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Diversity Of Aquatic Macrophytes In Komati Cheruvu And Ensanpally Pond Of Siddipet District

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Abstract
The objective of this study is to examine the Aquatic macrophytes of Komati Cheruvu, located in Siddipet (Mandal and District), Telangana state. The experiment on the identification of macrophytes was conducted from January 2024 to March 2024. The macrophytes sourced from the locale were identified and categorized into submerged, floating, and emergent forms of life:
The recorded genera were studied. Macrophytes are large aquatic plants belonging to diverse taxonomic groups, adapted morphologically, anatomically and physiologically to thrive in aquatic habitats such as freshwater, brackish water or seawater. An assemblage of macrophytic vegetation consists of emergent species, whose vegetative parts rise above the water surface, as well as submerged and floating species. Each ecological group has distinct morphological and physiological characteristics. Research should be undertaken to scientifically study and extract important constituents from lesser-known flora by collaborating with indigenous people.
This will allow for the identification of useful species that could further contribute to human welfare. Macrophytes are vital components of aquatic food webs and perform numerous ecological functions within water ecosystems. Their diverse roles highlight the need for conservation of aquatic resources and biodiversity, as these plants not only provide essential ecosystem services but also contribute to ecological balance and local livelihoods.

Keywords: Aquatic macrophytes, KomatiCheruvu,Ensanpally Pond, Siddipet.

Introduction
" The vast category of aquatic vascular plants have been brought under the umbrella term Aquatic Macrophytes" including the microscopic algae and members of the group bryophyta. Macrophytes are the chief exploiters of the nutrients from the sediments, which otherwise are lost temporarily from the water (Shailaja, andAruna, 2023).These nutrients are released only after death and decay of macrophytes and subsequent mineralization. Thus, role of macrophytes in nutrient dynamics and primary productivity of shallow aquatic ecosystems is far more significant than one can visualize.In India, aquatic plants are primarily herbs and shrubs.

Many species grow along the margins of water bodies, some appear during the rainy season and others more resilient, flourish even in dry periods. These plants utilize light energy, water, and carbon dioxide to synthesize carbohydrates and release oxygen into the aquatic environment during photosynthesis, which is then used by other organisms in the same ecosystem. Additionally, macrophytes can influence water temperature and oxygen availability thereby affecting the growth and survival of fish. Beyond providing food and habitat for fish, wildlife and other aquatic organisms, macrophytes stabilize sediments, improve water clarity and add diversity to the shallow areas of lakes. The sampling of aquatic macrophytes is a tedius work and depends on the type of habitat, type of vegetation, variation and distribution of vegetation. Studies related to aquatic and wetland flora were globally carried earlier by Sen and Chatarjee (1959), Subramanyan (1962), Vyas (1964), Mishra (1974), Boylen and Sheldon (1976), Srivastava et al. (1987), Baruah and Baruah (2000), Dhote and Dikshit (2007), Deshkar (2008) and Chandra et al. (2008).

Diversity of aquatic macrophytes:
The objectives related to aquatic macrophytes can vary depending on the context, whether it's scientific research, conservation efforts, ecological restoration, or management of aquatic ecosystems. Here are some common objectives associated with aquatic macrophytes:

Biodiversity Conservation: Protecting and preserving aquatic macrophyte species to maintain biodiversity within freshwater ecosystems.

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Habitat Restoration: Restoring degraded aquatic habitats by reintroducing native macrophyte species to improve water quality, provide habitat for aquatic organisms, and stabilize shorelines.
Water Quality Improvement: Using aquatic macrophytes to remove excess nutrients, pollutants, and sediments from water bodies through processes such as phytoremediation and biofiltration.

Ecosystem Functioning: Understanding the role of aquatic macrophytes in ecosystem processes such as nutrient cycling, carbon sequestration, and provision of habitat and food resources for other organisms.

Invasive species management: Controlling and managing invasive aquatic macrophyte species that can disrupt native ecosystems, alter habitat structure, and interfere with human activities such as recreation and navigation. Aquatic macrophytes offer a comprehensive insight into their pivotal role within freshwater ecosystems, delving into taxonomy, diversity, and ecological functions, such reviews unveil the intricate relationships between macrophytes and their environment. They shed light on how these plants shape habitat structure, foster biodiversity, and provide crucial ecosystem services like nutrient cycling and sediment stabilization.

Moreover, they explore how aquatic macrophytes respond to environmental stressors such as pollution, eutrophication, and climate change, highlighting their resilience or vulnerability in the face of anthropogenic disturbances by synthesizing research on management strategies, including invasive species control and habitat restoration, these reviews provide valuable guidance for conservation efforts.

Additionally, they underscore the broader implications of aquatic macrophyte research, ranging from their role in global carbon sequestration to their socio-economic significance in providing recreational opportunities and supporting fisheries. Through identifying research gaps and proposing future directions, these reviews catalyze scientific inquiry and inform policy development aimed at safeguarding these vital components of freshwater ecosystems. Reviews elucidate the taxonomy and distribution of macrophyte species, offering insights into their ecological niches and evolutionary adaptations. They provide a holistic view of how macrophytes influence water quality dynamics, including nutrient cycling, sedimentation, and the attenuation of pollutants, thereby influencing the overall health and resilience of aquatic habitats.

