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ARTIKEL JURNAL INTERNASIONAL BEREPUTASI

Judul Artikel : Manufacturing Natural Soap-Base (Multiclean) With The Addition Of Wuluh starfruit extraction (Averrhoa)

Jurnal : International Journal Of Advanced and Applied Sciences (IJAAS)

Penulis : Hamsina, Hamsina; Ifa Safira; Dyah Ekowatiningsih; Ruslan Hasani; M.Tang; Hermawati; Granita

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RESPON LETTER

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Below we attach a response letter to the reviewer's results from our article with the title:

" Manufacturing Natural Soap-Base (*Multiclean*) With The Addition Of Wuluh Starfruit Extraction (*Averrhoa)"*

Reviewer 1

The novelty of the work is not clear.
Answer author : The novelty in this research is a natural soap base made from starfruit which is healthy and environmentally friendly

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1. Does the paper contribute to the body of knowledge?

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2. Is the paper technically sound?

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Answer author : more in-depth statistical analysis

3. Is the subject matter presented in a comprehensive manner?

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Manufacturing natural soap-base (*Multiclean*) with the addition of wuluh starfruit extraction (*Averrhoa*)

1- starfruit or star fruit?

Hamsina Hamsina [1,*], Ifa Safira [2], Dyah Ekowatiningsih [3], Ruslan Hasani [3], M. Tang [1], Hermawati Hermawati [1], Granita Granita [1]

[1]*Department of Chemical Engineering, Universitas Bosowa, Indonesia*
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ABSTRACT

Starfruit extract is used as a base for making natural soap that is more environmentally friendly and beneficial for health. The aim of this study is to identify the optimal conditions for adding starfruit extract to natural soap production, which involves citric acid and surfactant components. The method involves maceration and extraction of starfruit to obtain citric acid by immersing it in 80% ethanol. The soap is produced using a hot process at temperatures between 70-80°C with three formulas: F1 (200:200:10), F2 (225:175:15), and F3 (250:150:20), representing different ratios of virgin coconut oil (VCO), olive oil, and starfruit extract, respectively. Potassium hydroxide (KOH) is used as an alkali at a concentration of 30%. After the soap is made, MES (a plant-based surfactant), sodium citrate ($Na_3C_6H_5O_7$) as a preservative, and sodium bicarbonate ($NaHCO_3$) as a cleanser are added. Testing of the three soap formulas showed they all meet Indonesian National Standards (SNI). Among 20 respondents, F1 was rated the highest in terms of color, scent, and softness. It had 83% foam stability, 0.85% moisture content, a pH of 8, and 0.001% free alkali content. These results suggest that consumer preference is influenced by the starfruit extract content.

1. Introduction

Soap consists of sodium or potassium compounds which can be fatty acids from vegetable oils or animal fats in solid, soft, or liquid form, and is foam (Yao et al., 2019). The use of soap is very high in households because the use of soap varies depending on the type of furniture. One household needs dish soap, laundry soap, floor cleaner, WC cleaner, and glass cleaner, which raises the cost of purchasing different cleaning soaps (Speiser et al., 2021). The process of making soap involves a saponification reaction, in which the base hydrolyzes fatty acids to produce glycerin and raw soap, which is subsequently reprocessed until it meets the required quality standards for use (Sukeksi et al., 2021).

Quality liquid detergents contain one to more types of synthetic surfactants, namely SLS. SLS can cause skin injury if used directly on the skin continuously and for a long period of time (Klimaszewska et al., 2022). The detergent test results showed that marketplace detergents fulfill standard, but the pH test parameter yielded results that did not match laundry soap quality, and the presence of surfactants could lower a medium's surface tension (Wołowicz et al., 2022). Surfactants have a negative impact on the environment because they are difficult to degrade naturally by microorganisms (Nagtode et al., 2023).

Compared to other vegetable oils like corn, soybean, palm, sunflower, and so on, virgin coconut oil, or VCO, is licenmonitored with the benefits of high molecular weight and saturated fatty acid content (Song et al., 2023). Soap made from VCO has the property of forming foam more easily in large quantities. VCO is a vegetable oil that has highly complex fatty acids and bioactive compounds in the form of minor components (Kurniawati and Paramita, 2023). The softness of the soap is impacted when using olive oil to make a natural soap base (Chandira et al., 2022). Olive oil's high oleic acid content is beneficial for skin health (González-Acedo

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et al., 2023). Its helps remove dead skin cells and moisturize flaky skin, olive oil that has been processed into soap is thought to be the best treatment for dry skin (Nuryanah, 2023). Additionally, olive oil can tighten wrinkled skin and lessen scars (Xie et al., 2024). Wuluh starfruit Averrhoa has a high citric acid content, it can be extracted in a Natural soap base and used as a mineral binder and deodorizer (Yoo et al., 2023). Citric acid is a compound that functions as a chelating agent in binding metal ions (Książek, 2023) and can clear the bathtub of dirt, clothing stains, water purifiers to overcome crusty pots and pans (Kurćubić. et al., 2024). Adding Wuluh starfruit can lessen the number of bacteria and colonies on dishes (Nasution et al., 2020). Star fruit has the highest saponin content. Natural surfactant, saponin is a compound that is like soap and is a secondary metabolite (Mursaliyeva et al., 2023). SLS is the most widely used ingredient in detergents. Long-term use of SLS continuously can irritate the skin (Leoty-Okomb et al., 2020). Because they are biodegradable, have low foaming, and strong detergency, vegetable oil surfactants have the advantage of being more environmentally friendly (Abdurrahman et al., 2023). In soap, MES (Methyl Ester Sulfonate) is a useful vegetable surfactant (Abd Maurad et al., 2020). Methyl Ester Sulfonate [illegible] for texapone which is made from vegetable ingredients and is environmentally friendly (Qadariyah et al., 2021).

