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Adosrption of Rhodomine B on different plant leaf powder

Shashi Bala, Sharmila S* and Jeyanthi Rebecca L

Department of Industrial Biotechnology, Bharath University, Chennai, India

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ABSTRACT

Dyes from industrial and laboratory waste are major water pollutants. Most of the dyes are stable to degradation. In this, the removal of Rhodamine-B from its aqueous solutions by adsorption on different plant leaf powder such as Annona squamosa, Manilkara zapota and Prosopis julifora were studied. The effects of various experimental parameters on adsorption such as pH, dye concentration and sorbent dosage were examined and the optimal experimental conditions were evaluated. The maximum removal of color was achieved by Annona squamosa with dosage of 1gm/100ml of effluent at neutral pH. In acidic pH (5.6) Manilkara zapota reduced more color (68.33%).

Keywords: dyes-*Annona squamosa- Manilkara zapota - Prosopis julifora*- adsorption.

INTRODUCTION

Industrial wastes are composed of various harmful chemicals. Dyes are one of the major water pollutants affecting agriculture and the aquatic environment. Since treating of dye effluent from textile industries is cost affair, industries illegally releasing their colored effluent without treatment directly to the nearby water bodies. A total of 10–15% of the world production of dyes is lost during the dyeing process and is released in textile effluents [**H. Zollinger**]. These harmful effluents affect the water plants, fishes and also agriculture. Adsorption is the most effective method to treat the colored effluent. Activated carbon is widely used as a adsorbent to treat the effluent which has different classes of dyes. Due to high cost of activated carbon, much research has been carried out to cheaper adsorbents like pearl millet husk, date pits, saw and buffing dust of leather industry, coir pith, crude oil residue, tropical grass, olive stone, almond shells, pine bark, rice and wheat husk, wool waste, de oiled soya, coconut shell, jackfruit peel, as a carbonaceous material [2-9]**,** plum kernels [10], chitin [11], peat [12], natural clay [13], boiler bottom ash [14], bagasse pith [15], orange peel [16], banana pith [17], tea leaves [18], pea shells charcoal [19], perlite [20], chitosan [21], eichhornia ash [22], bagasse fly ash [23], lemon peel [24], bottom ash [25] etc., as adsorbent for the removal of dye from effluent.

Rhodomine B is a red dye used to dye silk and wool. It is also used as a biological staining agent in combination with auramine-O in biomedeical research [26]. Even though the amount of these stains used in the laboratories are smaller, their high concentration affects the penetration of light in to the water bodies thereby affecting the photosynthesis reaction.

The present study investigates the adsorption of Rhodamine-B (RB) on a naturally occurring cheaper source of adsorbent, namely, *Annona squamosa, Prosopis julifora* and *Manilkara zapota* which is available in plenty in India. Various parameters affecting the adsorption have been studied. The current study was carried out to find out the possibility of using fresh leaf powder as an adsorbent rather than its carbonaceous material.

EXPERIMENTAL SECTION

Preparation of adsorbent

The leaves of *Annona squamosa*, *Prosopis julifora* and *Manilkara zapota* were collected from Madambakkam panchayat, Chennai, Tamil Nadu, India. The leaves were dried under sun light for 24 hrs. Then the dried leaves were powdered nicely using mixer and were used as a leaf powder adsorbent (LPA).

Preparation of dye solution

An aqueous solution of rhodomine B with concentration of 0.12 gm/l (25mM) was prepared using distilled water and the pH was checked.

Treatment process

An aliquot of 100ml of dye solution was treated for seven days with various amounts such as 2g, 1.5g, 1g and 0.5g of *Annona squamosa, Prosopis julifora* and *Manilkara zapota* leaf powder which acted as an adsorbent. Different pH was maintained in the treatment (5.6, 7, 7.5).

