INDONESIAN HEALTH JOURNAL
https://ihj.rivierapublishing.id/index.php/rp
Volume 5 Number 2, June 2026
P-ISSN: 2963-3044
E-ISSN: 2963-3036

Formulation and Antioxidant Activity Test of Hand Cream Extzract of Kumis Kucing Leaf (Orthosiphon Stamineus) Using DPPH (2,2- Diphenyl-1-Picrylhydrazyl) Methods

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Keywords:
Antioxidants; Flavonoids; Hand Cream; Kumis Kucing Leaf

Abstract

Extract of kumis kucing leaves (Orthosiphon stamineus) contains secondary metabolites, namely flavonoids, tannins, saponins, and phenolics. This study conducted an antioxidant activity test on the extract and its formulations. The aim of this research is to determine the antioxidant activity of the kumis kucing leaf extract and formulations, and to formulate it into a hand cream preparation at concentrations of 5 g, 10 g, and 15 g. The antioxidant activity of the extract and formulations was measured using UV-Vis spectrophotometry. The results of this study show that the IC_{50} value of the kumis kucing leaf extract (Orthosiphon stamineus) is 74 ppm. For the formulations, the IC_{50} values are as follows: Formulation 0 has an IC_{50} value of 257 ppm, Formulation 1 has an IC_{50} value of 108 ppm, Formulation 2 has an IC_{50} value of 91 ppm, and Formulation 3 has an IC_{50} value of 84 ppm. The hand cream preparations present as white, green, dark green, and dark greenish-black in colour respectively, with a characteristic scent of kumis kucing leaves, in cream form, with a pH range of 5–7, a spreadability range of 5–7 cm, an adhesion range of 4–8 seconds, and a viscosity range of 4,000–36,000 cps. The results confirm antioxidant activity in both the kumis kucing leaf extract and the formulations. The best formulation was Formulation 3, with an IC_{50} value of 84 ppm, while Formulations 1, 2, and 3 all meet the requirements for a good cosmetic preparation.

INTRODUCTION

Skin diseases are among the most prevalent conditions found in tropical countries, including Indonesia. The prevalence of skin diseases in Indonesia ranges from 4.60% to 12.95%, ranking third among the ten most common diseases. Skin diseases can occur as a result of poor sanitary environments as well as air pollution (Rahayu et al., 2023).

Kumis kucing (Orthosiphon stamineus) is a medicinal plant widely used in traditional medicine for purposes such as facilitating urinary excretion (diuretic), treating rheumatism, cough, kidney stones, diabetes, and albuminuria. In plant classification, kumis kucing belongs to the genus Orthosiphon of the family Lamiaceae. Beyond its role in traditional medicine, kumis kucing also exhibits several biological activities, including anti-inflammatory, antioxidant, anticancer, and diuretic properties (Rafi et al., 2021).

The ethanol extract of kumis kucing leaves contains secondary metabolites that are highly beneficial to the body, including flavonoids, alkaloids, tannins, saponins, and terpenoids/steroids (Alamgir, 2018; Kuswanto & Sopade, 2015; Zaidi et al., 2025). Flavonoids

are compounds produced by plants and belong to the group of polyphenol compounds. Flavonoids have potential antioxidant activity due to their ability to donate hydrogen atoms, chelate metal compounds, and scavenge reactive oxygen species (Salasa et al., 2021).

Hand cream is a topical preparation applied to the palms and the back of the hands, offering several advantages including ease of application and uniform spreadability (Hatwar et al., 2024; Krishnan et al., 2022; Lalita & Shalini, 2020; Mohiuddin, 2019; Sharma et al., 2025). Regular use of hand cream can help restore hydration and skin function compromised by dryness and roughness caused by frequent hand washing (Ambari et al., 2021). Antioxidants are compounds of great importance to the human body and skin, functioning primarily to neutralise free radicals (Karim et al., 2022). Free radicals are relatively unstable molecules characterised by atoms whose outer orbits contain one or more unpaired electrons. These molecules are known to oxidise healthy cells and cause damage to the skin. The use of sufficient antioxidants to prevent oxidative damage is therefore essential.

Against this background, the purpose of this study is to determine the antioxidant activity of kumis kucing leaf extract and its formulations in a hand cream preparation. This research is expected to provide theoretical benefits for the development of pharmaceutical science, particularly in the fields of phytochemistry and cosmetics, by enriching the body of knowledge on the use of kumis kucing as a natural source of antioxidants in topical preparations. Practically, this research is expected to serve as a reference for the cosmetics industry in developing safe and effective natural skincare products, as well as providing the public with information on the use of kumis kucing as an active cosmetic ingredient with antioxidant activity capable of protecting the skin from damage caused by free radicals.

METHOD

The method used to test antioxidant activity in this study is the DPPH (2,2-diphenyl-1-picrylhydrazyl method).

Tools and Materials

The tools used in this study are analytical scales, spatels, test tubes (pyrex), measuring cups (pyrex), glass cups (pyrex), stirring rods, hot plates, magnetic stirrer, pH meter, vortex, brookfield viscometer, petri dish, rotary evaporator, blender, UV spectrophotometry – Vis.

The ingredients used in this study were cat whisker leaf extract (Orthosiphon stamineus), cetyl alcohol (merck), triethanolamine (merck), propylene glycol (merck), methyl paraben (merck), propyl paraben (merck), stearate acid (merck), liquid paraffin (merck), aquadest, FeCl3, mayer reagent, dragendroff reagent, AlCl3, vitamin C, ethanol 96%, Lieberman Buchard reagent.

