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Formulation of Herbal Cream of Agung Semeru Banana Peel Extract to *Candida albicans* and *Staphylococcus aureus*

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ABSTRACT

Skin cream, is one of the dosage forms, which contain little water content, and is widely used both as a medicinal and cosmetic cream. This study made an herbal cream formulation based on Agung Semeru banana skin of Lumajang variety which was known as an antimicrobial at a concentration of 100% which would then be tested for its ability as an antimicrobial against the growth of *Candida albicans* and *Staphylococcus aureus*. The method used in this study is using the paper disk Diffusion method with 6 repetitions, where data in the form of inhibitory zone diameters were analyzed using 1% One Way ANOVA test and continued with Duncan's test at 1%. The results of this study showed that there were significant differences between the treatment groups ($\alpha = 0,000$), where the cream formulation of the *Candida albicans* fungi showed a larger inhibition zone diameter (22.50 ± 1.70 mm) than the inhibitory zone diameter in *Staphylococcus aureus* bacteria ($21,50 \pm 1.68$ mm).

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Introduction

The skin is one part of the body that is susceptible to infection by microbial pathogens fungi and fungi, such as *Candida albicans*, *Staphylococcus aureus*, *Pseudomonas aeruginosa* and pathogenic microbes that infect other skin. *Candida albicans* is one of the pathogenic fungi that often infects the skin (Inge *et al.*, 2008) and is one of the normal flora of the skin (Jenie *et al.*, 2011) and normal flora in other body parts such as the respiratory tract and female reproductive tract (Rahma & Rahman, 2010). *Staphylococcus aureus* is a group of Gram positive bacteria which is a normal flora in the human body and has the ability to infect, the skin (Rostinawati, 2010). Treatment of diseases caused by

microbial pathogens, especially those that infect the skin has been carried out, one treatment uses chemicals that have proven to be effective faster in inhibiting or killing the pathogenic microbes. On the other hand, the use of chemicals in the long term as a skin disease drug has an impact that can lead to microbial resistance to the drug (Dharma, 2001), so that other safer alternative treatments such as the use of plants as traditional herbal treatments are proven to have low toxicity (Fatrotin, 2010).

Many types of plants have been known to have phytochemical content that has the potential as an antimicrobial material, so it is widely used as an alternative to traditional treatments for

antifungals and antibacterials. One use of these herbal ingredients is as a treatment, especially for the treatment of skin diseases, namely in the form of cream preparations. Skin cream is one form of semi-solid dosage with a composition of more than one material which is dispersed into a suitable base material and has a small moisture content of less than 60% (Syamsuni, 2012), and has moisturizing and safe to use properties on the skin (Indonesia, 1995).

Banana peel of Agung Semeru which is one of the banana varieties in Lumajang which has phytochemical content such as phenol, terpenes, saponins and alkaloids which contain anti-microbial compounds (Sari, 2017), where the compounds have been widely researched and proven to be used as antimicrobial compounds. In addition, research conducted by Chabuck, et al. (2013), states that banana peel extract can inhibit the growth of pathogenic microbes such as *Staphylococcus aureus* and *Staphylococcus pyogenes*, this is due to the fact that banana peels contain glycosides, saponins, tannins, flavonoids and so on. which acts as an antimicrobial compound (Ehiowemwenguan *et al.*, 2014). Research on the ability of Agung Semeru banana peel extract has been carried out by Kholifah et al. (2018) which states that Agung Semeru banana peel extract at a concentration of 100 mg / mL can inhibit the growth of *Staphylococcus aureus*. In addition, the results of research conducted by Zakiyah, et al. (2017), that Agung Semeru banana peel extract Lumajang varieties combined with banana Mas Kirana Lumajang using diffusion method proved to inhibit the growth of *Candida albicans*.