After the seventh day, the OD was taken using calorimeter at 540nm for all treated samples. Using standard graph the concentration of dye was calculated and the percentage removal of color was estimated using the following formula;

$$\% \text{ Removal} = ((C_o - C_f) / C_o)*100$$

C_o is the initial concentration of dye (g/l)
C_f is the final concentration of dye (g/l)

RESULTS AND DISCUSSION

The use of plant material as a dye adsorbent was analyzed in this study.

Reduction of color with different adsorbent level

The maximum removal of dye was achieved by *Manilkara zapota* plant leaf powder (68.33%) with minimal amount of adsorbent (0.5g) followed by *Annona squamosa* (66.66%/0.5 g of adsorbent) and *Prosopis julifora* (64.16%/ 1g of adsorbent) at pH 5.6.(Table.1,2,3)

Table.1 Sample treated with *Manilkara zapota* leaf powder

Amount of adsorbent (gm)	Final concentration of dye after adsprption(g/l)	% Removal
2	0.05	58.33
1.5	0.052	56.66
1	0.051	57.5
0.5	0.038	68.33

Table.2 Sample treated with *Annona squamosa* leaf powder

Amount of adsorbent (gm)	Final concentration of dye after adsorption(g/l)	% Removal
2	0.042	65
1.5	0.061	49.16
1	0.044	63.33
0.5	0.04	66.66

Table.3 Sample treated with *Prosopis julifora* leaf powder

Amount of adsorbent (gm)	Final concentration of dye after adsorption(g/l)	% Removal
2	0.051	57.5
1.5	0.069	42.5
1	0.043	64.16
0.5	0.044	63.33

Reduction of color with different pH level

The dye solution was treated with optimum adsorbent amount (1g) at different pH level. At neutral pH *Annona squamosa* showed maximum reduction of color (70%), followed by *Prosopis julifora* (64.16%) and *Manilkara*

zapota (57.5%). But *Manilkara zapota* (68.33%) and *Prosopis julifora* (63.3%) reduced more color at acidic pH(5.6). (Fig.1)