Extraction

The cat whisker leaves used in this study come from cultivated plants at PT. Pallapa Muda Perkasa, Depok, Jakarta, Indonesia. The determination was made at the Biology Laboratory, Faculty of Applied Science and Technology, Ahmad Dahlan University, campus 4. The determination is carried out with the aim of finding out the truth of the plants to be studied and avoiding errors in the collection of materials and avoiding the possibility of mixing the plants to be studied with other plants. (Happy et al., 2021).

Extraction is carried out by the maceration method by putting cat whisker leaf powder into a bottle, adding 300g of extract then adding 96% ethanol solvent with a ratio of 1:10 then

closed and then left for 5 days, while stirring once a day, then filtered using flannel until obtained maserat. Then it is concentrated using a rotary evaporator until a thick extract is obtained. After that, it is waterbathed at 60°C to remove the remaining ethanol from the rotary evaporator. (Susanty, 2016) Screening Phytochemistry

Alkaloid

Filtrate is added 1 ml to the test tube and then 2 Mayer reagents are added.

Positive results are indicated by the formation of white deposits.

The filtrate is added 1 ml to the test tube and then 2 drops of Dragendroff reagent are added. Positive results are shown by the formation of orange-brown deposits.

Flavonoid

Put 1 mg of solid ethanol extract into the test tube, then put 10 drops of methanol in it, stir until dissolved. Next, a small amount of magnesium powder and 4 drops of concentrated HCl are added to the mixture. The onset of yellow, blue, orange or red colors shows positive results

Saponins

A total of 1 mg of solid ethanol extract is inserted into the test tube, then adds 5 ml aquades and shaken for 1 minute. If foam is formed, 4 drops of 1M HCl solution are added. If there is no foam, continue heating ±3 minutes. Then let it cool and then shake it vigorously. The formation of a stable foam within ±10 minutes indicates the presence of saponin compound Phenolics A total of 1 mg of a solid sample is put into the test tube, then added 10 drops of methanol, then stir with a spatula until dissolved. Next, 6 drops of 5% FeCl3 solution are added. Blue, green, purple, or reddish reddish color indicates a positive test result.

Tannins

A total of 1 mg of solid samples is dissolved in ethanol, then the extract is boiled with

water in a water bath, then filtered. Add 3 drops of 1% FeCl3 to the obtained filtrate. Positive results can be seen based on the formation of colors in the sample, namely dark blue and greenish-black

Determination of total flavonoid levels Cat whisker leaf extract Manufacture Reagent solution

Manufacture of 2% AlCl3 reagents. Weighing as much as 10 mg of AlCl3 powder is then dissolved using aquadest to the limit of the 10 ml mark.

Determination of Quercetin Standard Raw Curve

Weighted as much as 25 mg of standard quercetin and dissolved in 25 ml of ethanol p.a. From the standard solution of 1000 ppm quercetin, several concentration series are then made, namely 2 ppm, 4 ppm, 6 ppm, 8 ppm.

Each concentration series was added 3 ml of ethanol pa, 0.2 ml AlCl3 %, then the volume was sufficient to the limit of the mark with ethanol pa using a 10 ml measuring flask. After that, it is incubated for 30 minutes at room temperature. Absorbance is determined using the UV-VIS spectrophotometry method at maximum wavelength

Determination of Maximum Wavelength in Quercetin Standard Solution

Measuring 1 ml of each concentration of quercetin solution that has been made then 1 ml of AlCl3 2% reagent is added to it. The solution is stored for 30 minutes at room temperature.

The determination of the maximum wavelength of quercetin is carried out by running the quercetin solution in the wavelength range of 400 – 800 nm. The maximum wavelength will be used to measure the absorption of the sample

Determination of Total Flavonoid Levels of Cat Mustache Leaf Extract (Orthosiphone stamineus) With UV-VIS Spectrophotometry

A total of 0.01 cat whisker leaf extract (orthosiphon stamineus) was put into a 10 ml measuring pumpkin then added 3 ml of ethanol p.a 0.2 ml AlCl3 2%, and sufficient to the mark limit using aquadest. After that, it is incubated for 30 minutes at room temperature. Absorbance is determined using the UV-Vis spectrophotometry method at maximum wavelengths. Where the sample is made in three replications for each analysis so that the average absorbance value is obtained

Antioxidant Examination of Cat whisker leaf extract. Manufacture of DPPH solution (2,2- diphenyl-1-picrylhydrazyl)

Making a DPPH solution by means of DPPH powder is weighed as much as 5 mg, then dissolved using 100 ml of 96% ethanol using a measuring flask is whipped until homogeneous and DPPH solution with a concentration of 50 ppm is obtained, the solution is stored at room temperature and protected from light (Hansen Hartanto, 2018)

Manufacture of DPPH Blank Solution (2,2-diphenyl-1-picrylhydrazyl)

A total of 3 ml of DPPH solution is put into a 10 ml measuring flask and given 96% ethanol to the limit, then transfer it to a brown container and let it sit for 30 minutes at room temperature and observe its absorbance at a wavelength of 517 nm.

