

Treatment of Industrial Waste Water Using Natural Coagulant

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ABSTRACT: Textile industry is one of the large-scale industries, which produce organic effluents. These industrial effluents contain lot of hazardous element which affects human immunity, when it directly discharged into water bodies. The effluents from these industries contain high amount of Turbidity, TSS (Total suspended solids), TDS (total dissolved solids), TS (total solids), pH and colour, these parameters can be reduced by chemical coagulant which are highly expensive in nature. Our project is focused on primary treatment of effluent using natural coagulant, Moringa Oliefera and Optunia Dilleni that are cost efficient and are naturally available. The optimum usage of natural coagulant which gives high turbidity removal efficiency at same time its minimizing cost of water treatment compared to chemical coagulants. It is performed in laboratory scale by coagulation –flocculation method. The optimum dosage of Moringa Oliefera and Optunia Dilleni was found as 0.5g/500ml respectively. At optimum dosage, Moringa Oliefera and Optunia Dilleni had reduced turbidity about 85% and 76.2% in textile industrial effluent respectively. Also Moringa Oliefera has effectively removed colour in industrial effluent. Hence Moringa Oliefera and Optunia Dilleni can use as natural coagulant for primary treatment of industrial effluent.

KEYWORDS: Textile effluent, Moringa Oliefera, Optunia Dilleni, turbidity, suspended solids, natural coagulant.

INTRODUCTION

Access to safe drinking water is human right. However, now –a-day's more than 1100 million people live without access to safe drinking water, especially in developing countries. Solution to this global problem is aimed to developing simple, effective, low -cost and easy to use technologies, which are able to reduce organic, organic and microbiological water contamination [1]. Waste water arising from the textile industries was a major problem around the tamilnadu. Due to the bad effect of textile wastes in environment many industries were forced to close their industries. So they introduced some method were based to treat the waste water but all methods were based on the chemicals [2]. Here attempt to know the effect of natural coagulants in the colour and turbidity removal of textile waste water alternative use of synthetic chemicals. The natural coagulants Moringa oliefera and Optunia Dilleni. Mostly the waste water arising out of textile industries are matching the industrial waste water condition [2]. Turbidity and colour removal is one of the most important steps in waste treatment process, which is generally achieved using coagulants. Many coagulants are widely used in conventional water treatment process, based on their chemical characteristics, these coagulants are classified into inorganic, synthetic organic polymers, and natural coagulants [2]. Example of these coagulants is the seed of the tropical tree Moringa Oliefera and cactaceae family of Optunia Dilleni, which contains active agents with excellent activity [6, 7] and coagulating properties. In laboratory and field studies, seed of M.oleifera have shown promise as coagulant in the clarification of turbid water. The history of use of natural coagulants is quite long. Natural organic polymers have been used for more than 2000 years in India, Africa and china as effective coagulants and coagulant aids at high water turbidities [1].

II. MATERIALS AND METHODOLOGY

In this study *Moringa oleifera* (Drumstick seeds) and cactus were used as natural coagulants. *Moringa oleifera* were obtained from local market of Tamil nadu and cactus is collected from road side which is proved to be species *Optunia Dille*

2.1 Preparation of natural coagulants

Moringa Oleifera seeds were removed from the pods, kept for sun dry and external shells were removed. Mature seeds showing no signs of discoloration, softening, or extreme desiccation. The seed kernels were ground to fine powder and sieved to get particles of the size 600 μ m [4]. Dry *optunia* powder was prepared by cutting fresh *optunia* species into strips of 1cm width and followed by drying at 60 $^{\circ}$ c for 24 hours. Dry *optunia* species was ground in grinder and sieved to get particles of the size 600 μ m [5].



Fig 2.1 *Moringa Oleifera*



Fig 2.2 *Optunia Dilleni*

2.2 Sampling

Sampling of waste water is done at the main collecting tank by using grab sampling method[8], the sampling bottles are of 20 liter capacity, Sample were collected immediately for the study. The raw water is characterized in terms of some physical and chemical parameters before treatment. The evaluated parameters were color turbidity, pH, total suspended solids and total dissolved solids. The coagulation sedimentation process was conducted by using jar test apparatus. The efficiency of the process is evaluated by measuring the turbidity, total suspended solids and total dissolved solids. Before conducting the study initial characteristics of waste water is noted.

