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NATURAL COAGULATION FOR THE REMOVAL OF TURBIDITY AND TDS FROM SYNTHETIC WATER

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Abstract - *The study investigates the safe drinking water remains a critical issue, particularly in developing nations where waterborne illnesses claim numerous lives annually. The study evaluates the effectiveness of natural coagulants—Tamarindus indica, Strychnos potatorum, and Moringa oleifera in removing Turbidity and Total dissolved solids (TDS) from water. Experimental results demonstrate that Moringa oleifera achieves the highest Turbidity removal rate of 97.97% at 30 mg/l dosage, pH 5, and 30 minutes. Tamarindus indica and Strychnos potatorum achieve 92% and 86% Turbidity removal, respectively. Regarding TDS, Moringa oleifera also shows superior performance with a 95% removal rate, followed by Tamarindus indica (93%) and Strychnos potatorum (91%). The findings indicate that Moringa oleifera is the most effective natural coagulant for improving water quality, making it a promising option for water treatment in resource-limited settings.*

Keywords: *Synthetic water, Jar test, Drumstick seeds, Tamarindus indica, and Nirmali seeds.*

1.INTRODUCTION

One basic need that all organisms, including humans, must have is water. Utilizing limited resources can help living things on this earth. Approximately 75% of the current global population resides in developing nations. Approximately There are 1.2 billion individuals lack access to safe drinking water, and every year, over 6 million children in underdeveloped nations perish from bloody diarrhea. Nonetheless, it is inconceivable and intolerable in any circumstance that waterborne illnesses continue to claim the lives of 25,000 people on average each day in underdeveloped nations. At the same time, millions more endure the crippling consequences of these illnesses (1). For a community to be healthy and safe to drink, all water sources must be purified before being used. Water is made appealing to consumers and safe by a variety of techniques. The technique used is established by the raw water's characteristics. The significant seasonal variation in turbidity is one of the issues with treating surface water. Many treatment facilities in impoverished nations currently operate under arbitrary restrictions, especially when it comes to chemical doses. In addition, insufficiently trained laborers and a lack of lab space to track the process performances needed to run the plants. In the water treatment business, coagulation-flocculation, followed by sedimentation, filtration, and disinfection often with chlorine is employed globally before the distribution of treated water to consumers(1).To assess and contrast the efficiency of Tamarindus indica, strychnic potatorum, and drumstick seeds as natural coagulants for the extraction of turbidity and total dissolved solids (TDS) from water samples.

To ascertain the ideal dosage of each coagulant required to minimize turbidity and obtain the highest possible TDS.To determine the capacity of the seed extracts without the assistance of coagulants and to lessen the turbidity of the artificial turbid water.To offer a technologically sound and environmentally sustainable means of enhancing people's quality of life.researching the biosorbent's chemical and physical characteristics.To assess the natural biosorbents' ability to disinfect.

1.1 Operating Parameters.

- Contact time (30, 45 and 60)min.
- pH (5,7 and 9)
- Initial concentration (100-250)RPM
- Dosage of coagulants (20, 30, 40, 50, 60 and 70)mg/ltr.

2. MATERIALS AND METHODOLOGY.

Water, natural coagulants (Moringa oleifera seed, tamarind seed, and normal seed), and clay were the only materials

used in this investigation. The coagulants' detailed descriptions are provided below. In the current investigation, three natural coagulants were employed. These are specifically tamarind seed, Moringa oleifera seed, and. The coagulants' descriptions are provided.

2.1 Preparation of Coagulants.

- Moringa oleifera (Drumstick seeds)
- Tamarind seed (Tamarindus indica)
- Nirmali seeds (strychnine potatorum)

Dry the seed in the oven or sun.Use a kitchen blender to finely powder.Add 5 grams of natural coagulation powder to 100 milliliters of distilled water.Using a stirrer, shake vigorously for 45 minutes to encourage water extraction via filter paper.A filter percentage was utilized in dosages of 20, 30, 40, 50, 60, and 70 mg/l of coagulants to achieve the necessary level of natural coagulation.The use of tamarind seeds, Moringa oleifera, and Nirmali seeds is shown in Figure 1(a) and (b) below.

