

Formulation Of Peel-Off Mask From Sunflower Seed Oil (*Helianthus annuus*) and Evaluation of Physical Characteristics of the Preparation

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Abstract. The skin, as the body's protective barrier, is highly vulnerable to ultraviolet (UV) exposure, which can cause wrinkles, aging, and other skin problems. The use of cosmetics, especially peel-off face masks, is increasingly popular as a practical and effective skin care treatment. Peel-off masks have the advantage of removing dead skin cells and maintaining skin moisture. Sunflower seed oil (*Helianthus annuus*) is rich in vitamin E and antioxidants that effectively ward off free radicals that cause skin damage and premature aging. This study aims to create and determine the physical characteristics of peel-off masks from sunflower seed oil that have the potential to be safe and beneficial skin care products. This study is an experimental study. Sunflower seed oil is formulated into peel-off mask preparations with different concentrations. Then, the physical characteristics of the preparations are tested including organoleptic tests, homogeneity tests, pH tests, spreadability tests, drying time tests, and irritation tests. All three peel-off mask formulas show good and stable physical characteristics. The results of the One-Way Anova test showed that there were no significant differences in pH values ($p>0.05$), spreadability ($p>0.05$), and drying time ($p>0.05$). All formulas have a pH that matches the skin's pH range of 4.5-6.5, a spreadability that meets the standard of 5-7 cm, and an optimal drying time of 15-30 minutes, and do not cause irritation in application tests. The peel-off mask based on sunflower seed oil (*Helianthus annuus*) has physical characteristics that meet physical requirements and has the potential to be developed as a safe and effective skin care product.

Keywords: peel-off mask, sunflower seed oil, physical properties test

INTRODUCTION

As the body's primary barrier, the skin is highly vulnerable to exposure to ultraviolet (UV) rays, which can cause wrinkles, premature aging, and various other skin problems (Grace, 2015). This skin damage occurs due to free radicals produced by UV exposure, which damage skin cells and accelerate the aging process (Haerani *et al.*, 2018). Effective and safe skin care efforts are essential to prevent this damage.

Skin health problems caused by UV exposure and pollution are not only individual but also widespread and common issues in society, especially in Indonesia. This is evident in the high use of cosmetics as a primary skincare product. Facial masks, particularly peel-off masks, are very popular due to their ease of use and effectiveness in removing dead skin cells and maintaining skin moisture and cleanliness (Ishi *et al.*, 2017); (Mardhiyani, 2022); (Azwariah & Chan, 2019). This trend indicates that the need for safe, effective, and practical skincare products is becoming increasingly important for the wider community.

With the growing interest in natural cosmetic products, the public and the skincare industry have begun to utilize herbal plants as active ingredients. One promising natural ingredient is sunflower seeds, known to be rich in vitamin E and antioxidants, such as β -sitosterol, which plays a role in protecting the skin from oxidation and scavenging free radicals (Juniarti & Herdiana, 2018); (Arantika & Suhartiningsih, 2018). Sunflower seed oil is high in unsaturated fats, low in cholesterol, and has strong antioxidant properties (Simanullang *et al.*, 2021); (Susanti *et al.*, 2020); (Margono *et al.*, 2022). Despite the great potential of this ingredient, research related to the formulation of peel-off masks with sunflower seed oil and studies of its physical characteristics and safety are still limited, so in-depth studies are needed.

This study aimed to formulate a peel-off mask with sunflower seed oil at different concentrations and to test the product's physical characteristics and safety, such as pH, spreadability, drying time, and skin irritation (Istiqomah & Anindhita, 2018). With a good formulation, this mask is expected to be a natural, safe, and effective skin care product.

METHODS

Type of Research

This was an experimental study conducted in a laboratory. This study aimed to determine the formulation and physical characteristics of a sunflower seed oil (*Helianthus annuus*) mask using organoleptic tests, homogeneity tests, pH tests, spreadability tests, drying time tests, and irritation tests.

Time and Location of the Study

The study was conducted in the Pharmaceutical Technology Laboratory of the Cendekia Utama Kudus Health Technology Institute from March 2025 to May 2025.

