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Formulation and Evaluation of Body Scrub Cream Containing Ethanol Extract of Black Cumin Seeds (*Nigella sativa* L.) and Coffee Grounds (*Coffea arabica* L.) as Anti-aging

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Abstract. Cosmetics are now mandatory for most women. Various natural ingredients have now been used as basic ingredients for beauty treatments. This study aimed to formulate and determine the effectiveness of body scrub cream preparations containing ethanolic extract of *N. sativa* and coffee grounds as antiaging. The skin antiaging was divided into five formulas: F0 (cream base), F1 (coffee ground 5%), F2 [coffee ground 5% + Ethanol Extract of N. *sativa* (EENS) 2%], F3 (coffee ground 5% + EENS 3.5%) and F4 (coffee ground 5% + EENS 5%). The body scrub cream preparations were subjected to organoleptic, homogeneity, emulsion type, and pH evaluation. The irritation test and antiaging activity were evaluated by using a skin analyzer. The body scrub was stable in 12-week storage. The result showed that there was no irritation on the volunteers' skin. The body scrub cream with the highest antiaging activity was the F4 formula. It showed 9.6% for increasing skin moisture, 17.68% for increasing skin smoothness, 11.42% in reducing the size of pores and 12.84% in reducing the number of spots.

Keywords: *N. sativa*, Coffee Grounds, Body Scrub Cream, Antiaging.

Abstrak. *Kosmetik saat ini menjadi barang wajib bagi sebagian besar perempuan. Berbagai bahan alami kini telah banyak digunakan sebagai bahan dasar perawatan kecantikan. Penelitian ini dilakukan bertujuan untuk memformulasi dan mengetahui efektivitas sediaan krim body scrub yang mengandung ekstrak etanol N. sativa dan ampas kopi sebagai antiaging pada kulit. Sediaan krim body scrub dibuat dalam lima formula: F0 (dasar krim), F1 (ampas kopi 5%), F2 (ampas kopi 5% + EENS 2%), F3 (ampas kopi 5% + EENS 3.5%) dan F4 (ampas kopi 5% + EENS 5%). Evaluasi sediaan krim body scrub meliputi pemeriksaan organoleptis, homogenitas, tipe emulsi, analisis pH. Uji iritasi dan uji efektivitas antiaging menggunakan skin analyzer. Body scrub stabil dalam penyimpnana setelah 12 minggu. Hasil penelitian mennjukkan tidak ada iritasi pada kulit relawan. Krim body scrub yang memiliki aktivitas paling tinggi pada formula F4 dengan rata-rata persentase 9,6% pada peningkatan kelembapan kulit (moisture), 17,68% pada peningkatan kehalusan kulit (evenness), 11,42% pada penurunan besar pori-pori (pore) dan 12,84% pada penurunan jumlah noda (spot).*

Kata Kunci: EENS (ekstrak etanol N. sativa), Ampas Kopi, Krim Body Scrub. Antiaging.

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1. Introduction

Skin is the largest organ in the body and serves as a barrier to the entry of microbes into the body. The skin consists of three layers namely the epidermis, dermis and hypodermis. The structure of the skin is composed of an intricate network that serves as the body's initial barrier against pathogens, UV rays, chemicals and mechanical injuries plant contains flavonoids that play a role in stopping the cell cycle, inducing apoptosis, suppressing cancer cell proliferation, and suppressing the invasion process [1], [2]. Skin damage will interfere with human health and appearance, so the skin needs to be protected and maintain its health. The process of skin damage is characterized by the appearance of wrinkles, scales, dryness, and cracks. One of the things that cause skin damage is free radicals [3].

Cosmetics have now become a necessity that is considered important for some people [4]. The use of scrubs from coffee grounds by the public has long been known. The use of scrubs for women is an effort to take care of the skin. The body scrub is a cosmetic product that contains slightly abrasive ingredients that can remove dead skin cells [5]. It is a cosmetic used for body care that has an exfoliant function that can remove dead skin cells, clean and remove dirt, hydrate the skin, and make the skin smooth and soft [6]. The use of body scrubs can overcome dry and dull skin without causing side effects on the skin [7].

