SSRG International Journal of Civil Engineering
ISSN: 2348 – 8352 /doi:10.14445/23488352/IJCE-V7I7P116
Volume 7 Issue 7, 128-132, July 2020

Analysis of Industrial Waste Water Using Natural Coagulants

[1]Ms.M.Mangaiyarkarasi, [2]Mrs.Roopa D

[1](P.G. Scholar, Department of Environmental Engineering, Gnanamani College Of Engineering, Namakkal - 637018)
[2](Assistant Professor, Department of Civil Engineering, Gnanamani College Of Technology, Namakkal - 6370 18)

Received Date: 25 June 2020
Revised Date: 01 August 2020
Accepted Date: 06 August 2020

ABSTRACT

The industry is one of the most wastewater producing sectors, not only in terms of the volume of effluent generated but also in terms of its characteristics as well. Untreated effluents are irreversible to the environment when released directly into the water bodies or open lands. So we need to treat wastewater. Wastewater treatment methods include precipitation, coagulation/flotation, sedimentation, filtration, biological process, and chemical reactions. Each method has its value and cost limits in applications. Coagulation – flocculation is one of the most important physicochemical processes for industrial wastewater processing to reduce wastewater turbidity in suspended and colloidal materials. Aluminum and iron (III) salts are the two most commonly used primary coagulants. In recent studies, various drawbacks from the use of aluminum salts have been identified, such as Alzheimer's disease, Neurotoxicity, Cancer, and large volumes of sludge. The study has therefore led to these problems through some methods of natural treatment. It is easily biodegradable and less volumetric. Certain natural seeds are maize, grape seed, nirmali, pumpkin-seed, guar, ordinary bean, and many more. The conclusion was made that Hibiscus Rosa Sinensis natural coagulants obtained from MoringaOleifera showed only the same coagulation as a commercially available alum.

I. INTRODUCTION

Coagulation has been used in wastewater treatment since early times, the main purpose is to remove colloidal impurities from the water and therefore also to remove turbidity. The coagulant is a chemical used to remove the forces that stabilize colloidal particles and cause them to suspend in water. Once the coagulant is inserted in the water, the colloids must be aggregated and made larger to remove the impurities from the water suspension at the bottom of the beaker. In most industries, aluminum and iron are commonly used.

Aluminum, however, can cause several bad effects in human health when it is used as a coagulant in the treatment of wastewater such as intestinal constipation, loss of memory, convulsion, colic abdomen, energy loss, and learning problems. In the improvement and implementation of natural coagulants in the wastewater treatment process, much attention has now been paid. These natural coagulants can be formed or extracted from plants, animals, and micro-organisms. The Dolichas lablab, Azadirachta Indica, MoringaOleifera, and Hibiscus Rosa Sinensis are naturally coagulants used for our study and are locally available from vegetables and flowers. The aim of this study was to assess the use as an alternative to the existing commercial synthetic coagulant, such as aluminum sulfate, of natural coagulants and to optimize the process of coagulation.

II. LITERATURE COLLECTION

G.Vijayaraghavan et al studied Plant-based coagulant sources, processes, efficiency, and appropriate water treatment and wastewater processing coagulation mechanisms are presented. In general, these coagulants are used as point-of-use technology in less-developed communities as they are comparatively cost-efficient to chemical coagulants. When used in the treatment of low to medium turbidity (50–500 NTU) water, these natural coagulants have a comparable treatment efficiency with their chemical counterparts. They are still in their infancy with their application for industrial wastewater treatment.

