SPIN 6 (1) (2024) 54-61

SPIN
JURNAL KIMIA & PENDIDIKAN KIMIA
https://journal.uinmataram.ac.id/index.php/spin

QUALITY OF HAND SOAP WITH ADDITION KITOLOD LEAF EXTRACT (*Isotoma longiflora* (L.) *C. Presi*.)

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DOI: 10.20414/spin.v6i1.8879

History Article
Accepted:
Dec 28, 2023
reviewed:
June 03, 2024
Published:
July 13, 2024

Kata Kunci:
Daun Kitolod,
Kualitas fisik,
Sabun cuci tangan

Keywords:
Hand-washing soap, Kitolod leaves, Physical quality

ABSTRAK

Menggunakan sabun cuci tangan adalah salah satu cara untuk mencegah terjadinya penyakit karena bakteri. Daun kitolod dipercaya mengandung antiseptik alami sebagai zat aktif yang memiliki khasiat antibakteri. Kandungan alkaloid, flavonoid dan saponin pada ekstrak daun kitolod dapat dimanfaatkan sebagai zat aktif pada sabun. Tujuan penelitian ini adalah untuk mengetahui pengaruh konsentrasi ekstrak daun kitolod terhadap kualitas sabun cuci tangan. Metode penelitian yang digunakan adalah eksperimen. Uji kualitas sediaan sabun cuci tangan yaitu organoleptik, homogenitas, pH, viskositas, dan tinggi busa. Sampel daun kitolod diekstraksi menggunakan metode maserasi dengan etanol 96%. Hasil skrining fitokimia menunjukkan ekstrak daun kitolod mengandung alkaloid, flavonoid, saponin dan tanin. Hasil uji kualitas organoleptik tertinggi terdapat pada F_0 dengan besaran 3,6; 3,85; dan 4 untuk masing-masing uji warna, uji aroma dan tekstur. Berdasarkan uji homogenitas, semua formulasi mengalami homogen, pH tertinggi didapatkan pada F_0 yaitu 9,75, uji busa tertinggi didapat pada F_3 sebesar 86,12%, viskositas tertinggi didapat pada F_0 dengan nilai 16,071 cPs. Kualitas sabun yang didapatkan sudah sesuai dengan standar SNI kecuali pada uji viskositas. Adapun hasil yang didapatkan menunjukkan adanya pengaruh dari konsentrasi ekstrak daun kitolod terhadap kualitas sabun cuci tangan.

ABSTRACT

Using hand-washing soap is one way to prevent diseases caused by bacteria. Kitolod leaves are believed to contain natural antiseptics as active substances that have antibacterial properties. The content of alkaloids, flavonoids, and saponins in kitolod leaf extract can be used as active substances in soap. The purpose of this study was to determine the effect of the concentration of kitolod leaf extract on the physical quality of hand-washing soap. The research method used is An experiment. Test the quality of hand-washing soap preparations, namely organoleptic, homogeneity, pH, viscosity, and foam height. Kitolod leaf samples were extracted using the maceration method with 96% ethanol. The results of the phytochemical screening showed that kitolod leaf extract contained alkaloids, flavonoids, saponins, and tannins. The highest organoleptic quality test results were found in F_0 with a magnitude of 3.6, 3.85, and 4 for each color test, aroma, and texture test. From the homogeneity test, all formulations were homogeneous; the highest pH was obtained at F0, namely 9.75; the highest foam test was obtained at F3 of 86.12%, and the highest viscosity was found in F_0 with a value of 16.071 cPs. The quality of the soap obtained follows SNI standards except for the viscosity test. The results obtained showed that there was an effect of the concentration of kitolod leaf extract on the quality of hand-washing soap.

How to Cite

Romdani, N. A., Multazam., & Mustariani, B. A. A., (2024). Quality of Hand Soap With Addition Kitolod Leaf Extract (Isotoma longiflora (L.) C. Presi.). *SPIN-Jurnal Kimia & Pendidikan Kimia*. 6(1). 54-61.

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p-ISSN: 2580-2623
e-ISSN: 2745-6854

INTRODUCTION

Infectious diseases are one of the biggest health problems and are one of the causes of death in the world, including in Indonesia. This is because transmission of this disease is very easy. Infectious diseases can be transmitted from one person to another directly or indirectly. Infection from pathogenic germs can occur through the skin, where the skin is the outermost part that is in direct contact with the external environment. Hands are a medium that is very vulnerable to the spread of disease and infection in humans because hands often come into contact with the environment, contact with the eyes, nose, and mouth area, which is a very easy way for bacterial infections to enter the body. Washing your hands with soap is one way to prevent bacteria from entering the body. Liquid soap is a personal care product used to clean the skin. Apart from that, soap can also be used as a medicine for skin diseases, which usually occur due to the presence of fungi or bacteria (Korompis et al., 2022).

