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Formulation And Physical Quality Test Of Handsanitizer Gel Preparation Of Katuk Leaf Extract (Sauropus androgynus L.) With Gelling Agent Variations

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ABSTRAK

Background: Diarrhea is one of the diseases caused by bacterial infections. Data 2023 increased to 27,385 diarrhea patients. Along with the times, people products as waterless hand sanitizers known as hand sanitizers. Factors preparations is the gelling agent to see the effect on the physical quality of the preparation.**Objective**: This study aims to formulate a hand sanitizer gel preparation of katuk leaf extract and evaluate its physical quality test with variations of the gelling agents Carbopol, CMC-Na, and HPMC. **Method:** This type of research is experimental research in the laboratory. Uses katuk leaf extract as the active ingredient obtained by maceration method with 96% ethanol solvent. The variations of gelling agents are carbopol, CMC-Na, and HPMC. physical quality sting is carried were tested for organoleptic, homogeneity, pH, dispersability and viscosity, respectivitally **Results:** The preparation of katuk leaf extract hand sanitizer gel with HPMC gelling agent has a thick texture, green, homogeneous gel form, pH 7,530.06, dispersion capacity of 4.75 cm0.69, and viscosity of 2.933251.66. Preparations with carbopol gelling agent have a gel form, have a thick texture, green color, homogeneous, pH 6,770.25, dispersion test 5.28 cm0.27, and viscosity of 3.033404.14. Preparations with CMC-Na gelling agent have a gel form, thick texture, green color, homogeneous, pH 6,970.06, dispersion test 5.17 cm0.03, and viscosity of 2.867251.66**. Conclusion:** The evaluation of physical quality tests with variations of gelling agents that meet the standards of gel handssanitizer is from the gelling agent carbopol and CMC-Na, while HPMC does not meet the standards in spreadability.

Keywords: Katuk leaves; gel hand sanitizer; Physical Properties (Sauropus androgynus L.); gelling agent

INTRODUCTION

Diarrhea is one of the diseases caused by bacterial microorganism infection (Asda and Sekarwati 2020) where all age groups can be at risk of suffering from diarrheal disease. According to WHO and UNICEF data, there are about 2 billion cases of diarrhea every year which causes 1.9 million deaths worldwide. Data obtained in 2023 showed that diarrhea cases increased to 27,385 diarrhea patients. Gel hand sanitizer is a gel-shaped hand sanitizer that contains the active ingredient alcohol.

Hand sanitizers have a weakness, which can cause erosion of the skin to trigger eczema. To reduce side effects, a natural alternative is needed, namely katuk leaves. In the study (Djamil and Zaidan 2016)in the phytochemical screening test of katuk leaf extract, it was shown that positive katuk leaf extract contained compounds of the saponin group, glycosides, alkaloids, triterpenoids, and flavonoids that were able to inhibit the growth of Escherichia coli bacteria. In the formulation of this hand sanitizer gel preparation, three gelling agents are used, namely carbopol, CMC-Na and HPMC with an extract concentration of 10%. So the purpose of this study is to see the effect of *gelling agent* on the physical quality of hand sanitizer gel preparations.

Materials and Methods

This type of research was carried out by laboratory experimental methods at the Integrated Laboratory of dr. Soebandi University.

Tools and Materials

The tools used in this study are mortar, stamper, *oven* (*memmert),* analytical scale, blender (*miyako*), *beakerglass* 100 mL (*Iwaki),* measuring cup 10 mL (Iwaki), mixing rod, glass funnel, erlenmeyer 250 mL (*Iwaki),* porcelain cup, *waterbath* (Faithful), *rotary evaporator*, vial bottle, *glass object*, pH meter, *viscometer*, dispersion device, *hotplate stirrer*, drip pipette.

The ingredients used in this study were katuk leaves, 96% ethanol (Merck), carbopol 940, methyl cellulose, CMC-Na, HPMC, methyl parabens, glycerin, Triethanolamine (TEA), citrus oleum and filter paper.

