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Formula Lotion And Activity Test Antioxidant Lotion Ethanol Extract of Kirinyuh Leaves (Chromolaena odorata L.)

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Abstract

Skin damage caused by free radicals—manifesting as wrinkles, dryness, and premature aging—poses a major challenge in maintaining skin health. Kirinyuh leaves (Chromolaena odorata L.), which contain abundant flavonoids, possess strong antioxidant properties that can be utilized in cosmetic formulations. This study aimed to evaluate the antioxidant activity of kirinyuh leaf extract, determine the optimum lotion formulation using the Simplex Lattice Design (SLD) method, and assess the antioxidant activity of the resulting lotion. Using ethanol as the extraction solvent, the kirinyuh leaf extract exhibited very strong antioxidant activity with an IC_{50} value of 43,057 µg/mL. Optimization through SLD produced an ideal lotion formula containing 16% stearic acid and 4% triethanolamine. The formulated lotion with 20% kirinyuh leaf extract (Formula 3) demonstrated the highest antioxidant activity (IC_{50} = 87,061 µg/mL) and fulfilled standard physical quality parameters, including appropriate adhesion, spreadability, pH, and viscosity. In conclusion, kirinyuh leaf extract shows strong antioxidant potential, and the SLD method effectively optimizes lotion formulations, resulting in a stable, functional product suitable for protecting the skin oxidative damage.

Keywords: Chromolaena odorata L., Antioxidant, Lotion, Simplex Lattice Design, IC50.

INTRODUCTION

Research Phenomenon

Indonesia plays a crucial role as one of the countries with the world's most abundant herbal plant diversity. Indonesia's tropical forests boast the second-highest biodiversity after Brazil (Lubis et al., 2023). Skin damage can negatively impact a person's overall appearance. Skin damage can be characterized by the appearance of wrinkles, flaking, dryness, and cracking. Environmental factors such as exposure to heat, cold, dust, air and water pollution, and sunlight can impact skin health, causing it to become dry and rough. Free radicals are one of the causes of skin damage (Husni et al., 2022).

Most diseases are initiated by excessive oxidation reactions in the body, which can form highly active free radicals that can damage cell structure and function. Free radicals can damage collagen fibers and the skin's dermal matrix, causing dry, wrinkled, and scaly skin, as well as the risk of premature aging. Increasing public awareness of the importance of maintaining healthy skin has led to increased efforts to prevent skin damage and disease. This is to protect skin cells on the hands and body from the negative effects of free radicals, which can lead to skin cancer if left untreated (Dominica et al., 2019).

Antioxidants are compounds that have the ability to inhibit oxidation reactions by scavenging free radicals or donating electrons. Many natural antioxidants are found in plants, especially those rich in carotenoids and polyphenols, such as flavonoids (Rochayati et al., 2024). This has led to the formulation of many of these plants as natural antioxidants. The increasing public demand for safe, natural cosmetics containing natural antioxidants as free radical scavengers (Purwaningsih, 2014) that can be made into oral and topical preparations. One example of a plant containing flavonoids is the kirinyuh leaf (Chromolaena odorata L.).

Kirinyuh leaves (Chromolaena odorata L.) are a plant belonging to the Asteraceae family. These leaves are rich in various bioactive compounds, including tannins, phenols, flavonoids, saponins, and steroids. Furthermore, the essential oil produced from the leaves contains compounds such as α-pinene, cadinene, camphor, limonene, β-caryophyllene, and candinol isomers. Crude extracts of Chromolaena

odorata L. leaves are known to have significant antioxidant effects. This effect is likely due to the high flavonoid content, which has the ability to inhibit oxidation processes, thus contributing to the protection of body cells from free radical damage (Handayany et al., 2018).

Research Problems

Nowadays, cosmetics have become an integral part of people's lives. In Indonesia, cosmetic products come in various forms and have a variety of uses. Rapid advances in science and technology have driven innovation in cosmetic formulations, particularly those using natural ingredients as a base. The use of natural ingredients is considered safer, thus attracting consumer interest (Aprilliani, 2022).

