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# REMOVAL OF LEISHMAN'S STAIN FROM AQUEOUS SOLUTION BY USING NATURAL NILE ROSE PLANT (*EICHHORNIA CRASSIPES*)

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## Abstract

This study investigate the ability of aquatic plant *Eichhornia crassipes* use as adsorbent material to remove Leishman's stain from aqueous solution. Batch systems were conducted to obtain optimum removal conditions, such as activation methods (acid and thermal), concentration of dye, adsorbent dosage and contacted time. This study has shown increasing in the removal percentage of dye, for both used activation methods (acidic and thermal 98.3% and 93.3 respectively) comparing with the sample non activation adsorbents (88.7%) with progress contact time. The highest removal efficiency was recorded at 40 min contact time (98.4%). The removal Leishman's stain percentage decreased (98% - 89% - 67%), as the initial Leishman's stain concentration increased (10-40 – 60 ppm) respectively. The highest removal efficiency was (98.8%) at(6 g\l) of adsorbent dose.
***Key words*****:** *Eichhornia crassipes*, Leishman's stain, adsorbent material.

## Introduction

Presence of low concentrations of the effluents from industries containing stain are visible and potentially inhibiting photosynthesis. Printing, textiles, laundry, leather, rubber and painting are considered to be the main sources of pollution of colored effluents (Ren *et al.,* 2010). Untreated effluents of from industries may cause damage to the human health and also hard damage to aquatic life (Yasemin and Haluk, 2006). Many stain havetoxic effects on microorganisms, therefore they do not easily decompose by bioremediation (Garg *et al.,* 2003). Treatment of waste water and reclamation of water containing stains may performed using adsorption processes. Most traditional adsorption plants use activated carbon. But, activated carbon is expensive and has regeneration problems . Recent researches have focused on the use of low (Uddin *et al.,* 2009). A treatment that promises to be efficient, economic and safe is bioremediation.

There are many plants wastes were utilized as adsorbents due to (i) higher adsorption capacity, (ii) alternative low-cost materials and (iii) nontoxic, to treatment the pollution problems of eco-system that produced from the industry waste water (Mohd *et al.,* 2011). The water hyacinth *Eichhornia crassipes*is classified as a floating plant that found in tropical part of South America and now it's available in almost all tropic climates. *Eichhornia crassipes* is considered to be a productive macrophytes and worst aquatic plants in world (Epstein, 1998). The present experiments are executed to remove of certain water- soluble dye, namely Eosin methylen blue (Leishman's stain) by using natural Nile Rose Plant as adsorbent agent.

## Materials and Methods

### Acidic activation

2g from dry waste plant was treated with 50 ml 0.1M of hydrochloric acid for one hour under mechanical stirring at room temperature, and then powders treated with large amount of distill water and then it was oven dried at 25ºC for one day.

### Thermal Activation

2g from dry waste plant was heated at 100ºC for 2 hours.

### Preparation Adsorbate Solution

The solution of Leishman's stain was prepared by dissolving adequate quantities of stain as a dry powder in deionized water to make 1000 ppm of stock solution, then by dilutions working solutions of desired concentrations were prepared (Alaa *et al.,* 2016 and Jasim *et al.,* 2016).

**Adsorption Study**

100ml of Leishman's stain solution was measured and added to 0.5g of powder of Nile Rose Plant. The solution was shaken rigorously and continuously for 10, 20, 40, 80, 120, 160 and 200 min respectively. Different dye concentrations (10, 40 and 60 ppm) and different adsorbent dosage (2, 4 and 6 ppm) were used (Alaa *et al.,* 2016 and Jasim *et al.,* 2016).

The ultimate concentration of all samples of Leishman's stain was evaluated using spectrophotometry technique at the wavelength identical to the maximum absorbance for Leishman's stain (516 nm) utilizing a spectrophotometer. A diagram of removal Leishman's stain percentage time (hour)versus (g/L) was plotted for Leishman's stain. The amount of dye removal was calculated as following:

Removal percentage % = ($A^o$ - A) *$A^o$ * 100 ….(1)

Where, $A^o$: is the absorption of Leishman's stain before adsorption.

A: is the absorption of Leishman's stain after adsorption.

## Results and Discussion

**Influence of Activated method**

The influence of activated methods on the removal percentage by use *E. crassipes* powder as adsorbent was calculated at two contact time 10 and 200 minutes and with concentration of adsorbent 10mg/L and adsorbent dose 2g/L.

The results displayed increasing in the removal percentage of stain, for both used activation methods (acidic and thermal) comparing with the sample non activation adsorbents with progress contact time (Figure 1).

At the same time the acidic activation was more active than the thermal activation for dye removal, as show in the results the removal dye efficiency was 88.7% for non-activation, 98.3% for acidic activation, 92.3% for thermal activation. The thermal activation involve dehydration process, release the moisture, and impurities adsorbed on the common reed powder, this lead to increasing surface area and increasing active site of the catalyst (Bhatnagar and Sillanppa, 2010).

Physical properties incensement with the acidic activation: like increasing in the pour size and surface area. Also the chemical changes occur due to acidic activation such as cation exchanges. The wet activation favorable due to (i) low cost, (ii) decomposition of adsorbents is controlled via: acid concentration, temperature, time impregnation (Netpradit *et al.,* 2004).

