Testing The Antiacne Activity Of Mangostan (Garcinia Manggostana L.) Skin Extract Cream On *Propionibacterium Acnes*

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Abstract. The face is the part of the head that is often contaminated by bacteria. One way to get rid of bacteria on the face is to use acne cream. Mangosteen rind has antibacterial activity, mangosteen rind can be used as an acne cream preparation. This type of research is experimental by testing mangosteen rind extract using the well method against Propionibacterium acne bacteria to find out whether mangosteen rind extract has antibacterial activity, making a concentration series of 5 grams, 10 grams, 15 grams as a formula for preparing mangosteen rind extract acne cream. will be tested against Propionibacterium acne. The best concentration of mangosteen rind extract against Propionibacterium acne bacteria with a concentration of 25 mg/ml in 3 replications obtained the greatest inhibitory power of 1.6 cm of mangosteen rind extract on Propiobibacterium acne bacteria. Meanwhile, the inhibitory power obtained in the cream preparation was formulation III, namely 2.9 cm on the propionibacterium acne bacteria. Mangosteen rind extract cream preparation can inhibit Propionibacterium acne bacteria. The test result data was analyzed statistically if the data was normal using one way ANOVA and if it was not normal using the Kruskal-Wallis and Mann-Whitney tests.

Key words: [Antiacne cream, mangosteen peel, inhibitory power.]

INTRODUCTION

Indonesia is rich in biodiversity, including the mangosteen plant (*Garcinia mangostana* L.). Mangosteen is an Indonesian export commodity with an export volume reaching 6 million tons and an export value of US$ 3,611,995 in 2008. However, this amount is considered less than 10% of total production because many Indonesian mangosteens do not meet quality criteria, such as stems and lobes that are not intact, many of the fruits are bruised and have sap, so a solution needs to be found so that the low quality fruit can be used for other purposes. One of them is by processing the mangosteen fruit in order to increase added value as well as anticipating the decline in demand for fresh fruit (Yatman, 2012).

Mangosteen (*Garcinia mangostana* L.) is a plant originating from Southeast Asia including Indonesia, Malaysia, Thailand and Myanmar. Mangosteen is a functional plant because most of this plant can be used as medicine. Abroad, mangosteen is nicknamed the "Quen of the Tropical Fruits" which is a reflection of the combination of sweet and sour flavors that other fruit commodities do not have (Darmawansyih, 2014). Mangosteen peel is known to contain xanthone compounds, which are bioflavonoids with antioxidant, antibacterial, antiallergic, antitumor, antihistamine and anti-inflammatory properties (Srihari & Lingganingrum., 2015). Mangosteen extract is used to treat stomach ache, diarrhea, dysentery, infections, pus, and chronic ulcers (Pedraza-Chaverri et al., 2008). Many Indonesian people are returning to using herbal ingredients. The use of herbs is chosen because the side effects are relatively small or non-existent and can be obtained easily and cheaply (Mulyani, et al., 2017).

There are various kinds of acne medication available on the market. There are creams, masks, tablets and more. Basically herbal treatment is treatment that uses natural ingredients in traditional ways. Natural processing and attractive packaging will be an option for people who want herbal and practical treatment. Cream is a semi-solid preparation, in the form of an emulsion containing no less than 60% water and is intended for external use. There are two types of cream, namely oil-water type cream and water-oil type cream (Depkes RI, 1979). Cream dosage forms are more popular because they are easy to apply to the skin and easy to wash off with water (Yumas, 2016).

Based on the description above, the author is interested in conducting research with the title "Testing the anti-acne activity of mangosteen rind extract cream (*garcinia mangostana* L.) against Propionibacterium acnes".

METHODS

Types and Research Design

The type of research that will be used in this research is experimental research, namely by making anti-acne cream preparations and physical activity testing of mangosteen peel anti-acne cream preparations. This research uses an experimental design by observing changes in a variable due to treatment by another variable. Based on the research above, the independent variable is mangosteen rind and the anti-acne cream formulation including the dependent variable includes organoleptic test, spreadability test, stickiness test, PH test, p.acne antibacterial test.

