

Water Treatment by using Moringa Oleifera and Tamarind Seeds

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Abstract: Water purification is the process of removing undesirable chemicals, biological contaminants, suspended solids and gases from water. Purifying water may reduce the concentration of a range of dissolved and particulate matter. Commonly the chemical coagulants such as salts of iron and aluminum are used. Widely used coagulant is aluminum sulphate. Shortly known as Alum, but it is very costly. Alum reacts with the bicarbonate alkalinities present in water and forms a gelatinous precipitate. This flock attracts other fine particles and suspended material in raw water, and settles down at the bottom of the container. Over dosage of Alum causes harmful effects on human being. Instead of this, natural coagulants such as Moringa Oleifera and tamarind seed powder are used for avoiding these limitations. In this present study, an attempt has been made to evaluate the comparative effectiveness of chemical coagulant Alum with Natural Coagulant such as Moringa Oleifera and tamarind seed powder. The pH, alkalinity, acidity and total chlorides, optimum dosage was determined in treated sample of coagulants and finds the removal efficiencies.

Keywords: Moringa Oleifera, Tamarind seeds, Alum

1. Introduction

Contamination of soil, water, and air by heavy metals, causes threat to our environment, humans, animals, plants, and marine life. Transport and accumulation by plants and animals as well as the potential for its propagation into the food chain exacerbate its toxic health effects. Presently there are no low cost technologies available for removal of several commonly present groundwater contaminants. Fluoride is one such compound that is widely present in groundwater worldwide. Exposure to fluoride in drinking water has a number of adverse effects on human health. Chemical coagulants like Aluminium Sulphate (alum), FeCl_2 are used in Municipal drinking water treatment plant for purification process. In rural and undeveloped countries people living in extreme poverty are presently drinking highly turbid and microbiologically Contaminated water as they lack of knowledge of proper drinking water treatment and also not afford to use high cost of chemical coagulants. Some drinking water treatment plant in developing countries face a myriad of problems which are: large seasonal variation in raw water quality e.g. turbidity, high cost of water treatment chemicals, under dosing of chemicals leading supply of poor drinking water. To overcome chemical coagulant problems it is necessary to increase the use of natural

coagulants for drinking water treatment.

2. Objectives

To investigate the required dosage of Moringa Oleifera and tamarind seed powder in same needed in order to reduce turbidity of wastewater. To study the coagulation efficiency of Natural and Chemical coagulants in the collected sample of water and make comparative study.

3. Scope

Poor coagulation efficiency in cold weather will be minimized. Sludge produced will be highly biodegradable and to reduce surface and ground water pollutant. The environmental friendly natural coagulants would present a viable alternative for the treatment of contaminated surface water which will be economical and efficient at domestic level. The use of natural coagulant as coagulant aid with synthetic coagulants can reduce the chemical costs and threats can be minimized.

4. Methodology

- Selection, collection and preparation of natural coagulant
- Collection of water samples
- Sample analysis before treatment
- Treatment with natural coagulant and chemical coagulant
- Sample analysis after treatment (pH, acidity, alkalinity, chloride, turbidity) and determination of optimum.
- Comparison of treatment efficiencies of natural and conventional coagulants.

5. Material used

A. Moringa Oleifera



Fig. 1. Moringa Oleifera

Moringa Oleifera Seed Powder as natural coagulant. Moringa Oleifera seeds are harvested when they were fully matured, wings and coat from seeds are removed and fine powder was prepared and sieved.

B. Tamarind seeds



Fig. 2. Tamarind seeds

Tamarind Kernel powder, compared to alum, is not-toxic and biodegradable.

C. Alum



Fig. 3. Alum

Alum reacts with the bicarbonate alkalinities present in water and forms a gelatinous precipitate. This floc attracts other fine particles and suspended material in raw water and settles down at the bottom of the container.

6. Tests for water quality parameters for before and after treatment

A. Turbidity

Calibrate the nephelometer according to the instructions given in the to zero. Pour the well mixed sample into the cell and read the turbidity directly from the display.

B. pH

Clean the electrode using distilled water. Insert the electrode in the sample. Wait for a steady reading. Note the pH.

