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TREATMENT OF TEXTILE WASTE WATER USING MORINGA OLEIFERA AND TAMARINDUS INDICA

S.Ramesh[1], L.Mekala [2]

[1]PG Scholar, Erode Sengunthar Engineering College, Perundurai, Tamilnadu, India
[2]Assistant Professor, Department of Civil Engineering, Erode Sengunthar Engineering College, Perundurai, Tamilnadu, India

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Abstract - *Industrial pollutants are most harmful to the both environment and mankind. Treatment and disposal of industrial pollutants seems to be great risk for various industries due to its high pollutant concentration. Coagulation and flocculation seems to be most effective pollutants removal. So in my project I would like to bring solution for treating Textile industrial waste water through natural coagulants Moringa Oleifera and Tamarindus Indica. Through initial characterization of waste water is found that it contains high range of PH, Turbidity, TS, TDS and TSS at a range of 2.79, 250 NTU, 7000mg/l, 5750mg/l and 1250mg/l.*

In this project, preliminary investigation was carried out for the identification of the use of natural coagulant for the treatment of waste water. The industrial waste water were treated by coagulation-flocculation and sedimentation using natural coagulants. The natural coagulants used are Moringa Oleifera, Tamarindus Indica. The experiments were conducted at various proportions of dosages of natural coagulant. The physio-chemical parameters of waste water are measured after the treatment to evaluate the removal efficiency on the major pollutants of concerned in waste water treatment, such as pH, Turbidity, Total Dissolved and Suspended Solids. Then, the experimental studies were carried out to find out the optimum dosage of natural coagulants (Moringa Oleifera, Tamarindus Indica).In my project optimum dosage of Moringa Oleifera and Tamarindus Indica at 60 ml. The maximum removal efficiency in Moringa Oleifera than Tamarindus Indica on the major pollutants of concerned in waste water treatment, such as pH, Turbidity, TS, Total Dissolved and Suspended Solid.

***Key Words*: Moringa Oleifera, Tamarindus Indica, coagulation, flocculation, pH, Turbidity, Total Dissolved and Suspended Solids**

1.INTRODUCTION

India is the world's second major manufacturer of textiles and garments after china. The textile industry in India is one of the oldest manufacturing sectors in the country. Textile industry involves wide range of raw materials, machineries and processes to trick the required shape and properties of the final product. The fundamental strength of this industry flows from its strong production base of a wide range of fibers/yarns from natural fibers like cotton, jute, silk, and wool to synthetic/man-made fibers like polyester, viscose, nylon, and acrylic. With escalating demand for textile products, textile mills and their wastewater have been increasing proportionally, causing a major problem of pollution in the world. Among the many chemicals in textile wastewater, dyes are considered important pollutants. Worldwide environmental problems associated with the textile industry are typically those associated with water pollution caused by the discharge of untreated effluent and those because of use of toxic chemicals especially during processing. The discharge of textile wastewater to the environment may cause serious and very harmful to the environment if released without proper treatment. Hence, it becomes necessary to remove dyes from textile effluents before discharge to avoid negative environmental impacts. Textile printing and dyeing processes include pre-treatment, dyeing, finishing and other technologies. Pre-treatment includes desizing, scouring, washing, and other processes. Dyeing mainly aims at dissolving the dye in water, which l be transferred to the fabric to produce coloured fabric under certain conditions. Printing is a branch of dyeing which generally is defined as localized dyeing i.e. dyeing that is confirmed to a certain portion of the fabric that constitutes the design. It is really a form of dyeing in which the essential reactions involved are the same as those in dyeing.

Discharged wastewater by some industries under controlled and unsuitable conditions is causing significant environmental problems. The importance of the pollution control and treatment is undoubtedly the key factor in the human future. High values of COD and BOD, presence of particulate matter and sediments, and oil and grease in the effluent causes depletion of dissolved oxygen, which has an adverse effect on the aquatic ecological system. Effluent from textile mills also contains chromium, which has a cumulative effect, and higher possibilities for entering into the food chain. Due to the usage of dyes and chemicals effluents are dark in colour, which increases the turbidity of water body. For printing and dyeing wastewater, the first consideration is the organic pollutants, colour and heavy metal ions. Recently, as the lack of water the recovery of wastewater should be considered. So the decolourization of the printing and dyeing wastewater increased heavily.

