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Removal of Turbidity by Using Moringa Oliefera

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ABSTRACT- Water that is clean and hygienic must be available for drinking. Most of the water that is currently available needs to be cleaned. When water is contaminated, it may be required to recycle it. Water must be treated to eliminate impurities and standardize variables like turbidity and pH. Many of the treatment facilities employ any organic coagulants for the treatment, like alum, ferrous sulphate, etc.The usage of plant-based coagulants was developed since these coagulants are hazardous to living things.The utilization of biological plant materials as coagulants, such as agricultural waste, Chitosan, Moringa oliefera, maize seed, cactus plant, etc., has been thoroughly researched. In this project, studies are carried out to determine the turbidity removal efficiency utilizing locally accessible moringa oliefera. The outcomes are encouraging because the optimal dosage is 200 mg/l with an 88.9% clearance efficiency in dry form.

KEYWORDS- Fluorides, optimal dosage, adsorption, coagulation, and Moringa oliefera.

I. INTRODUCTION

Water is the driving force of all nature. Water is vital to life and development in all parts of the world. The availability of a water supply adequate in terms of both quantity and quality is essential to human existence. Civilization developed around water bodies that could support agriculture and transportation as well as provide drinking water. Recognition of the importance of water quality developed more slowly.

Early humans could judge water quality through physical senses of sight, taste and smell. Not until the biological, chemical and medical sciences developed were methods available to measure water quality and determine its effects on human health and well-being. Water pollution is the presence of some inorganic, organic, biological, radiological or physical foreign substance in the water that tends to degrade its quality. Normally, water is never pure in a chemical sense. It contains impurities of various kinds dissolved as well as suspended.

The polluted water is turbid, unpleasant, bad smelling, unfit for drinking, bath and washing and incompatible in supporting life. Water pollution is also caused by the presence of undesirable and hazardous materials and pathogens beyond certain limits. Much of the pollution is due to anthropogenic activities like discharge of sewage, effluence and wastes from domestic and industrial establishments, particulate matter and metals and their compounds due to mining and metallurgy and fertilizer and pesticide runoffs from agricultural activities.

Waste water need to be treated. Commonly the chemical coagulants such as salts of iron and aluminium are used. In this widely used coagulant is aluminium sulphate shortly known as Alum, when added to raw water reacts with the bicarbonate alkalinities present in water and forms a gelatinous precipitate. This floc attracts other fine particles and suspended material in raw water, and settles down at the bottom of the container. But this process is costly and also over dosage causes harmful effects on human being. In order to overcome these limitations, natural coagulants such as moringa oleifera and tamarind seed powder are used. The use of Moringa Oliefera have an added advantage over the chemical treatment of water because it is biological and has been reported as edible, ecofriendly, economical and locally available.

Modern wastewater treatment process is aiming at incorporating cost effective, economic, natural and simple. In conventional water treatment, coagulation is achieved using chemical coagulants such as aluminum sulphate, ferric chloride, poly aluminum chloride, etc. While the effectiveness of these coagulants is well-recognized, nonetheless, their application in water treatment is becoming unsuitable owing to ineffectiveness in low temperature water, relatively high procurement costs, detrimental effects on human health, production of large sludge volumes and the fact that they significantly affect pH of treated water. Hence it is necessary to make an in-depth study in the coagulating activity of these seeds' substance of moringa oleifera and tamarind and to evaluate the optimum dosage for maximum turbidity removal and pH, Acidity, Alkalinity and chloride content reduction.

Objectives the major objectives of this study are

- To recognize workable, cost efficient, nearby available, simple, effective, eco-friendly water treatment method which is appropriate for rural and urban population especially for developing countries like India.
- To reduce the level of Turbidity and thereby indirectly microbial contaminants from water using locally available natural coagulants.
- To make the water treatment process easier, safe, and environment friendly for household applications.

II. LITERATURE REVIEW

A. *Use of Moringa Oliefera as coagulant in water treatment*

Waterborne disease is a persistent health problem throughout the world. According to Schwarz (2000) an estimated 1.6 million people in developing countries are compelled to use contaminated water resources for drinking and food preparation. Yet, in many rural communities of these countries water clarification methods like flocculation, coagulation, and sedimentation are often impractical because of the high cost of equipment and low availability of chemical coagulants.

