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WATER HYACINTH - THE SILENT PURIFIER OF NATURE'S WATER BODIES

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Water hyacinth *(Eichhornia crassipes)* is a 'God given' plant for purification of natural water bodies says professor Haider of Decca University, a pioneer in studies on water hyacinth. Prof. Haider is one of the increasing number of scientists world over who are begining to convinced of the remarkable ability of water hyacinth to purify polluted waters. The fantastic ability of water hyacinth to survive, absorbe, accumulate and metabolize many a toxic elements from various types of polluted waters which no other plant can survive in, sometimes for even a few minutes or hours, has well been documented.

True, that water hyacinths are generally considered a pest due to their tremendous growth rate and extreme hardiness. One acre of water hyacinths has been reported to have a potential of producing over 70 tons of (63,640 Kg) dry plant material annually when grown under favourable nutrient conditions. This works out to about 175 Kg of dry matter per day per acre which by any standard is quite tremendous. Area-wise water hyacinths can double in 6-7 days during a growing season under favourable conditions. Such phenominal growth also implies removal of nutients from its sorroundings, whether they be toxic or non toxic, thereby purifying the aquatic medium. Nitrogen, phosphorous and potassium are three elements utilized by hyacinths for such prolific growth. Nitrogen and phosphorous are the two major elements responsible for eutrophication of natural water bodies due to natural and cultural reasons. Water hyaciths perform a process of natural purification of eutrophic waters and the plants can be harvested off once the job is completed.

The undesirable characteristic of water hyacinth namely the prolific growth is also the secret behind its ability to purify polluted waters. It is these same undesirable characteristics that can be desirable attributes thereby utilizing in controlled biological systems for pollutant removal.

The ability of water hyacinths to remove pollutants from contaminated waters has been investigated extensively both on developing and developed countries. Studies by researchers at NASA in the USA lead this field.

Water hyacinths have the potential for removing over 3500 pounds (1591 Kg) of nitrogen and over 800 pounds (364 Kg) of phosphorous annually from sewage effluent. It can absorb and metabolize over 150 pounds (68 Kg) of phenols every 72 hours, from waters polluted with this chemical. It can also remove over 120 g of trace heavy metal contaminants, every 24 hours, reports Dr Wolverton of NASA.

The capability of water hyacinths to absorb heavy metal ions including such toxic metals as lead and mercury from contaminated waters is quite astonoshing (see Table 1.)

Capability of water hyacinths to remove various pollutants from contaminated waters

chemical/metal pollutant	Quantity removed/absorbed Kg/ per acre/ per day
Cadmium	0.161 Kg
Lead	0.042 Kg
Mercury	0.036 Kg
Nickel	0.120 Kg
Silver	0.156 Kg
Cobolt	0.137 Kg
Strontium	0.237 Kg
Phenols	8.640 Kg

(Wolverton *et al.* 1976)

Scientists in a number of countries such as USA, China, Malaysia and Bangaladesh have attempted to make use of what water hyacinths are doing silently in nature-to utilize them in controlled biological systems for pollutant removal. The results have been

extremely promising. For instance, in a trial in Florida, USA, when sewage was passed through a pond at a rate of 2.2 million litres per ha per day (2000,000 gallons per acre per day), water hyacinths in the pond have removed 80 per cent of the nitrogenous matter and 40 per cent of the phosphorous compounds in 2 days. There are numerous reports with similar results from scientsts other countries.

Water hyacinth culture removes algae and faecal bacteria, greatly reduces suspended matter and removes odour causing compounds. As a result, the resultant effluent is clear, odourless and contain little nitrogen and phosphorous.

In some Asian countries such as China and Malaysia water hyacinths have been used in treatment systems for pig farm waste. Malaysians and Sri Lankans have reported successful of water hyacinths in treating rubber factory effluents in experimental trials. In Sri Lanka water hyacinths are being used in a ponding system for treatment of textile factory effluents. These represents only a few instances of utilization of water hyacinths in biological treatment systems for various industrial effluents.