Table 2.2: Initial wastewater characteristics

| S.No | Parameters | Initial values |
|------|-------------------------|----------------|
| 1. | pH | 8-9 |
| 2. | TSS | 1620 mg/l |
| 3. | TDS | 1974 mg/l |
| 4. | Turbidity | 45-70 NTU |
| 5. | color | Brown |
| 6. | Electrical conductivity | 640 ms /cm |

2.3 Coagulation Studies

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 of textile waste water using natural coagulants.

It was carried out as a batch test, accommodating a series of six beakers together of 500ml capacity with six spindle steel paddles. Before operating the jar test, the sample was mixed homogenously.

This study consists of batch experiments involving rapid mixing, slow mixing and sedimentation. The apparatus consists of four beakers to be agitated simultaneously. 500ml of textile waste water samples was put in to each 4 one-liter beakers and placed under jar test apparatus. The required dose of previously prepared powder of Moringa Oleifera and Optunia Dilleni i.e., 0.5,1,2,3,4,5 gm/500ml was added simultaneously. The paddles were instered in the jars , the apparatus was switched on the whole procedure in the jar test were conducted in different rotating speed, which consists of rapid mixing (100 rotation per minute, rpm) for 1 minute and slow mixing (30 minutes) for 10 minutes. After the agitation being stopped, the suspensions were allowed to settle for 30 minutes [5]. Finally, a sample was withdrawn using a pipette from the middle of supernatant for physicochemical measurements, so that the effect of coagulant dose on coagulation could



Fig. 2.3 A conventional jar test apparatus

III. RESULT AND DISCUSSIONS

The below charts portraits by varying the dosage of coagulants the change in initial parameters of textile industrial effluent is drastically changed to lower acceptance satisfactory level. The optimum dosage of the effluent for Moringa Oleifera and Opuntia Dilleni are shown in these charts.

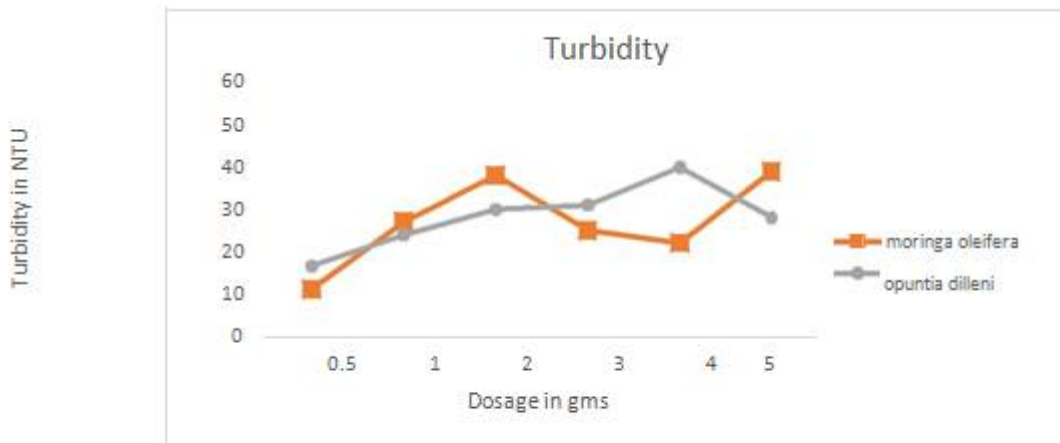


Fig. 3.1 Turbidity reduction using natural coagulants

While using the Moringa Oleifera and Opuntia Dilleni as coagulants, the optimum dosage of Moringa Oleifera and Opuntia Dilleni was found as 0.5g/500ml respectively. At optimum dosage, Moringa Oleifera and Opuntia Dilleni had reduced turbidity about 85% and 76.2% in textile industrial effluent respectively