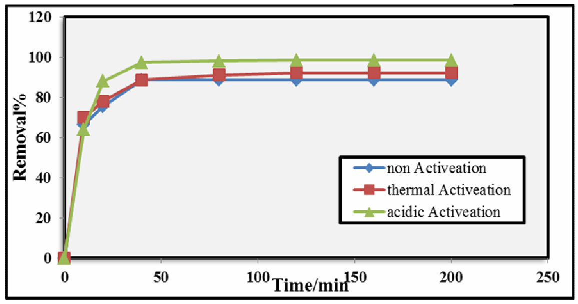


**Fig. 1 :** Effect of activated method on removal efficiency.

**Influence of Contact Time**

Two contact time effects were studied on removal efficiency of Leishman's stain and the procedure was carried out with first dye concentration of 10 ppm at pH (5.5), adsorbent dose 2 g/L of *E. crassipes* for the adsorption of dye and at temperature (22 ± 2°C). The increasing of contact time increases the removal efficiency. At the beginning, a fast adsorption of the dye was noticed. In first 40 min, 97% of the dye concentration was removed.

*E. crassipes* powder have active sites on its surface and that cause a rapid adsorption at the first contact, so there is a strong attraction between basic cationic adsorbate and those sites on the surface (Han *et al.,* 2007). The electrostatic hindrance or repulsion between basic cationic adsorbate species and the positively charged adsorbate species on the surfaces of *E. crassipes* may cause a gradual rate of adsorption. After 40 min the equilibrium was achieved at the highest stain adsorption (Malik and Saha, 2003). (Figure2).

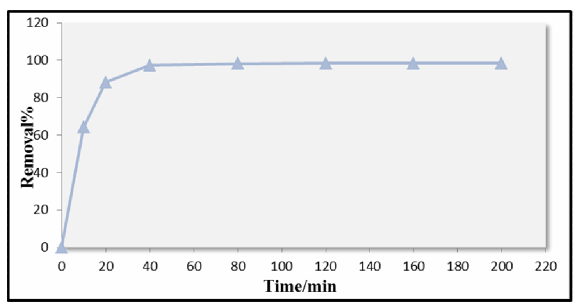


**Fig. 2 :** Effect of different contact time on removal percentage.

**Effects of Initial Dye Concentration:**

The removal efficiency of Leishman's dye reduced (98% - 89% - 67%) (Figure 3), when the initial concentration of Leishman's dye increased (10 - 40 - 60) mg/L respectively. The increasing of the initial dye concentration increases the adsorption of dye and decreases the removal percentage because of the saturation of active sites and reduction of the surface area (Malik and Saha, 2003).

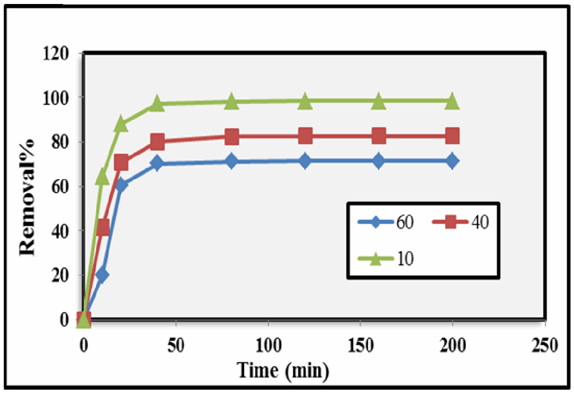


**Fig. 3:** Effect of initial dye concentration on removal percentage.

### Effect of Adsorbent Dose

Influence of adsorption dosage was studied for adsorbent dose (2, 4, 6) g/L. When the adsorbent dose increases the removal dye percentage increases two and then it remains constant (figure 4). This increasing because of availability of more adsorption sites and increase surface area, but the adsorbent unit mass reduces because of the adsorption sites staying unsaturated through the adsorption procedure (Malik and Saha, 2003; Han *et al.,* 2007).

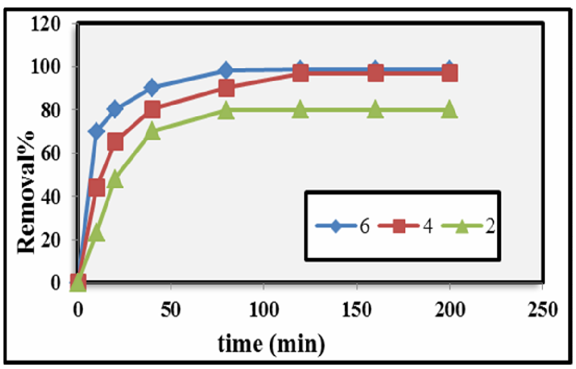


**Fig. 4 :** Effect of adsorbent dosage on removal percentage.

## Conclusion

The effect of the acidic and dry activation on the removal stain has been studied. This study has shown increasing in the removal percentage of dye, for both used activation methods (acidic and thermal) comparing with the sample non activation. At the same time the thermal activation was less active then the acidic activation for stain. The optimum operating condition were 120 min contact time, 10 mg/l initial concentration of dye and6 gm/L of the adsorbent dosage.

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