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PERFORMANCE EVALUATION OF MUSA ACUMINATA AS AN ADSORBENT IN COLOUR REMOVAL

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Abstract: **The experimentation was carried out to evaluate the color adsorption potential of banana pith using Bench scale studies, under different experimental conditions viz dosage (0.2, 0.4, 0.6, 0.8, 1.0, 1.2, 1.4)g/mL, Color intensity, Particle size of the adsorbent The results of experimentation carried out to evaluate the performance of Bench Scale studies in removing colour by the adsorbent Banana Pith under varied experimental conditions are presented The optimum removal of colour was 91.12 % at 1.0 g of banana stem adsorbent in 100 mL of sample. After this, the removal of colour slightly decreases to 88.5%**

Keywords—**Adsorbent,colour removal, spectrophotometer.**

I. INTRODUCTION

The textile industries are the major source for coloured wastewater production through their industrial process. Colour are used in large quantities in many industries including textile, leather, cosmetics, paper, printing, photographic, plastic, pharmaceuticals, food, etc. to colour their products. Though colour is considered to be very important from the aesthetic point of view but they are toxic in nature. These industries use about 10,000 different commercial colour and pigments and produce more than 735000 tonnes of synthetic colour annually worldwide . Since most of these colour are toxic in nature their presence in industrial effluents is of major environmental concern because they are usually very recalcitrant to microbial degradation. Colour are organic compounds which have complex aromatic molecular structure that make them toxic and harmful. The combination of the processes and products make the wastewater from textile plant contains many types of pollutants. The textile printing and dyeing industry use large volume of fresh water and equally produce wastewater through the process. It contains various waste chemical pollutants such as sizing agents, wetting agents, complexing agents, colour, pigments, softening agents, stiffening agents, fluorocarbon, surfactants, oils, wax and many other additives which are used throughout the processes "**the aim of this study is to find out the potential adsorbent from locally available material for colour removal from wastewater**".

Banana stem is an agriculture plant waste which is among the most popular fruit grown in Asia particularly India, Thailand, China, Indonesia, and Malaysia. A few tons per hectare of the banana stem have been estimated annually and this can lead to disposal issues. Several studies on activated banana stem and banana peel adsorbent have been conducted by the previous researchers. However, the study on agricultural waste using natural banana stem is still limited and need to be explored as an alternative to remove colour in textile wastewater. The aim of this study was to investigate the potential use of banana stem as adsorbent media for the removal of colour from Textile waste water. The effect of various adsorbent dosage and contact time were evaluated.

II. MATERIALS & METHODOLOGY

The experimental consists of three plastic container of internal diameter 18 cm and length of 30 cm. Column was mounted on a stand and cotton will be placed at the bottom of the column which acts as a supporting material for the adsorbent. Constant head was maintained using two aspiratory bottles which were placed at different heights for gravity and constant flow. Prior to each experiment distilled water will be passed through the column to get rid of the column contaminations and air bubbles. Synthetic coloured samples of known concentration will be passed through two aspiratory bottles and then it will be passed into the column containing adsorbent and the samples will be collected in sample bottles. Then the collected samples will be analyzed by using **Spectrophotometer.**.

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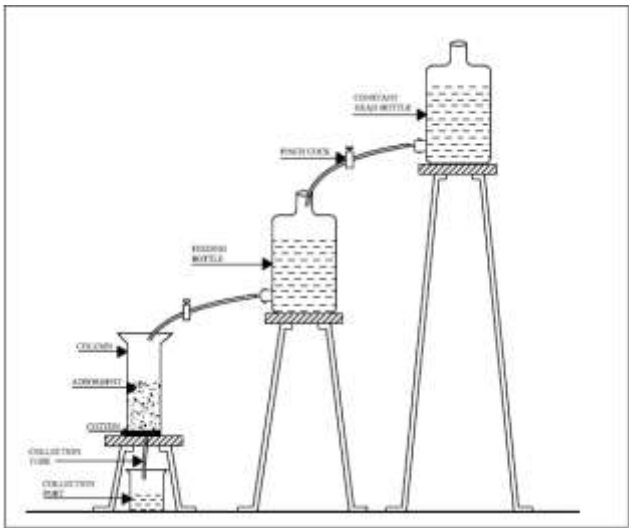

Schematic representation of experimental setup.

Fig. 1. **Systematic Arrangement of Experimental setup**

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Materials.

Musa acuminata.