Figure-1(a) Moringa oleifera, Tamarind seed

Figure-1(b) Nirmali seed.

2.2 Preparation of Turbid Water Sample.

Take 1kg of clay material sieved in a 4.75 mm IS sieve and add 10 liters of tap water.Next stirred well allow it to settle for 1hr.Supernatant liquid is used for studies.Preparation of synthetic turbid water.

3. RESULTS AND DISCUSSIONS.

The synthetic water created was used. Under cautious circumstances, the first features of synthetic water were tested as soon as the sample was brought into the lab. Table 1 lists the synthetic water's initial attribute values.

Table -1: Initial characteristic of synthetic water and BIS drinking water quality.

PARAMETER	INITIAL VALUE	BIS STANDARDS (IS10500: 2012) WATER QUALITY (ACCEPTABLE LIMIT)
pH	8.8	6.5-8.5
TDS	454 mg/l	500(Mg/l)
Electrical conductivity	881 ms/cm	750(ms/cm)
Turbidity	45 NTU	1 NTU

3.1 The Turbidity Removal Efficiency

The Turbidity Removal Efficiency For Contact Times 30, 45, And 60 is Observed in Experimental Trials. The removal percentage and pH (5, 7 and 9) and agitation time (100,200 and 250)RPM are shown in Table 2 . The Comparison Graph of Moringa oleifera, tamarind seed, and nirmali seed is Shown In chart 1, 2 and 3 below.

Table -2 The maximum removal percentage of turbidity.

Agitation time (RPM)	pH	Time	Dosage in mg/l	Removal efficiency in NTU (%)	Natural coagulants
100 RPM	5	30 min	30 mg/l	97.97%	Moringa oleifera
200 RPM	7	60 min	20 mg/l	92%	Tamarind seed
250 RPM	9	30 min	50 mg/l	86%	Nirmali seed

In below chart 1, it is demonstrated that moringa oleifera peaks at 30mg/l (97.97%) due to these proteins help neutralize the charge on suspended particles in synthetic water. Then, these bigger particles can be more easily removed from the synthetic water, reducing turbidity. Overall, the graph illustrates that moringa oleifera exhibits

the highest turbidity removal efficiency among the three natural coagulants tested. Making it the greatest way to make improvements in water quality.

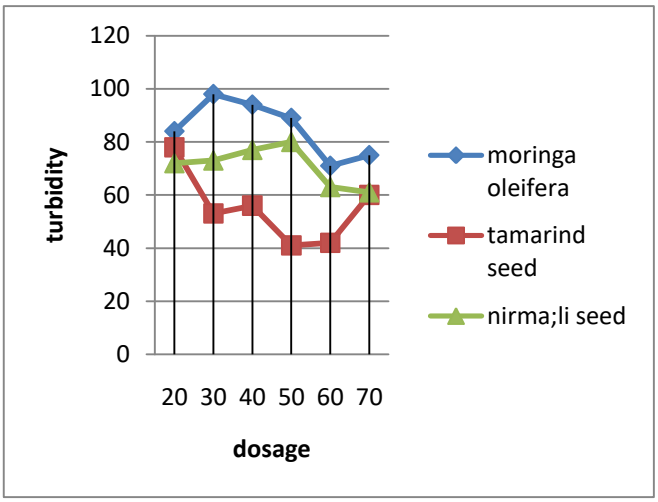

Chart -1: The turbidity removal efficiency vs dosage (mg/l).

In below chart 2 shows that the reason the concentration of tamarind seeds peaks at 40 mg/l (93.33%). These substances facilitate the easier removal of suspended particles from synthetic water by aggregating them. tamarind seeds have the highest efficacy in removing turbidity, as seen in the graph. maximizing its effectiveness.

