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REMOVAL OF REMAZOL BLUEDYEFROM AQUEOUS SOLUTION USINGRICE HULLS, COCONUT HUSKS AND NEEM LEAVES AS AN ABSORBENTS

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ABSTRACT:

Textile industry is considered as a concentrated using synthetic compounds and colors industry among different ventures. The nearness of color effluents makes a natural issue. The hued profluent in little focus has an inhibitory impact which produces small scale lethality in amphibian environment.

Remazol blue Dye is chosen since it hard to degradable and is lethal essentially. The impact of various parameters like pH, contact

time, adsorbent portion, and temperature were considered.

The Freundlich and Langmuir adsorption isotherm were contemplated. The measure of adsorption increments with expanding adsorption portion, contact time, pH and temperature. The ultrasonic speed of the color arrangement was likewise examined. The outcome demonstrated that, the speed increments with adsorption. The dynamic examination demonstrates that pseudo second request display is more fitted than pseudo first request show for all the three adsorbents. This impact is seen because of swelling of the structure of the adsorbent which empowers expansive number of color particles adsorbed on adsorbent body.

The outcome demonstrated that 88%dye was expelled when pH is 9.5 and contact time is 125 minutes. At the point when the temperature increments from 298K to 308K the adsorption limit likewise increases.The adsorptive intensity of coconut husk > Rice frames >Neem takes off

KEYWORDS: *adsorption, adsorption isotherms, adsorption kinetics,dye,Remazol blue Dye,Rice hulls, coconut husk, Neem leaves .*

INTRODUCTION:

Remazol blue Dyeis a hazardous dye which has generally been removed from effluent samples through electrolysis. Color removal from textile effluent is a major environmental problem.(Namasivayam C*et al*., 1993) Many dyes and their break down products are toxic for living organisms (Nigam P *et al*.,2000)and thus affecting aquatic ecosystem. Dyes have a tendency to produce colours in textile water which is useful in textile industry. There are many physical and chemical methods for the removal of dyes like osmosis, electrolysis, filtration, oxidation, and dialysis. But these methods are not widely used due to their high cost. Adsorption technique (Sarioglu M.*et al*.,2006) is the best versatile method over all other treatments. Therefore the proposed work will undertake using agriculture waste like corncob forremoving dye textile(Singh B.K. *et al.*, 1994) (Mckay G *et al*., 1986) (Khare S.K. *et al*., 1987) (Joung R.S. *et al*., 1977) from aqueous solution.

MATERIAL AND METHODS:

Coconut husk was washed with refined water and dried in a broiler at 1000 C. It was then sieved through sifter no.

100 (150µm). The BET surface zone of was 41.m2/gm. gotten from BET strategy. Remazol blue Dye utilized was from better synthetic substances Ltd.

The X-beam diffraction investigation of Coconut husk was done by X-beam Fluorescence Spectrometer (Philip display PW 2400) as appeared in (figure1).The morphological and XRD ponder obviously demonstrates that the adsorbent is permeable and formless in nature.