Antiseptic hand washing soap contains an antiseptic which is useful for strengthening its antibacterial power. The antibacterials contained in antiseptic soap are generally synthetic chemicals that have quite a few side effects, such as repeated use of antiseptic soap, which can cause skin irritation, dry skin, rashes, bacterial resistance, and can damage the skin's natural barrier (Sapra et al., 2021). The Food and Drugs Administration (FDA) has issued a warning against 2 antimicrobial substances that are often used in over-the-counter antiseptic soaps, namely triclosan and triclocarban. The potential dangers of these two substances include the risk of increasing antibiotic resistance, fertility disorders, and allergies (Hartono, 2022). The continuous use of the active ingredient triclosan can make the skin more sensitive and dry, so its presence is deemed less efficient in antiseptic soap. Utilizing natural ingredients as an alternative to replace antibacterial ingredients in soap can be a promising option.

The kitolod plant has been proven to be a natural ingredient that has antibacterial activity. The leaves and flowers of the kitolod plant are used to treat inflammation or infection. The results of the phytochemical analysis show that kitolod leaf extract contains bioactive substances such as alkaloids, flavonoids, saponins, and steroids, which have antibacterial properties (Gupta et al., 2020). The flowers of the kitolod plant are usually used as a medicine for cataracts and nearsightedness and to treat blindness due to glaucoma (Permana et al., 2022). Much research has been carried out on kitolod, especially regarding its ability as an antibacterial. Research conducted by Triya Choirin Nisa (2019) showed that the thick extract of kitolod leaves (*Isotoma longiflora* L.) was able to inhibit the growth of *Staphylococcus aureus* bacteria with the optimum inhibition zone diameter of 14.3 mm at a concentration of 300 mg/mL. This shows that the inhibitory power of the ethanol extract of kitolod leaves is in a strong category. Phytochemical tests of the kitolod plant show that it contains flavonoids, alkaloids, and saponins, which can be useful as antibacterials; therefore, with the many benefits of the kitolod plant, this research uses kitolod leaf extract as an active ingredient in hand washing soap.

This research is experimental in nature to formulate liquid soap containing kitolod leaf extract with varying concentrations of F0 (0%), F1 (20%), F2 (40%), F3 (60%), and F4 (80%). The aim of this research was to determine the effect of variations in the concentration of kitolod leaf extract on the quality of hand-washing soap. Testing the quality of hand-washing soap preparations includes organoleptic tests, pH, viscosity, homogeneity, and stability of the foam produced. Analysis of the characteristics of kitolod leaf extract liquid soap refers to SNI, which includes organoleptic (color, aroma, texture), pH (SNI 2588-2017 concerning hand washing soap), viscosity, and foam stability (SNI 06-4085-1996 concerning liquid soap).

METHODS

Materials

The materials used in this research were kitolod leaves (*Isotoma longiflora* L. C. *Presl*), Texapon (Sodium Lauryl Sulfate), glycerin, metain, CAPB (Cocamidopropyl Betaine), EDTA (Ethylenediaminetetraacetic Acid), sodium sulfate, glucotain, fragrance, 96% ethanol (Sigma Aldrich), and distilled water.

Tools

Glassware, analytical scales, a digital pH meter (Thermo Scientific Orion), a blender (Philip), a rotary evaporator (IKA, RV 10 Digital), and an oven (Memmert) were used in this research.

Kitolod Leaf Extraction

Clean, dry, and grind the kitolod leaves. 300 g of kitolod leaf powder was weighed and then macerated using 1.5L of 96% ethanol solvent for 2x24 hours. The results of the maceration are filtered, then the dregs from the first maceration are re-macerated again with 1.5L of 96% ethanol solvent for 2x24 hours. The filtrate resulting from maceration and remaceration was concentrated using a vacuum rotary evaporator at a temperature of 60°C with a speed of 30-35 rpm to produce a concentrated extract.

Phytochemical Screening

Phytochemical screening of kitolod leaf extract was carried out through identification tests of alkaloids, flavonoids, saponins, tannins, and steroids/terpenoids. The alkaloid test was carried out by mixing 2 mL of kitolod leaf extract with 5 mL of chloroform and ammonia. Filter the solution, then add 3 drops of H_2SO_4. The solution obtained was added with Dragendrof reagent. Positive results were indicated by the presence of sediment or turbidity (black). The flavonoid test was carried out by mixing 2 mL of extract with 10 mL of 70% ethanol, then reacting with 0.1 g of Mg powder and 2 drops of concentrated HCl. The formation of red, orange, and green colors indicates the presence of flavonoids.

