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Review Of Research

COMPARISON OF REMOVAL OF ORGANIC NEUTRAL RED DYE FROM AQUEOUS SOLUTION USING ORANGE PEEL ,SAW DUST AND TENDU LEAVES AS AN ABSORBENTS

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ABSTRACT

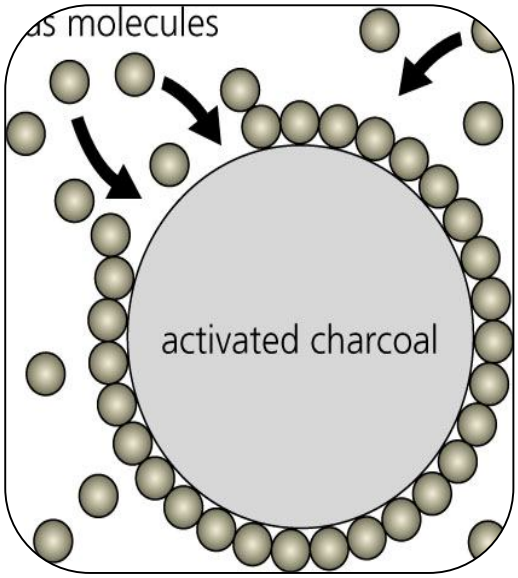
Utilization of different colors with the end goal to shading the item is a typical practice in material industry. The nearness of these hued colors in water makes a genuine naturalissues. The hued profluent inhibitorily affect the procedures of photosynthesis which are aggravating amphibian biological system.

Impartial Red Dye is chosen since it isn't effortlessly degradable and is poisonous in nature. 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 motor 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 huge number of color particles adsorbed on adsorbent body.

The outcome demonstrated that 82%dye was evacuated when pH is 8.5 and contact time is 110 minutes. At the point when the temperature increments from 298K to 308K the adsorption limit likewise increases.The adsorptive intensity of orange strip > Saw dust > Tendu clears out.

KEY WORDS: *adsorption, adsorption isotherms, adsorption kinetics, dye, Neutral Red Dye , orange peel ,saw dust, Tendu leaves.*



INTRODUCTION

Nonpartisan Red Dye is a dangerous color which has by and large been expelled from water tests through nano particles. Shading expulsion from material emanating is a noteworthy ecological problem. (Namasivayam C et al., 1993) Many colors and their separate items are dangerous for living beings (Nigam P et al.,2000)and therefore influencing oceanic environment. Colors tend to create hues in material water which is valuable in material industry. There are numerous physical and substance techniques for the expulsion of colors like assimilation, electrolysis, filtration, oxidation, and dialysis. Be that as it may, these techniques are not generally utilized because of their mind-boggling expense. Adsorption method (Sarioglu M. et al., 2006) is the best adaptable strategy over every single other

treatment. In this way the proposed work will attempt utilizing agribusiness squander like corncob forremoving color material (Singh B.K. et al., 1994) (Mckay G et al., 1986) (Khare S.K. et al., 1987) (Joung R.S. et al., 1977) from fluid arrangement.

MATERIALS AND METHODS:

Orange strip was washed with refined water and dried in a broiler at 1200 C. It was then sieved through strainer no. 100 (150µm). The BET surface region of Saw dust was 41.m2/gm. gotten from BET strategy. Impartial Red Dye utilized was from finer synthetic substances Ltd.

The X-Ray diffraction investigation of Orange strip was done by X-Ray Fluorescence Spectrometer (Philip demonstrate PW 2400) as appeared in (figure1).The morphological and XRD think about unmistakably shows that the adsorbent is permeable and indistinct in nature.

