Available online on 15.04.2022 at http://jddtonline.info

Journal of Drug Delivery and Therapeutics

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Research Article

Utilization of Ambon Banana Stem (*Musa paradisiaca* var. *sapientum* (L)) Ethanol Extract as Moisturizing Sheet Mask

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Article Info:

Article History:

Received 24 February 2022
Reviewed 19 March 2022
Accepted 25 March 2022
Published 15 April 2022

Cite this article as:

Ginting I, Rudang SN, Naldi J, Siboro E, Leny, Utilization of Ambon Banana Stem (*Musa paradisiaca* var. *sapientum* (L)) Ethanol Extract as Moisturizing Sheet Mask, Journal of Drug Delivery and Therapeutics. 2022; 12(2-s):25-29

DOI: http://dx.doi.org/10.22270/jddt.v12i2-s.5415

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Abstract

Ambon banana stem are known to contain chemical compounds including flavonoids, saponins, and tannins. One of these chemical compounds has the potential as an antioxidant, namely flavonoids which has antioxidant properties as free radical scavengers. Antioxidants can be used to repair skin cells damaged by free radicals, these antioxidants can provide a moisturizing and brightening effect on the skin so that the skin is not only kept moist and looks radiant. The purpose of this study was to formulate sheet mask preparation from ethanol extract of Ambon banana stem (*Musa paradisiaca* var. *sapientum* (L)) into various concentration 5%, 7% and 9%. The sheet mask was then being examined for its activity to provide smoother skin after 4 weeks of treatment by measuring skin moisture content. Data was then being analyzed using ANOVA method. The research showed that sheet mask preparation of Ambon banana stem ethanol extract met the requirements for organoleptic evaluation, homogeneity, pH, irritation test. In increasing moisture content of Ambon banana stem ethanol extract sheet mask preparation, showed insignificant value ($p > 0.05$) where there is no significant difference toward the positive control. These results conclude that the sheet mask preparation of Ambon banana stem ethanol extract provides a moisturizing effect on skin.

Keywords: Ambon banana stem, moisturizer, sheet mask

INTRODUCTION

Skin is a protective layer that covers the surface of the body which is very vulnerable to external influences, both physical and chemical influences. The function and appearance of skin are maintained by the balance between the water and lipid content inside the skin[1]. Too much sunlight exposure and free radical can destroy this balance. Moisturizers are one among cosmetic preparations that used to prove skin hydration and increases stratum corneum water content by directly providing water to the skin from their water phase and increasing occlusion to reduce trans-epidermal water loss, it also covers small skin fissures, provides a soothing protective film and protects skin from friction[2,3].

Sheet masks are a thin sheet made of cotton, fibre, or cellulose which is infused with concentrated hydrating ingredients. Sheet mask can boost skin's hydration levels, by leaving the mask on skin for a certain period, it will help to push the ingredients into the skin[2,3]. Sheet mask has good closing or adhering properties so it leaves a moist effect on the skin when compared to other mask[3,4].

Banana trees are widely planted and widespread in all regions in Indonesia. Ambon banana stems are known to contain chemical compounds including flavonoids, saponins, and tannins. These chemical compounds have potential as antioxidants[5]. Phenol and flavonoid compounds have antioxidant properties as free radical scavengers because they contain hydroxyl groups that act as reducing agents and can act as hydrogen donors to free radicals. Its hydroxyl group works to bind water content in the stratum corneum which is assisted by humectants so that it gives the impression of smoother skin and less wrinkles[6]. Antioxidants can be used to repair skin cells damaged by free radicals, provide a moisturizing and brightening effect on the skin[7].

MATERIALS AND METHODS

The tools used in this study were mortar and pestle, erlenmeyer (Pyrex), beaker glass (Pyrex), analytical balance, measuring cup (Pyrex), blender, oven, stirring rod, caliper, pH meter, object glass, rotary evaporator, water bath, porcelain cup

Materials used in this study were Ambon banana stem (*Musa paradisiaca* var. *sapientum* (L)), xanthan gum, butylene glycol, glycerin, methyl paraben, PEG-40 hydrogenated castor oil, parfume, aquadest, sheet mask dan foil bag.

Simplicia Making

The fresh Ambon banana stem were collected and washed with running water, drained and chopped to facilitate drying and then dried by aerating protected from sunlight. The dried simplicia was sorted to separate impurities left on the simplicia, then the simplicia is mashed using a blender so that it becomes simplicia powder[8,9].