Soap is produced by the saponification process, which is the hydrolysis of fat into fatty acids and glycerol under alkaline conditions (Prieto Vidal et al., 2018). Moreover, depending on the requirements and preferences of the customers, there are additional supporting ingredients such as fragrances, sodium carbonate, sodium phosphate, and others (Mourelle et al., 2024). This study, research was conducted on Natural Soap-Base is made with as few chemicals as possible to ensure user safety. The recipe calls for a different ratio of star fruit extraction, olive oil, and virgin coconut oil (VCO), plus the addition of MES to replace synthetic surfactants. The physical, chemical, and organoleptic properties of the natural soap-base produced will be evaluated.

2. Methods

This research method uses the maceration method to obtain star fruit extract using ethanol solvent. Using the hot process method, the natural soap base is made from coconut and olive oils and enhanced with MES, sodium bicarbonate, and citrate. The step of sample preparation is: 1. Wuluh starfruit is sliced thinly after cleaning. 2. Dry in the sun until a steady weight (dry) has been attained. 3. After that, Wuluh startfruit is ground into a powder, and the resulting particles are utilized as study samples. The stage of extracting Wuluh startfruit: 1. Wuluh startfruit powder is soaked using 200 mL of ethanol for 3 x 24 hours. 2. Stir once every twenty-four hours. 3. Next, a filter is added to the star fruit extract solution. 4. A rotary evaporator is used to concentrate the star fruit extract filtrate. 5. Calculate the concentrated extract from star fruit.

Stage of Natural Soap-Base Preparation: 1. Weigh [illegible]dient in a different location. 2. Each formula's coconut and olive oils are blended and heated to 700 degrees Celsius. 3. Gradually add 95 grams of KOH per formula into the oil after diluting it with distilled water. 4. Continue stirring until traces appear. 5. Check the pH with phenolphthalein; if it turns dark pink, the soap is not yet neutral. Cook the soap further and test the pH every hour. 6. You cook until it's clear. Next, combine 10 grams of MES with hot star fruit extract. 7. When the mixture reaches [illegible]ature, add the diluted sodium [illegible] and sodium citrate.

The foam stability test is the first of several testing phases. A scaled tube holding 10 ml of distilled water was filled with a 1 g sample of liquid soap, and the tube was sealed. After 20 seconds of shaking the tube, the height of the foam that forms is measured. Test for water content: The gravimetric method is used to determine the water content. One gram of the sample was weighed on a known-weight petri dish, and it was heated for two hours at 105 °C in a drying cabinet to maintain the weight.

A pH tester was used to measure the pH of 250 milliliters of Natural [illegible] is to ascertain the acid-[illegible] content of soap formulations in accordance with SNI standards, specifically within the 8–11 range (SNI, 2017). The liquid soap sample for the next test, the free alkali test, weighs roughly 5g and is placed in a 250 ml goblet.

Then boiling stones, a few drops of phenolphthalein indicator solution, and 100 milliliters of 96% alcohol were added. After that, boil the bath for 30 minutes. After the solution turns purple, titrate it with an alcohol-based 0.1 N HCl solution until the precise purple color vanishes. organoleptic test in this manner: Organoleptic testing involves visually assessing 15 respondents to ascertain the scent, color, amount of foam, and softness of the hands following the use of Natural Soap-Base, which is formulated with star fruit extract.

3. Results

Making Natural Soap-base (Multiclean) with the addition of star fruit extract in different concentrations and using several complementary ingredients including Methyl Ester Sulfonate (MES) as a surfactant to remove dirt and produce foam in the product, Sodium Citrate (Na3C6H5O7) as a preservative and thickener, Sodium Bicarbonate as a cleanser and foam maker and distilled water as a solvent.

The prepared materials have undergone several quality tests, such as the organoleptic, free alkali, foam stability, pH, and water content tests. The purpose of this test is to ascertain whether the Natural Soap-base (Multiclean) preparation meets

the requirements set forth in the established liquid soap standards. Ten grams (F1), fifteen grams (F2), and twenty grams (F3) of star fruit extract were used in this investigation.

Fig. 1: Extraction Stage of Wuluh startfruit

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Fig. 2: Natural soap-base formulation results of F3, F2, F1, respectively

3.1. Foam stability test

Because the foam content of soap is one of its draws, foam height testing attempts to measure the amount of foam produced. Because too much foam is used in soap, it can irritate the skin. For cleaning products, foam stability and foam formation speed are crucial factors.

When used, foam contributes to the cleaning action and gives soap its scent. It ranges from 60–90% based on good foam stability standards.

