Aquatic weeds problems and their management

Dr. Sushilkumar, Pr. Scientist
ICAR-Directorate of Weed Research
Jabalpur
What are aquatic weeds?

- Aquatic weeds are those unwanted plants, growing in water and complete at least a part of their life cycle in water.

- Aquatic weeds can be grouped into Algae and Hydrophytes.

- Algae normally inhibit the surface of fresh and saline water, exposed to sunlight.
Classification of aquatic weeds

• Aquatic weeds can be classified according to their habitat, and according to their morphological characteristics (Gupta, 1987).

• Water weeds -------
  • Surface weeds (floating)
    • Submerged weeds
    • Emerged weeds
    • Dispersed weeds

• Shoreline and ditch weeds
• Bank weeds
• Marshland and swamp weeds
Major aquatic weeds of India

- Out of 140 aquatic weeds, the following are of primary concern to our country -

1. *Eichhornia crassipes*  
2. *Salvinia molesta*  
3. *Nymphaea stellata*  
4. *Nelumbo nucifera*  
5. *Hydrilla verticillata*  
6. *Vallisneria spiralis*  
7. *Typha angustata*, and  
8. *Chara and Nitella spp.*  
9. *Ipomea spp.*  

- Recently, *Alternenthra philoxeroides* has become a growing menace in water bodies in India.

- Among these, *Eichhornia, Salvinia, Hydrilla* and *Pistia* spp. are four primary aquatic weeds of the world.
Problems caused by aquatic weeds

- Impair navigation
- Degrade and deteriorate water quality
- Disrupts hydropower generation
- Increase flood frequency and intensity
- Reduce species diversity
- Heaven for insect born disease vectors
- Interfere with safe swimming
- Interfere with fishing
- Reduce water storage capacity in reservoirs
- Impedes flow of water
- Reduce fish production

Growing ecological menace
Aquatic weed problems in different lakes and reservoirs in India

- In Rajasthan in drinking ponds and lakes water hyacinth. *Trapa*, *Pistia* and *Nelumbo* are the menace.

- In Pichola lake of Udaipur, and in Mansagar lake of Jaipur in 1980s, water hyacinth was a great problem but now *H. verticillata* has taken the niche vacated by WH.

- In Orissa, Anusupa lake and Hirakund reservoirs are facing problems with aquatic weed like *Hydrilla*, *Najas*, *Ceratophyllum*, *Vallisnaria* and *Chara* spp.

- In Punjab, floating, emerged and submerged weeds are major problem in irrigation canals, reservoirs and wet lands (Harike, Kanjili and Mand Bhartala).
• Weeds mushroom in Ooty lake
  • D. Radhakrishnan
  • I share the concern but am helpless, says Boat House official

• concern is growing among various sections of the society here over the re-appearance of water hyacinth in Udhagamandalam lake.

• Weed problem continues to plague Ooty Lake
  • D. Radhakrishnan

NO END IN SIGHT
Aquatic weed problems in different lakes and reservoirs in India

- In Tamil Nadu, almost 80% of 3900 tanks are infested with aquatic weeds like WH and HV.

- Big tanks like Verranam, Chembaraba k-kam and Veeranam are infested with Ipomoea aquatica.

- In Chennai- Velachery, portion of Adayar river, Buckingham canal and Otterinulla by WH.

- The same situations with water bodies around Trichy, Madurai, Comimbatore, Salem and other towns in TN.
Water Hyacinth – Menace in Jamshedpur’s rivers


Effects: Impact on aquatic life / Increase in water pollution / Increase in mosquito breeding / stagnation of water bodies
Alligator weeds - floating islands in Wular lake
Infestation in Dal lake
Weed problems in irrigation canals

- About one million ha of inland water canal area is threatened by AW
- Nearly 2100 km of Bhakra Canal System is badly infested along bank regions
- Submerged aquatic weeds are reported to cut the flow of water by 80% (Holm et al, 1991)

- Typha spp., Najas spp. Potamogeton spp. Hydrilla, Ipomoea spp are the worst weeds of canal system besides water hyacinth.
- In Kerela, Salvinia molesta is the worst AW in canal system
• India has a total area of about 7 million ha under different kinds of water bodies and about 1.7 lakh km under rivers and canals.

