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THE IMPACT OF PVA CONCENTRATION ON THE PHYSICAL QUALITY OF THE *Eleutherine palmifolia* (L.) Merr LEAVES PEEL-OFF GEL MASK

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ABSTRAK

Bawang dayak (*Eleutherine palifolia Merr.*) merupakan obat tradisional yang digunakan oleh masyarakat daerah Kalimantan Tengah untuk mengobati berbagai penyakit. Daun bawang dayak mengandung senyawa flavonoid. Ekstrak daun bawang dayak memiliki aktivitas antioksidan yang sangat kuat dengan nilai IC_{50} 45,33 ppm. Antioksidan efektif untuk mencegah kerusakan kulit akibat paparan sinar ultraviolet. Potensi daun bawang dayak sebagai antioksidan dapat dimanfaatkan dalam bentuk masker gel *peel-off*. Masker gel *peel-off* diformulasikan dengan variasi basis polivinil alkohol (PVA) F1 10%, F2 12%, dan F3 14%. Konsentrasi PVA merupakan faktor terpenting yang berpengaruh terhadap kinerja pembentukan film dalam masker gel *peel-off*. Penelitian ini bertujuan untuk mengetahui pengaruh variasi konsentrasi PVA terhadap sifat fisik dan aktivitas antioksidan masker gel *peel-off* daun bawang dayak. Seluruh formula dilakukan uji organoleptis, homogenitas, daya sebar, nilai pH dan kecepatan pengeringan serta aktivitas antioksidan yang diuji menggunakan metode DPPH. Hasil pengujian menunjukkan seluruh formula masker gel *peel-off* memenuhi persyaratan uji sifat fisik dan memiliki aktivitas antioksidan. Berdasarkan analisis statistik menggunakan *one way anova* variasi konsentrasi PVA memberikan pengaruh yang signifikan ($p<0,05$) pada kecepatan pengeringan masker *peel-off*.

Kata kunci: Bawang dayak, Antioksidan, Masker, PVA

ABSTRACT

The natives of Central Kalimantan utilize Eleutherine palmifolia (l.) Merr as a traditional medicine to treat various diseases. Eleutherine palmifolia leaves are rich in flavonoid substances. Eleutherine palmifolia leaves extract has an IC_{50} value of 45.33 ppm, indicating significant antioxidant activity. Antioxidants are helpful in reducing the risk of UV radiation-induced skin damage. Eleutherine palmifolia leaves have antioxidant properties that can be used as a peel-off gel mask. Polyvinyl alcohol (PVA) bases come in various formulations for peel-off gel mask that F1 10%, F2 12%, and F3 14%. The concentration of PVA is the most significant element affecting how well peel-off gel masks create films. This study aims to determine the impact of PVA concentration on the physical of the

Eleutherine palmifolia leaves ***Peel-off gel mask. All formulas are tested for organoleptics, homogeneity, spreadability, pH value, and drying speed. The results showed that all peel-off gel mask compositions pass the physical properties test. A one-way ANOVA statistical analysis reveals a significant variation in the preparations drying speeds (p<0,05).***

Keywords: *Eleutherine palmifolia* ,Antioxidant, Mask, PVA.

INTRODUCTION

One popular plant in Kalimantan used in traditional medicine is the *Eleutherine palmifolia* (L) Merr leaves (Novaryatiin et al., 2018). In practice, Dayak people have traditionally used *Eleutherine palmifolia* bulbs to cure skin conditions like blisters, but the community rarely uses the leaves (Siswanto Syamsul et al., 2015). *Eleutherine palmifolia* leaves are rich in alkaloids, flavonoids, saponins, steroids, and triterpenoids (Idrus et al., 2016). With an IC50 value of 45.33 ppm, *Eleutherine palmifolia* leaves extract is reported to have potent antioxidant properties (Kumalasari & Prihandiwati, 2019). Antioxidants help mitigate the effects of aging and ultraviolet (UV) light-induced skin damage. Antioxidants can reduce free radicals, lowering the likelihood of oxidation reactions (Priani et al., 2015).