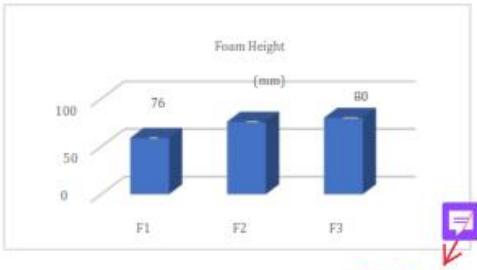

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Fig. 3: Graph of

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Fig. 4: Graph of foam stability values

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The obtained foam stability value exhibits a progressive tendency to increase, as depicted in the figure. The [12- ?] that more foam is produced in soaps with higher concentrations of star fruit extract. The saponin content of Wuluh startfruit plants, which indicates that these plants have the highest saponin content. Saponins are called natural surfactants because they are soap-like secondary metabolite compounds (Mursaliyeva et al., 2023)

It is a common misconception among consumers that high foam production indicates a high-quality soap, even though foam production is not always correlated with cleaning efficacy. The presence of surfactants, foam stabilizers, or soap-active ingredients affects the properties of the foam itself (Zhang et al., 2023). More stable foam is better than less or unstable foam. The presence of foaming agents can stabilize foam.

3.1.1. Moisture content test

It is necessary to measure the moisture content of an ingredient because water can have an impact on the final soap's quality. According to SNI 06-3532-1994 testing standards, laundry soap can have a maximum water content of 15%.

Table 1: Moisture content test results

No.	Sample	Starting weight sample (gr)	Final weight sample (gr)	Water content (%)
1.	F1	1,07	0,16	0,85
2.	F2	1,02	0,30	0,71
3.	F3	1,08	0,38	0,65

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Fig. 5: Graph of moisture content values

The figure illustrates that the percentage of moisture cont[illegible] creasing extract mass [illegible]ied. Hygroscopic substances like MES are the source of this increased water content. The soap will shrink or run out more easily when used with more water in it (Chirani et al., 2021). The speed and concentration of the mixing have a major impact on the liquid soap's moisture content. This analysis of moisture content is equivalent to the calculation of moisture. It is estimated that when the experiment is run for two hours at 105 ° C, the water in the soap evaporates, reducing the amount of water (moisture).

15- ?

3.2. Degree of acidity (pH)

One of the standards for liquid soap quality is the pH test. This is since liquid soap comes into direct touch with the skin and may cause issues if its pH differs from that of the skin. The resulting soap's pH value is still within the range of pH 8–11, which is the ra[illegible] (Indonesian National Standa[illegible] for standard liquid soap that has been set. This means that the soap is safe to apply to skin because no skin irritation is anticipated at th[illegible] (SNI, 1996).

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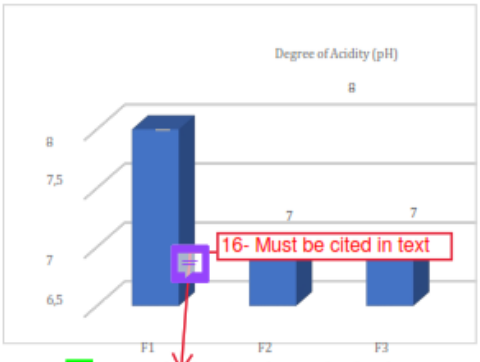

Fig. 6: Graph of acidity degree (pH) values

Star fruit contains acidic compounds, the average pH value at different concentrations of star fruit extract indicates that [illegible]crease or become more aci[illegible] The more star fruit extract added, the more acidic the soap produced. Although it does not usually cause skin irritation, the pH range of soap between 4 and 10.5 tends to cause changes in skin pH (Tarun et al., 2021)

17- Provide reference

3.3. Free alkali content test

Free alkali analysis is a residue that does not react in soap formation. Free alkali tends to decrease due to the length of stirring and due to the water/soap ratio. This is due to the reaction of alkali with fatty acids contained in refined oil so that the saponification reaction is more perfect, which has an impact on reducing free alkali. The decrease in free alkali is also caused by the ratio of water/soap added because water can reduce the concentration of free alkali in soap. The SNI maximum standard of free alkali content in liquid soap is 0.1%.

20- Distinguish between [illegible]nd "."

Table 2: free Alkali content test results

No.	Natural formulation soap-base	V HCl (mL)	Alkali content free (%)
1.	F1	1,8	0,01
2.	F2	2,5	0,002
3.	F3	4	0,004

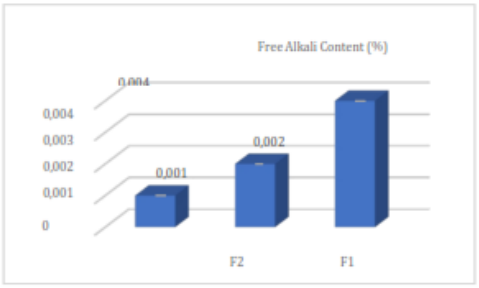

Fig. 7: Graph of free alkali content values

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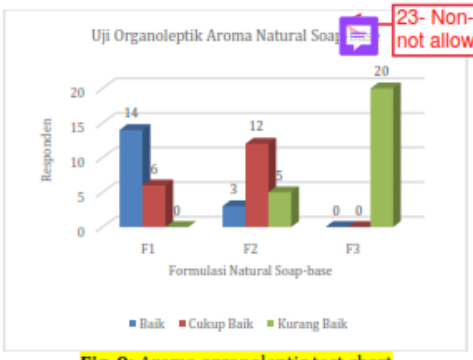
Excessive alkali content in [illegible] formulations can lead to skin irritation and dryness. This is because surfactants were used in high concentrations. Citric acid can be added to dishwashing liquid soap preparations to achieve SNI-compliant alkali content values, thereby lowering excess alkali levels (Dianursanti et al., 2020).

In this study, citric acid has been added through the extraction of Wuluh startfruit which has the

highest citric acid content so that the free alkali content in natural soap-base is far below the maximum value of 0.1%.