C. Alkalinity

Pipette 20 ml of sample Add two drops of phenolphthalein indicator. Titrate this sample against standard acid, 0.02 N in the burette till the color just disappears. Note the volume of the titrant used. Then add two drops of methyl orange indicator. The color turns yellow. Titrate this again against the aid in the burette, till the color just turns orange yellow. Note the volume of titrant used.

D. Acidity

Pipettes 20 ml of the sample. Add 1 or 2 drops of methyl orange indicator. Titrate the sample against 0.02 N standards NaOH. Note the end point when the color changes from orange to yellow. Add one or two drops of phenolphthalein indicator. Continue the titration till color change to faint pink. Note the end point.

E. Total chlorides

Take 20 ml of sample. Add 1 ml potassium chromate indicator. Note down the volume. Titrate the solution against standard silver nitrate solution until a reddish brown precipitate is obtained.

Table 1
Optimum dosage of coagulants

S. No.	Coagulant	Dosage (mg/L)	Turbidity in NTU
1	Alum	100	21
2		150	16
3		200	13
4		250	8
5		300	5
6		350	14
1	Moringa Oleifera	100	15
2		150	9
3		200	5
4		250	3
5		300	15
6		350	17
1	Tamarind Seed Powder	100	20
2		150	15
3		200	8
4		250	9
5		300	6
6		350	14
1	Combined Use of Moringa Oleifera And Tamarind Seed Powder	100	11
2		150	9
3		200	6
4		250	3
5		300	5
6		350	8

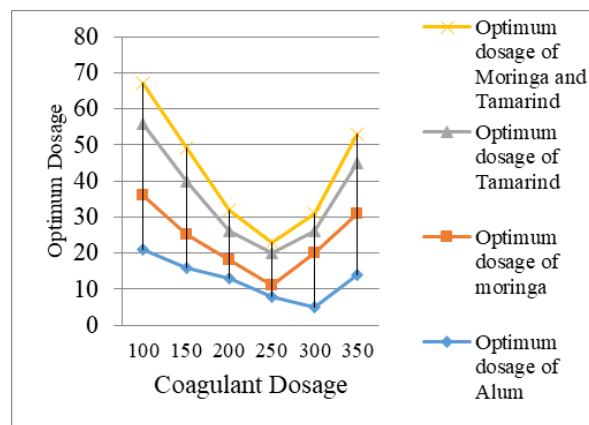


Fig. 4. Graph shows Optimum dosage

Table 2
Parameters and Initial values

S. No.	Parameters	Initial Value
1	Odour	Objectionable
2	Colour	Brownish
3	Ph	8.3
4	Turbidity	230 Ntu
5	Total Chloride	260 Mg/L
6	Alkalinity	300 Mg/L
7	Acidity	20 Mg/L

Table 3
pH of coagulants

S. No.	Coagulant	Dosage (mg/L)	pH
1	Alum	100	8
2		150	7.9
3		200	7.5
4		250	7.4
5		300	7.4
6		350	7.3
1	Moringa Oleifera	100	7.8
2		150	7.7
3		200	7.6
4		250	7.4
5		300	7.2
6		350	7.2
1	Tamarind Seed Powder	100	7.6
2		150	7.5
3		200	7.3
4		250	7.3
5		300	7.2
6		350	7.2
1	Combined use of Moringa Oleifera and Tamarind Seed Powder	100	7.3
2		150	7.2
3		200	7.2
4		250	7.2
5		300	7.1
6		350	7.1

