ANTIACNE ACTIVITY TEST OF MANGOSTEEN PEEL EXTRACT CREAM (*Garcinia mangostana* L.) AGAINST *Propionibacterium acnes*

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Abstract: The face is a part of the body that is often contaminated by bacteria. One way to eliminate bacteria on the face is by using acne cream. Mangosteen peel has antibacterial activity, and mangosteen peel can be used as an acne cream preparation. The purpose of this study was to determine whether mangosteen peel extract has antibacterial activity, with a series of concentrations of 5 grams, 10 grams, and 15 grams as a formula for acne cream preparations from mangosteen peel extract, which will be tested against Propionibacterium acnes bacteria. Mangosteen peel extract contains secondary metabolite compounds including flavonoids, saponins, and tannins. The mangosteen peel extract cream preparation has a distinctive mangosteen peel odor, is brown, and has a non-sticky texture. The antibacterial activity of the mangosteen peel extract cream preparation has an inhibitory power of 2.9 cm in formula III.

Keywords: [Antiacne, Cream, Mangosteen Peel, *Propionibacterium acnes*]

INTRODUCTION

Indonesia is rich in biodiversity, one of which is 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 to be less than 10% of its total production because many Indonesian mangosteens do not meet quality criteria, such as incomplete stalks and lobes, many of the fruits are bruised and have sap, so a solution needs to be found so that low-quality fruit can be used for other purposes. One way is to process the mangosteen fruit in order to increase added value, as well as being a form of anticipation of 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 these plants can be used as medicine. Abroad, mangosteen is nicknamed the "Queen 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 skin 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 aches, 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 even non-existent, and can be obtained easily and cheaply (Mulyani *et al*., 2017).

There are various types of acne medications on the market. There are creams, masks, tablets, and more. Basically, herbal medicine is a treatment that uses natural ingredients in a traditional way. 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 creams, namely oil-water type cream and water-oil type cream (Ministry of Health of the Republic of Indonesia, 1979). The cream dosage form is more in demand because it is easy to apply to the skin and easy to wash with water (Yumas, 2016). Based on the description above, the author is interested in conducting a study entitled "Test of the anti-acne activity of mangosteen peel extract cream (*Garcinia mangostana* l.) against *Propionibacterium acnes*".

METHODS

1. Preparation of simplicial

   The mangosteen peel used in this study was collected in January, then sorted to separate it from dirt or foreign materials, then washed with running water, then thinly sliced and dried using a drying cabinet at a temperature of 40ºC.

2. Mangosteen peel extraction

   Dried mangosteen peel was ground using a blender, then the dried mangosteen peel powder was macerated with 70% ethanol solvent for 3 days with stirring. The macerate was then filtered, and the filtrate obtained was concentrated with a rotary evaporator to obtain a thick extract of mangosteen peel (Rismana *et al*., 2014).

3. Phytochemical screening of mangosteen peel extract
   a. Saponin Examination
      A total of 1 gram of mangosteen peel extract was added to distilled water and then shaken vigorously for approximately 1 minute. Then let it stand for 10 minutes and observe the foam or foam that forms. The presence of saponin compounds in the sample is indicated by the formation of stable foam for 10 minutes with a height of 3 cm (Wijaya *et al*., 2014).
   b. Tannin Examination
      A 1 mL test extract solution is reacted with a 10% iron (III) chloride solution; if a dark blue, blackish blue, or greenish black color occurs, it indicates the presence of tannin compounds (Dewi *et al*., 2013).
   c. Flavonoid examination
      A total of 1 gram of mangosteen peel extract was put into a test tube, then sufficient magnesium powder and 10 drops of concentrated hydrochloric acid. The presence of flavonoids is indicated by the formation of a reddish black color in the solution (Wijaya *et al*., 2014).

4. Antiacne preparation formulation

Table 1. Antiacne Formulation

Material name	Formulation 1	Formulation 2	Formulation 3	Information
Mangosteen peel extract	5 grams	10 grams	15 grams	Active substance
Stearic acid	12	12	12	Former mass
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	Moisturizer
distilled water	ad 100	ad 100	Ad 100	Carrier

The oil phase, namely stearic acid, cetyl alcohol, and benzoic acid, is melted at a temperature of 70°- 80°C, stirred 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 mangosteen peel extract little by little, grind homogeneously until it forms a cream mass (Okpri *et al*., 2017).

5. Physical Parameters

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

   b. Cream pH test
      Weigh 1 gram of mangosteen peel extract and dilute it with 10 ml of distilled water. Insert the pH meter into the diluted extract. According to the Indonesian National Standards Agency, the pH of the skin is 4.5-6.5, then recorded (Made *et al*. 2017).

   c. Adhesion test
      Weigh the cream preparation as much as 0.2 g placed on a glass object then covered with another glass object then pressed with a load of 1 kg for 5 minutes, then the load is removed after that

both glass objects are released and the time is recorded until both can be released, the requirement for a good adhesive time for topical preparations is not less than 4 seconds (Made *et al*. 2017).

d. Spreadability test
A total of 0.1 grams 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 spread cream is measured, a load weighing 50 grams is added on top of the cover glass, and left for one minute, the diameter of the spread cream is recorded (Dewi *et al*., 2013).