Furthermore, literature reviews delve into the complex interactions between aquatic macrophytes and associated biota, elucidating their role as habitat providers, food sources, and drivers of species diversity. By synthesizing research on the responses of macrophytes to environmental stressors, such as changing hydrological regimes and invasive species encroachment, these reviews contribute to our understanding of ecosystem dynamics and inform adaptive management strategies. Moreover, reviews of macrophyte literature often highlight their cultural and societal importance, underscoring their aesthetic value, recreational significance, and contributions to human well-being. They also shed light on emerging topics such as the use of macrophytes in phytoremediation efforts, bioenergy production and the potential impacts of climate change on their distribution and phenology.

In summary, literature reviews on aquatic macrophytes serve as foundational documents that synthesize existing knowledge, identify research gaps, and provide guidance for future studies and management practices aimed at conserving and sustainably managing these essential components of freshwater ecosystems.

Materials and Methods

Study Site: Komati cheruvu and Ensanpally pond are located at Siddipet (mandal and district) Telangana state. The present study was carried out on aquatic macrophytes in ponds such as Komati cheruvu and Ensanpally pond, from January-2024 to March 2024. Siddipet one of the 31 districts of Telangana State, lies between Latitude of 18.096406°, Longitude 78.83997° of Komati cheruvu and Ensanpally pond lies between Latitude of 18.083108°, Longitude 78.820762°. The Aquatic macrophytes play a key role in the structural and functional balance of aquatic ecosystems by altering water movement regimes, providing shelter to fish and aquatic invertebrates, serving as a food source, and altering water quality by regulating oxygen balance, nutrient cycles, and accumulating heavy metals.

Result And Discussion

The present study attempts to explore the aquatic plant wealth of Komati cheruvu and Ensanpally pond with reference to aquatic macrophytes. The details of the samples collected during the period of survey were presented in Table 1 and 2. The study identified macrophytes belonging to different families and was recorded. Emergent aquatic macrophytes were found more abundant than compared to submerged forms. Macrophytes oxygen releases add to the dissolved oxygen of the water. Aquatic macrophytes indicate water quality and reduce pollution. Some aquatic plants are used as a food source by humans.

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In the present study a total of 10 species of aquatic macrophytes were recorded in all the selected ponds, out of which, four species belong to free floating, three species belong to submerged and eight species to emergent macrophytes in both Komati cheruvu whereas Ensanpally pond showed complete absence of free floating macrophytes throughout the study period.

1. Submerged Macrophytes: In some macrophyte plants, whether submerged largely or completely, it is observed that the roots may or may not be present (*Hydrilla, Nymphea, Nymphoides, Pistia, Potamogeton*). Most of these submerged aquatic macrophytes belong to the families (*Hydrocharitaceae, Nymphyaceae, Menyanthaceae, Araceae, Potamogetonaceae*).These macrophytes are prevalent in water bodies of various types, like estuaries, rivers, lakes, ponds, natural depressions, ditches, swamps and floodplains. Similar to other macrophytes, they compete with phytoplankton for nutrients, thereby decreasing the productivity of the water and hindering the movement of fish and causing inconvenience to irrigation and navigation.

2.Emergent Macrophytes: Macrophytes which are not submerged in water are further divided into two categories.
Erect leafed Emergent plants:
Rooted plants:
These plants are charecterized principally by photosynthetic surfaces projecting above the water (*Ipomea, Limnophila, Typha*)

3. Floating leaved emergent plants: Rooted plants with floating leaves (*Aponogeton, Nymphoides, Panicum, Pontedenia*)

Conclusion
During the last few decades, climatic changes and human activities produced many environmental problems and intensive pressure on Komati cheruvu and Ensanpally pond that resulted in changing its ecological features. The decrease in both bare lands and water bodies, aswell as the increase in vegetation cover were detected. Ten aquatic macrophyte species were recorded in the pond. The western and northern sectors of the pond were characterized by the presence of a dense vegetation cover composed mainly of *Aponogetonnatans*(L.) Engler& K. Krause, *Cyperusrotondus*L., *Hydillaverticillata* (L.f.) Royle, *Ipomoea aquatica*Forssk, *I. carnea*Jacq., *Limnophilaheterophylla*(Roxb.) Benth.,*Najas marina* L.,

Nymphoideshydrophylla(L.)Kuntze,*N.indica*(L.)Kuntze,J.*Nymphaeanouchali*Burm.f.*Panicumrepens*L.,*Pistiastratiotes*L. ,*Pontederiacrassipes*Mart.,*Potamogetonnodosus*Poir.,*Sagittariasagittifolia*L. and *Typhadomingensis*Pers. (Plate-1). Although these plants provided many ecological benefits, their greater spread affected the water circulation and subsequently may have affected the quality of the water and fish in the pond. On the other hand, these plants with their highest growth rate and production with an annual yield of up to 100 tons of dry matter per hectare are considered as a massive source of raw material for industrial production of paper pulp, biofuel and natural therapeutics. In addition, aquatic macrophytes have shown high efficiency to remove pollutants and recover nutrients from a wide variety of domestic, industrial and agricultural effluents, which validated their role in the bio-remediation of polluted water. A systematically heterogeneous group of macroscopic plants