The saponin test is carried out by mixing 1 mL of extract with 10 mL of distilled water. Shake the solution for 30 seconds and let the solution sit for 10 minutes. The formation of stable foam indicates the presence of saponin. The tannin test was carried out by mixing 1 mL of extract with 2-3 drops of 1% $FeCl_3$ solution. The formation of a bluish-black color indicates the presence of tannin compounds. (Kursia S., et al. 2016) To carry out the steroid and terpenoid test, 1 mL of the chloroform phase is added to the drop plate, then 5 drops of Lieberman-Burchard reagent are added; the formation of a blue or green ring layer indicates the presence of steroids, while terpenoids will give a red-purple color. (Iin Nurjannah, et al., 2022).

Making Hand Wash Soap

Put 120 g of Sodium Lauryl Sulphate (SLS) and 60 g of sodium sulfate into a 1L container, then add 400 mL of distilled water little by little and stir until the mixture forms a gel. After that, 25 mL of metain, 6 mL of CAPB, and 5 mL of fragrance were added to the mixture, then stirred until homogeneous, and a gel was formed. The next step is to add 4g of EDTA along with 400 mL of distilled water little by little and let the mixture form a gel until the foam disappears and becomes clear. The final stage of hand washing soap was added with kitolod leaf extract according to treatment F_0 (0%), F_1 (20%), F_2 (40%), F_3 (60%), and F_4 (80%). (Hasanah., et al., 2020)

Organoleptic Test

The organoleptic test was carried out by giving samples of kitolod leaf extract hand washing soap formulations F_0, F_1, F_2, F_3, and F4 directly to 20 panelists with the assessment criteria: Very dislike with a score of 1, Dislike with a score of 2, Quite like with a score of 3, Like with a score of 4, and Very like with a score of 5. The organoleptic testing of samples that must be assessed by panelists includes color, aroma, and texture.

pH Test

Calibrate the pH meter with buffer solution. Dip the pH meter into the sample, and

the sample's pH value will be detected on the pH meter scale. This pH test was carried out three times.

Foam Height Test

In this research, the foam height was tested by placing a 1 mL sample of liquid soap into a test tube and adding 10 mL of distilled water. Next, shake the tube for 20 seconds regularly, then measure the height of the foam after shaking and again after 5 minutes. This soap foam height test was carried out 3 times for each formulation following formula (1).

$$Foam\ Test = \frac{Initial\ foam\ height}{Final\ foam\ height} x100\% \quad (1)$$

Viscosity Test

Viscosity test using an Oswald viscometer. Put kitolod leaf extract hand washing soap into the Oswald viscometer, which has Bulp installed. The time it takes for the soap to pass from the initial limit to the final limit is measured. Three repetitions were carried out for each soap formulation.

RESULT AND DISCUSSION

Phytochemical Screening

The phytochemical screening test of kitolod leaf extract aims to confirm the presence of secondary metabolite compounds contained therein. At this stage, tests are carried out on the types of secondary metabolites, namely flavonoids, alkaloids, saponins, tannins, steroids, and terpenoids. The result data can be seen in Table 1.

Table 1. Phytochemical Screening Results of Kitolod Leaf Extract (*Isotoma longiflora* (L.) C. *Presi*.)

Phytochemical Screening		
Secunder Metabolic	**Changes/Color Formed**	**Observation result**
Flavonoids	Red or orange precipitate	+
Alkaloids	Black sediment/turbidity	+
Saponin	foam is formed	+
Tannin	blackish blue	+
Steroids	a blue/green ring is formed	-
Terpenoids	red-purple	-

The (+) sign indicates that kitolod leaf extract contains secondary metabolite compounds.
The (-) sign indicates that kitolod leaf extract does not contain secondary metabolite compounds.

Based on the results of phytochemical tests that have been carried out, kitolod leaf extract contains flavonoids, alkaloids, saponins, and tannins, which are presented in Table 1. Flavonoid testing using Mg powder and concentrated HCl showed an orange color, which indicates that there are flavonoids in kitolod leaf extract. The addition of Mg powder functions to reduce the benzopyrone core contained in the flavonoid structure. The reduction process is carried out in an acidic atmosphere with the addition of concentrated HCl. This reduction process with Mg powder and concentrated HCl produces a red, yellow, or orange color. (Yasser, et al. 2022).

