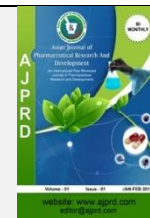


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Research Article

The Effectiveness of Pandan Wangi Leaves (*Pandanus Amaryllifolius* Roxb.) Body Scrub Formulation in Smoothing the Skin

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ABSTRACT

This study aims to formulate ethanol extract of pandan wangi leaves into a cream body scrub preparation and examining the effectiveness of body scrub in smoothing the skin by analyzing the moisture and evenness of volunteers' skin. This research was carried out by sample processing, extract making, formulating cream body scrub preparation by evaluating its consistency, color and odor (organoleptic), homogeneity, pH of preparation, spreadability, emulsion type, irritation test, stability and effectiveness test using skin analyzer. Cream scrub preparations were made with several concentrations, namely 1%, 2% and 3%. The results of the study showed that the ethanol extract of pandan wangi leaves (*Pandanus amaryllifolius* Roxb.) could be formulated in cream scrub preparations which show homogeneous preparations, pH ranging from 5.4-6.0, met the requirements for spreadability, was an oil in water emulsion type, did not irritate the skin and the preparations were stable during the accelerated stability test with cycling test method. Furthermore, the cream scrub preparations of Pandan wangi leaf extract can increase moisture and improve skin smoothness until 31.48% and show a significant different with another group test ($p \leq 0.05$).

Keywords: Body Scrub, Pandan wangi, *Pandanus amaryllifolius* Roxb.

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INTRODUCTION

Medicinal plants have traditionally been used to treat many diseases and to maintain health. In Southeast Asia, many plants are described as having traditional medicinal properties¹. One of the plants that can be used in cosmetics, namely pandan wangi leaves (*Pandanus amaryllifolius* Roxb.) is a tropical plant from the Pandanaceae family. Pandan leaves, often called pine needles, because they resemble pineapples with a spiral arrangement of green leaves that are long, narrow and string-shaped². Pandan leaves contain phytochemical compounds such as steroids, carbohydrates, phenols, is flavones, alkaloids, glycosides, amino acids and lot of vitamins³. The appearance and function of the skin are maintained by an important balance between the water

content of the stratum corneum and the lipids of the skin surface. Exposure to external factors as well as endogenous factors can interfere this balance. In addition, frequent use of unsuitable soaps, detergents and topical irritants. Disruption of the skin barrier causes various types of skin problems the most common condition is loss of moisture content which leads to dry skin such as rough, scaly and cracked skin. Topical treatment is needed to maintain moisture and skin health⁴. One example of skin care cosmetics is a scrub. Rubbing or scrubbing can remove dead skin cells which will allow skin to absorb moisturizer better to moisturize the skin, leaving the skin brighter and feeling soft. Just like skin cells on the face, skin cells in the body are also regularly replaced with healthy new cells under the skin. The process of regenerating these cells will slow down by the age goes by⁵.

MATERIALS AND METHODS

Materials and Tools

The materials used in this study were pandan wangi leaves (*Pandanus amaryllifolius* Roxb.), 96% ethanol, stearic acid, sorbitol, cetyl alcohol, propylene glycol, triethanolamine, methyl paraben, exfoliants, perfume, aquadest.

The tools used in this research are digital scales, drying cabinet, skin analyzer, mortar and pestle, glassware and pH meter.

Sample Processing

The pandan wangi leaves that have been taken are then sorted wet, washed with running water. After that, chopping

is done, then dried at a temperature of 40°C-60°C. Furthermore, the dried pandan wangi leaves are ground to a powder form⁶.

Extract Preparation

Pandan wangi leaves powder was macerated with 96% ethanol. A total of 500 grams of simplicia powder was put into a glass container, poured with 75 parts of ethanol closed, left for 5 days, the pulp was macerated again with 25 parts of ethanol for 2 days. Then filtered, the resulting filtrate was concentrated with the help of a rotary evaporator to obtain a thick extract⁷.

Cream Scrub Formula

The cream scrub formula can be seen in table 1.

