# **Formulation and Antioxidan Activity Identification of Jotang Herb Extract (*Acmella Paniculata)* Mask Cream Using Spectrofotometer Uv-Vis**

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**Abstract**

*Pollution in the environment can increase the production of reactive oxygen species (ROS) which can reduce the amount of antioxidants in the skin. Antioxidants are compounds that can inhibit oxidation reactions by binding to free radicals and reactive molecules. Herbaceous plant jotang (Acmella paniculata) which has secondary metabolites such as flavonoids, alkaloids, tannins and saponins which can protect the internal and external organs of the body's cells from damage caused by free radicals on the skin. One of the treatment preparations used for the skin is a cream mask because the use or application at the final level of skin care can improve cleanliness, health and stimulate and repair skin cells. This study aims to determine a formula that has a good antioxidant value using the DPPH method (2,2-diphenyl-1-pikrilhidrazyl), while in this study preparations were made with 3, namely F0 , FI (1% w/w) and FII (10%w/w). Evaluation of physical properties included organoleptic tests, homogeneity tests, spreadability tests, pH tests, viscosity tests, cream type tests and antioxidant tests. The result showed that the organoleptic test had a cream mask dosage form in the form of semi-solid,distinctive jotang odor,light and dark green in color, had a homogeneous dosage form,spreadability around 5,1-5,7 with an average pH value of 6, has a good viscosity value and has a type of cream M/A And a high antioxidant value in formula II (10% w/w ) with an IC50 value of 21.959 mg/ml. based on statistical test,significant result were obtained of 0,000<p (0,05) so that it can be interpreted that there is a significant difference in each concentration of jotang herb extract to the resulting IC50 value.*

***Keywords****: Jotang, Acmella paniculata, Mask Cream, DPPH (2,2-diphenyl-1-pikrilhidrazil).*

**Introduction**

Reactive Oxygen Species (ROS) are free radicals that play an important role in several physiological processes of the body's organs, ROS are known to also modulate vascular function by causing damage directly due to the influence of pollutants. In addition, pollutants can penetrate through the stratum corneum to deeper layers of the skin, causing damage to the skin (Maula, 2017).

Antioxidants are compounds that can inhibit oxidation reactions by binding to free radicals and reactive molecules. Antioxidants are compounds which in certain amounts can slow down or inhibit the damage caused by the oxidation process. Antioxidant compounds are needed for the body to protect against exposure to free radicals which work by donating electrons to compounds that have oxidant properties, so that they easily inhibit oxidant activity (Kholifah et al., 2022).

One of the plants that contains antioxidants and is often used is the jotang plant (Acmella paniculata) which has an ICs value of 1.77 pg/ml, is a herb that grows wild in gardens, along rice fields, river banks, moist soils in tropical and sub-tropical regions. Jotang plants also contain several active compounds that are good for health such as flavonoids, phenolic components, alkaloids, tannins and saponins. Flavonoid compounds in plants can protect internal body cells and external organs from damage caused by free radicals on the skin (Hidayat et al, 2021).

Facial skin is one of the parts most often exposed to UV rays. Ultraviolet rays can have adverse effects on the skin such as causing skin cancer, darkening of the skin surface, sunburn, and signs of aging. In addition, exposure to ultraviolet rays and air pollution contain free radicals. The skin care that most people use to treat their skin is mask preparations (Priandari, 2019).

Masks are cosmetics that are used at the last level in treating problematic facial skin, improving skin hygiene, health and beauty, repairing and re-stimulating skin cell activities (Ajiningrum, 2020).

Based on the above background, the jotang plant has various properties, one of which is as an antioxidant for facial skin care, research will be carried out on the formulation and evaluation of the physical properties of cream mask preparations from the ethanol extract of the jotang herb (Acmella paniculata).

**Methods**

**Extraction**

The ethanol extract of jotang herb was made. The jotang herb is washed under running water until all the dirt is gone. The jotang herb is then dried in the air, crushed and extracted. The jotang sample used was 300 g of simplicia and then added 3000 ml of 96% ethanol solvent until the sample was submerged or a layer above the sample surface. The container is tightly closed, then the container is stored for three days at room temperature, protected from light, with the treatment every day stirring 3 times a day, namely in the morning and afternoon until the 3rd day. Then the macerate obtained is filtered and collected and then evaporated using a rotary evaporator or evaporated over a water bath at 70-100°C to obtain a thick extract.