Currently, herbal ingredients are indispensable in the cosmetic industry. The use of these herbal ingredients provides essential nutrients for skin health and positively affects the skin's biological functions such as anti-inflammatory and antioxidant [8]. Coffee grounds can be used as a body scrub because it as natural scrub granules. The caffeine contained 3.59 to 8.09 milligrams per gram of coffee grounds [9] which can act as a vasoconstrictor (act as tightening and shrinking blood vessels) [10]. Black cumin seeds contain vitamin B3 which can stimulate the skin to build ceramides that maintain skin moisture [11].

Based on the vitamin, mineral, and high antioxidant content in coffee grounds and black cumin, we are interested in using coffee grounds as an active component of skin abrasives and black cumin ethanol extract as an antiaging component in body scrub creams. The body scrub cream was made by varying the concentration of 2% black cumin ethanol extract; 3.5%; and 5%, followed by characterization tests (organoleptic, homogeneity, pH test, emulsion type determination test) on body scrub cream preparations. Body scrub cream meets the requirements followed by testing for irritation and antiaging effectiveness on volunteer skin [4].

2. Methods

2.1 Materials

Aquadest, cetyl alcohol, coffee grounds, ethanol 96%, ethanol extract of *N. sativa*, methylparaben, propylene glycol, stearic acid, sorbitol and triethanolamine.

2.2 Plants material

N. sativa was obtained from Medan, North Sumatera. The plant was identified by Herbarium Medanese (MEDA) University of Sumatera Utara, Indonesia.

2.3 Extraction material

The extract was prepared by the maceration method. Briefly, the *N.* sativa seeds materials were cut, dried and ground. Then 500 g of the sample was soaked in ethanol at 3.75 L, then filtered after 5 days. Again, the residue was soaked in ethanol at 1.25 L and filtered after another 2 days. Thereafter, the combined filtrates were evaporated to remove the solvent and to obtain ethanol extract of *N. sativa.*

2.4 Formula cream body scrub

The preparation of a cream base is carried out according to the cream position of the formula shown in Table 1**.**

Table 1. Formula of body scrub

Materials	Formula % (w/w)				
	0	1	2	3	4
ethanol extract of *N. sativa*	0	0	2	3.5	5
stearic acid	15	15	15	15	15
cetyl alcohol	1	1	1	1	1
sorbitol	5	5	5	5	5
prophylene glycol	3	3	3	3	3
trietanolamine	1	1	1	1	1
methyl paraben	0.1	0.1	0.1	0.1	0.1
coffee grounds	5	5	5	5	5
aquadest up to	100	100	100	100	100

Description:
F0 : base cream
F1 : coffee ground 5%
F2 : coffee ground 5% + EENS 2%
F3 : coffee ground 5% + EENS 3.5%
F4 : coffee ground 5% + EENS 5%

2.5 Preparation of cream body scrub

The oil phase consisted of stearic acid, cetyl alcohol and methylparaben and was mixed over a water bath (70°-75°C) (mass I). The water phase consisting of propylene glycol, aquadest, triethanolamine and sorbitol was dissolved in hot water at 70°C (mass II). Then the first mass was put into a mortar that had been heated, and the second mass then was added little by little and then mixed constantly until the cream mass formed. Ethanol extract of *N. sativa* and coffee grounds were added and mixed until homogeneous.

2.6 Evaluation of body scrub cream

Organoleptic Test

Organoleptic testing is done visually. The colour, odour, and consistency of body scrub cream preparations at 25°C were observations.

Homogeneity Test

To clarify the homogeneity of body scrub preparations, homogeneity testing was carried out using a preparation glass.

pH Evaluation

The pH evaluation was carried out using a pH meter (ATC). The sample made in 1%, i.e 0.25-gram sample, was dissolved in 25 mL aquadest. The acceptable pH is in the range 4.5-6.5 [12].

Evaluation of Irritation

The irritation test on the volunteer's skin was carried out by applying a body scrub cream preparation on the back of the hand. Parameters observed were redness, itching, and skin swelling at the time of application of the preparation.

