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Application of Natural Coagulants for Removal of Physio-Chemical Impurities from River Water

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Abstract: ***Growing population, increased economic activity and industrialization has not only created an increased demand for fresh water but also resulted in severe misuse of this natural resource. Reusing wastewater by effective treatment can contribute to counter the water scarcity. Natural macromolecular coagulants show bright future and are concerned by many researchers because of their abundant source, low price, multifunction and biodegradation. The present study deals with the evaluation of treatment efficiency of natural coagulants Azadiracta indica and Cicer arietinum in removal of turbidity from waste water samples. The experiments were conducted at various proportions of dosages of natural coagulants Azadiracta indica (NC1) and the Cicer arietinum (NC2). The physio-chemical parameters of waste water such as pH, Colour, Turbidity, Total Dissolved Solids and Total Suspended Solids are measured before and after the treatment to evaluate the removal efficiency on the major pollutants of concerned in waste water treatment. Then, the experimental studies were carried out to find out the optimum dosage of natural coagulants. In this project, the optimum dosage Azadiracta indica and Cicer arietinum was indicated at 90 mg/L, respectively for Chitravathi river water. The Turbidity removal efficiency was 90% to 97% after treatment with NC1 and NC2 for dosage 70 to 100 Mg/L, respectively. From this study, high turbidity removal indicates that Azadiracta indica and Cicer arietinum powders has the potential for wastewater treatment application.***
Keywords: Natural coagulants, Azadiracta indica, Cicer arietinum, Turbidity, Wastewater.

I. INTRODUCTION

The rapid increase of industrialization and urbanization in the last few decades had caused a dramatic increase in the demanded water, as well as significant deteriorations in water quality throughout the world. Suspended and colloidal matter such as clay, silt, finely divided organic and inorganic matter and other microscopic organisms are responsible for turbid waters. The most used chemical coagulants to treat wastewater are aluminum and iron salts. Research works carried out by many researchers also proven that natural coagulants have brilliant potential due to their abundant availability, less price, innocuity, multifunctional, and biodegradation. The present study focuses on the coagulant activity of Azadiracta indica and Cicer arietinum for physio – chemical and biological parameters removal from lake water.

II. BACK GROUND

All research papers concluded that Natural macromolecular coagulants show bright future and are concerned by many researchers because of their abundant source, low price , environmentally friendly and multifunction.Cactus family is used for various purposes like treatment water, heavy metal removal, adsorbent to remove pesticides and medicinal use also. Optimum dosages of hyacinth bean peel powder is used for exclusive intensities to remove chlorides. As per Literature review, Natural Coagulant dosages are taken as 10, 20, 30, 40, 50 & 60 mg/l for treating waste water, our study is carried out by taking the dosages of 70, 80, 90, & 100 mg/l.

III.AIM AND OBJECTIVES OF THE STUDY

The aim of this study is to investigate the applicability of natural coagulants in waste water treatment.

A. Objectives

The Objectives of the study are:

1) To collect the water samples from the Chitravathi river near puttaparthi.
2) To analyze physio-chemical parameters such as Turbidity, pH, TSS, TDS and Color of river water samples using standard procedure.
3) Collection and preparation of natural coagulants for experimental study
4) To determine the optimum dosage of natural coagulants
5) To assess the efficiency of natural coagulants for treating lake water.

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IV. MATERIAL AND METHODOLOGY

A. *Material*

1) *Collection Of Water Samples*

Water samples was collected from the Chitravathi river, The Chitravathi is an inter-state river in southern India that is a tributary of the Penna River. Rising in Karnataka, it flows into Andhra Pradesh and its basin covers an area of over 5,900 km2. The pilgrim town of Puttaparthy is located on its banks. It was observed that the sample was highly turbid and dark Brown in color. Sample was collected and stored in clear plastic containers.

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2) *Preparation of Natural Coagulent – 1 (NC-1)*

Azadirachta indica, commonly known as neem, margosa or nimtree. It is native to the indian subcontinent and to parts of southeast asia, but is naturalized and grown around the world in tropical and subtropical areas. Dry Neem powder was prepared by cutting fresh neem leaves into strips and sun dried for one week and dried in Hot Air Oven at 60°C for an hour. Dry Neem leaves were grind in a grinder and sieved to get particles of the size 300 µm.

Drying and Sieving Powder of Azadiracta indica

3) *Preparation of Natural Coagulent – 1 (NC-1)*

Cicer arietinum (Chickpea), commonly called gram, Bengal gram, or garbanzo bean, is the most important food grain legume of South Asia and the third most important in the world. Dry Chickpeas powder was prepared by sun drying fresh Chickpeas for one week and dried in Hot Air Oven at 60°C for an hour. Dry Chickpeas was grind in a grinder and sieved to get particles of the size 300 µm.

Drying and Sieving Powder of Cicer arietinum

B. *Methodology*

To evaluate the optimum dosage of natural coagulants jar test apparatus was used.