*Table 1. preparation formulationof Of Jotang Herb Ethanol Extract Cream Mask*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **inggredies** | **Formula b/b (%)** | | | **Function** |
| **F0** | **F1** | **F2** |  |
| Ekstrak etanol herba jotang | - | 1 | 10 | Active Subtance |
| Asam stearate | 15 | 15 | 15 | Emulsifier |
| Setil alcohol | 1 | 1 | 1 | Emoliyent |
| Gliserol | 5 | 5 | 5 | Humectant |
| TEA | 2 | 2 | 2 | Emulsifier |
| Nipagin | 0,1 | 0,1 | 0,1 | Preservative |
| Nipasol | 0,05 | 0,05 | 0,05 | Preservative |
| Aquadest | 100 | 100 | 100 | Solvent |

Each ingredient is weighed and then the additional ingredients in the formula are separated into two groups, namely the oil phase and the water phase. The oil phase i.e. (stearic acid, cetyl alcohol, glycerol) is heated at 60°-70°C until melted. The water phase is (TEA, nipagin. nipasol and aquadest) Heat at 60°-70°C until melted. The oil phase is introduced slowly into the aqueous phase with stirring until a creamy mass is formed homogeneous, then add the ethanol extract of jotang herbs according to the crushed concentration homogeneous, After the preparation is homogeneous, put it in the appropriate container and test the evaluation.

**Evaluation of the Physical Properties of Cream Mask Preparations**

**1. Organoleptic Test**

Organoleptic evaluation uses the five senses, starting from the smell, color, texture of the preparations. Observations are seen directly from the preparations that are made (Tuzairoh Nadif, 2021).

**2. Homogeneity Test**

Amount of the preparation is applied to a piece of glass, the preparation must show a homogeneous composition and there are no visible coarse grains (Tuzairoh Nadif, 2021).

**3. Spreadability Test**

Sample of cream was placed in the center between two slides, where the top slide was loaded by placing weights until it reached a weight of 150 g. Measurements were made until the diameter of the spread of the cream was constant. This test was carried out for each formulation and replicated three times (Tuzairoh Nadif. 2021).

**4. Test the pH**

The pH test was carried out using a pH meter, weighing 1 gram of mask cream preparation and

dissolved in 10 mL., then dip the pH meter into the preparation. This test was performed on

each formulation and replicated three times (tuzairoh nadif, 2021).

**5. Viscosity Test**

The viscosity of the cream mask preparation was carried out to find out from each mask preparation cream, measured using a Brookfield viscometer and the respective formulas were replicated three times. then the spindle and rotor are installed. The viscosity result is recorded after the needle viscometer shows a stable number after five rounds (Husni et al., 2019)

**6. Cream Type Test**

The cream preparation is taken sufficiently then placed on the object glass. Added 1 drop of methylene blue indicator. If the blue color of methylene blue can be mixed evenly in the cream preparation, then the cream is type M/A (Genetics, et al 2016).

**7. Antioxidant Activity Testing of Jotang (Acmella paniculata) Herb Jotang (Acmella paniculata) Cream Mask Preparations**

1. Preparation of DPPH Solution

40 mg of DPPH powder was weighed, then dissolved in 100 ml of 96% ethanol to the mark using a 100 ml volumetric flask, left to stand at low temperature protected from light. Take 2 ml of DPPH solution and put it in a test tube and then add it

2. Determination of the Maximum Wavelength of DPPH

with 2 ml of 96% ethanol solution and shaken until homogeneous then poured into the cuvette as much as 3 ml and measured at a wavelength of 500-600 nm using spectrophotometer UV-Vis, the maximum wavelength is at 517 nm.

3. Preparation of Blank Solution

2 ml of DPPH solution was put into a test tube, then added ethanol 96% as much as 2 ml, shake until homogeneous and incubated in a dark room for 30 minutes then the absorption was measured using a UV-Vis spectrophotometer at a wavelength of 500-600 nm to obtain the maximum wavelength.

