

OPTIMIZATION AND TREATMENT OF WASTEWATER USING NATURAL COAGULANTS

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Abstract - Sewage wastewater is generating in larger quantity from various activities of living beings in day-to-day life. Which has led to be major concern in treating and discharging it to environment. Now a days huge number of research works are conducted to encounter these problems. In present study sewage waste-water is taken to analysis and generally to remove turbidity in any sort of polluted water chemical-based coagulants are used in reducing turbidity and other process like coagulation/flocculation process. Natural coagulants Okra and jackfruit seed has been used in replacing these chemical-based coagulants/flocculants. Firstly, initial parameters of sewage waste-water has been examined through standard procedures and later this sewage waste-water has been treated with okra powder and jackfruit seed powder in the form of natural-coagulants, mainly optimum dosages of both coagulants as performed using standard jar apparatus, which gave optimum dosage of okra powder and jackfruit seed powder as 120mg/l and 80mg/l respectively. Jackfruit seed powder has been more efficient in turbidity reduction with 84% efficiency, where has okra powder treated about 60% and Okra has been found more efficient in reducing COD about 80% but where has jackfruit seed powder was resulted to be 72% COD reduction. In BOD analysis Okra powder showed more efficiency about 48% when comparing to jackfruit seed powder which reduces to 21%. Okra has been found to be more effective and can be increases its efficiency by increasing its dosages.

Key Words: Coagulation-flocculation Process, Jar Test, Natural coagulants, jackfruit seed, okra.

1.INTRODUCTION

Sewage/domestic Wastewater which is generated from various communities, which cannot be used directly for various purposes. It can be categorized by how it has been generated, in broad prospective wastewater can be explicate as mixture of more than one wastage, which includes waste from domestic, industries, institutional waste. The discharge of untreated domestic sewage and toxic industrial effluents of water courses has impacted the quality of natural water.

Examining the quantification and process of treating wastewater from sewage is controlled and ruled by CPCB in central level and SPCBs/Pollution control Committees and

local bodies of States. Generally, SBR and ASP techniques have been used in almost STPs.

Unprocessed sewage may contain waste, unwanted nutrients, solids, pathogens, oil and greases and heavy metals. sewage treatment plants undergo some conventional methods like filtration, activated charcoal method and flocculation/coagulation method which is very important primary treatment, (P.Rajasulochana et al., 2016). In this present study we mainly aimed to derive natural coagulants/flocculants in replacement with conventional, chemical coagulants which leads to sustainable development.

Coagulation/Flocculation treatment method, which is vastly used in wastewater treatment. The major role of this treatment method has to get rid of suspended colloidal particles (Amir Hariz Amran et al.,2018) and to get rid of turbidity in wastewater and the water which contains more pollutants.

Natural coagulants/flocculants are emerging as one of the most used coagulants/flocculants because of their easy availability and sustainable nature. Natural coagulants/flocculants are extracted from so many sources for example: Plant based, animal based and organism based. After coagulation/flocculation treatment of wastewater with synthetic or chemical coagulants/flocculants, (Vicky Kumar et al., 2017). It has resulted in huge generation of toxic sludge that makes complication in disposing of sludge. The sludge produced from this coagulation/flocculation process is very toxic in nature, it is caused due to improper reaction of synthetic coagulant/flocculant (Setyo Budi Mohd Said et al.,2020).

In this study we have been used okra and jackfruit seed as natural coagulant/flocculant to know their efficiency.

1.1 Scope of present study

In this study it is mainly focused on usage of naturally and locally available fruits, vegetable wastes and agricultural waste, which can be abundantly available in nature which can used as natural coagulants instead of using chemical coagulants, which produces harmful sludge after treatment and using these naturally derived coagulants which leads to

sustainable environment. In this study jackfruit seed and okra has been used to know the efficiency, there coagulation/flocculation nature and behavior of this natural coagulants/flocculants with sewage wastewater treatment.

