

WASTE WATER TREATMENT USING BIO-COAGULANT AS ALOE BARBADENSIS MILLER AND CACTUS OPUNTIA FICUS INDICA

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Abstract

Water is important resource for the survival of life. This study focused on developing an efficient and cost-effective processing technique by using aloe Vera gel and prickly pear gel to produce natural coagulant for waste water treatment. Safe drinking water is one of the biggest problems in front of all over the world. There are two types of coagulants organic and inorganic coagulants. Alum is used worldwide in the developing countries to treat the water in the process of coagulation and flocculation. Continuous use of alum in the treatment of water can cause neurological disease like Alzheimer's disease. Therefore it has become a need to treat the water by using some natural coagulants. Natural coagulants are the coagulants which extracted from natural plants or animals. In this paper natural coagulant aloe vera gel and prickly pear gel has been used as a natural coagulant. This review highlights about maximum dosage and optimum ph at which turbidity removal is maximum. Plant-based coagulant have the potential are effective in wastewater treatment which is sustainable and environmental appropriate. The bio-coagulant proved to be efficient in Ph, turbidity, colour removal and efficient coagulant removal in waste water.

Keywords: *Aloevera gel, prickly pear gel, coagulant aid, ph, turbidity, suspended solids.*

Introduction

Water Treatment using Coagulant

Water is precious and essential natural resource, unevenly distributed on our planet. Freshwater represents only 2.5% of global supplies of water. About 70% of this fresh water quantity are either trapped under ice caps, or disseminated in the form of humidity or stream. Less than 1% of world's freshwater, about 0.007% of planet's waters, are easily accessible to the various uses for development. The use of natural resource in the process of water treatment, thus constitutes a potential promising ways to reduce on one hand, the high costs and environmental impacts due to the use of synthetic products used previously, and secondly allow as many people as possible access to drinking water. In conventional method of coagulation and flocculation alum, ferric chloride, ferrous sulphate were used as coagulant for effective removal of turbidity. But in one of the research it is found that continuous use of alum has caused several problems affecting human health. It is found that aluminium is one of the causes for alzheimer's disease. So this study is mainly focused on decreasing alum dose with use of **aloe vera gel** and **prickly pear gel**.

This project is about treating the domestic waste water for reuse by using natural coagulant it can avoid problems to human health and environment. it is the first process in waste water treatment plant. Once the coagulant is introduced in the water, the individual colloids must aggregate and grow bigger so that the impurities can be settled down at the bottom of the beaker and separated from the water suspension.

Nowadays, there has been great attention in improvement and implementation of natural coagulants in waste water treatment. These natural coagulants can be formed or extracted from animal, micro organisms, and also plant.

- **Coagulation:** It is a process in which dispersed colloidal particles agglomerate together.
- **Coagulants:** These are substances which bring about coagulation.
- **Bio coagulants: natural** and bio-degradable coagulants.

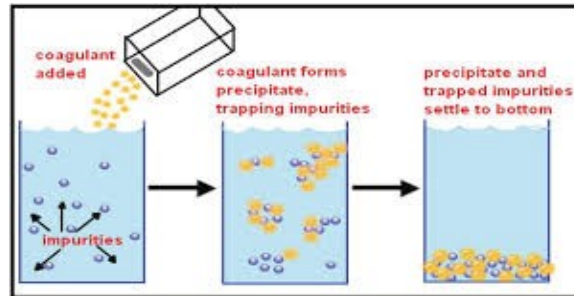


Figure 1 Cogulation treatment

These projects were carried out to investigate the efficiency of this natural coagulant to be used in the coagulation process of waste water treatment.

Scope

- Prevents wear of establishment and the machinery, achieving lower maintenance cost.
- Reduce expenditure on processing of costly chemicals.
- Reduced dependency on chemical coagulants.
- The bio-coagulants are eco-friendly with environment.
- Saving of electricity and reducing costs.
- Produce lower volumes of sludge, less toxic, and therefore cheaper to manage.
- It is safer to people, since they are not corrosive or dangerous to health.

Objectives

- The main objective is to remove colloidal impurities hence also removing turbidity from the water.
- To remove toxicants, neutralize coarse particles; kill pathogens, so that quality of discharged water is improved to reach the permissible level of water.
- To experiment and analyze the efficiency of natural absorbent from aloe vera and prickly pear seeds in treating wastewater.
- To provide an alternative solution for water treatment using natural coagulants.
- To improve the extraction method of coagulation active component.
- To improve the characteristics of water and to use it as potable drinking water.
- Treatment of water thus aims at reduction of bod, cod, eutrophication etc.of receiving water bodies and prevention of biomagnifications of toxic substances.

Methods and Materials

Two Natural Coagulants

In project two natural coagulant used for treatment

1) Material Collection



Aloe vera



Prickly pear

2) Gel Preparation



Aloe vera gel preparation preparation



Prickly pear gel

3) Sample Collection



River water from sivaganga district water



Domestic waste

Table 1 Initial treatment for wastewater

Parameters Analysed	Domestic Waste Water	River Water
PH	12	10
Turbidity	70NTU	50NTU
Total Solids	1000mg/l	700mg/l
Total Suspended Solids	1055mg/l	650mg/l
Total Dissolved Solids	1025mg/l	750mg/l