Location and time of research

Research location: The research was carried out in the Microbiology and Pharmaceutical Technology laboratory at Kudus Primary School of Health Sciences.

Research population and sample

The population is the entire research object or objects being studied, while the sample is the object being studied and is considered to represent the entire population (Notoatmodjo., 2012). The population in this study was mangosteen peel from Kragan sub-district, Rembang district, Central Java. The sample is a representation of the population which is used as a source of information for all data needed to answer the problem (the sample is part of the population). The samples used in this study were mangosteen peel from kragan that was ripe, fresh, not rotten, and not affected by disease, taken at random.

Research instrument

a. Research tools and materials

The tools used in this research include maceration tools, antibacterial tests, glassware, mortar, stamper, universal pH. The ingredients used in this research include mangosteen peel, stearic acid, trithanolamine, cetyl alcohol, benzoic acid, sodium benzoate, glycerin, P.acne, 70% ethanol.

b. Collection of materials

The mangosteen peel used in this research was obtained from Kragan sub-district, Rembang district, Central Java. The leaves are chopped and aired, after that, the dried skin is made into powder by grinding it using a blender.

c. Extraction Stage

The dried mangosteen rind was mashed using a blender, then the dried mangosteen rind powder was remaciated with 70% ethanol solvent for 3 days accompanied by stirring. The maserate is then filtered and the filtrate obtained is concentrated using a rotary evaporator to obtain a thick extract of mangosteen rind (Rismana et al., 2014).

d. Phytochemical Screening Test Stage

Mangosteen rind extract was obtained and then tested qualitatively for the presence of saponin, phalavonoid, tannin and ethanol-free compounds.

e. Antiacne formulation

Table 1. Antiacne formulations

Material name	Formulation 1	Formulation 2	Formulation 3	Information
Mangosteen rind extract	5 grams	10 grams	15 grams	Active substance
Stearic acid	12	12	12	Mass forming
Trithanolamine	0.24	0.36	0.48	Emulsifier
Cetyl alcohol	2	2	2	Emulsifier
Benzoic acid	0.2	0.2	0.2	Preservative
Sodium benzoate	0.2	0.2	0.2	Preservative
Glycerin	8	8	8	Moisturizing
Aqua distillate	ad 100	ad 100	Ad 100	Carrier

Created a phaseThe oil phase, namely stearic acid, cetyl alcohol, and benzoic acid are melted at a temperature of 70°-80°C, stir until homogeneous (1). The water phase, namely TEA, glycerin, and distilled water is melted at a temperature of 70°-80°C (2). Mix mass 1 and mass 2 little by little, then

grind until homogeneous at the maintained temperature. Then add little by little the mangosteen rind extract and grind until it forms a creamy mass (Okpri et al., 2017).

f. Physical Parameters

1. Organoleptic test

   Organoleptic analysis was carried out by observing changes in texture, color and odor of the mangosteen rind fruit extract cream preparation (Putri & Agustyiani, 2017)

2. Test the pH of the cream

   Weigh 1 gram of mangosteen rind extract and dilute itwith10 ml distilled water. Use a universal PH indicator to find out the PH of the preparation. The universal indicator paper was left for a while in the mangosteen extract solution until the color changed. The color that appears is matched or compared with the standard color in the universal PH acidity indicator. According to the Indonesian National Standards Agency, the pH of the skin is 4.5-6.5, then note it down (Made et al. 2017).

3. Test adhesion

   Weigh the cream preparation as much as 0.2 g, place it on a glass object, then cover it with another glass object, then press it with a 1 kg weight for 5 minutes, then take the load after that, the two glass objects are released and the time recorded until they can be separated, the condition is the length of time of the charge. Good adhesion for topical preparations is not less than 4 seconds (Made et al. 2017).

