Formulation And Antibacterial Activity Of Liquid Soap Of Sago Leaves Extract (Metroxylon Sago Rottb) Against Staphylococcus Aureus And Escherichia Coli Bacteria.

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ABSTRACT

Liquid soap is a skin cleansing formulation made from soap- based ingredients with addition of other permitted compound and can be used for bathing without causing irritation to the skin. One of the plants that has antibacterial activity is sago leaf (Metroxylon sago rottb) which contains various active compounds such as alkaloids, flavonoids, saponins, phenols, tannins, and steroids. This study aims to formulate the liquid soap preparations of ethanol extract of sago leaves with concentrations of 5 %, 10 %, and 15 % against the growth of Staphylococcus aureus and Escherichia coli bacteria.This study using laboratorium experimental method with the concentrations of ethanol extract (Metroxylon sago rottb) made into liquid soap formulations. Stability test were carried out including organoleptic tests, pH test, Foam height test, moisture content test, homogenity and viscosity test. Antibacterial testing was carried out using agar diffusion by means of wells. The results of the physical stability test, the liquid soap preparation with concentrations of 10 % and 15 % met the standard of nationally Indonesia (SNI), namely organoleptic test, pH test, Foam height test, water content test, homogeneity and viscosity test. The result of antibacterial activity test of sago leaf ethanol extract liquid soap could inhibit staphylococcus aureus bacteria at concentrations of 5 % (13.30 mm), 10 % (12,73 mm) and 15 % (11.30mm), and Escherichia coli at concentration 5 % (12.83), 10 % (13,53 mm) and 15 % (15.10 mm) are strong categories.

Key word : liquid soap, sago leaves, formulation, and antibacterial activity

INTRODUCTION

The simplest and most common way to keep skin clean is to bathe with soap (novianti, 2014). There are two types of bath soap, namely solid bath soap and liquid bath soap. Liquid soap is a skin cleansing preparation made from soap -based ingredients with addition of other permitted ingredients and can be used for bathing without causing irritation to the skin. Liquid soap is a product that is more preferred than solid soap by today's society,because it is more hygienic in storage, has an attractive shape compared to other soaps and is practically carried everywhere(yulianti et al, 2015). One of the natural plants that have antibacterial properties is sago (metroxylon sago Rottb). Based on the phytochemical studies that have been carried out , the sago plant (metroxylon sago

Rottb) is reported to contains alkaloids, tannins and saponins (bakriansyah, et al.2011). alkaloids, tannins and saponin are chemical compounds that have potential as antibacterial (agung, 2011). According to the research results of nurlila,et al (2021) that the 96 % ethanol extract of sago leaves (metroxylon sagu rottb) contains flaovonoids ,tannins and saponins which can be used as antibacterial and also has antibacterial activity against the growth of *Staphylococcus aureus* and *Escherichia coli*, with a concentration of 5 %, 10 % ,15 % and 30 % as a strong categories. And according to research conducted by sudiani (2021) where the 96 % ethanol extract of sago leaves (metroxylon sago Rottb) positively contains alkaloid compounds, flavonoids, saponins,phenols,tannins, and steroids as the antibacterial activity against the growth of Staphyloccocus Aureus Bacteria.

METHODS

Extraction

1 kg of dry sago leaf powder (metroxylon sago Rottb) was macerated using 96 % ethanol and stored at room temperature for 24 hours . the liquid ethanol extract obtained was then separated and the dregs of extract was remacerated 3 times for 24 hours. the maserate was then concentrated using a rotary evaporator. The next process is to concentrate the extract using a water bath with a temperature of 50 ^{o}C to remove the existing solvent content (utomo et al,2018).

Formulation of sago leaf extract of liquid soap (Metroxylon sago Rottb)

All materials to be used are calculated and weighed in advance according to the recommended dosage. put the olive oil into a beaker , then add 8 ml of 16 % potassium hydroxide little by little while continuing to heat at 50 ^{o} C until you get a paste of the soap. The paste soap was added with 15 ml distilled water, then added Na CMC which had been developed in hot distilled water, stirred until homogenous. Then added stearic acid , stirred until homogenous. Liquid soap is added with distilled water to a volume of 50 ml, put in a clean container that has been prepared. Making liquid soap from the ethanol extract of sago leaves is adjusted to each concentration (table 1)(hutauruk ,2020)

Organoleptic and physiochemical test

The research employed Completely Randomized Design with one factor, namely the variations of sago leaf extract. The research applied laboratory experimental method with quantitative descriptive analysis. The test parameters followed the quality standard of liquid soap according to the Indonesian National Standard number 4085 of 2017 [2], which included physicochemical and organoleptic tests namely pH test, Foam height test, water content test, homogeneity and viscosity test. The other additional tests were antibacterial activity as the physiochemical, The data obtained was analyzed using ANOVA or One Way Analysis of Variance with a 95% confidence level ($\alpha < 5\%$).

