POTENTIAL BANANA HUSK WASTE (MUSA PARADISIACA) FOR AN ADSORBENT MATERIAL

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Abstract:This paper reports the use of banana husk waste (Musa paradisiacal L) for an adsorbent material. Banana husk contains cellulose which can be processed for an adsorbent material. It has nitrogen, sulfur and carboxylic acid compounds. In this study, it took synthesized processing of some banana waste into adsorbent material by hydrothermal method; it tested the potential banana husk adsorbent in turbid water and contact time which aims to determine the efficiency of adsorption on water. The results obtained the activated carbon synthesized from banana husk waste has the significant potential for an adsorbent material. There is a meaningful linear relationship that the longer the contact time, the higher the efficiency of the activated carbon, which causes the water to become more apparent. **Acknowledgement:** Thanks for Rector UMN Al Washliyah for the 2nd batch of Research Grant Program 2018

Keywords: *Banana husk; water; adsorbent; hydrothermal method;*

1. INTRODUCTION

Many potential plants in Indonesia need further study for adsorbent materials. The plants would help the industry to find alternative raw materials besides metals and stones. Coconut shells also have been studied for seeing the potential elements to have clean water. Due to the massive number of bananas in Indonesia to research used bananas which grow a lot in Indonesia.Additionally, many benefits are obtained from banana plants; starting from the fruit, leaves, weevils, until the husk of bananas can be used (Castro, 2011). Traditionally bananas are mostly utilised as compliment food on the table and flour for cakes.It sometimes is made as alcoholic fermentation and vinegar. Banana leaves are used as packaging for various types of traditional Indonesian food. This research was to seek the potential banana husk waste for the adsorbent. It is expected to help people and industry to have recycling wastewater was inspired by industrial experience in Indonesia. The mining companies have the waste processes for materials such lead and copper, and flow into rivers have been done. The environmental problems of wasted waters to the streams (Abdi, 2015) due to heavy metals from water are costly, and some substances in the process are also toxic.

2. THEORETICAL REVIEWS

Previous study revealed that some plant wastes, such as fibre or coconut fibre and peanut shells, can remove material toxin materials from the water (Jusmanizah, 2012). A study concerning with the process of making activated carbon has been carried out; it was using the essential ingredients of cotton husk with $ZnCl_2$ activator. Therefore, the activation process is a necessary thing in addition to the raw materials used. Then research was carried out using banana peel ingredients with an activator in the manufacture of activated carbon to achieve optimal potent to be used as a substantial metal absorber on the packaging industry. It notes that water is one of the basic needs for living things, especially humans, in carrying out all daily activities such as washing, drinking purposes, and so on. Groundwater is one source that fills demands for these needs (Hewet, 2011). The quantity and quality of water following the requirements is one of the crucial factors in determining the health of human life — adjustments to organic, inorganic and microorganisms that determine the chemical composition of water. The presence of water will create quality and quantity problems, not available with good (Adinata, 2013). The needs of water increasing in Indonesia; groundwater plays an essential role in supplying water to much of the global population. Water availabilities for drinking, agriculture, and industrial purposes (Luczaj, 2016) tend to be decreasing, and it is necessary to make new alternatives. West Kalimantan, the quantity of groundwater is quite sufficient, but the quality standards have not met the requirements for clean water quality standards. One of the quality parameters of drinking water is iron ions. Iron in groundwater is in the form of Fe (II) and Fe (III). Iron (II) and iron metal in drinking water can dissolve and can combine with organic substances to form complex compounds. The presence of iron in drinking water is a maximum of 0.3 ppm (Subandono, 2011). The presence of iron metal at a concentration of 1-2 ppm can cause water to turn yellow, feel bitter and will leave stains on clothing and household appliances. Several methods that can be used to reduce the concentration of heavy metals in water include adsorption, precipitation and filtration and by absorption of pollutants. To find a cheaper and simple method of creating any adsorbent (Dewi, 2008), the use of wasted banana husk is offered. It reports that the banana husk contains cellulose which is high enough so that it can be used as an adsorbent. Additionally, it contains nitrogen, sulfur and carboxylic acid compounds. Carboxylic acids possess properties that can bind positively charged metals contained in river water and wells. In this study, some banana peel waste will be synthesized into the adsorbent material by hydrothermal method, tested the ability of banana husk adsorbent in reducing the concentration of Fe ions in groundwater by assessing the pH, adsorbent mass and contact time which aims to determine the efficiency of adsorption on iron ions (II) in groundwater (Mulyadi, 2012).

3. RESEARCH METHODS

Carbonization of banana husk waste by hydrothermal method Pre-dry the banana husk with a preparation technique to remove dirt that sticks to the banana husk and reduce moisture content. Carbonize at 500^{o}C. The process is carried out for 2 hours on the drum drum.

Activation process
Smooth particles with mortar and pestle, sieve them with sieves. Activating chemistry using H_2SO_4 solution. Sterilize particles and solution for 2 hours then put the sample into the oven for 4 hours.