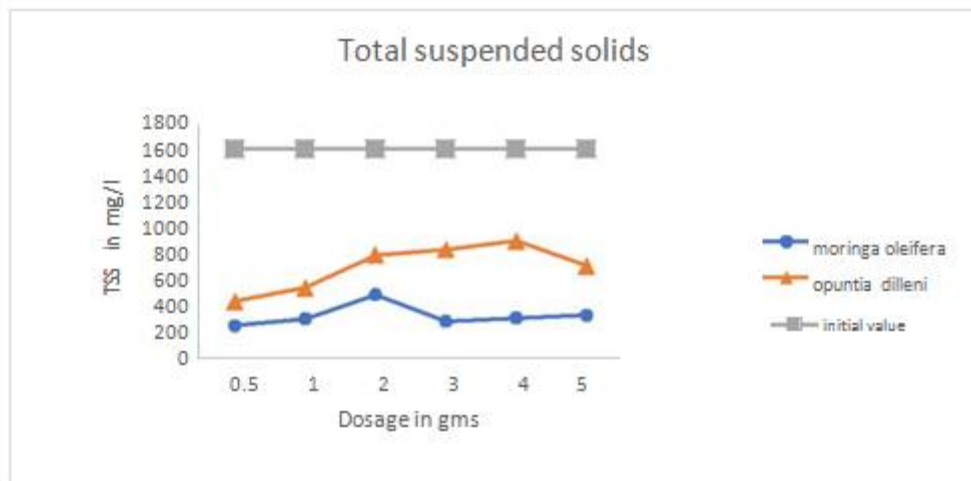


Fig. 3.2 Total suspended solids reduction using natural coagulants

While using the Moringa Oleifera and Opuntia Dilleni as coagulants, the optimum dosage of Moringa Oleifera and Opuntia Dilleni was found as 0.5g/500ml respectively. At optimum dosage, Moringa Oleifera and Opuntia Dilleni had reduced Total suspended solids about 84.38% and 72.83% in textile industrial effluent respectively

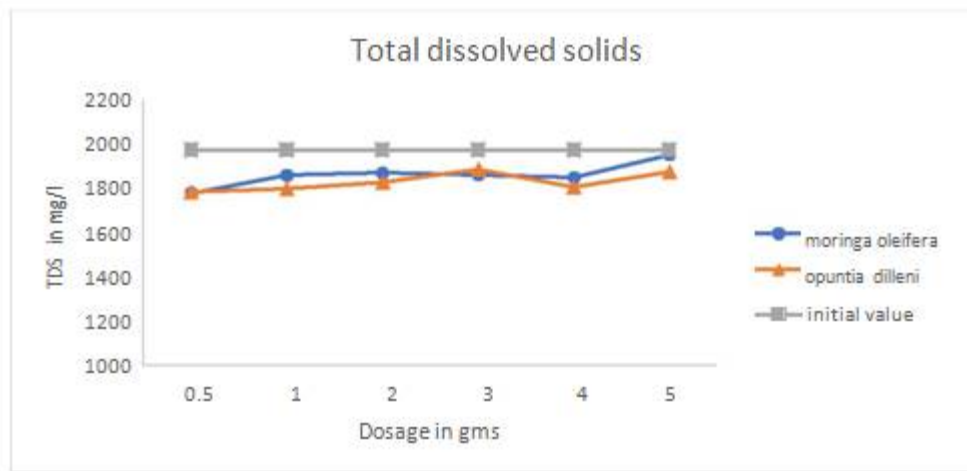


Fig. 3.3 Total dissolved solids reduction using natural coagulants

While using the Moringa Oleifera and Opuntia Dilleni as coagulants, The optimum dosage of Moringa Oleifera and Opuntia Dilleni was found as 0.5g/500ml respectively. At optimum dosage, Moringa Oleifera and Opuntia Dilleni had reduced Total suspended solids about 9.8% and 9.6% in textile industrial effluent respectively