Plant Extraction

Ambon banana stem powder was put into a glass container and then immersed in 75 parts of 96% ethanol solvent as much as 3750 ml then the container was covered with aluminum foil and left for 5 days while stirring occasionally and then filtered with filter paper. The residue was then soaked again with 25 parts of 96% ethanol as much as 1250 ml then the container was covered with aluminum foil and left for 2 days while stirring occasionally, after 2 days the sample was filtered. Filtrate one and filtrate two were mixed together and then evaporated using a rotary evaporator at 40ºC until a crude extract was obtained[8,10].

Phytochemical Screening

Identification of Alkaloids

The ethanol extract of Ambon banana stem of 0.5 g was divided into 3 test tubes. Afterward, the tubes were added with 1 ml of hydrochloric acid 2N and 9 ml of aquadest, respectively. Next, heated over a water bath for 2 minutes, then cooled and strained. Then 3 drops of filtrate was taken and added 2 drops of Meyer, Bouchardat and Dragendorff reagents[6,11].

Identification of Flavonoids

The ethanol extract (500mg) was divided into 2 test tubes. After that, the tubes were added with 10 ml of methanol, respectively. Next, refluxed using a cooler for 10 minutes. Filtered heat through multiple filter paper, diluted with 10 ml of distilled water. After cold, 5 ml of ether was added, stirring carefully, then let stand. The methanol layer is taken, evaporated at 40^{0}C under pressure. the extract obtained was dissolved in 5 ml of ethyl acetate. The extract in the first tube was evaporated to dryness, then dissolved in 2 ml of 96% ethanol, added 0.5 g of zinc powder and 2 ml of 2 N hydrochloric acid, left for 1 minute. Added 10 drops of concentrated hydrochloric acid, if within 2 to 5 minutes there is an intense red color indicating the presence of flavonoids (glycoside-3- flavonol). The extract in the second tube was evaporated to dryness, dissolved in 1 ml of 96% ethanol, added 100 mg of magnesium powder and 10 ml of concentrated HCl, if red orange was formed until the red purple color indicated the presence of flavonoids. If orange yellow is formed, indicates the presence of flavones and chalcons[6,11].

Identification of Saponins

The ethanol extract (500mg) was putted into a test tube. After that, 10 ml of hot water was added, then cooled and shaked with vigorously for 10 seconds. If the compound was examined in the form of a liquid preparation, diluted 1ml of that liquid preparation with 10 ml of distilled water and shaked vigorously for 10 minutes. A positive result was exhibited with a constant froth for no less than 10 minutes, as high as 1cm to 10cm then by addition 1 drops of HCl 2 N, the froth was not disappear[6,11].

Identification of Tannins

The ethanol extract (500 mg) was extracted with 10 ml of distilled water for 15 minutes. Then filtered, the filtrates were diluted with distilled water until they were almost colorless. Taken 2 ml of filtrate, and then added 2 drops of 10% $FeCl_3$ solution. Note the color that occurs, blue or green indicates tannin, blue indicates 2 hydroxyl groups in the aromatic ring of tannin[6,11].

Essence Formula for Sheet Mask

Table 1: Essence formulation for sheet mask preparation

Ingredients	Concentration (%)			
	F0	F1	F2	F3
Ambon banana stem extract	0	5	7	9
PEG-40 Hydrogenated castor oil	0.05	0.05	0.05	0.05
Butylene glycol	3	3	3	3
Glycerin	3	3	3	3
Xanthan gum	0.1	0.1	0.1	0.1
Methyl paraben	0.3	0.3	0.3	0.3
Perfume	qs	qs	qs	qs
Aquadest ad	100 ml	100 ml	100 ml	100 ml

Procedure of Making Sheet Mask

Xanthan gum was put into a mortar and then dissolve it little by little with aquadest. Then added butylene glycol, glycerin, PEG-40 Hydrogenated castor oil. Added methyl paraben which has been dissolved in hot water, grind homogenously, then added Ambon banana stem extract, and perfume, grind until homogeneous[1,2]. Essence is made in 4 formulations and each essence contains 0% (F0), 5% (F1), 7% (F2) and 9% (F3) extract of Ambon banana stem (*Musa paradisiaca* var. *sapientum* (L)) and the market sheet mask (F4) as a positive control.

Evaluation of Preparation Characteristics

1. Organoleptic test

Organoleptic test was carried out by observing the physical form, odor and color of the preparations. Test was observed before and after stability test[12,13].

