



## Free-floating Aquatic Plants in Modified Constructed Wetland Systems for Enhancing Treatment Efficiency in Textile Dye Effluents

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### Abstract

Treatment of textile dye effluent to acceptable level before discharging in to natural environment is practically a difficult situation in Sri Lanka since chemical & physical treatment processes are not applied intensively in order to reduce the cost of wastewater treatment. Generally wetlands are used for final adjustment of water quality parameters in partially treated biological wastes at preliminary and secondary treatment processes. In contrast, the main objective of the present work was to study the applicability of floating aquatic plants for purification of biologically and chemically untreated textile dye using floating aquatic plants. Three species of floating plants namely *Eichhornia*, *Salvinia* and *Pistia species* were used for comparative study in a batch system using plastic tanks with 8 liter capacity. Dye effluent which had undergone only sand filtering as a the preliminary treatment step and released from of textile dyeing plant of a small scale batik industry in Matara district was used as wastewater in this study. Analysis of water quality was conducted at five day intervals. The initial pH value of wastewater was 7.38 which changed to 7.31, 6.76, 6.50, 6.48 during the 20days of time respectively in control (without aquatic plants), *Eichhornia sp.*, *Pistia sp.* and *Salvinia sp.* grown systems. Considering pH, lowest reduction of original values and retained at more closer to neutral pH was also found in *Eichhornia* system. The initial values of Electrical conductivity (EC), Total solid (TS), Total suspended solid (TSS), Biochemical oxygen demand (BOD), Chemical oxygen demand (COD) and colour Intensity (CI) of partially treated dye effluent release from the primary treatment facility at the factory were 5.01mS, 243.3 ppm, 39.2 ppm, 81ppm, 189.5 ppm, and 1.654 abs respectively. During twenty days of time period the control system without use of aquatic plant indicated a decline in above mentioned water quality parameters as a percentage of the initial values are 7.03, 1.31, 0.77, 1.26, 34.97 and 0.59 respectively. Moreover, the decline percentage of respective parameters in *Eichhornia* grown wetland system were 61.51, 91.68, 77.87, 89.54, 93.86, 86.89. The observed decreased percentage of the EC, TS, TSS, BOD, COD and CI in *Pistia species* grown system are 65.55, 87.29, 33.68, 88.81, 83.46 and 84.60 respectively. The same water quality parameters have declined with percentages of 40.4, 84.16, 3.34, 89.19, 82.77, and 73.42. in *Salvinia species* grown system. The overall efficiency of reducing water quality parameters recorded at the 20<sup>th</sup> day indicates that *Eichhornia species* has highest potential and *Salvinia. Species* has lowest efficiency with regards to all the water quality parameters comparing three aquatic plant species. This study clearly indicate that under local climatic condition untreated textile dye wastes can be treated by *Eichhornia species* ubiquitous in our environment that can be utilized in engineered systems.

**Key words:** Floating aquatic plants, Textile dye waste, phytoremediation