

# Low Cost Bio coagulants For Removal of Turbidity and Total Coliforms from Lake Water

Suma Majeed<sup>1</sup>, Chinnamma MA<sup>2</sup>

<sup>1</sup>Student, Environmental Engineering, Malabar College of Engineering and Technology, Kerala, India

<sup>2</sup>Professor, Environmental Engineering, Malabar College Of Engineering and Technology, Kerala, India

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**Abstract** - It is a well-known fact that clean water is absolutely essential for healthy living. Adequate supply of fresh and clean drinking water is a basic need for all human beings. Factors such as industrial discharge, agricultural run-off and poor sanitation practices has led to contamination of water bodies at rural areas .It is essential to find alternatives that are eco-friendly and economical for purifying water . Bio coagulants can clarify the water by reducing the turbidity and hardness of water at low cost. In this project, Zee mays, Pisum sativum and Carica papaya are used as bio coagulants for removing the turbidity of lake water samples from Anapuzha lake. The main purpose of this project is to evaluate antimicrobial activity and turbidity removal efficiency of different coagulant seeds and to compare the effectiveness of natural coagulants seeds.

**Key Words:** Contamination, Eco-Friendly, Economical, Bio Coagulants, Turbidity,

## 1. INTRODUCTION

Natural coagulants may be manufactured from plant seeds, leaves, and roots. These natural coagulants are interesting because, comparative to the use of synthetic organic polymers containing acryl amide monomers, there is no human health danger and the cost of these natural coagulants would be less expensive than the conventional chemicals alike since it is locally available in most rural communities. In this project natural coagulants such as Zee Mays, Carica Papaya and Pisum Sativum are used for removing the turbidity of lake water.

### 1.1 Objectives

To evaluate antimicrobial activity and turbidity removal efficiency of different coagulant seeds

To make the water treatment process easier and environmental friendly

To compare the effectiveness of coagulating seeds

### 1.2 Sample Collection

Surface water sample for turbidity removal are collected from Anapuzha Lake near Kodungallur, Kerala. From this

lake, three locations having high turbidity ranges are suspected and selected as sample. The samples are collected from 15 cm (6 in) from surface water.

Coagulant seeds are collected from nearby market .These are dried and made fine powder by using grinder and stored in air tighten packets for future use

## 2. EXPERIMENTAL PROCEDURE

Before operating the jar test, the sample was mixed homogenously. Then, the samples need to be measured for pH, turbidity, TDS, hardness, coliform count for representing an initial concentration. Coagulants of varying concentrations were added in the beakers.

The whole procedures in the jar test were conducted in different rotating speed. After the desired amount of coagulants were added to the suspensions, the beakers were agitated at various mixing time and speed, which consist of rapid mixing 200 rpm for 3min and slow mixing 40 rpm for 15 minutes.



Figure- 1: Jar test apparatus

Finally, a sample was withdrawn using a pipette from the middle of supernatant for physicochemical and bacteriological measurements which represent the final concentration. All tests were performed at an ambient temperature in the range of 26–32°C for different turbid ranges.

In the experiment, the study was conducted by varying a few experimental parameters, which were coagulant dosage and mixing time in order to study their effect in flocculation and obtain the optimum condition for each parameter.

### 2.1 Test result before treatment

Samples collected from each locations of the lake are named as S1, S2 and S3. Before the treatment, tests for pH, turbidity, chlorides, total dissolved solids, hardness and coliform of lake water samples are done and results are found.

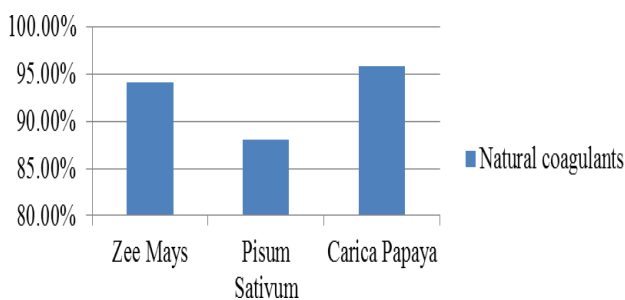
**Table -1:** Surface water sample analysis before treatment

#	Parameters	Standards (IS:10500)	Sampling Locations (Lake)		
			S1	S2	S3
1	pH	6.5-8.5	8.74	7.8	8.3
2	Turbidity (NTU)	<05	105.6	73.5	35.3
3	Chlorides (mg/l)	<250	303	150	199
4	TDS (mg/l)	<500	1195	3508	589
5	Total hardness (mg/l)	120	1158	955	760
6	Coliforms (cfu/ml)	0-10	1350	1100	1050

### 2.2 Comparison of turbidity removal efficiency

The jar test operations using different coagulants were carried out in different turbidity ranges of lake water. Reductions of turbidity after using natural coagulants are found.

Coagulants doses used in experiment starts from 50 mg/L to 100 mg/L for corresponding six beakers.



**Chart -1:** Comparison of turbidity removal efficiency of natural coagulants

After the experiment, It was found that Carica Papaya reduced maximum turbidity among all coagulants used. It reduced up to 95.89% for highly turbid water which is almost

as same as the normal reduction capacity of alum. So, it was found most efficient among the studied natural coagulants. Second highest among the natural coagulants used for the study was for Zee Mays. It reduced up to 94.1% for highly turbid water.

All of studied natural coagulants were efficient in higher-turbidity ranges than lower- and medium-turbidity waters. So, these natural coagulants might be considered as excellent alternative of traditional chemicals like alum and very efficient coagulants for high-turbidity ranges.

### 2.3 Reduction of total coliforms

Total coliform counts were determined for the turbid raw water and clarified treated water. Very significant removal of total coliforms was found after treatment with natural coagulants.

The test was conducted in high turbid water and total coliform count was recorded as  $1.35 \times 10^3$  cfu/100 ml and after treatment with water soluble extract of Zee Mays, it was  $1.0 \times 10^2$ . Pisum Sativum and Carica Papaya reduced to  $1.1 \times 10^2$  cfu/100 ml and  $1.4 \times 10^2$  cfu/100 ml respectively

**Table -2:** Reduction of total coliform using natural coagulants

coagulants	Total coliform counts (cfu/100ml)		% reduction
	Before treatment	After treatment	
Zee mays	$1.35 \times 10^3$	$1.0 \times 10^2$	92.59
Pisum sativum	$1.35 \times 10^3$	$1.4 \times 10^2$	89.62
Carica papaya	$1.35 \times 10^3$	$1.65 \times 10^2$	87.77

In this experiment, the reduction of total coliform counts was about 92.59 %, 89.62%, and 87.77% using Zee Mays, Pisum Sativum and Carica Papaya respectively.

### 3. CONCLUSIONS

Using locally available natural coagulants, such as Zee Mays, Carica Papaya and Pisum Sativum, significant improvement in removing turbidity and total coliforms from lake water was found. Maximum turbidity reduction was found for highly turbid waters. After treatment of lake water with Zee Mays, Carica Papaya and Pisum Sativum the turbidity was reduced to 94.1%, 95.89% and 88.9% respectively. Among the natural coagulants used in this study for turbidity reduction, Carica Papaya was found most effective. It reduced up to 95.89% turbidity from the turbid water. It was also found that these natural coagulants reduced about 87–92% of total coliforms. Zee Mays reduced about 92% of total coliforms from the highly turbid water. Thus bio coagulants can be considered as a better alternative of synthetic organic polymers.

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