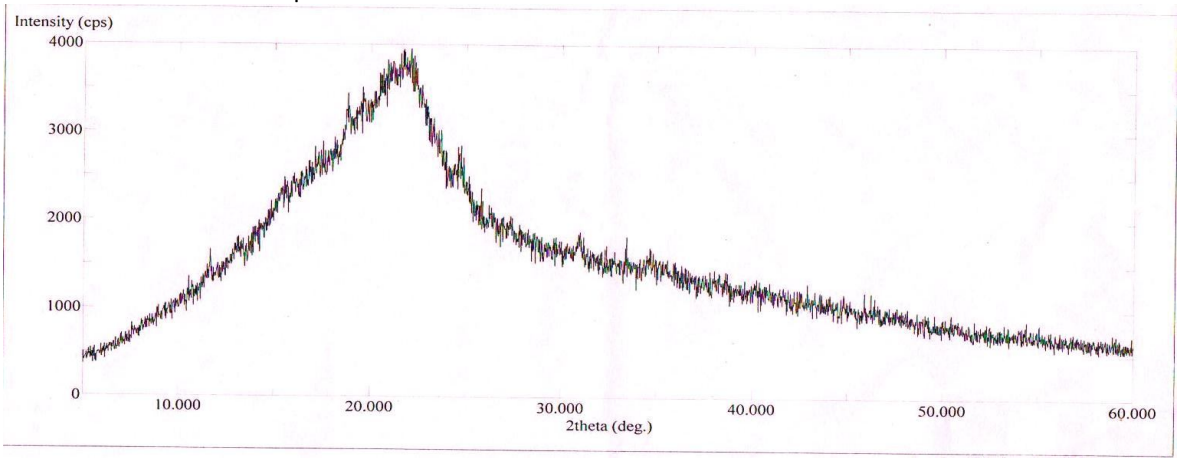


Figure 1: X-ray diffraction pattern of Orange peel

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

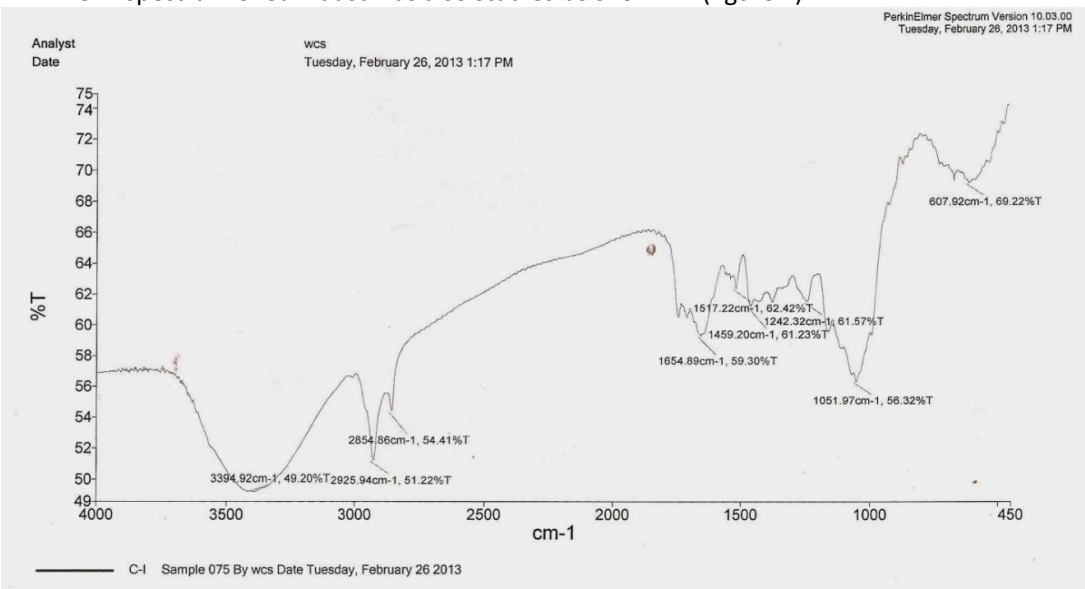


Figure 2 : IR spectrum of Orange peel

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)

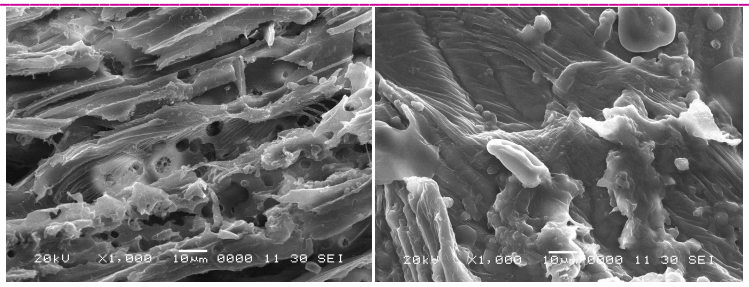


Figure 3
(Before adsorption) (After adsorption)
Scanning electron micrograph (SEM) of the Orange peel adsorbent

Experimental Procedure:

