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Sensory Evaluation And Yield Value of Vco Produced By Various Culture

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ABSTRAK

Virgin Coconut Oil (VCO) adalah minyak kelapa yang diolah dari kelapa segar dengan atau tanpa pemanasan dan tidak melalui proses pemurnian. Penelitian ini bertujuan untuk mengetahui tingkat penerimaan sensory dan nilai rendemen VCO yang diproduksi dengan metode fermentasi menggunakan berbagai kultur mikroorganisme (Saccharomyces cerevisiae, Lactobacillus plantarum dan Rhizopus oligosporus). Ketiga jenis kultur tersebut dicampurkan ke dalam krim sebanyak 5% (v/v), kemudian dilakukan proses fermentasi pada suhu 35^{o}C selama 24 jam. VCO hasil fermentasi berwarna bening, memiliki aroma khas kelapa, dan memiliki rasa yang hambar. Dari uji sensori secara hedonik, secara keseluruhan panelis memberi nilai lebih dari 3. Rendemen VCO berkisar antara 22.01—25.74%. Perbedaan penggunaan jenis mikroba tidak berpengaruh secara signifikan (p>0,05) terhadap hasil rendemen dan hasil uji organoleptik dari VCO yang dihasilkan.

Kata Kunci: *Fermentasi, Lactobacillus plantarum, Rhizopus oligosporus, Saccharomyces cerevisiae, Virgin Coconut Oil* (VCO)

1. INTRODUCTION

Coconut (Cocos nucifera) is one of the abundant plantation commodities that is natural resourse of Indonesia. Coconut meat has a considerable opportunity to be developed into processed products that have a high selling value (Pratiwi, Ali, Setiawan, Budiyanto, & Sucahyo, 2017). One of the processed products from coconut meat is pure coconut oil or known as Virgin Coconut Oil (VCO). VCO can be produced using the fermentation method. This method is considered to be able to maintain the content of active components in oil (Hamsi et al, 2015). The method of processing VCO by fermentation can use several types of microbial cultures such as yeast, bacteria, and mold. The results showed that VCO processing using Saccharomyces cerevisiae could produce a yield of 30% (Sukandar, 1980). While using Lactobacillus plantarum can produce a yield of 23.5% (Rahayu et al, 2008). Rhizopus oligosporus culture able to produce 20% yield. Each type of microbe used has a different performance on the yield and characteristics of VCO.

Clinical research have proven that VCO have many beneficial properties as it contain a high polypenol, antioxidant compounds (Srivasta et al, 2018), antioxidants and medium chain fatty acid (Hee et al, 2017). VCO has high Medium Chain Fatty Acids (MCFA) wich have smaller molecular sizes compared to long chain fatty acids (LCFA) (C> 14). This allows MCFA metabolism in the

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body to be digested and easily absorbed so that it can provide a fast source of energy and is not stored as fat in the body (Arpi, 2014). VCO can reduce total cholesterol, reduce low density lipoprotein (LDL), and increase high density lipoprotein (HDL) in blood serum that was tested in male rats of the Sprague – Dawley type (Nevin and Rajamohan, 2014). Due to it function, VCO becomes popular and widely consumed as functional food (Satheesh and Prasad, 2012). In addition, the VCO has the characteristics of clear, has a distinctive coconut aroma, and has high added value (Shah, 2005; Pontoh, 2011). Food products with health function claims have an increasing market (Prades, 2016). However, as food, oil has unique sensory characteristics. Most people do not consume pure oil directly, but applied to other foodstuffs.

Sensory evaluation is a key method to acquire information about product defferences, consumer preference or acceptance and attribute intensities. Quantitative consumer studies is used to measure preference and acceptance (degree of liking) among products (Yang and Boyle 2016). Information about the level of consumer acceptance of a product can be measured through hedonic testing (Pimental et al, 2016). This test is able to describe quantitatively the level of consumer acceptance in the form of a rating scale. This information will be very useful for the development and marketing department before the product is launched in the market. Until now there is still limited information that can be used to see and compare the sensory quality and performance of Saccharomyces cerevisiae, Lactobacillus plantarum, and Rhizopus oligosporus in producing VCO products by fermentation method. This research is expected to provide a sensory evaluation and performance of various microorganisms in producing VCO by fermentation method.

