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Ecofriendly Biosorbents of Synthetic Dye Methylene Blue

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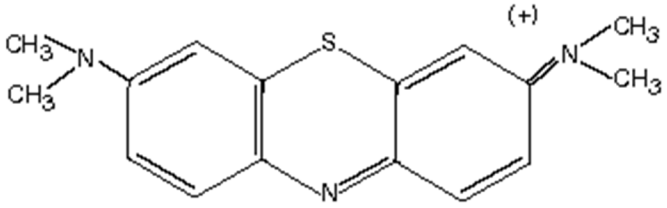
Abstract: Methylene blue is a cationic thiazine synthetic dye. It is a water pollutant from various industries and is difficult to get degraded. It contaminates the water resources and thus harms aquatic life and through food chain it enters the human bodies and causes adverse effects .Peels of vegetables and fruits from household, food processing industries etc. can be used as cost effective biosorbentMoreover it can be taken as a step towards solid waste management. The peels of the following fruits and vegetables Lagenariasiceraria , Solanumtuberosum , Cucumis sativa , Allium cepa , Mangiferaindica , Citrus limon have been found to be effective in removal of methylene blue dye . Methylene blue aqueous solution is used in different concentrations .The Freundlich and Langmuir adsorption isotherms have been verified by the experimental data.
Keywords: Methylene blue, Adsorption, Adsorption isotherms , Biosorbents , Vegetable and fruit peels

I. INTRODUCTION

Methylene blue is a synthetic dye, basic in nature and it is an organic pollutant.



For the removal of this dye from its aqueous solution various techniques can be employed[1] like discoloration of the methylene blue by chemical adsorbents[2] .Adsorption is a process highly recommended for the removal of inorganic and organic pollutants and the adsorption can be carried out by large variety of materials such as synthetic adsorbent , silica gel , clay , biosorbents[3] etc. Vegetable and fruit peels can act as good adsorbents[4,5] of dyes . Biosorbants are very attractive these days for the removal of synthetic dyes and they are economical and environmentally feasible[6].In this study identification of various biomaterials as adsorbents is performed followed by comparison of their adsorption constants. The experimental data verifies Langmuir and Frendlich adsorption isotherms.

II. MATERIALS AND METHODS

A. Adsorbate Preparation

10^{-5}M aqueous solution of Methylene blue is prepared as stock solution .This stock solution is made into various dilutions and then used for adsorption studies.

B. Adsorbent Preparation

The peels of the following fruits and vegetables Lagenariasiceraria (Gourd) , Solanumtuberosum(Potato), Cucumis sativa(Cucumber) , Allium cepa outer cover (Onion),Mangiferaindica(Mango), Citrus limon(Lemon) are collected washed , dried ,finely powdered and sieved for uniformity and are stored in separate air tight containers.

III. EXPERIMENT

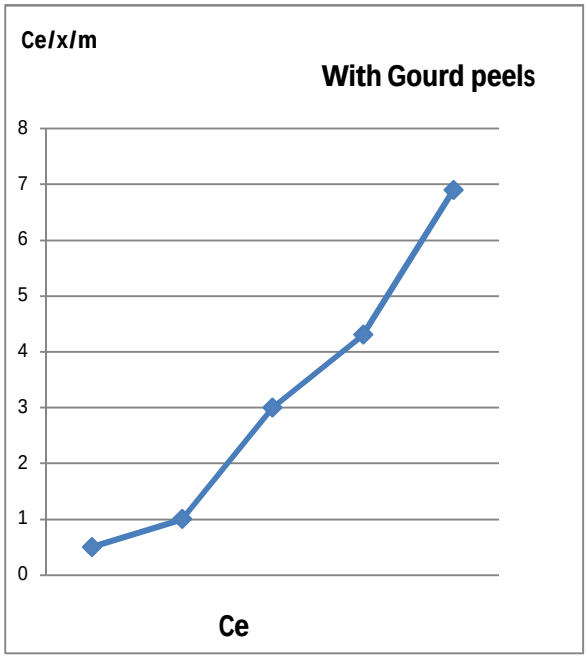
In this study different dilutions of methylene blue were prepared using its stock solution for testing the adsorption characteristics of adsorbents. The amount of adsorbent used was 0.5gms/50ml of adsorbate. A Constant time of 60 min. was maintained for every

