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Experimental Study on purification of Kitchen Waste Water by using natural coagulation

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***Abstract*— Over a past few years, water treatment plants use a variety of chemicals to remove contaminants that affect the taste, odour and overall safety of the water. So we use the natural coagulants like rice husk ash, tamarind seed and drumstick seed to reduce the turbidity of the kitchen waste water. Aluminium and iron coagulants are commonly used in most industries. Hence nowadays, there has been great attention in the improvement and implementation of natural coagulants in wastewater treatment. These natural coagulants can be formed or extracted from animal, microorganisms and also plant**

Keywords*—Jar Test, Coagulation, Natural Coagulants, pH, Total dissolved solids, Turbidity. NTU.*

I. INTRODUCTION

Water is undoubtedly the most vital element among the natural resources. In many developing countries, access to clean and safe water is a crucial issue. More than six million people die because of diarrhea which is caused by polluted water. Developing countries pay a high cost to import chemicals for water treatment. Water from all sources must have some form of purification before consumption. Various methods are used to make water safe and attractive to the consumer In this study, the effectiveness of a natural macromolecular coagulant derived from a Rice husk ash, tamarind seed and drumstick seed powder for turbidity removal from kitchen waste water were evaluated. In wastewater treatment, coagulation has been practiced since earliest times and the main objective is to remove colloidal impurities hence also removing turbidity from the water. Hence nowadays, there has been great attention in the improvement and implementation of natural coagulants in wastewater treatment. New developments in Environmental Engineering are providing promising solutions to many water pollution problems. In recent years various investigations were carried out and results into development of new coagulants, extracted from natural and renewable sources. The use of natural coagulants which are grown in the vicinity may results in economical and sustainable viable alternative.

The maximum turbidity removal efficiency for moringa oleifera, tamarind seed, and rice husk ash powder were 66.8%, 59.8% and 68.5%. Comparing the performance of moringa oleifera, tamarind seed powder and Rice husk ash The Rice husk ash was found to be more effective than other

II. OBJECTIVES

- To make use of the kitchen waste water for irrigation and lawn etc
- To reduce the turbidity and odour of the water.
- To increase the colour of the waste water.
- To improve the water quality and remove the contaminants present in the water.
- To make waste water usable for other purposes

III. SCOPE OF THE PROJECT

- Reduced expenditure on processing of costly chemicals.
- Reduced dependency on chemical coagulation.
- This process is very economical.
- The natural coagulants are eco-friendly

IV. MATERIALS AND METHODS

- Moringa oleifera seed powder
- Tamarind seed powder
- Rice husk ash powder
- Alum

A. *Moringa oleifera*

Moringa oleifera seed was found to be an effective purifier towards removing suspended materials such as suspended solids, turbidity and other waste products. As earlier stated, due to the nonexistence of enough knowledge on how such natural material works, the use of chemical coagulants in water treatment become more common. The mostly used chemicals are; alum (Aluminum sulphate),

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synthetic organic polymer, synthetic polymeric derivatives and inorganic coagulant which are all a threat to humans' health and environment as well as WHO (2004). Also, the use of such substances for water cleanness has developed a strong pressure on the economy of some developing and under-developing nations as the products are imported.

Moringa oleifera seeds

B. Tamarind seed

Tamarind seed kernel powder, discarded as agricultural waste, is an effective agent to make turbid municipal and industrial wastewater clear. The present practice is to use aluminium salt to treat such water. It has been found that alum increases toxic metals and ions in treated water and could cause diseases like the Alzheimer's. Kernel powder, compared to alum, is not-toxic and biodegradable. The sludge volume generated by coagulation activity from the seeds extract is lower as compared with that of alum or other ferric salts. It softens the hard water due to seed proteins that are essential for water purification and also contains antioxidant compounds that may be essential towards waste treatment.

Tamarind seeds

C. Rice husk

In this perspective **rice husk**, which is an agro-based waste, has emerged as an invaluable source for the utilization in the **wastewater treatment**. **Rice husk** contains 20% silica, and it has been reported as a good adsorbent for the removal of heavy metals, phenols, pesticides, and dyes. RHA proved to be an effective absorbent for pharmaceuticals also.

