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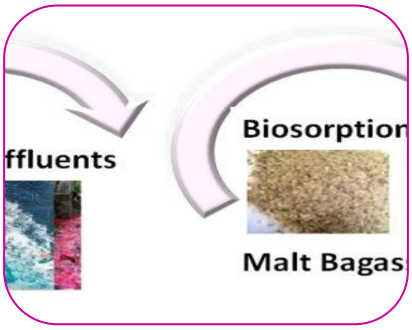
A STUDY ON COMPARISON OF REMOVAL OF TEXTILE DYE FROM AQUEOUS SOLUTION USING FLY ASH , SAW DUST AND CORN COB AS AN ABSORBENTS



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ABSTRACT:

Colour removal from textile effluent is a major environmental problem. The colored effluent have an *inhibitory effect on the processes of photosynthesis which are disturbing aquatic ecosystem.Textiledye is selected because it is not easily degradable and istoxic in nature. The effect of different parameters like p^H,contacttime, adsorbent dose, and temperature were studied .*

The Freundlich and Langmuir adsorption isotherm were studied. The amount of adsorption increases with increasing adsorption dose, contact time, p^H and temperature. The ultrasonic velocity of the dye solution wasalso studied. The result showed that, the velocity increases with adsorption. The kinetic study shows that pseudo second order model is more fitted than pseudo first order model for all the three adsorbents.This effect is observed due to swelling of the structure of the adsorbent which enables large number of dye molecules adsorbed on adsorbent body.

The result showed that 75%dye was removed when p^H is 8 and contact time is 110 minutes. When the temperature increases from 298Kto 308K the adsorption capacity also increases.The adsorptive power of Bagasse fly ash > Saw dust > Corn cob.

KEYWORDS *: adsorption, adsorption isotherms, adsorption kinetics,dye,Saw dust, fly ash, Corncob.*

INTRODUCTION

Textile ventures dependably utilize dyes and shades to color their items. Color expulsion from textile gushing is a noteworthy ecological issue. Numerous colors and their separate items are dangerous for living beings and subsequently influencing oceanic biological method. Dyes tend to deliver metal particles in textile water produces small scale poisonous quality in the life of fish. There are numerous physical and substance strategies for the expulsion of dyes like co-agulation, precipitation, filtration, oxidation, and flocculation. Be that as it may, these strategies are not broadly utilized because of their high cost. Adsorption method is the best flexible technique over every other treatment. In this manner the proposed work will embrace utilizing farming waste like corncob for expelling color textile from fluid arrangement.

MATERIALS AND METHODS:

Saw dust was washed with refined water and dried in a broiler at 1100 C. It was then sieved through strainer no. 100 (150µm). The BET external region of Saw dust was 40.m2/gm. acquired from Wager BET method dye color utilized was from FINER chemicals Ltd. The X-ray diffraction investigation of saw clean was done by X-ray Fluorescence Spectrometer as displayed in (figure1). The morphological and XRD ponder unmistakably shows that the adsorbent is permeable and amorphous in nature.

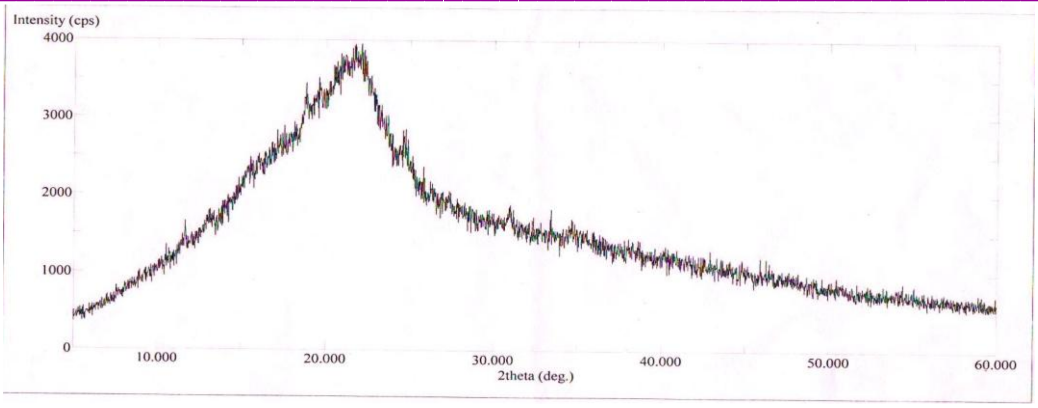

Figure 1: X-ray diffraction pattern of Saw dust

The Study of IR spectrum of saw dust also done and shown in (figure 2).

