Formulation and Evaluation of the Physical Properties of Clay Mask Containing Ethanol Extract of *Kenikir* (Cosmos caudatus) Leaves

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ABSTRACT

The demand for natural-based cosmetic products continues to increase due to their perceived safety and minimal side effects. Kenikir leaves (Cosmos caudatus Kunth) are known to contain active compounds such as flavonoids, tannins, and phenols, which have antioxidant potential and can be utilized in facial mask preparations. This study aims to formulate a clay mask preparation from the ethanol extract of kenikir leaves and evaluate its physical properties. The extract was obtained through maceration using 96% ethanol, and then formulated into three concentrations: F1 (0.5%), F2 (1%), and F3 (2%). The evaluation of the preparation included organoleptic tests, adhesion test, spreadability test, and pH measurement. The results showed that F1 had a pH of 6, adhesion time of 2 seconds, and spreadability of 5.3 cm. F2 had a pH of 6, adhesion time of 2 seconds, and spreadability of 5.2 cm. F3 had a pH of 6, adhesion time of 4.6 seconds, and spreadability of 5 cm. The evaluation results indicated that all clay mask formulations met the physical quality criteria for clay masks.

Keywords: *Clay Mask, Cosmos caudatus Leaves, Formulation*

INTRODUCTION

Skin damage caused by free radicals can lead to various negative effects, such as premature aging, skin cancer, and a decline in immune system function (Haerani et al., 2018). The skin plays an important role not only as a physiological protector of the body but also in influencing appearance, making skin health maintenance essential (Anikata, 2021).

Antioxidants are chemical compounds that neutralize the harmful effects of oxidation caused by free radicals. Several groups of compounds, such as flavonoids, polyphenols, and phenolics, are known to have potential as natural antioxidants. The use of plant-derived antioxidants is currently considered safer compared to synthetic antioxidants (Rompis et al., 2019).

One plant known as a source of natural antioxidants is kenikir leaves (*Cosmos caudatus* Kunth), which contain various active compounds such as flavonoids, polyphenols, tannins, quinones, phenols, saponins, and steroids (Abidin et al., 2024). The effectiveness of antioxidant compounds increases when applied in topical formulations, as the active ingredients can directly interact with the skin surface and maintain their activity longer than oral preparations (Rompis et al., 2019).

One effective cosmetic formulation for delivering topical antioxidants is the clay mask. This type of mask typically uses base materials such as bentonite or kaolin. Clay masks are popular because they support skin regeneration, provide a tightening effect as they dry, and help cleanse pores of dirt and blackheads upon rinsing (Indriastuti et al., 2022).

METHODE

analytical balance (Ohaus), maceration apparatus, pH meter, filter paper, glass stirring rod, Erlenmeyer flask, mortar and pestle, test tubes, spreadability test apparatus, adhesion test apparatus, and rotary evaporator (Biobase). Materials used in the study were: kenikir leaves (*Cosmos caudatus* Kunth) obtained from the researcher's garden in Dasan Erot, Selong District, East Lombok; distilled water (aquadest), bentonite, dimethylol-5,5-dimethyl (DMDM) hydantoin, 96% ethanol, essential oil, kaolin, glycerin, xanthan gum, Dragendorff reagent, 2N hydrochloric

acid (HCl), ferric chloride ($FeCl_3$), magnesium, and hydrochloric acid (HCl).

Preparation of Simplicia

Kenikir leaves (*Cosmos caudatus* Kunth) totaling 3.5 kg were collected, followed by wet sorting, cleaning, washing, and slicing. The samples were dried under direct sunlight while covered with a black cloth. Once dried, the samples were ground into powder.

Preparation of Kenikir Leaf Ethanol Extract

A total of 500 grams of simplicia were extracted using the maceration method with 96% ethanol as the solvent in a closed container at room temperature for 3 days. The resulting extract was filtered using filter paper and then evaporated using a rotary evaporator.

Clay Mask Preparation

Table 1. Clay Mask Formulation

Bahan	Penimbangan (% b/b)		
	F1	F2	F3
Ekstrak Etanol Daun Kenikir	0,5	1	2
Kaolin	20	30	40
Bentonit	6	6	6
Glycerin	2	2	2
DMDM Hydantoin	0,2	0,2	0,2
Xatan Gum	0,75	0,75	0,75
Essence Oil	qs	qs	qs
Aquadest	Add (100)	Add (100)	Add (100)

Bentonite was dissolved with dimethylol-5,5-dimethyl (DMDM) hydantoin using hot water and allowed to stand for 15 minutes before being transferred into a mortar. Xanthan gum, which had been previously dissolved in distilled water, was added and ground until homogeneous. Next, kaolin that had been previously ground and moistened with glycerin was gradually added into the mortar while continuously stirring until a homogeneous mixture was obtained. Finally, the ethanol extract of kenikir leaves (*Cosmos caudatus* Kunth) and essential oil were added and ground until the mixture was uniform.

Clay Mask Evaluation

Organoleptic Test

The organoleptic test was conducted to observe the physical appearance of the preparation by examining the form, color, and odor of the formulated mask.

pH test

The pH test was carried out to determine the pH of the clay mask using pH paper. Each formulation must fall within the acceptable pH range for skin, which is 4.5–6.5 (Tanjung & Rokaeti, 2020)

Spreadability Test

One gram of each formulation was placed on graph paper covered with a transparent acrylic sheet. The sample was then covered with another transparent acrylic sheet, and the diameter was measured. The preparation was allowed to stand for 1 minute, and the final diameter was recorded.

