

# Formulation of Cream Preparations from Handeleum Leaf Extract (*Graptophyllum pictum*) and Antioxidant Activity Test with DPPH (1,1-Diphenyl-2-Pikrilhydrazil) Method

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## ABSTRACT

**Introduction:** Handeleum leaves as a natural herbal medicine that is efficacious as a hemorrhoid medicine, launch urination, facilitate menstruation, rheumatic drugs and ulcers. Handeleum leaf antioxidant tests from ethanol, ethyl acetate and n-butanol extracts have been carried out which have the ability to reduce DPPH free radicals with IC<sub>50</sub> values of 83,25 ppm respectively; 271,04 ppm and 385,82 ppm. This study aims to formulate *G. pictum* leaf extract cream preparations and test its antioxidant activity with the DPPH method. Three formulas are made, namely F0 (Base), FI (10% extract) and FII (20% extract). Physical evaluation includes organoleptis, homogeneity, pH, adhesion and dispersion. The results of the evaluation formulation cream of organoleptis preparations, homogeneity, pH, adhesion and dispersion meet the standards. The IC<sub>50</sub> value of *G. pictum* leaf methanol extract, which is 86,24 ppm (strong), cream (F0) has an IC<sub>50</sub> value of 1, 231,30 ppm, *G. pictum* leaf extract cream with a concentration of 10% (FI) has an value of 800,41 ppm, and 20% (FII) has an value of 643,85 ppm. All three formulas fall into the category of having no antioxidant activity.

**Keywords :** Antioxidant, DPPH, *Graptophyllum pictum*, IC<sub>50</sub>

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## INTRODUCTION

Free radicals are one of the reactive compounds, which have unpaired electrons. The presence of unpaired electrons in free radicals causes the compound to be highly reactive in looking for a partner, by attacking and binding to the electrons of molecules around it [1]. Free radicals are the main factor causing the premature aging process in skin tissue. The formation of free radicals can be stopped by antioxidants, both from the body's biological system and from outside the body in the form of food and beverage intake [2].

Antioxidants are compounds that can be used to protect the skin from damage due to oxidation reactions so that it can prevent premature aging. Antioxidants are able to inactivate the development of radicals and can inhibit oxidation reactions by binding to free radicals and highly reactive molecules, as a result of which cell damage will be inhibited. One of the sources of antioxidants found in nature is the Handeleum Leaf Plant (*Graptophyllum pictum*).

The Handeleum Leaf Plant (*Graptophyllum pictum*) is one of the plants that is widely used as a natural herbal medicine that is efficacious as a medicine to overcome hemorrhoids (*Hemerroid*), reduce inflammation (anti-

inflammatory) and as an analgesic so that it has stool softening properties, but does not cause diarrhea and lowers the pain threshold value [3]. The *G. pictum* plant contains flavonoid compounds, terpenoids, steroids, alkaloids, saponins, tannins and glycosides [4]. Infusion from *G. pictum* leaves has antioxidant activity with an IC<sub>50</sub> of 125,09 µg/mL [5].

The use of *G. pictum* leaves as a skin protector is still rarely used by the public, so it is necessary to develop it into a form of cosmetic preparation. One of the most commonly used forms of cosmetic preparations is cream. Cream is a semi-solid preparation in the form of a thick emulsion that contains no less than 60% water and is intended for external use. The cream preparation can be applied easily and does not cause marks .

Cream is a form of semisolid emulsion that is used topically. An emulsion is an unstable system consisting of two phases that cannot be mixed with each other, namely the hydrophilic and lipophilic phases. Creams function as carriers of medicinal substances for skin treatment, lubricants for the skin and protective for the skin to prevent direct contact with harmful substances.

Creams are divided into two types, namely the oil-in-water type (m/a) and water-in-oil (a/m). The oil-water type is the type in which the lipophilic phase is dispersed in the hydrophilic phase so it is called an oil-in-water emulsion. M/A cream is often referred to as "vanishing cream" because of its properties that can disappear from the surface and have a cooling effect on the skin because water as a continuous phase will evaporate and increase the concentration of water-soluble substances in the attached layer.

Based on the above background, the researcher is interested in conducting research on "Formulation of Cream Preparations from Handeleum Leaf Extract (*Graptophyllum pictum*) and Antioxidant Activity Test Using the DPPH (1,1-Diphenyl-2-Pikrilhydrazil) Method".

