KnE Life Sciences

SIRES
Science and Technology Research Symposium (SIRES)
Volume 2022

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Conference Paper

The Development of a Natural, Antiseptic Liquid Bath Soap from Apple Rose Leaves

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Abstract.
The coronavirus has a high transmission capacity through direct physical contact between humans and objects. It is necessary to use disinfectants, to break the transmission chain. This study aimed to make liquid bath soap with apple rose leaves and evaluate its antiseptic properties. The active ingredient used is a water fraction of 0.78% w/v. The results of the pharmaceutical evaluation showed that liquid soap made from apple rose leaves is homogeneous and has no coarse granules, has a pH of 8, viscosity of 498 mPas, level of free alkaline of 0.7%, specific gravity of 1.03 g / mL and height of foam being 85.71%. The apple rose leaves bath soap can inhibit the growth of *S.aureus* and *E. coli* bacteria after 15 and 75 seconds of contact time, respectively. Apple rose leaves have the potential to be developed into a natural antiseptic bath soap.

Keywords: corona virus, liquid bath soap, apple rose leaves, antiseptic activity

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Published 27 December 2022

Publishing services provided by Knowledge E

Selection and Peer-review under the responsibility of the SIRES Conference Committee.

1. INTRODUCTION

The coronavirus or severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), has a high transmission capacity through direct physical contact between humans and various objects or equipment [1,2]. This must be dealt with by breaking the chain of transmission, among others by using liquid bath soap [3]. So far, there have been many circulating and using liquid bath soap containing antiseptic substances. However, the long-term use of these antiseptic substances can have detrimental effects such as killing normal flora on the skin and causing irritation [4]. For that we need a liquid bath soap containing natural antiseptic ingredients that are safe against the possibility of destroying normal flora and not causing skin irritation. Based on the research that has been done, apple rose [*Eugenia aqueum* (Burn F.) Alston] leaves contain tannins and flavonoids which are active in microbial cells [5]. One study has even proven that one of the flavonoid class compounds, quercetin contained in apple rose leaves, has been

shown to have antiviral activities [6]. This research aims to make liquid bath soap with apple rose leaves that meet the pharmaceutical requirements and is effective and safe as a natural antiseptic that can break the chain of transmission of the coronavirus. The research's novelty is obtaining scientific data regarding formulas and liquid bath soap products with active ingredients of apple rose leaves that have antiseptic properties and can be used as an alternative for the community to break the chain of transmission of the coronavirus.

2. METHODS

This research is an effort to develop an antiseptic bath soap with active ingredients of apple rose leaves. The research stage included the development of liquid bath soap and antiseptic activity tests. The development of liquid soap was carried out by using the best active ingredients from the results of the antimicrobial activity test of apple rose leaves' ethanol extract and extract fractions from previous studies. Liquid soap was evaluated for its quality pharmaceutically. Evaluation of quality by pharmaceutical includes viscosity, pH, homogeneity and free alkaline content [6-9]. The viscosity test was carried out using the Brookfield method [9]. The pH of the preparation is measured by a universal indicator [8]. Homogeneity was evaluated based on the presence or absence of coarse grains [8]. The free alkaline content of soap was determined by means of acidimetric titration [7,10]. The antiseptic potential of liquid soap was carried out using contact time on the tested bacteria [11]. This test was conducted to evaluate the ability of liquid soap to inhibit the growth of the tested bacteria.

3. RESULTS AND DISCUSSION

The active ingredient selected from the apple rose leaves was the water fraction, because based on the results of previous studies the water fraction showed the best results. The water fraction had the lowest minimum inhibitory concentration (MIC), namely 0.78% in both *S. aureus* and *E. coli* [12]. Based on Bell's criteria, the water fraction showed strong antibacterial activity because it produced an inhibitory diameter of > 6 mm [13]. The water fraction showed a broad working spectrum because it was active in both Gram positive and negative bacteria [14]. The water fraction has a bactericide working type in both *S. aureus* and *E. coli.* The growth curves of *S. aureus* and *E. coli* under the influenced of the water fraction did not show any growth at all, but continued

to decline. This showed that the working type of water fraction is primary bactericide [14].

The antibacterial activity of the apple rose leaf fraction is due to the content of the tannins and flavonoid compounds. The activity of tannins in cells is to cause cell walls to shrink. The shrinking of the cell wall causes the cell permeability to change. Changes in cell permeability disrupt cells' ability to select material that enters and leaves the cell, resulting in cell death [15]. The activity of flavonoids in cells is to inhibit cell growth. In addition, flavonoids work to reduce the biofilm's production, which are protective components of cells [16]. There are similarities in the structure of the cell membranes in bacteria and viruses, including the coronavirus, namely there is a lipid structure. Apple rose leaves have a bactericidal type of action, so the effect is to kill bacteria by damaging the cell wall or membrane. Suppose a material can damage the lipid structure of the bacterial cell membrane. In that case, it is certain that this material will be able to damage the lipid structure contained in the coronavirus membrane. If the coronavirus membrane is damaged, it will not be able to attach to the host cell (in this case humans) because the spike protein in the viral membrane is damaged as well. If the coronavirus cannot enter the host cell, the virus will die [1,17]. Thus the apple rose leaves have the potential to kill the coronavirus.

The liquid bath soap formula with the active ingredient in the apple rose leaf fraction is listed in table 1 [7,11].

