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"REMOVAL OF PHYSIO-CHEMICAL IMPURITIES FROM SYNTHETIC TEXTILE INDUSTRIAL WASTEWATER BY USING LOW COST COAGULANTS-A REVIEW"

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Abstract:

Synthetic dyes used by the textile industry pollute a lot of water. Textile dyes are not tightly bound to the cloth and released into the streams as waste water. For this reason, a large part of the wastewater of the textile industry is discharged without treatment, causing a serious impact on the environment and human health. Therefore, environmentally friendly technology should be used for the effective treatment of wastewater in order to prevent its negative effects on the environment, human health and naturalresources. This study focuses on lowcost coagulants to remove physicochemical impurities in wastewater.Aluminum, lime and iron coagulants have been used for many years in most industries to coagulate substances in surface water and to remove turbidity from water prior to flocculation, sedimentation or filtration. Although useful, inorganic coagulants have some disadvantages, and there are concerns about the association between aluminum residues in purified water and Alzheimer's disease, and the toxi city of metal coagulants on the water supply. Therefore, the development of natural coagulants inwater treatment is of great interest today. In this study, fenugreek, chickpeas, neem and nirmali were used to remove physicochemical i mpurities such as turbidity, TDS and color in synthetic textile industrial wastes. The flocculation method will be use d for this batch coagulation.This review is expected to be useful to researchers in the community who want to address the wider risk of organic pollution from the textile industry.

Keywords: Textile Effluent, Coagulant, Coagulation Flocculation, Colour, Trigonella foenum-graceum, Cicer arientinum, Azadirachta indica, Strychnos potatorum

I. INTRODUCTION

Water is an essential product in all natural and human activities, and generation of drinking water from primary water often uses the coagulation process to takeout muddiness in the form of suspended and colloidal matter. A coagulant is used to remove the solids that cause the particles to clump together and add them to the water to keep the particles suspended in the water. When the coagulant enters the water, the colloids should clump together and become larger so that the impurities can stayatthebottom of the beaker and separate from the suspended water. Inorganic coagulants such as lead and iron are used in most industries. When lead is used as a coagulant in treatment, it will cause some harm to human health such as constipation and memory loss. For example, fenugreek seeds, chickpea seeds, neem leaves, nirmalli seeds, papaya seeds, peanuts, etc. they are used in wastewater treatment and give the best results.

The main purpose of water treatment is to reduce the amount of organic and inorganic impurities present in wastewater. Untreated water can cause many diseases in the water. Wastewater treatment is the urgent need of this study and coagulation treatment is carried out to improve the quality of the wastewater and reach the permissible water level. Recycle for other purposes or leave for land or agriculture.

Characteristics Of Textile Wastewater:

- High BOD;
- High COD;
- High TDS.

Typical Composition Of Textile Wastewater:

pH	9.8-11.8
Total alkalinity(mg/l) as $CaCO_3$	17.35-21
BOD(mg/l):	760-933
Chemical Oxygen Demand(mg/l)	1418-2250
TSS(mg/l)	3170-5800
Total chromium(mg/l)	12.5-19.1
Turbidity(NTU)	110-175

Natural coagulants are a solution for water treatment. Plant
based coagulants are considered 3 pillars of sustainability: 1) Natural coagulants are cost-effective
2) These natural coagulants are environmentally friendly
3)Plantbased natural coagulants are socially correct, especially in India, a developing country. where resources are plentiful.

II. MATERIALS AND METHODS

To amend the removal of physio chemical impurities from textile industrial wastewater natural coagulants such as Trigonella foenum-graceum, Cicer arientinum, Azadirachta indica and Strychnos potatorum are used. These flocculants have been selected based on their potential effectiveness in color as well as other impurities removal. By conducting research and experiments, the optimal conditions for achieving maximum color removal can be determined..

III. MATERIALS

Fenugreek (Trigonella foenum-graecum)

Fenugreek (Trigonella foenumgraecum) is a popular herb that grows in India and North Africa. There is some evidence that fenugreek seeds can be used as a prime coagulant for water filtration and wastewater treatment, as they contain water-soluble cationic coagulant proteins that can reduce turbidity in purified water. Seeds are described to contain Phytonutrients. and coagulation proteins that can play an important role in reducing water turbidity. The seeds of T. foenumgraecum were collected locally from the market in the city of Amravati.Grind the dried fenugreek seeds into a very fine powder in a grinder for 2 minutes. All soil materials were sieved through a 0.4 mm membrane sieve and the fraction with a particle size greater than 0.4 mm was used for testing.