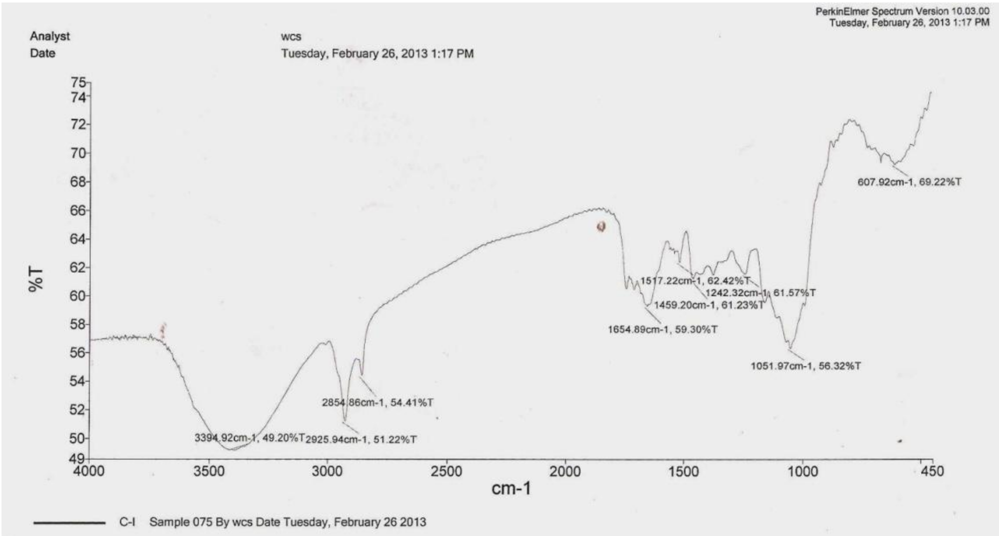

Figure 2 : IR spectrum of Saw dust

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 (

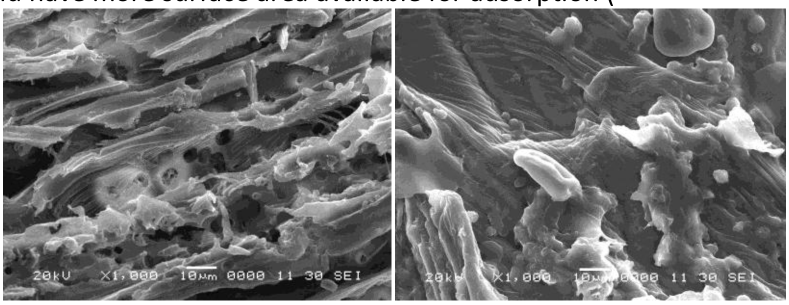

Figure 3

(Before adsorption) (After adsorption)

Scanning electron micrograph (SEM) of theSaw dust adsorbent

EXPERIMENTAL PROCEDURE:

Batch adsorption tests were directed by shaking 150 ml of dye color soln. having concentration (50mg/l) i.e. 50 ppm with various measure of adsorbent and having diverse p^H esteems, at various temperatures and in addition distinctive time interims. The adsorbent was then evacuated by filtration and the centralization of dye color was assessed spectrophotometrically at λ_{max}= 590nm. The measure of dye color adsorbed was then aggregated by mass adjust relationship equality $q_e = \frac{C_o - C_e}{X}$

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:

With a specific end goal to know least measure of adsorbent for the evacuation of huge amount of dye color, the interaction time was improved. The outcomes demonstrated that the degree of adsorption is quick at the primary stage following 120 minutes the rate of adsorption is steady. Around 80% dye color was evacuated (Figure 4)

