Increasing the Antioxidant Activity of Liquid Soap with a Combination of Carrot Peel Extract (Daucus carota L) and VCO (Virgin Coconut Oil)

Dyani Primasari Sukamdi [1*], *Nadila* Nur Oktaviani[1], *Sabtanti* Harimurti[1], and *Vella* Laili Damarwati[1]

[1]Pharmacy Department, Faculty of Medicine and Health Science, Universitas Muhammadiyah Yogyakarta, Special Region of Yogyakarta, Indonesia

Abstract. Bath soap is a skin cleansing preparation made from the saponification or neutralization process of fat, oil, wax, rosin, or acid with an organic or inorganic base that does not irritate the skin. Skin rashes can be treated with antioxidant compounds. This can be observed from the antioxidant compounds, such as the carotenoid compound, and the bromelain enzyme found in carrots (Daucus carota L) and pineapple (Ananas comosus). The combination of these two plants is believed to produce maximum antioxidant activity. This research aims to assess the possibility for increasing the ability of antioxidant activity in liquid soap preparations combining VCO carrot extract from pineapple fruit by creating several series of liquid soap formulas with carrot peel extract combined with VCO. The preparation was then evaluated and antioxidant activity was tested using DPPH. Subsequently, data analysis was conducted using SPSS with the Kruskal-Wallis method. Given the findings, the best formula is Formula 3, which had an IC_{50} value of 4.11 ppm and very significant antioxidant activity.

1 Introduction

Indonesia has a tropical climate. Climate change has caused many people to suffer from dry skin. Climate change has caused numerous people to get dry skin. Dry skin is a common dermatological problem, particularly among people living in tropical regions like Indonesia. Dry skin impairs the effectiveness of the body's defences [1]. Bath soap with a hydrating formula is one technique for dealing with dry skin. Bath soap is high in antioxidants. Antioxidants protect body cells from free radical damage by keeping the skin healthy and shielding it from the effects of free radicals already present [2]. Soap effectively wets the material being cleaned, lowering the surface tension of the water. Furthermore, soap acts as an emulsifying agent, dispersing oil or fat, and is absorbed by dirt granules [3]. Soap liquid is a form of soap that is widely made today due to its practical use [4]. One natural raw material added during the production of liquid shower soap is fat or oil derived from vegetable or animal sources. Oil with skin health efficacy is used as vegetable oil, namely oil pure coconut, also known as Virgin Coconut Oil (VCO). The VCO is used as the base for making soap because it has the richest oil with fatty acid content that improves the skin [4]. Many methods produce VCO, including the enzymatic method with pineapple (Ananas comosus L. Merr) [5]. Pineapple fruit contains acid citrate, saponin, tannins, flavonoids, polyphenols, and bromelain enzymes. Moreover, it contains vitamins C and A, both of which act as antioxidants that can stop the chain reaction formation of free radicals [6].

Carrot (Daucus carota) is another antioxidant-rich ingredient. Carrots are high in antioxidants, especially β-carotene, which can dissolve in fat/oil [7]. β-carotene is the most powerful antioxidant efficient for singlet inactivation of oxygen in biological systems. Antioxidants work as a termination agent, breaking the chain reaction of free radicals in the body and protecting the cells against damage caused by radicals [8]. The DPPH (2,2-diphenyl-1-picrylhydrazyl) technique is one way to demonstrate anti-antioxidant activity. Principles of the activity test method: This antioxidant quantifies DPPH radicals exhibiting antioxidant activity by UV-Vis spectrophotometry, allowing the determination of the activity value as the reduction of free radicals represented by the IC_{50} value. Mark IC_{50} represents the extract concentration that inhibits 50% of oxidation [9]. According to the aforementioned description, researchers are eager to examine the activities of antioxidant composition using the DPPH method from soap preparations in a liquid bath containing a combination of carrot extract and VCO.

