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Conference Special Issue - 65 March - 2026

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Conference Special Issue / Proceedings Issue - 65

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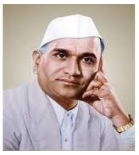

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The department has persistently striven to provide quality teaching to the students who are drawn to the college from rural backgrounds and tribal area. The faculty members are constantly upgrading by attending and organizing seminars, conferences, workshops, Faculty Development Programmes, etc. Seed Broadcasting is one of the best practice run by the department and certificate course in Mushroom Cultivation. The department is progressing steadily due to recent developments in biological science and biodiversity aspects by publishing their reference books and research papers in Peer-reviewed and UGC Care listed journals. The faculty also have patents published at their credits.

Department of Zoology: The Department of Zoology started in 1964. Since then, it is headed by the eminent academicians like Captain A. J. Sonawane, Dr. N. A. Ansari, Dr. T. K. Birari, Dr. B. S. Yadav, Dr. Smt. S. V. Deore and Dr. P. V. Jabde. At present Dr. S.D. Patil is Head of the Department with their associates Dr. A. K. Sonawane, Dr. K. T. Patil, Mr. D. S. Magar, Miss. K. D. Suryawanshi, Miss. P. M. Pawar, Mr. P. D. Gaikwad, Mr. H. K. Pawar and Mr. J. N. Deore. The third-year course in Zoology started in the year 1971. while Post Graduate course started from June 1989 with specialization in Animal Physiology and Research Centre started in 2007. Different Interactive Teaching- learning Tools are used to impart updated knowledge

to students. Different instruments are available in the department as sponsored by DST-FIST for conducting the practical in the laboratory as well as for advanced research. The Department has well-qualified and research-oriented faculty who persistently engage in research by publishing research papers in reputed UGC CARE, referred and peer-reviewed journals of national and international levels. The faculty also have patents published at their credits. The department runs a certificate course in Apiculture to equip students for self-employment and entrepreneurship.

About the Event:

The 21st century has witnessed unprecedented advancements in Life Sciences, transforming the way we understand biological systems and address global challenges. From molecular biology to biodiversity conservation, from biotechnology to environmental sustainability, life science research plays a pivotal role in shaping a resilient and sustainable future.

This National Conference aims to bring together academicians, researchers, industry experts, and students to deliberate on recent developments, innovative approaches, and sustainable strategies in various domains of life sciences. The conference will serve as a dynamic platform for sharing research findings, fostering collaborations, and promoting interdisciplinary dialogue.

The central theme emphasizes the integration of scientific research with innovation-driven solutions to ensure environmental sustainability, biodiversity conservation, food security, public health, and climate resilience.

Objectives:

1. To provide a platform for academicians, researchers, industry professionals, and students to share recent advancements in Life Sciences.
2. To promote interdisciplinary interactions among diverse domains such as biotechnology, biodiversity conservation, environmental science, and molecular biology.
3. To discuss innovative research approaches addressing global challenges related to environmental sustainability, climate change, and public health.
4. To encourage the exchange of scientific knowledge and dissemination of research findings through presentations, discussions, and networking.
5. To foster collaborations between academic institutions, research organizations, and industry for innovation-driven solutions.
6. To highlight the role of life sciences in ensuring biodiversity conservation, food security, and sustainable development.
7. To motivate young researchers and students to engage in cutting-edge research and scientific inquiry.
8. To explore sustainable strategies for climate resilience and ecosystem management.

Conference Themes: The conference will encompass a broad spectrum of themes, including but not limited to; Agriculture and Food Science, AI and Life Sciences, Biochemistry, Biodiversity and Conservation Angiosperm Taxonomy, Ecology and Toxicology, Environmental Biology, Ethnobotany and Ethnozoology, Fishery Science, Microbiology, Molecular Biology Biotechnology, Parasitology and Reproductive Biology.

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Message of Principal

It gives me immense pleasure to learn that the Department is organizing a National Conference on the theme focusing on recent advancements, innovation, and sustainability in Life Sciences. In the 21st century, Life Sciences have emerged as a transformative discipline, addressing crucial global challenges related to biodiversity conservation, environmental sustainability, food security, public health, and climate resilience.

Such academic gatherings provide an excellent platform for academicians, researchers, industry experts, and students to exchange ideas, share innovative research findings, and foster interdisciplinary collaborations. The integration of scientific knowledge with innovative approaches is essential for developing sustainable solutions and building a resilient future for society.

I am confident that this conference will encourage meaningful discussions, inspire young researchers, and strengthen the research culture among participants. It will also contribute significantly to the dissemination of knowledge and promote collaborative efforts in various domains of Life Sciences.

I congratulate the organizing committee for taking this initiative and extend my best wishes for the grand success of the National Conference. I hope the deliberations and outcomes of this conference will pave the way for innovative research and sustainable development.

Dr. Subhash N. Nikam
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ORCHID DIVERSITY IN THE PARTS OF NORTHERN WESTERN GHAT OF NASHIK DISTRICT, MAHARASHTRA.

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ABSTRACT

The Sahyadri ranges of Nashik district, forming part of the northern Western Ghats, provide suitable habitats for numerous wild orchid species, particularly across high-altitude rocky plateaus and semi-evergreen forest patches. These orchids are mainly observed during the monsoon season. The present investigation evaluates orchid diversity in the Northern Western Ghats (NWGs) based on systematic field surveys conducted from 2021 to 2024. The study documented 19 orchid species belonging to 13 genera within the surveyed region, indicating considerable diversity. Both epiphytic and terrestrial orchids were encountered, adapted to distinct ecological niches. Three species were found to be endemic to the region. The findings highlight the ecological importance of the NWGs of Nashik district as a significant refuge for orchid diversity.

Keywords: Orchidaceae, Diversity, Northern Western Ghats, Nashik district, Biodiversity, Conservation.

1.INTRODUCTION

The family Orchidaceae is among the largest groups of flowering plants, comprising approximately 25,000–35,000 species distributed across nearly 800 genera worldwide (Christenhusz & Byng, 2016; Govaerts et al., 2018; POWO, 2025). Orchids are well known for their remarkable floral variation and complex ecological interactions, representing a highly specialized lineage within angiosperms. India supports substantial orchid diversity owing to its varied climatic and geographical conditions, with nearly 1,200–1,300 species reported so far (Singh et al., 2019). Although orchid diversity is predominantly associated with humid evergreen forests of the Himalayas and Western Ghats, recent studies have also documented significant orchid presence in relatively drier deciduous ecosystems (Bhatt, 2014, 2015, 2016; Kulloli & Purohit, 2020).

Maharashtra, despite being largely characterized by semi-arid and arid conditions, includes several protected areas such as six National Parks, forty-nine Wildlife Sanctuaries, and one Biosphere Reserve. Nashik district alone contains three wildlife sanctuaries and a portion of the Western Ghats

Biosphere Reserve, also referred to as the Sahyadri Biosphere Reserve. While faunal diversity in this region has been fairly well documented, information on orchid flora remains limited. The present study aims to provide a preliminary assessment of orchid diversity in the Northern Western Ghats of Nashik district based on extensive field surveys. The data generated will serve as baseline information for future research and conservation planning.

2.STUDY AREA

Nashik district lies between latitude 20°50′ N and longitude 73°35′ E, covering an area of approximately 15,587 sq. km. The district is bordered by the Dangs and Surat districts of Gujarat in the northwest, Dhule district in the north, Jalgaon and Aurangabad districts in the east, Ahmednagar in the south, and Thane district in the southwest. The northern Western Ghats portion includes segments of the Sahyadri range comprising the Satmala, Selbari, and Trimbakeshwar ranges. Important peaks within the Satmala range include Dhodap, Chandwad, and Indrai; the Selbari range includes Salher, Mulher, and Mangi-Tungi hills; while the Trimbakeshwar range encompasses Brahmagiri (origin of the Godavari River) and Anjaneri hills. These mountainous landscapes represent important biodiversity-rich zones characterized mainly by dry and moist deciduous forests.

3.MATERIALS AND METHODS

The present study is based on field collections carried out between 2021 and 2024 through systematic explorations. Several intensive field visits of 6–9 days duration were conducted during the months of September to November. Greater emphasis was placed on intensive surveys to document orchid diversity. Specimens were collected and processed for herbarium preparation following standard dry preservation techniques as described by Santapau (1955) and Jain and Rao (1976). The collected material was critically examined in the laboratory using relevant floras, monographs, revisions, and other taxonomic literature for accurate identification.

4.RESULTS AND DISCUSSION

Field explorations conducted during 2021–2024 in the northern Western Ghats of Nashik district resulted in the documentation of 19 orchid taxa belonging to 13 genera (Table 1 & Plate 1). This represents noteworthy orchid diversity considering the predominance of dry and moist deciduous forest vegetation in the study region. The occurrence of orchids in these habitats suggests the presence of favorable microclimatic conditions, especially across rocky plateaus, hill slopes, and semi-evergreen patches within the Satmala, Selbari, and Trimbakeshwar ranges.

Among the recorded taxa, 08 species were terrestrial and 11 were epiphytic, indicating adaptation to varied ecological niches. Terrestrial orchids were mostly observed on grassy slopes and lateritic plateaus during the monsoon season, whereas epiphytic species were confined to moist forest patches and shaded valleys.

Three endemic species *Dendrobium barbatulum* Lindl., *Dendrobium microbulbon* A. Rich., and *Habenaria gibsonii* Hook.f. were recorded during the study. The occurrence of these endemic orchids emphasizes the conservation significance of the Northern Western Ghats of Nashik district. These taxa were largely restricted to relatively undisturbed habitats, suggesting sensitivity to environmental disturbances.

The orchid flora of the study area appears to be influenced by its geographical position at the northern extension of the Western Ghats. This transitional zone between the semi-arid Deccan Plateau

and the humid Western Ghats supports a distinctive assemblage of orchid species. Microhabitats such as rock crevices, moss-covered tree trunks, and seasonal grasslands play a crucial role in sustaining orchid populations.

Although the region receives comparatively moderate rainfall relative to the southern Western Ghats, the monsoon season provides adequate moisture for orchid growth and flowering. However, anthropogenic activities including grazing, habitat degradation, tourism pressure, forest fires, and invasion of alien species pose threats to orchid habitats. Therefore, conservation of these fragile ecosystems is essential for maintaining orchid diversity.

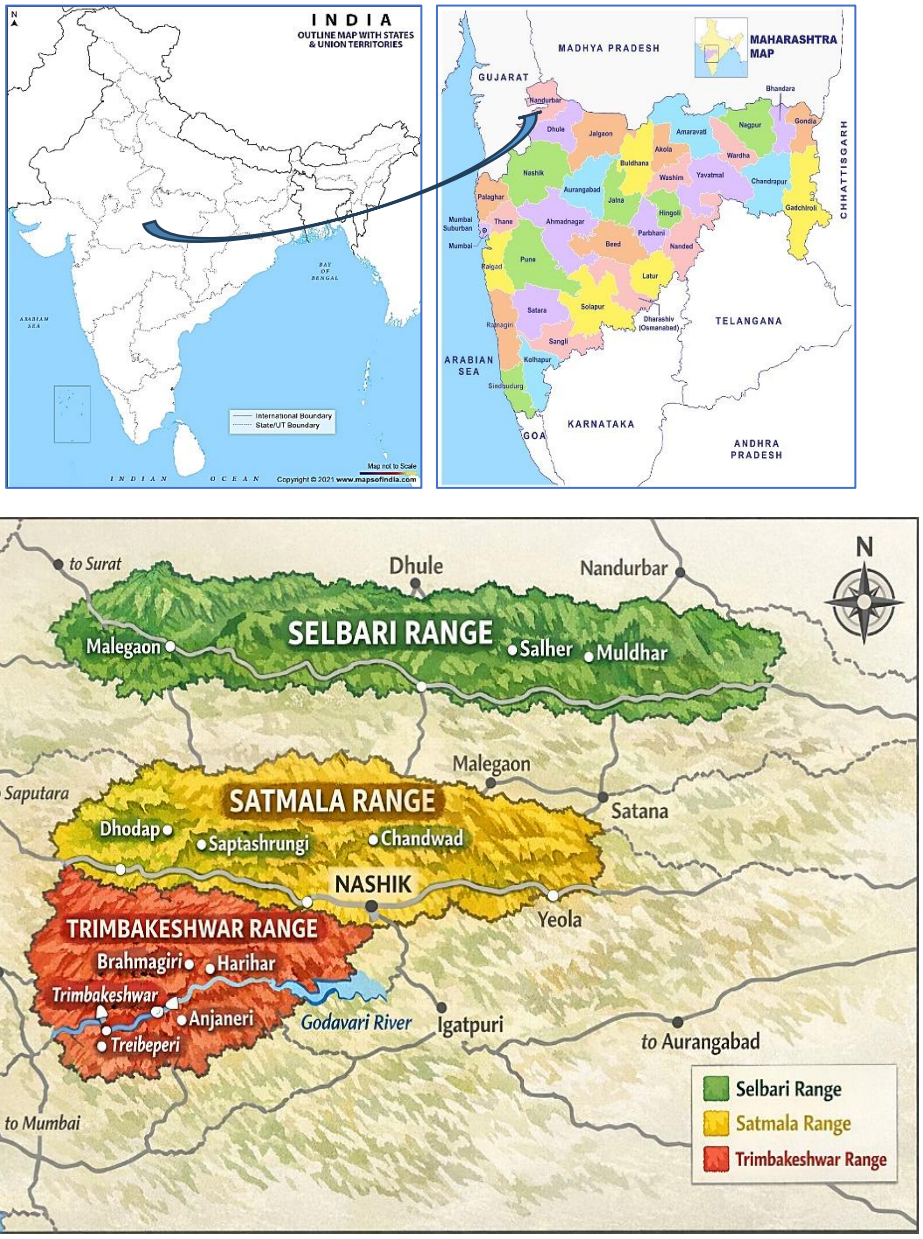

Fig 1: Study area map of Parts of Northern Western Ghat of Nashik District, Maharashtra

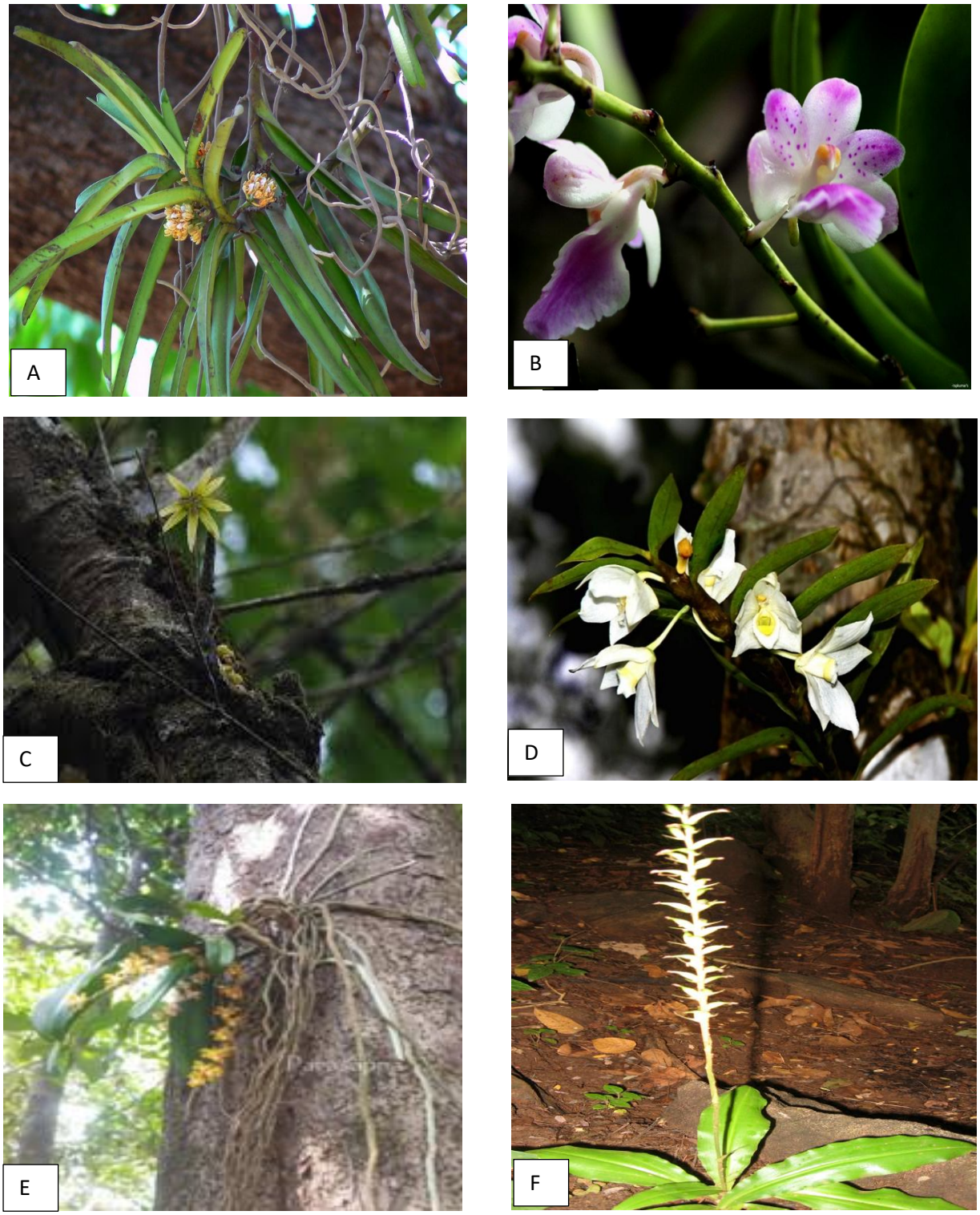

Plate 1.: A. *Acampe praemorsa* (Roxb.) Blatt. & McCann; **B.** *Aerides maculosa* Lindl.; **C.** *Bulbophyllum fimbriatum* (Lindl.) Rchb.f.; **D.** *Dendrobium aqueum* Lindl.; **E.** *Eulophia spectabilis* Dennst.; **F.** *Habenaria furcifera* Lindl.

Table 1. List of Orchids of NWGs of Nashik District.

Sr. No.	Botanical Name	Habit	Flowering & Fruiting	Locality (Nashik District)	Threatened Category
1	*Acampe praemorsa* (Roxb.) Blatt. & McCann	Epiphytic	Mar–Jun	Trimbakeshwar, Anjaneri	Least Concern (LC)
2	*Aerides crispa* Lindl.	Epiphytic	Jun–Sep	Brahmagiri, Igatpuri	Near Threatened (NT)
3	*Aerides maculosa* Lindl.	Epiphytic	Apr–Jun	Satmala range	Least Concern (LC)
4	*Bulbophyllum fimbriatum* (Lindl.) Rchb.f.	Epiphytic	Aug–Oct	Trimbakeshwar forests	Not Evaluated (NE)
5	*Conchidium filiforme* (Wight.) Rauschert	Epiphytic	Jul–Sep	Anjaneri hills	Not Evaluated (NE)
6	*Dendrobium aqueum* Lindl.	Epiphytic	May–Jul	Igatpuri, Ghoti	Least Concern (LC)
7	*Dendrobium barbatulum* Lindl.	Epiphytic	Aug–Oct	Trimbak range	Near Threatened (NT)
8	*Eulophia spectabilis* Dennst.	Terrestrial	May–Jul	Satmala plateau	Least Concern (LC)
9	*Geodorum densiflorum* (Lam.) Schltr.	Terrestrial	Jun–Aug	Moist valleys, Trimbakeshwar	Least Concern (LC)
10	*Habenaria plantaginea* Lindl.	Terrestrial	Aug–Sep	Selbari range	Not Evaluated (NE)
11	*Habenaria roxburghii* R.Br.	Terrestrial	Aug–Oct	Satmala grasslands	Not Evaluated (NE)
12	*Habenaria furcifera* Lindl.	Terrestrial	Sep–Oct	Brahmagiri slopes	Near Threatened (NT)
13	*Nervilia concolor* (Blume) Schltr.	Terrestrial	Jun–Jul	Forest floor, Trimbakeshwar	Least Concern (LC)
14	*Nervilia crociformis* (Zoll. & Moritzi) Seidenf.	Terrestrial	Jul–Aug	Igatpuri forests	Data Deficient (DD)
15	*Pecteilis gigantea* (Sm.) Raf.	Terrestrial	Sep–Oct	Grassland plateaus	Near Threatened (NT)
16	*Rhynchostylis retusa* (L.) Blume	Epiphytic	May–Jun	Trimbakeshwar	Least Concern (LC)
17	*Smithsonia viridiflora* (Dalzell) C.J. Saldanha	Epiphytic	Jul–Sep	Anjaneri	Vulnerable (VU)

18	*Vanda tessellata* (Roxb.) Hook. ex G.Don	Epiphytic	Mar–May	Satmala range	Least Concern (LC)
19	*Vanda testacea* (Lindl.) Rchb.f.	Epiphytic	Apr–Jun	Selbari range	Near Threatened (NT)

5.CONCLUSION

The present investigation recorded 19 orchid taxa belonging to 13 genera from the northern Western Ghats of Nashik district, Maharashtra. The presence of both terrestrial and epiphytic orchids, along with three endemic species, highlights the ecological importance of the Satmala, Selbari, and Trimbakeshwar ranges as suitable orchid habitats.

The study provides baseline information for orchid diversity in this relatively underexplored region. Continued floristic surveys, habitat conservation, and awareness among local communities are necessary for safeguarding orchid populations. The Northern Western Ghats of Nashik district may serve as an important refuge for orchid diversity, emphasizing the need for long-term monitoring and conservation planning.

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MATURITY INDEX OF SAPTASHRUNGI FOREST OF NASHIK DISTRICT, MAHARASHTRA (INDIA)

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ABSTRACT
In this present work four stands of about 40 quadrats randomly sampled to collect varied species from Saptashrungi forest. Maturity index provides the information about the maturity of the forest community and species dominant within the community. From the study it can be observed that the degree of maturity is less or high in forest.

1.INTRODUCTION:
Phytosociological studies deal with qualitative study of the structure of the vegetation with an emphasis on quantitative relationship of few species which are to be dominant on the belief that these largely control the community and there by the occurrence of a large number of rare species. As author aware, there detailed accounts on the Phytosociology of Chotaudaepur forests (Shah, Yadav and Parabia, 1979): Pancha mahals (Shah and Bhatt, 1980): Dangs forests (Yadav, 1979): From Maharashtra Talegaon (Jadhav, 2016), Sapgaon (Jadhav, 2018), Tryambakeshwar (Jadhav, 2018), Saptashringi forest (Jadhav, 2020),Vani forest (Jadhav,2020),Pimpalner forest (Jadhav,Deore 2025), Baripada forest (Jadhav,Deore 2025), Similar investigation is carried out in 4 stands of Saptashrungi Forest with a view to study the maturity of the forest community, species dominant within the community and the degree of maturity is less or highest in forest.

2.MATURITY INDEX: Pichi-Sermolli (1948) suggested an index for the establishment of the maturity in plant communities based on the frequency percent of all species in the stands of a community. The principle is the long-accepted notion that higher the frequency percent of each species and smaller the number of sporadic species, the more mature is the community. The Index of maturity of each stand is compared with other stands to establish the general maturity of the community.

3.AREA OF STUDY: Saptashringi lies at 73º 51' – 73º 58' E and 20º 20' – 20º 27' N. It is about 64 Km from Nashik. It is formed from seven hills, Shrungs so it is called as Saptashringi. It is the seat of Saptashringi Nivasini Devi. The middle part of the hill is barren rock formed by the Deccan trap. It forms coarse gravel soil. These hills lies a little in the interior, of the main Sahyadri rang on a lateral spur extending from Chandwad eastwards. The vegetation is mostly on the lower part of the hill and in the Valleys where soil is better. On the upper part of the hill the soil is brown but in the valleys it is black. The hill tops have scarcely any soil as they are eroded due to high winds and rains. Only a few

trees and shrubs occur on the high slopes and in valleys. The climate like that of many parts of Nashik district is dry for 8 months of a year. Rain fall is very high, mostly from June to September.

4.METHODOLOGY: Four stands' areas located randomly throughout the study area in the Saptashrungi forest. Quadrats of 10 x 10 m were laid down in different directions in forest, so that quadrats represented almost all species in the area. All together 40 plots (covering 4000 Sq m.) are laid down.

Frequency (%) was calculated by the formula given by Raunkiaer (1934). Maturity index is based on the frequency percentage of all species in the stands of community. It is obtained by adding the frequency percentage of all species in a stand and dividing this sum by the total number of species in the stand (Pichi-Sermolli, 1948).

5.OBSERVATION:

Maturity index provides information about the maturity of the forest community. It also impresses up on the dominance of specie within the community. From Table I, it can be seen that the stands 1,2 and 3, are showing maximum maturity index where as other stand 4 is within less maturity index. This can be attributed due to the factors operating upon the vegetation on some patches and stands which are showing highest maturity index are under the control of forest department and declared as reserve forest. It can also be seen that the average Maturity Index of Saptashrungi forest is higher.

From fig. 1: showing the histogram of Maturity Index. It can be seen that highly matured vegetation is in the stands of 1 and 2. The average Maturity Index (36.67) is better.

Discussion and Conclusion:

The Maturity Index value at Saptashrungi forest shows that as a whole these are of three types.

1. Still under the process of succession: At stand No.4 maturity value is 33.10.
2. Moderately mature: Stand No.3 shows the maturity index value 35.67.
3. The highest degree of maturity index: stand No.1 (40.00) and 2 (37.93) indicates that the community is more stable and the disturbance to the vegetation by biotic influence is very less. Saptashrungi forest has the better average maturity value index.

From Table 1, it can be seen that the stands 1, 2, are showing maximum maturity index where as other stands are within much less maturity index. This can be attributed due to the factors operating upon the vegetation on some patches and stands which are showing highest maturity index are under the control of forest department and declared as reserve forest. It can also be seen that the average Maturity Index of Saptashrungi forest is better.

The average maturity index value and degree of maturity of Saptashrungi forest as a whole show that it is higher.

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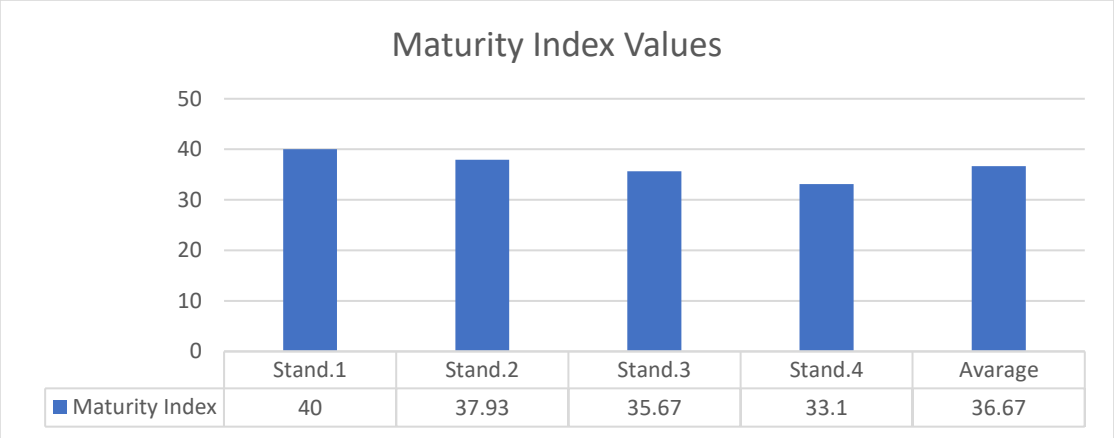
Table. 1: Showing the 8 stands and their Maturity Index

Sr. No	Localities	Maturity Index (M.I.)
1	Stand No. 1	40.00
2	2	37.93
3	3	35.67
4	4	33.10
Total		146.70
Average M.I.		36.67

Fig 1: Showing the Comparative histograph of Maturity Index stand wise (4) and Saptashrungi forest as a whole Localities



Localities

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UTILIZATION OF SOME MEDICINAL PLANTS OF SALHER FORT AREA OF BAGLAN, NASHIK, MAHARASHTRA

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ABSTRACT

Present study gives an account of various uses of medicinal plants from Salher fort area of Baglan. 24 medicinal plants belonging to 23 genera and 21 families are dealt herewith which are used by villagers for cure of different diseases. The aim of present investigation is to enumerate the medicinal plants used by villagers and their medicinal uses. It also throws light on their families, botanical name/s, local name/and their use/s .