Saravanan et al reported Natural coagulant is a natural occurrence of a plant coagulant that can be used to reduce turbidity in the coagulation-flocking process. This study aimed to assess the use as an alternative to the existing commercial synthetic coagulant, such as aluminum sulfate, of natural coagulants and to optimize the process of cooperation. Based on the experimental findings,

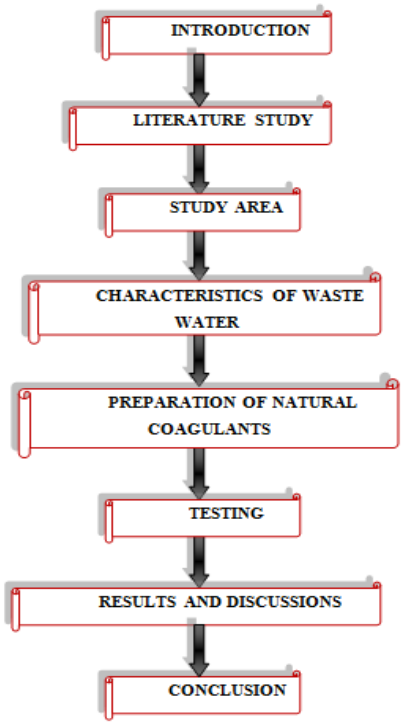
Hibiscus Rosa Sinensis, Azadirachta Indica, MoringaOleivera, and Dolichas lablab, have found mere coagulation in comparison to trade alum. natural coagulation is shown to be equal. The efficiencies for the removal of turbidity were respectively 37.45% for Dolichas lablab, Azadirachta Indica, MoringaOleifera, and Hibiscus Rosa Sinensis, 31.47%, 12.95% for aluminum compared with 75.01%.

TasneembanoKazi et al investigated it is an extremely complex, oldest industry, with high BOD, COD, solid hanging, settled solids, sulfides, chloride, and chromium. the tanning industry is highly complex. Untreated tannery effluents are irreversible to the environment if dumped directly into water bodies or open areas. Coagulation – flocculation is one of the most important physicochemical processes for industrial wastewater processing to reduce wastewater turbidity in suspended and colloidal materials. In the last decade, the use of natural coagulants in industrial waste water has been given more attention.

Asrafuzzaman et al studied Turbidity give water treatment a big problem. As locally available natural coagulants for synthetic water turbidity reduction in this study Moringaoleifer, Cicerarietinum, and Dolichos lablab were used. The tests were done using conventional jar-testing devices for artificial turbid water. The intensity and duration of the mixing were optimally determined. Dosing of Moringaoleifera water-soluble extracts resulted in a reduction from turbidity of 100NTU and 5, 3.2 and 9.5, NTU respectivamente, following dosages and filtration of the cicerarietinum and Dolichos lablab, to 5.9, 3.9 and 11.1 nephelometric turbidity unit (NTU).

An H Birima et al predicted the potential of peanut seed for the treatment of high turbid water as an environment-friendly and natural coagulant. Peanut seeds were used following oil extraction, and distilled water and salt solution from various salt levels were used to extract the active coagulation component. NaCl, KNO 3, KCl, NH4Cl, and -1O3 were the salts used. It has been used synthetic water with a turbidity of 200 NTU. NaCl-recovered peanuts can effectively remove 92% of the 200 NTU turbidities with only 20 mg / l, and only 31.0% of the same turbidities can be removed with peanut seeds extracted from the distilled water (PC-DW).

III. METHODOLOGY



IV. TREATMENT OF COAGULATION

A. TREATMENT OF INDUSTRIAL WASTE WATERS

Due to their low availability of large-scale treatment and the extremes of the wastewater (pH and concentration), several natural coagulants may not be suitable for the treatment of industrial wastewater. However, the use of natural polymeric coagulants can offer benefits, some of which can offset their inconvenience. In addition to obvious sustainable and environmentally friendly aspects, natural polymer coagulants also form stronger flocks through a bridging effect with a higher shear strength resistance in turbulent flow than non-polymeric coagulants like aluminum. That means that natural coagulants can be used, at least in a mechanical sense, in a loop-stirred tank set up to process contaminated industrial wastewater since bridging connections are more resistant to rupture at high levels of shear. Up to now, natural coagulants have been used only for research in academics for industrial wastewater. However, many results from these academic studies show that industrial wastewater treatment has good potential.

