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Original Research Article

The Influence of Kenikir (*Cosmos caudatus* Kunth) Ethanol Extract Concentrations on Peel off Gel Formula and its Anti-Aging Effect

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ABSTRACT

Anti-aging is considered as an option to slow down or prevent the natural aging process in the body, including skin area. Kenikir (*Cosmos caudatus* Kunth) is known for its promising potential to be developed as a natural anti-aging alternative. The purpose of this research was to evaluate the effect of various concentrations of kenikir ethanol extract on the characteristics of peel off gel mask produced and its anti-aging effects. The ethanol extract was obtained by maceration. Various concentrations of ethanol extract (1, 3, and 5%) were inserted to the gel base containing Carbomer 940 as gelling agent and compared with the negative control. The organoleptic test, homogeneity, pH determination, drying time, irritation test and stability test were conducted to evaluate the gel characteristics. The anti-aging test was done using a skin analyzer. The results showed that all formulation had successfully produced a peel off gel mask with good characteristics which were homogenous, within range of normal skin pH (5.3 – 6), drying time of below 21 minutes, non-irritant and stable for 3 months. All formula demonstrated anti-aging effects which were pore size reduction, increase in moisture level, and reduction of dark spots and wrinkles. The results were dependent on the extract concentration. The peel off gel mask with kenikir extract was successfully developed and the highest extract concentration (5%) showed the maximum anti-aging effects.

***Keywords*:** Anti-aging, *Cosmos caudatus* Kunth, Peel off gel mask, Skin analyzer.

Introduction

There has been significant advancement and strategies to solve or slow down skin aging process as skin health and fairness are associated with good health condition in human. One of the strategies that has been widely implemented is the development in cosmetic area.[1] In the pharmaceutical industry, there are formulations that have been developed, such as cream,[2] peel off gel mask,[3] or phytosomal gel,[4] and nearly all of these formulations use natural plant sources as part of the ingredients.

Antioxidant is one of the solutions that can help prevent the aging symptoms.[5] Some active compounds in cosmetics for anti-aging purposes can slow down the anti-aging process through moisturizing mechanism, cell repair, UV absorption or eliminating free radicals.[6] Excess free radicals can lead to oxidative stress which has a significant role in the aging process.[7] In Indonesia, there are large numbers of plants with antioxidant effect which can be developed into anti-aging formulation.[8] Kenikir (*Cosmos caudatus* Kunth) is one of the plants that consists of polyphenolic compounds and can be used as a potential source of antioxidant for medicinal purposes.[9,10] The peel off gel mask is a formulation that can be used to improve the skin quality. This product is popular due to its practicality, ease of use, and the proven effect on skin repair.[11] Furthermore, this mask is very unique as it is skin adhesive, and can be removed without any residue or side effect to the skin.[12]

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Some of the peel off gel masks were formulated from plants such as spinach leaves (*Amaranthus tricolor* L.)[13] and andaliman (*Zanthoxylum acanthopodium* DC.).[14] Based on these reasons, this study was aimed to develop the peel off gel mask formulated with kenikir extract, which have the anti-aging potential and can be used as a natural facial treatment.

Materials and Methods

Plant collection

Kenikir leaves were obtained from Sei Sikambing Traditional Market, Medan, North Sumatera, Indonesia in July 2017. The plant identification was carried out at Herbarium Medanense, Universitas Sumatera Utara with an identification number: 1385/MEDA/2017.

Chemicals

The materials used in this study were carbomer 940 (Bratachem, Indonesia), 96% ethanol (Merck, Germany), glycerin (Bratachem, Indonesia), sodium lauryl sulfate (Bratachem, Indonesia), methyl paraben (Bratachem, Indonesia), distilled water (Bratachem, Indonesia) and polyvinyl alcohol (Bratachem, Indonesia).

Extract preparation

The extraction process was carried out with 600 g of plant sample. The extraction was done by maceration using 6 L of 96% ethanol as the solvent for a total of 7 days. Rotary evaporator was used for further processing until the crude extract was obtained.

Peel off gel mask preparation

The preparation of gel mask was conducted based on a slight modification from Rieger.[15] The composition of the formula is shown in the Table 1. The different concentrations of kenikir extract were mixed to the formula and evaluated with F0 as the negative control.

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Table 1: The composition of peel off gel mask with different concentrations of kenikir extract

Material	Formula (%)			
	F0	F1	F2	F3
Kenikir extract	-	1	3	5
Polyvinyl alcohol	10	10	10	10
Carbomer 940	0.5	0.5	0.5	0.5
Glycerin	10	10	10	10
Sodium lauryl sulfate	2	2	2	2
Ethanol	20	20	20	20
Methyl paraben	0.2	0.2	0.2	0.2
Distilled water until	100	100	100	100

This formulation was made by adding distilled water to the polyvinyl alcohol in a beaker glass and stirred. The carbomer 940 was swollen in hot water, which then cooled for 20 minutes, and mixed until mucilago layer was formed. This mucilago was added to the polyvinyl alcohol solution, and then mixed with methyl paraben, sodium lauryl sulfate and glycerin. The mixture was stirred until homogeny, and then cooled until gel was formed. The extract was diluted in 1 mL of 96% ethanol and added to the formed gel.