Keywords: medicinal plants, Salher Fort area, uses.

1.INTRODUCTION

Salher Fort is the highest fort in Maharashtra and the second - highest peak in the Western Ghats (1,697 meters). Located in the Baglan region of Nashik district, Salher village, located at the base of the historic Salher Fort, had a total population of 3,112 as per the Census 2011. A rich biodiversity hotspot of the Western Ghats has historically provided crucial medicinal resources to tribal communities like the Bhil, Kokana, Mahadeo Koli and Warali. According their traditional knowledge various plants parts like stem, root, leaves, bark, seed, flowers, fruit, latex etc. as well as tree species, major and minor plants extensively used for health care and other purposes. The annual temperature range of 21.5^0C to 31^0C

In India the ethnobotanical studies were carried out by various workers such as Vartak and Gadgil (1980) and Jain (1981) undertookintensive field study among the tribals of Central India, with regard to ethnobotany, particularly in the Indian context.Some medicinal plants from Satpuda mountain have been carried out by Karnik (1966), Ethnobotany has evolved into a specific discipline over the last century, that looks at the people-plant relationship in a multidisciplinary manner, such as economic botany ecology, pharmacology, and public health (Balick,1996).

Sonawane et al., (2006) studied utilization of some medicinal plants of Baglan and Malegaon Taluka of Nasik district, Sonawane (2008) Surveyed Some Medicinal Plants of Nasik District, Jondhale et al., (2018) Studied Ethnomedicinal Survey of Peth Tribal region of Nashik District, Palwe (2019) Studied Indigenous knowledge of Medicinal plants among the tribal population of Dang-Surgana Forests of Western Ghats. Sonawane (2019) Studied Ethnobotanical and Ethnomedicinal Studies of Salher and Mulher Forest & Gaikwad et.al. (2022) surveyed Ethnomedicinal potential of Salher-Mulher forest Nashik District. Traditionally there are many plant species used as herbal medicines all over the world. Therefore, present work was taken to study medicinal plants of Salher Fort area.

2.MATERIAL AND METHODS

An extensive survey was carried out in Salher Fort Area in year 2024. To collect the data of medicinal plants frequent visits were arranged in different seasons. Information was collected from tribal people conducting oral interviews of Vaidu, Bhagat and elderly village people who have knowledge of therapeutic uses of plants and mostly use them in treating various ailments. Study work was concentrated to medicinal plants which are used by villagers for curing various kind of disease. The plants were identified with the help of keys to families, genera and species provided in standard floras like Flora of Bombay Presidency (Cooke, 1967), Flora of Savantwadi (Almeida, 1990), Flora of Maharashtra State (Singh & Kathikeyan,2000,Vol.I), The Bombay Flora (Dalzell & Gibson, 1973), Flora of Nasik District (Lakshminarasimhan and Sharma, 1991), Nature Heals A Glossary of Selected Indigenous Medicinal Plants of India (Jayvir Anjaria, et al., 1997), relevant literature and expert opinions.

3.ENUMERATION

The medicinal plants with their families, botanical names, local name/s and their use/s are given below.

1. *Aegle marmelos* Corr. (Rutaceae) - Bel. Some people chew one fresh, washed leaf frequently to maintain sugar level.
2. *Asparagus racemosus* Willd. (Liliaceae) - Shatavari. Tuberous roots are commonly used to boost vitality.
3. *Balanites roxburghii* Planch. (Balanitaceae) – Hinganbet. Seed oil applied on burns and wounds.
4. *Blumea lacera (Burm.f.)* DC. (Asteraceae) – Kukundara. Leaf paste is applied topically to heal cuts, wounds, and boils.
5. *Boswellia serrata* Roxb .ex. (Burseraceae) - Salai. Gum resin, which is commonly used to treat join pain and inflammation.
6. *Cardiospermum halicacabum* L. (Sapindaceae) – Kapalphodi. Leaf oil extract is applied to relieve joint inflammation and stiffness.
7. *Cassia fistula* L. (Caesalpinaceae) - Bahava. The leaf juice is applied on eczema and other skin disease.
8. *Chlorophytum borivilianum* Santapau. & R. R. Fern. (Liliaceae) - Safed Musali. Plant is used in ayurvedic preparations.
9. *Cullen corylifolium* (L.) Medik. (Fabaceae) - Bakuchi. Seed oil is used in perfumes.
10. *Curcuma neilgherrensis* Wight. (Zingiberaceae). Nangli Halad. The rhizome is used to treat cuts, boils and wounds.
11. *Cynodon dactylon* (L.) Pers. (Poaceae) - Durva. Whole plant is used on wounds and urinary troubles.
12. *Ficus exasperate* Vahl. (Moraceae) - (Bhui Umbar). Ash from stem bark or wood is applied on wounds as a healing agent.
13. *Ficus religiosa* L. (Moraceae) – Pimpal. Leaves are used in cracked hands and heels to get best RESULTS.
14. *Helicteres isora* L. (Sterculiaceae) - Murudsheng. Pod extract is given as a tonic to weak children.
15. *Madhuca longifolia* (Koen.) MacBride (Sapotaceae) - Mahuwa. Seed oil is a popular topical treatment for rheumatism and Joint pain.
16. *Meyna laxiflora* Robuns. (Rubiaceae) – Aaval. Tribal communities use leaf pastes for skin issues and swelling.
17. *Senegalia catechu* (L. f.) P. J. H. Hurter & Mabb. (Mimosaceae) - Khair. Bark is used in the treatment of conjunctivitis. Kath is applied to boils and ulcers.
18. *Syzygium cumini* (L.) Skeels (Myrtaceae) - Jambul. Dried seed powder is used in managing blood sugar levels.
19. *Tectona grandis* L. f. (Verbenaceae) - Sag. Bark powdered used on snake bite.

20. *Tinospora cordifolia* (Willd.) Hook. f. (Menispermaceae) - Gulvel. Stem pest is applied for fast healing. Known for its use in treating fevers and immune boosting.
21. *Tridax procumbens* Linn. (Asteraceae) - Ghavti. Leaf juice is used cuts and wounds.
22. *Vitex negundo* L. (Verbenaceae) - Nirgundi. The leaves are warmed and applied to swollen joints to reduce pain and inflammation associated with arthritis and rheumatism.
23. *Withania somnifera* Dunal. (Solanaceae)- Ashwagandha. Plant roots are used to treat cough, fever and ulcers.
24. *Ziziphus jujube Mill.* (Rhamnaceae) - Bor. Fruits are used for digestive health

4.RESULT AND DISCUSSION

Many of the villagers using herbal medicine for their primary health care. The information collected indicates that in all 24 medicinal plants are utilized for treatment of various kinds of diseases such as diabetes, ulcers, burns, wounds, rheumatism, fever, skin disease, eczema, digestive health etc. Based on the present investigation it is evident that most of the medicinal plants are having good attractive features but some plant species are facing a constant threat due to over exploitation. Therefore, there is an urgent need to creating awareness in villagers for conservation of medicinal plants, which are continuously becoming degraded.

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COMPARATIVE ANALYSIS OF GROWTH RATES AND NUTRIENT DENSITY IN HYDROPONICALLY VERSUS SOIL-GROWN MEDICINAL PLANTS: CASE STUDIES FROM NASHIK DISTRICT, MAHARASHTRA

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ABSTRACT

Hydroponic cultivation has emerged as a sustainable alternative to traditional soil-based agriculture for medicinal plants. This study evaluates the comparative growth performance, nutrient uptake, and phytochemical accumulation of two important medicinal plants from the Nashik region of Maharashtra—Withania somnifera (Ashwagandha) and Asparagus racemosus (Shatavari)—grown under hydroponic and soil-based cultivation systems. Conventional soil cultivation frequently faces limitations such as soil degradation, nutrient imbalance, climatic variability, and soil-borne pathogens, which negatively affect plant productivity and phytochemical composition. Hydroponic systems provide a controlled environment where plants are grown in nutrient-rich solutions, allowing precise regulation of pH, electrical conductivity, and nutrient availability.

The present study compared plant growth parameters including plant height, leaf number, root length, fresh biomass, and dry biomass over a cultivation period of twelve weeks. Additionally, phytochemical analysis focused on withaferin-A content in Withania somnifera and steroidal saponins in Asparagus racemosus. RESULTS indicated that hydroponically grown plants exhibited faster vegetative growth and higher biomass production compared to soil-grown plants. Ashwagandha cultivated under hydroponic conditions demonstrated increased withaferin-A concentration, suggesting enhanced phytochemical synthesis due to optimized nutrient availability. In contrast, Shatavari showed relatively similar saponin levels under both cultivation methods, indicating that certain phytochemicals may also depend on soil microbial interactions.

Overall, the findings highlight the potential of hydroponic cultivation systems to improve medicinal plant productivity, ensure consistent phytochemical composition, and support sustainable agricultural practices for herbal drug production.

Keywords: Hydroponics, Medicinal Plants, Withania somnifera, Phytochemical Analysis.

1.INTRODUCTION

Medicinal plants play a vital role in traditional and modern healthcare systems. Species such as Withania somnifera (Ashwagandha) and Asparagus racemosus (Shatavari) are widely used in Ayurvedic medicine due to their adaptogenic, rejuvenative, and therapeutic properties. However, cultivation of medicinal plants under conventional soil-based systems often faces challenges including declining soil fertility, environmental stress, and pathogen infestation.

Hydroponic cultivation provides an alternative approach where plants grow in nutrient-enriched water solutions without soil. This system allows precise control over nutrient availability, pH, and environmental conditions, which improves plant growth and reduces the risk of soil-borne diseases. In recent years, hydroponic cultivation has gained attention for producing high-quality medicinal plants with enhanced biomass and standardized phytochemical profiles.

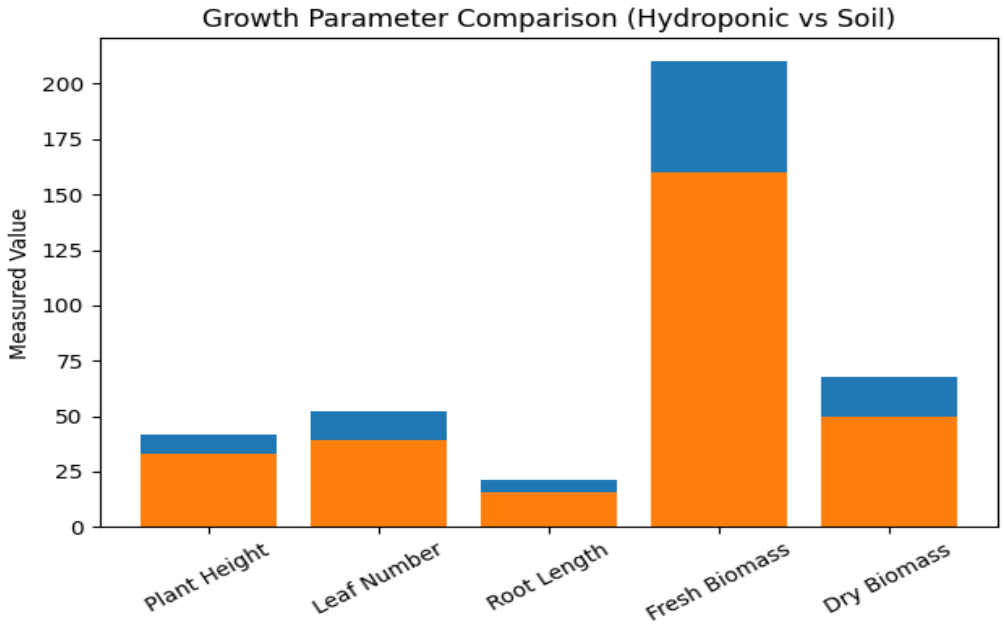
2.MATERIALS AND METHODS

Two medicinal plants, Withania somnifera and Asparagus racemosus, were selected for the present study. Healthy seedlings were obtained from local nurseries in the Nashik region. The experiment was conducted using two cultivation systems: hydroponic cultivation and traditional soil-based cultivation.

In the hydroponic setup, the Nutrient Film Technique (NFT) was used. Plants were placed in net pots containing cocopeat and perlite as inert support media. A Hoagland nutrient solution was circulated continuously to ensure adequate nutrient supply. The nutrient solution was maintained at pH 5.5–6.5 and electrical conductivity of approximately 1.8–2.2 mS/cm. Temperature conditions were maintained between 25–30°C with proper aeration for root respiration.

For soil cultivation, plants were grown in pots containing a mixture of garden soil, sand, and farmyard manure in the ratio of 2:1:1. Growth parameters such as plant height, leaf number, root length, fresh biomass, and dry biomass were recorded during the 12-week cultivation period. Phytochemical analysis was performed to estimate withaferin-A using HPLC and saponin content using spectrophotometric methods.

3.RESULTS



Parameter	Hydroponic	Soil

Plant Height (cm)	42	33
Leaf Number	52	39
Root Length (cm)	21	16
Fresh Biomass (g)	210	160
Dry Biomass (g)	68	50

4.CONCLUSION

The present study demonstrates that hydroponic cultivation significantly improves growth performance and biomass production of medicinal plants compared to conventional soil-based cultivation. Withania somnifera grown in hydroponic systems showed enhanced phytochemical accumulation, particularly withaferin-A, indicating improved medicinal quality. Although Asparagus racemosus exhibited similar saponin levels under both cultivation systems, hydroponic cultivation provided better growth conditions and resource efficiency. Therefore, hydroponic cultivation may serve as a promising approach for sustainable production of high-quality medicinal plants in regions like Nashik.

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WILD EDIBLE PLANTS OF SURGANA REGION: AN ETHNOBOTANICAL PERSPECTIVE

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ABSTRACT

Wild edible plants represent an underexplored nexus of biodiversity, nutrition, and cultural resilience. In the Western Ghats region of Maharashtra, tribal communities such as the Kokna, Mahadev Koli, and Warli continue to rely on these “wild foodscapes” to buffer seasonal food insecurity and maintain dietary diversity. A comprehensive ethnobotanical investigation was conducted in Surgana taluka, Nashik district, integrating ecological field surveys with participatory rural appraisal techniques. Data were collected through semi-structured interviews and focus group discussions with traditional knowledge holders. Plant specimens were collected, taxonomically verified using standard regional floras, and documented for vernacular names, edible parts, and culinary practices. A total of 44–61 wild vegetable species belonging to diverse taxonomic families were documented, with Amaranthaceae, Fabaceae, and Asteraceae being predominant. Commonly utilized species included *Amaranthus viridis*, *Cassia tora*, *Momordica dioica*, and *Celosia argentea*. Herbaceous taxa dominated (>70%), indicating their ecological abundance and accessibility. Leaves and tender shoots were the most frequently consumed plant parts, although fruits, flowers, and tubers also contributed significantly to local diets. These species reflect deep ecological knowledge and seasonal adaptation strategies. The study highlights the critical role of wild edible plants in sustaining nutritional security and preserving indigenous knowledge systems. However, these resources are increasingly threatened by land-use change, climate variability, and shifting dietary preferences. Conservation interventions, alongside nutritional and pharmacological validation, are essential to integrate these species into sustainable food systems and policy frameworks.

Keywords: Ethnobotany, Wild edible plants, Nutritional security, Indigenous knowledge, Tribal communities; Sustainable food systems

1.INTRODUCTION:

The utilization of wild edible plants (WEPs) is one of the oldest traditions in human history, serving as a vital link between biodiversity and human nutrition. In many developing regions, particularly within the forest-dwelling communities of India, these non-cultivated species provide a resilient safety net during periods of agricultural scarcity and food crisis. Beyond their role as a "starvation diet," wild vegetables are increasingly recognized as "superfoods" due to their rich concentrations of vitamins, minerals, and antioxidant properties. Surgana located in the Nashik district of Maharashtra, is a region characterized by its rugged terrain, dense forest pockets, and a predominantly tribal population. Over 98% of the inhabitants belong to Scheduled Tribes, primarily the Kokna, Mahadev Koli, Warli, Harijan, and Charan communities. Geographically situated at the boundary of Maharashtra and Gujarat, this area forms part of the northern Western Ghats, a global biodiversity hotspot known for its high species

endemism. For these ethnic groups, traditional knowledge of the local flora is not merely a survival skill but a deep-seated cultural heritage passed down through generations.

Despite the abundance of cultivated staples like paddy, ragi, and millets, the tribal people of Surgana remain significantly dependent on wild green leafy vegetables to meet their daily nutritional demands. These vegetables are naturally organic—grown without fertilizers or pesticides—and are often superior in nutrient density to modern, commercially produced crops.

However, this rich repository of biocultural wealth is currently facing unprecedented threats. Modernization of agricultural practices, increasing urbanization, and erratic rainfall patterns have led to a decline in the availability of these wild species. Furthermore, the rapid shift toward modern diets among the younger generation is causing a gradual erosion of traditional ethnobotanical knowledge.
The present study, therefore, aims to document the diversity of wild vegetable species in the Surgana region. By identifying these plants and recording their traditional methods of preparation and seasonal availability, this research seeks to provide a benchmark for their conservation and potential domestication. Highlighting these "hidden harvests" is a crucial step toward achieving long-term food security and improving the nutritional status of the tribal communities in North Maharashtra.

2.METHODOLOGY:

Study Area and Period

The research was conducted in the Surgana taluka of Nashik district, Maharashtra an area dominated by the Kokna, Mahadev Koli, and Warli tribes. Field surveys were carried out across various forest pockets, ghats, and local tribal markets from 2024 to 2025, ensuring coverage across all four seasons to document the specific phenology (flowering and fruiting) and seasonal availability of wild vegetables.

Informant Selection and Ethical Considerations

- **Prior Informed Consent (PIC):** Before any data collection, the objectives of the study were explained to the participants in their local language, and their verbal or written consent was obtained.
- **Sampling:** A combination of **purposive and snowball sampling** was used to identify "key informants"—individuals with extensive knowledge of wild flora, such as elderly tribal members, traditional healers (Vaidus), and experienced foragers.
- **Demographics:** Interviews were conducted with a diverse group including farmers, forest dwellers, housewives, and local students to ensure a representative cross-section of community knowledge.

Ethnobotanical Data Collection

- **Semi-Structured Interviews:** Guided discussions were held using a pre-designed questionnaire to record the **local names, edible parts, preparation methods (recipes), and medicinal properties** of the plants.
- **Field Walks and "Inventory-on-the-Spot":** Researchers accompanied informants into the forest for direct observation. This method allowed for the identification of plants in their natural habitat and the documentation of ecological data such as habit (herb, shrub, tree) and preferred soil types.
- **Market Surveys:** Local weekly markets (*haats*) in Surgana were visited regularly to document the commercial status and seasonal flux of wild vegetables sold by tribal vendors.

Botanical Identification and Documentation

- **Specimen Collection:** Voucher specimens were collected in duplicate, preferably with flowering or fruiting parts for accurate taxonomic determination.
- **Herbarium Preparation:** Plants were pressed, dried, and preserved using standard herbarium techniques.
- **Verification:** Species were identified using regional floras, specifically the **Flora of Nashik District** and the **Flora of Maharashtra State**. Scientific names were updated according to the latest standards on World Flora Online.

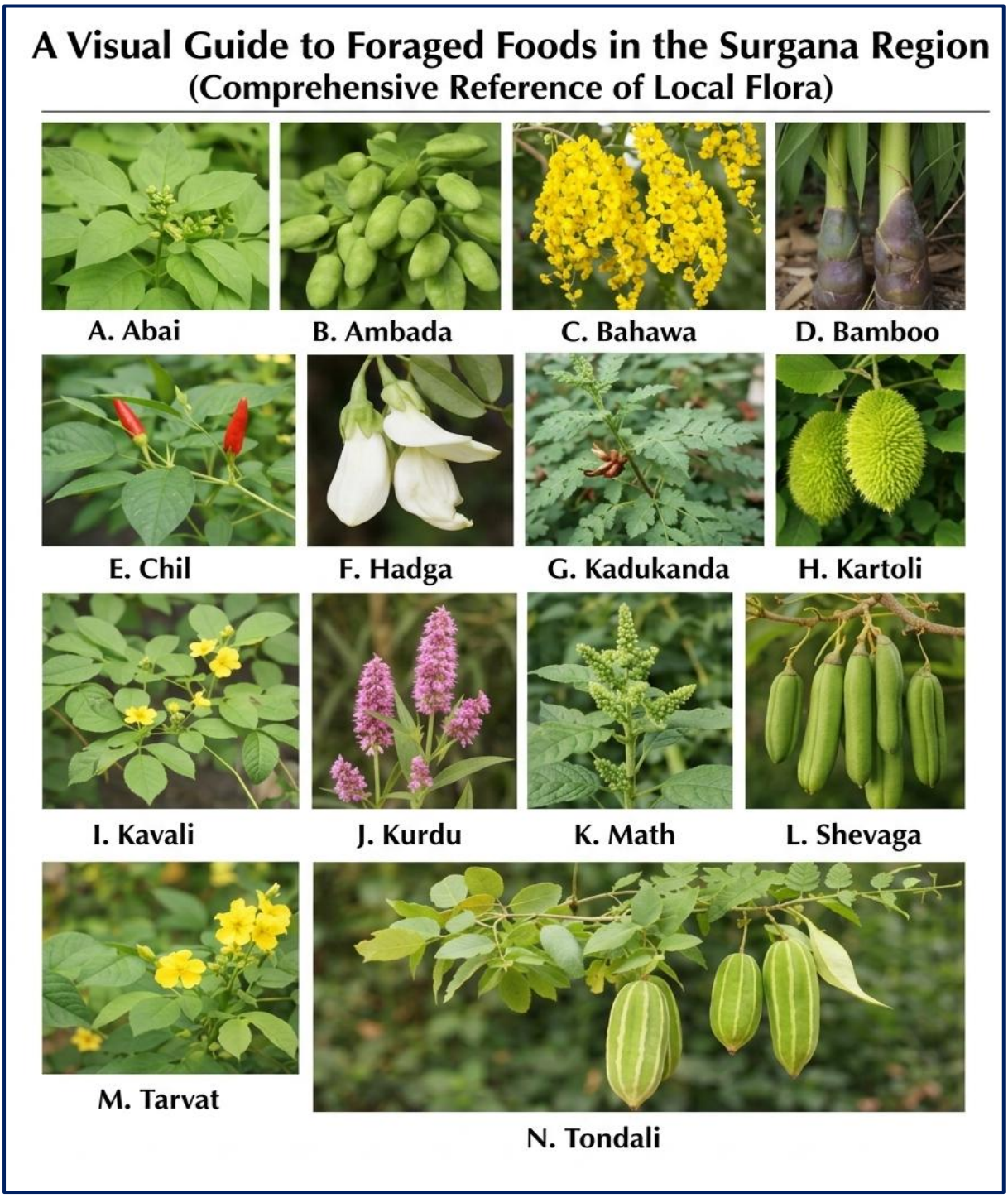
Data Analysis

The collected data was organized into a matrix including:

- **Taxonomic Details:** Family, Genus, and Species.
- **Ethnobotanical Use:** Edible parts (leaves, tubers, fruits) and preparation (boiled, fried, raw)

List of Wild Vegetable Species in Surgana

Local Name	Botanical Name	Family	Habit	Part Used & Preparation	Seasonal Availability
Abai	*Canavalia gladiata*	Fabaceae	Herb	Pods cooked as vegetable	Oct – Dec
Ambada	*Hibiscus sabdariffa*	Malvaceae	Herb	Leaves cooked as vegetable	July – Sept
Bahawa	*Cassia fistula*	Caesalpiniaceae	Tree	Flowers cooked as vegetable	March – May
Bamboo	*Bambusa arundinacea*	Poaceae	Tree	Tender shoots cooked	March – May
Chil	*Chenopodium album*	Chenopodiaceae	Herb	Leaves cooked as vegetable	July – Sept
Hadga	*Sesbania grandiflora*	Fabaceae	Tree	Flowers cooked as vegetable	Nov – Jan
Kadukanda	*Dioscorea bulbifera*	Dioscoreaceae	Climber	Tubers (eaten raw/boiled)	June – Oct
Kartoli	*Momordica dioica*	Cucurbitaceae	Climber	Unripe fruits as vegetable	July – Sept
Kavali	*Urginea indica*	Liliaceae	Herb	Tender leaves and bulbs	June – July
Kurdu	*Celosia argentea*	Amaranthaceae	Herb	Leaves cooked as vegetable	July – Sept
Math	*Amaranthus viridis*	Amaranthaceae	Herb	Leaves as leafy vegetable	July – Sept
Shevaga	*Moringa oleifera*	Moringaceae	Tree	Leaves, flowers, and pods	Year-round
Tarvat	*Cassia tora*	Caesalpiniaceae	Shrub	Tender leaves cooked	July – Sept
Tondali	*Coccinia grandis*	Cucurbitaceae	Climber	Young fruits (raw/cooked)	July – Dec



3.RESULT:

Taxonomic Diversity and Ethnobotanical Richness

The survey revealed a remarkable diversity of **61 wild green leafy vegetable species** distributed across **28 botanical families**, underscoring the Western Ghats as a micro-hotspot of edible biodiversity. Dominant families such as *Amaranthaceae* (*Amaranthus viridis*), *Fabaceae* (*Cassia tora*), *Asteraceae*

(*Tridax procumbens*), and *Cucurbitaceae* (*Momordica dioica*) reflect both ecological adaptability and cultural preference.

This taxonomic spread illustrates not merely species richness, but a **functional food network**, where multiple plant lineages contribute to dietary resilience, micronutrient diversity, and traditional ecological knowledge systems.

Life Forms and Edible Spectrum

The structural composition of these wild edibles is heavily skewed toward **herbaceous species (47 spp.)**, followed by trees (7 spp.), shrubs (4 spp.), and climbers (3 spp.), indicating a strong reliance on fast-growing, easily accessible flora.

The consumption pattern reveals a **leaf-dominant food system**, where:

- Leaves and tender shoots account for ~47% of usage,
- Fruits contribute ~28%,
- Stems ~22%,
- Flowers and inflorescences ~8%.

This distribution highlights a **"multi-part utilization strategy"**, maximizing plant utility across growth stages and ensuring continuous nutrient intake. It also reflects an efficient, low-waste foraging system deeply embedded in indigenous practices.

Seasonal Dynamics and Food Security Buffering

A key insight emerging from the study is the **seasonal synchronization between wild food availability and agricultural cycles**. The majority of species, including *Celosia argentea* and *Momordica dioica*, are abundant during the **monsoon season (June–October)**.

This period represents a critical **"nutritional bridge window"**, when cultivated crops are not yet harvest-ready. Wild vegetables thus act as **temporal safety nets**, buffering food scarcity and stabilizing diets during transitional agricultural phases.

Such seasonal dependence underscores the role of wild edibles as **climate-resilient food resources**, capable of sustaining communities under fluctuating environmental and socio-economic conditions.

4.DISCUSSION:

Traditional Knowledge and Consumption

Tribal communities like the **Kokna, Mahadev Koli, and Warli** possess specialized knowledge regarding preparation. Many vegetables, such as *Cassia tora* (Tarvat), are specifically used as offerings during festivals like **Gauri-Ganpati**. These plants are valued for being **chemically free** and having superior nutrient profiles compared to commercially farmed crops.