Tools and Materials

1. Tools

The tools used were analytical balances, porcelain dishes, Erlenmeyer flasks, measuring cylinders, pH meters, droppers, spatulas, beakers, mortars and stampers, watch glasses, slides, weights, stirring rods, tripods, wire supports, Bunsen burners, test tube racks, test tubes, wooden clamps, filter paper, and containers.

2. Materials

The materials used in this study included sunflower seed oil (*Helianthus annuus*), polyvinyl alcohol (PVA), carbomer 940, glycerin, Tween 80, Span 80, methylparaben, propylparaben, flavoring (tutti frutti), distilled water, ethanol, chloroform, ammonia, 2N sulfuric acid, Dragendorff's reagent, magnesium, concentrated HCl, sodium hydroxide, methanol, and 1% FeCl₃.

ways of working

1. Preparation of the Sunflower Seed Oil (*Helianthus annuus*) Peel-Off Mask

Polyvinyl alcohol (PVA) was placed in a glass beaker, then heated distilled water was added in six batches while stirring. The PVA was then heated again and stirred until the color became clear. In a separate container, carbomer 940 was dissolved in distilled water and then basicized with 2N NaOH. These two mixtures were mixed, followed by the addition of glycerin, tween 80, and methylparaben, and stirred until homogeneous [mass one (M1)].

Sunflower seed oil (*Helianthus annuus*) was weighed individually for preparations with sunflower seed oil concentrations of 3%, 6%, and 9%, then tween 80 was added in small increments and stirred until homogeneous. Propylparaben, dissolved in ethanol, was added, and finally, the flavoring (tutti frutti) was added in mass two (M2). Mix M1 to M2 in a heated mortar then stir the mixture again until homogeneous. The formula for the sunflower seed oil (*Helianthus annuus*) peel-off mask can be seen in table 1.

Table 1. Sunflower seed oil (*Helianthus annuus*) peel-off mask formulation

Material	Concentration %			Function
	F1	F2	F3	
Sunflower Seed Oil	3	6	9	Active ingredient
PVA	10	10	10	Gel Former
Carbomer 940	1	1	1	Gel Former
Glycerin	15	15	15	Moisturizes the skin
Tween 80	1,3	1,3	1,3	Emulsifying Agent
Span 80	3,7	3,7	3,7	Emulsifying Agent
Methyl Paraben	0,1	0,1	0,1	Preservative
Propyl Paraben	0,05	0,05	0,05	Preservative
Fragrance (tutti frutti)	0,5	0,5	0,5	Fragrance
NaOH 2 N	0,5	0,5	0,5	alkalizing agent
Aqua Destilata ad	100	100	100	Solvent

2. Evaluation of Physical Characteristics of Mask Preparations Peel-off Sunflower seed oil (*Helianthus annuus*)

a. Organoleptic Test

Testing is done by visually observing the odor, color, and shape of the gel. The gel generally appears clear with a semi-solid consistency (Warnida *et al.*, 2016).

b. Homogeneity Test

The test was carried out by applying 0.1 grams of the preparation to a transparent glass, then observing whether there were any parts that were not mixed perfectly (Fauziah *et al.*, 2020).

c. pH test

The pH test method is carried out by dipping the pH meter electrode into the mask preparation formula, peel-off, then wait until the number displayed on the pH meter screen is stable (Syam *et al.*, 2021). pH value that matches the pH of human skin, namely in the range of 4.5-6.5, is one of the requirements for topical preparations (Samsul *et al.*, 2022).

d. Spreadability

0.5 gram gel mask was weighed and placed in the center of a glass plate. Then, it was placed on top of the gel and left for 1 minute. The gel's spread diameter was measured. An additional 50 gram load was added, left for 1 minute, and the spread diameter was measured again. The same procedure was repeated with successive loads of 100 and 200 grams, each allowed to rest for 1 minute before measuring the spread diameter (Sopianti & Yanuarto, 2022). The ideal spreadability is between 5-7 cm (Fauziah *et al.*, 2020).

e. Drying Time Test

This test is conducted by applying 0.2 grams of the preparation to a glass slide to form a thin layer. The layer is then left to dry and can be peeled off. The drying time is calculated, with the ideal drying time for a peel-off mask being between 15 and 30 minutes (Fauziah *et al.*, 2020).

f. Irritation Test

The irritation test was conducted by applying a specific amount of the mask to the backs of the hands of 10 different respondents for 15 minutes, then observing any irritation reactions that occurred (Mahulauw & Pratiwi, 2024).