The use of natural materials to clarify water has been practiced for centuries. Extracts of seeds from the M. oleifera tree have been found to be one of the most effective clarifiers. Studies to test its effectiveness for treating water have been conducted since the early 1970's (Beth, 2005). These early investigations established its effectiveness as a coagulant for treatment of water with high levels of turbidity. Other plant extracts, such as from the seeds of Prosopis juliflora tree, have also been shown to be good coagulants (Forster et al., 1999). Of equal importance to coagulation efficiency is the human health issue in the use of such coagulants for potable water production.

Toxicological assessments by Berger et al. (1984) and Grabow et al. (1985) indicate that use of M. oleifera as a primary coagulant does not pose a human health threat. The use of non-toxic natural coagulants obtained from local resources would lessen the economic hardship in developing countries of procuring conventional chemical coagulants. Several in-depth studies have confirmed that M. oleifera seeds possess effective coagulation properties (Jahn 1986, 1988; Muyibi and Okuofo 1995; Muyibi and Evison 1996; Ndacigengesere et al. 1998; and Amagloh and Benang, 2009). Treatment efficiency for this alternate natural coagulant is high.

For instance, M. oleifera has been utilized as a main coagulant in river waters with starting turbidities ranging from 105 to 350 nephelometric turbidity units (NTU). Muyibi and Evison (1996) reported turbidity removals by M. oleifera used as a primary coagulant as high as 99%. A crude water extract of M. oleifera has also been shown in these tests to compare favorably with aluminum sulfate, and as a result, its application as a water treatment agent in impoverished nations has been suggested (Jahn 1986, 1988; Ndacigengesere et al., 1995).

Moringa seeds in two forms—shelled versus unshelled—are used in coagulation to improve the quality of water (Ndacigengesere et al., 1995, 1998). Extracts made from unshelled, powdered seeds performed less well in coagulating and clearing turbidity. Furthermore, Amagloh and Benang (2009) found that mature seed extracts outperformed immature seed extracts in turbid waters. The level of active component in M. oleifera preparations, which have been purified and identified as dimeric cationic proteins, was indirectly addressed by these research. The concentration of organic matter in treated water increases with coagulant dose, which is a drawback of its use and may cause water quality issues when treated water is stored (Ndacigengesere et al., 1995).

In addition, coagulation efficiency of M. oleifera decreases with an increase in storage duration because it is highly biodegradable with a short shelf life (Katayon et al., 2004, 2006a and 2006b). Other studies have also shown that the coagulation efficiency can be increased by extracting its active component using a salt (Tsatsuji et al., 1999, 2001).

III. COAGULATION

Destabilizing (lowering the charge) particles is the process of coagulation, and the coagulant is the substance used to carry out coagulation. Flocculation refers to the process of particles colliding to create a larger particle that is easily removed by a straightforward procedure like sedimentation or filtering.

Surface water and industrial wastewater are both treated using the coagulation-flocculation method, which uses coagulants. The most extensively used method for treating wastewater and producing potable water is coagulation flocculation. This coagulant could be chemical or natural in origin. In many rural locations, natural coagulants have been utilized for generations in domestic water treatment at the home level. As shown in Figure 1, these natural coagulants are introduced to the turbid water to remove the turbidity.

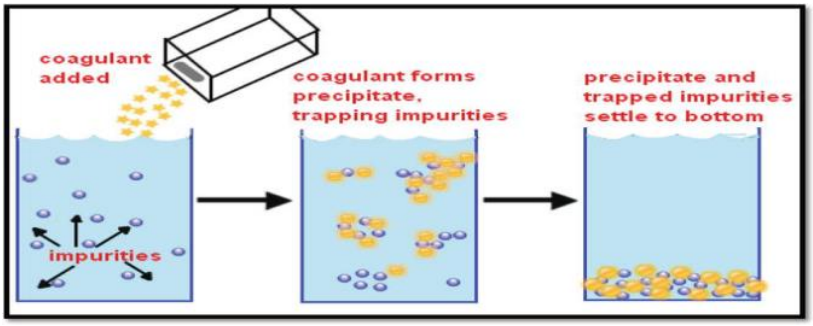

Figure 1: Process of Coagulation

IV. METHODOLOGY

The water sample was taken from the VALLURU pond, which is close to the campus. The water in the pondis used for domestic purpose. The water sample taken from the pond has a pH of 7.97 and a turbidity of 54 NTU.