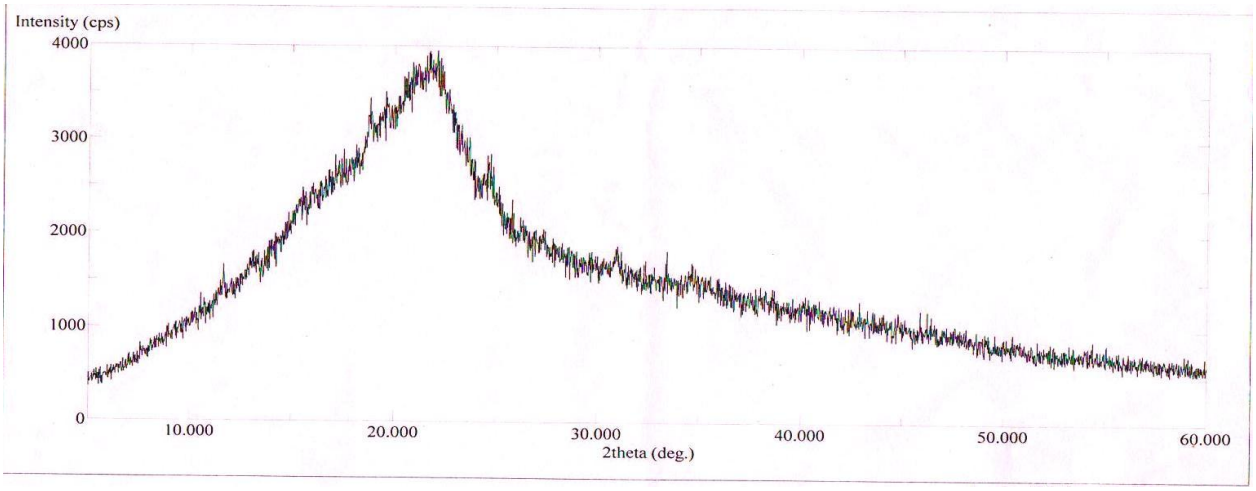

Figure 1: X-ray diffraction pattern of Coconut husk

The IR spectrum of Saw dust was also studied as shown in (figure 2).

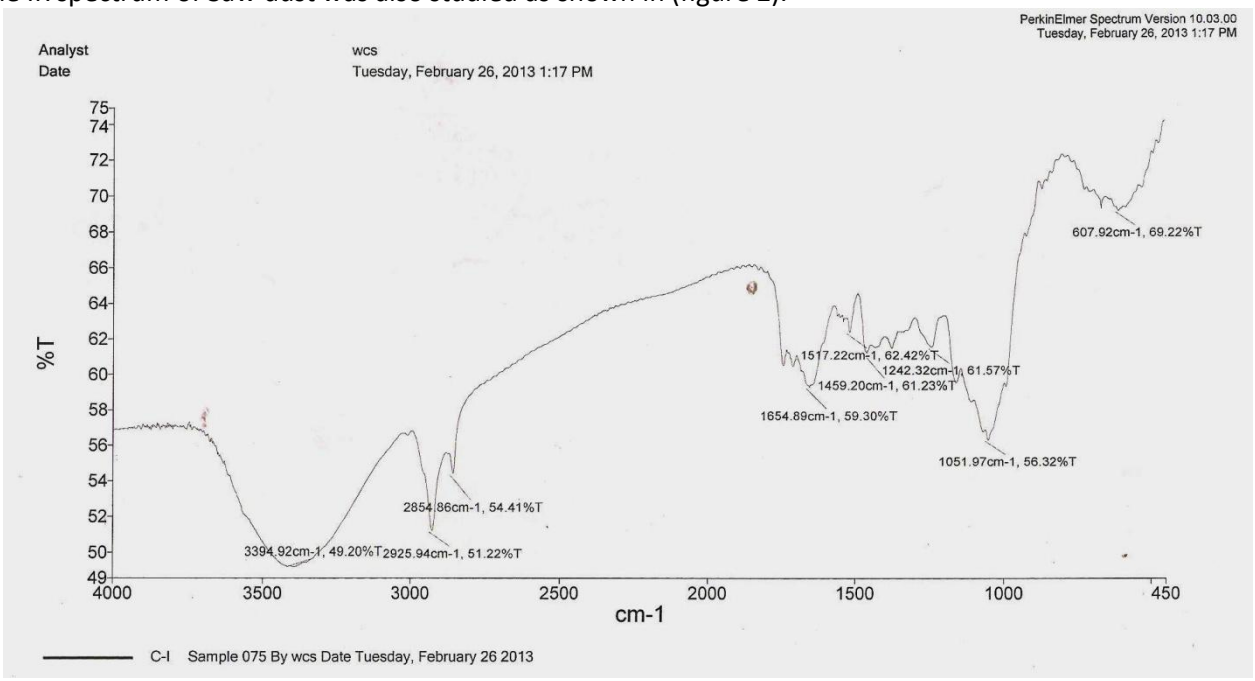

Figure 2 :IR spectrum of Coconut husk

From the **SEM** analysis it was found that there were holes and cave type openings on the surface of adsorbent which would have more surface area available for adsorption (Khatri S.D. *et al.*, 1999) as shown in(figure 3)