Studies on the adsorption of various pollutants by rice husk materials are reviewed and the adsorption mechanism, influencing factors, favorable conditions, etc., discussed in this article. It is evident from the review that rice husk and its ash can be potentially utilized for the removal of various pollutants from water and waste waters.

Rice husk

D. Alum

One of the first of the several steps that municipal water suppliers use to prepare water for distribution is getting it as clear and as particulate-free as possible. To accomplish this, the water is treated with aluminum sulfate, commonly called alum, which serves as a flocculant. Raw water often holds tiny suspended particles that are very difficult for a filter to catch. Alum causes them to clump together so that they can settle out of the water or be easily trapped by a filter. The alum promotes coagulation of fine particles which helps resolve problems of color as well as turbidity. If the process is given enough time to work and is applied properly, it not only corrects problems in the water but actually results in removing most of the aluminum used in the process.

Alum

E. JAT TEST

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 of synthetic turbid water using some coagulants. It was carried out as a batch test, accommodating a series of three beakers together with six spindle steel paddles. Before operating the jar test, the sample was mixed homogenously. Then, the samples thought to be measured for turbidity, 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.

Jar test

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V. MATERIAL PROPERTIES

A. *Moringa oleifera seed pwder*

Moringa oleifera seeds removes 80% of turbidity present in the grey water. Moringa oleifera seed was found to be an effective purifier towards removing suspended materials such as suspended solids, turbidity and other waste products. Moringa oleifera seeds contains vitamin A and B1

Ash 5%
Fibres 4.7%
Lipids 43.6%
Proteins 35.4%
Carbohydrates 9.2%

It also contains minerals like calcium, phosphorus, Iron, sodium, potassium, magnesium, copper, zinc and Iodine etc

Moringa oleifera seed powder

B. *TAMARIND SEED POWDER*

Tamarind seeds powder removes 70% of turbidity present in grey water.

It contains proteins 16.2%
Fat 7%
Fibre 17.7 %
Ash 1.16%

It also contains minerals like calcium, phosphorus, Iron, sodium, potassium, magnesium, copper, zinc etc.

Tamarind seed powder

C. *RICE HUSK ASH*

Rice husk ash obtained from rice husk stove can be used for treatment of water. It has been reported that absorption efficiency of RHA is 78% for microbial contaminants.

Ash 23.34%
Protein 1.2%
Fat 0.4%

Rice husk ash contains greater than 80% silica, with a range of relatively high surface areas reported. Crystalline silica, such as quartz and cristobalite, can be present in large amounts depending on the burning conditions.

Rice Husk ash

D. *ALUM*

Alum, any of a group of hydrated sulfate, water of hydration, and the sulfate of another element. Most alums have an astringent and acid taste. They are colourless, odourless, and exist as a white crystalline powder. Alums are generally soluble in hot water, and they can be readily precipitated from aqueous solutions to form large octahedral crystals. Aluminum hydroxide adsorbs suspended particles from water and is thus a useful flocculating agent in water-purification plants.

E. *GREY WATER*

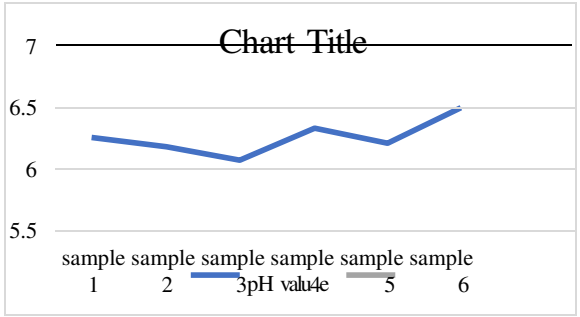
The grey water collected from several household. To conduct the study screened raw water collected and the initial parameters analyzed the procedure given in Standard Method such as turbidity, pH, TDS, are characterized.