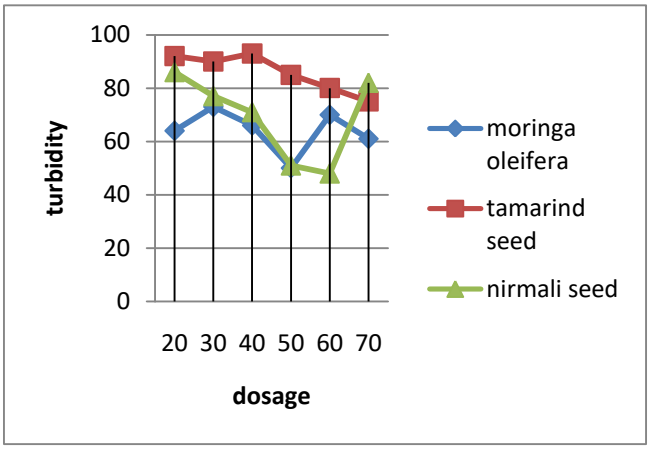

Chart -2: The turbidity removal efficiency vs dosage (mg/l).

In chart 3 shows that the reason Nirmali seeds peak at 50 mg/l (86%). Out of the three natural coagulants that were evaluated, Nirmali seeds have the highest efficacy in removing turbidity, as seen by the graph. maximizing its effectiveness.

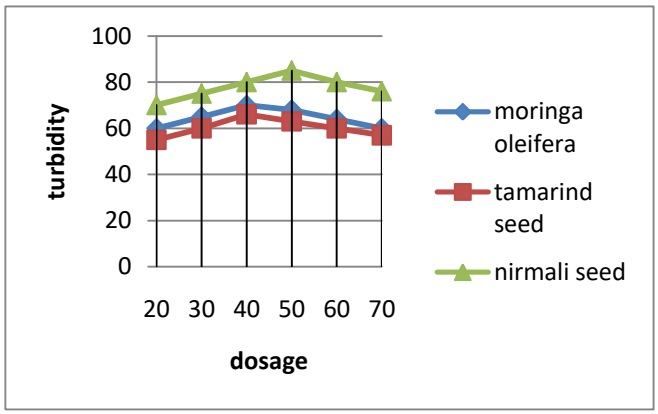

Chart -3: The turbidity removal efficiency vs dosage (mg/l).

3.2 The TDS Removal Efficiency.

The TDS Removal Efficiency For Contact Times 30, 45, And 60 is Observed in Experimental Trials. The removal percentage and pH (5, 7 and 9) and agitation time (100,200 and 250)RPM are shown in Table 3 . The Comparison Graph of Moringa oleifera, tamarind seed, and nirmali seed is Shown In Chart 4, 5 and 6 below.

Table -2 The maximum removal percentage of TDS.

Agitation time (RPM)	pH	Time	Dosage in mg/l	Removal efficiency in NTU (%)	Natural coagulants
100 RPM	9	30 min	30 mg/l	95%	Moringa oleifera
200 RPM	7	30 min	50 mg/l	93%	Tamarind seed
250 RPM	5	60 min	50 mg/l	91%	Nirmali seed

In below chart 4 shows that the reason Moringa oleifera is useful in synthetic water systems is because it can act in a variety of water chemistries and situations, making it a versatile and effective TDS remover. It peaks at 30 mg/l (95.15%). the graph shows that out of the three natural coagulants that were evaluated, moringa oleifera has the highest TDS removal effectiveness.

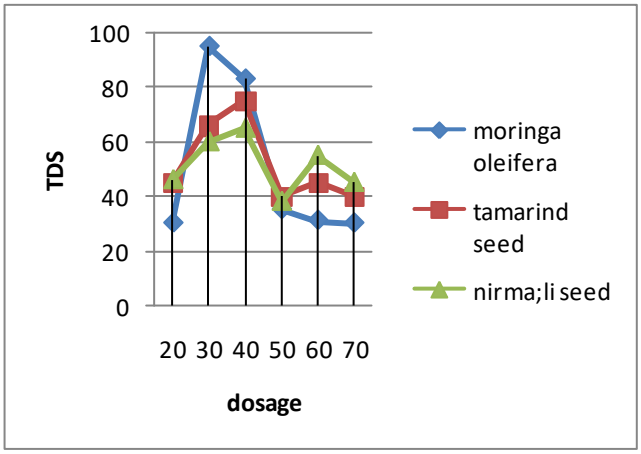

Chart -4: The TDS removal efficiency vs dosage (mg/l).