Commercial and Economic Value

Wild vegetables are not just for subsistence; a large variety is sold in local **tribal markets (haats)** in Surgana. Urban populations are increasingly interested in these "organic" alternatives, providing a potential source of income for poor tribal families.

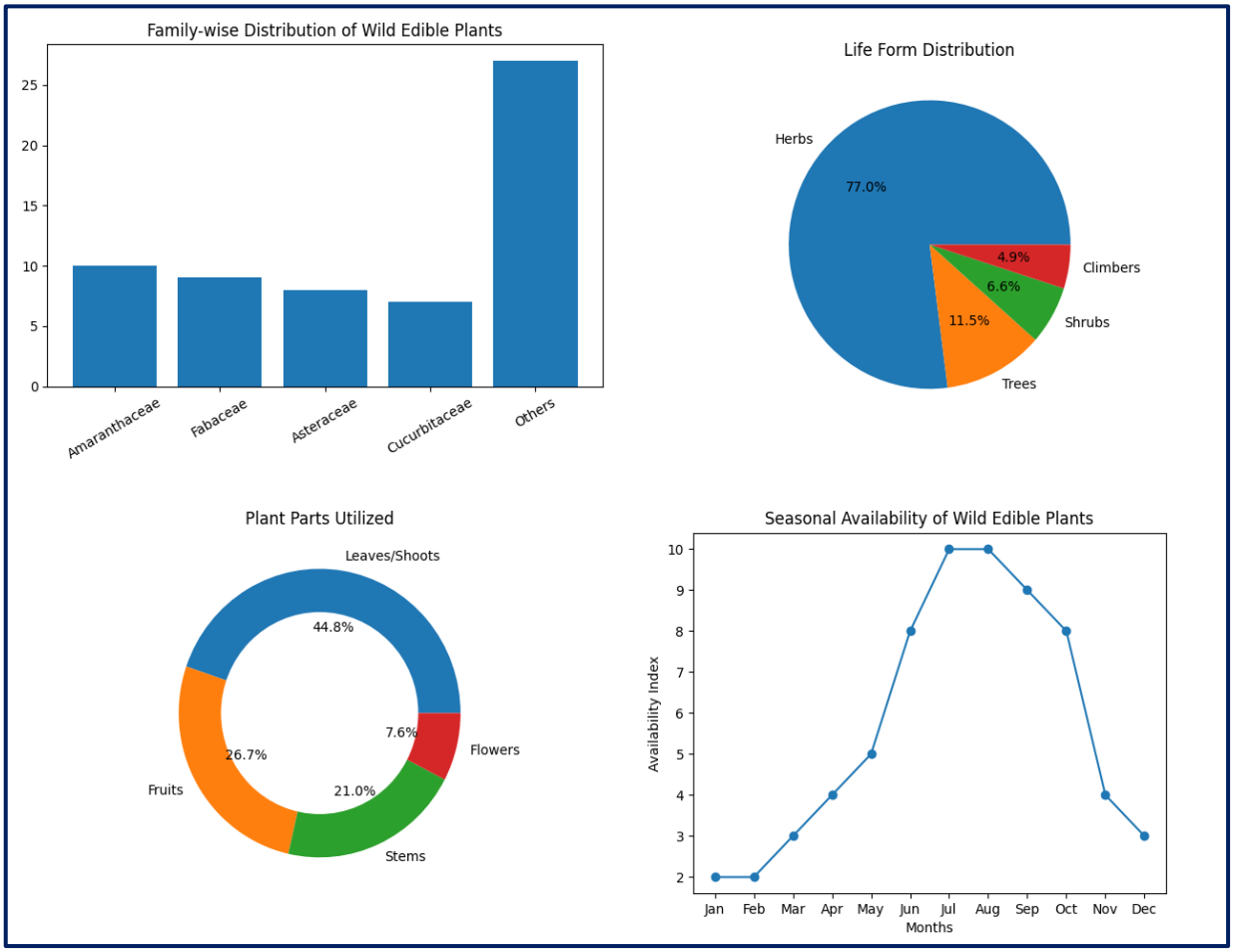
Threats and Conservation

Modernization and environmental shifts are major concerns:

- **Erratic rainfall** and **urbanization** are making several species increasingly rare in the Surgana region.
- **Modern agricultural practices** often lead to the neglect of these uncultivated species, treating them as weeds.
- There is a visible **erosion of traditional knowledge** among the younger generation, necessitating immediate documentation and awareness programs.

Summary of Vegetative Habits:

Habit	Number of Species	Percentage (%)
Herb	47	77%
Tree	7	11.5%
Shrub	4	6.5%
Climber	3	5%



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ETHNOBOTANICAL STUDIES ON SACRED PLANTS IN DASANE VILLAGE, MALEGAON TEHSIL, NASHIK DISTRICT, MAHARASHTRA (INDIA)

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ABSTRACT

Sacred plants play an important role in the cultural, religious, and ecological traditions of rural communities in India. This study explores the diversity, traditional uses, cultural importance of sacred plant species in Dasane village, Malegaon Tehsil, Nashik district, Maharashtra, India. Field surveys and semi-structured interviews with 30 local informants, including elders, temple priests, farmers, and traditional healers, were conducted between January and March 2025. A total of 28 plant species from 21 families were documented. These species are integral to religious, rituals, traditional medicine, festivals, and community-led conservation practices. The research demonstrates how indigenous knowledge sustains cultural identity and promotes biodiversity preservation.

Keywords: Sacred plants, ethnobotany, traditional knowledge, cultural heritage, medicinal plants, Dasane village.

1.INTRODUCTION

Plants are fundamental to the cultural, spiritual, and ecological landscape of rural India. Sacred plants are revered due to their association with deities, rituals, festivals, and traditional healing practices, forming an integral component of local belief systems (Jain, 2019). In Maharashtra, these practices are prevalent but often under-documented at the village level. Dasane village, located in Malegaon Tehsil of Nashik district, presents a rich repository of ethnobotanical knowledge, where sacred species play pivotal roles in religious ceremonies, seasonal festivals, and healthcare. This study aims to systematically document sacred plant diversity, analyse their cultural and medicinal significance, and assess their role in biodiversity conservation.

2.STUDY AREA

Dasane village is situated in Malegaon Tehsil of Nashik district. The area experiences a tropical monsoon climate with hot summers, moderate rainfall during the monsoon, and mild winters. Agriculture forms the primary livelihood of the local population, and the village landscape includes temples, home gardens, fields, and community gathering spaces where sacred plants are cultivated and ritualized.

3.MATERIALS AND METHODS

Data Collection

Field surveys were conducted from January to June, 2025. Sacred plants were observed in domestic gardens, temple precincts, agricultural fields, and community spaces. A combination of purposive and random sampling ensured the inclusion of culturally and medicinally significant species.

Informant Interviews

Thirty informants (15 males and 15 females), including village elders, temple priests, traditional healers, and farmers, were interviewed using semi-structured questionnaires. Data recorded included local plant names, parts used, ritual and medicinal applications, and associated cultural beliefs.

S. No	Scientific Name	Local Name	Family	Habit	Part Used	Religious / Cultural Significance
1	*Aegle marmelos*	Bel	Rutaceae	Tree	Leaves	Sacred to Lord Shiva; used in temple offerings
2	*Areca catechu*	Supari	Arecaceae	Tree	Nut	Offered in almost all religious rituals
3	*Asparagus racemosus*	Shatavari	Asparagaceae	Climber	Roots	Used in traditional healing and ritual offerings
4	*Azadirachta indica*	Neem	Meliaceae	Tree	Leaves	Used in purification rituals and festivals
5	*Butea monosperma*	Palash	Fabaceae	Tree	Flowers	Used during Holi and sacred fire rituals
6	*Calotropis gigantea*	Rui	Apocynaceae	Shrub	Flowers	Offered to Lord Shiva
7	*Cassia fistula*	Amaltas	Fabaceae	Tree	Flowers	Used in seasonal religious rituals
8	*Clitoria ternatea*	Aparajita	Fabaceae	Climber	Flower	Used in devotional worship
9	*Cocos nucifera*	Naral	Arecaceae	Tree	Fruit	Broken during religious ceremonies

10	*Curcuma longa*	Halad (Turmeric)	Zingiberaceae	Herb	Rhizome	Used in marriage rituals and auspicious ceremonies
11	*Cynodon dactylon*	Durva	Poaceae	Grass	Whole plant	Essential offering to Lord Ganesh
12	*Datura metel*	Dhatura	Solanaceae	Shrub	Fruit/Flower	Used in Shiva worship
13	*Ficus benghalensis*	Banyan (Vad)	Moraceae	Tree	Whole tree	Associated with longevity; worship during Vat Purnima
14	*Ficus racemosa*	Umbar	Moraceae	Tree	Fruit	Worshipped in local traditions
15	*Ficus religiosa*	Peepal	Moraceae	Tree	Whole tree	Sacred tree near temples; worshipped on Saturdays
16	*Hibiscus rosa-sinensis*	Jaswand	Malvaceae	Shrub	Flower	Offered to Goddess Durga and Lord Ganesh
17	*Lawsonia inermis*	Mehendi	Lythraceae	Shrub	Leaves	Applied during marriage ceremonies
18	*Mangifera indica*	Mango	Anacardiaceae	Tree	Leaves	Used in toran (door decoration)
19	*Musa paradisiaca*	Banana	Musaceae	Herb	Whole plant	Used in wedding and festive decorations
20	*Nelumbo nucifera*	Kamal (Lotus)	Nelumbonaceae	Aquatic herb	Flower	Symbol of purity in religious ceremonies
21	*Ocimum tenuiflorum*	Tulsi	Lamiaceae	Herb	Leaves	Worshipped daily; symbol of purity and protection

22	*Pongamia pinnata*	Karanj	Fabaceae	Tree	Leaves	Planted near temples and sacred spaces
23	*Ricinus communis*	Erand	Euphorbiaceae	Shrub	Leaves	Used in folk healing traditions
24	*Saccharum officinarum*	Sugarcane	Poaceae	Grass	Stem	Used during harvest festivals
25	*Santalum album*	Chandan	Santalaceae	Tree	Wood	Sandalwood paste used in religious marking
26	*Syzygium cumini*	Jamun	Myrtaceae	Tree	Leaves	Used in certain village rituals
27	*Tinospora cordifolia*	Gulvel	Menispermaceae	Climber	Stem	Used for medicinal and spiritual purification
28	*Ziziphus mauritiana*	Bor	Rhamnaceae	Tree	Leaves	Used in local folk rituals

Plant Identification

Plants were identified through local vernacular names and cross-verified using regional floras and botanical databases. Scientific names conform to standard taxonomic REFERENCES.

4.RESULTS

Species Diversity

A total of 28 sacred plant species belonging to 21 botanical families were documented. Trees were the dominant life form (15 species), followed by shrubs (5), herbs (4), climbers (3), grasses (2), and one aquatic herb. Fabaceae was the most represented family with four species.

Plant Uses and Ritual Functions

• Religious and spiritual use: Tulsi and Peepal are central to daily worship and temple rituals.
• Medicinal applications: Neem and Shatavari are commonly used in traditional remedies.
• Cultural and social functions: Banana and Turmeric are essential in weddings and festive decorations.
• Conservation role: Sacred trees and groves are protected by customary norms, indirectly preserving biodiversity and ecological stability.

Discussion and Conclusion

The study demonstrates that sacred plants in Dasane village have multidimensional importance encompassing spiritual, medicinal, social, and ecological domains. Traditional reverence contributes to

biodiversity conservation by protecting sacred groves and trees. Indigenous knowledge systems play a vital role in sustaining cultural continuity, healthcare practices, and ecological balance. Documentation and promotion of such traditions are essential for conservation and sustainable management of plant resources.

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ETHNOPHARMACOLOGICAL STUDY OF TRADITIONAL PLANTS USED TO CURE SKIN DISEASES IN MALEGAON, NASHIK, MAHARASHTRA (INDIA)

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ABSTRACT

Plant-based traditional medicine continues to play a vital role in rural healthcare systems, particularly in managing dermatological conditions. The present investigation documents ethnobotanical knowledge from Malegaon, Nashik district, Maharashtra. The survey was conducted during month of June 2025 to December 2025 for spot collection, identification and ethnobotanical enumeration of herbal plants. The information was provided by tribal people of the village regarding the medicinal use of the plants was compared with the available literature regarding to the skin disease treatment. Information was collected through field visits and interviews with 30 tribal informants between May and December 2025. A total of 30 plant species representing 22 families were recorded for treating various skin disorders such as wounds, eczema, fungal infections, burns, and insect bites. The study emphasizes the significance of indigenous practices and highlights the importance of conservation and scientific validation of medicinal plants.

Keywords: Ethnobotany, Medicinal plants, Skin disorders, ethnomedicinal, Traditional practices, Maharashtra

1.INTRODUCTION

Skin-related disorders are widespread and often persistent, especially in rural regions where access to modern healthcare is limited. Traditional medicinal systems, including Ayurveda and folk medicine, rely heavily on plant-based remedies. Despite their importance, detailed documentation at local levels remains inadequate. This study aims to record and analyze medicinal plants used by local communities in Malegaon for treating skin diseases.

2.STUDY AREA

Malegaon is a city in Maharashtra, West India. The city is a history settlement located on the banks of the Girna River, Mosam River and famous with its wonderful temples. The district is known for its rich floristic composition and traditional culture. The climate shows moderate conditions rainfall observed in during the monsoon season rainfall with a tropical monsoon climate. Traditional healing practices are integral to local culture.

3.MATERIALS AND METHODS

Data Collection

Conducted between June and December 2025 using purposive and snowball sampling.

Informant Selection and Interviews

Thirty informants (12 Male and 18 Female) aged 28–78 years were interviewed using pre-tested questionnaires in their local language to gather ethnomedicinal data. Thirty informants, including village elders, temple priests, traditional healers, and farmers, were interviewed using semi-structured questionnaires. Data recorded included local plant names, parts used, ritual and medicinal applications, and associated cultural beliefs.

Plant Identification

Plants were collected, photographed, and identified using regional floras and herbarium REFERENCES.

Sr.No	Scientific Name	Local Name	Part Used	Preparation	Uses
1	Aegle marmelos	Bel	Leaves	Paste	Antimicrobial wash
2	Allium cepa	Onion	Bulb	Paste/Extract	Inflammation, swelling
3	Allium sativum	Garlic	Bulb	Paste	Wound healing, antimicrobial
4	Aloe vera	Ghritkumari	Leaf gel	Gel application	Burns, wounds, dermatitis
5	Azadirachta indica	Neem	Leaves/Bark	Paste/Decoction	Eczema, fungal infections
6	Boerhavia diffusa	Punarnava	Whole plant	Decoction	Inflammation
7	Catharanthus roseus	Sadabahar	Leaves/Flowers	Paste/Decoction	Skin rashes
8	Cissus quadrangularis	Hadjod	Stem	Paste	Cuts, bruises
9	Curcuma longa	Turmeric	Rhizome	Paste	Ringworm, infections

10	Cymbopogon citratus	Lemongrass	Leaves	Decoction	Antibacterial wash
11	Eclipta alba	Bhringraj	Whole plant	Paste/Juice	Fungal infections
12	Emblica officinalis	Amla	Fruit	Decoction	Skin nourishment
13	Ficus benghalensis	Banyan	Bark/Latex	Poultice	Sores, wounds
14	Ficus racemosa	Umbar	Bark	Decoction	Skin eruptions
15	Hibiscus rosa-sinensis	Jaswand	Flowers	Paste	Wound healing
16	Lawsonia inermis	Henna	Leaves	Paste	Psoriasis, dermatitis
17	Mangifera indica	Mango	Leaves	Decoction	Skin allergies
18	Moringa oleifera	Shevga	Leaves	Paste	Insect bites
19	Musa paradisiaca	Banana	Fruit/Pseudostem	Poultice	Burns, rashes
20	Ocimum basilicum	Sweet Tulsi	Leaves	Paste	Rashes
21	Ocimum sanctum	Tulsi	Leaves	Paste/Decoction	Skin allergies
22	Sapindus emarginatus	Ritha	Fruit	Wash	Scabies, itching
23	Syzygium cumini	Jamun	Seeds/Leaves	Paste	Fungal infections
24	Taraxacum officinale	Dandelion	Leaves	Decoction	Dermatitis
25	Terminalia bellirica	Bahera	Fruit	Paste	Skin sores
26	Terminalia chebula	Hirda	Fruit	Paste	Fungal infections

27	Tridax procumbens	Ghamasya	Whole plant	Poultice	Wound healing
28	Tribulus terrestris	Gokhru	Whole plant	Paste	Skin lesions
29	Vitex negundo	Nirgundi	Leaves	Paste	Ringworm
30	Zingiber officinale	Ginger	Rhizome	Paste	Inflammation

(Table 1.- Medicinal Plants with their properties)

4.RESULT

The information from the prescription in (Table 1) showed that twenty formulations were applied for microbial skin infectious diseases, including bacterial infections such as Acne, Boil, Eczema, Pimples, Ringworms. A total of 30 plant species belonging to 22 botanical families were documented.

5.DISCUSSION

Medicinal plants play a crucial role in managing skin diseases in Malegaon. Frequently used plants such as Neem and Aloe vera reflect strong ethnomedicinal traditions. However, lack of standardization and clinical validation remains a limitation. Conservation and scientific research are necessary.

6.CONCLUSION

The study documents 30 medicinal plant species used for skin diseases. It highlights the importance of traditional knowledge and the need for phytochemical and clinical validation along with conservation strategies.

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COMPARATIVE PHYTOCHEMICAL CONSTITUENTS IN LEAVES, FLOWERS, AND BARK OF *BOMBAX CEIBA* (L.) AND *BUTEA MONOSPERMA* (LAM.) TAUB: A STUDY FROM NASHIK DISTRICT, MAHARASHTRA, INDIA

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ABSTRACT:

Bombax ceiba (Semal/Savar) and *Butea monosperma* (Palash) are prominent ethnomedicinal trees in the deciduous forests of in Nashik district, part of the Western Ghats region. This study aimed to perform a comparative qualitative and quantitative phytochemical screening of leaves, flowers, and bark from both species collected in Nashik. Standard extraction methods (methanol, ethanol, aqueous) were used, followed by qualitative tests and estimation of total phenolics, flavonoids, etc.

RESULTS revealed the presence of alkaloids, flavonoids, tannins, saponins, terpenoids, steroids, glycosides, and phenols in varying amounts across parts. *Bombax ceiba* showed higher triterpenoids (e.g., lupeol, β-sitosterol) in bark and leaves, while flowers were rich in phenolics and flavonolignans (shamimin). *Butea monosperma* exhibited dominant chalcone flavonoids (butein, butrin, isobutrin) in flowers, with apigenin derivatives in leaves. Bark of both had tannins and steroids. Nashik's semi-arid to subtropical climate may influence higher flavonoid content compared to other regions. These phytochemicals support traditional uses for anti-inflammatory, antioxidant, antidiabetic, and wound-healing properties. This regional study highlights potential for drug development from local biodiversity. Further GC-MS/HPLC quantification and bioassays are recommended.

Keywords:- *Phytochemical screening Bombax ceiba, Butea monosperma, Flavonoids, Comparative analysis Ethnomedicine Nashik Maharashtra*.

1. INTRODUCTION

Bombax ceiba (family: Malvaceae/Bombacaceae) and *Butea monosperma* (family: Fabaceae) are deciduous trees widely distributed in Maharashtra's forests, including Nashik (Baglan Mulher hills, etc.). Locally called Semal and Palash, they are used in Ayurveda for diabetes, inflammation, diarrhea, and skin issues. Phytochemicals like flavonoids, phenolics, and terpenoids contribute to bioactivities. Regional variations due to soil (basalt in Nashik), rainfall, and altitude exist. Limited studies focus on Nashik-specific profiles, hence this comparative study on leaves, flowers, and bark.

Objectives:-

- Qualitative phytochemical screening.
- Comparative analysis between species and plant parts.
- Discuss implications for traditional medicine in Nashik.

2. MATERIALS AND METHODS

2.1 Plant Collection Leaves, flowers, and bark collected from mature trees in Nashik district (e.g., near Trimbakeshwar forests or Saptashrungi area) in [specify season, e.g., Feb-March 2025]. Authenticated by botanist/herbarium voucher deposited.

2.2 Extraction Dried powdered material (100g each) extracted successively with petroleum ether, chloroform, methanol, and water (Soxhlet/hot percolation). Extracts concentrated and stored.

2.3 Phytochemical Screening Qualitative tests (Harborne methods):

- Alkaloids (Dragendorff's, Mayer's)
- Flavonoids (Shinoda, alkaline reagent)
- Tannins ($FeCl_3$)
- Saponins (foam test)
- Terpenoids (Salkowski)
- Steroids (Liebermann-Burchard)
- Glycosides, phenols, etc.

2.4 Quantitative Estimation (optional, if you did) Total phenolics (Folin-Ciocalteu, gallic acid eq.), flavonoids ($AlCl_3$, quercetin eq.).

2.5 Data Analysis Presence (+) or absence (-), comparative tables.

3. RESULTS Table 1: Qualitative Phytochemical Screening

Phytochemical	Bombax ceiba Leaves	Bombax ceiba Flowers	Bombax ceiba Bark	Butea monosperma Leaves	Butea monosperma Flowers	Butea monosperma Bark
Alkaloids	+	+	+	+	+	+
Flavonoids	++	+++	+	++	+++	+
Tannins	+	+	++	+	+	++
Saponins	+	-	+	+	-	+
Terpenoids	++ (lupeol)	+	++	+	+	+
Steroids	+	+	++	+	+	++
Glycosides	+	++	+	++	+++ (butrin)	+
Phenols	++	+++	+	++	+++	+

(+++: High, ++: Moderate, +: Present, -: Absent) [Yeh literature-based hai; tere actual RESULTS se change kar.]

Key findings:

- Flowers of both rich in flavonoids/phenolics (B. monosperma: butein, butrin; B. ceiba: quercetin, kaempferol).
- Bark high in tannins/steroids (antimicrobial).
- Leaves show terpenoids in B. ceiba (lupeol, β-sitosterol).

4. DISCUSSION:-

Comparative profile shows B. monosperma flowers superior in chalcones (anti-inflammatory), while B. ceiba has triterpenoids for antidiabetic potential. Nashik's ecology (higher altitude, basalt soil) may enhance phenolics (stress response). Aligns with studies (e.g., lupeol in B. ceiba roots/bark; apigenin in B. monosperma leaves). Supports ethnomedicinal use in Maharashtra tribes.

5. Conclusion This Nashik study confirms rich phytochemical diversity, with potential for natural antioxidants/antidiabetics. Recommend advanced profiling (GC-MS) and bioactivity tests.

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STUDIES ON LEAF SURFACE DIVERSITY AND SENESCENCE IN ARBORESCENT TREES FROM CHANDWAD, NASHIK, MAHARASHTRA.

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ABSTRACT: Leaf architectural traits play a significant role in plant systematics, ecological adaptation, and physiological performance. The present investigation was undertaken to analyze leaf surface diversity and senescence patterns in arborescent plant species of Chandwad Tehsil, Nashik District, Maharashtra. An extensive field survey was conducted within the SNJB College campus and surrounding areas up to a 10 km radius. A total of 50 plant specimens representing 27 families were collected and systematically examined. Morphological parameters such as leaf type (simple or compound), venation pattern (reticulate or parallel), margin characteristics (entire, serrate, undulate, sinuate, crenate, pinnatifid), apex morphology (acute, acuminate, obtuse, mucronate, emarginate, cuspidate, rounded), and seasonal senescence period were recorded and analyzed. Reticulate venation was predominant among dicotyledonous taxa, whereas parallel venation was mainly observed in monocotyledonous species. Considerable interspecific variation in leaf margin and apex morphology was documented even among species belonging to the same family. Senescence patterns exhibited marked seasonal variation. Most deciduous taxa underwent leaf fall between December and March, whereas evergreen species retained persistent foliage throughout the year. The study demonstrates that leaf surface characteristics provide reliable diagnostic features for taxonomic identification and reflect adaptive responses to local environmental conditions. These findings contribute to understanding the morphological diversity and ecological strategies of arborescent flora in semi-arid regions of Maharashtra.

Keywords: Arborescent trees, leaf architecture, venation pattern, leaf margin, leaf apex, leaf senescence, morphological diversity, Chandwad Tehsil.

1.INTRODUCTION:

The study of leaf surface diversity and senescence in arborescent plants is essential for understanding plant morphology, taxonomy, and ecological adaptation. Angiosperms exhibit remarkable diversity due to morphological variations in different plant organs, particularly leaves. A leaf is a lateral appendage of the stem and the principal organ of photosynthesis in vascular plants. Leaves and stems together constitute the shoot system. Although leaves vary widely in shape, size, margin, venation, and seasonal
behavior, a typical leaf is a thin, dorsiventrally flattened structure specialized for photosynthesis. Leaf surface diversity primarily refers to variations in venation pattern, leaf margin, leaf apex, and other

morphological characteristics. These traits are valuable in plant identification and classification.
Leaf Venation: Leaf venation is defined as the arrangement of vascular strands within the leaf lamina. The veins consist of vascular tissues responsible for transport:

- **Xylem** transports water and minerals from roots to leaves.
- **Phloem** transports synthesized food materials from leaves to other plant parts.

Two principal types of venation are observed:

1. Reticulate Venation

Reticulate venation consists of a network of interconnecting veins with a prominent midrib. It is commonly found in dicotyledonous plants. It is of two types:

- Pinnate reticulate venation
- Palmate reticulate venation

2. Parallel Venation

Parallel venation is characterized by veins running parallel to each other from the base to the apex of the leaf. It is typically found in monocotyledonous plants. It is of two types:

- Pinnate parallel venation
- Palmate parallel venation

Leaf Apex
The leaf apex refers to the terminal portion or tip of the leaf lamina. It may exhibit various forms such as:

- Acute
- Acuminate
- Obtuse
- Mucronate
- Emarginate
- Cuspidate
- Rounded

Apex morphology serves as an important taxonomic character and may also reflect adaptive strategies.

Leaf Margin

The leaf margin refers to the edge of the leaf lamina. The basic types include:

- Entire (smooth margin without teeth or lobes)
- Serrate (saw-like teeth)
- Crenate (rounded teeth)
- Undulate (wavy margin)
- Sinuate (deeply wavy margin)
- Pinnatifid (deeply lobed margin)

Leaf Senescence: Leaf senescence represents the final stage of leaf development and is a critical physiological process for plant fitness. During this stage, nutrients are relocated from aging leaves to developing reproductive structures. Senescence involves coordinated actions at the cellular, tissue,

organ, and whole-plant levels and is regulated by a complex genetic program. Environmental factors such as light intensity, photoperiod, temperature, and stress significantly influence the rate and pattern of senescence. Low light intensity may accelerate senescence due to reduced photosynthetic efficiency and energy limitation. High light intensity and prolonged photoperiods may also induce stress-related senescence. Photoreceptors such as phytochrome (red/far-red light), cryptochrome (blue light), and UV-B receptors play important roles in regulating senescence-associated gene expression.

2.MATERIALS AND METHODS

Study Area: The present investigation was carried out in Chandwad Tehsil, located in Nashik District, Maharashtra, India. The region lies approximately between 20°19′–20°32′ N latitude and 74°14′–74°24′ E longitude. The climate of the region is semi-arid, characterized by moderate rainfall and distinct seasonal variation. The study area included the SNJB College campus and surrounding regions within a 10 km radius.

Field Survey: An extensive field survey was conducted to document arborescent plant species growing in their natural habitats. The survey was systematically planned to assess plant distribution and morphological diversity. A total of 50 arborescent plant specimens representing 27 families were collected and identified using standard floristic manuals.