Cluster adsorption tests were led by shaking 200ml of color arrangement having focus (50mg/l) i.e. 50 ppm with various measure of adsorbent and having diverse p^H esteems, at various temperatures and also unique time interims. The adsorbent was then evacuated by filtration and the grouping of color was assessed spectro photometrically at λ_{max}= 610 nm. The measure of color adsorbed was then computed by mass equalization relationship condition,

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

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 80% dye was removed(Figure 4)

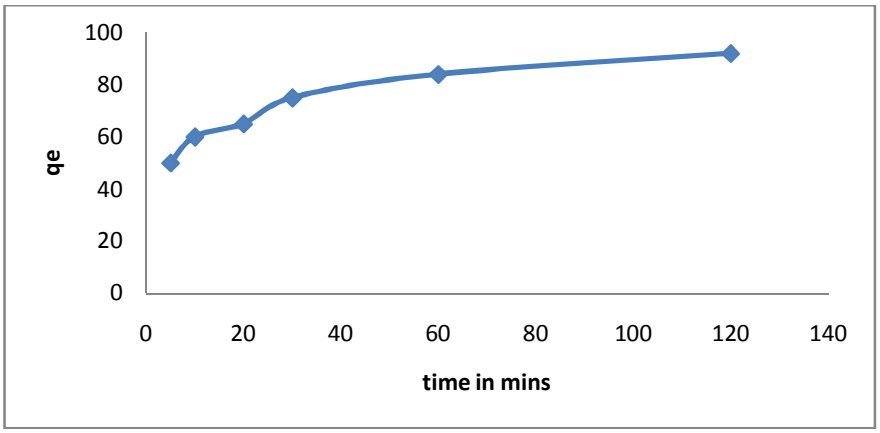


Figure 4 Effect of contact time on removal of Neutral Red Dye dye by Orange peel

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= 9, adsorption is maximum. By further increase in p^H adsorption decreases slightly. (Paul .*et al.*, 2014)

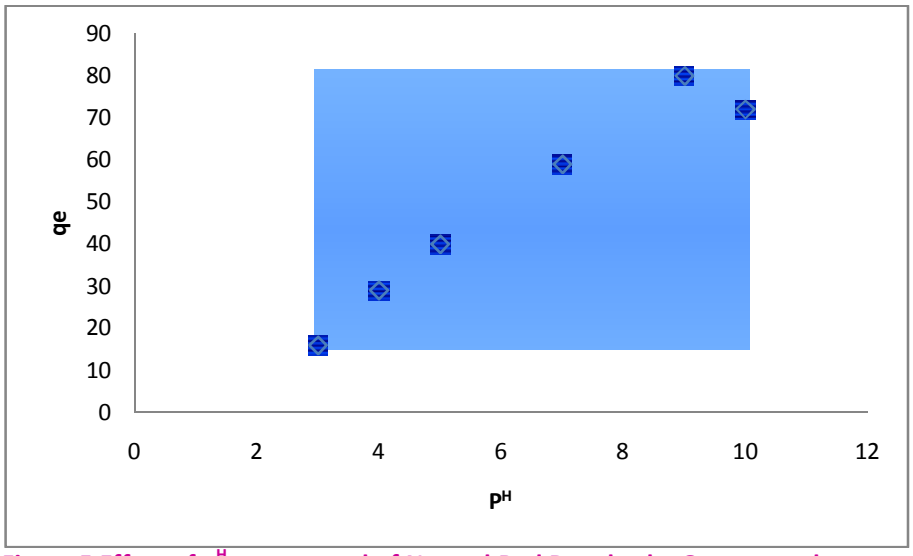


Figure 5 Effect of p^H on removal of Neutral Red Dye dye by Orange peel

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)

