

**FORMULASI DAN UJI MUTU FISIK SABUN PADAT DARI KOMBINASI
MINYAK SERAI WANGI (*Cymbopogon nardus*) DENGAN MINYAK DAUN NILAM
(*Pogostemon cablin* Benth.) TERHADAP BAKTERI *Staphylococcus aureus***

NASKAH PUBLIKASI

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2011102415118**



**PROGRAM STUDI S1 FARMASI
FAKULTAS FARMASI
UNIVERSITAS MUHAMMADIYAH KALIMANTAN TIMUR
JANUARI 2024**

**FORMULASI DAN UJI MUTU FISIK SABUN PADAT DARI
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MINYAK DAUN NILAM (*Pogostemon cablin* Benth.) TERHADAP
BAKTERI *Staphylococcus aureus***

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Diajukan Sebagai Salah Satu Persyaratan Untuk Memperoleh Gelar Sarjana
Farmasi Fakultas Farmasi Universitas Muhammadiyah Kalimantan Timur

Diajukan oleh:

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PROGRAM STUDI S1 FARMASI

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UNIVERSITAS MUHAMMADIYAH KALIMANTAN TIMUR

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LEMBAR PERSETUJUAN

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**Disetujui untuk diujikan
Pada tanggal 17 Januari 2024**

Pembimbing



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Formulasi dan Uji Mutu Fisik Sabun Padat Dari Kombinasi Minyak Serai Wangi Dengan Minyak Daun Nilam Terhadap Bakteri *Staphylococcus aureus*

Formulation and Physical Quality Testing Of Solid Soap From A Combination Of Citronella oil With Patchouli Leaf Oil Againsts *Staphylococcus aureus* Bacteria

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ABSTRAK

Bakteri pada kulit dapat menyebabkan infeksi mulai dari yang ringan hingga cukup serius, bakteri yang umum ada pada kulit manusia ialah bakteri patogen *Staphylococcus aureus*. Pemilihan pembuatan sabun padat antibakteri yang berbahan dasar bahan aktif dari minyak nilam dan minyak serai wangi ialah minyak tersebut memiliki daya hambat dalam pertumbuhan bakteri yang ada pada kulit salah satunya ialah *Staphylococcus aureus*. Tujuan dari penelitian ini ialah untuk mengetahui seberapa besar zona hambat yang dihasilkan oleh formulasi sediaan sabun padat antibakteri dan untuk mengetahui karakteristik serta uji mutu fisik dari sediaan sabun padat kombinasi minyak serai wangi dengan minyak daun nilam sehingga aman untuk digunakan. Metode yang digunakan ialah metode eksperimental murni. Hasil penelitian pada uji zona hambat menggunakan 2 konsentrasi yaitu 50% dan 100% dari semua formula. Hasil diameter zona hambat terbesar dari semua formula diperoleh pada formula 2 dengan konsentrasi minyak serai wangi lebih tinggi dari pada minyak nilam, zona hambat yang dihasilkan pada konsentrasi 50% yaitu 21mm dengan kategori sangat kuat dan rata-rata zona hambat pada konsentrasi 100% yaitu 19,5mm dengan kategori kuat. Pada uji karakteristik mutu fisik sabun padat dilakukan 4 pengujian yaitu uji organoleptis, uji pH, uji Stabilitas busa, dan Uji Homogenitas, pengujian ini dilakukan selama 4 minggu. Hasil dari pengujian karakteristik mutu fisik yaitu semua sudah memenuhi persyaratan standar sabun

Kata Kunci: *Staphylococcus aureus*, minyak nilam, minyak serai wangi, sabun padat antiseptic

ABSTRACT

Bacteria on the skin can cause infections ranging from mild to quite serious. Bacteria that are commonly found on human skin are the pathogenic bacteria Staphylococcus aureus. The choice for making antibacterial solid soap based on active ingredients from patchouli oil and citronella oil is that this oil has inhibitory power in the growth of bacteria on the skin, one of which is Staphylococcus aureus. The aim of this research is to determine how large the inhibition zone is produced by the antibacterial solid soap formulation and to determine the characteristics and physical quality tests of the solid soap preparation combining citronella oil with patchouli leaf oil so that it is safe to use. The method used is a pure experimental method. The results of the research on the inhibition zone test used 2 concentrations, namely 50% and 100% of all formulas. The largest inhibitory zone diameter results from all formulas were obtained in formula 2 with a higher concentration of citronella oil than patchouli oil, the resulting inhibitory zone at a concentration of 50% was 21mm in the very strong category and the average inhibitory zone at a

concentration of 100% was 19 .5mm in the strong category. In testing the physical quality characteristics of solid soap, 4 tests were carried out, namely organoleptic test, pH test, foam stability test and homogeneity test. This test was carried out for 4 weeks. The results of testing the physical quality characteristics are that everything meets the soap standard requirements