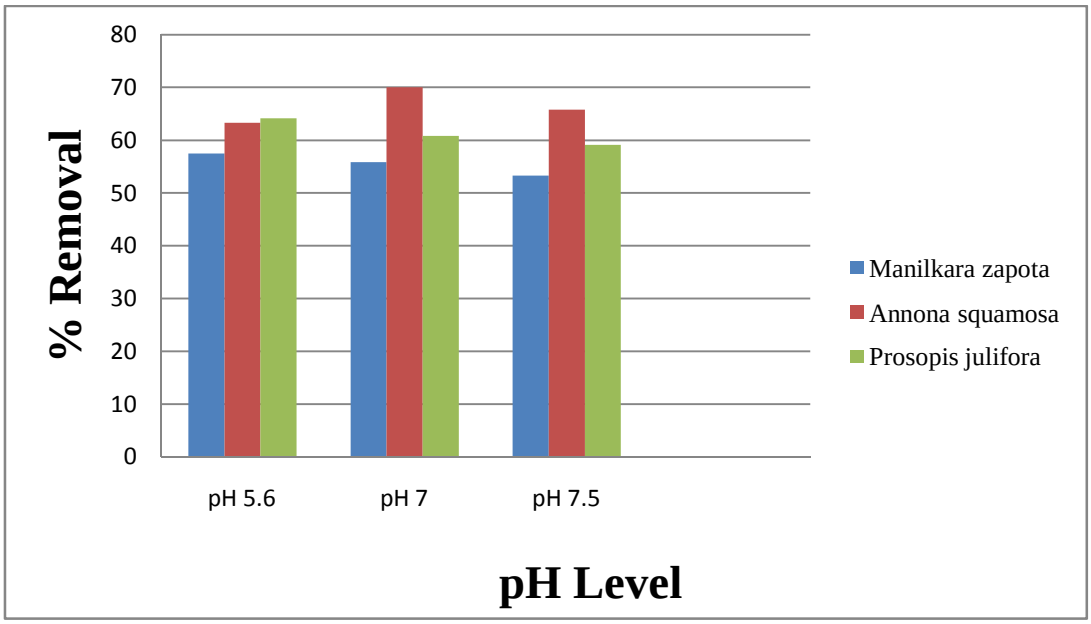

Fig.1 Reduction of color at various pH levels

CONCLUSION

As rhodomine B is a harmful toxicant, it is necessary to remove those chemicals which are left to water bodies without treatment. Since the leaves of *Manilkara zapota*, *Annona aquamosa* and *Prosopis julifora* are available in most of the places of India, it can be used as a low cost adsorbent without any pretreatments. Further more research is required to be carried out to optimize the characteristics and also to check the role of used adsorbent as a biofertilizer.

REFERENCES

[1] H. Zollinger (Ed.), *Color Chemistry.* New York: VCH Publishers, **1991**.
[2] Arivoli A; *Ph.D thesis, Gandhigram rural University*, **2007.**
[3] Mittal A; Krishna L and Gupta V K, Sep. *Puri Technol*, **2005,** 43(2), 125.
[4] Gupta V K; Mittal A; Jain R; Mathur M and Sikarwar S, *J colloid interface Sci*, **2006**, 303(1), 80.
[5] Gupta V K; Jaiin R and Varshney Shaily, *J Hazard Mater*, **2007**, 142(2), 443.
[6] Stephen Inbaraj B and Sulochana N, *Indian J Chem Technol*, **2002**, 9, 201.
[7] Stephen Inbaraj B and Sulochana N, *Indian J Chem Technol*, **2006**, 13,17.
[8] Sekaran G; Shanmugasundaram K A; Mariappan M and Raghavan K, *Indian J Chem Technol*, **1995**, 2, 311.
[9] Selvarani K, *Ph.D Thesis, Regional College of Engg, Thiruchirappalli*, **2000**.
[10] G. Mckay, *J. Chem. Technol. Biotechnol*., **1982,** 32, 759.
[11] G. Mckay, H. S. Blair and J. R. Gardener, *J. Appl. Polym. Sci*., 27, 3043, (1982).
[12] S. J. Allen, *Fuel.* **1987**, 66, 1171.
[13] M. S. El-Geundi, *Adsor. Sci. Technol.*,**1991**,8, 217,
[14] I. D. Mall and S. N. Upadhyay, *J. Indian Pulp Paper Technol. Assoc*., **1995**, 7 (1) 51.
[15] M. M. Nassar, E. A. Ashour and Y. H. Magdy, *Proceedings 5th International Conference on Energy and Environment. Cairo, Egypt.*,**1996**, 993.
[16] C. Namasivayam, N. Muniasami, K. Gayathri, M. Rani and K. Rananathan, *Bioresour. Technol.*, **1996**, 57, 37.
[17] C. Namasivayam, D. Prabha and M. Kumutha, *Bioresource. Technol*., **1998**,64, 77.
[18] Sumanjit, T. P. S .Walia and R. K. Mahajan, *J. Environ. Engg. Sci*., **2008**, 7, 83.
[19] Sumanjit, T. P. S. walia and Ravneet Kaur, *O. J. Hlth. & Allied Sci*., 6, 3, (2007).

[20] M. Dogan and M. Alkan, *Chemosphere*, **2003,** 50, 517.
[21] Y. C. Wong, Y. S. Szeto, W. H. Cheung and G. Mckay, *Process*. *Biochem*., **2004,** 39, 693.
[22] Sumanjit and P. Singh, *Colourage*, **2007,** 54 (3), 52.
[23] V. S. Mane, I.D. Mall and V. C Srivastava, *Dyes & Pigments*, **2007**, 73, 269.
[24] K. Vasanth Kumar, *Dyes & Pigments*, **2007,** 74, 595.
[25] I. D. Mall and S. N. Upadhyay, *Ind. J. Environ. Health*, **1995**, 37 (1), 1-10,
[26] Poulios I, Avranas A, Rekliti E, Zouboulis A, *J chem. Technol Biotechnol*, **2000**, 75,205.