Manufacture of Cat Whisker Leaf Extract Master Solution (Orthosiphon Stamineus)

A total of 5 mg of ethanol extract is dissolved with 50 ml of 96% ethanol, mix and soak for 24 hours, Strain with filter paper. Next, a solution with concentrations of 40 ppm, 45 ppm, 50 ppm, and 55 ppm was made. The test was carried out by sampling 1 ml of sample solution from various concentrations of 40 ppm, 45 ppm, 50 ppm, and 55 ppm. Then 2 ml of 0.1 mM DPPH solution was added each. Mix, then incubated for 30 minutes at room temperature in a dark room. Its absobancy was measured at a wavelength of 517 nm (Recta Olivia Umboro, 2020)

Manufacture of Ascorbic Acid (Vitamin C) Parent Solution

Weigh 5 mg of vitamin C, then dissolve with 50 ml of 96% ethanol, mix and soak for 24 hours, strain with filter paper. Next, a concentration solution of 2 ppm, 4 ppm, 6 ppm, and 8 ppm was made. The test was carried out by mipetating 1 ml of vitamin C solution from various concentrations (2 ppm, 4 ppm, 6 ppm, and 8 ppm). Then 2 ml of DPPH solution is added each. Then it was incubated for 30 minutes at room temperature in a dark room. Its absorbance is measured at a wavelength of 517 nm (Recta Olivia Umboro, 2020)

Solution Absorbance Measurement

Once the absorbance value is obtained, calculate the % inhibition of each solution (blank solution, vitamin c solution or comparator, and cat whisker leaf extract parent solution). After obtaining the % inhibition, then finding the value of IC50 (Inhibition Concentration 50%) is calculated using the linear regression equation formula with the equation $y = a + bx$, where $y = 50$ and the value of x is the value of IC50. The % inhibition calculated using the following formula can be seen in equation 1 (Purwanto et al., 2017)

% inhibisi = abs.blanko−abs.sampel
ABS blank
× 100% (1)

Formulation of Handcream Preparation Cat whisker leaf extract

Ingredients	Formula (%)			
	F0	F1	F2	F3
EDKK	-	5	10	15
Asam stearate	15	15	15	15
Paraffin cair	9	9	9	9
Acetyl alcohol	2	2	2	2
Trietanolamin	3	3	3	3
Propylene Glycol	15	15	15	15
Methyl Paraben	0,18	0,18	0,18	0,18
Propil Paraben	0,02	0,02	0,02	0,02
Aquadest	100	100	100	100

Manufacturing Procedure

Prepare the tool and materials, calibrate the tool then The oil phase is made by melting stearic acid, cetyl alcohol, liquid paraffin together with heat at a temperature of 80°C. The water phase is made by heating aquadest, propylene glycol, triethanolamine, nipagin and nipasol together at a temperature of 80°C while stirring continuously until homogeneous. Mix the masses 1, 2, until homogeneous. Add the cat whisker leaf extract little by little to the beaker glass at 35°C, stir until homogeneous, then transfer to a closed, airtight container. Do it again at F1, F2, F3 with different concentrations of cat whisker leaf extract (orthosiphone stamineus). (H. Benjamin M Noer, 2014)

E**valuation of Handcream Preparations Cat Mustache Leaf Extract Organoleptic Test**

The organoleptic test was carried out by visually observing the preparations including color, odor, consistency and homogeneity with the observation range carried out on day 0, day 7, day 14, day 21, day 28 (Trisyani et al., 2021)

Homogeneity Test

The preparation is weighed 0.1 g then applied evenly and thinly on transparent glass, the preparation must show a homogeneous arrangement and not visible rough grains observations are made on day 0, day 7, day 14, day 21, day 28 (Rasydy et al., 2021)

pH Test

A total of 1 mg of handcream was diluted with 1 ml of ethanol and then measured using a pH meter to measure the pH of the handcream (Tanjung et al., 2022). The pH quality requirements for skin moisturizers according to SNI 16-4399-1996 are ranging from 4.0 – 8.0 observations are made on day 0, day 7, day 14, day 21, day 28 (Patihul Husni, Yuni Ruspriyani, 2021)

Viscosity Test

The viscosity of the cat's whisker leaf extract handcream preparation was measured using a Brookfield viscometer with 150 mg of the preparation placed in a container. Measurement begins by installing spindle 4 by turning the spindle key clockwise. The spindle speed is set at 6 revolutions per minute (rpm). Viscosity measurements are carried out starting

from the longest number and are often displayed on the viscometer screen with a percentage of about 58%. The standard optimal viscosity value required for skin moisturizing preparations is 2,000–50,000 cps observations are made on day 0, day 7, day 14, day 21, day 28. (Karim et al., 2022)

Flow Properties

The flow rate test is carried out by putting 50 g of handcream preparation in a beaker glass then measured using a Brookfield viscometer and using the no. 4 cream spindle was put into a glass container then the installed spindle was lowered so that the spindle limit was dipped in the cream. The speed of the tool is set at 3 rpm, 6 rpm, 12 rpm, 30 rpm, 60 rpm; then turned 60 rpm, 30 rpm, 12 rpm, 6 rpm, 3 rpm; In succession, then it is read and recorded on the scale (dialreading) when the moving red needle has stabilized. The viscosity value (n) in centipoise (cps) is obtained from the dialreading multiplication with a special correction factor for each spindle. The flow properties can be obtained by making a curve between the shear pressure and the shear speed observations are made on day 0, day 7, day 14, day 21, day 28

Dispersion Test

A handcream of 1 mg is placed in the center of the tool with a diameter of 15 cm, the glass of which is placed on it is left for 1 minute. Furthermore, the diameter of the spreading cream was measured, 50 grams of additional load was added to sit for 1 minute, measured in diameter of the spreading cream using a caliper, observation was carried out on day 0, day 7, day 14, day 21, day 28 (Syafitri & Rahma, 2023)