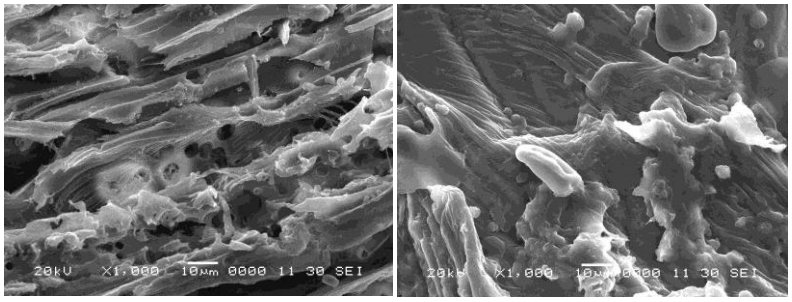

Figure 3

(Before adsorption) (After adsorption)

Scanning electron micrograph (SEM) of the Coconut husk **adsorbent**

Experimental Procedure:

Batch adsorption experiments were conducted by shaking 200ml of dye solution having concentration (50mg/l) i.e. 50 ppm with different amount of adsorbent and having different p^H values, at different temperatures as well as different time intervals. The adsorbent was then removed by filtration and the concentration of dye was estimated spectrophotometrically at λ_{max}= 640 nm. The amount of dye adsorbed was then calculated by mass balance relationship equation,

$$q_{e=}\frac{C_o - C_e}{X}$$

Where,

C_o= Initial dye concentration

C_e= Equilibrium dye concentration

q_e= Amount of dye adsorbed per unit mass of adsorbent.

X = Dose of adsorbent.

RESULTS AND DISCUSSIONS:

For getting highest amount of dye removal various factors were optimized.

EFFECT OF CONTACT TIME:

In order to know minimum amount of adsorbent for the removal of maximum amount of dye, the contact time was optimized. The results showed that the extent of adsorption is rapid at the initial stage after 120 minutes the rate of adsorption is constant. About 90% dye was removed(Figure 4)

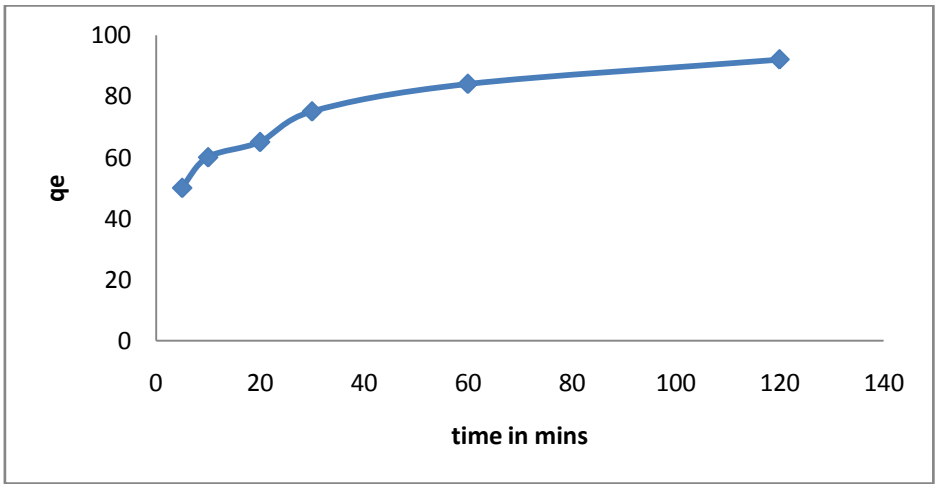

Figure 4 Effect of contact time on removal of Remazol blue Dye dye by Coconut husk

Effect of p^H:

From (figure 5), it reveals that when p^H of the dye solution increases from 3 to 9 the percentage of dye removal also increases. At p^H= 8, adsorption is maximum. By further increase in p^H adsorption decreases slightly. (Paul .*et al.*, 2014)

