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The Effect of Egg Yolk on the Physical and Organoleptic Properties of Mayonnaise from Virgin Coconut Oil and Coconut Water

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ABSTRACT: Mayonnaise is a semi-solid food ingredient produced by mixing vegetable oil with an emulsifier consisting of vinegar and egg yolks, and sugar or salt can also be added to taste. The purpose of this study was to evaluate the effect of egg yolk on the physical and organoleptic properties of mayonnaise made of virgin coconut oil (VCO) and coconut water. Mayonnaise is typically produced by mixing egg yolk (0, 5, 7, 9, 11) %, salt, sugar, xanthan gum, mustard, lime, coconut water and VCO (coconut water : VCO ratio = 4:1). Furthermore, homogenization was carried out using ultra turrax for 4 minutes at 15000 rpm until mayonnaise was formed. Analysis was carried out on viscosity, stability, organoleptic tests (color, taste, aroma, and texture) and chemical tests (moisture/water content, fat content, and protein content) as well as total plate number. The results showed that mayonnaise made of virgin coconut oil had stable properties. The highest viscosity value was 1040 cP in the concentration of 7% egg yolk. An increase in egg yolk content decreases the viscosity of mayonnaise. In organoleptic testing, it was found that the combination of coconut water and 7% egg yolk had a neutral preference for taste. For the color aspect, the results found were included in the like category, while for the aroma aspect, the results was included in the neutral category. The result found was classified as like for texture aspect. When compared to SNI 01-4473-1998, mayonnaise with a combination of coconut water and 7% egg yolk had a water content of 76.75% higher than SNI (max 30%), fat content 12.49% lower than SNI (min 65%), protein content 2.21% meets SNI requirements (min 0.9%), and total plate count (TPC) $2.7x10^2$ colonies/gr meets SNI standards (max $1x10^4$ colonies/g). Therefore, the mayonnaise produced in this study is classified as low fat

KEYWORDS: Egg Yolk, Mayonnaise, Virgin Coconut Oil, coconut water

I. INTRODUCTION

Virgin Coconut Oil (VCO) is an oil produced from the fresh old coconut kernel (*Cocos nucifera L*.) processed without adding water, heating no more than 60°C or without heating therefore it is safe for consumption (Mandei, 2019). VCO can stimulate metabolism, reduce free radicals, prevent heart attacks, help reduce platelet stickiness, has a role as an antioxidant as well as vitamin E, and lowers blood and liver levels of low-density lipoprotein (LDL) cholesterol (Fatimah and Gugule, 2013).

Most people do not like to consume it directly because of the oily taste. Therefore, one alternative to reduce its oily taste by making it in the form of an emulsion. Emulsions are generally made by mixing the aqueous and oil phases. Wiyani et al., (2016a) conducted research on making emulsions made from VCO with various types of emulsifiers and using tween 80 and span 80 emulsifiers (Wiyani et al., 2016b). Wiyani et al., (2021b) has also made a VCO emulsion using orange extract and carrot extract (Wiyani et al., 2017) as the aqueous phase. Fruit juice or coconut water can be used as an alternative to the aqueous phase.

Coconut water is a product from the coconut plant that has not been widely utilized, even though coconut water contains lots of carbohydrates, calories, minerals and protein which are very beneficial for the body (Pakaya et al., 2021). Coconut water has properties and high nutritional value (Hasyim et al., 2017). In addition to carbohydrates and protein, coconut water also contains micro elements in the form of minerals, which the body needs. These minerals include potassium (K), calcium (Ca), magnesium (Mg), ferum (Fe), cuprum (Cu), phosphorus (P), and sulfur (S) (Wahyuni, 2018).

The process of making the emulsion is influenced by several factors including temperature, stirring time and stirring speed. Several previous studies have carried out various rotation speeds in the manufacture of emulsions such as 8000 rpm (Dianingsih et al., 2016), 15000 rpm for 10 seconds (Fasinu et al., 2015), 12000 rpm for 20 minutes (Estiasih et al., 2015) 10000 rpm for 10

minutes (Fatimah et al., 2012), and 15000 rpm for 4 minutes (Muin and Faradillah, 2021), (Wiyani et al., 2018) and (Wiyani et al., 2016b).