23- Non-English texts are not allowed

Fig. 9: Aroma organoleptic test chart

22- Must be cited in text

3.3. Organoleptic test color

An ingredient's quality is typically determined by several factors. Taste, texture, color, and nutritional value are some of these components. The color factor will be considered visually before other factors. When selecting an ingredient, color will be considered first. After aroma, color is the most alluring aspect of food or non-food items. Food colorings can boost a product's acceptance among consumers.

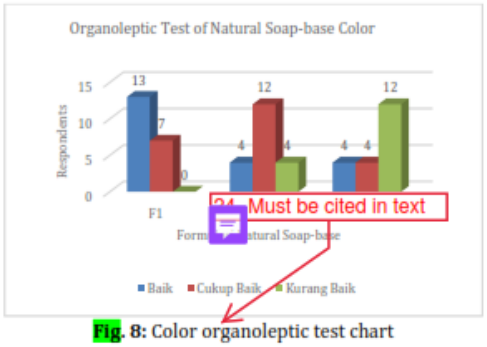


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Fig. 8: Color organoleptic test chart

Based on the results of the color organoleptic test on 20 respondents, 13 respondents preferred the color of natural soap-base in formula 1 while formula 2 and formula 3 were preferred by 4 respondents each. This states that the impact of brown color produced from star fruit extraction is mostly disliked by respondents. The more composition of star fruit extraction in the formulation, the lower the respondents' interest in the soap. And vice versa, the lower the composition of star fruit extract that does not change the color of the soap has very much respondent interest.

3.4. Aroma organoleptic test

The results of star fruit extraction have an unpleasant aroma. This aroma greatly impacts the natural soap base made with the addition of star fruit extraction. Essential oils are added to each formula with the same composition, so they have different aromas in each sample. 14 respondents gave scores on the aroma of formulation 1 and respondents gave unfavorable scores on formulation 2. This states that the greater the composition of star fruit extract added to the sample, the more unpleasant the aroma that makes respondents less interested. The aroma of essential oil has more impact on giving a fragrant aroma to formulation 1 which contains the lowest amount of star fruit extract.

3.5. Foam organoleptic test

Foam is the main feature in the use of soap, both liquid and solid soap. The amount of foam produced in soap greatly impacts the level of consumer desire for soap products. Each consumer's opinion also varies on the amount of foam in soap.

The organoleptic test of the soap on 20 respondents resulted in Fig. 10.

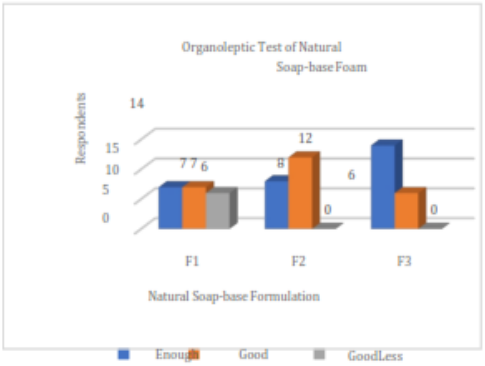

Fig. 10: Foam organoleptic test chart

Based on the results of the physical test for foam stability, it was found that the more Wuluh startfruit extract there was in the soa[illegible] foam.

25- ?

The soap sample has a lot of foam in it as well. According to a graph in Figs. 12-14 respondents said they preferred soaps with a lot of foam because they believed it would improve the soap's high level of cleaning. The seven respondents who indicated that they preferred soap with a lot of foam scored the lowest because they were aware that a lot of foam could cause their skin to become dry or irritated.

However, the three sample formulas in this study can be verified as safe because they meet the Indonesian National Standard for foam height and stability percentage, meaning they are suitable for skin irritation-free cleansing.

3.6. Organoleptic test for soap softness

The soap softness test is a test conducted to determine the impact of soap on hand skin after the

use of natural soap-base. The graph of the test results can be seen in Fig. 11.

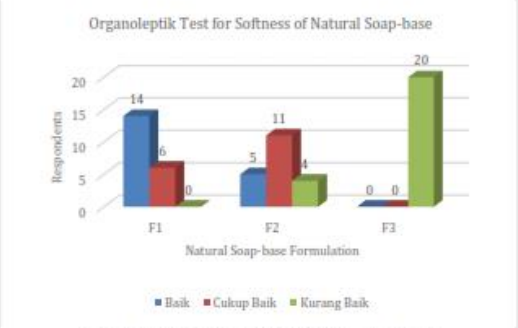

Fig. 11: Organoleptic test for soap softness

Out of all the formulations, formula 1 was selected by 14 respondents as the most gentle and comfortable for hand skin. This supports the theory regarding olive oil's effect on skin softness after use. Since Formulation 1 contains the most olive oil, this study can conclude that skin softness in natural soap-base users increases with the amount of olive oil in the soap.

