MAKING ACTIVATED CARBON FROM PINEAPPEL HUMPS AS AN ADSOBENT FOR CRUEDE PALM OIL (CPO) WITH AN ACTIVATION TIME 1,5 HOURS USING NaOH

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ABSTRACT - This study aimed to inestigate the use of pineapple humps waste as a raw material to produce activated carbon which is then used as an adsorbent in the adsorption process of Crude Palm Oil (CPO). Waste from pineapple humps is a potential source that has not been optimally utilized, while CPO is a raw material containing a lot of oil, often causing water pollution. Activated carbon was produced by activation using 1 M NaOH with variable times (0.5 hours, 1 hours, 1.5 hours. This study includes the quality of the activated carbon produced, as well as evaluating the ability of the activated carbon in the CPO adsorption process. The results showed that activation time had a significant influence on the properties of activated carbon, including specific surface area and CPO adsorption force. This research actively contributes to managing pineapple residue waste and minimizing environmental pollution due to CPO, as well as opening up opportunities for developing environmentally friendly adsorbent materials in the pineapple and palm oil processing industries.

Keywords: activated carbon, adsorbent, *Crude Palm Oil* (CPO)

INTRODUCTION

Crude palm oil (CPO) is the result of processing palm oil dregs through sterilization, pressing and clarification processes. This oil is a high quality product that can provide added value of around 30% of the value of fresh fruit bunches. CPO can be used as raw material for the cooking oil industry, soap industry, margarine industry and fuel.

The ingredients contained in CPO include triglyceride fatty acids (the highest content in vegetable oils, reaching around 95%), free fatty acids (FFA), mono and diglycerides, as well as a number of other ingredients such as phosphoglycerides, vitamins and minerals. or sulfur in small quantities. Free fatty acids are one of the quality parameters of CPO. The higher the free fatty acids, the lower the quality of CPO. One way that can be used to reduce free fatty acids is adsorption using activated carbon.

Activated carbon is a porous solid containing 85 to 95% carbon. Materials containing the element carbon can produce active carbon by heating the carbon to a high temperature and adding other substances such as acids or bases. These pores can be used as an absorbing agent (adsorbent). Large area activated carbon can be used for a variety of applications, including color removal and odor removal. This activated carbon has been used in various fields so that the need for active carbon is currently increasing.

Pineapple humps are waste from pineapple fruit which can be used as active carbon as an adsorbent. Pineapples are monocotyledonous plants and are plants that grow in clusters (budding plants). The leaves are very long, the spines grow on the edges upwards (towards the tip of the leaf) and the leaves that appear are concentrated at the base of the stem. The leaves have long fibers.

In Jambi, pineapple production in 2022 will reach 119,862 tons/year. The average pineapple fruit is 1.5 kg, 1 fruit contains around 21% pineapple tubers. The composition of pineapple tubers consists of 86.70% water, 0.69% crude protein, 0.002% crude fat, 0.48% ash content, 1.66% crude fiber, 10.54% carbohydrates.

Pineapple humps can be processed into active carbon using the carbonization and activation method. Active carbon from pineapple tubers is fine active carbon in the small tuber mater. Lack of knowledge about the contents of pineapple tubers means that the use of pineapple tubers for activated carbon is still lacking. The carbonization method for pineapple tubers is chemical heating at a temperature of 300oC. Then an activation method will be carried out using NaOH solution.

This research aims to examine the use of pineapple humps waste as raw material to produce active carbon, which is then applied as an adsorbent in the absorption of Crude Palm Oil (CPO).

2. RESEARCH METHOD

2.1 Materials and Tools

The tools used in this research Furnace, Magnetic stirer, Funnel buncher, Erlemeyer, Measuring cup, Hot plate, Vacuum pump, Beaker glass, Oven, Blender, Analytical balance, Burette, Stative, pH indicator, Porcelain dish, Volume pipet, Desiccator, Trya pan, Filter paper, Sieve 100 mesh, Stirring rod, Suction rubber, SEM, Stop watch.