Characteristics of peel off gel mask
Some characteristics such as organoleptic test, homogeneity test, pH determination, gel drying time, stability test, irritation test and anti-aging activity were evaluated.

Organoleptic test
The evaluation of parameters such as texture, odor, and color of gel formulation was performed for 28 days to assess the physical characteristics of the formula.[3]

Homogeneity Test
The object glass was used to evaluate the homogeneity of the formula where certain amount of gel was applied to the glass and was visually checked for presence of any particles or homogeny. This evaluation was carried out by 3 non-professional assessors. The results of homogeneity were presented as: (++) = very good, (+) = good and (-) = poor.[14]

pH determination
The pH meter (Milwaukee Mi 150, USA) was used to measure the pH of the gel formula. Calibration process for pH meter was conducted to ensure that the pH meter was in good condition. The measurement was done in triplicate for every sample.[3]

Gel Drying time
1 g of gel was applied to the skin in 7 cm x 7 cm area and left until the gel became dry. The time needed for the gel to become a film was measured using stopwatch.[17]

Irritation test
Irritation test was performed to the panelists to evaluate the potential of gel mask to cause skin irritation when used. Certain amount of gel was applied to 24 female panelists of age 20 – 25 years old. The gel was applied three times a day for 3 days and any side effects were then observed.[3]

Anti-aging test
The anti-aging activity of the formula was assessed by evaluating the moisture, pore size, spot and wrinkle parameters using skin analyzer (Aramo). Twenty-four panelists were divided into 4 groups (F0, F1, F2 and F3) and were checked for the initial condition prior to the use of gel mask. The evaluation was conducted at the end of each week for four weeks and the results were reported based on Aramo rating scale.[18]

Statistical Analysis
The experiment were done in triplicate for the pH and drying time evaluations. The anti-aging test were calculated from 6 data and expressed by mean ± standard deviation using Microsoft Excel.

Results and Discussion

The crude kenikir extract produced was 85.52 g (14.20%) from the maceration process. Maceration was chosen as the extraction method as it was an easy, simple, and safe procedure for thermolabile ingredients.[19] A previous study found that the extraction of kenikir leaves by maceration method using methanol solvent produced a higher extract than percolation method.[20] This research also found that the IC_{50} of this extract was 12.5 ± 0.3 µg/mL. The similar research using 80% ethanol showed IC_{50} of 58.4 µg/mL.[21] These findings indicated that kenikir leaves had strong antioxidant activity.
The organoleptic evaluation for the gel showed no alteration in odor and color during the 28 days storage. The homogeneity test for the gel showed that all formulations were homogeneous. The organoleptic and homogeneity results can be seen in Table 2. In pH determination, all gel formula had a very stable pH even after 4 weeks storage. There were only slight changes observed, and the reasons were due to the hydrolysis reaction of acidic compound from the formula and the influence of storage temperature.[22] The pH of the formulation was between 5.3 - 6. This pH was still within the range of normal skin pH, which is around 4.5 - 6.5.[23] From Figure 1, it can be seen that the pH was stable in room temperature for 4 weeks. The drying time assessment was done to evaluate the time taken for the gel to dry after being applied to the skin. The data showed that all formulation started to dry within the time range of 18.2 - 21 minutes (Figure 2). This time range was still acceptable as the drying time for peel off gel mask product found in the market was between 15 - 30 minutes in general.[22]
The irritation test result showed that the gel formulations were safe with no symptom of redness, swelling or itching responses observed from all panelists. The purposes of the irritation test were to check for the safety of the kenikir extract in the peel off gel formula and the absence of side effects on the skin when the gel was in contact and applied to the skin for 3 days evaluation. Products such as peel off gel masks are generally being used long term and in a high frequency, thus, product safety was extremely critical during the formulation and development of the product. The anti-aging test was done by using the skin analyzer. This test was conducted to determine the anti-aging effect of the formula after 4 weeks application to the skin. The anti-aging test showed that the kenikir extract peel off gel mask had anti-aging effect, especially in increasing the moisture level of the skin (Figure 3). The highest concentration of extract, 5% (F3) gave the best result although the 3% concentration (F2) was also found to be enough to treat the moisture level from dehydrated state to normal based on Aramo criteria (30 – 50). On the other hand, F0 and F1 formulation were unsuccessful to increase the moisture level to normal and, thus, these two formulae still fall under the dehydration category (0-29).[18]
The pore size evaluation showed that the extract had an effect to reduce the pore size of the skin after 4 weeks treatment. The pore size score from the instrument showed a good descending pattern from the initial test until the end of the 4 weeks treatment, although longer treatment was needed to yield a better result. The Aramo criteria stated that score 20-39 and 0-19 referred to big and small pore size, respectively. The result for pore size test can be seen on Figure 4.
The spot test result in Figure 5 showed that the 5% concentration (F3) gave the best result in decreasing the appearance of spots on the skin compared with other groups. After one month treatment, F3 formula could decrease the spot level to below 19 based on Aramo criteria, which demonstrated its effectivity to reduce spot level to the small spot category. On the other hand, the other formula could not give the same result after the same period of treatment. The wrinkle test also showed that the extract had an effect to reduce skin wrinkles. The highest concentration of extract, 5%, (F3) gave the best result compared with the other groups. Figures 6 shows wrinkle test result.

