Sewage Water Treatment using Natural Coagulants

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***Abstract*— The treatment of waste water using chemical coagulants are considered to be very expensive and over dosage causes harmful effects on human beings. And for limiting the chemical used in treatment of waste water natural coagulants can be the best substitute. The study aimed to evaluate the efficiency of natural coagulants like orange peel, papaya seed and neem leaf powder for the evaluation of purity in collected waste water sample. Three characteristics of water sample are tested this includes Turbidity, PH, and TSS. Jar test apparatus was used for determining the optimum dosage of natural coagulants. After the preparation and application of coagulants in the collected sample a dosage of 0.6g of natural coagulant is best suited for purification. Since natural coagulants are environmental friendly and low cost it could be widely used in future.**

Keywords: Chemical coagulant, Natural coagulant, Jar test, Turbidity, TSS

I. INTRODUCTION

Pure water is a basic need of human beings unfortunately it is not available to a large segment of human population. The sources of water are continuosly decreasing around world due to various environmental degradation activities, population growth, climate change, urbanization and increasing standard of living. Disposal of waste water from industries and households are released into the water bodies. The problem is due to lack of sufficient treatment capacity but also due to the inefficient methodology for the treatment of waste water. Waste water comes from two major sources process waste from manufacturing industries and human sewage. Discharge of untreated dairy waste water is the single most important concern of watershed management. Salts of aluminum and iron are commonly used chemical coagulants. However when Aluminum is used as a coagulant in waste water treatment it can cause several bad effects on human health such as loss of memory convulsions etc.. Now a days there has been great attention in the implementation of natural coagulants in wastewater treatment.

II.LITERATURE REVIEW

Water is an essential resource in our life. World Health Organization (WHO), report that wholesome of water means absence of suspended solids, inorganic solids and pathogens. When water characteristics like PH, Turbidity TSS etc. varies from its optimum value, the purity of water suppressed.

So natural coagulants are used as an applicant for making the water pure.

Rajesh K Kaushal and Hemanth Goyal (2019) conducted an experiment for the treatment of waste water using natural coagulant. Municipal waste water and dairy plant waste water are used in this study. Main natural coagulants are Moringa Oleifera and Okra plants. After the treatment of 2 samples of water with the coagulants taken, the results show that there is a reduction in percentage of various polluting parameters like COD, BOD, Turbidity, Hardness, TSS and TDS etc.

Sandly Maurya and Achlesh Daveray(2018) conducted an experiment for plant based natural coagulants for municipal waste water treatment. The coagulants used in this experiment are Banana peel powder, Banana stem juice and papaya seed. Main experiment conducted to analyze the characteristics of municipal sewage water are turbidity, COD, TSS. And the main advantages noted on this experiment is that, all the natural coagulants tested in the study did not change the PH of the waste water. By analyzing the result, the banana peel powder was found to be more effective while banana stem juice has poor coagulation activity.

Devanandh R and Dinesh M et al(2020), conducted a comparative study of bio materials as a coagulant for waste water treatment. The main natural coagulants used are neem leaf powder, orange peel powder, banana pinth juice. New coagulant process technique such as composite polymerisatiion and impregnation method can be incorporated in producing coagulant with enhanced capability. This review highlighted that many potential advantages in using natural coagulant from various sources of plant, animals or biomass.

Dhruva R and Suresh B(2016) conducted an investigation of effect of natural coagulants for reduction of PH, Turbidity and COD from Sewage water. Main natural coagulant used is Holy basil powder. Different dosage of holy basil powder was used for the

treatment . Overall holy basil; leaves an eco friendly bio material was revealed to be a very efficient coagulant and a promising option for the removal of PH, Turbidity and COD from sewage water in waste water treatment plant.

III.OBJECTIVES

The aim of the study is to investigate the effectiveness of neem leaf, orange peel and papaya seed powder as a natural coagulant to reduce turbidity of different water sample collected from dairy plant, kitchen waste water with various dosages of coagulants to remove turbidity and other contaminants. The jar test procedure was performed to detect the performance of coagulants and coagulation action. Dairy waste water from milma plant vadavathoor and kitchen waste water from nearby areas are utilised in this research.

