Science and Technology Innovation Utilization of Used Cooking Oil and Aloe Vera Leaf Skin as Hand Soap and Dish Soap in the Community During the 2021 Pandemic

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Abstract
Cooking oil is one of the nine staple ingredients consumed by the people of Indonesia. According to experts, the dangers of consuming cooking oil by using it more than twice can cause various diseases. Therefore, it is important to make efforts to utilize waste cooking oil so that it has economic value. One of the innovations of using used cooking oil is to process it into hand soap and dish soap. During the Covid-19 pandemic, maintaining sanitary hygiene is a mandatory thing that must be done to break the chain of the spread of Covid-19, such as washing hands and ensuring that cutlery is clean from germs. According to research from Safitri, et al the content of used cooking oil still contains components of saturated and unsaturated fatty acids such as oleic acid and linoleic acid. Oleic acid works to soften and smooth the skin. In addition, oleic acid and linoleic acid function to restore skin barrier function. Therefore, the use of used cooking oil waste as hand soap and dishwashing products is an alternative solution to maintain Sanitary Hygiene. The use of used cooking oil can be combined with aloe vera leaf skin as an additional ingredient in soap making. According to Untari Eka Kartika, and Robiyanto (2018) Aloe vera leaf skin can minimize irritation to the skin due to the continuous use of hand soap and dish soap. This study aims to determine the potential of utilizing cooking oil waste as antiseptic soap and aloe vera leaf skin waste as an anti-allergic agent to reduce skin irritation due to the continuous use of soap during the pandemic.

Introduction

The SARS-CoV-2 (COVID-19) virus pandemic, which was first discovered in the Chinese city of Wuhan at the end of 2019. There have been reported positive cases of the corona virus in the world, which has infected about 3.4 million people with nearly 240 thousand deaths and an estimated number of this will continue to grow1. Transmission of Covid-19 can be through droplets in the air and objects contaminated with droplets. One of the prevention efforts taken is to maintain sanitary hygiene, such as washing hands and ensuring that cutlery is clean from germs (WHO, 2020).

One of the nine basic ingredients used by the people of Indonesia is cooking oil. According to health experts, cooking oil should only be used two to four times for

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frying. Used cooking oil that has been filtered is indeed clear and odorless, but it is not recommended to be consumed again because it is not good for health2. Generally, used cooking oil is considered by the community to have no economic value. Therefore, there is a need for an innovation in the use of used cooking oil in addition to consumption. One of the innovations in utilizing waste cooking oil is to reprocess it into soap, as a form of support for efforts to prevent Covid-19 in washing hands and maintaining hygiene and sanitation of eating utensils.

Based on the results of previous research, used cooking oil can be reused by being purified through a saponification reaction process using KOH solution3 and used as an alternative raw material in soap making, both in liquid and solid form4. According to research from waste cooking oil (cooking oil) still contains components of saturated and unsaturated fatty acids such as oleic acid and linoleic acid5. Oleic acid and linoleic acid function to soften the skin, smooth the skin and restore the skin barrier function. In addition, another advantage of used cooking oil is the high fatty acid content of vegetable oils.

Behind the prevention of Covid-19 transmission by washing hands and maintaining hygiene and sanitation of cutlery, there are side effects that occur due to the high intensity of repeated use of soap on the skin of the hands. In individuals who have dry skin, the elderly, and patients with atopy (allergic tendencies), the risk of irritation is higher.

The aloe vera plant is used by the community into various preparations, both food and medicine. Usually aloe vera is used as a moisturizer, other studies have shown that aloe vera is effective in reducing dryness of the skin, clearing acne, skin allergies, dark spots and uneven skin tone and making the skin brighter6. The active ingredients of aloe vera that have been identified include saponins, sterols, acemannan, anthraquinones7. The majority of the use of aloe vera is found in the flesh and leaves the skin of the aloe vera leaf. Aloe vera leaf skin can be used as a source of active compounds to inhibit bacteria in addition to reducing aloe vera leaf skin waste.

Based on the potential possessed by used cooking oil and aloe vera leaf skin, the researchers wanted to find out the effectiveness of used cooking oil and aloe vera leaf skin as a preparation for hand washing soap and washing dishes in the community during the Covid-19 pandemic.

METHOD

Types of research

This study uses a type of laboratory experimental research. Laboratory Experiment is a test whose work process is carried out by conducting experiments in the laboratory to make a product.

Place and time of research

Place and Time of Research The research was conducted at the Integrated Laboratory of the Undergraduate Public Health study program, Ngudi Waluyo University. This research was conducted in 2021.