Katuk Leaf Extraction

The manufacture of katuk leaf simplicia is carried out by taking 500 grams of katuk leaf shoots on the stalk then wet sorted, cleaned using running water until clean and drying process is carried out using an oven with a temperature of 50oC per day for 8 hours for 3 days (Salsabila, Nurcahyo, and Febriyanti 2020) The simplicia of katuk leaves is then mashed using a blender and sifted using a mesh sieve 40 and then put in a closed container (Azzahra 2022)

Simplisia powder is extracted by maceration using a 96% ethanol solvent. A total of 200 grams of simplicia powder were macerated with 96% ethanol solvent with a solvent ingredient ratio of 1:5 for the maceration process. Katuk leaf powder from the solvent that has been mixed is then tightly closed and protected from sunlight then left for 3×24 hours for the extraction process. The filtrate and residue are separated by using a funnel that has been lined with coarse filter paper. After obtaining the filtrate, it is then evaporated with *a rotary evaporator* at a temperature of 70oC and a thick extract (Pendit, Zubaidah, and Sriherfyna 2016)obtained. Then it is continued by calculating the extract yield.

Preparation of Katuk Leaf Extract *Hand Sanitizer* Gel Preparation

In formula 1 carbomer 940 as much as 1.5 grams, then sprinkled on top of 20 mL of aqua which has been heated at a temperature of 80ºC. After that, stirring is done quickly in the mortar until it expands and a gel period is formed.

In formula 2 cmc-na as much as 3 grams, then sowing above 20 mL of aqua that has been heated to a temperature of 80ºC. After that, stirring is done quickly in the mortar until it expands and a gel period is formed.

In formula 3 hpmc as much as 6.5 grams, then sowing above 20 mL of aqueducts that has been heated at a temperature of 80ºC. After that, stirring is done quickly in the mortar until it expands and a gel period is formed.

Next, dissolve 0.2 grams of methylparaben in glycerin as much as 10 grams in a porcelain cup and stir until homogeneous. Once homogeneous add to the formula 1,2,3. For each formula, add 1 mL of Triethanolamine (TEA) to the mortar and add 10 grams of katuk leaf extract. Then citrus oleum is added little by little to each formula. Then the addition of aqueducts up to 100 mL is stirred until a gel is formed. The gel is added aquadest and stirred until homogeneous. Pour into a 100 mL (Zarwinda et al. 2022).

Results and Discussion

Katuk Leaf Extraction

Ethanol extract of katuk leaves obtained through the maceration extraction method uses 96% ethanol solvent with a ratio (1:5). In this study, katuk leaf extract has green color characteristics. Katuk leaves contain chemical compounds, including saponins, flavonoids and tannins (Nazli and Daulay 2022)

Manufacture of Katuk Leaf Extract Hand Sanitizer Gel

Hand sanitizer *gel* formulated with katuk leaf *extract (Sauropus androgynus)* has various properties that can increase the effectiveness of products in maintaining hand hygiene. According to research (Ramadheni et al. 2018) has been conducted to test the effectiveness of katuk leaf extract in killing microbes. The results of the study show that katuk leaf extract with a certain concentration is able to significantly inhibit the growth of bacteria and fungi which the *hand sanitizer* gel made can reduce the growth of bacteria.

The preparation of katuk leaf extract hand sanitizer *gel preparations* consists of 3 formulas with a concentration of 10% extract produced in the form of a gel with each preparation of 100 mL, then put in a prepared container.

Physical Quality Test

1. Uji Organoleptis

The organoleptic test aims to observe the preparation of hand *sanitizer gel* including color, smell and shape. In this study, the results of organoleptic tests were obtained from gel preparation formulas with *different gelling agents*, including HPMC, Carbopol and CMC Na. The results of the organoleptic test can be seen in Table 3.

