



Phytoremediation and reduction of physico-chemical parameters in pond water contaminated with industrial effluent using aquatic weeds

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ABSTRACT

The release of industrial wastes containing heavy metals to the aquatic bodies cause deleterious effects on organisms. The disposal of effluent into nearby natural water bodies leads to depletion of DO and increase in BOD of the water. Aquatic plants were found to be very effective in the reduction of pollutants in the water bodies. Aquatic plants play a major role in stabilizing and maintaining clear water state and maintaining the water quality in aquatic system. Aquatic plants are also very effective in treatment of waste water and industrial effluents. Maximum reduction of EC, Total dissolved solids, BOD, COD, Sulphate and Phosphate was observed during 96 hours in industrial effluents by using *Eichhornia crassipes* than *Pistia stratiotes*.

Keywords: *Eichhornia crassipes*, *Pistia stratiotes*, Effluent, Physico-chemical parameters

INTRODUCTION

Most of the industries are simply drained out the effluents into the water bodies or drainage nearby without any proper treatment. This waste water is spoiling the entire environmental condition of the town (Ramasubramanian *et al.*, 1993). These industrial wastes may have polluted almost all kinds from simple nutrient and organic matter to complex toxic substances. Biological method of treatments especially using macrophytic plants is simple, safer and cost effective (Binukumari *et al.*, 2015). It is an economically viable technology and can be used at any reason.

MATERIALS AND METHODS

Aquatic weeds selected for the study were *Eichhornia crassipes* and *Pistia stratiotes*. Plants of equal size from each group were used for the experiment. Pond water sample was taken in 7 plastic troughs (7 litre capacity). Weighed

quantity of two types of aquatic plants was introduced separately to each tub containing pond water. One tub containing the same pond water without the plants served as control. All the troughs were kept exposed to sunlight for 48, 72 and 96 hrs and the plants were removed after these periods of treatment and the parameters were analysed in the control and the plant treated waters by standard method of APHA, (2005).

RESULTS AND DISCUSSION

Eichornia crassipes and *Pistia stratiotes* are found to be very effective in pond water treatment for the removal of EC, BOD, Sulphate and Phosphate. Increase in pH has been recorded during treatment with *Eichornia crassipes* and *Pistia stratiotes* and maximum reduction in EC was achieved by *Eichornia crassipes* and *Pistia stratiotes* under treatment. In the present study where 74 percent, 75 percent and 86.40 percent of total dissolved solids was removed from pond water treated with *Eichornia crassipes* and 61.40 percent,

61.50 percent and 85.50 percent by *Pistia stratiotes* during 48, 72 and 96 hours treatment. The solids removed by plants are probably due to the root systems which favour sedimentation of solid particles both on the bottom of the container as well as by trapping in the root hairs. In the present study, BOD removal was found to be effective by plants in 96 hours treatment with *Eichornia crassipes* and *Pistia stratiotes*. The Oxygen not required for root respiration may diffuse into the waste water and be utilized by bacteria for the oxidation of BOD. This statement agrees with present finding with regard to the efficiency of *Pistia stratiotes* which affects 75.68 percent, 81.08 percent and 83.78 percent removal of BOD during 48, 72 and 96 hours treatment. Sulphates and phosphates have been effectively removed by plants during treatment for 48, 72 and 96 hours and it was found 87.5 through the treatment with *Eichornia crassipes* and 60.61 percent removal of phosphate was achieved through *Pistia stratiotes* treatment in 96 hours.

Table 1: Reduction of pollution load in pond water contaminated with industrial effluent by using aquatic plants.

Parameters	Raw Effluent	E. crassipes			Pistia stratiotes		
		48 hrs	72hrs	96hrs	48 hrs	72hrs	96hrs
pH	7.72	8.33	8.20	8.04	8.32	8.22	8.14
EC	3.36	2.40	2.32	2.21	2.90	2.60	2.51
TSS	8000	4000	4000	2200	2655.64	2200	3000
TDS	5213.33	2050	2050	646.01	1233.33	1233.33	656.67
BOD	124.35	39.33	36.57	20	30	22.36	34
COD	278.34	170.33	162.33	146.87	155.31	149.30	155.3
Sulphate	40.00	9.33	6.65	3.00	11.00	6.62	5.00
phosphate	9.47	4.23	5.12	3.53	4.17	3.93	5.03

CONCLUSION

Phytoremediation, especially using macrophytic plants is simple, safer and cost effective. It can be used at any time at any season and it is an economically viable technology. The aquatic plants are effective in controlling the growth of algae in lagoons and purification of waste water by their cellular enzyme system.

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Conflict of Interest

The author declares that there is no conflict of interest.

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