

Treatment of Dye Waste Water by using Natural Coagulants

P. Sasirekha, M. Sasi Kumar, R. Siva Shankar, S. Vignesh Alias Shangesh

Abstract: Waste water from dye industries containing various dyes is dangerous to the human health and environment. This research work focused on a low-cost coagulants for the removal of dyes from the effluent of dye industries. The effect of experimental conditions like dye concentration, pH, dosage and contact time on the removal efficiency of dyes were studied using design of experiments. Natural Coagulants can be used as a cost effective and efficient technique for the removal of contaminants from wastewater. Waste material from industries such as food processing and agriculture may act as natural coagulants. The discharge of the effluents into the receiving environment should follow acceptable level. Therefore, various techniques have been employed for the treatment of bearing industrial wastewaters including biological treatment through natural coagulants offers the advantages of low cost and good efficiency. The successful application of local fruit waste in treating wastewater containing contaminants requires a deeper understanding of how coagulants material proceeds. This research focusing on reducing of contaminants in wastewater using natural coagulants will be presented.

Keywords: Wastewater Treatment, Natural Coagulants, Low Cost.

I. INTRODUCTION

Worldwide water demand is increasing day by day due to rapid population and industrial growth, and on the other hand there is continuous decline in ground and surface water levels due to over exploitation. Wide range of complex solutions for treatment of wastewater exists in industrial plants. Efforts are being taken to find the alternatives for water supply and one prominent solution is treatment and reuse of industrial waste water. Coagulation and flocculation process are physical- chemical methods that widely used in the treatment of wastewater. In order to decrease waste hazards and to restrict the resulted effects on the environment, research for the wastewater treatment is necessary. Many technologies are in practice to treat the dye waste water and in the present study, an attempt was made to investigate the application of low cost natural coagulants (banana peel powder, neem seed powder, papaya seed powder, peanut seed powder) for the treatment by considering the waste water from the local dye industry from Madurai. Dye wastewater is often discharged intermittently. The nature and composition of wastes depends on type of products produced and processing capacity of the plants. It is also important to understand some disadvantages of this methodology i.e., the addition of treatment chemicals may increase the total volume of waste water,

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large amounts of chemicals may need to be transported to the treatment location and these chemical used can be expensive Coagulation is an essential process for surface water and industrial wastewater treatment. It is also a well-known process involving destabilization of colloids and other suspended substances so as to promote its aggregation as greater and weightier flocks. Alternatively to those chemical based coagulants, scientists have been looking for new and natural plant-based coagulants which have shown few advantages like the production of biodegradable sludge, lower alkalinity consumption and renewable sources origin . On this way, alum has been being an effective coagulant in the treatment of numerous types of water and wastewater, presenting better performance than other coagulants. Both treatments are compared.

II. NEED OF THE PROJECT

The main purpose of water treatment is to reduce organic and inorganic impurities suspended soil present in the dye waste water. The polluted untreated water causes abundant water borne diseases .There is an urgent need for the treatment of dye waste water In this project, the process of coagulation is done, so that the quality of the waste water is improved to meet the permissible level of water to be recued for other purpose or discharged in land or agricultural purposes.

A. Objectives of the Study

The objectives of this study were To identify the removal efficiency using alum, cassava powder, cactus powder, chickpea powder, potato powder, fenugreek powder.

To determine either chemical coagulant or natural coagulant is most effective in the treatment processes

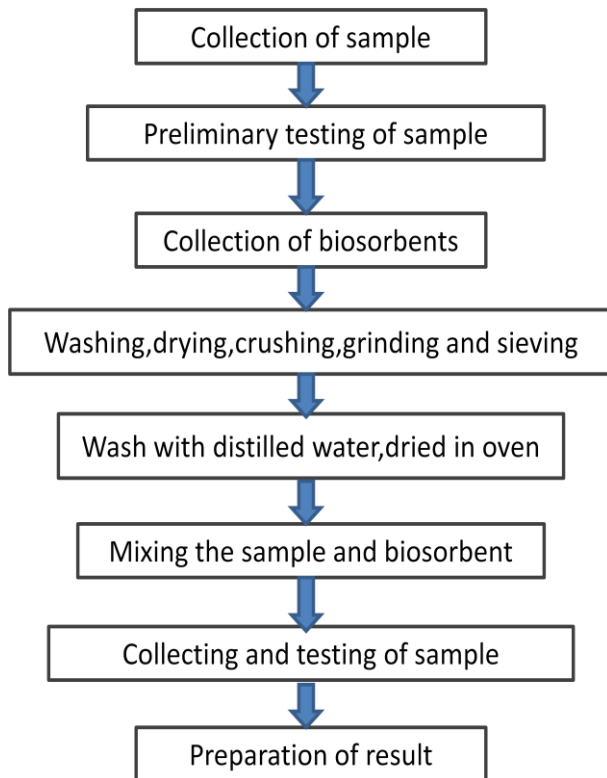
- Elimination of pollutants & Toxicants
- To make wastewater usable to other purposes

B. Experimental Program

The waste water is collect from the nearby dye industry. The required quantity of waste water is collected and then initial waste water tests were carried out. The natural and chemical coagulants are chosen and prepared for the treatment of the waste water. The result were calculated and compared.



