



TYPHADOMINGENSIS : A NEW HOPE FOR WASTE WATER TREATMENT

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ABSTRACT

Phytoremediation is continuously driving the attention as a cost effective technique that uses plants to remediate contaminants from wastewater, soil and sediments. In this study, the ability of *Typha domingensis* was used to examine its potential application for phytoremediation. Pollutant concentrations were measured in samples of wastewater initially and after phytoremediation. This study was specifically focused on the capacity of *Typha domingensis* to absorb the contaminants from the textile effluents and thus reduce them in the same during the course of study. Results indicated that *Typha domingensis* was remarkably efficient to reducing the pH, total solids and harmful ions from wastewater to a considerable manner, but it increased the BOD of the sample.

Key words: Phytoremediation, *Typha domingensis*, Textile effluents, pH, Total dissolved solids, BOD.

INTRODUCTION

Jodhpur district is located in the Thar desert, where scarcity of water is the basic problem throughout the year. Textile industries in Jodhpur and Pali districts are most important and rapidly developing industrial sectors. They have high impact on the environment, as it consumes a huge volume of processed water and discharge large amount of effluents. One of the burning problem of our industrial sector is the high consumption of water.

Many approaches have been taken to reduce water consumption, but it would be better to recycle waste water into high quality water¹. Dyeing and finishing are two

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important steps in the textile industry, which involve the dyeing of man-made or natural fibers to the desired permanent colors and processing of the fibers into final commercial products. In the dyeing and finishing processes a considerable amount of wastewater, effluent is generated, which is very toxic and contain strong colour, a large amount of suspended solids, a highly fluctuating pH, high temperature, COD, BOD etc.². This may contain a wide spectrum of heavy metals and other toxic organic pollutants^{3,4}. Moreover, these areas are also famous for their traditional batik and woven cloth. Unfortunately, these products, in Rajasthan particularly, are mostly manufactured in small scale industries, where wastewater treatment facility is not provided. As a consequence, coloured waste water with high COD and suspended solid levels is discharged directly into the environment with no or very limited treatment. Such a kind of disposal may lead to water as well as soil pollution and may turn the nearby land areas unfertile and barren in due course of time. Thus, it is the demand of time that textile wastewater must be suitably treated before it is being disposed to natural water system⁵.

Numerous chemical and physical treatment methods are in practice, but these may either leave behind some chemicals used for the treatment or may form harmful by products that may deteriorate the environment.

Phytoremediation methods are comparatively cheap and ecologically advantageous, compared to other common technological approaches. There are several species of plants known for their phytoremediative abilities⁶⁻⁸. The phytoremediation potentials of plant species have been considered in many previous researches⁹⁻¹¹.

Typha domingensis, the subject of the present study is a widespread and dominant plant species in many aquatic systems in Egypt. It is found easily in the wetland areas nearby Jodhpur. *T. domingensis* is a tall (2.0-2.5 m) perennial marsh that occurs naturally in both pristine and disturbed habitats with widely fluctuating water levels¹². This specie can act as an aggressive invader and can completely choke lakes, ditches and canals. Among various species, Typha is the most widespread water weed around the world belonging to the *Typhaceae* family. These plants have the advantages of growing under varied climatic conditions and Asian accumulates heavy metals under natural conditions or from contaminated environments. Several species of Typha including *T. angustifolia* L., *T. dominengensis*, *T. orientalis* C. and *T. latifolia* L. appears to be highly adaptable and establish easily in most regions and show potential to remove various contaminants including heavy metals from waste waters.

In the present study an attempt has been made to evaluate the performance of wetland plant specie, *Typha* on treatment of textile effluents.

EXPERIMENTAL

Textile effluents were collected from two textile factories in Pali and one from Jodhpur district. An experimental scale wetland was constructed and its potential for treatment of the effluents was investigated. The samples were collected from the respective sites and kept in refrigeration until analysis was carried out. Physico-chemical parameters like pH, TSS, BOD and chloride content were analyzed in raw water sample as per the standard methods. The sample was then used for phytoremediation. Plant specie *Typha* was planted in large containers and the sample was provided to the same in fixed volume. The number of plants per container was also kept fixed.

RESULTS AND DISCUSSION

In the present study, an attempt has been made to assess the efficiency of aquatic weeds like *Typha* species to reduce the harmful contents in the effluents from textile industries from Pali and Jodhpur districts of Rajasthan under laboratory conditions. The effluent samples collected were analyzed periodically after treatment to observe changes in physico-chemical properties i.e. pH, total dissolved solids, and chloride content.

The data of the parameters analyzed are as follows:

A decrease in the pH was observed when textile effluents were treated with *Typha* species. The pH decreased steadily from 9.8 to 7.1 for sample-1; in case of sample-2 from 8.9 to 6.5 and from 9.2 to 6.9 for sample-3, as evident in Table 1 and Fig. 1.

In the bio-absorptive process pH is the most important parameter. Solution chemistry of metals is affected by pH, it also influences the activity of the functional groups in the biomass and the competition of metallic ions¹³. The pH of the treated samples were brought to the nearly neutral range, which in raw samples were found to be alkaline. It can be attributed to the fact that the reduction in pH is due to absorption of pollutants by plant¹⁴.