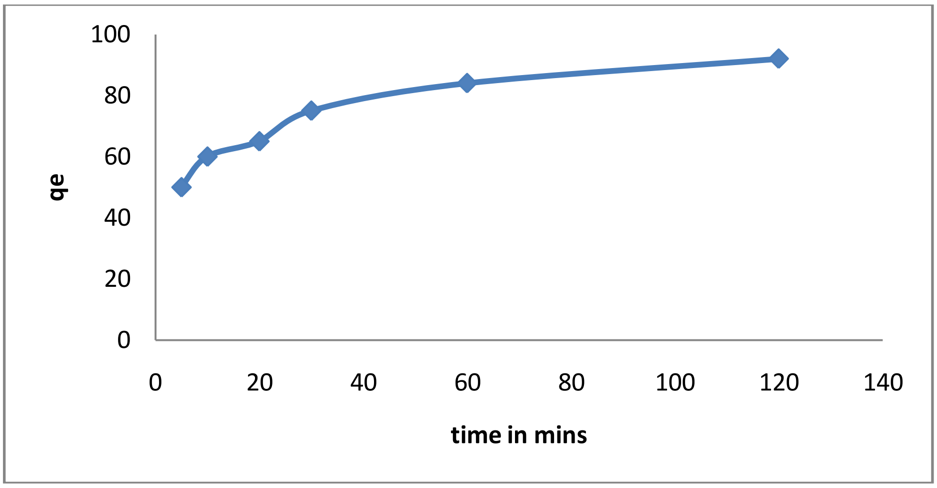

Figure 4 Effect of contact time on removal of dye by saw dust

Effect of p^H:

From (figure 5), it obsered that when p^H of the dye solution growths from 3 to 10 theproportion of dye evacuated also growths. At p^H= 8 adsorption is extreme. Bymoregrowth in p^H adsorption reductionsmarginally.

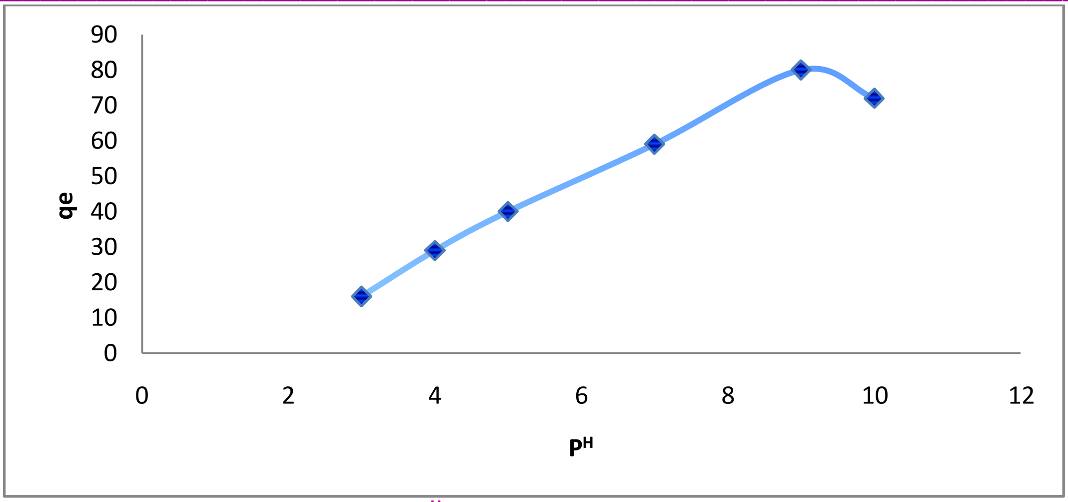

Figure 5 Effect of p^Hon removal of by saw dust.

EFFECT OF ADSORBENT DOSE:

The distinctive adsorbent dosages were observed from the range 0.5gm to 8.0 gm from the outcomes, clear the ideal measurements is 1gm/150ml. (Figure 6). By additionally increment of adsorbent measurements, the removal of adsorbent reductions because of a portion of the adsorption unsaturated during the procedure.