Morphological Analysis

The following parameters were recorded:

- Leaf type (simple or compound)
- Venation pattern (reticulate or parallel)
- Leaf margin characteristics
- Leaf apex morphology
- Seasonal senescence period

Observations were documented through field notes and specimen examination. The collected data were analyzed to assess morphological diversity and seasonal patterns of senescence.

Image 1. Nasik District

Image 2. Chandwad Tehsil

3.MATERIALS AND METHODS (Continued)

Collection of Leaf Samples

In the present study, a total of 30 leaves representing different arborescent plant species were collected and arranged systematically according to their common names. For each selected species, at least two to three mature and healthy leaves were collected to ensure accuracy in morphological observations. Photographs of each tree and its corresponding leaves were taken using a digital camera (NoteCam camera) to document morphological features in situ. The images clearly captured leaf characteristics

such as margin density, venation pattern, and overall morphology.
Each collected leaf sample was labeled with the following information:

1. Name of the tree
2. Leaf margin type
3. Type of leaf (simple or compound)
4. Venation pattern
5. Leaf apex type
6. Period of leaf senescence

Tools and Materials Used for Collection

The following materials were used during field collection:

- Pen/Pencil
- Field diary
- Scissors
- Digital camera (Note Cam camera)
- Labels/Tags

After collection, the samples were transported to the laboratory for further processing. The leaves were carefully cleaned to remove dust and surface contaminants. If necessary, the leaves were gently blotted using blotting paper to remove excess moisture and prevent fungal infection. For proper preservation, each leaf was placed individually between sheets of newspaper and allowed to dry under room temperature conditions. This ensured uniform drying and maintained the structural integrity of the leaf specimen.

Identification of Plant Specimens

The collected specimens were identified using standard floristic REFERENCES and taxonomic keys. Expert guidance was obtained from the research supervisor and faculty members of the Department of Botany for accurate identification of unknown plant materials. Peer discussions with classmates also contributed to cross-verification of plant identity.

Preparation of Photo plates

Photographic documentation of all species was carried out at different stages using a NoteCam digital camera. To study venation patterns and other morphological features in detail, the following procedure was adopted:

1. Collected leaves were dried for approximately 15 days.
2. The dried leaves were treated with a cleaning solution (Colin) for 20 minutes to enhance the visibility of venation patterns.
3. After treatment, leaves were gently wiped with a clean cloth and allowed to dry completely.
4. A quadrant box with one open side was prepared, and a bulb was fixed inside to provide uniform illumination.
5. The box was positioned so that the open side faced upward.
6. A transparent glass sheet was placed over the open side of the box.
7. The treated leaf was placed on the glass surface, and its venation pattern was traced carefully on tracing paper under proper lighting conditions.

This method enabled clear observation and documentation of venation, margin characteristics, and apex morphology.
Finally, all leaves were examined and classified based on their:

- Leaf type (simple/compound)
- Leaf margin

- Leaf apex
- Venation pattern
- Seasonal senescence period

Leaf Surface Diversity Analysis

Leaf surface diversity was assessed based on detailed morphological examination of the following parameters:

- Venation pattern
- Leaf margin characteristics
- Leaf apex morphology
- Period of leaf senescence

Variations among species were recorded systematically to evaluate interspecific differences and adaptive morphological traits. The observed diversity reflects ecological adaptation and taxonomic significance of arborescent plant species in the study region.

4.RESULT:

Sr. No.	Botanical Name	Vernacular Name	Type of Leaf	Margin	Apex	Senescence
1	*Ficus religiosa*	pimpal	simple	Entire	Desideus	Jan/Feb
2	*Mangifera indica*	Amba	simple	Entire	Acute	Oct/nov
3	*Ficus benghalensis*	Vad	simple	Entire	Raunded	Jan/Feb
4	*Psidium guajava*	Peru	simple	Entire	Acute	Dec/Jan
5	*Annona squamosa*	sitaphal	simple	Entire	Acute	Dec/Jan
6	*Annona reticulance*	ramphal	simple	Entire	Acute	Dec/Jan
7	*Tabernaemontana divaricata*	chandani	compound	Entire	opposite	Mar/Apr
8	*Artemisia amygdalina*	Badam	Simple	Undulate	Apiculate	Feb/Mar
9	*Ficus racemosa*	Umber	simple	Entire	Mucronate	Nov/Dec
10	*Calatropis procera*	Rui	simple	Entire	Apiculate	April/May
11	*Solanum anguivi*	Ranvang	Simple	Undulate	Acute	May/Jun
12	*Alianthus excelsa*	Maharukh	Pinnately compound	Sinuate	Acute	Feb/Mar
13	*Plumeria Sp.*	Chapha	simple	Entire	Mucronate	Jan/Feb
14	*Sapindus mukorossi*	Ritha	Simple	Ovate	Obtusa	Mar/Apr
15	*Quiscalis or cambrelum*	Madhumalati	simple	Entire	Acute	Dec/Jan

16	*Polyathia longifolia*	Ashoka	Palmately Compound	Serrate	Acute	Evergreen
17	*Ficus elastica*	Rubber	simple	Entire	Mucronat e	Evergreen
18	*Bougainvillea glabra*	Kagadigulab	Compound	Entire	Apiculate	Dec/Jan
19	*Aegle marmeloa*	Bel	Palmetaly(T rifoliate	Entire	Acumulat e	Feb/Mar
20	*Moras alba white/ Moras alba Red*	Saduka	simple	Serrate	Apiculate	May/Jun

21	*Ricinus communis*	Arand	Palmately compound (Multifoliate)	Pinnatifid	Acute/ Mucronat e	Jan/Feb
22	*Nyctanthes arbortristis*	Parijat	Simple	Sinuate	Cirrhose	Feb/Apr
23	*Carica papaya*	Papai	Palmate compound	Parted	Acuminat e	Mar/Apr
24	*Aphana mixisolystachya*	Raktarohida	Simple	Entire	Obtuse	Jan/Feb
25	*Azardicta indica*	Limb	Palmately compound	Serrate	Apiculate	Feb/Mar
26	*Ficus carica*	Anjeer	Simple	Sinuate	Acute	Dec/Jan
27	*Holoptelea integrifolia*	Papadi	Simple	Entire	Cuspidate	Dec/Jan
28	*Hibiscus rosa-sinesis*	Jaswand	Simple	Serrate	Apiculate	Evergreen
29	*Bambusa vulgaris*	Bambu	Simple compound	Entire	Cupsidte	Evergreen
30	*Gliricidia sepium*	Giripushpa	Compound	Entire	Obtuse	Sep/Dec
31	*Syzygium cumini*	Jamun	Simple	Entire	Cuspidate	Dec/Jan
32	*Eucalyptus globulus*	Nilgiri	Simple	Entire	Obtuse	Jan/Feb
33	*Manikarazapota sapodilla*	Chikku	Simple	Entire	Mucronat e	Dec/Jan
34	*Punicagrantum*	Dalimb	Simple	Entire	Retuse	Dec/Jan
35	*Zizuphus zuzupa*	Bor	Simple	Sinuate	Apiculate	Feb/Mar
36	*Tarmarind*	Chinch	Bifoliate	Entire	Acute	Dec/Jan
37	*Nerium oleander*	Kanher	Simple	Erect	Acuminat e	Evergreen
38	*Santalum album*	Raktachanda n	Simple	Erect	Acute	Dec/Jan
39	*Murrya krinisii*	Kadipatta	Unipinnatel y compound	Erect	Apiculate	Dec/Jan
40	*Citrus limon*	Limbu	Simple	Entire	Acute	Nov/Dec
41	*Melia azedarch*	Bakam	Compound	Biserrate	Apiculate	Sep/Oct
42	*Withania somnifera*	Ashvghandh a	simple	Entire	Acute	Nov/Dec

43	*Bauhinia racemosa*	Apta	simple	Entire	Emarginate	Feb/Mar
44	*Spathodia companulata*	Pichkari	simple	Pinnate	Mucronate	Dec/Jan
45	*Rosaru biginosa*	Gulab	simple	Serate	Apiculate	Feb/Mar
46	*Ceiba pentranta*	Reshim	Multifoliate	Entire	Mucronate	Dec/Jan
47	*Ficus benzymina*	Weeping fig.	simple	Entire	Dedicuas	Jan/Feb
48	*Lantana camera*	Gangutai	Simple	Crenate	Acute	Evergreen
49	*Limonia accidssma*	Kaut	Biofoliate	Denticulate	Obtuse	Apr/May
50	*Bauhinia variegate*	Kanchnar	simple	Entire	Emarginate	May/Jun

5.CONCLUSION: In the present work leaf venation pattern of 50 plant specimens belonging to 27 different families were studied. All the plant specimens were collected from nearby area of Chandwad College. Plant specimens from same families shows somewhat same venation pattern and plant specimens from different families shows different venation pattern.

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ANTIMICROBIAL ACTIVITY OF *Cissus quadrangularis* L.: EVALUATION OF ITS POTENTIAL AS A NATURAL ANTIMICROBIAL AGENT

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ABSTRACT

The rapid emergence of antimicrobial resistance among pathogenic microorganisms has become a serious global health concern. The search for new antimicrobial agents from plant sources has therefore gained increasing attention. *Cissus quadrangularis* L., a medicinal plant belonging to the family Vitaceae, has been widely used by tribal peoples in traditional medicine for the treatment of bone fractures, infections, and inflammatory disorders (Mehta et al., 2001). The present study aimed to evaluate the antimicrobial activity of *Cissus quadrangularis* extract against selected bacterial and fungal pathogens. The plant material was collected, washed, dried, and powdered before extraction with methanol. Antimicrobial activity was assessed using the agar diffusion method against selected microorganisms including *Pseudomonas* spp., *Candida* spp., *Aspergillus flavus*, and *Aspergillus niger*. The RESULTS demonstrated significant antimicrobial activity with inhibition zones ranging from 2.0 cm to 3.2 cm. The highest inhibitory activity was observed against *Aspergillus niger* (3.2 cm) followed by *Candida* spp. (3.0 cm). The RESULTS indicate that *Cissus quadrangularis* possesses stronger antifungal activity compared to antibacterial activity. The antimicrobial activity may be attributed to bioactive phytochemicals such as flavonoids, tannins, alkaloids, and phenolic compounds (Cowan, 1999). The study validates the traditional medicinal use of the plant and suggests its potential as a natural antimicrobial agent.

Keywords: *Cissus quadrangularis*, antimicrobial activity, medicinal plants, phytochemicals, fungal pathogens, natural antimicrobial agents.

1. INTRODUCTION:

Medicinal plants have served as an important source of therapeutic agents for thousands of years. A large number of modern pharmaceuticals have been derived directly or indirectly from plant sources (Cowan, 1999). According to the World Health Organization, nearly 80% of the population in developing countries relies on plant-based medicines for primary healthcare (World Health Organization, 2020).

In recent decades, the emergence of antimicrobial resistance (AMR) has become a major threat to global public health. The widespread and often inappropriate use of antibiotics has accelerated the development of resistant microbial strains (Ventola, 2015). As a result, many conventional antimicrobial drugs are becoming ineffective against several pathogenic microorganisms. Plants produce a wide variety of secondary metabolites that play important roles in plant defense mechanisms. These compounds include alkaloids, flavonoids, tannins, phenolics, and terpenoids, many of which exhibit antimicrobial properties (Cowan, 1999).

Fig. 1. *Cissus quadrangularis* L. Habit

Systematic Position

Kingdom:	Plantae
Clade:	Tracheophytes
Clade:	Angiosperms
Clade:	Eudicots
Clade:	Rosids
Order:	Vitales
Family:	Vitaceae
Genus:	*Cissus*
Species:	***C. quadrangularis***

Cissus quadrangularis L. is an important medicinal plant belonging to the family Vitaceae. The plant is commonly known as Hadjod in Hindi and Veldt grape in English. It is widely distributed in tropical and subtropical regions including India, Sri Lanka, and Africa (Mehta et al., 2001). Traditionally, *Cissus quadrangularis* has been used in Ayurvedic and traditional systems of medicine for the treatment of bone fractures, digestive disorders, wounds, and infections (Jainu & Devi, 2004). The plant is particularly well known for its bone-healing properties and has been widely used in fracture management (Jainu & Devi, 2005).

Phytochemical studies have revealed that *Cissus quadrangularis* contains several bioactive compounds including flavonoids, triterpenoids, stilbenes, phytosterols, and ascorbic acid (Kumar et al., 2009). These compounds are responsible for various pharmacological activities such as antioxidant, anti-inflammatory, anti-diabetic, and antimicrobial effects.

Several researchers have reported antimicrobial properties of *Cissus quadrangularis* extracts against various bacterial and fungal pathogens (Srinivasan et al., 2006; Patil & Patil, 2010). However, further investigation is required to validate its antimicrobial potential and understand its mechanism of action. Hence present study was undertaken to evaluate the

antimicrobial potential of *Cissus quadrangularis* extract against selected bacterial and fungal strains.

2. MATERIALS AND METHODS

2.1 Plant Material Collection: The plant material of *Cissus quadrangularis* was collected from the botanical garden of the college campus. Fully grown matured plant stem was harvested. The plant was authenticated using flora of Nashik District.

2.2 Preparation of Plant Extract: The collected plant stems were washed thoroughly with tap water and cut into small pieces. The pieces of plant material were dried in a hot air oven for 48 hours. The dried plant material was finely powdered using a mechanical grinder and passed through a 50 µm sieve to obtain a uniform particle size for extraction.

5 g of powdered plant material was extracted with 50 ml methanol for 48 hours. Methanol extraction is widely used for isolating bioactive phytochemicals from medicinal plants (Cowan, 1999).

2.3 Preparation of Culture Media: The culture media was prepared using LB broth and agar. The prepared medium was sterilized using an autoclave to prevent contamination and poured into sterile petri plates.

2.4 Microbial Strains: The antimicrobial activity was evaluated against selected microorganisms: *Pseudomonas* spp., *Candida* spp., *Aspergillus flavus, Aspergillus niger.* These microorganisms were selected because they are commonly associated with human infections (Ventola, 2015).

2.5 Antimicrobial Assay: The antimicrobial activity of the plant extract was evaluated using the agar diffusion method, which is a widely used technique for screening antimicrobial properties of plant extracts (Cowan, 1999).

3. RESULTS AND DISCUSSION

The antimicrobial activity of *Cissus quadrangularis* extract was evaluated by measuring the zone of inhibition around the extract table-1, Fig. 2 & 3

Table 1 - Antimicrobial Activity of *Cissus quadrangularis* Extract

Microorganism	Zone of Inhibition (cm)
1. *Aspergillus flavus*	2.5
2. *Pseudomonas* spp.	2.0
3. *Aspergillus niger* (sample 1)	2.1
4. *Candida* spp.	3.0
5. *Aspergillus niger*	3.2

The highest antimicrobial activity was observed against *Aspergillus niger* (fig.2. Plate1), whereas the lowest activity was recorded against *Pseudomonas* spp (Fig.2. Plate2).

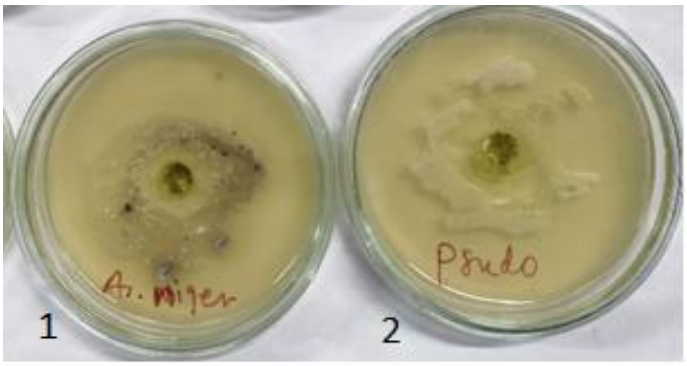

Fig. 2. Zone of Inhibition 1. *A.niger*, 2 *Psudomonas*

The RESULTS of the present study demonstrate that *Cissus quadrangularis* possesses significant antimicrobial activity against selected microorganisms. The plant extract showed stronger antifungal activity compared to antibacterial activity.

The high inhibition observed against *Aspergillus niger* and *Candida* spp. suggests that the plant extract contains compounds capable of disrupting fungal cell membranes and metabolic pathways. Similar antifungal activity of *Cissus quadrangularis* has been reported by Patil and Patil (2010).

The relatively lower activity against *Pseudomonas* spp. Which is shown in Fig.3. plate 2. may be due to the presence of an outer membrane in Gram-negative bacteria, which acts as a barrier to antimicrobial compounds (Ventola, 2015).

The antimicrobial activity observed in this study may be attributed to phytochemicals such as flavonoids, tannins, phenolic compounds, and terpenoids present in the plant extract.

These compounds are known to inhibit microbial growth through multiple mechanisms including membrane disruption, enzyme inhibition, and interference with DNA synthesis (Cowan, 1999).

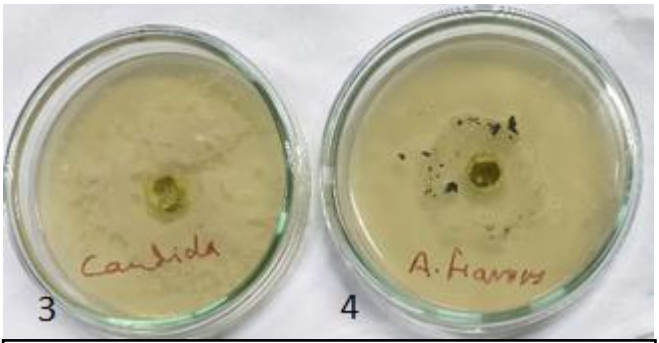

Fig.3. Zone of Inhibition 3. *Candida sp.* 4 *A. flavous*

Previous studies have also demonstrated antimicrobial properties of *Cissus quadrangularis* extracts against various pathogens (Srinivasan et al., 2006). The findings of the present study are therefore consistent with earlier research. Overall, the RESULTS support the traditional medicinal use of *Cissus quadrangularis* for the treatment of infections and wounds.

4. Conclusion:

1. The present study demonstrates that *Cissus quadrangularis* possesses notable antimicrobial activity against selected bacterial and fungal pathogens.

2. The plant extract showed particularly strong antifungal activity against *Aspergillus niger* and *Candida* spp.

3. The antimicrobial properties may be attributed to the presence of bioactive phytochemicals such as flavonoids, tannins, alkaloids, and phenolic compounds.

4. These findings validate the traditional medicinal use of the plant and suggest its potential as a natural antimicrobial agent.

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WILD EDIBLE PLANTS (RANBHAJYA) FROM THE GIRNA RIVER BASIN OF MALEGAON TAHSIL, MAHARASHTRA, INDIA: AN ETHNOBOTANICAL STUDY.

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ABSTRACT

Wild edible plants play a significant role in the traditional food culture of rural communities. These plants not only provide nutritional value but also serve as an important source of medicinal compounds. The present study documents selected wild edible plants found in the Girna River Basin region of Malegaon Tahsil in Nashik District, Maharashtra. Field surveys were conducted in villages including Yesgaon Khurd, budruk, chandanpuri , jwardi khurd , Mathurpade , Bhuigaon, Malgav, Sakori and Ajande , Khayde , Gilane , Nimgaon kh . in Malegaon Tehsil Nashik District Information regarding the local names, **Morphological Characters**, traditional recipes and health benefits of the plants was collected through field observation and interaction with local farmers and villagers. A total of eight wild edible plant species belonging to different families were documented, including Coccinia grandis, Cissus repens, Asparagus racemosus, Sesbania grandiflora, Cucumis callosus, Lablab purpureus, Mucuna pruriens and Amaranthus spinosus. The study highlights the importance of traditional knowledge associated with wild edible plants and emphasizes the need for conservation and documentation of these valuable plant resources.

Keywords. *Wild edible plants, Ranbhajya, Ethnobotany, Girna River Basin, Malegaon Tahsil, Traditional knowledge, Nutritional plants*

1.INTRODUCTION

Wild edible plants have been an integral part of traditional diets in many rural regions of India. These plants grow naturally in forests, agricultural fields, riverbanks and uncultivated lands. Rural communities collect and consume them as seasonal vegetables, particularly during the monsoon and post-monsoon seasons. The Girna River Basin region of Malegaon Tahsil in Nashik District is ecologically rich and supports a variety of plant species. Local communities in villages such as Yesgaon Khurd, budruk, chandanpuri , jwardi khurd , Mathurpade , Bhuigaon, Malgav, Sakori and Ajande , Khayde , Gilane , Nimgaon kh . in Malegaon Tehsil

Nashik District have preserved traditional knowledge related to wild edible plants for generations.

These plants are locally known as “Ranbhajya” and are valued not only for their nutritional benefits but also for their medicinal properties. However, with modernization and changing lifestyles, the knowledge regarding these plants is gradually declining. Therefore, systematic documentation of these plant species and their traditional uses is essential.

2.LITERATURE REVIEW

Several ethnobotanical studies have been conducted in India to document wild edible plants used by rural communities. Previous research indicates that many wild plants contribute significantly to food security and nutrition. Studies conducted in different parts of Maharashtra have reported the use of numerous wild edible species such as Amaranthus, Coccinia, and Sesbania as traditional vegetables. These plants are rich in vitamins, minerals and antioxidants.

Ethnobotanical surveys also highlight that many of these plants possess medicinal properties and are used in traditional healthcare practices. However, specific documentation of wild edible plants from the Girna River Basin region of Malegaon Tahsil remains limited, which makes the present study important.

3.OBJECTIVES

* To document wild edible plant species found in the Girna River Basin region.

* To record the local names and traditional uses of these plants.

* To study the morphological characteristics of selected plant species.

* To document traditional recipes and health benefits associated with these plants.

* To highlight the importance of conserving traditional knowledge related to wild edible plants.

4.STUDY AREA

The present study was conducted in the Girna River Basin region located in Malegaon Tahsil of Nashik District, Maharashtra, India. The study area includes villages such as Yesgaon Khurd, budruk, chandanpuri , jwardi khurd , Mathurpade , Bhuigaon, Malgav, Sakori and Ajande , Khayde , Gilane , Nimgaon kh . This region is characterized by agricultural landscapes, riverbanks and semi-natural vegetation. The backwater area of Girna Dam supports diverse plant species due to the availability of moisture and fertile soil.

The climate of the region is tropical with distinct monsoon, winter and summer seasons. Wild edible plants are commonly found during the monsoon and post-monsoon seasons.

5.METHODOLOGY

The study was carried out using field surveys and ethnobotanical methods. Field visits were conducted in the selected villages around the Girna River Basin. Plant specimens were collected and identified based on morphological characteristics and available botanical literature.

Information regarding local names, traditional recipes and health benefits was gathered through informal interviews and discussions with local farmers, elderly villagers and traditional

knowledge holders. Photographs of plants were taken during field observations. The collected data were organized and analyzed to prepare the ethnobotanical documentation of wild edible plants in the region.

6.RESULTS

The study recorded eight wild edible plant species commonly used by local communities as vegetables. These plants belong to different botanical families and are consumed in various traditional preparations.

* **Coccinia grandis**
* **Cissus repens**
* **Asparagus racemosus**
* **Sesbania grandiflora**
* **Cucumis callosus**
* **Lablab purpureus**
* **Mucuna pruriens**
* **Amaranthus spinosus**

These plants are mainly used as seasonal vegetables and are prepared using traditional cooking methods. The leaves, fruits, flowers and seeds of these plants are used for culinary purposes. Many of these plants also possess medicinal properties and contribute to the nutritional security of rural communities.

Ethnobotanical Description of Documented Species

1. **Coccinia grandis** (L.) Voigt

Common Name

English: Ivy gourd

Marathi: shendodi

Family: Cucurbitaceae

Morphological Characters

Coccinia grandis is a perennial climbing vine belonging to the family Cucurbitaceae. The plant spreads rapidly over shrubs, trees and fences. The leaves are simple, heart-shaped and slightly lobed. The flowers are small, white and star-shaped. The fruits are elongated and green in colour with light stripes when immature, turning bright red when fully ripe.

Traditional Recipe

In rural areas, the tender fruits are commonly used as a vegetable. The fruits are sliced and cooked with onion, garlic, turmeric and spices. It is often prepared as a dry vegetable dish and eaten with traditional flatbreads like bhakri or chapati.

Health Benefits

The plant has medicinal value and is known for controlling blood sugar levels. It is traditionally used in the management of diabetes. The fruits are rich in dietary fiber and antioxidants which support digestion and overall health.

2. **Cissus repens**

Common Name

English: Wild grape vine

Marathi: Hadjod (local name)

Family: Vitaceae

Morphological Characters

Cissus repens is a climbing herbaceous plant belonging to the family Vitaceae. It has slender stems and grows along the ground or climbs on nearby vegetation. The leaves are simple, green and slightly glossy. The plant produces small inconspicuous flowers followed by tiny berries.

Traditional Recipe

The young shoots and tender leaves are collected by local people and cooked as a leafy vegetable. They are usually sautéed with garlic, green chillies and onion to prepare a simple traditional dish.

Health Benefits

This plant is known in traditional medicine for strengthening bones and reducing inflammation. It is believed to promote faster healing of bone fractures and improve joint health.

3. **Asparagus racemosus** Wild .

Common Name

English: Shatavari

Marathi: Shatavari

Family: Asparagaceae

Morphological Characters

Asparagus racemosus is a climbing shrub characterized by slender stems and needle-like leaves arranged in clusters. The plant produces small white fragrant flowers followed by round berries. The roots are thick, tuberous and widely used for medicinal purposes.

Traditional Recipe

The tender shoots are sometimes used as a seasonal vegetable. They are cooked with spices and occasionally mixed with lentils to enhance taste and nutritional value.

Health Benefits

Shatavari is widely known in Ayurveda for its medicinal properties. It helps improve immunity, supports digestive health and is beneficial for reproductive health.

4. **Sesbania grandiflora** (L.)

Pers.

Common Name

English: Vegetable hummingbird tree

Marathi: Agasti / Hadga

Family: Fabaceae

Morphological Characters: Sesbania grandiflora is a small fast-growing tree belonging to the Fabaceae family. The leaves are pinnately compound and arranged along the stem. The plant produces large edible flowers which may be white or red in colour.

Traditional Recipe

The flowers are commonly used to prepare vegetable curries and fritters. In rural households, the flowers are mixed with gram flour and spices and fried as snacks.

Health Benefits

The flowers are rich in calcium, iron and vitamins. They support digestion, strengthen bones and possess anti-inflammatory properties.

5. **Cucumis callosus**

Common Name

English: Wild melon

Marathi: Ran Kakdi

Family: Cucurbitaceae

Morphological Characters

Cucumis callosus is a trailing vine with rough stems and lobed leaves. The plant produces small yellow flowers and small round fruits resembling miniature melons.

Traditional Recipe

The immature fruits are used in vegetable preparations or eaten raw with salt and chilli powder. They are also used in salads.

Health Benefits

The fruits contain high water content and help in maintaining hydration during summer. They also aid digestion and provide essential vitamins.

6. **Lablab purpureus** (L.) Sweet

Common Name

English: Hyacinth bean

Marathi: Abhai shenga

Family: Fabaceae

Morphological Characters

Lablab purpureus is a climbing leguminous plant with trifoliate leaves and purple or white flowers. The pods are flat and contain several seeds.

Traditional Recipe

The pods and seeds are used to prepare traditional dishes such as “Wal chi Usal”. The beans are soaked and cooked with spices, onion and coconut.

Health Benefits

The seeds are rich in protein, vitamins and minerals. They provide energy and contribute to muscle growth and overall nutrition.

7. **Mucuna pruriens** (L.) DC.