Figure 1 Shows *Trigonella foenum-graecum* seeds and powder

Chickpea or Chick Pea (*Cicer Arietinum*)

Chickpeas or chickpeas (Cicer arietinum) are annual legumes of the Fabaceae family, subfamily Fabaceae. Varieties are called "gram " or "Bengal gram", "garbanzo" or "chickpea beans", "corn peas", "chana" and "chole". Chickpea seeds are rich in protein. Chickpeas are a type of legume that contains two to three peas in one pod.It has blue, purple or pink and white flowers. Cicer arietinum seeds were collected locally from the market in thecity of Amravati. Wash the seeds with plenty of water to remove impurities, then dry in the sun for 2 days.Grind Cicer arietinum seeds into a fine powder using a food processor in the lab..

Figure 2 Shows Cicer arietinum seeds and powder

Neem Powder (*Azadirachta Indicia)*

Neem (Azadirachta Indicia) is a flowering plant from the Meliaceae family, most commonly known as Neem and Indian Lilac. Neem is a versatile plant with extensive wastewater treatment and its cultivation has been promoted in many countries The leaves of this tropical tree are made of beneficial proteins that are soluble and act as powerful coagulants. Wastewater treatment is cost prohibitive due to the use of coagulants in the process, so almost all villagers choose to use simple equipment as an alternative, which is often still low and causes disease in the water. Neem leaves are collected from local neem trees in Amravati.Neem leaf powder is made organically. Kept the leaves in the sunlight for a week and process the leaves using household supplies in the kitchen. The powder is well processed and used as a coagulant in models for additional adsorption processes in wastewater treatment.

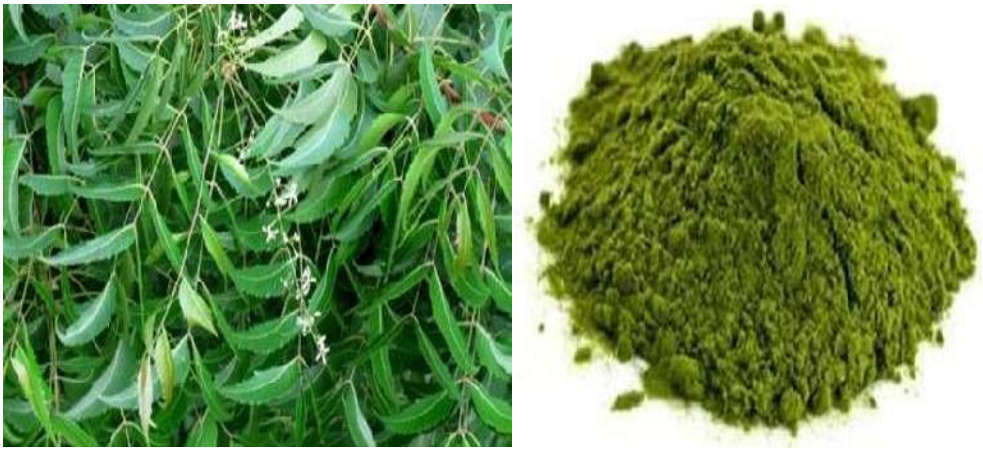

Figure 3 Shows Azadirachta Indicia leaf and powder

Nirmali Seed (*Strychonomous Potatorum*)

Nirmali is a small herb found in sounthern and central India, Sri Lanka and Myanmar and used as an herbal medicine. Sanskrit texts in India report that seeds were used more than 4,000 years to soften surface water, suggesting that they were the first reported plant coagulants for water purification. Seeds were collected from the market in the city of Amravati. Grinded the seeds into fine powder using a food processor in the lab.

