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Formulation and physical quality test of Kerinci Arabica Coffee: Skin waste scrub preparation

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Abstract

Background: Scrubs are traditional cosmetic preparations that are prescribed for generations and are used to remove dead skin cells, impurities and open pores so that air exchange is free and the skin becomes brighter and whiter Previous phytochemical research shows that the bioactive properties of Kerinci Arabica coffee bark consist of alkaloids, flavonoids, terpenoids, saponins and tannins, Therefore, coffee peel has great potential to be used as an ingredient for the manufacture of scrubs. The purpose of this study is to evaluate the formulation and physical quality test of scrub preparations.
Method: The research method used is experimental in a laboratory with a Complete Random Design (RAL). Powder scrub formulations are made in 3 formulas with the weight of each formula being 100 g. The physical quality stability test of powder scrub preparations was carried out on the 1st, 7th and 14th days including organoleptic, moisture content, homogeneity, pH, drying time, and adhesion.
Results: The test results found that during 2 weeks of storage, the scrub preparations made had met the requirements of good physical quality. In the organoleptic test, the color, shape and smell of the preparation did not change, the preparation was homogeneous, the pH was stable at 6, the moisture content was stable below 10%, the drying time test met the requirements, which was at least 15 minutes and the adhesion test was in accordance with the requirements, which was greater than 1 second.
Conclusion: Formulation and physical test of Kerinci Arabica Cofee Scrub was great.

Keywords: Formulation; Scrub; Coffee Skin Waste.

INTRODUCTION

Coffee is a plant that is widely consumed as a drink and this plant is widely found in various parts of the world. Arabica coffee is widely grown on the plains with an altitude of more than 500 meters above sea level. Arabica coffee will grow optimally when planted at an altitude of 1000-2000 meters above sea level. With rainfall ranging from 1200-2000 mm per year (1). The chemical content of coffee is alkaloids, flavonoids, tannins, caffeine and chlorogenic acid which can be used as anti-oxidants and anti-aging (2).

Antioxidants can be used to repair skin cells damaged by free radicals and ward off free radicals(3). Antioxidants in cosmetic ingredients can provide a moisturizing and brightening effect on the skin so that the skin is not only kept moist but looks more radiant (4).

The components of phenolic compounds include catechins, epicatechins, proanthocyanidins, phenolic acids, tannins, and other flavonoids that function as antioxidants to refresh the skin and regulate the balance of free radicals that can slow down the aging process (5).The components of phenolic compounds in the polyphenol group are catechins, epicatechins, proanthocyanidins, phenolic acids, tannins and other flavonoids that function as antioxidants in the skin. The community still cannot make full use of the coffee fruit skin. Plantation development, especially in coffee

processing that is currently carried out, will indirectly produce a large amount of coffee fruit peel waste. The skin of this coffee fruit also contains several secondary metabolite compounds (6). Compounds that are antioxidants are one of the benefits in coffee peel waste (7). Antioxidants are compounds that bind free radicals and highly reactive molecules by inhibiting oxidation reactions, so cell damage will be inhibited (8). The antioxidant activity in the bark of Arabica coffee fruit can be used as a good utilization of waste and can have the potential for the use of cosmetics, fertilizers, and food additives (9).

One of the problems of today's world society, especially women, is skin aging, where this process cannot be avoided due to various factors so that the skin experiences dryness, itching, scaly and redness (10). This can happen because the skin is the outermost limb that is directly exposed to sunlight, making the skin dull, wilted, and wrinkled (11). Therefore, the skin needs intensive care, one of which is by using cosmetics that can help exfoliate and remove dead skin cells such as the regular use of scrubs or body scrubs.

