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Utilization of Secang Wood Ethanol Extract (*Caesalpinia sappan* L.) as an Additional Ingredient Antiseptic Hand Cream Preparations Instead of Hand Sanitizer

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Abstract

Secang wood is a plant used in medicine. This study aims to find out that ethanol extract of secang wood can be formulated into a hand cream preparation and to determine the antibacterial activity against *Staphylococcus aureus* as an antiseptic. This study used the maceration method to produce ethanol extract, then made a hand cream dosage formula using 2, 4, and 6% ethanol extract of secang wood. Then a physical quality evaluation is carried out including organoleptic testing, homogeneity testing, pH measurement, viscosity testing, and dispersion power. After that, an antiseptic test of *Staphylococcus aureus* is carried out. Based on research, the results show that hand cream preparations meet the standards. The anti-bacterial activity test of the hand cream extract of wood ethanol extract can inhibit the growth of *Staphylococcus aureus* with a concentration of 2, 4, and 6% respectively by 13.1; 13.9 and 14.8 mm fall into the category of inhibitory solid zones.

Keywords: Secang wood, Ethanol, Maceration, Preparation of hand cream, *Staphylococcus aureus.*

INTRODUCTION

In the era of the Covid-19 pandemic, hand sanitizers are one of the needs of the community that can be used to clean hands from microorganisms. Hand sanitizer is a product that contains antiseptic ingredients, is used as a hand sanitizer, and can kill viruses and bacteria. Rini & Nugreni (2018) stated that antiseptic hand sanitizer is effective in reducing the number of germs and descriptively the most effective is a hand sanitizer that contains 60% alcohol, where regular use of hand sanitizer can cause adverse effects such as turning the skin of the hands dry. Alcohol content can erode skin moisture and overuse can result in dryness, broken skin, and even eczema, especially in children whose skin is very sensitive. Especially in a pandemic like today, the intensity of using hand sanitizers is increasing so there is also a greater risk that the skin will become dry. In addition, excessive use of antiseptics or hand sanitizers will also irritate such as burning the skin (Asngad et al., 2018; Ramadani et al., 2022; Idrus et al., 2021). One way to keep the skin from irritation due to the continuous use of alcohol as an antiseptic base is to use topical preparations such as hand creams from natural ingredients as an additional treatment so that skin moisture is maintained and can also be antiseptic.

The hand cream has ingredients that are very safe to use for excessive use and maintaining skin moisture. One of the additional ingredients for a hand cream that is likely to inhibit the growth of microorganisms is secang wood. Secang wood is an example of a plant, that has been widely used by the community in the health sector and potential as a Cyanide chemosensor (Anita et al., 2019; Sari et al., 2017). The Effectivity of Secang wood Extract Topically can increase the density of collagen on incision wound healing in albino rats (*Rattus norvegicus)*. In addition, other active compounds contained in sapwood, such as Brazilin, total phenol and Flavonoid have been shown to have efficacy for Antioxidant activity and had a potential activity to lower the incidence of type 2 diabetes melllitus, and go out in vitro (Holidah et al., 2021); Masturi, 2021;Sarjono & Tukiran, 2021) Ethanol extract and Acetone extract of secang wood has anticancer activity by reducing viability in and terpenoids that are useful as antioxidants (Sari dan Suhartati et al., 2010; Juwitaningsi, 2022: Mere et al., 2021).

The content of secang wood which is useful as an antibacterial includes, Tannins can be antibacterial and astringent, Brasilin has antibacterial and bacteriostatic activities, and flavonoids contained in secang wood act as anticancer, antiviral, anti-inflammatory, diuretic and antihypertensive.

(Hardiyati, 2016) conducted an activity test of secang wood ethanol extract against *Staphyloccocus aureus* Isolate code 100-Sv using concentrations 0, 3.125, 6.25, 12.5, 25, 50 and 100 % indicate the diameter of the inhibition zone, which is 6, respectively 6, 7.06, 9.54, 11.50, 12.79 and 14.34 mm. In addition, the content of flavonoid compounds of 60% and anthocyanins of 2.43% in the extract of secang wood can inhibit the growth of *Vibrio cholerae* at concentrations of 20%, 40%,80%, and 100% with a strong category (Nomer et al., 2019).

Based on the description above, this study was carried out regarding the use of secang wood ethanol extract (*Caesalpinia sappan* L.) An additional ingredient is antiseptic hand cream preparation against *Staphyloccocus aureus* as a substitute for hand sanitizer.

METHODOLOGY

Materials and Instrumentals

The materials that will be used in this study are secang wood, distilled water, stearic acid, butylated hydroxytoluene (BHT), ethanol pa., methyl parabens, liquid paraffin, cetyl alcohol, triethanolamine, acetone pa., pH indicators, filter paper, Agar Nutrients, Staphylococcus aureus Bacterial Seeds, TLC Plates.