The use of topical preparations containing antioxidants can help neutralize free radicals in the skin. Antioxidants can protect the skin from free radical attacks, thereby slowing the aging process. Antioxidants are active compounds that can neutralize free radicals (Karim et al., 2022). Skincare cosmetics available on the market come in various dosage forms, one of which is lotion. Oil-in-water (O/W) lotions are very popular for topical dermatological use because they have good absorption qualities and can be designed into elegant cosmetic products, are easy to apply, and are easier to remove with water (Dina et al., 2020). Recently, antioxidant-containing cosmetic preparations have become a trend (Dominica et al., 2019).

Purpose, Urgency, and Novelty of the Research

Previous research has been conducted by Amin et al., (2022). From the results of research that has been conducted on the ethanol extract of the stem, leaves and roots of Chromolaena odorata L. kopasanda, it can be concluded that the three extracts have very strong antioxidant activity with an IC50 value of <50 ppm, namely: root extract 37.556, µg / ml, stem extract 35.435, µg / ml and leaf extract 23.4 µg / ml Therefore, researchers are interested in formulating a lotion and testing the antioxidant activity of a lotion of 96% ethanol extract of kirinyuh leaves (Chromolaena odorata L.). To obtain the optimum lotion formula, an optimization study is needed that aims to facilitate the design, compilation, and interpretation of data mathematically using a simplex lattice design. The use of optimization with a simplex lattice design has the advantage of being relatively simple compared to others (Florentia, 2013).

Based on the background above, the author is interested in knowing whether the ethanol extract formula of kirinyuh leaves after being formulated into a lotion has antioxidant activity and whether the physical quality evaluation of the resulting lotion can be carried out.

RESEARCH METHODS

Types and Methods of Research

Data Analysis Instruments and Techniques

The tools used are a set of maceration tools, Rotary Evaporator (IKA HB 10 Basic), UV-Vis Spectrophotometry (Shimadzu UV mini-1240), moisture analyzer, water bath, viscometer (brookfield), blender (miyako), Software Design Expert, Dell laptop, analytical balance (Ohause EP 214 sensitivity 0.1mg). Materials used Kirinyuh leaves (Chromolaena odorata L.) which are extracted with 96% ethanol, DPPH, vitamin C, 96% ethanol, lotion making materials (cetyl alcohol, lanolin, stearic acid, glycerin, TEA, methyl paraben, propyl paraben, distilled water), methanol pa, and lotion (M).

Research Procedures

Making Simple Powder

Kirinyuh plants were collected from Potrojalu Village, Girimulyo Subdistrict, Ngargoyoso District, Karanganyar Regency. Fresh, disease-free kirinyuh leaves were collected. The fresh kirinyuh leaves were cleaned of dirt and washed with running water until completely clean. Afterward, the cleaned leaves were shredded and dried in the sun until dry. The dried kirinyuh simplicia was sorted to separate the simplicia from any remaining dirt. The dried leaves were ground and sieved using a 40-mesh sieve.

Standardization of Simple Drugs

Drying Loss A total of 2 g of powder was placed on a dish and then dried in an oven at 1050C for 30 minutes. Cooled in a desiccator for 15 minutes, after cooling, weighed to obtain a constant weight and calculated the drying loss (Setyani et al., 2021).

Water content

A 2-gram sample was placed into the moisture balance. After turning on the device, the temperature was set to 105ºC and the weight was then allowed to stabilize. The resulting number represents a percentage, indicating the moisture content of the sample, with a value of no more than 10% (Ningsih et al., 2024).

Ash Content

A 2-gram sample of the crude drug was carefully weighed and placed in a pre-weighed container. The sample was then heated in a furnace at 600°C for 4 hours until a constant weight was achieved. After 2 hours, it was weighed to obtain the correct weight. The requirement was no more than 8% (Indriyanti et al., 2018).