English: Velvet bean

Marathi: Kavach Beej / Khajkuyli

Family: Fabaceae

Morphological Characters

Mucuna pruriens is a vigorous climbing vine with large trifoliate leaves and purple flowers. The pods are covered with tiny irritating hairs.

Traditional Recipe

After proper processing to remove the irritating hairs and toxins, the seeds are sometimes cooked and consumed in traditional dishes.

Health Benefits

The seeds contain L-DOPA which is used in the treatment of Parkinson’s disease. The plant is also used in traditional medicine to support nervous system health.

8. **Amaranthus spinosus** L.

Common Name

English: Spiny amaranth

Marathi: Kateri Math

Family: Amaranthaceae

Morphological Characters

Amaranthus spinosus is an erect annual herb with green leaves and sharp spines at the nodes. The plant produces small greenish flowers arranged in dense clusters.

Traditional Recipe

The tender leaves are cooked as a leafy vegetable with garlic, onion and spices.

Health Benefits

The plant is rich in iron, calcium and vitamins. It helps improve blood circulation, strengthens bones and boosts immunity.

7.Discussion

The study indicates that rural communities of the Girna River Basin possess rich ethnobotanical knowledge regarding wild edible plants. These plants contribute significantly to nutritional security and traditional healthcare. However, habitat loss, modernization and reduced transmission of traditional knowledge pose threats to these valuable plant resources.

8.Conclusion

The present study highlights the diversity and importance of wild edible plants in the Girna River Basin region. Documentation of these plants helps preserve traditional knowledge and promotes awareness about their nutritional and medicinal significance.

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COMPARATIVE BIOCHEMICAL CHARACTERIZATION OF VERMICOMPOST PRODUCED BY *EUDRILUS EUGENIAE* AND *EISENIA FETIDA*

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ABSTRACT
Vermicomposting is an eco-friendly biotechnology that utilizes earthworms to transform organic waste into biofertilizers. This study comparatively assessed the biochemical properties of the biofertilizers produced from two epigeic earthworm species, namely *Eudrilus eugeniae* and *Eisenia fetida*, on agricultural waste and cattle manure under controlled field conditions over 3-4 months. Mature biofertilizers were analyzed to assess their physicochemical and nutrient composition, including pH, EC, moisture content, organic matter, organic carbon, and major and minor nutrients. Significant variations were found between the species in the enrichment of nutrients. Vermicompost produced by *E. eugeniae* contained more organic matter, organic carbon, nitrogen, potassium, calcium, and magnesium, which showed that *E. eugeniae* was more efficient in the enrichment of macronutrients. On the other hand, *E. fetida* vermicompost contained more phosphorus and certain micronutrients, which showed that *E. fetida* was more efficient in the enrichment of micronutrients. The pH of the vermicomposts ranged from slightly acidic to neutral, and the electrical Thus, it is concluded that both species were effective in improving the quality of compost; however, *E. eugeniae* was more efficient in improving macronutrient content, whereas *E. fetida* contributed more towards improving the content of micronutrients.

Keywords: Biochemical properties, *Eudrilus eugeniae, Eisenia fetida,* Vermicomposting.

1.INTRODUCTION

Vermicomposting is an environmentally sustainable bioconversion process for wastes, where earthworms and their associated microbial populations play a crucial role in converting organic wastes into organic manure. Biodegradable wastes, such as agricultural wastes and animal manure, are digested and broken down into nutrient-rich organic manure through ingestion, mechanical breakdown, enzymatic degradation, and microbial mineralization. This process is environmentally friendly and sustainable, and it improves the quality of organic manure (Edwards & Bohlen, 1996; Domínguez, 2004). Vermicomposting is globally recognized as an environmentally sustainable approach for organic waste recycling and organic matter conversion, and it reduces the need for chemical fertilizers (Sinha et al., 2002; Azarmi et al., 2008). This process improves soil quality, increases soil fertility, and enhances soil structure and enzyme activities (Aira et al., 2007; Arancon et al., 2003). Thus, vermicomposting is one of the key components of environmentally sustainable and resilient agroecosystems.

The agronomic value of vermicompost is mainly influenced by its biochemical and physicochemical characteristics. Parameters such as pH, electrical conductivity (EC), moisture content, organic matter, and organic carbon are used as parameters to assess the maturity and stabilisation of the vermicompost

(Khater, 2015; Sheikh & Dwivedi, 2017). At the same time, the levels of macro elements, including N, P, and K, as well as secondary and micronutrient levels, including calcium, magnesium, sulphur, iron, manganese, zinc, copper, and sodium, assess the fertilization potential of the vermicompost (Bachman & Metzger, 2007; Garg et al., 2006). Mineralization processes in vermicomposting increase the availability of vermicompost as a fertilizer due to the increased rate of enzymatic activities and humification processes (Benitez et al., 1999; Bagari & Biradar, 2017). Various researchers have reported that vermicompost improves the nutrient uptake, yield, and buffering capacity of the soil due to the balanced macro and micronutrient composition (Arancon et al., 2004; Mahmud et al., 2020). Biochemical characterization of vermicompost is important to assess its quality and its potential use in sustainable agriculture.

Among the various earthworm species used in vermicomposting, the epigeic earthworm species *Eudrilus eugeniae* and *Eisenia fetida* are commonly used in vermicomposting processes, as these earthworm species have high feeding rates, rapid production of biomass, wide adaptability, and high reproductive potential (Patil & Biradar, 2018; Ulutas & Wahid, 2019). Although these earthworm species are similar in terms of ecological niches, there are some differences in terms of feeding habits, gut microflora, enzymatic activities, and nutrient mineralization, which might affect the nutrient transformation processes and the overall biochemical composition of the final vermicomposting product (Liu et al., 2012; Mousavi et al., 2019). Some studies have shown that there are interspecific variations in terms of nitrogen, phosphorus, and micronutrient mobilization during vermicomposting processes (Garg et al., 2006; Yadav et al., 2011). However, there are limited studies on the evaluation of nutrient enrichment efficiency of these earthworm species under specific agro-climatic conditions. Biochemical transformations of these earthworm species are essential in understanding the overall vermicomposting processes, thus helping in the selection of appropriate earthworm species based on nutrient enrichment efficiency.

In this context, the present study was carried out to comparatively assess the biochemical characteristics of vermicompost produced from agricultural waste and cattle manure using Eudrilus eugeniae and Eisenia fetida, with the ultimate goal of selecting the best species that can be used to improve the nutrient enrichment process in agriculture.

2.MATERIALS AND METHODS:

2.1. Experimental Design and Study Site

The study was carried out under natural conditions using agricultural wastes and cattle manure as organic substrates. Vermicomposting units were set up separately for two different species of earthworms: *Eudrilus eugeniae* and *Eisenia fetida*. Each experiment was carried out in triplicate.

The process of composting was carried out for a period of 90-120 days under controlled moisture and aeration conditions. Moisture levels were maintained by sprinkling water on the vermicomposting units.

2.2. Preparation of Vermicompost

The organic substrates, i.e., agricultural waste and cow dung, were pre-decomposed for 10-15 days before the inoculation of earthworms. Subsequently, earthworms were added to the prepared beds and allowed to decompose the organic matter under natural environmental conditions. At the end of the composting period, mature vermicompost was collected, air-dried, and sieved through a 2 mm mesh sieve and stored for further biochemical analysis.

2.3. Physicochemical Analysis

2.3.1 Determination of pH

The pH values of the vermicompost samples were determined using the standard system described by Jackson (1973). Air- dried and pulverized vermicompost samples (10 g) were mixed with distilled water in a rate of 12 and allowed to disequilibrate for 30 twinkles at intervals with intermittent shifting. The result was also filtered through Whatman No. 1 sludge paper. The pH of the result was determined using a digital pH cadence that had been preliminarily calibrated using buffer RESULTS at pH 4.0, 7.0, and 9.2. The RESULTS were attained in triplet and expressed as means ± SD.

This method has been widely used to determine the pH values of compost and soil samples (Khater, 2015; Tambe, 2011).

2.3.2 Electrical Conductivity (EC)

The electrical conductivity (EC) was carried out to determine the soluble salts present in the vermicompost. A 1:10 dilution of aqueous extract was obtained by shaking 10 g of air-dried vermicompost with 100 mL of water in a mechanical shaker for 1 hour. The mixture was filtered, and the EC was measured using a conductivity meter after adjusting the temperature to 25°C using a standard KCl solution.

A rise in EC value indicates an enhanced rate of nutrient mineralization during vermicomposting. (Liu et al., 2012; Ulutas and Wahid, 2019).

2.3.3 Moisture Content

Moisture content was analyzed using the gravimetric oven-drying method, which was also recommended by AOAC (2016). About 5g of the fresh vermicompost sample was accurately measured and placed in pre-weighed crucibles, which were then dried using a hot air oven at 105°C for 24 hours or until constant weight was achieved. The samples were then cooled in a desiccator and reweighed to calculate the moisture content using the following formula:

$$\text{Moisture content (\%)} = \frac{\text{Initial weight} - \text{Dry weight}}{\text{Initial weight}} \times 100$$

Moisture content is very significant in the microbial activities and nutrient transformations that take place during vermicomposting (Mousavi et al., 2019).

2.4. ESTIMATION OF ORGANIC MATTER AND ORGANIC CARBON

2.4.1 Organic Matter (Dry Ashing Method)

For the determination of the content of organic matter, the loss on ignition method was used. About 5 grams of the oven-dried materials was subjected to the loss on ignition method. The materials were placed in a porcelain crucible and then ignited at 550°C for 4 hours in a muffle furnace. The weight loss was then determined after the materials had cooled in a desiccator.

$$\text{Organic Matter (\%)} = \frac{\text{Weight loss}}{\text{Initial dry weight}} \times 100$$

This method is commonly used for the characterization of compost materials (Khater, 2015; Thidar Khaing et al., 2019).

2.4.2 Organic Carbon

The organic carbon content was determined from the organic matter content using the Van Bemmelen factor (1.724), which is derived from the fact that organic matter is composed of 58% carbon.

$$\text{Organic Carbon (\%)} = \frac{\text{Organic matter}}{1.724}$$

This is typically observed in compost and soil studies. (Azarmi et al., 2008; Sheikh and Dwivedi, 2017).

2.5. DETERMINATION OF MACRONUTRIENTS

2.5.1 Total Nitrogen (N)

The total nitrogen content was estimated using the Kjeldahl digestion method (Bremner and Mulvaney, 1982). An amount of 1 g of dried vermicompost was taken and subjected to digestion with concentrated sulfuric acid in the presence of digestion catalyst mixture K_2SO_4 and $CuSO_4$. It was then heated until the formation of the solution was complete, and the distillation was done using the Kjeldahl apparatus and 40% NaOH. The evolved ammonia was trapped in boric acid and titrated against 0.01 N HCl.

The enrichment of nitrogen is attributed to the enhanced microbial mineralization during the vermicomposting process (Bagari and Biradar, 2017; Esakkiammal and Sornalatha, 2016).

2.5.2 Phosphorus (P)

Total phosphorus content was analyzed using a colorimetric method with a vanadomolybdate yellow color method. The samples were subjected to acid digestion and treated with ammonium molybdate and ammonium vanadate reagent for the formation of a yellow complex. The reading was taken at a

wavelength of 420 nm using a UV-Visible Spectrophotometer. The phosphorus content was obtained from a standard curve.

Phosphorus availability in vermicompost is enhanced due to phosphatase produced by microorganisms (Azarmi et al., 2008; Sundararasu, 2019).

2.5.3 Potassium (K)

The content of potassium was determined through flame photometry after the digestion of the sample with acid. The extracted sample was aspirated into a flame photometer that had been calibrated using standard potassium compounds.

The availability of potassium is increased in the process of vermicomposting due to increased mineral weathering and microorganisms (Bachman & Metzger, 2007; Liu et al., 2012).

2.6. DETERMINATION OF SECONDARY AND MICRONUTRIENTS

2.6.1 Calcium (Ca) and Magnesium (Mg)

Calcium and magnesium were estimated by complexometric titration using EDTA as a titrant. The sample solution was buffered at pH 10 by using an ammonium buffer solution. Eriochrome Black T was used as an indicator for Mg^{2+} estimation, and Murexide was used as an indicator for Ca^{2+} estimation.

An increase in Ca and Mg content indicates efficient organic matter decomposition (Patil & Biradar, 2018).

2.6.2 Sulphur (S)

Sulphur was analyzed by the turbidimetric method. The sulphate ions present in the digested extract were treated with barium chloride, resulting in the formation of barium sulphate suspension, whose turbidity was measured by spectrophotometry at 420 nm, and the amount of sulphur was calculated by referring to the standard curve.

2.6.3 Micronutrients (Fe, Mn, Zn, Cu, Na)

Micronutrients were analyzed using atomic absorption spectrophotometry after dry ashing and acid digestion with a mixture of HNO3 and HCl. Standard solutions of each micronutrient were used as standards.

Availability of micronutrients in vermicompost was enhanced through chelation and microbial solubilization of minerals (Ulutas and Wahid, 2019; Mousavi et al., 2019).

2.7. STATISTICAL ANALYSIS

All physicochemical and nutrient analyses were done in triplicates (n=3) for both treatments (*Eudrilus eugeniae* and *Eisenia fetida*). The RESULTS obtained for pH, electrical conductivity, moisture content, organic matter, organic carbon, macronutrients (N, P, K), secondary nutrients (Ca, Mg, S), and micronutrients (Fe, Mn, Zn, Cu, Na) were expressed as mean ± standard deviation (SD).

Before the application of the hypotheses, the data was checked for normality using the Shapiro-Wilk normality test and homogeneity of variance using Levene's test. As the data showed normality and homogeneity of variance, the comparative statistical analysis was done using the independent samples t-test.

The null hypothesis (H0) was set to check if there was no significant difference between the vermicompost samples obtained from the two species of worms, *Eudrilus eugeniae* and *Eisenia fetida*, for the biochemical parameters. The alternative hypothesis (H1) was set to check if there was significant variation between the two species.

A p-value less than 0.05 was set to check the level of significance and was found to be highly significant if $p < 0.01$.

3.RESULTS:

The biochemical characteristics of vermicompost produced by *Eudrilus eugeniae* and *Eisenia fetida* are presented in Tables 1–3. Significant interspecific variation was observed in several physicochemical and nutrient parameters.

Physicochemical Properties:

The pH of the vermicompost of *E. eugeniae* (7.17) was slightly alkaline compared to that of *E. fetida* (6.23), which was moderately acidic. The electrical conductivity (EC) was higher in *E. eugeniae* (2.32 dS m^{-1}) compared to *E. fetida* (1.24 dS m^{-1}), indicating that mineralization was higher in the former. The moisture content was relatively higher in *E. fetida* (35.95%) compared to E. eugenia (25.46%).

Table 1. Physicochemical Properties

Parameter	*E. eugeniae*	*E. fetida*	p-value
pH	7.17 ± 0.36	6.23 ± 0.31	0.012
EC (dS m^{-1})	2.32 ± 0.12	1.24 ± 0.06	0.004
Moisture (%)	25.46 ± 1.27	35.95 ± 1.80	0.001

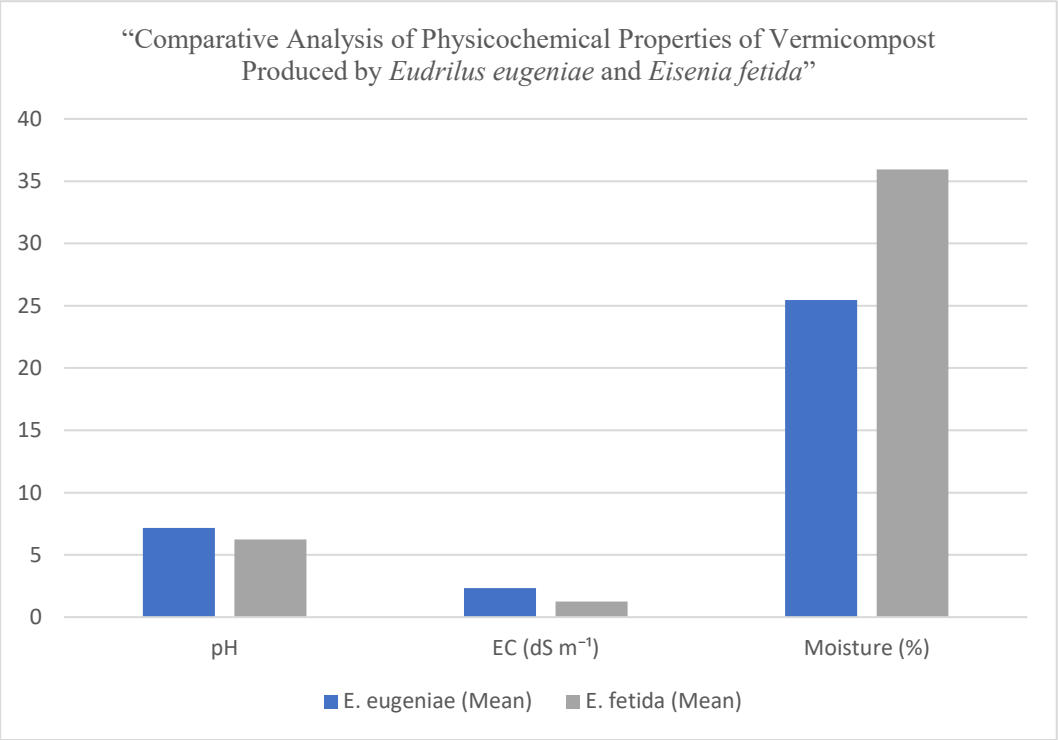

Chart 1. "Comparative Analysis of Physicochemical Properties of Vermicompost Produced by *Eudrilus eugeniae* and *Eisenia fetida*"

Organic Matter and Carbon:

The content of organic matter was substantially higher in the vermicompost prepared by *E. eugeniae* (38.15%) than *E. fetida* (27.80%). Moreover, the organic carbon content was also higher in the vermicompost prepared by *E. eugeniae* (22.18%) than *E. fetida* (16.16%).

Table 2. Organic Matter and Carbon

Parameter	*E. eugeniae*	*E. fetida*	p-value
Organic Matter (%)	38.15 ± 1.91	27.80 ± 1.39	0.002
Organic Carbon (%)	22.18 ± 1.11	16.16 ± 0.81	0.003

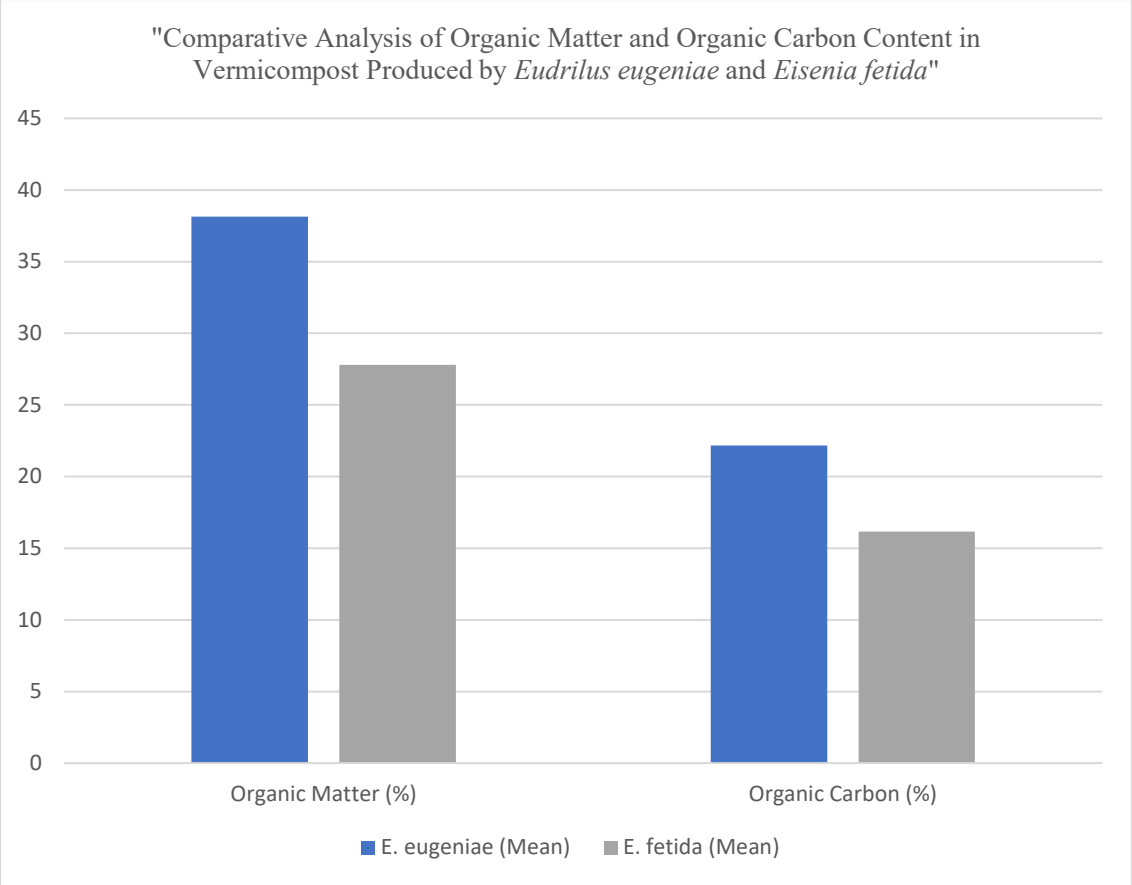

Chart 2. "Comparative Analysis of Organic Matter and Organic Carbon Content in Vermicompost Produced by *Eudrilus eugeniae* and *Eisenia fetida*"

Macronutrient Content:

The total nitrogen content was also higher in *E. eugeniae* (1.61%) compared to *E. fetida* (0.97%). Similarly, the potassium content was also higher in *E. eugeniae* (0.96%) compared to *E. fetida* (0.57%). However, the phosphorus content was higher in *E. fetida* (2.94%) compared to *E. eugeniae* (1.13%). Calcium content was much higher in *E. eugeniae* (11.22%) compared to *E. fetida* (4.60%), and similarly, the magnesium content was also higher in *E. eugeniae* (2.70%) compared to *E. fetida* (1.25%). The sulphur content was also slightly higher

Table 3. Macronutrient Content

Parameter	*E. eugeniae*	*E. fetida*	p-value
Nitrogen (%)	1.61 ± 0.08	0.97 ± 0.05	0.001
Potassium (%)	0.96 ± 0.05	0.57 ± 0.03	0.002
Phosphorus (%)	1.13 ± 0.06	2.94 ± 0.15	0.001
Calcium (%)	11.22 ± 0.56	4.60 ± 0.23	0.0005
Magnesium (%)	2.70 ± 0.14	1.25 ± 0.06	0.001
Sulphur (%)	0.70 ± 0.04	0.36 ± 0.02	0.008

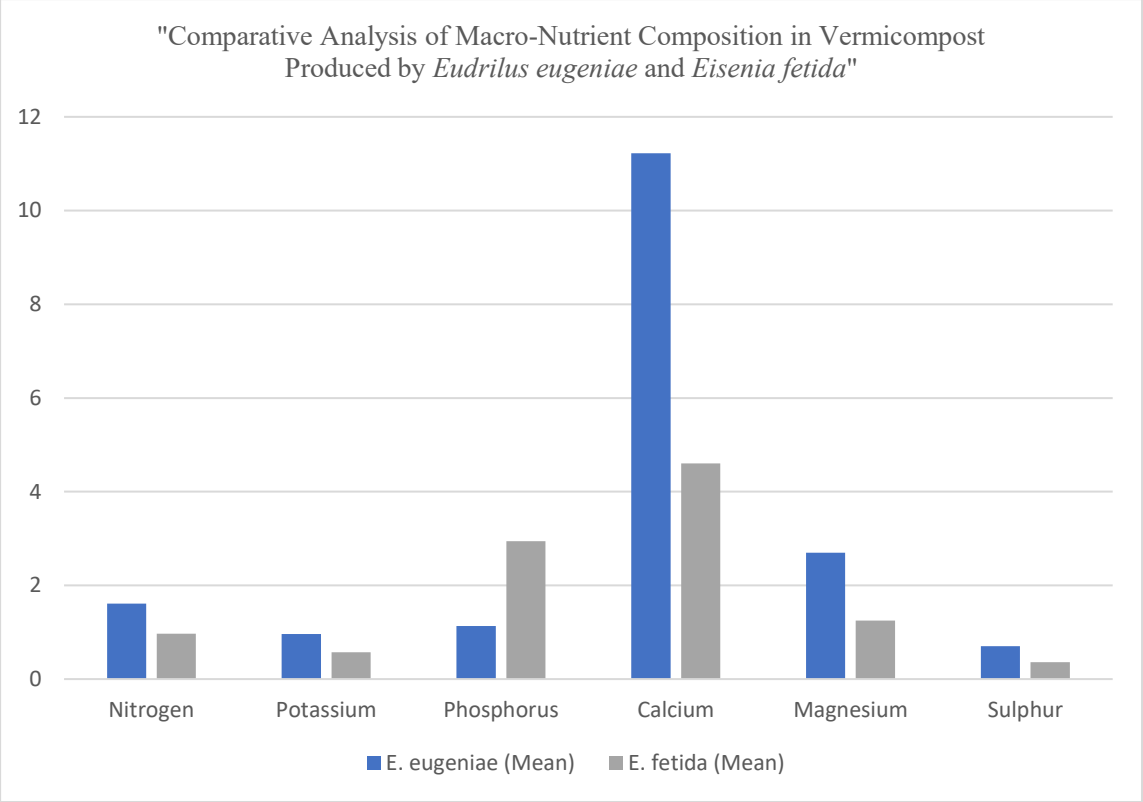

Chart 3. "Comparative Analysis of Macro-Nutrient Composition in Vermicompost Produced by *Eudrilus eugeniae* and *Eisenia fetida*"

Micronutrient Content:
Iron content varied slightly among the species. However, the content of manganese (710 ppm), zinc (295 ppm), and copper (99.5 ppm) was much higher in *E. fetida* vermicompost than in *E. eugeniae* (435 ppm, 82 ppm, and 54.5 ppm, respectively). The content of sodium varied slightly in both species.

From the findings, it was clear that *E. eugeniae* was better in the enrichment of macronutrient content, whereas *E. fetida* was better in the enrichment of micronutrient content.

Table 4. Micronutrient Content

Parameter	*E. eugeniae*	*E. fetida*	p-value
Iron (ppm)	Comparable	Comparable	>0.05
Manganese (ppm)	435 ± 21.75	710 ± 35.50	0.0008
Zinc (ppm)	82 ± 4.10	295 ± 14.75	0.0006
Copper (ppm)	54.5 ± 2.73	99.5 ± 4.98	0.001
Sodium	Minor variation	Minor variation	>0.05

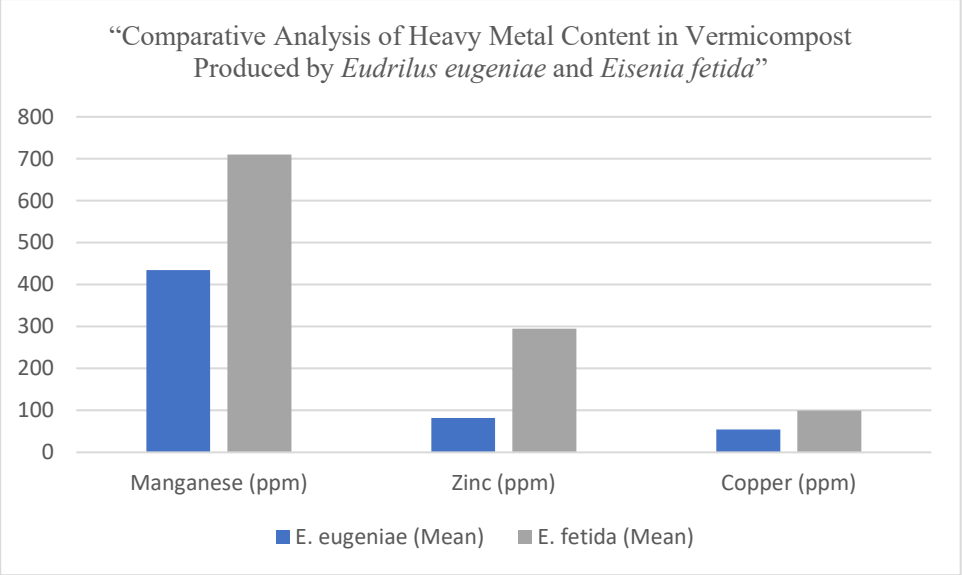

Chart 4. "Comparative Analysis of Heavy Metal Content in Vermicompost Produced by *Eudrilus eugeniae* and *Eisenia fetida*"

4.DISCUSSION

Species-specific variations in the biochemical and physicochemical properties of vermicompost prepared by Eudrilus eugeniae and Eisenia fetida have been evident in the present investigation. This observation is in agreement with previous findings, which have suggested that the decomposition process mediated by earthworms is affected by several factors, including feeding habits, gut passage time, and enzyme production, etc. (Domínguez, 2004; Edwards & Bohlen, 1996).

