 families were recorded from the campus and the surrounding area. The diversity pattern represents the effect of regional microclimate and vegetation association. The order Passeriformes with 18 species and family Cuculidae with 4 species found dominant during study.
Keywords : Avifauna, Bioindicators, Diversity, Ecofriendly, Microclimate, Sustainable development.

1. Introduction:

Birds, the masters of air, are homeothermic, egg laying vertebrates with feathery exoskeleton and forelimbs modified into wings [**1**]. Biodiversity studies mostly used as an ecological indicator [**2, 3**], as their presence reflects different habitats qualitatatively and quantitatively. Avifauna is the potent indicator for urban and semi-urban biodiversity [**4**]. Avifauna maintain stable and sustainable ecosystem. Avifaunal diversity plays a vital role in maintaining food webs in ecosystems [**5**]. Both natural and anthropogenic activities viz. floods, droughts, deforestation, climate change [**6**] adversely affect global avifaunal diversity [**7, 8**]. Anthropogenic activities and climate change are the reasons of declining avifauna worldwide [**8, 6**]. Birds occupy almost all the habitats over the globe and exhibit great diversity in terms of their habitat and geographical conditions and provide many ecosystem services [**9, 10, 11**]. Regular monitoring and assessment of any taxa is a pre-requisite for management and conservation of biodiversity.

The birds are unique omnipresent faunal group occupies almost all habitats for various purposes viz. roosting, foraging and breeding activities, with diverse feeding guilds; herbivorous [12], frugivorous [13], grainivorous [14], insectivorous [15, 16] and nectarivorous [17]. The omnivorous nature of birds leads them to offer various ecological services contributing to healthy and sustainable ecosystem [18]. Beside this, avifauna also associated with pollination services, insect pest control, seed propagation and a source of green manure [19].

MATERIAL AND METHODS:

Study Area: The college campus of Dada Patil Mahavidyalaya is spread over an area of 7.5 hec., with lush green vegetation containing large trees, shrubs and ornamentals providing feeding, nesting and breeding sites for birds. The campus of educational institute includes administrative block, laboratories, classrooms, hostels, library, NSS and NCC units, auditorium, sports complex, canteen etc.

Fig. 1. Green canopy at College campus

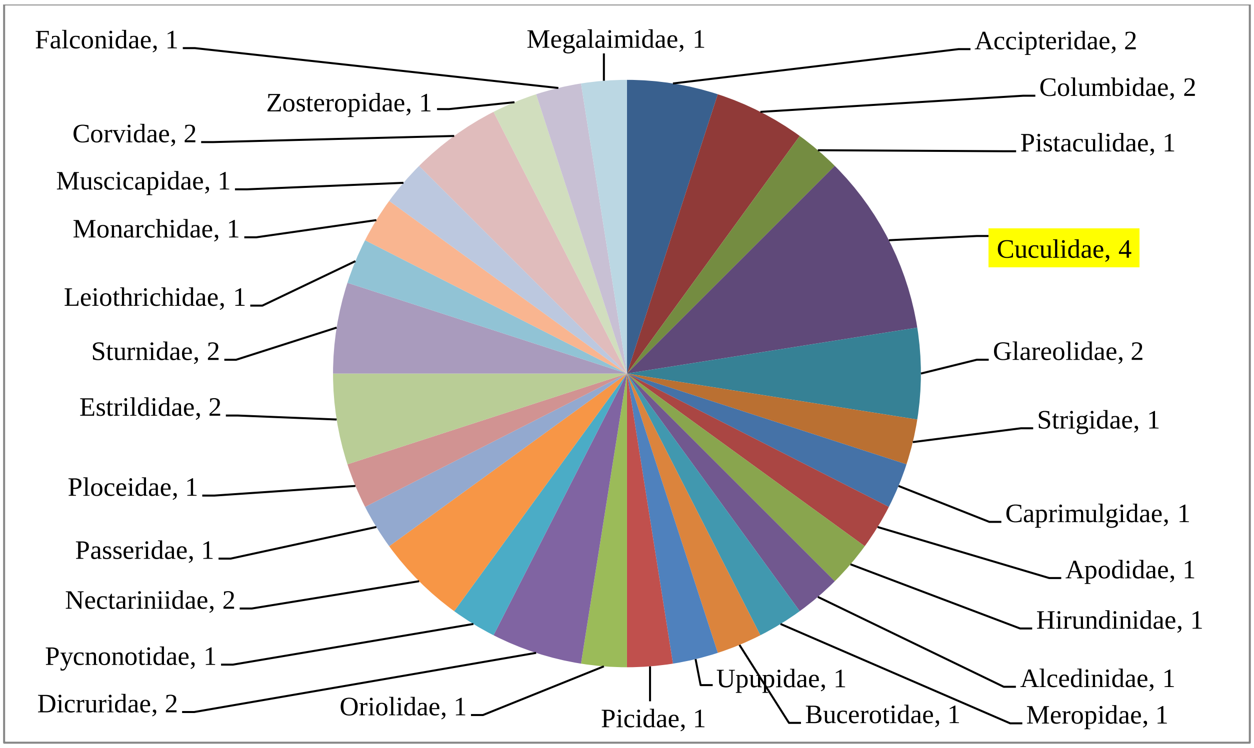
Actual avifaunal survey was carried out from June 2020 to May 2021, probably during morning hours from 07:00 am to 10:00 am and Evening hours from 04:00 pm. to 07:00 pm. The visits were scheduled once in a week probably on Sunday or holiday to reduce disturbances. Visual encounter survey was conducted at sampling sites [20, 21] for direct observation of birds. Direct observation method was adopted for observation of bird species. Birds were observed from vantage points (Probably Terrace) and walking on the borders of campus compound [16].

