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Removal of Rhoda mine-B from Aqueous Solution with the Help of Saccharomyces Cerevisiae and Treated Sugarcane Bagasse

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Abstract: ***Water is a important natural resource but because of globalization and industrialization degradation of water takes place. Textile industries play an adverse role in degradation of water. So in present study showed the use of natural biomass for removal of dyes from water source. In this study, Sugarcane biogases got immobilsed with Saccharomyces Cerevisiae yeast for removal of Rhodamine-B dye from aqueous solution. Recent research carried all experiments to get optimum parameter for removal of dye.***

Keywords: Adsorption, Biodegradation, Sugarcane biogases, Textile dyes, Rhodamine-B, Saccharomyces Cerevisiae.

I. INTRODUCTION

Water is a important to human being life and to the healthiness of the surroundings. Water is important and precious natural resource. 71% of earth is covered with water & highest percent of water establish on this planet is held within the oceans. But there is limited used of water for living beings as ocean contains dissolved in it which is not good for human health. Living Beings primarily use the freshwater found in groundwater etc., which is less than 1 % of the earth's supply. Because of globalization water bodies affected many pollutant harms water bodies like major pollutants contain a range of organic and inorganic chemicals like heavy metals and industrial compounds. If the percentage of a pollutant in the water bodies increase beyond safer level for given water use, the water consumption is risky. So it is very important to prevent water to become polluted with contaminants [1].Dyed water is one of the severe pollutant which harms the water bodies, dyed water comes into the contact with ground water which indirectly affect the aquatic life as well as human health.So removal of dye from water become prominent role for environment protection [2][3][4]. In developed as well as developing countries , industrial activities mainly the textile and dyeing Industries are the chief reason of pollution of the aquatic environment [5].

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Henceforth, Researcher did research in order to remove dyes contaminant from water. A variety of biosorbent namely bacteria, fungi and algae can use to industrial and agricultural to remove dye contaminant from waste water by using biosorption method [6]. Biosorption Technique is efficient because recovery is good and cost is less [7]. In recent research showed that in biosorption process, the contaminants stick on the cell surface of organisms like dead bacteria, fungi, algae and lichen and or mount up in cells [8]. For removing the color of the dye, these organisms' dead biomass and waste of any plants which doped with yeast used [9]. This present work was carried out to find out the potential of immobilized Saccharomyces cerevisiae doped on activated sugarcane biogases for removal of Rhodamine-B dye from aqueous solution.

II. METHODS

- ***Bagasse Preparation from waste sugarcane biogases:***

Washed Sugarcane biogases with water to eliminate dirt and sugar particles from it then sun dried for 4 to 5 days in an open atmosphere and then crushed and sugarcane biogases washed with distilled water til the pH of water became neutral. Then the powder was dried out in hot air oven at 90°C at about 4 hours and sieved in order to get particles with same size i.e. 1mm to 1.5mm.This powder used as base biomass material.

- ***Sugarcane Bagasse Treatment:***

Immobilization process carried out by taking 1gm of dried biogases in conical flask which contains 50ml of 2% PEI solution(Polyethyleneimine) then the solution is adjusted by adding HCL to get neutral solution(pH 7.00).Then flask kept into the batch agitator for agitation at 160rpm for 24hours.After completing 24hours of agitation autoclaved it for 20mins in order to get sterilized solution then remove it and washed with distilled water and maintained pH-7. Filtered the suspended material and dried it in hot air oven for 4 hours.

- ***S. Cerevisiae suspension:***

Suspension stock solution made by 1% S. Cerevisiae in distilled water while maintaining pH neutral. A standard solution was formed from a various variety of concentrations of yeast to minimize trial errors and calculate the correct yeast concentration values. UV-Spectrophotometer (*Perkin Elmer*, CE2021 2000 Series) were used to calculate absorbance values of each suspension at 540 nm wavelength of sample [10].

