

Chemical control of aquatic weeds: A review

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ABSTRACT

Aquatic weeds can be regarded as hydrophytes occupying different niche in the aquatic environment. They grow gregariously in the new limnetic habitat suppressing the growth and metabolic activities of native plants to such an extent that the latter may be subject to temporary or permanent extinction. Economic drain, on account of the obnoxious weeds is not an exceptional aspect. The present work deals with chemical control of aquatic weeds, implemented at Jamtara district of Jharkhand state. Preventive measures were duly adopted to ensure that the side effects of the operation were minimal. Attention was also paid to the important touchpoints concerned with the use of herbicides.

Key Words - Aquatic weeds, Chemical control, Herbicides, Jamtara, Habitat.

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INTRODUCTION

It is very important to control the aquatic weeds in order to conserve the plants of economic importance, pisciculture and for efficient use of water bodies. The first step in aquatic weed control program is to identify the weed species and to find out the degree of damage caused by them in aquatic habitat in general and fish ponds or important aquatic flora in particular.

However, controlling weeds in an aquatic environment is greatly complicated and not so easy because some weeds are useful in one case but harmful in another case. Some of the plants growing in our aquatic environments do not have so much negative impacts; moreover, some of them also accelerate the production and growth of desirable flora and favours the growth of fishes and other aquatic fauna (Jha, 2017).

Several aquatic plants may act as weeds when they grow profusely without leaving much space for the flourishing growth of the crop plants or check the movement of other flora or fauna, but these weeds may also be economic if they are allowed to grow for a certain extent, which may also help or benefit

for the cultural desirable operations (Jha, 2018). For example, the duckweeds cause several harmful effects in the fish ponds if they grow profusely and chock the water bodies, but the same weed is used in fish culture ponds by providing food. Therefore, it is earnestly required to know the extent of infestation and the degree of damage caused by the aquatic weeds in the cultural operations before undertaking the control measures.

One of the important features for management is selection of proper timing for the specific weed growth or reproduction. It is desirable to control weeds before turions or seed production (Kumar, 1987).

It is well known that treatment of chemicals in the aquatic habitat is not safe. In one hand they will control infestation of aquatic weeds but in other hand use of chemicals will also kill important aquatic lives like fishes etc (Lawrence, 1955). In case of severe infestation and ineffectiveness of physical or biological methods, the application of suitable herbicides may be operated, but with adequate care and thinking of the side effects. The use of

newly formulated hormone weedicides may be less toxic to other biotic factors and they are biodegradable too. The herbicides may pollute the aquatic environment by killing the entire vegetation including the algal flora (Little, 1968). This may result sudden drop of dissolved oxygen due to decomposition of dead vegetation and increased microbial respiration.

Therefore, for the herbicides treatment a few points should be kept in mind as discussed below.

- I. Selection of suitable time for the herbicidal treatment.
- II. Selection of effective herbicides and proper doses.
- III. To ascertain the possible side effects for herbicidal application.
- IV. To ascertain the recovery period and breakdown process of the herbicides.
- V. It should not have any toxic or poisonous effect to other aquatic lives. It should be environmentally safe for humans, fish and other aquatic flora and fauna.
- VI. The chemical should degrade or dissipate from water immediately after action on weeds.

The effectiveness of herbicides varies among different kinds of aquatic weeds. The first critical step in selecting an appropriate herbicide is identifying the weed. The waterbody selected for herbicide treatment must be restricted for common use of human beings. Restriction on swimming, livestock watering and irrigation also must be considered before a herbicide is applied. In the present work the chemical control of aquatic weeds was done in a small tub like container and ditches with dense mass of weedy flora. It was done to avoid loss of biodiversity from the permanent water bodies.

MATERIALS & METHODS

The present work has been performed at Jamtara district of Jharkhand state which is located between 23°10' and 24°05' North latitudes and 86°30' and 87°15' East longitudes.

However, some of the common referred herbicides include Copper sulphate, Endothall compounds (Aquathol & Hydrothol), Diquat, Fluridone, Glyphosate and 2,4 - D but out of these six herbicides, endothall compounds and copper sulphate are highly toxic to fish and other aquatic animals. Therefore, in this work, three herbicides named 2,4 - D, glyphosate and diquat were used as herbicides. All the herbicides were purchased from Kheti bari beej bhandar, Jamtara and were applied to weeds with precaution.