1) In the jar test apparatus, 1000ml of water samples were put into each 4 one liter beakers and placed under paddles of jar test equipment.
2) Then paddles were inserted into the jars and then the apparatus was turned on with a mixing rate of 100rpm at starting.
3) The required amount of doses of NC-1 and NC-2 i.e. 70, 80, 90 and 100 Mg/L was added instantaneously and quickly combined for 1 minute.
4) Then the mixing speed was slowed down to 30rpm and slow mixing is continued for 20 minutes for flocculation.

5) Then allowed for settling at 30-40 minutes, then the treated water from each beaker is tested for various tests like Turbidity, pH, TSS and TDS optimum dosage of natural coagulant was noted down.

V. RESULTS AND DISCUSSION

TABLE.1. TABLE SHOWING VARIATION OF VARIOUS PARAMETERS BEFORE AND AFTER TREATING WITH AZADIRACTA INDICA

S.NO	PARAMETERS	BEFORE TREATMENT	NATURAL COAGULANTS ADDED	DOSAGE OF (NC-1 & 2)	RESULTS AFTER TREATMENT	STANDARD VALUES
1	pH	7.25	Azadiracta indica	70 mg/l 80 mg/l 90 mg/l 100 mg/l	7.154 7.132 7.06 7.10	6.5 – 8.5
2	TURBIDITY	199.5 NTU	Azadiracta indica	70 mg/l 80 mg/l 90 mg/l 100 mg/l	15.83 NTU 9.9 NTU 4.08 NTU 7.93 NTU	5 NTU
3	TSS	247 mg/L	Azadiracta indica	70 mg/l 80 mg/l 90 mg/l 100 mg/l	67 mg/L 52mg/L 44mg/L 49mg/L	75 mg/L
4	TDS	683 mg/L	Azadiracta indica	70 mg/l 80 mg/l 90 mg/l 100 mg/l	385 mg/L 357 mg/L 329 mg/L 354 mg/L	500 mg/L
5	Colour	Dark Brown	Azadiracta indica	70 mg/l 80 mg/l 90 mg/l 100 mg/l	Colourless	Colourless

Table.2. variation of various parameters before and after treating with Cicer arietinum

S.NO	PARAMETERS	BEFORE TREATMENT	NATURAL COAGULANTS ADDED	DOSAGE OF (NC-1 & 2)	RESULTS AFTER TREATMENT	STANDARD VALUES
1	pH	7.25	Cicer arietinum	70 mg/l 80 mg/l 90 mg/l 100 mg/l	7.159 7. 145 7. 09 7. 11	6.5 – 8.5
2	TURBIDITY	199.5 NTU	Cicer arietinum	70 mg/l 80 mg/l 90 mg/l 100 mg/l	18.67 NTU 12.93 NTU 7.98 NTU 9.63 NTU	5 NTU
3	TSS	247 mg/L	Cicer arietinum	70 mg/l 80 mg/l 90 mg/l 100 mg/l	72mg/L 61mg/L 56mg/L 62mg/L	75 mg/L
4	TDS	683 mg/L	Cicer arietinum	70 mg/l	489 mg/L	500 mg/L

				80 mg/l 90 mg/l 100 mg/l	465 mg/L 433mg/L 459 mg/L	
5	Colour	Dark Brown	Cicer arietinum	70 mg/l 80 mg/l 90 mg/l 100 mg/l	Colourless	Colourless

VI. CONCLUSIONS

The main conclusions that can be withdrawn from this study are as follows:

1) The results from this study indicates that powdered Azadiracta indica (NC-1) and Cicer arietinum (NC-2) are very effective in removing Turbidity, TSS, TDS, and Color from the waste water.

2) In the present study, Turbidity removal efficiency was found to be 97% and 90% after treatment with Azadiracta indica (NC-1) and Cicer arietinum (NC-2), Respectively for the Chitravathi river water.