Testing of banana husk waste
Weighing the activated carbon into several different parts of mass variation. Put the activated carbon into filter paper. Filtering turbid water using activated carbon from the residue of the banana husk. Measuring pH levels from the water before and after filtering using activated carbon. Test the elements contained in cloudy water before and after filtering using activated carbon

4. RESULTS AND DISCUSSION

Carbonization of banana husk waste by hydrothermal method
This part shows the research process which has been applied in a lab. A hydrothermal method was carried out in which banana husk waste put to carbonized technique. At this stage, the sample preparation stage is where the banana peel waste is dried to remove moisture and moisture. To get the carbon waste, banana peel is done by the maximum heating method, namely with a temperature of more than 500^oC on the pre-prepared combustion drum. Then the carbon sample is activated by using H_2SO_4 solution

The results of the carbon sample are as shown below :

Fig 1. Banana husk waste and activated carbon sample

The carbonization process is carried out at a temperature of 300-800o C. If the temperature is lower than 3000C then the carbonization that occurs is not more than 800 ° C, the pores will be damaged and will turn into ash. It can be seen in the picture above that the sample of banana peels has become activated carbon in solid black. The particles produced are fairly even after sieving with a 100 mesh sieve.

Activation and trial of active carbon samples waste banana peels
Activation has been carried out on the sample using a sulfuric acid solution. Activation will produce more and more amount because activator will provide an amount that will create more when activating activator will bind the pollutant containing compounds from the carbonization process, where the impurity will be wasted during washing. Then the activation is continued by turning on the air in turbidity.

Where the test results are obtained as follows:

Fig 2. The process of activation and testing of actuary carbon samples in turbid water with a contact time of 2 hours, 4 hours, 6 hours, 8 hours and 10 hours. **Sources: Primary figure**

It can be seen from the pictures that activated carbon synthesized from banana peel waste has the potential as an adsorbent material. Seen from the five samples that are increasingly added to the contact time, the water becomes more apparent. The contact time used to know the efficiency of activated carbon. Calculation of the practical value of the

adsorbent for activated carbon of banana husk waste in the table below:

Table 1. Adsorbent efficiency in a banana husk

No	Time Contact active carbon waste banana peel with water	Adsorbent efficiency
1	2 hour	20 %
2	4 hour	35 %
3	6 hour	40%
4	8 hour	65%
5	10 hour	100%

Sources: Primary figure

From the table above the data for 10 hours of observation (5 samples) are made into the 2013 excel graph. The results of the chart are shown in the following figure

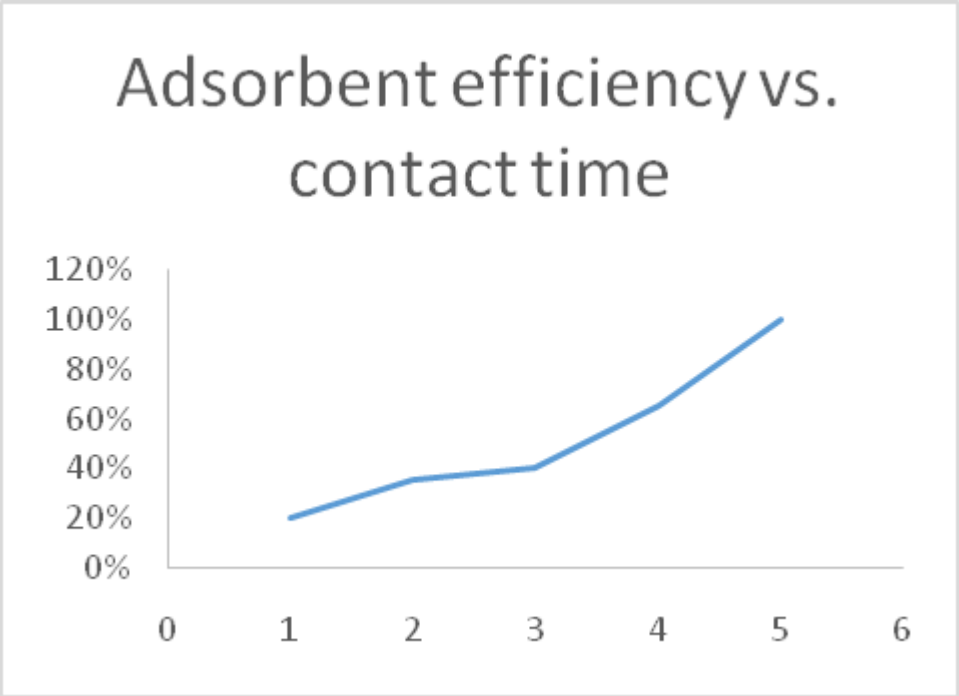

Fig 3. *Graph adsorbent efficiency vs contact time.* ***Sources: Primary figure***

From the graph, it can be seen that there is a significant linear relationship that the longer the contact time, the higher the efficiency of the activated carbon, which causes the water to become more transparent.

5. CONCLUSION

Data analysis gives some conclusions;

1. The hydrothermal method has shown its capacity to make use of the banana husk for adsorbent material. A sample of activated carbon is quite perfect in the hydrothermal technique.
2. There is a significant linear relationship with the duration of contact of the sample with cloudy water where the longer the contact time of the sample, the turbid water becomes more transparent. To see the content contained in banana husk waste related to morphological characterization and crystal structure that can bind certain metal metals needs further study.

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