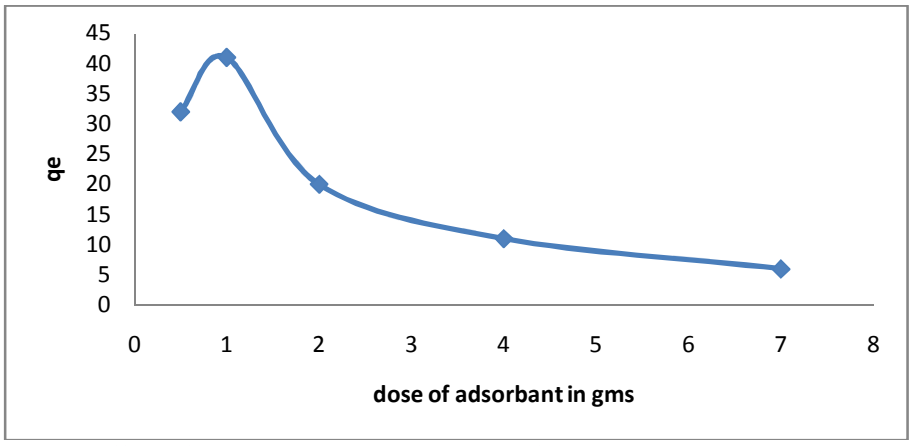


Figure 6 Effect of adsorbent dose on removal of Neutral Red dye by Orange peel

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.

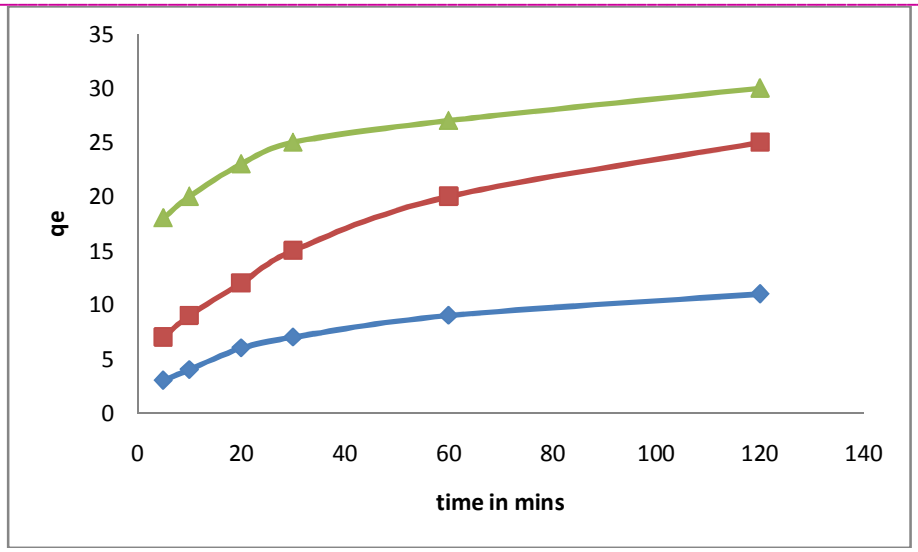


Figure 7 Effect of contact time on removal of Neutral Red Dye by Orange peel

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)

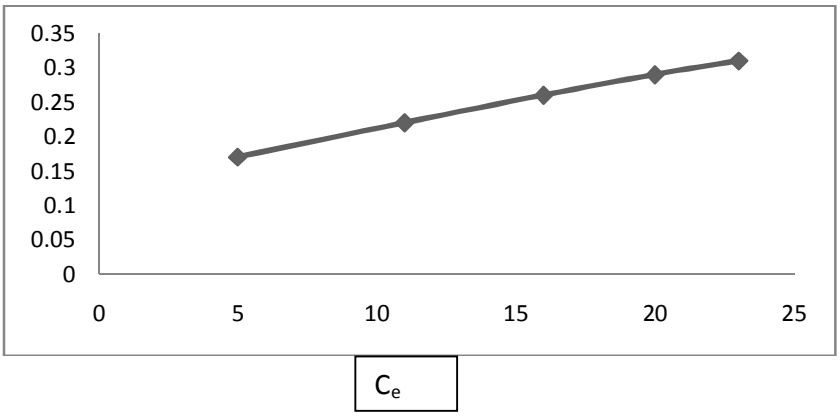


Figure 8 Langmuir Isotherm for adsorption of Neutral Red dye on Orange peel

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 Freundlich isotherm the following equation was used. (Karabulut S. *et al*., 2000)