Table 1: The Formula of Cream Scrub

Ingredients	F0 (g)	F1 (g)	F2 (g)	F3 (g)
Pandan wangi leaf ethanol extract	-	1	2	3
Stearic acid	12	12	12	12
Cetyl alcohol	0,5	0,5	0,5	0,5
Sorbitol	5	5	5	5
Propylene glycol	3	3	3	3
Triethanolamine	1	1	1	1
Methyl paraben	0,2	0,2	0,2	0,2
Exfoliant	5	5	5	5
Perfume	q.s	q.s	q.s	q.s
Aquadest ad	100	100	100	100

F : Formula

Cream scrubs are made by weighing all the ingredients that will be used. The mortar is heated using distilled water and then wiped dry. Put the ingredients of the oil phase (stearic acid and cetyl alcohol) in a porcelain cup and melted (mass no. 1). The aqueous phase (methyl paraben, propylene glycol, triethanolamine and sorbitol) was dissolved in hot aquadest (mass no. 2). Put the mass no. 1 mixture into the mortar and add little by little mass no. 2 and then grind it. Added ethanol extract of pandan wangi leaves, exfoliant little by little and perfume then mixed until homogeneous.

Evaluation of Cream Scrub Formula

The evaluation of the cream scrub formula was organoleptic test, homogeneity, pH of the preparation, spreadability, emulsion type, irritation test, cycling test stability for six cycles and effectiveness as a skin moisturizer. Organoleptic test is carried out to see the physical appearance of the preparation by observing the shape, color and odor of the preparation that has been made⁷.

The homogeneity test was carried out to see whether the preparations that had been made were homogeneous or not. By means of a cream scrub preparation is smeared on a transparent glass. Homogeneity is indicated by the absence of coarse lumps⁸.

Measurement of the pH value was carried out using a pH meter. The instrument was first calibrated using a neutral buffer solution and an acid buffer solution. Then the electrodes were washed with distilled water, and dried with a tissue. A total of 0.5 grams of cream scrub preparation was dissolved in 50 ml of distilled water in a glass beaker,

then dipped the electrode into the solution, left until the pH value was constant. The number shown by the pH meter is the pH of the preparation^{9,10}.

Spreadability test was carried out to ensure even distribution of cream scrub preparations when applied to the skin. A total of 1 gram of the preparation was placed in the middle of a round glass, covered with another glass, and left for one minute, then the diameter of the spread was measured. After that, 50 grams, 100 grams and 150 grams were added and then measured the spreadability of the cream scrub preparation¹¹.

The emulsion type test was carried out by the staining method, by adding a little methylene blue to the cream scrub preparation on a glass object. If the methylene blue is evenly distributed, it means that the preparation is an oil-in-water (o/w) emulsion type, but if only blue spots are found, it means that the preparation is a water-in-oil (w/o) emulsion type¹².

Stability test was done by cycling test method. This test uses 2 different temperatures, namely low temperature and high temperature. The cream scrub preparations were stored at 4°C for 24 hours and continued by storing at 40°C for 24 hours counting one cycle for 48 hours¹³.

The irritation test was carried out by means of a cream scrub preparation applied to the back of the ear for 24 hours. A positive irritation reaction is indicated by the presence of redness, swelling or itching in the treated area¹¹.

Moisture Effectiveness Test

Moisture effectiveness test was conducted on 15 volunteers who were divided into 5 groups. Each volunteer was given a scrub cream containing ethanolic extract of pandan wangi leaves, and carried out for 4 weeks using a cream scrub twice a week. Each volunteer was measured for water content and smoothness using a skin analyzer on the skin first, then a cream scrub preparation was given to the skin area of the volunteer's elbow. Re-measurements were carried out on the skin of volunteers' hands using a skin analyzer to see an increase in the level of moisture and skin smoothness.

RESULTS AND DISCUSSION

Evaluation Results of Cream Scrub Preparations

Cream scrub preparations are made by adding pandan wangi leaves extract as a nutritious substance to moisturize the skin. The concentration of ethanolic extract of pandan wangi leaves used were 1%, 2%, and 3%. The results of the evaluation of cream scrub preparations can be seen in tables 2, 3, 4 and 5 below:

Table 2: Organoleptic test results for cream scrubs

Observation	F0	F1	F2	F3
Form	Semi-solid	Semi-solid	Semi-solid	Semi-solid
Color	White	Green	Green	Dark green
Odor	Vanilla	vanilla	Vanilla	Vanilla

Table 3: The results of the average pH values before and during the cycling test

Formula	Homogeneity Observation						
	Before	Cycle 1	Cycle 2	Cycle 3	Cycle 4	Cycle 5	Cycle 6
F0	6,0	6,0	6,0	6,0	6,0	6,0	6,0
F1	5,9	5,9	5,9	5,8	5,8	5,8	5,7
F2	5,8	5,8	5,8	5,7	5,7	5,6	5,5
F3	5,7	5,7	5,7	5,6	5,4	5,4	5,3