Extract Preparation

Extraction using the maceration method was carried out by soaking 500 grams of simplicia using 5000 ml of 96% ethanol solvent with a ratio of 1:10. Stirring was carried out occasionally to speed up the extraction time so as to accelerate the diffusion of active compounds from the simplicia into the solvent, and left for 24 hours, carried out for 3 days. Next, remaceration was carried out for 2 days and then filtered using filter paper. In the maceration method, no heating was carried out but used room temperature (Mumarli et al., 2024). The results of the maceration of the Kirinyuh leaves were then filtered using a Whatman 42 filter paper filter to produce an ethanol filtrate and a part which was then called the residue. After that, remaceration was carried out for two days (2x24 hours), the residue obtained was then added with 1500 ml of 96% ethanol, then the macerate was filtered and the filtrate and residue were obtained. The filtrate obtained was then evaporated using a rotary evaporator at a temperature of 400oC-600oC, then concentrated using a water bath to obtain a thick extract of kirinyuh leaves.

Extract Standardization

Drying Loss

The determination of drying loss was carried out by weighing 2 grams of kirinyuh leaf extract and putting it into a crucible and then putting it in an oven at a temperature of 105˚C for 30 minutes. The extract was spread evenly in the crucible by shaking the bottle until the extract layer was ± 5-10 mm thick, then put it in the oven in an open state and included with the lid. The crucible was heated until the weight of the crucible remained which indicated the results of the drying loss process with a value of no more than 10% (Setyani et al., 2021).

Ethanol Free

A portion of the extract was added to concentrated sulfuric acid, followed by glacial acetic acid and heated. The results were obtained by adding sulfanilic acid, NaOH, HCl, and NaNO2, then heating. The extract was declared ethanol-free if it did not exhibit the characteristic ester odor of ethanol (Indriyanti et al., 2018).

Water content

To determine water content using a moisture balance, weigh 2 grams of kirinyuh leaf extract, place it in a measuring cup, and level it. Turn on the moisture balance at 105°C and wait for the beep to indicate the analysis is complete (Ningsih et al., 2024).

Metal Free

Determination of lead (Pb) levels by adding 5 ml of sample to a test tube and then adding K2CrO4 reagent, a positive test for lead content if a yellow precipitate is present. Determination of cadmium (Cd) levels by adding 5 ml of sample to a test tube and then adding NaOH reagent, a positive test for cadmium content if a white precipitate is present.

Phytochemical Screening

Screening tests are conducted to determine the chemical properties contained in the plants being studied. These tests include alkaloid tests, flavonoid tests, tannin tests, steroid/triterpenoid tests, and saponin tests.

Making Kirinyuh Leaf Extract Lotion Lotion Formula

Table 1. Kirinyuh Leaf Extract Lotion Formulation

No	Material	F0	F1	F2	F3	Utility
1.	Leaf extract kirinyu h	-	10 %	15 %	20 %	Active ingredient

2.	**Stearic Acid**	**16**	**16**	**16**	**16**	**Emulsifying agent i**
3.	**Cetyl alcohol**	**4**	**4**	**4**	**4**	**Emulsifying agent i**
4.	**TEA**	**4**	**4**	**4**	**4**	**Binder**
5.	**Glycerin**	**2**	**2**	**2**	**2**	**Emulsifying agent i**
6.	**Lanolin**	**2**	**2**	**2**	**2**	**Humectant**
7.	**Methyl Paraben**	**0.18**	**0.18**	**0.18**	**0.18**	**Preservative**
8.	**Propyl Paraben**	**0.02**	**0.02**	**0.02**	**0.02**	**Preservative**
9.	**Aquade st**	**100**	**100**	**100**	**100**	**Solvent**

Making Lotion

All oil phase ingredients (stearic acid, lanolin, cetyl alcohol, propyl paraben) were dissolved at 65℃-75℃ in a water bath. The water phase ingredients (aquadest, glycerin, triethanolamine, methyl paraben) were dissolved separately at 65℃-75℃. After all phases were dissolved, the water phase was added to the oil phase little by little while constant stirring was carried out to form an emulsion (Agustin et al., 2023).