4. Conclusion

In the research on the manufacture of Natural Soap- base with the addition of star fruit extraction, three soap formulas were produced. Formula 1, containing 200 grams of coconut oil, 200 grams of olive oil, and 10 grams of star fruit extraction, has the lowest foam stability of 83% but still meets SNI, which is 60–90, has the highest water content of up to 0.85% with a pH of 8, and the lowest free alkali content of 0.001%. In formula 2, which consists of 225 grams of coconut oil, 175 grams of olive oil, and 15 grams of star fruit extraction, the test results are 85% foam stability, 0.71% water content, pH 7, and 0.002% free alkali content.

free alkali content. Meanwhile, formula 3 with 250 grams of coconut oil, 150 grams of olive oil, and 20 grams of star fruit extract has a foam stability of up to 86%, the lowest water content with 0.65%, pH 7, and free alkali content of 0.004%. The three formulas have different laboratory test results but still meet the applicable SNI so that the respondents' organoleptic test is carried out to determine the level of consumer interest. Based on the results of organoleptic tests on 20 respondents, formula 1 has advantages in terms of color, aroma, and softness of soap. Formula 3 is much in demand in terms of the amount of foam produced. The optimal amount of water to add for each use of natural soap base can be calculated using the researcher's suggestion for the next study. Moreover, more research on Wuluh startfruit extraction can be conducted to obtain the highest possible saponin content, which will affect the amount of foam that is produced.

Compliance with ethical standards

Conflict of interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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Manufacturing Natural Soap-Base (*Multiclean*) With The Addition Of Wuluh Starfruit Extraction (*Averrhoa*)

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ABSTRACT

Natural Soap Base from starfruit is used as a soap base that is more environmentally friendly and beneficial for health. This study aims determine the optimum conditions for adding starfruit extract to the manufacture of natural base soap. which consists of citric acid and surfactant components. This Methode is maceration and extraction of star fruit to obtain citric acid content with 80% ethanol immersion and uses the *hot process* method at 70-800C in the manufacture of natural soap-base with 3 formulas, namely the ratioof VCO, olive oil and star fruit extraction respectively: F1 200:200:10, F2 225:175:15 and F3 250:150:20 with KOH concentration as an alkali of 30%. After obtaining the soap, MES was added as a vegetable surfractant, Na3C6H5O7 solution as a preservative and NaHCO3 as a cleanser.The results of the Natural Soap-base test of the three formulas meet SNI.Twenty respondents ranked F1 as having the best quality in terms of organoleptic color, scent, and softness of soap. It has 83% foam stability, 0.85% moisture content, pH 8, and 0.001% free alkali content. This indicates that consumer interest is influenced by star fruit extract.

1. Introduction

Soap consists of sodium or potassium compounds which can be fatty acids from vegetable oils or animal fats in solid, soft, or liquid form, and is foam (Richard T. Yao., et al.,2019). The use of soap is very high in households because the use of soap varies depending on the type of furniture. One household needs dish soap, laundry soap, floor cleaner, WC cleaner, and glass cleaner, which raises the cost of purchasing different cleaning soaps (Speiser E ., et al., 2021) The process of making soap involves a saponification reaction, in which the base hydrolyzes fatty acids to produce glycerin and raw soap, which is subsequently reprocessed until it meets the required quality standards for use (Sukeksi L ., et al ., 2021) .

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Quality liquid detergents contain one to more types of synthetic surfactants, namely SLS. SLS can cause skin injury if used directly on the skin continuously and for a long period of time (Klimaszewska E ., et al 2023) . The detergent test results showed that marketplace detergents fulfill standart, but the pH test parameter yielded results that did not match laundry soap quality, and the presence of surfactants could lower a medium's surface tension (Wołowicz A .,et al., 2022). Surfactants have a negative impact on the environment because they are difficult to degrade naturally by microorganisms (Nagtode V.S et al (2023)

Compared to other vegetable oils like corn, soybean, palm, sunflower, and so on, virgin coconut oil, or VCO, is licenmonitored with the benefits of high molecular weight and saturated fatty acid content (Song C et al., 2023). Soapmade from VCO has the property of forming

foam more easily in large quantities. VCO is a vegetable oil that hashighly complex fatty acids and bioactive compounds in theform of minor components (Kurniawati Y., et al., 2023) . The softness of the soap is impacted when using olive oil to make a natural soap base. (Chandira M . R. et al., 2022). Olive oil's high oleic acid content is beneficial for skin health (Gonzalez – Acedo A .,et al., 2023'). Its helps remove dead skin cells and moisturize flaky skin, olive oil that has been processed into soap is thought to be the best treatment for dry skin (Nuryanah., 2023). Additionally, olive oil can tighten wrinkled skin and lessen scars (Xiu M., 2024). Wuluh starfruit or Averrhoa has a high citric acid content, it will be extracted in a Natural soap base and used as a mineral binder and deodorizer (Yoo. J.W., et al., 2023). Citric acid is a compound that functions as achealting agent in binding metal ions (Ewelina esk ., et al., 2024) and can clear the bathtub of dirt , clothing stains, water purifiers to overcome crusty pots and pans (Vladimir . S.K., et al., 2024). Adding Wuluh starfruit can lessen the amount of bacteria and colonies on dishes (Nasution M ., et al, 2020). Star fruit has the highest saponin content. Natural surfactant, saponin is a compound that is similar to soap and is a secondary metabolite (Mursaliyeva. V. K., et al., 2023). SLS is the most widely used ingredient in detergents. Long-term use of SLS continuously can irritate the skin (Leoty-Okomb S., et al ., 2020). Because they are biodegradable, have low foaming, and strong detergency, vegetable oil surfactants have the advantage of being more environmentally friendly (Darbi Abdurrahman M., et al.,2023) . In soap, MES (Methyl Ester Sulfonate) is a useful vegetable surfactant (Abd Maurad Z., et al., 2020). Methyl Ester Sulfonate is used as a substitute for texapone which is made from vegetable ingredients and is environmentally friendly (Qadariyah L, et al., 2021).