Table 4: The results of the test for the spreadability of the cream scrub

Observation	Before Cycling Test				After Cycling Test			
	F0	F1	F2	F3	F0	F1	F2	F3
0 gram	5,0 cm	5,1 cm	5 cm	5,0 cm	5,2 cm	5,3 cm	5,1 cm	5,2 cm
50 grams	5,1 cm	5,5 cm	5,2 cm	5,3 cm	5,8 cm	5,6 cm	5,7 cm	5,5 cm
100 grams	5,6 cm	5,6 cm	5,5 cm	5,4 cm	5,9 cm	5,8 cm	5,8 cm	5,6 cm
150 grams	5,8 cm	5,8 cm	5,6 cm	5,6 cm	6,1 cm	6,0 cm	6,0 cm	5,9 cm

Description: (+) : soluble methylene blue (-) : insoluble methylene blue

Table 5: Observation results of cream scrub stability

Observation	Formula	Cycle					
		1	2	3	4	5	6
Form	F0	-	-	-	-	-	-
	F1	-	-	-	-	-	-
	F2	-	-	-	-	-	-
	F3	-	-	-	-	-	-
Color	F0	-	-	-	-	-	-
	F1	-	-	-	-	-	-
	F2	-	-	-	-	-	-
	F3	-	-	-	-	-	-
Odor	F0	-	-	-	-	-	-
	F1	-	-	-	-	-	-
	F2	-	-	-	-	-	-
	F3	-	-	-	-	-	-

Description: (-): no changes (+): there are changes

The organoleptic results showed that the cream scrub was semi-solid, green to dark green in color and odor of vanilla. Homogeneity examination showed that the preparation of ethanol extract cream of pandan wangi leaves had good homogeneity. homogeneity test to ensure that the active substance contained in it has been evenly distributed¹⁴.

The pH results of the cream scrub during the six cycles of storage showed quite stable results and met the requirements because they were in the pH range between 5.3-6.0. high degree that the topical product must be

acidified and have a pH in the range from 4 to 6¹⁵.The spreadability test was carried out to see the ability of the cream scrub preparation to spread when applied to the skin. The results of the measurement of the spreadability of the cream scrub have a good spreadability when applied to the skin and meet the requirements for the spreadability value of topical preparations, namely 5-7 cm¹².

The emulsion type test showed that the methylene blue color could be evenly distributed in all formulas, so it could be concluded that the cream scrub preparation was oil in

water (o/w) type. Preparations with the type (o/w) have the advantage that they are less sticky and easy to remove by washing and are easier to apply to the skin and leave a comfortable feeling compared to cream preparations of the water in oil (w/o) type¹¹. Stability observations showed that each formula that had been observed for six cycles gave good results, namely no change in color, odor and phase separation. In general, an emulsion is considered physically unstable if all or part of the preparation forms a distinct layer on the surface or base of the emulsion in a preparation^{16,17}. From irritation test, can be seen that the

results of all cream scrubs do not cause irritation such as redness, swelling and itching of the volunteers' skin. The irritation test of a preparation is a very important test of the quality of the preparation after application, it should not irritate the skin in order to be accepted to be used¹⁸.

Moisture Effectiveness Test Results

Measurement of the effectiveness of moisture is done by looking at the moisture content and skin smoothness of volunteers. The measurement results can be seen in tables 6 and 7 below:

Table: 6: Results of the percentage increase moisture content on the skin of volunteers

Formula	Moisture (week)			
	% Enhancement			
	After Week 1	After Week 2	After Week 3	After Week 4
F0	4,62	7,71	12,33	13,85
F1	6,65	16,65	23,30	31,65
F2	13,81	27,57	43,09	60,37
F3	17,53	35,05	54,37	66,63
+ Control	25,89	46,28	68,50	90,72