Keywords: Staphylococcus aureus, patchouli oil, citronella oil, antiseptic solid soap

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Introduction

Skin is the most important part of the human body and is tasked with protecting the inside of the body from heat, cold and bacteria. Skin is an organ located outside the body. The function of the skin is to protect the body's tissues and organs, therefore it is necessary to protect the skin, one of which is by using soap [1]

Staphylococcus aureus is a round Gram-positive bacterium with a diameter of 0.7-1.2 μm , in irregular clusters like grapes, does not form spores, is facultative anaerobic, and does not move [2] *Staphylococcus aureus* is also the main pathogenic bacteria for humans. Almost everyone has experienced skin infections due to *Staphylococcus aureus* bacteria during their life, from skin infections that are not too severe to quite severe [3]

Indonesia has many plants that have antibacterial potential, one of which is patchouli and citronella. The patchouli plant is one of the main essential oil producing plants in Indonesia and has high economic value. Indonesia is the largest supplier of patchouli oil in the global market, where almost 70% of the world's total patchouli oil comes from Indonesia [4]. The citronella plant is a grass plant that is widely cultivated by people in Southeast Asia. Citronella plants are included in intercropping crops, where plants are planted involving more than one type of plant on one agricultural land [5]

Essential oils are compounds that are generally in liquid form and are obtained through steam distillation of several parts of plants such as roots, bark, stems, leaves, fruit, seeds or flowers [6]. The essential oil of the patchouli plant is known to contain the compound patchouli alcohol which is effective against bacteria on the skin, namely *Staphylococcus aureus*. The essential oil contained in citronella is one of the essential oils that has the greatest antibacterial activity, this is because citronella oil contains an active compound, namely citronellal. Citronella oil also contains active compounds such as saponins, alkaloids, flavonoids and polyphenols. Flavonoid and saponin compounds are also known to have antibacterial activity. Considering the antibacterial properties found in the essential oils of citronella and patchouli plants, it is interesting to process them into formulations such as antiseptic solid soap preparations [7]

Ingredient	Formulation 1	Formulation 2	Formulation 3
Coconut oil	120g	120g	120g
NaOH	22,08g	22,08g	22,08g
Aquadest	52,5ml	52,5ml	52,5ml
Citronella oil	0%	2%	1%
Patchouli oil	0%	1%	2%

Material and Methods

The tools that will be used in this research are beakers, measuring cups, dropper pipettes, porcelain cups, digital scales, pH meters, stirring rods, silicone soap molds, Erlenmeyer, test tubes, test tube racks, tubes,

petri dishes, autoclaves, bunsen, spirit, filter paper, cotton swab, hot plate, incubator

The ingredients that will be used in making this soap are patchouli leaf oil (Patchouli Essential Oil) which is produced in Indonesia, citronella oil (Citronella Oil) which is produced in Indonesia, NaOH, distilled water, coconut oil, nutrient agar, NaCl 0, 9%, cotton, gauze, cotton balls, cotton swabs, aluminum foil, *Staphylococcus aureus* bacteria

Table 1. Formulation of solid soap preparations from a combination of citronella oil (*Cymbopogon nardus*) and patchouli leaf oil (*Pogostemon chablin* Benth.)

Prepare the tools and materials to make solid soap, then weigh all the ingredients according to the formula. After that, make a NaOH solution by mixing 22.08 grams of NaOH with 52.5 ml of distilled water and stir until dissolved. Then mix 120 grams of coconut oil, add citronella oil and patchouli leaf oil according to the concentration requirements in each formulation and mix thoroughly using a hand blender until a trace is formed, which is a thickened mixture. After that, pour the soap mixture into the silicone mold and let it sit. The soap preparation is left at room temperature for 1-3 days so that the soap hardens completely [8]

Results

This research used 5 tests, namely physical quality characteristic tests which included : Organoleptic test, pH test, Homogeneity test, and Foam stability test. Meanwhile, for testing bacteria, use the paper disc diffusion method with Nutrient agar media. Physical quality characteristics testing was carried out for 4 weeks, and testing on bacteria was carried out 3 times. Data analysis used in the bacterial inhibition zone test was using graphade

A. Analysis Organoleptic

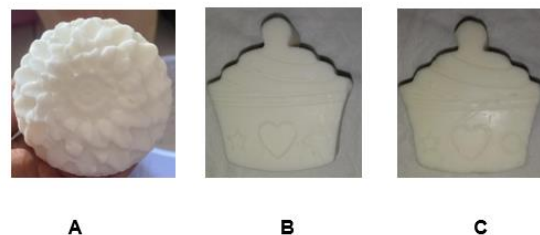


Figure I. Solid soap formulation with a combination of patchouli oil and citronella oil