## MATERIALS AND METHODS

### Tools and Materials

Plant material was obtained from Menes, Cimanying Village, Pandeglang, Banten, Indonesia. This plant has been determined at Herbarium Bogoriensis, Padjadjaran University Bandung, West Java with Nomor **04/HB/09/2021**. Extraction solvents: technical methanol. Phytochemical test materials: Mg metal, HCl, mayer reagent, chloroform p.a, NH<sub>4</sub>OH, H<sub>2</sub>SO<sub>4</sub>, ethanol p.a, and iron (III) chloride reagent. Antioxidant test material: DMSO, methanol p.a, DPPH powder and vitamin C.

The **equipment** used in this research are grinder, measuring cup, measuring flask, beaker, Erlenmeyer, analytical balance, test tube, tube rack, maceration device, oven, distillation device. The instruments used are rotary evaporator and UV-Visible type Aligent Cary 60.

### Preparation and Extraction of *G. pictum* Leaves

Handeleum leaves (*G. pictum*) are cleaned by washing, coarsely shredded, dried by drying in the sun by covering with a black cloth, mashed using a blender and sifted with a sieve number 60 mesh. Fine samples of *G. pictum* were extracted by soaking them at room temperature for 3x24 hours using methanol solvent. The maserat is filtered every 24 hours and replaced with fresh solvents. The extraction results are concentrated with an evaporator so that a concentrated extract of methanol [6].

### Phytochemical Screening Test

#### Alkaloid Test

500 mg of extract is added 10 mL of chloroform and 3 drops of ammonia. The chloroform fraction is put into 6 test tubes and acidified with a few drops of HCl 2N. In 3 tubes, a Mayer reagent was added and another 3 tubes were added a Wagner reagent. If positive the alkaloids in the sample are characterized by white deposits on the Mayer reagent and brown deposits on the Wagner reagent.

#### Flavonoid Test

500 mg of the extract is dissolved with methanol and put in a test tube, heated and filtered. Filtrate is added Mg powder and 0.5 mL HCl 2N. Flavonoid positives are characterized by the formation of red, yellow or orange colors.

#### Phenolic Tests

Phenolic secondary metabolite testing is performed by taking 2 mL of samples, ethanol is added, then boils for 5 minutes and strains in heat. Then the solvent is evaporated, the extract is strongly whipped with chloroform and then FeCl<sub>3</sub> 1 % is added after which aquades is added. Let stand until 2 layers are formed, take a layer of water and add 1% FeCl<sub>3</sub>. If green or purple is formed, it indicates the presence of phenolics.

**Saponin Test**

500 mg of the extract is put in a test tube added hot aquades 10 mL and shaken vigorously for 10 minutes. Saponin is positive when the foam is stable for not less than 10 minutes and with the addition of HCl 2N the foam is not lost.

**Steroid/Terpenoid Tests**

500 mg of the extract is put into a test tube dissolved in chloroform. 0.5 mL of anhydrous acetate is added. 1 drop of concentrated mL H<sub>2</sub>SO<sub>4</sub> is added through the wall of the tube. If positive terpenoids are present, a red color is formed while a positive steroid is formed a blackish-green color.

**Tannin Test**

500 mg of the extract is put into the test tube. Add water and simmer for 5 minutes. Then filter and then filtrate is added 2-3 drops of FeCl<sub>3</sub> 1 %. If the tannins are positive, it shows the formation of a dark blue color or greenish black.

**Antioxidant Activity Test****Manufacture of Extract Solution**

Methanol extract was weighed as much as 20 mg dissolved with 20 mL of methanol until it became 1,000 ppm (parent solution). Next, take 5, 10, 15, 20 and 25 mL of each extract solution, then re-dilute it in a 100 mL measuring flask so that an extract solution with concentrations of 50, 100, 150, 200 and 250 ppm is obtained [7].

**Manufacture of DPPH**

40 Solution µg/mL (0.1 mM) weighted as much as 4 mg of DPPH and put in a pumpkin measure 100 mL, then dissolve with methanol and volume adjusted to the limit mark. Next measure long maximum wave DPPH ranges from 450 nm – 550 nm [7].

**Manufacture of Vitamin C Solution**

Vitamin C is weighed as much as 2 mg dissolved with 20 mL of methanol to 100 ppm. Next, take 0.5 of each of the extract solutions; 1,0; 2.0 and 4 mL are then re-diluted in a 100 mL measuring flask so that a solution with a concentration of 0.5 is obtained; 1,0; 2.0 and 4.0 ppm [7].