* Corresponding author: dyani.primasaris@umy.ac.id

2 Method

2.1 Research Phase

2.1.1 Extraction

Carrot extract was created through the maceration technique. The procedure employed a 1:10 ratio of carrot powder to solvent for 72 hours at ambient temperature. The solvent used is hexane, which is non-polar. The mixture of carrot powder and hexane solvent was subsequently filtered via a Buchner funnel and Whatman No. 1 filter paper. The filtrate was evaporated using a rotary evaporator at 40°C, yielding a concentrated extract for subsequent analysis [10].

2.1.2 VCO Production

VCO is made via the enzymatic process. First, make 10 liters of coconut milk and allow it for ± 6 hours to form two separate layers, namely skim and coconut cream. Then, separate cream layer from from the skim layer [11]. To make pineapple extract, weigh approximately ± 10 kg of pineapple. Then, mash it using a blender that was previously loaded with water in a 1:1 ratio. The meat from the mashed pineapple is squeezed and filtered using a sieve to produce a pulp-free pineapple extract. After obtaining the cream, mix it with pineapple extract in a used gallon container. Stir until homogeneous and leave for approximately 24 hours. After leaving it for 24, when three layers are formed in a row, the first is termed "Blondo", the second is oil (VCO), and the third is water. Finallt, extract the oil from the second layer and get VCO ± 2L.

2.1.3 Liquid Soap Formulation

Table 1 shows the formulation of the antioxidant liquid soap, which includes carrot extract and VCO. This study incorporated an extra formula for manufacturing liquid soap from prior studies [12].

Table 1. Formulation of Liquid Soap

Ingredients	Function	Formula (%w/v)				
		F1	F2	F3	F4	F5
Carrot peel extract	Active ingredients	-	1	2	3	4
VCO	Fatty Acid	10	-	15	20	25
KOH 40%	Alkali	8	8	8	8	8
CMC	Filler	2	2	2	2	2
SLS	Surfactant	2	2	2	2	2
Stearic Acid	Neutralizer	0.25	0.25	0.25	0.25	0.25
BHT	Stabilizer	0.5	0.5	0.5	0.5	0.5
Nipagin	Preservative	1	1	1	1	1
Aquadest	Solvent	Ad 100 mL	Ad 100 mL	Ad 100 mL	Ad 100 mL	Ad 100 mL

2.1.4 Antioxidant Activity Test Using the DPPH Method

a. Preparation of 0.5 mM DPPH stock solution

Take 20 mg of DPPH powder to be weighed, diluted in 100 mL ethanol (concentration 200 ppm), and wrapped in aluminium foil [13].

b. Determination of the maximum wavelength of DPPH

Take 3.5 ml of the DPPH solution, then pour 10 ml of methanol into the solution, and leave the mixed solution for 30 minutes in a dark room; measure the absorption of the solution using a UV-Vis spectrophotometer with a wavelength of 400 – 800 nm [14].

c. Preparation of test solution

Add the test solution weighed 10 mg, and 10 ml of methanol. Test using a series of levels,

namely 50 µg/ml, 100 µg/ml, 200 µg/ml, and 400 µg/ml.

d. Preparation of quercetin solution as a positive control

The quercetin solution served as a comparison solution. Weigh 2.5 mg of quercetin powder into a measuring flask and dissolve using methanol p.a. to 10 ml up to the mark [15]. The solution was subsequently diluted to a concentration of 250 µg/ml using 1 ml of the quercetin stock solution. Put the solution into a 10 ml volumetric flask, and add methanol to the calibration mark. Repeat the steps using five concentration series: 5 µg/ml, 10 µg/ml, 20 µg/ml, and 40 µg/ml.

e. Antioxidant activity testing

First, take 2 ml of the test and quercetin solutions and add them to a 10 ml measuring flask with 3 ml of DPPH solution and methanol until the mark is reached. Allow it to operate for a period of time before testing it in a confined room. Read the sample's absorbance with the maximum DPPH wavelength, and calculate the IC_{50} value d using equation (1) as follows:

$$\%\ Inhibition = \frac{Control\ Absorbance - Sample\ Absorbance}{Control\ Absorbance} \times 100\% \quad (1)$$

Note:

