

# ARTIKEL 1

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## FORMULATION AND ANTIOXIDANT ACTIVITY OF PEEL-OFF GEL MASK FROM *PAEDERIA FOETIDA* EXTRACT

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### ABSTRACT

The peel-Off gel mask is one of the unique characteristic forms of the mask that will form an elastic transparent film layer. It can be removed without rinsing after drying and leaving no residue. The manufacture of masks using natural material is better than synthetic materials as it can cause side effects and damage the natural shape of the skin. One of the natural materials that can be used as a natural ingredient mask is the *Paederia Foetida* leaf. *Paederia Foetida* leaf contains antioxidants beneficial as the antidote to free radicals. One of the antioxidants contained in the *Paederia Foetida* is a flavonoid compound. The research aimed to determine the best concentration of *Paederia Foetida* leaf extract in the formulation of peel off gel masks with high antioxidant activity. The research method consists of preparing the sample by macerating *Paederia Foetida* leaf powder using ethanol. Making peel-off gel mask with variation in concentration from *Paederia Foetida* leaf extract of 0%, 15%, 20%, 25%, 30%. mask quality test include organoleptic test, pH, Homogeneity, stability, Drying, and dispersibility—antioxidant activity test by using DPPH with expressed as  $IC_{50}$  concentration. The Result of the research is that *Paederia Foetida* leaf extract can be formulated into a peel-off gel mask stock. The formulation of a peel-off gel mask with a concentration of *Paederia Foetida* leaf extract of 20% was chosen because it meets the criteria of peel-off gel mask of Indonesian Nasional Standard (It is homogeneous and stable, pH 6, spreadability 6,5 cm, and dry time 28 minutes with an  $IC_{50}$  of 167.74 which is a weak antioxidant).

**Keywords:** *Paederia Foetida*, Peel-Off Gel Mask, Antioxidant

### INTRODUCTION

Face masks are a mixture of chemicals and other ingredients used on the face to give a cleansing effect and a firm feel [1]. A peel-Off gel mask is one of the mask forms with a unique character that will form an elastic transparent film layer [2]. The benefit of a gel peel-off face mask is to prevent facial skin from being dull, dry, and wrinkled and can shrink pores caused by exposure to UV rays

[3,4]. Making cosmetics using natural ingredients is better than using synthetic ingredients, which can cause side effects and damage the natural shape of the skin [4]. Natural ingredients used in making masks are plants containing antioxidants that can treat the skin by preventing premature aging [5].

Antioxidants are compounds that can ward off or reduce the negative impact of oxidants in the body caused by free radicals.

The human body needs exogenous antioxidants to overcome free radicals formation. Exogenous antioxidants consist of synthetic antioxidants and natural antioxidants. Natural antioxidants usually come from plants and fruits. Flavonoids are aromatic compounds found in plants and fruits that are antioxidants. Most flavonoids are contained in plant parts such as leaves, roots, stems, flowers, and fruit [6].

One of the plants that contain antioxidants is the *Paederia Foetida* leaf. Indonesians call it to fart leaves. *Paederia Foetida* leaves are usually utilized as botok (traditional food), diarrhea medications, overcoming ulcers, detoxification, increasing the production of white blood cells, worm drugs, and others [7,8]. *Paederia Foetida* leaves have a high antioxidant activity of 79.69% [9]. The leaf chemical compounds are quite numerous; they are flavonoids, terpenoids, alkaloids, and tannins [10,11,12].

In this research, the *Paederia Foetida* leaf extract was formulated in the form of a peel-off gel mask. Based on the explanation above, The purpose of the research was to formulate a peel-off gel mask from *Paederia Foetida* leaf extract and determine the best concentration of *Paederia Foetida* leaf extract that meets the category determined by SNI (Indonesian Nasional Standard). The research novelty of *Paederia Foetida* leaf, which is usually a medicinal and food ingredient, can become a natural cosmetic ingredient. Besides that, This research purpose was to raise the benefits of natural ingredients like the essential ingredients of masks skin safe. The importance of using natural masks is the background for making natural mask

formulations made from *Paederia Foetida* extract to reduce the use of chemicals dangerous that can damage the skin face.

## METHODS

### 1. Materials

The ingredients used were *Paederia Foetida* leaf obtained from bushes in the village of Kembiritan, PVA, HPMC, Gelatin, Glycerin, Nipagin, Alcohol 96%, aquades, ethanol, Mg powder, methanol, concentrated HCl, DPPH. These chemicals were purchased from the Chemical Laboratory at PGRI University of Banyuwangi

### 2. Sample Preparation

A 10 g of *Paederia Foetida* leaf powder was macerated using 100 mL ethanol p.a 96% for 5 x 24 hours with occasional stirring at room temperature. Then, it is filtered. The residue was macerated again with the same amount of solvent and day (the maceration process is repeated until the residue is colorless) [11].