2. pH test

Determination of the pH of the preparation is done using a pH meter. The instrument was first calibrated using a standard neutral pH buffer solution (pH 7.01) and an acid buffer solution (pH 4.01) until the instrument showed the pH value. Then the electrodes were washed with distilled water, then

dried with a tissue. Samples were made with a concentration of 1%, namely weighing 1 g of the preparation and dissolved in distilled water up to 100 ml. Then the electrode is immersed in the solution[12,13].

3. Homogeneity test

A certain amount of the preparation is smeared on two pieces of glass or other suitable transparent material, the preparation must show a homogeneous arrangement and no coarse grain were seen[12,13].

4. Cycling test

Stability test using the cycling test method was carried out by storing the preparation at a temperature of ±4ºC for 24 hours, then transferred to a temperature of ±40ºC for 24 hours (1 cycle). The test was done for 6 cycles or equal to 12 days[12,13].

5. Irritation test

Place the sheet mask that has been cut ± 2.5 cm behind the ear for 24 hours of application. Symptoms of irritation such as redness, itching and swelling were been observed[14].

6. Effectiveness test

Moisture effectiveness test was conducted on 15 volunteers who were divided into 5 groups.

1. Group 1 : 3 volunteers for F0 (negative control)
2. Group 2 : 3 volunteers for F1 (5% Ambon banana stem)
3. Group 3 : 3 volunteers for F2 (7% Ambon banana stem)
4. Group 4 : 3 volunteers for F3 (9% Ambon banana stem)
5. Group 5 : 3 volunteers for positive control

Each volunteer was given a sheet mask and test was carried out for 4 weeks by 20 minutes application in each week. Volunteer's cheek was cleaned by dry tissue and checked for the moisture content by using skin analyzer before sheet mask application. After application of sheet mask, it was removed and wait for about 15 minutes for the next checking on its moisture content. Data was then being analyzed by using ANOVA (*Analysis of variance*)[12].

RESULT AND DISCUSSION

The result of extract phytochemical screening

Table 2: Result of screening

	Metabolite	Reagent	Appearance	Result
1	Alkaloids	Mayer	No yellowish precipitate	
		Bouchardat	No brownish precipitate	
		Dragendorff's reagent	Red precipitate	-
2	Flavonoids	Mg powder + concentrated HCl	Reddish solution	+
3	Saponins	Hot water + shaken with HCl 2N	Foamy solution	+
4	Tannins	$FeCl_3$ 1%	Greenish to black color	+

Description: (+) Positive result (-) Negative result

Based on the results of phytochemical screening, it was shown that the ethanol extract of Ambon banana stem (*Musa paradisiaca* var. *sapientum* (L)) contained flavonoids, saponins and tannins and did not contain alkaloid compounds. When it was added with Mayer reagent, it did not produce yellow precipitate, in Bouchardat test did not produce brownish precipitate, though in the Dragendorff test it produced red precipitate, it was concluded as negative results[15].

It was found that the ethanol extract of Ambon banana stem (*Musa paradisiaca* var. *sapientum* (L)) was positive for flavonoids because solution turn into red. The concentrated HCl produced orange complex compounds in flavonols, flavones, flavanonol and xanthones. The resulting orange color indicates the presence of flavonoids as a result of reduction by concentrated hydrochloric acid and magnesium[16].

Flavonoid compounds have antioxidant properties as free radical scavengers because they contain hydroxyl groups which act as reducing agents and can act as hydrogen donors against free radicals. Its hydroxyl group works to bind water content in the stratum corneum which is assisted by humectants so that it gives the impression of smoother skin and less wrinkles. Flavonoids can increase hydration and inhibit evaporation. With the presence of a water-resistant lipid barrier, evaporation that occurs through the skin surface can be prevented. The stratum corneum will also increase the skin capacitance so that it gives the impression of a better skin[17]. In the saponin test, it was found that Ambon banana stem extract (*Musa paradisiaca* var. *sapientum* (L)) was positive for saponins which was indicated by the presence of foam after shaking.For tannin test, the solution turns into blackish green which indicated positive results for tannins in extract of Ambon banana stem (*Musa paradisiaca* var. *sapientum* (L))[18].