It is collected from an area near Addanki village, Andhra Pradesh. On the tree, Moringa oleifera seed pods are left to develop and naturally dry until they turn brown. The seeds were taken out of the pods, allowed to dry in the sun, then had their outer shells scraped off. We used mature seeds that didn't exhibit any signs of fading, softening, or significant desiccation. To achieve solubilization of the active compounds in the seed, the seed kernels were ground to a

fine powder using a kitchen blender. The finished product had a particle size of about 600 m.

Figure 2: Moringa oliefera seed powder

A. Turbidity

Turbidity is the cloudiness or haziness of a fluid created by a large number of individual particles, analogous to smoke in air. Turbidity measurement is an important indicator of water quality. Water containing suspended and dissolved particles, which causes the water to seem turbid.

V. PREPARATION OF STANDARD STOCK SOLUTION

All 5 seeds' seed kernels were ground to a fine powder with a size of around 600 micrometers to ensure solubilization of active compounds in the seed. 100 cc of distilled water was added to the powdered form of each known quantity of seed. It was then forcefully blended to improve coagulant protein water extraction.

A. Jar Test

The jar test is one of the most common experimental methods for coagulation-flocculation. In the studies, a traditional jar test setup was utilized to coagulate a sample of synthetic turbid water using several coagulants. It was carried out as a batch test, with a total of six beakers and six spindle steel paddles. The sample was homogeneously mixed before running the jar test. The samples should next be tested for turbidity and coliform count to indicate an initial concentration. In the beakers, coagulants of varied concentrations were introduced. The jar test methods were carried out at various rotation speeds. After adding the necessary amount of coagulants to the suspensions, the beakers were stirred at various mixing times and speeds, including quick mixing (80-100 rpm) for 1 minute and gradual mixing (30-40 rpm) for 30 minutes. The suspensions were allowed to settle for 20-60 minutes after the agitation was ceased. Finally, a pipette was used to extract a sample from the middle of the supernatant for physicochemical and bacteriological measurements that indicate the final concentration.

VI. MEASUREMENT OF TURBIDITY

The samples were combined with cactus powder in dry form, and the turbidity was studied by increasing the dose of fabsorbent. The jar test was used to carry out all of the trials. Turbidity is measured photo metrically by calculating the percentage of a particular intensity of light that is absorbed or dispersed. The first instrument, known as a Nephelometric turbidity meter, was based on light absorption.

The instrument is turned on and given 10-15 minutes to warm up. The 'CALIB' control was turned all the way clockwise. A suitable measurement range (0-1000) was chosen. The test tube was filled with distilled water before being placed in the cell holder and shielded from light. The 'SET ZERO' control was modified to display zero. The test tube was replaced with a new test tube containing standard turbidity solution. The 'CALIB' control was now set to read the turbidity of the standard solution. The apparatus was now prepared to measure the turbidity of the test sample. The unknown material was placed in the test tube, which was then placed in the cell holder. The turbidity of the sample was shown directly on the screen. Finally, a sample was collected from the middle of the jar using a pipette.

VII. RESULTS AND DISCUSSION

The coagulation efficiency of Moringa oleifera was investigated in this study. The turbidity of waste water was found to decrease as the coagulant dosage was increased. The jar test was used to find the optimal dosage. The jar test is a simple experiment that can be used to determine the optimal coagulant dose. The initial water turbidity is 54 NTU, and the initial pH of the buffer solution is 7.97. Dosages for the corresponding six beakers ranged from 50mg/L to 100mg/L and from 100 mg/L to 200 mg/L. Before and after treatment, turbidity was assessed.