Table 1. Modification of sago leaves extract liquid soap extract (*Metroxylon Sagu Rottb.*)

Material	utility	Formula liquid soap (%)				
		F1	F2	F3	F4	F0 (K-)
Sago leaves extract	Active ingredients	5	10	15	30	-
KOH	Alkali	16	16	16	16	16
Olive oil	Fatty acid	30	30	30	30	30
Na CMC	thickener	1	1	1	1	1
SLS	Foaming	1	1	1	1	1
Stearic acid	neutralizer	0,5	0,5	0,5	0,5	0,5
BHT	antioxidant	1	1	1	1	1
Oleum Rosae	fragrance	1	1	1	1	1
Aquadest	solvent	Ad 50 ml	Ad 50 ml	Ad 50 ml	Ad 50 ml	Ad 50 ml

F1 : Liquid soap formula contains 5 % sago leaves extract
F2 : Liquid soap formula contains 10 % sago leaves extract
F3 : Liquid soap formula contains1 5 % sago leaves extract
F0/K- : Liquid soap formula without sago leaves extract

RESULT AND DISCUSSION

Antibacterial activity test

The classification of antimicrobial power by Davis and Stout (1971) points out that the diameter of clear zone smaller than 5 mm is categorized as weak. Clear zone of 5-10 mm is average, and 10-20 mm clear zone is categorized strong. Clear zone of more than 20 mm is categorized as very strong. Based on the observation data, the diameter of clear zone in sago leaves extract has an average of 12 mm(table 2) According to the classification of antimicrobial power, which is categorized as a strong candidates for both the bacteria test.

The ANOVA signified α below 5%, implying significant difference in the characteristics of liquid soap. A further test using the analisis LSD (least significance different) showed a significant difference between the inhibition zone of sago leaves extract liquid soap with varied sago leaf extracts produced for the staphylococcus aureus, with an average inhibition zone of 12 mm. The soap with 0% sago leaves extract did not have any significant difference compared to liquid soap with 5% and 15% sago leaves extracts. Meanwhile, the liquid soap with 15% sago leaves extract had a significant difference with positif control to the inhibition zone. In terms of antimicrobial test, 15% sago leaves extract in liquid soap was found to be the best concentration. However, the result test of bacteria Escherichia coli using non parametric Kruskal wallis test showed significantly different ($p = 0,016 < 0,05$) for varied concentration of sago leaves extract liquid soap. The data is considered to be significantly different

and it can be said that sago leaf extract liquid soap (metroxylon sago Rottb) can provide an antibacterial activity.

Table 2. Antibacterial activity test results of Liquid soaps against S. aureus and E. coli bacteria

treatment	Test bacteria	The average diameter of the inhibition zone			Mean diameter of inhibition zone (SD)	description
		replication I (mm)	replication II (mm)	replication III (mm)		
(F1) Concentration 5%	*Staphylococcus aureus*	13	14,6	12,3	13,30 ± 1,17	strong
(F2) Concentration 10%		11,3	13,3	13,6	12,73 ± 1,25	strong
(F3) Concentration 15%		11	12,3	10,6	11,30 ± 0,88	strong
Positive control		22	21	19,3	20,76 ± 1,36	Very strong
Negative control		0	0	0	-	-
(F1) Concentration 5%	*Escherichia coli*	13,6	13,3	11,6	12,83 ± 1,07	strong
(F2) Concentration 10%		13,3	12,3	15	13,53 ± 1,36	strong
(F3) Concentration 15%		13,3	13	19	15,10 ± 3,38	strong
Positive control		23,3	19,6	21,6	21,50 ± 1,85	Very strong
Negative control		0	0	0	-	-

The three formulas (table 3) for sago leaves extract liquid soap have a liquid form with the perfume odor. The color and shape of the liquid soap depends on the concentration of sago leaves extract used. In the color, the greater the concentration of sago leaves extract formulas more darker the resulting of the liquid soap. The color of the liquid soap formulas showed the brown color except the F0 formula have the yellowish white caused there is no additional sago leaves extract. The organoleptic test was continued in for 4 weeks of observation and the results showed no difference was found . In shape of the formulas, the smaller of concentration of sago leaves extract in the liquid soap formula the more watery the consistency of the liquid soap, whereas F3 (15%) did not meet the

organoleptic test requirement, namely the dosage form which was slightly viscous compared to liquid soap preparations F0 (Liquid soap base), F1 (5 %), and F2 (10 %).

