

## EFFICIENT REMOVAL OF TURBIDITY IN TURBID WATER BY NATURAL COAGULANTS

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### ABSTRACT

Access to clean water is the significant need in all nations on the planet in which many people and living live forms pass on because of tainted water related ailments consistently. Health problems caused by alum have been recently reported. Various reports have mentioned the direct and indirect toxic effects of alum in the form of tumours, cancers and allergies. No investigations have been done to discover whether seeds of *Trigonella Foenum-graecum* and *Cuminum cyminum* can be used as water coagulants. In order to partially replace alum as coagulant, the combination of Fenugreek seed powder and Cumin seed powder is used as coagulant in water treatment via coagulation-flocculation process. pH and coagulant dosage were identified for the combinations of Alum, Fenugreek and Cumin seed powder. The overall best efficient turbidity removal proportion is studied for both the synthesized turbid water and river water.

**KEY WORDS :** Synthesized turbid water, River water, Commercial alum, Fenugreek seed powder, Cumin seed powder, Jar test.

### INTRODUCTION

To sustain life, everything on earth requires water. Proper management of waste water is a necessity in modern societies. For aquatic life pH is an important limiting chemical factor. In the event that the water in a waterway is excessively acidic or basic, the H<sup>+</sup> or OH<sup>-</sup> particle movement may disturb aquatic organisms biochemical responses by either hurting or executing the stream living beings. One of the parameters which influence effective waste water treatment has been identified as waste water pH. The suspended particles, for example, mud, sediment, finely separated natural and inorganic particles, dissolvable shaded natural mixes, and tiny fish and other minute life forms cause turbidity in waste water. Turbid water is aesthetically unattractive as it is muddy or cloudy in appearance. As the sewage become stronger, turbidity increases. Enormous problems in waste water treatment are caused by turbidity.

### LITERATURE REVIEW

When the natural coagulant *Cicer areitinum* and Tamarind seed is used with the partial replacement of alum, the removal of turbidity was 83.3% and 80% at an optimum dose of 0.15g/ml and 0.6g/ml with optimum pH of 7 and 8 respectively by Manoj *et al.*, 2019. The turbidity removal efficiency for *Dolichas lablab*, *Azadirachta Indica*, *Moringa oleifera*, *Hibiscus rosa Sinensis* respectively were 37.45%, 63.01%, 31.47%, 12.95% against 75.01% obtained from alum by Saravanan *et al.*, 2017. Combining the advantages of both Moringa and Alum (A50M50) yielded overall best results with all parameters within WHO drinking water standards and ultimately enabling reusability of sullage by Ugwu *et al.*, 2017. The recommended ratio for the combined coagulant dose was 80% watermelon seed powder and 20% alum with an efficiency of about 89% by Muhammad *et al.*, (2015). Natural seeds are highly efficient for the removal of turbidity in pond

water and the synthetic coagulants for treatment of dye water by Jeyakumar, (2014). The two cassava species treated with acid were more efficient than alum as coagulants in wastewater treatment having turbidity removal efficiency of 51.8% and 58.3% at the dosage of 30 ml and 10 ml respectively by Adamu *et al.*, (2014).

### Effect of Turbidity in Water

In streams, expanded sedimentation and siltation can happen, which can bring about damage to environment zones for fish and other amphibian life. When there are more particles in the water, temperature rises. Warmer water holds less dissolved oxygen. When the water is highly turbid less amount of light reaches the aquatic plants that depend on sunlight for photosynthesis.

Usually turbidity is removed by alum as a coagulant. But excess use of alum causes Alzheimer's disease. To reduce the impact of alum, in this project we use natural coagulants such as Cumin seed powder and Fenugreek seed powder which are readily available, eco-friendly biomaterial, non-toxic and economical.

### MATERIALS COLLECTION

The materials used for the project are:

- Synthesized turbid water.
- River water.
- Commercial Alum.
- Fenugreek seed powder.
- Cumin seed powder.