Data Analysis

Data from the physical characteristics and SPF tests of the peel-off masks were analyzed using SPSS, using the One-Way ANOVA test or the Shapiro-Wilk test to assess the normality and homogeneity of the resulting data.

RESULTS AND DISCUSSION

Organoleptic Testing

The organoleptic test was conducted by observing the texture, odor, and color of the resulting peel-off mask. The results of the organoleptic tests are shown in Table 2. Good organoleptic criteria for a peel-off mask are semi-solid and bone-white. The organoleptic tests of F1, F2, and F3 showed similar physical characteristics: bone-white and semi-solid color and a tutti frutti odor.

Table 2. Organopetitic Test of Sunflower Seed Oil (*Helianthus annuus*) Peel-Off Mask

Formulation	Color	Smell	Form
F1	White bone	smell of all fruits	Semi-solid
F2	White bone	smell of all fruits	Semi-solid
F3	White bone	smell of all fruits	Semi-solid

Homogeneity Test

The results of the homogeneity test can be seen in Table 3. The homogeneity test on the peel-off mask preparation aims to ensure that all ingredients in the formula are evenly mixed. Homogeneity is assessed based on the absence of lumps or coarse grains in the preparation (Kartika *et al.*, 2021). The homogeneity test results for all formulas (F1, F2, and F3) showed homogeneous results. This indicates that all ingredients in the sunflower seed oil peel-off mask preparation were evenly mixed, with no visible lumps or coarse grains.

Table 3. Mask Homogeneity TestPeel-Off Sunflower Seed Oil (*Helianthus annuus*)

Formulation	Information
F1	Homogeneous
F2	Homogeneous

pH Test

The pH test aims to determine whether the pH value of the peel-off mask preparation matches the pH of human skin, which according to SNI 16-4380-1196 ranges from 4.5 to 6.5. The pH test results for each peel-off mask formula can be seen in Table 4. The test results show that formulas F1 and F2 have a pH of 4.6, while formula F3 has the highest pH at 4.7. All pH values are within the standard skin pH range, making them safe for use. These results align with research by Fauziah *et al.* (2020), which states that topical preparations should have a pH between 4.5 and 6.5 to avoid irritation and side effects on the skin. Hadi *et al.* (2023) added that a pH that is too acidic can cause irritation, while a pH that is too alkaline can cause dry and flaky skin.

From these results, it can also be concluded that varying the concentration of sunflower seed oil in the peel-off mask formulation does not significantly affect the pH value of the preparation. Thus, all tested formulas met the appropriate pH requirements for human skin and were potentially safe for topical application to the face. Statistical testing was performed using a one-way ANOVA test with a significance value of $0.000 > 0.05$, indicating no differences between the formulas.

Table 4. pH Test of Sunflower Seed Oil Peel-Off Mask (*Helianthus annuus*)

Formulation	Mean $\pm$ SD	Standard	Information
F1	4,6 $\pm$ 0,05	4,5 – 6,5	Qualify
F2	4,6 $\pm$ 0,06		Qualify
F3	4,7 $\pm$ 0,11		Qualify

