Journal of
Bioremediation & Biodegradation

Pavithra and Kousar, J Bioremediat Biodegrad 2016, 7:5
DOI: 10.4172/2155-6199.1000364

Research Article Open Access

# Potential of *Salvinia molesta* for Removal of Sodium in Textile Wastewater

**Pavithra M and Hina Kousar***

*Department of PG Studies and Research in Environmental Science, Kuvempu University, Shankaraghatta, Karnataka, India*

**Abstract**

Textile industries are one of the major contaminators of water and soil. Sodium is the only major cation present in textile wastewater due to high consumption of sodium salts in processing units. Many aquatic macrophytes are successfully used for phytoremediation of contaminated water. An attempt has been made to test the potential of *Salvinia molesta* in reduction of sodium from textile effluent. The experimental study showed that *Salvinia molesta* is a suitable candidate for effective removal of sodium from textile wastewater.

**Keywords:** Textile wastewater; Sodium; Macrophytes; Phytoremediation; *Salvinia molesta*

## Introduction

Water is the most vital resource for all kinds of life, but it is being adversely affected both quantitatively and qualitatively. Today, most of the rivers receive millions of litre of sewage and industrial effluents containing varying characteristics from simple nutrients to highly toxic substances [1]. Because of increasing population and industrial developments, a huge amount of wastewater is discharged to the environment above the level that the nature can eliminate. One of the most important industrial activities in India with its magnitude of economy is the textile industry. Textile industry discharges a complex huge volume of waste water containing various chemicals used in dyeing, printing and finishing processes. The effluent generated in different steps or processes is well beyond the standard and thus it is highly polluted and dangerous [2]. Sodium is the only major cation present in textile wastewater due to high consumption of sodium salts in processing units [3]. Sodium salts are generally highly soluble in water and are leached from the terrestrial environment to groundwater and surface water. They are non-volatile and will thus be found in the atmosphere only in association with particulate matter [4]. Although it is generally agreed that sodium is essential to human life, there is no agreement on the minimum daily requirement. In general, sodium salts are not acutely toxic because of the efficiency with which mature kidneys excrete sodium. However, acute effects and death have been reported following accidental overdoses of sodium chloride. Acute effects may include nausea, vomiting, convulsions, muscular twitching and rigidity, and cerebral and pulmonary oedema [5]. Excessive salt intake seriously aggravates chronic congestive heart failure, and ill effects due to high levels of sodium in drinking-water have been documented [6].

The excess negative properties of textile wastewater for the environment and the health of human beings show how important it is to find a solution for this problem. In various stages of textile industry, a significant amount of water is consumed and this situation puts forth the necessity for regular control of textile wastewater into consideration.

Phytoremediation, the plant based green and cost effective technology has been receiving increased attention after the discussion on hyper-accumulating plants which are able to accumulate, translocate and concentrate high amount of hazardous elements in the harvestable part [7,8]. Macrophytes are the potent phytoremediators and the macrophytes phytoremediation mechanism consists of several processes such as phytoextraction, rhizofiltration, phytostabilization, phytovolatilization and phytotransformation or phytodegradation in which each of the process have different role in the accumulation and remediation of the metals [7,9-12]. Many wetlands macrophyte species are successfully used for phytoremediation of contaminated water [13]. These wetland macrophytes were utilized to absorb and degrade the contaminants to prevent from further contamination of the water bodies. The goal of the present study is to assess the effectiveness of *S. molesta* in the reduction of sodium in textile mill effluent.

## 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 in laboratory conditions for three days. Later they were introduced into the effluent [14].

### Collection of samples

The sample for the analysis was collected from a textile industry near Shimoga. It was brought to the laboratory and analysed for various physico-chemical parameters.

### Method

Different concentrations (10% to 70%) 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 concentration 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 the efficiency of *Salvinia molesta* in reducing sodium [15].

**Sodium:** Sodium (as N mg/L) was determined by Flame photometry method (IS: 3025(p45)) before and after the treatment.

## Results

The present study investigates the capability of *Salvinia molesta*

***Corresponding author:** Dr. Hina Kousar, Department of Environmental Science, Kuvempu University, Shankaraghatta, Karnataka, India, Tel: +919449100288; E-mail: eshinakousar@gmail.com

**Received** July 18, 2016; **Accepted** August 02, 2016; **Published** August 03, 2016

**Citation:** Pavithra M, Kousar H (2016) Potential of *Salvinia molesta* for Removal of Sodium in Textile Wastewater. J Bioremediat Biodegrad 7: 364. doi:10.4172/2155-6199.1000364

in reducing sodium concentration in textile wastewater. The result clearly indicates that *Salvinia molesta* is highly efficient in reducing concentration of sodium as there was a significant reduction in their concentration. Concentration of sodium of effluent after treatment with *Salvinia molesta* is represented in Table 1. The percentage of sodium reduction is represented in Figure 1.