Tools and materials

The tools used in this study are in the form of glassware and non-glass tools. Glassware consists of a beaker, analytical balance, and thermometer. Then for non-glass tools, namely measuring cups, spoons or stirrers, pans (water baths), bottles, filter paper, and litmus paper or pH meters.

The materials used in this study were 100 ml of used cooking oil, 35 grams of activated charcoal, 200 ml of distilled water, 70 ml of 30% KOH, 10 ml of glycerin, 10 grams of foambooster, 10 grams of dye, and 2 ml of fragrance.

Research Implementation Steps

Oil Purification Process In the oil refining process, there are three stages,

namely removing impurities (despicing), neutralization and bleaching.
At the stage of removing impurities (Despicing The process carried out was heating 100 ml of used cooking oil at a temperature of 110oC with a volume of 1:1 until the volume of distilled water was reduced to half of the initial volume. After being heated, the next process is the deposition process. In the layer deposition process

The oil is on top and the water layer is on the bottom. This is because the specific gravity of oil is heavier than water. Then, the oil obtained is filtered using ordinary filter paper. The next process is neutralization, at the neutralization stage 15 grams of KOH are added in 100 ml into the desiccated oil and stirred until neutral. This is done when it is hot. Then at the bleaching stage (bleach) the process carried out is by heating the oil from the neutralization result to a temperature of 700C and then adding activated carbon charcoal with a volume of 1:2.The final step, a filtering process is carried out to separate activated carbon charcoal from used cooking oil to obtain pure used cooking oil.

Liquid Soap Making Process.
The skin of the aloe vera leaf is cleaned of the leaf flesh (gel) that is still attached then mashed by means of a blender and weighed 15 grams to be infused with 100 mL with distilled water for 15 minutes while stirring. After 15 minutes the water was taken to be used in the formulation of the preparation. The next process in making liquid soap is heating water in a bath, then dissolving 30% KOH in a glass cup, then taking the KOH and entering as much as 70 mL in water in the bath. Furthermore, in a separate place, heat the oil that has been purified as much as 100 grams in a bath with a glass cup while stirring. Then put the mixture back into the bath and stir. Add 10 mL of glycerin in it while stirring constantly. Add 25 mL of distilled water, then stir continuously. Add the extracted aloe vera leaf skin. Then add 10 grams of foambooster, 2 mL of dye and fragrance and mix well. Then the last step is to want it and put it in the bottle. Hand soap and dish soap are ready to use.

Chemical analysis or soap quality test based on SNI
The soap quality test is carried out based on SNI 06-2048-1990 which is the standard of SNI Quality and Test Method for Laundry Soap which consists of free alkali test, non-soap fat test, pelican oil test and the amount of fatty acids. This test aims to determine the characteristics of the soap that has been produced. The following is a description of how to test soap according to SNI:
Alkali free
In the free alkali test, 5 grams of the sample were carefully weighed into a 250 ml Erlenmeyer, then added 100 ml of neutral alcohol and boiling stone and five drops of phenolphthalein, placed on a water bath using an upright cooler and allowed to boil for 30 minutes. then the mixture is cooled but not frozen and titrated with HCl in alcohol of 0.1 N. Remarks on calculations:

N	=	Concentration (Normality) HCl
grams of substance	=	Sample weight (soap product)
Ml	=	titrated HCL volume

Soapless fat
The process in the soapy fat test is that 10 ml of KOH in alcohol is pipetted into the free fatty acid determination solution. Then heated on a water bath with vertical cooling for one hour. Then cooled and then titrated with 0.5 N HCL with an indicator phenolphthalein. Also do the determination of the blank using 70 ml of neutral alcohol. Remarks on calculations:

b	=	blank volume
a	=	sample volume
N	=	HCL normality
56.1	=	HCL equivalent weight
258	=	Average number of saponification

Amount of fatty acids (shake method)

A sample of 10 grams was mixed with 5-10 ml of 10% HCL until it was excessive so that the fatty acids could be completely liberated and put into a separating funnel, then added ether and then shaken. Then the aqueous solution was removed and the ether solution was poured into a beaker. The process was repeated until 100 ml of solvent was obtained, then the solvent was shaken and washed again with 10 ml until the water did not react with the acid. After that, the solvent was dried, filtered and put into a fat flask that had been weighed with a boiling stone. Perform distillation and dry at a temperature of 105oC to constant weight. Remarks on calculations:

grams of substance = sample weight (soapy fat)

Pelican Oil

The pelican oil test was carried out by means of 0.3 ml of fat from the former determination of fatty acids mixed with 5 ml of KOH in alcohol of 0.5 N and heated. Then add water, if in the process there is turbidity it indicates the presence of mineral oil.