Eleutherine palmifolia leaves have antioxidant properties that can be used as a peel-off gel mask. Peel-off gel mask preparations are one of the most well-liked cosmetics due to their simplicity of usage. The mask is easier to use once it dries because the gel layer can be removed from the skin without having to be rinsed with water (Andini et al., 2017). Polyvinyl alcohol (PVA) is the base for peel-off masks. Because PVA has sticky qualities, it can form a film layer that is effortlessly peeled off after drying[7], contributing to the peel-off effect. The primary factor influencing peel-off mask film formation performance is PVA concentration. As a result, it is necessary to adjust the PVA content and test the mask physically, ensuring that it passes organoleptic, homogeneity, spreadability, pH value, and drying speed tests.

METHODS

The equipment used was a rotary evaporator, analytical balance (Ohause), glassware, water bath (Mamert), universal pH (Merck). The materials used in this research were *Eleutherine palmifolia* leaves, aquadest, PVA, HPMC, methyl paraben, paraben profile, and propylene glycol.

Preparation of samples

Making Extract

Eleutherine palmifolia leaves are obtained from the Petuk Katimpun area of Palangkaraya, Central Kalimantan. After being cleaned by running water, the leaves are chopped and then dried in the oven at a temperature of 50^{o}C. The results of drying are pulverized into a powder simplicia. 1.5 liters of 70% ethanol were macerated with 500 g of simplicia for three days while constantly stirred. A thick extract is produced by filtering and evaporating the macerate. Organoleptic extract testing is carried out using the five senses by describing color, smell and consistency as simply and objectively as possible. The extract obtained was calculated by the yield

$$\%\text{Yield} = \frac{\text{Extract weight}}{\text{Simplicia weight}} x100$$

Phytochemical screening

Extract that has been dissolved using aquadest, taken as much as 1 ml, is inserted into the reaction tube, then added Pb acetate (1 ml). When the extract causes the yellow color of the encapsulation, the positive extract contains the active flavonoid compound.

Making Peel-Off Gel Mask Formulation

Table 1. *Eleutherine palmifolia* leaves peel-off gel mask formulation

Materials	Concentration (%)			Function
	FI	FII	FIII	
Eleutherine palmifolia leaves extract	5	5	5	Active substance
PVA	10	12	14	Film layer forming
HPMC	1	1	1	Gelling agent
PG	10	10	10	Humectant
Methyl paraben	0,02	0,02	0,02	Preservative
Propyl paraben	0,05	0,05	0,05	Preservative
Lily oil	qs	qs	qs	Corigen odoris
Aquadest ad	100	100	100	Solvent

After adding hot distilled water to the evaporator cup, stirring until the PVA fully expands. Additionally, HPMC was generated by expanding the material to its ideal size using hot distilled water. PVA and HPMC are combined and then ground into a

consistent powder. After adding the dissolved propyl paraben, methyl paraben, and crushed propylene glycol, stir until everything is thoroughly mixed. Next, gradually add the dissolved Eleutherine palmifolia leaves extract in 70% ethanol and mill everything until it is completely smooth. When the mixture is consistent with 100 g, add the Lili fragrance and the remaining crushed distilled water.

Peel-Off Gel Mask Evaluation

Organoleptic test

Organoleptic testing is done visually on mask preparations, considering the mask's color, odor, and shape. It is also simple to apply and does not include any rough particles.

Homogeneity Test

An excellent gel dosage form doesn't include rough granules or grains. To conduct this test, the gel preparation is applied to two glass objects.

Spreadability Test

To determine its spreadability, place one gram of mask on a glass scale, top it off with the same glass, increase the load with 50-gram and 100-gram weights, and give it one minute to settle. When the stock stops spreading, the spreading diameter is then measured at each progressive load. Spreadability at 5 to 7 cm reveals a semi-solid consistency that is extremely pleasant to work with.

pH Test

For testing pH, one gram of the preparation is measured before distilled water is added, the pH paper is dipped into the preparation, and the results are adjusted to the pH number by waiting. For a stable reading, the pH of the gel should be between 4.5 and 6.5, which is the same as the pH of the skin.