Control Absorbance: absorbance that does not contain sample

Sample Absorbance: absorbance containing sample

f. IC_{50} value

Enter the % inhibition values for each concentration into a linear regression equation, where sample concentration is represented on the x-axis and percent inhibition on the y-axis. The IC_{50} value is derived from the computation when the percent inhibition reaches 50%, as shown in equation (2).

$$Y = ax + b \quad (2)$$

Note:

Y: % inhibition

a: gradient

x: concentration

b: constanta

2.1.5 Evaluation of Liquid Soap Formulation

Evaluate the liquid soap using organoleptic criteria, pH measurement, homogeneity analysis, foam-height determination, viscosity assessment, and foam-alkali testing.

2.1.6 Data Analysis

Descriptive data includes evaluation and homogeneity tests. Quantitative data comprises pH test results, viscosity test, free alkali test, foam height test, and antioxidant activity test. The antioxidant activity test data results were analyzed using linear regression and the SPSS program.

3 Result and Discussion

3.1 Extraction

Dry carrot powder was obtained using the maceration method. This approach entails soaking dry carrot powder in a solvent that matches the plant's active component level. The maceration method was selected based on the simplicity and ease of the extraction process; furthermore, this method was chosen to avoid damage to the active plant compounds during the heating phase [16]. The first step in the maceration process was to submerge 1293.5 grams of dry carrot powder in hexane solvent with a ratio of 1:10 for three days. Hexane was chosen as a solvent because of the high concentration of β-carotene in carrots. Hexane's polarity is parallel to that of the target molecule, which is non-polar. Following that, maceration was conducted for two days to extract chemicals that might persist after the maceration process. The yield value is related to the carrot plant sample's bioactive content. The yield result of 1.57% in this study is deemed small since other active substances that are not soluble in hexane are not adequately absorbed.

3.2 VCO Production

VCO is produced using an enzymatic technique involving the enzyme bromelain, which is extracted from the juice of immature pineapple flesh. The enzymatic method employed in VCO production follows the notion of adding enzymes to the substrate.

3.3 Liquid Soap Formulation

Liquid soap is created using the semi-boiled process method which involves heating to speed up the saponification reaction. In this study, liquid soap was produced by heating it to a temperature of 50-60°C. The process was commenced by dissolving 40% KOH in distilled water. Next, mix the basic ingredients for making soap, namely VCO and KOH 40%. VCO was heated and gradually mixed with 40% KOH while stirring until a soap paste was formed. The next stage is to include carboxymethyl cellulose (CMC) into soap paste, which was earlier created in hot distilled water. In the process of adding stearic acid as a soap thickener, it

produces stable and softer foam. The addition of Sodium Lauryl Sulphate (SLS) functions as a surfactant and a foam producer. Next, distilled water was poured into a volume of 100 mL and perfume in the form of lemon was added to cover the rancid smell of the soap. In the final stage, carrot extract and VCO in varying concentrations were added into each formula; in Formula 3, carrot extract was added with a concentration of 2% and VCO 15%; in Formula 4, carrot extract was added with a concentration of 3% and VCO 20%, and in Formula 3, carrot extract was added with a concentration of 4% and VCO 25%. The formula to which the ingredients were added was given lemon essential fragrance and put into each clean.

3.4 Antioxidant Activity Test

The antioxidant activity of liquid bath soap prepared from a combination of carrot extract and virgin coconut oil (VCO) was determined using UV-Vis spectrophotometry with DPPH (2,2-diphenyl-1-picrylhydrazyl). The IC_{50} value indicates antioxidant activity. The IC_{50} value suggests the concentration of a test sample required to inhibit 50% of free radicals. The IC_{50} value is derived from the linear regression equation, which correlates sample concentration with the fraction of free radical scavenging. The IC_{50} value is inversely related to the antioxidant activity of the sample; thus, a lower IC_{50} value demonstrates greater antioxidant activity [13].

