

Utilization of Green Betel Leaves (*Piper Betle L*) Extract as an Additive Material on Paper Soap Production

Endang Supraptiah^{1,*} Aina Fathiah² Idha Silviyati¹ Jaksen Jaksen¹ Aisyah Suci
Ningsih¹ Tri Lestari¹ Hasna Salsabila¹, Issye Lissri¹

¹ Politeknik Negeri Sriwijaya, Palembang, Indonesia

² Politeknik Tun Syed Nasir Syed Ismail, Malaysia

*Corresponding author. Email: endang.supraptiah@polsri.ac.id

ABSTRACT

The pandemic caused by COVID-19 virus is a big thing faced by people all over the world, including Indonesia. Washing hands with soap and water is one way to prevent the spread of COVID-19 virus. Soap formation is the saponification process which is the reaction between triglycerides and alkali that produces glycerol. One of the innovations on soap production is paper soap. Paper soap is a soap that easy to carry because its small and thin shape. Soap antiseptic properties can be produced by the addition of other materials, such as green betel leaves (*Piper betle L*) extract. This research aims are to produce paper soap product that compatible with SNI 3532:2016 characteristics and to get the best paper soap formulation. Paper soap production using coconut oil and Virgin Coconut Oil (VCO) and green betel leaves extract composition 2 ml, 4 ml and 6 ml. The analysis that has been done to determine soap characteristic is water content, insoluble in ethanol, free fatty acid, free alkali pH, and foam stability. Characteristics of paper soap from coconut oil and VCO with 4 different treatments all according to the requirements of SNI 3532:2016 with a water content value of 0.25%-2.09%, insoluble ingredients in ethanol 0.112% - 1.876%, free fatty acids 1.128% - 2.425%, pH 9.25 – 10.73, and foam stability 77.96% - 90%.

Keywords: Paper Soap, Green Betle Leaves (*Piper betle L*), Extract Composition.

1. INTRODUCTION

Pandemic is one of the problems faced by people in the world from years including Indonesia. This pandemic is caused by a virus commonly known as COVID-19. The Indonesian Ministry of Health (2020) stated that people who touch objects that have been contaminated by droplets from sufferers can also be infected with COVID-

19. The rapid spread of the virus is due to the large number of cases that are not accompanied by symptoms. One of the prevention efforts is done by washing hands with water and soap, because about 98% of the spread of disease comes from hands.

A mixture of sodium or potassium salts with animal oils or vegetable fats can form soap [1]. Sodium (NaOH) is used when the product is solid soap, while potassium (KOH) is used when the product is liquid

soap [2]. Each soap molecule has a hydrophilic head that can mix with water, while the hydrophilic tail can only combine with oils and fats [3]. Soap molecules consist of long chains of hydrocarbons with a carboxylic acid at one and the end bonded to a metal ion, such as sodium or potassium [4].

These days, people want hand cleaning soap that is practical and easy to carry. Paper soap is a solid soap that has a thin, paper-like shape that turns into foam when exposed to water. Paper soap is simple to carry because of its small and thin shape and is suitable for use when doing outside activities [5]. Widyasanti researched the manufacture of paper soap with the composition of ingredients within the form of virgin coconut oil (VCO) (21 ml), NaOH (25 grams), stearic acid (11 grams),

distilled water (7.5 ml), ethanol 96% (14.2 ml), and glycerin (15 ml). The paper soap obtained has a water

content of 13.72%, free alkaline content (0.21%), and pH (10.78). based on SNI 3532:2016, the quality requirements for solid soap are water content (maximum 15%), insoluble material in ethanol (maximum 5%), and free alkali content (maximum 0.1).

VCO and coconut oil is used in soap making because it has a high lauric acid content with clean power and functions as a microbe [6]. In addition, lauric acid can also smooth and moisturize the skin. VCO and coconut oil has a clear white color and is also easily soluble in water [6].

This research aims to produce paper soap product that compatible with SNI 3532:2016 characteristics and to get the best paper soap formulation

2. METHOD

2.1. Material

The equipment used in this research are chopper, rubber ball, porcelain cup, glass funnel, erlenmeyer, beaker, hotplate, watch glass, filter paper, measuring flask, magnetic stirrer, analytical balance, oven, water bath, glass stirrer, pH meter, dropper, measuring pipette, distillation set, spatula, and thermometer.

