

Utilization of Wungu leaf extract (*Graptophyllum pictum* (L.) Griff.) in the formulation of spray sunscreen as a halal cosmetic preparation



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ABSTRACT

Ultraviolet (UV) A and Ultraviolet (UV) B rays can also hurt the skin, and sunscreen helps keep the skin awake. Wungu leaf has some potential for sunscreen because it has antioxidant activity that allows it to absorb UV light. Besides considering the security aspect, the formulation of the sunscreen spray also observes the halal critical points of the ingredients used. This study aims to formulate a more comprehensive sunscreen spray halal extract of wungu leaves with variations in the concentration of glycerin, a humectant. Data collection techniques run through descriptive analysis. This is made with variations in glycerin concentration: 5%, 10%, and 15%. The availability of formulated physical evaluations then included organoleptic tests, homogeneity tests, pH tests, viscosity tests, and test patterns of spraying. According to this study, availability in green, homogenous pH stands at 5.42 – 5.73, viscosity in the 1571 – 1983 cPs, and the targeting pattern at about 3 cm, 5 cm, 10 cm, and 15 cm at 5.67 – 16.6 cm. Therefore, in this study, the conclusion is that the availability of sunscreen spray with variations of glycerin has more physical properties that could be used. The more glycerin is used, the more available viscosity will increase.

Keywords: Critical point of halal, Skin, Spray sunscreen, Ultraviolet, Wungu leaves

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INTRODUCTION

Indonesia is a tropical country located on the equator. This causes Indonesia to be exposed to very high-intensity sunlight. The sunlight can be used for human survival, such as drying, alternative energy sources, vitamin D, and so on (Ridwan et al., 2021). However, despite the myriad benefits, sunlight also negatively impacts human skin due to ultraviolet rays. Excessive exposure to UV radiation can cause skin problems such as aging and pigmentation caused by UV A rays and erythema caused by UV B. Most of the damage to the skin is caused by the formation of Reactive Oxygen Species (ROS) (Ajwad, 2019).

With the magnitude of the danger of radiation caused by UV rays, the skin, as the main barrier of defense from sunlight, needs to be protected. There are two ways to protect the skin from UV radiation: physical and chemical. Physical protection is wearing long clothes, umbrellas, hats, and . At the same time, chemical protection is provided by using sunscreen (Mumtazah et al., 2020). Sunscreen is one of the cosmetics that protects the skin from solar radiation (Mansuri et al., 2021). The selection of halal cosmetics is now also a special standard for Muslim consumers. This is because cosmetic products labeled halal are claimed to have a higher level of safety on the skin.

The halal industry is a world trend today. This matter is evidenced by the prospects for the halal industry, which continues to grow from year to year. According to a report from the State of The Global Islamic Report (2019), around 1.8 billion Muslim population are industrial consumers. Halal means permitted, and despite its association with ritual slaughter in Islam, the halal doctrine pervades all aspects of life (Putri et al., 2022). Despite its association with ritual slaughter in Islam, the halal doctrine pervades all aspects of life, including business and management.

However, today's sunscreen products are mostly derived from chemicals. Therefore, it is necessary to innovate the use of herbal ingredients in the manufacture of sunscreens in order to reduce the side effects produced. One herb that can be formulated in the sunscreen is the wungu leaf plant (*Graptophyllum pictum* (L.) Griff.). All parts of the plant contain antioxidants (Salim & Suryani, 2020). The ethanol solvent of 200 ppm is claimed to have good effectiveness in forming sun protection (Poh-Yen et al., 2018). This study aimed to formulate a spray sunscreen preparation of wungu leaf extract with variations in the concentration of glycerin as a humectant.

RESEARCH METHOD

Materials

The tools used in this study include a refrigerator (Sharp), oven (Memmert), rotary evaporator (Heidolph), microscope (Nikon), analytical balance (Shimadzu), hotplate (Heidolph), beaker glass (Iwaki), pH meter, funnel, Ostwald viscometer, magnetic stirrer (Heidolph), porcelain dish, stirring rod, thermometer, measuring cup (Iwaki), parchment paper, filter paper, erlenmeyer, filter cloth, aluminum foil (Klin pak), tripod, bunsen, asbestos gauze, plastic sheet, dropper, and spray bottle.