Information :

A = F1 (does not use the active ingredients patchouli oil and citronella oil)

B = F2 (concentration of citronella oil 2% and patchouli oil 1%)

C = F3 (Concentration of patchouli oil 2% and citronella oil 1%)

B. pH Exam

Table 2. pH Test Results

Formulation	pH Results				Average
	Week 1	Week 2	Week 3	Week 4	

Formulation 1	9,0	9,0	9,2	9,5	9,18
Formulation 2	8,9	8,9	9,3	9,3	9,1
Formulation 3	8,9	9,1	9,1	9,3	9,1

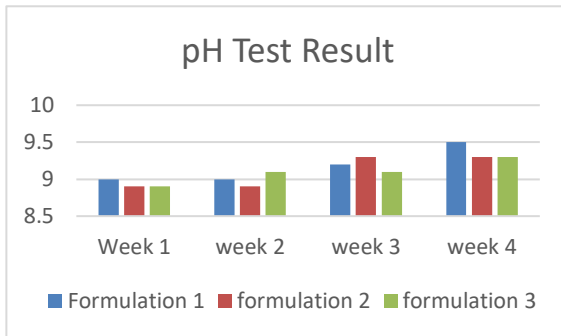


Figure 2. Graph pH test results

C. Homogeneity Test

Table 3. Homogeneity Test Results

Formulation	Homogeneity Test Results			
	Week 1	Week 2	Week 3	Week 4
Formulation 1	Homogen	Homogen	Homogen	Homogen
Formulation 2	Homogen	Homogen	Homogen	Homogen
Formulation 3	Homogen	Homogen	Homogen	Homogen

D. Foam Stability Test

Table 4. Foam stability test results

Formulation	Week 1	Week 2	Week 3	Week 4	Average
Formulation 1	71,43%	76,93%	62,3%	58,63%	67,55%
Formulation 2	71,43%	80,4%	57,15%	77,59%	71,64%
Formulation 3	72,92%	86,8%	51,43%	41,38%	63,13%

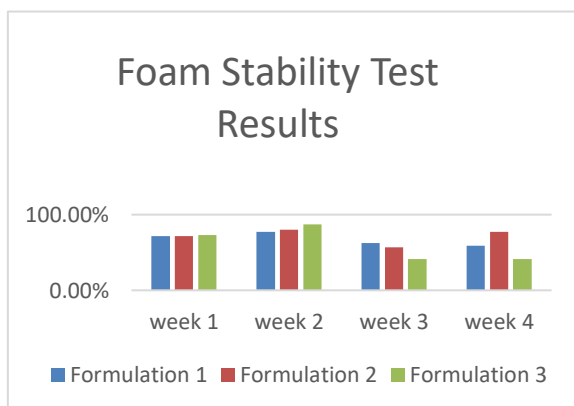


Figure 3. % Stability foam

E. Test for the inhibition of *Staphylococcus aureus*

Table 5. Test for the inhibition of *Staphylococcus aureus* results

Formulation	Diameter Of The Inhibition Zone			Average	Information
	R1	R2	R3		
K-	0mm	0mm	0mm	0mm	-
K+	48mm	48mm	48mm	48mm	Very Strong
F2 50%	15.5mm	20mm	28mm	21mm	Very Strong
F2 100%	17.5mm	26mm	15mm	19.5mm	Strong
F3 50%	12mm	11.5mm	24.5mm	16mm	Strong
F3 100%	17.5mm	17.5mm	8mm	14.3mm	Strong