Alkaloid testing using Dragendrof reagent showed black turbidity results. The alkaloid test uses chloroform to dissolve the compounds contained in the extract, and the addition of ammonia aims to break ionically bound acid-alkaloid bonds. The addition of sulfuric acid will re-bind the alkaloid salt so that it can react with the Dragendrof reagent to produce an inorganic salt complex (precipitate or turbidity) (Mangalu, 2022). The saponin test using the foam test showed positive results with the formation of stable foam after 10 minutes of standing. Saponin has glycosyl, which is surface active, so when shaken with water, saponin can form foam.

The tannin compound identification test uses the transition metal Fe. Kitolod leaf extract was reacted with 1% $FeCl_3$ compound, showing positive results with a blackish-blue color. This color change occurs due to 1% $FeCl_3$ reacting with one of the hydroxyl groups in the tannin compound. Tests for steroid and terpenoid compounds obtained negative results; as seen from the results obtained, the changes that occurred after adding the Lieberman-Burchard

reagent were green-brown in color, and no rings were formed. Positive test results with the Lieberman-Burchard reagent will produce a blue or green ring for steroid compounds, while terpenoids will give a red-purple color (Meigaria, 2016).

Organoleptic Test

The organoleptic test in this study aims to determine the level of panelists' preference for hand-washing soap products with the addition of kitolod leaf extract. Observations made in this organoleptic test include color, aroma, and texture. Organoleptic testing was carried out using a numerical scale with the selection of 20 somewhat trained panelists with an age range of 20-22 years. The observation results for each soap formulation with concentrations of F_0(0%), F_1(20%), F_2(40%), F_3(60%) and F_4(80%) were different and there were significant changes in each formulation.

Figure 1. Formulation of Kitolod Leaf Extract Hand Soap

The resulting soap is in liquid form, showing an increasingly intense color (dark green) as more kitolod leaf extract is added to the soap. The soap aroma produced at F_0 smells like soap perfume. Meanwhile, the aroma of the soap in formulations F_1, F_2, F_3, and F_4 has a distinctive aroma of mixing soap with kitolod leaf extract. The color of the soap produced in F_0 is clear; in F_1, it is brownish yellow; in F_2, the soap produced is light brown; the soap in F_3 is brownish green; and in F_4, the soap is blackish green. The green color of the soap is produced from the chlorophyll pigment contained in kitolod leaf extract. The soap has the distinctive aroma of kitolod leaf extract, and all formulations are in liquid form.

Table 2. Organoleptic Parameters

Formulation	Organoleptic Parameters				
	Color	Smell	Texture	Mean	Category
F_0(0%)	3,60	3,85	4,00	3,81	Like
F_1(20%)	2,60	3,20	3,05	2,95	quite like it
F_2(40%)	2,70	3,20	2,75	2,88	quite like it
F_3(60%)	2,60	2,70	2,75	2,68	quite like it
F_3(80%)	2,85	2,85	2,35	2,68	quite like it

Based on Table 2, it can be seen that kitolod leaf extract hand washing soap was most liked by the panelists in F_0, reaching an average score of 3.81 (likes), both in terms of color, aroma, and texture. The results of organoleptic statistical tests using the Kruskal-Wallis test for each test parameter include the color parameter having a significant value of 0.002<0.05 and the aroma parameter having a Sig value. 0.001<0.05, then the texture parameter has a Sig value. 0.001<0.05. These statistical results show that there are significant differences between

treatments for organoleptic tests of color, aroma, and texture. The hand washing soap produced is in accordance with the standards set by SNI, namely liquid form, color, and distinctive aroma from kitolod leaf extract. Based on SNI-1996, the results of organoleptic testing on liquid hand-washing soap with a combination of extracts have a soap texture in liquid form, an attractive color, and a distinctive aroma. (Purnama., 2022).

pH is a parameter used to determine the acidity level of a product. pH measurement is important to see whether the preparation made has an appropriate pH value and is acceptable to the skin. Human skin has resistance to acids or bases in a certain pH range. According to SNI 2588-2017, the pH of liquid hand washing soap is between 4-10 because in this range, the pH value of the preparation is appropriate and acceptable to the skin. preparations that do not match the skin's pH can irritate the skin. (Sarlina, 2017). Based on the test results in Table 3, kitolod leaf extracts hand washing soap is in accordance with the requirements of SNI.

