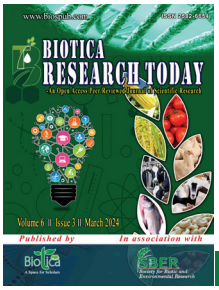
Bio. Res. Today 2024, 6(3):97-99



Biotica Research Today

e-ISSN: 2582-6654

March, 2024

Article ID: RT1577 Popular Article

Eicchornia crassipes: Impacts and Mitigation

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Conflict of interests: The author has declared that no conflict of interest exists.

How to cite this article?

Paul *et al*., 2024. *Eicchornia crassipes*: Impacts and Mitigation. *Biotica Research Today* 6(3), 97-99.

Abstract

Eichhornia crassipes (water hyacinth) cause various problems in sectors of fisheries, navigation, tourism, health and environment. Though physical, chemical and biological methods of removal are available, removal for utilization is the best method. The paper cites various methods of utilisation of this weed and advocates community mobilisation as a first step towards eradication of the weed.

Keywords: Community mobilisation, *Eichhornia crassipes*, Exotic weed, VLCA

Introduction

Eichhornia crassipes (water hyacinth) is an obnoxious weed introduced into India in 1896 (Biswas and Calder, 1954) from South America. This exotic weed which spread through the Indian water bodies at an alarming rate, has affected many indigenous flora and fauna of our waters. One major waterbody that the weed has infested is Vembanad Lake.

Problems Caused by Eichhornia in Vembanad Lake

Eichhornia crassipes cause various problems in sectors of fisheries, navigation, tourism, health and environment.

1. Fisheries Sector

Eichhornia sp. detrimentally affects fisheries on multiple aspects such as fish catch/ diversity, fishing inventories and livelihood of fishers and associated stakeholders.

- *Fish Catch/ Diversity: Eichhornia* sp. directly impact water quality. It causes water loss, enriches nutrients, affects pH and dissolved oxygen causing fish mortality. The weed causes sedimentation in the estuarine system leading to decline of fishing areas and fishery resources particularly the migratory fishes and shrimp.
- *Fishing Crafts and Gears:* Water hyacinth entangles fishing nets and boats' propellers, impairs fishing, breeding and nursery grounds, hampers scouting and thereby reduces fish catches. The rapid proliferation of the species during the monsoon season affects CPUE by preventing access to fishing grounds, clogging and damaging the eye of the net. It also increases the cost of fishing due to damage on gill nets and boats' motors.
- *Livelihood:* Water hyacinth significantly impacted the livelihoods of people in Vembanad. Water hyacinth caused difficulty in anchoring and berthing of crafts and affected crop management in the banks of the lake. Regular cost of repair of fishing inventories led to loss of livelihood among fishermen and fish farmers, further leading to youth leaving the sector.
- *Effects on Paddy Farmers:* Paddy farmers around the lake were also affected by WH as the infestation intervened with timely harvesting. These farmers were not able to transport workers, harvested paddy and machineries through weed infested water channels.

2. Navigation and Tourism

Water hyacinth affected movement of vessels and carrier boats through Vembanad Lake which was a major form

Article History

RECEIVED on 29th February 2024 RECEIVED in revised form 19th March 2024 ACCEPTED in final form 20th March 2024

of transport around the region. Tourism industry is also affected by water hyacinth, especially houseboat owners in Alappuzha district.

3. Health

Water hyacinth proliferation led to an increase in mosquitoe-borne diseases such as Japanese Encephalitis (JE), dengue, elephantiasis, *etc*. It facilitates a habitat for vectors (snails and mosquitoes) for diseases like Bilharzia and malaria.

4. Environment

Water hyacinth infestation prevents penetration of solar rays into aquatic ecosystems causing oxidation of organic matter and contributing to large scale production of hydrogen sulphide. This reduces dissolved oxygen, creates anorexic conditions for plants and animals, affects the chemistry of surface water (Uka *et al.*, 2007) and increases biological oxygen demand resulting in deterioration of water quality and loss in aquatic biodiversity (Muli, 1996). Finally, it disrupts the food web and primary productivity. It also enhances water loss by 2.5 to 3 times due to evapo-transpiration. The weed absorbs large numbers of organic pollutants and upon completion of its life cycle and death, it releases all these contaminants and pollutants into the same water bodies in much higher concentration and increased rate causing major problems for ecology.

Types of Removal

Several methods were adopted to control water hyacinth in many areas around the world.

- *Physical Removal*: Water hyacinth can be removed by raking or seining it from the water surface. This method is effective for infestations over a small area. It is highly laborious and expensive and the invasive weeds will re-appear if not removed at regular intervals. In manual removal, mechanical mowers, dredgers or other methods are widely practiced.

- *Herbicide Control*: This method of removal is ecologically detrimental. The active ingredients of herbicides for controlling water hyacinth range from Bispyribac to 2,4-D.

- *Bioremediation*: Use of Neochetina beetles as a biological management factor for water hyacinth has proved to be an adequate control method in developing countries.

- *Removal through Utilization*: Eradication through utilization is a novel, suitable, economical and viable method.

Uses

E. crassipes can be used for bioenergy, biofertilizer production, wastewater treatment (absorption of heavy metals) and animal feed. At Bozaltoli village in Assam's Tinsukia district, local villagers remove water hyacinth and use its dried stems to weave eco-friendly baskets, containers, vases, dining mats, coasters, bags and other products which have found a global market. The craft is eco-friendly and sustainable and it provides a source of livelihood for rural communities.

Furthermore, *E. crassipes* is rich in bioactive metabolites such as sterols, alkaloids, phenolics, flavonoids, tannins and saponins. The extracts from *E. crassipes* possess anticancer, antioxidant, anti-inflammatory, antimicrobial, skin whitening, neuroprotective and hepatoprotective properties. Naturally growing *Eichhornia* could be used in fly ash ponds. Various researchers reported methods such as phytoaccumulation, rhizo-filtration and photo-degradation in Eichhornia. It has also been considered as a potential source of bioenergy (Carreño Sayago and Rodríguez, 2018) and biofertilizers (Manyuchi *et al.*, 2022).

Hydroponics

Water hyacinth roots can be used as a substitute for rockwool in hydroponics growing media. Water hyacinth can be used as food for animals, paper and as compost. Anaerobic digestion of Eichhornia produces biogas - methane.

In Kapra Lake in Hyderabad, a technology known as Accelerated Anaerobic Composting (AAC) was discovered for removal of water hyacinth. Studies were also conducted to produce cellulase enzymes from bacteria using water hyacinth and water moss. Pulp from water hyacinth leaves and stem can be used with newspaper and binders to make disposable plates, biodegradable nursery pots and trays. Baby fibres of coirs are mixed with water hyacinth pulps to make canvas for painting.

Conclusion

Community mobilisation for effective eradication is a necessity. Fishers, farmers, workers and volunteers can contribute to the labor for removing weeds from Vembanad Lake. Ministry of Environment and Forests, Government of India should enact a plan for coordinating mechanism for water hyacinth management. Pollution control boards should implement stricter monitoring to prevent polluted effluents from reaching the lakes. Stakeholders such as state line departments should work uniformly for the cause. The removal of hyacinths is labor and cost-intensive and local bodies have demanded the formation of a Vembanad Lake Conservation Authority (VLCA) and to bring in mechanical dredging machines to remove the mud and hyacinths.

Acknowledgements

The authors would like to extend gratitude to Director, ICAR-CIFRI for his continuous support.

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