Drying speed Test

The test for dry time was conducted by evenly applying 0.1 gram of gel to an area of 2.5 x 2.5 cm on the arm and then timing the amount of time needed for the preparation to dry, which is the amount of time from the application of the gel mask until the formation of a dry and elastic layer. Remove the skin's surface without leaving a gel mass behind.

Data Analizes

Data analysis was carried out descriptively and using SPSS Statistics software. Organoleptic and homogeneity test analyzes were carried out descriptively. Meanwhile, analysis of pH, spreadability, drying speed was carried out using SPSS software. The analysis carried out was normality and homogeneity tests. To see the relationship between treatment groups, a one-way analysis of variance (ANOVA) was carried out if the data was normally distributed and homogeneous. If the data is not normally distributed, a Kruskal-Wallis analysis is performed.

RESULTS AND DISCUSSION

The 64.8-gram extract had a thick consistency, a brown color, and a strong fragrance. In this investigation, the extract yield value was 12.17%. The extract was discovered to contain flavonoid compounds in the findings of the phytochemical screening test. The positive result is characterized by the reaction of the flawonoid composite to be oxidized by a Pb2+ metal by forming a complex with lead ions. It is shown by the color of the yellow depot.

Varying PVA concentrations are used to make peel-off gel mask formulas. Polyvinyl alcohol is used in the formulation of peel-off gel masks as an agent that creates an elastic film layer that allows the formula to be peeled off. HMPC is a gelling ingredient that improves the peel-off mask base's viscosity. Propylene glycol, a humectant that can stop excessive water evaporation in the gel preparation during storage and during skin application, is added to the preparation in an attempt to preserve its stability (Samsul et al., 2022).

In addition, propylene glycol has the ability to raise the preparation's viscosity, making it thick enough to rub on face skin easily while maintaining flow. In addition, rising humidity will have an impact on the properties of the polyvinyl alcohol layer. The rise of moisture content will render the layer softer and more flexible, which will enhance the layer's properties. Since humectants are hygroscopic and typically exist in liquid form, they may have an impact

on the gel preparation's physical characteristics (Sari et al., 2016).

Methylparaben and propylparaben are two of the preservatives applied to the base preparations to stop germs and fungi from growing. Because they can intensify their effect on certain bacteria and fungi, these two substances are utilized in tandem. Distilled water is utilized as a solvent (Sari et al., 2016).

A peel-off mask's perfect qualities would be to be free of abrasive particles, non-toxic, irritant-causing, and able to cleanse the skin. Capable of moisturizing the skin, creating a consistent thin layer level, tightening the skin, and drying in five to thirty minutes. Peel-off masks must to be simple to apply and painless(Grace et al., 2015).

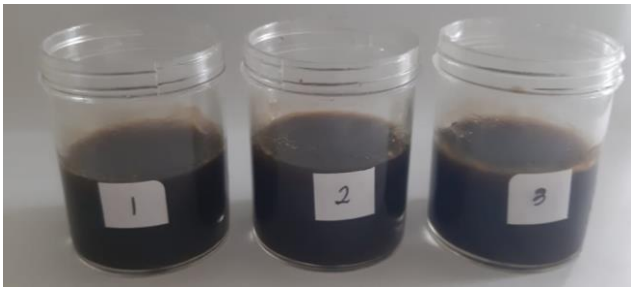

Figure 1. *Eleutherine palmifolia* leaves gel peel-off mask

Table 2. Evaluation results of the physical properties of the peel gel mask of *Eleutherine palmifolia* leaves extract

Parameter	Formulation		
	I	II	III
Organoleptis	Chocolate, lily aroma, thick	Chocolate, lily aroma, thick	Chocolate, lily aroma, thick
Homogenitas	Homogen	Homogen	Homogen
Spreading Power 5-100 g (cm)	3,8 - 6,5	3,9 - 6,7	3,2 - 6,4
pH	5 ± 0	6 ± 0	6 ± 0
Drying Time (Minute)	19,67 ± 0,58	19,00 ± 0,58	16,67 ± 1,00

The color, odor, and consistency of the *Eleutherine palmifolia* leaves extract gel peel-off mask were examined using organoleptic methods. Because it has to do with how well the product is received by consumers, this test is carried out. Organoleptic examinations indicate

that the peel-off gel mask preparation recipe has a thick viscosity, lily fragrance, and brown shade throughout.