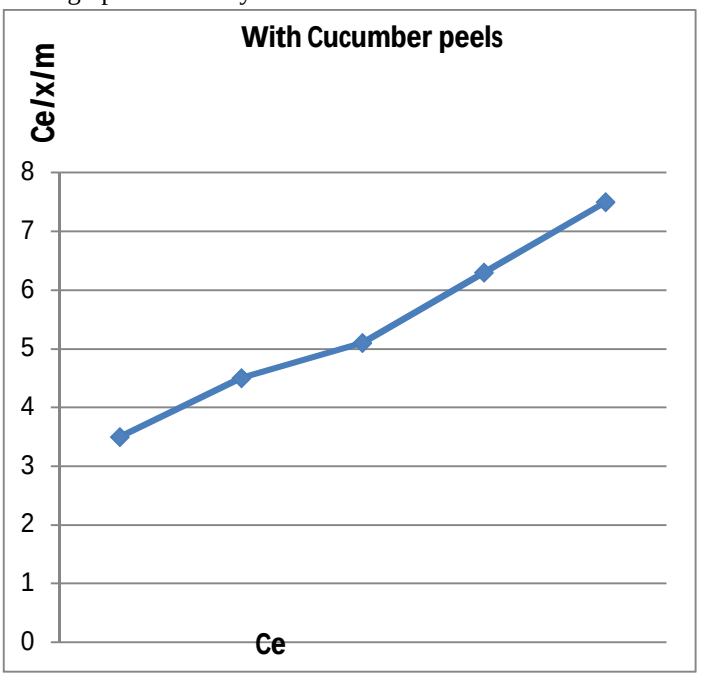
adsoption and the adsorbate is filtered and filtrate is collected and its optical density values were determined to check the discoloration.

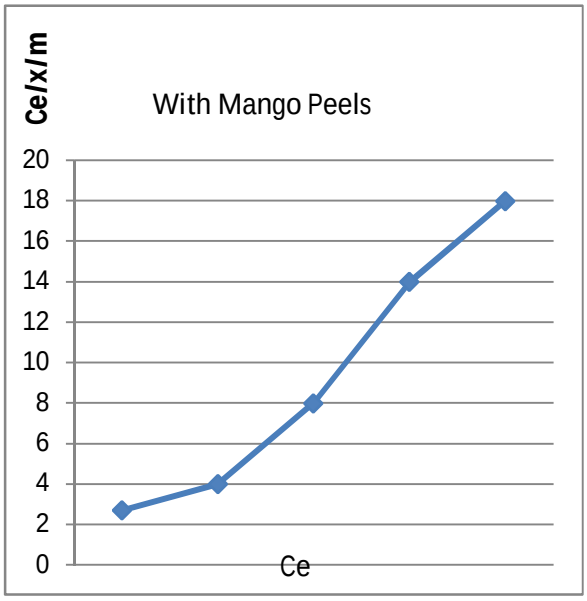
IV. RESULT AND DISCUSSION

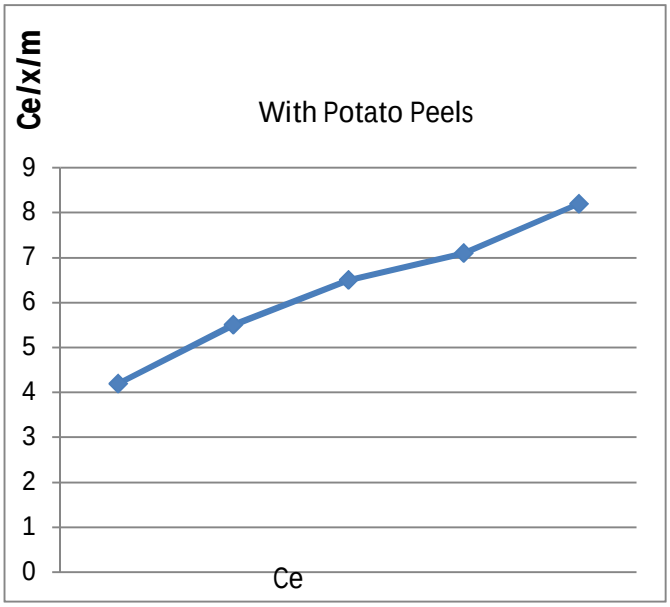
The adsorption properties of the peels of the Lagenariasiceraria , Solanumtuberosum , Cucumis sativa , Allium cepa , Mangiferaindica , Citrus limon have been studied by using Freundlich and Langmuir adsorption isotherms . Langmuir adsorption isotherms equation is valid for monolayered sorption onto a surface with a finite number of identical sites. Langmuir adsorption isotherms equation is Ce/x/m = ab* Ce/1+ab where a and b are Langmuir constants.Freundlichadsorption isotherms equation is ln x/m = ln k + 1/n *lnCe

