

Experimental Investigation on Treatment of Waste Water Using Natural Coagulants

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Abstract

The main objective of the project is to treat waste water using natural coagulant. A brief study on natural plants and their properties had made. We are having the intention of achieving a natural coagulant of low market price to treat waste water. Waste water is a substance which is very vital in all areas including agricultural, industrial, household and environmental activities. The amount of coagulant that was added to the water sample is an important factor to destabilize colloidal particles in a given water sample. According to the factor we are consuming mainly plants which are not utilized by the environment. With help of the solution made through our coagulant, the waste water and fresh water were separated. The settling time and amount of solid will be faster and higher while mixing our solution. The filtered water can be used for domestic purposes. Both sewage water and polluted water can be treated by our solution.

Keywords: WHO, PH (potential of hydrogen), BOD (Biochemical oxygen demand), Juliflora

INTRODUCTION

Water crisis plays a major role in the environment. In order to control the water scarcity, we are treating the waste water by using natural coagulants. The sample of our project consists of natural coagulants. By using our product we can reuse the waste water for domestic purposes without any side and health effects.

Most of the waste water are mixing with the sea without any use to the environment mainly in the rural areas. By using our Coagulant we can settle down the colloidal particles at the bottom. The coagulant used in our project is easily available and free of cost because we are only using the unusable products of the environment.

Contaminants such as bacteria, viruses, heavy metals, and salt have polluted the given water resources. This is due to inadequate treatment and disposal of waste from humans. The limiting values of these

parameters are recommended by the World Health Organization (WHO). As estimated by the World Health Organization, up to 80% of all diseases and sicknesses in the world are caused by inadequate sanitation and polluted water.

In today world most of the Ground water is mainly contaminated with fluoride and chloride. It may cause severe health diseases. This was another main reason for the water scarcity.

RELATED WORKS

The normal water is mainly contaminated by bacteria, viruses, heavy metals, nitrates, and salt. This is mainly due to less no of treatments for large no of overuse in limited water resources. This plays a vital role in water scarcity. The quality of drinking water is determined in terms of physical, chemical, and biological parameters. The limiting values of these parameters are recommended by the World

Health Organization (WHO) as estimated by the World Health Organization, up to 80% of all diseases and sicknesses in the world are caused by inadequate sanitation and polluted water. This estimation reveals that waterborne diseases contribute to the death of 4 million children in developing countries each year. On according to sort the water scarcity we must reuse the water for the purpose we have collected various natural coagulants which are not utilized by the environment like Cactus, Peanut Cake and Prosopis Julifora for treating waste water. Our main aim is to reuse the waste water for domestic purposes and to reduce water scarcity to one-third.

CACTUS

The One of the major coagulant in our project is cactus which is available near the mountain areas. While mixing our coagulant with the waste water and stirred for 10 min. Effective of cactus made the solid particles to settle down quickly.

Whereas the turbidity had reduced from 130 NTU to 10 NTU on frequent addition of our coagulant sample which was displayed below. Same way the waste water characteristics such as BOD, pH and also tested through our sample. High removal efficiency of turbidity and BOD could be obtained when cactus solids were used to treat sewage water, potable water source and high turbidity seawater.



Figure 1: Cactus.



Figure 2: Cactus solution.

Cactus solution is more effective in maintaining neutrality of a water sample. They have an enormous effect on pH value. This does not cause corrosion problem in piping and produces less volume of sludge compared to Alum. This may remove larger particles that may settle or be removed by filtration. Moreover, Alum is strongly neurotoxic which causes Alzheimer's disease Thus it is better to use cactus solution to maintain pH value during water treatment.

The turbidity removal efficiency of waste water was determined by adding different ml of cactus solution. As shown in table 1, the removal of turbidity from the turbid water sample was increased from 9 to 4.5 with the increment of cactus solution ml from 2 ml to 4ml. This increment in removal of turbidity is due to increment of active site of the cactus solution.

Total Dissolved Solids is mostly used to determine the concentration of dissolved solid particles in a given water sample. It contains carbonates, chlorides, sulphates, phosphates, and nitrates of calcium, magnesium, sodium, and potassium .It increases the conductivities of water due to the presence of those dissolved impurities.

Cactus is a natural coagulant which is effective in the removal of turbidity which is comparable with Alum in the water treatment process, which produce greater result than alum. Thus, the percentages of turbidity removal of Alum and cactus powder are quite equal but cactus removal of turbidity is much higher than alum. But the percentage removal of turbidity from turbid water was enhanced by cactus solution as natural-chemical coagulants. whereas cactus is free of cost which is available in nearby forest , so it appear as cost efficiency comparing to alum although alum cause some harmful effects on human, by using cactus we can reduce such effects on water consumed by humans . The initial concentration of BOD

in the collected water sample was 25 mg/L. When the dose of cactus powder increased from 2 ml to 4 ml, the concentration of BOD decreased from 12 mg/L to 6 mg/L.