Evaluation of Orgnoleptic Test Lotion Preparations

Organoleptic testing is carried out by observing the smell, color, and texture of the lotion.

Homogeneity Test

The homogeneity test aims to determine whether the prepared preparation can be mixed homogeneously or evenly. Homogeneity is indicated by the absence of coarse grains or clumped particles on the slide.

pH test

The pH test of a lotion preparation aims to determine the degree of acidity or alkalinity of a preparation to ensure that the preparation does not cause skin irritation.

Adhesion Test

The adhesion test is conducted to determine the strength of the lotion preparation's adhesion when applied to the skin surface. The adhesion requirement for lotion preparations is more than 4 seconds.

Spread Power Test

A lotion spreadability test is performed to determine how well a lotion spreads when applied to the skin. A good spreadability test is performed if the spreadability value is 5-7 cm.

Viscosity Test

The tool used for viscosity testing is a Borkfield viscometer, by observing the numbers on the viscometer scale. The viscosity test is carried out by putting 100 ml of lotion into a beaker glass and then installing spindle no. 4. The spindle must be submerged in the test preparation. The viscometer is turned on and the spindle is ensured to rotate at a speed of 12 rpm. The viscosity test requirements for lotion are 20,000 cps – 50,000 cps.

Antioxidant Test of Extract DPPH Method Preparation of 100 ppm DPPH Blank Solution

Dissolve 10 mg of DPPH in methanol pro analysis to the mark in a 100 ml volumetric flask wrapped in aluminum foil. The result is a DPPH solution of 100 ppm.

Preparation of Kirinyuh Leaf Extract Test Solution

To make a stock solution of kirinyuh leaf extract with a concentration of 100 ppm, 10 mg of kirinyuh leaf extract was added to a 100 mL measuring flask and added with methanol to the limit point.

Preparation of Test Solution for 100 ppm Kirinyuh Leaf Extract Lotion Preparation

Weigh 10 mg of lotion and dissolve it in methanol up to 100 ml of a volumetric flask. A series of concentrations was prepared at 20 ppm, 40 ppm, 60 ppm, 80 ppm, and 100 ppm, each with 10 ml.

Determination of Maximum Wavelength of Measurement

Maximum Wavelength Measurement The maximum wavelength is calculated using spectrophotometry UV-Vis onmaximum wavelength 400–600 nm to determine the absorbance of the DPPH blank solution.

Determining Operating Time

A 4 ml DPPH solution with a concentration of 20 ppm was placed in a test tube. For 30 minutes, measure the absorbance using UV-Vis spectrophotometry at maximum wavelength every 1 minute.

Antioxidant Activity Test on Extracts and Preparations

The concentrated test samples were taken. 2 ml of each sample and 2 ml of the 100 ppm DPPH stock solution were taken and allowed to stand in a dark place for 30 minutes. The absorbance was then measured using a UV-Vis spectrometer at the maximum DPPH absorption wavelength of 516 nm. The sample's antioxidant activity was determined by the magnitude of the DPPH radical absorption inhibition through the IC value calculation.$_{50}$withusing a linear equation obtained from a straight line comparison between concentration and percentage inhibition. Antioxidant activity was obtained using the equation and IC value.$_{50}$which is a number that showsThe concentration of the sample that is able to inhibit the oxidation process by 50% is obtained by making a linear curve between the concentration of the test solution (x-axis) and the % antioxidant activity (y-axis).

Data analysis

Data processing in this study uses IC value determination$_{50}$uselinear regression equation by substituting the equation y=a+bx, where y is the % inhibition of 50 and x determines the IC value$_{50}$.

RESULTS AND DISCUSSION

Sample Collection and Plant Determination

Determination of Kirinyuh Plants

Kirinyuh leaves (Chromolaena odorata L.) were carried out at the Functional Implementation Unit of Dr. Sardjito Tawangmangu Regional Hospital, Karanganyar, Central Java. The purpose of the determination was to determine the truth of the kirinyuh leaf sample (Chromolaena odorata L.) which would be used for research in order to avoid errors and mixing of materials with other plants in sample collection. After the determination was carried out, the results obtained were the plants used in this study were kirinyuh leaves (Chromolaena odorata L.).

