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Research Article

WATER HYACINTH: A NATURAL TOOL FOR CONTROLLING WATER POLLUTION

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ABSTRACT
Water Hyacinth (*Eichhornia crassipes* (Mart) Solms., the most dominant, persistent, obnoxious and troublesome aquatic weed was firstly introduced in Indian sub-continent as an ornamental plant from Brazil in 1896. It has been proved to be an economic drain posing ecological and economical problems for decades. The dense and massive growth of this plant obstructs water flow in irrigation channels, interferes with navigation and hydroelectric power generation along with quality deterioration of fresh water supply. In addition to its obnoxious nature, its utilization for combating aquatic pollution and resource recovery cannot be ignored besides its application in the field of food, feed, fibres, fuels and fertilizers. This invasive aquatic weed has been proved to be boon for human civilization due to presence of high energy and protein content in its stolon. Its utilization not only solves the environmental problems but it is used as a low cost treatment technology for absorbing various kinds of pollutants like heavy metals and organic wastes from water and improves the water quality. Hence, regarded as a new tool for advanced water treatment in sewage by providing a suitable environment for aerobic bacteria. The present paper deals with assessment of this invasive plant in controlling water pollution and improving its quality.

Keywords: *Water Hyacinth, Pollution, Utilization, Environmental*

INTRODUCTION
Water Hyacinth (*Eichhornia crassipes* (Mart) Solms-Laubach) has been regarded as the most pernicious aquatic weed all over the world. It can easily be observed in more or less most of the fresh water bodies like ponds, pools, ditches, lakes etc. This troublesome plant was introduced in America in 1884. It was introduced in Indian sub-continent from Brazil in 1896 through the Bay of Bengal. It is commonly called the world's worst aquatic weed, sometimes termed as, economic drain due to its ability to cover whole waterways.

Water hyacinth is a free floating perennial aquatic plant native to the Amazon Basin in South America. But now a day it has become pantropic with remarkable and significant appearance in most of the aquatic habitat forming dense mats above the surface of water. It grows in still or slow flowing fresh water in tropical and temperate climate. This weedy plant can be seen gregariously on the canals, ditches, lakes, less used ponds or near any other waste aquatic habitat. It grows well at temperature of between 23°C and 30°C and does not tolerate high temperature. It survives well under diverse nutritional conditions in abundance of inorganic minerals like nitrogen and phosphorous. It's growth is not favoured in saline or sea water.

Water hyacinth is a monocot angiosperm belonging to family Pontederiaceae and is commonly known as "Jalkumbhi" by most of the people. It contains fibrous roots upto one metre length. The stem is mostly of stolon type. It is a very impressive plant with sympodial rhizome creeping in mud. The terminal end of each sympodial branch bears a rosette of broad spoon – shaped leaves with very turbinately swollen petioles. Petioles are mostly bulbous and spongy but sometimes they seem to be non – bulbous also. The leaves are smooth, glossy and bright green in colour having rusty yellow appearance on their edges. From the centre of the rosette arises a sheathed scape about 6 – 12 inches high of violet blue, funnel shaped flowers. Flowers are bisexual, zygomorphic, distinctly gamophyllus bearing 6 stamens. It reproduces primarily by asexual means i.e. by stolons, which form daughter plants. It has 3 – celled fruits and small, ovoid and ribbed seeds. Each plant produces thousands of seeds every year.

In addition to its obnoxious nature, its utilization for combating aquatic pollution and resource recovery cannot be ignored besides its application in the field of food, feed, fibres, fuels and fertilizers. This invasive aquatic weed has been proved to be boon for human civilization due to presence of high energy and protein content in its stolon.

Its utilization not only solves the environmental problems but it is used as a low cost treatment technology for absorbing various kinds of pollutants like heavy metals and organic wastes from water and improves the water quality. Hence, regarded as a new tool for advanced water treatment in sewage by providing a suitable environment for aerobic bacteria.

MATERIALS AND METHODS

The present work is based on primary and secondary sources and has been done to acquaint the common poor mass of people about the possible and potent role of water hyacinth in a number of fields including pollution control and this plant cannot be regarded as economic drain but it can also be boon for us and aquatic environment.

The information collected for *E.crassipes* (Mart.) Solms. commonly known as "Jalkumbhi" had been documented with botanical name, family name, common name, taxonomic descriptions and its use in controlling pollution.

RESULTS AND DISCUSSION

During present work, the possible uses of water hyacinth in various fields were observed as follows:

Paper Production

This plant contains massive amount of fibrous tissues, thus when blended with jute can produce paper of good quality. In Thailand, leaves are used as cigar wrapper and for preparing plastic moulded materials like furniture, electric insulation board etc. (Grist, 1959; Karim 1948).

Fibre Board

Fibre boards can be prepared by using this weed which are of good quality and can be used in indoor partition and ceilings.

Yarn & Rope

The fibres present in this plant can be used to make ropes which will not only be beneficial to poor farmers but will also uplift the economic status.

Charcoal Briquetting

This troublesome aquatic weed can be used in charcoal briquetting industry which will provide an alternative source of income, alternative source of biomass, will reduce health risk due to its nuisance role in addition to alleviation of pressure on other biomass fuel sources.

Biogas Production

Dried water hyacinth is used in Indian villages as fuel and it can be used in generating fuel gas (Sen & Chatterjee, 1931). However, due to presence of high water content in it, there is need of a large sized digester and it should be pre-treated before entering into the digester. Sen & Chatterjee (1931), suggested addition of sewage to green water hyacinth to get more methane by the process of fermentation.

Water Purification

Water hyacinth plays very important role in the field of pollution abatement by absorbing various kinds of pollutants including heavy metals present in water. In a drinking water treatment plant, this plant has been used in pre-treatment.

In sewage systems, the root structures of water hyacinth provide a suitable environment for aerobic bacteria. Water hyacinth can absorb suspended particles, algae, dissolved impurities, nitrogen, phosphorous and other nutrients (Dunigan *et al.*, 1975; Miner, 1972).

It can also absorb heavy metals like Cu, Cd, Ni, Ag, Cr, Fe, Zn. Mg, Mn, Co, Sr, Pb, Hg, K, Arsenic and organic pollutants like phenols, dyes, photographic pollutants etc. (Dinges, 1978; Wolverton, 1975; Johnson & Sheehan, 1977). It has been used for advanced water treatment in sewage and in treatment of hospital waste water.

Conclusion

On the basis of above mentioned facts, it can be concluded that water hyacinth, an invasive aquatic weed can be used in so many ways and it can very effectively solve the problem of water treatment in addition, it can also uplift the socio-economic status of common poor mass of people.

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