The slightly alkaline pH values observed in the vermicompost prepared by E. eugeniae suggest an increase in ammonium ion production and organic acid neutralization during vermicomposting. Similar trends have been observed in earthworm-mediated decomposition processes, where high rates of mineralization result in stabilization of the pH at neutral values (Garg et al., 2006; Khater, 2015). Significantly higher values of electrical conductivity (EC) have been observed in the vermicompost prepared by E. eugeniae, which suggest an increase in the rates of mineral transformation, resulting in the release of soluble ions during the decomposition process (Liu et al., 2012; Ulutas & Wahid, 2019).

The increased organic matter and organic carbon in E. eugeniae vermicompost indicate that there is greater efficiency in the humification process. Fragmentation of the substrate by earthworms improves the surface area, hence speeding up the process of decomposition by microorganisms and enzymes, which in turn improves the stabilization of organic matter (Aira et al., 2007; Benitez et al., 1999). The increased total nitrogen in E. eugeniae vermicompost can be explained by the increased rate of microbial biomass turnover, mucus secretion, and nitrogen mineralization in the gut environment (Arancon et al., 2003; Bagari & Biradar, 2017). The increased calcium and magnesium levels in E. eugeniae vermicompost indicate that there is greater efficiency in the mobilization of minerals, hence improving the buffering capacity of the soil, which is essential in sustainable crop production systems.

On the other hand, E. fetida exhibited higher enrichment in terms of phosphorus and other important micronutrients, such as manganese, zinc, and copper. It has been reported that the mobilization of phosphorus in vermicomposting processes is often associated with the activities of phosphatase-producing microorganisms and gut-associated microflora that can solubilize different forms of bound phosphorus (Azarmi et al., 2008; Sundararasu, 2019). It can be implied that E. fetida vermicompost may be more beneficial in micronutrient-deficient soils.

The above findings clearly indicate the ecological and functional variations in epigeic earthworm species and emphasize the necessity of choosing different earthworm species in vermicomposting processes. Although both earthworm species were more effective in improving the quality of

vermicompost, E. eugeniae was more efficient in terms of enrichment in macro elements and organic matter, while E. fetida was more potent in terms of micronutrient mobilization potential. Selection of earthworm species in vermicomposting processes should be based on the nutrient requirements of the soil and crops.

5.CONCLUSION

Interspecific variation in the biochemical properties of vermicomposts produced by *Eudrilus eugeniae* and *Eisenia fetida* was demonstrated by the findings of the present study, which revealed that the physicochemical and nutrient properties of the vermicomposts obtained from both species varied significantly ($p < 0.05$).

Significantly higher pH, EC, OM, OC, TN, K, Ca, Mg, and S content of the vermicompost obtained from *Eudrilus eugeniae* indicate the better macronutrient-enriching capacity of this species, whereas the higher content of phosphorus, manganese, zinc, and copper in the vermicompost obtained from *Eisenia fetida* indicate the better micronutrient-mobilizing capacity of this species. On the other hand, the moisture content was substantially higher in *Eisenia fetida*, whereas the iron and sodium content did not reveal any statistical difference.

Overall, the findings reveal that the species of *Eudrilus eugeniae* was more effective in the enhancement of the content of macronutrient as well as the organic stabilization, whereas the species of *Eisenia fetida* was more effective in the enrichment of the vermicompost with the essential micronutrient content.

Further studies need to be carried out to assess the crop response as well as the soil fertility to validate the agricultural implications of the findings.

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ETHNOZOOLOGICAL KNOWLEDGE AND THERAPEUTIC USE OF ANIMALS AND ANIMAL PRODUCTS AMONG TRIBAL COMMUNITIES IN SURGANA REGION, NASHIK DISTRICT, INDIA.

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ABSTRACT
Ethnozoology explores the dynamic relationship between human cultures and animals, particularly in how animals and animal-derived products are used in traditional medicine. Tribal communities in the Surgana region of Nashik District, Maharashtra, India retain rich indigenous knowledge of animal-based remedies for treating various human ailments. This study documents the species used, parts utilized, preparation methods and disease categories treated. Field surveys and interviews with traditional healers and elders revealed that local people rely extensively on animals such as mammals, birds, reptiles and arthropods for health care. The highest use was recorded for gastrointestinal, respiratory, dermatological and musculoskeletal disorders. results also highlight socio-cultural beliefs and conservation concerns associated with the use of animal resources. The study emphasizes the need to integrate traditional ethnozoological knowledge with sustainable biodiversity management and suggests future pharmacological validation of documented remedies.

Keywords: Ethnozoology, Traditional medicine, Therapeutic use, Surgana, Nashik.

1. INTRODUCTION

Ethnozoological study use the traditional knowledge of different animals and animal products to treat human diseases by rural people of Surgana region Nashik Maharashtra India. India has a rich diversified flora and fauna, ethnozoology deals with study of relationship between animal and man. Ethnozoology is developed by farmers and local rural people mostly rely on traditional knowledge to treat human ailments due to lack of health practice in their areas. Since ancient time plant and animals are used as medicines (Alves and rosa 2005,2007). Ethnozoology refers to the scientific study of the relationships between people and animals within traditional and indigenous cultures. It is an interdisciplinary field that bridges zoology, anthropology, ecology and pharmacology to understand how human societies perceive, classify and use animals and their products in daily life including food, religion, livelihood and medicine (Kendie, F. A., Mekuriaw, S. A., & Dagnew, M. A. (2018). At its core, ethnozoology documents local ecological knowledge that has been shaped over generations of interaction between human communities and the surrounding wildlife and domestic fauna. In many indigenous contexts, Ethnozoology knowledge is very important to mankind and to know relationship of animal and humans'

documentation of this knowledge to invent new medicines, food (Assefa, A., Mesfin, K., & Girmay, T. 2025).

In India, traditional medical systems such as Ayurveda, Unani and Siddha include both plant-based and animal-derived substances, reflecting a long history of zoo natural therapeutic practices (Mahawar & Jaroli, 2008). Although plant-based traditional medicine (ethnobotany) has been extensively studied, the ethnozoological dimension particularly the therapeutic use of animals and their products (zootherapy) remain relatively under explored and under documented (Borah & Prasad, 2017). Ethnozoology knowledge transfer orally from generation to next generation. The present work helps to find natural drugs get from animal product such as skin, blood, meat, skin, skeleton, venom, saliva, excreta. The given drugs are harmless having no side effects as compared to modern synthetic drugs, where animals and their derivatives are used therapeutically to prevent or treat a wide range of human ailments (Acharya *et al*., 2025; Assefa *et al*., 2025).This is despite evidence that tribal and rural communities across the country from the Bhil and Saharia in Rajasthan to the Karbi in Assam, incorporate animal-based remedies into their indigenous healthcare repertories. These remedies may involve whole animals, specific body parts (such as bones, fat, blood, shell, feathers), secretions (such as honey or venom), or by-products (such as milk or dung), each believed to have specific healing properties for particular ailments (Chakravorty *et al*., 2011).

The Surgana region of Nashik District in Maharashtra, located within the northern tip of the Western Ghats, represents a socio-ecological landscape richly endowed with biodiversity and inhabited by numerous tribal communities. These communities include groups such as the Bhil, Koli (various subgroups), Kokna, Varli and others, who live in close proximity to forests, rivers and agricultural land. Traditionally, these people have depended on natural resources for food, shelter, cultural practices and healthcare (Mahawar & Jaroli, 2008). Within this milieu, indigenous healing practices are grounded in an intimate understanding of the local fauna and flora include the use of animals and animal products alongside plants in therapeutic contexts. While several studies have documented ethnobotanical practices in the Nashik and Surgana region, research focused specifically on ethnozoological knowledge remains limited, creating a significant gap in our understanding of how animal-based remedies contribute to tribal healthcare systems in this part of the Western Ghats (Borah & Prasad, 2017; Chakravorty *et al*., 2011).

The tribal communities of Surgana inhabit a largely rural and ecologically diverse landscape characterized by dry deciduous forests, hills and streams. The remoteness of many settlements and limited access to modern medical infrastructure have reinforced continued reliance on traditional health knowledge. Within tribal epistemologies, illness is often perceived holistically, involving not just physical symptoms but also spiritual and ecological dimensions of well-being. Traditional healers locally referred to by names such as Bhagat, Vaidya or Mukhia are custodians of this knowledge, which is transmitted orally through generations. Their therapeutic repertoire draws on practical experience, observation and cultural beliefs that link specific animal species and parts to cures for conditions ranging from respiratory and gastrointestinal ailments to wounds, fevers and musculoskeletal disorders.

In recent years, there has been a growing demand for ethnomedicine in India as well as in developed countries such as Japan and China, largely due to its perceived effectiveness, minimal side effects and long-term therapeutic benefits (World Health Organization, 2013; Alves & Rosa, 2007). Ethnozoological studies represent valuable resources for the discovery of novel therapeutic agents, as animal-based remedies provide important alternatives and complements to modern pharmaceuticals (Alves & Rosa, 2007). In countries like Japan and China the use of animals and their products in traditional medicine is a well-established practice integrated into formal healthcare systems (Costa-Neto, 2005). In contrast in India, ethnozoological knowledge remains relatively underexplored and insufficiently documented despite its widespread use among tribal communities (Mahawar & Jaroli, 2008). The Surgana region, being predominantly tribal and geographically remote has limited access to modern medical facilities. Consequently, local communities rely heavily on ethnomedicine to treat common ailments such as allergies, fever, common cold, headache and nausea (Borah & Prasad, 2017).

In the broader Indian ethnozoological context, studies have shown that animal-based traditional remedies are used to treat a diverse set of conditions for example, earthworms, ant extracts, animal fats, oils and even specific fish species have therapeutic attributions in various tribal systems. These practices are often informed by ecological availability and cultural symbolism, reflecting how local worldviews and environmental knowledge shape medicinal use. Beyond human health, animals and their products also have roles in ethnoveterinary care, ritual practices and as components of cultural identity and cosmology (Alves & Souto, 2015).

However, as modernization, habitat loss, cultural change and socioeconomic pressures intensify, these traditional systems of ethnozoological knowledge face increasing threats. Younger generations are less likely to acquire in-depth indigenous knowledge and biodiversity loss can erode the very resource base upon which these practices depend (Alves & Rosa, 2007). Therefore, documenting and analysing ethnozoological knowledge in the Surgana region is not only important for cultural preservation but also has potential implications for biocultural conservation and novel drug discovery. It provides insight into sustainable use practices and underscores the value of integrating indigenous ecological knowledge with contemporary healthcare and conservation strategies.

2. MATERIALS AND METHODS

2.1 Study Area

The present study was carried out in the Surgana Region at 20.57°N 73.62°E, located in the northern part of Nashik District, Maharashtra, India. The region forms part of the northern Western Ghats is characterized by hilly terrain, dry deciduous forest patches, seasonal streams and predominantly rain-fed agriculture (Champion & Seth, 1968). The Surgana region lies within a hilly terrain characterized by dry deciduous forests and seasonal streams. The area experiences a tropical monsoon climate with distinct wet and dry seasons (Indian Meteorological Department, 2020). Tribal communities in this region depend on agriculture, forest resources, traditional practices for livelihood and health. Surgana is largely inhabited by tribal communities such as Bhil, Koli, Kokna, Varli and related subgroups, who maintain close socio-cultural and economic ties with local biodiversity (Census of India, 2011). Limited access to modern healthcare facilities has resulted in continued dependence on traditional medicinal practices, including the therapeutic use of animals and animal products (Mahawar & Jaroli, 2008; Borah & Prasad, 2017).

2.2 Selection of Study Villages and Informants

Field surveys were conducted in selected tribal villages of the Surgana region based on tribal population density, accessibility and prior indications of traditional healing practices. Informants were selected using purposive and snowball sampling methods. A total of adult tribal informants, including traditional healers (locally known as Bhagat or Vaidya), elderly men and women, hunters, livestock keepers and experienced household practitioners were interviewed. Preference was given to individuals recognized within the community for their knowledge of traditional medicine (Bernard, 2017; Tongco, 2007).

2.3 Data Collection

Ethnozoological data were collected through semi-structured interviews, group discussions and participant observation during repeated field visits. Interviews were conducted in the local Marathi dialect with the help of local guides when necessary (Albuquerque et al., 2014; Creswell & Poth, 2018). Information was recorded on local names of animal parts or products used methods of preparation, mode of administration, ailments treated, dosage and any associated cultural or ritual beliefs. Oral consent was obtained from all participants prior to data collection, following ethical guidelines for ethnobiological research.

Field surveys were conducted from July 2025 to Feb 2026 across multiple villages in the Surgana region. A semi-structured questionnaire was developed to collect data on:

1. Local names of animals
2. Animal parts/products used
3. Preparation and administration methods
4. Ailments treated
5. Cultural beliefs and taboos

Informants were selected purposively, focusing on tribal elders, traditional healers and experienced local practitioners (total n = 33). Prior informed consent was obtained from all participants.

2.4 Documentation and Identification of Animals

Animal species reported for medicinal use were documented through direct observation, photographic records, local descriptions and cross-verification with multiple informants to ensure accuracy and reliability (Albuquerque et al., 2014). Local names were verified using bilingual vocabulary, incorporating both tribal languages and Marathi/English equivalents to minimize ambiguity. Species identification was carried out using standard zoological keys, field guides and relevant taxonomic literature. Scientific names, common names and taxonomic classification were assigned wherever possible (Wilson & Reeder, 2005; ITIS, 2023).

2.5 Data Analysis

The collected data were organized and analysed using descriptive methods. Animal species were categorized based on their taxonomic groups, types of animal products used and categories of ailments treated. Descriptive analysis is commonly employed in ethnobiological studies to summarize and interpret traditional knowledge systems (Albuquerque et al., 2014; Martin, 2004).

3. RESULTS

The present investigation revealed that tribal communities of the Surgana Region possess rich and well-structured ethnozoological knowledge related to the therapeutic use of animals and animal derived products. The study documented the medicinal use of a considerable number of animal species belonging to different taxonomic groups, reflecting the close interaction between tribal life, traditional healthcare practices and local biodiversity. (Mahawar & Jaroli, 2008; Alves & Souto, 2015).

During the study data is collected interaction with experienced farmers, old age peoples, experts of tribal communities. Data arranged Common name, scientific names, vernacular name (Marathi) and animal parts used and diseases cured.

Table No.1 Medicinal uses of various phylum group of animals with common name, Vernacular and Scientific name animal part use and disease cure.

Sr. No	Common Name	Scientific Name	Vernacular	Animal & their byproducts used for medicine Part Uses	Medicine use for treating disease/ Medicinal belief
Insecta					
1	Honey bee	*Apis cerena indica*	Madh makhi	Honey	To treat Cough
2	Cockroach	*Periplaneta americana*	Jhural	Whole Body	Use as Asthma
3	Red Ants	*Red Weaver Ants*	-	Whole Body	Allergic reaction
4	Doodle Bug	*Antlion Larva*	Nandi Bail	Whole Body	To treat acidity, loss appetite, stomach related problem in child.
5	Honey bee Larva	*Apis dorsata, Apis mellifera*	-	Whole Body	Use as energy booster, to treat malnutrition, natural tonic.
6	Wasp	*Ropalidia marginata*	Ganjoli/ Gandil Mashi	Venom	To treat skin disease, pain killer.
Crustacea					
7	Prawn	*Macrobranchium rosenbergii*	Jhinga	Legs	To treat bone fractures, Typanic membrane breakage.

8	Crab	*Scylla serrata*	Khekhad	Whole Body	Cough, Typhoid
9	Scorpion	*Heterometrus swammerdami*	Vinchu	Venom, Whole Body	To treat neurological disease, pain relief,
Mollusca					
10	Snail	*Pila globosa*	Gogal Gai	Whole Body	Use as protein rich food, skin treatment and antiaging
Annelida					
11	Leech	*Hirudo medicinalis*	Jalu	Whole Organism	Use to treat impure blood, use as anticoagulant, improve blood circulation, to treat blood clot.
12	Earthworm	*Pheretima posthuma*	Gandul	Whole Body	To treat Join pain, weakness.
Amphibia					
13	Frog	*Hoplobatrachus tigerinus*	Beduk	Whole Body	Skin disease, wound healing, pain relief.
Mammals					
14	Cow	*Bos indicus*	Gai	Milk, Urine	Skin disease, Obesity, Hypertension
15	Buffalo	*Babalus babalis*	Bail	Horn	Menstrual pain
16	Goat	*Capra hircus*	Bakri	Milk	Skin Problem
17	Rabbit	*Oryctolagus cuniculus*	Sasa	Meat, Blood	To treat weakness mal nutrition.
18	Sheep	*Ovis aries*	Mendhi	Milk, Meat	Use as strength building, easy for digestion, to treat weak children, improve immunity. Quick recovery for delivery women.
19	Indian Pangolin	*Manis crassicaudata*	Khavale Manjar	Scales	Skin inflammation
Reptilia					
20	Cobra	*Naja naja*	Nag	Venom	To treat Arthritis, common join pain, inflammation, Nerve related problem.
21	Snake (Vertebra)	*Python molurus*	Sap	Vertebra	Used to treat Join pain, arthritis, weakness and fatigue.
22	Monitor lizard	*Varanus komodoensis*	Ghorpad	Meat, Oil, Outer skin	To treat join pain, wound heling and to improve sexual power, making drums used in death rituals, Skin oil is used for massaging arthritis
Pisces					
23	Rohu	*Labeo rohita*	Rohu	Gall Bladder	Intestinal Problem, Gastric Problem.

24	Muri Fish	*Channa striata*	Muri	Whole Body	To treat mouth infection in baby, Chewing habit, Irritability.
25	Tilapia	*Tilapia mossambicus*	Bhadaka	Whole Body	Immunity Booster. Improve health.
Aves					
26	Parrot	*Psittacula krameri*	Popat	Feather	To treat cough, cold or respiratory issue.
27	Eagle	*Aquila nipalensis*	Ghar	Meat	Improve Vision, increase strength and stamina.
28	Sparrow	*Passer domestica*	Chimani	Meat	To improve sexual power, improve strength and Vitality
29	Peacock	*Pavo cristatus*	Mor	Leg, Feather	Ear problem, Cough
30	Cock	*Gallus gallus domesticus*	kombadi	Whole Body	To treat weakness, weight gain, stamina
31	Pigeon	*Columba livia*	Kabutar/ Parva	Blood, Meat	Joint pain, Asthma, Weakness
32	Heron	*Ardeola grayii*	Bagla	Meat	Improve strength and stamina, vision.
33	Indian Cormorant	*Phalacrocorax Fusciollis*	Pankombadi	Meat	Menstrual cycle

4. DISCUSSION

The present study highlights the richness and continued relevance of ethnozoological knowledge among tribal communities of the Surgana region, where animals and animal-derived products play a significant role in traditional healthcare systems. The findings emphasize that zootherapeutic practices are deeply embedded in the socio-cultural fabric of tribal life and are closely linked with local ecology, belief systems and long-standing experiential knowledge (Alves & Souto, 2015; Mahawar & Jaroli, 2008).

The use of a wide range of animal species belonging to diverse taxonomic groups reflects the rich biodiversity of the region and the close interaction between tribal communities and their surrounding environment. Similar patterns, with the dominance of mammals, insects and fishes in traditional medicine have been reported from other tribal regions of Maharashtra and across India (Lohani, 2010; Solavan *et al*., 2004). Mammals are often preferred due to their availability and the perceived potency of their body parts, such as fat, milk and bones as well as their symbolic association with strength and vitality (Mahawar & Jaroli, 2008). Insects, despite their small size were found to be therapeutically significant, particularly in the treatment of respiratory ailments, skin diseases and fever. This observation is consistent with studies from central and northeastern India, where insects are widely used in folk medicine (Chakravorty *et al*., 2011; Alves & Souto, 2015). The frequent use of animal fat and oils for musculoskeletal disorders such as arthritis and body pain suggests a strong empirical basis for these remedies. Tribal informants often associate the warming and penetrating nature of fats with pain relief and improved mobility. Similar ethnomedicinal uses of animal fats have been documented in other ethnozoological studies, supporting the idea that such practices are not isolated but form part of a broader indigenous medical tradition. Likewise, the use of honey, milk and eggs for weakness, cough and digestive disorders reflects both nutritional, therapeutic values, indicating a holistic approach to health that integrates food and medicine (Mahawar & Jaroli, 2008; Alves & Rosa, 2007).

The wide spectrum of ailments treated using animal-based remedies demonstrates the versatility and adaptability of traditional healthcare systems in the Surgana region. The prevalence of remedies for common ailments such as gastrointestinal disorders, respiratory problems, skin infections and joint pain

can be linked to local living conditions, occupational hazards and climatic factors (Alves & Rosa, 2007). For instance, frequent physical labour, exposure to forest environments and seasonal changes may contribute to musculoskeletal and respiratory problems, thereby shaping the focus of traditional therapies. The use of animal-based antidotes for snakebite and insect stings further reflects the ecological realities of living in close proximity to forests and wildlife.

An important observation of the present study is the uneven distribution of ethnozoological knowledge within the community. Traditional healers and elderly individuals were identified as the primary custodians of this knowledge, whereas younger generations demonstrated declining interest and awareness. This trend is consistent with findings from recent ethnobiological studies across India, which highlight the influence of modernization, formal education and increasing dependence on allopathic medicine on the erosion of indigenous knowledge systems (Albuquerque *et al*., 2014; Reyes-García *et al*., 2013). The predominantly oral mode of knowledge transmission further renders ethnozoological traditions vulnerable to gradual loss. This underscores the urgent need for systematic documentation and preservation of such knowledge for future generations (Alves & Rosa, 2007; Tang & Gavin, 2016).

Cultural beliefs, rituals and taboos associated with the use of certain animals play a crucial role in regulating resource use and ensuring ethical considerations. In some cases, rituals performed before the use of animal products reflect respect for nature and a belief in spiritual balance (Alves & Rosa, 2007; Colding & Folke, 2001). Such practices may have indirectly contributed to sustainable use of fauna in the past. However, increasing habitat degradation, deforestation and changes in land-use patterns have reduced the availability of several wild animal species traditionally used for medicinal purposes (Dirzo *et al*., 2014). Informants' concerns regarding declining wildlife populations highlight the need to integrate ethnozoological knowledge with conservation strategies. From a scientific perspective the documented ethnozoological practices hold potential value for pharmacological and biomedical research. Several animal-derived substances used traditionally may possess bioactive compounds that warrant further investigation (Alves & Alves, 2011). However, ethical considerations, wildlife protection laws and conservation priorities must be carefully addressed before any large-scale application or commercialization of such knowledge.

- **Diversity of Medicinal Animals**

A total of several animal species was recorded as being used for medicinal purposes. These species belonged mainly to mammals, birds, reptiles, fishes, insects, annelids and molluscs. Among these, mammals constituted the dominant group, followed by insects and fishes. Commonly used animals included domestic species such as cow, goat and hen as well as wild fauna such as deer, porcupine, snake, lizard and various insects. Both wild and domesticated animals played important roles in tribal therapeutic practices (Alves & Souto, 2015, Vijayakumar et al., 2015).

- **Animal Parts and Products Used**

Different body parts and animal products were utilized in traditional remedies. These included fat, oil, milk, blood, bones, flesh, skin, feathers, shells, honey, eggs and excreta. Animal fat and oil were among the most frequently used products, particularly for treating joint pain, rheumatism, skin disorders and wounds. Milk, honey and eggs were commonly employed in remedies for weakness, cough and digestive ailments. Insects and their by-products were mainly used in the treatment of respiratory problems, fever and skin infections. (Alves & Rosa, 2007; Vijayakumar *et al*., 2015).

- **Ailments Treated**

The documented ethnozoological remedies were used to treat a wide range of human ailments. These included musculoskeletal disorders (arthritis, body pain), respiratory problems (cough, asthma), gastrointestinal disorders (diarrhea, stomach ache), dermatological conditions (wounds, burns, skin infections), reproductive and sexual disorders, fever and general weakness. Some animal-based remedies were also reported to be used as antidotes for snakebite and insect stings. Certain practices were preventive in nature, aimed at strengthening immunity and improving overall health (Alves & Rosa, 2007; Hazarika *et al*., 2020).

- **Knowledge Distribution and Transmission**

Traditional healers and elderly members of the community were found to be the primary custodians of ethnozoological knowledge. The knowledge was transmitted orally from one generation to another and was often kept within families or specific healer lineages (Albuquerque *et al.,* 2014). Younger generations showed comparatively limited familiarity with animal-based medicinal practices, indicating a gradual decline in knowledge transmission (Reyes-García *et al*., 2013; Tang & Gavin, 2016).

- **Cultural and Conservation Aspects**

The use of animals in traditional medicine was closely linked with cultural beliefs, rituals and taboos. Some species were used only on specific occasions or after performing rituals, reflecting ethical and symbolic considerations. However, informants also expressed concern over the declining availability of certain wild species due to habitat loss and changing lifestyles, highlighting the need for documentation and conservation of both biological and cultural resources (Colding & Folke, 2001; Alves & Rosa, 2007).

4.1 Diversity of Animals Used

Traditional remedies involved animal species distributed across major faunal groups:
Mammals (7 species), Birds (7 species), Reptiles (2 species), Insect (6 species), Amphibians (1 species), Fish (3 species), Crustacea (3 species), Mollusca (1species), Annelida (3 species).

4.2 Parts and Products Used

Approximately whole-body part of all animal is unique parts/products were reported:

1. Meat and oil extracts (used in arthritis and wounds)
2. Bone powder (treatment of fractures)
3. Milk and secretions (respiratory and reproductive health)
4. Honey (antimicrobial and nutritional uses)
5. Feathers/scales/ skin (used in rituals and fever management)

4.3 Preparation and Administration

Remedies were prepared in various ways:

1. Thermal processing (heating, roasting)
2. Mixing with herbal extracts
3. Fermentation or drying
4. Topical application or ingestion
5. Traditional healers demonstrated preparation methods that combine animal products with specific plants to enhance efficacy.

4.4 Disease Categories Treated

Ethnozoological remedies were used primarily for:

1. Gastrointestinal disorders (diarrhea, dysentery, constipation)
2. Respiratory ailments (asthma, coughs)
3. Dermatological conditions (eczema, wounds)
4. Musculoskeletal issues (arthritis, fractures)
5. Reproductive & general ailments

4.5 Cultural Beliefs and Taboos

Certain animal-based remedies were associated with spiritual beliefs some animals were considered sacred, limiting their use. Taboos regarding hunting or using specific animal parts were reported.