Adhesive Strength Test

The adhesion test is carried out with 0.2 g of the preparation placed in the center of the glass object, which is then covered with the glass of another object. An object weighing 500g is placed on a glass object for 5 minutes. The load is then taken, and the time it takes to separate the two glass items is recorded as the adhesion time. The adhesion time requirement for topical preparations must be at least 4 seconds, observations are made on day 0, day 7, day 14, day 21, day 28 (Karim et al., 2022)

Antioxidant Activity Test Manufacturing DPPH Solution (2,2- Diphenyl-1-Picrylhydrazyl)

Making DPPH solution is made by weighing 5 mg of DPPH powder, then dissolving using 96% ethanol as much as 100 ml using a measuring flask is whipped until homogeneous and obtained DPPH solution with a concentration of 50 ppm, the solution is stored at room temperature and protected from light (Hansen Hartanto, 2018)

Blank Solution Manufacturing

A total of 3 ml of DPPH solution is put into a 10 ml measuring flask and given 96% ethanol to the limit, then transfer it to a brown container and let it sit for 30 minutes at room temperature and observe its absorbance at a wavelength of 517 nm.

Manufacture of Handcream Cat Whisker Leaf Extract Parent Solution

The solution is made using the best formulation that contains extracts, the 100 ppm stock solution is made by weighing 5 mg of the preparation of cat whisker leaf extract, dissolved with 50ml of 96% ethanol. Then a dilution or series solution is made with concentrations of 40 ppm, 45 ppm, 50 ppm, and 55 ppm. (Ambari et al., 2021)

Manufacture of Ascorbic Acid (Vitamin C) Parent Solution as a Positive Control

Weigh 5 mg of vitamin C, then dissolve with 50 ml of 96% ethanol, mix and soak for 24 hours, strain with filter paper. Next, a concentration solution of 2 ppm, 4 ppm, 6 ppm, and 8 ppm was made. The test was carried out by mipetating 1 ml of vitamin C solution from various concentrations (2 ppm, 4 ppm, 6 ppm, and 8 ppm). Then 2 ml of 0.1 mM DPPH solution was added each. Then it was incubated for 30 minutes at room temperature in a dark room. Its absorbance is measured at a wavelength of 517 nm (Recta Olivia Umboro, 2020)

Solution Absorbance Measurement

Once the absorbance value is obtained, calculate the % inhibition of each solution (blank solution, vitamin c solution or comparator, and cat whisker leaf extract parent solution). After obtaining the % inhibition, then find the value of IC50 (Inhibition Concentration 50%) calculated using the formula of the linear regression equation with the equation y = a + bx, where y = 50 and the value of x is the value of IC50

Data Analysis

The data obtained in this study were processed statistically using IBM SPSS statistical 25.0 software starting with a normality test using the kolmogrov-smirnov test and a homogeneity test using the levene test (the results of measuring pH, dispersion, adhesion, and viscosity). The data obtained were normal and homogeneous so that they were continued using the two-way ANOVA test. With independent factors (formula and time) and dependent factors (observation parameters) then followed by the tukey test. In IC50 in extracts, formulation 1, formulation 2, and formulation 3 use a formula based on absorbance results on Uv-vis spectrophotometry.

RESULTS AND DISCUSSION

The cat whisker leaves used in this study come from cultivated plants at PT. Pallapa Muda Perkasa, Depok, Jakarta, Indonesia. The determination was made at the Biology Laboratory, Faculty of Applied Science and Technology, Ahmad Dahlan University, campus 4. The determination is carried out with the aim of finding out the truth of the plants to be studied and avoiding errors in the collection of materials and avoiding the possibility of mixing the plants to be studied with other plants. (Happy et al., 2021).

Extraction

Extraction is carried out by the maceration method by putting cat whisker leaf powder into a bottle, adding 300g of extract then adding 96% ethanol solvent with a ratio of 1:10 then closed and then left for 5 days, while stirring once a day, then filtered using flannel until maserrate is obtained. Then it is concentrated using a rotary evaporator until a thick extract is obtained. After that, it is waterbathed at 60°C to remove the remaining ethanol from the rotary evaporator. (Susanty, 2016)

Test	Berat simplisia (g)	Berat Extract (g)	% Rendemen
Rendemen	300	35,7	11,9%

Phytochemical Screening Results

Yes	Screening Phytochemistry	Results
1.	Alkaloid A. Alkaloid Mayer	-
	B. Alkaloid Dragendroff	-
2.	Flavonoid	+
3.	Saponin	+
4.	Tanin	+
5.	Phenolic	+

Alkaloids are the most abundant secondary metabolite group containing nitrogen atoms, and can be found in both plant and animal tissues. In the alkaloid test of cat whisker leaf extract, black deposits were obtained, which showed negative results or no detection of alkaloids in the sample.Flavonoids are secondary metabolites that belong to the polyphenol group, found in plants. In this study, the flavonoid test showed an orange result, which means it shows positive for the presence of flavonoids.

Saponins are surface active compounds that have the ability to form foam when shaken in water. In the saponin test on cat whisker leaf extract, a 2 cm high foam was obtained that was stable for 10 minutes, so it can be concluded that the extract is positive for saponins. Phenolic compounds are one of the groups of compounds that function as natural antioxidants in plants. In this test, the cat whisker leaf extract showed positive results characterized by a change of color to green, which indicated the presence of phenolic compounds in the extract. (Sarah, Nurcholis et al., 2022)

Tannins are one of the secondary metabolite compounds that are active and have various benefits, including as an astringent, antidiarrheal, antibacterial, and antioxidant. In this test, the extract showed a blackish-green discoloration, which indicates that the cat's whisker leaf extract contains tannins. (Sarah, Nurcholis et al., 2022)

Results of Determination of Total Flavonoid Levels of Cat Mustache Leaf Extract (orthoshiphone stamineus)

Testing of total flavonoid levels in cat whisker leaf extract (Orthosiphon stamineus) was carried out by UV-Vis spectrophotometry method. This method was chosen because flavonoids have a conjugated aromatic system that is able to provide strong absorption bands in ultraviolet light and visible light areas (Aminah et al., 2017).In this study, quercetin was used as a standard solution with concentration variations of 10, 20, 30, and 40 ppm. The use of concentration sequences is necessary because the determination of flavonoid levels is done through the equation of the standard curve.