**Antioxidant Activity Test [8]**

For determination of antioxidant activity, a 2 mL sample was inserted into a test tube, DPPH 40 was added µg/mL (0.1 mM) as much as 2 mL then in the vortex until homogeneous and incubated at room temperature for 30 minutes. Next, the test solution is measured for absorption use Spectrophotometer UV-Vis.

Vitamin C as a positive control was measured at concentrations of 0.5; 1.0; 2.0 and 4.0 ppm. Each concentration was placed in a pipette and transferred to a test tube of 2 mL and then 2 mL of DPPH 40 µg/mL was added. The mixture is incubated in a dark room for a long time 30 minutes. The incubated solution is measured for absorbance at the maximum wavelength.

**Calculation of Antioxidant Potential with IC<sub>50</sub>**

The IC<sub>50</sub> value will be calculated based on the linear line equation obtained from the relationship graph between concentration and % DPPH inhibition. The antioxidant potential with DPPH reagent will be determined by calculating the IC<sub>50</sub> value of each sample obtained. The % inhibition of DPPH will be calculated using the formula

$$\%DPPH \text{ inhibition} = \frac{Abs. blank - Abs. sample}{Abs. blank} \times 100\%$$

The variation of sample concentration and % inhibition will be plotted on the sample absorbance curve on the x and y axis of the linear regression equation. The IC<sub>50</sub> value will be calculated from the equation  $y = ax + b$  with x-axis as sample concentration variation and y-axis as % inhibition with the formula:

$$IC_{50} = (50 - b) : a$$

The equation used to determine the  $IC_{50}$  of each test sample is expressed by the value of  $y = 50$  and the  $x$  value obtained as  $IC_{50}$ . The extract is declared to have antioxidant activity if the resulting  $IC_{50}$  value is less than 100 ppm.

### Leaf Methanol Extract Cream Formulation *G. pictum*

Cream formulation refers to Formulary Medicamentorium Selectum (FMS). The cream is made with 3 formulations.

**Table 1.** Formulation of cream methanol extract leaves *G. pictum*

Formula	F0 (Basis)	FI 10%	FII 20%
Methanol Leaf Extract <i>G. pictum</i>	-	10 g	20
Stearate acid	19,5 g	19,5 g	19,5
Adeps Lanae	1,5 g	1,5 g	1,5
Parafin Liquidium	3 g	3 g	3
Aquadest	25 g	25 g	25

Available materials are weighed according to Table 1. First, F0 was made first as much as 100 mL by mixing the water phase (TEA 1,5 g + aquadest) and the oil phase (25 g paraffin liquidium, 19,5 g stearic acid and 3 g *Adeps lanae* + aquadest) on beaker glass with a total aquadest add 100 mL heated at a temperature of 70°C and then stir again with a hot lump until homogeneous. FI is made in the same way and amount as F0 but with a total aquadest add of 100 mL. FII is also made in the same way and amount as F0 but with a total aquadest add of 100 mL. In FI and FII, methanol extract of *G. pictum* leaves is added in the amount of 10 g (FI) and 20 g (FII) if the cream temperature has reached  $\pm 45^\circ\text{C}$  and stir again until homogeneous.

## Evaluate Cream Preparations

### Organoleptic Observations

Organoleptic observation is the simplest test using the five senses which include shape, smell and color.

### Homogeneity

Homogeneity testing is carried out by applying a cream that has been made on the glass object, then covered with the glass of another object and seen whether the preparation is homogeneous and whether the smooth surface is evenly distributed [9].

### pH measurement

The cream is put in a container, then measured pH with a pH meter. Measurements are taken on freshly made creams and stored creams. The requirement for the pH value of cream preparations is 4,5-8 [9].

### Dispersion Testing

Cream as much as 0,5 g is placed in the center of a round glass, covered with another glass that has been weighed and left for 1 minute then measured the diameter of the cream spread. After that, a load of 0,5 kg was added and left for 1 minute then the spread diameter was measured. The spreadability requirement for topical preparations is about 5-7 cm [9].

### Adhesive Testing

The adhesion test is carried out two glass objects, a stopwatch, a gram scale and is carried out by attaching enough cream on top of the other glass object on top of the cream then pressed with a load of 0,5 kg for 5 minutes then install the glass object on the test tool after that release the weight of 20 grams and the time is recorded until the two objects are detached and repeated the above method on each formula 3 times each. The requirement for a good cream is 2-300 seconds [9].