So in my project textile waste water is treated by using natural coagulants such as Moringa Oleifera, Tamarindus Indica. I wish to do some study and research of natural coagulants in the coagulation process of textile waste water. In our project I am using coagulation process to increase the efficiency of treatment process. The powdered seed of the Moringa Oleifera and Tamarindus Indica has coagulating properties that have been used various aspects of Turbidity, PH, Total Dissolved Solids and Total Suspended Solids.

2. TEXTILE WASTE WATER

Water pollution has many sources. The most polluting of them are the city sewage and industrial waste discharged into the rivers. Industrial waste is defined as waste generated by manufacturing all industrial processes. The textile industry is very water intensive. Water is used for cleaning the raw material and many flushing steps during the whole production. Produced waste water has to be cleaned from fat, oil, colour and other chemicals, which are used during the several production steps. The cleaning process is depending on the kind of waste water and also on the amount of used water.

Nowadays, the extraction of textile dyes from the waste water in the industry becomes an environmental worldwide issue. Water contamination is a big threat of not only for state of the environment but human body causes some chronic diseases. By reviewing of effects of textile dyes such as toxicity and mutagenicity, bacteria and organism embedded a prologue of the explusion of metals to the environment. In purposes of dyes removal, few of processes can be applicable for the textile waste water treatment.

Names are given below:

- Coagulation
- Flocculation
- Biodegradation

In my project, adopted coagulation- flocculation process for remove the turbidity, PH, Total Dissolved Solids, Total Suspended Solids from the textile waste water.

2.1. COAGULATION PROCESS

- Double layer compression
- Charge neutralization
- Entrapment in a precipitate
- Intra particle bridging

Moringa oleifera Family: Moringacae

Range: Native to the Indian sub-continent and naturalized in tropical and sub-tropical areas around the world. **Description:** Deciduous tree or shrub, fast-growing, drought resistant, average height of 12 meters at maturity.

Common Name of Moringa Oleifera: Benzolive, Drumstick tree, Kelor, Marango, Mlonge, Mulangay, Saijhan and Sajna.

Tamarindus indica

Family: Fabaceae

Range: Indigenous to trobical Afirica, but has been cultivated for so long on the Indian subcontinent.

Description: Long-lived, medium-growth shurb, drought resistant, maximum height of 12 to18meters at maturity.

Common Name of Tamarindus Indica: Tamarindo, Tamon.

3. OBJECTIVES

- To identify the use of natural coagulant for the treatment of waste water.
- To study the properties of Natural coagulants such as Moringa Oleifera, Tamarindus Indica.
- To study the physio-chemical parameters of waste water before and after the treatment of textile waste water and to evaluate the removal efficiency on the major pollutants of concerned in waste water treatment, such as pH, Turbidity, Total Dissolved and Suspended Solids.
- To study the optimum dosage of natural coagulants for textile waste water treatment.

4. MATERIALS AND METHODS

Collection of sample water

The sample textile waste water was collected from the Bala Krishnan Textile Industry in Erode, Tamil nadu, India. The collected waste water was kept as stock solution in the refrigerator and the sample used for studies was prepared by diluting the stock solution for avoiding fault results.

COAGULANTS PREPARATION

Preparation of MO Powder

Moringa oleifera seeds pods are allowed to mature and dry naturally to a brown colour on the tree. The 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 were used. After sun dry, external shells were removed and seed kernel were obtained. Using grinder, fine powder achieved from seed kernel.

Fig.1 Powdered sample of MO

Preparation of Tamarindus Indica powder

The Tamarindus Indica seeds were washed with water to remove dust and pulp and the clean seeds were dried in the shade for 24 hours, and then removed the coat by treatment with the Hydrochloric acid. After that the seeds are

powdered with the grinder and takes up to 100 grams of the powdered natural coagulant.

Fig.2 Powdered Sample of TI

PREPARATION OF SOLUTIONS

Natural coagulants

To prepare solution, 10 gms of Moringa oleifera powder is taken and made up to 200 ml using distilled water. Likewise Tamarindus Indica powder of 10gms is taken and 200ml of distilled water is added.

5. EXPERIMENTAL METHODOLOGY

Jar test

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 turbid water 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 homogenously. Then, the samples ought to be measured for turbidity, for representing an initial concentration. Coagulants of varying concentrations were added in the beakers.