### 3. Flavonoid Test

The test for flavonoids' presence was carried out using a phytochemical test on the *Paederia Foetida* leaf extract. The Phytochemical test is an initial testing method that provides an overview of the class of compounds in plants as indicated by the color testing reaction using a color reagent. A 2 mL of the sample is dissolved in 2 mL of methanol, added a little Mg powder, and 5 drops of concentrated HCl. The red or orange color formation indicates the presence of flavonoid compounds [11, 13]. *Paederia Foetida* extract contains flavonoids by 1.18%.

#### 4. Formulation of Peel-Off Gel Mask *Paederia Foetida* Extract

The ingredients for making the peel-off gel masks of extract *Paederia Foetida* leaf consist of PVA, HPMC, Gelatin, Glycerin, Nipagin, and alcohol. PVA (polyvinyl alcohol) is a good film-forming and water-soluble PVA concentration of 10-16% [17]. Hydro Propyl Methyl Cellulose (HPMC) as a gelling agent (an additional material used to thicken and provide texture through gel formation), Nipagin as a preservative, and the recommended concentration are 0.02-0.3% [17]. Glycerin and gelatin as a softener, and Alcohol 96% as a solvent for nipagin.

36 Table 1. Formulation of Peel-Off gel mask  
*Paederia Foetida* Extract

Materials	Concentration (% w/w)				
	F0	F1	F2	F3	F4
PVA	14	14	14	14	14
HPMC	5	5	5	5	5
Gelatin	10	10	10	10	10
Glycerin	10	10	10	10	10
Nipagin	0.3	0.3	0.3	0.3	0.3
Alcohol 96%	10	10	10	10	10
Aquadest	Ad	Ad	Ad	Ad	Ad
<i>Paederia Foetida</i> Extract	100	100	100	100	100
	-	15	20	25	30

Prepare a water bath with a temperature of 80°C. Add the PVA (Polyvinyl Alcohol) which has been added with aquadest into a water bath, stirring until homogeneous forms a gel base. In another container, HPMC is added with aquadest and stirred until it expands. Put the HPMC that has blown into the PVA gel base and stir until homogeneous. Add gelatin, glycerin, and nipagin stir until homogeneous. Gradually add the 96% alcohol, stirring until homogeneous, then add with extract and

distilled water until it reaches 20 g of peel-off gel mask.

#### 5. The quality Analysis of The Peel-Off gel Mask Formulation

The quality test of mask formulation includes the organoleptic test, pH, Homogeneity and stability test, Drying, dispersibility [14]. Organoleptic tests were carried out by looking at the gel peel-off mask preparation's color, shape, and smell. The pH test by taking 1 gram of sample is added with 10 mL of aquadest and checked using universal pH. Stability test 1 gram of the gel sample is smeared on the glass slide to form a thin layer. Covered with a prep glass. Homogeneous if there are no coarse grains and even texture. Mask stability can be determined by doing a cycling test of 6 cycles. First, the mask is stored at 4°C for 24 hours and then transferred to an oven at 40 °C for 24 hours. The time during which these two temperatures are stored is considered to be one cycle. Then, the mask stock was observed for changes in color, aroma, and changes in gel texture. The drying test was carried out by weighing 1 gram of gel applied to the back of the hand with an area of 3x3 cm and calculating the time required for the gelled stock to dry. Spreadability test by taking A 500 mg of gel is placed in the middle of a round glass scale, covered with another glass. The spreadability test determines the distribution diameter of the Peel-Off gel mask preparation when applied to the skin [14].

#### 6. Antioxidant Activity

A 50 mg DPPH add 100 mL methanol p.a [14]. Preparation of Stock Solution of peel-off gel mask *Paederia Foetida* extract

(Sample Solution) A10 mg of gel mask add 100 mL of methanol p.a. dilution of 5 ppm, 6 ppm, 7 ppm, 8 ppm, 9 ppm [14]. A 2 mL of DPPH solution, add 2 mL of sample. They were incubated at room temperature for 30 minutes. The absorption test was carried out using a UV-Vis spectrophotometer with a wavelength of 517 nm. With 2 mL DPPH 50 ppm control solution added with 2 mL methanol p.a [15].

IC<sub>50</sub> test 2 mL of DPPH solution, plus 2 mL of sample. They were incubated at room temperature for 30 minutes. The absorption test was carried out using a UV-Vis spectrophotometer with a wavelength of 517 nm. With 2 mL DPPH 50 ppm control solution added with 2 mL methanol p.a [15].

$$\%Antioxidant = \left\{ \frac{(A_1 - A_2)}{A_1} \right\} \times 100\% \quad (1)$$

A<sub>1</sub> = Control Absorbance

A<sub>2</sub> = Sample Absorbance

IC<sub>50</sub> value obtained from the intersection of the percent inhibition and concentration then entered into the equation  $y = mx + c$ , where  $y = 50$  and the  $x$  value indicates IC<sub>50</sub>

## RESULTS AND DISCUSSION

### 1. Sample Preparation

The part of the *Paederia Foetida* plant used in this research is the leaf. The leaves are washed using running water. Furthermore, the cleaned leaves are dried in the sun until they are completely dry. The process of drying the *Paederia Foetida* leaves so that the moisture content in the leaves is lost.