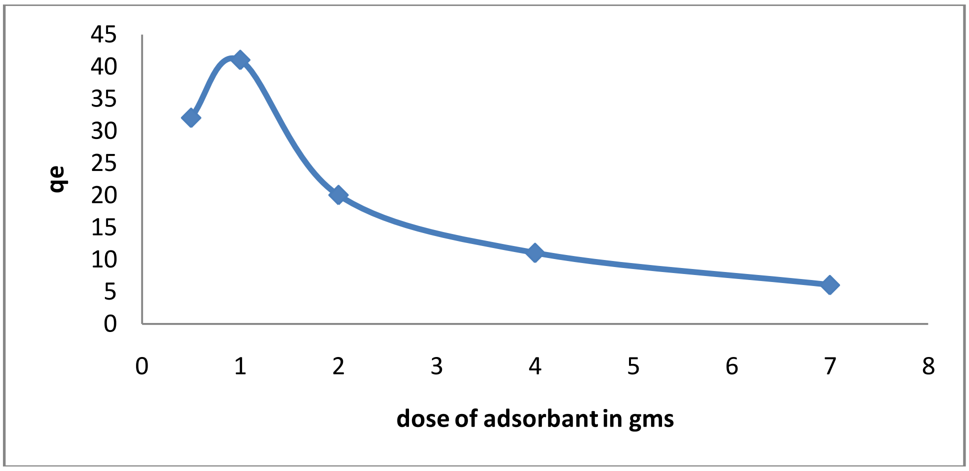

Figure 6 Effect of adsorbent doseon removal of by saw dust

EFFECT OF TEMPERATURE:

The observation of (figure 7) plainly adsorption limit of adsorbent increments with increment in temperature, because of increment in the portability of dye color particles. Expanding temperature likewise causes a swelling impact inside the structure of adsorbent. So that huge number of dye color molecules can without much of a stretch enter through it. The temperature extend was 298K, 303K,308K.

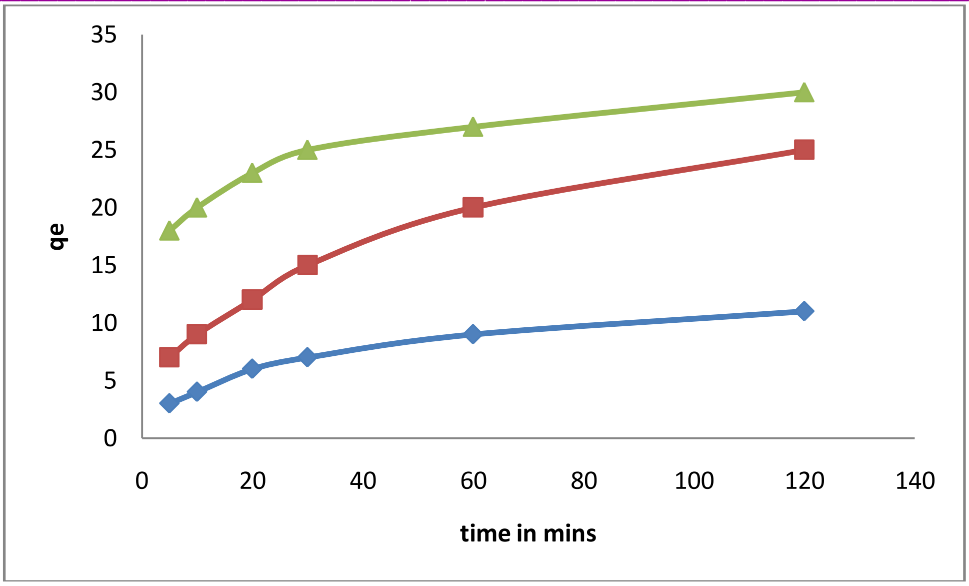

Figure 7 Effect of contact timeon removal of by saw dust

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)