The antioxidant activity test in this investigation was performed utilising five previously developed formulations. This study incorporated mathematical equations to calculate the IC_{50} values in five formulas based on the inhibition-sample concentration relationship. Pa and DPPH methanol solutions were used as blanks. The ratio used in this study was quercetin, a secondary antioxidant that confines free radicals and stops chain reactions. Table 3 displays the antioxidant activity value of liquid bath soap that binds carrot extract with VCO.

Absorbance measurements were performed three times, yielding different line equations for each sample. The IC_{50} value was obtained from a linear regression equation that defines the correlation between the solution concentration and the percentage of radical capture (also known as percent inhibition). Antioxidant activity is classified as extremely strong (IC_{50} value < 50 ppm), strong (50-100 ppm), moderate (101-150 ppm), and weak (>150 ppm) [17].

Formula 5 had a higher antioxidant capability, with an average IC_{50} value of 4.11 ppm, compared to other liquid soap formulas combining carrot extract and VCO. The liquid soap recipe combines carrot extract and virgin coconut oil, resulting in maximum antioxidant action. Increased quantities of carrot extract and VCO in the liquid soap formulation correlate with enhanced antioxidant activity.

Table 2. Formatting sections, subsections, and subsubsections.

Formula	IC_{50} (ppm)
F1	10.51
F2	10.45
F3	7.18
F4	9.21
F5	4.11
Quercetin	2.16

BHT is an additional component in the liquid bath soap composition. BHT is a synthetic antioxidant that prevents soap from becoming rancid. Formula 1 and Formula 2 have robust IC_{50} values, with average IC_{50} values of 10.51 ppm and 10.45 ppm, respectively. These values were attained due to the inclusion of VCO and BHT in Formula 1. Formula 2 consists of carrot extract and BHT [18].

The quercetin solution was tested three times, resulting in an average IC_{50} of 2.16 ppm, indicating a high potency. These findings are consistent with recent investigations that show quercetin has a low IC_{50} value [15]. This situation is suitable as quercetin has established itself as a benchmark chemical for evaluating antioxidant activity. The Kruskal-Wallis test yielded a significant result of 0.00. The significance value exceeded 0.05, suggesting no difference in antioxidant activity among the treatment samples.

3.5 Evaluation of Liquid Soap Formulation

a. Organoleptic Test

Organoleptic assessments were performed by visually inspecting the liquid soap for aroma, colour, and form. This observation seeks to ascertain the physical state of the liquid bath soap composition created. Table 3 presents the results of organoleptic examinations as follows:

Table 3. Organoleptic Test Results

Characteristics	Formula				
	F1	**F2**	**F3**	**F4**	**F5**
Form	Liquid	Liquid	Liquid	Liquid	Liquid
Colour	White	Orange	Orange	Orange	Orange
Aroma	Typically Lemon	Combination of Lemon and Carrot	Combination of Lemon and Carrot	Combination of Lemon and Carrot	Combination of Lemon and Carrot

According to studies completed through organoleptic tests, each formula was in liquid form. The aroma of the soap produced in Formula 1 resembled lemon essential oil; in Formula 2, it was akin to a combination of lemon and carrot. The colour produced in Formula 1 was white because there was no extract; in Formula 2, Formula 3, Formula 4, and Formula 5 coloured orange because it contained extract.

b. PH Test

The pH level is an important indicator of soap as pH impacts the acceptability and safety of liquid soap when used [18]. According to Indonesian National Standard No. 40-4058-1996, liquid soap's pH should be between 8 and 11. The pH test results are shown in Table 4.

Table 4. PH Test Result

Formula	PH
F1	13
F2	13
F3	10
F4	10
F5	10

The research found that Formula 3, Formula 4, and Formula 5, which comprised carrot extract and VCO, had a pH of 10. Formulas 3, 4, and 5 are based on the SNI provisions. Meanwhile, the pH of liquid soap in Formulas 1 and 2 contained the highest pH, namely 13. Thus, liquid soap with a formulation without carrot extract and VCO cannot be used because it will irritate the skin. This is because carrot extract and VCO are acidic. Measurements of the pH of the liquid bath soap demonstrate that the liquid bath soap product has an alkaline pH; this is because the liquid bath soap composition contains KOH, a strong base [19]. This implies that the concentration of carrot extract and VCO has no effect on the pH value of liquid bath detergent.

c. Homogeneity Test

The homogeneity of the liquid bath soap formulation was determined by the absence of granules in the experiments conducted.

d. Foam Height Test

The foam height test assesses the foam capacity generated by liquid bath soap, conforming to the foam standards set by the Indonesian National Standard (SNI), specifically 13-220 mm.