While the ingredients used were distilled water, stearic acid, betel leaves, 96% ethanol, glycerin, phenolphthalein indicator, 0.1 N KOH solution, NaOH, VCO and Coconut Oil.

This study used laboratory experimental approach using descriptive analysis. The parameters observed in this research were variations in fatty acids, that is Virgin Coconut Oil (VCO) and coconut oil, and the addition of green betel leaf extract. There were 4 treatments of this research that is 1 (paper soap without the addition of green betel leaves extract), 2 (paper soap with the addition of 2 ml green betel leaves extract), 3 (paper soap with the addition of 4 ml green beetle leaves extract), 4 (paper soap with the addition of 6 ml green beetle leaves extract). This research consists of 3 parts, the first was making green betel leaf extract, the second was making paper soap, the third was analysis quality of paper soap.

2.2 Procedure

2.2.1. Green Betel Leaf Extract

Green betel leaf (*P. betle*) is taken by selecting the young leaves, then weighed the leaves and washed with running water, and dried using the heat from the sunlight for 2 days. the dried leaves are weighed again. The leaves that have been weighed, mashed into powder with a blender, then sieved through a 60 mesh. Leaf powder is stored in a dry container and then tightly closed. The dried leaf powder was dissolved in aquadest

in a ratio of 1: 6, stirred and then allowed to stand for 3 days. The extract was then filtered 2 times, then the filtrate was distilled to evaporate the solvent.

2.2.2. Paper Soap Making

VCO/Coconut oil is heated at a temperature of 60 – 70oC for 10 mins, add NaOH while stirring (temperature is maintained at 60 – 70oC). Then add stearic acid, while stirring until an emulsion is formed. enter the ethanol slowly and heat to a temperature of 60-70oC while stirring until the solution turns into clear. add the glycerin and sugar solution and stir till the solution turns clear, wait for a minute and the soap solution can be poured into the silicone mold. await about 24 hours, then removed the soap from the mold and cut it using a scissor. dimension of paper soap is 2x2 cm with a thickness of 1 mm. Analysis of the quality of paper soap is carried out after the curing process, which is about 2-4 weeks, during the curing period, the saponification process still occurs in the soap and the pH of the soap will decrease. During curing, the soap is placed in a closed place at room temperature

2.3. Quality Test

On this research, There 2 analyzes have been done, the first was a phytochemical test on green betel leaf extract, this was carried out to look the bioactive content inside the extract, that is flavonoids, tannins, and saponins. the second quality analysis of paper soap, that is water content, free alkali content material, free fatty acid content, insoluble material in ethanol, and pH. For a test of chemical properties based on SNI 3532: 2016 concerning the usual of solid soap bath quality

3. RESULT AND DISCUSSIO

3.1. Characteristics of Green Betel Leaf Extract

A phytochemical test is a way to identify bioactive that has not been seen via a check or examination that can quickly distinguish between natural elements that include certain phytochemicals with natural ingredients that don't contain certain phytochemicals. Phytochemical screening is a step introduction in phytochemical research that pursuits to provide an outline of the group compounds contained in plants which are researched.

Table 1. Bioactive Content of Green Betel Leaf Extract.

Test	Result	Description
Flavonoid	Dark green color	Contains Flavonoid
Saponin	Have foam	Contains Saponin
Tanin	Black dark green	Contains Tanin

Based on the results of the tests that have been carried out, the green betel leaf extract positively contains flavonoids, saponins, and tannins as seen from the changes that occurred after the test.

Flavonoids are one of the phenolic compounds that are rich in hydroxyl groups [7]. FeCl₃ reacts with phenolic compounds to form Fe³⁺ ions so that the solution will be blackish in color [8]. The foam formed in the saponin test is caused by the glycoside compounds in the saponins being hydrolyzed into glucose or other compounds [9]. Tannins are divided into two types, namely hydrolyzed tannins and condensed tannins [10]. Hydrolyzed tannins will form a blue color when added with FeCl₃, while condensed tannins will turn black [7]. In the tannin content test, the color formed is blackish green, so the tannins contained in the basil leaf extract are condensed tannins.