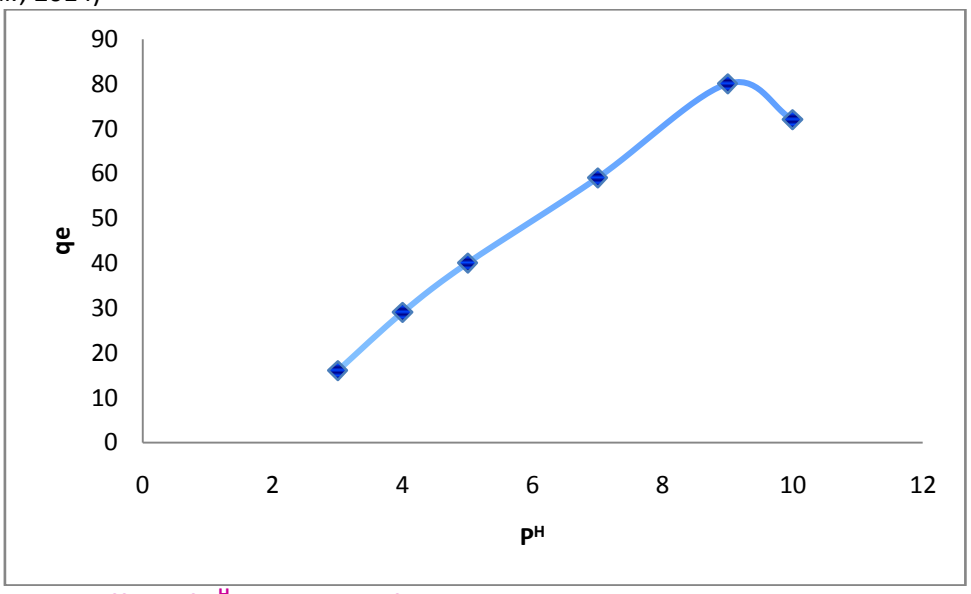

Figure 5 Effect of p^Hon removal of Remazol blue Dye dye by Coconut husk

EFFECT OF ADSORBENT DOSE:

The different adsorbent doses were studied from the range 0.5gm to 7.0 gm from the results, it is clear that the optimum dose is 1gm/150ml. (Figure 6). By further increase of adsorbent dose, the removal of adsorbent decreases due to some of the adsorption sites remains unsaturated during the process(Ferro. F *et al*., 2008) (Bhatt R. *et al*., 2011) (Theng B.K.G. *et al*., 1955) (Garg V.K. *et al*., 2004)

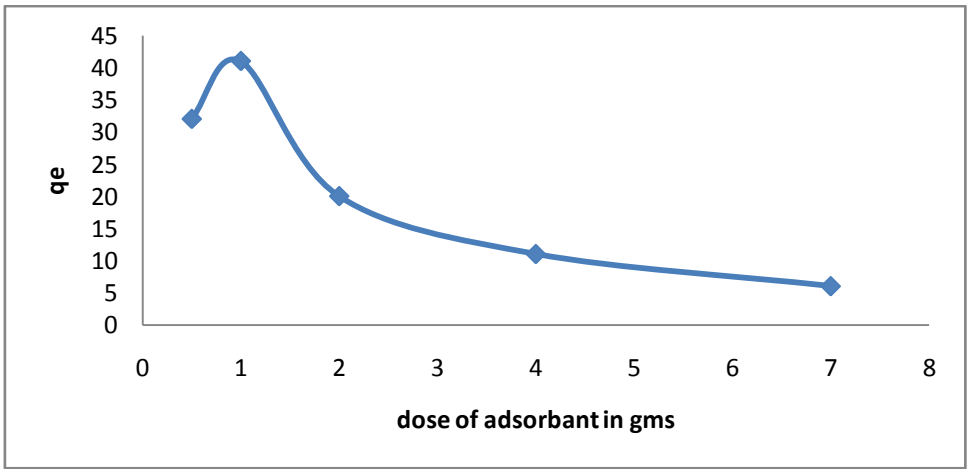

Figure 6 Effect of adsorbent doseon removal of Remazol blue dye by Coconut husk

Effect of temperature:

The perusal of(figure 7) it is clear that adsorption capacity of adsorbent increases with increase in temperature, due to increase in the mobility of dye ions. Increasing temperature also causes a swelling effect within the internal structure of adsorbent. So that large number of dye molecules can easily penetrate through it (Yamin Y*et al*., 2007) (Mane R.S. *et al*., 2012). The temperature range was 298K, 303K,308K.