The purpose of the homogeneity test is to verify that the active component, base, and other ingredients are all combined evenly (Wulandari & Wahyudi, 2023). The absence of rough, lumpy granules and the uniform distribution of color in the mask preparation are signs of homogeneity. The steps involved in creating PVA and HPMC and combining them are crucial markers in the creation of consistent mask preparations. Another key to producing a uniformly dispersed mask color is to dissolve the extract in ethanol before adding it to the mask base.

This pH measurement seeks to demonstrate the pH range of 4.5 to 6.5 that the mask ought to possess to be able to function well when applied to the skin (Rahim & Nofiandi, 2014). When the preparation is basic, it will result in smooth core skin, quickly dry, and affect the elasticity of the skin, whereas if the formulation is acidic with a pH below the pH range, it will cause the skin easily irritated (Khaeri & Nursamsiar, 2019). It is evident from the tests that every peel-off gel mask recipe satisfies the required pH value. The Spreadability test results data were analyzed using one way anova and obtained a significance value of >0.05, which means there was no influence between variations in the PVA on the pH of the the peel-off gel mask.

The results of testing the mask preparation's spreadability indicate that it is simple to apply to the skin, making it comfortable to wear (Anindhita et al., 2023). It will be simpler to apply the mask preparation to the skin's surface due to its high spreading capacity. Testing reveals that every peel-off gel mask formula satisfies the 5-7 cm spreadability criteria (Amaliah et al., 2018). The spreadability test results data were analyzed using one way anova and obtained a significance value of >0.05, namely 0,835, which means there was no influence between variations in the concentration of PVA on the spreadability of the peel-off gel mask preparation. The

spreadability test findings indicate that the spreadability value declines with increasing PVA concentration. In general, spreadability measurements show a negative correlation with preparation viscosity: the higher the viscosity of the preparation, the less spreadable it is on the skin. This is consistent with the inverse relationship between viscosity and particle diameter, as stated by Stoke's law: the more significant the viscosity, the smaller the particle diameter.

To figure out how long the preparation may dry after being applied to the skin, its drying time is examined. Ideally, a peel-off mask should dry in 15 to 30 minutes. One of the most crucial tests to do when assessing peel-off gel mask preparations is the drying speed test, which establishes how well the preparation dries after skin application. The peel-off gel mask is a preparation for a mask that dries on the skin, solidifies, and leaves behind a flexible, typically transparent covering. The thickness of the application, the temperature, and the air during the application process are some of the variables that might affect drying time (Kartikasari & Anggraini, 2018).

All of the formulations satisfy the drying time specifications, according to the drying time test findings. It is considered to be very good preparation if it dries rapidly, as the application takes a short time to have an effect (Ayuchecaria et al., 2023). As may be shown, formula III has the quickest drying time, with a PVA content of 14%. The Drying speed test results data were analyzed using one way anova and obtained a significance value of <0.05, namely 0,006, which means there was influence between variations in the concentration of PVA on the Drying speed of the peel-off gel mask preparation. This is due to the fact that PVA addition affects how a preparation responds to longer drying times; the more PVA value-added, the faster a preparation dries (Kartikasari & Anggraini, 2018). The chemicals that go into a peel-off gel mask determine its physical properties. PVA is a film former that can be used at concentrations ranging from 10-

16% for peel-off gel face masks (Noviana Suhery et al., 2023).

CONCLUSION

The results showed that all peel-off gel mask compositions pass the physical properties test and have antioxidant activity. A one-way ANOVA statistical analysis reveals a significant variation in the preparations drying speeds ($p<0,05$).

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