One of the emulsion products that can be made from VCO is mayonnaise. It is an emulsion made from a mixture of vegetable oil and egg yolk as an emulsifier. In addition to egg yolks, mayonnaise can be made by adding various other ingredients such as sugar, mustard, lime and salt (Hidayati et al., 2020). According to Devi et al. (2021) mayonnaise consist of some basic ingredients such as 70-80% vegetable oil and around 15-20% egg yolks. Besides that, mayonnaise can also be made of a low-fat content (Mohammed et al., 2022). Mayonnaise is widely used as a flavoring and dressings in several types of food such as pizza, salad, or burgers (Wahyuni and Sulistyani, 2021).

Based on the description abovementioned, research on mayonnaise production from virgin coconut oil (VCO) and coconut water with various additions of egg yolks needs to be further investigated. It is expected that the data obtained can be the basis for the development and utilization of VCO emulsions.

II. RESEARCH PROCEDURE

Research Materials and Tools

The ingredients used were coconut water, virgin coconut oil (VCO), egg yolks, sugar, mustard, lime, xanthan gum, and salt. The equipment used was the ultra turrax homogenizer. Other tools included sample bottles, viscometers, spatulas, stopwatches, ovens, 250 mL beakers, analytical balances, refrigerators, and other equipment for analysis.

Research Method

For experiments, the process of making mayonnaise from VCO was using a method elaborated by Hidayati et al., (2020) and Wiyani et al., (2020) 5% egg yolk was mixed with 1g sugar, 8.5g lime, 0.5g salt, 5g mustard, 0.75g xanthan gum, coconut water and VCO (ratio of coconut water:VCO = 4:1). Furthermore, stirring process was carried out with the ultra turrax homogenizer for 4 minutes at a speed of 15000 rpm until a mayonnaise dough was formed. This procedure was repeated with the addition of 7%, 9%, 11% egg yolk and without egg yolk (0% yolk).

Tests were carried out on viscosity (Viscometer Atago VISCOTM 6800), stability (Wiyani et al., 2016a), organoleptic (Test Likeness), water content (SNI 01-2891-1992), protein content (SNI 01-2891-1992), total plate count (SNI 01-2891-1992) and fat content (SNI 01-2891-1992) 1992).

III. RESULT AND DISCUSSION

Viscosity

The results of the analysis showed that the use of coconut water and the egg yolks affect on the mayonnaise produced. In Table 1, the mayonnaise viscosity data is listed using coconut water and the egg yolks.

Table 1. Mayonnaise Viscosity Data

	Egg Yolk Concentration				
	0%	5%	7%	9%	11%
Viscosity (cP)	1040	673	691	614	555

Table 1 shows that the highest mayonnaise viscosity is found at a concentration of 0% egg yolk of 1040.20 cP. By increasing the egg yolk content, the viscosity of mayonnaise decreased. The viscosity of mayonnaise on the market ranges from 3000-4000 cP. The mayonnaise in this study was thinner than the mayonnaise on the market because it was made of a larger amount of water than oil. Several factors affect the decrease in viscosity, namely the selection of the type and concentration of the emulsifying agent, the stirring process carried out and the size of the dispersion particles (Raihana, 2015).

Stability

The results of the analysis revealed that the use of coconut water and the egg yolks to mayonnaise resulted in good stability, ranging from 98.53% -100% as shown in Table 2

Table 2. Mayonnaise Stability Data

Egg Yolk Concentration	Stability (%)	Information
0%	100.00	Stable
5%	100.00	Stable

7%	100.00	Stable
9%	100.00	Stable
11%	98.53	Stable

Table 2 shows that the highest stability of mayonnaise is at a concentration of 0%, 5%, 7% and 9% egg yolk of 100%, respectively, and the lowest stability of mayonnaise is at a concentration of 11% egg yolk of 98.53% yet it is still considered as relatively stable because according to Ayu et al., (2020) an emulsion is said to be stable if it achieves a minimum stability of 65%.

Organoleptic

Organoleptic testing in this study was assessed by 30 panelists on mayonnaise samples. The assessment included color, taste, aroma and texture, with a value of 1 = really do not like, 2 = do not like, 3 = neutral, 4 = like and 5 = really like. The test results from the panelists are listed in Table 3.