- Before going to jar test the water sample of 500ml is filled in the four jars. The natural
- Coagulants of different proportion are added to the samples.
- A jar test stimulates the coagulation process. In our project we have to coagulate the sample by slow
- Mixing process. The duration of mixing is 20 minutes.
- After the flocculation process the sample is tends to various tests.

Estimation of optimum coagulant dosage

Take 0.5 liter of sample in four beakers and keep in jar test apparatus. Switch on the motor and adjust the speed of the paddles. Add various dose of natural coagulants (i.e.) 10ml, 20ml, 30ml, 40ml to different beakers. Allow flash mix rapidly for 1minute. Reduce the speed of the paddles and continue it for 10 minutes. Switch off the motor and allow the solution to settle for 20 minutes. Measure the amount of floc produced at the bottom. Draw the graph between amount of dosage added to the floc produced. From that notes the ideal dosage of coagulant.

Determination of pH

After coagulation process, the jars are taken out from the jar test apparatus and allowed to settlement process. The pH is measured using the pH meter. The coagulated water is taken after 20 minutes of settlement. All the samples are taken and pH is measured using pH meter and results are given.

Determination of turbidity

Take a sample of water from the water source. Switch on the Nephelometricturbidimeter and wait for few minutes till it warms up. Set the instrument at 100 on the scale with a 40NTUstandard suspension. In this case, every division on the scale will be equal to 0.4NTU turbidity. Shake thoroughly the sample and keep it for sometimes to eliminate the air bubbles. Take samples in Nephelometer sample tube and put the sample in sample chamber and find out the values on the scale.

Determination of Total Solids

Total Solids,
TS (mg/l) = mg of solids in the beaker x 1000 / (volume of sample)

Determination of Dissolved Solids

Total Dissolved Solids,
TDS (mg/l) = mg of solids present in the beaker x 1000/ (volume of sample)

Determination of Suspended Solids

Total suspended solids,
TSS (mg/l) = TS (mg/l) - TDS (mg/l)

6.RESULTS AND DISCUSSION

Characterization of Textile Waste Water

Table.1:Characterization of Textile Waste Water

S.No	Parameters	Concentration
1	PH	2.79
2	Turbidity	250 NTU
3	TDS	5750(mg/l)
4	TSS	1250mg/l
5	TS	7000mg/l
6	BOD	48060mg/l
7	COD	31558mg/l

DETERMINATION OF OPTIMUM DOSAGE OF NATURAL COAGULANT

Determination of Optimum Dosage of MO

The results were plotted in an graph with coagulant dosage on x- axis and floc produced on y- axis .This plotted graph was shown in fig 3.

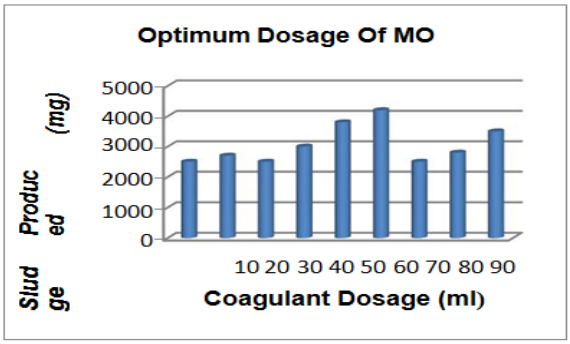

Fig.3 Optimum dose of coagulant MO

From graph,

- MO coagulant vs floc produced the optimum dosage of Moringa Oleifera is
- indentified as 60 ml and amount of floc formed 4200mg.
- MO coagulant vs floc produced the minimum dosage of Moringa Oleifera is
- indentified as 10 ml,30ml,70ml and amount of floc formed 2500mg.

Determination of Optimum Dosage of TI

The results were plotted in an graph with coagulant dosage on x- axis and floc produced on y- axis .This plotted graph was shown in Fig 4.

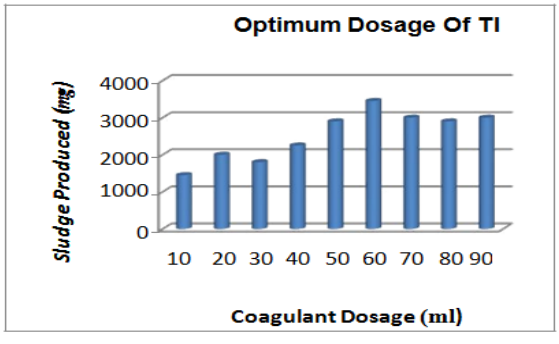

Fig.4 optimum dosage of TI

From graph,

- TI coagulant vs floc produced the optimum dosage of Tamarindus Indica is indentified as 60 ml and amount of floc formed 3450mg.
- TI coagulant vs floc produced the minimum dosage of Tamarindus Indica is indentified as 10 ml and amount of floc formed 1450mg.