Spreadability Test

The results of the spreadability test can be seen in Table 5. The spreadability test was conducted to determine the mask's ability to spread on the skin surface so that it could be easily spread without excessive pressure (Sumule *et al.*, 2020). The requirement for a good spreadability value is 5-7 cm (Fauziah *et al.*, 2020). The test results showed that the three peel-off mask formulas with sunflower seed oil concentrations of 3%, 6%, and 9% had a spreadability of 5,2 cm to 5,4 cm, respectively, thus meeting applicable standards. This indicates that the masks are easy to apply and provide optimal coverage. A decrease in spreadability below 5 cm is usually caused by an increase in the gelling agent content, which increases viscosity and inhibits spread (Zubaydah & Fandinata, 2020), while a spreadability above 7 cm may indicate too low a viscosity, resulting in a suboptimal mask film (Rahmawanty *et al.*, 2015). Thus, this peel-off mask formulation has a spreadability suitable for skin application and is potentially comfortable to use. Statistical testing was performed using a one-way ANOVA test with a significance value of $0.000 > 0.05$, indicating no difference between the two formulas.

Table 5. Spreadability Test of Sunflower Seed Oil (*Helianthus annuus*) Peel-Off Mask

Formulation	Mean $\pm$ SD	Standard	Information
F1	5,2 $\pm$ 0,2	5-7 cm	Qualify
F2	5,4 $\pm$ 0,15		Qualify
F3	5,2 $\pm$ 0,15		Qualify

Drying Time Test

The drying time test aims to determine the duration required for a peel-off mask preparation to dry after being applied to the skin surface and form a film. A good drying time for a peel-off mask is between 15-30 minutes (Fauziah *et al.*, 2020). The results of the drying time test can be seen in Table 6. The results of the test on three mask formulas with sunflower seed oil variations of 3%, 6%, and 9% showed an average drying time of between 24 and 27 minutes, which is within the ideal drying time range for a peel-off mask preparation. Statistical analysis using a one-way ANOVA test with a significance value of $0.000 > 0.05$ showed no differences between the formulas. This indicates that the addition of sunflower seed oil did not significantly affect the product's drying time, and all formulas met the standard drying time for comfortable use.

Table 6. Drying Time Test of Sunflower Seed Oil (*Helianthus annuus*) Peel-Off Mask

Formulation	Mean $\pm$ SD	Standard	Information
F1	24,01 $\pm$ 1,33	15-30 minutes	Qualify
F2	24,19 $\pm$ 2,80		Qualify
F3	27,24 $\pm$ 0,90		Qualify

Irritation Test

An irritation test was conducted to evaluate the safety of peel-off masks against the possibility of causing redness, itching, or swelling on the skin after application. The masks were tested on 10 female volunteers aged 20-25 years old by applying them to the back of their hands. Results showed no irritation reactions in all formulas (F1, F2, F3) after skin testing (Ridyawati, 2024). This safety is supported by the mask's pH value, which is within the pH range of healthy skin (4,5–6,5), thus categorizing the product as safe for topical use.

Table 7. Irritation Test of Sunflower Seed Oil (*Helianthus annuus*) Peel-Off Mask

No.	Reaction	Formulation	Probandus									
			1	2	3	4	5	6	7	8	9	10
1.	Redness	F1	-	-	-	-	-	-	-	-	-	-
		F2	-	-	-	-	-	-	-	-	-	-
		F3	-	-	-	-	-	-	-	-	-	-
2.	Itching	F1	-	-	-	-	-	-	-	-	-	-
		F2	-	-	-	-	-	-	-	-	-	-
		F3	-	-	-	-	-	-	-	-	-	-
3.	Swelling	F1	-	-	-	-	-	-	-	-	-	-
		F2	-	-	-	-	-	-	-	-	-	-
		F3	-	-	-	-	-	-	-	-	-	-

CONCLUSION

Conclusion

Sunflower seed oil (*Helianthus annuus*) can be used to make peel-off masks. All sunflower seed oil peel-off masks (*Helianthus annuus*) met the physical requirements based on organoleptic testing, homogeneity testing, pH testing, spreadability testing, drying time testing, and irritation testing. There was no effect of varying the concentration of sunflower seed oil (*Helianthus annuus*) on the physical characteristics of the peel-off masks.

Recommendations

Further testing of the antioxidant activity of the preparations is necessary to ensure the effectiveness of the active ingredients used, thus supporting the development of more optimal formulations. Further viscosity testing is necessary to more optimally evaluate the formulation quality.

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