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Role of Aquatic Plants in Water Treatment

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Editorial

Aquatic plants grow in bodies of water that have been supplemented by natural processes as well as fertiliser loading from urban and agricultural operations. Aquatic plants commonly seen in eutrophic water bodies include *Eichhornia crassipes* (water hyacinth), *Pistia stratiotes* (water lettuce), *Alternanthera philoxeroides* (alligator weed), *Salvinia rotundifolia* (salvinia), *Lemna minor* (duckweed), *Elodea canadensis* (elodea), *Egeria densa* (egeria or Brazilian elodea), *Hydrilla verticillata* (hydrilla), *TyPha latifolia* (cattail), and *Phragmites communis* (reed). Much of the focus on vascular aquatic plants has been on their removal from bodies of water, because dense stands of aquatic vegetation can obstruct navigation and jeopardise the balance of biota in aquatic systems.

For these reasons, there is a wealth of literature on strategies to limit the growth of aquatic plants. For example, about 90% of the 1500 known literature citations on water hyacinth are devoted to control. Despite their nuisance traits, many aquatic plants' high productivity and nutrient removal capability has sparked significant interest in their photosynthetic and physiological characteristics, as well as their potential usage for beneficial purposes. In recent years, research has focused on the utilisation of aquatic plants for wastewater treatment.

However, the successful use of aquatic plants to extract nutrients and recycle waste has been hampered by a lack of "exported uses" for the plants once they have been harvested from the system. The potential use of collected plant biomass as an energy feedstock has recently sparked significant interest in wastewater aquaculture. The economic effectiveness of energy production and water treatment using an aquatic plant-based water treatment/biomass production system is heavily reliant on the plants' photosynthetic activity and growth rates. Several water plants have been discovered to be more efficient than many terrestrial plants at utilising solar energy. The floating water hyacinth has the fastest growth rate of any aquatic, with an output potential of roughly 200 dry metric tonnes ha-1 year-1. Certain emergent and submerged plants are also extremely productive and can be used to remediate wastewater in an artificial wetland system. Various woody, shrubby, and herbaceous species have been used in artificial wetlands to renovate wastewater while accumulating nutrients in the developing biomass.

In nutrient film approaches, other species have showed promise. Engineering studies have demonstrated that using Aquatic Macrophyte-Based Systems (AMATS) rather than conventional treatment methods can minimise the cost of secondary and advanced household wastewater treatment in some places. In tropical and subtropical regions, floating macrophytes are the most widely employed plants for wastewater treatment, but emergent species are more commonly used in temperate settings.

The goals of this paper are to summarise existing information on the concept of using aquatic plants in pollution control, critically examine the role of aquatic plants in water treatment, describe two case studies involving aquatic plants for water treatment and resource recovery, and identify future research needs in each of these areas. Aquatic macrophyte-based treatment systems typically consist of a monoculture or poly culture of vascular plants maintained in very low ponds or raceways that receive wastewater over a longer residence time than traditional wastewater treatment systems. AMATS's long wastewater residence period necessitates pollutant removal using a variety of techniques.

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