

Effect of Contact Time and Rate of Stirring of Rhodamine B Dyestuff on Lengkeng Shell Absorption (*Euphoria Longan Lour*)

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ABSTRACT

Rhodamine B is a very dangerous dye because it is carcinogenic and can cause various diseases. Rhodamine B waste mostly comes from waste from textile, batik and food industries. Biosorption is an alternative method to reduce the presence of dyes in solution using biomaterials which are often called biosorbents. Litchi shell which is used as a biosorbent has been shown to be able to bind dye ions in the presence of active groups such as: amines, hydroxyl, carbonyl and carboxyl which can form complexes with dye ions. This study used a batch method with the treatment of variations in particle size, contact time and stirring speed.

The results showed that the optimum conditions for the absorption of rhodamine B were at: particle size 106 μm , contact time 180 minutes and stirring speed 200 rpm with an absorption capacity of 25.3222 mg / g. The adsorption isotherm study conducted, Langmuir equation yields a regression coefficient value close to one ($R^2 = 0.8237$) so that it can be said to be better with a maximum absorption capacity of 53.4759 mg / g.

Keywords: Biosorption, Rhodamine B, Lengkeng Shell, batch method

PRELIMINARY

The material business is a genuinely evolved industry in Indonesia. Things that should be considered in this material industry are squander that can dirty the climate, particularly water contamination [11]. Textile industrial waste will flow into ditches or rivers, so this fluid waste can decrease the characteristic cleaning force of water, can

change the shade of waterway water, and can even bring about the demise of sea-going living beings that are essential to human existence. Textile industrial waste is caused by contamination with natural and synthetic dyes in the production process. So far, the textile industry has the highest ranking in the use of dyes. Dyes in the textile industry have developed from year to year [8]. However,

most of the textile industry uses. Synthetic dyes on the grounds are cheap, durable, easy to obtain and easy to use, but the resulting waste contains synthetic dyes and is also difficult to decompose [1]. Examples of dyes that are often used are Rhodamine B, Methylene blue, Methyl orange, and Methyl violet.

The enormous number of waste colors that are non-biodegradable can mess up the climate and wellbeing. Engineered colors are for the most part gotten from azo mixtures and their subsidiaries from the benzene bunch [9]. Benzene bunches are extremely hard to corrupt and take quite a while [8]. Azo mixtures are cancer-causing so they can cause disease on the off chance that they gather excessively long and enter the body. Then, benzene compounds are additionally intensifies that are hard to debase. Therefore, it is necessary to give special treatment to dyestuff waste before being discharged into the environment so that the concentration does not exceed the threshold. The dye that is often used in the textile industry such as paper mills is Rhodamine B dye, which is a basic dye (cation) which is generally the chloride or oxalate salts of organic bases [14].

Adsorption is the most productive method utilized for the treatment of color containing wastewater. The most famous and

broadly utilized material for adsorption is enacted carbon, which has countless miniature permeable designs, more adsorption limit and high surface region.

A few investigations have shown that few sorts of dry biomass like orange strips, lemon strips, banana strips can be utilized as promptly accessible adsorbents. The explanation is that the shell natural product contains useful gatherings, for example, CO_2H , -OH , N-H , C-H , C=O , C=C , which can shape ligands when metal particles stay on a superficial level. Examination by Jaitrong et al. [6] states that longan shell has different synthetic mixtures like gallic corrosive, flavone glycosides, and hydroxynamates with the principle substance of flavones as quercetin and kaemferol.

Lengkeng (*Euphoria longan* Lour) is an evergreen tree from the Sapindaceace family. This plant is widely available in China and Thailand which are consumed as fruits, but China is the country that produces the largest longan [7]. In the area of China longan is commonly used as a medicinal ingredient such as stomachache medicine, fever-reducing medicine and as an antidote to poison. In dry longan it can also be used as a treatment for insomnia. In longan it has also been found that it has pharmacological properties that can act as anti-cancer. [5] [15]

METODE

One of the methods used to remove pollutants from wastewater is adsorption [4]. There are two strategies for adsorption, in particular inundation (group) and section (fixed bed). In the inundation strategy or bunch the arrangement is blended and shaken with a retentive material until harmony is reached. This solid phase absorption reaches equilibrium when the adsorbent is saturated by the adsorbate. The non-adsorbed substance is further separated from the mixture and filtered. After equilibrium has been achieved, measurements of the concentration of residual substances in the filtrate are carried out to determine equilibrium conditions.