IV.MATERIALS AND METHODS

a) SAMPLE COLLECTION

Project begin with collection of waste water. In this project we are taking 2 samples of water. These are dairy waste water from milma plant Vadavathoor and Kitchen waste water. Dairy industry includes transformation of raw milk into pasteurized and sour milk. Water requirements are huge for cleaning, washing, disinfection, hearing and cooling etc.. On average waste water discharge is 70% of the amount of fresh water used at the plant. Second sample kitchen waste water from the home.And this water is of less lipid content.

b) COAGULANT PREPARATION

Neem leaves – Neem leaves were collected from a neem tree and washed in water to remove dirt and impurities from it. The leaves were then dried in sunlight for one week and powdered.

Orange peel – Orange peel were collected and dried for 4-6 days in sunlight. Powdered specimen then washed and dried for 24 hours with 80 degree celsius.

Papaya seed – The fruit cleaned and sliced using a knife. Then seeds collected and washed several times with water then dried under sunlight for a period of 5 days before crushing. The seeds were powdered using mixer grinder and powder was collected to sterile with air tight cap. Then seed powdered was sieved and finer particles were used as coagulant.

c) JAR TEST APPARATUS

The coagulation test was carried out using jar test. The study involved steps such as rapid mixing slow,mixing and sedimentation in a batch process. Several beakers were filled with 300 ml of waste water and coagulant dosage of 0.2, 0.4, 0
.6, 0.8, 1.0, 1.2 grams were added. A rapid mixing period of 2 minute at 100 rpm followed by slow mixing at 40 rpm was done for the next 20 minutes. The sample was left for a sedimentation period of 45 minutes after sedimentation. Sample were filtered through filter paper and supernatant was collected to measure the final turbidity using nephelometer.

V. EXPERIMENTAL APPARATUS

Jar test experiment was carried out using Jar test apparatus which consist of six beakers with paddle and a gauge for revolution per minute (rpm). The experiment were performed using dairy waste water and kitchen waste water samples. For each water sample, 6 beakers were filled with 300ml ,placed in the jar tester and then coagulant with different dosages were added. After that stirred at approximately 100 rpm for 2 minutes. The rapid mix allows the disappearing the coagulant through out each container. Then speed was reduced upto 30 to 40 rpm and maintained at slow mixing for 20 minutes. The slower mixing speed helps promote floc formation by enhancing particle collision which leads to larger floc . Turn off the mixing and allow the container to settle for 45 minutes. Then measure the final turbidity in each

container.After that, a graph of residual turbidity vs coagulant dosage is plotted and optimum dosage is determined.

FOR TEST RESULT FOLLOWING PARAMETERS WERECHECKED

A. Initial turbidity
B. Initial PH
C. Initial Total Suspended Solids
D. Turbidity of samples at different dosages
E. PH of samples at different dosages
F. TSS of samples at different dosages

VI. RESULT ANALYSIS

1.DIARY WASTE WATER

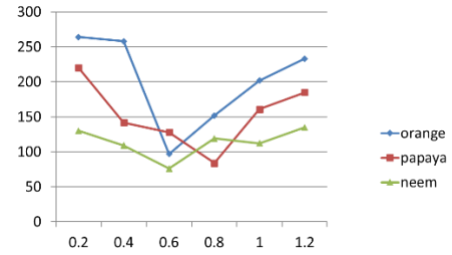
Initial Parameters

- Turbidity - 464 NTU
- PH - 7.7
- TSS - 1870 mg/L

Treated water parameters **Turbidity**

Dosage (gm)	Orange peel	Papaya seed	Neem leaf
0.2	264	220	130
0.4	258	142	109
0.6	97	128	76
0.8	152	84	119
1.0	202	161	112
1.2	233	185	135

Graph – Dosage vs Turbidity

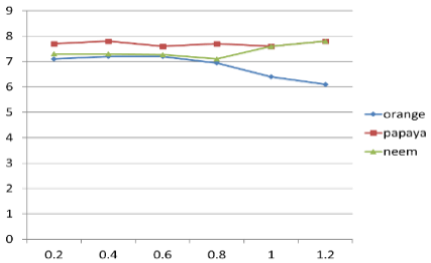


The optimum dosage was found to be 0.6g of neem .
Turbidity removal efficiency = 83.62%

PH

Dosage(gm)	Orange peel	Papaya seed	Neem leaf
0.2	7.1	7.7	7.3
0.4	7.2	7.8	7.3
0.6	7.2	7.6	7.27
0.8	6.94	7.7	7.1
1.0	6.4	7.6	7.6
1.2	6.1	7.8	7.8

