



The Characteristics of Solid Soap with Varied Additions of Kefir Cheese Whey

Solikah Ana Estikomah ^{1*}, Kurniawan ¹, Ashiqotul Husna ¹, and Isyana Nuha Pitaloka ¹

¹ Department of Pharmacy, Faculty of Health Science, Universitas Darussalam Gontor, Ponorogo, Indonesia

* Correspondence: ana@unida.gontor.ac.id

Abstract

Background: Kefir cheese whey is a product of fermented cheese whey wastewater. Kefir cheese whey has been known to contain Lactoferrin. Lactoferrin functions as an antimicrobial. **Methods:** This study focuses on producing solid soap from kefir cheese whey. The saponification reaction of coconut and palm oil, with Sodium Hydroxide with kefir cheese whey, initiated the solid soap production. **Results:** show that all formulae of solid soap from kefir cheese whey showed good physicochemical characteristics, pH 10.09–10.98 (ASTM requirement 9–11), foam content 10.98–12.89. Soap Kefir cheese whey can be concluded that all formulas meet the requirements that all formulas meet the criteria established in SNI 3532:2016 and ASTM D 2022. **Conclusions:** The Best formula for solid soap variant kefir is 100 % whey. Thus, the giving of kefir whey is recommended for manufacturing kefir soap. It suggests that soap kefir cheese whey is recommended for use as an antibacterial agent in the manufacture of solid soap.

Keywords: Cheese; fermented; soap.



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Introduction

Soaps are one of the significant elements that we use in our everyday life. Soap is a cleaning skin product made of saponification or neutralization process of wax, fat oil, acid, or rosin with inorganic or organic bases without irritating. Soap is also a medical agent for reducing bacteria (Perencevich et al., 2001). Antibacterial soap contains ingredients with active antimicrobial activity (Kim, 2015). The active substance commonly used in soap as an antimicrobial is Triclosan. As an antimicrobial agent in liquid soap, Triclosan causes several negative impacts, including dry skin and irritation (Olaniyan, 2016). Research from 1999 to 2000 showed that 45% of the soap circulating in the United States contained Triclosan or triclocarban (Perencevich, 2001). Meanwhile, data on the advantages of antibacterial agents are still limited and are suspected to cause resistance. Therefore, antibacterial agents of natural ingredients are needed to make soap to reduce the risk of health problems.

Soap is a product of the saponification process between alkali (NaOH or KOH) and triglyceride (McMurry, 2016). These compounds have been recognized to induce various skin allergies and have been classified as carcinogenic by the International Agency for Cancer Research (Atolani et al., 2016). Synthetic materials as antimicrobials can be avoided by using other natural ingredients: kefir, whey, and colostrum.

Kefir is a fermented milk product that will separate into two phases after settling down for a particular time. Kefir whey cheese. Kefir contains several bioactive compounds, such as polysaccharides, peptides, and organic acids, which are known to be beneficial for skin health (Yilmaz-Ersan et al., 2016). A research study has shown that goat milk kefir has better

antibacterial activity against *Bacillus cereus* than kefir from cow milk (Suhartanti & Septian, 2014).

Kefir is a cultured milk beverage produced by microbial action to a wide community of microorganisms present in kefir grains in milk. Kefir whey cheese is a cultured milk beverage produced by the microbial action of a wide community of microorganisms in kefir grains on cheese whey. Cheese whey is liquid remaining after removing the fat and casein from milk by rennet-induced coagulation of the casein. Kefir has valuable health properties, such as antitumor for names, antibacterial properties, and the ability to control metabolisms like probiotics. Thus, kefir is very interesting as the object of research in making soap. This research aims to know the optimum kefir whey dose in the soap-making process, the characteristics of the soap produced, and the antimicrobial activity of soap kefir cheese whey.

Method

Materials

Cheese and whey water waste are recycled products used as primary raw materials in soap formulas. Cheese whey water waste samples were acquired from Cangkringan, Yogyakarta, Indonesia. The ingredients used in this study were whey from Cangkringan, Yogyakarta, starter kefir, coconut oil, palm oil, and Natrium Hydroxide with kefir cheese whey.

Procedure

Kefir Cheese Whey Waste-Water Production

Kefir cheese whey was made from fresh milk and whey with variations of 100, 75, 50, and 25% whey. Fresh milk and whey were pasteurized for 20 to 30 minutes at 80°C, then cooled to vaccination with a starter culture of 2 to 3% starter kefir for 24 hours. The mixture was then molded and acclimatized for 24 hours until hardened. The solid soap was then removed from the mold and stored on an open shelf at room temperature for 14 days for further analysis.

Solid Soap Production

In making soap Kefir cheese whey, the first stage was mixing 23,33% Kefir cheese whey (from W, A1, A2, A3) to dissolve 10% NaOH. In making essential soap, whey yogurt is replaced by using 23.33% aquadest. The second stage is a mixture of 29,7% coconut oil and 13,64% palm oil. The mixture was stirred until the trace phase was at room temperature (cold process). The solid soap mass is poured into a mold and incubated for 24 hours until it is hard (Handayani et al., 2021).

pH value

In this study, we used some methods to characterize samples. The pH test is a parameter used to assess the feasibility of the soap. A good soap generally has a pH of 9–11, which is safe for the skin. Soap's relatively high pH value can increase absorption and cause skin irritation (peeling, dry skin, wounds, and itching). Soap pH testing is done by weighing 1 gram of mashed soap, putting it in a beaker, adding 10 ml of aquadest, and stirring until dissolved. Then, the electrode was dipped into the sample solution until the instrument showed a constant pH value. The number shown on the pH meter is the pH value of the preparation (Sitompul, 2018).