3.2. The Characteristic of Coconut Oil based Paper Soap and VCO based Paper Soap

The paper soap produced is a thin transparent soap with the addition of green betel leaf extract as a natural antiseptic. The formula for adding betel leaf extract is 0 ml (as control), 2 ml, 4 ml and 6 ml. Paper soap products that have been cut to a size of 2 x 2 can be seen in picture 1.

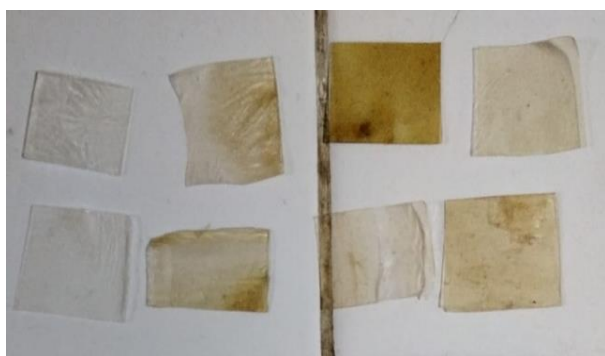


Figure 1. Virgin Coconut Oil Soap (Up) and Coconut Oil Soap (Down)

3.3. Quality of Paper Soap

3.3.1. Water Content

Splitz (1996) [11] stated that the quantity of water that is too much contained in soap will make the soap easy to shrink and uncomfortable when used. The percentage of water content and volatile substances in the resulting transparent soap can be seen in Figure 2.

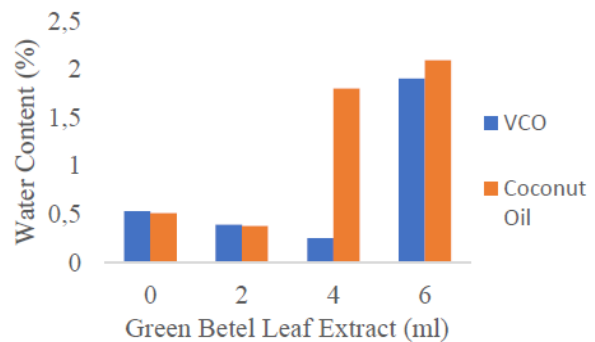


Figure 2. The Relation between green betel leaf extract addition with water content

The water content material of coconut Oil-paper soap (0,38 -2,09 %) changed into barely higher than the water content material of VCO paper soap (0,25 – 1,9%). based on the information in figure 2, the water content in paper soap has a tendency to increase that is because of the formation of hydroperoxides as a consequence of the oil oxidation procedure causing the breakdown of the H₂O, the resulting soap will cross rancid, and cause the water content of the soap to increase. The moisture content maximum of solid soap according to SNI 3532: 2016 is 15% (wb). From the results of the analysis of water content at the paper soap, all treatment met the requirements of water content material,

3.3.2. Insoluble Material In Etanol

The insoluble part in alcohol is used to determine how much a large part of the soap is not soluble in alcohol. The more parts which are not soluble in alcohol, the less soap stock in transparent soap. In addition, the alcohol- insoluble part gives rise to clumps that interfere with the appearance of transparent soap

The results of the examination of preparations for materials that are not soluble in ethanol obtained 0.112 – 1.876% for paper soap made from coconut oil and 0.402-1.684% for paper soap made from VCO. The value of the obtained ethanol insoluble material still meet the requirements for the material to be insoluble in ethanol according to SNI (max 5%).

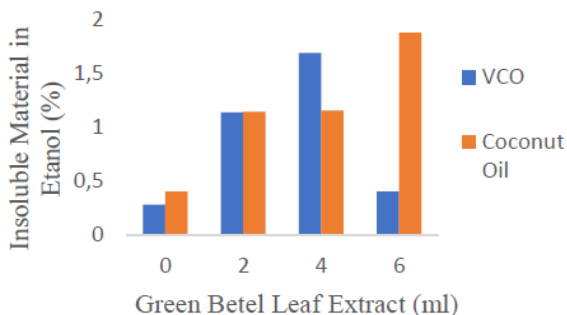


Figure 3. The Relation between green betel leaf extract addition with Insoluble Material in Etanol

The presence of an insoluble material in ethanol is suspected by the usage of ingredients in the paper soap-making process like fatty acid because of the difference in polarity and which is not well saponified, and the oil is not completely soluble in water and ethanol

3.3.3. Free Fatty Acid

High free fatty acids in soap will reduce the cleaning power of soap because soap that should emulsify dirt will emulsify free fatty acids first so that the use of soap becomes less effective [12]. The hydrolysis reaction can cause damage to oil or fat resulting in damage to this oil or fat due to the presence of water in the oil or fat, which in turn causes rancidity with changes in the taste and smell of the oil.