Making Kirinyuh Leaf Simple Medicine

Table 2. Simple Rendering

Wet weight	Powder weight	Yield (%)
5000	520	10.4%

From the results of table 2, it was found that the shrinkage in the kirinyuh leaf simplicia was 10.4% with a powder yield of 520 grams.

Standardization of Simplex for Determining Drying Loss

Drying loss is a measurement of the remaining substance after the drying process using an oven at a temperature of 105°C for 30 minutes and obtaining a constant weight.

Table 3. Drying Loss

Sample	Results	Average	Terms (Library)
Replication I	6%		
Replication II	7.5%	6.6%	<10 (FHI, 2017)
Replication III	6.5%		

Determination of Water Content of Simple Drugs

Determining the water content of simple drugs aims to provide a minimum limit or range of water content in the material and to determine the durability of a material during storage.

Table 4. Water content

Sample	Results	Average	Condition (Library)
Replication I	7.31%		
Replication II	7.97%	7.7%	<10% (FHI,
Replication III	7.92%		(2017)

Ash Content

Determining the ash content is a test where sample heated ontemperature, at which organic compounds and their derivatives are destroyed and evaporated.

Table 5. Ash Content

Sample	Results	Average	Condition (Library)
Replication]	4%		
Replication I	5%	5%	<8% (FHI,
Replication III	6%		(2017)

The ash content obtained in the Kirinyuh leaf simplicia was 14.78%, which means that the Kirinyuh leaf simplicia has met the standard parameter requirements.

Extraction

Extraction aims to extract the active compounds contained in a plant.
Extraction was carried out using the maceration method. The results of the kirinyuh leaf extract can be seen in Table 6.

Table 6. Extract Yield

Powder weight	Weight extract	Results	Condition
500 grams	76.11 grams	15.2%	<10% (FHI, (2017)

The resulting thick extract yielded 76.11 grams, with a yield of 15.2%. Yield is the ratio of the number of metabolites obtained after extraction to the weight of the sample used. A yield greater than 10% is considered good.

Extract Standardization Determination of Drying Loss

Determining the water content of simple drugs aims to provide a minimum limit or range of water content in the material and to determine the durability of a material during storage.

Table 7. Drying Loss

Sample	Results	Average	Terms (Library)
Replication I	5%		
Replication II	6%	5.5%	<10% (FHI, 2017)
Replication III	5.5%		

Determination of Water Content

Determination of the water content of kirinyuh leaf extract using a Moisture Balance tool. The results of the extract water content determination can be seen in Table 8.

Table 8. Water content

Sample	Results	Average	Condition	Library
Replication I	7.21%	6.9%	<10%	(FHI, (2017)
Replication II	6.38%			
Replication III	7.39%			

In this study, the water content of kirinyuh leaf extract was 6.9%.

Ethanol Free Test

The ethanol-free test aims to determine the presence of ethanol in the kirinyuh leaf extract. The result was negative for ethanol and did not exhibit the characteristic ester odor (Ningsih et al., 2024).

Table 9. Ethanol Free Test

Ethanol free test	Observation	Library
Kirinyuh leaf extract + acetic acid + sulfuric acid (heated)	There is no ester odor	(Ningsih et al., 2024)

Metal Free Test

Table 10. Metal Free Test

Sample	Compound	Test	Library	Results
Extract kirinyuh leaves	Metal Lead (Pb)	Extract 2 ml + K_2CrO_4 (Chromic Acid) 10 drops	A yellow precipitate is formed (Ningsih*et al.*, 2024)	No yellow precipitate is formed (-)
	Candidium Metal (Cd)	Extract 5 ml + NaOH 1 ml	A white precipitate is formed (Ningsih*et al.*, 2024)	No sediment formedwhite (-)

