

## Treatment of Textile Wastewater Using Plant Based Coagulant

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**Abstract:** The aim of the research work is to study the efficiency of plant based coagulants for the treatment of textile wastewater. Textile industries are one of the most common and essential sectors in the world. On the other hand, high volume of water consumption and varying wastewater characteristics are the factors that have caused a sustained effort to find appropriate technologies to treat textile industry wastewater. These industries discharge large volume of wastewater which is characterized by high COD, chlorides, sulfides, suspended solids, dissolved solids. Textile wastewater treatment are mostly using Polyaluminium Chloride (PAC), a synthetic coagulant, possess health risk and high expensive cost. The present work focuses on evaluating the efficiency of removal of color, suspended solids, dissolved solids, chlorides by the plant based coagulants the experiment is carried out to observe the efficiency of coagulants as natural coagulant to replace synthetic coagulant. The efficiency of Moringaoleifera and trigonella seed towards TDS, COD, and chloride removal has been studied earlier but in addition to these attempts will be made of using both the coagulants together in varying combinations to know the most efficient mix proportion. The results of the current work shows that the most efficient dose of M.oleifera and T.foenum comes out to be 0.14 and 1.5 mg/l for textile wastewater when used individually. M.Oleifera gave the maximum removal efficiency of 67.10% and 63.95% towards TDS and COD. These natural coagulants can be used instead of chemical coagulants as they do not cause any harm to environment and also avoids sludge disposal problems.

**Keywords:** BOD, COD, Moringa Oleifera, TDS, Trigonella Foenum.

### 1. INTRODUCTION

Textile industries in India are one of the largest manufacturing sectors in the country. These industries are considered as highly polluting industries due to improper treatment of wastewater. Treatment and disposal of textile wastewater seems to be great risk due to its high pollutant concentration. These industries discharge large volume of waste water which is characterized by high BOD, COD, suspended solids, dissolved solids, sulphide, chloride, chromium, animal hairs, epidermic fats and other bio-contaminants. Therefore, need arises to focus our attention on treating the textile effluent before its disposal. Hence, there has been a great attention in the improvement and implementation of natural coagulants in wastewater treatment. Natural coagulants are promising and have attracted the attention of many researchers because of their abundant source, low price, multi-purposeness and biodegradation. This paper concentrates on the treatment of textile waste water using natural coagulant obtained from Moringaoleifera and trigonellafoenum seeds. Both the Coagulant was used in varying combinations and also used individually to find most efficient quantity.

### 2. MATERIALS AND METHODS

#### 2.1. Raw Effluent Characterization

Textile industries are major sources of industrial effluents due to the nature of their operations, which requires high volume of water that eventually results in high wastewater generation. Table shows the characteristics of textile wastewater.

Table 1

Sr.no	Parameters	values
1	pH	9.0
2	TDS	260.2mg/l
3	COD	2100mg/l
4	Chloride	350.4mg/l

## 2.2 Collection of Samples

The samples were collected from SMS ENVOICARE PVT.LTD., M.I.D.C. Nandgaonpeth, Amaravati before subjecting it into wastewater treatment plant.

## 2.3 Analysis of Samples

The wastewaters that were collected in the field were transported to laboratory. Then these samples were analyzed to study the physio-chemical characteristics such as pH, Total dissolved solids, Chlorides and COD in laboratory using appropriate experiments.

## 2.4 Natural Coagulants

### 2.4.1 Moringa Oleifera

Moringaoleifera is the thirteenth species of the genus Moringaceae. Moringa was highly valued in the ancient world. MoringaOleifera seeds are used as a primary coagulant in drinking water clarification & waste water treatment due to the presence of a water- soluble cationic coagulant protein which are able to reduce turbidity of treated water.



bwc28671298 Barewails



#### 2.4.2 Trigonella foenum

T.foenum-graecum (Fenugreek) belongs to the family Leguminosae that grows predominantly in Asia, Northern Africa and the Middle East. Fenugreek seed contains 23% - 26% protein, 6% - 7% fat and 58% carbohydrates of which 25% is dietary fiber, saponins and rich in flavonoids. Fenugreek has been widely used as a flocculating agent and in folk medicine.

