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Okra Seeds: An Efficient Coagulant

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Abstract: *Treatment of drinking water in developing and under developed countries through the defined treatment methods is very expensive and inappropriate as well, this is because of the lack of proper infrastructure, and accessories required and also due to the hazards caused by the chemicals used in the treatment. In the following study the efficiency of natural coagulant, namely Okra seeds, has been checked. This efficiency has been checked through standard Jar Tests performed at Kasna STP, Greater Noida making use of the water sample collected from Hindan River, Greater Noida. The efficiency was defined by the amount of turbidity removal which confirmed an effective range of turbidity removal for a dose of 200 mg/l.*

Keywords: *Okra Seeds, Coagulant, turbidity*

I. INTRODUCTION

Water is the most important material used by mankind this defines the importance of its purification, surface water used for drinking purposes is getting polluted day by day though various domestic and industrial wastes which needs to be checked and the purification of such water is mandatory.

There are few pollutants which are disastrous and may cause certain kind of diseases which may be in curable, such as Cancer, liver damage, lung damage, serious stomach illness etc. the main reason behind these illness are the contaminated water, containing lead, aluminum, arsenic and other kinds of toxic elements. Such pollutants become a big and a more serious threat to infants, pregnant females and senior citizens.

Thus it is highly recommended to treat this water through various processes available before distributing such water for domestic use and even for drinking in some cases. One among many treatment processes is coagulation it is one of the most efficient method of treatment which helps in removing mainly toxic metals and chemicals present in the water, there are many coagulants that are being used for example, alum, copper sulphate, lime, etc. Certain polymers are also being used as coagulants in many industries but the major drawback of such coagulants is the treatment and management of the toxic sludge produced after coagulation. Thus efficiency of natural coagulants has been checked

The polluted water will be going through treatment processes before distributing it to the consumers for domestic use, including drinking (Anto, 2009). Coagulation is one of the processes of water treatment. In the treatment, when a coagulant is added to water to "destabilize" colloidal suspensions coagulation occurs. "Coagulation is one of the cheapest processes for treatment of various organic effluents."

Aluminum sulfate $Al_2(SO_4)_3$ is a chemical compound, which is soluble in water and is used as a main flocculating agent in the treatment of drinking water and is also used in waste water treatment plants, and in paper manufacturing. Aluminum is a significant poisoning factor in dialysis encephalopathy. Aluminum is one of the factors which might contribute to Alzheimer disease. The reaction of aluminum with water lessens water pH and its cold water efficiency. Thus using natural and locally available coagulants results in an efficient, environment friendly, Economically beneficial alternative.

Plants of many kinds have been used to purify water. Coagulants made up of natural agents are usually considered safe for human health. Few examples of such coagulants are *Moringa stenopetala*, *Moringa oleifera*, *Canavalia ensiformis*, *Vicia faba*, *constatum*, *Bombax*, and okra seed have proved to be few efficient and important replacement coagulant for chemicals such as aluminum sulphate (alum). The flocculating properties of the fresh stems of mucilage of Gumbo (*Hibiscus esculentus*) can be derived by reducing the turbidity.

A. natural Coagulant-Okra (Abelmoschus esculentus)

Okra is produced in subtropical, tropical, and warm temperate regions around the world (National Research Council, 2006). As per the knowledge Okra Can be used as a coagulating agent along with its edible use.

II. METHODS AND MATERIALS

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A. Materials

Nearby vegetable market became the source of Okra. The seeds from okra were used for the preparation of the Extract. Sodium hydroxide and Hydrochloric acid adjusted the pH of stock solution. The preparation of coagulant powders has been explained.

B. Okra (lady finger or bhindi)

Okra commonly known as lady finger is one of the important vegetable crop grown in tropical and subtropical region of the country. The oil present in the okra seeds is extracted first and then utilized for the treatment of waste water treatment. Studies represent that the volume of Gumbo mucilage decides the pH which changes the turbidity of the water.

C. Water sample

The water sample for the testing was collected from the Hindon river (Gr. Noida). The collection of water sample was used within the period of 2-3 weeks and stored the water sample at the temperature of about 2⁰C using refrigerator. Two different samples and volume of 40 liters, each were collected, and the raw characteristics were recorded.