2. METHODS

2.1. VCO Production

The main ingredients used are coconuts aged 11-13 months purchased from local markets in the Jakarta area. Then ground using a grated machine. The shredded coconut meat is added to water with a ratio of meat and water was 1: 2 to do the pressing process using a filter cloth to obtain coconut milk. Coconut milk that has been obtained then allowed to stand for 2 hours to form 3 layers. The top layer is cream, the middle layer is skimmed, and the lowest layer is the solid phase. Then the cream is separated. For the fermentation process using 3 types of microorganisms: Saccharomyces cerevisiae, Lactobacillus plantarum, Rhizopus oligosporus obtained from Indonesian Culture Collection (InaCC). Before mixing proses the starter added into the cream to continue the fermentation process, the starter culture has been cultured in a liquid medium such as nutrient broth (NB) so that the addition of the starter can be expressed in units of volume. After that, each starter of 5% microorganisms is put into the cream. The fermentation process is carried

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out for 24 hours (Barlina, 2004) and at temperature 35°C until it is separated into 3 layers. The top layer is oil, the middle layer is protein, and the bottom layer is water. The last stage is the separation and purification of oil using filter paper.

2.2. Sensory Evaluation

Organoleptic testing was carried out using the hedonic test method involving 80 untrained panelists (Wahyuningtyas et al, 2014). The panelist will be given a sample that has been given a 3-digit code, then asked to give his personal response about which sample he likes and his level of preference based on the attributes of taste, aroma, and color. The number or value given by the panelist was in the form of a hedonic scale. The hedonic scale used in this test was 1-5. Where the value of 5 = very like, 4 = like, 3 = neither like nor dislike, 2 = dislike and 1 = very dislike. The use of hedonic scales was intended to determine the differences in each sample, so that the hedonic test is often used to assess sensory atribute of new product development (Setyaningsih et al., 2010).

2.3. Yield Calculation

The yield obtained from VCO processing using the fermentation method with the difference in the addition of starter microorganisms can be calculated using the following equation (Ahmad et al., 2013).

$$\% \text{ yield} = \frac{\text{Vı} \qquad \text{o V}}{\text{Vı} \qquad \text{o cı}} \times 100\% \quad \text{..} (1)$$

3. RESULTS *AND DISCUSSION*

3.1. Sensory Evaluation

Organoleptic testing was done by hedonic test method. The hedonic test is a test conducted to determine the level of panelists' preference for a VCO sample processed by fermentation method using *Saccharomyces cerevisiae culture, Lactobacillus plantarum, and Rhizopus oligosporus*. The level of preference is made for the attributes of color, aroma, and taste with a rating scale of 1 to 5, where: 1 = very dislike; 2 = dislike; 3 = neithe like nor dislike; 4 = like; 5 = very dislike.

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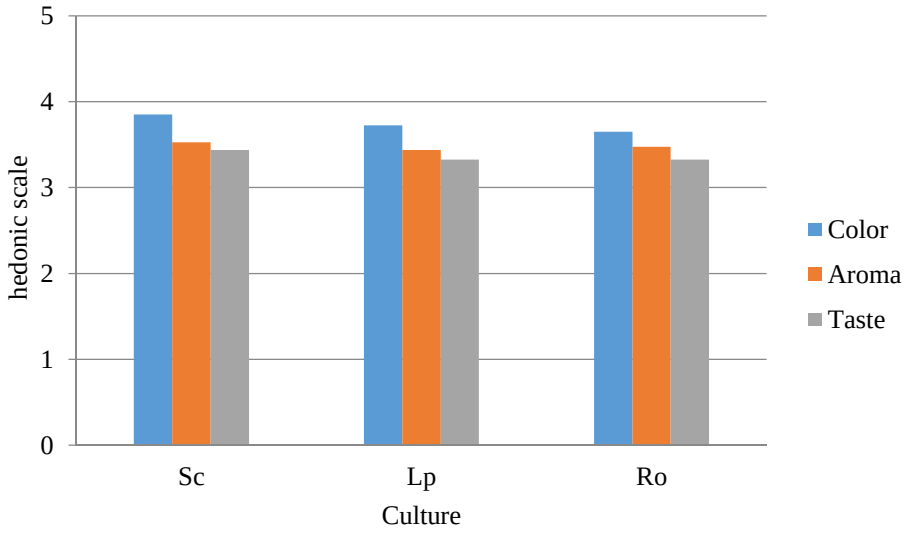