Phytochemical Screening

Table 11. Phytochemical Screening

Test	Reagent	Pustaka	Results	Information
Phytochemicals a				
Alkaloid	Dragendrof Mayer	(Sanit(ra et al., 2017)	Colored brick red A yellowish white precipitate formsn	Positive for alkaloid content
Flavonoid d	ethanol + HCl + magnesium powderum	(Sanit(ra et al., 2017)	Orange in color	Positive contains Flavonoids
Tannin	Ethanol + $FeCl_3$	(Sanitra et al., (2017)	greenish black	Positive mengandTannin

Saponin	HCL shake vigorously for 10 seconds	(Sanit(ra et al., 2017)	Formedfoam	Positive contains Saponin
Triterpenesoids and steroids	acetic acid anhydrous + H_2SO_4	(Sanit(ra et al., 2017)	Green color is formed	Positive contains Triterpenes oid

Information : (+) Positive contains compounds
: (-) Negative contains compounds

Evaluation of Preparations

The purpose of testing the physical quality of lotion products is to assess whether a product is of good quality. In this study, the physical quality tests conducted included organoleptic testing, homogeneity testing, pH testing, adhesion testing, spreadability testing, and viscosity testing. All tested lotion formulations demonstrated results that met the quality standards for a good lotion product.

Organoleptic Test

Table 12. Organoleptic Test

Formula	Organoleptic		
	Color	Smell	Texture
F0	Milky white	No smell	A bit thick
F1	whitish green	Special extract	A bit thick
F2	Dark green	Special extract	A bit thick
F3	Deep green	Typical extract	A bit thick

Based on observations, the formula without the extract had a clearer color than the formula with the addition of kirinyuh leaf extract. The higher the concentration of the extract, the deeper the green color and the stronger the odor (Anna, 2024).

Homogeneity Test

Table 13. Homogeneity Test

Formula	Organoleptic		
	Color	Smell	Texture
F0	Milky white	No smell	A bit thick
F1	whitish green	Special extract	A bit thick
F2	Dark green	Special extract	A bit thick
F3	Deep green	Special extract	A bit thick

Based on observations, the results showed that F0, F1, F2, and F3 were all homogeneous. This indicates that the ingredients in the lotion preparation were well mixed because there were no coarse particles (Anna, 2024).

pH test

Table 14.pH test

Formula	Library	pH
F0	(Ningsih et al., 2024)	6.0
F1	(Ningsih et al., 2024)	5.8
F2	(Ningsih et al., 2024)	5.7
F3	(Ningsih et al., 2024)	5.9

Based on the evaluation results in Table 36, all formulations meet the skin-safe pH requirements. According to Shintya (2020), the acidity level of the lotion samples is also not significantly different from the skin's normal pH of 4.5-6.5. Therefore, the resulting lotion is relatively safe for use. A lotion with a pH that is too alkaline can cause scaly skin, while a pH that is too acidic can cause skin irritation.

Adhesion Test

Table 15. Adhesion Test

Formula	Library	Adhesive Power
F0	(Ningsih et al., 2024)	4.6
F1	(Ningsih et al., 2024)	5.0
F2	(Ningsih et al., 2024)	4.9
F3	(Ningsih et al., 2024)	5.6

Based on the results of the adhesive strength evaluation in Table 35, it shows that the four preparations have good adhesive strength test values, namely F0 4.6 seconds, F1 5 seconds, F2 4.9 seconds, F3 5.6 seconds. It can be concluded that in this formulation, all formulas have good adhesive strength.

Spread Power Test

Table 16. Spread Power Test

Formula	Library	Spread Power
F0	(Karim et al., 2022)	5.58
F1	(Karim et al., 2022)	6.53
F2	(Karim et al., 2022)	6.43
F3	(Karim et al., 2022)	6.92

The F0 result of the spreadability measurement was 5.58, the F1 result was 6.53, the F2 result was 6.43, and the F3 result was 6.92. Based on the results of the spreadability test on the lotion preparations, it can be concluded that all lotion preparations meet the requirements of 5-7 cm (Karim et al., 2022).

