*Int. J. Chem. Sci.: 11(1), 2013, 383-389*
*ISSN 0972-768X*
*www.sadgurupublications.com*

# *TYPHADOMINGENSIS* : A NEW HOPE FOR WASTE WATER TREATMENT

**CHETNA GOMBER[*], SUNITA PARIHAR, YASMIN[a] and GANPAT CHOUDHARY**

Department of Chemistry, Jodhpur Institute of Engineering And Technology For Girls, JIET Universe, N.H-65, Pali Road, Mogra, JODHPUR (Raj.) INDIA
[a]Department of Chemistry, Techno India NJR Institute of Technology, UDAIPUR (Raj.) INDIA

## 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 water[1]. Dyeing and finishing are two

[*]Author for correspondence; E-mail: chirag11gomber@gmail.com, pariharsunita@yahoo.co.in, ali_yasmin2002@yahoo.com, ganpat.choudhary83@gmail.com

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 system[5].

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 abilities[6-8]. The phytoremediation potentials of plant species have been considered in many previous researches[9-11].

*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 levels[12]. 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 ions[13]. 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 plant[14].

**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 |

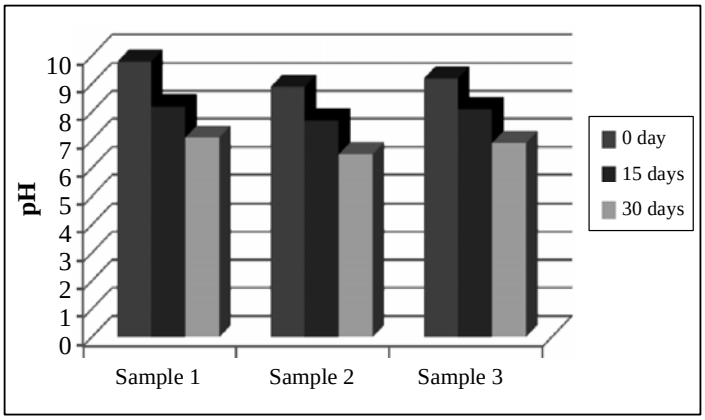


**Fig. 1: Variation in pH of textile effluents treated with Typha species**

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 |

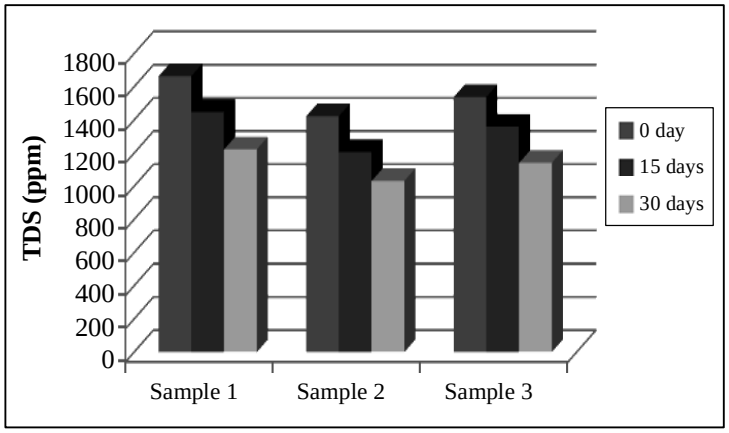


**Fig. 2: Variation in total dissolved solids [TDS] content in textile effluents treated with Typha species**

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 system[15].

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 |

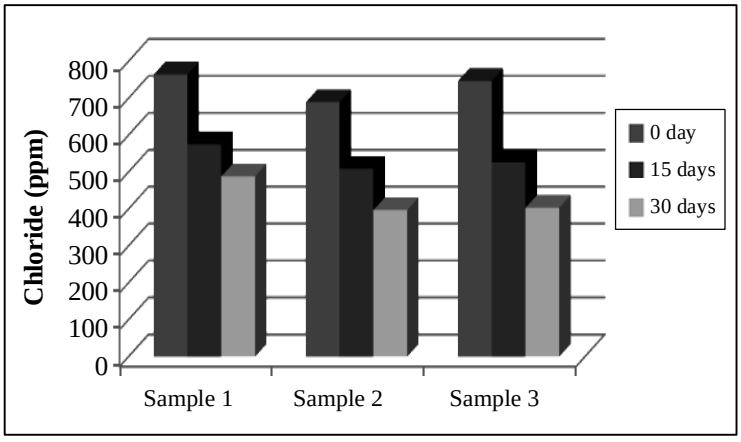


**Fig. 3: Variation in chloride content in textile effluents treated with Typha species**

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 them[16].