1.2 Objectives

1. To collect and examine the characteristics of sewage waste water.
2. To determine the performance of Okra and Jackfruit seed as natural coagulant.
3. To extract natural coagulant from okra and jackfruit seed.
4. To identify the efficiency of jackfruit seed and okra as natural coagulants in treatment of sewage wastewater.
5. To Know the feasibility of using natural coagulants/flocculants as alternate to chemical coagulants/flocculants.
6. To remark the Sustainability and cost effectiveness of natural coagulants/flocculants over synthetic coagulants.

2. MATERIALS AND METHODOLOGY

2.1 Preparation of Natural coagulants

2.1.1 Jack fruit seed

Jack fruit seed was collected about 1kg of seeds were collected, peeled of above layer of jackfruit seed and cleaned with water to remove impurities. Then these seeds were sundried for about 4-5 days, later these seeds were chopped to pieces and grind into fine powder then sieved in 4.75 mm sieve (Aneesu Rahman et al., 2018). This powder was stored in air-tight container to prevent impurities and moisture to enter the powder. Further this jackfruit seed powder is used for experiment, later dilutions were prepared about 0.1 gram of powder was diluted in 100 ml distilled water and further dilutions were as per requirement for studies.



Fig-1: Jackfruit seed powder Preparation.

2.1.2 Okra seed

okra has been cleanly washed with water 2 to 3 times, then okra was wiped with clean cloth to remove moisture content, then okra has been chopped into very small pieces and kept in hot air oven at 105°C for 24 hours. This hot air-dried okra was grinded in normal blender to a fine texture, further this powder was sieved in 4.75mm sieve later this sieved powder is stored in a tight container to prevent entering of air and impurities which may cause change in characteristic of the powder (Muhammad Ridwan Fahmi et al., 2014). This powder was used carefully as per requirement for the present study, later about 0.1 gram of powder is diluted in 100 ml of distilled water and further different dilutions were prepared as per requirement of the ongoing project.



Fig 2- Okra powder Preparation

2.2 Sample collection and analysis

Raw sewage wastewater was collected using grab sampling technique from 20 MLD sewage treatment plant was used in this study. The sample was collected at receiving chamber or raw sewage sump, the color of the sample collected was green-brownish in color and very turbid which is situated before fine screen channels and grit chamber without disturbing the sample about 20 liters of raw sample has been collected in wastewater storing containers and carried to laboratory and preserved in very cool room temperature.

Main purpose of this study is to identify initial raw wastewater characteristics like, P^H, turbidity, total solids, Cod and Bod before and after treatment.

Table -1: Initial characteristics of Sewage waste water.

Characteristics	Values
P ^H	7.18
Turbidity	678 NTU
Total solids	1200 mg/l
Total dissolved solids	700 mg/l
COD	800 mg/l
BOD	380 mg/l

3. RESULTS AND DISCUSSION

Performing out the jar test with different proportions of dosages of jackfruit seed powder and okra seed powder according to standard jar test procedure and then followed by turbidity test for supernatants from each jar of jar test. Optimum dosage of both okra and jackfruit seed was found accordingly to the least turbidity value. Further experiments were optimized using optimum dosage as dosage for treating other parameters of sewage wastewater. From the jar and turbidity tests the optimum dosage of jackfruit seed powder was found to be 80 mg/l and for okra it was found to be 120 mg/l.

