ISSN NO. 2320-5407

Journal homepage: http://www.journalijar.com

INTERNATIONAL JOURNAL OF ADVANCED RESEARCH

RESEARCH ARTICLE

AN EXPERIMENTAL INVESTIGATION OF ALUM AND MORINGA OLEIFERA SEED IN WATER TREATMENT

***A. Sethupathy**

Department of Civil Engineering, Indira Institute of Engineering and Technology, Tamil Nadu, India - 631203

Manuscript Info

Manuscript History:

Received: 15 November 2014
Final Accepted: 22 December 2014
Published Online: January 2015

Key words:

Alum, Moringa oleifera, Turbidity, Physical parameters, Chemical Parameters

Corresponding Author

A.Sethupathy

Abstract

The main objective of this work is comparing the effectiveness of alum as a chemical coagulant and M.oleifera as natural coagulant for treating river water. In this study, the water sample was collected from Cauvery River, at Srirangam, Trichy. Various concentration of alum viz 15,25,35,45 ppm and M.oleifera viz 10,20,30,40 ppm were taken. Before and after treatment of river sample were analyzed of physical parameters like pH, Turbidity, TDS, Electrical conductivity and chemical parameters like Total Hardness, alkanity, Chloride, Fe. The present study discussed that treating turbid water from river with alum and Moringa oleifera as coagulant and for further purification required simple sand filtration assembly for rural people purpose.

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INTRODUCTION

About 1.3 billion people still lack safe drinking water and more than 6 million children die from diarrhoea in developing countries every year (Litherland, 1995). Only 61% of people in under

[1]Corresponding Author: Tel: +91-9176366249.
Email: sethu1021@gmail.com

Developing countries are estimated to have access to a potable water supply, greater in urban than rural areas, and 36% to sanitation, greater in urban than in rural areas (WHO, 1998). However, in many parts of the world river water which is used for drinking purposes can be highly turbid (Sureshsundar and Sugir, 2003).

The turbidity is conventionally removed by treating the water with expensive chemicals, many of which are imported at great cost and these are frequently unavailable. Large water treatment centers to the water purification by adding coagulants to the water such as alum. The production of drinking water is a major problem of developing countries and particularly those in tropical area of Africa. There are serious problems regarding the water supplies in the towns with high density of population, because the quantity and quality of groundwater are not sufficient to ensure the total potable water demands.

It is necessary to use surface waters to produce potable water. Surface waters composition (natural organic matter, turbidity) depends of season and geographic area. Physico-chemical method is commonly used in drinking water treatment plants in order to remove turbidity and natural organic matter (Edzwald et al., 1999).

In the water treatment step involving coagulation is conducted by physico-chemical modification of colloidal particles that characterize the color and turbidity by adding coagulant chemicals, reduce the forces responsible for keeping the particles apart and suspended (Richter, 2009). Naturally occurring coagulants are usually presumed safe for human health. Earlier studies have found the Moringa oleifera seeds are non-toxic, and recommended its use as coagulant in water treatment in developing countries. Moringa oleifera is the best natural coagulant discovered so far that can replace alum (Eman N.Ali et al., 2009).

Material and Methods

Alum and good quality of dried Moringa oleifera (drumsticks) were selected and wings and coat from seeds were removed. Fine powder was prepared by using mortar and pestle and this powder was directly used as coagulant. Water samples for study purpose were collected from Cauvery River at Trichy, Tamilnadu. The water quality parameters were checked before and after treatment. Doses of seed powder i.e. 10, 20, 30, and 40 mg/l were chosen.

The coagulant was mixed with drinking water sample and kept on the shaker for 45 min at 110 - 120 rpm. The settling time was 1 - 2 hours (depending on the water turbidity). After sedimentation, supernatant of treated water was used for test. The water quality parameters were checked for physicochemical as per standard methods (Srivastava et al., 2011) before and after the treatment. The efficiency dose of M. oleifera seed powder was determined (Maithi, 2004).

Result and Discussion

The water samples were collected from Cauvery River, Srirangam, Tamilnadu, following drinking water quality parameters were analyzed before and after the treatment of various doses of MOSP and Alum are listed in the Table 1.In this study using alum and Moringa seed as a coagulant. The initial turbidity of river water was observed as 27NTU which beyond the limits of WHO standards. It was observed that after treatment with alum, turbidity was decreased to 4.7NTU at a dose of 25ppm.

The turbidity was decreased due to destabilization mechanism could be adsorption and charge neutralization(Madsen et al.,1987).The initial pH of river water was observed as 7.4.During the analysis, pH was slightly decreased at alum dose of 35 and 45ppm.

The pH was observed in alkaline nature after treated with Moringa seed powder. Before the treatment Electrical conductivity was observed as 575 µS/cm .