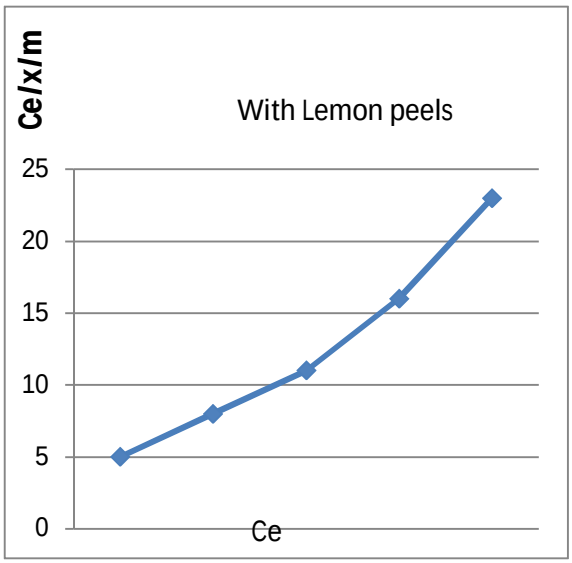
Langmuir Adsorption Isotherm graphs for Methylene blue

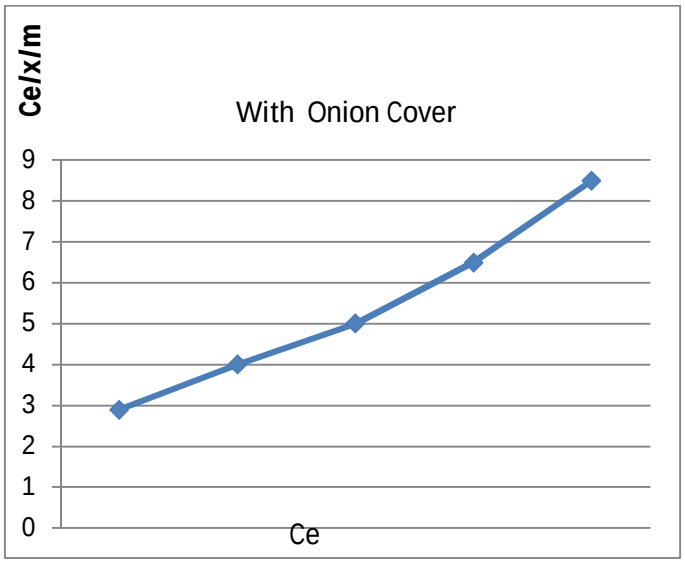




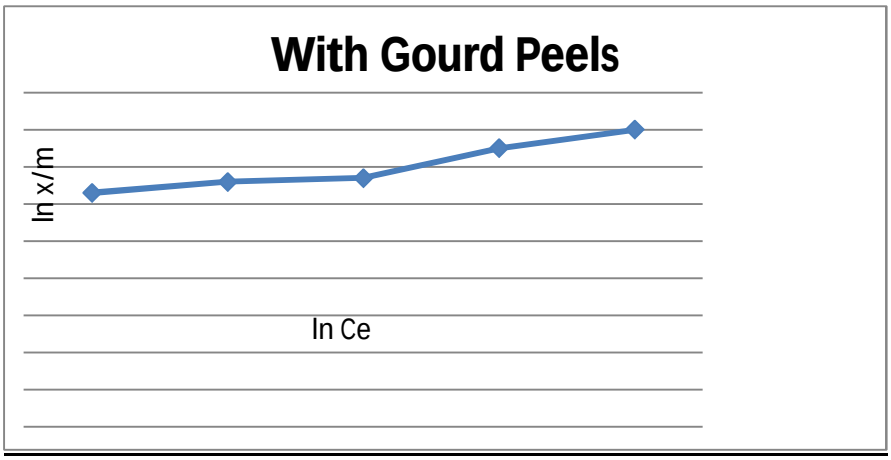