The results of free fatty acid on coconut oil paper soap were 1,128 – 2,425 %, and for VCO paper soap were around 1,748 – 2,256%. The value of the obtained free fatty acid still meet the requirements for the standard of solid soap baths according to SNI (max 3,2%). The result of free fatty acid on paper soap can be seen in Figure 4.

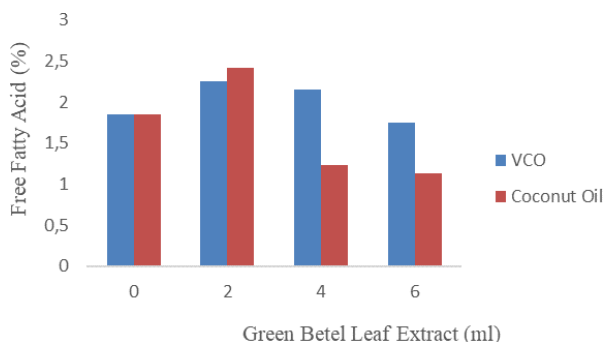


Figure 4. The Relation between green betel leaf extract addition with Free Fatty Acid

based on the data in figure 4, the free fatty acids in each paper soaps generally tend to decrease with the addition of green betel leaf extract, that is because the antioxidants inside the betel leaf extract donate hydrogen so that the unstable double bond fatty acids have a tendency to react with free fatty acids

because of hydrolysis so free fat might be decreased [13].

3.3.4. Free Alkali Content

Free alkali is an alkali in soap that is not bound to fatty acids. The advantages of free alkali in soap should not be more than 0.1% for Na soap, and 0.14% for KOH soap. Alkali has a hard nature and causes irritation to the skin. The excess of free alkali on soap can be caused by concentration concentrated or excess alkali in the process saponification [14]. The percentage of free alkali was presented in figure 5.

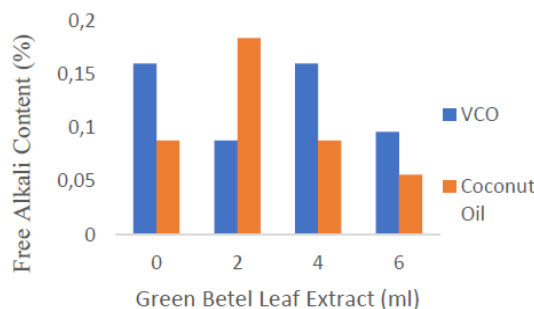


Figure 5. The Relation between green betel leaf extract addition with Free Alkali Content

Based on the data from Figure 5, it was found that the free alkali content in coconut oil paper soap tends to decrease with the addition of green betel leaf extract, cause of the alkaline reaction with the fatty acids in refined oil so that the reaction saponification will complete, which has an impact on the decrease in free alkali. There is a decrease this free alkali is also due to the ratio of added water/soap, because water can reduce the concentration of free alkali in soap.

According to Wijana (2009) [15], the lower free alkaline residue is recommended for guarantee the perfection of the saponification reaction and antibacterial effect

3.3.5. pH

The pH value is a measure of the degree of acidity and is an indicator in soap preparations [16]. Soaps with a relatively high pH can increase the absorption of the skin so that the skin becomes irritated such as peeling, itching, sores, and the skin becomes dry [17]. The results showed that the highest pH was shown in VCO paper soap with the addition of 6 ml of green betel leaf extract, which was 10.01, while the lowest was in coconut oil paper soap with the addition of 2 ml betel leaf extract of 9.25. This value is still included in the ASTM D 1172-95 standard of bath soap that is 9-11. The pH value in the resulting paper soap show in figure 6.