The results of organoleptic tests show that all *hand sanitizer gel formulas* have a thick consistency, are green in color and have a distinctive lemon smell due to the addition of *citrus oleum*.

2. Homogeneity Test

The homogeneity test of the *katuk leaf extract* hand sanitizer gel aims to see whether all gel components are well mixed or not. The results of the homogeneity test of katuk *leaf extract hand sanitizer* gel preparations with different *gelling agents* such as HPMC, Carbopol and CMC Na can be seen in table 4.

In this study, the three preparations of hand *sanitizer gel* with katuk leaf extract showed that the preparation was homogeneous because there were no coarse grains at the time of the homogeneity test. This is in accordance with Susanty*'s research et.al* 2019 that the good homogeneity of a preparation shows that the active substances used are evenly distributed in *the hansanitizer preparation,* so that when used on the skin directly there are no solid particles.

3. pH Test

The results of the pH test on *the preparation of hand sanitizer* gel preparation of katuk leaf extract with *different gelling agents* such as HPMC, Carbopol and CMC Na can be seen in table 5.

Based on table 5, the pH test results on each formula show that the three formulas of katuk leaf extract *hand sanitizer* gel preparations have different results. The *preparation of katuk leaf extract* hand sanitizer gel using HPMC *gelling agent* has an average pH value of 7.53, the pH value of the preparation with *the gelling agent* carbopol is 6.77 and the pH value of the preparation with *gelling agent* CMC Na is 6.97. The pH test is performed to determine the sensitivity of *the hand sanitizer* to the skin. The range of requirements for the pH value of gel preparations that meet the requirements is 4-10. In this study, the preparation of hand *sanitizer gel* formulation of katuk leaf extract with *gelling agent* carbopol and CMC Na and HPMC each had a pH value that was in the range (4-10).

4. Dispersion Test

The results of the dispersion test of *katuk leaf extract* hand sanitizer gel

preparations with different *gelling agents* such as HPMC, Carbopol and CMC Na can be seen in table 6.The dispersion test was carried out to determine the dispersal ability of the *hand sanitizer* gel on a surface. The dispersion test also looks at the gel's ability to spread on the surface of the skin where the gel is expected to be able to spread easily when applied to the skin of the hands. The dispersion test value that meets SNI No. 06-2588 is 5-7 cm. Based on table 6 formulas *of katuk leaf extract* hand sanitizer gel preparations with different *gelling agent* variations such as HPMC, carbopol and CMC Na, the average dispersion test values were 4.75 cm; 5.28 cm and 5.17 cm, respectively. This shows that formulas with *gelling agents* carbopol and CMC Na have significant average values. The dispersion test that falls within the range compared to the formula that uses *HPMC gelling agent* has an average dispersion test value of less than 5 cm or is not within the standard range of the test. This can happen due to the concentration of *gelling agent* used. According to research (Suhesti, Rohman, and Sunarto 2022) the more the concentration of *gelling agents* used, the less dispersible value there will be in each formula.

5. Viscosity Test

In this study, the results of the viscosity test on the formula *of katuk leaf extract* hand sanitizer gel preparation with variations of *gelling agents* such as HPMC, carbopol and CMC Na can be seen in table 7.

In this study, the viscosity test was measured with *a brookfield viscometer*. A good gel formula is not too thick or too liquid. Formulas that are too thick can feel sticky in the hands, reducing user comfort, while formulas that are too liquid take longer to dry on the hands (Santana, Rahayu, and Mulyaningsih 2021)

Based on table 7, the viscosity test results of hand *sanitizer gel* preparations of katuk leaf extract with *variations of gelling agents* such as HPMC, carbopol and CMC Na were obtained at 2,933; 3,033 and 2,867, respectively. This shows that each preparation has an average viscosity value that meets the range of 2,000-4,000 Cps.