### Water Samples

#### Preparation of Synthesized Turbid Water

Initially, turbid water was prepared using bentonite clay. 1g of Bentonite clay was added to 2 liters of distilled water, the turbid water obtained was stirred



Fig. 1. Alum

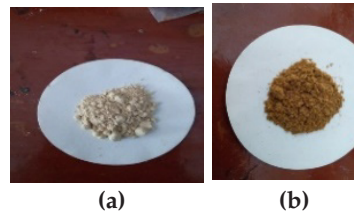


Fig. 2a. Fenugreek seed powder Fig. 2b. Cumin seed powder

well and then the experiments were carried out.

### COLLECTION OF RIVER WATER

The water sample from the river Thamirabarani was collected from Tirunelveli District. And it was found to be very low turbid water.

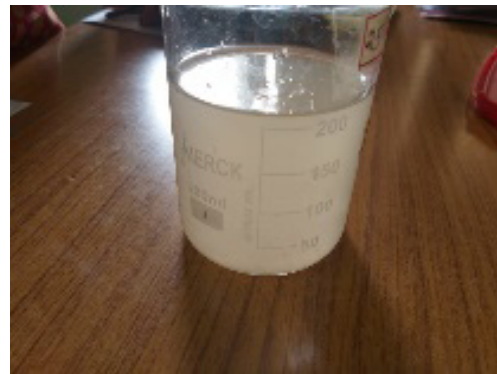


Fig. 3. Synthesized turbid water

### Experimental Setup

#### Determination of Turbidity

The turbidity of the water samples are found to be within 300 NTU.

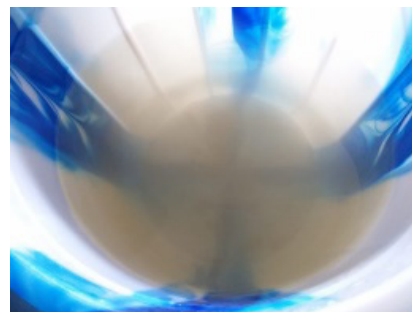


Fig. 4. River water

Table 1. Initial turbidity of samples

S.No	Sample	Turbidity (NTU)
1	Synthesized clay water	275
2	River water	17



Fig. 5. Turbidity meter

### Determination of pH

Table 3.2 Initial pH of samples

S.No	Sample	pH
1.	Synthesized clay water	8.30
2.	River water	8.0

The samples are found to be basic in nature based on the pH values.



Fig. 6. pH meter

### JAR TEST

#### Observation of Turbid Water Samples

A-Alum

Table 4. Turbidity removal efficiency in synthesized turbid water

Proportions of coagulants	Initial turbidity (NTU)	Final turbidity (NTU)	Optimum dosage (g)	Turbidity Removal efficiency (%)
100A	274	6	0.9	97.81
50A 50F	278.4	10.2	1.4	96.33
50A 50C	278.6	6.7	0.3	97.59
50A 40F 10C	274.3	3.7	0.3	98.69
50A 30F 20C	275.1	13.7	0.6	95.01
50A 20F 30C	274.4	15.5	2.5	94.35
50A 10F 40C	273	15.5	2.5	97.83



