Emulsification of Virgin Coconut Oil (VCO) with Grass Jelly (*Cyclea barbata Miers*) Using Kappa Carragenan and Konjac into VCO Jelly Product

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ABSTRACT

VCO is a coconut processed product that can increase the body's immunity against various degenerative diseases. Besides coconut, there is also a food product that is no less important, namely green grass jelly (Cyclea barbata L. Miers) leaf extract. In this study, the process of mixing the two foodstuffs will be carried out. Processing process by combining two types of food ingredients with different polarity, namely VCO which is non-polar and grass jelly which is polar. Therefore, in the manufacturing process, an emulsifier is needed as a stabilizer of the mixture. Kappa carrageenan and Konjac are two emulsifiers that can provide increased viscosity in the gelling process. With the addition of kappa carrageenan and konjac as an emulsifier, it will provide gel stability in the manufacture of VCO-Jelly. This research was conducted in 2 stages, namely preliminary research and main research using a Randomized Block Design (RAK). Observations and tests to be carried out are physical characteristics test, chemical characteristic test (Proximate). The test results will be analyzed using analysis of variance (ANOVA). If the treatment given has a significant effect on the test parameters, a further test will be carried out with the Least Significant Difference Test (BNT) with a significance level of 5% to determine the difference between treatments. The results of the physical test of VCO Jelly showed an increase in the value of the brix degree from formula 1 to 5 and the highest value was in formula 5 with a brix value of 13.00. Meanwhile, from the results of the proximate VCO Jelly test, the highest water content was F1: 86.31%, ash content F1: 0.43%, Fat content F6: 5.77%, protein content F3: 1.75%, carbohydrate content F5. : 20,75%, and crude fiber content F4: 3.34%.

Keywords: *VCO, grass jelly, Kappa carrageenan, Konjac, Jelly*

1. INTRODUCTION

Coconut (Cocos nucifera L) is one of the most well-known members of the palm plant and is widely distributed in the tropics. Virgin Coconut Oil (VCO) is a coconut processed product that can increase the body's immunity against various degenerative diseases and as a raw material for high-value cosmetics [2]. Besides coconut, there are also processed food products that can provide benefits to human health, namely green grass jelly (Cyclea barbata L. Miers) leaves. In general, grass jelly contains carbohydrates, fats, proteins and other compounds such as polyphenols, flavonoids and minerals (calcium and phosphorus), vitamins A and B [1]. Grass jelly is often processed into jelly products which are obtained through aqueous extract of the leaves, but the resulting jelly has a high syneresis power so that the product becomes watery and easily damaged [6]. In addition, hydrocolloids in grass jelly can provide certain functional properties in food products related to texture such as viscosity, elasticity, emulsion stability and gel strength [3].

Carrageenan (Kappa) is a polysaccharide contained in the seaweed species Kappaphycus alverizii or commonly called Eucheuma cottonii. Polysaccharides contained in several species of seaweed or red algae (Rhodophyceae) are called carrageenan. Each species of seaweed produces different types of carrageenan from one another [4]. In addition, in Indonesia there is a porang plant that produces porang tubers or Iles-iles (Amorphophallus onchophyllus). In Japan this plant is known as Amorphophallus konjac. The tuber of this konjac plant is used as an ingredient for making

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konyaku in Japan which can also function as a thickening agent in the emulsion process. Iles-iles is a type of porang plant, which is a tropical plant that contains very high glucomannan in its tubers. Iles-iles exported to Japan are usually used to make flour and gel. Iles-iles flour can then be processed into a food product called konyaku [5].

By knowing the great benefits of both types of local food ingredients VCO and grass jelly, plus emulsifiers in the form of carrageenan and konjac, the author will carry out research on these foodstuffs. In this study, the process of mixing the two foodstuffs with the addition of emulsifiers into ready-to-eat food products that provide health benefits for the human body will be carried out.

1.1. Formulation of the problem

There are several problems that are the focus of the settlement, namely 1) how to make processed food products in the form of jelly-shaped foods that are preferred, easy to make, and have good physical, chemical, functional, and sensory characteristics, 2) how to DETERMINE the ratio of VCO: grass jelly: emulsifier, and 3) how to mix VCO: grass jelly: emulsifier to produce stable VCO-Jelly.