1. Spektronik

A spectrophotometer is a tool for measuring the transmittance or absorbance of a sample which is expressed as a function of wavelength. The principle of spectrophotometry is that the sample will absorb light at a certain wavelength and destroy light other than that wavelength. Samples capable of absorbing light in the visible region or colored compounds have electrons. These electrons in the normal state or in the atomic shell with the lowest energy are called the ground state. The energy

possessed by visible light is able to make electrons excited from the ground state to the atomic shell which has a higher energy or to an excited state [12].

The absorption of light by the solution follows the Lambert - Beer law, namely:

$$A = \log (I_0 / I_t) = a b c$$

Information :

I_0 = intensity of the incident rays

I_t = intensity of the transmitted light,

a = absorptivity,

b = the length of the cell or cuvette,

c = concentration (g / l),

A = absorbance [13]

2. FTIR spectroscopy

FTIR spectroscopy is an analytical method used to analyze the functional groups of a sample based on infrared light absorption spectra [3]. In general, FTIR is used for functional group analysis of a sample. In infrared spectroscopy a portion of the infrared radiation is consumed by the example and a piece of it is passed (transmitted). The FTIR work scheme is:

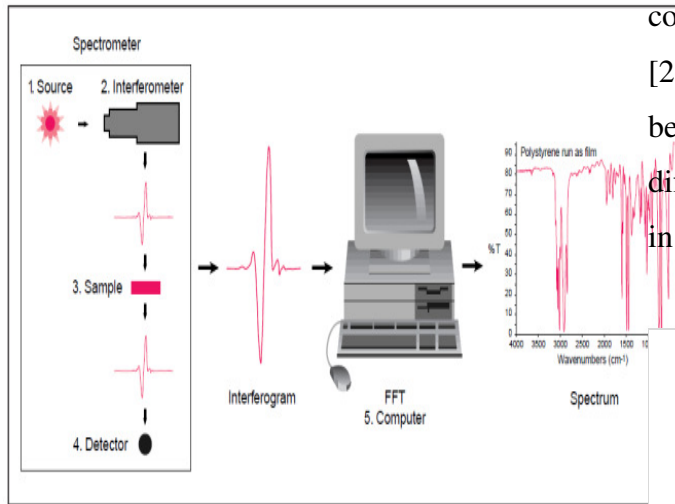


Figure 1 Instrumental schematic of FTIR [16]

On the off chance that an example is passed by infrared radiation, the atoms will assimilate energy and there will be a progress between the fundamental vibration level and the energized vibration level. At wave numbers 600 - 4000 cm⁻¹. The spectrum formed in FTIR will provide information about the functional groups of a molecule [10].

RESULTS AND DISCUSSION

The particle size also uses up the absorption ability. The more modest the size of the biosorbent utilized the more surface region. On the off chance that the size of the biosorbent utilized is more noteworthy, it can cause a decline in the surface space of the biosorbent. Bigger molecule size can increase internal diffusion to biosorbent penetration thereby inhibiting equilibrium and

consequently decreasing absorption capacity [2]. In this study, varying the particle size between 106, 150, 250 and 425 μm. The difference in absorption capacity for variations in particle size can be seen in Figure 2.