## Discussion

The experimental study showed that *Salvinia molesta* is a suitable candidate for effective removal of sodium from textile wastewater [16]. These findings indicate that phytoremediation could promote the removal of nutrient like sodium from the textile mill effluent. It is also in agreement with the report of Ref. [17] that aquatic macrophytes are very efficient in remediating nutrients from wastewaters. The released contaminants are absorbed by plants, and the contaminants in water will gradually be diminished. The study has shown that *Salvinia molesta* could remove large amount of nutrients from textile wastewater.

## Conclusion

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

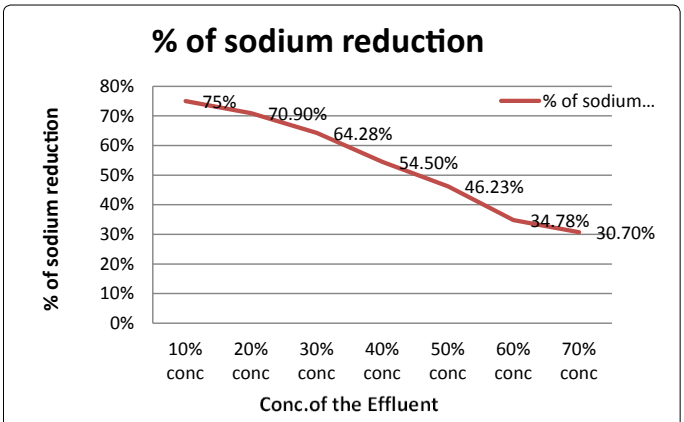


**Figure 1:** Different concentration of effluent and percentage of sodium reduction.

| Samples | Sodium reduction |
|---|---|
| 10% concentration | 400 ± 169.7056 |
| 20% concentration | 710 ± 275.7716 |
| 30% concentration | 950 ± 318.1981 |
| 40% concentration | 1280 ± 339.4113 |
| 50% concentration | 1430 ± 304.0559 |
| 60% concentration | 1900 ± 282.8427 |
| 70% concentration | 2200 ± 282.8427 |

**Table 1:** Concentration of total sodium of effluent after treatment with *Salvinia molesta*.

## References

1. Pavithra M, Hina K (2016) Characterization of certain physico-chemical parameters of textile waste water. International Journal of Environmental Sciences 5: 39-41.
2. Tekoglu O, Ozdemir C (2010) Wastewater of textile industry and its treatment processes. BALWOIS, Republic of Macedonia.
3. Hussain J, Hussain I, Arif M (2004) Characterization of textile waste water. Journal of industrial pollution control 20: 137-144.
4. WHO (1996) Sodium in Drinking-water: Background document for development of WHO Guidelines for Drinking-water Quality. Guidelines for drinking water quality. 2nd edn. World Health Organization, Geneva.
5. Elton NW, Elton WJ, Narzareno JP (1963) Pathology of acute salt poisoning in infants. American journal of clinical pathology 39: 252-264.
6. WHO Copenhagen (1979) Sodium, chlorides and conductivity in drinking water. EURO Reports and Studies, Vol: 2.
7. Rai PK (2008) Heavy-metal pollution in aquatic ecosystems and its phytoremediation using wetland plants: An eco-sustainable approach. International Journal Phytoremediation 10: 133-160.
8. Rahman MA, Hasegawa H (2011) Aquatic arsenic: Phytoremediation using floating macrophytes. Chemosphere 83: 633-646.
9. Rai PK (2008) Phytoremediation of Hg and Cd from industrial effluents using an aquatic free floating macrophyte Azolla pinnata. International Journal Phytoremediation 10: 430-439.
10. Rai PK (2009) Heavy metal phytoremediation from aquatic ecosystems with special reference to macrophytes. Critical Reviews in Environmental Science and Technology 39: 697-753.
11. Rai PK (2011) Heavy metal pollution and its phytoremediation though wetland plants. Nova Science Publisher, New York, USA, p: 196.
12. Rai PK (2012) An Eco-sustainable Green Approach for Heavy metals Management: Two Case Studies of Developing Industrial Region. Environmental Monitoring and Assessment 184: 421-448.
13. Rai PK, Mishra A, Tripathi BD (2010) Heavy metals and microbial pollution of river Ganga: A case study on water quality at Varanasi. Aquatic Ecosystem Health and Management 13: 352-361.
14. Department of National Health and Welfare (Canada) (1992) Guidelines for Canadian drinking water quality. Supporting documentation, Ottawa, Canada.
15. National Research Council (1989) Recommended dietary allowances. 10th edn. National Academy Press, Washington, USA.
16. Singh MM, Rai PK (2016) A microcosm investigation of Fe (iron) removal using macrophytes of Ramsar Lake: a phytoremediation approach. International Journal of Phytoremediation.
17. Ugya AY, Imam TS, Tahir MS (2015) The Use of Pistia stratiotes to Remove Some Heavy Metals from Romi Stream: A Case Study of Kaduna Refinery and Petrochemical Company Polluted Stream. Journal of Environmental Science, Toxicology and Food Technology 9: 48-51.

**Citation:** Pavithra M, Kousar H (2016) Potential of *Salvinia molesta* for Removal of Sodium in Textile Wastewater. J Bioremediat Biodegrad 7: 364. doi:10.4172/2155-6199.1000364