The pH test is one of the quality requirements for liquid soap. This aims to determine the safety of the preparations when used so as not to irritate the skin. This was explained in holifah et al, (2020) that pH value that is too low can caused an increased in the absorption power of soap on the skin so that can cause a n irritation to the skin. Based on the results of pH testing for 4 weeks in table 3 the measurement of pH every week of the formulas remain between namely 9 and 10, it was obtained that the skin pH range which is included in the standard value. According to SNI (2017) shows that pH measurement in the range of 8-11 is relatively safe for the skin. Therefore,the liquid soap products have a pH that tends to be alkaline. This is caused bythe basic ingredients of the liquid soap,namely KOH, which is used to produce a saponification reaction(rasyadi et al,2019). The increasing in the pH value that occurs due to the additional of KOH which has a wide pH range so that can be increasingly the pH value of the soap (Rowe et al,2009)

Table 3. the organoleptic and physiochemical test of liquid soap

Test	F0	F1	F2	F3
Color	Yellowish white	brown	brown	brown
odor	Characteristic odor	Characteristic odor	Characteristic odor	Characteristic odor
shape	liquid	liquid	liquid	liquid
pH	9	9	10	10
Foam (cm)	50,5	47	42,5	35,2
Moisture content (%)	42 %	38,5%	35,5%	30%
Viscocity (cp)	100 cp	100 cp	70cp	60cp
Homogeneity	Pass	Pass	Pass	Pass
Stability	Pass	Pass	Pass	Pass

The foam height test is a test carried out to determine stability as measured by the height of the foam in scale test tube and a certain time span and the ability of surfactants to produce foam. Based on the results of observations of foam height for 4 weeks in table 3, of the 4 formulas concentrations (F0,F1,F2,and F3)which ranged from 37-55 cm. according to SNI (1996) the height requirement for foam in soap is around13-220 nm .based on the high yield of liquid soap foam,the resulting foam complies with SNI. The characteristics of soap foam are influenced by several factors,namely the presence of surfactants, foam stabilizer and other ingredients of liquid soap (djajadisastra , 2004). In general, consumers think that good soap is soap that produces lot of foam, eventough a lot of foam is not always proportional to the cleaning power of the soap. The characteristics of the foam itself are influenced by the presence of active soap ingredients such as surfactants and foam stabilizers (Saputri et al., 2014).

The water content test was carried out to determine the percentage of water content contained in each liquid soap preparation. Measurement of water content and volatile matter needs to be done because it will affect the quality of the soap. The highly content of water in the soap, the easier it will shrink when used (oktari et al,2017). The water content standard for liquid soap set by SNI is maximum of 60 %. The measurement result for concentration of liquid soap formulas (F0,F1,F2 and F3) in table 3 showed the greater concentration of extract added, the smaller the percentage of water content obtained. Viscosity is a parameter to see the viscosity of a preparations. The lower the viscosity value the faster the flow time of the preparations. viscosity is the main characteristic related to the formulas (Yuniarsih et al., 2020). The measurement of viscosity of the formula (F2 and F3) indicates that the formulas F2 and F3 (table 3) have met the requirements of SNI namely 60 -90 cp. The liquid soap formula (F0 and F1) has a high viscosity value namely 100 cP due to other factors that result in greater viscosity, such as the duration of stirring in the liquid of the soap formula and the temperature used in the process of making the liquid soap formulas. The water content can also affected the viscosity of the liquid soap.

CONCLUSION

The result of antibacterial activity test of sago leaf extract liquid soap could inhibit staphylococcus aureus bacteria at concentrations of 5 % (13.30 mm), 10 % (12,73 mm) and 15 % (11.30mm), and Escherichia coli at concentration 5 % (12.83), 10 % (13,53 mm) and 15 % (15.10 mm) are strong categories. The results of organoleptic and physiochemical test contained odor, shape and colour of the sago leaves extract liquid soap meets SNI 06-4085-2017 [2]. The results of the physiochemical test involving the moisture content test, pH test, foam height test, viscosity and homogenity test also meets the SNI of the liquid soap. The best concentration for sago leaf extract liquid soap impliying a significant difference in the characteristics of liquid soap based on the anova statistic result ($p< 0,5$) for the both antibacterial activity in Staphylococcus aureus and Escherichia colii

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