To record the observations, Canon- EOS 700D camera with 100-400 mm. lens and Olympus 10 X 50 binocular was used. Identification of bird species done with the help of field guides, Handbook of Birds of India and Pakistan [22, 23], Book of Indian birds [22,23], Birds of Indian sub-continent [24, 25], and A pictorial bird guide to Birds of India, Pakistan, Nepal, Bhutan, Sri Lanka and Bangladesh [26].

RESULTS AND DISCUSSION:

Birds are known to be very much responsive to variations in ambient conditions [27]. The study area selected, despite small in size, support extremely rich and diverse avifauna. The distribution and sightings are correlate well with the vegetation pattern of the area [28]. Present study of avifauna revealed the presence of 40 species of birds belonging to 13 orders and 29 families. It is essential to understand the avian fauna to define pattern of local landscape [29, 30]. The order Passeriformes with 18 species and family

Cuculidae with 4 species found dominant during study. Of the total birds species documented, *Circus macrourus* and *Strix occidentalis* are under near-threatened category as per IUCN status. Academic campuses like college and university premises acts as safe sites in conserving avifaunal diversity [**31, 32, 33, 34**].



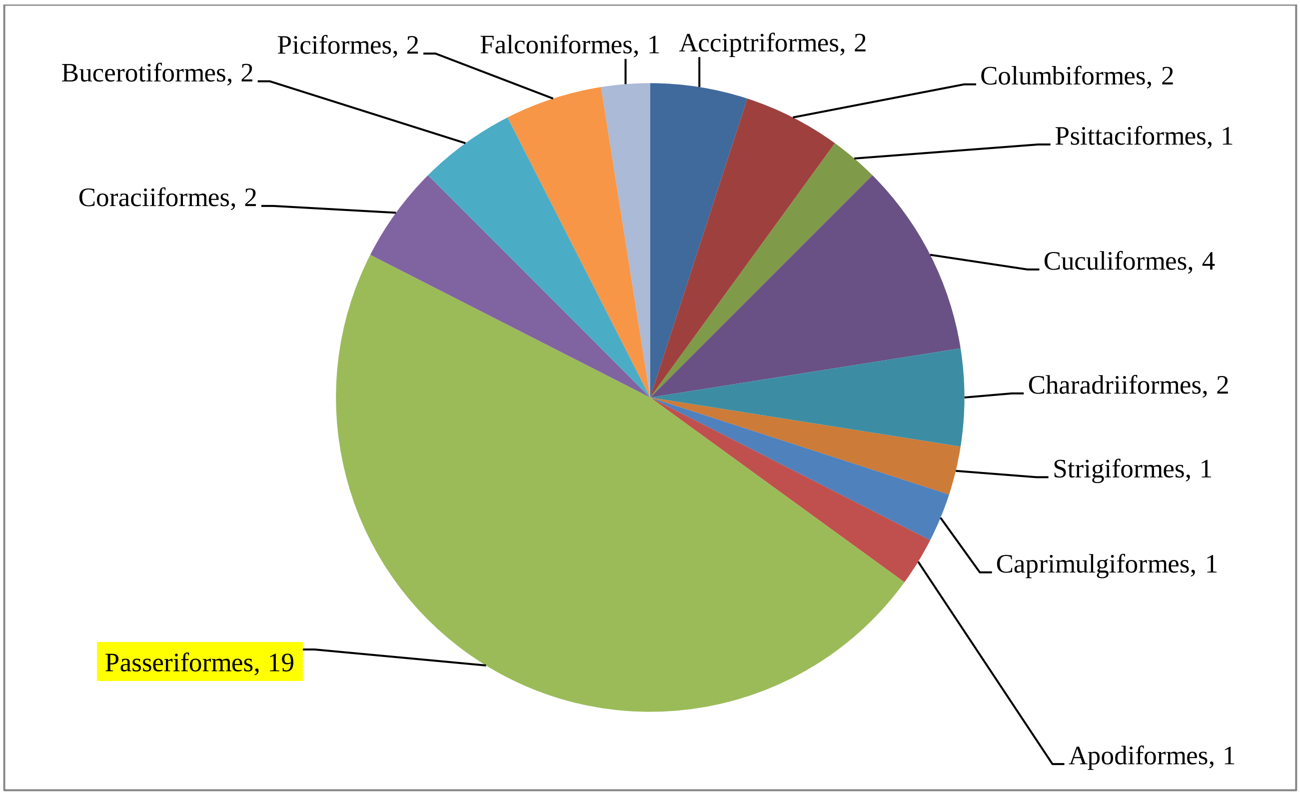


Fig. 3. Order-wise distribution of avifauna reported in and around College Campus