Methods

Extract Manufacturing

Extraction is carried out using the maceration method, where 250 grams of Simplicia will be put into the vessel and then ethanol solvent is added until it is completely submerged. Simplisia was macerated within 3x24 hours with six repetitions and monitored with TLC. Then the result of maceration is filtered to separate the filtrate from the pulp. Furthermore, the filtrate is evaporated using a rotary evaporator at a temperature of 50 ° C to obtain a dry extract.

Hand Cream Formulation

The draft Formula to be made is in accordance with the following Table 1.

Stability Test

The stability test is carried out based on the influence of temperature (freeze-thaw), which is a test where hand cream preparations are stored at a temperature of 4 °C and 40 °C for 12 hours for 6 cycles each. The physical quality evaluation is carried out before and after being given a freeze-thaw treatment for 6 cycles. Physical quality evaluation includes:

Organoleptic Observations

Hand cream formulas namely F1, F2, F3, and F4 were analyzed through visual observations including the aroma, colour, and texture.

Homogeneity Test

Homogeneity is indicated by the absence of coarse grains in the preparation.

Table 1. Design of the hand cream formula of Secang wood Ethanol Extract.

Ingredient	Function	Concentration (%)			
		F1	F2	F3	F4
Secang wood Extract	Active Substances	-	2	4	6
Stearic Acid	Fatty Base	12	12	12	12
Setil Alcohol	Emulgator	0.5	0.5	0.5	0.5
Triethanolamine	Emulgator	1	1	1	1
Paraffin Liquid	Humectant	10	10	10	10
Butylated Hydroxytoluene (BHT)	Antioxi-Dants	0.1	0.1	0.1	0.1
Methyl Paraben	Preservative	0.1	0.1	0.1	0.1
Aquadest	Solvents	Ad 100 ml	Ad 10 ml	Ad 100 ml	Ad 10 ml

Note:

F1 : Negative control without Secang wood Ethanol Extract (*Caesalpinia sappan L.*)

F2 : Formula I with Secang wood Ethanol Extract (*Caesalpinia sappan L.*) 2%

F3 : Formula II with Secang wood Ethanol Extract (*Caesalpinia sappan L.*) 4%

F4 : Formula III with Secang wood Ethanol Extract (*Caesalpinia sappan L.*) 6%

K+ : Positive Control is a cream hand sanitizer, that is containing Benzalkonium Chloride 0.1%.

pH measurement

The pH of the preparation meets the criteria if it is by the pH of the skin, namely in the interval of 4.5 –6.5.

Spread Power Measurement

Dispersion of 5–7 cm indicates a semisolid consistency that is very comfortable to use.

Viscosity Test

Viscosity tests were performed using the Lv viscometer Brookfield.

Antibacterial Testing of *Staphylococcus aureus*

The manufacture of NA media and bacterial suspension is carried out. Then carried out, testing the Inhibitory Power of Hand Cream preparations Ethanol

Extract wood secang. Finally, observed and measured The resistance Diameter

Data Analysis

Data Collection

The data collected are the results of the evaluation test and measurement of the diameter of the resistance of antiseptic hand cream preparations of wood ethanol extract.

Data Analysis

The analysis of the data obtained includes organoleptic tests, homogeneity tests, viscosity tests, dispersion tests, pH tests, and inhibition zone measurements which are first graphed except organoleptic tests are then analyzed statistically using spss.

RESULTS AND DISCUSSION

Secang wood extract

Secang wood extract was obtained from 250 grams of sapling sawdust federated with 500 mL of ethanol p.a solvent, then soaked for 3x24 hours 6 times and monitored with TLC (Fig.1), Secang wood ethanol extract was obtained from maceration I, II, III, IV, V, and VI. The TLC test was carried out producing 2 blue fluorescent spots which are indicated to be phenolic compounds in UV lamps with a wavelength of 366. maceration I has Rf values of 0.71 and 0.40, maceration II has Rf values of 0.73 and 0.42, maceration III has Rf values of 0.72 and 0.42, maceration IV has Rf values of 0.73 and 0.42, maceration V has Rf values of 0.72 and 0.42 and maceration VI has Rf values of 0.74 and 0.41 using 100% chloroform eluent. Based on research conducted by Sari et al., (2018), for blue fluorescent spots in the 0.71 area using 100% chloroform eluents indicated the possibility of brazilin derivative compounds. Maceration was stopped after maceration IV because the spot result of the TLC test on Rf was about 0.7 starting to decrease. Then filtered and evaporated to remove the solvent. Ethanol extract of secang wood in powder form (Figure 2) was obtained in the amount of 16 grams.