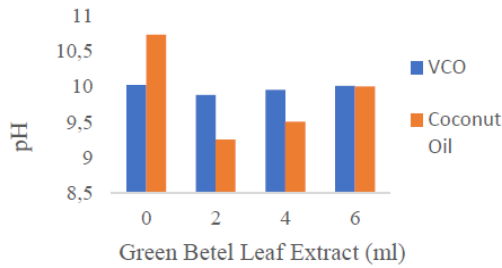


Figure 6. The Relation between green betel leaf extract addition with pH

The addition of green betel leaf extract to paper soap can affect the acidity of paper soap. Based on Figure 6, the addition of green betel extract and betel leaf causes the pH to increase, this is because the green betel leaf extract contains alkaline alkaloid compounds so that it can increase the pH of paper soap.

3.3.6. Foam Stability

Foam is one of the important parameters in determining the quality of bath soap. In its use, foam plays a role in the cleansing process and imparts a soapy fragrance to the skin. the presence of unsaturated compounds (unsaturated fatty acids) in the oil mixture will not stabilize the foam [18]. Foam is gas trapped through the coating thin liquid containing a few molecules of soap which can be absorbed in a thin layer. within the bubble, the hydrophobic group surfactant will lead to gas, whereas the hydrophilic component will cause the solution then the bubbles will come out of the liquid body. Foam stability is the ability of a material foam generator to maintain the foam it produces. The percentage of foam stability on paper soap can be seen in Figure 7

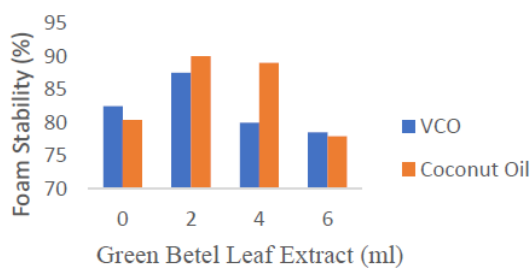


Figure 7. The Relation between green betel leaf extract addition with foam stability

Based on the graph in Figure 7, the stability of the foam on paper soap tends to decrease with the addition of green betel leaf extract. The highest percentage of stability of paper soap foam produced was coconut oil paper soap with the addition of 2 ml of betel leaf extract, which was 90%. This is assumed because it is influenced by the fatty acids used, in coconut oil there are lauric and myristic acids which can produce a soft

foam, while palmitic and stearic acids have foam stabilizing properties. while oleic and ricinoleic acids can produce a stable and soft foam [19]

4. CONCLUSION

Based on the results of the research that has been done, it can be concluded that:

1. Characteristics of paper soap from coconut oil and VCO with 4 different treatments all according to the requirements of SNI 3532:2016 with a water content value of 0.25%-2.09%, insoluble ingredients in ethanol 0.112% - 1.876%, free fatty acids 1.128% - 2.425%, pH 9.25 – 10.73, and foam stability 77.96% - 90%.
2. The best formulation of coconut oil paper soap was obtained with a composition of 2 ml of betel leaf extract. The results of the analysis showed that the water content was 0.38%, insoluble in ethanol 1.14%, free fatty acids 2.425%, free alkali 0.184, pH 9.25, and foam stability 90%. While the paper soap formulation from VCO was obtained with a composition of 2 ml of betel leaf extract. The results of the analysis showed that the water content was 0.39%, the insoluble material in ethanol was 1.134%, the free fatty acid was 2.256%, the free alkali was 0.088%, the pH was 9.95, and the foam stability was 87.5%.

ACKNOWLEDGMENTS

The authors would like to thank the Sriwijaya State Polytechnic which has provided PNPB funds for this year 2021 and Politeknik Tun Syed Nasir Syed Ismail as a partner for the research. The authors also thank the students who helped in this research.

REFERENCES

- [1] Wathoni, M., Susanto, A., & Syahban, A. K. D. P. (2020, Februari). Pemanfaatan Bahan Rumah Tangga dalam Pembuatan Sabun Cair dari Sabun Batang di Masa Pandemi. Dalam
- [2] Bidillah, Siti Aulia., Rumape Opir., Mohammad Erni., 2017, Optimasi Waktu Pengadukan dan Volume KOH Sabun Cair Berbahan Dasar Minyak Jelantah, Jurnal Entropi Volume 12, Nomor 1, Februari 2017 (PP. 55-60)
- [3] Nakoe, Moh. Rivai, Nur Ayini S lalu, Yesintha Amelia Mohamad, 2020, Perbedaan Efektivitas Hand-Sanitizer Dengan Cuci Tangan Menggunakan Sabun Sebagai Bentuk Pencegahan Covid-19 Jambura Journal of Health Sciences and Research Volume 2 no 2, Juli 2020.

