



Study on Adsorption Efficiency of Neem Leaves Powder in Removal of Congo Red Dye Color from Aqueous Solution

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ABSTRACT

Textile Dyes are low Bio Degradable in nature. The objective of this work is the study of adsorption of congo red dye using low cost adsorbents. In this article adsorption process has been adopted and studied by using Neem leaves. The use of Natural alternative adsorbent is found very effective in treatment of removal of Congo red dye. The optimum conditions like dye concentration, adsorbent dosage, time period for color removal are studied. Spectrometric method is used in identification of concentration of dye. The removal efficiency were fitted for Freundlich and Langmuir isotherm adsorption equations which shows favorable condition for dye removal.

Key Words: *Neem leaves, Congo red Dye, Adsorption, Natural adsorbent. Freundlich, Langmuir Isotherm*

1. INTRODUCTION:

Adsorption is the simplest and easiest form of treatment of contaminated effluent water compared to other process of treatment method. This involves the processes through which certain substances which concentrate specific substances from solution onto their surface [1]. This principle occurs at any solid fluid interface. Adsorption process can be conducted by Batch studies and Column studies. In this present work the batch studies were carried out. Dyes are usually high colored polymers and they are very low bio degradable substance. Causes effects on photosynthesis process in

water. The most commonly used Adsorbent in treatment of waste water is Activated carbon. Due to its high cost and reuse of used adsorbent have limited application. Due to its drawback the new approaches are studied in utilization of low cost adsorbent [2]. There are many agricultural waste like Rice husk, saw dust, coir pith, water hyacinth, perlite, palm fruit bunch, Neem are used [3]. Neem belongs to the Meliaceae family which is deciduous species and which will be found in arid and semi arid region [3]. This study was conducted to investigate the adsorption capacity of Neem leaves powder in removal of Congo red color. The experimental condition

such as Reactive dye initial concentration, pH, are measured and adsorption Isotherms were plotted.

2. LITERATURE SURVEY

Adsorption is the most effective process of dye removal process from effluents. It is one of the sludge free clean operation process. Activated carbon is widely used adsorbent [4]. Large amount of agricultural waste materials are widely used in treatment of effluent [5].reduction of color from textile effluent with different pH, time and dosage of adsorbent [6]. The maximum color removal efficiency of 95% were found by conducting Batch study at 0.3g adsorbent dosage [7].The color removal efficiency were obtained about 74.2%, 79.3%, 80.7% and 85.6% for agricultural waste like Neem leaves, orange peel, Coconut coir pith and Peanut hulls powder which found very effective adsorbent in treatment of textile waste waster [8].

2.1 Sources of waste water

The consumption of water in any industries depends on the types of operations performed, type of equipments used.This is one of the major water consuming industries. The raw materials used for production undergoes for various biological, physical and chemical changes which contributes natural impurities waste water. These natural impurities with chemical and other cleaning agents used in productioncauses generation of waste water in industry.

3 MATERIAL AND METHODOLOGY

3.1 Preparation of Stock solution of Reactive Red

Congo red dye is widely used in cotton industries. Synthetic samples were prepared by weighing 10 mg of the Congo red dye powder and dissolved in 500 ml of water as per experimental requirements.

3.2 Preparation of Adsorbent

Neem leaves were washed and leaves were dried naturally under sun light till the leaves turns to pale yellow. The dried leaves were crushed and powdered and passed through 150 micron sieve. 20 gm oven dried leaves powder is treated with 10ml of 0.1 N HCL and kept in an oven for 4hrs at 80°C.The activated sample is cooled and stored for further Batch study experimental work.

3.3 Experimental Setup

The Batch study was carried at different dosage amount of 1.0g, 5.0g, 10g, 15g and 20g. The weighed samples are taken in 250 ml conical flask with 100ml of stock solution. Later the samples are kept in rotary shaker at constant speed of 120 rpm. At temperature 30°C and contact time of 120 minutes.

4 RESULT AND DISCUSSION

The different variables like Dosage, Contact time has been considered for Batch Study experiment for adsorption process.

- The maximum percentage of reactive red color removal of about 78.3 % found at a dosage amount
- of 1g at a contact time of 120 minutes. Correspondingly for same contact period at different adsorbent weights 83.4%, 85.4%, 90%, 91.4% of color removal efficiency obtained at different dosage values as shown in below Table and fig 1.