Figure1. Sensory Evaluation using Hedonic Test

Color has an important role in food commodities, namely attractiveness, identification, and quality attributes. Among the properties of food products, color is a quality factor mostly attracts the attention of consumers and quickly gives the impression of being liked or disliked (Soekarto, 1985). VCO samples using *Saccharomyces cerevisiae* had the largest average value of 3.85 (Figure 1). While VCO samples using *Lactobacillus plantarum* and *Rhizopus oligosporus* have an average value of 3.73 and 3.65. Based on these average values, it was found that the panelists almost liked the colors of the three samples. VCO produced from fresh coconut using fermentation methods will produce clear colors (Andi, 2005).

Aroma is a value contained in products that can be directly enjoyed by consumers. Soekarto (1985), stated that the aroma of a product can determine the freshness of the product, even the aroma is more complex than the taste. The sensitivity of the sense of smell is usually higher than the taste. Even the industry considers the smell test on the aroma of the product is very important. VCO produced from fresh coconut using fermentation method will produce a distinctive coconut aroma (Andi, 2005). From Figure 1 showed that the panelist's assessment of aroma from the three VCO samples is almost like.

Taste is important attributes that can influence a person's acceptance of a product (Hayati et al, 2012). The taste of the VCO sample which has the largest average is the VCO sample that uses Saccharomyces cerevisiae with an average value of 3.44 (Figure 1). Whereas for the samples of Lactobacillus plantarum and Rhizopus oligosporus, both have an average value of 3.33. It can be concluded that the panelists' assessment of the taste of the VCO sample is almost like. VCO

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produced from fresh coconut using fermentation method will produce tastes that are bland or normal as typical of coconut oil (Andi, 2005)

Overall, the attributes of color, aroma, and taste from VCO samples produced using Saccharomyces cerevisiae, Lactobacillus plantarum, and Rhizopus oligosporus can be seen in Table 1. Based on the research of Rahayu et al (2008), the results of organoleptic VCO test were processed by fermentation method were used different types of microbes, namely yeast, bacteria, and mold, all of them have a clear color. In terms of taste, VCO produced from yeast and bacteria types has a slightly oily taste, whereas from mold types it has a mild taste. In contrast to the results of this study, that the three samples turned out to have a mild taste (like water). However, for color attributes according to the research, the three samples also have a clear color. Based on Table 1. the color, aroma and taste of the three VCO samples were almost favored by the panelists and have apropriate value with the standards of SNI (2008) and APCC (2009).

Table 1. Sensory atribute of VCO Prpduce by Various Cultures

Sensory atributes	**Sampel VCO**			**Standar**	
	Saccharomyces cerevisiae	***Lactobacillus plantarum***	***Rhizopus oligosporus***	**SNI (2008)**	**APCC (2009)**
Color	Pure and clear	Pure and clear	Pure and clear	Colorless	Pure and clear
Aroma	Coconat	Coconat	Coconat	Fresh coconut	Fresscoconut
Taste	Tasteles and coconat	Tasteles and coconat	Tasteles and coconat	Tasteles and coconat	Do not rancid

Table 2. showed the hedonic test found that there were no significant differences (p> 0.05) between the three samples based on the attributes of color, aroma, and taste. That is, that the use of different types of microbes does not give significant effect the sensory attributes (color, aroma, and taste) of the VCO samples produced.

Table 2. Statistic Test for Signifancy Value Using Kruskal Wallis Test

Parameter	Warna	Aroma	Rasa
Chi-Square	2.446	0.223	0.854
df	2	2	2
Asymp.Sig.	0.294	0.895	0.652

*P value> 0.05 indicates that there is no significant difference

3.2. Yield Value

During the fermentation process, *Saccharomyces cerevisia* carried out amylolytic and proteolytic activities. *Lactobacillus plantarum* performs amylolytic, proteolytic and lipolytic activities. *Rhizopus oligosporus* conducts proteolytic and lipolytic activity but more proteolytics than lipolytics. These enzymes are needed to hydrolyze the components of carbohydrates, proteins,

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and fats that can make the coconut milk cream emulsion unstable, so that the oil components can be separated (Rahayu et al., 2008). Amylase enzyme will break down carbohydrates to produce acid. The presence of acid will reduce the pH of the coconut milk until it reaches the isoelectric point of the protein so that the protein will be coagulated. Then the protease enzyme will break down the protein that is coagulated so that the protein in the coconut milk will lose its active surface properties, and eventually be easily separated from the oil (Mujdalipah, 2016).

