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DECOLOURISATION OF DYE SOLUTION USING VARIOUS FRUIT PEELS AS ADSORBENT

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ABSTRACT - Use of various dyes in order to colour the products is a common practice in composite knit industry. The presence of these dyes in water even at low concentration is highly visible and undesirable. This study was carried out for the utilization of various fruit peels as adsorbent for the removal of dyes from wastewater. This experiment was performed in the laboratory scale. The materials were obtained and treated for the removal of dyes at different doses. Initially we have taken orange, banana and Water melon peel as adsorbent at different dosages. These three adsorbent were used in dye solution like methyl blue, Congo red and malachite green dyes and its percentage of decolourisation was studied. At 1PPM solution orange peel has effective colour removal of 79.71% over methylene blue. Water melon and banana has removal capacity of 62.85% and 34.28 % respectively. The other dye solution has very less effect over orange peel as 25.75% for Congo red and 44.4% for malachite green. The increase in concentration of solution has very less decolourisation percentage.

Keywords—**Dye removal, fruit peel, Adsorbent, % removal, Batch studies. Comparison.**

I. INTRODUCTION

The textile industry require a large volume of water for their processes and the waste water discharged from the mill is equally large and of polluting nature. Many dyes and their break down products may be toxic for living organism. Therefore, decolourisation of dyes is an important aspect of wastewater treatment before discharge. Adsorption is a widely used for removal of dyes from wastewater. Activated carbon is the most widely used adsorbent for this purpose because it has a high capacity for adsorption of colour but its use is limited because of high cost. A number of non-conventional low cost adsorbent used for dye removal, include fruit waste. The present study is to explore the feasibility of fruit peel as a low cost natural adsorbent against various dye solution. In this study we have chosen, orange peel, Banana peel, and Water melon peel as adsorbent against dye solution like methylene blue, Congo red and Malachite green.

II. PROPOSED METHODS & MATERIALS

Waste fruit peels were obtained from the local fruit stall. These peels then dried in sunlight for one week and ground to a fine powder. The powdered material of peels were selected for the batch adsorption and pH study. Both the materials were dipped in a 1N HCl for 5 hrs then washed with distilled water, dried and used for the study. The colour concentration was determined using colorimeter.

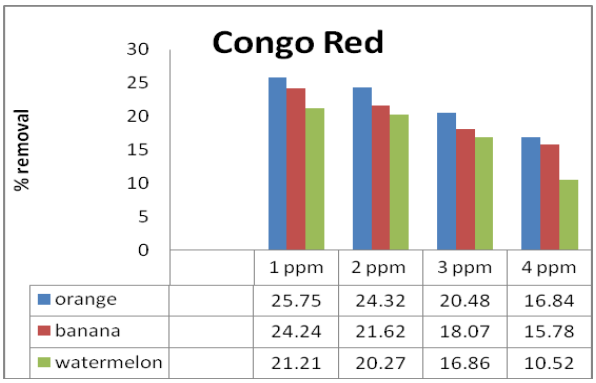
The batch adsorption experiments were conducted to study optimum removal of colour from textile wastewater.

Dye solutions were prepared from 1 ppm to 4ppm and 2 gms of adsorbent was added and stirred using a shaker for about 15 minutes. After 15 minutes of adsorption process, samples were taken and analyzed using calorimeter.

$$\% \text{ Decolourisation} = \{(Co - Cf) / Co\} * 100$$

The experiment was carried out at 30 deg C in an orbital shaker of around 150RPM. The contents were filtered using whatman filter paper 42.

III. EXPERIMENTAL RESULTS



	1 ppm	2 ppm	3 ppm	4 ppm
orange	25.75	24.32	20.48	16.84
banana	24.24	21.62	18.07	15.78
watermelon	21.21	20.27	16.86	10.52

Fig-1 Decolourisation of Congo red

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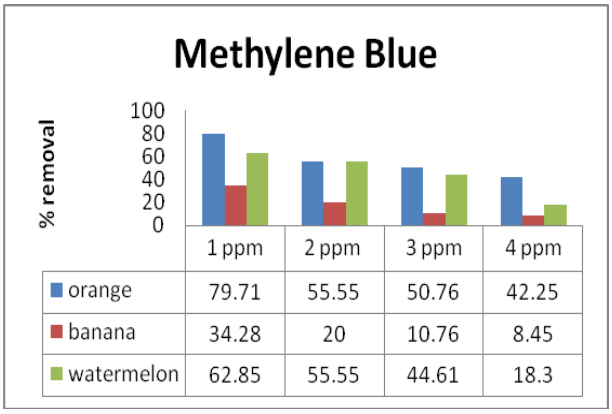

Fig-2 Decolourisation of Methylene Blue

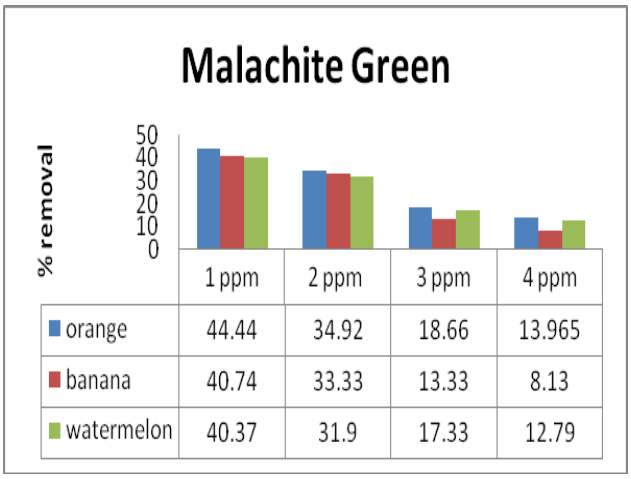

Fig-3 Decolourisation of Malachite Green

Effect of different adsorbent over dye solution was studied at a concentration level of 1 to 4 ppm. The pH of solution was maintained at 7 in a room condition of 30 deg C. The orange peel has higher percentage of colour removal of 79.71% over methylene blue solution. Also orange peel has some effect over other dye solution and it removes 44.4% malachite green and 25.7% congo red solution. When the concentration of dye solution was increased the effect of adsorbent was minimul and colour removal is quite low. This is due to increase in concentration of dye solution with low amount of adsorbent. Throughout the batch studies only 2 gms of adsorbent was used for all concentration of solution.

Next to orange peel, water melon peel has some significant amount of colour removal over dyes. It removes 62.8% of methylene blue solution and 40.3 % malachite green for 1ppm solution.

Banana peel has the lowest colour removal percentage. It removes only 34.28% of methylene blue. But, the banana peel has some significant over malachite green dye solution. It removes 40.74%, when comparing to other dye, it is quite higher colour removal for banana peel.

IV. CONCLUSION

It may be concluded that the removal of various dyes from wastewater by adsorption on orange peels has been found to be useful for controlling water pollution due to dyes. It is found that increase in concentration may affect the colour removal capacity of adsorbent. Future work should be carried out to study the effect of contact time, pH, Adsorbent dosage and also whether it follows Langmuir and freundlich Isotherm. The Orange peel can be used for removal of colour from the waste water and increasing use of agro based bioadsorbent can be seen in coming decade for removal of dyes from wastewater. Orange peel has good potential as a low cost adsorbent for improving the effectiveness of waste water treatment.

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