4. Spreadability test

   A total of 0.1 gram of cream is weighed and placed in the middle of a round glass, the cover glass is weighed, then placed on top of the cream and left for one minute and the diameter of the cream spread is measured, a 50 gram weight is added on top of the cover glass, and left for one minute, note the diameter of the cream spread (Dewi et al., 2013).

5. Test the antibacterial activity of the cream

   The antibacterial activity test of the cream was carried out using the well method (Miratunnisa, et al, 2015) and the bacteria used in this test is propionibacterium acne. The cream extract formulation was made in a concentration series of 5 grams, 10 grams, 15 grams, each concentration had 3 replications. One cycle of bacterial colonies that have been cultured and inoculated in 10 ml of nutrient broth is then incubated at 37°C for 18-24 hours (Niswah 2014). The turbidity of the bacterial suspension was adjusted using a standard 0.5 Mc Ferland solution.

   P.acne suspension as much as100 µL, put into a petri dish, then pour 100 ml of NA media into the petri dish and wait until it solidifies. After solidifying each cup, five wells were made using a syringe to adjust the distance between the wells, then put 5 gram, 10 gram, 15 gram formula cream in each well, dimethyl sulfoxide solution (negative control) and "V" anti-acne cream (positive control). The petri dish is then incubated at 37ºC for 18-24 hours. After incubation, observe the clear zone then measure its diameter, the clear zone is located around the wells containing the sample, the test is repeated three times.

Data analysis

The results of the anti-acne activity test data were analyzed using hypothesis testing, aiming to determine the normality and homogeneity of each research variable including the PH test, spreadability test, stickiness test, antibacterial activity test, if there are normality and homogeneity results, it shows that the results are normally and homogeneously distributed, then proceed with a parametric test using one-way ANOVA statistical analysis, but if it is not homogeneous or not normally distributed then proceed with a non-parametric test using Kruskal Wallis statistical analysis using SPSS.

RESULTS AND DISCUSSION

This research was conducted to test the antibacterial power of mangosteen rind extract cream against Propionibacterium acne. Mangosteen peel in traditional medicine is efficacious as a medicine for stomach aches, diarrhea, dysentery, infections, pus and chronic ulcers (Pedraza-Chaverri et al., 2008). The materials that have been collected are then washed until they are completely clean, then continued with drying. Drying the skin of the mangosteen fruit is first sliced thinly and then heated in the sun. This drying process is intended to reduce the water content, reducing the water content aims to avoid the growth of fungi or bacteria which will damage the simplicia, so that the simplicia obtained is

not easily damaged and can be stored for a long time after drying the mangosteen peel is blended until a fine powder is obtained. Mangosteen peel with a wet weight of 2.7 kg has a dry weight of 270 grams with a drying loss of 90%.

Mangosteen rind extraction using the maceration method. Maceration is the process of soaking samples using an organic solvent at room temperature. This process is very beneficial in isolating natural compounds because by soaking plant samples, the walls of the cell membrane will break down due to the pressure difference inside and outside the cell, resulting in secondary metabolites in the solvent. organic and compound extraction will be perfect because the soaking time can be adjusted. The choice of solvent for the maceration process will provide high effectiveness by paying attention to the solubility of natural compound compounds in the solvent (Arista, 2008). The solvent used in this maceration is 70% ethanol as a filtering solvent. Mangosteen rind extract contains saponins, flavonoids, tannins and is ethanol free, which is a polar compound that is easily soluble in water and can be extracted with 70% ethanol (Depkes RI, 1979). The 70% ethanol solvent is very effective in producing optimal amounts of active ingredients, where only small-scale disturbing materials enter the extraction fluid. Ethanol is a universal solvent so it can extract more than other solvents. Stirring in the extraction process aims to achieve a balance in the concentration of the extractive material more quickly in the liquid and remove the extractive material, so concentration is carried out using a rotary evapolator (Harborne, JB 1996).