Scrubbing is an activity to remove dirt, oil or dead skin which is done by massaging the entire body. The results can be seen immediately, the skin is smoother, firmer, fragrant and has a healthy glow (12). Scrub is a skin care cosmetic that functions to clean pores and remove dead skin cells, so it will help remove toxins from the body and help facilitate the entry of ingredients containing nutrients into the body (13). The characteristics of a body scrub are that it can be applied to the skin, has a scrub or rough texture which is useful for helping exfoliate dead skin cells and contains elements of substances that are beneficial for the skin (14). The development of cosmetic body scrubs is made by adding other natural ingredients derived from materials that are no longer used, but still contain ingredients appropriate to the function of the body scrub (15). The ingredients in the scrub preparation have their respective uses. Choosing the right ingredients influences whether the scrub preparation is safe or not when used. Choosing natural ingredients reduces the dangerous risks of using body scrub preparations. Scrub is a cosmetic treatment that is used to care for and clean the skin from dirt and dead skin cells. Scrubbing is an activity to remove dirt, oil or dead skin which is done by massaging the whole body. The results can be seen immediately, the skin will be smoother, firmer, fragrant and have a healthy glow (10). Scrubs are divided into 2 types, namely traditional scrubs and modern scrubs.

Traditional body scrubs are made from spices and flour with a rough texture which are used by rubbing or rubbing them slowly all over the body. Meanwhile, modern body scrubs are made from scrub granules which are accompanied by lotion which is usually made from milk. Modern scrubs use a mixture of natural ingredients in the form of extracts so that the scrub lasts longer and its use is designed to be more practical so it is easy to use (16).

METHODS

Tool

The tools used in this study are analytical scales, sieves, spatula, blenders, glassware, microscopes, ovens, hotplates and pH measuring instruments.

Material

The ingredients used consist of Cetyl alcohol, Stearic Acid, Triethanolamine, Propylene glycol, Glycerin, Propyl paraben, Methyl paraben, Kerinci Arabica Coffee Bark Powder, Aquadest

Research Procedure

1. Plant Identification

Plant identification was carried out at the Phytochemical Pharmacognosy Laboratory, Department of Pharmacy, Ministry of Health, Jambi.

2. Sample Collection

Sample collection is carried out purposively, namely without comparing with the same material from other regions

3. Arabica Coffee Skin Pass Formulation

Tabel 1. Scrub Preparation Formula Design

Materials	consentrations of arabica coffee skin scrub			
	0%	5%	10%	15%
1Setil alcohol (g)	0,5	0,5	0,5	0,5
Stearic Acid (g)	7,5	7,5	7,5	7,5
TEA (g)	1	1	1	1
Propilen glikol (g)	2,5	2,5	2,5	2,5
Glycerin(g)	2,5	2,5	2,5	2,5
Propil paraben (g)	0,05	0,05	0,05	0,05
Metyl paraben (g)	0,3	0,3	0,3	0,3
2,5C5ofee Skin (g	-	2,5	5	7,5
Aquadest ad (ml)	50	50	50	50

Procedure

Work Procedure of Scrub Preparation Preparation Weighed all the necessary materials. Separate the material into two groups which are the oil phase and the water phase. The oil phase consists of stearic acid, cetyl alcohol, melted on a water bath at a temperature of 70ºC, then propyl paraben (mass I) is added. The water phase consisting of propylene glycol, triethanolamine and methyl paraben is dissolved in hot water at a temperature of 70°C (mass II). Put mass I in a hot mortar, then put mass II in small and constant grinding until a creamy mass is formed. After the cream mass is formed, it is mixed with coffee that has been ground according to the concentration little by little, ground until a homogeneous cream is formed. until a cream base is formed (E.A. Rawlins, 2003).

Spesific Parameters Test

The specific quality inspection of natural scrub materials is carried out with the aim of determining the parameters of the simplicia quality standard. Simplicia powder in this study includes organoleptic/macroscopic, water-soluble juice content, ethanol-soluble juice content, microscopic, and water content.

1. Organoleptic/Macroscopic

Organoleptic/macroscopic test is one of the tests that is carried out directly through the senses, to find out the shape, color, smell and taste of symplisia.