1.2. Research purposes

Making ready-to-eat food products, namely VCO-Jelly which is made by mixing VCO food ingredients, grass jelly, with emulsifying agents according to the formulation and determining the ratio of VCO: grass jelly with the addition of emulsifying agents (Kappa carrageenan and konjac) to produce VCO-Jelly which has chemical characteristics and good functional characteristics.

1.3. Framework

In making new food products made from VCO and grass jelly, proper processing is needed, especially in making formulations so that the products produced are in accordance with the expected goals. Emulsifier is a substance that can help maintain the stability of the emulsion between oil and water.

Generally, emulsifiers are organic compounds that have two chemical groups, both polar and non-polar so that the two substances can be mixed. The non-polar emulsifier group will bind to the oil while the water will be strongly bound by the polar group of the emulsifier. The polar part will then be ionized to become negatively charged, this causes the oil to also become negatively charged. The oil particles will then repel so that the two substances that were initially insoluble can mix and then become stable [7].

The type of emulsion that will be used in the manufacture of VCO-Jelly is a solid emulsion (gel), which is a dispersion of liquid phase substances into solid phase substances. Emulsifier, if added to the mixture, will have a great ability to absorb water molecules, thereby reducing the mobility of water in the mixture and providing good viscosity and shape. With the addition of carrageenan (Kappa) and konjac as an emulsifier it will make the VCO-Jelly stable.

2. METHOD

The ingredients to be used are Vico Bagoes brand VCO, grass jelly, carrageenan (Kappa), Konjac Glucomannan Powder, clean water, additional ingredients (sugar, citric acid, flavorings). Cooking utensils, mixers, basins, cutting boards, pans, blenders, strainers, pans, spoons, trays, gas stoves. gas stove, refrigeration machine, chairs and tables, proximate test equipment in THP Lab, caliper, hand refractometer (°Brix), spectrophotometer.

The process of making VCO Jelly begins with preliminary research, namely making the right mixture formulation between VCO: Cincau: Emulsifier. The stages of the process carried out were making grass jelly extract, preparing VCO, weighing the ingredients in the form of kappa carrageenan, konjac powder, citric acid and sugar additives. Then in the main research, analysis was carried out in the form of physical analysis, chemical analysis (proximate) and good functional characteristics.

Observations and tests that will be carried out in the main research on VCO-Jelly products are as follows: Physical characteristics test using a hand refractometer (TPT). Chemical characteristic tests are water content test (AOAC, 1970, oven method), crude fiber content (AOAC, 1984), fat content analysis (AOAC, 1984), carbohydrate content (AOAC, 1970), protein content (AOAC, 1970, Method Gunning).

3. RESULTS AND DISCUSSION

3.1 Materials and Equipment in Preliminary Test

In the preliminary research, the process of collecting raw materials and equipment needed was carried out. The raw materials needed are VCO, grass jelly, kappa carrageenan, konjac and additional ingredients of citric acid and sugar.

Figure 1 Grass jelly raw material

The raw material for green grass jelly leaves is obtained in the Tanjung Bintang and Bandar Lampung areas and is still widely spread in the yards of people's homes.

Figure 2 Carrageenan and Konjac VCO and equipment

The resulting product is VCO Jelly which is made from a combination of VCO and grass jelly with the addition of emulsifiers in the form of carrageenan and konjac powder and flavors (sugar and citric acid).

3.2 Preliminary Research

Preliminary research aims to see and determine the best formula to proceed to the main research. There were 12 formulations of VCO Jelly that were successfully made in the preliminary study, the twelve formulations showed results in accordance with the research objective, namely being able to form a gel, 6 formulations were selected to proceed to the main study.

