

“STUDY ON ADSORPTION EFFICIENCY OF NEEM LEAVES POWDER IN REMOVAL OF REACTIVE RED DYE COLOR FROM AQUEOUS SOLUTION”

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Abstract - Reactive Dyes are low Bio Degradable in nature. The objective of this work is the study of adsorption of Reactive 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 Reactive 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, Reactive Dyes, 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 found in arid and semi arid region [3]. This study was conducted to investigate the adsorption capacity of Azadirachta Indica leaves powder in removal of Reactive dye color. The experimental condition such as Reactive dye initial concentration, pH, TDS, EC, Turbidity are measured and adsorption Isotherms were plotted.

1.1 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 water [8].

1.2 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 production causes generation of waste water in industry.

2. Material and Methodology

2.1 Preparation of Stock solution of Reactive Red

Reactive Dyes are widely used in cotton industries. Synthetic samples were prepared by weighing 10 mg of the reactive dye powder and dissolved in 500 ml of water as per experimental requirements.

2.2 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 60°C. The activated sample is cooled and stored for further Batch study experimental work.

2.3 Experimental Setup

The Batch study was carried at different dosage amount of 0.2g, 0.4g, 0.6g, 0.8g and 1g. 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 a varying contact time of 20,40, 60, 80, 100 minutes.

3 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 78.18% found at a dosage amount

of 1g at a contact time of 100 minutes. Correspondingly for same contact period 70.27%, 71.31%, 72.68%, 74.81% of color removal efficiency obtained at different dosage values as shown in below Table and fig 1.

Dosage	20min	40min	60min	80min	100min
0.2g	60.28	61.98	63.25	67.8	70.27
0.4g	70.32	70.48	76.82	71.12	71.31
0.6g	71.97	72.08	72.18	72.33	72.68
0.8g	72.89	73.86	74.02	74.36	74.81
1g	74.96	75.03	75.18	76.88	78.18

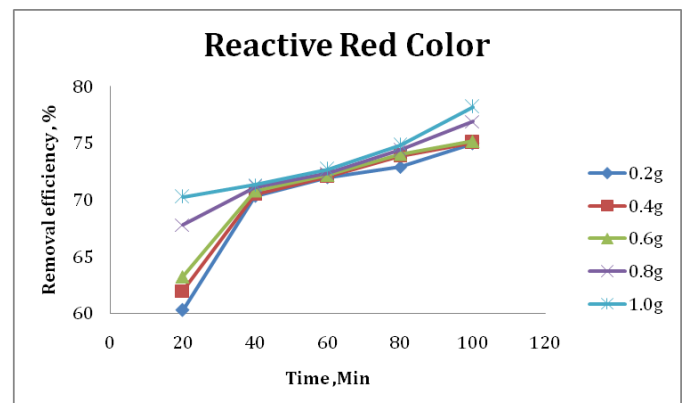


Fig 1: Effect of dosage and Contact Time on Removal efficiency of color by Adsorbent

3.1 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.

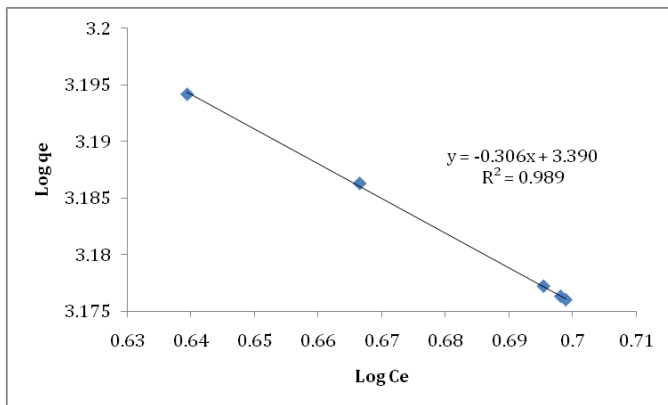


Fig 2: Freundlich Isotherm plotted for Log qe Vs Log Ce values

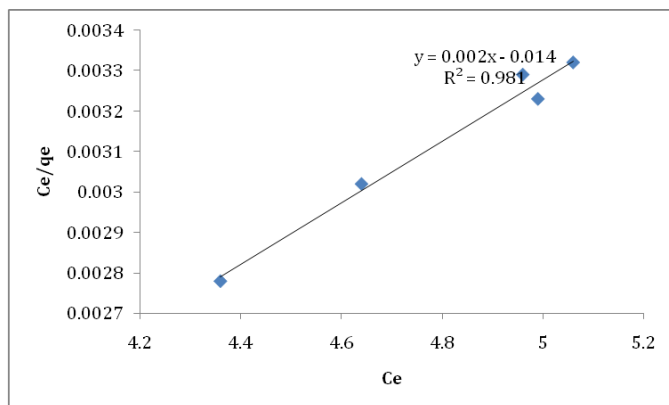


Fig 3: Langmuir Isotherm Plotted for Ce/qe Vs Ce Values

The Above linear plot for log Ce Vs log qe and Ce Vs Ce/qe represents the Freundlich Isotherm and Langmuir Isotherm. The Values of R are 0.989 and 0.981, where $R < 1$ indicates the favorable adsorption condition for Removal of Reactive Red Dye. Which indicates the used adsorbent provides a favorable system.

3. 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 0.2 –1 g. The efficiency of color removal was observed upto 78.18% at a dosage of 1 g with a contact time of 100 minute. And the reduction of concentration of parameters like pH, Turbidity, Conductivity, TDS were found .Freundlich and Langmuir

Isotherms values indicated a favorable system for use of Neem as an cost effective Adsorbent.

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