2. Water Soluble Sari Rate

Testing of water soluble juice content was carried out by weighing 2.5 g of simplisia, macarated in 50 mL of chlorogenic saturated water (2.5 ml of chlorophore in 1 L of water) for 24 hours while occasionally shaking. Then it is filtered. The filtrate is taken as much as 10 mL and then evaporated in a porcelain cup that has been weighed until dry. Next, the porcelain cup is put in the oven and soaked at a temperature of 105◦C for 30 minutes, cooled and then weighed. Do the same until you gain weight. The value of the water soluble juice content is obtained through the formula equation:

3. Ethanol Soluble Juice Rate

$$\text{Water-soluble anthers} = \text{Pollen Weight /Simplisia Weight} \times \frac{50}{10} \times 100$$

Testing of ethanol soluble juice content was carried out by weighing 2.5 g of simplisia, macerated in 50 mL of 96% ethanol for 24 hours while occasionally shaking. Filtered and taken 10 mlL of phytrate then, evaporated in a porcelain cup that has been weighed until dry. Next, the porcelain cups are put in the oven and heated at a temperature of 105◦C for 30 minutes, cooled and then weighed. Do the same until you get a constant weight (Utami, et.al., 2020). The value of ethanol soluble juice content is obtained through Equation

$$\text{Ethanol soluble juice} = \text{Stain Weight /Simplisia Weight} \times \left(\frac{50}{10}\right) \times 100$$

This test is carried out by placing the simplicia on a glass object that has been dripped with water and chloralhydrate on a spritus lamp, then examined under a microscope to be able to see the identifying fragments in the form of cells, cell contents, or plant tissues

5. Moisture Content

The sample is weighed in a volume of 2 g and put into a closed porcelain crux that has been preheated at a temperature of 105oC for 30 minutes, then the sample is flattened in a porcelain crux by shaking the crux until it forms a layer 5-10 mm thick, then the exchange rate is put into the oven, dried at a temperature of 105oC for

1 hour, cooled and weighed. Do the same until you get a fixed weight. The moisture content value is obtained through Equation

RESULTS

Physical Quality Evaluation

The analysis of the coffee skin scrub included: homogeneity check, determination of emulsion type, physical stability test, pH test, skin irritation test of volunteers, and test of the effectiveness of body scrub cream preparations on volunteers.

Homogeneity

A certain number of preparations if applied to glass objects or other suitable transparent materials, the preparations must show a homogeneous arrangement, with no coarse grains visible.

Determination of Preparation Emulsion Type

The determination of the type of emulsion can be determined by phase dilution and staining with blue methylene. Phase dilution is carried out by diluting 0.5 grams of the preparation with 25 ml of water in a glass beaker. If the preparation is homogeneously dispersed in water, then the preparation includes a medium m/a type emulsion If the preparation is not homogeneously dispersed in water, then the preparation includes an a/m type emulsion.

Physical Stability Test

Each cream formula is placed in a plastic pot, stored at room temperature and measured for stability parameters such as odor, color, and separation of the emulsion during 12-week storage with observation intervals at the time the preparation is finished, storage 0 (finished), 2, 4, 6, 8, 10 and 12 weeks.

Determination of pH of Scrub Preparation

Determination of the pH of scrub preparations using a universal paper pH tool: (pH 7) and an acidic pH solution (4) until the tool shows the pH price.

Irritation Test

An irritation test is carried out on the preparation with the aim of determining the irritating properties of the preparation. The preparation selected for this irritation test is the preparation with the highest concentration, which is a concentration of 15%. The technique used in this irritation test is a usage test. This irritation test was carried out on 15 volunteers. The cream with the highest concentration of 15% is applied to the skin behind the ear or on the bottom of the volunteer's arm and then left for 24 hours. After 24 hours counted from the first application, the reaction that occurs is observed. A positive irritation reaction is characterized by redness, itching, or swelling of the skin behind the ear or the lower part of the treated arm.

Determination of the Effectiveness of Scrub Preparations

Marked with the skin of the volunteers' hands covering an area of 2.5cm x 2.5cm and then cleaned with a fine tissue. The condition of the skin is measured using a skin analyzer which includes moisture content, softness (evcnness), pore size, blemishes (spots), wrinkles (wrinkles) on the skin before treatment. Apply the scrub preparation (±0.5 grams) to the marked area, leave for about ten minutes then rinse with water and measure again.

Apply Power Test

The application test is carried out to find out if the preparation has good applicability. The application test was carried out on each formula preparation by applying it five times on the back of the palm, good application power provides an intensive, even and homogeneous color when applied to the skin.