4. Preparation of Cream Mask Solution from Jotang Herb Extract

1. Preparation of 100 ppm concentration main solution

Mask Cream from Jotang Herba Extract weighed as much as 10 mg and added with 96% ethanol then put into a 100 ml measuring flask, the volume is filled with 96% ethanol up to the mark.

2. Pre Conc paration of entration Series Test Solutions

The main solution of Mask Cream from Jotang Herb Extract was made in a series of concentrations 2,4,8,16 and 32 ppm. From the main solution of 100 ppm, pipette 0.2 ml, 0.4 ml, 0.8 ml, 1.6 ml and 3.2 ml into a 10 ml volumetric flask, then make up.

3. Absorption Measurement of UV-Vis Spectrophotometer

A total of 2 ml of the jotang herb ethanol extract cream mask test solution was put into a test tube, added 2 ml of DPPH solution and shaken until homogeneous, incubated for 30 minutes in a dark room then measured the absorption at wavelength.

5. Preparation of Comparison Solution

1. Preparation of 100 ppm concentration main solution.

Mugwort cream mask as a comparison, weighed 10 mg and dissolved in 96% ethanol then put into a 100 ml volumetric flask, the volume was made up with 96% ethanol up to the mark mark.

2. Concentration Series Test Preparation

Mugwort cream mask solution as a comparison with concentrations of 2, 4, 8, 16 and 32 ppm. from solution mains 100 ppm pipette 0.2 ml, 0.4 ml, 0.8 ml, 1.6 ml and 3.2 ml put into a 10 volumetric flask ml, then enough.

3. Absorption Measurement of UV-Vis Spectrophotometer.

The test was carried out by pipetting 2 ml of various concentrations of the mugwot cream mask solution (2,4,8,16 and 32 ppm) then 2 ml of DPPH was added until it was completely mixed. Mixture stored for 30 minutes in a dark room, then the absorbance was measured using UV-Vis spectrophotometry at the maximum wavelength.

**Results and discussion**

**Extraction**

In the extraction process, the jotang herb (Acmella paniculata) is extracted using the maceration method with 96% ethanol solvent for 3 days 24 hours then remaceration was carried out 2 times. The resulting filtrate was then concentrated using a rotary evaporator at 50°C aims to concentrate the extract and be able to separate between ethanol solvents and compounds active herb jotang, the results of the thick extract obtained were then weighed and the results calculated extract yield.

*Table 2. extract yield results*

|  |  |  |  |
| --- | --- | --- | --- |
| Sample | Sample Weight | Solvent Volume | Extract Weight (gram) |
| Herb Jotang | 300 gram | 3000 ml | 13,2 gram |

The yield of jotang herb extract was 4.4%. The yield obtained was lower than that of Melawati S (2022) who obtained a thick extract of 5.12%. The yield percentage obtained is influenced by the effectiveness of the extraction process and is influenced by several factors, namely the stirring process during maceration, the type of solvent, the amount of simplicia, the time and temperature used during the extraction process (Mailana, et al 2016)

**Evaluation of Physical Properties of Preparations**

1. Organoleptic

Organoleptic tests carried out aim to observe the physical properties of the preparations including shape, color and smell. Organoleptic examination is carried out to describe the consistency, color and smell of the cream that has been mixed with several bases, the resulting preparation should have an attractive color, a pleasant odor and sufficient consistency to be comfortable in use (Apitalau et al, 2021).

The organoleptic test results obtained from the cream mask preparation of the ethanol extract of the jotang herb (Acmella paniculata) for Formula 0, Formula 1 and Formula 2 have the same form, namely semi-solid, the cream mask preparation Formula 0 (without extract) has a white color and is odorless, for Formula 1 with an extract concentration of 1 gram has a light green color and has a distinctive jotang smell while Formula 2 with an extract concentration of 10 grams has a dark green color and has a distinctive jotang odor (Genatrika, et al 2016).

