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Adsorption of Ammonia Nitrogen using Variance Melons Rind as Adsorbent

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Abstract: Water treatment has been widely done by various parties involved in the removal of contaminants, organic matter, and groundwater remediation from wastewater. However, the process offers high costs and requires high maintenance such as chemical precipitation, carbon adsorption, ion exchange, evaporations, and membrane processes. In this study, the capability of different types of melon's rind was determined by the percentage of ammonia nitrogen reduction in synthetic wastewater. Other than that, the objective of this study is a comparison between the percentage reduction of raw and modified of both Watermelon Rind (WR) and Honeydew Rind (HR) on ammonia nitrogen adsorption. The data obtained from batch equilibrium analysis were analyzed using adsorption capacity, q, and removal efficiency, E. The ability of modified WR on adsorbing ammonia nitrogen was higher than other adsorbents with 56.4% of removal efficiency. The effect of modifying the WR and HR for the adsorption of ammonia nitrogen was verified to contribute to reducing the contaminant from synthetic wastewater with the texture of the surface has changed to be rougher. Beneficial research could result from this study, which can gain wider technical acceptance at the local level and be applied to the agricultural field.

Keywords: Adsorption, Adsorbents, Ammonia nitrogen, Synthetic wastewater, Contaminants

1. Introduction

In the past few years, a large quantity of ammonia has been dissolved in the water and the most common cause of the dissolution was agricultural wastewater. Excessive ammonia nitrogen happened when the fertilizers are not fully made use of by the farmer on the plants. The fertilizers are then carried

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by the water flow during the rain, and the water flow will go to the nearest river. The high level of ammonia concentration in water can cause eutrophication because of too many nutrients that can cause serious threats to humans [1]. The clean water will be mixed with the ammonia nitrogen which can lead to pollution. High levels of nitrate not only have threatened the survival of aquatic life [2] but also can be harmful to humans when it is contained in drinking water.

These days, low-cost adsorbents have shown their potential to remove heavy metals from agricultural waste. Furthermore, the previous researchers get a positive outcome by using agricultural waste such as banana peel [3], langsat peel [4], jackfruit peel [5], and cassava peel [6] to adsorb ammonia nitrogen. Watermelon peel shows its potential as a biosorbent by containing a natural and rich source. Meanwhile, Honeydew also comes from a melon family planted in tropical countries including Malaysia [7]. The natural source of honeydew also can be a good adsorbent of ammonia nitrogen but there are still no studies about modified honeydew in adsorb ammonia nitrogen.

This study determined ammonia nitrogen from different types of melon rind by drying the sample for 48 hours and with 40℃ in the oven. It will be a thorough adsorption process with synthetic water with different contact times. The concentration after the adsorption process will be measured by using the HACH DR6000 UV-VIS Spectrophotometer brand at a wavelength of 425 nm. This study also focuses to compare ammonia nitrogen adsorption between the rind of and modified melons. The rind of the modified watermelon is expected to adsorb more compared to the other adsorbent.

2. Materials and Methods

According to the flow chart in **Figure 1**, the first stage is sample preparation, which includes synthetic wastewater and ammonia nitrogen adsorbent medium; WR, and HR. For this research, synthetic water is used to ensure that the pH of wastewater is constant, and besides widely used in many fields of wastewater research and operational management. The adsorbent media is prepared by the amount allotted depending on the study's parameters.

Figure 1: The flow of the adsorption process

Following is the process's second stage, which is the initial laboratory testing. Two (2) different types of melon rind conditions that will be produced are raw melon rind and modified melon rind. Raw melon rind only needs to be dried in a drying oven as in **Figure 2 (a)**. The process for modified slightly different from the raw melons because before the melons are dried, the rinds are mixed in a sodium hydroxide (NaOH) for around 24 hours at room temperature, and the adsorbent sample is next dried for 48 hours at 40°C in a drying oven [8] as shown in **Figure 2 (b)**. Soon after, it needs to be dried before undergoing the next stage.

Alongside, the adsorption process is held as the third stage. For this procedure, the adsorbents are mixed with synthetic water. The drop in the value of ammonia nitrogen solution after the adsorption process was recorded after taking into account the rpm value of 150, different contact times (10 minutes, 20 minutes, 30 minutes, 40 minutes, and 50 minutes), and concentration of 50 mg/L for each sample. This experiment was conducted to identify the ability of each melon rind as an adsorbent either in a raw or modified state. The rind of the melon may be considered a success when it comes to water adsorption utilizing low-cost materials since the adsorption value of ammonia nitrogen is high.