After treated with Moringa seed powder, electrical conductivity was reduced to 310 µS/cm at a dose of 40ppm.The permissible limit of electrical conductivity is 280 -330µS/cm as per WHO standard. The total hardness of the river water was 96 mg/l. The hardness was reduced from 96mg/l to 42 mg/l after treated with Moringa seed powder.

According to Suleyman and Lilian (1995) stated that M.oleifera reduce hardness in water through adsorption and inter-particle bridging. Before treatment, TDS of river water was 341mg/l. After treated with alum, TDS was slightly reduced rather than treated with Moringa seed powder.

Alkanity of the present research work was 84 mg/l for river water. After treated with Moringa and alum , alkanity slightly decreased due to precipitation of insoluble products of reaction between Coagulant and hardness causing ions(Srivastava et al.,2011).The other characteristics of river water likes fluoride, sulphate , Chloride, Fe were not effectively reduced after treated with alum and Moringa seed powder as a coagulant.

Table 1

Parameters	Raw Water	ALUM (50 NTU)				Moringa Seed Powder (50 NTU)			
		15 ppm	25 ppm	35 ppm	45 ppm	10 Ppm	20 ppm	30 ppm	40 ppm
Turbidity(NTU)	27	11.2	8.4	5.4	3.1	6.1	4.7	5.1	6.2
pH	7.4	7.1	7.2	6.3	6.2	7.3	7.1	7.4	7.3
Electrical Conductivity(µS/cm)	575	509	521	525	534	370	355	356	310

Total Hardness(mg/l)	96	96	96	96	96	48	42	43	40
TDS(mg/l)	341	346	354	357	363	250	240	212	238
Alkanity (mg/l)	84	82	81	79	76	83	82	82	82
Flouride (mg/l)	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Sulphate(mg/l)	69	73	78	81	87	69	69	69	69
Chloride(mg/l)	49	49	49	49	49	49	49	49	49
Fe(mg/l)	1.61	0.9	0.79	0.37	0.24	0.79	0.44	0.70	0.89

Physical -Chemical analysis of Cauvery river water with alum and Moringa seed powder
Table 2

Parameters	**Raw Water**	**ALUM**	**Moringa Seeds**
	50 NTU	**35 ppm**	**20 ppm**
Turbidity(NTU)	50	5.4	4.7
pH	7.4	6.3	7.1
Electrical Conductivity (µS/cm)	501	525	355
Total Hardness(mg/l)	96	96	42
TDS(mg/l)	341	357	240
Alkanity (mg/l)	84	79	82
Flouride (mg/l)	0.8	0.8	0.8
Sulphate(mg/l)	69	81	69
Chloride(mg/l)	49	49	49
Fe(mg/l)	1.61	0.37	0.44

Optimum dosage of Alum and M.oleifera at 50NTU

The water sample taken from Cauvery River has the turbidity of 37 NTU turbidity the optimum dosage of alum and Moringa Oleifera seed were identified as 35 mg/l and 20 mg/l respectively.

References

1. **J.K. Edzwald, J.E. Tobiason, (2009)**. Enhanced coagulation, US requirements and a broader view, Water Science and Technology, 40, 9, pp. 63-70.

2. **Eman N. Ali., Suleyman A. Muyib.i, Hamzah M. Salleh., Md Zahangir Alam, Mohd Ramlan M. Salleh, (2009).** Production of Natural Coagulant from Moringa Oleifera Seed for Application in Treatment of Low Turbidity Water. J. Water Resource and Protection, 259-266.
3. **Litherland, S. (1995).** Large scale water purification article: Trees for life. Inter Press Service, Washington DC.
4. **Madsen, M., Schlundt, J., & Omer, E. F. (1987).** Effect of water coagulation by seeds of M. oleifera on bacterial concentration. J. Trop. Med. Hyg., 1, 90-109.
5. **Maithi, S. K. (2004).** Handbook of methods in environmental studies vol.1: water and waste water analysis, second edition, published by ABD.
6. **Richter, CA. (2009).** Water Methods and treatment technology. 1st ed. São Paulo, Ed Blucher, 333 p.
7. **Sureshsundar, S. & Sugir- tharan, M. (2003).**New choice in water purification; Moringa seeds.
8. **Srivastava, A., Mittal, D., Sinha, I., Chakravarty, I., & Raja, R. B. (2011).** Study of Adsorption Isotherms for the reduction of basic dyes in effluent water using Moringa oleifera seeds, Anna. Biolog. Resea, 2(2), 227-238.
9. **Suleyman, A. M., & Lilian, M. E. (1995).** Moringa oleifera seeds for softening hard water. Wat. Res., 29(4), 1099-1105