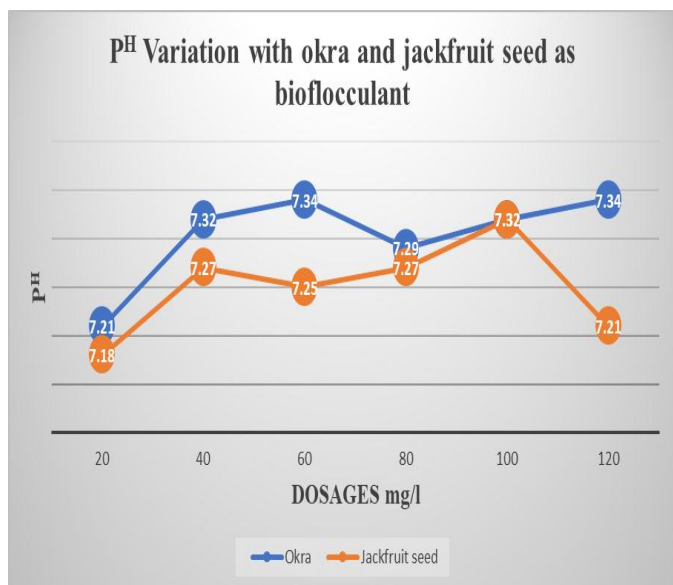


Chart 1- PH Variation

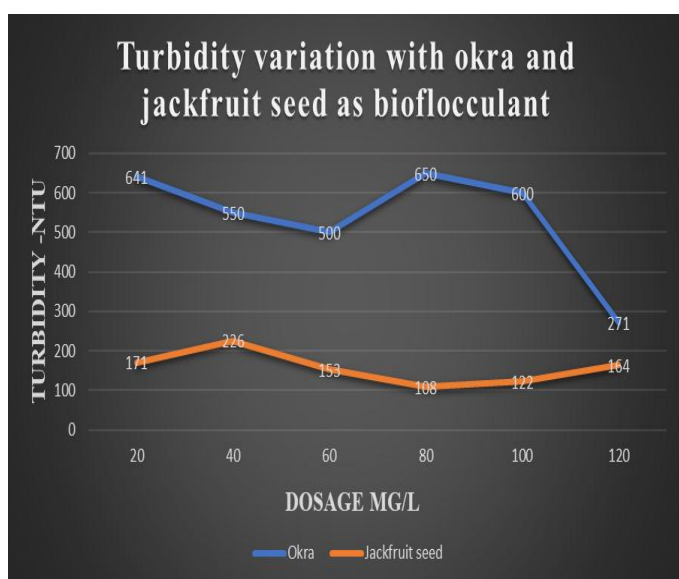


Chart 2- Turbidity Variation

Table -2: Characteristics of sewage waste water after treatment.

Sl. No	Characteristics	Okra	Jackfruit seed
1	PH	7.34	7.27
2	Turbidity	271NTU	108NTU
3	Total Solids	750mg/l	845 mg/l
4	Total dissolved solids	580mg/l	600 mg/l
5	COD	200mg/l	300mg/l
6	BOD	160mg/l	180mg/l

From this present study okra and jackfruit seed has been used as natural coagulants in coagulation/flocculation process in treating of sewage wastewater. From the results obtained we can conclude that optimum dosage of both coagulants okra and jackfruit seed powder are obtained to be 120 mg/l and 80 mg/l respectively by performing jar test. In this work it has been shown the efficiencies of both jackfruit seed powder and okra powder in treating different sewage wastewater characteristics. When we compared the efficiency of both natural coagulants/flocculants. Okra powder was turned out to be more effective in removing COD, Total dissolved solids, BOD. Parameters of sewage water using jackfruit seed powder was turned out to be more effective in removing turbidity of sewage waste water.

4 CONCLUSION

The outcomes were resulted as showing turbidity reduction efficiency was found to be 60% when raw sample is treated by okra powder and 84% turbidity reduction efficiency when it is treated with jackfruit seed powder, when COD experiment was conducted using these coagulants the results were obtained as 80% COD reducing efficiency when okra powder used as coagulant and when jackfruit seed powder was used as coagulant it was turned to be 72% reduction in COD. When BOD test was conducted using okra powder as coagulant material it was turned out be reduced to 48% and by using jackfruit seed powder BOD was reduced to 21%, which can be improved by increasing the dosages. It can be concluded that using both natural coagulants we came to know that jackfruit seed powder has been more effective in removing turbidity effectively and okra powder has been showed more effective in removing COD and BOD effectively.

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