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Table 2: The organoleptic and homogeneity test of the peel off gel mask

Parameters	Day	F0	F1	F2	F3
Texture	0	Semisolid	Semisolid	Semisolid	Semisolid
	28	Semisolid	Semisolid	Semisolid	Semisolid
Odor	0	Specific	Specific	Specific	Specific
	28	Specific	Specific	Specific	Specific
Color	0	Transparent	Deep green	Deep green	Deep green
	28	Transparent	Deep green	Deep green	Deep green
Homogeneity	0	++	++	++	++
	28	++	++	++	++

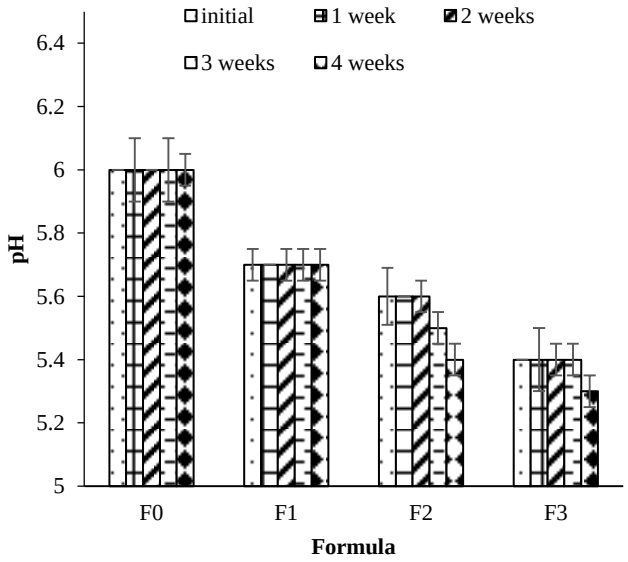

Figure 1: The pH of the peel off gel formula during 4-week storage at room temperature (mean ± SD, n = 3)

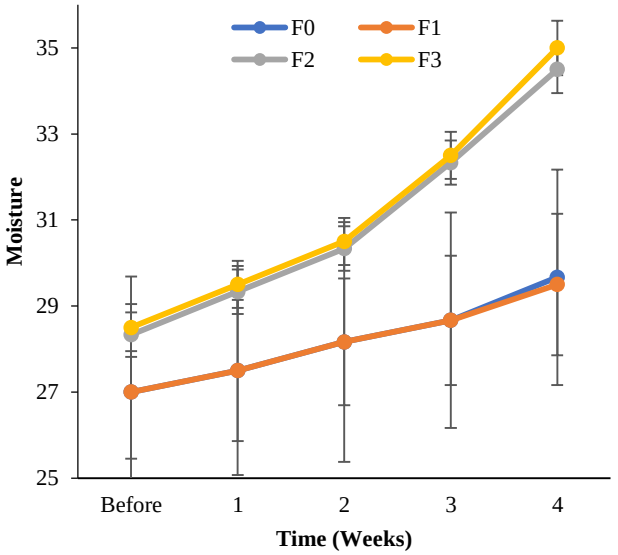

Figure 3: The effect of kenikir extract peel off gel mask to the moisture level (mean ± SD, n = 6)