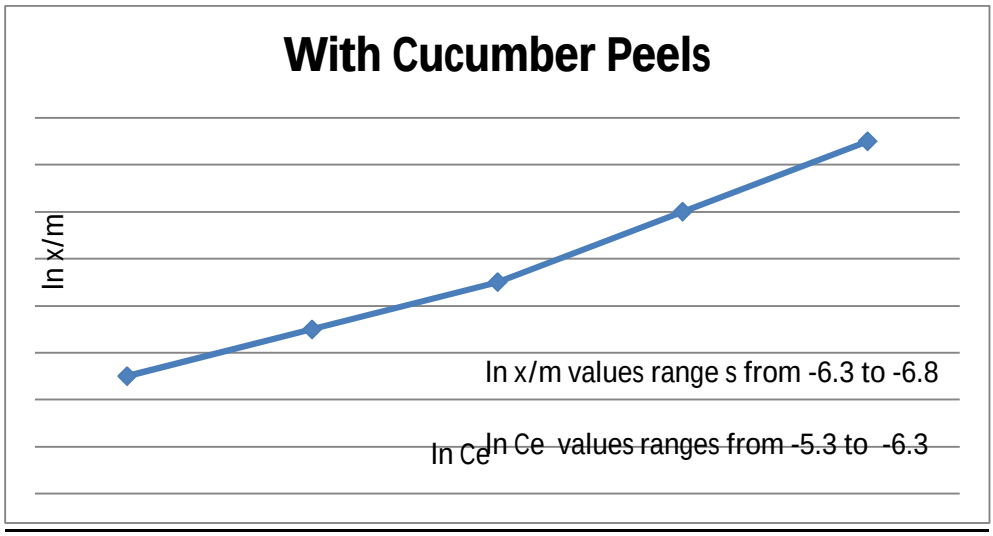






Freundlich Adsorption Isotherm graphs for Methylene blue





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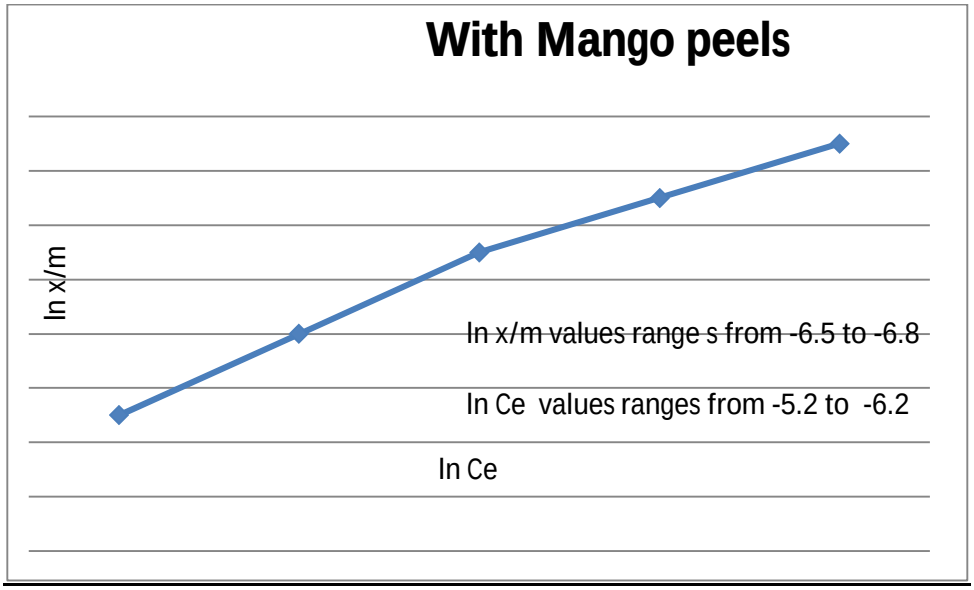