## RESULTS AND DISCUSSION

### Results

#### Extraction of *Simplisia G. pictum* leaves

Extraction was performed using methanol as a solvent. The maceration results can be seen in Table 2.

**Table 2.** Yields maceration results

Extract	Mass Simplification (g)	Extract Mass (g)	% Yields
<i>G. pictum</i> leaves	1.000	50,168	5,017%

**Phytochemical Screening**

The results of phytochemical screening of *G. pictum* extract can be seen in Table 3 as follows:

**Table 3.** Result phytochemical screening

	Chemical reagent	Result	Description
<b>Alkaloids</b>	Mayer	+	White Deposits Formed
<b>Alkaloids</b>	Wagner	+	Brown Deposits Formed
<b>Flavonoids</b>	Mg + HCl 2N	+	Orange Color Formed
<b>Saponins</b>	HCl 2N	+	Stable Foam Formed
<b>Terpenoids</b>	Lieberman Burchard	-	No Red Formation
<b>Steroids</b>	Lieberman Burchard	+	Blackish Green Color
<b>Tannins</b>	Aquades + FeCl <sub>3</sub>	+	Greenish Black Color
<b>Phenolic</b>	Lieberman Burchard	+	Color Green
<b>Flavonoids</b>	Mayer	+	White Deposits Formed

**Antioxidant Activity of *G. pictum* Extract and Vitamin C**

The antioxidant activity test was carried out using the DPPH method (1,1-diphenyl-2- Pikrilhydrazil) that repeated 2 times with various variations Concentration and Vitamin C comparator that produces antioxidant activity values as shown in Table 4.

**Table 4.** Antioxidant Activity Test Results *G. pictum* Extract and Vitamin C

Sample	Regression equations	Correlation	IC <sub>50</sub> Value (µg/mL)	Antioxidant Activity
Extract	$y = 0.2968x + 24.405$	$R^2 = 0.9960$	86,24	Strong
Vitamin C	$y = 20.573x + 11,235$	$R^2 = 0,9917$	1,88	Very Powerful

**Evaluation of *G. pictum* Leaf Methanol Extract Cream Preparation**

Evaluation of the physical preparation of Methanol Extract Cream of *G. pictum* Leaf includes organoleptic, homogeneous, pH, viscosity, dispersability and adhesion testing.

## 1. Organoleptic Observations Organoleptic

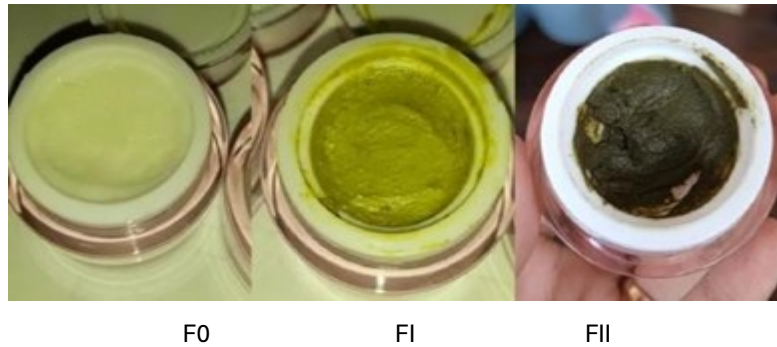
This is done by observing the shape, smell and color of the cream preparation. The results of organoleptic testing of cream preparations can be seen in Table 5 and Figure 1.

**Table 5.** Observations organoleptic

Formulation	Criterion	Result
F0	Shape	Semi Solid
	Smell	Distinctive
	Color	White
FI	Shape	Semi Solid
	Smell	Distinctive
	Color	Green
FII	Shape	Semi Solid
	Smell	Distinctive
	Color	Deep Green

\*Information:

F0 : Cream Base; FI : Cream Extract 10%; FII : Cream Extract 20%



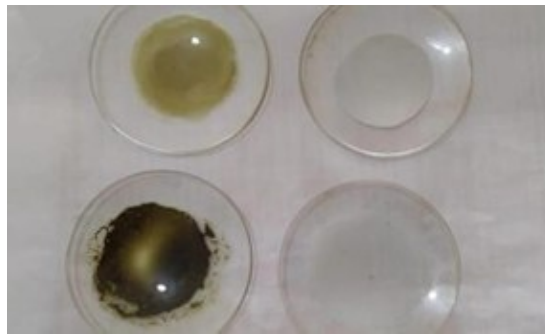
**Figure 1.** Organoleptic observations

## 2. Homogeneity Observation

The results of observations of the homogeneity of the cream preparation can be seen in Table 6 and Figure 2.