Evaluation Results of Hand Cream Preparations

Organoleptic Test

Organoleptic testing aims to determine the aroma, color, and texture of hand cream preparations from visually observed secang wood ethanol extract. The results of the test can be seen in Table 3. Shows that before and after the cycling test did not undergo significant changes. The shape of F1, F2, F3, and F4 is semi-solid, for F2, F3, and F4 (Figure 3.) have a red color following the concentration and has a distinctive aroma of secang wood.

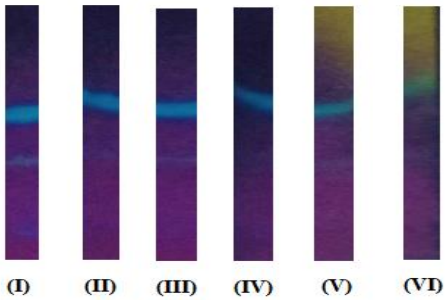

Figure 1. monitoring with TLC the results of maceration I-VI.

Figure 2. Results of the secang wood ethanol extract

In addition, hand cream containing secang wood extract is not sticky when applied to the skin, the skin feels soft and easily absorbed the skin, so it can be concluded that this cream is included in the category of creams that are liked by the public (Swastika et al., 2013). Based on organoleptic test (Table 2), observations The favorability test on the hand cream preparation tested by 20 panelists can show that Formula F4 as many as 12 panelists really like it and 8 panelists liked hand cream preparations.

Tabel 2. Preparation Favorability Test Results Data (Hedonic)

No.	Formula	Favorability test			
		Really Like	Like	Less Like	dislike
1.	F1	-	-	-	-
2.	F2	4	16	-	-
3.	F3	8	12	-	-
4.	F4	12	8	-	-

Table 3. Organoleptic Testing Results of Hand Cream Preparations

Formulation	Colour		Aroma		Texture	
	Before Cyclng Test	After Cycling Test	Before Cycling Test	After Cycling Test	Before Cycling Test	After Cycling Test
F1	White	White	None	None	not Sticky and easily absobed	not Sticky and easily absobed
F2	Orange	Orange	Typical Extract	Typical Extract	not Sticky and easily absobed	not Sticky and easily absobed
F3	Red	Red	Typical Extract	Typical Extract	not Sticky and easily absobed	not Sticky and easily absobed
F4	Dark Red	Dark Red	Typical Extract	Typical Extract	not Sticky and easily absobed	not Sticky and easily absobed

Figure 3. Cream preparations with 2% ethanol extract (F2), 4% ethanol extract (F3) and 6% ethanol extract (F4).

pH test

pH testing of the secang wood ethanol extract hand cream aims to determine the level of cream flavoring. Based on Tranggono and Latifa in Sawstika et. al., 2013, suggested that the safety of cream preparations when used so that they do not irritate the skin has a pH range of 4.5-6.5. pH Test Results before and after the cycling test in Table 4. Shows that there is no significant change ($p > 0.05$) where the higher the concentration of the secang wood ethanol extract, the more the pH value will increase (Fig. 3) and entered the safe category. Creams that have a pH below 4.5 are acidic so they can irritate while creams that have a pH above 6.5 are alkaline so that they can make the skin dry or flaky (Edy et.al., 2016; Parwanto, 2017; Swastika et al., 2013).

Table 4. pH Testing Results of Hand Cream Preparations

Formulation	pH measurement		Terms
	Before Cycling Test	Before Cycling Test	
F1	4.54	4.54	4.5-6.5
F2	4.76	4.74	
F3	5.10	5.07	
F4	5.64	5.60	

It can be concluded that F2, F3, and F4 preparations containing secang wood ethanol extract

are included in the safe category, and F4 is the best preparation because it has a low acidity value compared to F2 and F3.

Viscosity Test

Viscosity testing using Brook Field's LV viscometer tool aims to determine the magnitude of a cream preparation. The viscosity yield in Table 5. shows that there was a decrease in the viscosity of F1, F2, F3, and F4 after a cycling test, but it still met the requirements. The viscosity requirement for a good cream preparation is at 4,000-40,000 cPs (Pratasik et al., 2019). From the results of the viscosity test on the paired sample test, it shows that $p > 0.05$.That is no significant effect on stability before and after the cycling test on the hand cream of secang wood ethanol extract. In viscosity testing, the longer preparation is stored, the more the viscosity of the preparation will decrease. This is due to the influence of water vapor absorption in the environment to increase the volume of water in the preparation (Rabima & Marshall, 2017). It can be concluded that the preparation F4 has a better viscosity value compared to F2 and F3.

