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A Study on Bioadsorption of Synthetic Dye Using Guava (*Psidium guajava*) Leaves

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Abstract:-

- ***Background:***

Guava (Psidium guajava, white Indian) is common fruit bearing plant found throughout the Indian peninsula. It is said to be native to Mexico and Southern America and now can be found in many of the Asian countries. It is grown in tropical and sub-tropical region around the world. Guava leaves have shown many properties like antibacterial, bioadsorbent, etc. The bioadsorbent property can be exploited to remove coloured residues from water bodies. Problems like water pollution have arisen due to rapid industrialization and urbanization. Various harmful dyes like Coomassie brilliant blue, used in both textile industries and laboratories, are expelled into water bodies. To reduce the effects of such dye on ecology the research was carried out using guava leaves as bioadsorbent. That being the case the Coomassie brilliant blue solution at different pH was treated with guava leaf powder and the decrease in absorbance was noted at 625 nm.

- ***Material and Methods:***

The Guava leaves were obtained from Mumbai suburban. The leaves were dried and powdered for further testing as bioadsorbent. All the chemicals have been used were of analytical grade.

- ***Result:***

The study showed high absorption rate in acidic medium as the colour changed from dark blue to light blue. The optimum pH for bio-adsorption was found to be 3. As the amount of guava leaf powder increased, the rate of adsorption also increased.

- ***Conclusion:***

Guava leaf powder is effective as a bioadsorption as rate of adsorption increases with increase in guava leaf powder. With further optimization it can become potential source of adsorbent.

Keywords:- *Guava, Leaf Powder, Bioadsorption, Coomassie Brilliant Blue, Low Cost Bioadsorbent.*

I. INTRODUCTION

Guava (*Psidium guajava*) is familiar fruit bearing plant found all over the Indian peninsula. The Spanish first observed the fruit in Mexico and from there it was taken to various parts of the world. There are different varieties of guava plant depending upon its flesh colour. The pulp also shows high concentration of beta-carotenes, lycopene, beta-cryptoxanthin and polyphenols which has given plant its anti-antioxidant properties along with vitamin C which is found 5 times more than the oranges[5]. The leaves of guava plant show presence of many volatile oils and other chemical compounds which gives them characteristic fragrance and other medicinal properties. The guava leaves extract shows many medicinal properties like antibacterial, antifungal, anti- inflammatory etc. [1].

II. METHODS AND MATERIALS

The guava leaves sample was obtained from residential area in Ghatkopar east, Mumbai- 400 075. The leaves were fully matured, green in colour.

Study Design: Colorimetric assessment of subsiding dye colour
Study Location: The study was conducted in Ramnarain Ruia Autonomous College, Matunga, Mumbai, Maharashtra.
Study Duration: September 2019- December 2019

- *Procedure Methodology:*

The guava leaf powder was prepared by method given by Rabia Rehman[6]. Guava leaves were collected from home garden. The adsorbent was washed in order to remove dust particles and impurities and then air dried, followed by oven drying at 70°C for two hours. This is the sample of the untreated bio-adsorbent. Bio-adsorbent was chemically treated with acetone by dipping 100 g of dried powder into 400 mL of acetone solution for 24 hours. After filtration, it was again dried out in oven at 70°C for two hours. The bio-adsorption of synthetic dye was carried out by suspension method [7] [8]. The dye was prepared by mixing 1g of Coomassie brilliant blue in citrate buffer, having concentration of 20mg/L.

Fig 1:- Guava leaf powder

III. RESULTS

➢ *Effect of pH*

In accordance with fig. 2, maximum adsorbance was seen at pH 3. Heeding to the further study the optimum pH was found to be 3.2, in the pH range 2.8- 3.6