B. COAGULATION AND FLOCCULATION

The coagulation-flocculation involves adding polymers that clump small destabilized particles in larger compounds to be separated from the water more easily. Coagulation is a chemical process involving charge neutralization, whilst flocculation is a physical process and does not involve charge neutralization. The method of coagulation-flocculation may be used as an

intermediate or transitional phase between other water processes and wastewater disposals, such as filtration and sedimentation. The most commonly used coagulants are iron and aluminum salts, but salts of other metals, like titanium and zirconium, are highly reported

The treatment of drinking water and wastewater is an important element of the coagulation and flocculation process. This article gives a summary of the processes and examines the latest ideas. The material was largely taken from the reference for this article.

C. APPLICATIONS OF NATURAL COAGULANTS TO TREAT WASTEWATER

The natural coagulants are used in wastewater treatments include microbial polysaccharides, starches, gelatingalactomannans, cellulose derivatives, chitosan, glues, and alginate. Coagulants that carry natural characteristics are supposed to be harmless for human health, whereas the existence of aluminum zest may provoke neurology & pathology diseases. Natural coagulants are mixed with some artificial coagulants that are consumed as a coagulant aid, their effectiveness as the key coagulant remains stays at early stages. The process of treatment in these coagulants composed of molecules bridging, adsorption, and charge balancing. Natural coagulants are capable for wastewater treatment following effluents discharge standard.

V. MATERIAL COLLECTION

A. PREPARATION OF ALOE VERAGEL

Aloe Vera leaves from the campus have been collected. Beneath the tap water, the leaves were washed away. Carefully separated from a gel section was the thick green cover or epidermis. Then the gel section was mixed in a liquid mixer and stored in refrigerator glass bottles. The use of 1 ml aloe Vera gel in 100 ml distilled water produced a 1 percent dilution of aloe Vere similarly different percent of the aloe Vera solutions. Peanut seed powder preparation. The peanut seeds used were obtained near the study area. Just before extraction, the seed cover was shelled by hand. The activity was extracted from the shell to collect the kernel inside the shell. The shell has been removed. The kernels have been crushed and molded to medium-fine powder using the domestic blender each time the preparation of Peanut seed extraction is required for the efficiency of peanut seed extraction.

B. PREPARATION OF PEANUT SEED POWDER

Peanut seeds were obtained from a nearby study area. Just before extraction, the seed cover was shelled by hand. The removal was carried out by replacing the casing to extract the kernel from within the container. To ensure the efficiency of peanut seed extraction, each moment of the preparation of peanut seed extraction is crushed and molten in medium fine powder with a domestic blender (Aspire, Model 900).

C. PEANUT SEEDS

The extraction of Peanut Seeds was done using the NaCl salt solution of varied concentrations, with the Peanut cake mixed for 10 minutes and left to set for 10min in a 5 percent (w / v) suspension with a domestic blender (Asspire, Model 900). Then the suspension was filtered via a 70 μm pore (Whatman) filter vacuum pump filter. There were five salts used, NaCl, KNO3, KCl, and NH4Cl. Various levels have been tested for each type. The required dose of coagulant was obtained with this extraction.

Fig 1 Peanut Seeds,

Fig 2 Peanut Seeds powder

D. CHICKPEA

The name chickpea is derived from a cicer in Latin, which refers to the legume family Fabaceae. The garbanzo bean is also known for its popular Spanish name. Kidney beans, black beans, lima beans, and peanuts represent other foods known to this family of legumes. These plants produce a high nutrient value of edible seeds. In addition, to the smaller dark irregularly shaped Desi-type, which is frequently used in India and the Middle East, two main varieties of chickpeas are the larger, rund light-colored Karl-type.

In early recordings, chicken potatoes appear approximately 3500 BCE in Turkey and 6790 BCE in France. India produces the world's largest number of chickpeas but is grown in over fifty nations. They are a nutritious staple of many diets, an excellent source of carbohydrates, protein, fiber, B vitamins, and a few minerals.