RESULTS AND DISCUSSION

The type of research carried out is experimental, so the data obtained from the experiment of making hand washing soap and dish soap from used cooking oil and aloevera skin that have been carried out in the laboratory. The data obtained are primary data from the results of soap making experiments and analysis of soap characteristics testing based on the Indonesian National Standard (SNI).

The experiment was repeated twice in order to obtain more accurate mean data. The data obtained in the experiment was that 100 grams of used cooking oil obtained 600 mL of soap at a heating temperature of 70-80oC and the color of the soap was green. This is due to the addition of aloe vera leaf extract and coloring agents. Based on the quality test carried out, in the free alkali test on soap, the volume of HCL titrated was 0.6 mL, the normality of HCL used was 0.0986 N, and the weight of the soap weighed was 5.0018 grams.

Then in the soapy fat test, the data for the blank volume (b) is 11.5 mL, the sample volume (a) is 15 mL, the normality of HCL is 0.0986 N, and the weight of the soap weighed is 5.0018 grams. Next is the test for the amount of fatty acids (shake method). In the test for the amount of fatty acids, the data obtained are for the additional weight of the pumpkin fat of 6.0011 grams, and the weight of the soap being weighed is 10.0023 grams.

Based on these data, the results for each test stage, namely for the free alkali test, the test results obtained are 0.047%, then the soapy fat test results obtained are 1.50%, the results of the calculation of the amount of fatty acids (shake method) are obtained as much as 59.99%, and the results of the pelican oil test showed that there was no turbidity (pelican oil was negative).

Based on the calculation of free alkali, the result is 0.047%, when compared with SNI 06-2048-1990 with a maximum value of 0.1, the results obtained are 0.047≤0.1. Free alkali is an alkali in soap that is not bound as a compound. Excess free alkali in soap can be caused by concentrated or excessive alkali concentration in the soaping process. Soaps that contain high alkali are usually used for laundry soap. The excess of free alkali in soap should not be more than 0.1% for Na soap and 0.14% for KOH soap because alkali has harsh properties and causes skin irritation (Qisti, 2009). The result of the soap-free alkali test is less than 0.1 so it does not cause skin irritation.

Calculation of unsaponifiable fat is 1.51%, when compared with SNI value of 2.5, it is 1.51≤2.5 so there is no potential for decreasing soap reaction. In testing the level of unsaponifiable fat, we can analyze the fat from the soap and the fat from the solvent in two ways, namely extraction and distillation. This is done

because in determining the level of unsaponifiable fat there are two processes that must be passed, namely separating the fat from the soap (using the extraction method) and separating the fat from the solvent (using the distillation method).

Then, for the calculation of the amount of fatty acids, which is 59.9 when compared to the SNI standard of 57.5, it is 59.9 57.5, which causes the emulsion in soap to be higher. Free fatty acid analysis was determined to determine the free fatty acids contained in the soap product formed. High levels of free fatty acids will cause an unpleasant soap odor due to oxidation, the color of the soap is not attractive. In this study, researchers minimized the impact of unpleasant soap odors and unattractive colors using fragrances. The color of the soap is obtained from aloe vera skin extract and the addition of food coloring.

Furthermore, for the calculation of bacterial colonies, soap can reduce the number of colonies by 41%, while soap with the addition of aloe vera extract can reduce the number of colonies by 60%. This shows that soap with the addition of aloe vera extract can reduce the number of bacteria more than soap without the addition of aloe vera leaf extract. The decrease in the number of bacterial colonies by soap is caused by the alkaline pH of the soap where bacterial metabolism will be disturbed at that pH so that bacterial growth is inhibited.

Oganoleptic calculations on used cooking oil soap with the addition of aloe vera leaf extract showed that the soap did not have an irritating effect on the skin. The organoleptic test aims to determine the physical appearance of aloe vera leaf skin liquid soap. The liquid soap of aloe vera leaf skin produced is in the form of a thick and homogeneous liquid, green in color and has a fragrant aroma of essence. The results of organoleptic observations of liquid soap in this study were in accordance with the standards set by SNI 1996.

CONCLUSION

Based on the results of the free alkali test, the results obtained were 0.047% 0.1%; the unsaponifiable fat test obtained the results of 1.5% 2.5%; the fatty acid test is 59.9≥57.5, from the three tests it meets the SNI standard. In the bacterial colony test there was a decrease in the number of bacterial colonies so that it can be concluded that soap does not cause irritation and can be used as an antiseptic.

SUGGESTION

There is a need for further research and a more complete analysis of the quality of soap in accordance with the standard for washing soap, for example: pH test, foam stability test, and viscosity test.

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