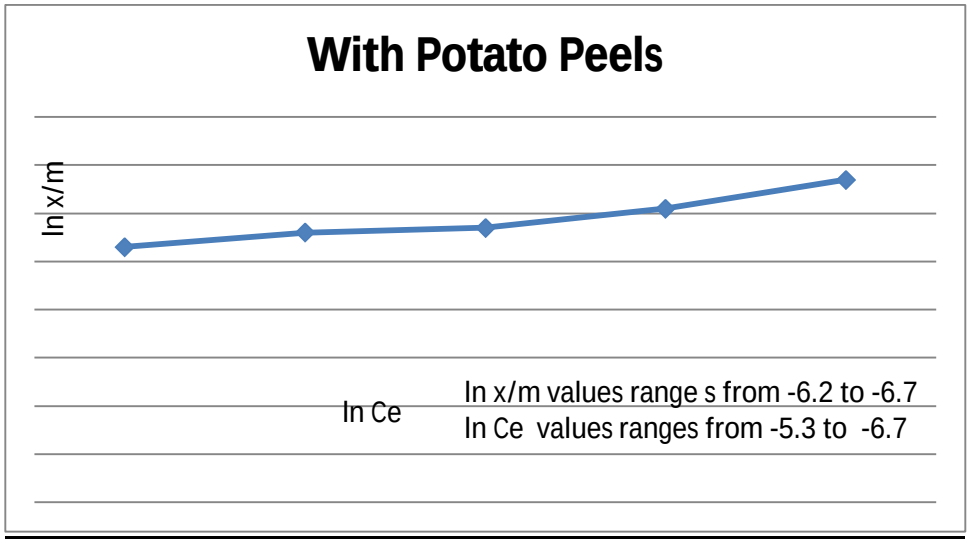

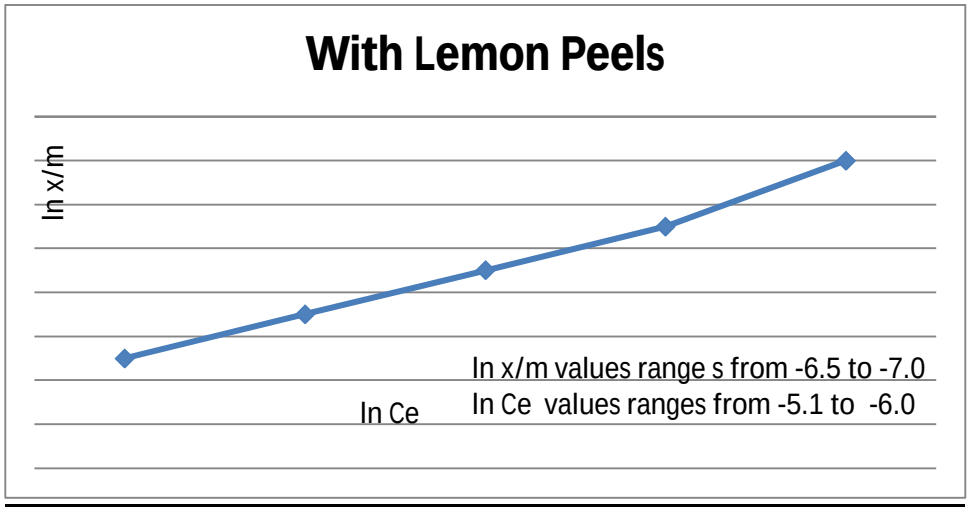

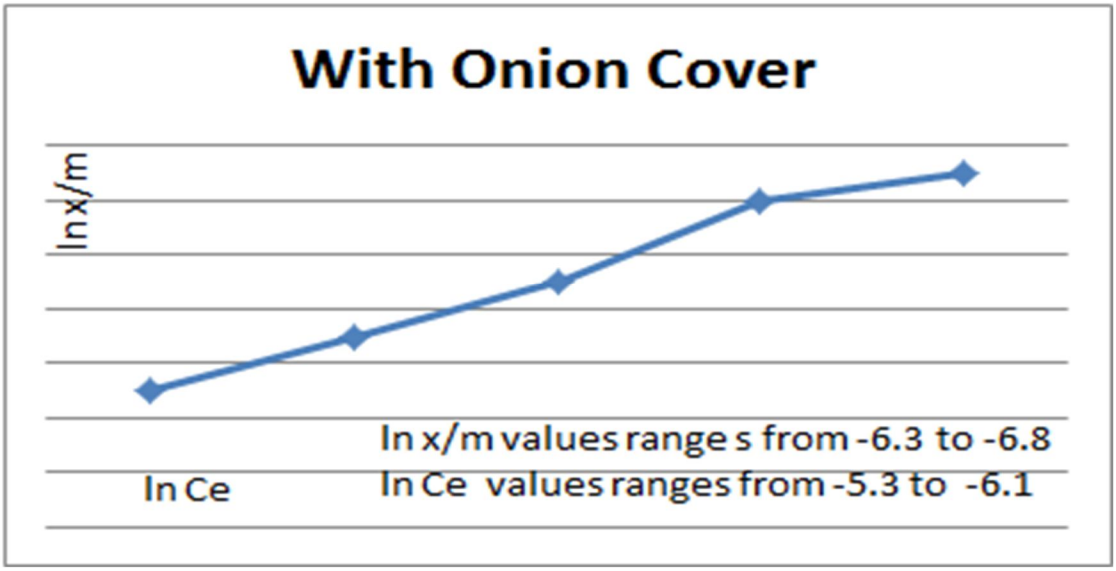

Table 1
Adsorption constants for methylene blue
Langmuir isotherm parameters

Adsorbent	**a**	**b**	**K_L**
Gourd peels	3999999.9	0.00000062	2.47
Cucumber peels	416666.67	0.00000085	0.35
Mango peels	3436426.11	0.00000037	1.27
Potato peels	7999999.0	0.000000157	1.25
Lemon peels	1176470.58	0.00000034	0.39
Onion outer cover	704225.35	0.00000070	0.49

Table 2
Adsorption constants for methylene blue
Freundlich isotherm parameters

Adsorbent	k	**1/n**	**n**
Gourd peels	1.99×10^{-5}	0.2	5
Cucumber peels	3.16×10^{-4}	0.6	1.7
Mango peels	5.01×10^{-5}	0.4	2.5
Potato peels	6.30×10^{-5}	0.6	1.6
Lemon peels	7.94×10^{-4}	0.7	1.4
Onion outer cover	1.25×10^{-3}	0.4	2.5

V. CONCLUSION

The results obtained for the study of adsorption properties ofpeels of Lagenariasiceraria (Gourd) , Solanumtuberosum (Potato), Cucumis sativa(Cucumber) , Allium cepa outer cover (Onion), Mangiferaindica (Mango), Citrus limon (Lemon) are in agreement with Langmuir and Frendlich adsorption isotherms. The maximum value of k_L from Langmuir adsorption isotherms suggests the Gourd peels having maximum adsorption potential for methylene blue.