D. Formation of Coagulant

Okra seed purchased from the market were dried washed and sun dried for 24 hours. Such dried seeds were then grinded through pestle and mortar to obtaining powdered form and sieve to a mesh (500) μ particles size to remove the large particles size of the seeds. 10g of seeds powders was mixed with 1000ml of distilled water to form 1000ml of suspension. The suspension was then thoroughly mixed using a clean magnetic stirrer for 5min to extract the component. The solution was left untouched for 15 min suspension, then filtered to remove particles and dried the powder left for 6-8 hrs.



Figure 1: Okra seeds

E. Procedure

The physical and chemical properties like pH value, turbidity, conductivity TDS etc of the sample was checked before testing. All these tests were conducted through the conventional methods.

The coagulation efficiency of the Okra seeds was checked and verified with the help of clarifloculators. The Okra coagulant doses were sampled in 6 parts. 500ml of the sample water was taken for jar test. Following steps were followed:

Coagulant prepared was first mixed in the water sample at different doses in the available 6 jars, which was then subjected to jar test. The jar was subjected to rapid mixing at 120 rpm for 3min and then slow mixing at 20 rpm for 20 min

Thereafter, switched off the stirrer and allowed the flocks to settle without disturbing the beaker jars for half an hour. The samples for residual turbidity measurement were withdrawn using a pipette from a height of 5cm below the surface of each beaker, and the residual turbidity was measured for each sample of beaker. The efficiency of turbidity removal was checked and compared with the standard values.

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Figure 2: Jar Test Apparatus

III. RESULTS AND DISCUSSION

A. Results

Table 1: Raw water sample parameters

<i>Sr. No</i>	<i>Parameters</i>	<i>Raw Water Characteristics</i>
1	Turbidity (NTU)	17.0
2	pH	8.4
3	Hardness (mg/l)	230
4	Alkalinity(mg/l)	108.15
5	Total dissolved solid(mg/l)	320
6	Total suspended solid(mg/l)	280
7	Total solid(mg/l)	760
8	Chloride (mg/l)	32.51

Table 2: Results of Alum treatment

<i>Sr. No</i>	<i>Parameter</i>	<i>10mg/l</i>	<i>20mg/l</i>	<i>30mg/l</i>	<i>40mg/l</i>
1	Turbidity (NTU)	4.5	4.26	3.8	3.92
	Total Dissolved Solids (mg/l)				
3	Suspended Solids (mg/l)	200	205	180	194
4	Total Solids (mg/l)	430	415	405	413
5	pH	7.48	7.45	7.4	7.41

Table 3: Results of Okra Seeds

<i>Sr. No</i>	<i>Parameter</i>	<i>150mg/l</i>	<i>200mg/l</i>	<i>250mg/l</i>
1	Turbidity (NTU)	5.61	4.52	4.67
2	Total Dissolved Solids (mg/l)	270	228	242
3	Suspended Solids (mg/l)	240	223	230
4	Total Solids (mg/l)	518	455	470
5	pH	7.67	7.42	7.56

B. Discussions

A graph of turbidity (NTU) against dosage number

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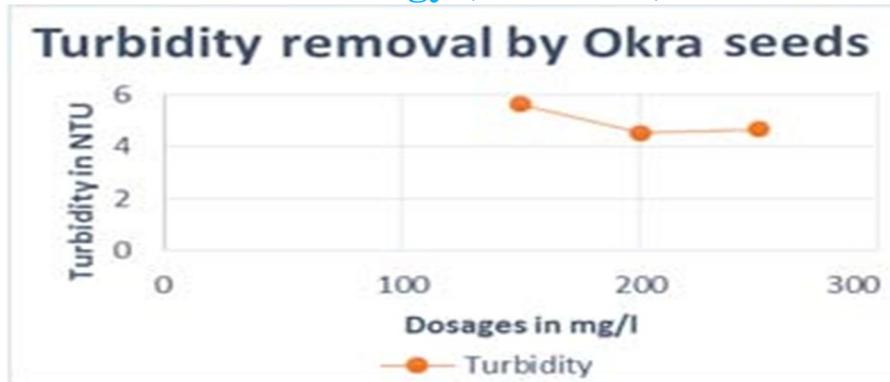


Figure 3: A graph that shows relationship between the alum Turbidity (NTU) and Dosages (mg/l)

