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# Biodiversity of Aquatic Plants in Selected Wetlands of Kolhapur City, Maharashtra, India

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**Abstract:** *Aquatic macrophytes are essential structural and functional components of wetland ecosystems. The present investigation documents the diversity, life-form composition, and distribution of aquatic plants in four important wetlands of Kolhapur city—Rankala Lake, Kalamba Lake, Rajarampuri Talav, and Kotitirth Talav. Seasonal field surveys carried out from 2022 to 2025 recorded 112 species of aquatic and semi-aquatic plants belonging to 79 genera and 43 families. Emergent macrophytes formed the dominant life-form group, followed by submerged and floating plants. The frequent occurrence of invasive species such as Eichhornia crassipes and Pistia stratiotes reflects nutrient enrichment and anthropogenic stress in urban wetlands. The study highlights the ecological importance of urban wetlands and emphasizes the need for effective management strategies for conservation of aquatic plant biodiversity.*

**Keywords:** Aquatic plants, macrophytes, wetlands, Kolhapur, biodiversity, invasive species

## I. INTRODUCTION

Aquatic plants or macrophytes play a crucial role in freshwater ecosystems by regulating nutrient cycling, stabilizing sediments, enhancing dissolved oxygen levels, and providing food and shelter to aquatic organisms. They act as primary producers and determine habitat complexity in wetlands. Wetlands are known to support high plant diversity and serve as biodiversity hotspots. However, urban wetlands are increasingly exposed to sewage inflow, eutrophication, land reclamation, and biological invasions, resulting in altered plant communities. Several studies from India and Maharashtra have reported rich macrophyte diversity in reservoirs and lakes; however, detailed studies focusing on urban wetlands of Kolhapur city remain limited. Rankala, Kalamba, Rajaram Talav, and Kotitirth Talav are historically important and ecologically valuable water bodies. These wetlands are intensively used for domestic, cultural, and recreational purposes, making them vulnerable to ecological degradation. Therefore, the present study aims to document aquatic plant biodiversity and analyze their ecological significance in selected wetlands of Kolhapur city.

## II. STUDY AREA

The study was conducted in four wetlands located within Kolhapur city namely Rankala Lake (large urban lake), Kalamba Lake (semi-urban reservoir), Rajaram Talav (urban pond) and Kotitirth Talav (temple-associated tank). These wetlands differ in size, water retention capacity, and degree of anthropogenic disturbance.

## III. MATERIALS AND METHODS

Seasonal surveys were conducted during post-monsoon, winter, and pre-monsoon periods from 2022 to 2025. Aquatic plants were recorded along shoreline transects and within quadrats (1 m²). Plants were photographed, collected, and identified using standard floras. Species were classified into emergent, submerged, rooted floating, free-floating, and marginal categories. Species richness and life-form composition were calculated for each wetland.

## IV. RESULTS

### Species Richness

A total of 112 species of aquatic and semi-aquatic plants belonging to 79 genera and 43 families were recorded.

**Life-form Distribution**

| Life Form | No. of Species | Percentage |
|---|---|---|
| Emergent | 40 | 35.7% |
| Submerged | 21 | 18.8% |
| Rooted floating | 17 | 15.2% |
| Free-floating | 14 | 12.5% |
| Marginal/semi-aquatic | 20 | 17.8% |
| **Total** | **112** | **100%** |


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**Site-wise Species Richness**

| | |
|---|---|
| Rankala Lake | 92 |
| Kalamba Lake | 85 |
| Rajaram Talav | 68 |
| Kotitirth Talav | 60 |

Dominant species included *Typha angustifolia*, *Phragmites karka*, *Hydrilla verticillata*, *Vallisneria spiralis*, *Nymphaea nouchali*, *Nymphoides indica*, *Lemna minor*, *Eichhornia crassipes*, and *Ipomoea aquatica*.

## V. DISCUSSION

The present investigation demonstrates that the selected urban wetlands of Kolhapur city support considerable aquatic macrophyte diversity despite intense anthropogenic pressure. Similar patterns of macrophyte dominance in shallow urban wetlands have been reported from other parts of India, where emergent plants form the major life-form group due to nutrient-rich sediments and fluctuating water levels (Cook, 1996; Sharma & Gopal, 2008). The dominance of emergent species such as *Typha angustifolia* and *Phragmites karka* in Rankala and Kalamba lakes is indicative of eutrophic conditions. Emergent macrophytes are known to stabilize sediments and reduce shoreline erosion while simultaneously acting as nutrient sinks (Wetzel, 2001; Barko et al., 1991). Their abundance suggests increased organic matter deposition and shallow littoral zones favorable for colonization.

Submerged macrophytes like *Hydrilla verticillata* and *Vallisneria spiralis* were well represented in Rankala and Kalamba lakes, indicating relatively higher water transparency and moderate water quality. Submerged vegetation plays a vital role in oxygenating water and providing breeding habitats for aquatic fauna (Chambers et al., 2008). The presence of these species suggests that these wetlands still retain partial ecological integrity despite urban stress. Rooted floating-leaved species such as *Nymphaea nouchali* and *Nymphoides indica* contribute significantly to habitat complexity and surface shading. Such plants regulate temperature and light penetration, thereby influencing planktonic productivity (Lacoul & Freedman, 2006). Their distribution reflects stable hydrological regimes in larger wetlands like Rankala Lake. The frequent occurrence of free-floating invasive species such as *Eichhornia crassipes* and *Pistia stratiotes* indicates advanced nutrient enrichment caused by sewage discharge and agricultural runoff. *Eichhornia crassipes* is recognized globally as a problematic invasive species that alters community structure by reducing light availability and dissolved oxygen, leading to biodiversity loss (Gopal, 1987; Villamagna & Murphy, 2010). Similar invasion patterns have been documented in urban lakes across Maharashtra and India (Patil & Kumawat, 2016; Trivedi et al., 2018). Lower species richness observed in Rajaram Talav and Kotitirth Talav compared to Rankala and Kalamba lakes may be attributed to higher levels of disturbance, reduced water renewal, and solid waste disposal. Habitat fragmentation and pollution are well known to cause decline in aquatic plant diversity by altering substrate characteristics and nutrient dynamics (Mitsch & Gosselink, 2015; Bornette & Puijalon, 2011). Comparative studies from Indian wetlands report a similar dominance of emergent macrophytes and increasing prevalence of invasive species under eutrophic conditions (Sharma & Gopal, 2008; Srivastava et al., 2014). The findings of the present study thus conform to broader ecological trends observed in tropical urban wetlands.

Aquatic macrophytes also serve as bioindicators of water quality, as their species composition reflects nutrient status and hydrological stability (Palmer et al., 1992; Lacoul & Freedman, 2006). Therefore, regular monitoring of macrophyte diversity in Kolhapur wetlands can provide an effective and low-cost tool for assessing ecological health and guiding restoration strategies. From a conservation standpoint, unchecked spread of invasive species may lead to homogenization of plant communities and reduction of ecosystem resilience (Mitsch & Gosselink, 2015). Management interventions such as mechanical removal of invasives, reduction of nutrient inputs, and protection of native macrophyte stands are necessary to sustain biodiversity and ecosystem services of these wetlands (Gopal, 2013; Villamagna & Murphy, 2010).

## VI. CONCLUSION

The wetlands of Kolhapur city exhibit rich aquatic plant diversity but are under increasing anthropogenic pressure. Rankala and Kalamba lakes function as important reservoirs of macrophyte diversity, while Rajaram Talav and Kotitirth Talav show signs of ecological stress. Sustainable management and conservation of these wetlands are essential for preserving their biodiversity and ecological functions.

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