*Table 3. organoleptic test results*

|  |  |  |  |
| --- | --- | --- | --- |
| **Formulas** | **form** | **color** | **smell** |
| Formulas 0 | Semi solid | White | No smell |
| Formulas 1 | Semi solid | Light green | Typical jotang smell |
| Formulas 2 | Semi solid | Dark green | Typical jotang smell |

2. Homogeneity Test

The homogeneity test is one of the physical property evaluation tests that aims to see and know the mixing of the ingredients of the cream preparation so that the entire cream preparation does not show any coarse grains when the preparation is smeared on the slide. Cream is said to be homogeneous if there is an even color equation and no particles are found in the cream (Apitalau et al, 2021).

The results obtained from the homogeneity test of the jotang herb extract cream mask from Formula 0, Formula 1 and Formula 2 show a homogeneous composition. The active substance properties of the ethanol extract of the jotang herb are mixed with the M/A base so that phase collection and separation does not occur. This shows that a homogeneous cream mask preparation indicates that the ingredients used in the cream mask preparation are perfectly mixed (Tuzairoh Nadif, 2021).

3. Spreading Test

Spreadability test was carried out to determine the quality of the spreading power of the cream preparation when applied to the skin. The greater the spreading power, the better the physical properties of the cream preparation (Apitalau et al, 2021).

The results of the spreading power of the cream mask from the ethanol extract of jotang herb from the table above show an average value obtained for FO of 5.1 cm, for F1 of 5.4 cm and F2 of 6.2 cm. these results indicate that the spreadability of the cream mask preparation meets the standard requirements for a good spread, which is around 5-7 cm (Ratnapuri, et al 2020).

*Table 4. spreadability test results*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Formulas** | **Power Spread (cm) replikation** | | | **Average** |
| **1** | **2** | **3** |
| F 0 | 5 | 5 | 5,5 | 5,1 |
| F1 | 5 | 5,2 | 6 | 5,4 |
| F 2 | 5 | 6 | 6,2 | 5,7 |

4. pH Test

The pH test carried out aims to determine whether the preparation is acidic, alkaline or neutral. For topical preparations, it must meet the requirements because if the pH is too alkaline it will results in dry skin otherwise if the pH is too acidic it can trigger irritation to the skin (Wibowo and Ali 2020). The results of the table data above show that F0 has value pH 6.06, Fl has a pH value of 6.04, and F2 has a pH value of 6.09. The ideal pH of cream preparations preferably according to the physiological pH of the skin, which is around 4.5-6.5 (Ratnapuri, et al. 2020).

*Table 5. pH Test Result*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Formulas** | **pH test**  **Replication** | | | **Average** |
| **1** | **2** | **3** |
| F 0 | 5,85 | 6,14 | 6,19 | 6,06 |
| F 1 | 6,08 | 6,04 | 6,01 | 6,04 |
| F 2 | 5,99 | 6,08 | 6,29 | 6,09 |

5. Viscosity Test

The viscosity test was carried out aiming to determine the level of thickness of the mask preparation the resulting cream, the higher the viscosity the greater the resistance. On the viscosity test a brookfiled viscometer is used to determine the viscosity of a preparation. Measurement Viscosity was determined by attaching the sample in a Brookfield viscometer to the spindle submerged, then let the spindle rotate at the specified speed. Measurement viscosity using spindle number 4 and speed 60 rpm. The value of the viscosity range is located in the range of 2,000-50,000 centipoise viscosity values ​​(Sagala, 2019).

*Table 6. Results of Viscosity Testing*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Formulas** | **Viscosity test (cps)**  **Replication** | | | **Average** |
| **1** | **2** | **3** |
| F 0 | 9990 | 9990 | 9990 | 9990 |
| F 1 | 9820 | 9970 | 9990 | 9926,66 |
| F 2 | 6020 | 6020 | 6020 | 6020 |

6. Test of Cream type

The cream type test aims to determine the type of cream mask preparation from herbal extracts jotang that has been made. The results of microscope observations that the cream mask preparation is a type M/A This is indicated by the blue color visible on the outer phase due to methylene bluesoluble in water (Genetics, et al 2016). There is a combination of ingredients stearate sour cream and triethanolamine will form a stable M/A cream preparation (Saryanti, et al 2019).