After the drying process, the leaves are blended into a fine green powder. Next, the *Paederia Foetida* leaf powder is sieved using a 350 mesh. The more delicate *Paederia Foetida* leaf powder expands the contact between the solvent and the *Paederia Foetida* leaf powder, making it easier for the solvent to attract or bind the compounds in the *Paederia Foetida* leaf [11].

Table 2. The Result of Maceration with Ethanol Solvent

No	Cycle	Observation	
		The color of filtrate	Total
1	one	Deep green	85 mL
2	second	green	89 mL
3	third	Light green	90 mL
<b>Total</b>			264 mL

Extraction is a chemical separation process using a suitable solvent to obtain the appropriate chemical content. The choice of solvent must be according to the like-dissolve-like principle. The extraction method chosen in this research is maceration (immersion). This method was chosen because it can extract compounds well and prevent the decomposition of unstable compounds to heat.

### 2. Flavonoid Test

The results obtained from the flavonoid test showed a positive reaction, namely forming orange. This is because Mg metal with concentrated HCl reacts to reduce the bezopiron core contained in the flavonoid structure. So a red/orange color change can be formed [13]

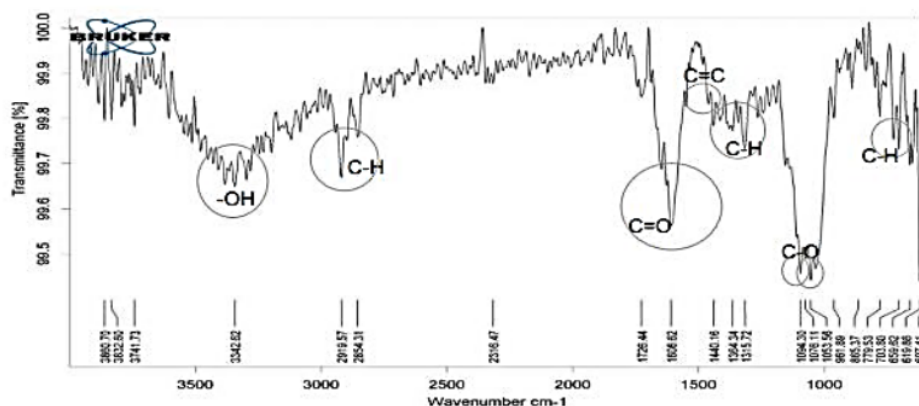


Figure 1. FT-IR Test of Paederia Foetida Leaf Powder

The Paederia Foetida leaf powder identification results are shown in **Figure 1** with an FTIR spectrophotometer. The figure shows the changing vibration of the group showing the -OH group at  $3342.62\text{ cm}^{-1}$  absorptions. The very strong absorption at wavelengths of  $2919.57\text{ cm}^{-1}$  and  $2854.31\text{ cm}^{-1}$  showed aromatic C-H groups. It was strengthened by C = C aromatic absorption at  $1500\text{-}1600\text{ cm}^{-1}$  and moderate absorption of aromatic CH bending vibrations. On waves  $703, 80\text{ cm}^{-1}$ . The strong absorption band in the form of a sharp band in the wave area of  $1608.62\text{ cm}^{-1}$  indicates the presence of a carbonyl group (C = O). The strong absorption bands at  $1053.56\text{ cm}^{-1}$  and  $1094.30\text{ cm}^{-1}$  indicated the presence of an ether (C-O) group. In figure 1, it is assumed that there are functional groups such as OH, C-H aromatic, C = C aromatic, C-O alcohol, C = O, and C-O ether, where these functional groups are functional groups of flavonoid compounds [19].

### 3. Test the quality of the Peel-Off gel Mask Formulation

In this research, peel-off gel masks were made using variations in the extract volume. Each variation was tested for the gel Peel-Off mask formulation quality. The Quality test includes the organoleptic test, pH test, homogeneity test, stability test, dry time test, and spreadability test. The observation was carried out on the seventh day due to organoleptic factors, the shape of the peel-off gel mask was already in the form of a gel, and the color of the mask was transparent green. Therefore, if it is less or more than 7 days, the mask's shape will be a little runny, and the color will be dark green.