REFERENCES

[1] Oana Maria paska ,Corniliapacuraria , Simona Gabriela M, "Kinetic and thermodynamic studies on methylene blue biosorption using corn-husk", Journal RSC ,vol.107,2014.
[2] M.A.Tabbara ,MM EI Jamal , " A Kinetic study of the discoloration of methylene blue by Na_2SO_3 , comparison with NaOH" , journal of the uni. Of chemical tech. and metallurgy, 47 , 3, 2012 , 275-282.
[3] Dina D.J.D , Ntieche A .R , Ndi .J. N ,Ketcha M J , "Adsorption of acetic acid onto activated carbon obtained from maize cobs by chemical activation with Zinc chloride" , Research jou of chemical sciences , vol. 2,Sept .(2012).
[4] SudeviBasu, Neha ,Prtibha Nair , Shryasingh , Nisha ," Decoloration of synthetic dyes using ecofriendly fruits and vegetable peel adsorbents" , IJSR vol.3 ,Dec -2014.
[5] KononikaTanzim, M.Z Abedin , " Adsorption of mehtelene blue from aqueous solution by pomelo (Citrus maxima) peels", IJSTR , vol.4,Dec-2015.
[6] T.Smitha,JSanthi , Ashley leena Prasad, S Manrnmani, "Cucumsativus used as adsorbent for the removal of dyes from aqueos solution" , Arabian journal of chemistry ,vol.10,Feb 2017.