

Full Length Research Paper**Efficiency of *Salvinia molesta* for Color removal from Textile Waste Water****Pavithra M* and Hina Kousar****

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Abstract

Water pollution is gaining increasing importance in present days. Textile industry processes are among the most environmentally unfriendly industrial processes, because they produce colored wastewater that heavily pollutes the environment. The removal of color from textile wastewater is one of the major environmental problems, because of difficulty of treating such water by conventional methods. Phytoremediation is an emerging technology that uses green plants for removal of contaminants of concern (COC). The present study was undertaken for removal of color from textile effluent using *Salvinia molesta*. Analysis of Variance (ANOVA) revealed statistically significant relationship. *S.molesta* has proved effective in substantial color reduction in textile wastewater.

Key words: Water pollution, Phytoremediation, Contaminants of concern (COC), Textile waste water, *Salvinia molesta*

Introduction

Water pollution is one of the most serious problems faced by man today (Robinson. T *et al.*, 2010). Lack of wastewater treatment facilities or their inefficiency is the single greatest cause of water pollution. In India, lack of modern and sophisticated technology has made the waste water treatment scenario pathetic. To reach the full objective of zero pollution, adoption of alternative technologies with low capital availability, minimum man power and limited energy consumption are necessary. So, there is an urgent need of establishing cost effective treatment systems.

The textile waste water is rated as the most polluting among all in the industrial sectors (Vilaseca *et al.*, 2010 and Awomeso *et al.*, 2010). Among the complex industrial wastewaters with various types of coloring agents, dye wastes are predominant (Sanmuga Priya and Senthamil Selvan, 2014). The textile wastewater containing dyes is not only toxic to the biological world, its dark colour blocks sunlight that leads to severe problems in the ecosystem (Choi *et al.*, 2004). Dyes exhibit considerable structural diversity and thus become difficult to treat by a single process (Karaca *et al.*, 2008).

Phytoremediation, the use of plants and their associated microbes for environmental cleanup, has gained acceptance in the past 10 years as a cost-effective, noninvasive alternative or complementary technology for engineering-based remediation methods (Pilon Smits E, 2005).

The application of aquatic plants for the removal of color and other toxic materials from wastewater has gained increasing interest (Rai, 2002). Many aquatic plant species have been studied and assessed to know their potential for remediation. The present study was conducted to test the feasibility of *Salvinia molesta* for treating textile wastewater in reducing the colour. *Salvinia molesta*, commonly known as giant salvinia or kariba weed, is an aquatic fern and a free floating plant.

Materials and Methods**Collection of Plants:**

Salvinia molesta was collected from a natural pond near Shimoga. Same sized young and healthy plants were collected and acclimatized under laboratory conditions for three days. Later they were introduced into the effluent.

Collection of samples

The sample for the analysis was collected from Shahi Exports Private Limited, Machenahalli, Shimoga District from the inlet of the effluent treatment plant. It was brought to the laboratory and analyzed for various physic-chemical parameters.

Method

Different concentrations (10% to 100%) of effluent were used for treatment, while the control was maintained separately. Plastic troughs of 10 litre capacity were filled with 7 litre of different concentrations of effluent. The plants were allowed to grow in laboratory model ponds for 7 days, after which they were taken out and the plant treated effluent was analyzed for color removal efficiency of *Salvinia molesta*.

Concentration of the dye was analyzed using UV-visible spectrophotometer at λ_{max} 498 nm. The decolorization efficiency was calculated using the relation:

$$\%E = \frac{A_i - A_f}{A_i} \times 100$$

Where; A_i and A_f are the absorbance values of effluent before and after treatment with respect to their λ_{max} (IS-3025 (P4)).

Data analysis

Results are expressed as mean \pm SEM. Statistical analysis was carried out using one way ANOVA followed by Tukey's t-test. The difference in values at $p < 0.05$ or $p < 0.01$ were considered as statistically significant. Statistical analysis was performed using ezANOVA 0.98 version.

Result and Discussion

The present study investigates the capability of *Salvinia molesta* in reducing the dye color of textile wastewater. The presence of dyes even in minute concentration in effluent is highly visible and undesirable. The study revealed a significant reduction in color concentration. The concentration of dye reduced from 2595 \pm 5 to 1377 \pm 2.65 on Pt-Co scale in raw effluent; in 90% concentration of the effluent it was reduced from 2586 \pm 3.61 to 1263.67 \pm 3.21, in 80% concentration from 2501.33 \pm 4.16 to 1102.33 \pm 2.52, in 70% concentration from 2463.67 \pm 3.21 to 895.33 \pm 5, in 60% from 2405.33 \pm 3.06 to 782.67 \pm 2.52, in 50% concentration from 2380 \pm 2 to 664.33 \pm 4.04, in 40% concentration from 2321 \pm 1 to 512.67 \pm 8.74, in 30% concentration from 2264.67 \pm 4.16 to 337.67 \pm 2.52, in 20% concentration from 2092.33 \pm 4.04 to 209.67 \pm 1.53 and in 10% concentration from 2405.33 \pm 3.06 to 82.67 \pm 2.52 on Pt-Co scale (Table 1). Results showed considerable reduction in color concentration and Analysis of Variance (ANOVA) revealed statistically significant relationship. Percentage reduction in color concentration after treatment with *Salvinia molesta* is represented in figure 1.