The materials used in this study included wungu leaf powder (*Graptophyllum pictum* (L.) Griff.) obtained from Karangpandan District, Karanganyar Regency, Central Java Province; ethanol 70% (Bratachem); propylparaben (Bratachem); methylparaben (Bratachem); triethanolamine (TEA) (Bratachem); glycerin (Bratachem); propylene glycol (Bratachem); carbopol 940 (Bratachem); butylated hydroxytoluene antioxidant (BHT) (Bratachem); greens; and aquadest.

Methods

1. Microscopic Identification

Microscopic identification aims to determine the typical fragments in a simplicia, cell contents, and cell shape (Novitasari et al., 2021). Microscopic identification was done by dissolving 1 gram of wungu leaf powder with distilled water on a glass slide and then observed using a microscope.

2. Extract Preparation

The dry powder of wungu leaves was extracted using the cold maceration method by dissolving the simplicia powder in ethanol for 5 days (Asworo & Widwastuti, 2023). Then, the extract obtained was concentrated with a rotary evaporator until thickened. Then dry in the oven until dry. The dried extract can be scraped with a spatula until the porcelain cup is clean.

3. Preparation Formula

Table 1. show the formulation was carried out into three formulas with varying concentrations of extract and glycerin. The materials needed were weighed using an analytical balance, including carpool 940, methylparaben, propylparaben, and BHT. Carbopol 940 was dissolved in 70°C distilled water and waited 30 minutes until all parts were dispersed. After carbopol 940 was dispersed, TEA was added to form a fairly thick gel mass (Mixture A). The addition of TEA is intended to purify the mixture (Shintia et al., 2021). Aquadest, methylparaben, propylene glycol, glycerin, propylparaben, ethyl vanillin, and BHT were heated in a container with a temperature of 70°C while stirring (Mixture B). Mixture B is poured into Mixture A, and the remaining aquadest, extract, and dye are added and then stirred until homogeneous (Mixture C). The mixed C mixture was homogenized again using a 1200 rpm magnetic stirrer for 2 minutes. The homogeneous preparation was put into a 100 ml spray bottle, and then physical evaluation and stability tests were carried out.

Table 1. Wungu leaf extract spray sunscreen formula

Ingredients	Formula		
	F1	F2	F3
Wungu leaf extract	0.05 g	0.05 g	0.05 g
Methyl paraben	0.027 g	0.027 g	0.027 g
Propyl paraben	0.014 g	0.014 g	0.014 g
Glycerin	5 %	10 %	15 %
Carbopol 940	0.06 g	0.06 g	0.06 g
Propylene glycol	10 ml	10 ml	10 ml
Green dye	1 ml	1 ml	1 ml
BHT	0.01 g	0.01 g	0.01 g
TEA	0.05 ml	0.05 ml	0.05 ml
<i>Ethyl vanillin</i>	1.186 g	1.186 g	1.186 g
Aquadest	83.77 ml	78.77 ml	73.77 ml

4. Physical Evaluation

a. Organoleptic Test

Organoleptic tests were carried out visually using human senses for measurement. The senses commonly used are the sense of sight (eyes) and smell (nose). The parameters assessed were the color and odor of the preparation (Gusnadi et al., 2021).

b. Homogeneity Test

The homogeneity test is carried out to see the mixture of materials and preparations by visually observing the distribution of particles in the preparation using the sense of sight (eyes) (Dewanti & Azzahra, 2020).

c. pH Test

The pH test was carried out to determine the level of skin acceptance of the preparation. The pH test was carried out using a calibrated pH meter before use.

d. Viscosity Test

A viscosity test is used to determine the amount of viscosity of a preparation. The viscosity value in the viscosity test interprets a liquid's resistance to flow. Viscosity testing using an Ostwald viscometer and pycnometer was then calculated using the density and flow time formula. The formula for calculating density is:

$$\rho = \frac{m}{v}$$

Information : ρ = density; m = mass ; v = volume

Then, the flow time of the preparation using the following formula:

$$\eta = \eta_0 \frac{t \cdot \rho}{t_0 \cdot \rho_0}$$

Information : η = dosage viscosity; η_0 = water viscosity; t = preparation flow time; t_0 = water flow time; ρ = density of preparation; ρ_0 = density of water

e. Spray Pattern Test

The spraying pattern was carried out on a mica plastic layer with variations in distance, namely 3 cm, 5 cm, 10 cm, and 15 cm. Each spraying distance was replicated in triples (three times), and the spraying pattern and the diameter of the distance formed were then observed.

