MORINGA OLEIFERA SEED CAKE POWDER AS A BIO COAGULANT IN TEXTILE EFFLUENT TREATMENT

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Abstract - *Textile industries are one of the most common and essential sectors in the world. The expulsion of dyes from textile effluent can be brought out through several chemical and/or physical methods. Significant contaminations in material wastewaters are high suspended solids, chemical oxygen demand, variety, TDS, and other dissolvable substances. The uses of synthetic coagulants like FeSO4 are not considered suitable due to health and economic considerations. This project concentrates on the treatment of textile wastewater using natural coagulants obtained from Moringa Oleifera seed cake powder. The Moringa seed cake powder was used alone, in combination with lime, in combination with lime, and polyelectrolyte to find out the proper combination and quantity required. Subsequent to recognizing the right blend, the untreated and treated profluent boundaries were dissected. The parameters like TDS, pH, BOD, COD, Turbidity, Chlorides, and color were found. An abstract summarizes, in one paragraph (usually), the major aspects of the entire paper in the following prescribed sequence.*

Key Words: **Effluent, Treatment, Bio Coagulant, Coagulant, Iron Sulphate, Moringa seed cake powder, Moringa seed powder.**

1. INTRODUCTION

The material business is perhaps the most dynamic synthetic industry and is considered the primary driver of water contamination. This area causes solid degrees of contamination, predominantly in the age of wastewater containing a ton of varieties that have complex ascribes and substance development, and low biodegradability. The material business effluents are described by outrageous changes in boundaries, such as the synthetic oxygen interest (COD), biochemical oxygen interest (BOD), pH, variety, and salinity. Some of the typical parameters of these effluents are visible colour (1100-4500 units), chemical oxygen interest (800-1600 mg/L), pH by and large soluble (9-11), and complete solids (6000-7000 mg/L). The presence of colours in water not just modifies its stylish appearance and causes social contentions in the networks involved, but it also interferes in the photosynthetic process carried out by some organisms and the exchange of oxygen, in expansion many colours are harmful and impervious to debasement processes, even some of them are viewed as cancer-causing agents and mutagens. There is a wide assortment of colours with various compound designs; among them are azo, anthraquinone, and indigo colours, which thusly can be immediate, responsive, scatter, corrosive, and so forth. The azo colours are the most normal and address 75% of the shades utilized by the material business. By and large, there are physicochemical, synthetic, organic, and later enzymatic techniques for the treatment of wastewater.

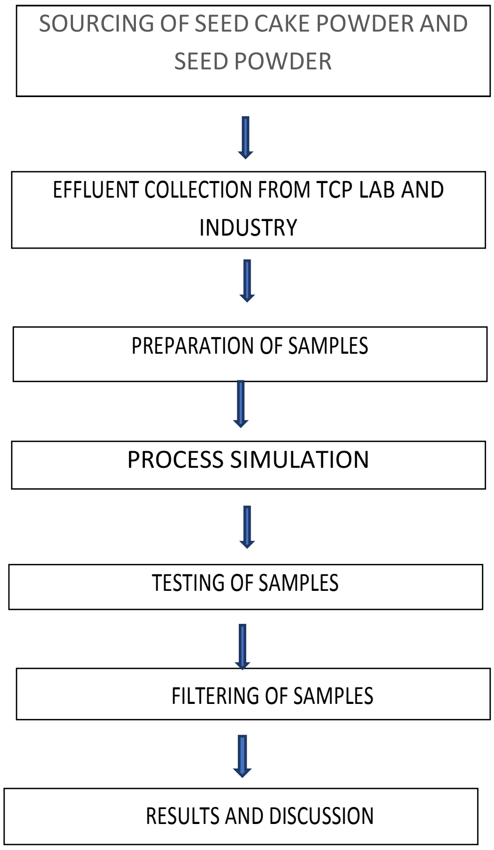
The most usually utilized in the material business are compound strategies that utilization oxidizing specialists like ozone, peroxide of hydrogen, and even bright radiation, these methodologies are suggested as Cutting edge oxidation cycles" and contain reactions outlining engineered oxidation achieving hydroxyl progressives (OH-) talented of corrupting colours to its mineralization, notwithstanding, its vitally restricting variables are the significant expense, complex activity and sometimes, its long debasement time. Then again, one of the most regular techniques utilized in water treatment and sanitization is the physicochemical course of coagulation-flocculation, where substance compounds are utilized, the most utilized are aluminium and iron salts. This physicochemical process is widely used both in developed countries and in developing, for its easy operation and low cost. In any case, when applied in material wastewater, presents a few detriments, like the age of huge volumes of sewage ooze and the incapable decolouration of a few solvent colours. In the area of the textile industry, this mechanism has proved to be inefficient because of its low removal of pollutants. However, this project's aim is to dispense with the use of these chemical coagulants to evaluate the ability of an organic origin coagulant, which was extracted from the seeds of the Moringa Oleifera tree instead.