Soap is produced by the saponification process, whichis the hydrolysis of fat into fatty acids and glycerol under alkaline conditions (Vidal P.N et al., 2018). Moreover, depending on the requirements and preferences of the customers, there are additional supporting ingredients such as fragrances, sodium carbonate, sodium phosphate, and others (Mourelle L M., et al., 2024). This study, research was conducted on Natural Soap-Base is made with as few chemicals as possible to ensure user safety. The recipe calls for a different ratio of star fruit extraction, olive oil, and virgin coconut oil (VCO), plus the addition of MES to replace synthetic surfactants. The physical, chemical, and organoleptic properties of the natural soap-base produced will be evaluated.

2. Methods

This research method uses the maceration method to obtain star fruit extract using ethanol solvent. Using the hot process method, the natural soap base is made from coconut and olive oils and enhanced with MES, sodium bicarbonate, and citrate. The step of sample preparation is: 1. Wuluh starfruit is sliced thinly after cleaning. 2. Dry in the sun until a steady weight (dry) has been attained. 3. After that, Wuluh startfruit is ground into a powder, and the resulting particles are utilized as study samples. The stage of extracting Wuluh startfruit: 1. Wuluh startfruit powder is soaked using 200 mL of ethanol for 3 x 24 hours. 2. Stir once every twenty-four hours. 3. Next, a filter is added to the star fruit extract solution. 4. A rotary evaporator is used to concentrate the star fruit extract filtrate. 5. Calculate the concentrated extract from star fruit.

Stage of Natural Soap-Base Preparation: 1. Weigh every ingredient in a different location. 2. Each formula's coconut and olive oils are blended and heated to 700 degrees Celsius. 3. Gradually add 95 grams of KOH per formula into the oil after diluting it with distilled water. 4. Continue stirring until traces appear. 5. Check the pH with phenolphthalein; if it turns dark pink, the soap is not yet neutral. Cook the soap further and test the pH every hour. 6. You cook until it's clear. Next, combine 10 grams of MES with hot star fruit extract. 7. When the mixture reaches room temperature, add the diluted sodium bicarbonate and sodium citrate.

The foam stability test is the first of several testing phases. A scaled tube holding 10 ml of distilled water was filled with a 1 g sample of liquid soap, and the tube was sealed. After 20 seconds of shaking the tube, the height of the foam that forms is measured. Test for water content: The gravimetric method is used to determine the water content. One gram of the sample was weighed on a known-weight petri dish, and it was heated for two hours at 105 °C in a drying cabinet to maintain the weight.

A pH tester was used to measure the pH of 250 milliliters of Natural Soap-Base. The objective is to ascertain the acid-base content of soap formulations in accordance with SNI standards, specifically within the 8–11 range (SNI, 2017). The liquid soap sample for the next test, the free alkali test, weighs roughly 5g and is placed in a 250 ml goblet.

Then boiling stones, a few drops of phenolphthalein indicator solution, and 100 milliliters of 96% alcohol were added. After that, boil the bath for 30 minutes. After the solution turns purple, titrate it with an alcohol-based 0.1 N HCl solution until the precise purple color vanishes. organoleptic test in this manner: Organoleptic testing involves visually assessing 15 respondents to ascertain the scent, color, amount of foam, and softness of the hands following the use of Natural Soap-Base, which is formulated with star fruit extract.

3. Results

Making Natural Soap-base (Multiclean) with the addition of star fruit extract in different concentrations and using several complementary ingredients including Methyl Ester Sulfonate (MES) as a surfactant to remove dirt and produce foam in the product, Sodium Citrate ($Na_3C_6H_5O_7$) as a preservative and thickener, Sodium Bicarbonate as a cleanser and foam maker and distilled water as a solvent.

The prepared materials have undergone a number of quality tests, such as the organoleptic, free alkali, foam stability, pH, and water content tests. The purpose of this test is to ascertain whether or not the Natural Soap-base (Multiclean) preparation meets the requirements set forth in the established liquid soap standards. Ten grams (F1), fifteen grams (F2), and twenty grams (F3) of star fruit extract were used in this investigation.

Fig1 : Extraction Stage of Wuluh startfruit

Fig 2 : Natural soap-base formulationresults of F3, F2, F1, respectively.

3.1.Foam Stability Test

Because the foam content of soap is one of its draws, foam height testing attempts to measure the amount of foam produced. Because too much foam is used in soap, it can irritate the skin. For cleaning products, foam stability and foam formation speed are crucial factors.

When used, foam contributes to the cleaning action and gives soap its scent. It ranges from 60–90% based on good foam stability standards.

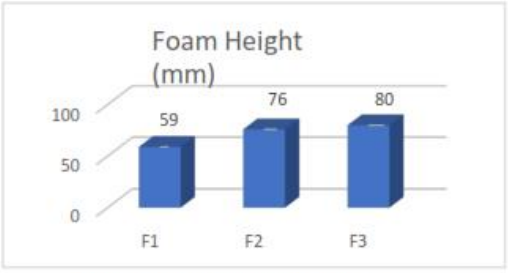
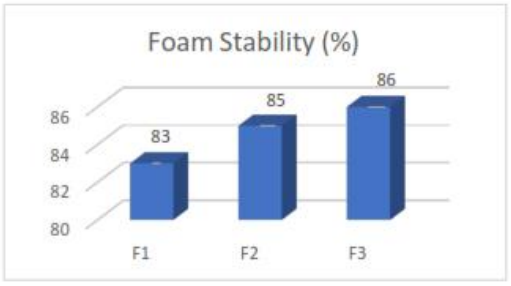