The materials used in this reseacrh Crude palm oil (CPO), NaOH, Aquades, and Pineapple humps.

2.2 Research Produre

This research procedure begins with the preparation of raw materials to be used by separating them from the dirt attached to the pineapple weevil. Then proceed with the manufacture of activated carbon, namely by carbonizing pineapple weevils to get activated carbon after which pineapple crown carbon activation is carried out using activators, namely NaOH (Sodium Hydroxide), and CPO adsorption is carried out with activated pineapple weevil activated carbon that has been activated.

2.2.1 Preparation of Raw Materials

Preparation of raw materials begins with the sampling of pineapple crown waste. Then carry out the washing process on the pineapple crown sample and pineapple humps cutting which aims to remove dirt attached to the pineapple humps. After the pineapple crown waste sample is clean, drying is carried out first using sunlight and continued with the drying process using an oven at 105^{o}C to ensure the pineapple humps has dried.

2.2.2 Pineapple Humps Carbonization

The stages of carbonization are carried out by means of a dried pineapple humps weighed as much as 100 grams. The pineapple crown sample is filled into the rector and put into *the furnace* for carbonization process at a temperature of 300^{o}C with a time of 1 hour. The results of the carbonization process are cooled and smoothed using a *chopper*.

2.2.3 Carbon Activation

The activation carried out in this study is chemical activation. Performing chemical activation, 2 grams of carbon or pineapple humps charcoal were soaked in 20 ml of NaOH solution with a concentration of 1M (ratio 1 : 10) with time variations of 0,5 hours, 1 hours, 1.5 hours. Pineapple humps is put into NaOH (Nartrium Hydroxide) solution and continued with stirring using a *hot plate* and *nagnetic stirrer* for 1 hour. Stirring is carried out so that the solution becomes homogeneous. Then the washing

process is carried out using filter paper and aquades solution with the help of a vacuum pump until the washing pH 7 (neutral) is obtained. After washing, proceed with the drying process using an oven at a temperature of 105^{o}C with a time of 12 hours so that it becomes activated carbon.

2.2.4 Adsorption Test

For the first step, prepare activated carbon and Crude Palm Oil (CPO) in a ratio of 1: 5 in a beaker glass. After that, the mixture is heated using a hot plate to reach a temperature of 60^{o}C and then homogenized using an electric motor at a constant speed of 12 rpm. After reaching the desired temperature and homogenization, the mixture is taken periodically every 2 minutes until it reaches an equilibrium state. The last step, the sample is filtered using filter paper.

In β-carotene, the adsorption process is carried out in a beaker glass with a weight ratio between activated carbon and palm oil of 1:3. Next, the mixture is heated using a hot plate to reach a temperature of 40^{o}C and homogenized by using an electric motor at a speed of 120 rpm for 2 hours. After that, the mixture is filtered using filter paper. After the filtering process is complete, the mixture is transferred into a container for analysis

The quality of edible oil is determined by several factors, among others, peroxide number, free fatty acid content and oil color. Therefore, the analysis carried out is the analysis of free fatty acid levels, peroxide number and oil color.

3.1 Carbon Activated

Activated carbon is activated for 1.5 hours, 2 hours, and 3 hours with a drying time of 12 hours. Activation using 1M NaOH solution.

Figure 1. Activated Carbon

3.2 Adsorption

The adsorption test was carried out using a hot plate and glass beaker with a ratio of 1: 3 for 2 hours at a speed of 120 rpm at a temperature of 40^{o}C.

Figure 2. Adsorption

4. CONCLUSION

This research includes physical and chemical characterization of the activated carbon produced, as well as assessing the ability of the activated carbon to absorb CPO. The results showed that activation time had a significant effect on the properties of activated carbon, including surface area and adsorption strength on CPO. This research makes a positive contribution in managing pineapple crown waste and reducing environmental pollution due to CPO, while also opening up opportunities for the development of environmentally friendly adsorbents in the palm oil processing industry.

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