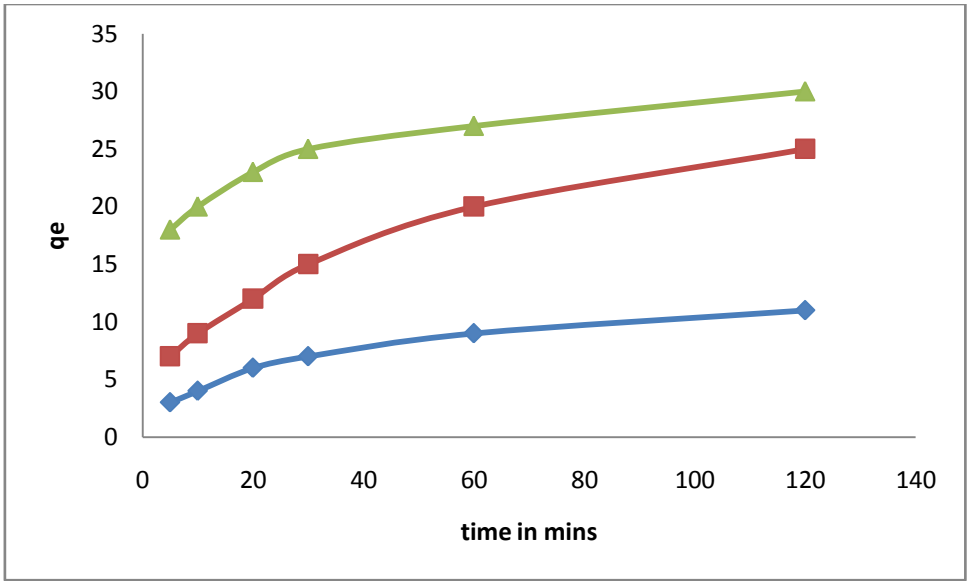

Figure 7 Effect of contact timeon removal of Remazol blue Dye by Coconut husk Adsorption Isotherm:

Langmuir Isotherm:

In order to study the adsorption of dye according to Langmuir isotherm, following equation was used

$$\frac{C_e}{q_e} = \frac{1}{Q_m \times b} \times \frac{C_e}{Q_m}$$

Where
C_e =Dye concentration at equilibrium (mg/ L)
q_e =Amount of dye adsorbed on the adsorbent (mg/g)
b =Langmuir constant
A graph of C_e/ q_e against C_e was plotted as shown in (figure 8)

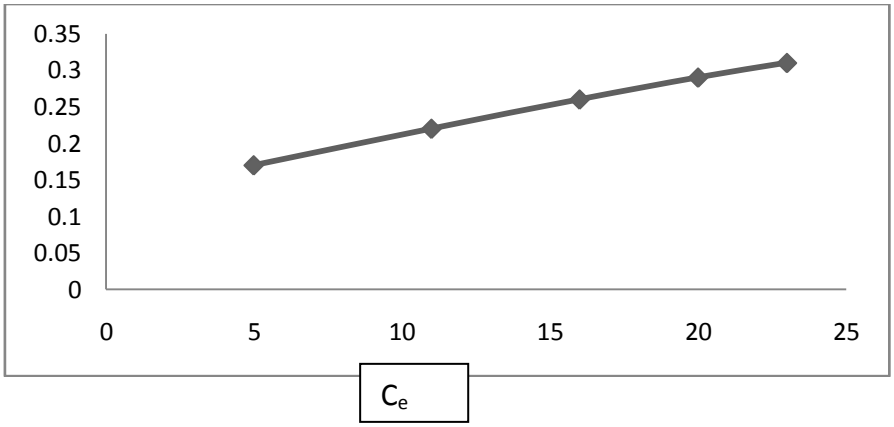

Figure 8 Langmuir Isotherm for adsorption of Remazol blue Dye byCoconut husk

The correlation factor is closely related to unity, which indicates that the Langmuir isotherm model is applicable(Sen A.K. *et al*., 1987) (Mallipudi S.*et al*., 2013) (Parvathi C.*et al*., 2009). The formation of monolayer takes place on the surface of the adsorbent(Arivoli S.*et al*., 2007) (Thievarasu C. *et al*., 2011)