Table 1: Optimum dosage of Moringa Oleifera (up to 100 ml).

S .NO	Dosage of Coagulant (mg/L)	Turbidity(NTU)
1	50	22
2	60	21
3	70	19
4	80	17
5	90	15
6	100	14

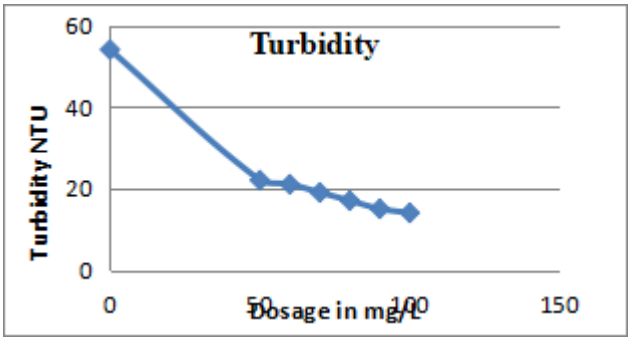

Figure 1: Graph of Optimum dosage of Moringa Oliefera (up to 100 ml)

Table 2: Optimum dosage of Moringa Oleifera (100 – 200 ml).

S. NO	Dosage of Coagulant (mg/L)	Turbidity (NTU)
1	100	14
2	120	12
3	140	8
4	160	7
5	180	7
6	200	6

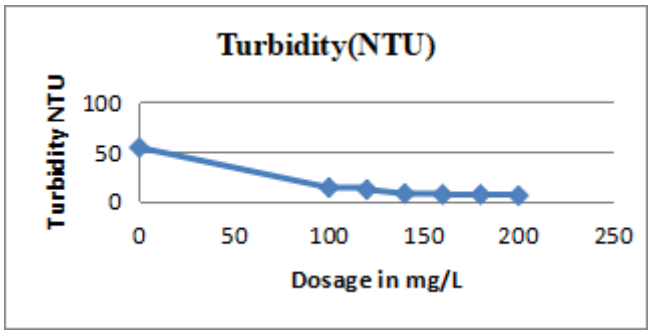

Figure 2: Graph of Optimum dosage of Moringa Oliefera (100 - 200 ml Dosage)

Table 3: Removal of efficiency of turbidity using different Optimum dosage of Moringa Oleifera. (up to 100 ml Dosage)

S. NO	Dosage of Coagulant(mg/L)	Initial Turbidity(NTU)	Final Turbidity(NTU)	Removal Efficiency
1	50	54	22	59.3
2	60	54	21	61.1
3	70	54	19	64.8
4	80	54	17	68.5
5	90	54	15	72.2
6	100	54	14	74.1

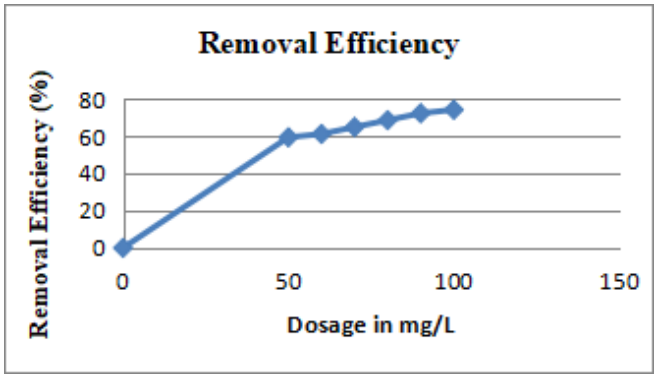

Figure 3: Graph of Removal efficiency of turbidity using different Optimum dosage of Moringa Oleifera. (up to 100 ml)

Table 4: Removal of efficiency turbidity using different Optimum dosage of Moringa Oleifera.