The results of mangosteen rind extraction resulted in a yield of 18.2% from 250 grams of simplicia with 70% solvent. Then the extract was tested, namely qualitative tests for saponins, flavonoids, tannins and ethanol free. The qualitative test is a preliminary test that functions to confirm the presence of phytochemical content in the skin of the mangosteen fruit. The presence of tannin content is indicated by the formation of a greenish black color, because tannins will form complex compounds with $FeCl_3$ (hydrochloric acid (III)) (Halimah, 2010). The presence of flavonoids is characterized by the formation of a reddish black color, due to the reaction between magnesium and concentrated HCL which forms H_2 gas bubbles, while magnesium with concentrated HCL functions to reduce the benzopyrone nucleus contained in the flavonoid structure so that a red color is formed (Halimah, 2010), the presence of saponin indicates the formation of foam, because saponin has the physical property of being easily soluble in water so it will produce foam when shaken (Eko, 2016) and ethanol free, it is indicated that there is no strong ester odor.

The process of making O/W type cream is carried out in a hot atmosphere, namely at a temperature of 70º-80ºC. The addition of thick extract of mangosteen rind to each formula is carried out at the last stage, namely when all the cream base has been mixed homogeneously. This is done to ensure that the thick extract of mangosteen rind can be mixed homogeneously with the base.

Organoleptically, the O/W type cream preparation has a semi-solid form like cream, and has a distinctive odor of mangosteen rind extract, the color of the cream preparation is chocolate, and the texture is soft. This shows that the higher the concentration of mangosteen rind extract in a cream preparation, the stronger the smell of the cream produced.

The pH test aims to determine the safety of a preparation, especially topical preparations. Ideally, topical preparations have a pH value that is the same as the pH of the skin so that irritation does not occur on the skin surface. The data from the pH test results of the mangosteen rind extract cream preparation showed that there was an influence on the base group with formulation I, base with formulation II, base with formulation III, on formulation I with formulation II, formulation I with formulation III, formulation II with formulation III showed no there is a difference in having the same pH value, namely 6. This pH value is still within the normal pH range.TestingpreparationTopicals should have a pH that matches the skin's pH (4.5-6.5) (Natalia, et al, 2015) So this cream preparation can still be said to be good in that it increases the comfort of the cream when skin has acne.

The adhesive test aims to determine the time it takes for the cream to stick to the skin. Good adhesion means that the cream does not come off easily and sticks to the skin longer so that it can produce the desired effect, The adhesion test requirement for topical preparations is more than 4 seconds (Wibowo et al, 2017). The results of the adhesion test can be seen in figure 1 below.

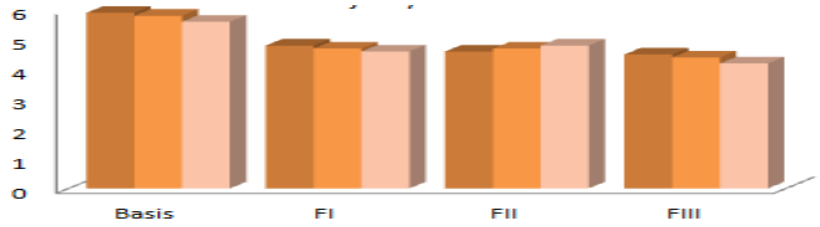

Figure 1. Adhesion test results

Information :
FI: 5 gram mangosteen rind extract cream
FII: 10 gram mangosteen rind extract cream
FIII: mangosteen rind extract cream 15 grams

The adhesion test results showed that the higher the concentration of mangosteen rind extract in the cream, the smaller the adhesion power, however the adhesion power of all the cream preparations made met the requirements for good topical preparations.