2.7 Effectiveness of Body Scrub

Testing the effectiveness of the body scrub cream was carried out on 15 volunteers and divided into five groups, namely:

Group I : 3 volunteers for cream F0
(Cream base)
Group II : 3 volunteers for cream F1
(Cream base with coffee grounds)
Group III : 3 volunteers for cream F2
(*N. sativa* extract at the concentration of 2 %)
Group IV : 3 volunteers for cream F3
(*N. sativa* extract at the concentration of 3.5 %)
Group V : 3 volunteers for cream F4
(*N. sativa* extract at the concentration of 5 %)

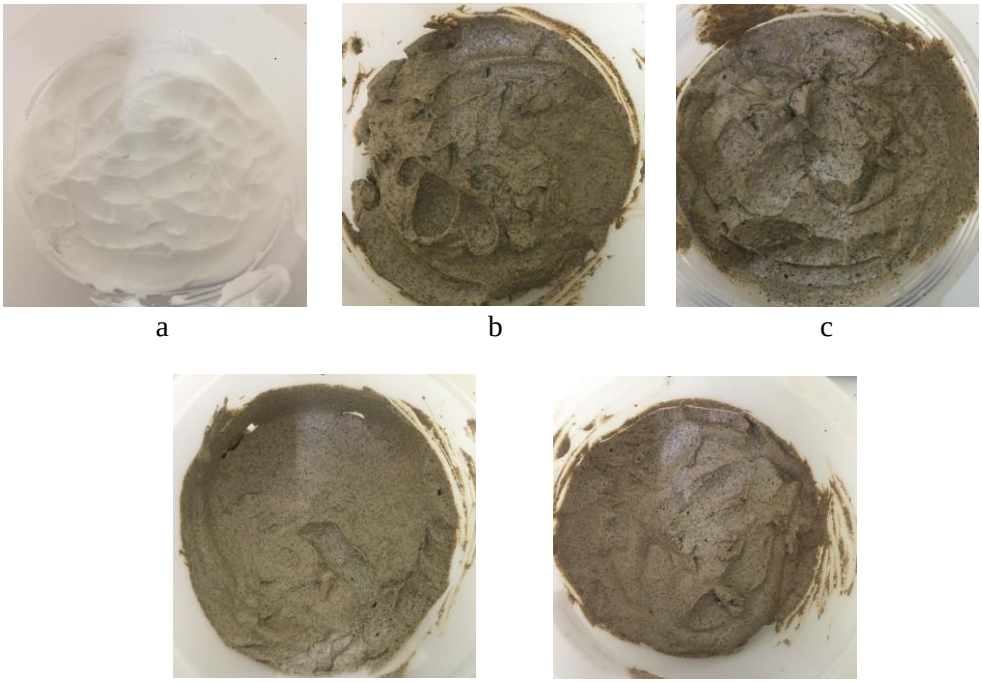
The initial skin conditions of all volunteers were measured before the application of the body scrub creams with the frequency of use once a week for one month. Then on the test area, a body scrub cream is applied and spread as much as 1 g over the surface of the skin of the hands of an area of 5.0 x 2.5 cm to form a uniform thin layer with a thickness of 1 mm, the tests carried out include moisture, blemishes, pores and smoothness test using a skin analyzer.

3. Result and Discussion

3.1 Evaluation of body scrub cream

Organoleptic is one of the quality control preparations creams. The results of observations of the type of emulsion in the body scrub cream preparation can be seen in Figure 1. Organoleptic

observations show that the colour and odour of the cream base and each formula did not change and did not undergo phase separation during the storage [13].

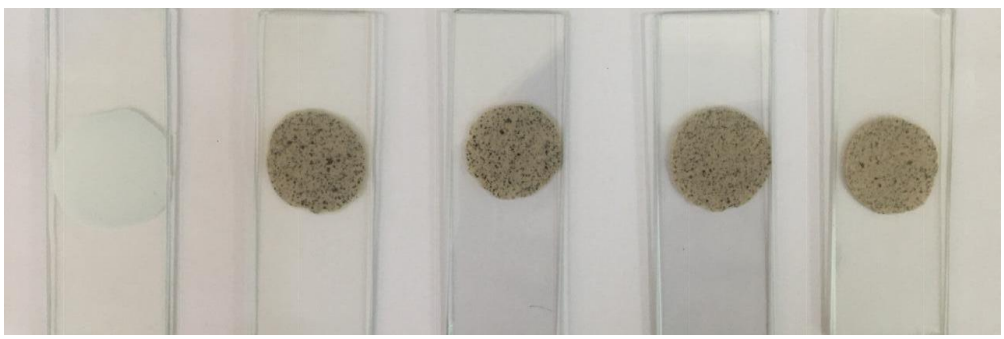


a b c

d e

Figure 1. Organoleptic test. (a) F0; (b) F1; (c) F2; (d) F3 and (e) F4

The homogeneity test was carried out on the preparations. The results of the homogeneity examination of the preparation F0 (cream base without extract and pulp) show that the preparation did not show any coarse grains when the preparation was smeared on transparent glass. The homogeneity examination of F1, F2, F3, and F4 show that the coffee grounds particles were mixed evenly when the preparation was smeared on a transparent glass. Homogeneity affects the effectiveness of preparation due to the relationship with the level of the active substance used in each use. If the preparation is homogeneous, then the content of the active substance to be used in each application of the preparation is assumed to be the same. The homogeneity test is declared good if the preparation has an even texture and does not clot [14].