#### 2.4.3 Preparation of Moringaoleiferapowder

Moringa seed were collected manually from the dried pods of trees. The seeds were dried in sun light for 48 hours. The skull was removed from the seed surface and wings from the kernels after drying. The kernels were ground in to medium fine powder with a domestic grinder. The seeds then sieved through 600um sieve.

#### 2.4.4 Preparation of trigonellafoenum powder

The trigonellafoenum seeds were washed with water to remove dust and ground to medium fine powder with domestic grinder and sieved through 600um sieve.

### 3. EXPERIMENTAL METHODOLOGY

#### 3.1 Procedure

To prepare solution, Moringaoleifera powder and trigonellafoennumpowder are added in 500ml of wastewater sample in following quantities:

Moringaoleifera: 0.04,0.06,0.08,0.10,0.12,0.14,0.16(mg/l)

Trigonellafoenum: 0.25,0.5,1.0,1.5,2.0,2.5,3.0(mg/l)

After addition of coagulant doses mixing is done by jar test apparatus for mixing period.

Rapid mixing at 100 rpm for 15 minutes and slow mixing at 30rpm for 30 minutes and samples were allowed to settle for 60 minutes in jar test apparatus.

#### 3.2 Jar test apparatus

All coagulation experiments were carried out by using a conventional jar test apparatus. Jar test is the most widely used experimental methods for coagulation/flocculation. A conventional jar test apparatus was used in the experiments to coagulate sample using natural coagulant. It was carried out as a batch test, accommodating a series of six beakers together with six sample steel paddles. Before operating the jar test, the sample was mixed homogeneously. Coagulants of varying concentrations were added in the beakers.

- Before going to jar test the wastewater sample of 500ml is filled in the six jars.
- The natural Coagulants of different proportion are added to the samples.
- A jar test stimulates the coagulation process. After coagulation the sample were coagulated by slow and rapid Mixing process. Rapid mixing was done at 100rpm/minute and slow mixing at 30rpm for 30 minutes.

- After the flocculation process various tests were carried out on the sample.

### 3.3 Determination of pH

The jars are taken out from the jar test apparatus and allowed to settle for 60 minutes. The pH is measured using the pH meter.

### 3.4 Determination of TDS

TDS was measured with the digital TDS meter for 500 ml sample after the settling of the wastewater for 60 minutes.

## 4. RESULT AND DISCUSSION

The following table shows the doses of natural coagulants used and removal efficiencies for total dissolved solids and chloride.

Table 2: Showing % removal OF TDS and Chloride using M.Oleifera

Sr.no	Doses	% TDS removal	% Chloride removal
1	0.04	48.80	44.34
2	0.06	51.87	48.30
3	0.08	54.79	52.18
4	0.10	58.18	56.18
5	0.12	62.94	61.99
6	0.14	67.10	63.95
7	0.16	60.72	59.92
8	0.18	55.25	57.40

Table 3: Showing % removal of TDS and COD using T.Foenum

Sr.no	Doses	% TDS removal	% Chloride removal
1	0.10	42.9	43.50
2	0.125	44.12	47.28
3	0.25	47.42	50.85
4	0.50	49.23	53.98
5	1.00	53.38	56.37
6	1.50	57.11	59.83
7	2.50	51.31	52.15
8	3.00	47.32	46.37

The dosage value of coagulants of M.Oleifera powder and T.Foenum powder for textile wastewater are represented on X axis and the removal efficiencies are represented on Y axis are shown in the Figure no. 1 to 4