A good *hand sanitizer* gel must meet several requirements, such as not

causing a feeling of heat or stickiness to the skin, having an appropriate pH, and viscosity in the range of 2,000-4,000 Cps. In addition, the product must be effective in cleaning and not toxic or cause irritation. Gel preparations are chosen because they dry easily and provide a cold feeling on the skin(Salam, Kulit, and Nipis 2021)

The preparation of *katuk leaf extract* hand sanitizer gel with HPMC *gelling agent* has a gel form, thick texture, green, homogeneous, pH value 7.53±0.06, dispersion test value 4.75 cm±0.69, and viscosity value of 2.933±251.66. Preparations with *carbopol gelling agent* have a gel form, thick texture, green color, homogeneous, pH value 6.77 ±0.25, dispersion test value 5.28 cm ±0.27, and viscosity value of 3,033±404.14. Preparations with *CMC Na gelling agent* have a gel form, thick texture, green color, homogeneous, pH value 6.97±0.06, dispersion test value 5.17 cm±0.03, and viscosity value of 2.867±251.66. The results of the physical quality test obtained each met the standard, but in the dispersion test the preparation of hand *sanitizer gel preparations* of katuk leaf extract with *HPMC gelling agent* did not meet the standard. This happens because of the difference in the concentration of *gelling agents* used in each formulation. In the research of putri and meta (2022) stated that the use of HPMC with high concentrations produces a thick consistency, resulting in preparations with a smaller dispersion value.

In this study, the data obtained by statistical method was carried out using *One Way Anova*. The testing criteria for *the One Way Anova test* with a sig.p value of <0.05 concluded that there was a significant difference. And if the sig.p value > 0.05 can be concluded there is no significant difference. In the *One Way Anova* test , the data obtained in the pH test obtained normality test data were obtained (0.174), homogeneity value (0.122) and *One Way Anova* value (0.177). In the dispersion test, the normality test data (0.169), the homogeneity value (0.074), and *the One Way Anova* value (0.820) were obtained. In the viscosity test, normality test data (0.780), homogeneity value (0.151) and *One Way Anova* value (0.981) were obtained. The data shows that the normality test shows a value >from 0.05, then *the hand sanitizer* is said

to be normal. The data produced from the homogeneity test in each physical quality test showed a value of >0.05, so the hansanitizer was concluded to be homogeneous in each preparation. The *preparation of hand sanitizers* in the *One Way Anova* test did not have a significant difference, because the value obtained was >0.05.

CONCLUSION

Based on the results of the study, it can be concluded that *the preparation of katuk leaf extract* hand sanitizer gel with *gelling agent* HPMC, CMC-Na, Carbopol has a gel form, has a thick texture, green color, and homogeneous. The results of the physical quality test obtained each met the standard, except for the dispersion test of the hand *sanitizer gel preparation* of katuk leaf extract with *HPMC gelling agent* did not meet the standard because it was <5 cm. Based on the results of the one-way statistical analysis test, the physical quality test of the preparation of hand *sanitizer gel* and katuk leaf *extract (Sauropus androgynous* L) from each test group differed significantly.

SUGGESTION

For further research, it is expected that anti-irritant tests will be carried out to determine the safety of a product and antibacterial tests will be carried out to determine the ability to inhibit bacterial growth.

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Kedokteran dan Kesehatan : Publikasi Ilmiah Fakultas Kedokteran Universitas Sriwijaya 9(3): 321–30. doi:10.32539/jkk.v9i3.18939.