Fig3: Graph of foam height values



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l) Moisture Content Test

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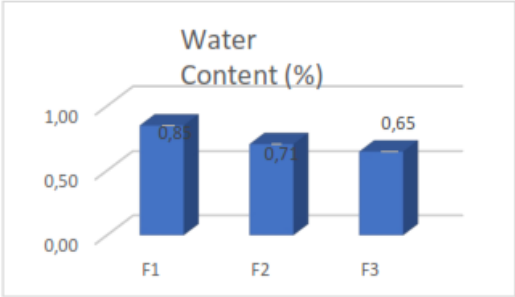

Fig5: Graph of moisture content values

The figure illustrates that the percentage of moisture content obtained decreases with increasing extract mass added. Hygroscopic substances like MES are the source of this increased water content. The soap will shrink or run out more easily when used with more water in it.(Chirani MR., et al., 2021). The speed and concentration of the mixing have a major impact on the liquid soap's moisture content. This analysis of moisture content is equivalent to the calculation of moisture. It is estimated that when the experiment is run for two hours at 105 ° C, the water in the soap evaporates, reducing the amount of water (moisture).

3.2. Degree of Acidity (pH)

One of the standards for liquid soap quality is the pH test. This is due to the fact that liquid soap comes into direct touch with the skin and may cause issues if its pH differs from that of the skin. The resulting soap's pH value is still within the range of pH 8–11, which is the range specified by the SNI (Indonesian National Standard) for standard liquid soap that has been set. This means that the soap is safe to apply to skin because no skin irritation is anticipated at that pH (SNI, 1996).

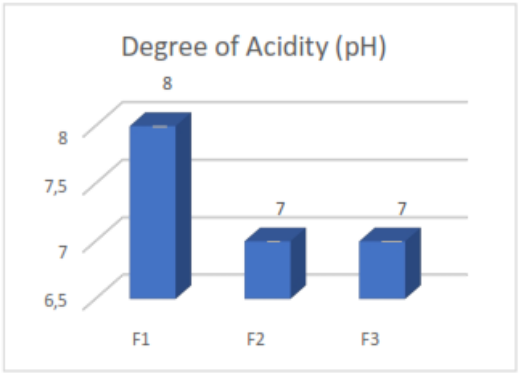

Fig 6 : Graph of acidity degree (pH) values

Star fruit contains acidic compounds, the average pH value at different concentrations of star fruit extract indicates that the soap's pH tends to decrease or become more acidic. The more star fruit extract added, the more acidic the soap produced. Although it does not usually cause skin irritation, the pH range of soap between 4 and 10.5 tends to cause changes in skin pH (Tarun J., et., 2021)

3.3. Free Alkali Content Test

Free alkali analysis is a residue that does not react in soap formation. Free alkali tends to decrease due to the length of stirring and due to the water/soap ratio. This is due to the reaction of alkali with fatty acids contained in refined oil so that the saponification reaction is more perfect, which has an impact on reducing free alkali. The decrease in free alkali is also caused by the ratio of water/soap added because water can reduce the concentration of free alkali in soap. The SNI maximum standard of free alkali content in liquid soap is 0.1%.

Table 2. free Alkali Content Test Results

No.	Natural Formulation Soap-base	V HCl (mL)	Alkali Content Free (%)
1.	F1	1,8	0,01
2.	F2	2,5	0,002
3.	F3	4	0,004

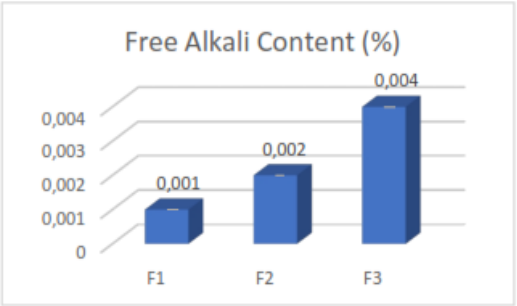

Fig 7: Graph of free alkali content values

Excessive alkali content in liquid dish soap formulations can lead to skin irritation and dryness. This is because surfactants were used in high concentrations. Citric acid can be added to dishwashing liquid soap preparations to achieve SNI-compliant alkali content values, thereby lowering excess alkali levels(Dianursanti, et al., 2020).

In this study, citric acid has been added throughthe extraction of Wuluh startfruit which has the highest citric acid content so that the free alkali content in natural soap-base is far below the maximum value of0.1%.

3.4.Organoleptic Test Color

An ingredient's quality is typically determined by a number of factors. Taste, texture, color, and nutritional value are some of these components. The color factor will be taken into account visually before other factors. When selecting an ingredient, color will be taken into account first. After aroma, color is the most alluring aspect of food or non-food items. Food colorings can boost a product's acceptance among consumers..