Quercetin was chosen as the standard because it is a flavonoid of the flavonol group that has a ketone group.The determination of the maximum wavelength is carried out by scanning in the range of 400– 500 nm. The results showed that quercetin had a maximum absorption at 460 nm, so this wavelength was used to measure the absorption of cat whisker leaf extract. Can be seen in table 1

Table 1. Quercetin absorbance measurement results at 460nm wavelength

Concentration	Absorbansi
10	0.358
20	0.474
30	0.628
40	0.751

Source: Primary data, UV-Vis spectrophotometry measurement results of quercetin standard solution at 460 nm wavelength (2026)

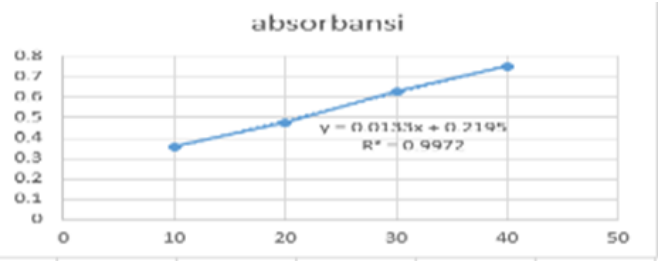

Figure 1. Quercetin calibration curve at a maximum wavelength of 460nm
Source: Primary data, UV-Vis spectrophotometry measurement results of quercetin standard solution at 460 nm wavelength (2026)

Based on the test results, it can be concluded that the increase in concentration is directly proportional to the increase in absorbance value. The standard data of quercetin is plotted between its content and absorbance, so that a linear regression equation y = 0.0133x + 0.2195 with a determination coefficient R^2 = 0.9972 is obtained. This calibration curve equation is used as a reference in determining the total concentration of flavonoid compounds in cat whisker leaf extract (Orthosiphon stamineus).

In the measurement of total flavonoids, a solution of cat whisker leaf extract was added to the $AlCl_3$ reagent which formed a complex, thus causing a wavelength shift to the visible region . This is indicated by the discoloration of the solution to be more yellow. The incubation process is carried out for 30 minutes before absorbance measurement using a spectrophotometer, so that the reaction takes place optimally and the intensity of the color formed is maximized. From the results of the study, the total flavonoid level in cat whisker leaf extract was 33.24 mg QE/g, which can be seen in table 2

According to research (Salasa et al., 2021) that has been carried out, a number of medicinal plants that contain flavonoids have activities as antioxidants, antibacterial, antiviral, antiallergic, and anticancer.

Table 2. Results of determining the total flavonoid level in cat whisker leaf extract

Sample	ABS Sample	x concentration	KTFLA	average	Sd	ktfla ± sd
Simplo	0.842	46.804	46.8	33.24	11.74337	33.34 ± 11.7
Double	0.571	26.428	26.42			
triple	0.572	26.503	26.5			

Source: Primary data, UV-Vis spectrophotometry measurement results of cat whisker leaf extract at 460 nm wavelength (2026)

Antioxidant Examination of Cat Whisker Leaf Extract (orthosiphone stamineus)

The antioxidant activity of cat whisker leaf extract was tested using the DPPH method. The level of antioxidant activity of a compound or extract is indicated by the IC50 value, which is a concentration that is able to inhibit 50% of free radicals. The test results showed that cat whisker leaf extract had an IC50 value of 74.23 ppm and was classified as a strong antioxidant (50–100 ppm). Meanwhile, vitamin C used as a benchmark has an IC50 value of 9,410 ppm, so it is classified as a very powerful antioxidant because its IC50 value is less than 50 ppm. Can be seen in tables 3 and 4

Table 3. Vitamin C absorbance measurement results at 517 nm wavelength

Concentration	absorbansi	inhibisi	% inhibisi
2	0.59	0.303424	30.342385
4	0.537	0.365998	36.599764
6	0.501	0.408501	40.850059
8	0.455	0.46281	46.280992
blanko	0.847		

Source: Primary data, UV-Vis spectrophotometry measurement results of vitamin C at 517 nm wavelength (2026)

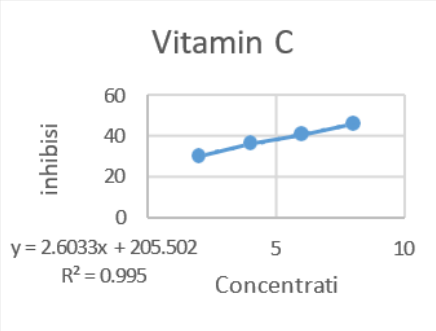

Figure 2. vitamin c calibration curves at 517nm wavelength

Source: Primary data, UV-Vis spectrophotometry measurement results of vitamin C at 517 nm wavelength (2026)

In this study, a linear regression equation was obtained, namely y = 2.6033x + 25.502 with a value of R2 = 0.995. from this equation, an IC50 of 9,410 ppm was produced, which resulted in the

Included in antioxidants is very powerful. In the cat whisker leaf extract, the results of the linear regression equation were obtained, namely y = 0.5407 x + 9.8583 with a value of R2 = 0.9998, from this equation the result of IC50 of 74.23 ppm was obtained including a strong antioxidant.