*Figure1. cream type test*

7. Antioxidant Activity Test of Jotang Herb (Acmella paniculata) Ethanol Extract Cream Mask

Determination of the value of antioxidant activity in this study is to use the method DPPH. The antioxidant activity test method with DPPH (2,2-diphenyl-1-fikrylhidrazyl) was chosen because it is a method that is easy, simple, fast and only requires a little samples to evaluate the antioxidant activity of natural product compounds. Test method This antioxidant is a quantitative measurement of antioxidant activity, namely by to measure DPPH radical scavenging by a compound that has antioxidant activity using a UV-Vis spectrophotometer so that it can be identified the value of free radical scavenging activity expressed by the value of ICs (Inhibitory Concentration) (Deshpande, 2013).

In this study, the antioxidant activity test was carried out on 3 cream mask preparation formulas from the ethanol extract of jotang herbs in each formula, with the aim of knowing the IC 50 value in each formula for the preparation of jotang herb extract cream masks with extract ratios as much as 1 gram and 10 grams and to find out the comparison of mugwort cream masks. Measurement of the absorbance of cream mask samples was carried out with various concentrations (2, 4, 8, 16 and 32 ppm) then measured at a wavelength of 517 nm.

* 1. Linearity curve F0 b. Linearity curv F1
  2. Linearity curve F2 d. Linearity curve k+

*Table 7. Antioxidant Test Results*

|  |  |
| --- | --- |
| Sample | IC50 |
| Formulas 0 | 40,1959 µg/ml |
| Formulas 1 | 25,663 µg/ml |
| Formulas 2 | 21,959 µg/ml |
| Positive control | 28,228 µg/ml |

The results of the IC50 value of the antioxidant test for cream mask preparations from the ethanol extract of the jotang herb (Acmella paniculata) showed that Formula 0 cream masks have very strong antioxidants (40.1959 µg/ml) and Formula I has a very strong antioxidant value (25.663 µg/ml). Formula II has antioxidants of (21.959 µg/ml) while the mugwort comparator mask has antioxidant value of (28.228 µg/ml). Preparation of cream masks from the ethanol extract of jotang herbs categorized into strong antioxidant activity. In Formula 0 does not contain extract but has very strong antioxidant activity. This is due to the presence of materials cream base that contains antioxidant activity, namely those found in stearic acid and glycerol.

Stearic acid is one of the fats, namely nonessential fatty acids, resulting in a greater amount of oil phase in the preparation. The greater the number of oil phases in the jotang herbal cream mask formulation (Acmella paniculata) causes the need for antioxidants to protect the stability of cream mask preparations against oxidation is also greater (Rahmawati et al, 2020), as well as the presence of a glycerol base which affects activity antioxidants because there is an OH group which is the mechanism of action of antioxidants in the propagation stage of the formation of free radicals (R) which are very reactive (Nugrahaeni et al, 2023). Another factor that causes FO to have antioxidant activity is due to the pipetting process, the tools used are less clean cause Formula O has antioxidants, Formula O should not have antioxidants. While the formulas I and II contain extracts jotang herb so it has a very strong antioxidant value (Elmitra, et al 2022).

Based on the results of the data analysis above, the statistical test is continued with the Post Hoc Test tukey honestly significant difference (HSD). The goal is to find out the difference in the results of each substance concentration. The table above shows that there are differences significant difference between the treatments of jotang herb ethanol extract. Where in FO, F1, F2, and Comparator mugwort there is a significant difference because all formulas have a Sig value 0.00 <0.05 which means there are differences in each cream mask formula from herbal ethanol extract jotang as an antioxidant. This states that the provision of variations in the concentration of herbal extracts jotang has an effect on the ICs values ​​obtained (Elmitra, et al 2022).

**Conclusions**

The ethanol extract of jotang herb (Acmella paniculata) can be formulated in a mask preparation cream and has a good physical evaluation test with a homogeneous dosage form, power spread with an average value of FO 5.1, FI 5.4 and F2 5.7, an average pH value of 6, a viscosity value of 6020-9990 cps, and the type of cream M/A. Formula 2 cream mask preparation which has a higher antioxidant value of 21.959 µg/ml.

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