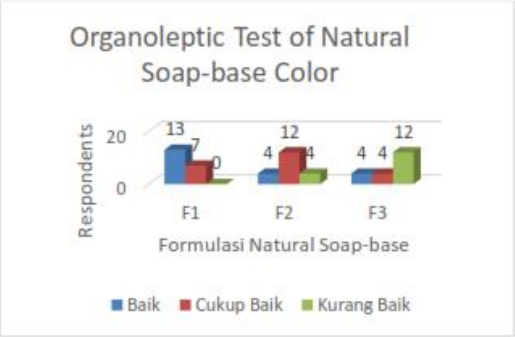

Fig 8: Color Organoleptic Test Chart

Based on the results of the color organoleptic test on 20 respondents, 13 respondents preferred the color of natural soap-base in formula 1 while formula 2 and formula 3 were preferred by 4 respondents each. This states that the impact of brown color produced from star fruit extraction is mostly disliked by respondents. The more composition of star fruit extraction in the formulation, the lower the respondents' interest in the soap. And vice versa, the lower the composition of star fruit extract that does not change the color of the soap has very much respondent interest.

Fig 9: Aroma Organoleptic Test Chart

3.5.Aroma Organoleptic Test

The results of star fruit extraction have an unpleasant aroma. This aroma greatly impacts the natural soap base made with the addition of star fruit extraction. Essential oils are added to each formula with the same composition, so they have different aromas in each sample. 14 respondents gave good scores on the aroma of formulation 1 and all respondents gave unfavorable scores on formulation 2. This states that thegreater the composition of star fruit extract added to the sample, the more unpleasant the aroma that makes respondents less interested. The aroma of essential oil has more impact on giving a fragrant aroma to formulation 1 which contains the lowest amount of star fruit extract.

3.6.Foam Organoleptic Test

Foam is the main feature in the use of soap, both liquid and solid soap. The amount of foam produced from soap greatly impacts the level of consumer desire for soap products. Each consumer's opinion also varies onthe amount of foam in soap.

The organoleptic test of the soap on 20 respondents resulted in the following graph:

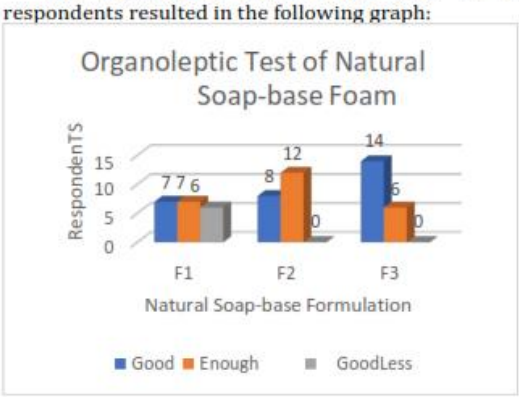

Fig 10: Foam Organoleptic Test Chart

Based on the results of the physical test for foam stability, it was found that the more Wuluh startfruit extract there was in the soap, the more stable the foam.

The soap sample has a lot of foam in it as well. According to a graph in Figure 12, 14 respondents said they preferred soaps with a lot of foam because they believed it would improve the soap's high level of cleaning. The seven respondents who indicated that they preferred soap with a lot of foam scored the lowest because they were aware that a lot of foam could cause their skin to become dry or irritated.

However, the three sample formulas in this study an be verified as safe because they meet the Indonesian National Standard for foam height and stability percentage, meaning they are suitable for skin irritation-free cleansing.

3.7. Organoleptic Test for Soap Softness

The soap softness test is a test conducted to determine the impact of soap on hand skin after the use of natural soap-base. The graph of the test results can be seen below:

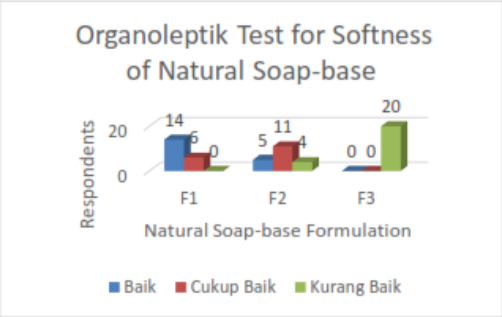

Fig11: Organoleptic test for soap softness

Out of all the formulations, formula 1 was selected by 14 respondents as the most gentle and comfortable for hand skin. This supports the theory regarding olive oil's effect on skin softness after use. Since Formulation 1 contains the most olive oil, this study can conclude that skin softness in natural soap-base users increases with the amount of olive oil in the soap.

4. Conclusion

In the research on the manufacture of Natural Soap-base with the addition of star fruit extraction, three soap formulas were produced. Formula 1, containing 200 grams of coconut oil, 200 grams of olive oil, and 10 grams of star fruit extraction, has the lowest foam stability of 83% but still meets SNI, which is 60–90, has the highest water content of up to 0.85% with a pH of 8, and the lowest free alkali content of 0.001%. In formula 2, which consists of 225 grams of coconut oil, 175 grams of olive oil, and 15 grams of star fruit extraction, the test results are 85% foam stability, 0.71% water content, pH 7, and 0.002% free alkali content. free alkali content. Meanwhile, formula 3 with 250 grams of coconut oil, 150 grams of olive oil, and 20 grams of star fruit extract has a foam stability of up to 86%, the lowest water content with 0.65%, pH 7, and free alkali content of 0.004%. The three formulas have different laboratory test results but still meet the applicable SNI so that the respondents' organoleptic test is carried out to determine the level of consumer interest. Based on the results of organoleptic tests on 20 respondents, formula 1 has advantages in terms of color, aroma, and softness of soap. Formula 3 is much in demand in terms of the amount of foam produced. The optimal amount of water to add for each use of natural soap base can be calculated using the researcher's suggestion for the next study. Moreover, more research on Wuluh startfruit extraction can be conducted to obtain the highest possible saponin content, which will affect the amount of foam that is produced..

Compliance with ethical standards

Conflict of interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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