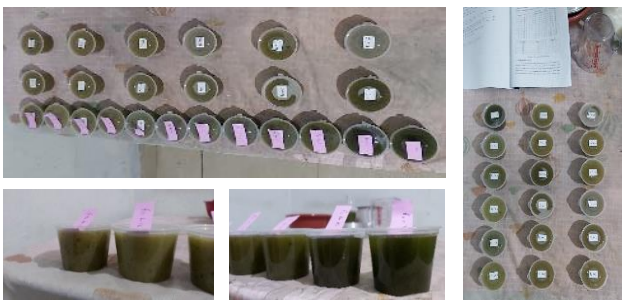

Figure 3 Twelve Cups and 6 Cups of VCO Jelly Research Introduction

3.3 Physical Characteristics

3.2.1 Total Dissolved Solids (°Brix)

Total dissolved solids are dissolved solids, either in the form of ions, in the form of compounds, colloids in the wate. Total dissolved solids were tested using a hand-refractometer.

Table 1. Total Dissolved Solids (°Brix) VCO Jelly

Formula	Test			Average
	1	2	3	
F1	11.00	11.00	11.50	11.17
F2	10.50	10.50	10.50	10.50
F3	12.50	12.50	12.50	12.50
F4	12.00	12.00	12.00	12.00
F5	13.00	13.00	13.00	13.00
F6	11.50	11.50	11.50	11.50
			Total	70.67

From the results of measuring the degree of brix using a refractometer, it is known that the total dissolved solids in each formula. It can be seen that there is an increase in the brix degree value from formula 1 of 11.17 to formula 5 of 13.00 and a decrease in formula 6. The increase in the value of the brix degree can be seen clearly in the graphic image of total dissolved solids (TPT) below.

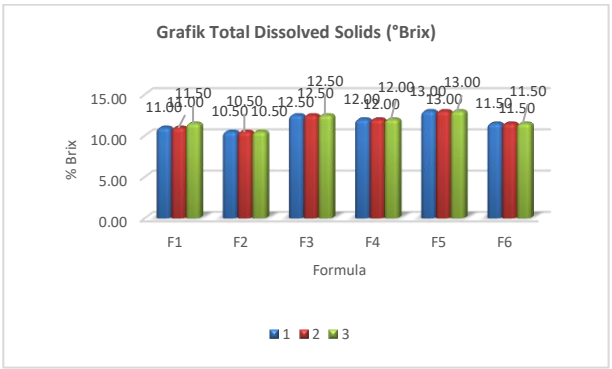

Figure 4 Graph of Total Dissolved Solids Test Results (% Brix)

3.4 Chemical Characteristics

Table 2. Six VCO Jelly formulations per 100 g of ingredients

Formula	The main ingredient		Emulsifier		Additional Ingredients	
(100 g)	VCO (g)	Cincau (g)	Kappa (g)	Konjac (g)	Asam Sitrat (g)	Gula (g)
F1	3	82	2	3	0.1	9.9
F2	7	78	2	3	0.1	9.9
F3	11	74	2	3	0.1	9.9
F4	15	70	2	3	0.1	9.9
F5	19	66	2	3	0.1	9.9
F6	23	62	2	3	0.1	9.9

Table 3. Test Results of Chemical Characteristics of VCO Jelly from Emulsification of VCO with Grass jelly using Kappa Keragenan and Konjac

Chemical Characteristics											
Formula (%)	Water Content (%)	Formula (%)	Ash Content (%)	Formula (%)	Fat Content (%)	Formula (%)	Protein Content (%)	Formula (%)	Carbohydrate Content (%)	Formula (%)	Crude Fiber Content (%)
F1	86.31a	F1	0.43a	F6	5.77a	F3	1.75a	F5	20.75a	F4	3.34a
F2	85.63a	F3	0.41a	F5	3.49b	F4	1.73a	F4	19.56a	F6	2.45ab
F3	77.84b	F2	0.40a	F4	2.27bc	F6	1.64a	F6	19.27a	F5	1.93abc
F4	76.07bc	F6	0.39a	F3	1.44cd	F5	1.38ab	F3	18.56a	F3	1.27bc
F5	74.05c	F4	0.37a	F2	0.73d	F2	1.18ab	F2	12.06b	F2	1.00cd
F6	72.92c	F5	0.33a	F1	0.63d	F1	0.91b	F1	11.72b	F1	0.31d

Note: Numbers followed by different letter notations show significant differences according to the BNT test at a significance level of = 0.05

Table 2 describes the six selected formulas from the 12 formulas in the preliminary study. Meanwhile, table 3 above shows the proximate test results of several test parameters on testing the chemical characteristics of VCO jelly, namely; water content test, ash content test, fat content test, protein content test, carbohydrate test, and crude fiber test.

