MAKING ACTIVATED CARBON FROM PINEAPPLE LEAVES AS CRUDE PALM OIL (CPO) ADSORBENT WITH AN ACTIVATION TIME OF 1.5 HOURS USING NAOH

Tadzkiratul Mubarakah[1)], Nazarudin[*2)]

**Corresponding author*

*ORCHID IDs: https://orcid.org/0000-0002-8404-5999

[1)]Tadzkiratul Mubarakah (Agricultural Technology, Jambi University, Indonesia)

[2)]Nazarudin (Chemical Engineering, Jambi University, Indonesia))

**Email: Tadzkiratulmubarakah@gmail.com*

Abstract

In pineapple leaves there are carbon compounds such as cellulose and lignin, so pineapple leaves have the potential to be used as the basic material for adsorbents. The purpose of this study was to determine the characteristics of activated carbon produced from pineapple leaf waste as an adsorbent to improve the quality of Crude Palm Oil (CPO). Pineapple leaf activated carbon is produced through activation for 1.5 hours using 1M NaOH. This study used variations in absorption time of 15 minutes, 30 minutes, 45 minutes, 60 minutes, and 75 minutes. With adsorption temperatures of 30°C, 40°C, 50°C, 60°C, and 70°C, 3 repeats were performed. The results of this study show that activated carbon from pineapple leaf waste has the potential as a basic ingredient for adsorbents to improve the quality of Crude Palm Oil (CPO). The positive impact of utilizing pineapple leaf waste can reduce environmental pollution and can be the basic material for absorbents.

Keywords: Pineapple Leaves, Activated Carbon, Adsorbent, *Crude Palm Oil* (CPO)

1. INTRODUCTION

Pineapple plants have short stems. Pineapple is a monocotyledonous plant that is clumped (sprouting saplings). The leaves are long, at the edges there are thorns facing upwards (towards the tip of the leaf) and leaves appear and collect at the base of the stem. Pineapple leaves have long fiber (Sunanrjono, 2008).

So far, pineapple plants used are only the fruit while pineapple leaves are relatively not widely used. At the time of harvest, pineapple plants must be replaced with new plants while the leaves are discarded as waste. Pineapple plants must be dismantled after every two or three harvests and replaced with new plants and can result in pineapple leaf waste continuing to grow. The high cellulose content in pineapple leaves can be used as a heavy metal adsorbent because the cavity structure in cellulose can adsorb heavy metals (Handayani et al, 2012).

Various types of adsorbents that have been developed include using activated carbon. Activated carbon is carbon that has very many pore spaces with certain sizes that can capture particles to be absorbed (Irmanto and Suyata, 2010).

Activated carbon is a product of the carbon activation process which has a higher absorption ability and has more uses than ordinary carbon. Activated carbon is a form of carbon that resembles charcoal that serves to absorb impurities in waste. Activated carbon can be made from various materials as long as the material contains carbon, one of which is pineapple leaves.

2. RESEARCH METHODS

2.1 Materials and Tools

The tools used in this study are: measuring cup, *furnace*, magnetic stirrer, Erlenmeyer, *oven, vertical reactor,* buncher funnel, *horizontal reactor*, autoclave, *separator funnel*, hot plate, *caliper, vacuum pump, analytical balance*, beaker glass, injector, *T faucet, and pH indicator*

The ingredients used in this study are: pineapple leaf fiber, *Crude Palm Oil* (CPO), NaOH, and aquades

2.2 Research Implementation

2.2.1 Pineapple Leaf Sample Preparation

Preparation of raw materials begins with sampling of pineapple leaf waste. Furthermore, pineapple leaves are washed and cut into small sizes which aims to remove dirt attached to pineapple leaves and can speed up the drying process. Pineapple leaves are dried using sunlight and then continued with the drying process using an oven at 105°C to ensure that the pineapple leaves have dried.

2.2.2 Pineapple leaf carbonization

The next stage, carbonization of pineapple leaf samples. Pineapple leaves that have dried are tasked with 100 grams. Pineapple leaf samples are filled into the reactor and put into *the furnace* for the carbonization process to be cooled and mashed.

2.2.3 Pineapple Leaf Carbon Activation

The activation carried out in the study is chemical activation. How to carry out chemical activation by soaking carbon samples of pineapple leaves in 20 ml of NaOH solution with a concentration of 1M with a ratio (1: 10) with a time of 1.5 hours. Pineapple leaves are put into the NaOH solution and continued with stirring using a *hot plate* and *magnetic stirrer* for 1.5 hours. And stirring is carried out which aims to make the solution homogeneous.

Then the next process is carried out, namely washing using filter paper and aquades solution with the help of a vacuum pump until it gets a pH of 7 (neutral) from the washing results. After the washing process, proceed with the drying process using an oven with a temperature of 105 ° C with a time of 12 hours until 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. After that, the mixture is heated using a hot plate to reach a temperature of 60oC and then homogenized using an electric motor with a constant speed of 12 rpm. Upon reaching the desired temperature and homogenization, the mixture is periodically taken every 2 minutes until it reaches a state of equilibrium. The last step, the sample is filtered using filter paper. In β-carotene, the adsorption process is carried out in a beaker with a weight ratio between activated carbon and palm oil 1:3. Furthermore, the mixture is heated using a hot plate to reach a temperature of 40oC and homogenized 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.

3. RESULTS AND DISCUSSION

The quality of vegetable oils is determined by several factors, including 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.

3.2 Adsorption

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

4. CONCLUSION

The results of this study show that activated carbon from pineapple leaf waste has the potential as a basic ingredient for adsorbents to improve the quality of Crude Palm Oil (CPO). The positive impact of utilizing pineapple leaf waste can reduce environmental pollution and can be a basic absorbent material.

References

Sunarjono, H., 2008, Berkebun 21 Jenis Tanaman Buah. Cetakan Keenam. Penebar Swadaya. Jakarta.

Irmanto dan Suyata., 2010, Optimasi Penurunan Nilai BOD, COD dan TSS Limbah Cair Industri Tapioka Menggunakan Arang Aktif dari Ampas Kopi, Molekul, 5:22-32.