Viscosity Test

Table 17. Viscosity Test

Formula	Library	Viscosity
F0	(Karim et al., 2022)	33016
F1	(Karim et al., 2022)	28762
F2	(Karim et al., 2022)	20032
F3	(Karim et al., 2022)	17274

Lotion viscosity testing was performed using a Brookfield viscometer with spindle no. 4 at a speed of 12 rpm. The viscosity test was conducted to determine the consistency of the lotion preparation so that it could be easily applied to the skin (Karim et al., 2022). The viscosity test results had varying cps values ranging from 33.016 to 17.274. The differences in results from the four lotion formulations were due to differences in extract concentrations used.

Antioxidant Activity Test DPPH Method Wavelength Determination

The determination of the maximum wavelength for DPPH (2,2-diphenyl-1picrylhydrazyl) aims to determine its maximum absorption. The results showed a maximum wavelength of 517 nm and an absorbance of 0.622.

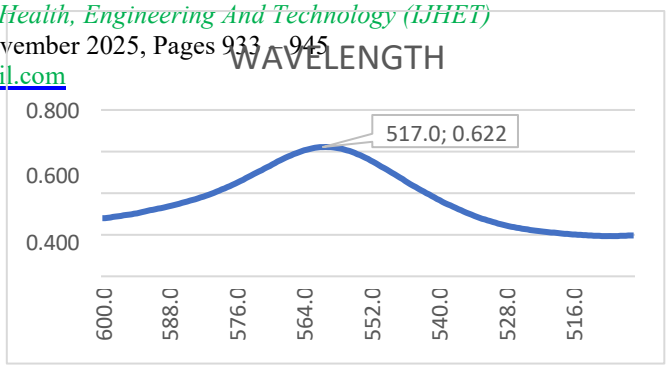

Figure 1. Wavelength

Determining Operating Time

The operating time determination aims to measure the compound at its most stable absorbance. Measurements are performed to determine the optimal time for consistent solution absorbance. The results showed stable absorbance at 24 minutes, with an absorbance of 0.602.

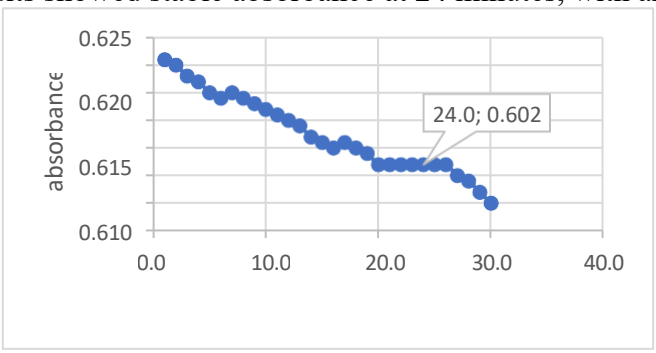

Figure 2.*Operating Time*

Antioxidant Activity Testing Using the DPPH Method

The antioxidant activity of kirinyuh leaf extract has an IC value$_{50}$of 43.057 µg/ml. This shows that the antioxidant activity in kirinyuh leaves is very strong due to the IC$_{50}$The resulting concentration is <50µg/ml. Antioxidant activity can be seen from the IC value.$_{50}$Standard Vitamin C as a comparison has an IC value$_{50}$of 17.315µg/ml. This shows that the antioxidant activity of vitamin C is very strong due to the IC$_{50}$The resulting concentration was <50 µg/ml. The results of the antioxidant activity test graph of the lotion preparation in the three formulas, Formula 1 with an extract concentration (10%) obtained IC results$_{50}$of 97.981µg/ml, indicating strong antioxidant activity due to the IC value$_{50}$falls into the <50 µg/ml category. Formula 2 with an extract concentration of 15% obtained IC results$_{50}$of 93.213µg/ml, indicating strong antioxidant activity due to IC$_{50}$falls into the <50 µg/ml category. Formula 3 with an extract concentration of 20% obtained an IC value of$_{50}$of 87.061µg/ml, indicating strong antioxidant activity due to the IC value$_{50}$falls into the <50 µg/ml category.The three formulas with the addition of kirinyuh leaf extract showed very strong antioxidant activity. This can be concluded that the higher the concentration of extract in the sample, the lower the absorbance value but the higher the percentage inhibition value. Meanwhile, the positive control, brand M Lotion, produced IC50 results.$_{50}$of 84.337µg/ml indicatesstrong antioxidant activity where vitamin C is a pure compound and both have high antioxidant compounds. The lower the IC50 value, the more active the Lotion preparation as a DPPH radical scavenging compound or antioxidant compound. From the results obtained, the Lotion with the highest antioxidant activity was in formula 3 with an IC50 value of 87.061 µg/ml with a concentration of kirinyuh leaf extract of 20%.