Fig 3 Chickpea

E. FENUGREEK

In many parts of the world, Fenugreek is an annual plant, also known as methi. He belongs to the bean family and his name is Fabaceae. It originates in the Middle and Near East and is common in the Indian subcontinent. Small leaves are circled. The ancient Egyptians have even understood the advantages of this herb because it was found in graves and in particular Tutankhamen. This crop is cultivated in countries around the world, but in India, most of it is grown and consumed.

Fenugreek's health benefits include anemia relief, taste loss, fever, pulmonary dandruff, gallstones, respiratory disturbances, mouth ulcers, sore throat, diabetes, inflammation, wound, and insomnia. It helps improve digestion and hair health. This helps lactation. Cholesterol levels have been reduced and cardiac health is protected, while the immune system is boosted and influenza and various infections are protected.

Fig 4 Fenugreek

VI. TEST RESULTS

Wastewater treatment is done by using chickpea and fenugreek as coagulants. Dosage of coagulant given to water treatment in percentage, which helps to reduce water particulars levels like pH, Turbidity, and COD.

S.NO	Particulars	Waste water (before treatment)	Waste water (after treatment)			
			Chickpea		fenugreek	
			Dosage	value	Dosage	value
1	pH	7.83	10%	7.6	10%	7.3
			20%	7.4	20%	7.0
2	Turbidity	0.9	10%	0.7	10%	0.6
			20%	0.6	20%	0.4
3	COD	55 mg/lit	10%	50	10%	48
			20%	47	20%	45

Table 1 Chemical properties of wastewater

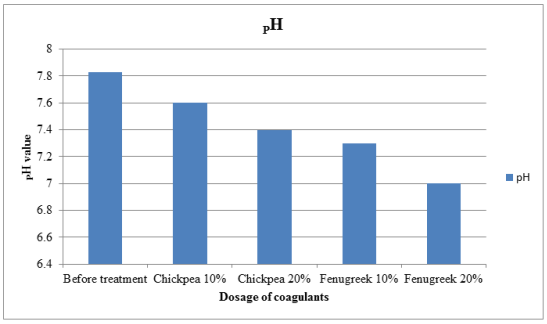


Fig 5 pH value on wastewater

While giving chickpea 10% and 20%the pH value will change, 20% of chickpea reduce the pH value when compared to 10% of chickpea. Similarly, when adding fenugreek instead of chickpea. Comparison of chickpea and fenugreek, the fenugreek is reducing the water parameter than a chickpea.

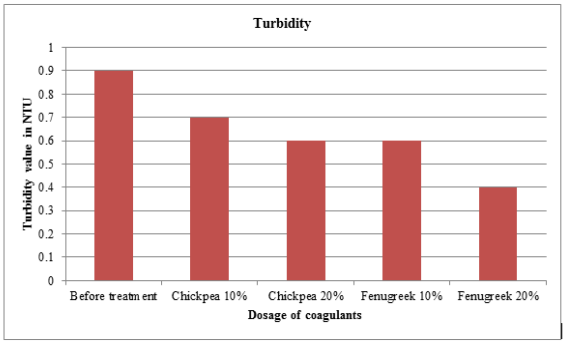


Fig 6 Turbidity value on wastewater

While using fenugreek as a coagulant, the optimum was dosage 20%, which gave 0.4 turbidity removal efficiency.

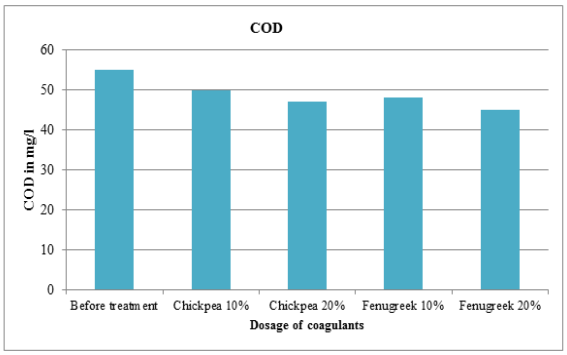


Fig 7 COD value on wastewater

While using fenugreek as a coagulant, the optimum was the dosage of 20%, which gave a COD value of 45. When compared with untreated water it gives a better result.