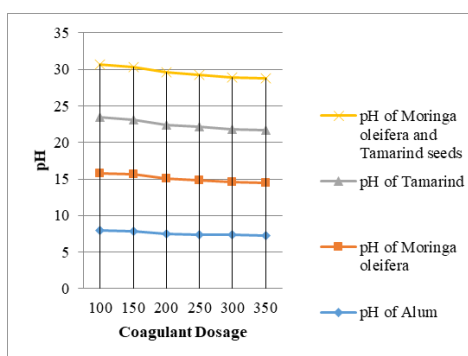


Fig. 5. pH of coagulants

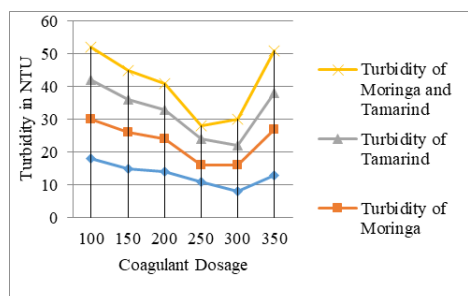


Fig. 6. Turbidity

Table 4
Turbidity of coagulants

S. No.	Coagulant	Dosage (Mg/L)	Turbidity in NTU
1	Alum	100	18
2		150	15
3		200	14
4		250	11
5		300	8
6		350	13
1	Moringa Oleifera	100	12
2		150	11
3		200	10
4		250	5
5		300	8
6		350	14
1	Tamarind Seed Powder	100	12
2		150	10
3		200	9
4		250	8
5		300	6
6		350	11
1	Combined Use Of Moringa Oleifera And Tamarind seed powder	100	10
2		150	9
3		200	8
4		250	4
5		300	8
6		350	13

Table 5
Alkalinity of coagulants

S. No.	Coagulant	Dosage (mg/L)	Alkalinity (mg/L)
1	Alum	100	125
2		150	120.2
3		200	118.35
4		250	115.5
5		300	114.15
6		350	112.8
1	Moringa Oleifera	100	102.6
2		150	98.5
3		200	95.8
4		250	91.2
5		300	88.55
6		350	88.75
1	Tamarind Seed Powder	100	112.4
2		150	108.8
3		200	101.65
4		250	97.5
5		300	96.35
6		350	95.5
1	Combined Use of Moringa Oleifera and Tamarind Seed Powder	100	89.45
2		150	88.7
3		200	84.55
4		250	82.4
5		300	81.75
6		350	79.15

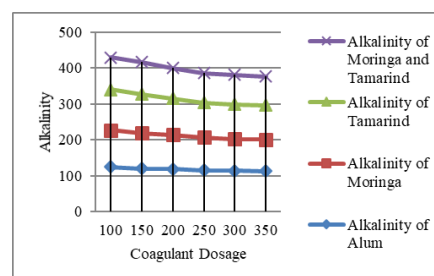


Fig. 7. Alkalinity

Table 6
Total chlorides of coagulant

S. No.	Coagulant	Dosage (mg/L)	Total Chloride (mg/L)
1	Alum	100	173
2		150	169
3		200	167
4		250	164
5		300	163
6		350	162
1	Moringa Oleifera	100	135
2		150	134
3		200	132
4		250	130
5		300	128
6		350	125
1	Tamarind Seed Powder	100	138
2		150	136
3		200	133
4		250	131
5		300	130
6		350	128
1	Combined Use of Moringa Oleifera And Tamarind Seed Powder	100	115
2		150	114
3		200	112
4		250	111
5		300	109
6		350	105

Table 7
Acidity of coagulants

S. No.	Coagulants	Dosage (mg/L)	Acidity (mg/L)
1	Alum	100	13
2		150	12
3		200	12
4		250	9
5		300	5
6		350	4
1	Moringa Oleifera	100	7
2		150	7
3		200	5
4		250	4
5		300	4
6		350	3
1	Tamarind Seed Powder	100	7
2		150	6
3		200	6
4		250	5
5		300	4
6		350	4
1	Combined Use Of Moringa Oleifera And Tamarind Seed Powder	100	6
2		150	5
3		200	4
4		250	4
5		300	3
6		350	3

7. Guidelines

- The maximum turbidity reduction of alum, Moringa Oleifera, tamarind and combined use of Moringa Oleifera tamarind seed were found as 96.52%, 97.82%, 97.39% and 98.26% with optimum dosage of 300, 250, 300 and 250mg/l.
- The pH, alkalinity, acidity and total chlorides were determined in treated sample of coagulants and maximum reduction efficiency was found in the combined use of Moringa Oleifera and tamarind seed powder.
- The Utilization of locally available natural coagulant was found to be suitable, easier, cost effective and environment friendly for water treatment.

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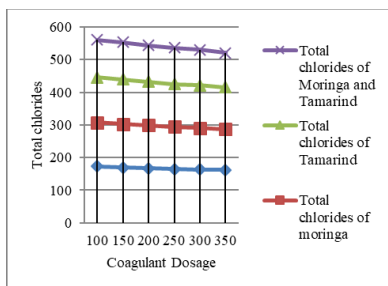


Fig. 8. Total chlorides