

Coagulation Efficiency of Mangifera Indica Leaf Powder and Curcumin on Treatment of Rubber Effluent

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Abstract – Rubber production has well-established in our country, treatment of wastewater from rubber production plants is still an ongoing issue. Most of the industrial scale rubber production plants are equipped with wastewater treatment facilities. But small-scale rubber producers who cover 75% Indian rubber production have no available treatment facilities. Rubber industry consumes large volumes of water, also uses chemicals and other utilities and produces large amounts of wastes and effluent. Discharge of untreated rubber effluent to waterways results in the water pollution that affects the human health and wealth. For ensuring a new trend towards the sustainable development of the country, the industry needs to focus on cleaner production technology, waste minimization, and proper utilization of waste, resource recovery and recycling of water. The present work deals with the usage of mangifera indica and curcumin powder as the biological method for the treatment of the rubber effluent by the coagulation process and the corresponding characteristics like Turbidity, pH, Hardness, Dissolved oxygen, Biochemical oxygen demand, Total solids, Sulphate etc... are checked.

Key Words: Mangifera indica, Curcumin, Hardness, Dissolved oxygen demand, Biochemical oxygen demand, Total solids, Sulphate

1. INTRODUCTION

The Indian Rubber Plantation Sector is dominated by smallholdings in India, which accounts for almost 88% of the production and area. Of these 95% of production is in Kerala. Mainly large scale rubber industry uses wide area of the effluent treatment methods in order to prevent the pollution in various ways. Large varieties of treatment are going on in the large scale rubber industry. But in the case of small household rubber industry the treatment methods are not properly done. There is no treatment plant or safety measures or the people who produces the rubber sheets in the case of small scale works and also the method of implementation of large equipment and treatment facilities are not feasible for them.

Conventional methods are much better to treat waste water as compare with Coagulation and flocculation which are physical, chemical methods. Chemicals used to treat waste water by clariflocculation generate sludge which is one sort of pollutant. For upgrading conventional methods to treat

waste water, there is a need to think sustainable way to minimize waste by using naturally available materials. The study concentrates over use of natural coagulant for rubber effluent treatment and also quality and uses of sludge generated by using natural coagulants during treatment of rubber effluent. Coagulation and Rapid Mixing Coagulation is the process by which particles become destabilized and begin to clump together. Coagulation is an essential component in waste water treatment operations. Evaluation and optimization of the coagulation/rapid mixing step of the water treatment process includes a variety of aspects. Here optimal coagulant dosages are critical to proper floc formation and filter performance. Maintaining the proper control of these chemicals can mean the difference between an optimized surface plant and a poorly run surface plant. Inadequate mixing of chemicals or their addition at inappropriate points in the treatment plant can also limit performance [1].

Mangifera indica is an important herb in the Ayurveda and indigenous medical systems for over 4000 years. Mangoes belong to genus Mangifera which consists of about 30 species of tropical fruiting trees in the flowering plant family Anacardiaceae. According to Ayurveda, varied properties are attributed to different parts of mango tree. Mangiferins phenolic characteristics have a great role in treatment. Curcumin is a phytopolyphenol pigment isolated from the plant Curcuma longa, commonly known as turmeric with a variety of pharmacologic properties also the Curcumin blocks the formation of reactive-oxygen species.

1.1 Objectives of the study

The main objectives of the study is to compare the efficiency of mangifera indica leaf powder and turmeric on treatment of rubber effluent and also to find out the best biological remedy for the treatment of small scale household rubber effluent

1.2 Scope of study

The study mainly deals with the small scale rubber industry, mainly in houses where the individuals cultivate and produce rubber sheets for their daily requirements and needs. Comparing from the large scale rubber industry these industries does not contain any waste effluent treatment and

there develop a number of environmental issues. It includes high concentration of BOD, COD in the effluent water which are just discharged in to the soil and hence the soil will also get contaminated. The mineral composition of the soil gets changes and hence the growth of the nearby plants gets effected by this process. Moreover the soil acidity also Increases and result in the decreased growth of plants and their non-productivity. In case of workers who works in the process of converting the latex in to the rubber sheets will also affected by this untreated effluent, they will have rashes and other skin diseases when they contact with effluent. These effluents produce a bad odor in the surroundings and also attract flies and mosquitoes and hence the surrounding environmental hygiene will be hardly affected by this untreated effluent. Large implementation of treatment facilities is not possible in the case of this small scale industry so it is necessary to find a solution for this problem which is economically good. This biological method of treatment is the best method since it is cost effective comparing with other treatment methods. Here mangifera indica leaf powder and turmeric powder were used which are highly available and have good coagulation property. By using these two coagulants the coagulation property of individual items are found out and also we can compare both the properties of coagulants, hence the suitable method can be adopted [4].