**Table 6.** Homogeneity observation

Observation	F0	F1	FII
<b>Homogeneity</b>	Homogeneous	Homogeneous	Homogeneous



**Figure 2.** Homogeneity observation results

## 3. pH Measurement

The results of the power of hydrogen (pH) measurement of cream preparations can be seen in Table 7.

**Table 7.** Result pH measurement

Cream	pH	Description	Standard
F0	5,81	Meet Standards	4,5-8,0 SNI 16-4399-1996
F1	5,70	Meet Standards	
FII	5,07	Meet Standards	

## 4. Adhesive Testing

The results of the test of the adhesion of the cream preparation can be seen in Table 8.

**Table 8.** Result adhesive testing

Cream	Adhesive	Description	Standard
F0	7,99	Meet Standards	2-300
F1	4,51	Meet Standards	
FII	2,31	Meet Standard	

## 5. Dispersion Testing

The results of the dispersion test of the cream preparation can be seen in Table 9.

**Table 9.** Test results spreadability

Cream	Load Power	Parameters		Description	Standard
		Q>	H^		
F0		6,4	6,2	Meet Standards	
FI	500 g	6,0	6,0	Meet Standards	5-7 cm
FII		5,6	5,5	Meet Standards	[10]

\*Information:

Q>: Vertical

H^: Horizontal

### Antioxidant Activity of Cream Preparations

The antioxidant activity test was carried out using the DPPH (1,1-diphenyl- 2- pykrilhydrazil) method which was repeated 2 times with various variations in concentration (Table 10).

**Table 10.** Results of antioxidant activity test of cream preparations

Sample	Regression equations	Correlation	IC <sub>50</sub> Value	Sample
Base	$y = 0.0401x + 0,625$	$R^2 = 0.9939$	1.231,30	Not Have
FI	$y = 0.063x - 0.426$	$R^2 = 0.9978$	800,41	Not Have
FII	$y = 0.0743x + 2,162$	$R^2 = 0.9963$	643,85	Not Have

## Discussion

### Simplicia Setup

Plant sampling is very important, it is necessary to consider when medicinal plants are right to be harvested not only in large biomass but also optimal content of active compounds. For this reason, the collection of medicinal plants must be carried out at the right time and age and parts of the plant [11].

Crops in the form of more fragile or decaying leaves and flowers must be handled with care. Undue damage must be avoided in order for the cut plant to grow back. Mechanical damage to the harvested material should be avoided to prevent changes in the quality of the material. For plants in the form of trees, it is avoided to harvest all the leaves on the plant so that physiological processes are not disturbed. Avoid harvesting young leaves unless it is known that there is a desired chemical content [11].

The leaves of *G. pictum* are harvested on old plants at the end of the vegetative period. The washing of the material is carried out under running water coming from a clean water source. This activity is carried out in stages until the washing water is clear. This is done to remove dirt or dust that sticks to the leaves, then roughly shred them to help speed up drying. Carry out the washing process carefully so that the leaves are not damaged because damage to the material will trigger the decay process [11]. Leaf *G. pictum* is dried in the sun covered with a black cloth until dry. Drying aims to obtain leaf simplicia that is not easily damaged, not overgrown with fungi and simplicia in good condition. It is weighed as much as 1,050 g then mashed with a blender and sifted using a 60mesh sieve which produces a mass of 1,000 g of simplicia. The smaller the sample size, the easier it will be for the solvent to diffuse into the sample tissue, making it easier to extract the compound. A good size in maceration is 60 mesh because too fine simplicia will give difficulties to the filtering process. This happens because the space between cells will become narrower, making it difficult for solvents to enter the powder.

### Extraction of Simplisia *G. pictum*

Extraction is the separation of secondary metabolite compounds from a sample of plants, animals and other materials using appropriate solvents. The extraction method used in this study is the maceration method. Maceration is carried out using methanol solvents, because methanol has a very high polarity so that it can attract all compounds in the sample.

The maceration method was chosen because it has the advantage of not heating so that it does not damage the compounds contained in the sample. The 13 liters of filtrate obtained are concentrated using a Rotary Vaccum Evaporator so that a thick extract is obtained. A good rotary temperature for methanol solvents, which is at a temperature of 50°C because the higher the temperature (below the boiling point of methanol which is 65°C) can make it easier for methanol as a solvent to get a higher yield value because the content of the active substances obtained becomes more [12].