Adhesion Test

One gram of the preparation was applied onto a glass plate mounted on an adhesion testing device. A second glass plate was then placed on top until it adhered completely. A weight of 100 grams was applied for 5 minutes. Afterward, a detachment load of 80 grams was applied, and the time taken for the two plates to separate was recorded (Yusuf et al., 2022)

RESULTS AND DISCUSSION

Simplicia Preparation

The preparation of *kenikir* leaf simplicia involves several essential steps aimed at producing high-quality and safe raw materials. Fresh and unwilted *kenikir* leaves were selected for use. To obtain 500 grams of simplicia powder, approximately 3.5 kg of fresh *kenikir* leaves were required.

Pembuatan Ekstrak

The extraction process was carried out using the maceration method for three days with 96% ethanol as the solvent, applied to 500 grams of simplicia powder. This process yielded 64.39 grams of extract. The obtained extract was characterized by a dark brown color and a strong distinctive aroma of *kenikir* leaves. The yield obtained was 12.87%. According to the Indonesian Herbal Pharmacopeia, the minimum acceptable yield for ethanol as a solvent is 5.6%, thus this result meets the requirement. Furthermore, a yield above 10% is considered good, as a higher yield indicates a greater number of active compounds successfully extracted.

Organoleptic Test

The organoleptic test was conducted by observing the form, odor, and color of the *kenikir* leaf clay mask.

Table 2. Organoleptic Evaluation Results

Formulasi	Bentuk	Aroma	Warna
F1 (0,5 %)	Pasta kental	Aroma parfum	Coklat kehijauan
F2 (1 %)	Pasta kental	Aroma khas daun kenikir	Coklat kehijauan
F3 (2 %)	Pasta kental	Aroma khas daun kenikir lebih pekat	Coklat kehijauan

Formulations F1, F2, and F3 exhibited a greenish-brown color resulting from the natural combination of bentonite and *kenikir* leaf extract. Throughout the observation period, no significant

color changes were detected in any of the three formulations. The final color of the clay mask was strongly influenced by the proportion of bentonite and extract used. Bentonite tends to impart a brown hue, while the greenish-brown color of *kenikir* leaf extract contributes its own distinct tone. Therefore, the variation in the appearance of the formulations is determined by the balance between these two components.

pH Test

The pH test was conducted to determine the acidity level of the formulation. A pH value that is too high (alkaline) can cause the skin to become scaly and uncomfortable, while a pH that is too low (acidic) may cause skin irritation.

Table 3. pH Evaluation Results

Replikasi	Formulasi		
	F1	F2	F3
Replikasi 1	6	6	6
Replikasi 2	6	6	6
Replikasi 3	6	6	6
Rata-rata	6	6	6

Observations showed that all three clay mask formulations prepared with ethanol extract of *kenikir* leaves had pH values within the safe range for skin, namely between 4.5 and 7.5. This range is a general standard for topical products, including cosmetics, to prevent irritation and to maintain the skin's natural protective barrier (acid mantle). Therefore, all formulations in this study met the pH requirements for topical skin preparations.

pH adjustment in clay mask formulations plays a crucial role, as it affects the chemical stability, effectiveness of the active ingredients, and user comfort. Maintaining pH stability is essential to ensure the product remains safe and pleasant to use throughout storage and application (Ananda et al., 2024)

Spreadability Test

The spreadability test aims to assess the ability of the formulation to spread on the skin. An ideal mask base should have good spreadability to ensure optimal delivery of active ingredients.

Table 4. Spreadability Test Results

Replikasi	Formulasi		
	F1	F2	F3
Replikasi 1	5,1 cm	4,9 cm	5,1 cm
Replikasi 2	5,9 cm	5,6 cm	5,0 cm
Replikasi 3	5,0 cm	5,1 cm	5,1 cm
Rata-rata	5,3 cm	5,2 cm	5,0 cm

The spreadability test results for the three formulations—F1, F2, and F3—showed variations in spread diameter across the formulas. These differences

were influenced by the varying concentrations of *kenikir* leaf ethanol extract used in each formulation. In general, an increase in extract concentration tended to reduce the spreadability value. This is due to the relatively thick consistency of the *kenikir* leaf extract, which, when added in higher amounts, increases the viscosity of the formulation and makes it more difficult to spread (Pradiningsih & Mahida, 2019). This phenomenon aligns with previous studies stating that the higher the concentration of a viscous active ingredient in a formulation, the lower its ability to spread across the skin surface (Ulandari & Sugihartini, 2020).

Adhesion Test

The adhesion test aims to assess the ability of the clay mask to adhere to the skin, which can influence the mask's ability to penetrate the skin and produce the desired effects.

Table 5. Adhesion Test Results

Replikasi	Formulasi		
	F1	F2	F3
Replikasi 1	2 Detik	2 Detik	4 Detik
Replikasi 2	2 Detik	2 Detik	5 Detik
Replikasi 3	2 Detik	2 Detik	5 Detik
Rata-rata	2 Detik	2 Detik	4,6 Detik

The adhesion test of the three clay mask formulations showed average adhesion times ranging from 1.0 to 4.6 seconds. The highest value was observed in formulation F3, which contained 40% kaolin, with an adhesion time of 4.6 seconds. These results indicate that the kaolin concentration plays a significant role in enhancing the adhesive properties of the formulation.

In general, the higher the kaolin content in the formulation, the stronger and firmer the adhesion of the clay mask. Conversely, lower kaolin concentrations tend to result in reduced adhesion, due to decreased viscosity and intermolecular cohesion within the formulation. Kaolin, as a base ingredient in clay masks, possesses absorbent and adhesive properties that help increase cohesion between particles in topical preparations.

CONCLUSION

Based on the evaluation of physical properties, all clay mask formulations containing ethanol extract of *kenikir* leaves (F1, F2, and F3) exhibited characteristics that meet the quality standards for clay mask preparations.

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