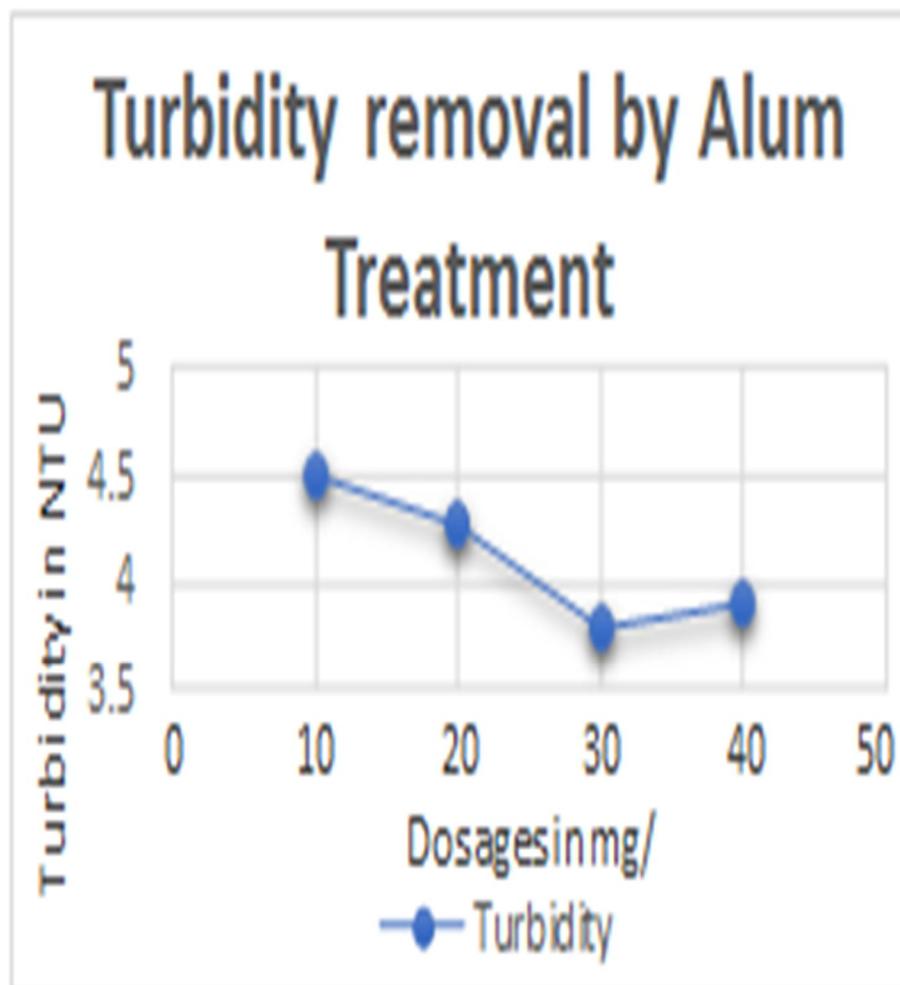


Figure 4: A graph that shows relationship between the okra seeds and Dosages (mg/l)

IV. CONCLUSION

Surface water can be treated and used for Domestic purposes .There is a great scope of doing so this can be achieved by using a Natural Coagulant namely OKRA SEEDS or Synthetic coagulant (pH adjustment by addition of neutralizing substances can work very well in meeting the discharge standards after treatment and reuse standards after the treatment. By making use of pressure sand filter the removal efficiency can be reached upto 99%. The increase in water demand for domestic uses, caused by population

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growth and by the rising standard of living, together with progressive environmental pollution problems have led to over utilization of renewable drinking water sources and the diminution of water quality. As we all know that our country is a developing country which lacks behind in both in technology as well as finance, thus treatment of water by such a natural coagulant is both economically safe and sustainable. A comparative study was made for different okra seeds, and alum dosages and effect on turbidity, TDS, TS, SS & pH was calculated. On comparison both alum and okra gave almost similar results moreover okra, in few cases gave even better results. While the sludge obtained by treatment alum was higher than that of okra seeds. It can be thus suggested that we can use locally available material okra seeds to treat low turbid waste water which is environmental friendly as well as cost effective and naturally available. A continuous monitoring is required to check the pH for a proper removal as compared to the traditional coagulants, so that they can easily be replaced by the natural ones.

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