Freundlich isotherm:

To study the Freundlichisotherm the following equation was used. (Karabulut S. *et al*., 2000)

$$\log \quad q_e = \log \quad K_f + \log \frac{C_e}{n}$$

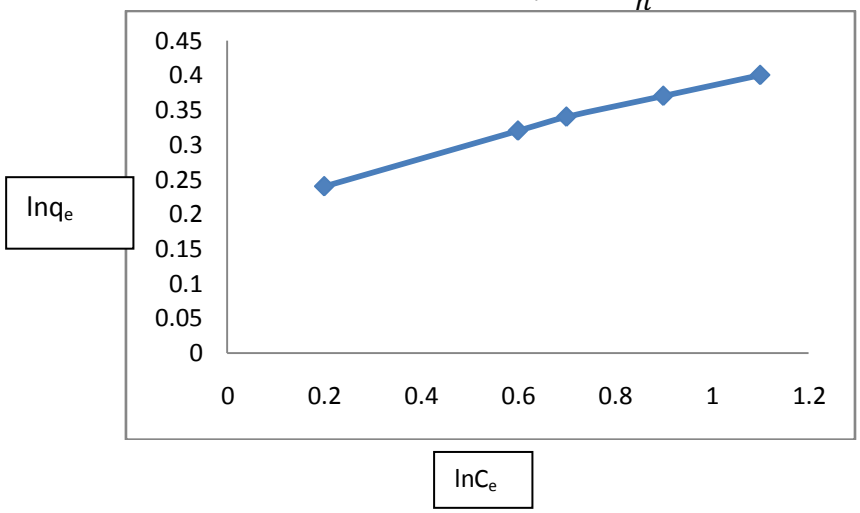

Figure 9 Freundlich Isotherm of Remazol blue dye on Coconut husk

The graph of $\ln q_e$ against $\ln C_e$was plotted. From the slope, the value of n and correlation factor can be calculated. The value of correlation factor is closely related to one as shown in(figure 9)So it indicates that the Freundlich isotherm also satisfied. The value of n is greater than 1. So the Freundlich adsorption develops appropriately.

Adsorption kinetics:

Pseudo 1st order model:

The pseudo 1st order kinetics model is used to understand the kinetic behavior of the system(Paul S. A. *et al*., 2011) (Nagada G. k. *et al*., 2007)(Sarioglu M. *et al*.,2006) It is given by the equation.

$\frac{dq}{dt} = k_i (q_e - q_t)$

A graph of $\ln(q_e - q_t)$ vs time was plotted as shown in (figure 10)