SAMPLE ANALYSIS BEFORE TREATMET

The value of pH, total dissolved solids and turbidity is calculated before treatment.

sample	pH	Turbidity	TDS
Sample1	6.25	75 NTU	237 mg/l
Sample2	6.18	85 NTU	312 mg/l
Sample3	6.07	83 NTU	235 mg/l
Sample4	6.33	85 NTU	344 mg/l
Sample5	6.2	77 NTU	228 mg/l
Sample6	6.5	75 NTU	246 mg/l

GRAPHICAL ANALYSIS OF pH VALUE



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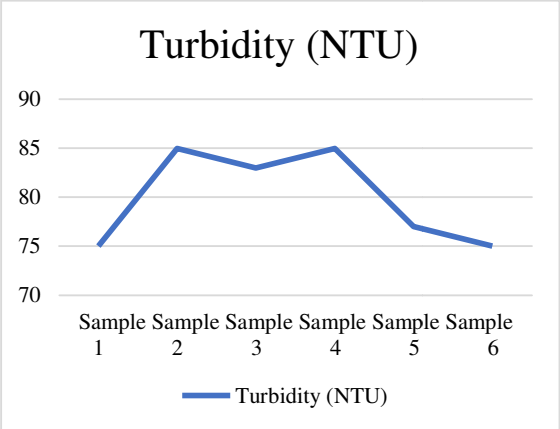
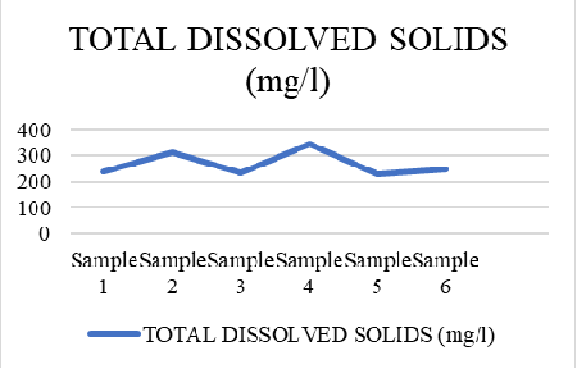
GRAPHICAL ANALYSIS OF TURBIDITY



GRAPHICAL ANALYSIS OF TOTAL DISSLOVED SOLIDS

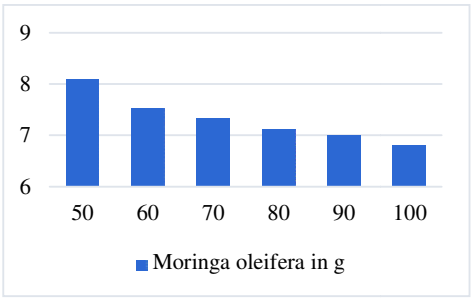


VI. RESULTS AND DISCUSSION

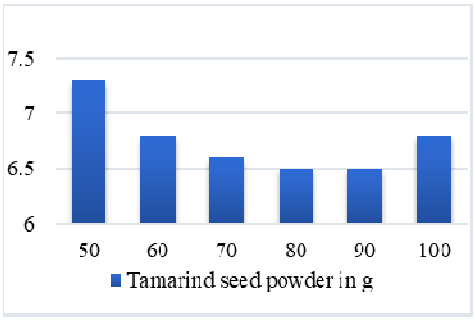
A. pH

The pH electrode used in the pH measurement is combined glass electrode.

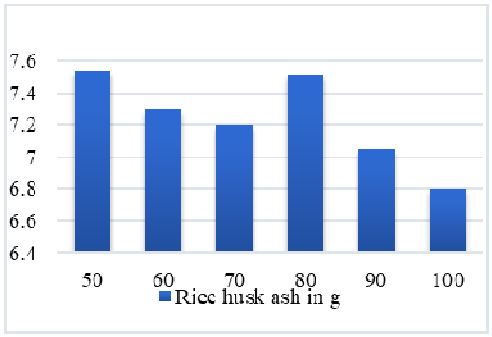
GRAPHICAL ANALYSIS OF pH WHEN ADDING MORINGA OLEIFERA



GRAPHICAL ANALYSIS OF pH WHEN ADDING TAMARIND SEED



GRAPHICAL ANALYSIS OF pH WHEN ADDING RICE HUSK ASH

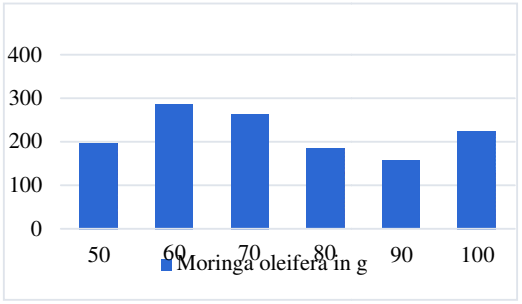


B. TOTAL DISSOLVED SALTS

Total dissolved solids (TDS) is a measure of the dissolved combined content of all inorganic and organic substances present in a liquid in molecular, ionized, or micro-granular (colloidal sol) suspended form.