In below chart 5 shows that the Tamarind seeds peak at 50mg/l (93.11%) because their extracts help in flocculation, where suspended particles clump together. This process makes it easier to separate and remove particles from the synthetic water.Overall, the graph illustrates that tamarind seeds exhibit the highest TDS removal efficiency among the three natural coagulants tested. For this reason, it is the best option for improving the quality of the water.

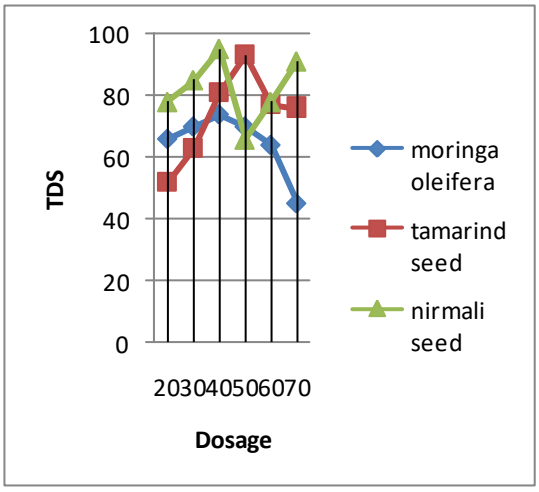

Chart -5: The TDS removal efficiency vs dosage (mg/l).

In below chart 6 shows that the reason Nirmali seeds peak at 50mg/l (91%) due to it's the natural components in help neutralize the surface charge of particles, reducing repulsive forces and promoting their aggregation and removal.The graph shows that out of the three natural coagulants that were evaluated, nirmali seeds have the highest TDS removal effectiveness.

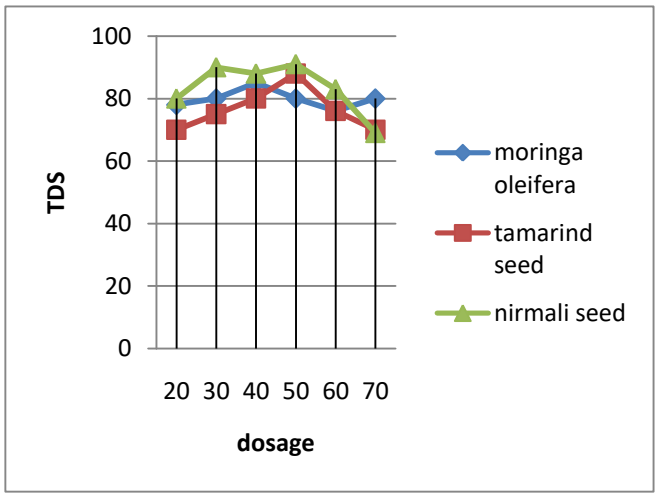

Chart -6: The TDS removal efficiency vs dosage (mg/l).

3. CONCLUSIONS

The maximum removal turbidity percentage of 97.97% is achieved using 30 mg/l of Moringa oleifera at pH = 5, RPM = 100 NTU, and 30 minutes. Additionally, utilizing tamarind seed, the percentage elimination was 92%at dosages of20mg/l,pH= 7, RPM=250, and 60minutes. Utilizing Nirmali seed, turbidity was removed by 86% at a dosage of 50 mg/l, a pH of 9, an RPM of 200, and a duration of 30 minutes.

The greatest percentage of TDS removal was 91% with Nirmali seed at a dosage of 50mg/l, pH of 5, RPM of 250, and duration of 60 minutes. Tamarind seed removes 93% of TDS at a dosage of 50 mg/l, pH of 7, RPM of 200, and duration of 30minutes. Using Moringa oleifera, the elimination of TDS is 95% at a dosage of 30 mg/l, a pH of 9, an RPM of 100, and a duration of 30min. moringa oleifera has the highest TDS and turbidity removal effectiveness and best option for improving the quality of the water.

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