Table 1: Variation in pH of textile effluents treated with *Typha* species

	Sample 1	Sample 2	Sample 3
0 day	9.8	8.9	9.2
15 days	8.2	7.7	8.1
30 days	7.1	6.5	6.9

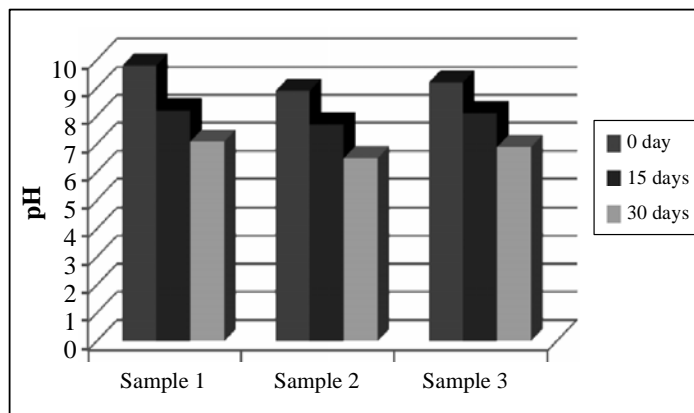


Fig. 1: Variation in pH of textile effluents treated with Typha species

Total Dissolved Solids (TDS) parameter was also found to decrease with time. A significant decrease was observed in TDS from 1665 to 1224 in 30 days for Sample-1, from 1423 to 1034 in Sample-2 and in Sample-3 from 1539 to 1143, as expressed in Table 2 and Fig. 2.

Table 2: Variation in total dissolved solids [TDS] content in textile effluents treated with Typha species

	Sample 1	Sample 2	Sample 3
0 day	1665	1423	1539
15 days	1449	1208	1361
30 days	1224	1034	1143

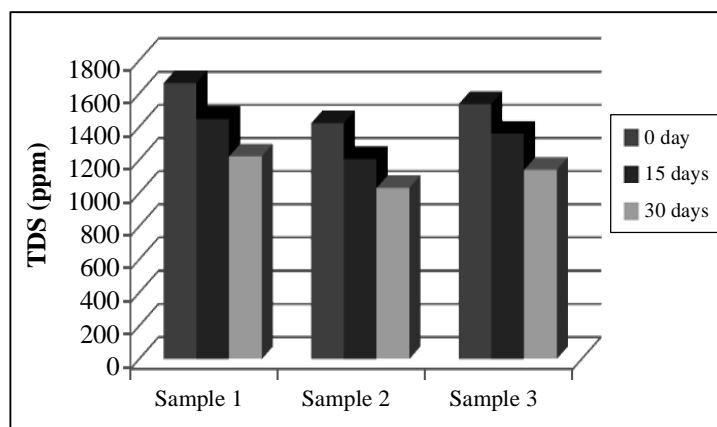


Fig. 2: Variation in total dissolved solids [TDS] content in textile effluents treated with Typha species

Total dissolved solids are used to express the degree of contamination. Marked reduction in total solids was noticed after treatment period in all the samples. It can be interpreted that the reduction in TDS was due to the retaining of coarse and fine particulate organic materials present in water bodies supporting their growth by the root system¹⁵.

Statistically significant in Table 3 and Fig. 3. The next parameter i.e. chloride content also decreased from initial level after 30 days. In Sample-1 it was observed to reduce from 765 ppm to 489 ppm, from 690 ppm to 398 ppm in Sample-2 whereas, from 747 ppm to 404 ppm. in Sample-3.

Table 3: Variation in chloride content in textile effluents treated with Typha species

	Sample 1	Sample 2	Sample 3
0 day	765	690	747
15 days	576	509	527
30 days	489	398	404

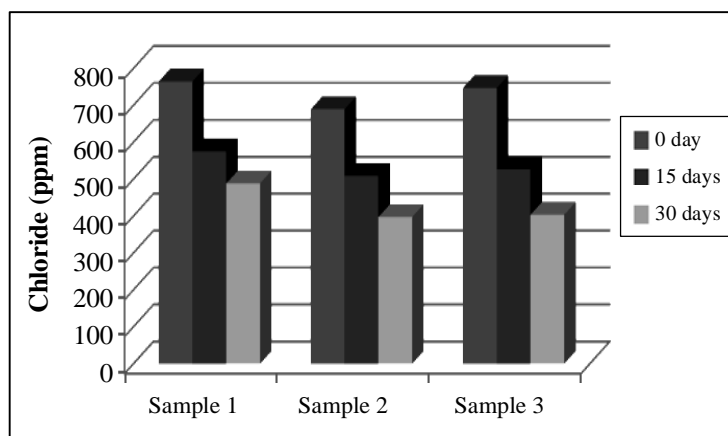


Fig. 3: Variation in chloride content in textile effluents treated with Typha species

A remarkable decrease in chloride content was evident in all the samples was evident. An approximate decline of about 40-50% could be seen in all of them¹⁶.

CONCLUSION

Phytoremediation is still in a phase of research and development and requires immense efforts to overcome technical barriers. This study concludes that Typha species,

which has undoubtedly proved to be promising tool for textile effluent treatment, more attention is required to make it publically applicable and accepted. Moreover, it has the potential to treat sites polluted with more than one type of pollutant.

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