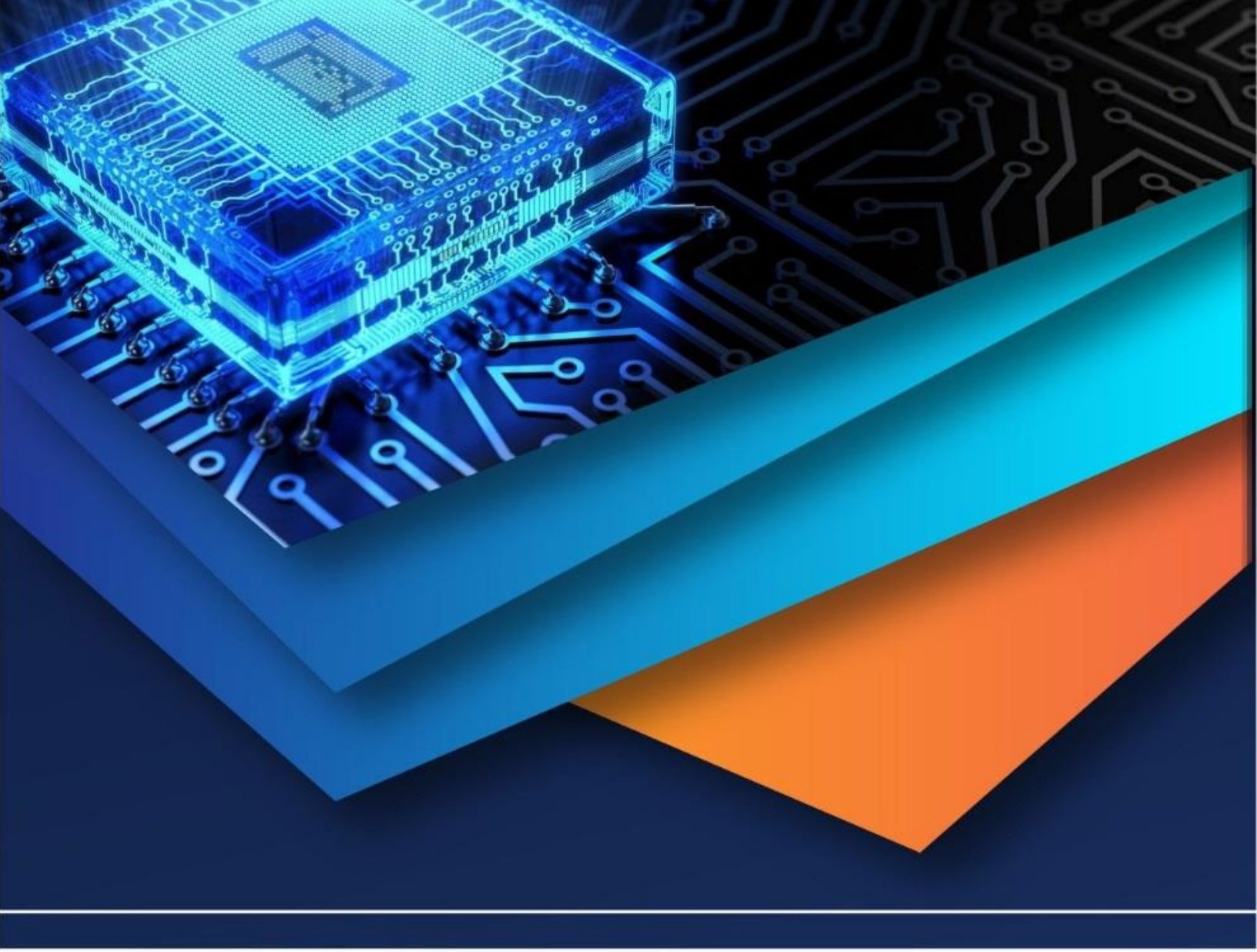
3) TSS removal efficiency was found to be 44 % and 56 %, after treatment with Azadiracta indica (NC-1) and Cicer arietinum (NC-2) Respectively.

4) TDS removal efficiency was found to be 51 % and 36 %, after treatment with Azadiracta indica (NC-1) and Cicer arietinum (NC-2), Respectively.

5) Hence, it can be concluded that Azadiracta indica (NC-1) and Cicer arietinum (NC-2) can be used as coagulants in water treatment.

REFERENCES

[1] G.RAMMOHAN, An Experimental study on usage of banana pith and orange peels as natural coagulants to treat river water of 2024 april.
[2] G.RAMMOHAN, An Experimental Study on Usage of Cactus and Hyacinth Bean Peelsas Natural Coagulants to Treat Lake Water of 2023 april.
[3] Nath A, Mishra A, Pande P P 2020 A review natural coagulants in wastewater treatment.
[4] Evaluation of Cactus and Hyacinth Bean Peels as Natural Coagulants, by Shilpa Bs in the year of 2012 june.
[5] Vikashni Nand, Matakite Maata, Kanayathu Koshy, Subramanium Sotheewaran. “Water Purification using Moringa Oleifera and other Locally Available Seeds in Fiji for Heavy Metal Removal”,
[6] Investigation of Coagulation Activity of Cactus Powder in Water Treatment, by Hayelom Dargo Beyene, Tessema Derbe Hailegebrial, Worku Batu Direrssa in the year of 2016.
[7] Effective Waste Water Treatment by the Application of Natural Coagulants by Kartika Panwar, Itika Dadhich, Nagaraju Shaik in the year of 2021 June.
[8] Evaluation of Cactus and Hyancinth bean peels as natural coagulants to treat Waste water (Municipal water), by B.S. Shilpa, Akanksha, Kavita, p. Girish in the year of 2012.
[9] Wastewater (Industrial water)treatment using Bio-coagulant as cactus opuntia ficus indica by Saurabh O. Deshmukh, Dr. M. N. Hedaoo in the year of 2018 .



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