Table 5. Viscosity Testing Results of Hand Cream Preparations

Formulation	Viscosity Measurement		Terms
	Before Cycling Test	Before Cycling Test	
F1	4.148	4.054	4.000-40.000
F2	4.428	4.207	
F3	4.795	4.447	
F4	4.964	4.726	

Dispersion Test

The spreading ability of creams applied to the skin can be known based on the spreading test. (Baskara et al., 2020), posits that good spreading power in the cream shows a semi-solid consistency that is comfortable for its users by having a spreading power of 4-7 cm. Based on the test results in Table 4. Shows that there is a decrease in dispersal power with an increase in the concentration of ethanol extract of secang wood. In addition, there was an increase in the spreading power of the hand cream of the sapwood ethanol extract after a cycling test but still met the requirements. This is due to a decrease in the viscosity value (Table 6.). The more liquid the cream preparation, the wider the diameter of the distribution of the cream preparation will be due to the spreading power (Figure 4) inversely proportional to viscosity. The results of the Paired sample t-test data showed that $p>0.05$ had no significant difference in the stability of the cream spreading power value before and after the cycling test (Figure 4). F4 preparation is the spread power compared to F2 and F3 because it has the middle value of the specified range.

Table 6. Test Results of Hand Cream Dosage Dispersion

Formulation	Spread Power Value (Load 50g)		Terms
	Before Cycling Test	Before Cycling Test	
F1	6,0	6,4	4-7
F2	5,8	6,3	
F3	5,5	5,8	
F4	5,2	5,5	

Figure 3. Scatter Power Test Results

Homogeneity Test

The homogeneity testing aims to find out whether the components in the cream preparation are fully mixed or not. The results of the homogeneity test are in Table 7. shows that F1, F2, F3 and F4 are homogeneous creams because there are no coarse grains on the glass of the object and an even color either before or after the cycling test.

Table 7. Test Results of Homogeneity of Hand Cream Preparations

Formulation	Homogeneity
F1	Homogeneous
F2	Homogeneous
F3	Homogeneous
F4	Homogeneous

Testing the Antibacterial Activity of Hand Cream

The test samples used were negative control, hand cream preparations with concentrations of 2%, 4%, and 6% as well as a positive control of *Staphyloccocus aureus* bacteria. The results of testing antibacterial activity in hand cream preparations of secang wood extract can be seen in Table 8. shows that the cream preparations used as a negative control are inactive against *Staphyloccocus aureus* bacteria while the cream preparations of good wood ethanol extract have a content of 2%, 4%, 6% and active positive control of *Saphyloccocus aureus* bacteria. This shows strong antibacterial potential. According to Rahmi (2019), the inhibition zone ≤5 mm is categorized as weak, 5-10 mm is categorized as a medium, 10-20 mm is categorized as strong, and ≥ 20 is categorized as very strong. This study proved that the higher the concentration of hand cream preparations of sapwood Ethanol Extract, the greater the diameter of the inhibitory zone formed around the good hole. phytochemical screening results that have been described by (Prabawa et al., 2019), ethanol extract of secang wood contains flavonoids, alkaloids, tannins, and phenolic. Where the four groups of compounds have biological activity as antibacterial (Widyasari et al., 2019; Putri, Dwi et al., 2014; Putri, et. al., 2019; Jati et al., 2019;Wahid et al., 2022).

Table 8. Results of Inhibition Zone Measurements (mm) against Staphylococcus aureus.

Formulation	Replikastion			Average	Description
	I	II	III		
F1	0	0	0	0	-
F2	13,2	12,9	13,1	13,07	Strong
F3	14,0	13,8	13,9	14,33	Strong
F4	14,8	14,7	14,9	15,17	Strong
K(+)	16,4	16,6	16,5	16,50	Strong

Description of inhibition power:

- <5 mm : Weak
- 5 – 10 mm : Medium
- 10 – 20 mm : Strong
- 20 mm : Very Strong

The positive control used was a hand sanitizer cream containing Benzalkonium chloride 0.1%. Benzalkonium chloride has effectiveness against bacterial growth by damaging cell walls and cytoplasmic membranes. Benzalkonium chloride acts actively on the cell surface by destroying fat on cell membranes, resulting in the leakage of cellular contents and causing death in bacteria (Susanti, 2017). The data obtained were then analyzed using One-way ANOVA statistical data. The results of one-way ANOVA statistical testing can be concluded that there is a noticeable difference in the inhibitory power value of each Formula, this is indicated by the sig value of $p<0.05$. All three formula F2, F3, and F4 fall into the strong category but F4 has greater inhibitory power than F2 and F3.

CONCLUSIONS

Based on the research conducted, it can be concluded that the preparation of the secang wood ethanol extracts hand cream using the F4 formula can be used as a hand cream instead of a hand sanitizer because it has stability and meets SNI standards.

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