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III. MATERIALS AND METHODS

A. Collection of Sample

Raw wastewater samples were collected at random from nearby dye industry.. The samples of wastewater manufactures a variety of dye – Coloring Material (Textiles, Hair And Wood) The parameters of raw wastewater samples were determined in accordance to Tamil Nadu Pollution Control Board.

B. Waste Water Characterization

To indicate the quality of water, the characteristic of water and the presence of the contaminants are used. The quality of water is very fundamental for good ground water, river water etc., If the water quality is affected, then the surrounding environment, agricultural land also gets affected. In the dye industry, the waste water has high bio- degradable contaminants, and more suspended solids. The particles with high specific gravity would settle under the influence of gravity would settle under the influence of gravity. But the particles with lower specific gravity, do not settle under the influence of gravity. When coagulation is done, it helps in flock formation, and the waste water is purified and the required characteristics are obtained.

C. Initial Test of Waste Water

The initial test that are conducted for the treatment of dairy wastewater and pH ,Biochemical oxygen demand (BOD), Chemical oxygen demand (COD),Turbidity, Total suspended solids(TSS), and Total dissolved solids(TDS).

The pH test is the main test to be conducted in the waste water. The waste water test results would be reported in milligrams per litre (mg/l) or parts per million (ppm).

Table I: Initial Test Result with Standards

S. No	PARAMETERS	INITIAL TEST RESULT (UNITS IN mg/L)	STANDARD VALUE (TNPCCB)
1.	PH	7.6	5.5-9.0
2.	TURBITITY	91.5	1000
3.	CHEMICAL OXYGEN DEMAND (COD)	1486	1300
4.	BIOCHEMICAL OXYGEN DEMAND (BOD)	817	790
5.	TOTAL SUSPENDED SOLIDS (TSS)	886	100
6	CHLORIDE	950	1000

D. Selection of Natural Coagulants

The usage of natural coagulants derived from plant based is conducted as it has various advantages. The natural coagulants does not modify the pH of the treated water. Some coagulants are used for the processes, based on their conventional water treatment. The process of removing turbidity, colour and other bacteria from water.. As alum promotes coagulation of minute particles which help to resolve problems of turbidity of wastewater. The following are the natural coagulants used for the treatment of dairy industry waste water.

- Banana peel powder
- Neem Seed Powder
- Papaya Seed Powder
- Peanut Seed powder

E. Preparation of Natural Coagulants.

The required quantity is taken and dried well in sunlight . Then, they are grinded and crushed well to attain powder form .These powdered coagulant is mixed and stirred well in (1000 ml) distilled water and filtered by using filter paper or cloth. The filtered liquid is used for the process of coagulation processes in different dosages (10 to 40mg/L).

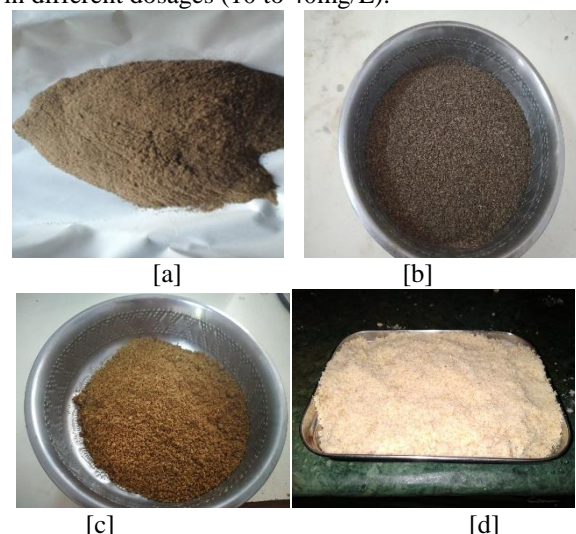


Fig 1: natural coagulants

- i)Banana Peel powder,
- (ii)Papaya Seed powder
- (iii)neem seed powder
- (iv)peanut seed powder



F. Treatment of Dairy Waste Water

Jar apparatus has been used for the study of coagulation. A coagulant is added which causes compression of the double layer and the neutralization of the electrostatic surface potential of the particles.. The doses considered for the natural coagulants are 10mg, 20mg, 30mg, 40mg. The jar apparatus has 4 beakers and 4 steel paddles which helps in the agitation process. The coagulant liquid which was prepared were taken in dosages - 10mg/L,20 mg/L,30 mg/L,40 mg/L and added to the sample taken in for different beakers respectively. The initial speed of the agitation is 100rpm for 5 mins and followed by 40rpm for 20mins. The settling time applied for the coagulation process is 20 mins. After the settling time is over, the treated water is taken and separately tested.