Total dissolved solids (TDS) is usually low for freshwater sources, at less than 500 ppm. Seawater and brackish (mixed fresh and sweater) water contain 500–30,000 and 30–40,000 ppm TDS, respectively. TDS is most accurately measured by weighing a filtered sample, and drying at 105°C until no further mass is lost.

GRAHPIAL ANALYSIS OF TDS BY ADDING MORINGA OLEIFERA



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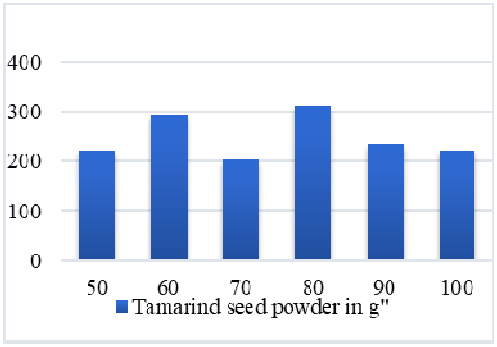
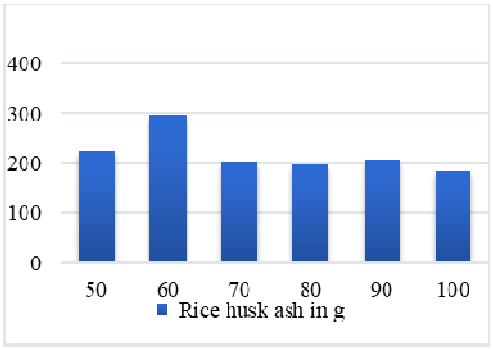
GRAHPIAL ANALYSIS OF TDS BY ADDING TAMARIND SEED POWDER



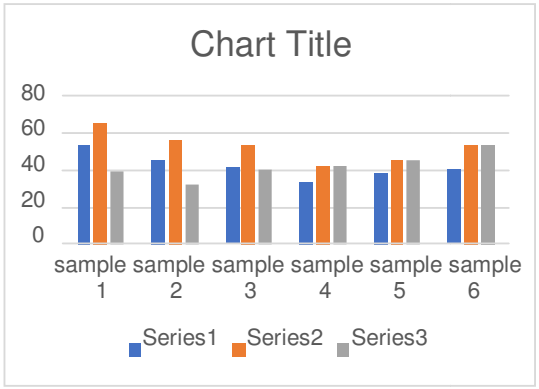
GRAHPIAL ANALYSIS OF TDS BY ADDING RICE HUSK ASH



C. TURBIDITY

Turbidity of water sample due to presence of suspended impurities of organic and inorganic salts. Different amount of coagulant doses was added to six water samples.

Turbidity is based on the comparison of the intensity of light scattered by the sample under defined conditions with the intensity of the light scattered by a standard reference suspension under the same conditions.



GRAPHICAL ANALYSIS OF TURBDITY

VII. CONCLUSION

Using some locally available natural coagulants, for example, Moringa oleifera, Tamarind seed powder and Rice husk ash significant improvement in removing turbidity. Based on the above results obtained, it was found that Rice husk ash gives the maximum turbidity removal efficiency. Optimum dosage coagulant may vary for each of the test samples (natural coagulants) since they possess different chemical properties. The maximum turbidity removal efficiency for moringa oleifera, tamarind seed, and rice husk ash powder were 66.8%, 59.8% and 68.5%. And for alum it was 68%. Comparing the performance of moringa oleifera, tamarind seed powder and Rice husk ash The Rice husk ash was found to be more effective than others.

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