Aquatic macrophytes comprise representatives of both vascular and non-vascular higher plants, and green macroalgae and charophytes. Macrophytes populate various reservoirs of fresh-water, brackish-water, and marine ecosystems and Depending on environmental conditions display plasticity of metabolism and are attributed by various growth forms. The trophic, structural and functional aspects of aquatic ecosystems, are influenced by Macrophytic vegetation which contributes to the formation of organic carbon compounds and 88 M. 79-94 oxygen release, seriously affecting the hydrological regime of water bodies by altering water quality, providing food and shelter for ichthyo fauna and aquatic invertebrates. Humans widely use Macrophyte species for bio-indication and phytoremediation of polluted water bodies, treatment of various types of wastewater, for therapautic purposes, etc. However, anthropogenic and climatic factors such as destruction of natural habitats, water pollution, eutrophication and global warming threaten the diversity of aquatic macrophytes in freshwater and marine ecosystems.

Table 1: List of Macrophytes identified from KomatiCheruvu.

S. No.	Scientific Name	Common Name	Family	Life form
01	*Aponogetonnatans*(L.) Engler& K. Krause	Floating lace plant	Aponogetonaceae	Floating
02	*Cyperusrotondus*L.	Purple nutsedge	Cyperaceae	Emergent
03	*Hydillaverticillata*(L.f.) Royle,	Water thyme	Hydrocharitaceac	Submerged
04	*Ipomoea aquatica*Forssk,	Morning glory	Convolvulaceae	Emerged
05	*Ipomeacarnea*Jacq.	Bush morning glory	Convolvulaceae	Floating

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06	*Limnophilaheterophylla*(Roxb.) Benth.,	Indian marshweed	Plantaginaceae	Aquatic
07	*Nymphaeanouchali*Burm.f.	Water lilly	Nymphaeaceae	Submerged
08	*Nymphoideshydrophylla*(L.)Kuntze	Crested floating-heart	Menyanthaceae	Floating
09	*Nymphoidesindica*(L.) Kuntze	Water snowflake	Menyanthaceae	Floating
10	*Panicumrepens*L.	Torpedo grass	Poaceae	Emergent
11	*Pistiastratiotes*L.	Waterlettuce	Araceae	Floating
12	*Pontederiacrassipes*Mart.	Waterhyacinth	Pontederiaceae	Floating
13	*Typhadomingensis*Pers.	Southern cattail	Typhaceae	Emergent

Table 2: List of Macrophytes identified from Ensanpally pond.

S. No.	**Scientific Name**	**Common Name**	**Family**	**Life form**
01	*Aponogetonnatans*(L.) Engler& K. Krause	Floating lace plant	Aponogetonaceae	Floating
02	*Cyperusrotondus*L.	Purple nutsedge	Cyperaceae	Emergent
03	*Hydrillaverticillata* (L.f.) Royle,	Hyrdrilla, Water thyme	Hydrocharitaceae	Submerged
04	*Ipomoea aquatica*Forssk,	Water spinach	Morning glories	Floating
05	*Ipomeacarnea*Jacq.	Bush morning glory	Convolvulaceae	Floating
06	*Najas marina* L.	Holly-leaved water-nymph	Hydrocharitaceae	Submerged
07	*Nymphaeanouchali*Burm.f.	Blue lotus	Nymphaeaceae	Submerged
08	*Nymphoidesindica*(L.) Kuntze	Water snowflake	Menyanthaceae	Floating
09	*Panicumrepens*L.	Torpedo grass	Poaceae	Emergent
10	*Pontederiacrassipes*Mart.	Water hyacinth	Pontederiaceae	Floating
11	*Potamogetonnodosus*Poir.	Longleaf pondweed	Potamogetanaceae	Floating
12	*Sagittariasagittifolia*L.	Arrowhead	Alismataceae	Submerged

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Plate-1. A. *Aponogeton natans* (L.) Engler & K. Krause, B. *Cyperus rotondus* L., C. *Hydilla verticillata* (L.f.) Royle, D. *Ipomoea aquatica* Forssk, E. *Ipomea carnea* Jacq., F. *Limnophila heterophylla* (Roxb.) Benth., G. *Najas marina* L., H. *Nymphoides hydrophylla* (L.) Kuntze, I. *Nymphoides indica* (L.) Kuntze, J. *Nymphaea nouchali* Burm.f. K. *Panicum repens* L., L. *Pistia stratiotes* L., M. *Pontederia crassipes* Mart., N. *Potamogeton nodosus* Poir., O. *Sagittaria sagittifolia* L., P. *Typha domingensis* Pers.

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