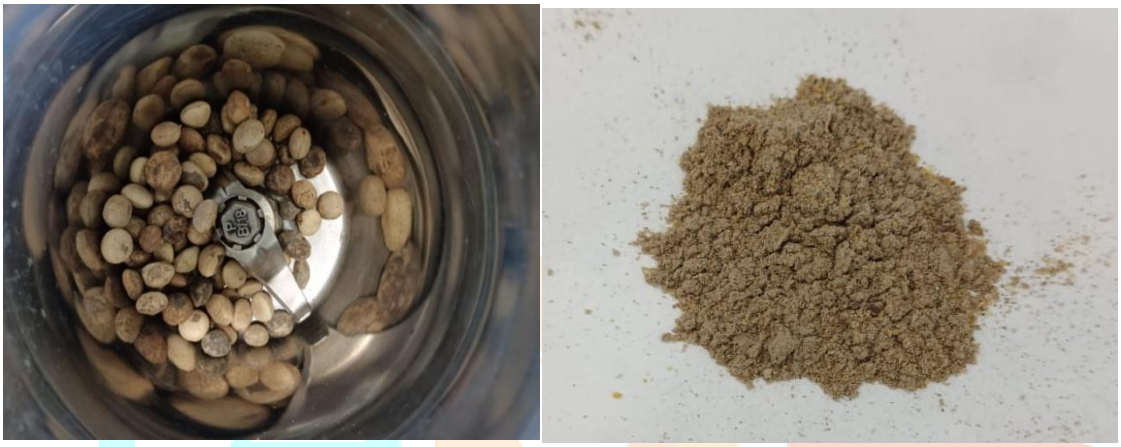

Figure 4 Shows Strychonomous Potatorum seeds and powder

IV. Preparation of Synthetic wastewater

To analyze the results and for conducting batch study the synthetic textile industrial wastewater was prepared. The sample was prepared in such a way that it should have the properties same as original or real effluent coming from the textile industry. For this, different chemicals and dyes were used. Components involved in making of synthetic sample: 300 mg/L of basic red dye 5001 B, 3 gm/L of sodium chloride, 5.56 mg/L of hydrolyzed starch, 11.12 mg/L of ammonium sulfate, 11.12 mg/L of disodium hydrogen phosphate, and approximately 7-8 drops of liquid detergent. All the above components were mixed in the tap water by using mechanical stirrer and then was kept on the hot plate for heating till 80°C for 1.5 hours to attain the same or real sample from textile industry. After all these procedure that sample was allow to cool down at room temperature. And this is how synthetic textile industrial wastewater sample was prepared for further experiments.

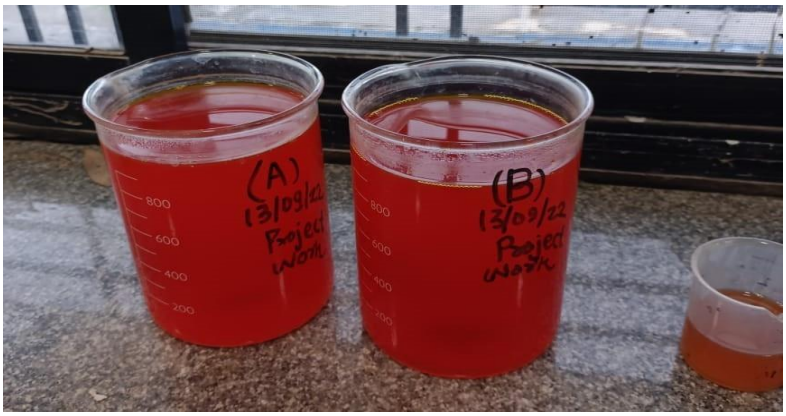

Figure 5 Synthetic textile industrial wastewater sample

V. METHODS

Because rural or underdeveloped communities do not have suitable water treatment systems, the best available option is to use simple and costeffective technologies such as coagulation. Coagulation is an important process in the treatment of surface waters and wastewater. Its applications include removing dissolved chemicals and turbidity in wastewater by adding various coagulants. For the coagulation process, jar test apparatus was used.