Batch experiments were performed in order to optimize the effect of various parameters such as pH, dose of adsorbent, initial concentration of dye, contact time, and rpm using horizontal shaker (*Labline*, LS-104) on dye removal.

- ***Yeast Cell Immobilization***

Take one gram of pre-treated biogases which was added to 250-ml conical flasks contains 50 mL of 1% standard yeast stock solution which already made and stored.

The flasks kept in batch agitator for agitation at 150 rpm for 24 hours. After agitation yeast got properly doped on biogases biomass which is finally used for removal of dye (Rhodamine-B).

- ***Preparation of Dye Solution***

A stock standard solution of Rhodamine-B dye was made from dye powder. It showed that absorbance value maximum when solution under acidic i.e. pH-2 which observed in one research paper. Removal of dye efficient if solution under acidic condition [11][12].

III. RESULTS AND DISCUSSIONS

1. Effect of Adsorbent Dose (Immobilized Bagasse):

The Dye(Rhodamine-B) removal efficiency was calculated by varying the adsorbent dosage i.e. change in quantity of immobilized biogases from 0.5-3gm/100ml by keeping other parameters constant like initial concentration of dye 5.0 mg/l, 100 rpm, contact time 120 min and 28°C temperature was maintained. In figure (1) it was the percentage removal of dye increases till 83.34%. It observed that initial percentage of dye removal increases as increased in adorbent dosage but after 120 min the percent removal of dye(Rhodamine-B) was decreased due lack of active sites of adsorbent as it got saturated.

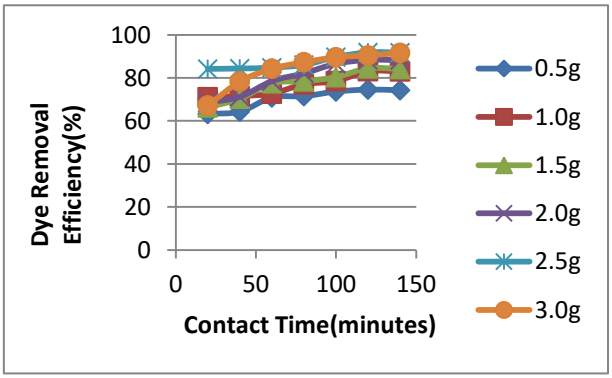


Figure 1: Effect of Adsorbent Dose

2. Effect of rpm

The Dye (Rhodamine-B) removal efficiency from water on effect of rpm speed of agitation as shown in figure (2). The removal of dye percentage was improved with rpm as it attained equilibrium at 100 rpm after two hours. As the rpm increased further than 100 rpm the percent removal was decreased. As the centrifugal forces were acted within the system the contact area between adsorbent and adsorbate was reduced i.e. contact between the dye and immobilized biogases decreased.

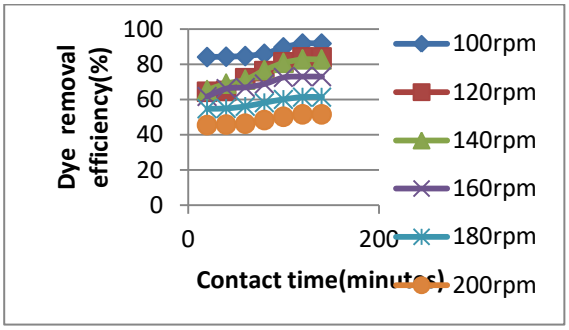


Figure 2: Effect of rpm

3. Effect of Dye concentration(Rhodamine-B)

The effect of dye concentration was carried out by using the dye concentration 5 mg/l to 25 mg/l and other parameters were kept constant such as pH 7, biosorbent dose 2.5 gm/100ml, 100 rpm at room temperature. All experiment was carried out under contact time of 120 minutes as it showed maximum adsorption. It was found that effect on dye removal efficiency was decreased by increased in dye concentration. It observed that maximum removal at 5 mg/l dye fluoride concentration as shown in figure 3. As many scientist concluded that by research as ppm of aqueous solution increased so there might be unavailability of adsorbent which was sugarcane biogases doped with S. Cerevisiae in this case. So adsorption was less.