Table 5. Foam Height Test Result

Formula	Foam Height (mm)
F1	60
F2	72
F3	80
F4	83
F5	85

Table 5 shows that absent saponin components in the liquid bath soap causes Formula 1 to show the lowest foam height. Because there is less lauric acid and myristic acid than in Formulas 3, 4, and 5, the liquid bath soap Formula 2 has a lower foam height. Given that the extract's saponin compounds are what cause the foam to form in the first place, the results of the foam height test show that a higher concentration of carrot extract is associated with more foam generation [20]. Moreover, the amount of foam generated increased with the amount of VCO in the liquid bath soap. VCO can produce a lot of foam due to its high amount of lauric and myristic acids [21]. When carrot extract and VCO were combined to test the liquid bath soap's foam height, the

results showed that the foam height ranged from 60 to 85 mm. This indicates that it still satisfies SNI criteria..

e. Viscosity Test

SNI standardizes liquid bath soap formulations' viscosity levels (400–4000 cPs). The stability increases with viscosity because thicker particle movements tend to be more stable. [22].

Table 6. Viscosity Test Result

Formula	Viscosity (cPs)
F1	411.6
F2	483.6
F3	748.8
F4	258.0
F5	690.0

The liquid bath soap compositions' viscosity test results (Table 6) showed variations in five formulas, showing both rises and decreases. The viscosity value parameters of 400–4000 cPs are matched by the viscosity values obtained from the five formulas, Formulas 1, 2, 3, and 5. Meanwhile, Formula 4 is inappropriate because it made too much liquid soap due to a technological fault. Liquid bath soap's viscosity decreases with increasing water content while viscosity increases with decreasing water content [21].

f. Free Alkali Test

The free alkali content was evaluated using alkalimetric titration. The free alkali in the soap manufactured in this study is potassium, as KOH is the alkali employed to make liquid soap. Excess alkali in soap should not exceed 0.14% (SNI, 1996) since alkali is abrasive and can cause irritation to the skin [23]. Table 7 shows the results of the free alkali test on liquid bath soap containing carrot extract and VCO.

Because the base used to create liquid bath soap is powerful, the high proportion of free alkali in formulas without extracts, 0.30%, can cause dryness and irritation to the skin. High quantities of free alkali are defined by an excessively alkaline soap pH [8]. SNI's maximum standard for the proportion of free alkali in soap with a base utilizing KOH is 0.14% (SNI, 1996).

Table 7. Free Alkali Test Result

Replikasi	Free Alkaline Concentration (%)				
	F1	F2	F3	F4	F5
1	0.30	0.24	0.02	0.05	0.11
2	0.30	0.25	0.03	0.06	0.03
3	0.31	0.32	0.02	0.06	0.06
Average	0.30	0.27	0.03	0.05	0.07

Table 7 demonstrates that Formula 3 has the lowest % free alkali value of 0.03%, while Formulas 1 and 2 have % free alkali above 0.14% due to the subpar saponification process, which leaves free alkali in the soap [24]. This denotes how adding carrot peel extract and VCO to liquid soap alters its free alkali value and demonstrates that the liquid soap that contains carrot extract and VCO satisfies SNI criteria.

4 Conclusion

The physical testing results indicate that Formula 3 is the optimal formula, and the entire carrot extract liquid soap with VCO formula contains antioxidants.

5 Acknowledgement

Thanks are given to the Research and Innovation Institute of Universitas Muhammadiyah Yogyakarta for funding this program. This Community Empowerment Learning Program is held with a grant from LRI with the number: 50/R-LRI/XII/2023 Regarding the Recipient of Internal Research Grants Batch 1B of the Tri Dharma Higher Education Improvement Program of Universitas Muhammadiyah Yogyakarta in 2023/2024. Thanks, are also given to the VCO team for their support and cooperation in this research program.