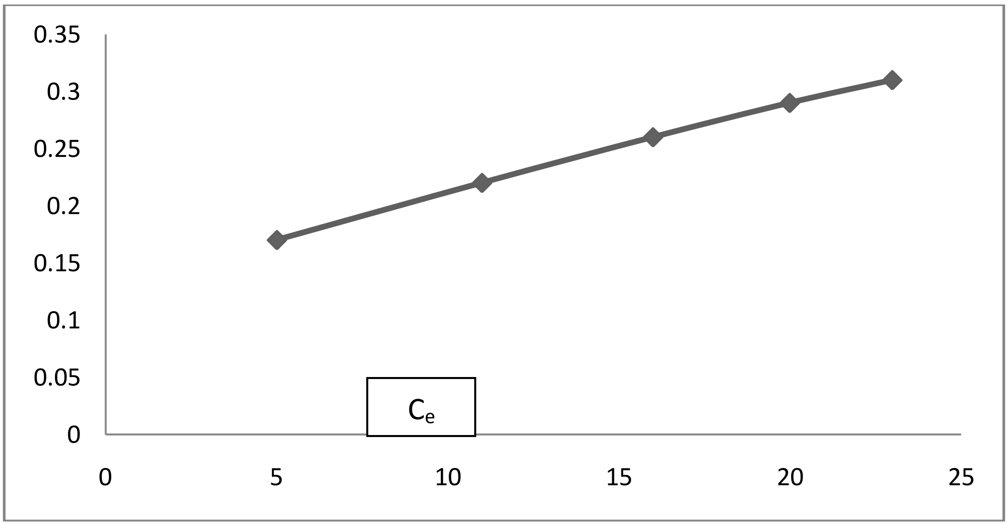

Figure 8 Langmuir Isotherm for adsorption of on saw dust.

The correlation factor is firmly identified with solidarity, which demonstrates that the Langmuir isotherm model is valid. The development of monolayer happens on the surface of the adsorbent.

Freundlich isotherm:

To study the Freundlichisotherm the following equation was used.

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

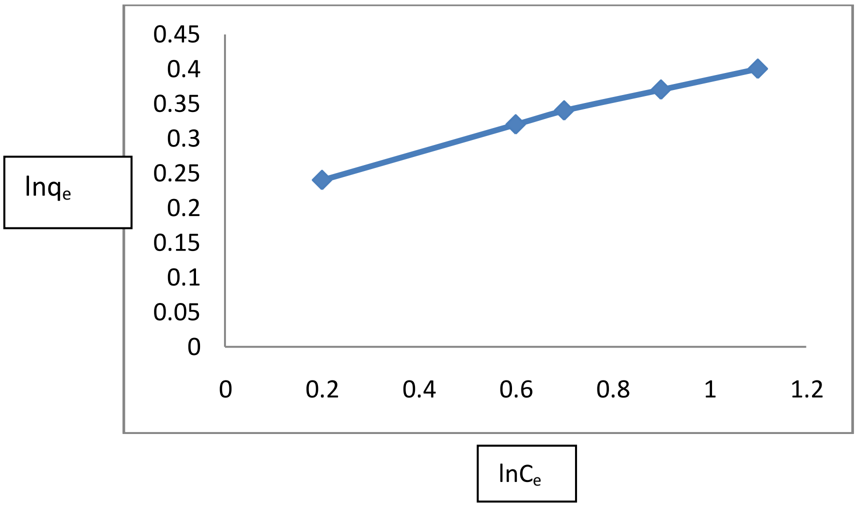

Figure 9 Freundlich Isotherm of on saw dust.

The chart of lnqe against lnCe was plotted. From the incline, the significance of n and correlation factor can be computed. The significance of correlation factor is firmly identified with one as displayed in (figure 9) So it shows that the Freundlich isotherm likewise fulfilled. The significance of n is more greater than 1. So the Freundlich adsorption grows properly.