3.4.1 Moisture content

Moisture content is the percentage of water content contained in the material (product). From the results of testing the water content in each formulation different levels. In the sample formulations F1, F2, and F3 the water content contained was not significantly different having almost the same percentage of water content, while the water content in samples F4, F5, and F6 had a lower water content.

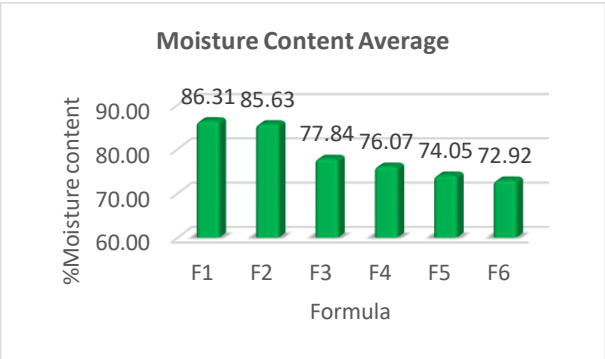

Figure 5 Graph of the Average Water Content of VCO Jelly

In Figure 5 above, it can be seen that the highest water content is found in sample 1, namely Formulation 1 (F1). The water content contained in the F1 to F6 samples was 86.31%, respectively; 85.63%; 77.84%; 76.07%; 74.05%; 72.92%. Looking at the trend of water content above, it shows that The addition of grass jelly is directly proportional to the value of the water content obtained.

3.4.2 Ash Content

Ash content is the amount of ash content in product materials where the ash content indicates the residue of inorganic materials remaining after the organic matter in food is destroyed. He amount of ash content is shown in table 3 above. The ash content test listed in the table above shows a difference between formulation 1 to formulation 6. Where the BNT test results show different values, the highest ash content is found in the sample formulations F1 and F3 with values of 0.43% and 0.41%.

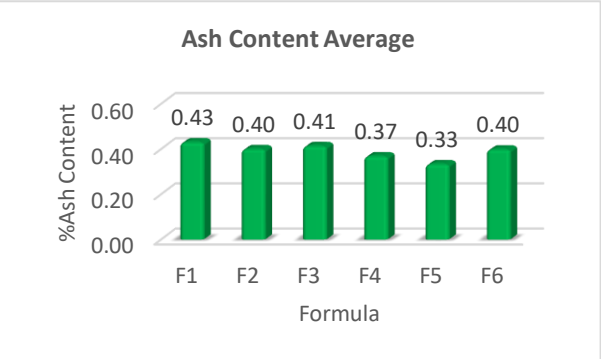

Figure 6. Graph of the Average Ash Content of VCO Jelly

This study showed an increase in the ash content of VCO jelly along with the increase in concentration of the addition of kappa carrageenan and konjac. This is in accordance with the higher the addition of kappa kareganan, the value of the ash content will also be greater. according to FAO (2014) kappa carrageenan has an ash content of 15-40%. This is the basis for the cause of the ash content value in the VCO Jelly product to increase along with the addition of kappa carrageenan in the formulation.

3.4.3 Fat Content

Fat content is the percentage of the amount of fat contained in food ingredients which indicates the amount of fat value in a product, the product tested in this study is VCO Jelly. In table 3 above, it can be seen the amount of fat content contained in each formulation. The table also shows that the highest fat content is found in formulation 6, formulation 5, and formulation 4. The value of fat content contained in each formulation can be seen clearly in Figure 7 of the fat content graph below.

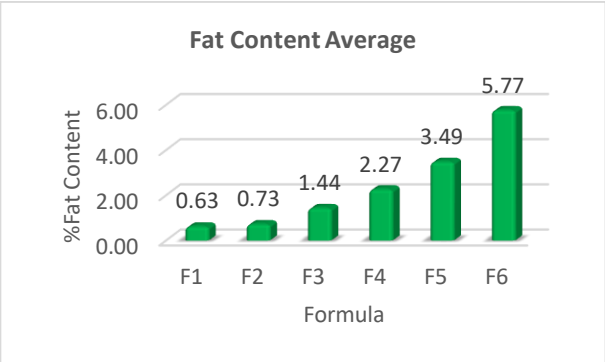

Figure 7 Graph of Average Fat Content of VCO Jelly

The highest percentage of fat content was 5.77% (F6), respectively; 3.49% (F5); and 2.27% (F4). The large amount of VCO in the F6, F5, and F5 formulas causes the fat content value in the VCO Jelly product to increase. This is in line with the large addition of VCO in the formulation where the greater the amount of VCO added is directly proportional to the amount of fat contained in the formulation.