References

[1] C. Sativareza, I. Tivani, And A. Barlian, "Uji Stabilitas Sifat Fisik Sediaan Sabun Mandi Cair Ekstrak Kulit Nanas (Ananas Comosus L.)," 2021, Accessed: Sep. 12, 2024. [Online]. Available: Http://Eprints.Poltektegal.Ac.Id/229/

[2] A. Noordia And T. Nurita, "Pelatihan Lidah Buaya Masyarakat Tebo Selatan Kelurahan Mulyorejo," *J. Abdi*, Vol. 3, No. 2, P. 84, Mar. 2018, Doi: 10.26740/Ja.V3n2.P84-87.

[3] H. Widiastuti, S. M.-B. Jurnal, And Undefined 2022, "Sabun Organik: Pengenalan, Manfaat Dan Pembuatan Produk," *Journal.Isi-Padangpanjang.Ac.Idh Widiastuti, St Maryambatoboh J. Pengabdi. Pada Masyarakat, 2022•Journal.Isi-Padangpanjang.Ac.Id*, 2022, Accessed: Sep. 12, 2024. [Online]. Available: Http://Journal.Isi-Padangpanjang.Ac.Id/Index.Php/Batoboh/Article/View/1400

[4] A. Widyasanti, A. Y. Rahayu, And S. Zain, "Pembuatan Sabun Cair Berbasis Virgin Coconut Oil (Vco) Dengan Penambahan Minyak Melati (Jasminum Sambac) Sebagai Essential Oil," *Download.Garuda.Kemdikbud.Go.Ida Widyasanti, Ay Rahayu, S Zeinjurnal Teknotan Vol. 2017•Download.Garuda.Kemdikbud.Go.Id*, Vol. 11, No. 2, 2017, Doi: 10.24198/Jt.Vol11n2.1.

[5] S. Harimurti, D. P. Sukamdi, H. Widada, H. F. Sari, And A. Amid, "Bromelain-Extracted Of Virgin Coconut Oil: Physical And Chemical Stability In Different Temperature During The Storage," *Borneo J. Pharm.*, Vol. 7, No. 2, Pp. 198–205, May 2024, Doi: 10.33084/Bjop.V7i2.6857.

[6] J. Firdausi, "Uji Mutu Fisik Gel Dari Sari Buah Nanas (Ananas Comusus (L.) Merr) Sebagai Pelembab Kulit," *J. Ilm. Farm. Attamru*, Vol. 2, No. 1, Pp. 20–26, Nov. 2021, Doi: 10.31102/Attamru.V2i1.1265.

[7] T. Grune *Et Al.*, "B-Carotene Is An Important Vitamin A Source For Humans," *J. Nutr.*, Vol. 140, No. 12, P. 2268s, Dec. 2010, Doi: 10.3945/Jn.109.119024.

[8] R. Hernani And M. Rahardjo, *Tanaman Berkhasiat Antioksidan*, Cetakan I. Jakarta: Penebar Swadaya, 2005.

[9] P. Molyneux, "The Use Of The Stable Free Radical Diphenylpicrylhydrazyl (Dpph) For Estimating Antioxidant Activity," *Acad. Molyneuxsongklanakarin J. Sci. Technol*, 2004, Accessed: Sep. 12, 2024. [Online]. Available: Https://Www.Academia.Edu/Download/39013361/Molineux_07-Dpph.Pdf

[10] A. C. Yolanda Simamora, N. L. A. Yusasrini, And I. N. Kencana Putra, "Pengaruh Jenis Pelarut Terhadap Aktivitas Antioksidan Ekstrak Daun Tenggulun (Protium Javanicum Burm. F) Menggunakan Metode Maserasi," *J. Ilmu Dan Teknol. Pangan*, Vol. 10, No. 4, P. 681, 2021, Doi: 10.24843/Itepa.2021.V10.I04.P13.