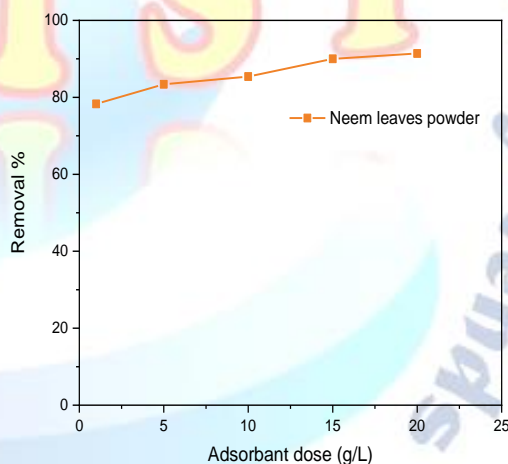


Fig.1 Effect of Adsorbent Dosage on % Removal of Congo red dye at 30°C, Contact time 2 Hr, pH 6.0 and Initial Concentration 10 mg/L.

5 ADSORPTION ISOTHERM

Adsorption process is studied with the help of graphs and Mathematical relationships. It is a graph which represents amounts of Adsorbate adsorbed on the surface of adsorbent.

Adsorbate + Adsorbent → Adsorption.

Fig 2 and Fig 3 represents Freundlich and Langmuir Isotherm studies.

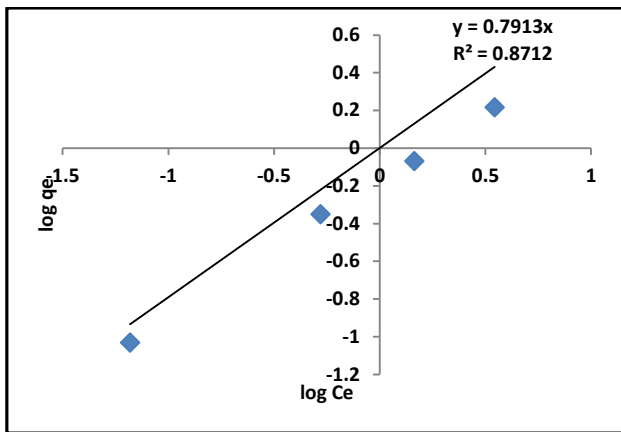


Fig 2: Freundlich Isotherm plotted for Log q_e Vs Log C_e values

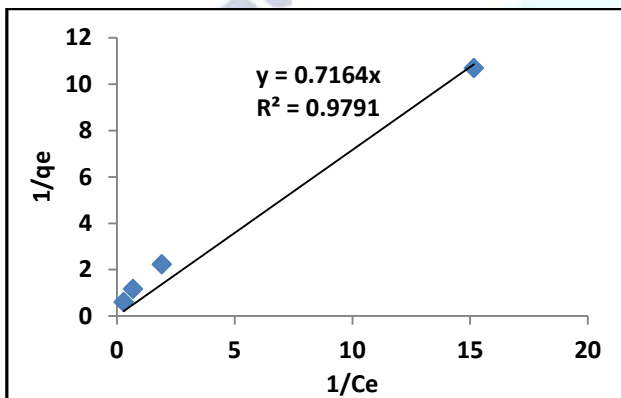


Fig 3: Langmuir Isotherm Plotted for $1/q_e$ Vs $1/C_e$ Values

The Above linear plot for log C_e Vs log q_e and $1/C_e$ Vs $1/q_e$ represents the Freundlich Isotherm and Langmuir Isotherm. The Values of R^2 are 0.8712 and 0.9791, where $R < 1$ indicates the favorable adsorption condition for Removal of Congo red Dye. Which indicates the used adsorbent provides a favorable system.

6 CONCLUSIONS

This study found that the natural Neem powder as a adsorbent is very effective in treatment of textile effluent .The study was carried from varying dosage value of 1 –5 g. The efficiency of color removal was observed upto 91.4% at a dosage of 20 g with a contact time of 120 minute. And the reduction of concentration. Freundlich and Langmuir Isotherms values indicated a favorable system for use of Neem as an cost effective Adsorbent.

Conflict of interest statement

Authors declare that they do not have any conflict of interest.

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