a b c d e

Figure 2. Homogeneity test. (a) F0; (b) F1; (c) F2; (d) F3; (e) F4

The results of observations of the type of emulsion in the Body Scrub cream preparation can be seen in Figure 3. Based on the results of the emulsion type test, basic cream and formulas were O/W emulsions, because the methylene blue dye was soluble in the outer phase, namely the water phase of the O/W emulsion. O/W type cream has the advantage that it is not easy to stick and easy to wash with water [13].

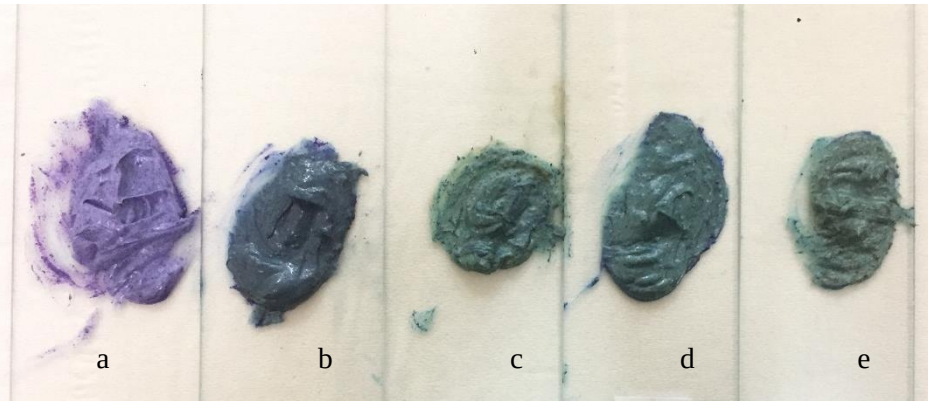


Figure 3. Type of emulsion. (a) F0; (b) F1; (c) F2; (d) F3; (e) F4

The results of the pH test on the preparation can be seen in **Table 2**. Based on the results, there was a decrease in the pH of the preparation, this may be due to the acidic properties of the ingredients contained. However, the pH of the Body Scrub cream preparations still showed a pH that followed normal skin pH, which was between 4.5-6.5 [12].

Table 2. pH Evaluation

Formula	Week											
	1	2	3	4	5	6	7	8	9	10	11	12
F0	6	6	6	6	6	6	5.9	5.9	5.9	5.9	5.9	5.9
F1	5.9	5.9	5.9	5.9	5.9	5.8	5.8	5.8	5.7	5.7	5.7	5.7
F2	5.8	5.8	5.8	5.8	5.8	5.7	5.7	5.7	5.7	5.7	5.7	5.7
F3	5.8	5.8	5.8	5.8	5.7	5.7	5.7	5.7	5.6	5.6	5.6	5.6
F4	5.7	5.7	5.7	5.7	5.6	5.6	5.6	5.6	5.6	5.5	5.5	5.5

The irritation test on the volunteer's skin was carried out by applying a body scrub cream preparation on the back of the hand. Parameters observed were redness, itching, and skin swelling at the time of application of the preparation. The result shows that all volunteers gave negative results on the irritation reaction parameters, so it was concluded that the preparations made were safe to use.

3.2 Antiaging test

The antiaging effectiveness test conducted on body scrub cream preparations aimed to see how much influence the use of cream has on the skin during treatment. Observations were made by observing the skin condition of 15 volunteers starting from the initial conditions (before treatment) for approximately one month. Observations were made using the Aramo-SG skin analyzer. The results of the antiaging effectiveness test can be seen in Figure 4.