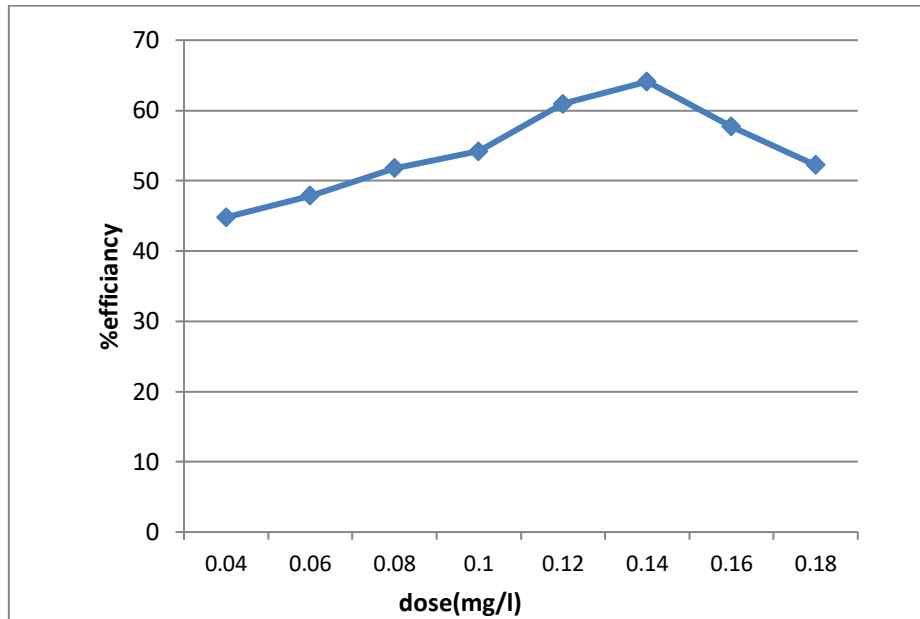


Fig. 1: Showing Optimum Dose (moringa) For TDS

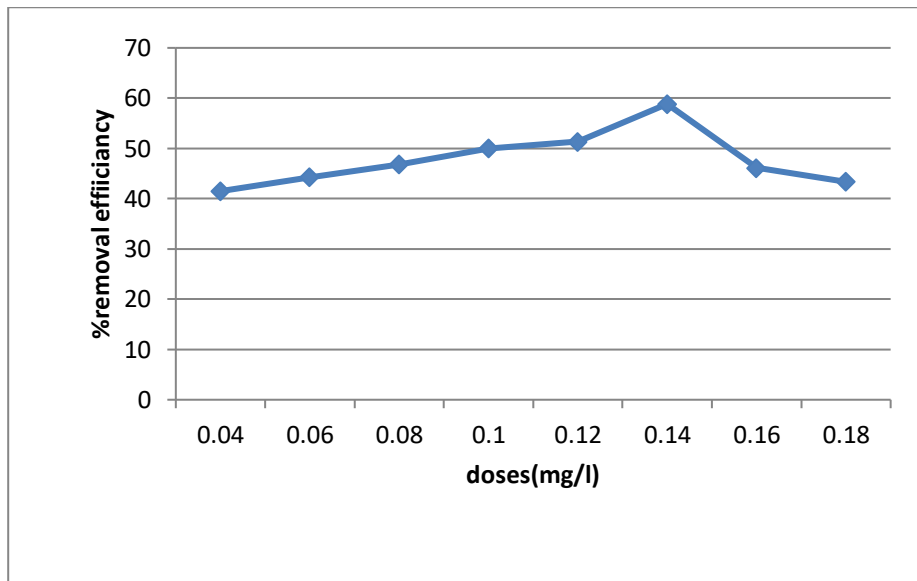


Fig.2: Showing Optimum Dose (moringa) For Chloride

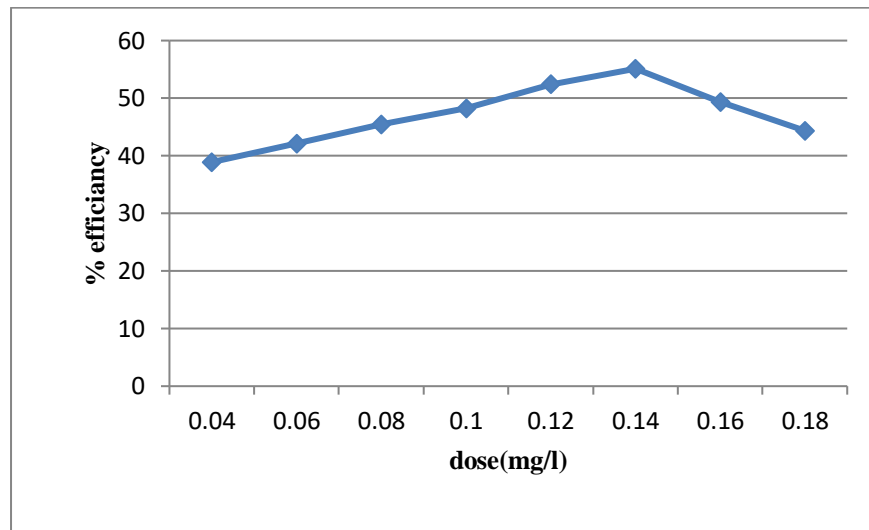


Fig 3 : showing optimum dose(Trigonella)for TDS

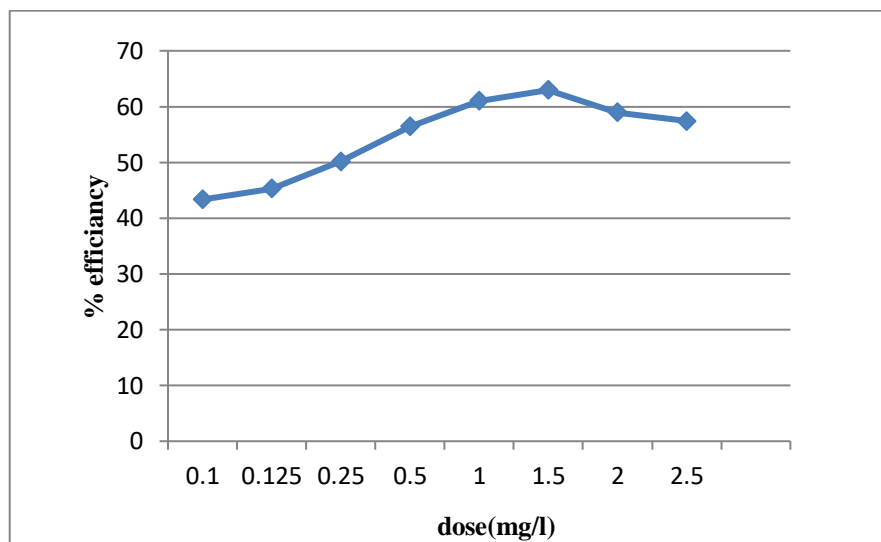


Fig.4: Showing optimum dose(trigonella) for chloride

Above figure shows that moringaoleiferais most efficient at the dose 0.14mg/l for TDS and chloride removal. Trigonellafoenum gave the maximum removal of TDS and chloride is at 1.50mg/l of dose.

## 5. CONCLUSION

Advantages of using natural coagulants over synthetic coagulants.

- Moringa and fenugreek extracts possess antimicrobial properties.
- They improve subsequent biological treatment and biodegradability of sludge produced also allows its use in agriculture, by not providing metals. Using these natural coagulants smaller volumes of sludge

are obtained and less toxic sludge are generated so the costs associated to the sludge handling are highly reduced.

- Due to the more compact floc formation, is greatly reduced or completely eliminated the use of flocculants, and can achieve an effective precipitation of floc formed in the first purification stage and avoiding the extra costs due to the use of flocculent and the use of neutralizing agents is also avoid (calcium hydroxide and sodium hydroxide)
- Its use not modifies treated water conductivity. For this reason, these products are highly recommended in recalculating water where the ion concentration may increase over time. Thus, protects against corrosion of metallic parts.
- Among the two natural coagulants used in the study, maximum TDS reduction is found to be 67.96% with *Moringaoleifera*.
- Among the two natural coagulants used in the study, *MoringaOleifera* has the Chloride reduction of 68.67%. Hence it is concluded that comparison with two coagulants, *Moringaoleifera* is the effective coagulant in treating textile effluent
- From the experimental study, it may be concluded that the maximum removal efficiency in *moringaoleifera* than *TrigonellaFoennum* the major pollutants of concerned in waste water treatment, such as chloride, total dissolved Solid.

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