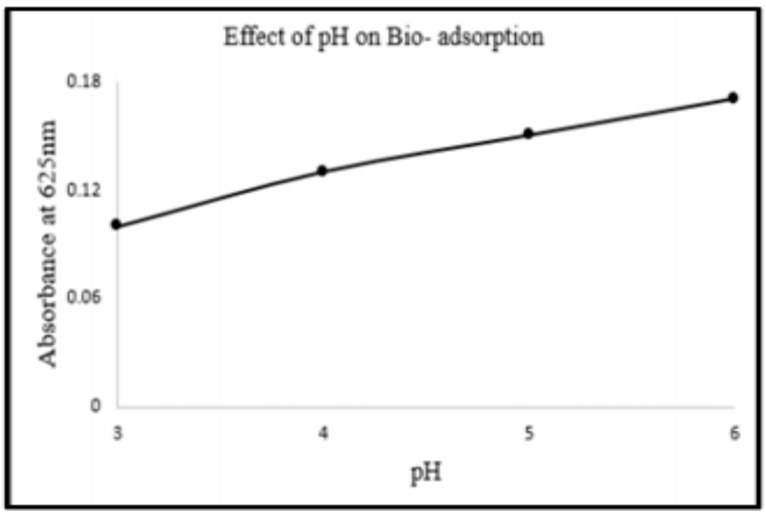

Fig 2:- Bioadsorption at different pH range (a)

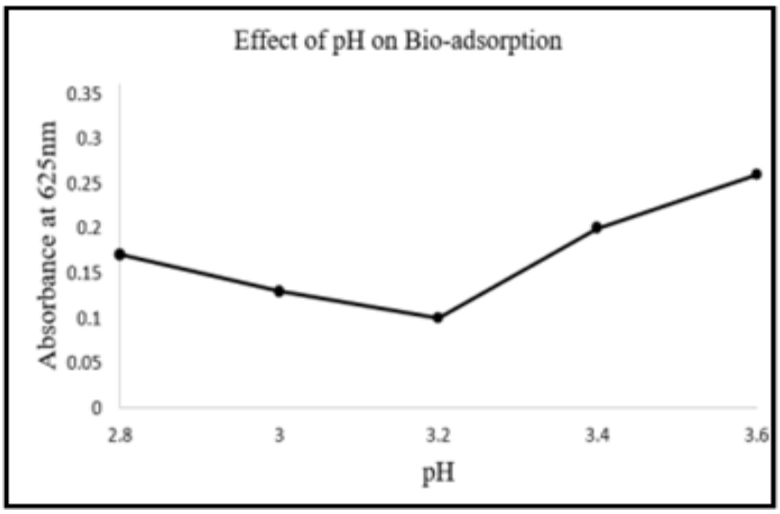

Fig 3:- Bioadsorption at different pH range (b)

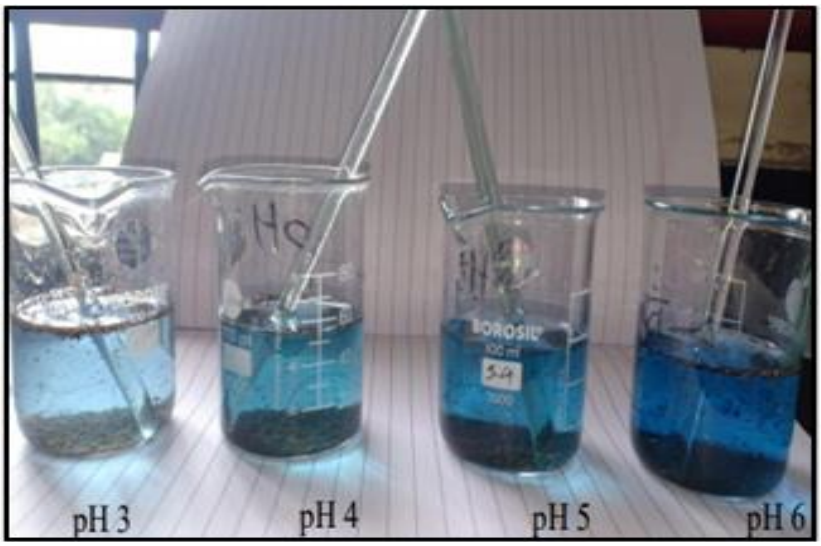

Fig 4:- Bioadsorption at different pH range (b)

