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# ADSORPTION STUDY ON REMOVAL OF BASIC DYE BY MODIFIED COCONUT SHELL ADSORBENT

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## ABSTRACT

*Adsorption process are most widely used treatment methods to remove certain pollutants from water and wastewater. The biological treatment processes and adsorption are together commonly used for treatment of dye effluent. Although many commercial adsorbents are preferred, the researchers go in search of alternative low-cost adsorbents. In this study, application of Coconut shell which has been modified to remove Brilliant Green dye (BG) has been investigated. Adsorption of dye was effective with this adsorbent and removal percentage depends on dye molecules in wastewater.*

**Key words:** Brilliant Green (BG), Coconut shell, Adsorption, Adsorbent.

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## 1. INTRODUCTION

Development of industries has led to the problem of many types of pollution. Because of scarcity of water in many areas we are in need to preserve the available water. When population has started to increase, demand also increased. Earlier it was believed that the water bodies like oceans were very large to pollute.

Many types of wastes from industries are produced by various processes in industries which releases materials that are noted as useless while manufacturing a product. Industrial wastes are in various forms like toxic waste, chemical waste, industrial solid waste and municipal solid waste.

Many industries discharge wastewater including coloring dyes as sediments which leads to various many health hazards. Most of the dyes used are not biodegradable. They cause water pollution and severely affects the environment mainly aquatic ecosystem.

Adsorption is the best processes to treat dye wastewater. Previously only widely used adsorbents were in practice for treatment purposes but many researches are now conducted to use cheaply available natural materials.

## 2. METHODOLOGY

### 2.1. Coconut Shell

Coconut Shell was cleaned with water and dried. Then powdered and sieved. Then soaked in dilute  $H_2SO_4$  and again dried oven. Now the chemically modified natural coconut Shell was obtained as adsorbent.

### 2.2. Brilliant Green (BG) dye solution

Brilliant Green Dye sample was made by mixing the dye in water.

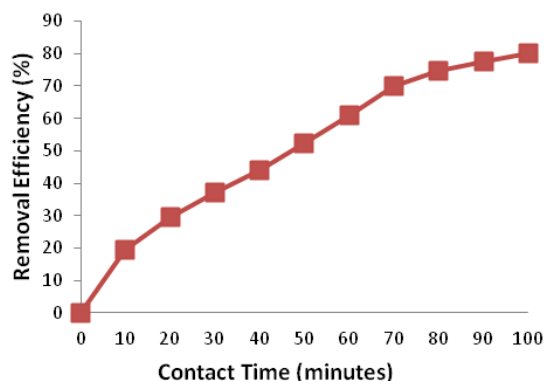
### 2.3. Experimental batch mode

The experiment was conducted in an orbital shaking incubator and 50 mg of coconut shell powder is taken with 20 ml of BG dye aqueous solution. After certain time, concentration of BG dye was analysed.

## 3. DISCUSSIONS

### 3.1. Study of contact time

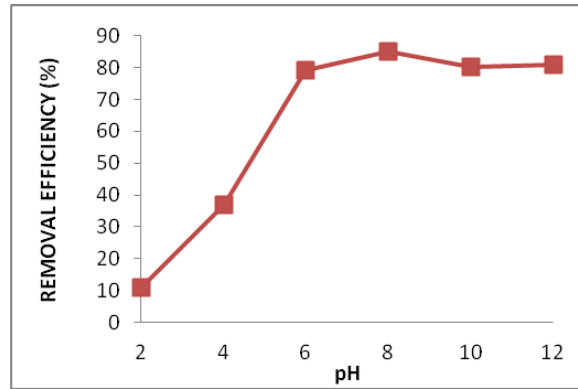
The study of contact time was conducted with initial BG dye concentration of 10mg/L and with 50mg of adsorbent and pH adjustments. The adsorptive removal of BG dye by coconut shell without varying concentration initially has been shown in fig.1. There was no change in removal of dye after 100 minutes.



**Figure 1** Study of time of contact on basic dye Brilliant Green Adsorption using Coconut Shell

### 3.2. Study of pH

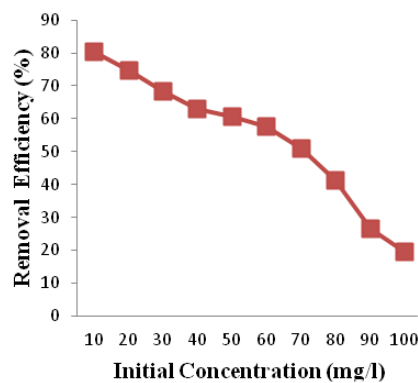
The variation of pH was conducted with 10mg/L of BG dye. The values of pH were between 2 to 12. This resulted in tremendous adsorptive removal of BG dye. This clearly shows that ions like  $H^+$  or  $OH^-$  helps in BG dye adsorption by coconut shell.



**Figure 2** Study of variation of pH on adsorptive removal of Brilliant Green by Coconut Shell

### 3.3. Study of variation of BG dye concentration

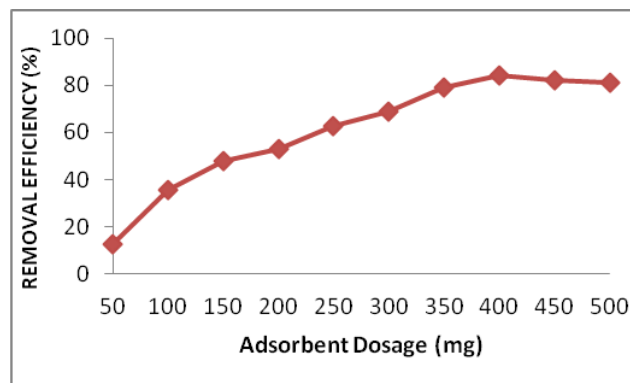
The concentration of BG dye was varied. It is significantly proved that at low concentration, the dye molecules to the available surface area is very less and the adsorption becomes independent of dye. But at large number of dye molecules the available places becomes low and thus the adsorptive removal of BG dye is depends on its dye molecules initially.



**Figure 3** Study of initial concentration on adsorptive removal of BG Dye by Coconut Shell

### 3.4. Study of Coconut shell adsorbent dosage

The study of dosage of coconut shell on adsorptive removal of dye at same concentration was studied by varying dosage of coconut shell from 50 mg to 500mg. It shows that adsorptive removal increases with increase in the coconut shell dosage. It is due to surface area of Coconut Shell and due to many sites of adsorption.



**Figure 4** Study of dosage of coconut shell on adsorptive removal of BG Dye

## 4. CONCLUSION

Adsorptive removal of Brilliant Green (BG) dye with chemically modified Coconut shell has been conducted and observations were made. The rate of adsorptive removal becomes less with increase in concentration of dye initially. Optimum contact time after adsorptive removal was 100 minutes. The adsorptive removal of BG dye is due to variation in pH. Adsorption of BG dye seems to be higher with time. Initially, the adsorptive removal of BG dye is rapid due to large number of free sites and later it decreases due to saturation of these active sites.

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