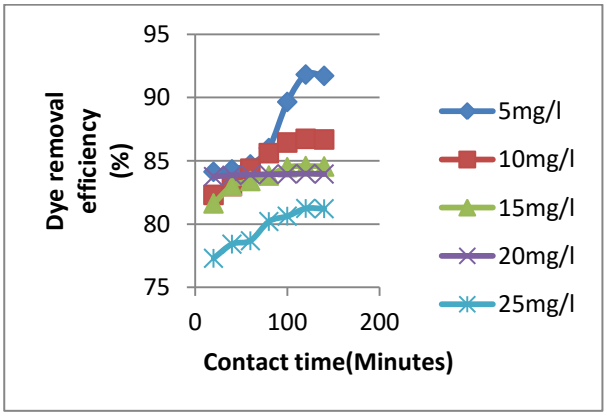
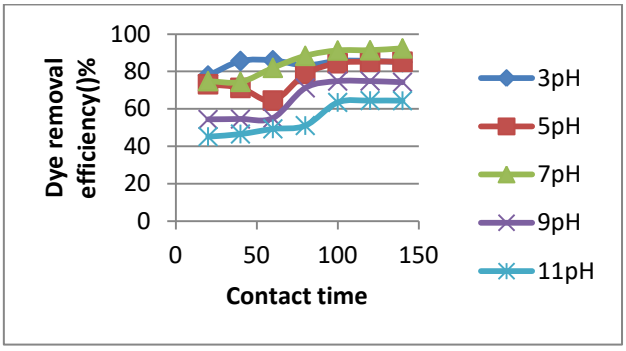


Figure 3: Effect of Dye Concentration

4. Effect of pH

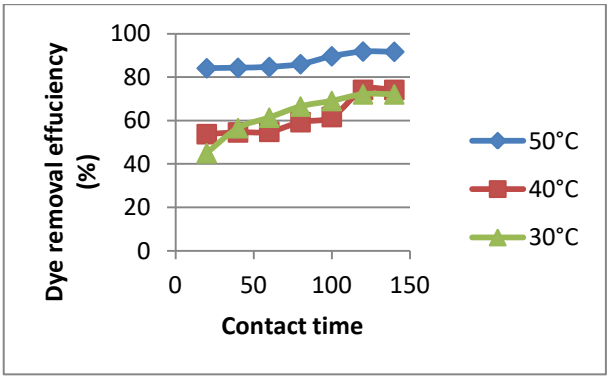
Effect of pH on adsorption of immobilized sugarcane biogases on removal of dye of aqueous solution with difference of contact time shown in figure 4. It observed that amount of fluoride adsorption on the system decreased by increased in pH from 3 to 11. The Effect of pH played an important role as it was directly related to the interaction of adsorption system.At pH 3 maximum sorption observed. As pH increased adsorption decreased despite of RH (Rhodamine -B) formed cationic molecules still adsorption was good in acidic condition. It showed that electronic interaction did not play an important part in adsorption. In addition, the tiny monomeric RB might be got distributed into the micropores of the adsorbent particle more than the dimer form [13].



5. Effect of pH

6. Effect of Temperature

The effect of temperature on dye removal efficiency was approved three various temperatures (30°C, 40°C and 50°C) by keeping all other experimental parameters at optimum condition as shown in figure 5. It was observed that as increased in time the adsorption capacity was also increased and maximum removal of dye from aqueous solution increased.



5. Effect of Temperature

IV. CONCLUSION

Batch experiment were carried out on immobilized sugarcane biogases doped with Saccharomyces cerevisiae yeast for removal of rhodamine-B dye showed various parameter such as dye concentration, pH, rpm, temperature, dosage of adsorbent with contact time. At lower pH range dye removal capacity increased. It means acidic condition of aqueous solution was more suitable for adsorption of dye on immobilized sugarcane biogases doped with yeast.

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