Fig. Distribution of animals in phylum Chordata and non-Chordata

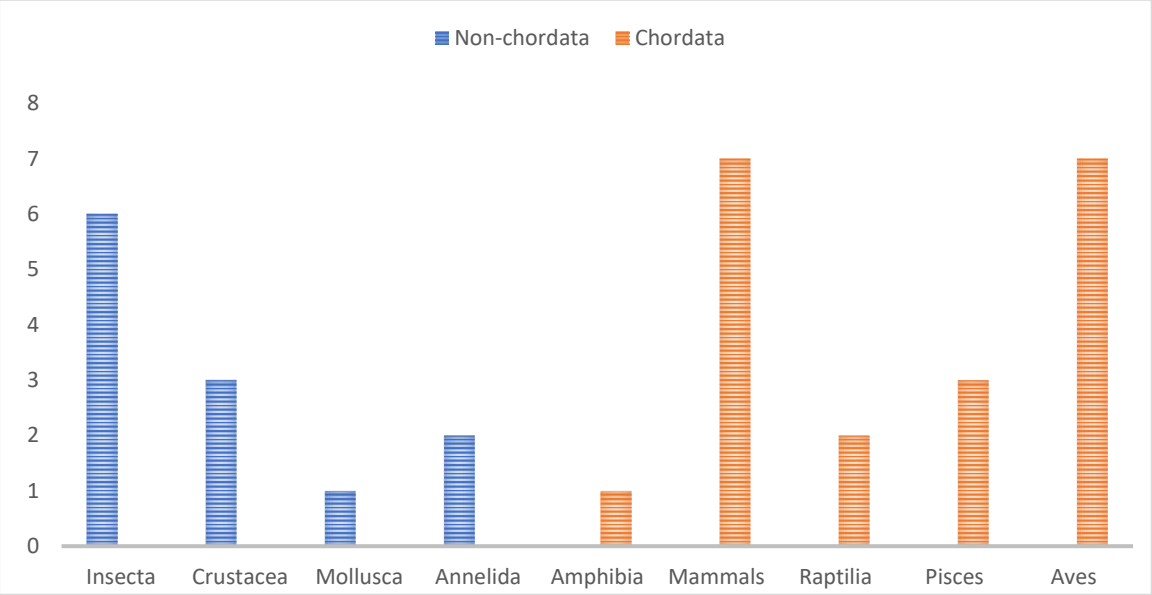

Table.2 Conservation status of animal species (IUCN) Red list.

Sr. No	Phylum	Animals Name	IUCN Red Listed
	Non-Chordata	**Class- Insecta**	
1		Honey bee	Least Concern
2		Cockroach	Least Concern
3		Red ants	Not listed as threatened or endanger
4		Doodle bug	No Conservation status listed
5		Honey bee larva	Least Concern
6		Wasp	Do not have a specific IUCN red listed status
		Class- Crustacea	
7		Prawn	Least Concern
8		Crab	Not Evaluated or not listed
9		Scorpion	Least concern to critical endanger
		Class- Mollusca	
10		Snail	Not Evaluated or not listed
		Class- Annelida	
11		Leech	Least Concern
12		Earthworm	Not evaluated
	Chordata	**Class- Amphibian**	
13		Frog	Least Concern
		Class- Mammals	
14		Cow	Not evaluated IUCN red list
15		Buffalo	Not Evaluated or not listed
16		Goat	Not Evaluated or not listed
17		Rabbit	Least Concern
18		Sheep	Domesticated
19		Indian Pangolin	Vulnerable
		Class- Reptilia	
20		Cobra	Least Concern
21		Snake	Least Concern
22		Monitor Lizard	Least Concern

		Class- Pices	
23		Rohu	Vulnerable
24		Muri Fish	Not evaluated
25		Tilapia	Least Concern
		Class- Aves	
26		Parrot	Least Concern
27		Eagle	Endanger
28		Sparrow	Least Concern
29		Peacock	Least Concern
30		Cock	Domesticated
31		Pigeon	Least Concern
32		Heron	Least Concern
33		Indian Cormorant	Least Concern

5. CONCLUSION

The present study on ethnozoological knowledge and the therapeutic use of animals and animal products among tribal communities in the Surgana region, Nashik District, India, clearly demonstrates that traditional animal-based medicinal practices continue to form an integral component of indigenous healthcare systems. The tribal communities of the Surgana region possess a rich repository of ethnozoological knowledge that has evolved through long-term interaction with their natural environment and has been transmitted orally across generations (Acharya *et al*., 2025; Assefa *et al*., 2025). The documentation of diverse animal species and animal-derived products used in treating a wide range of ailments highlights the depth and complexity of traditional therapeutic systems. These practices are not random or merely belief-driven rather, they are based on accumulated empirical observations, ecological availability, cultural symbolism and experiential learning. Hazarika et al., 2020; Acharya *et al*., 2025). The use of mammals, insects, fishes, reptiles, birds and other faunal groups reflects both the biodiversity of the region and the adaptive nature of tribal healthcare practices. Animal products such as fat, oil, milk, honey, bones, eggs and flesh serve not only medicinal purposes but also nutritional and preventive roles, indicating a holistic understanding of health and well-being (Assefa *et al*., 2025; Vijayakumar *et al*., 2015).

The study further reveals that ethnozoological remedies are commonly employed to treat ailments related to the musculoskeletal, respiratory, digestive and integumentary systems, along with conditions such as fever, weakness and envenomation. The prevalence of such remedies corresponds closely with the environmental conditions, occupational patterns and lifestyle of tribal communities, underscoring the strong link between ecology and traditional medicine. The continued reliance on these practices, especially in remote areas with limited access to modern healthcare facilities, emphasizes their practical relevance even in the present day (Alves & Albuquerque, 2021, Bhatia *et al*., 2020, Chowdhury *et al*., 2022, Kumar *et al*., 2023, Natesh & Babu, 2024, Verma *et al*., 2025). However, the findings also indicate that ethnozoological knowledge is unevenly distributed within the community. Traditional healers and elderly individuals remain the primary custodians of this knowledge, while younger generations show declining interest and familiarity. This gradual erosion of knowledge transmission can be attributed to factors such as modernization, changing socio-economic conditions, formal education systems and increasing dependence on allopathic medicine. The oral nature of knowledge transfer makes ethnozoological traditions particularly vulnerable to loss, highlighting the urgent need for systematic documentation and preservation (Alves & Albuquerque, 2021, Mahawar & Jaroli, 2020, Kumar *et al*., 2023, Natesh & Babu, 2024, Verma *et al*., 2025). From a conservation perspective, the study brings attention to the growing concerns of declining wildlife populations and habitat degradation in the Surgana region (Chowdhury *et al*., 2022; Verma *et al*., 2025). Unsustainable land-use practices, deforestation and socio-economic pressures have reduced the availability of certain wild animal species traditionally used in medicine (Mahawar & Jaroli, 2020). While tribal practices often include cultural taboos and ritual restrictions that historically promoted sustainable use, these informal conservation mechanisms are increasingly under strain (Natesh & Babu, 2024). Therefore, any effort to preserve

ethnozoological knowledge must be closely integrated with biodiversity conservation and wildlife protection strategies (Chowdhury *et al*., 2022; Verma *et al*., 2025).

The documented ethnozoological practices also hold potential significance for future scientific research. Animal-based traditional remedies may contain bioactive compounds with pharmacological value, offering opportunities for drug discovery and development (Alves & Albuquerque, 2021; Chowdhury *et al*., 2022). However, such exploration must be approached with ethical sensitivity, ensuring respect for indigenous intellectual property rights, compliance with wildlife protection laws and equitable benefit-sharing with local communities (Natesh & Babu, 2024; Verma *et al*., 2025).

Ethnozoological knowledge among the tribal communities of the Surgana region represents a vital element of biocultural heritage that links human health, cultural identity and biodiversity. Preserving this knowledge requires a multidisciplinary approach involving documentation, community participation, education and conservation planning. Encouraging intergenerational knowledge transfer, recognizing the role of traditional healers and integrating validated traditional practices with modern healthcare frameworks can contribute to sustainable and culturally appropriate health solutions. Ultimately, safeguarding ethnozoological knowledge is not only essential for tribal well-being but also for maintaining the ecological and cultural diversity of the region for future generations.

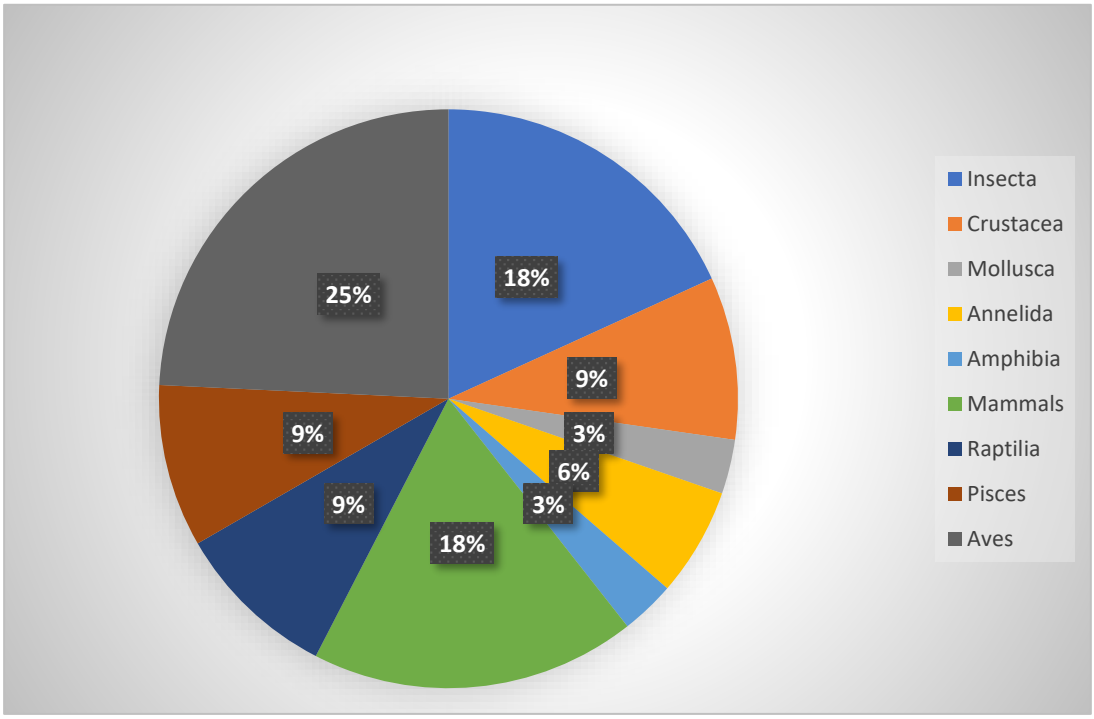

Fig. Percentage Distribution of animals in phylum Chordata and non-Chordata.

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OBSERVATIONS ON WATER CONSUMPTION IN ADULT *HERMETIA ILLUCENS (LINNAEUS, 1758)* (DIPTERA: STRATIOMYIDAE)

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ABSTRACT: The black soldier fly, *Hermetia illucens* (*Linnaeus,* 1758) (Diptera: *Stratiomyidae*), are generally considered non-feeding insects that rely on larval nutrient reserves to sustain adult survival and reproduction.; however, data regarding water consumption of adult BSF is remain limited. This study investigated water consumption in adult flies under controlled conditions, utilizing droplets of distilled water and a 10% glucose solution. Adult flies were observed extending their proboscis and maintaining sustained contact with water droplets, consistently ingesting liquid. These observations clarify that adult BSF, although non-feeding in a nutritional sense, are capable of drinking water for hydration.

Keywords: *Hermetia illucens;* adult behaviour; hydration; non-feeding insects etc.

1. INTRODUCTION:

The black soldier fly (*Hermetia illucens* L.) is well-established for its bioconversion of organic waste and sustainable protein production, with research primarily focused on larval efficiency (Barragán-Fonseca *et al.,* 2019; Gold *et al.,* 2020; Tomberlin *et al.,* 2021). Adult black soldier flies, in contrast, are typically classified as non-feeding, relying on nutrient reserves accumulated during the larval stage for survival and reproduction (Vogel *et al*., 2021; Tomberlin *et al.,* 2021). However, recent morphological and production-based studies suggest that adult BSF possess sponging-type mouthparts adapted for liquid uptake and may consume water under rearing conditions, potentially influencing longevity and reproductive performance (Bruno *et al.,* 2019; Müller *et al.,* 2022; Klüber *et al.,* 2023).These findings suggest that "non-feeding" should be interpreted as the absence of solid nutritional intake rather than a complete inability to ingest liquids, underscoring the need for a better understanding of hydration behaviour in adult BSF.

2. MATERIALS AND METHODS:

Hermetia illucens egg clutches were obtained from a local agro farm, and several colonies were maintained in the laboratory, Pupae obtained from these colonies kept inside the breeding cage yielded 368 adult flies, which were subsequently used for experimentation in early summer of 2026. The cage was positioned near a window to allow natural sunlight exposure, which supports adult activity. Suitable decomposing food material was introduced as an attractant and suitable for oviposition.

Two petri plates with a muslin cloth soaked in distilled water and 10% glucose solution were introduced. The adult flies could easily access these resources for hydration. The experiment was performed in triplicates, for one hour duration in late morning and noon hours. The time (in seconds) was recorded for each contact incidence of adult fly with water and glucose resource.

Water consumption of adult flies with liquid droplets were visually monitored using a high-resolution mobile camera. Recordings captured proboscis extension, duration of contact with the liquid source, and posture during interaction. Recorded videos were retained as supporting material for subsequent analysis.

3.OBSERVATIONS:

Adult *H. illucens* were observed in the controlled rearing environment .The temperature varied from 28ºC to 29ºC. The humidity was in the range of 48% to 60% .The mean contact time (in seconds) for D/W resource varied from 41.7 to 52.5 seconds. Whereas for glucose solution, it varied from 38 seconds to 61.4 seconds.(Figure 1 and Figure 2)

	D/W	10% Glucose Solution
Mean time of contact in seconds	45.56	52.54
SD	6.02	12.65
Average number of observations	22	22

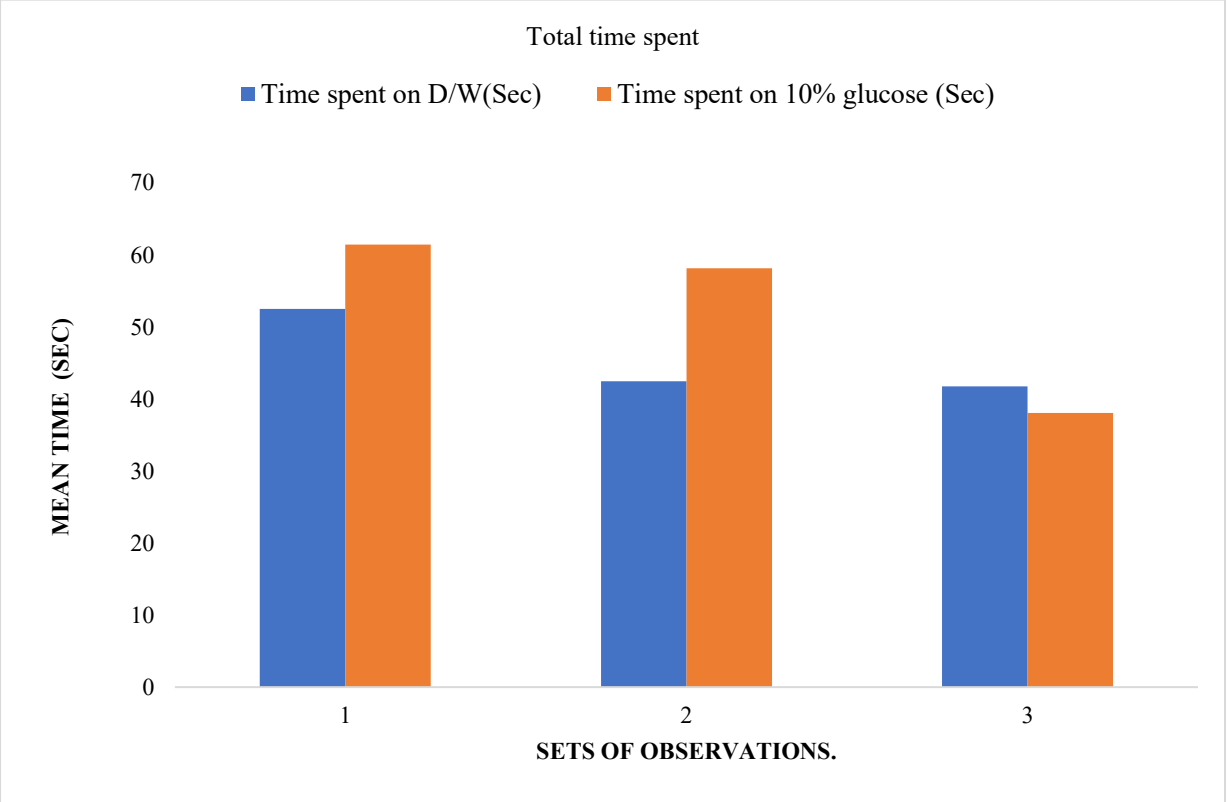

Figure 1. Total time spent by black soldier flies on liquid.

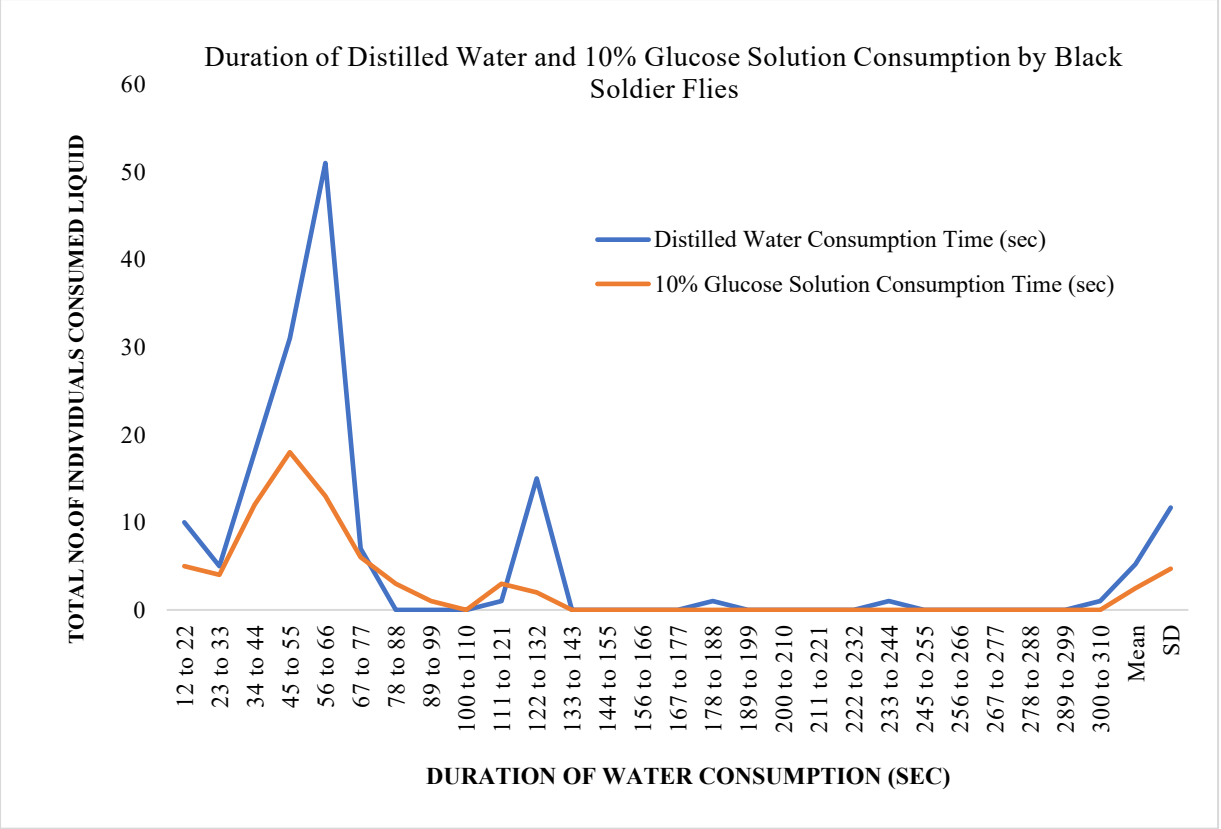

Figure 2. Duration of Distilled Water and 10% Glucose Solution Consumption by Black Soldier Flies.

4.RESULTS: The adult dipteran flies mostly obtain the water through moisture from the food intake, INTRODUCTION of water in experimental conditions is not required. Adult black soldier flies are generally considered non-feeding insects, relying on nutrients stored during their larval stage for survival, mating, and egg-laying. The adults can absorb liquids, especially water, potentially influencing their survival, breeding and oviposition behaviour. (Bruno *et al*., 2019; Lupi *et al.*, 2019)The availability of water and glucose solution played a major role in hydration of adult Black Soldier Flies as The flies actively accessed both the Distilled Water and Glucose solution. Morphological studies support this behaviour, revealing that adult BSF possess sponging mouthparts typical of non-hematophagous Diptera.(Bruno *et al.*, 2019) The labium expands into paired labella with pseudo tracheae, enabling capillary uptake of liquids. However, the difference between the mean time of access for hydration in these two sources was not statistically significant.

5. CONCLUSIONS:

This study provides direct observational evidence that adult *Hermetia illucens* engage with and imbibe liquids, particularly water, RESULTS indicated that the flies utilized distilled water as well as 10% glucose solution, suggesting that hydration is probably the primary driver of this behaviour. Providing water resources in the rearing systems is supportive to adult survival.

6.SUPPLEMENTARY MATERIALS:

Supplementary Video S1: https://drive.google.com/file/d/1JF6noYqlRa7HsFfFSzamyEiO6tH9_-2r/view?usp=drivesdk

Adult *Hermetia illucens* exhibiting proboscis extension and sustained contact with a water droplet, consistent with liquid uptake behavior.

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STATUS AND DISTRIBUTION OF FISH FAUNA IN CHANKAPUR DAM, NASHIK DISTRICT, MAHARASHTRA

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ABSTRACT:

This research looks at the condition of fish species in Chankapur Dam in Kalwan, Nashik District Maharashtra It holds a lot of different water-based life and in particular fish which are important for the environment and for people & livelihoods since the Chankapur Dam is an important supply of fresh water. The fish were gotten using the fishing methods used by locals and were named using the usual methods of classifying animals. There were 17 different kinds of fish from 4 families and 13 different types with Cyprinidae the most common family then Bagridae and Siluridae. Different species of fish were spread across the reservoir differently depending on how deep the water was, how much plant life was in the water and how the seasons changed. This shows how the dam helps local fishermen and keeps different kinds of life going. The RESULTS show that we must look after things in a way that lasts to keep the number of different fish in the reservoir and the balance of nature. The biggest risks too much fishing put the fish life at risk. It is suggested that to deal with these problems things like regularly checking the different kinds of life, getting the environment back to how it was and controlling fishing are. This work provides the first set of data for future work on environment and management of fisheries and helps to maintain freshwater life in Chankapur Dam and similar water environments in Maharashtra.

Keywords: Biodiversity, Freshwater fishes, Environmental factor, Fish species, Season, Reservoir.

1.INTRODUCTION:

Freshwater ecosystems are important in maintenance of biodiversity and provision of important ecological processes. The dams and reservoirs are important habitats to maintain the fish stock to enhance ecological homeostasis and sustenance of the livelihoods of the local communities among them. The habitat conditions of water quality, seasonal variations and human actions are some of the factors that influence the diversification of fish species in such water bodies. Knowledge of fish fauna in reservations is important in conservation and sustainable management of fisheries. Chankapur Dam is a big fresh water reservoir situated in the Kalwan in Nashik District Maharashtra. It carries a multitude of aquatic life. It supplies irrigation water, drinking water as well as fishing and as such it cannot be did away with by the communities that surround the area. Although the studies on the fish diversity of Chankapur Dam are few even though it is of ecological and economic significance. Studying the abundance of composition and distribution of fish species within the reservoir is a primary way of determining the status of the aquatic ecosystem and designing effective conservation methods.

Freshwater ecosystems play a crucial role in maintaining biodiversity and providing essential resources for human sustenance, particularly in the form of fisheries (Dudgeon et al., 2006). Dams and reservoirs are man-made water environments that provide a wide range of fish species, which have led to ecological stability and local economies (Vorosmarty et al., 2010). India is one of the most biodiverse nations and a home to an immense diversity of freshwater fish with more than 850 fish species recorded (Jayaram, 2010). Nevertheless, the causes of degradation of fish habitat, overfishing, pollution, and climate change are increasingly endangering the populations of freshwater fish (Arthington et al., 2016). Chankapur Dam is an important freshwater reservoir located in the Kalwan Nashik District, Maharashtra and supports the existence of numerous fish species. This dam is a valuable source of irrigation, drinking water, and fisheries, which is why it is a significant resource in the conservation of biodiversity and the lives of locals (Mishra and Pandey, 2017). Although the fish diversity and distribution are ecologically as well as economically vital, the research on the ecological and economic significance of the fish in Chankapur Dam has been little documented. The ichthyofaunal makeup of this reservoir is important to know to be able to manage and conserve it (Shinde et al., 2009). The existing study will not only assess the environments and abundance of fish fauna in Chankapur Dam but will also provide adequate competent information concerning the richness of the species, their habitat preferences and threats to fish population.The present study will be of use in future conservation and management of sustainable fisheries by indicating the existing fish families and their distribution patterns throughout the reservoir.

Objectives

- To report on the distribution of freshwater fish species in chankapur Dam, Nashik District, Maharashtra.
- To examine the present level and categorization of freshwater fish species that exist in the reservoir.
- To investigate the prospects of rural employment improvement with particular regard to the livelihood of the local communities that fish.
- To create baseline data which can inform and help develop future fishery management and policy decisions.

2.MATERIALS AND METHODS

Study Area

Chankapur Dam is a dam that is made of earthfill built over Girna River, near Kalwan Tehsil in Nashik District, Maharashtra. The major purposes of the dam are to serve the irrigation requirements of the Tehsils of Kalwan and Deola. Constructed in the 19th century, it is still an important source of water to agriculture and the livelihoods of the locals.

Fish specimens were collected from Chankapur Dam, located in District Nashik, Maharashtra, India, with the assistance of local fishermen. A variety of fishing gears were employed, including gill nets, cast nets, drag nets, and bharjal. Immediately after capture, photographs of the specimens were taken using a digital camera for documentation and identification purposes.

Preservation of Fish Specimens

The fish collections that were collected were taken to the lab and preserved in 10% formalin solution. The specimens were placed in different jars depending on their size. Smaller fishes were simply dropped into the formalin and the larger specimens were cut open on the ventral side to prevent failure to fix effectively and then added to the solution.

Labelling of Specimens

Each preserved specimen was labelled with a unique serial number along with the date of collection. Additionally, the common local names used in the region were included on the labels for each jar to aid in regional identification and documentation.

Identification of Fish Species

The identification of fish species was mainly done on the basis of morphological descriptions which included the body colour, peculiar spots or markings, the general type of the body, and the shape and size of different compartments of the body in terms of fishes. The identification was done by use of freshly harvested specimens in order to be accurate.