- *Effect of addition of different amount of guava powder:*

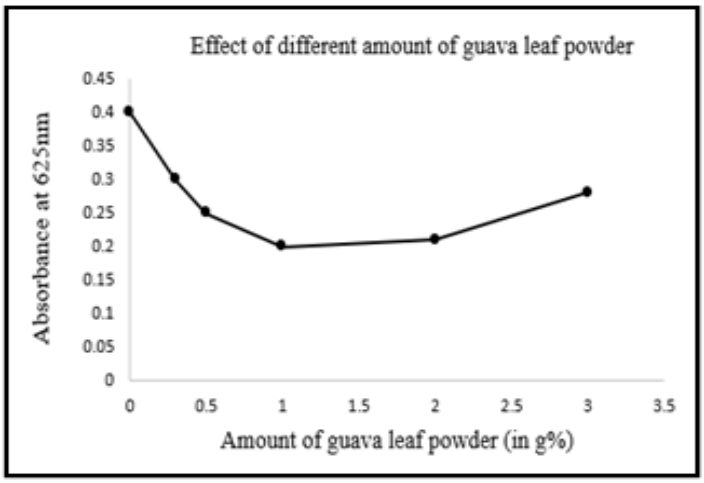

Fig 5:- Graphical representation of different amount of guava leaf powder

According to fig. 5, without addition of guava leaf powder the maximum absorbance of dye was found to be 0.40 After addition of guava leaf powder decrease in absorbance was noted. Upon addition of 1g% guava powder, absorbance decreased up to 0.2.

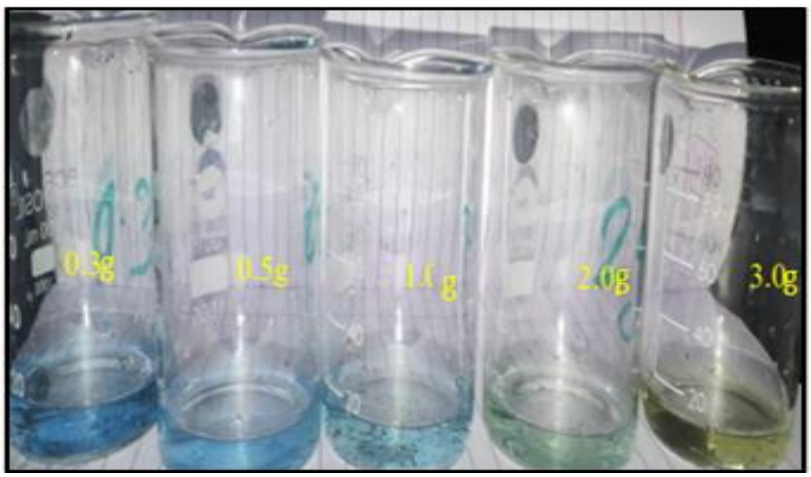

Fig 6:- Effect of addition of different amount of guava leaf powder on dye adsorption

IV. DISSCUSSION

The study was carried out on potential use of guava leaf powder as bio-adsorbent. The leaf powder was activated at 100^0C- 150^0C for 2hours. This temperature range was used to study adsorption efficiency of guava leaf powder. The increase in activation temperature, increased the adsorption capacity of guava leaf powder as the colour of solution changed from dark to light blue in short period of time. The pH of the solution also played an important role in the adsorption rate. The variation in pH range of dye was made by making dye in citrate buffer of range 3-6. The rate of adsorption decreased as the pH keep on increasing. The optimal pH was found to be 3. With regards to difference in amount of leaf powder added, 0.5- 1.5g% of powder can be added for better adsorption. After addition of 2g% or more powder the colour of solution changed from light blue to light green to olive green.

V. CONCLUSION

As guava showed increased rate of bioadsorption, guava leaves are effective bioadsorbent. Since addition of large quantity of guava powder produces green coloured solution, its amount must be optimized before inclusion. The maximum adsorption was observed at acidic pH making it suitable to treat acidic effluent. Owing to its good adsorption capacity, the bioadsorbent can be further investigated for its feasible use.

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