Various studies on the potential of banana peel as one of the compounds that can be used as antimicrobial pathogen have been carried out, and herbal skin cream formulations have also been carried out using the basic ingredients of banana peel extract, one of them is Agung Semeru banana of Lumajang variety (Sari¹ *et al.*, 2018), but there has not been much testing

of skin cream formulations, especially skin cream formulations with basic ingredients extracted from Agung Lumajang banana peel. Based on this background, the researchers wanted to test skin cream formulations using basic ingredients of Agung Semeru banana skin extract which is one of the banana varieties in Lumajang City, and compare the ability of these skin creams to growth in bacteria *Staphylococcus aureus* and fungi *Candida albicans* at extract concentration by 100%.

Materials and Methods

This research was conducted in August 2018 at the Laboratory of Biology FP.MIPA IKIP PGRI Jember. This study was an experimental study using Completely Randomized Design (CRD) with 3 treatment groups, namely control treatment (using 96% ethanol) and treatment based herbal extract on extract of Agung Semeru banana peel extract at a concentration of 100% (repetition of 6 times) carried out in vitro.

Tools and Materials. The tools used are beaker glass, stirring rod, cotton, rotary evaporator, grinding mortar and mortar, magnetic stirrer, petri dish, pipette volume, beaker glass 25 mL, ruler, stirrer, cream container, pH meter, paper filter, horn spoon, analytical scales, erlenmeyer flasks, test tubes, incubators, laminar air flow. Spirtus, needle case, calipers, tweezers, cotton, glass plates. The ingredients used were extract from Banana peel of Agung Semeru with a concentration of 100%, filter paper, 96% ethanol, distilled water, cera flava, nipasol, nipagin, olividae oil, olium bubble gum.

Making Simplicia of Banana Peel Extract. The making of simplicia is the first done by collecting banana peels and sorting, namely choosing fresh banana peels and not changing color and washing until the banana peel looks clean from dirt. Next, do the chopping by cutting the banana make it easier when smoothing, and drying the banana peel until it is completely dry. After the banana skin is dry, then put it into a

blender until smooth for the next maceration process. To make the extract of wet extract, it is carried out by weighing as much as 100 grams of Agung Semeru banana peel macerated by using 750 mL 96% ethanol (ratio 1:10), and stirring it until homogeneous. After the mixture has been completely homogeneous, then let it stand for 1 x 24 hours, and the extract is immediately filtered with a Buchner funnel using a vacuum. A rotary vacuum evaporator was obtained using a rotary vacuum evaporator. (Sari¹, et al. 2018); Zakiyah et al. 2017).

Making Cream From Banana Peel Of Agung Semeru. Prepare the ingredients to be used and weigh according to the composition of each. Making liquid cream phase by mixing all the required ingredients such as banana peel extract in the form of wet simplicia, nipagin, and nipasol into the first porcelain dish with the stirrer, and stirring it until it is perfectly homogeneous. After finishing, then prepare the second Proselen cup and the stirrer to make the oil phase by mixing the Cera material which was previously diluted above the magnetic stirrer and the *Olium Alivae* material gradually according to its size and dissolving together until it is perfectly homogeneous. After the two materials on porcelain one and two have been perfectly homogeneous, then mix the oil phase little by little into the porcelain water phase by continuing to stir using a stirrer until all the components appear to be perfectly mixed and homogeneous. After the water phase and the oil phase are perfectly homogeneous, it gives the aroma according to the needs, which in this study uses the aroma of bubble gum (Sari¹ et al. 2018). The cream formulation is shown in table 1 below:

Tabel 1. Formulation Cream Banana Peel of Agung semeru

Ingredient of Cream	Unit
Banana Peel Agung Semeru Extract	100%
Cera Flaya	27.24 gram
Nipasol	0.15 gram
aNipagin	0.05 gram
Olium Olivade	63.5 gram

Make NA and PDA Media. The media used in this study were using Nutrient Agar (NA) media for bacteria *Staphylococcus aureus* and Potatoes Dextrose Agar (PDA) media for fungi *Candida albicans*. Making NA media was carried out by weighing 0.46 gram NA and dissolving it in distilled water as much as 20 mL and heating it until it was completely dissolved and ready to be used as a test medium as well as *Staphylococcus aureus* growth medium to tilt (Paju et al., 2013). PDA media is done by inserting the PDA media as much as 3.9 grams into a 100 mL sterile aquadest (PDA media needed 39 g / L) and heated on an electric stove to boil and dissolve perfectly to be ready for use as growth media and test media (Sari et al. 2017).