RESULT & DISCUSSION

In the present work the chemical control of aquatic weeds was done at very small scale in tubs containing massive growth of weedy flora to avoid loss of biodiversity from the permanent water bodies. The present work is based on use of three herbicides which were easily available in local market at Jamtara.

The result, application methods and impact have been discussed below.

2, 4 - D

This is a systemic herbicide which is used to control submersed, emerged and floating weeds. It is available as an ester or amine formulation. This weedicide is more effective in acidic water. It has not been preferred to be used in water for irrigation, livestock or domestic purposes.

Target Weeds: Water hyacinth, Alligator weeds, Water lettuce, Sagittaria sp. etc.

Glyphosate

It is a foliar applied systemic herbicide used to control marginal as well as emerged weeds. It is chemically known as N-phosphonomethyl glycine. Glyphosate showed good result with emergent weeds having floating leaves. The glyphosate was not applied directly in water but it was applied to the plants with the help of sprayer.

Target Weeds: Water hyacinth, Alligator weeds, Phragmites karka, Typha sp. etc.

Diquat

Diquat is a contact herbicide that can be used to control submersed weeds and filamentous algae.

It was not found effective on emergent plants.

Target Weeds: Hydrilla verticillata, Duckweed, Water lettuce, filamentous algae etc.

Application of Herbicides

Herbicides were treated in a small tub with target aquatic flora and after foliar spray it was observed after three days that weeds began to dry and after seven days it was much more.

After 15 days of spray, the weeds were completely

burnt out and their volume was found to be reduced. In this way, herbicides are very effective against targeted weedy flora but the main problem using chemical treatment is that they do harm to other flora and fauna also in addition to some restrictions in the field of fishing, swimming, irrigation, potable water intake etc. The use of herbicides and their range of action can be shown by the following table.

Table: Use of Selected Herbicides and their mode and range of action

Sl. No.	Herbicides	Range of Action	Application	Rate of Application
1.	2,4 - D	Submersed, Emerged & Floating weeds	Foliar	0.5 – 4.0 ppm
2.	Glyphosate	Marginal & Emerged weeds	Foliar	1 – 2 Kg/ht surfactant at 1% solution
3.	Diquat	Submersed weeds & Filamentous algae	Subsurface & foliar	0.1 – 0.37 ppm

It is also important to discuss here that herbicidal treatment should be done during spring season because the weeds are smaller in size. Treating a pond with herbicides during summer month is risky because of lower dissolved oxygen level and higher weed biomass.

Advantages of Chemical Control

Despite of causing harm to other flora and fauna, herbicidal treatment has some advantages also which have been enlisted below.

- I. The degree or range of action of herbicides is fast and time saving.
- II. The dead weed biomass sinks to the bottom of the water body avoiding loss of nutrients and biomass.
- III. Herbicides kill even the roots and other deep rooted reproductive organs which generally cannot be removed by mechanical means.
- IV. One or two applications of herbicides is sufficient while mechanical or manual methods may need to be applied a number of times.

V. Chemical method of control is much more effective against the obnoxious weeds in comparison to other methods.

VI. Many weeds, especially perennials that cannot be effectively controlled by other methods are generally susceptible to herbicides, etc.

Disadvantages of Chemical Control

In spite of the effectiveness of herbicides against the weeds, they seem to be problematic solution for the use in any form. There are a number of disadvantages of using herbicides as discussed below.

- I. The use of herbicides may be toxic for aquatic habitat as well as mankind.
- II. Sometimes use of herbicides results decay of weeds reducing the oxygen level in water resulting death of fishes and other aquatic lives. So, there is significant hazardous effect on pisciculture and economy of fish farmers.
- III. The use of herbicides is more expensive than any other control measures.

- IV. Water use restriction is also one of the limitations of herbicidal treatment. The people of such localities having no other water resources may have to face great problem.
- V. The water may lose its original taste and odour due to herbicidal treatment.
- VI. Herbicides may also kill planktonic algae, thereby reducing the fish food supply.

CONCLUSION

Undoubtedly, aquatic weeds can be effectively and efficiently controlled by the judicious use of herbicides, but illiteracy and ignorance among the local masses is a hindrance. Neither do they have proper awareness about the usage of such chemicals, nor do they have expertise in adopting the preventive measures. The need of the hour is to educate and acquaint the fish farmers and localists with the modus operandi of the usage of several important chemicals and their effects.

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