2. MATERIALS AND METHODS

The effluent was collected from household rubber production sector at Palakkad. The samples were collected in sterilized bottles and were preserved in the refrigerator during storage. Initial characterization of waste water like Acidity, Turbidity, pH, BOD, COD, Sulphate etc... were determined.



Fig -1: Image of effluent

Table -1: Effluent characteristics before treatment

Characteristics	Observed value
Acidity (mg/l)	200
Turbidity (NTU)	32.1
pH	3.48
BOD (mg/l)	3032
COD (mg/l)	7426
Sulphate (mg/l)	864
Optimum coagulant dosage (gm)	Mangifera indica at 120 min
	Curcumin at 120 min

2.1 Preparation of powders

Mangifera indica leaf and curcumin were collected and washed in fresh water these are again washed in distilled water and kept in oven for drying. 24 hr is essential for the leaf drying at a temperature 80°C and 72 hr for curcumin at the same temperature. The dried specimen is powdered in to fine powder and sieved in 75 micron sieve and used as coagulants.



Fig -2: Mangifera indica leaf and its powdered form



Fig -3: Curcumin and its powdered form

2.3 Experimental Setup

Coagulation studies were performed to determine the optimum condition and to study the coagulant dosage and contact time. Each coagulant with 1g, 2g, 3g, 4g, 5g and 6g are mixed with 1000ml of effluent to study its effects. At the end of the desired contact time, the samples were filtered using filter paper and the filtrate was analyzed. Characteristics of effluent after and before treating are also analysed. The parameters include pH, turbidity, acidity, BOD, COD, sulphate are tested.



Fig - 4 : Jar test apparatus

3. RESULTS AND DISCUSSIONS

Mangifera indica and curcumin powder is added into the waste water at various concentrations of 1, 2, 3, 4, 5, and 6g. The optimum coagulant dosage for both the powder was founded as 2g. Further treatment of effluent characteristics with this optimum coagulant dosage was founded and those effluent characteristics are,

Table -2: Effluent characteristics after treatment

Characteristics	Mangifera indica	Curcumin
Acidity(mg/l)	162	153
Turbidity(NTU)	13.2	11.1
pH	4.2	3.9
BOD(mg/l)	2010	1987
COD(mg/l)	5674	5063
Sulphate(mg/l)	676	683

3.1 Comparative Efficiency

The relative efficiency of two coagulants is the ratio of their efficiencies, although often this concept is used where the comparison is made between a given procedure and a notional "best possible" procedure. From which we can identify the best coagulant for the removal of each parameters

Table -2: Comparative efficiency

Characteristics	Efficiency (%)	
	Mangifera Indica	Curcumin
Acidity(mg/l)	19	23
Turbidity(NTU)	14	15
pH	20	17
BOD(mg/l)	33	34
COD(mg/l)	23	31
Sulphate(mg/l)	21	23

4. CONCLUSION

In this study the curcumin shows greater efficiency in the treatment of acidity, turbidity, BOD, COD, sulphate while the mangiifera indica has the efficiency in reducing the acidic content of the effluent. These two biological methods show their efficiency in the reducing effluent property. Their result can be further increased by using them with alum or any other coagulation reagent. This method is beneficial for the small scale rubber industry because they are cost effective and can be further used with a primary treatment. The use of mangifere indica results in the reducing acidic content of the rubber effluent, which produce a lot of health problems in the workers and also the soil nearby the area where this effluent presence is abundant. Plant growth gets effected on those area where the presence of these effluents due to its acidic behavior. Hence the usage of the mangifera indica and curcumin will enhance the better environmental condition of the site. Further the performance can be increased by adding alum or any other chemical coagulant with this treatment method.

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