Banana (Musa acuminate) is a popular fruit worldwide due to its flavour, texture, nutritional value, and convenience of being easy to peel and eat. It contains a lot of nutrients and minerals that are beneficial to health. Its **vitamin C** content, which is regarded as a familiar antioxidant, is 15%. Bananas are usually harvested before being fully mature for domestic consumption

Preperation of adsorbent

After drying process, the cutted pieces of Banana pith was grinded for 5 minutes to acquire its required size then different sizes of adsorbent powder is collected.

Sieves.

For further preparation of adsorbent we use sieves of different sizes to obtain required size of adsorbent . the sizes of sieves we used are,300µ passing and 150µ retaining. The sieves are washed with distilled water to remove dust particles and sun dried to remove moisture for to get the better performance of adsorbent.

Experimental setup

The experimental setup consists of three plastic container of internal diameter 18 cm and length of 30 cm. Column was mounted on a stand and cotton was placed at the bottom of the column which acts as a supporting material for the adsorbent. Constant head was maintained using two plastic container which were placed at different heights for gravity and constant flow. Prior to each experiment distilled water was passed through the column to get rid of the column contaminations and air bubbles. Textile coloured samples of known concentration were passed through two plastic container and then it was passed into the column containing adsorbent and the samples were collected in sample container. Then the collected samples were analyzed by using Spectrophotometer.

III. EXPERIMENT AND RESULT

The results of experimentation carried out to evaluate the performance of Bench Scale studies in removing colour (Sunset Yellow) by the adsorbent Banana Pith under varied experimental conditions are presented in table 1 and by graphs. Based on the experimental observations, the discussions were made and thereby inferences were drawn.

Removal efficiencies recorded for two initial concentrations of Sunset Yellow indicated that better removal can be achieved at lower initial concentrations. Further the results. Again at lower particle size of adsorbent where in surface area will be maximum, better removal efficiency was observed.. Therefore within the limits of experimentation variables studied. It is inferred that Banana Pith can adsorb the Sunset Yellow under the optimum condition of Particle size-300-150µ.

It can be observed that the removal of colour increased significantly when the dosage from 0.2 to 1 g. Increase in adsorption of colour with the banana stem adsorbent dose can attributed to increase surface area of adsorbent and the availability of active site increase. The optimum removal of colour was 91.12 % at 1.0 g of banana stem adsorbent in 100 mL of sample. After this, the removal of colour slightly decreases to 88.5%. As the dose of banana stem adsorbent increases, not much change in adsorption is observed. This phenomenon indicated that active sites were fully occupies, due to the limited capacity of banana stem adsorbent to adsorb high amount of colour.

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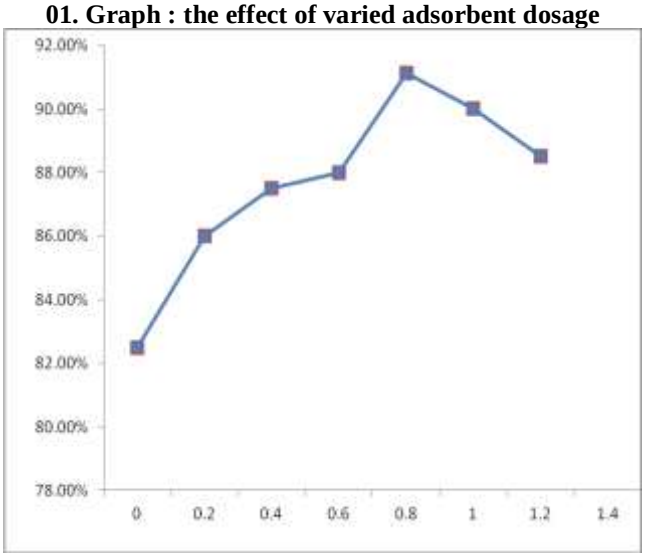
Table.1 Results of Column Studies on textile water (Particle Size of Adsorbent : 300-150µ)

Dosage of Adsorbent (g/100mL)	Percentage Removal
0.2	**82.50%**
0.4	**86.00%**
0.6	**87.50%**
0.8	**88.00%**
1.0	**91.12%**
1.2	**90.00%**
1.4	**88.50%**

01. Graph : the effect of varied adsorbent dosage



IV. CONCLUSION

1. Banana stem adsorbent has the capability to remove colour for textile wastewater. The adsorbent removed **91.12%** of colour at optimum dosage of 1.0 g in 100 mL.
2. It is concluded that, the particle size of the adsorbent has good bearing on the removal efficiencies and exhibited inverse relation in the present work..
3. It is concluded that the maximum colour removal by the adsorbent can be achieved at adsorbent particle size of 300-150 µ.
4. It is concluded that the maximum dye removal efficiency of Banana Pith in removal of colour from textile water under optimum condition will be 62.1%.

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