Analysis of the Chemical Content of Virgin Coconut Oil (VCO) with Raw Material of Coconut From Walennae Village, Sabbangparu District, Sengkang Regency

Sumiati Side[1], Suriati Eka Putri[2]*, Muhammad Iskandar Musa[3]

Jurusan Kimia, Universitas Negeri Makassar[1,2]
Jurusan Teknik Otomotif, Universitas Negeri Makassar[3]
correspondent author: ekaputri_chem@unm.ac.id[2]

Abstract. Coconut (*Cocos nucifera L.*) is a plant that provides many benefits to the rural economy. The part of coconut that has many benefits is the flesh of the fruit which can be taken from the coconut milk to make pure coconut oil which is commonly called Virgin Coconut Oil (VCO). In this study, the manufacture of VCO with the basic ingredients of old coconut from Walennae Village, Sabbangparu District, Sengkang Regency was carried out. This study aims to determine the characteristics of VCO in the form of peroxide number, Free Fatty Acid (FFA) number, and air content. The results showed the physical properties of the VCO produced, including the physical appearance of oil with a clear color, a distinctive aroma of oil, and no rancid smell. The results of the analysis of the chemical properties of the resulting VCO have a peroxide value of 1.5835 mg ek/kg; FFA number is 0.08% and water content is 0.18%.

Keywords: virgin coconut oil, coconut, characteristic

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INTRODUCTION

Coconut plants are one of the agricultural products which are Indonesia's export commodities. Judging from the area of distribution, coconut plants spread throughout the country (Barlina, 2004). In South Sulawesi, especially in Wajo Regency, coconuts are generally processed into copra and some are used for household needs such as processing into coconut milk and coconut oil. This is a way for local people to get results from coconuts as a source of fulfilling their daily needs (Putri, Ramdani, & Salempa, 2019; Side, Putri, & Musa, 2022).

Coconut which is the raw material for oil is called copra, where the oil content ranges from 60–65% while the fresh (young) fruit flesh has an oil content of around 43% (Winarti et al., 2007). Coconut oil consists of glycerides, which are compounds between glycerin and fatty acids. The fatty acid content of coconut oil is an estimated 91% saturated fatty acids consisting of caproic, caprylic, capric, lauric, myristic, palmatic, stearic, arachidic, and approximately 9% unsaturated fatty acids consisting of oleic and linoleic (Al-Hamid, Leiwakabessy, & Bandjar, 2019). According to Barlina (2004) the main content of VCO is lauric acid and capric acid, these acids in the human body are converted into monolaurin and monocaprin which are anti-viral, anti-bacterial and anti-fungal.

One of the products from processed coconut that has a high selling value is pure coconut oil or VCO. The VCO product contains $CH_3(CH_2)10COOH$ lauric acid and 7% $CH_3(CH_2)_6COOH$ caprylic acid. Both of these acids are medium chain saturated fatty acids which are easily metabolized and anti-microbial. In the body, lauric acid becomes monolaurin, while caprylic acid becomes monocaprin. Lauric acid has a function, which is converted into monolaurin in the human body. Monolaurin is an antiviral, antibacterial and antiprotozoal monoglyceride that is used by the human and animal immune systems to destroy lipid-protecting viruses, such as HIV, herpes, influenza and various pathogenic bacteria. Capric acid which also functions as an immune substance when converted into monocaprine in the human or animal body. Monocaprin has an antiviral effect against HIV and herpes simplex and bacteria that are transmitted (Emilia, Putri, Novianti, & Niarti, 2021). The benefits of VCO according to (Perdani, Pulungan, & Karimah, 2019) and (Dwi Sutanto, Ratnawati, & HP, 2021), among others, as a supplement in food, cosmetics, and pharmaceuticals (drugs).

RESEARCH METHOD

VCO manufacture

Grated coconut, then mixed with water and put into the coconut milk squeezer, put in a container then closed and let stand ± 2 hours. 2 layers will be formed (the top is thick coconut milk and the bottom is water). The bottom layer (water) is removed using a hose. Thick coconut milk is stirred and left to stand for 1 day. 3 layers will be formed (the top is oil, the middle is blondo or coconut milk dregs and the bottom is water), then the top is taken and filtered conventionally 3 times using tissue and cotton as shown in Figure 1. Let the oil drip onto in a container.