Table 4. Absorbance results of cat whisker leaf extract at a wavelength of 517 nm

Concentration	absorbansi	inhibisi	% inhibisi
10	0.718	0.152302	15.23022
20	0.671	0.207792	20.77922
30	0.627	0.25974	25.97403

Concentration	absorbansi	inhibisi	% inhibisi
40	0.58	0.31523	31.52302
blanko	0.847		

Source: Primary data, UV-Vis spectrophotometry measurement results of cat whisker leaf extract at 517 nm wavelength (2026).

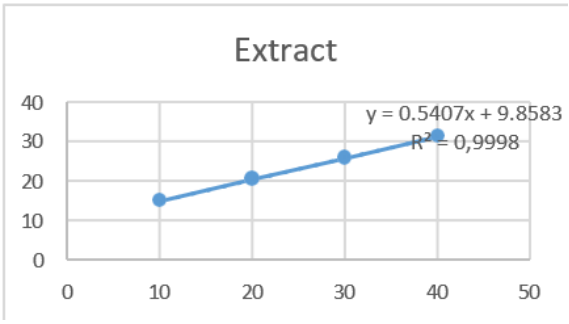

Figure 3. Calibration curve of cat whisker leaf extract at 517nm wavelength
Source: Primary data, UV-Vis spectrophotometry measurement results of cat whisker leaf extract at 517 nm wavelength (2026)

Evaluation of Handcream Preparations for Cat Mustache Leaf Extract (orthosiphone stamineus) Organoleptic Test

Organoleptic observations were carried out subjectively by assessing smell, color, shape and taste. Organoleptic will affect the user of the handcream, therefore the resulting preparation should have an attractive color, pleasant smell and soft texture on the skin. The results of organoleptic observations of cat whisker leaf extract show that formulation 1, formulation 2, and formulation 3 have the same characteristics, namely green in color, smell typical of cat whisker leaf extract and in the form of cream that is soft on the hand and not sticky. Observations were made for 28 days on the four formulations and on the (+) control as a comparison, that during the observation showed no change in color, smell, shape and taste, this shows that the handcream preparation is organoleptically stable with an observation period of 28 days. The results can be seen in table 4.7 of the color, smell, and texture parameters H0 – H28

Homogeneity Test

The homogeneity test is carried out to find out whether a prepared prepared is homogeneously mixed and there are no coarse particles. Handcream is applied on top of a glass object and then covered with another glass object. The results of homogeneity observation in formulation 0, formulation 1, formulation 2, formulation 3 and formulation 4 stored for 28 days showed homogeneous results, this was characterized by the absence of coarse granules in the handcream preparation. Results can be seen in table 5

Table 5. Organoleptic results of handcream preparations of cat whisker leaf extract

Organoleptics	Formula	Observation Day				
		Day 0	Day 7	Day 14	Day 21	Day 28

Source: Primary data, organoleptic observation results of hand cream preparations of cat whisker leaf extract during 28 days of storage at room temperature (2026)

Table 6. Homogeneity Test Results of Formulation of *Handcream Preparation* of Cat Mustache Leaf Extract

Day	Temperature Observations	Homogenites				
		F0	F1	F2	F3	F4
0	20 – 25 °C	H	H	H	H	H
7		H	H	H	H	H
14		H	H	H	H	H
21		H	H	H	H	H
28		H	H	H	H	H

Source: Primary data, homogeneity test results of hand cream preparations of cat whisker leaf extract during 28 days of storage at room temperature (2026)

pH Test of Handcream Preparations

pH measurement aims to determine the acidity and alkaline level of the preparation so as not to irritate the skin. In general, the pH of the skin for handcream preparations ranges from pH 4.0 – 8.0, because if the cream has a pH that is too alkaline it can cause the skin to become dry and if the pH is too acidic it can irritate the skin.The pH value of the cat 's whisker leaf extract handcream preparation with an observation period of 28 days showed a pH value that experienced a pH change that was not too far during storage. This shows that the PH of each formulation decreased during the 28-day observation period. Can be seen in table 7 and figure 4.

Table 7. pH Test Results of Handcream Preparation of Cat Whisker Leaf Extract

Formula	Day 0	Day 7	Day 14	Day 21	Day 28
Formula 0	7.7 ± 0.17	6.7±0.23	6.7±0.37	6.6±0.1	6.5±0.1
Formula 1	7.3±0.05	6.4±0.15	6.2±0.05	6.1±0.15	6.1±0.15
Formula 2	7.26±0.05	6.56±0.37	6.5± 0.15	6.4 ± 0.1	6.03±0.45
Formula 3	7.2±0.1	6.5±0.1	6.2±0.15	6.2 ±0.1	6.06±0.45
Formula 4	5.9 ±0.15	5.6 ±0.1	5.5 ± 0.20	5.5 ± 0.1	5.3 ± 0.1

Source: Primary data, pH measurement results of hand cream preparations of cat whisker leaf extract using a pH meter during 28 days of storage at room temperature (2026)