1.1 OBJECTIVES

- To use a bio-degradable, eco-friendly, non-toxic coagulant

- To reduce the health issues caused by commercial coagulants
- To reduce the sludge toxicity
- To use plants and plant extracts as an alternative to existing toxic chemicals

1.2 METHODOLOGY



2. EFFLUENT TREATMENT

The textile effluent treatment can be done in three steps namely primary treatment, secondary treatment, and tertiary treatment. This step-by-step removal ensures the removal of suspended solids, heavy metals, ions, and color in it.

2.1 PRIMARY TREATMENT

The purpose of primary treatment is to remove the insoluble organic color, miscible, colloidal organics, and suspended solids by coagulation and separation as sledge from clarified water. Primary reductions of COD and BOD values are also enhanced by this treatment. The insoluble organics also are settled along with sledge. Various steps involved in the primary treatment are

- Screening
- Equalization
- Neutralization
- Coagulation and
- Flocculation

2.2 COAGULATIVE PROPERTY OF MORINGA OLEIFERA

Moringa Oleifera prefers hot, semi-arid regions; thus, it develops broadly all through the jungles. Moreover, it is appropriate for marsh development at heights under 600m. This tree is open-minded toward light ices and somewhat basic soils up to pH 9. Its seeds which have viable coagulation properties are very proficient in lessening turbidity, miniature creatures of wastewaters, and furthermore in slime molding. The active agents of coagulation are dimeric cationic proteins with a molecular weight of approximately 13 (kDa) with an isoelectric point between 10 and 11. Coagulation's dynamic part in Moringa Oleifera should eliminate the suspended solids in wastewater by the scope coagulation component.

2.3 CHEMICAL COMPOSITION OF MORINGA

Since the chemical content of plants is affected by the type of soil or climatical condition they grow, it would be expected that there will be variation in the chemical composition reported by different researchers. Likewise, the strategy taken on for investigation and the condition of the leaves i.e., whether fresh or dried could contribute to variation in values obtained.

2.4 CHEMICAL COMPOSITION OF MORINGA

The chromatogram of the methanolic extract of the seeds of Moringa oleifera showed five peaks. These peaks (1-5) indicate the presence of five compounds (1-5) in the extract. The molecular formula, percentage composition, and molecular mass of the compounds are shown in Table 2.2. These compounds comprise mainly hydrocarbons, fatty acids, alcohols, and esters. The constituent of the extract comprises; oleic acid (84%), L-(+) -ascorbic acid- 2, 6-dihexadecanoate (9.80%) 9-octadecenoic acid (1.88%), methyl ester-hexadecanoic acid (1.31%) and 9-octadecenamide (0.78) (Table 2.2). Compound 1 was identified as methyl ester-hexadecanoic acid with a molecular formula of $C_{17}H_{34}O_2$ (m/z 270) and a base peak at m/z 74 which was due to the loss of benzyl group ((C_6H_{13}) from the parent molecule. It constitutes 1.31% of the extract. Compound 2 has the molecular formula $C_{38}H_{68}O_8$ (m/z 652) and constitutes 9.80% of the extract. The base pinnacle happened at $C_3H_5O_2$ (m/z 73). This pinnacle happened because of McLafferty's re-plan. Other prominent peaks observed on the compound occurred at m/z 43 (C_3H_7 +) and m/z 41 (C_3H_5). These pinnacles happened because of the proton movement and revamp. Compound 2 was recognized as L-(+) - Ascorbic corrosive 2, 6-dihexadecanoate. Compound 3 has atomic recipe $C_{19}H_{36}O_2$ (m/z 296) and base top at m/z 55. The compound was identified as methyl ester 9-octadecenoic acid constituting 1.88% of the extract. Compound 4 is oleic corrosive with atomic recipe $C_{18}H_{34}O_2$ (m/z 282) and base top at m/z 55. This constituent is made up of 84% of the extract. Compound 5 was recognized as 9-octadecenamide with atomic equation $C_{18}H_{35}NO$ (m/z 281) and base top at m/z 59. The base peak occurred as a result of the detachment of C_3H_9 (m/z 57) and hydrogen molecule fragments from the compound. It constitutes 0.78% of the extract.