A couple of NARESA funded research projects, a few years ago looked into the possibility of using Eichhornia in treatment systems for several types of rubber factory effluents. With appropriate preconditioning and dilutions, it was shown that water hyacinth can be successfully used in ponding systems for treating effluents from crepe and latex concentrate factories.

Significant reductions in effluent parameters such as Biological Oxygen Demand (BOD) and Chemical Oxygen Demand (COD) have been achieved by using water hyacinths in treatment ponds. Studies carried out at the Rubber Research Institute, Sri Lanka show that a 90 per cent reduction of BOD and a 80 per cent reduction of COD in rubber factory effluents can be obtained by ponding systems with water hyacinths in period of about 10 days. This 10 - day treatment period or retention time as compared to 22 days required for conventional ponding systems (without plants) is a remarkable improvement.

This in turn brings down the land requirement for construction of ponding systems by 50 per cent thus making it more attractive to most rubber plantations where land for setting up of ponding systems, is scarce. In Sri Lanka a rather peculiar situation exists with regard to water hyacinth. Although water hyacinth can do the trick as far as pollutant removal is concerned, Sri Lankan rubber planters can not make use of this research finding since growing dissemination and transport of water hyacinth has been declared a punishable offence by a gazette notification in 1905.

Eichhornia crassipes is not the only aquatic plant adapted for growing in waste waters. As far as the removal of pollutanta is concerned it certainly ranks top. Among the other aquatic plants that seem to grow well in waste waters are several common weeds, for example the common weed *(Phragmites communis)*, bulrush *(Scripus lacastris)*, duck weeds *(Lemma* spp. and *Spirodela* spp.*)*, forms of elodea *(Elodea canadensis), Ergaria densa*, (hydrilla) and *Ceratophyllum demersum* etc.. Water lettuce *(Pistia stratiotes)*, another aquatic plant of floating type like water hyacinth, has been investigated extensively as waste water purifier.But can not match hardy water hyacinths since it can not withstand high concentrations of toxic elements in waste waters. *Pistia* is therefore more suitable for polishing of pre-treated effluent prior to final discharge.

The Max plank Institute of West Germany has developed and patented a water treatment process that uses reeds and bulrushes to purify water. Bilogical treatment systems with water hyacinths provide an attractive alternative to costly waste water treatment methods such as oxidation ditch, activated sludge system etc. These bilogical systems are also energy saving and their operational and maintenace costs are very low.

However, the anaerobic- facultative ponding systems are not without problems. The main drawback of water hyacinth lagoons being that the root system of the plant provides an ideal breeding ground for mosquitoes which could pose a health problem particularly in the tropics where malaria and other mosquito-borne diseases are common. Researchers

have found an answer to this too - the use of larvae feeding fish species. The improved qualilty of water in lagoons with water hyacinth allows *Gambusia affinis,* commonly refered to as mosquito fish, to flourish in it and naturally control mosquitoes by feeding on the larvae.

Despite so much of information gathered over the years on the economic potential of water hyacinth and other aquatic plants through a wide range of uses including pollutant removal the general attitude towards aquatic plants seem to remain the same.

Dr. N.W. Pirie who is world famous for his pioneering work on leaf proteins, in 1960, in a short note entitled "Water hyacinth - curse or crop" made an eloquent plea for a change in single minded approach to eradication, in favour of re-orientation towards utilization.

Shouldn't we appreciate what aquatic plants particularly water hyacinths are doing silently to our natural water bodies - namely purification. Shouldn't we recognise and appreciate this silent act of water hyacinths and extend it to our own advantage in the way we wanted. Professor Bates and Professor Hentges of University of Florida said in 1974 that "Eradication has presumably not worked since we are worse off in 1974 than in 1960. Simply stated the aquatic infestation is ever present. Like it or not, such vegetation appears to be a relatively stable component of tropical environment. It seems logical to make most of these plants and use them to serve man and his environment."