6. Test the antibacterial activity of the cream

The antibacterial activity test of the cream was carried out using the well method, and the bacteria used in this test were *Propionibacterium acnes*. The cream extract formulation was made in a series of concentrations of 5 grams, 10 grams, and 15 grams; each concentration had 3 replications. One loop of bacterial colonies that had been cultured and inoculated in 10 ml of nutrient broth was then incubated at 37°C for 18-24 hours (Niswah 2014). The bacterial suspension was measured for turbidity with a standard solution of 0.5 McFarland. 100 µL of *P. acnes* suspension was put into a petri dish, then NA media was poured into the petri dish as much to 100 ml and allowed until it solidified. After solidifying, five wells were made in each well using a syringe, adjusting the distance between the wells, then each well was filled with 5 grams, 10 grams, and 15 grams of formula cream, dimethyl sulfoxide solution (negative control), and anti-acne cream "V" (positive control). The petri dish was then incubated at 37ºC for 18-24 hours. After incubation, observe the clear zone and then measure its diameter. The clear zone is around the wells containing the sample, and the test was repeated three times.

RESULTS AND DISCUSSION

1. Making Simple Drugs

Mangosteen peel that has been collected, then washed until completely clean, then sliced thinly, and continued with drying. This drying process is intended to reduce water content. The reduction of water content aims to avoid the growth of fungi or bacteria that will damage the simplicia, so that the simplicia obtained is not easily damaged and can be stored for a long time. Mangosteen peel with a wet weight of 2.7 kg gets a dry weight of 270 grams with a drying loss of 90% (Prasetyo & Inoriah, 2013).

2. Mangosteen peel extraction

The results of the extraction of mangosteen peel obtained a yield of 18.2% from 250 grams of the simplisia with 70% ethanol solvent. Extraction of mangosteen peel using the maceration method. Maceration is the process of soaking samples using organic solvents at room temperature, this process is very beneficial in the isolation of natural material compounds because by soaking plant samples there will be a breakdown of the walls of the cell membrane due to the difference in pressure inside and outside the cell, so that secondary metabolites in organic solvents and compound extraction will be perfect because the duration of soaking can be adjusted.

The selection of solvents for the maceration process will provide high effectiveness by considering the solubility of natural material compounds in the solvent (Arista, 2008). The solvent used in this maceration is 70% ethanol as a solvent. Mangosteen peel extract contains saponins, flavonoids, tannins, and is free from ethanol, which are polar compounds that are easily soluble in water and can be extracted with 70% ethanol (Depkes RI, 1979). Ethanol solvent 70% is very effective in producing the optimal amount of active ingredients, where only small-scale interfering materials are included in the extraction liquid. Ethanol is a universal solvent, so it can extract more than other solvents. Stirring in the extraction process aims to achieve a faster balance of extractive concentration into the liquid and remove the extractant, so concentration is carried out with a rotary evaporator (Harborne, J.B. 1996).

3. Phytochemical screening of mangosteen peel extract

The results of the qualitative test of mangosteen peel extract can be seen in Table 2 below.

Table 2. Qualitative Test Results of Mangosteen Peel Extract

Inspection	Indicator	Results
Tannin	Black greenish	+
Flavonoid	Black reddish	+
Saponins	Foam	+

Qualitative testing is a preliminary test that functions to ensure the presence of phytochemical content in the mangosteen skin. The presence of tannin content is indicated by the formation of a greenish black color, because tannin will form a complex compound with FeCl3 (hydrochloric acid (III)) (Halimah, 2010). The presence of flavonoids is indicated 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 core contained in the flavonoid structure so that a red color is formed (Halimah, 2010), the presence of saponins is indicated by the formation of foam, because saponins have physical properties that are easily soluble in water so that they will produce foam when shaken (Eko, 2016).

4. Physical parameters of mangosteen peel extract cream preparation
   a. Organoleptic test
   The results of the organoleptic test of the mangosteen peel extract cream can be seen in Table 3 below.

Table 3. Organoleptic Test Results of Mangosteen Peel Extract Cream

Sample	Color	Smell	Texture
Base	White	Stearic acid characteristics	Not sticky
Formulation I	Brownish white	Typical mangosteen skin	Not sticky
Formulation II	Chocolate young	Typical mangosteen skin	Not sticky
Formulation III	Chocolate young	Typical mangosteen skin	Not sticky

The results of organoleptic tests on the color formula preparation showed that the more extract used, the more concentrated the color obtained, if the smell, the more mangosteen peel extract used, the smell is more pungent or typical of mangosteen peel, and if the texture is when making the cream in a stable temperature, it is softer and not rough when applied to the skin.

   b. Cream pH test
   The results of the pH test of the mangosteen peel extract cream can be seen in Table 4 below.