Lactobacillus plantarum has more varied enzime than *Saccharomyces cerevisiae* and *Rhizopus oligosporus*. However, the yield produced by *Lactobacillus plantarum* was smaller compared to the yield produced by *Saccharomyces cerevisiae*. This is presumably because the use of temperature during the fermentation process (35^{o}C) is the optimum temperature of *Saccharomyces cerevisiae* growth. Kumalasari (2011) states that *Saccharomyces cerevisiae* will grow optimally in a temperature range of 30-35^{o}C. If the temperature is too low, then fermentation will take place slowly. Likewise, if the temperature is too high, *Saccharomyces cerevisiae* will die so the fermentation process will not take place. Whereas, for *Lactobacillus plantarum* has an optimum growth temperature of 43^{o}C (Rahayu et al., 2008). According to Marina et al. (2009), that Lactobacillus plantarum can multiply faster in coconut milk medium with a temperature of 40-50^{o}C. Thus, it can be concluded that the use of different types of microorganisms does not significantly influence the yield obtained.

In addition, *Saccharomyces cerevisiae* (yeast / yeast), *Lactobacillus plantarum* (bacteria), and *Rhizopus oligosporus* (mold) have different cell structures. Yeast has unicellular eukaryotic cells, mold has multicellular eukaryotic cells, whereas bacteria have prokaryotic cells. Eukaryotic cells do cell division by mitosis / meiosis, whereas prokaryotic cells do cell division by amitosis. Each type of microbe has a different cell morphology (Waluyo, 2004). Yeast is a type of unicellular fungus, the form of a single cell and breed in breeding. The yeast cell size varies, the width ranges from 1-5 µm and its length ranges from 5-30 µm or more. Usually yeast cells are egg shaped, but some are elongated or spherical. Each species has a distinctive shape, but even in pure cultures there are wide variations in size and shape. Individual cells, depending on their age and environment. Yeast is not equipped with flagellum or other driving organs (Dwijoseputro, 2005). Based on Figure 2. VCO yields ranged from 22.01 to 25.74%.

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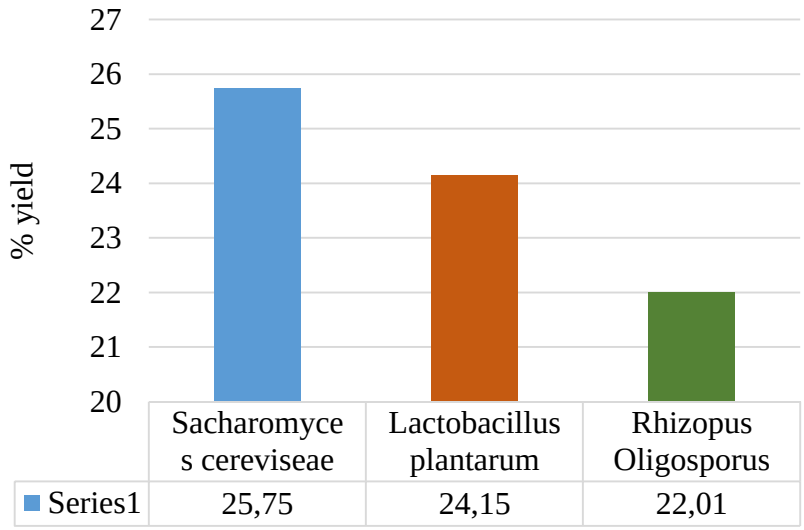

Figure 2. Yield of VCO Produced by Various Cultures

4. CONCLUSION

The difference in the use of microbial types did not significantly influence (p> 0.05) the yield and the results of organoleptic testing of the VCO produced. VCO which has the highest yield is VCO which is produced using Saccharomyces cerevisiae (25.74%). Organoleptic test results from VCO using Saccharomyces cerevisiae have the highest average value between the two other samples for the attributes of color, aroma, and taste, with the average value for color attributes (3.85), aroma (3,525), and taste (3,475).

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