S.NO	Dosage of Coagulant (mg/L)	Initial Turbidity(NTU)	Final Turbidity(NTU)	Removal Efficiency
1	100	54	14	74.1
2	120	54	12	77.8
3	140	54	8	85.2
4	160	54	7	87
5	180	54	7	87
6	200	54	6	88.9

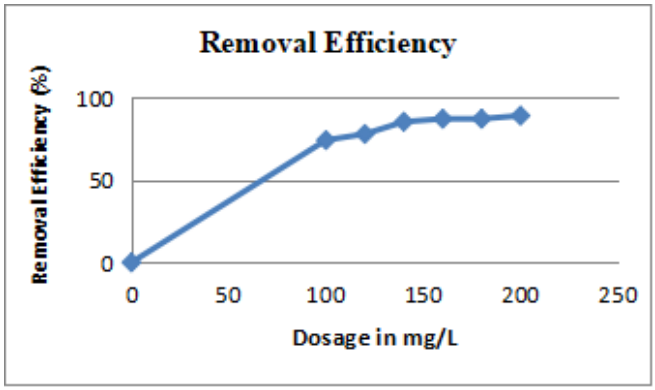

Figure 4: Graph of Removal of efficiency of turbidity using different Optimum dosage of Moringa Oleifera (100 – 200 ml)

Table 5: Test results after pH treatment using different Optimum dosage of Moringa Oleifera (up to 100 ml Dosage)

S. NO	Dosage of Coagulant (mg/L)	pH
1	50	8.00
2	60	8.04
3	70	7.96
4	80	7.95
5	90	7.95
6	100	7.92

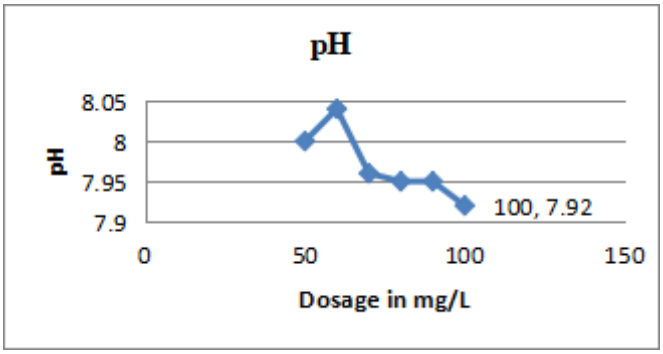

Figure 5: Graph of test results after pH treatment using different Optimum dosage of Moringa Oleifera

Table 6: Test results of pH after treatment using different Optimum dosage of Moringa Oleifera.

S. NO	Dosage of Coagulant (mg/L)	pH
1	100	7.81
2	120	7.74
3	140	7.57
4	160	7.60
5	180	7.55
6	200	7.56

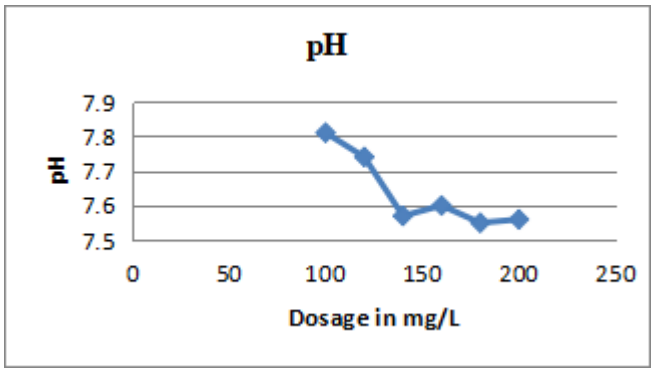

Figure 6: Graph of test results of pH after treatment using different Optimum dosage of Moringa Oleifera.

VIII. CONCLUSION

Moringa applications Olieferaas a primarily eco-friendly coagulant, it has the potential to reduce the need for chemical coagulants used in water treatment, hence reducing human sickness. The optimal dosage was 200mg/l with a removal efficiency of 88.9%, with the powder remaining on 150.

The water's efficiency varies depending on the size of the coagulants. If the coagulant's size is large, the efficiency decreases; if the coagulant's size is small, the efficiency increases.

The use of a locally accessible natural coagulant for water treatment was discovered to be acceptable, simpler, cost effective, and environmentally beneficial.

CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

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