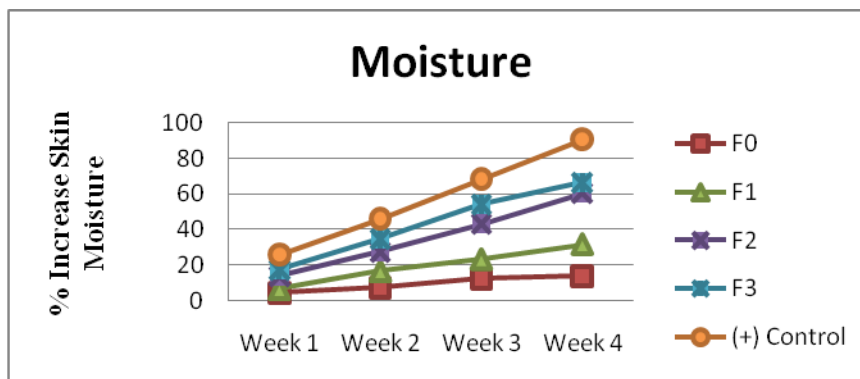


Figure: 1: Graph of the percentage increase in skin moisture

Based on the results of measurements of the water content of the volunteers' skin, it was shown that during four weeks of treatment using a cream scrub twice a week on a regular basis, it could increase the water content of the volunteers' skin. Cream scrub preparations with a higher concentration of pandan wangi leaf extract gave a greater effect on increasing the water content of the skin. The results of the percentage of recovery of the skin moisture content of volunteers who have the largest percent recovery in the fourth week are cream scrub with ethanol extract of pandan

wangi leaves F3 (3%) which is 90,72% and cream scrub which produces the smallest effect seen in cream scrub F0 (blank) which is 13,85%. Pandan wangi leaves contain sugars such as glucose and fructose which are humectants that are able to bind water from the air so that it can reduce water evaporation from the skin so that skin moisture will be maintained and the skin will not easily become dehydrated and dry². Based on data analysis, the use of cream scrub after four weeks of using F3 had a significant difference in increasing the moisture of the skin ($p \leq 0,05$).

Table: 7: Percentage results of skin smoothness improvement

Formula	Smoothness (week)			
	% Recovery			
	After Week 1	After Week 2	After Week 3	After Week 4
F0	2,01	4,03	6,04	12,75
F1	3,92	7,84	12,43	18,96
F2	6,92	12,58	17,62	23,28
F3	8,04	16,67	23,46	31,48
+ Control	12,18	24,39	32,93	42,68

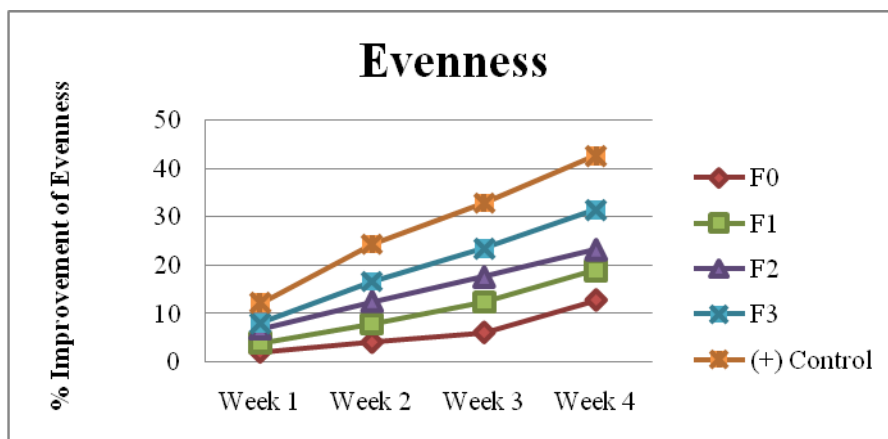


Figure 2: Graph of the percentage improvement in skin smoothness

The cause of dry skin is the lack of oil production by the skin's sebaceous glands. Some of the reasons for dry skin are environmental factors such as dry climate, sun exposure and population¹⁷. After using the ethanol extract cream of pandan wangi leaves for four weeks of use, it can be seen that the pandan wangi leaves ethanol extract cream scrub has an effect on improving skin smoothness. Each formula has its own improvement. The results of the percentage improvement in skin smoothness in the fourth week that the preparation of the cream of ethanol extract of pandan wangi leaves extract F3 (3%) had a large percentage of skin smoothness improvement, namely 31,48% compared to F1 and F2. Based on data analysis, the use of cream scrub after four weeks of using F3 had a significant difference in improving skin smoothness on the skin ($p \leq 0,05$).

CONCLUSION

The ethanol extract of pandan wangi leaves (*Pandanus amaryllifolius* Roxb.) can be formulated in cream scrub preparations that meet the requirements for physical evaluation of the preparation. F3 cream scrub (3%) had the largest percentage increase in moisture, which was 90, 72% and improved skin smoothness, which was 31,48%. Based on the results of data analysis after four weeks of use on F3 there was a significant difference towards another group of test ($p \leq 0.05$).

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