Antimicrobial Test of Cream. Antimicrobial testing of base cream of Agung Semeru banana peel extract using Agar Diffusion method and observing the growth inhibition zone of each test microbial isolate. The diffusion method was carried out by inserting a microbial isolate of ± 1 mL into a sterile petri dish, and then inserting 5 mL of both NA and PDA liquid media into the petri dish containing the test microbial isolates. and homogenize in the form of number 8. After completion, incubate at room temperature of 37 C, for bacteria for 1 x 24 hours and for fungi for 2x24 hours. then observing and measuring the growth inhibition zones of each test microbial isolate produced (Sari², et al. 2018).

Results and Discussion

Antimicrobial testing for skin cream formulations using banana peel of Agung Semeru was carried out using the diffusion method, namely measuring the diameter of the inhibition using paper disks that had a diameter of 6 mm. The banana skin extract used was 100% and formulated with various cream-making ingredients, which were then tested for antimicrobial activity against *Staphylococcus aureus* and Fungi *Candida albicans*. The measurement

results of the average diameter of the growth inhibition zone of the microbial isolate test by giving the herbal skin extract formula Agung Semeru extract with a extract concentration of 100% are presented in Figure 1.

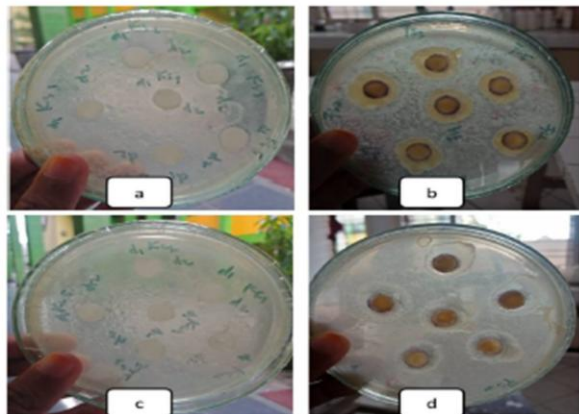


Figure 1. Clear Zona in each treatment.
 a) Control of *Staphylococcus aureus* (KS); b) Formulation of cream againts *Staphylococcus aureus*(FS);
 c) Control of *Candida albicans* (KC); and d) Formulation of cream againts *Candida albicans*(FC).

Tabel 2. Test of Anova One Way 1%

ANOVA					
Diameter Hambat Pertumbuhan Staphylococcus dan Candida					
	Sum of Squares	Df	Mean Square	F	Sig
Between Groups	220.630	3	73.543	45.945	0.00
Within Groups	32.014	20	1.601		
Total	252.644	23			

Based on the results of statistical testing using the one way ANOVA test at the level of 1% using the diffusion method showed the results there were significant differences for all treatments (table 2), where the administration of herbal cream formulations with the ingredients of banana peel extract of Agung Semeru at 100% extract concentration could inhibit the growth of bacteria *Staphylococcus aureus* and fungi *Candida albicans*. The administration of cream formulations using the diffusion method showed results of FS (21.50 ± 1.68) mm, KS (18.00 ± 0.82) mm, FC (22.50 ± 1.70) mm, KC (15, 00 ± 0.10)

mm (table 3), wherein the follow-up test using Duncan's test shows differences between treatments, but for FS and FC treatment there is no significant difference. The testing of the antimicrobial activity of cream formulations showed that the cream formulation was more effective in inhibiting the growth of fungi *Candida albicans* (22.50 ± 1.70) mm compared to *Staphylococcus aureus* (21.50 ± 1.68) mm (table 3, Figure 1).