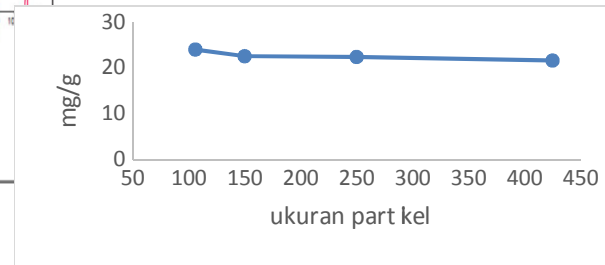


Figure 2 The particle size determinant of the absorption capacity of rhodamine B dye using longan shell (0.2 g of biosorbent, 25 mL of optimum rodamine B solution of 300 mg / L, optimum pH of 5, 200 rpm for 30 minutes)

In Figure 2, it can be seen that there is a decrease in absorption from the larger particle size. The decrease occurred from the particle size of 106 μm to 425 μm. The particle size of 106 μm is the optimum size with a capacity of 24.0465 mg / g.

Contact time is a deciding variable in the adsorption cycle. Since the contact time permits the dissemination and grip of the adsorbate atoms to occur. To decide the ideal contact time, this examination was done at varieties of 30,60,90,120,180 and 240 minutes with a pH of 5, a centralization of 300 mg/L,

an answer volume of 25 mL and an adsorbent mass of 106 μm and an adsorbent mass of 0.2 grams.

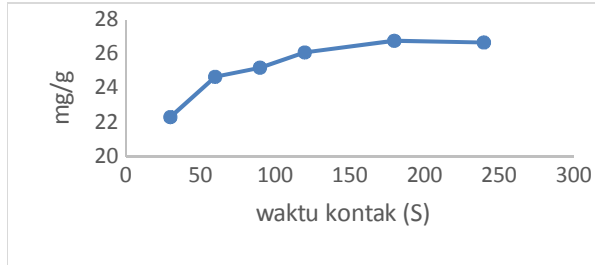


Figure 3. The effect of variations in contact time on the absorption capacity of rhodamine B dye using longan shell (0.2 g of biosorbent, 25 mL of rhodamine B solution 300 mg / L, pH 5, size 106 μm , speed 200 rpm)

In Figure 3 it can be seen that the optimum contact time occurred at 180 minutes with a capacity of 26.7707 mg / g. at 240 minutes the absorption chart decreased to a capacity of 26.6659 mg / g. This condition is due to the polysorbent that has been bound / saturated by the dye ion little by little, the active site that has been bound again is released into the dye, so that the additional time does not increase the absorption of dye ion rhodamine B.

The speed of stirring greatly affects the results of the biosorption on the dye ion rhodamine B. The faster the stirring speed, the greater the absorption. This is because with the rapid stirring, the contact that occurs between the active site on the surface of the

biosorbent and the dye ion will be faster and better, resulting in a large absorption capacity. The effects of variations in stirring speed on the absorption of rhodamine B dye were 50, 100, 150, 200, and 250 rpm for 180 minutes.

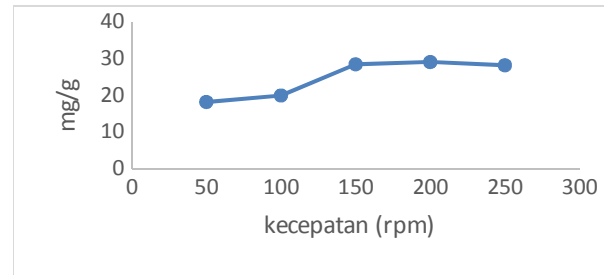


Figure 4 Effect of stirring speed on the absorption capacity of rhodamine B dye using longan shell (0.2 g of biosorbent, 25 mL of rhodamine B dye solution 300 mg / L, pH 5, size 106 μm , for 180 minutes)

In Figure 4, it can be seen that increasing the stirring speed can increase the absorption capacity. The optimum stirring speed occurs at a speed of 200 rpm with an absorption capacity of 29.1806 mg / g. at a speed of 250 rpm there is a decrease in absorption capacity of 28.2900. This is because the biosorbent has been saturated and cannot absorb the dye ion rhodamine B.

CONCLUSION

Based on the research that has been done, it can be concluded that longan shell (*Euphoria longan lour*) which is agricultural

waste can be used as an adsorbent to absorb rhodamine B dye. stirring time. The maximum absorption capacity obtained from the absorption of rhodamine B dye using longan (*Euphoria lour*) is 53.4759 mg / g.

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