Fig. 7. Experiment on jar test

F-Fenugreek seed powder

C-Cumin seed powder

$$\text{Turbidity Removal Efficiency} = \frac{T_0 - T_1}{T_0} \times 100$$

Where,

$T_0$  – Initial Turbidity

$T_1$  – Final Turbidity

#### Observation for Synthesized Turbid Water

#### Observation for River Water

#### Effectiveness of Coagulants in Water Samples

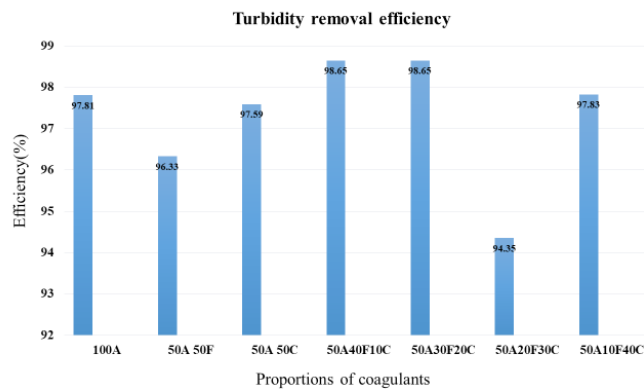
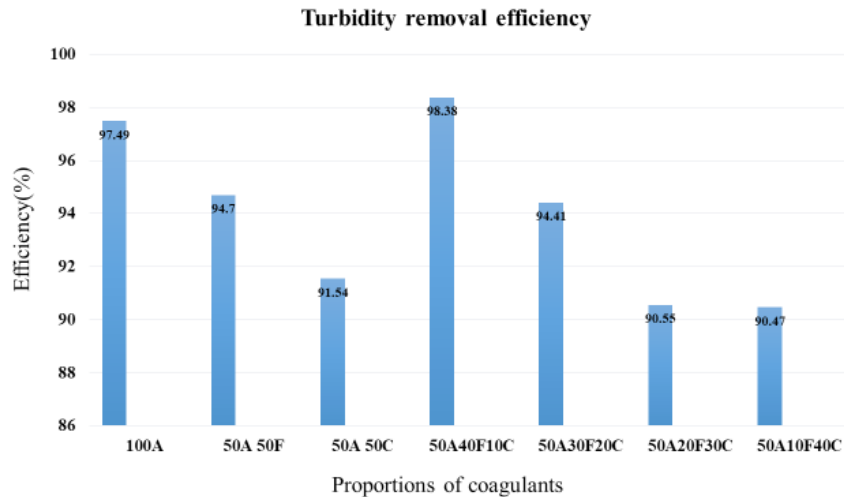
From this bar chart, it is observed that the best proportion for efficacious turbidity removal is 50A40F10C in synthesized turbid water and river water.

### CONCLUSION

- The overall best efficient turbidity removal proportion is studied for both the synthesized turbid water and river water, it is observed to be 50A40F10C.
- The optimum dosage for the synthesized turbid water is 1.5g for 1 litre at 98.69% turbidity removal efficiency.
- The optimum dosage for the river water is 0.35 g for 1litre at 98.38% turbidity removal efficiency.
- When Cumin and Fenugreek seed powders are

**Table 4.** Turbidity removal efficiency in river water

Proportions of coagulants	Initial turbidity (NTU)	Final turbidity (NTU)	Optimum dosage (g)	Turbidity Removal efficiency (%)
100A	15.97	0.4	0.06	97.49
50A 50F	15.1	0.8	0.06	94.70
50A 50C	14.2	1.2	0.8	91.54
50A 40F 10C	18.6	0.3	0.07	98.38
50A 30F 20C	17.9	0.3	0.07	94.41
50A 20F 30C	12.7	1.2	0.3	90.55
50A 10F 40C	14.7	1.4	0.2	90.47

**Effectiveness in synthesized turbid water****Effectiveness in River water**

individually added with alum (50A50C & 50A50F) to turbid water, Cumin (50A50C) exhibited high coagulation properties but when they are used in combination, the efficient turbidity removal proportion is noted as 50A40F10C.

- The powder of *Trigonella foenum-graecum* showed the effective coagulant property.

- When they are combinedly used as coagulants, 50A40F10C is found to be the best efficient turbidity removal proportion.

**FUTURE WORKS**

Our future work in this project is to attain 100% turbidity removal efficiency by introducing an

## Effectiveness in synthesized turbid water and river water

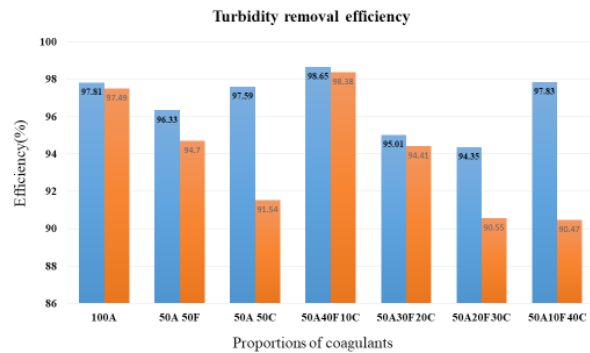


Fig. 5. Effectiveness of coagulants in synthesized and turbid water

additional natural coagulant *Moringa oleifera* along with alum, fenugreek and cumin. By introducing *Moringa oleifera* with those coagulants in different proportions, the turbidity removal efficiency of turbid water will be studied.

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