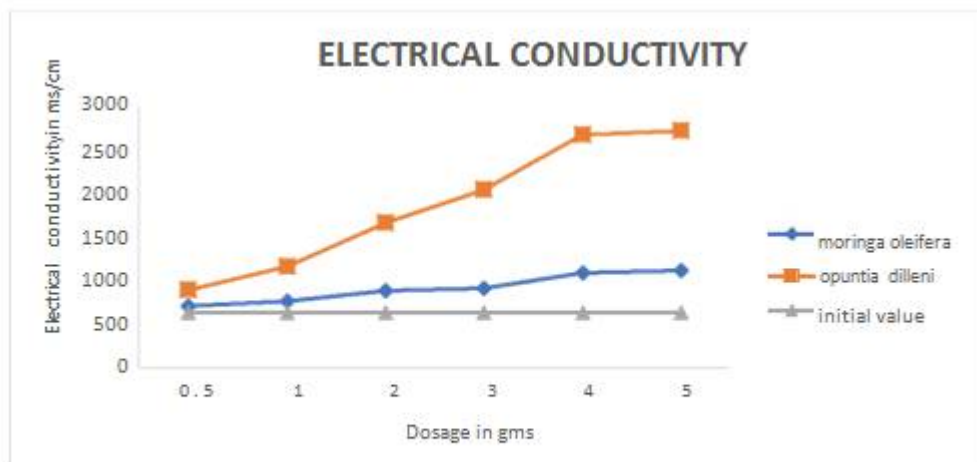


Fig. 3.4 Electrical conductivity reduction using natural coagulants

While using the Moringa Oleifera and Opuntia Dilleni as coagulants, the physicochemical parameter electrical conductivity of treated water increasing due to organic matter presents in these natural coagulants.

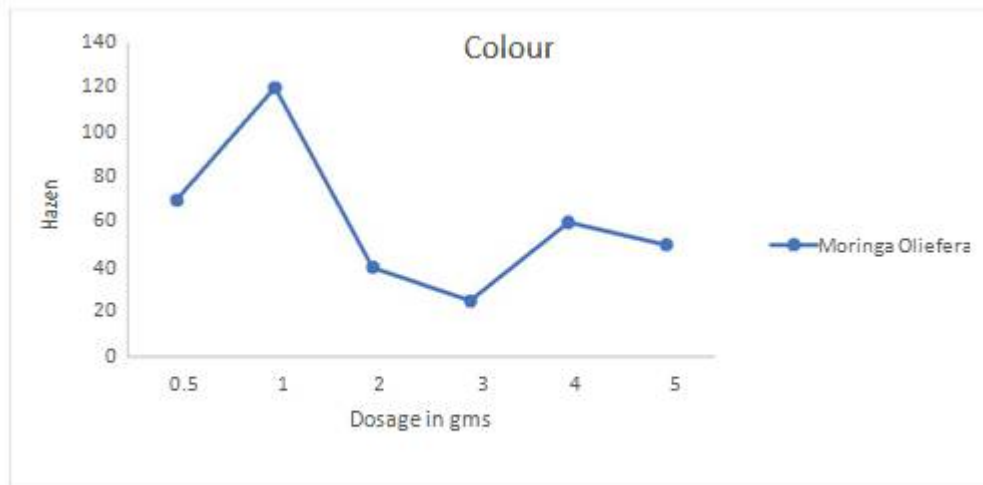


Fig. 3.5 Total suspended solids reduction using natural coagulants

While using the Moringa Oleifera as coagulant, the optimum dosage of Moringa Oleifera was found as 3g/500ml respectively. Which shows effective removal in colour of 25 hazen. But in case of Opuntia dilleni fails to remove the colour of textile industrial effluent.

| Natural coagulants | Turbidity | Total suspended solids |
|--------------------|-----------|------------------------|
| Moringa Oleifera | 85% | 84.38% |
| Optunia Dilleni | 76.2% | 72.83% |

Table 3.1: Comparison efficiency of natural coagulants

Table 3.1 comparative results of two natural coagulants; moringa oleifera , Optunia dilleni in reduction of turbidity and Total suspended solids at optimum dosage .from the table 3.1, it is clear that, out of two coagulants Moringa Oleifera is more efficient in reduction of turbidity of 85%.on the other hand TSS reduction of 84.38%.

VI. CONCLUSION

Textile effluents are highly polluted. Such polluted effluents must be treated properly before into the drainage channel to minimize the effect of various pollutants on the environment. The purpose of this study was to investigate the ability of some natural coagulant for the purpose of primary treatment of textile industrial effluent .The present study clearly demonstrate a good scope for use of natural coagulant for treatment of textile wastewater. From the experimental results, we have concluded that the natural coagulant moringa oleifera and Opuntia Dilleni have shown good removal efficiency of turbidity and suspended solids. Moringa Oleifera is more efficient to remove the color of the effluent to satisfactory level than compared to Opuntia Dilleni. In coagulation –flocculation process TDS and electrical conductivity of the effluent cannot be reduced by natural coagulant moringa oleifera and Opuntia Dilleni due to high organic matter present in natural coagulants.

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