The foam height value

The foam height value is carried out by taking a soap sample of 1g and then putting it into a test tube that contains 10 ml of aquadest. After this, it is homogenized using a vortex. The foam formed is measured in height using a ruler from the initial height of the foam to the final height of the foam. (Idoko et al., 2018).

Data analysis

Quality tests on solid cheese kefir whey soap focus on pH analysis, free alkali content, water content, foam content, and antimicrobial activity. A solid-solid soap kefir whey cheese quality test was performed based on the Indonesian National Standard (INS) (BSN, 2016). The solid-solid soap kefir whey cheese for pH Standard Guide for pH was performed based on the Aqueous Solution of Soap (ASTM-D 2002). The data quality test by analysis of variance (ANOVA) when there was a significant treatment effect when the differences between treatments were tested with Duncan.

Result

A series of quality tests on the soap involved analyzing the pH value, Foam value, and antibacterial activity. Results of the pH of the solid soap containing kefir whey cheese are demonstrated in Table 1. pH was the following parameter to be determined. pH is the measure of the acid or alkalinity of a substance. pH is also a significant parameter in determining the quality of soap. The pH value determines the suitability of soap as a solid soap. The resulting kefir solid soap is at a pH of 10-11.

Table 1. pH Value

Formulae	pH Value
W	10.98 ^c
A1	10.34 ^b
A2	10.22 ^b
A3	10.08 ^a
A4	10.09 ^a

Note:W: basic A: Kefir 100% A2: Kefir Whey 75% A3: Kefir Whey 50% A4: Kefir Whey 25%

The foam formed might be derived from oil ingredients in the soap formula. The concentration of fatty acids or oils and alkaline solution can affect the foam formation rate. The foam value of kefir whey cheese is shown in Table 2.

Table 2. Foam Value

Formulae	Foam Value
W	10.98 ^a
A1	12.67 ^b
A2	12.69 ^b
A3	12.79 ^b
A4	12.89 ^c

Note:W: basic A: Kefir 100% A2: Kefir Whey 75% A3: Kefir Whey 50% A4: Kefir Whey 25%

Table 3. Antibacterial Activity

Formulae	Antibacterial Activity
W	1.23
A1	14.69
A2	11.76
A3	11.47
A4	10.37

Note:W: basic A: Kefir 100% A2: Kefir Whey 75% A3: Kefir Whey 50% A4: Kefir Whey 25%

Discussion

Biodegradable antiseptic herb soaps have been produced from a natural, renewable source in line with the principles of green chemistry. In their manufacture, additional raw materials such as sodium hydroxide, sodium sulfate, sodium silicate, artificial fragrances, inhibitors, dyes, and synthetic antimicrobial substances are avoided. Sodium hydroxide has been linked to the cause of skin irritation and cancer. The soaps were made from sustainable and renewable sources, such as kefir cheese whey.

Based on Table 1. pH value, the degree of pH acidity is a chemical parameter to determine whether the resulting paper soap is acidic or alkaline. Soap that is too alkaline can irritate, so

based on ASTM D 1172-95, the standard p-value of solid soap is 9-11, which shows that solid soap in this study meets the pH standard of solid soap. Solid kefir soap is safe for the skin. The pH value in soap indicates the absence of free caustic alkali. The obtained pH value indicates that the soaps would be less corrosive. Soap kefir cheese whey is expected to produce less skin reaction when used. High pH values are usually obtained (often when industrial sodium or potassium hydroxides are used) due to incomplete hydrolysis resulting from the saponification process. Higher pH values in soap products can be overcome or controlled by adding excess fat/oil (superfatting) in acceptable amounts or by applying pH adjusters to reduce harshness and corrosiveness on the skin (Christopher, 2020).

Foam is defined as a dispersion system consisting of gas bubbles covering a layer of liquid. The best foam produced is yogurt soap from the kefir variant 75% milk 25% kefir cheese whey (soap ingredients use 23.33% kefir cheese whey, with the kefir cheese whey variant 75% milk 25% whey) soap because 75% milk contains more lauric acid, myristic, linoleic acid, and oleic acid. Whey cheese has a lower fatty acid content than milk. Fat is used in cheese whey production. Foam value in soap products is not determined in SNI. The foam height is not related to the ability of a soap product in the cleaning process. The height of foam is related to consumer perception and aesthetics.

All the prepared soaps showed appreciable levels of microbial activity (Table 3.). In this study, kefir whey cheese is used as an antibacterial agent. The diameters of soap kefir cheese whey inhibition zones with microbes, namely *S. Aureus*, are shown in Table 3. The result was that the antimicrobial activity showed growth inhibition on the bacteria for all formulae solid soap from kefir whey. The antibacterial compound was diffused into the media to prevent the growth around the paper disc and form the inhibition zone. It was shown that the larger the diameter of the zone, the bigger the inhibition power of the compound. Based on NCCLS (Cavaliere et al., 2005), the data in this study are distributed into three criteria, i.e., susceptible (≥ 21 mm), moderate (17-20 mm), and resistant (≤ 16 mm). The results of all formulae solid soap from kefir whey show an inhibited growth of *S. aureus* on every sample of the solid soap from kefir whey.

Conclusions

The results show that all formulae of solid soap from kefir whey showed good physicochemical characteristics, pH 10.09–10.98 (ASTM requirement 9-11), and foam content 10.98-12.89. All formulas of solid soap from kefir meet the requirements established by SNI 3532: 2016 and ASTM-D 2002. The Best formula for solid soap variant kefir is 100 % whey. The study's results offer a potential alternative to the cosmetic industry in anti-age soap production.

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Declaration statement

The authors reported no potential conflict of interest.

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