2.5 MECHANISM

The Moringa seed contains a cationic protein in it. Most of the dyes used are anionic in nature. So, there might be interaction and the color are removed. Also, there might be ester formation between the seed cake powder and the components present in the textile wastewater. The suspended solids are removed by means of sweep coagulation. Also, it results in improved particle removal than the destabilization by charge neutralization. Considering the center of the extended solid. The other possible mechanism is adsorption between the suspended particle and seed cake powder. It permits interparticle bridging. This component ordinarily works by a material with a high sub-atomic weight like 1000 kDa. It is not likely for the active component in seed cake powder with a low molecular weight of 13 kDa to induce inter-particle bridging.

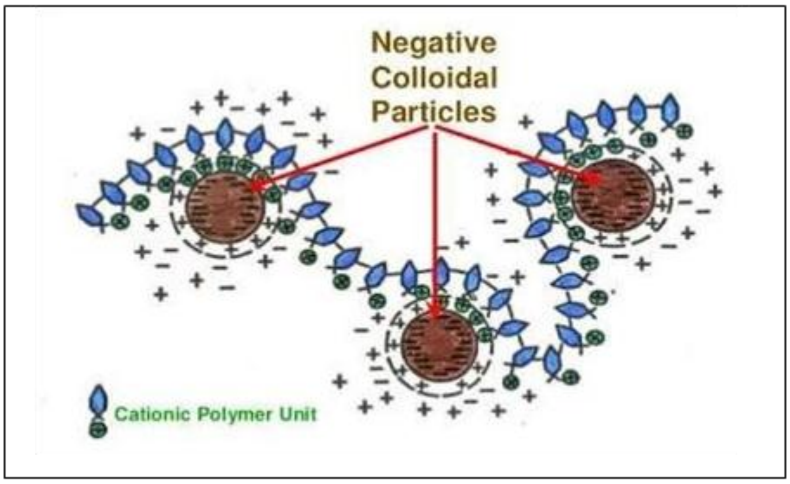


Fig.1 Interparticle bridging

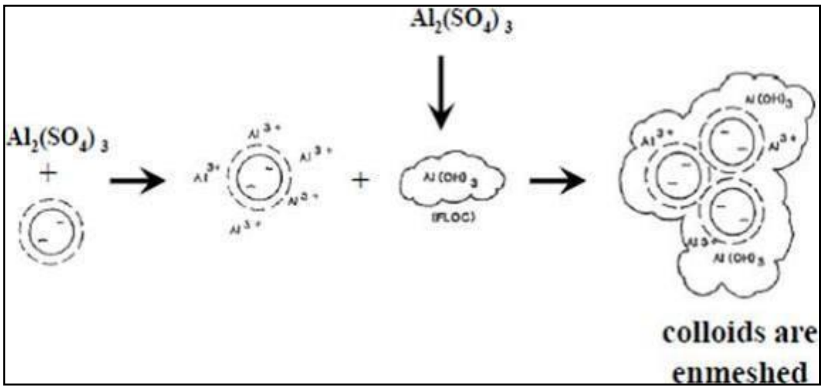


Fig.2 Sweep coagulation

3. CONCLUSIONS

The Moringa oleifera seed cake powder can be termed a techno-economical bio coagulant. The use of the seed cake powder helps to overcome the effects caused by the commercial coagulants such as toxicity, health hazards, more sludge generation, etc. apart from this the moringa seed cake powder showed good results by reducing the TDS and pH values. The color of the effluent was removed by removing the dye component and the turbidity value was also found to be reduced. The BOD and COD values were good for the Moringa seed cake powder treated effluent. The chloride content was low for this treated emanating.

4. SCOPE FOR THE PROJECT

- The presentation of bio-based natural parts for treating the material effluents.
- Making the textile effluent treatment process more eco-friendly through bio-based coagulants.
- Reducing the toxicity and health hazards of the effluent treatment process.
- Valorization of the plant waste to make the textile effluent treatment process a techno-economical process

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