3.4.4 Protein Content

Protein is a food substance that is very important for the human body, because this substance functions as fuel in the body and also functions as a building block and regulator in the body's cell tissues. Protein is also a source of amino acids that contain many elements of C, H, O, and N elements which are not owned by fat or carbohydrates. Table 3 above shows the value of protein content in each formulation. The highest content is owned by formulation 3 with a value of 1.75%, respectively Formulation 4 with a value of 1.73%, and formulation 6 with a value of 1.64%. For the value of each formula, the difference can be clearly seen in Figure 8 below.

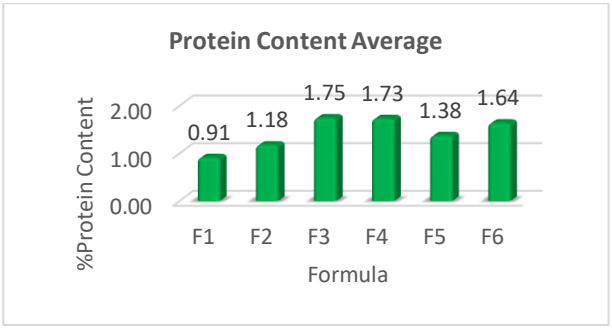

Figure 8 Graph of Average Protein Content of VCO Jelly

From the test results, it can be seen that the highest protein content is found in formulation 3 or F3 which has the largest protein content compared to the other 5 formulations.

3.4.5 Carbohydrate Content

Carbohydrates are essential nutrients or nutrients needed by the body to function properly. Carbohydrates are composed of Carbon, Hydrogen, and Oxygen. To be able to get the benefits, carbohydrate sources must be processed in the form of food so that it can provide good value for the body. In table 3 above, it can be seen that the carbohydrate content contained in each formulation where the best carbohydrate content is found in formulation 5 which is 20.75%, followed by Formulation 4 with a value of 19.56%, and Formulation 6 with a value of 19.27%. The table clearly shows the carbohydrate content of each formulation made. For more details, the value of each of the carbohydrate levels can be seen in Figure 9 the graph of carbohydrate content below.

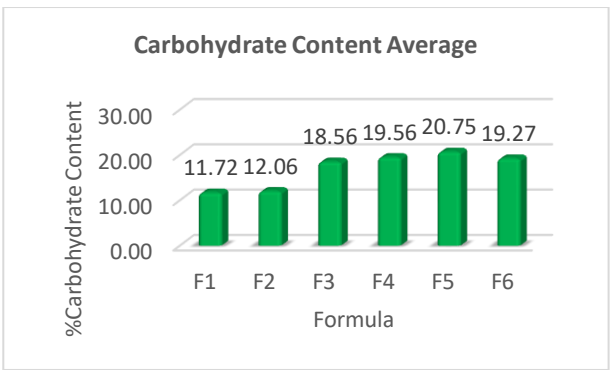

Figure 9 Graph of Average Carbohydrate Levels of VCO Jelly

From the graphic above, it shows an increase in carbohydrate levels in a row. The value of the carbohydrate content formed is influenced by the less grass jelly that is added, the smaller the water content. In addition, the greater the solids in the form of carbohydrates contained in VCO, kappa carrageenan,

konjac, citric acid, will also affect the amount of carbohydrates formed in VCO Jelly.

3.4.6 Crude Fiber Content

Crude fiber is a residue from food or agriculture after being treated with boiling acid or alkali, and consists of cellulose with a small amount of lignin and pentosan. Crude fiber is a compound that cannot be digested by human or animal bodies. The crude fiber test results contained in table 3 show that the largest crude fiber content is in formulation 4 with a value of 3.34%, followed by formulation 6 with a value of 2.45%, and formulation 5 with a value of 1.93%. To see more clearly the amount of crude fiber contained in each formula, it can be seen in Figure 10 the graph of crude fiber content below.