Tabel 3. Duncan’s Test 1%

Treatment of Cream Extract	Mean (mm)
FS	22.00 ± 1.60 ^c
KS	10.20 ± 0.82 ^b
FC	22.66 ± 1.70 ^c
KC	15.13 ± 0.04 ^a

The skin cream formulation that was made previously has been carried out a descriptive test which is testing organoleptically including homogeneity test, pH test, absorbency test and scattering power test. For homogeneity testing shows that the cream formulation has undergone a perfect homogeneity process, this is due to the presence of flavonoid compounds found in banana peel extract which cause no separation of the water phase and oil phase (Sari¹, et al., 2018). For testing pH cream, it shows that the cream is not too acidic and alkaline which is 5.5 and is still in the safe range of the skin, where the safe range of pH for skin products ranges from 4.5 to 6.5 (Tranggono & Latifah, 2007) And for absorbency testing shows that the cream of Agung Semeru banana skin meets the range > 1 mg / 1 mL of water (Juwita, et al., 2013).

Giving herbal skin cream formulation of banana peel extract of Agung Semeru Lumajang with 100% extract concentration on the growth of *Staphylococcus aureus* has an average inhibitory power (22.00 ± 1.68) mm. According to Suryawiria in Zahro and Agustini (2013) the inhibitory power produced by an average (22.00 ± 1.68) mm has a very strong growth inhibition power against *Staphylococcus aureus* compared to

controls. While the administration of herbal skin cream formulations of banana peel extract of Agung Semeru Lumajang with a concentration of 100% to the fungi *Candida albicans* has an average inhibitory power (22.50 ± 1.70) mm. According to Setyaningsih (2017) the inhibitory power produced on average (22.50 ± 1.70) also has a very strong growth inhibition power against the growth of *Candida albicans* (Figure 2).



Figure 2. Graph of Growth Inhibitory Diameters (DHP) (mm). Control of *Staphylococcus aureus* (KS); Formulation of cream againsts *Staphylococcus aureus*(FS); Control of *Candida albicans* (KC); and Formulation of cream againsts *Candida albicans*(FC).

Phenol compounds, terpenes, saponins and alkaloids are antibacterial compounds that have been known to inhibit and kill pathogenic microbes, one of which is against *Staphylococcus aureus* and *Candida albicans*. Saponin as an antibacterial and antifungal is to reduce surface tension resulting in increased permeability or cell leakage and resulting intracellular compounds will come out (Roysidah et al. 2012). Whereas according to Heni and Zaharah (2015) states that alkaloids have antibacterial ability and inhibitory mechanisms by interfering with the peptidogonian component in bacterial cells so that the cell wall layer is not formed intact and causes cell death. In addition, alkaloids also inhibit the formation of protein synthesis so that it can interfere with bacterial metabolism. While phenol compounds have the ability to form

complexes with proteins and polysaccharides so that they can inhibit the work of various enzymes that play a role in enzymatic reactions in bacterial cells. According to Gunawan, et al. (2008) the mechanism of inhibition of terpenoid compounds as antibacterials is reacting with porin on the outer membrane of bacterial cell walls and hitting strong polymeric bonds so as to cause damage to the porin. The entry of compounds that will reduce the permeability of bacterial cell walls is a result of damage to the porin so that bacterial cells experience nutrient deficiencies and growth of bacteria is inhibited and even dies. Based on the above explanation, it can be concluded that the herbal skin extract formula of banana peel extract of Agung Semeru Lumajang with a concentration of 100% extract can function as an antimicrobial, especially against *Staphylococcus aureus* and *Candida albicans*.

Conclusion

Testing of herbal skin cream formulations of banana peel extract of Agung Semeru Lumajang with a concentration of 100%, gave significant results ($\alpha = 0.00$) for all treatments, where banana skin cream is more effective in inhibiting the growth of fungi *Candida albicans* has an average inhibitory power ($22,50 \pm 1.70$) mm compared to the growth of *Staphylococcus aureus* (22.00 ± 1.68) mm.

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