Hedonic Test

This preference test was carried out to find out the level of preference of the panelists for the preparations made. The larger the number of preference test panels, the better. In this study, the number of respondents was 15 people. Each respondent gave an assessment of each body scrub based on its texture/shape, and scent

Information:

Really like 5

Like 4

Kinda like 3

Dislike 2

Very dislike 1

3. Physical Quality Stability Testing of Powder Scrub Preparation

Physical quality stability testing of scrub preparations is carried out for 2 weeks. The test was carried out on the 1st, 7th, and 14th days which included organoleptic, moisture content, homogeneity, pH, drying time and adhesion.

1. Organoleptic Test

Organoleptic testing is carried out by looking at the color, smell, and shape of the scrub preparation made to see if it is stable after a 2-week storage period. The results of the organoleptic test are as seen in Table 6.

2. Homogeneity Check

Homogeneity affects the effectiveness of therapy because it is related to the same level of the drug in each use, if the preparation is homogeneous, the level of the active substance at the time of use is assumed to be the same, each part of the active substance must have the same opportunity to occupy the therapeutic place, on the contrary, each part of the therapeutic site has the same opportunity to be in contact with the active substance, This condition can be achieved when the preparation is homogeneous

Table 2. Homogeneity Test Observation Results

Formula	Homogeneity Observation
F0 (blanko)	Homogen
F1	Homogen
F2	Homogen
F3	Homogen

Homogeneity checks on the blanks showed that the preparation showed the presence of coarse grains when the preparation was applied to transparent glass. Homogeneity checks against the F0, F1, F2, and F3 formulas showed that the coffee particles were evenly mixed when the preparation was applied to transparent glass. This shows that the preparations made have a homogeneous arrangement.

Emulsion Type Determination

The results of the test type of emulsion of body scrub cream preparations, for all cream preparations show that the blue color of methyl can be homogeneous or evenly dispersed in the cream so that it can be proven that the cream preparations made have an oil-in-water emulsion type (m/a). The same results were also shown by dilution testing, where the cream can be diluted with water. So that the cream made is of the type of emulsion m/a. (oil emulsion in water).

Observation of Stability of Preparations

The instability of the formulation can be detected in several ways with a change in the physical appearance, color, smell, taste and texture of the formulation. Generally, an emulsion is considered physically unstable if all or part of the deep phase liquid is not emulsified and forms a different layer on the surface or base of the emulsion. Therefore, it is necessary to conduct an evaluation test for 6 weeks and is considered the minimum stability that an emulsion must have. Evaluation of the stability of the preparation is carried out during 6 weeks of storage with observation intervals of every 0 (completed making), 2, 4, and 6 weeks. Body scrub cream preparations are stored at room temperature and changes in odor, color and phase separation are observed. Based on the data obtained, it shows that each formula that has been observed for 6 weeks gives good results, namely no discoloration, odor and phase separation. The results of the stability evaluation of each parameter can be seen in Table 4.

Table 4.Stability Observation

Parameters	Formula	Time (week)		
		2	4	6
Color	F0 (blanko)	White	White	White
	F1 (5%)	Brown	Brown	Brown
	F2 (10%)	Brown	Brown	Brown
	F3 (15%)	Brown	Brown	Brown
Smell	F0 (blanko)	Typical	Typical	Typical
	F1 (5%)	Typical	Typical	Typical
	F2 (10%)	Typical	Typical	Typical
	F3 (15%)	Typical	Typical	Typical
Phase Separation	F0 (blanko)	No	No	No
	F1 (5%)	No	No	No
	F2 (10%)	No	No	No
	F3 (15%)	No	No	No

pH Measurement

The pH measurement of coffee peel scrub preparations was carried out using a ph meter, the results of the pH measurement of the body scrub cream preparation were obtained at the time of completion, the pH of the body scrub cream preparation was obtained F0: 5; F1: 6; F2: 6 ; F3: 6 ;. Meanwhile, after 6 weeks of storage, there was a change in the pH of each preparation of body scrub cream, namely F0: 5; F1: 6 ; F2: 6 ; F3: 6. After 6 weeks of storage, the pH obtained is still stable as when the preparation was made.