[11] C. Perdani, … M. P.-I. J. T., And Undefined 2019, "Pembuatan Virgin Coconut Oil (Vco) Kajian Suhu Inkubasi Dan Konsentrasi Enzim Papain Kasar," *Ind. Perdani, Mh Pulungan, S Karimahindustria J. Teknol. Dan Manaj. Agroindustri, 2019•Industria.Ub.Ac.Id*, Doi: 10.21776/Ub.Industria.2019.008.03.8.

[12] A. S. Isya Syamsu, Muhammad Yusuf, Arfiani, And Dedy Maruf, "Formulasi Dan Uji Aktivitas Sediaan Sabun Mandi Cair Ekstrak Etanol Daun Kapuk (Ceiba Pentandra (L.) Gaertn) Terhadap Pertumbuhan Bakteri Staphylococcus Aureus," *Sehatmas J. Ilm. Kesehat. Masy.*, Vol. 1, No. 1, Pp. 92–104, 2022, Doi: 10.55123/Sehatmas.V1i1.53.

[13] P. Nasution, R. Batubara, S. S.-P. F. Science, And Undefined 2015, "Tingkat Kekuatan Antioksidan Dan Kesukaan Masyarakat Terhadap Teh Daun Gaharu (Aquilaria Malaccensis Lamk) Berdasarkan Pohon Induksi Dan Non-Induksi," *Neliti.Compa Nasution, R Batubara, S Surjantoperonema For. Sci. Journal, 2015•Neliti.Com*, Accessed: Sep. 12, 2024. [Online]. Available: Https://Www.Neliti.Com/Publications/158327/Tingkat-Kekuatan-Antioksidan-Dan-Kesukaan-Masyarakat-Terhadap-Teh-Daun-Gaharu-Aq

[14] U. Rastuti, P. Program, S. Kimia, J. Mipa, F. Sains, And D. Teknik, "Uji Aktivitas Antioksidan Ekstrak Daun Kalba (Albizia Falcataria) Dengan Metode Dpph (1, 1-Difenil-2-Pikrilhidrazil) Dan Identifikasi Senyawa," *Ojs.Jmolekul.Comu Rastuti, P Purwatimolekul, 2012•Ojs.Jmolekul.Com*, Accessed: Sep. 12, 2024. [Online]. Available: Http://Ojs.Jmolekul.Com/Ojs/Index.Php/Jm/Article/View/104

[15] M. Gustandy And C. J. Soegihardjo, "Uji Aktivitas Antioksidan Menggunakan Radikal 1,1-Difenil-2- Pikrilhidrazil Dan Penetapan Kandungan Fenolik Total Fraksi Etil Asetat Ekstrak Etanol Buah Anggur Bali (Vitis Vinifera L.)," *J. Farm. Sains Dan Komunitas (Journal Pharm. Sci. Community)*, Vol. 10, No. 2, 2013, Doi: 10.24071/Jpsc.0097.

[16] R. Y. Asworo And H. Widwiastuti, "Pengaruh Ukuran Serbuk Simplisia Dan Waktu Maserasi Terhadap Aktivitas Antioksidan Ekstrak Kulit Sirsak," *Indones. J. Pharm. Educ.*, Vol. 3, No. 2, Pp. 2775–3670, May 2023, Doi: 10.37311/Ijpe.V3i2.19906.

[17] R. Rienoviar, L. Heliawati, A. K.-I. J. Of Industrial, And Undefined 2019, "Aktivitas Antioksidan Dan Identifikasi Senyawa Aktif Dalam Ekstrak Buah Andaliman (Zanthoxylum Acanthopodium Dc.)," *Neliti.Comr Rienoviar, L Heliawati, A Khoiriyahindonesian J. Ind. Res. 2019•Neliti.Com*, Accessed: Sep. 12, 2024. [Online]. Available: Https://Www.Neliti.Com/Publications/451208/Aktivitas-Antioksidan-Dan-Identifikasi-Senyawa-Aktif-Dalam-Ekstrak-Buah-Andalima