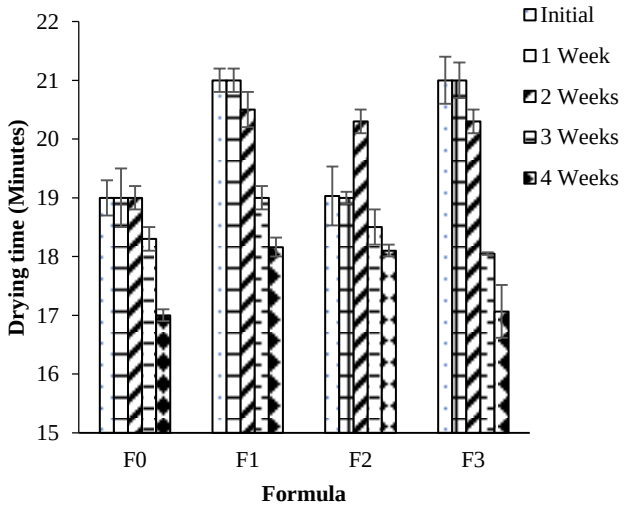

Figure 2: The drying test during 4-week storage (average ± SD, n = 3)

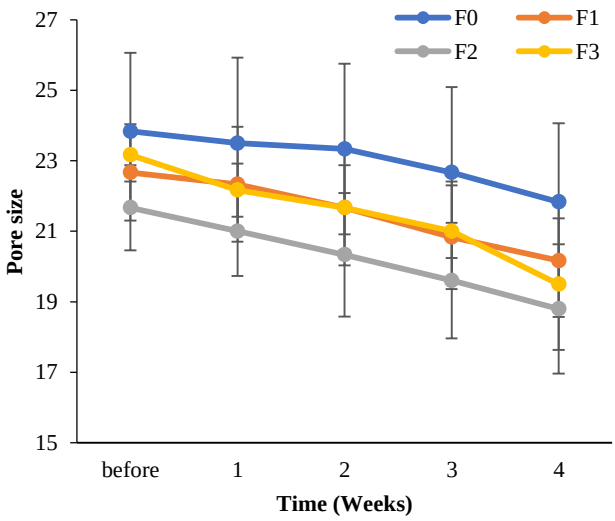

Figure 4: The effect of kenikir extract peel off gel mask to the pore size of the skin (mean ± SD, n = 6)

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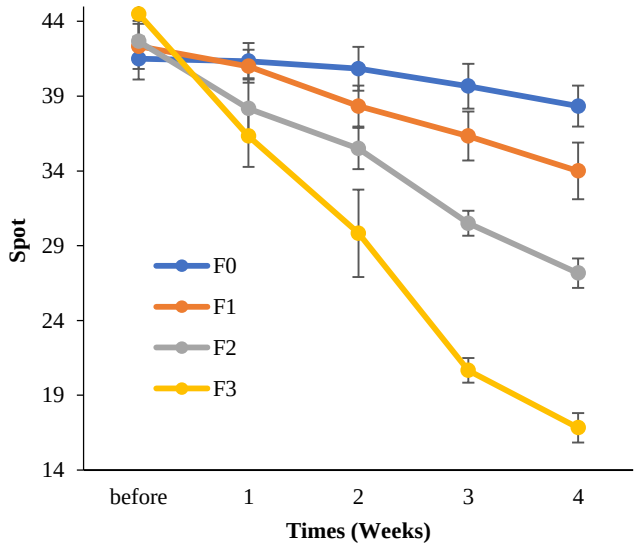

Figure 5: The effect of kenikir peel off gel mask on the spot appearance on the skin (mean ± SD, n = 6)

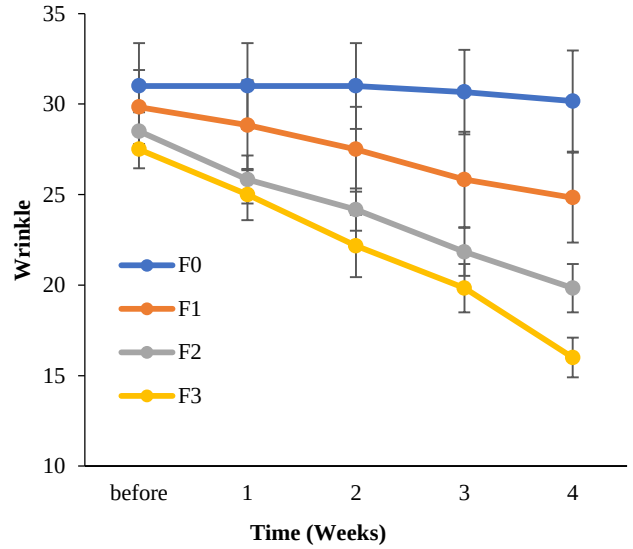

Figure 6: The effect of kenikir peel off gel mask on skin wrinkles (mean ± SD, n = 6)

Conclusion

The peel off gel mask with kenikir extract has been successfully developed with good physical characteristics, stable during room temperature storage, non-irritant, and has potential to provide anti-aging effects. The highest extract concentration (5%) was found to give the maximum anti-aging effect.

Conflict of interest

The authors declare no conflict of interest.

Authors' Declaration

The authors hereby declare that the work presented in this article is original and that any liability for claims relating to the content of this article will be borne by them.

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