- [4] [4] NPCS Board of Consultants & Engineers. (2019). *Soaps, Detergents and Disinfectants Technology Handbook- 2nd Revised edition*. Delhi: Asia Pacific Business Press Inc.
- [5] Widyasanti, A., Ginting, A. M. L., Asyifani, E., & Nurjanah, S. (2018, Maret). The production of paper soaps from coconut oil and Virgin Coconut Oil (VCO) with the addition of glycerine as plasticizer. In *IOP Conference Series: Earth and Environmental Science* (Vol. 141, No. 1, p. 012037). IOP Publishing
- [6] Widyasanti, A., Rahayu, A. Y., & Zain, S. (2017). Pembuatan Sabun Cair Berbasis Virgin Coconut Oil (VCO) dengan Penambahan Minyak Melati (*Jasminum Sambac*) sebagai Essential Oil. *Jurnal Teknotan*, 11(2), 1-10.
- [7] Kumalasari, M. L. F., & Andiarna, F. (2020). Uji Fitokimia Ekstrak Etanol Daun Kemangi (*Ocimum basilicum* L). *Indonesian Journal for Health Sciences*, 4(1), 39-44.
- [8] Artini, P. E. U. D., Astuti, K. W., & Warditiani, N. K. (2013). Uji Fitokimia Ekstrak Etil Asetat Rimpang Bangle (*Zingiber purpureum* Roxb.). *Jurnal Farmasi Udayana*, 2 (4), 279805
- [9] Marlina, S. D., Suryanti, V., & Suyono. (2005). Skrining Fitokimia dan Analisis Kromatogramafi Lapis Tipis Komponen Kimia Buah Labu Siam (*Sechium edule* Jacq. Swartz.) dalam ekstrak etanol. *Biofarmasi*, 3(1), 26-31.
- [10] Malanggi, L., Sangi, M., & Paendong, J. (2012). Penentuan Kandungan Tanin dan Uji Aktivitas Antioksidan Ekstrak Biji Buah Alpukat (*Persea americana* Mill.). *Jurnal Mipa*, 1(1), 5-10.
- [11] Spitz, L. 1996. *Soap and Detergen a Theoretical and Practical Review*. AOCS Press, Champaign-Illionis : 2, 47-73.
- [12] Qisti, R., 2009, *Sifat Kimia Sabun Transparan Dengan Penambahan Madu Pada Konsentrasi Yang Berbeda*, Skripsi, Fakultas Pertanian, Institut Pertanian Bogor, Bogor
- [13] Ariono, D., Christian, M., Irfan, P., Suhano, S.M., Tamara, A. 2017. Pengaruh Penambahan Ekstrak Bahan Alami Terhadap Laju Oksidasi Minyak Kelapa. *Reaktor*, Vol. 17 (3): 157 – 165.
- [14] Rozi, M. 2013. *Formulasi Sediaan Sabun Mandi Transparan Minyak Atsiri Jeruk*
- [15] Wijana, S., Soemarjo., T. Harnawi. 2009. Studi Pembuatan Sabun Mandi Cair Dari Daur Ulang Minyak Goreng. *Jurnal Teknologi Pertanian*, Vol. 11 No. 2 (Agustus 2010) 114-122.
- [16] Wijana dan Muhammad Rohmadi. (2009). *Analisis Wacana Pragmatik Kajian Teori dan Analisis*. Surakarta: Yuma Pustaka
- [17] Sari, T. Indah., J. P. Kasih, dan T. J. N. Sari. (2010). Pembuatan sabun padat dan sabun cair dari minyak jarak. *Jurnal Teknik Kimia*, 17(1): 28-33.
- [18] Purnamawati, D. 2006. *Kajian Pengaruh Konsentrasi Sukrosa Dan Asam Sitrat Terhadap Mutu Sabun Transparan*. Skripsi. Fakultas Teknologi Pertanian. Institut Pertanian Bogor. Halaman 4-7
- [19] Cavitch, S. 1995. *The Natural Soap Book, Making Herbal and Vegetable-Based Soaps*. Ebook. ISBN: 978-0-88266-888-8.