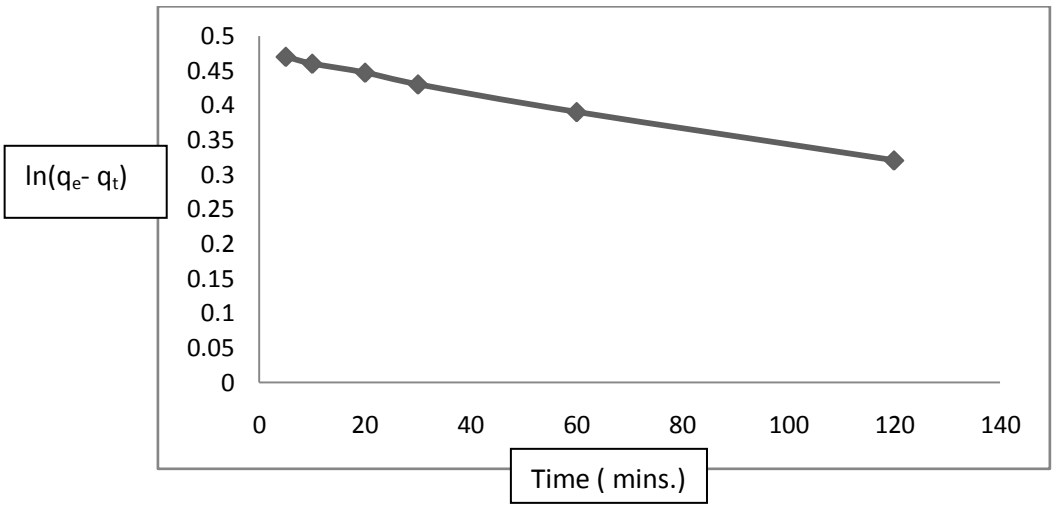

Figure 10 Plot of pseudo 1st order for adsorption of Remazolblue on Coconut husk

Table no.1

Slope (K_i) (correlation coefficient)	Intercept (q_e) (Max. adsorption capacity)	Correlation Factor
-0.00109	0.55	-0.82

Pseudo 2nd order kinetics:

The pseudo 2nd order kinetic model was studied using equation

$$\frac{t}{q_e} = \frac{q^2_e}{k_2} + \frac{t}{q_e}$$

Where q_e = dye adsorbed at equilibrium.

q_t = dye adsorbed at time t

A graph t/q_t of against time was plotted as shown in (figure 11)

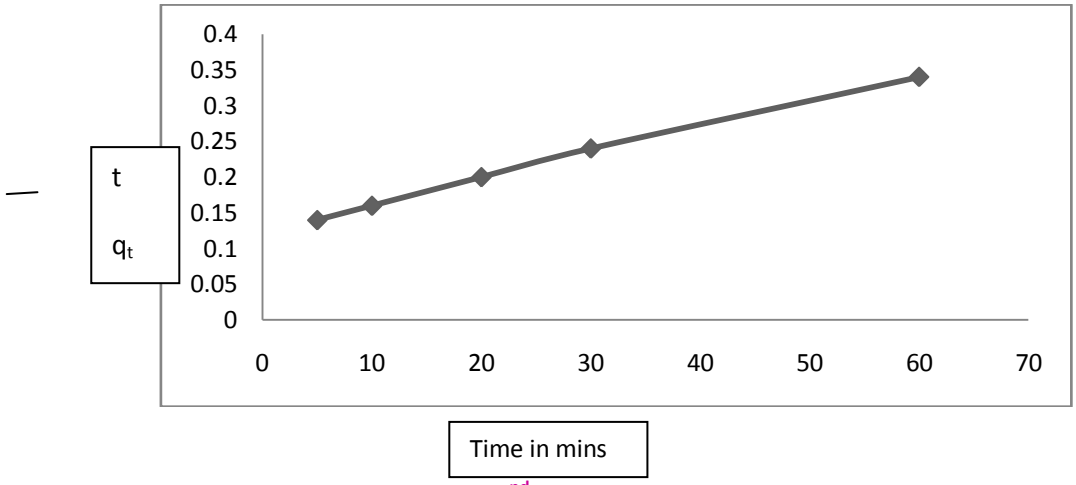

Figure 11 Plot of pseudo 2nd order of Remazol blue on Coconut husk .

Slope (K_2)	Intercept (q_e)	Correlation factor
0.00340	0.117	0.89

Table no 2

In case of pseudo 1st order kinetic model,(Table no.1) the value of slope and correlation factor are negative. While in case of pseudo 2nd order kinetic model,(Table no 2)the value of slope and correlation factors are positive. Which implies that, the system is more fevourable for pseudo 2nd order kinetics.

CONCLUSION:

The order for the removal of basic dye like Neutral Red due isCoconut husk >Rice hulls>Neem leaves.Batch adsorption was shown that yield of adsorption increases by increasing adsorbent dose, contact time,p^H,and temperature.The study of Langmuir model shows that there is a formation of monolayer on the adsorbent surfaces. Similarly Freundlich isotherm also develop in small scale.

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