An irrigation canal severely attacked by water hyacinth in Punjab
Water hyacinth, *Salvinia molesta*, *Hydrilla*, Alligator weed are a great nuisance to fisheries, navigation, irrigation, hydroelectric projects and in tourism.
Aquatic weed problem in different situations
Problem in paddy and crop field

- In about 1.6 lakh ha area in north east is hindered by Aquatic weeds

- Vast area of low land paddy in North-east, West bengal and kerala are badly infested with AQW

- Water hyacininth, Chara spp. Nittela and algal scams are nuiscens

- In Kerala Salvina molesta plays havoc

- Alligator weed in Paddy in Orissa

- In Maize in Plampur
Menace to water course and navigation

Impedes flow of water by 20-95%

Affect navigation

A water body clogged by severe infestation of aquatic weeds
Management of aquatic Weeds

• Preventive management

• Quarantines are legislative tool that may be used to mitigate the effects of weeds.

• The success of preventive weed management programmes varies with the weed species, its means of dissemination and the amount of effort applied.

• Preventative weed programs usually require community action through the enactment and enforcement of appropriate laws and regulations.

• There is need of strict implementation of quarantine laws in India.
• **Physical Control**: removal is most prevalent which is highly laborious and expensive, besides the disposal of the harvested material is also a big problem.

*Salvinia* mats being cleared in preparation of the paddy fields for transplantation in Kerala

Should be used for compost and vermicompost making but seldom this practice is opted after removal of huge biomass.
Success story - Preventive management of Water hyacinth in Jamshedpur based on DWR protocol

in 15 km course of rivers by Municipality
Inlet points should be blocked with mesh: A effective barrier to check weeds entry and other waste.

But at inlet points, there may be growing weeds which need to be cleared.
Mechanical control of aquatic weeds

• **Tools and techniques**

• **Netting**: Small floating weeds can be skimmed out of small water

• **Barriers**

• **Chaining**: Pulling of drag chain close to water bottom in up and down

• **Dredging**: Pulling of weeds along with their roots from the mud is done

• **Draining**: This involves draining the weedy areas (canals) during
• **Harvesters**: Machines that cut or picks up the weeds from a water body and conveys these to the shore simultaneously, is called a harvester.

• **Water weed cutters and harvesters**: In high discharge canals and very large lakes these are used for controlling rooted submerged weeds.

• **Under water weed cutters**: These are motor boat equipment with a sharp, strong cutter bars, having heavy reciprocating blades.
Variation types of weed harvester

Costly operation but

Give quick relief
Removal of floating aquatic weeds at Jabalpur through JCB

Pushing of aquatic biomass towards bank side by labours using boats:
Mechanical removal is cost effective
Removal of water hyacinth from a 65 hectares lakes at Banswara (Rajasthan) with the help of JCB and tractors-trolley.

It took almost one month using 6 JCB, 12 tractors trolley and about 30 labours.
Chemical management

- In India so far no molecule has been registered exclusively for weeds for water, however, many herbicides are claimed to control aquatic weeds particularly floating weeds.

- 2,4-D, Praquat, glyphosate, MSM are most prevalent herbicides which have been reported to control many type of aquatic weeds.
Fear of using chemicals in water bodies

• Effect on non-target species
• Effect on crops if water is being used for irrigation purpose.
• Residue problem
• Water quality deterioration
• Therefore, no blanket spray is required;
• May be used in strips and patches at different time intervals.
Biocontrol of water hyacinth with *Neochetina spp*

- Effective in perennial ponds and lakes
- Not effective in seasonal water bodies or water recedes quickly
Gradual control of water hyacinth through *Neochetina* spp. in Mylardevapally, Hyderabad

Jan 2015

October 2016

December 2016
A canal choked by salvinia where bioagent was released

Bioagent stared damage

Resulted Clear Water
• Use of biological agents should become more prevalent in view of the restricted use of herbicides in aquatic bodies.
• Ex: *Neochetina* spp. on water hyacinth,
• *Cyrtobagous salviniae* on *Salvinia* and
• Grass carp (*Ctenopharyngdon idella*) against small floating and submerged weeds.
Insect and Fungi integration for biological control of water hyacinth

• There are some effective local strains of fungi which can be used with *Neochtina* spp.
Control by integration of fungus and insect
Biological and chemical integration to control water hyacinth
Release of beetle on 31st May

Integration of herbicides in 15% area

Collapsing one wave

Partial clearing of pond
New growth of water hyacinth

Again infesting the pond

Collapse of second wave

Integration of herbicides in 15% area again
• There was drastic decrease in flower production in second cycle growth, which reduced to about 1 flower/m² from initial 15/m². Like wise, there was decrease in height of plant, dry weight and length and width of leaves.
Thanks