Organoleptic tests are shown to obtain a peel-off gel mask stock with an attractive color, a smell that is acceptable to the user, and a comfortable shape to use, and are six people as panelists [21]. The results can be seen in Table 3. From the table, we can conclude by following the criteria of the form of a peel-off gel mask, F1 and F2 are in gel form (semi-thick and liquid), have a distinctive smell (foul-smelling), and transparent green gel.

Table 3. Organoleptic test of Peel-Off gel mask

Formulation	Observation		
	Shape	Smell	Color
F0	Medium thick	No smell	Clear
F1	Gel	Typical	Transparent green
F2	Gel	Typical	Transparent green
F3	Little runny	Typical	Transparent green
F4	Little runny	Typical	Transparent green

The pH test results for the peel-off gel mask stock are made to have a pH that matches the skin pH, namely 4.5-8.0. F0 and F1 have a pH of 5, while the peel-off gel masks F2, F3, and F4 have a pH of 6. If the pH of the stock is outside the pH interval, the skin is feared; it will cause scaly skin and even irritation. Whereas if it is above the skin's pH, it can cause the skin to feel slippery, dry quickly and can affect skin elasticity [14].

Table 4. The Result of observing the pH of the peel-off gel mask preparation

Formulation	pH before storage	pH after Storage (Day 7)
F0	5.0	5.0
F1	5.0	5.0
F2	6.0	6.0
F3	6.0	6.0
F4	6.0	6.0

The homogeneity test's purpose is to determine the distribution of the active substance of a preparation. No secondary particle aggregation was found. The peel-off gel mask that has been made is homogeneous from the first day to the seventh day at room temperature and after a cycling test. It is concluded that the variation in extract concentration does not affect the Homogeneity of the peel-off gel mask [16].

Table 5. The Result of observing the Homogeneity of the peel-off gel mask preparation

Formulation	Homogeneity before cycling test	Homogeneity after the cycling test
F0	Homogeneous	No change
F1	Homogeneous	No change
F2	Homogeneous	No change
F3	Homogeneous	No change
F4	Homogeneous	No change

The drying test purpose of determine how long the peel-off gel mask will dry on the skin surface and form a film layer. The results showed that all the various formulations of the peel-off gel mask met the standard dry time for the Peel-off gel mask, which was 15-30 minutes [16]. PVA works through the development process by binding the existing water so that water molecules will be close together and attraction occurs between water molecules, lead to increased cohesiveness [20].

Table 6. The Result of observing the Drying of the peel-off gel mask preparation

Formulation	Drying time before storage (minutes)	Drying time after Storage (Day 7) (minutes)
F0	30	28
F1	29	27
F2	28	25
F3	30	27
F4	28	26

Spreadability test to determine the ability of the mask to spread when applied to the skin. The easier it is applied to the skin, the greater the surface area of the mask's contact with the skin gets bigger. So, the absorption of substances on the skin will be more optimal. The good dispersibility of the Peel-off gel mask ranges 5-7 cm [14]. The results of the spreadability test showed that F2 and F3 fulfill

the spreadability range. It is because the F2 and F3 mask forms are in the form of a gel. In addition, peel-off gel masks have the highest antioxidant value at the *Paederia Foetida* leaf extract on a concentration of 30% with an IC<sub>50</sub> of 165.81. It is possible because the Peel-off gel mask of the *Paederia Foetida* leaf extract contains the greatest concentration of the *Paederia Foetida* leaf.

Table 7. The Result of observing the Spreadability of the peel-off gel mask preparation

Formulation	before storage (cm)	after Storage (Day 7) (cm)
F0	4.8	4.5
F1	5.6	5.3
F2	6.5	6.2
F3	8.1	7.8
F4	8.6	8.2

#### 4. Antioxidant Activity

The peel-off gel mask of *Paederia Foetida* leaf extract was tested for its antioxidant activity by using DPPH to determine the ability to catch free radicals. Measurements of antioxidant activity are shown in Table 8.

Table 8. The Result of IC<sub>50</sub> Value

Formulation	IC <sub>50</sub> Value (ppm)
F0	265.50
F1	168.46
F2	167.74
F3	167.42
F4	165.81

From Table 8, it can be seen that the Peel-off gel mask contains weak antioxidant activity at F1-F4 and very weak antioxidant activity at F0. This is suitable for the antioxidant properties of Molyneux, which

23 were very strong (<50 ppm), strong (50-100 ppm), moderate (100-150 ppm), weak (150 - 200 ppm) [18], The antioxidant test activity

#### CONCLUSION

Based on the discussion results above, it can be concluded that *Paederia Foetida* leaf extract can be formulated into a peel-off gel mask stock. The formula with a concentration of 20% fulfills the organoleptic requirements. Furthermore, it is homogeneous and stable, with pH 6, Spreadability of 6,5 cm, and dry time of 28 minutes with an IC<sub>50</sub> of 167.74, which is a weak antioxidant.

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