Based on the results of maceration, the methanol extract of *G. pictum* leaves obtained has a % yield of 5,017%. Condensed extracts of *G. pictum* were tested by organoleptic testing. This test is a test method that uses the five senses including smell, color, taste and consistency.

Visually, methanol extract has a thick texture, has a distinctive smell and has a blackish-green color. Organoleptis, *G. pictum* thick extract has conformity with the requirements in accordance with FHI (2017) but if the value does not meet the requirements because the yield value is less than 9,3% (FHI, 2017). This is likely due to the use of solvents that are not in accordance with the provisions of FHI (2017) which should use ethanol where the solvent properties of ethanol are more universal than methanol based on its polarity. The higher the yield, the greater the extract produced with the weight of the simplicia powder used [13].

### Antioxidant Activity of *G. pictum* Extract

The antioxidant test in this study used the DPPH method. This method is a simple, easy, fast and sensitive method of antioxidant activity testing and uses only a small sample. DPPH is a stable free radical compound of the nitric oxide group. This compound has the characteristics of a blackish-purple solid, soluble in ethanol or methanol solvents (14). The interaction of antioxidants with DPPH, either by electron transfer or hydrogen radicals in DPPH, will neutralize the free radical character of DPPH [15].

The parameter used for antioxidant activity with this DPPH radical capture method is  $IC_{50}$ . The  $IC_{50}$  is the concentration of test compounds that can reduce free radicals by 50%. The smaller the  $IC_{50}$  value, the higher the free radical suppression activity will be [16].

#### 1. Result Determination Maximum Absorption Wavelength Maximum Absorption Measurement

The 40  $\mu\text{g/mL}$  DPPH solution in methanol was performed using a UV-Visible spectrophotometer. The data from the measurement of the maximum wavelength The measurement results showed that the DPPH solution in methanol produced maximum absorption at a wavelength of 515,78 nm. The results of the maximum wavelength are in accordance with the maximum wavelength of DPPH which is in the range of 515-520 nm [17,18]. The results of the wavelength measurement are used to determine the use of the type of light used in the tool used in the antioxidant testing of the sample extract, namely with the UV-Vis Spectrophotometer. The type of light that is included in the maximum wavelength value range of DPPH obtained, namely visible light that has a wavelength range value of 400-750 nm [19].

#### 2. Results of Measurement Time Analysis (Operating Time)

Measurement time (Operating Time) of the DPPH method according to several recommended literature during the 60 minutes, but in some studies the time used varies greatly from 1 minute to 240 minutes. Determining the Operating Time of DPPH solution The 40  $\mu\text{g/mL}$  in methanol obtained the best working time, i.e. in the 30th minute after the addition of the methanol solvent. The results of the Operating Time of DPPH solution 40  $\mu\text{g/mL}$  in methanol.

#### 3. Results of Antioxidant Activity Analysis of Extracts

The antioxidant activity of Methanol extract of *G. pictum* leaves was obtained from the results of DPPH absorbance measurements to which the test solution was added with concentrations of 50, 100, 150, 200 and 250  $\mu\text{g/mL}$ , then compared with the DPPH control (without the addition of the test solution). The results of the antioxidant activity analysis decreased the absorbance value of DPPH in proportion to the increase in the concentration of the test solution.

Vitamin C is used as a positive and comparative control, as it is a natural antioxidant that is better than synthetic antioxidants. The use of positive controls in this study aims to find out how strong the potential antioxidant activity in leaf extract is *G. pictum*. If the  $IC_{50}$  of the sample is close to or even equal to the  $IC_{50}$  of positive controls, then it can be said that *G. pictum* leaf extract has the potential to be one of the most powerful antioxidant alternatives.

A decrease in absorbance values indicates an increase in antioxidant activity. The decrease in absorbance value occurs because Methanol extract of *G. pictum* leaves contains secondary metabolite compounds that are thought to be able to neutralize DPPH by giving electrons to DPPH so that atoms with unpaired electrons get a pair and no longer become radical. The results of the linear regression equation and the results of the analysis of the  $IC_{50}$  value can be seen in Table 4.