It has been found that *S.molesta* performed well in 10% concentration of the effluent. This indicates dilution enhances the performance of test plants in dye waste water.

Table 1. Color concentration of effluent before and after treatment with *Salvinia molesta*

Samples	Color concentration (Pt-Co)	
	Before treatment	After treatment (7 days)
100% concentration	2595 \pm 5**	1377 \pm 2.65**
90% concentration	2586 \pm 3.61**	1263.67 \pm 3.21**
80% concentration	2501.33 \pm 4.16**	1102.33 \pm 2.52**
70% concentration	2463.67 \pm 3.21**	895.33 \pm 5.03**
60% concentration	2405.33 \pm 3.06**	782.67 \pm 2.52**
50% concentration	2380 \pm 2**	664.33 \pm 4.04**
40% concentration	2321 \pm 1**	512.67 \pm 8.74**
30% concentration	2264.67 \pm 4.16**	337.67 \pm 2.52**
20% concentration	2188.33 \pm 7.64**	209.67 \pm 1.53**
10% concentration	2092.33 \pm 4.04**	82.67 \pm 2.52**

Values are expressed as mean \pm SEM ($n=3$), * $p < 0.05$; ** $p < 0.01$, denotes significance with respect to initial values (before treatment) using one way ANOVA followed by Tukey's test.

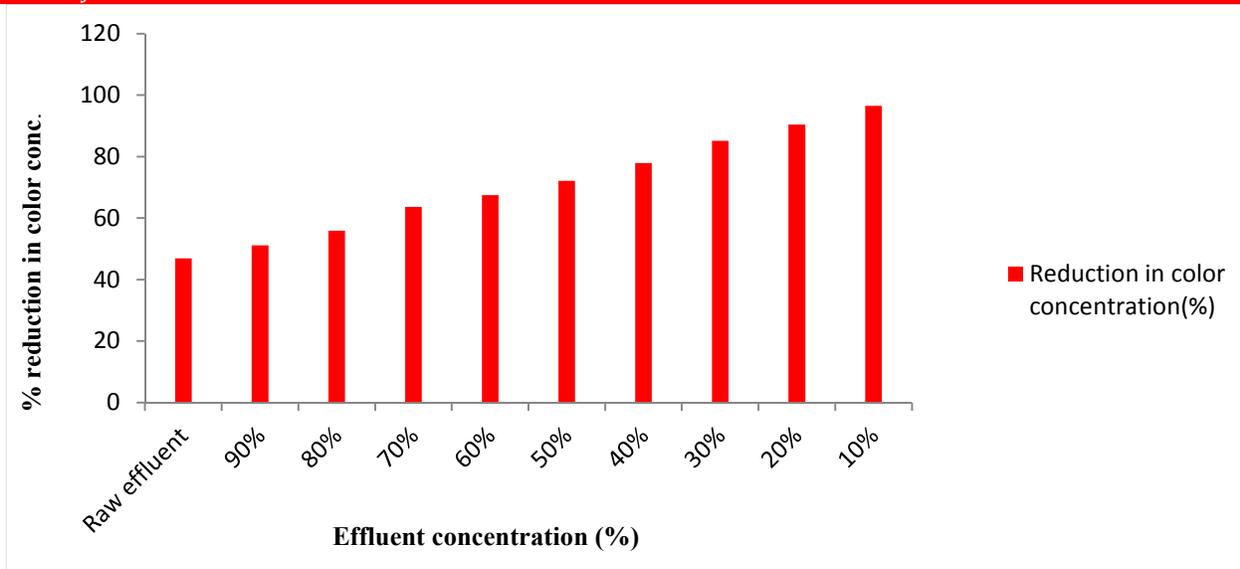


Fig. 1. Color reduction potential (%) of *Salvinia molesta*.

Conclusion

The feasibility of *S. molesta* to treat textile effluent was investigated and it was found to be efficient in reducing the concentration of color within 7 days of treatment. Hence, *S. molesta* could be used for remediation of textile mill effluent.

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