Table-1: Checklist of Birds reported in College Campus

Sr. No.	Scientific Name	Common Name	Order	Family	IUCN status
01	Accipiter badius	Shikra	Acciptriformes	Accipitridae	LC
02	Circus macrourus	The pale harrier	Accipitriformes	Accipitridae	NT
03	Streptopelia capicola	Ring dove	Columbiformes.	Columbidae	LC
04	Columba livia	Blue rock pigeon	Columbiformes.	Columbidae	LC
05	Psittacula krameri	Rose-ringed parakeet	Psittaciformes	Psittaculidae	LC
06	Eudynamys	Koel	Cuculiformes	Cuculidae	LC
07	Centropus sinensis	Crow pheasant	Cuculiformes	Cuculidae	LC
08	Hierococcyx varius	Common hawk cuckoo	Cuculiformes	Cuculidae	LC
09	Cursorius coromandelicus	Indian courser	Charadriiformes	Glareolidae	LC
10	Strix occidentalis	The spotted owl	Strigiformes	Strigidae	NT
11	Caprimulgus asiaticus	Common Indian nightjar	Caprimulgiform es	Caprimulgida e	LC
12	Apus nipalensis	House swift	Apodiformes	Apodidae	LC
13	Hirundo rustica	Common swallow	Passeriformes	Hirundinidae	LC
14	Halcyon smyrnensis	White-breasted Kingfisher	Coraciiformes	Alcedinidae	LC
15	Merops orientalis	Small green bee eater	Coraciiformes	Meropidae	LC
16	Ocyceros birostris	Common grey hornbill	Bucerotiformes	Bucerotidae	LC
17	Upupa epops	Hoopoe	Bucerotiformes	Upupidae	LC
18	Leiopicus mahrattensis	Yellow fronted pied	Piciformes	Picidae	LC
19	Oriolus oriolus	Golden oriole	Passeriformes	Oriolidae	LC
20	Dicrurus macrocercus	Black Drongo	Passeriformes	Dicruridae	LC
21	Pycnonotus cafer	Red-vented bulbul	Passeriformes	Pycnonotidae	LC
22	Cinnyris asiaticus	Purple sunbird	Passeriformes	Nectariniidae	LC
23	Passer domesticus	House sparrow	Passeriformes	Passeridae	LC
24	Ploceus philippinus	Baya weaver bird	Passeriformes	Ploceidae	LC

25	Euodice malabarica	White throated munia	Passeriformes	Estrildidae	LC
26	Acridotheres tristis	Indian myna	Passeriformes	Sturnidae	LC
27	Sturnia pagodarum	Brahminy myna	Passeriforme	Sturnidae	LC
28	Turdoides caudata	Common babbler	Passeriforme	Leiothrichidae	LC
29	Terpsiphone paradisi	Peradise flycatcher	Passeriform	Monarchidae	LC
30	Saxicoloides fulicatus	Indian robin	Passeriforme	Muscicapidae	LC
31	Corvus splendens	House crow	Passeriforme	Corvidae	LC
32	Corvus macrorhynchos	Jungle crow	Passeriforme	Corvidae	LC
33	Amandava amandava	Red Avadavat	Passeriformes	Estrildidae	LC
34	Cursorius coromandelicus	Indian courser	Charadriiformes	Glareolidae	LC
35	Cinnyris asiaticus	Purple sunbird	Passeriformes	Nectariniidae	LC
36	Dicrurus macrocercus	Black drongo	Passeriformes	Dicruridae	LC
37	Centropus sinensis	Southern coucal	Cuculiformes	Cuculidae	LC
38	Zosterops palpebrosus	Indian white eye	Passeriformes	Zosteropidae	LC
39	Falco tinnunculus	Common kestral	Falconiformes	Falconidae	LC
40	Psilopogon haemacephalus	Coppersmith Barbet	Piciformes	Megalaimidae	LC

CONCLUSION:

The diversity of any animal taxa is attributed to structure and geographical location of the habitat. The findings of the present study underline importance of such habitats in view of conservation of such habitats. Our study will also add important mutualistic interactions with other floral and faunal intra- and Inter-specific interactions. If the landscaping and vegetation patterns maintained well in the educational premises, faunal diversity will increase automatically. Conservation of natural habitats is very crucial for the existence of many species of avian fauna. The study mentioned above provides baseline data on the species richness in Dada Patil Mahavidyalaya campus.

CONFLICT OF INTEREST:

Authors declare that, there is no any conflict of interest.

AUTHORS' CONTRIBUTIONS:

Author-1 and 2 surveyed entire college campus and recorded photographs of birds, Author 3 developed the methodology and identified and confirmed the bird species from literature, Author 4 finalize and approved the final version of the manuscript.

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