Table 3. pH Test of Kitolod Leaf Extract Liquid Soap

Formulation	pH Value				
	U1	U2	U3	Mean	Standard
F_0(0%)	9,72	9,81	9,72	9,75	4-10 (SNI 2558-2017)
F_1(20%)	7,08	6,88	7,03	6,99	
F_2(40%)	6,67	6,66	6,68	6,67	
F_3(60%)	6,41	6,43	6,41	6,41	
F_3(80%)	5,97	6,00	6,01	5,99	

Based on Table 3, the highest mean is shown in F_0 hand washing soap with an average pH of 9.75, while the lowest mean is shown in the F_4 formulation with a pH of 5.99. The pH of liquid soap decreased along with the addition of kitolod leaf extract. The decrease in pH occurred due to the addition of kitolod leaf extract, which contains flavonoids and saponins, which are acidic, thus affecting the pH of the soap. The pH value of preparation depends on the constituent components, both active and additional substances used in the formulation. An increase or decrease in the pH value indicates a reaction to the constituent components of a preparation. (Venna., 2020). The results of the pH statistical test using the Kruskal-Wallis test show that the Sig. 0.009<0.05. This indicates that there is a significant difference in the treatment given. This difference in pH value shows that adding the amount of kitolod leaf extract has an effect on the pH of the hand-washing soap produced.

Foam Height Test

The foam height test aims to find out how strong the foam can be produced by kitolod leaf extract hand washing soap. The foam in soap functions as a particle to lift dirt that has been dissolved in soapy water so that the dirt can be removed with the water. According to SNI 06-4085-1996, the standard value for good foam is if, after 5 minutes, the foam is able to retain more than 60% of its initial volume. The foam height test results can be seen in Table 4.

Table 4. Foam Height Test

Formulation	Foam Height Value			
	U1	U2	U3	Mean
F_0(0%)	66,66%	83,33%	86,66%	78,88%
F_1(20%)	86,95%	87,36%	82,14%	85,48%
F_2(40%)	92,13%	84,21%	82,02%	86,12%
F_3(60%)	66,15%	66,66%	73,97%	68,92%
F_3(80%)	68,57%	88,63%	94%	83,73%

Based on Table 4, the highest average is shown in Kitolod F_2 leaf extract hand washing soap (40%) with a foam height of 86.12%. The lowest value was shown at F_3 (60%), with a foam height of 68.92%. These results show that the foam produced by kitolod leaf extract liquid soap can last a long time and is stable after being measured within 5 minutes. The foam can maintain more than 60% of the initial volume. Foam stability is expressed as the resistance of a

bubble to maintaining its size or breaking the film layer of the bubble. This foam stability result is due to the soap-making ingredients that act as surfactants, namely texapon and CAPB, which function as foam binders. Based on the foam stability results in Table 4, the results are not much different; this is because the saponin compound contained in kitolod leaf extract is able to produce foam in soap. The results of the statistical test for foam height using the Oneway ANOVA test show that the Sig. 0.145>0.05. This indicates that there is no significant difference in the treatment given.

Viscosity Test

Viscosity is a measure of fluid viscosity that states the amount of friction in the fluid. Testing the viscosity of the kitolod leaf extract hand-washing soap preparation was carried out to determine its ease of application, such as being easy to pour and not easily spilling or flowing from the hands. According to the requirements of SNI 06-4085-1996, the viscosity for liquid soap ranges from 500-20,000 cPs. The results of testing the viscosity of Kitolod leaf extract hand-washing soap can be seen in Table 5.

Table 5. Viscosity Test

Formulation	Viscosity Value			
	U1	U2	U3	Mean
F_0(0%)	15.965,21	18.561,15	13.701,98	16.071,74
F_1(20%)	140,921	123,839	140,921	135,227
F_2(40%)	108,619	137,863	137,863	128,115
F_3(60%)	144,362	140,116	148,608	144,362
F_3(80%)	115,684	135,63	115,684	122,332

Based on Table 5, the highest average viscosity is shown in Kitolod F_0 leaf extract hand washing soap (0%), namely 13,701.98 cPs. The lowest value was shown at F_4 (80%) with a viscosity of 122,332 cPs. The viscosity of liquid soap is influenced by the viscosity of the solvent added; the more dilute the solvent, the less viscosity decreases. This is also in accordance with research (Wiyono et al., 2020) that adding extracts to liquid soap can reduce the viscosity of a preparation. The results of the viscosity statistical test using the Kruskal-Wallis test show that the Sig. 0.024<0.05. This indicates that there is a significant difference in the treatment given.

CONCLUSION

Based on the results of research and discussion, kitilod leaf extract contains flavonoids, alkaloids, saponins, and tannins. Preparation of hand washing soap with varying concentrations of kitolod leaf extract as an active substance has an effect on the physical quality of hand washing soap; namely, the higher concentration of kitolod leaf extract added causes a decrease in the panelists' preferences in organoleptic tests (color, aroma, and texture). In addition, it causes the viscosity and pH quality of the soap to decrease.

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