VI. Literature Review

R. Ajith Kumar (2018) conducted an experimental study on industrial wastewater treatment (wash water) to examine the use of natural coagulants for better water treatment. During treatment, natural coagulants such as nuxichon and water hyacinth are used for wastewater treatment. This includes pH, sulfate, chloride, total solids, total suspended solids (TSS), total dissolved solids (TDS), acidity, alkalinity, good coagulation as well as how (tank setup), biological oxygen demand (BOD) etc. contains many parameters. and chemicals. oxygen demand (COD). These natural coagulants are comparable to chemical coagulants in treatment efficiency when used to treat water in the low to medium turbidity range (50-500 NTU).
Experimental results show that natural coagulant can be used alone or mixed with coagulant alum, and the effect is better. Natural c oagulants produce fewer lumps, which reduces sludge disposal costs. Judging by the natural coagulants used, water hyacinth works better than nirmalli seeds. As long as there is enough coagulant, it can be used to treat waste materials [1]

S. Mohan (2019) The title of their work is "Textile Wastewater Treatment Using Natural Coagulant (NeemAzadirachta India)". In this study, an experiment was conducted to evaluate the effectiveness of neem leaf powder, a local coagulant, to reduce wastewater and improve its quality. The use of less effective sorbents from the leaves of plant materials, such as neem leaves, for the decolorization of aqueous solutions of industrial dyeing wastewater is highly encouraged, as they not only waste money, but are sometimes better than business electronics. Natural coagulants are more environmentally friendly and sustainable than biodegradable chemical coagulants.Studies have shown that neem leaves have a coagulation effect, which can lower the pH of wastewater, and the effect is better. During the analysis, the COD was found to be 2980.00 after treatment with neem leaf powder. Experimental results show that the coagulation/flocculation process can effectively purify the wastewater and the BOD3/COD ratio in the wastewater increases to 0.19.The amount of food (or carbon) that can be oxidized by bacteria, as measured by the BOD test, decreases after adding neem leaf powder. Post-treatment pH is between 7-8 and is within limits.[2]

Farah Amira Binti Mohammad Lanan (2021) Treatment of palm oil mill wastewater (POME) using fenugreek (Trigonella foenum-graecum) and okra (Abelmoschus esculentus) as natural coagulants and flocculants, respectively. Coagulant and flocculant concentrations, pH values, and mixing speed were optimized and modeled using the response surface method (RSM) using analysis of variance (ANOVA). ANOVA examines the relationship between four independent variables to ensure maximum removal of pollutants.During the operation, the particle bridging mechanism was found to predominate. The sludge produced is non-toxic and has calorific value, which can be converted into clean fuel briquettes. The production of POME using natural materials has proven to be effective and environmentally friendly, providing the industry with more options for waste management litter as well as waste generation. Test results show that 94.97, 92.70, and 63.11% Turbidity, TSS, and COD were removed respectively. [3]

Amera Marey Mohammed Hassanien (A.Marey)(2021) Using Cicer Arietinum (CA) or chickpea seeds as a local natural coagulant, cheap and grown in Egypt, can be used to reduce wastewater turbidity. Chemical coagulants cause different diseases such as constipation, forgetfulness, seizures, so this article represents the use of chickpeas as a natural coagulant, and scientists now recommend its use as it is environmentally friendly as it is good for human health and effective in wastewater treatment. Natural coagulants as coagulation aids, which can make flocculation consistent and prevent coagulation activity. The best removal conditions used in this study are: temperature = 250 °C, pH = 3, contact time = 120 min, mixing speed 2 m in = 80 rpm (rapid mixing), (CA) amount 90 mg/L, (95.89 %) in the working area decreased.[4]

VII. CONCLUSION

Coagulation and flocculation are useful for turbidity removal in wastewater. The process removes many suspended solids from waste water and can be used to remove color from wastewater in the textile industry. Another way to use biocoagulants such as fenugreek, chickpea, nirmali and leaf powder can be a solution, because all plant material is cheap, plentiful and readily available. Due to the presence of natural coagulants, the sludge produced in this process will be disposed of safely and without danger to humans.

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[3] Journal of Environmental Chemical Engineering Volume 9, Issue 1, February 2021, 104667 Utilisation of natural plant-based fenugreek (*Trigonella foenum-graecum*) coagulant and okra (*Abelmoschus escluentus*) flocculant for palm oil mill effluent (POME) treatment "Farah Amira Binti Mohammad Lanan, Anurita Selvarajoo, Vasanthi Sethu, Senthil Kumar Arumugasamy"

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