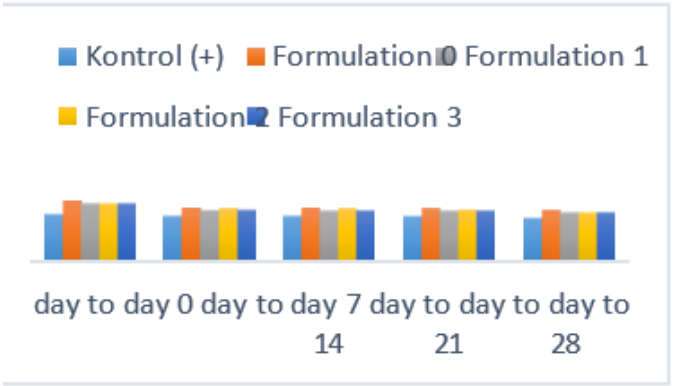

Figure 4. Ph test curve of cat's whisker leaf extract handcream preparation

Source: Primary data, pH measurement results of hand cream preparations of cat whisker leaf extract using a pH meter during 28 days of storage at room temperature (2026)

In this study, the highest average pH was obtained in formulation 0 with pH 7.7 ± 0.17 and the lowest average pH value was obtained in formulation 4 or positive control with pH 5.3 ± 0.1

Handcream Preparation Dispersion Test

The spreadability test aims to see the spread of the cream over the surface of the skin when applied. The spreadability of the cream is related to how wide the surface of the skin is with the preparation at the time of application. The wider the spread, the wider the cream will be in contact with the skin. In accordance with the condition that the good spreading power of the cream is in the range of 5 – 7 cm. During the observation of hand cream preparations, cat whisker leaf extract still meets the requirements for the diameter of the cream's spreadability. Can be seen in table 8

Table 8. Test results of the Dispersability of the formulation of handcreamcat

formula	Spreadability (cm)				
	0th day	Day 7	happy Wed 14	Day 21	Day 28
Formula 0	5,9 ±0.3	5,6±0.2	5,4±0.1	5,4±0.2	5,3±0.1
Formula 1	5,6±0.2	5,5±0.3	5,4±0.1	5,4±0.3	5,4±0.25
Formula 2	6,1±0.4	5,8±0.1	5,8±0.2	5,7±0.2	5,6±0.2
Formula 3	5,6±0.05	5,5±0.2	5,5±0.3	5,5±0.2	5,4±0.1
Formula 4	6,4±0.1	6,9±0.5	6,4±0.3	5,9±0.15	5,9±0.15

Source: Primary data, spreadability test results of hand cream preparations of cat whisker leaf extract during 28 days of storage at room temperature (2026)

In this study, the results of the dispersion test were obtained, namely with the lowest size obtained in the formulation 0 days to 28 with a spread of 5.3±0.1 cm. while the largest diameter was obtained in formulation 4 or control + on day 7 with a spread of 6.9±0.5 cm. in the range of dispersion of the results obtained is included in the results of good or qualified handcream preparations.

Adhesive Testing of Handcream Preparations

The results of the adhesion evaluation were obtained that the cat whisker leaf extract hand cream preparation has different adhesion, but still meets the requirements for the adhesion of the handcream. This is in accordance with the condition that the good adhesion of the cream is not less than 4 seconds. During the observation of hand cream preparations, cat whisker leaf extract still meets the requirements for the adhesion of the cream. Changes in adhesion can be affected by changes in observation period for 28 days. It can be known that handcream preparations have an adhesion ranging from 4 seconds to 8 seconds, where the adhesion enters into good adhesion, because the adhesion range is <4 seconds. Can be seen in Table 9

Table 9. Adhesion test results of cat whisker leaf extract handcream preparation

formula	Adhesive Strength (seconds)				
	0th day	Day 7	Day 14	Day 21	Day 28
Formula 0	06.95 ±1.3	05.68 ±1.01	05.80 ±1.014	08.02 ±1.32	06.95±0.32

formula	Adhesive Strength (seconds)				
	0th day	Day 7	Day 14	Day 21	Day 28
Formula 1	05.54 ±0.6	06.55 ±1.64	05.87 ±0.38	05.86 ±0.90	06.07 ±0.64
Formula 2	07.26 ±1.38	06.33 ±0.58	06.87 ±1.56	07.18 ±0.61	05.68 ±0.94
Formula 3	05.37 ±0.61	05.29 ±0.13	05.22±35	05.11 ±0.21	05.10 ±0.23
Formula 4	05.47± 1.02	04.90 ± 0.5	04.93 ±0.67	05.58 ±1.05	04.53 ± 0.272

Source: Primary data, adhesion test results of hand cream preparations of cat whisker leaf extract during 28 days of storage at room temperature (2026)

Viscosity and Flow Properties Test

Viscosity testing was carried out to determine the viscosity changes in each handcream formulation using a Brookfield viscometer type LV and spindle number 64. The test results showed that an increase in the concentration of the extract led to a decrease in viscosity. The viscosity of the cream is influenced by the content of fatty acids, especially stearic acid, where the higher the amount of stearic acid, the fatty acid content also increases so that the cream becomes thicker and the viscosity value is greater.

Based on the table, it can be known that the viscosity of handcream preparations ranges from 4000 – 37,000 cps, the lowest average is obtained in formulation 1 with a viscosity value of 4,000 ±0.00 and the highest value in formulation 4 with a viscosity value of 36,333 ±0.76 which according to the standard for the viscosity of handcream ranges from 2000 – 50000 cps, this shows that the handcream preparation is qualified.