Table 4. Results of pH Test of Mangosteen Peel Extract Cream

Replication	Formulation I	Formulation II	Formulation III
1	6	6	6
2	6	6	6
3	6	6	6
Average	6	6	6

The pH test aims to determine the safety of a preparation, especially topical preparations. Ideally, topical preparations have the same pH value as the skin's pH so that irritation does not occur on the skin's surface. Data from the pH test of the mangosteen rind extract cream preparation showed that the preparation had the same pH value, namely 6. This pH value is still within the normal pH range. Testing of topical preparations should have a pH that matches the skin's pH (4.5-6.5) (Natalia *et al*, 2015) so that this cream preparation can still be said to be good in terms of increasing the comfort of the cream when the skin has acne.

   c. Adhesion test
   The results of the adhesion test of the mangosteen peel extract cream can be seen in Table 5 below.

Table 5. Results of the Test of the Adhesion Power of Cream

Replication	Base	Formulation I	Formulation II	Formulation III
1	5.9 seconds	4.8 seconds	4.6 seconds	4.5 seconds
2	5.8 seconds	4.7 seconds	4.7 seconds	4.4 seconds
3	5.6 seconds	4.6 seconds	4.8 seconds	4.2 seconds
Average	5.7 seconds	4.7 seconds	4.7 seconds	4.3 seconds

The adhesion test aims to determine the time required for the cream to adhere to the skin. Good adhesion allows the cream not to come off easily and to adhere 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).

d. Spread power test

The results of the mangosteen peel extract spreadability test can be seen in Table 6 below.

Table 6. Results of the Spreadability Test of Cream

Replication	Base	Formulation I	Formulation II	Formulation III
1	5.3 cm	5.7 cm	5.9 cm	5.8 cm
2	5.1 cm	5.5 cm	5.7 cm	5.7 cm
3	5.2 cm	5.6 cm	5.8 cm	5.6 cm
Average	5.2 cm	5.6 cm	5.8 cm	5.7 cm

The spreadability test aims to determine the softness of the cream mass so that the ease of applying the preparation to the skin can be seen. Good spreadability causes contact between the cream and the skin to be extensive, so that the absorption of the cream into the skin takes place quickly. The spreadability test requirement for topical preparations is around 5-7 cm (Wibowo *et al*, 2017).

5. Test the antibacterial activity of the cream

The antibacterial results of the mangosteen peel extract cream can be seen in Table 7 below.

Table 7. Results of the Inhibition Zone of Mangosteen Peel Extract Cream Against *P. acnes*

Replication	Base	Control +	Control -	Formulation I	Formulation II	Formulation III
1	0 cm	3.2 cm	0 cm	2.3 cm	2.6 cm	2.6 cm
2	0 cm	3.2 cm	0 cm	2.5 cm	2.7 cm	2.7 cm
3	0 cm	3.2 cm	0 cm	2.6 cm	2.8 cm	2.9 cm
Average	0 cm	3.2 cm	0 cm	2.4 cm	2.7 cm	2.7 cm

Antibacterial activity test of mangosteen rind extract cream (*Garcinia mangostana* L.) was determined by measuring the diameter that inhibits the growth of P. acnes bacteria, which is one of the secondary bacteria that causes acne. Bacterial activity testing was carried out using a well method with a diameter of 0.7 cm, which is relatively easy and possible, so that it will be easier to see visually the inhibition by measuring the presence of a clear zone around the well where the bacteria are inhibited by antibacterial (Jawetz *et al*., 2005).

Based on the results of the inhibition of the mangosteen rind extract cream preparation against P. acnes bacteria, it showed that in formulation I an average inhibition of 2.4 cm was obtained, in formulation II, an average inhibition of 2.7 cm was obtained, and in formulation III, an average inhibition of 2.7 cm was obtained. All three formulas are included in the very strong response, because the diameter shows ≥20 mm (Fitri & Sri, 2017).

Compounds from the content of mangosteen rind extract that have been proven to have antibacterial activity are the xanthone group, xanthone as a polyphenol compound, which can damage the cell membrane of microorganisms, membrane damage that results in bacteria to lose important metabolism from bacterial cells, resulting in bacterial death (Ade, 2010). The results of the antibacterial activity test showed that the higher the concentration in the cream formulation, the

greater the increase in the antibacterial activity of the mangosteen rind extract formulation. Negative control used dimethyl sulfoxide (DMSO) as a negative control because the solvent used as an extract diluent, the purpose is to serve as a comparison that the solvent used as a diluent does not affect the antibacterial test of the extract and the base is included as a negative control because it does not have inhibitory activity against P. acnes bacteria. The positive control used is verile cream, which has activity that can inhibit P. acnes bacteria.

CONCLUSION

The preparation of mangosteen rind extract cream can inhibit propionibacterium acne bacteria using the well method with the highest concentration of 10 grams and 15 grams, and the average inhibition power obtained was the same, namely 2.7 cm.

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