TABLE AND FIGURE

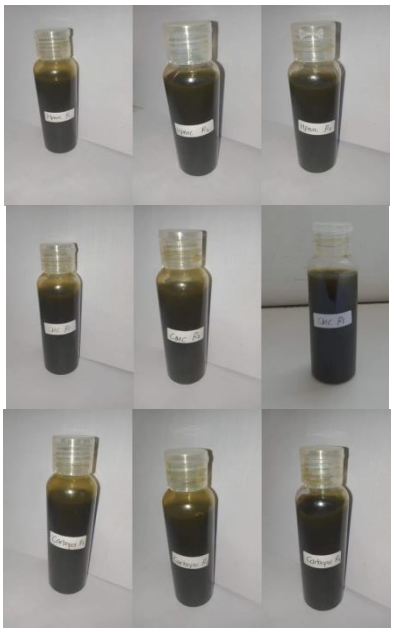

Figure 1. Gel *Formula Hand Sanitizer* Katuk Leaf Extract

Table 1. Katuk leaf extract hand sanitizer gel preparation formula

Ingredient	F I	F II	F III	Use For
Katuk leaf extract	10%	10%	10%	Active ingredients
Carbomer 940	2 %	-	-	*Gelling agent*
CMC-Na	-	3 %	-	*Gelling agent*
HPMC	-	-	6,5%	*Gelling agent*
Methyl paraben	0,2%	0,2%	0,2%	Preservatives
Glyserin	10%	10%	10%	Humektan
Triethanolamine	1%	1%	1%	*Alkalizing agent*
Oleum Citrus	1%	1%	1%	Deodorizer
Distilled water	ad 100 mL	ad 100 mL	ad 100 mL	Solvent

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Table 2. Yield of Katuk Leaf Extract

Extract Type	Powder (grams)	Powder (gram)	Yield (%)	Average±SD (%)
Katuk Leaves	200	1	36,84	29,43% ± 6,93
		2	23,12	
		3	28,33	

Table 3. Organoleptic Test Results of Hand Sanitizer Gel Preparations for Katuk Leaf Extract

Types of Inspections	Examination Results								
	HPMC			Carbopol			CMC Na		
	R1	R2	R3	R1	R2	R3	R1	R2	R3
Shape	Thick	Thick	Thick	Thick	Thick	Thick	Thick	Thick	Thick
Color	Green	Hijau	Hijau	Hijau	Hijau	Hijau	Hijau	Hijau	Hijau
Construction	Distinctive smell	Distinctive smell	Distinctive smell	Distinctive smell	Distinctive smell	Distinctive smell	Distinctive smell	Distinctive smell	Distinctive smell

Table 4. Homogeneity Test Results of Katuk Leaf Extract Hand Sanitizer Gel Preparation

Formula	Replication	Examination Results
HPMC	1	Homogeneous
	2	Homogeneous
	3	Homogeneous
Carbopol	1	Homogeneous
	2	Homogeneous
	3	Homogeneous
CMC Na	1	Homogeneous
	2	Homogeneous
	3	Homogeneous

Table 5. pH test resurt of katuk leaf extract hand sanitizer gel preparation

Formula	Replication	Examination Results	Average±SD
HPMC	1	7,5	7,53±0,06
	2	7,5	
	3	7,6	
Carbopol	1	6,8	6,77 ±0,25

	2	6,5	
	3	7,0	
CMC Na	1	6,9	6,97±0,06
	2	7,0	
	3	7,0	

Table 6. Results of the Dispersion Test of *Hand Sanitizer Gel* Preparation with Katuk Leaf Extract

Formula	Replication	Examination Results (cm)	Average±SD (cm)
HPMC	1	3,95	4,75 cm±0,69
	2	5,15	
	3	5,15	
Carbopol	1	5,10	5,28 cm ±0,27
	2	5,15	
	3	5,60	
CMC Na	1	5,15	5,17 cm±0,03
	2	5,15	
	3	5,20	

Table 7. Viscosity Test Results of Katuk Leaf Extract Hand Sanitizer Gel Preparation

Formula	Replication	Examination Results (Cps)	Average±SD (Cps)
HPMC	1	2.700	2.933±251,66
	2	2.900	
	3	3.200	
Carbopol	1	3.200	3.033±404,14
	2	3.100	
	3	3.400	
CMC Na	1	2.600	2.867±251,66
	2	2.900	
	3	3.100	