[18] M. Purwanto, E. Yulianti, … I. N.-I. C., And Undefined 2019, "Karakteristik Dan Aktivitas Antioksidan Sabun Padat Dengan Penambahan Ekstrak Kulit Buah Naga (Hylocereus Polyrizhus)," *Journal.Unesa.Ac.Idm Purwanto, Es Yulianti, Nurfauzi, W Winarniindonesian Chem. Appl. Journal, 2019•Journal.Unesa.Ac.Id*, Vol. 1, No. 3, P. 2019, Accessed: Sep. 12, 2024. [Online]. Available: Https://Journal.Unesa.Ac.Id/Index.Php/Icaj/Article/View/6171

[19] A. Widyasanti, A. Y. Rahayu, And S. Zain, "Pembuatan Sabun Cair Berbasis Virgin Coconut Oil (Vco) Dengan Penambahan Minyak Melati (Jasminum Sambac) Sebagai Essential Oil," *Download.Garuda.Kemdikbud.Go.Ida Widyasanti, Ay Rahayu, S Zeinjurnal Teknotan Vol. 2017•Download.Garuda.Kemdikbud.Go.Id*, Vol. 11, No. 2, 2017, Doi: 10.24198/Jt.Vol11n2.1.

[20] E. Pereira, L. Barros, And I. C. F. R. Ferreira, "Relevance Of The Mention Of Antioxidant Properties In Yogurt Labels: In Vitro Evaluation And Chromatographic Analysis," *Antioxidants*, Vol. 2, No. 2, Pp. 52–61, Jun. 2013, Doi: 10.3390/Antiox2020062.

[21] A. Widyasanti, … Y. Q.-C. Et N., And Undefined 2017, "Pembuatan Sabun Mandi Cair Berbasis Minyak Kelapa Murni (Vco) Dengan Penambahan Minyak Biji Kelor (Moringa Oleifera Lam)," *Garuda.Kemdikbud.Go.Id*, Accessed: Sep. 13, 2024. [Online]. Available: Https://Garuda.Kemdikbud.Go.Id/Documents/Detail/1218731

[22] S. Ayu Sri Eka Oktari, L. Putu Wrasiati, N. Made Wartini, M. Jurusan Teknologi Industri Pertanian, F. Teknologi Pertanian Unud, And D. Jurusan Teknologi Industri Pertanian, "Pengaruh Jenis Minyak Dan Konsentrasi Larutan Alginat Terhadap Karakteristik Sabun Cair Cuci Tangan," Vol. 5, No. 2, Pp. 47–57, 2017.

[23] A. Fajarullah, H. Irawan, A. P.-R. Umrah, And Undefined 2014, "Ekstraksi Senyawa Metabolit Sekunder Lamun Thalassodendron Ciliatum Pada Pelarut Berbeda," *Res. Fajarullah, H Irawan, A Pratomorepository Umr. 2014•Researchgate.Net*, 2014, Accessed: Sep. 13, 2024. [Online]. Available: Https://Www.Researchgate.Net/Profile/Henky-Irawan/Publication/322055827_Ekstraksi_Senyawa_Metabolit_Sekunder_Lamun_Thalassodendron_Ciliatum_Pada_Pelarut_Berbeda/Links/5a4f16f40f7e9bbfacfc8b0c/Ekstraksi-Senyawa-Metabolit-Sekunder-Lamun-Thalassodendron-Ciliatum-Pada-Pelarut-Berbeda.Pdf

[24] R. Putri, R. R.-S. J. Farmasi, And Undefined 2023, "Pembuatan Sabun Padat Dari Vco (Virgin Coconut Oil) Dan Ekstrak Buah Mentimun (Cucumis Sativus L.)," *Ejournal.Akfarimambonjol.Ac.Idr Putri, R Ranovasitawa J. Farm. Sains Dan Obat Tradisional, 2023•ejournal.akfarimambonjol.ac.id*, vol. 2, no. 2, p. 223, 2023, Accessed: Sep. 13, 2024. [Online]. Available: https://ejournal.akfarimambonjol.ac.id/index.php/jfkes/article/view/63