According to [18] a compound is said to be a very strong antioxidant if it has an  $IC_{50}$  less than 50  $\mu\text{g/mL}$ , strong if  $IC_{50}$  is valued at 50-100  $\mu\text{g/mL}$ , while if  $IC_{50}$  is valued at 100-150  $\mu\text{g/mL}$  and weak if  $IC_{50}$  is 151-200  $\mu\text{g/mL}$ . The results of the study (Table 4) showed that Methanol extract of *G. pictum* leaves had strong antioxidant activity with an  $IC_{50}$  of 86,24  $\mu\text{g/mL}$  because it is in the range of 50-100  $\mu\text{g/mL}$ . The results of this study are in line with the research of that purple leaf ethanol extract has strong antioxidant activity with an  $IC_{50}$  of 83,25 ppm. Flavonoid and

phenolic compounds have a great contribution to antioxidant activity. The higher the level of flavonoids/phenolic compounds in the extract, the better the antioxidant activity.

Phenolic compounds can dampen free radicals in several ways, including donating hydrogen to oxygen radical species so as to break the cycle of new radical formation. In addition, phenolic compounds can also donate hydroxy groups to radical species. The antioxidant power of phenolic compounds is also attributed to the ability of phenolic compounds to chelate with metal ions involved in free radical reactions. Antioxidants are needed to prevent oxidative stress. Oxidative stress is a condition in which the amount of free radicals and antioxidants in the body is out of balance. Oxidative stress plays an important role in the pathophysiological occurrence of the aging process and various degenerative diseases so that antioxidants are needed by the body.

### Evaluation of *G. pictum* Leaf Methanol Extract Cream Preparation

Evaluation of the physical preparation of *G. pictum* Leaf Methanol Extract Cream includes organoleptic testing, homogeneity, pH, dispersability and adhesion.

#### 1. Organoleptic Observation

This First Stage It is done by observing directly on the preparation of the cream. The components observed in organoleptic testing include the shape, smell and color of the cream (Table 5). Observation organoleptic is one of the most important tests for semisolid preparations especially creams with the observation of color, aroma and shape. Based on results observations that have been made, the preparation of *G. pictum* leaf methanol extract cream has a semi-dense texture, the distinctive smell of *G. pictum* cream and extract and the color produced by the three cream formulas are different. This is due to the difference in the concentration of extracts used in each formula. A good cream is a cream that does not cause a rancid smell. Changes in smell or firmness can be caused by oxygen from the air that oxidizes fats or oils, besides that light is one of the catalysts that can also cause oxidation reactions, so it can be concluded that the oil phase contained in the cream preparation does not undergo oxidation because the organoleptic results of the smell in the three formulations do not smell rancid but still smell typical of cream and *G. Pictum* extract [20].

#### 2. Homogeneity

The homogeneity test aims to see the uniformity of particles in the leaf cream preparation *G. pictum* so as to provide good and maximum quality when Used. Homogeneity is one of the factors that can affect the physical quality of the cream preparation. Good homogeneity checks are characterized by all particles being evenly dispersed over the glass of the object and no clumping in each preparation [21].

Based on the observation results (Table 6), the three formulas have a homogeneous arrangement, there are no rough grains on the glass plate when tested. This shows that all cream sedative formulas have good homogeneity and meet the requirements.

#### 3. pH measurement

This pH measurement is carried out to determine the degree of acidity of the preparation of *G. pictum* leaf extract cream. Measurements were made on all three formulas (Table 7). According to SNI 16-4399-1996, the ideal cream pH is in accordance with the pH of the skin, which ranges from 4,5 – 8,0. If the pH The cream does not match the pH of the skin, then it will cause skin irritation. The measured pH of the three cream formulas was 5,81 (base), 5,70 (FI) and 5,07 (FII). The pH measurement of each preparation showed that the higher the concentration of stearic acid and extract, the higher the pH. The pH measurement results on the three formulas have met the requirements in accordance with SNI 16-4399-1996 in [22].

#### 4. Adhesive Testing

Testing the adhesion of a cream to a preparation aims to evaluate the ability of the cream preparation to be able to adhere to the skin. The longer a cream preparation can stick to the skin, the better the absorption of active substances on the skin. The requirement for good cream adhesion is about 2-300 seconds.

Based on the test results, the three formulas of *G. pictum* leaf extract cream met the specified requirements because they were between 2-300 seconds (Table 8). This can affect the release of active substances when applied to the skin.

Based on the test results, the greater the concentration of stearic acid and the extract, the greater the adhesion. A good cream is able to guarantee effective contact time with the skin so that the purpose of use is achieved, but it is not too sticky when used. The adhesion time also affects the effectiveness of the active substance at the location of its application.