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

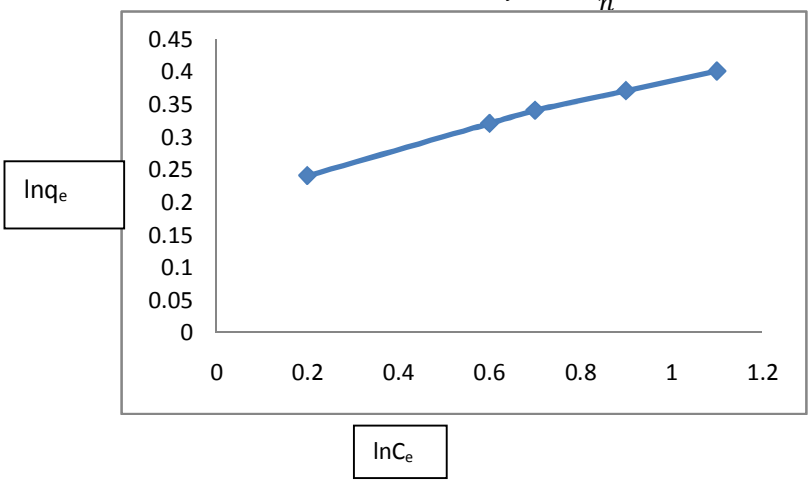


Figure 9 Freundlich Isotherm of Neutral Red dye on orange peel

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)

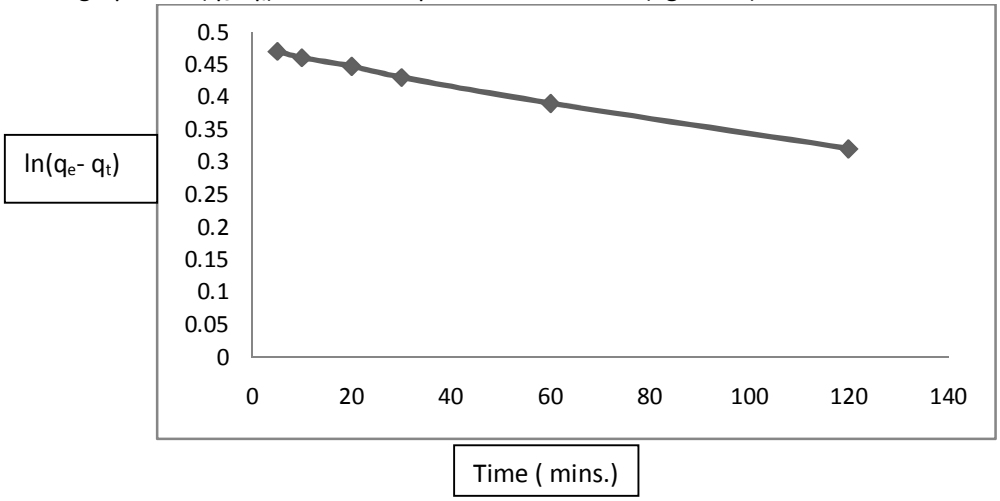


Figure 10 Plot of pseudo 1st order for adsorption of Neutral red dye on orange peel

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)

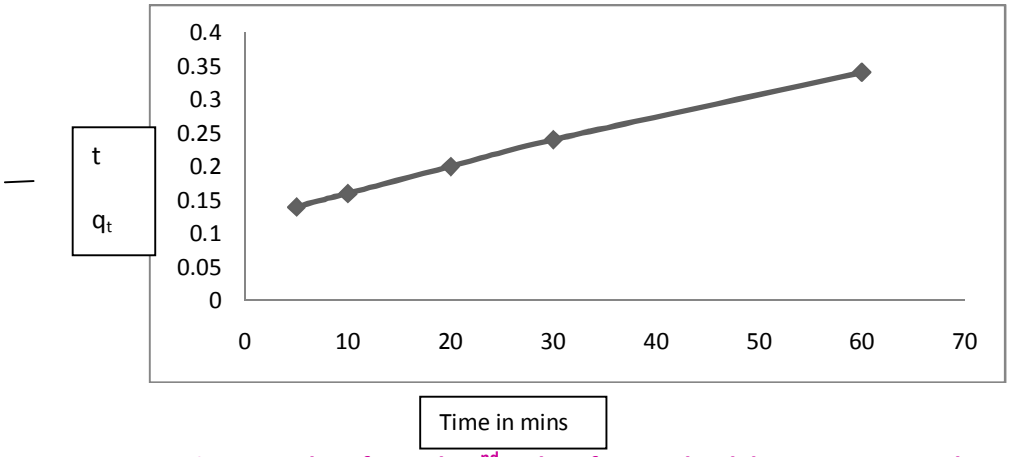


Figure 11 Plot of pseudo 2nd order of Neutral red dye on orange peel.

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 is orange peel > Saw dust > Tendu 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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