IV. RESULT

Table II: Comparison of Results after Adding Natural Coagulants

S.NO	COAGULANT	PH	TURBIDITY (NTU)	BOD mg/l	COD mg/l	CHLORIDE mg/l
1	BANANA PEEL POWDER	7.3	39	3.76	587	238
2	NEEM SEED POWDER	7.1	33	3.61	563	116
3	PAPAYA SEED POWDER	7.2	31	3.43	538	104
4.	PEANUT SEED POWDER	6.9	25.5	3.15	504	147

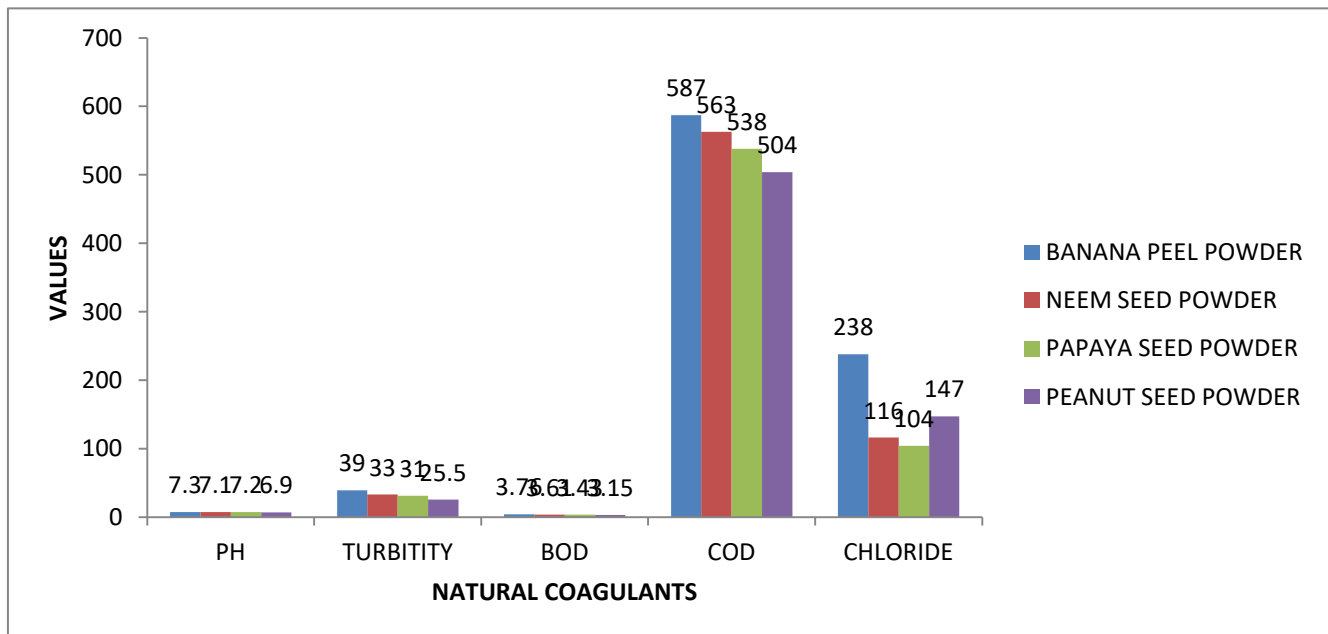


Fig 2– Graph Comparison Results After Addition of Natural Coagulants.

V. CONCLUSIONS

The final effluent can be readily used for irrigation purpose, agricultural use and sludge itself acts as a good fertilizer. The characteristics of Dye wastewater pH which is maintained the 7.32 while using neem seed powder as the coagulant, 90% reduction in the value of B.O.D and 82% reduction in the value of C.O.D The neem seed powder is more effective for treatment of dye wastewater.. The subject of this project is the management and control of waste

A. pH Effects

The term “pH” refers to the measurement of hydrogen ion activity in the solution we have taken. It is also referred as the acidity of the effluent and domestic wastewater before treatment typically has a pH of 6.8 and after the treatment it has come under the required values. While treating with cactus powder, the turbidity removed up to 90%, pH value is also reduced. We have used the pH test as the basic test and proceeded other tests.

B. O.D and C.O.D effects

B.O.D test is more important than C.O.D test because its data is used by sanitary engineers. The B.O.D level was reduced to the maximum while using cassava powder as the coagulant - 1.62mg/L. While treating with the cactus powder, both the B.O.D and C.O.D values got reduced.

discharge in dye processing, by comparing the usage of natural coagulants. This Industry waste water can be used in agricultural land growth after the coagulation process.



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