Adsorption kinetics:

Pseudo 1st order model:

The pseudo 1st order kinetics model is used to recognize the kinetic performance of the system. 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)

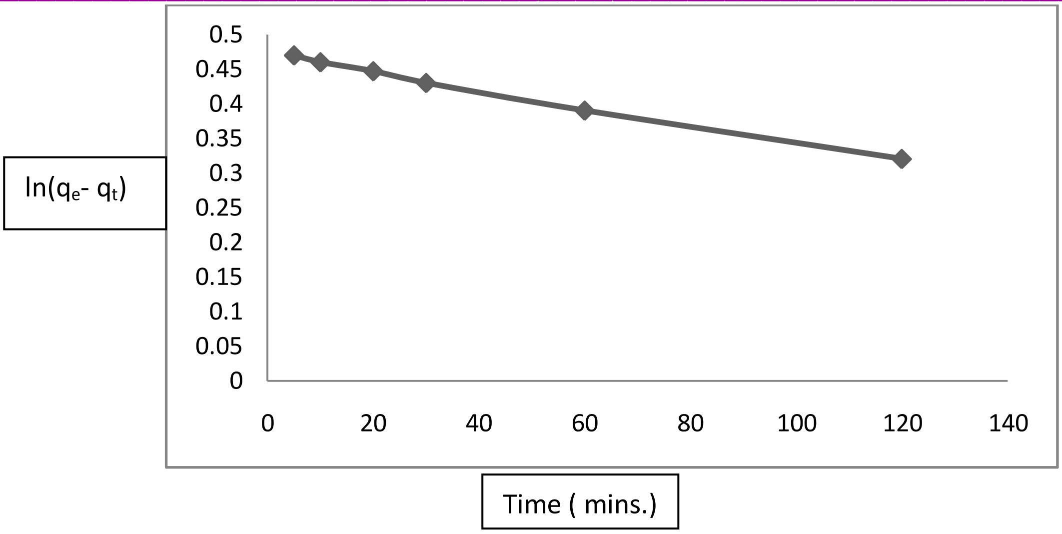

Figure 10 Plot of pseudo 1st order for adsorption of Malachite green on saw dust.

Table no.1

Slope (K_i) (correlation coefficient)	Intercept (q_e) (Max. adsorption capacity)	Correlation Factor
-0.00120	0.42	-0.90

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)

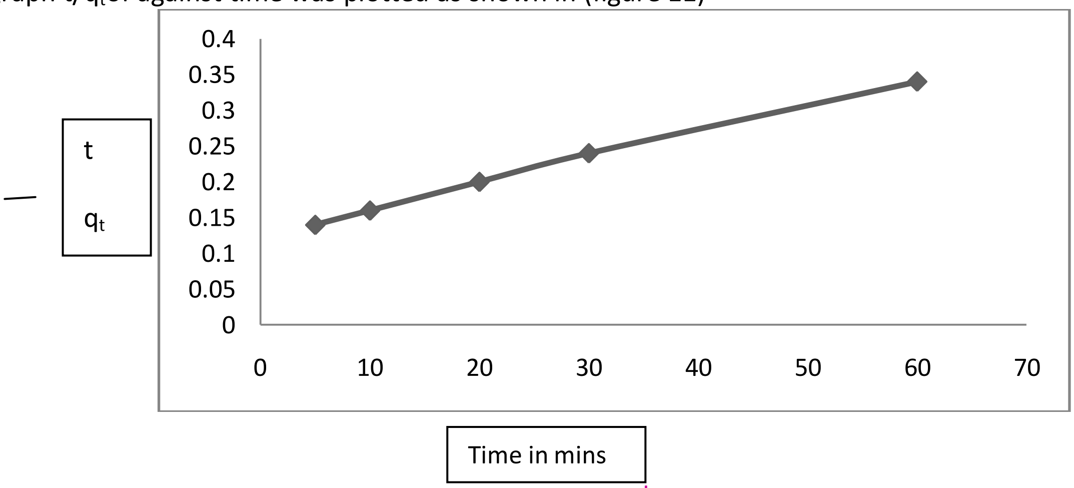

Figure 11 Plot of pseudo 2nd order of on saw dust.

Table no 2

Slope (K_2)	Intercept (q_e)	Correlation factor
0.00300	0.117	0.97

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 evacuation of essential dye color like is Bagasse fly ash > Saw dust > Corn cob. Clump adsorption was demonstrated that yield of adsorption increments by expanding adsorbent dose, connection time, pH, and temperature. The fittness of Langmuir model displays that there is an creation of monolayer on the adsorbent surfaces. Correspondingly Freundlich isotherm additionally grow properly.

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