VII. CONCLUSION

From the experimental results,

We have concluded that among the chosen natural coagulants, fenugreek showed a better coagulation and turbidity removal from wastewater. An expanding study can experimentally detect the effects of pH, turbidity, and COD, which can further improve the efficiency of natural coagulation turbidity removal. Fenugreek gives better results when gives dosage was 20% like pH value is 7.0, turbidity removal value is 0.4, and COD value 45. Since we have collected wastewater from the industry; we suggest that we can reduce treatment expenses to a substantial extent by applying fenugreek as a coagulant instead of commercial aluminum for sedimentation.

REFERENCES

[1] I. Cissouma, F. Tounkara, M. Nikoo, N. Yang, and X. Xu, Physico Chemical Properties and Antioxidant Activity of Roselle Seed Extracts, 5(11)(2013) 1483–1489.

[2] E. N. Ali, S. A. Muyibi, H. M. Salleh, M. R. M. Salleh, J. Gombak, I. Islamic, J. Gombak, and C. Author, Maringa oleifera seeds as natural coagulant (2009)163–168,

[3] G. Muthuraman, S. Sasikala, and N. Prakash, Proteins from Natural Coagulant for Potential Application of Turbidity Removal in Water, 3(1)(2013) 278–283.

[4] A. Baghvand, A. D. Z and, N. Mehrdadi, and A. Karbassi, Optimizing Coagulation Process for Low to High Turbidity Waters Using Aluminium and Iron Salts, 6(5)(2010) 442–448.

[5] Oliveira Isabelle Mendes de , Cruz Vinícius, Visconte Leila Léa Yuan , Pacheco Élen Beatriz AcordiVasques, DezottiMárcia, Tannin Treated Water for use in the Emulsion Polymerization of SBR Polímeros, 23(3)(2013) 326-330.

[6] Aweng E.R., A. Anwar I., SitiRafiqah M.I., and Suhaimi O., Cassia alata as a Potential Coagulant in Water Treatment, Research Journal of Recent Sciences, 1(2) (2012) 28-33.

[7] Miller S.M., Ezekiel J.F., Vinka O.C., James A.S., and Julie B.Z., Toward Understanding the Efficiency and Mechanism of Opuntia spp. as a Natural Coagulant for Potential Application in Water Treatment, Environmental Science and Technology, 42(12)(2008) 4274-4279.

[8] Warhurst A. M., McConnachie G. L., and Pollard S. J. T., The Production of Activated Carbon for Water Treatment in Malawi from the Waste Seed Husks of Maringa Oleifera, Water Science and Technology,34(11)(1996) 177-184.

[9] Katayon S., Noor M., Asma M., Ghani L. A. A., Thamer A. M., Azni I. A., Khor B. C., and Suleyman A. M., Effects of Storage Conditions of Maringa Oleifera Seeds on Its Performance in Coagulation, Bioresource Technology,97(13)(2006) 1455-1460.

[10] Dhanushree M S, Hina Kousar, A study on bioremediation potency of Aspergillus niger in treatment of pulp and paper mill effluent and evaluation of phytotoxicity effect of treated effluent on Vigna radiate, SSRG International Journal of Agriculture **&** Environmental Science 4(4) (2017) 97-99.

[11] Okuda T., Base A. U., Nishijima W., and Okada M., Improvement of Extraction Method of Coagulation Active Components from Maringa Oleifera Seed, Water Research, 33(15)(1999) 3373- 3378.

[12] Rondeau V. J. H. and Commenges D. D. J. F., Aluminium in Drinking Water and Cognitive Decline in Elderly Subjects, The Paquid Cohort American Journal of Epidemiology,154 (3)(2001), 288-290.