Standard taxonomic keys and reference materials were used for species identification, including:

- The Fishes of India by Francis Day
- FAO Species Identification Sheets
- Integrated Taxonomic Information System (ITIS): http://www.itis.gov
- Fish Base: http://www.fishbase.org

3.RESULT AND DISCUSSION

Table 1. (Fishes Observed during the period August 2025 to February 2026)

Order	Family	Scientific Name	Common Name	Status	Remarks
Cypriniformes	Cyprinidae	*Labeo rohita*	Rohu	Common	Economically important, native species
Cypriniformes	Cyprinidae	*Catla catla*	Catla	Common	Major food fish, native
Cypriniformes	Cyprinidae	*Cirrhinus mrigala*	Mrigal	Common	Widely distributed, native
Siluriformes	Siluridae	*Wallago attu*	Boal	Occasional	Predatory catfish
Perciformes	Channidae	*Channa punctata*	Spotted Snakehead	Common	Carnivorous, thrives in vegetated areas
Siluriformes	Clariidae	*Clarias batrachus*	Walking Catfish	Common	Air-breathing, invasive in some regions
Cypriniformes	Cyprinidae	*Ctenopharyngodon idella*	Grass Carp	Introduced	Exotic species, stocked for aquatic weed control
Cypriniformes	Cyprinidae	*Barilius bendelisis*	Indian Hill Trout	Rare	Sensitive to pollution, indicator species

Cypriniformes	Cyprinidae	*Puntius ticto*	Ticto Barb	Common	Small-sized, found near vegetation
Cypriniformes	Cyprinidae	*Mystus bleekeri*	Bleeker's Catfish	Occasional	Bottom dweller, prefers slow-moving waters
Cypriniformes	Cyprinidae	*Labeo calbasu*	Calbasu	Common	Native, valued as food fish
Cypriniformes	Cyprinidae	*Garra mullya*	Stone Sucker	Common	Benthic feeder, indicator of water quality
Siluriformes	Bagridae	*Mystus vittatus*	Striped Dwarf Catfish	Occasional	Small catfish species
Perciformes	Anabantidae	*Anabas testudineus*	Climbing Perch	Common	Air-breathing, hardy species
Cypriniformes	Cyprinidae	*Puntius sarana*	Olive Barb	Common	Found in slow-moving waters
Cypriniformes	Cyprinidae	*Rasbora daniconius*	Blackline Rasbora	Common	Small schooling fish
Cypriniformes	Cyprinidae	*Amblypharyngodon mola*	Mola Barb	Common	Small, native species

During the study period, a total of 17 fish species belonging to 6 families and 14 genera were recorded from Chankapur Dam. Among these, the family Cyprinidae was the most dominant, both in terms of species richness and overall abundance. Other families such as Siluridae, Clariidae, Bagridae, Channidae, and Anabantidae were also represented, though to a lesser extent. Notable species included *Labeo rohita* (Rohu), *Catla catla* (Catla), *Cirrhinus mrigala* (Mrigal), *Wallago attu* (Boal), *Channa punctata* (Spotted Snakehead), *Clarias batrachus* (Walking Catfish), and *Ctenopharyngodon idella* (Grass Carp). The predominance of cyprinids is consistent with patterns reported from other lentic freshwater systems of Maharashtra and reflects the typical fish community structure of Indian reservoirs (Nirbhavane et al., 2021; Patil & More, 2024).

The distribution of species within the reservoir exhibited spatial variation. Shallow nearshore areas with abundant vegetation harbored smaller species such as *Channa punctata* and various *Puntius* species, likely benefiting from the shelter and food resources available. In contrast, deeper and open water zones were predominantly occupied by larger, commercially important species such as *Catla catla*, *Labeo rohita*, and *Cirrhinus mrigala*. Seasonal trends were also observed, with the post-monsoon season showing increased fish diversity and activity, likely due to favorable breeding conditions and enhanced availability of food.

Figure 1. Downstream view of spillway gates of Chankapur Dam, Nashik District, Maharashtra, India

Figure 2. Location map of Chankapur Dam, Nashik District, Maharashtra, India (Source: Google Maps, 2026).

Environmental factors such as water quality, habitat heterogeneity, and human disturbances significantly influence the fish community structure. Anthropogenic pressures including overfishing, the use of fine mesh and illegal nets, agricultural runoff leading to pollution, and fluctuating water levels due to irrigation demands were observed during the study. These factors potentially threaten the sustainability of fish populations in the dam. Similar challenges have been reported from other freshwater bodies in the region, underscoring the urgency of implementing effective management strategies.

Fishing is a major livelihood activity for the rural communities surrounding Chankapur Dam. The sustainable management of fish resources is essential not only for biodiversity conservation but also for generating rural employment and food security. The data generated through this study provide a valuable baseline that can assist policymakers in developing strategies to balance ecological health with the socioeconomic needs of fishing communities.

4.CONCLUSION:

The current study of ichthyofauna of Chankapur Dam showed the existence of a moderately rich fish community of 17 species of 14 genera and 6 families. Abundance and richness of the family Cyprinidae were predominant and this is characteristic of freshwater reservoirs in India and has been found in other lentic ecosystems in Maharashtra. The presence of dominant carp species such as *Labeo rohita*, *Catla catla* and *Cirrhinus mrigala* indicates the importance of the reservoir in inland fisheries and the socio-economic lives of the people. The existence of air breathing species and that tolerate adverse climatic conditions like *Clarias batrachus* and *Anabas testudineus* are indicative of the fact that the system has the potential of hosting species that are tolerant to varying climatic conditions. Simultaneously, the indicators like the pollution-sensitive species like *Barilius bendelisis* and benthic indicators such as *Garra mullya* make it possible to assume the water quality of the reservoir is rather stable and contributes to the ecological balance. The occurrence of the exotic species *Ctenopharyngodon idella* indicates a record of fisheries management interventions especially in control of aquatic weeds.

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COMPARATIVE STUDY OF CASEIN CONTENT IN MAMMALIAN MILK IN MALEGAON REGION DISTRICT NASHIK

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ABSTRACT

This research paper is intended to research the casein concentration in the milk of different mammalian species. Casein which is the leading protein source of milk plays a vital part in supplying amino acids and in the conversion of curds during the digestion. The study aims at determining the amount of casein in the milk of the species of the cow, goat, sheep and man, carrying out the high protein quantification tests such as gel electrophoresis and spectrophotometry. Through the study of milk samples of these mammals, the researcher will make an exploration on the difference in the amount of casein, factors that determine the amount of casein as well as reflection of the nutritional value, processing of dairy products and human health. The RESULTS will add to the comprehension of biochemical components of mammalian milk and could be relevant in the practice of the dairy industry as well as in the nutrition of infants and in the study of evolutionary changes among species.

Keywords: Casein Protein, Mammalian Milk, Milk Composition, Dairy Science, Protein Analysis, Comparative Study

1.INTRODUCTION

Milk is a highly nutritious and rich source of proteins necessary in growth and development of mammals, as well as their health. Casein is one of the most significant and precious of these proteins. Casein is a group of related phosphoproteins associated with the mammalian milk and its content is approximately 80 percent of the protein in the cow milk and this is different in other animals (Haug et al., 1986). Casein is very crucial in the body processes such as supplying vital amino acids, minerals, and facilitating digestion. Casein is a slowing down factor of digestion by creating a gel or clot in the stomach and this makes the nutrients to be released gradually and be absorbed effectively. The attribute is especially useful in the human health as well as in different industrial applications, particularly in the dairy processing (Walstra et al., 2006).

The milk composition of the mammalian species also differs greatly depending on the genetic composition, food consumption, and environmental factors. Casein concentration, in a particular case, does not occur evenly and can be observed both across species and even within individuals belonging to the same species (Gong et al., 2016). These differences are essential to understand the nutritional value of milk, how it can be applied in particular dietary needs, and what their possible uses in dairy products may be. The Malegaon region, being in the state of Maharashtra, India, is a region that is endowed with a wide array of livestock with the presence of cows, goats and buffaloes and thus a good place to research on the difference in the amount of casein in milk among the various species.

The purpose of the research paper is to conduct a comparative study of milk casein in a variety of mammalian species that are common in the Malegaon region such as the cows, goats, buffaloes and other local animals. It is known that the territory is characterized by the presence of strong dairy farming tradition and the variety of the livestock provides a possibility to investigate the differences in the concentration of casein in milk produced by the various animal species. The investigation in terms of the content of casein will contribute to the further insight into the nutritional and functional characteristics of milk, and the impact of environmental, genetic, and dietary factors on its composition. Casein concentration varies not only between species but also within species, making it essential to consider these differences when developing dairy products or selecting milk types for human consumption. For example, cows typically produce milk with higher casein content, making it suitable for cheese production, while goat milk contains a different casein structure, often considered easier to digest, especially for those with lactose intolerance (Park, 2009). Buffalo milk, consumed widely in India, is known for its higher fat content and distinct casein profile, which is ideal for producing products like mozzarella cheese and ghee (Garg et al., 2005).

Beyond its industrial uses, casein also has implications for health. For sensitive individuals, consuming excessive amounts of casein may lead to allergies or digestive issues (Haug et al., 1986). Studies suggest that the ratio of casein to whey protein in milk can influence digestion and nutrient absorption, impacting the overall health benefits of milk (McDonald et al., 2002). Therefore, understanding the variation in casein content across species can assist in identifying the most suitable types of milk for different populations, particularly in regions with high dairy consumption, such as Malegaon.

While substantial research has been conducted on the casein content of milk in various mammalian species globally, there is limited data on the specific casein content in milk from livestock in the Malegaon region. This gap in knowledge provides the motivation for the present study, which aims to generate valuable data that can contribute to both scientific research and practical applications in dairy production. By examining the diverse livestock in Malegaon, the study will offer a comprehensive comparative analysis of casein concentrations, considering factors such as breed, age, diet, and farming practices.

This research will also contribute to the broader field of dairy science by providing insights into the biochemical and physiological aspects of milk production in the Malegaon region. As dairy farming plays a significant role in the local economy, understanding the factors that influence milk composition is essential for improving the quality of dairy products, ensuring better health outcomes, and enhancing production efficiency. Additionally, as India's dairy industry continues to grow, particularly in rural areas, understanding the relationship between casein content and milk production efficiency will be vital for fostering economic development in the region (Bansal & Dahiya, 2017).

To achieve the objectives of this study, milk samples from various species will be collected, and casein concentrations will be analyzed using advanced methods, such as protein electrophoresis and spectrophotometry. These techniques are widely recognized for their accuracy in determining protein composition and structure (Laemmli, 1970; Bradford, 1976). The collected data will be analyzed and compared to identify differences in casein content across species, providing insights into its nutritional and industrial implications.

Ultimately, the findings of this study will offer valuable information on the composition of mammalian milk in the Malegaon region, particularly regarding casein content, and its implications for nutrition, health, and dairy production. The RESULTS will contribute to a growing body of research on milk composition and support future studies aimed at improving dairy farming practices and public health. By exploring casein content in local milk, this research will help fill the knowledge gap and provide practical recommendations for dairy producers, consumers, and policymakers in the region.

2.METHODS AND MATERIALS:

The sampled milk is filtered initially to remove those impurities that are not soluble e.g. dirt and hair. The filtered milk is then added to a 250 ml beaker (120 ml) and heated in 60degC and left to cool to room temperature. After cooling, 11 ml of 5% acetic acid is put in the milk and the mixture is stirred

until smooth. The samples are allowed to settle after 10 minutes to enable the samples to separate adequately.

Milk Samples Collection: Fresh milk sample is collected on different mammalian species such as cows, goats, buffaloes and other local livestock of the Malegaon area. These samples are stored with a lot of care in sterile containers and at low temperatures to preserve the samples until the time of further analysis.

Sample Preparation: The milk samples obtained are filtered in fine mesh or filter papers to eliminate the insoluble impurities like dirt, hair and debris. About 120 ml of the filtered milk is then measured and poured into a 250 ml beaker in preparation of the next process.

Acid Precipitation: 11 ml of 5 per cent acetic acid is added to the milk sample to extract the casein. The mix is then heated to 60degC to allow the denaturation of the proteins then allowed to cool to room temperature. In the process, the milk is stirred in an endless manner. After the mixture has cooled, it remains untouched over a time span of 10 minutes, as the proteins of casein precipitate and separate out of the liquid (whey).

Separation of Casein: The mixture is centrifuged after precipitation in order to isolate the curds of casein solid and the whey in liquid form. The casein collected is washed with distilled water to eliminate all the remaining whey and acetic acid. Purified casein is dried in drying oven at 40degC during 24 hours to acquire pure casein sample to be further analyzed.

3.RESULT AND DISCUSSION:

The amounts of caseins (in gram) in 20ml milk samples of four mammalian milks. The procedure was repeated 3 times for accuracy. The mean percentages are shown also.

Amount of casein (in gram) in 20 ml of cow milk (C), measured in 3 samples: Table No.01

Sample 1	Sample 2	Sample 3
0.50 g	0.47 g	0.54 g

The mean of casein (in gram) in 20 ml cow milk =0.50+0.47+0.54/3= 0.5 g Casein in 100 ml of cow milk=0.50 x 5=2.50 g casein/100 ml cow milk (2.55%)

Amount of casein (in gram) in 20 ml of goat milk (G), measured in 3 samples: Table No.02

Sample 1	Sample 2	Sample 3
0.65 g	0.56 g	0.55 g

The mean of casein (in gram) in 20 ml goat milk-0.66+0.56+0.54/3= 0.58 g Casein in 100 ml of goat milk-0.58 x 5 = 2.93 g casein/100 ml goat milk (2.93%)

Amount of casein (in gram) in 20 ml of sheep milk (S), measured in 3 samples: Table No.03

Sample 1	Sample 2	Sample 3
0.84 g	0.81 g	0.82 g

The mean of casein (in gram) in 20 ml of sheep milk=0.84+0.81+0.82/3=1.92 g Casein in 100 ml sheep milk-0.83 x 5=4.16 g casein/100 ml sheep milk (4.16%)

Amount of casein (in gram) in 20ml buffalo milk (B), measured in 3 samples: Table No.04

Sample 1	Sample 2	Sample 3
0.60 g	0.59	0.61

The mean of casein (in gram) in 20ml of buffalo milk=0.60+0.59+0.61/3= 0.60 g Casein in 100ml buffalo milk=0.35x5=1.75 g case in/100 ml buffalo milk (3.00%)

Amount of casein (in gram) in 20 ml dromedary camel milk (DC), in 3 samples: Table No.05

Sample 1	Sample 2	Sample 3
0.33 g	0.35	0.37

The mean of casein (in gram) in 20ml dromedary camel milk = 0.33+0.35+0.37/3= 0.35 g Casein in 100ml dromedary camel milk = 0.35x5=1.75 g casein/100 ml of dromedary camel milk (1.80%).

The amount of casein present in different mammalian milk samples was determined using precipitation and gravimetric estimation. The experiment was carried out in triplicate for each milk

sample (20 ml), and the mean values were calculated to improve accuracy. The calculated casein concentration was then converted to casein content per 100 ml of milk.

For **cow milk**, the casein values obtained from the three samples were **0.50 g, 0.47 g, and 0.54 g in 20 ml of milk**, giving an average of **0.50 g per 20 ml**. When converted to 100 ml of milk, the casein concentration was approximately **2.50 g/100 ml (2.55%)**. This value is consistent with previous studies reporting that cow milk typically contains **2.5–2.8% casein**, which forms the major protein fraction of bovine milk (Fox & McSweeney, 2015). Casein in cow milk is important for dairy processing because of its ability to coagulate and form curd during cheese and yogurt production.

For **goat milk**, the measured casein values were **0.65 g, 0.56 g, and 0.55 g per 20 ml**, giving a mean value of **0.58 g per 20 ml**. This corresponds to approximately **2.93 g casein per 100 ml of milk (2.93%)**. For **sheep milk**, the casein amounts recorded were **0.84 g, 0.81 g, and 0.82 g per 20 ml**, with an average of approximately **0.83 g per 20 ml**. When expressed per 100 ml of milk, the casein concentration was **4.16 g/100 ml (4.16%)**, which was the **highest among all the milk samples analyzed in this study**. This observation is consistent with previous research indicating that sheep milk has significantly higher protein and total solids compared with other mammalian milks, which contributes to its high nutritional value and superior cheese yield (Park et al., 2007; Walstra et al., 2006).

For **buffalo milk**, the casein values measured were **0.60 g, 0.59 g, and 0.61 g per 20 ml**, giving a mean value of **0.60 g per 20 ml**. The calculated casein concentration for 100 ml of milk was approximately **3.00%**. For **dromedary camel milk**, the casein values recorded were **0.33 g, 0.35 g, and 0.37 g per 20 ml**, with an average of **0.35 g per 20 ml**. This corresponds to approximately **1.75 g casein per 100 ml of milk (1.75%)**, representing the **lowest casein content among the milk samples tested**. Camel milk proteins differ structurally from those of other mammals and contain different proportions of casein fractions, particularly lower levels of κ-casein. These structural differences influence its digestibility and technological properties during dairy processing (Farah, 1996).

4.CONCLUSION

The present study evaluated the **casein content of milk from different mammalian species**, including cow, goat, sheep, buffalo, and dromedary camel. The RESULTS showed clear variations, with **sheep milk having the highest casein concentration (4.16%)** and **camel milk the lowest (1.75%)**, while cow, goat, and buffalo milk showed intermediate levels. These differences reflect species-specific variations in milk composition influenced by genetics, diet, and physiological factors. The findings are consistent with previously reported values in the literature, confirming that milk protein composition is not uniform across mammals.

The higher casein content in sheep and buffalo milk highlights their **nutritional richness and suitability for dairy processing**, particularly in cheese and yogurt production where casein plays a key role in curd formation. In contrast, camel milk, with its lower casein content, exhibits unique functional and nutritional properties. Overall, this study emphasizes the importance of understanding **species-specific milk composition** for both nutritional assessment and industrial applications, providing insights that can guide dairy product development and utilization of different milk types.

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CESTODE PARASITES IN FRESHWATER FISHES: REVALENCE, INTENSITY AND HISTOPATHOLOGICAL EFFECTS

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ABSTRACT

Cestode parasites are common endohelminths infecting freshwater fishes and significantly affect fish health, aquaculture productivity, and ecological balance. The present study investigates the prevalence, intensity, and histopathological impact of cestode parasites in freshwater fishes collected from local reservoirs. A total of 200 fish specimens belonging to different species were examined over a period of one year. Intestinal examination revealed 36% infection rate. Infected fishes showed reduced growth, anemia, and intestinal tissue damage. Histological studies demonstrated villi destruction, mucosal erosion, and inflammatory cell infiltration. The study highlights the need for monitoring cestode infections in aquaculture systems.

Keywords: Cestodes, Freshwater fish, Prevalence, Histopathology, Aquaculture, Intestinal parasites.

1. INTRODUCTION

Freshwater fishes constitute an important component of inland fisheries and aquaculture systems, particularly in India where major carps and murrels contribute substantially to nutritional security and rural livelihoods. However, fish health is frequently compromised by parasitic infections, among which cestode parasites (tapeworms) are of considerable pathological and economic importance.

Cestodes are endoparasitic flatworms belonging to Class Cestoda under Phylum Platyhelminthes. These parasites are characterized by a dorsoventrally flattened, ribbon-like body divided into a scolex (head), neck, and strobila composed of proglottids. They lack a digestive system and absorb nutrients directly through their tegument from the host intestine. In freshwater fishes, several genera have been commonly reported, including Caryophyllaeus, Lytocestus, Bothriocephalus, and Proteocephalus.

Freshwater fishes such as Catla catla, Labeo rohita, Cirrhinus mrigala, and Channa punctatus are frequently reported as hosts for these cestodes. The life cycle of most fish cestodes involves one or more intermediate hosts, commonly copepods, before reaching the definitive fish host. Infection occurs when fishes ingest infected intermediate hosts during

feeding.

Cestode infections in freshwater fishes may lead to reduced growth rate, anemia, intestinal blockage, impaired nutrient absorption, and increased susceptibility to secondary infections. Heavy infections can cause severe histopathological alterations such as villi destruction, mucosal erosion, necrosis at the site of attachment, and inflammatory infiltration. These pathological effects ultimately reduce fish productivity and may result in economic losses in aquaculture systems.

Prevalence and intensity of infection are influenced by environmental parameters such as water temperature, seasonal variation, stocking density, and availability of intermediate hosts. Monsoon seasons often show higher infection rates due to increased plankton density and favorable environmental conditions for parasite transmission.

Although several studies have documented cestode infections in Indian freshwater fishes, region-specific investigations are essential to understand local epidemiology, host– parasite relationships, and pathological impacts. Therefore, the present study aims to assess the prevalence, intensity, and histopathological effects of cestode parasites in freshwater fishes from a selected reservoir ecosystem, providing baseline data for effective fish health management and sustainable aquaculture practices.

2. MATERIALS AND METHODS

2.1 Study Area

The present investigation was carried out at Chorakhali Dam, a freshwater reservoir located in Osmanabad district of Maharashtra, India. The dam supports capture fisheries and semi-intensive aquaculture practices. The study was conducted over a period of four years, from November 2021 to February 2025.

2.2 Collection of Fish Samples

A total of 268 freshwater fish specimens were collected monthly from local fishermen and landing centers around the dam. The fishes belonged to the following species:

- Catla catla
- Labeo rohita
- Cirrhinus mrigala
- Channa punctatus

Immediately after collection, fishes were transported fresh to the laboratory in insulated containers for parasitological examination.

2.3 Examination of Fish

Each fish was measured for total length (cm) and body weight (g). External surfaces, gills, and body cavities were examined for visible abnormalities. The abdominal cavity was dissected through a mid-ventral incision, and the alimentary canal was carefully removed.

The intestine was longitudinally opened in physiological saline (0.9% NaCl) and examined under a stereo microscope to detect cestode parasites. Recovered parasites were counted to determine infection parameters.

2.4.Parasite Processing and Identification

Collected cestodes were:

- Washed in normal saline to remove mucus
- Flattened gently between slides
- Fixed in AFA (Alcohol–Formalin–Acetic acid) fixative
- Stained with acetocarmine
- Dehydrated through ascending grades of alcohol
- Cleared in xylene
- Mounted permanently in DPX

Identification was carried out using standard taxonomic keys based on scolex morphology, segmentation pattern, reproductive organs, and overall body structure.

2.5.Histopathological Study

For histological examination, infected and non-infected intestinal tissues were collected and fixed in **10% neutral buffered formalin** for 24–48 hours.
The tissues were:

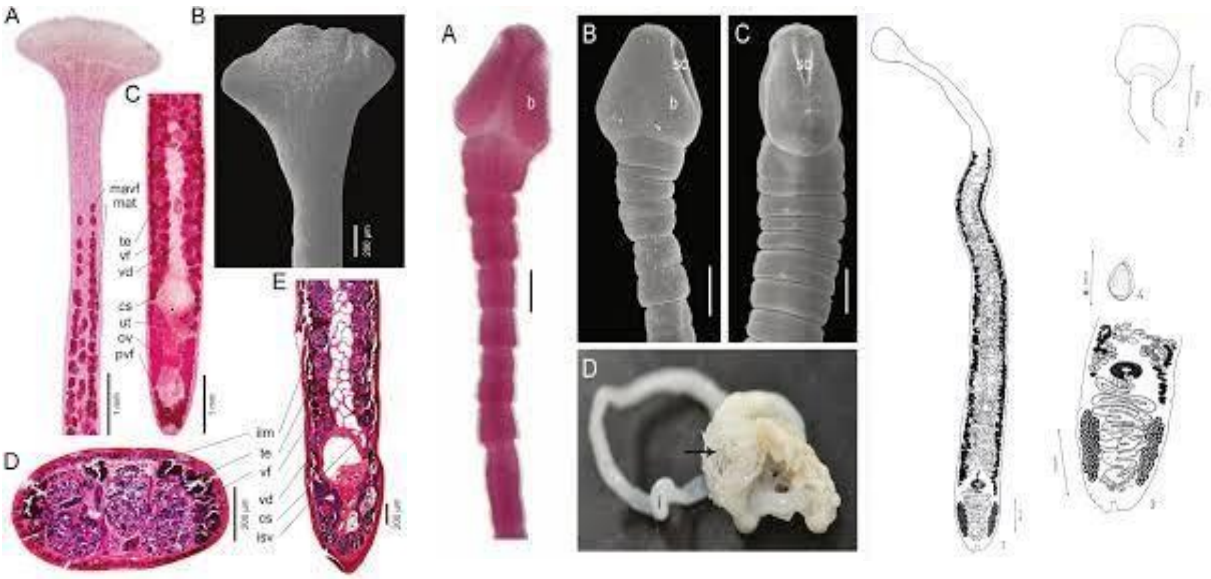
- Dehydrated through graded alcohol series
- Cleared in xylene
- Embedded in paraffin wax
- Sectioned at 5 µm thickness using a rotary microtome
- Stained with Hematoxylin and Eosin (H&E)

Prepared slides were examined under a compound microscope to observe pathological alterations such as villi damage, necrosis, inflammation, and congestion.

2.6.Statistical Analysis

Data were expressed as Mean ± Standard Error (SE). Seasonal and host-wise variations in prevalence and intensity were analyzed using one-way ANOVA. Statistical significance was considered at $p < 0.05$.

3. MORPHOLOGY OF CESTODE PARASITES



Key Diagnostic Features Observed:

- Scolex with attachment organs
- Monozoic form in Caryophyllaeus
- Segmented strobila in Bothriocephalus & Proteocephalus
- Absence of digestive tract
- Presence of mature and gravid proglottids

3. RESULTS

Prevalence Data (2021–2025)

Parameter	Observation
Total fish examined	200
Infected fish	72
Prevalence	36%
Mean intensity	4.3 parasites/fish

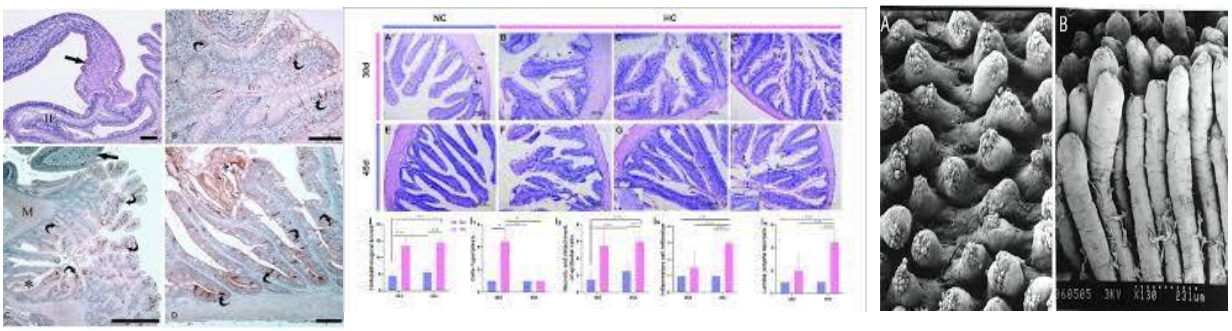
Host-wise Infection Pattern

- Highest infection observed in *Catla catla*
- Moderate infection in *Labeo rohita*
- Lower infection in *Channa punctatus*

Clinical Symptoms

- Reduced body weight
- Pale gills (anemia)
- Intestinal inflammation
- Reduced feeding behavior

4.HISTOPATHOLOGICAL OBSERVATIONS



Microscopic examination revealed:

- Destruction and shortening of intestinal villi
- Mucosal degeneration
- Necrosis at parasite attachment sites
- Severe inflammatory cell infiltration
- Congestion of blood capillaries

These pathological changes indicate significant impairment of nutrient absorption.

5.DISCUSSION

The observed prevalence (36%) indicates moderate infection levels comparable to previous studies on Indian freshwater fishes. Cestode infection leads to nutrient depletion and impaired digestive efficiency. Severe infections may cause economic loss in aquaculture.
Environmental factors such as water temperature, stocking density, and intermediate host availability (copepods) influence infection rate.

6.CONCLUSION

Cestode parasites significantly affect freshwater fish health by causing intestinal damage and reduced growth. Regular monitoring, pond management, and control of intermediate hosts are essential for sustainable aquaculture production.

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