Jar test Procedure

- **STEP 1:** Fill the 1000 mL sample in jars.
- **STEP 2:** Place the filled jars on the gang stirrer, with the paddles positioned identically in each beaker.
- **STEP 3:** Mix the beakers at 40 – 50 rpm for 30 seconds. Discontinue mixing until polymer addition is completed.
- **STEP 4:** Add increasing dosages of the first polymer to subsequent beakers.
- **STEP 5:** Increase the mixing speed to 100-125 rpm for 15-60 seconds
- **STEP 6:** Reduce the mixing to 40 rpm and continue the slow mix for twice the duration of the rapid mix. (Note relative floc sizes).
- **STEP 7:** Turn the mixer off and allow settling to occur. (Note relative rates of settling).
- **STEP 8:** After settling for a period of time (typically 10 or 15 min.), note supernatant appearance.
- **If desired, the latter may be quantified using a turbid meter or clarity wedge (for turbidity), or determined gravimetrically (for suspended solids).**
- **STEP 9:** Remove the jars from the gang stirrer, empty the contents and thoroughly clean the beakers.
- **STEP 10:** Repeat the procedure from Step 1, but substituting for the Blank the dosage selected as providing the desired level of performance in the first series of test.

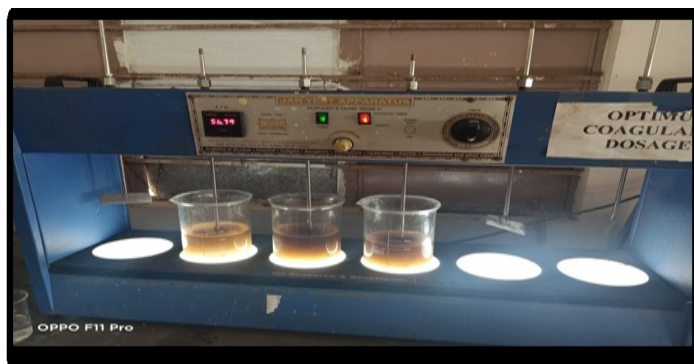
**Figure 1 Jar test using coagulants**

Table 2 Jar test readings

Samples	Domestic Waste Water		River water		Floc Size Index
	Aloe Vera Gel	Prickly Pear Gel	Aloe Vera Gel	Prickly Pear Gel	
Rapid Stirring for 30second @50RPM	0.37mm	0.4mm	0.3mm	0.5mm	A
Coagulant added to All Jars	Dosages added 5,10,15,20,25,and 30 mg/l				
Rapid Stirring for 1 Minute Extra@200RPM	0.75mm	0.80mm	0.78mm	0.90mm	C
Slow Stirring for 15 Minutes @ 40 RPM	2.40mm	2.80mm	2.30mm	2.89mm	F
Time of Floc Formation(Minutes after Flash Mix)	10	11	8	9	
Floc Settling after 30minutes	95%	92%	95%	94%	
Floc Size	10µm	8.5µm	9.6µm	9.0µm	

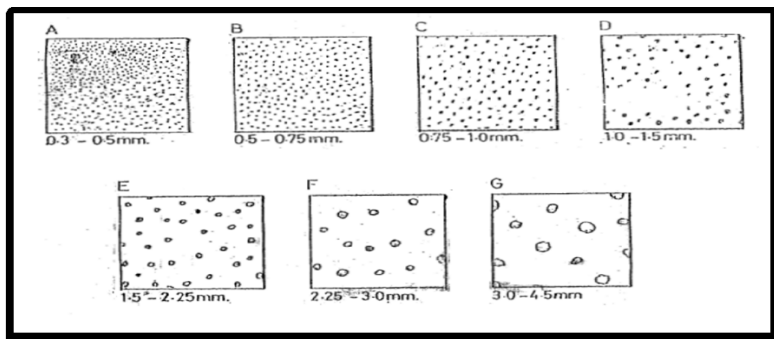


Figure 2 Floc size index chart

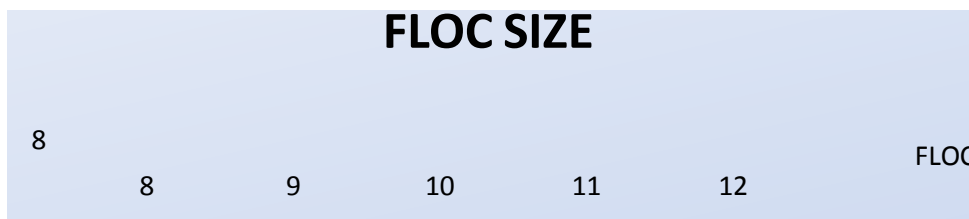


Figure 3 Settling time and floc size

Table 3 Final treatments for wastewater

Parameters Analysed	Domestic Waste Water	River Water
PH	6.5	7.0
Turbidity	4 NTU	5 NTU
Total Solids	555mg/l	500mg/l
Total suspended Solids	400mg/l	460mg/l
Total Dissolved Solids	550mg/l	450mg/l

Table 4 Final treatment reading by using aloe vera gel

Parameters Analysed	Domestic Waste Water	River Water
PH	7.5	8.5
Turbidity	5 NTU	4.5 NTU
Total solids	400mg/l	450mg/l
Total Suspended Solids	350mg/l	390mg/l
Total dissolved solids	400mg/l	480mg/l

Conclusion

From the present study, it can be concluded that, the use of natural coagulants like Aloe Vera and Opuntia Ficus Indica are receiving attention for their effectiveness in water treatment. Therefore, the use of natural coagulants that are locally available, abundant and inexhaustible provides a solution to the need for clean and safe drinking water. The technologies involved are economical, traditional, easy to implement and decreases morbidity and mortality from water borne diseases and thus, improve public health. In the present study, turbidity, ph and coagulant removal efficiency was found to be 89.03% and 80% after treatment with NC1 and NC2 for domestic waste water and river water. Hence, it can be concluded that NC1 and NC2 can be used as coagulants.

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