Figure 1. Conventional VCO filtering

Analysis of peroxide number

5 g of sample was weighed, then 12 mL of chloroform and 18 mL of glacial acetate were added to the Erlenmeyer. The solution is stirred until all the solution are dissolved. After all of the compounds were mixed, 0.5 mL of a saturated solution of potassium iodide was added. Let stand in a dark room for 30 minutes, then add 30 mL of distilled water. Next, 0.5 mL of 1% starch was added to the mixed solution and immediately titrated with 0.1 N $Na_2S_2O_3$ until the solution turns blue until the blue color disappears. The determination is carried out by repeating 3 times and in accordance with SNI 7381:2008. Peroxide numbers are expressed in mg-equivalent peroxide in every 100 g of sample. In the same way a blank titration was made.

Analysis of FFA number

3 g of the sample was weighed, then 50 mL of 96% ethanol was added. The sample is heated with a hotplate for 10 minutes to a temperature of 50 °C while stirring so that it is homogeneous. The sample was added with 1% PP indicator in alcohol then titrated with 0.1 N KOH. The end of the titration is reached until a pink color is formed. The same treatment was carried out 3 times and in accordance with SNI 7381:2008. Calculation of acid number is done based on equation (1).

$$\text{FFA number} = \frac{M \; x \; A \; x \; N}{1000 \; x \; G} \text{ x } 100\% \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Information:
M = molecular weight of fatty acids (coconut oil=200; palm oil=263)
A = volume of KOH for titration (mL)
N = Normality of KOH solution
G = sample weight (grams)

Analysis of water content

The sample is weighed and the internal weight is recorded (W_1), put in the tray then weighed and the weight recorded (W_2). The weight of the test object is calculated ($W3 = W_2 - W_1$). Dry the test object along with it in the oven at a temperature of (110 ± 5) °C until the weight remains constant. After drying, weigh and record the weight of the specimen along with the tray (W_4). Calculate the weight of the dry specimen ($W5 = W_4 - W_1$). The water content is determined using equation (2).

$$\text{Water content} = \frac{(W_3 - W_5)}{W_5} \text{x} 100\% \text{ .....(2)}$$

RESULTS AND DISCUSSION

The physical appearance of the resulting VCO is shown in Figure 2, and the results of the physical analysis are shown in Table 1. The resulting VCO product shows a clear color with an oil-like aroma and is not rancid. Based on the physical appearance, the resulting VCO product fulfil the standards.

Figure 2. Physical appearance of VCO

Peroxide number is an index of the amount of fat or oil that has undergone oxidation. The peroxide number is very important for identifying the oxidation state of an oil. The results of the peroxide number test are shown in Table 1. The peroxide value of the resulting VCO was 1.5835 mg ek/kg. The resulting value is lower than the VCO produced using turmeric antioxidants (more than 2 meq/kg) (Meliyani Bouta, Abdul, & Kandowangko, 2020). It shows that the value of the peroxide number meets the Indonesian National Standard (SNI).

Table 1. Results of the analysis of the physical and chemical properties of VCO with coconut as the raw ingredient

Chemical Physics Properties	Unit	Results
Color	-	Clear
Scent	-	Typical oil
Rancid smell	-	Not rancid
Peroxide number	mek/kg	1.5835
FFA number	%	0.08
Water content	%	0.18

Free fatty acids (FFA) is a value that indicates the amount of free fatty acids present in fat after the fat is hydrolyzed. Free fatty acids are the result of degradation of triglycerides as a result of oil damage. The results of the test for free fatty acids are presented in Table 1. The FFA value of the VCO produced was very low, only 0.08%, but it complied with SNI 7381 (2008). The low free fatty acids are also related to the

water content in the VCO. If the water content in the oil is high (in this study 0.18%), a hydrolysis reaction will occur which can increase the free fatty acid content and vice versa.

FFA are produced through hydrolysis reactions which can be caused by a number of water, enzymes or microorganism activity. The increase in free fatty acids was due to the presence of water in the substrate, namely coconut milk, which caused the hydrolysis process in coconut oil during the mixing process which triggered the formation of free fatty acids. The FFA value produced in this study was lower than VCO made with the addition of turmeric antioxidants (Meliyani Bouta et al., 2020).

CONCLUSION

Based on the results of the research, it can be concluded that the VCO characteristic test has a value that is not much different from the VCO results obtained in accordance with SNI standards.

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