REMOVAL EFFICIENCY OF NATURAL COAGULANTS

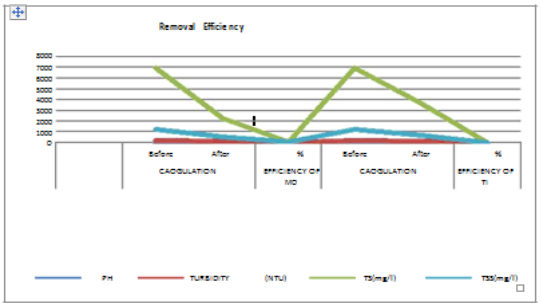

Fig. 5 Removal efficiency of natural coagulants

7. CONCLUSIONS

- The use of natural coagulant for the treatment of waste water and the properties of Natural coagulants such as Moringa Oleifera and Tamarindus Indica.
- Preparation of natural coagulant such as Moringa Oleifera, Tamarindus Indica.
- The physio-chemical parameters of waste water before and after the treatment of textile waste water and to evaluate the removal efficiency on the major pollutants of concerned in waste water treatment, such as pH, Turbidity, Total Dissolved and Suspended Solids are examined.
- The optimum dosage of natural coagulant such as Moringa Oleifera and Tamarindus Indica are examined and test results are given.
- From the experimental study 1, it may be concluded that the amount of sludge removal capacity of the natural coagulants
    - For Moringa oleifera, it reaches its amount of sludge removal of 4200 mg at optimum dosage of 60 ml.
    - For Tamarindus Indica, it reaches its amount of sludge removal of 3450 mg at optimum dosage of 60 ml.
- In my project, MO coagulant removing content 35% pH, 48% Turbidity, 68% TS, 70% TDS, 57% TSS and Tamarindus Indica coagulant removing content 32% pH, 32% Turbidity, 47% TS, 48% TDS, 44% TSS.
- From the experimental study II, it may be concluded that the maximum removal efficiency in moringa oleifera than Tamarindus Indica on the major pollutants of concerned in waste water treatment, such as pH, Turbidity, TS, Total Dissolved and Suspended Solid.

REFERENCES

[1] Amir Montakhab, Abdul HalimGhazali, MegatJoharib. MegatMohd. Noor, Thamer Ahmed Mohamed, Badronnisabt.Yusuf, "Effects of Drying and Salt Extraction of Moringa Oleifera on its Coagulation of High Turbidity Water":

[2] Dalen, M.B., J.S. Pam, A. Izang, and R.Ekele (2009), Synergy Between Moringa Oleifera Seed Powder and Alum in the Purification of Domestic Water. Science World Journal, 4(4):6-11.

[3] Eman N. Ali1*, Suleyman A. Muyibi2, Hamzah M. Salleh2, MohdRamlan M. Salleh2 and MdZahangir Alam2 Moringa Oleifera Seeds As Natural Coagulant For Water Treatment 2009

[4] Lea.M, (2010), Bioremediation of Turbid Surface Water Using Seed Extract from Moringa oleifera Lam. (Drumstick) Tree Current Protocols in Microbiology.

[5] Mangale, S.M.,S.G. chonde and P.D.Raut 2012. Use of moringaoleifera (Drumstick) seed as Natural Absorbent and an Antimicrobial agent for Ground water Treatment. Research Journal of Recent Sciences, 1(3):31-40.

[6] Raveendra,B., &Chaudhri.M, (2005). Home water treatment by direct filtration with natural coagulation. Journal of Water and Health, 3(1), 27-30.

[7] Sunita Singh Thakur* and SonalChoubey Assessment of coagulation efficiency of Moringa oleiferaand Okra for treatment of turbid water Assessment of coagulation efficiency of Moringa oleiferaand Okra for treatment of turbid water 2014.

[8] WHO. 2006. Guidelines for Drinking Water Quality, Third Edition. Incorporating First Addendum, Vol. 1 . Recommendations. World Health Organisation, Geneva, Switzerland. Yin, C.Y.2010. Emerging usage of plant-based coagulants for water and wastewater treatment. Process Biochemistry,45(9):1437