Table 3. Mayonnaise Organoleptic Data

Criteria	Egg Yolk Concentration				
	0%	5%	7%	9%	11%
Color	3.73^{a}	3.97^{a}	3.97^{a}	3.77^{a}	3.80^{a}
Taste	3.03^{ab}	2.76^{ab}	2.93^{ab}	3.23^{b}	3.10^{ab}
Aroma	3.63^{b}	3.30^{a}	3.36^{a}	3.40^{a}	3.40^{a}
Texture	3.63^{bcd}	3.80^{cd}	4.03^{d}	3.43^{abcd}	3.20^{abc}

Note: Different letters indicate significant differences

Based on the data in Table 3, the color of the mayonnaise obtained is yellowish. The score shows 3.73-3.97 (rounded 4). It can be assumed that the panelists like the color of mayonnaise produced in this study. However, the addition of egg yolks had no effect on the color of mayonnaise (Table 3). One of the factors that consumers need to pay attention to when choosing a product is the color of the food (Kartikasari et al., 2019). Besides functioning as an emulsifier, egg yolks also affect the color of a food. Besides that, the use of mustard also affects the color of food (Prabowo, 2020).

The highest preference value for taste was obtained on mayonnaise at a concentration of 9% egg yolk (score 3.23). While the lowest preference value on mayonnaise at a concentration of 5% egg yolk. Mayonnaise made in addition to these combinations has the same taste. The value of consumer preference for the taste of mayonnaise is classified as neutral.

Mayonnaise made at a concentration of 9% and 11% egg yolks, produced the same aroma. The highest flavor preference value was obtained for mayonnaise made without the addition of egg yolks of 3.63 (rounded 4). The mayonnaise made of other variations produced the same level of preference. The results of this study are close to the value of mayonnaise made of palm oil which has a score of 4.2 (Hutapea et al., 2016).

The effect of using coconut water and egg yolk on mayonnaise showed a very significant difference in the mayonnaise texture. The highest preference value is in mayonnaise which is made of the addition of 7% egg yolk with a score of 4.03 (preference). Wahyuni and Sulistyani, (2021) stated that panelists tended to like the mayonnaise with a thick texture (like), but not too hard (very thick).

Mayonnaise Characterization compared to SNI

Mayonnaise characteristics testing was carried out on mayonnaise at the concentration of 7% egg yolk. The resulting data are listed in Table 4.

Table 4. Data Comparison of SNI Mayonnaise

Parameter	Result	SNI 01-4473-1998
Water content	76.75%	Maks 30%
Protein content	2.21%.	Min 0.9%
Fat content	12.49%	Maks 65%
Total Plate Count (TPC)	$2.7x10^{2}$	Max $1x10^{4}$ colonies/gr

In Table 4, it was known that the water content of the mayonnaise produced was 76.75%. According to SNI 01-4473-1998, the water content in mayonnaise is a maximum of 30%. Thus, the results of this study do not meet the requirements for mayonnaise quality standards in SNI because this study aims to make low fat mayonnaise so as to produce high water content.

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The results of testing the mayonnaise protein content in this study was 2.21%. This value is in accordance with SNI-01-4473-1998, which is a minimum of 0.9%. The chicken egg yolk used is a source of protein in mayonnaise, which contains vitamin A and 15-16% of protein content (Prabowo, 2020).

The results of the mayonnaise fat content test were 12.49%, while the quality requirements for mayonnaise fat content in SNI 01-4473-1998 were at least 65%. When compared with the standard mayonnaise, the fat content obtained in this study did not meet the requirements. However, the mayonnaise obtained in this study is classified as low-fat mayonnaise. This is in line with Mohammed (2022) which obtained 30% fat content in the mayonnaise produced.

The result of the total plate count (TPC) test was $2.7x10^2$ colonies/gr. This is in accordance with SNI-01-4473-1998 that the quality requirement for the total plate count of mayonnaise is a maximum of $1x10^4$ colonies/gr.

IV. CONCLUSIONS

Mayonnaise made of virgin coconut oil and coconut water has stable properties and the highest viscosity value of 1040 cP at the addition of 0% egg yolk. An increase in egg yolk content decreases the viscosity of mayonnaise. In organoleptic testing, the addition of 7% egg yolk has a preference level for taste (score 2.93 = neutral), color (score 3.97 = likes), aroma (score 3.36 = neutral), and texture (score 4.03 = likes). When compared with SNI 01-4473-1998, mayonnaise in this study met the requirements for protein content (2.21%) and total plate count (2.7x102 colonies/gr). However, the water content (76.75%) is higher than SNI, whereas the fat content (12.49%) is lower than SNI. To conclude, the mayonnaise produced in this study is classified as low fat.

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