Table 10. Viscosity test results of handcream preparation of cat whisker leaf extract

Day	Observation temperature	Viscosite (cps)				
		F0	F1	F2	F3	F4
0		16.300 ±0,57	13.600 ±7.17	13.100 ±7.19	7.500 ±4.18	32.800 ±0.76
7	20 – 25 °C	27.500 ±1.32	4.166 ± 0,29	16.833 ±0,76	7.166 ±0,29	36.333 ±0,76
14		17.833 ±0.29	4.000 ±0.00	13.000 ±0.50	9.833 ±0.76	34.000 ±0.00
21		19.166 ±0.29	4.000 ±0.00	11.833 ±0.29	10.333 ±0.29	32.833 ±1.26
28		13.000 ±0.00	10.500 ±0.00	12.833 ±0.29	10.000 ±0.00	22.833 ±0.29

Source: Primary data, viscosity measurement results of hand cream preparations of cat whisker leaf extract using a Brookfield viscometer during 28 days of storage at room temperature (2026)

The results of the flow nature test showed that the cat's whisker leaf extract handcream preparation in the flow control and formulation properties had a plastic flow. The characteristics of plastic flow are to form a linear line that cuts the axis of shearing stress. According to Newton's flow, the greater the viscosity of a liquid, the greater the shearing stress required to produce a certain rate of shear. Shearing stress is defined as the unifying force of lua (F/A) with dyne/cm2 units. The rate of shear is obtained by dividing the shearing stress value by the viscosity of the semisolid preparation (RPM)

Antioxidant Preparation Handcream Preparation Cat Whisker Leaf Extract (orthoshiphone stamineus)

In this study, secondary metabolites in the form of flavonoids were used as antioxidant compounds. Flavonoids play a role in preventing free radicals through three mechanisms, namely inhibiting the formation of

Testing the results of the analysis of antioxidant activity using the DPPH method showed that in the formulation of the cat's whisker leaf extract handcream which has the strongest antioxidant activity, it was found in F3 with an IC50 value of 87.3 ppm which is included in the strong category. while in F0 the IC50 value was obtained at 257 ppm, F1 at 108 ppm, F2 at 91 ppm, In F4 or positive or comparative control produced an IC50 value of 67.6 ppm included in the strong antioxidant. So it is concluded that the greater the concentration of extracts added to a preparation, the stronger the antioxidants.

Table 11. Results of IC50 antioxidant preparation handcream cat whisker leaf extract

Formula	IC50 (ppm)	Parameter
Formula 0	257.7	Very weak (>200)
Formula 1	108.5	Weak (>100)
Formula 2	91.6	Strong (50 – 100)
Formula 3	87.3	Strong (50 – 100)
Formula 4	67.6	Strong (50 – 100)

Source: Primary data, antioxidant activity measurement results of hand cream preparations of cat whisker leaf extract using the DPPH method with UV-Vis spectrophotometry at 517 nm wavelength (2026)

In this study, the results of the linear regression equation were obtained, namely y = 0.2157x + 5.5882 with a value of R2 = 0.9979, from the equation the result of IC50 was obtained of 257 ppm which the result was included in the antioxidant very weak

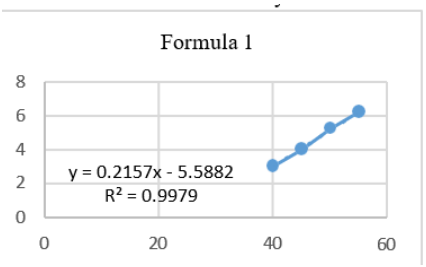

Figure 5. Antioxidant calibration curve formulation 1 preparation handcream

Source: Primary data, antioxidant activity measurement results of formulation 1 hand cream preparation using the DPPH method with UV-Vis spectrophotometry at 517 nm wavelength (2026)

In this study, the results of the linear regression equation were obtained, namely y = 0.2157x - 5.5882 with a value of R2 = 0.9979, from this equation the result of IC50 was obtained of 108 ppm which the result was included in the weak antioxidant.

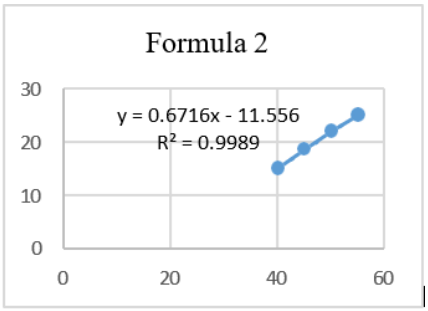

Figure 6. Antioxidant Calibration Curve Formulation 2 Handcream Preparation
Source: Primary data, antioxidant activity measurement results of formulation 2 hand cream preparation using the DPPH method with UV-Vis spectrophotometry at 517 nm wavelength (2026)

In this study, the results of the linear regression equation were obtained, namely y = 0.6716x - 11.556 with a value of R2 = 0.9989, from the equation the result of IC50 was obtained of 91 ppm which the result was included in the strong antioxidant

CONCLUSION

Based on the results of the study, it can be concluded that in cat whisker leaf extract there is antioxidant activity which is included in strong antioxidants with an IC50 value obtained at 74 ppm. In the formulation of cat whisker leaf extract handcream preparation, there is antioxidant activity with an IC50 value obtained in formulation I which is 108 ppm, in formulation II it is 91 ppm in formulation III which is 84 ppm, the formulation that shows the best results is in formulation III. The preparation of the cat whisker leaf extract handcream meets the requirements well for the preparation of the cream, at the pH test it has the highest average pH at pH 7.7 ± 0.17 and the lowest average pH value at pH 5.3 ± 0.1. the lowest average dispersion at 5.3±0.1 cm, and the largest at 6.9±0.5 cm. the adhesion range at 4 – 8 seconds, The viscosity range is in the range of 4,000 ±0.00 and at 36,333 ± 0.76 cps.

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