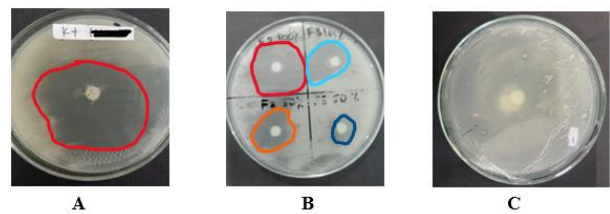


Figure 4. *Staphylococcus aureus* bacteria inhibition zone

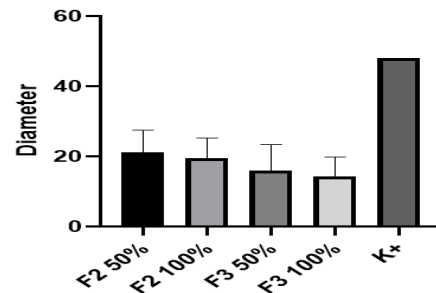


Figure 5. *Staphylococcus aureus* Bacterial Inhibition Zone Test Graph

Discussion

A. Analysis Organoleptic

Organoleptic analysis was carried out with the aim of determining the color, odor, texture and shape of the solid soap. This testing was carried out for 4 weeks. The results of this test show that each formulation has a different color because there are differences in the concentration of active ingredients. The organoleptic results for the 3 formulas did not change from week 1 to week 4, only there were differences in the color and aroma of each formula. Based on 2 previous studies conducted by [9], organoleptic results showed that there were no significant changes in texture, color and aroma. Based on the results of research [10] from the first week to the fourth week, this is in accordance with what researchers have done where there was no change.

B. pH Exam

Soap pH testing was carried out for 4 weeks, and formula 1 had an average result of 9.18, formula 2 had an average pH of 9.1, and the average pH in formula 3 had an average pH of 9.1. The pH value obtained shows that the soap preparation is alkaline. This is in accordance with the required pH value for solid soap preparations, namely 9-11. Based on research conducted by previous researchers [11]. The pH results of solid bath soap ranged from 9.99 - 10.42 and the pH of solid antiseptic bath soap ranged from 9.99 - 10.47. These results meet the requirements for a safe pH value for soap, namely 9 – 11 [12]

C. Homogeneity Test

The homogeneity test was carried out with the aim of seeing whether there was butyram in the soap preparation. The homogeneity test of the solid soap preparation was carried out by first dissolving the preparation using distilled water on a piece of glass. After that, observe that the ingredients are not mixed evenly or there are grains. Based on the results of the homogeneity test, the homogeneous soap preparation from week 1 to week 4 was homogeneous or the ingredients used were evenly mixed for all formulas. So that the ingredients used in making soap have been mixed perfectly. Based on these results, solid soap has fulfilled the organoleptic evaluation test because the formula is organoleptically stable

D. Foam Stability Test

The aim of foam stability is to determine the stability of foam produced by solid soap preparations using different concentrations of patchouli oil and citronella oil. The criteria for good foam stability is, if within 5 minutes the foam stability range is between 60-70%. The soap foam stability results obtained from all formulas met the soap stability requirements. In research conducted by [8], there was a foam stability test which showed that foam stability was in accordance with the parameters, namely at F1 it was 68% according to the foam stability criteria. Within 5 minutes it was said to be stable if the foam stability was in the range of 60 - 70%.

E. *Staphylococcus aureus* Bacterial Inhibition Test

Testing the antibacterial activity of *Staphylococcus aureus* used the disc paper diffusion method on agar media, namely Nutrient agar. This research used two concentrations, namely 50% and 100% of the solid soap formula of Citronella (*Cymbopogon nardus*) with Patchouli Leaf Oil (*Pogostemon cablin* Benth). For the positive control, use Aquadest and for the negative control, use N brand solid soap. The results obtained are that formula 2 solid soap with citronella oil combined with patchouli oil can inhibit the growth of

Staphylococcus aureus bacteria to a greater extent than the other formulas [13]. These results were influenced by the large concentration of added citronella oil, namely 2%. Based on research conducted by it was found that the results of adding 3 grams of citronella to formula 3, in inhibiting the growth of *Staphylococcus aureus* bacteria, had the largest diameter of the inhibition zone, namely 22.1mm. According to citronella contains saponins and flavonoids which can inhibit the growth of *Staphylococcus aureus* bacteria [14] Based on data analysis, the P value of N brand soap with F2 50% is 0.0008, N brand soap with 100% F2 is 0.0004, N brand soap with 50% F3 is 0.0002 and N brand soap with 100% F3 namely <0.0001 [15]

Conclusion

Based on the research results obtained on the formulation and physical quality test of solid soap preparations from a combination of citronella oil (*Cymbopogon nardus*) with patchouli leaf oil (*Pogostemon cablin* Benth) against *Staphylococcus aureus* bacteria, namely, patchouli leaves and citronella leaves can be used as a solid soap formulation and safe to use because the pH of the soap meets the requirements of the Indonesian National Standard (SNI), namely 9-11. Patchouli and citronella leaves have been proven to inhibit the growth of *Staphylococcus aureus* bacteria, this is because citronella (*Cymbopogon nardus*) and patchouli (*Pogostemon cablin* Benth) contain flavonoids and saponins which can inhibit the activity of the growth of *Staphylococcus aureus* bacteria. 3. Physical quality testing consisting of organoleptic tests, pH tests, homogeneity tests and foam stability tests was carried out for 4 weeks. In each test there were significant and insignificant differences in each formula. This can be caused by temperature or storage location of the preparation

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