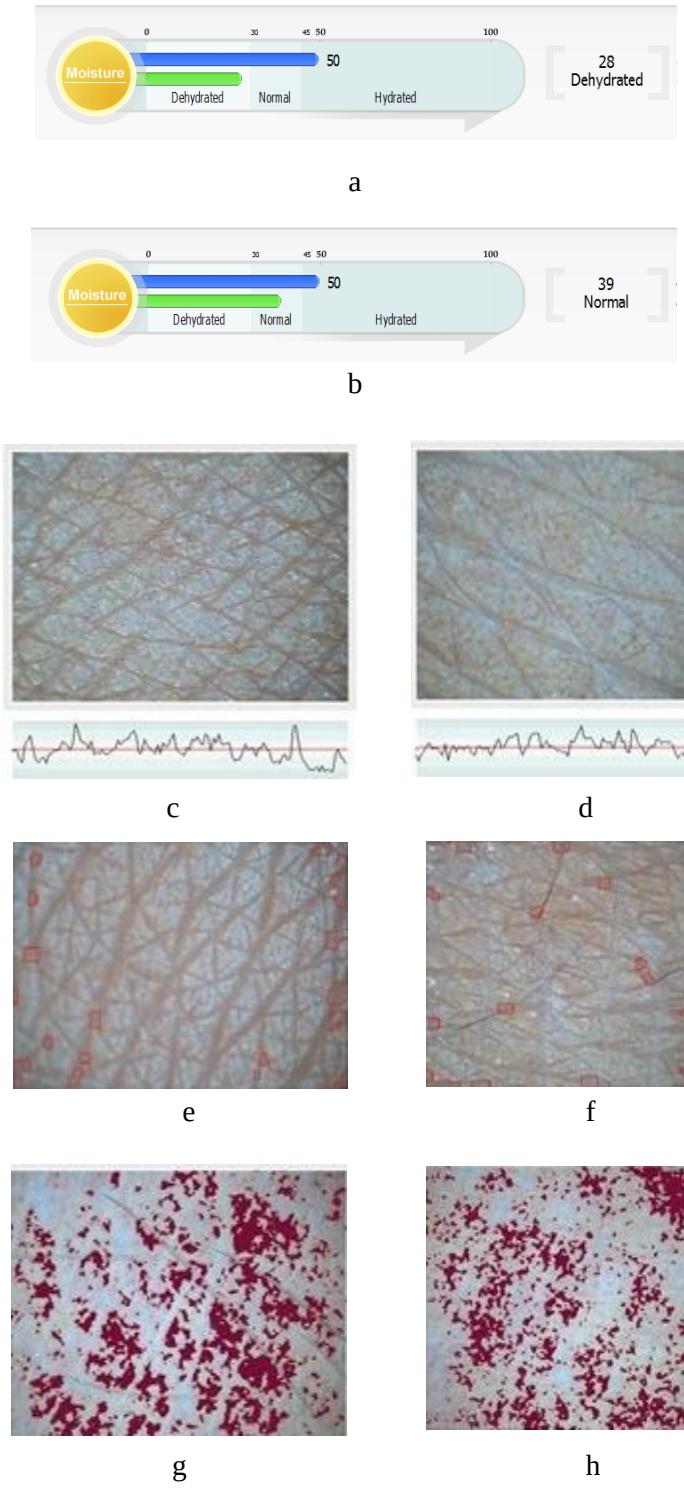


Figure 4. The antiaging activity of body scrub creams. (a), (c), (e) & (g) initial condition; (b) skin moisture treatment with F4 after four weeks; (d) skin smoothness (evenness) treatment with F4 after four weeks; (f) skin pores treatment with F4 after four weeks; (g) skin spots treatment with F4 after four weeks

The anti-ageing activity of body scrub coffee grounds and ethanol extract of black cumin by testing the humidity is shown in Figure 4a. Observations made before and after being treated for four weeks showed no increase in moisture on the skin of volunteers with a significance value of $p>0.05$, which can be seen in Figure 4b. The results of the skin smoothness test on the preparation show an increase in smoothness with a significant difference ($p<0.05$). Tests on

pore size showed a change in size with a significance value of <0.05. The results also show that the use of cream scrub body scrub after four weeks showed a reduction in the number of stains with a significant value of p<0.05, which can be seen in Figure 4h.

4. Conclusion

The preparation of Coffee Scrub Body Scrub cream and *N. sativa* ethanol extract showed an antiaging effect by increasing softness, and smoothness, decreasing pore size, and increasing the number of stains. The best results were found using *N. sativa* ethanol extract with a concentration of 5%.

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