TABLE 1: Liquid bath soap formula for apple rose leaves.

Ingredients	Composition	Function
Water fraction of apple rose leaves	0,78%	Active ingredients
Coconut oil	90 g	Lipid base
Olive oil	60 g	Lipid base
Potassium hydroxide	38 g	Alkaline
Citric acid	460 mg	Preservatives and pH regulators
Green tea	2 g	Aroma
Green chlorophyll	q.s.	Natural dyes
Distilled water	114 g	Solvent

After obtaining liquid soap preparations, evaluation is carried out to test the pharmaceuticall quality. Pharmaceuticall quality evaluation includes viscosity, pH, homogeneity and free alkaline content [7-9]. The viscosity test was carried out using the Brookfield method. The results were compared with the normal viscosity standard of liquid soap

which ranged from 2000 - 4000 cps [9]. The pH of the preparation must be in accordance with the normal pH of the skin, which is 8-11 so as not to cause irritation [8]. Homogeneity was evaluated based on the presence or

absence of coarse grains [8]. A good soap is soap produced from the perfect reaction between fat and alkali, that is, there is no alkaline residue after the lathering reaction. The free alkaline content indicates the amount of free alkaline that can be neutralized by the acid. The determination of the free alkaline content was carried out by means of an acidimetric titration. The free alkaline in the soap produced in this study is potassium, because the alkaline used in making liquid soap was KOH. The excess lye in soap should not exceed 0.1% as lye can irritate the skin [7,10,18].

Table 2: Pharmaceutical evaluation results of liquid bath soap.

Evaluation Parameters	Observation Results
Organoleptic	
Colour	Green
Aroma	Green tea
Dosage form	Semisolid
pH	8
Homogeneity	Homogeneous and there are no coarse grains
Specific gravity (g/mL)	1,03
Height of foam (%)	85,71
Viscosity (mPas)	498
Level of free alkaline (%)	0,07%

Table 2 lists the results of the pharmaceutical evaluation on liquid soap preparations. In organoleptic observation based on the SNI provisions, there are no specific requirements regarding colour and odor, it is only stated as ”typical”. The resulting soap dosage form was semi solid, while the SNI states that it is a homogeneous liquid. This is related to the problem of viscosity. Based on the results of measuring the viscosity of soap preparations, the water fraction of apple rose leaves was lower than commercial soap. The SNI does not include this viscosity problem, only mentions liquid soap in the form of a homogeneous liquid. Viscosity is a parameter that is also of concern for liquid soap. Viscosity aims to determine the consistency of soap, which in turn will affect its application, such as ease of pouring from the container but not easily spilling from the hand. Typical values are 2000 mPas. All liquid soap preparations had a viscosity value below 2000 mPas so that the viscosity was below the commercial liquid soap that has decreased in the trade. Based on the homogeneity measurement, the liquid

soap obtained had homogeneous properties and there are no coarse grains. This is in accordance with the provisions in SNI that liquid soap must be homogeneous [10].

Based on SNI, the pH of liquid soap ranges from 8 - 11. Soaps that have a very high or very low pH value can irritate the skin [19]. The pH test results show that the pH of the liquid soap produced was 8. Thus the pH is in accordance with that stipulated by SNI for the category of non-detergent liquid soap. The standard for liquid soap specific gravity in SNI is between 1,010-1,100 g / ml. The specific gravity of liquid soap produced was in this range. Specific gravity values can be caused by the type and concentration of raw materials in the preparation. Each type of raw material added to the soap formulation determines the specific gravity of the soap product produced. The higher the weight of the raw materials added, the higher the density of the soap produced. Foam formation is not actually required and has little effect on the cleaning process, but tends to favour patient acceptance of the product. The criteria for good foam stability are 60-70% within five minutes. The results of observing the formation of foam in this liquid soap preparation showed the results were close to the criteria, namely around 60-90%. Based on the results of the determination of the free alkaline content, it was found that the level of free alkaline met the requirements because the value was <0.1%, namely 0.07%. This shows that the lathering process was complete so that the soap will not irritate the skin [10,20].

Table 3: Observation of the growth of tested bacteria after contact with liquid bath soap, water fraction of apple rose leaves.

Tested Bacteria		**Bacterial Growth Based on Contact Time (Seconds)**				
	15	**30**	**45**	**60**	**75**	**90**
S. aureus	-	-	-	-	-	-
E. coli	+	+	+	+	-	-

The results of the contact test of liquid soap preparations on the tested bacteria are listed in table 3. Based on the results of the contact test on *S. aures*, it can be seen that the water fraction of liquid soap showed activity after 15 seconds of contact with *S. aures*. After contact with *S. aures* for 15 seconds with the water fraction liquid soap, *S. aures* could not grow on the media. The water fraction bath soap showed activity after 75 seconds of contact with *E.*

coli. After contact with *E. coli* for 75 seconds with a water fraction of liquid bath soap, *E. coli* could not grow on the media.

4. CONCLUSION

Apple rose leaves can be developed into liquid bath soap that meets pharmaceutical requirements (water fraction as an active ingredient) with the active ingredient. Liquid soap is effective as an antiseptic so that it has the potential to be used as a chain breaker of the coronavirus transmission.

ACKNOWLEDGMENTS

Acknowledgments go to the Society Research and Community Service at the University Islam Bandung (LPPM_Unisba) which has funded this research through the Lecturer Research Grant Program.

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