Irritation Test on Volunteers

Based on the results of the irritation test conducted on 20 volunteers, which was carried out by applying a scrub preparation on the back of the hand, it showed that all volunteers gave negative results on the irritant reaction parameters. The parameters observed were the presence of red skin, itching, or swelling. From the results of the irritation test carried out, it was concluded that the preparations made were safe to use. Volunteer skin irritation test applied cream to the skin on the forearm and left on for 24 hours.

Table 5. Results of Irritation Test on Volunteer Skin

Obs	Volunteer																			
	F0 (blank)					F1(5%)					F2(10%)					F3(15%)				
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Red	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
itchy	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Swollen	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Information:

(-) : non-irritating (+) : reddish skin (++) : itchy skin (+++) : swollen skin

From the table above, results were obtained that showed that there were no irritating effects in the form of itching, redness and swelling on the skin caused by the Arabica coffee bark scrub preparation applied to the skin.

Based on Table 5, it can be seen that the moisture content of all powder scrub formulas meets the requirements, which does not exceed 10%. All formulas show an increase in moisture content after 2 weeks of storage. This may be because the container where the powder scrub preparation is stored is not airtight, so the preparation can absorb the surrounding moisture. Formula F1 has the highest moisture content of all formulas, and F3 indicates the lowest formula. pH Test

The pH test results of powder scrub preparations can be seen in Table 6.

Table 6. pH Test Results of Powder Scrub Preparation

Formula	Day 1	Day 7	Day 14
F1	6,5	6,3	6,2
F2	6,5	6,3	6,2
F3	6,5	6,3	6,2

Based on Table 6, it can be seen that the pH of all formulated formulas is stable at 1 week of storage, and then drops after 2 weeks of storage. The pH test results meet the requirements, which are still within the limit 4.6 -6.5 pH scrubs that are too alkaline will cause scaly skin and if the pH is too acidic it will cause skin irritation

3. Homogeneity Test

The results of the homogeneity test can be seen in Table 7.

Table 7. Results of Homogeneity Test of Scrub Preparations

Formula	Parameter Particle		
	Day 1	Day 7	Day 14
F1	No Particle	No Particle	No Particle
	Uniform color	Uniform color	Uniform color
F2	No Particle	No Particle	No Particle
	Uniform color	Uniform color	Uniform color
F3	No Particle	No Particle	No Particle
	Uniform color	Uniform color	Uniform color

Based on Table 7, it can be seen that all powder scrub preparations have coarse

starch granules, the preparations are evenly distributed so that from the beginning of observation to the 14th day all formulas show the same results. All preparations are mixed well and there are coarse particles because in powder scrub preparations coarse grains are needed for scrubbing. If the cosmetic product is smooth and smooth, it cannot work to remove dead skin cells on the surface of the skin, therefore a coarse material is needed that can release dead skin cells from the skin.

4. Adhesion Test

Adhesion tests are performed to see how long it takes for a formula to adhere when used. The test results can be seen in Table 8.

Table 18. Results of Adhesion Test of Powder Scrub Preparation

Sample	Day 1 (second)	Day 7 (second)	Day 14 (second)
F1	2	2	2
F2	2	2	2
F3	2	2	2

Based on Table 11, it can be seen that the adhesion of all formulas for 2 weeks meets a good requirement, which is more than 1 second (Putri & Dewi 2022). The F1 and F2 formulas showed higher adhesion, after 2 weeks, while the F1 formula showed lower adhesion.

CONCLUSIONS

Based on the results of the study, it can be concluded that all formulated scrub formulas have met the requirements of good physical quality during 2 weeks of storage. In the organoleptic test of the color, shape and aroma of the preparation did not change, the moisture content had met the requirements of no more than 10%, and the pH of the preparation met the skin pH requirements of 4.6 -6.5. The homogeneity of the preparation has coarse starch granules and even preparations, t and also the adhesion test has met the requirements, which is greater than 1 second.

This study only tests the stability of the physical quality of the formulated scrub preparations, in the future there will be further research to test the effectiveness of scrub preparations to brighten the skin, antioxidant and antibacterial abilities as well as hedonic tests.

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