## 5. Dispersion Testing

The dispersion power test was carried out to determine the ability of the base to spread on the surface skin when applied. Base deployment capabilities that good will provide convenience moment dosage the cream is applied to the skin. Testing the spreadability of the cream is an important requirement for cream preparations [23]. Result observation show bases have a greater dispersion value than FIs and FIIs. This shows that the greater the concentration stearic acid and extracts will reduce the area of dispersion produced due to increased viscosity. The wider the spread area produced by a cream, the cream will have a better spreading ability when applied. The dispersion requirement for a good topical preparation is about 5-7 cm [10]. Dispersion testing of leaf extract cream *G. pictum* shows results that meet the requirements. The three preparations of the cream after storage have an increase in area that is not much different. So it can be said that the three *G. pictum* leaf extract creams have stable spreadability.

## Antioxidant Activity of Cream Preparations

The antioxidant activity of Methanol extract of *G. pictum* leaves was obtained from the results of DPPH absorbance measurements to which the test solution was added with concentrations of 200, 400, 600, 800 and 1000 µg/mL, then compared with the DPPH control (Table 10).

The absorbance value obtained can be calculated as the percentage value of DPPH radical inhibition (% inhibition). Furthermore, a linear regression curve and its equation with concentration as the x-axis and absorbance as the y-axis are obtained. The IC<sub>50</sub> can be calculated from the linear regression equation that has previously been obtained by replacing y with 50 in the equation. The IC<sub>50</sub> is a number that indicates the concentration of the test sample (ppm) which is able to inhibit the oxidation process by 50%. The smaller the IC<sub>50</sub> indicates the higher the antioxidant activity [24].

The results of the study (Table 10) show that all three formulas have no antioxidant activity. However, the higher the methanol extract content of *G. pictum* leaves, the smaller the IC<sub>50</sub> value produced. This is suspected to be caused by the content of secondary metabolite compounds found in *G. pictum* methanol extract at higher concentrations. This indicates that the higher the concentration of extracts in the cream preparation, the antioxidant activity in the cream preparation will increase. The difference in the value of IC<sub>50</sub> can be caused by the difference in the amount of antioxidant activity contained in the extract with the increase in the concentration value of the extract used, where the IC<sub>50</sub> value obtained is 1,231.30 ppm (cream base/F0), 800,41 ppm (FI) and 643,85 ppm (FII).

The cause of the absence of antioxidant activity in the three cream preparations may be due to the damage to the content of compounds that act as antioxidants in the extracts used. This is likely due to one of the reasons why in the three cream formulations there are no ingredients that function as preservatives in them to prevent one of the shortcomings of cream preparations, which is easily damaged due to contamination from microbes. Microbial contamination can affect the quality or quality of the compound content contained in it so that the compound is not perfectly emulsified or mixed well at the temperature used during storage or manufacturing that is not suitable [25].

Another cause that can damage the compound content in cream preparations is likely due to the use of temperature during storage or improper manufacturing. This is related because antioxidants themselves are compounds that are also susceptible to damage to light and heat. A decrease in antioxidant power will occur if the temperature used when mixing the extract sample is too hot [25].

The deterioration of the quality of the compound content contained in cream preparations can be prevented by several things such as the addition of preservatives that function to keep the cream from microbial contamination when stored and change the use of temperature when making cream preparations. The preservative that should be able to be added to the formulation is Propyl paraben. This is because the pH of The cream preparations made are around the pH value of <6 and propyl paraben actively works in the pH value range of 4-8 and is easily soluble in ethanol and methanol [25-27]. The temperature in the preparation of cream preparations when adding the extract should also be cooler to maintain the content of compounds that are susceptible to heat damage. The temperature when mixing the extracts can possibly be reduced to 25°C or 30°C is cooler than 45°C.

## CONCLUSIONS

Based on the results of the research, the conclusions that the author can draw are as follows: First, Methanol extract of *G. pictum* leaves has the potential as a powerful antioxidant with an IC<sub>50</sub> of 86,24 ppm. Second, Methanol extract of *G. pictum* leaves can be formulated into cream preparations with evaluation of preparations that have met the requirements in terms of organoleptic, homogeneity, pH, dispersibility and adhesion. Third, cream formulations have no antioxidant activity based on IC<sub>50</sub> values with IC<sub>50</sub> values of 1,231.30 ppm (cream base/F0), 800,41 ppm (FI) and 643,85 ppm (FII).

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