Sample	Concentration	Repetition			Average	Inhibition	IC$_{50}$
		1	2	3			
Vitamin C	2	0.567	0.564	0.561	0.564	7,074	17,315
	4	0.526	0.527	0.523	0.525	15,756	
	6	0.510	0.500	0.497	0.502	20,740	
	8	0.470	0.466	0.469	0.468	26,527	

	10	0.445	0.446	0.447	0.446	28,457	
Leaf Extract Kirinyuh	2	0.520	0.523	0.527	0.523	15,273	43,057
	4	0.518	0.518	0.517	0.518	16,881	
	6	0.510	0.509	0.510	0.510	18,006	
	8	0.499	0.500	0.501	0.500	19,453	
	10	0.480	0.481	0.482	0.481	22,508	
F0	20	0.519	0.525	0.515	0.514	17,363	154,257
	40	0.475	0.475	0.481	0.477	23,312	
	60	0.450	0.453	0.457	0.453	27,117	
	80	0.420	0.418	0.424	0.421	32,369	
	100	0.392	0.395	0.392	0.393	36,817	
F1	20	0.506	0.510	0.527	0.514	18,006	97,981
	40	0.463	0.469	0.476	0.469	24,598	
	60	0.445	0.441	0.450	0.445	29,100	
	80	0.320	0.332	0.338	0.330	46,624	
	100	0.310	0.311	0.298	0.306	50,000	
F2	20	0.535	0.520	0.524	0.526	13,987	93,213
	40	0.460	0.439	0.440	0.446	26,045	
	60	0.440	0.429	0.431	0.433	29,260	
	80	0.325	0.311	0.310	0.315	47,749	
	100	0.299	0.288	0.289	0.292	51,929	
F3	20	0.534	0.516	0.521	0.524	16,238	87,061
	40	0.458	0.435	0.433	0.442	30,386	
	60	0.452	0.423	0.427	0.434	31,350	
	80	0.341	0.305	0.306	0.317	50,804	
	100	0.280	0.284	0.280	0.281	54,984	
Comparison lotionbrand M	20	0.523	0.518	0.513	0.408	34,352	84,337
	40	0.449	0.445	0.450	0.370	40,461	
	60	0.428	0.429	0.422	0.338	45,659	
	80	0.299	0.290	0.285	0.314	49,518	
	100	0.272	0.278	0.275	0.288	53,644	

Conclusion

Based on the results of research that has been conducted on lotion preparations and antioxidant activity tests of ethanol extracts of kirinyuh leaves, it can be concluded that:

1. Kirinyuh leaf extract (Chromolaena odorata L.) results of antioxidant activity test with IC value$_{50}$43.057 µg/mL, it can be concluded that it has very strong antioxidant activity.
2. The lotion preparation of kirinyuh leaf extract (Chromolaena odorata L.) has antioxidant activity with an IC value of$_{50}$Formula I concentration of 10% is 97.981 µg/mL, Formula II concentration of 15% is 93.213µg/mL and formula III with a concentration of 20% of 87.061 µg/mL, it can be concluded that it has strong antioxidant activity.

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