The spreadability test aims to determine the softness of the cream mass so that it can be seen how easy it is to apply the preparation to the skin. Good spreadability causes contact between the cream and the skin to be extensive, so that absorption of the cream into the skin occurs quickly.The spreadability test requirements for topical preparations are around 5-7 cm (Wibowo, et al, 2017). The results of the spread power test can be seen in figure 2 below

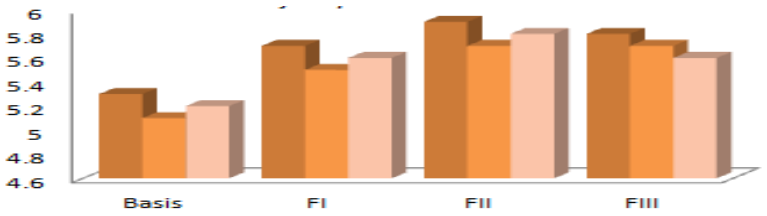

Figure 2. Spreadability test results

Information :
FI: 5 gram mangosteen rind extract cream
FII: 10 gram mangosteen rind extract cream
FIII: mangosteen rind extract cream 15 grams

The spreadability test results show that the higher the concentration of mangosteen rind extract in the cream, the wider the spreadability. However, the cream preparation meets the requirements for a good topical preparation.

The antibacterial activity test of the mangosteen rind extract cream preparation (*garcinia mangostana* L.) was determined by measuring the diameter that inhibits the growth of propionibacterium acne bacteria, which is one of the secondary bacteria that causes acne. Bacterial activity testing was carried out using the well method with a diameter of 0.7 cm which is relatively easy and possible, so it will be easier to visually see the inhibitory power by measuring the presence of a clear zone around the well where bacteria are inhibited by antibacterials (Jawetz et al., 2005). The results of the antibacterial activity test can be seen in figure 3 below.

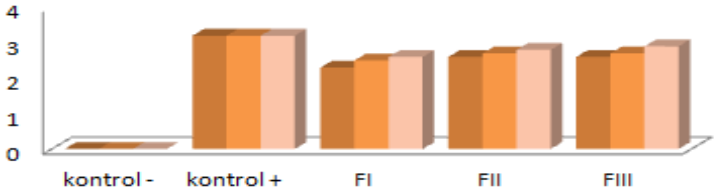

Figure 3. Antibacterial activity test results

Information :
FI: 5 gram mangosteen rind extract cream
FII: 10 gram mangosteen rind extract cream
FIII: mangosteen rind extract cream 15 grams

The results of the antibacterial activity test showed that the higher the concentration in the cream formulation resulted in an increase in the antibacterial activity of the mangosteen rind extract formulation. The negative control was used Dimethyl sulfoxide (DMSO) was used as a negative control because the solvent was used as an extract diluent, the aim was as a comparison that the solvent used as a diluent did not affect the antibacterial test of the extract and Basis was a negative control because it did not have inhibitory activity against the Propionibacterium acne bacteria. The positive control used was verile cream, which has activity that can inhibit Propionibacterium acne bacteria.

Statistical data analysis showed that the data from the antibacterial inhibition test were normally distributed based on Shapiro-Wilk statistical analysis, then the data were analyzed using one way ANOVA and the Tukey HSD test.

CONCLUSION

Based on the results of research conducted by researchers, it can be concluded that:

1. Mangosteen rind extract contains compounds using qualitative phytochemicals proven by the presence of saponin, flavonoid and tannin compounds.
2. Mangosteen rind extract can inhibit Propionibacterium acne bacteria using the well method. The concentration of mangosteen rind extract was 25 mg/ml and the inhibitory power obtained for 3 replications was 1.4 cm; 1.4cm; 1.6 cm
3. The mangosteen rind extract cream preparation meets the physical quality as evidenced by the adhesive power, spreadability, pH of the cream which meets the requirements for a good cream preparation.
4. Mangosteen rind extract cream preparation can inhibit Propionibacterium acne bacteria using the well method with the largest concentration being 10 grams and 15 grams, with an average inhibitory power of 2.7 cm.

Suggestion

Further research is needed on cream formulas to improve the shape of the cream and the color of the cream to make it look more attractive. And the cream must be continued with other bacteria to better understand the quality of the extract cream.

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