## 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.

## ACKNOWLEDGEMENT

The authors extend their thanks and gratitude to the Director (JGI), JIET Group of Institutions, Jodhpur to provide all the facilities to work upon the project and also for his constant motivation, which enabled to bring this work in the present form.

## REFERENCES

1. P. Schröder, J. Navarro-aviñó, H. Azaizeh, A. G. Goldhirsh, S. Digregorio, T. Komives et al., Using Phytoremediation Technologies to Upgrade Waste Water Treatment in Europe, Env. Sci. Poll. Res., **14**, 490-497 (2007).
2. F. C. Gurnham, Industrial Wastewater Control, Academic Press, NY, Ed. (1965).
3. G. Mckay, M. S. Otterburn and A. A. Jamal, Fuller's Earth and Fired Clay as Absorbents for the Dyestuffs: Equilibrium and Rate Studies, Water, Air and Soil Pollution, 24, 307-322 (1985).
4. P. K. Ray, Environmental Pollution and Cancer, J. Sci. Indust. Res., **45**, 370-371 (1986).
5. E. S. Kabir, M. Kabir, S. M. Islam, C. M. Mia, N. Begum, D. A. Chowdhury et al., Assessment of Effluent Quality of Dhaka Export Processing Zone with Special Emphasis to the Textile and Dying Industries, Jahangirnagar Uni. J. Sci., **25**, 137-138 (2002).
6. S. Riffat, M. T. Arefin, R. Mahmud, Phytoremediation of Boron Contaminated Soils by Naturally Grown Weeds, J. Soil Nature, **1(1)**, 1-6 (2007).
7. J. Nouri, N. Khorasani, B. Lorestani, M. Karami, A. H. Hassani, N. Yousefi, Accumulation of Heavy Metals in Soil and Uptake by Plant Species with Phytoremediation Potential, Environ. Earth Sci., **59(2)**, 315-323 (2009).
8. J. Nouri, B. Lorestani, N. Yousefi, N. Khorasani, A. H. Hasani, S. Seif, M. Cheraghi, Phytoremediation Potential of Native Plants Grown in the Vicinity of Ahangaran Lead-Zinc Mine (Hamedan, Iran), Environ. Earth Sci., **62(3)**, 639-644 (2011).
9. M. Sharifi, Y. Sadeghi and M. Akpapour, Germination and Growth of Six Plant Species on Contaminated Soil with Spent Oil, Int. J. Environ. Sci. Tech., **4(4)**, 463-470 (2007).

10. S. K. Singh, A. A. Juwarkar, S. Kumar, J. Meshram and M. Fan, Effect of Amendment on Phytoextraction of Arsenic by Vetiveria Zizanioides from Soil, Int. J. Environ. Sci. Tech., **4(3)**, 339-344 (2007).

11. H. Zhang, Z. Dang, L. C. Zheng, X. Y. Yi, Remediation of Soil Co-Contaminated with Pyrene and Cadmium by Growing Maize (Zea Mays L.), Int. J. Environ. Sci. Tech., **6(2)**, 249-258 (2009).

12. L. Boulos, Flora of Egypt Checklist, Revised Annotated Edition, Al-Hadara Publishing, Cairo (2009).

13. M. Galun, Removal of Metal Ions from Aqueous Solutions by Penicillum Biomass : Kinetic and uptake parameters, Water, Air and Soil Pollution, **33**, 359-371 (1987).

14. Q. Mahmood, P. Zhen, Islam, Y. Hayat, M. J. Hassan, G. Jilani and R. C. Jin, Lab Scale Studies on Water Hyacinth (Eichhorniacrassipes Marts Solms) for Bio treatment of Textile Wastewater, Caspian J. Env. Sci., **3(2)**, 83-88 (2005).

15. A. E. Ghaly, M. Kamal and N. S. Mahmood, Phytoremediation of Aquaculture Waste Water for Water Recycling and Production of Fish Feed, Environ. Technol. **14**, 1011-1016 (2004).

16. S. Nayana and S. N. Malode, Phytoremediation Potential of *Cassia Tora* (L.) Roxb. To Remove Heavy Metals from Waste Soil Collect from Sukali Compost and Landfill Depot, Amaravati, (M.S.), Global J. Bio-Sci. Biotech., **1(1)** (2012) pp. 104-109.

*Revised : 20.12.2012* *Accepted : 23.12.2012*