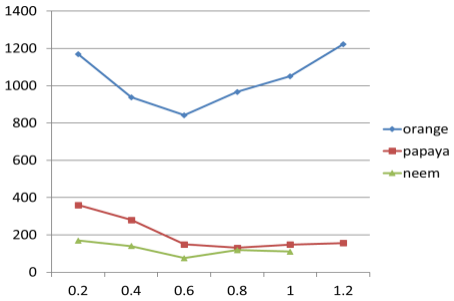
Graph – Dosage vs PH



TSS

Dosage(gm)	Orange peel	Papaya seed	Neem leaf
0.2	1170	360	170
0.4	938	280	140
0.6	842	149	76
0.8	967	131	119
1.0	1051	148	110
1.2	1223	156	135

Graph – Dosage vs TSS



The optimum dosage was found to be 0.6g of neemTSS removal efficiency = 95 %

2. KITCHEN WASTE WATER

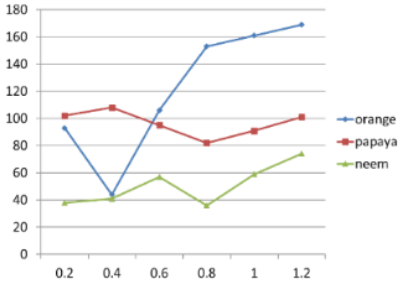
Initial Parameters

- Turbidity – 320 NTU
- PH – 7.31
- TSS – 1101 mg/lTreated water parameters

Turbidity

Dosage(gm)	Orange peel	Papaya Seed	Neem leaf
0.2	93	102	38
0.4	44	108	41
0.6	106	95	57
0.8	153	82	36
1.0	161	91	59
1.2	169	101	74

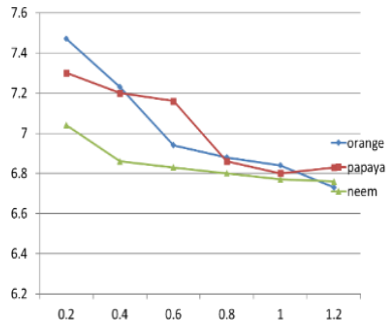
Graph – Dosage Vs Turbidity



The optimum dosage was found to be 0.8g of neem.
Turbidity removal efficiency =88.75%

PH

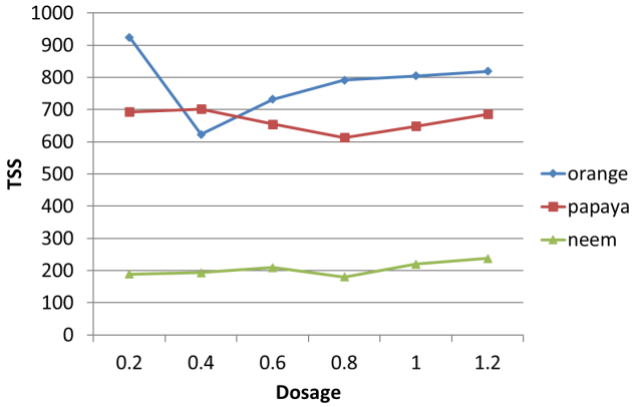
Dosage(gm)	Orange peel	Papaya seed	Neem leaf
0.2	7.47	7.3	7.04
0.4	7.23	7.2	6.86
0.6	6.94	7.16	6.83
0.8	6.88	6.86	6.8
1.0	6.84	6.8	6.77
1.2	6.73	6.83	6.76



TSS

Dosage (gm)	Orange peel	Papaya seed	Neem leaf
0.2	925	693	189
0.4	623	702	194
0.6	732	655	210
0.8	792	613	180
1.0	805	649	220
1.2	819	686	238

Graph – Dosage vs PH



Removal efficiency 95%

VII.CONCLUSION

It was evidenced from this study, orange peel powder, Neem leaf powder and papaya seed powder coagulant as a real alternative to traditional inorganic metal coagulants in the removal of turbidity and total suspended solids. The PH reading was found to be almost similar before and after treatment. From the results neem leaf powder has been found to be an efficient natural coagulant for Diary and Kitchen waste water treatment. Natural coagulant is suitable economical and sustainable way of water treatment process. The use of these natural coagulants has not giving any toxic effect. It provides cheaper and ecofriendly method of water treatment. The settled can be usedas bio fertilizer.

VIII. REFERENCE

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