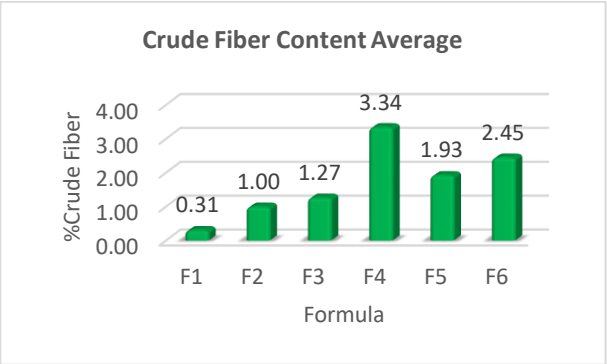

Figure 10 Average Graph of VCO Jelly Crude Fiber Test Results

From the graph, it is clear that there are differences in each formula. From Figure 10, the graph and table 3 above show that the greater the addition of grass jelly in the formula, the crude fiber content increases, this is because the substance content in the formula is different from one another so that, making the crude fiber content higher when the amount of grass jelly given increases a little.

4. CONCLUSION

The formulation in the process of making VCO Jelly was successfully carried out with the concentration of adding kappa carrageenan and konjac as an emulsifier which was very influential and succeeded in forming an emulsion and was able to maintain gel stability in the product. There is still a need for further research on the product, especially during the mixing process so that this product can be better and can be accepted and consumed by consumers widely both for health and as a source of healthy and healthy food.

AUTHOR'S CONTRIBUTION

For the author, of course this research will be a passion and encouragement to continue to develop local food diversity, ideas, and new innovations in local food processing processes in Indonesia.

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REFERENCE

[1] C.T. Sabilla, T.U. Soleha, Manfaat Ekstrak Daun Cincau Hijau (Cyclea barbata L. Miers) sebagai Alternatif Terapi Hipertensi, Jurnal MAJORITY I, vol. 5(4), 2016, pp. 44-49. http://juke.kedokteran.unila.ac.id/index.php/majority/article/viewFile/882/790

[2] R. Rukmana, H. Yudirachman, Untung Berlipat dari Budidaya Kelapa, Yogyakarta, Lily Publisher, 2016.

[3] M. Fajri, Potensi Cincau Hijau Sebagai Pangan Fungsional Untuk Kesehatan. Kajian Pustaka, 2016, pp. 241-246. http://digital.library.ump.ac.id/596/2/30.%20%20Muhammad%20Fajri.pdf

[4] R. Ferdiansyah, dkk., Karakaterisasi Kappa Karagenan Dari Eucheuma Cottonii Asal Perairan Kepulauan Natuna Dan Aplikasinya Sebagai Matriks Tablet Apung, Indonesian Journal of Pharmaceutical Science and Technology, vol. 4(1), 2017, pp. 14-26. https://ejournal.stfi.ac.id/index.php/jstfi/article/view/60

[5] Kementan, Mengolah Umbi Porang jadi Konnyaku. Pustaka Setjen Pertanian, 2019. http://pustaka.setjen.pertanian.go.id/index-berita/mengolah-umbi-porang-jadi-konnyaku

[6] Hardoko, dkk., Subtitusi Agar-Agar Dalam Pembuatan Jelly Drink Cincau Hijau (Cyclea barbata) Untuk Menurunkan Sineresis, Jurnal Jurnal Sains dan Teknologi, vol. 3(2), 2019, pp. 45-56. https://ojs.uph.edu/index.php/FaSTJST/article/download/2065/pdf

[7] Y.M. Arismet, A. Rini, Deteksi Gen b Babi Pada Emulsifier Makanan Yang Beredar di Kota Padang dengan Metode (PCR), 2010. https://www.academia.edu/8417449/Deteksi_Gen_Cytochrome_b_Babi_Pada_Emulsifier_Makanan_yang_Beredar_di_Kota_Padang_dengan_Metode_Polymerase_Chain_Reaction_PCR.