PEANUT CAKE

The peanut seeds are used to extract oil, after extracting the oil from the peanut seed, peanut cake will be drawn off as byproduct. Our coagulant was the peanut cake. Then the peanut cake was crushed and made as a powder. Thus peanut seed extraction was needed.

Peanut cake solution was prepared by mixing a salt solution of NaCl with varied concentrations, and Peanut cake powder in 5% (w/v) suspension mixed with a domestic blender (Assparo, Model 900) for 10 minutes and left settling for 10 minutes. The suspension was then filtered using a vacuum pump filter with filter paper of 70 μ m pore size. The five salts used were, NaCl, KNO₃, KCl, NH₄Cl and NaNO₃. Different concentrations for each type were tested. This extraction was used to obtain the required dosage of coagulant. The figure shows the peanut seeds which is used in this study.

Thus peanut cake was quite less effective comparing to cactus. It reduces the turbidity content from 130 to 70 NTU.



Figure 2: Peanut cake.

PROSOPIS JULIFLORA

Prosopis (Prosopis juliflora) is a natural type plant available in all areas. As long as it was confined to its natural habitat, P. juliflora was a great resource, especially to

the economically weak inhabitants, who could beneficially use each and every part of that tree.

Prosopis juliflora was converted into carbonation unit (activated carbon) by maintaining same temperature and pressure.

The activated carbon act as a filter media which removes odour, smell and color from the treated waste water sample. After coagulation using natural coagulant the treated waste water sample was allowed to pass through activated carbon of prosopis juliflora with help of filter paper. then the treated sample of waste water is free from odour and colour. This give a pleasant look while using for domestic purposes .



Figure 3: Prosopis Juliflora.

LABORATORY TESTING TURBIDITY

Turbidity is a measure of the amount of solid particles present in the water sample. The more total suspended solids in the water, then higher the turbidity.

Turbidity is considered as a good parameter to determine the quality of water. The principle of nephelometry (nephelometric turbidity unit) is based on the scattering or absorption of light by solid or colloidal particles suspended in solution. When light is passed through the sample, the amount of solids which is not visible to naked eye is noted in the turbidity meter in the form of NTU.

We must calibrate the instrument by using distilled water, 20 NTU and 200 NTU solutions. The percentage of removal of

turbidity for alum (0.25 mg/l) is 92.3% and for cactus solution is 96.53%.



Figure 4: Turbidity meter.

PH TEST

PH (potential of hydrogen) is a numeric scale used to specify the acidity or basicity of an aqueous solution. It is approximately the negative of the base 10 logarithm of the molar concentration, measured in units of moles per liter, of hydrogen ions. More precisely it is the negative of the base 10 logarithm of the activity of the hydrogen ion.^[1] Solutions with a pH less than 7 are acidic and solutions with a pH greater than 7 are basic. Pure water is neutral, at pH 7 (25 °C), being neither an acid nor a base.

The pH can be 6 to 8.5 for domestic as well as drinking water. Cactus solution reduces the pH from 6.6 to 6.6, whereas alum has no effect on pH solution.

Formula for pH

$$pH = -\log_{10} [H^+]$$

Table 1: Turbidity and Ph Values

SAMPLES	TURBIDITY (NTU)	PH	BOD(3 DAYS)
Raw water	130	6.6	21
Cactus(2 ml)	8.5	6.1	12
Cactus(4 ml)	4.5	6.0	06

Table 2: TURBIDITY AND pH VALUES

SAMPLES	TURBIDITY (NTU)	PH	BOD(3 DAYS)
Raw water	140	7.6	—
Peanut cake(5 ml)	80	7.6	—
Peanut cake(10 ml)	75	7.5	—



Figure 5: pH meter.

BOD TEST

Biochemical oxygen demand or BOD is a chemical procedure for determining the amount of dissolved oxygen needed to deoxidize the biologically active material in the waste water sample under a certain temperature and condition. Generally BOD of a normal drinking water is zero and for domestic purposes it may be minimum. Removal of BOD using our natural coagulant cactus reduces it from 50 to 21 at 5th day of BOD.



Figure 6: BOD apparatus.

Table 3: Bod Values

BOD (5 DAYS)	RAW WATER	CACTUS (2ML)	CACTUS (4ML)
1 DAY	21	12	6
2 DAY	35	19	11
3 DAY	46	28	16
4 DAY	MORE THAN 50	34	23
5 DAY	50	33	21

CONCLUSION

The study sought to explore the promise of cactus as a natural plant-based coagulant for the environmentally friendly and sustainable treatment of water and wastewater. Following a review of the literature, the study establishes that plant-based coagulants are available locally comparing to chemicals to treat waste water. As using our coagulant we can treat the sewage water and can reuse it for domestic purposes. Due to our natural coagulant we can settle down the solids at the bottom and separate the fresh water at the top. After that we can filtered the treated water through activated carbon unit of prosopis juliflora. As we only used the unusable natural product of the environment, so our project solution is free of cost which is economical comparing to other waste water treatment.



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