Sheet mask evaluation

Organoleptic testing on sheet mask preparations was carried out before and each cycling test. F0 is white in color, odorless and liquid form. F1 & F2 has a light green color, banana odor and a liquid form. F3 has a dark green color, banana odor and a liquid form. And F4 (Quret banana sheet mask) as a positive control has clear color, distinctive banana odor and liquid form. After stability test by using cycling test method, there is no change in consistency, colour and odor in all formulas.

pH Test Results

Table 3: pH value of essence sheet mask preparations during storage

Formula	pH during cycle-							Average pH
	0	1	2	3	4	5	6	
F0	6.16	6.30	6.40	6.43	6.95	6.93	6.93	6.59
F1	6.03	6.06	6.10	6.10	6.10	6.03	5.94	6.05
F2	5.63	5.76	5.83	6.06	6.03	5.86	5.93	5.87
F3	5.30	5.50	5.86	5.90	5.93	5.88	6.00	5.77

Note: F0: essence without ambon banana stem extract (negative control) F1: essence containing 5% ambon banana stem extract
F2: essence containing 7% ambon banana stem extract F3: essence containing 9% ambon banana stem extract

If the essence of the sheet mask preparation is too acidic from the pH of the skin, it will irritate the skin, and if it is too alkaline, it will dried the skin[19]. The higher the content of extract in the essence, the lower the pH value of the preparation, it is because extract contains acidic compounds such as flavonoids and tannins[20]. But the values of the four formulas containing Ambon banana stem extract (*Musa paradisiaca* var. *sapientum* (L)) meet the requirements because they are in the pH range between 5.3-6.95, so that they are comfortable to use topically without causing irritation or dry skin. The pH value of the four essence formulas for sheet mask preparations meets the skin pH criteria, which is between 4.5-6.5, the pH of the essence of sheet mask preparations is declared stable during storage[19,13].

Homogeneity Test

Based on the homogeneity test which was carried out before and each cycle of the cycling test, showed that F0, F1, F2, F3, F4 showed a homogeneous results. There were no coarse grains on the glass object, and the separation of color in sheet mask containing the essence of Ambon banana stem extract (*Musa paradisiaca* var. *sapientum* (L)) are distributed equally in all formulas. Preparations are homogenous if the color is well distributed and contain no grainy particles[19,7].

Skin Irritation Test Against Volunteers

Irritation test was carried out on 15 volunteers and observed for redness, swelling, and itching on the skin. The irritation test of F0, F1, F2, F3 and F4 sheet mask showed no irritation on volunteers skin. Irritation test of a preparation is needed to ensure the quality of the preparation after application, it should not irritate the skin in order to be accepted to be used[12, 21].

Effectiveness in moisturizing skin

The results of measurement in water content/ moisture can be seen in Table 4.

Table 4: Moisture in volunteers' skin during treatment

No	Formula	Moisture on week- (SD)				
		0	1	2	3	4
1	F0	28.90 ± 0.60	29.06 ± 0.66	29.26 ± 0.58	29.56 ± 0.68	30.83 ± 0.92
2	F1	29.56 ± 1.09#	31.83 ± 1.11#	33.13 ± 0.89*	36.16 ± 0.55*#	37.83 ± 0.83*
3	F2	28.60 ± 0.10#	31.43 ± 0.70#	34.20 ± 0.10*#	36.56 ± 0.32*#	38.76 ± 1.24*
4	F3	28.83 ± 0.35#	32.43 ± 0.15#	35.26 ± 0.30*#	37.16 ± 0.41*#	40.80 ± 1.12*#
5	F4	29.13 ± 0.30	32.73 ± 0.32	35.93 ± 0.37	37.33 ± 0.76	43.33 ± 3.06

Description:

F0: sheet mask without Ambon banana stem extract (blank/ negative control) F1: sheet mask containing 5% ambon banana stem extract
F2: sheet mask containing 7% ambon banana stem extract F3: sheet mask containing 9% ambon banana stem extract
F4: positive control (Quret banana sheet mask) *significantly different with negative control/blank
No significant different with positive control

The largest increasing of moisture found in those who used 9% concentration of Ambon banana stem extract sheet mask with 40.80%. Based on ANOVA statistic test, formula containing Ambon banana stem extract (F1, F2, F3) showed a non significant effect compared to positive control in increasing skin moisture with p value > 0.05 during 4 weeks of treatment. On the second week, it started to show a great result which proved by a significant different of F1, F2,and F3 towards F0 in increasing moisture which is $p \leq 0.05$. Results showed that Ambon banana stem extract has a good activity in hydrating skin because it contains flavonoids, phenols compound and carotenoid[20].

CONCLUSION

It can be concluded that Ambon banana stem ethanol extract can be formulated into a moisturizing sheet mask. From the physical characteristic test, the preparation is homogeneous, remains stable after the stability test using the cycling test method, have a pH of 5.3-6.95 which is suitable for skin pH and does not irritate the skin. The sheet mask preparation had the ability to moisturize the skin almost the same as the positive control.

CONFLICT OF INTEREST

All authors have nothing to declare.

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