Data Analysis

The data obtained was analyzed using descriptive analysis, presented as tables and figures to make it easier for readers to understand.


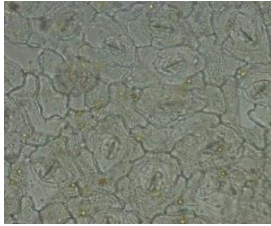

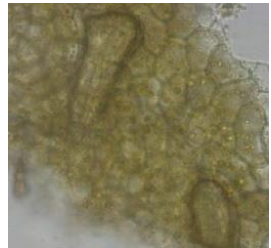


RESULT AND DISCUSSION

Preparation of wungu leaf extract using the maceration method. Maceration is an extraction method through an immersion process using a solvent suitable for certain active compounds without any heating process. The advantage of the maceration method is that the extracted active substance will be guaranteed and will not break or be damaged (Chairunnisa et al., 2019). Wungu leaf powder was macerated using 70% ethanol for five days. After obtaining the extract was concentrated using a rotary evaporator and placed in the oven to dry. After drying, the extract in a porcelain cup was scraped to obtain a dry extract.

Findings on Microscopic Identification

On microscopic identification of wungu leaf powder, several cells or tissues were found inside, such as stomata, vascular bundles with spiral thickening, and needle-shaped calcium oxalate crystals. This part can be used as a characteristic or identification fragment of wungu leaf *simplicia* (Singh et al., 2015). The results of the microscopic comparison of wungu leaves are presented in Table 2.

Table 2. Wungu leaf powder microscopic test result.

Part Name	Figure Experimental Laboratory	Reference Image (Kemkes, 2017)
Stomata	 Desc: Enlargement 40 x	
Spiral thickening vascular bundle	 Desc: Enlargement 40 x	
Needle-shaped calcium oxalate crystals	 Desc: Enlargement 40 x	

Organoleptic Test Result

No significant change was based on the organoleptic test of formulas 1, 2, and 3. All three formulas are bright green and are in liquid form. At the same time, the three formulas have a distinctive smell of extract combined with the aroma of vanilla produced from ethyl vanillin. Clarity in the formula produces clear preparations, too.

Homogeneity Test Result

Based on the homogeneity test, the preparation was well mixed, characterized by the absence of agglomerates of material particles. Carbopol 940 is well dispersed in aquadest at 70°C. These results

indicate that all preparations have good homogeneity based on the required homogeneity criteria, namely the absence of large particles when the homogeneity test is carried out (Salwa et al., 2020).

pH Test Result

Based on the pH test carried out, it was found that the pH of the preparation met the required acceptance criteria, namely, according to the pH of the skin in the range of 4.5 - 7. The pH of the preparation that was too alkaline could cause the skin to become scaly, and the pH of the preparation that was too acidic resulted in skin irritation (Veronika, 2021). The following is the result of measuring the pH of the preparation, which can be seen in Figure 1.

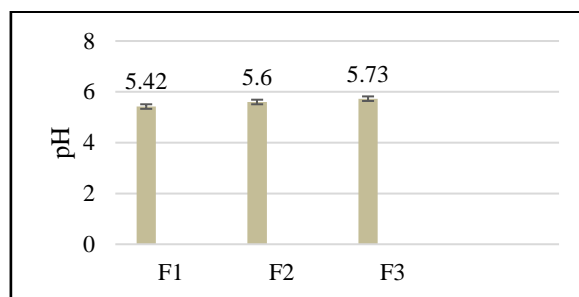


Figure 1. Graph of the pH value of the preparation.

Based on the graph in Figure 1 above, F3 has the highest pH among the other two formulas. These results align with research (Ariyanti et al., 2022) that shows that the pH of the preparation is in the skin pH range. The higher the concentration of glycerin used in the formulation, the pH of the preparation will be directly proportional to the higher it is.

Viscosity Test Result

The viscosity test on spray sunscreen preparations is included in the good viscosity category because it is in the acceptance criteria range of 500-5000 cPs (Anindhita & Oktaviani, 2020). The results of the viscosity test for sunscreen spray preparations can be seen in Figure 2.

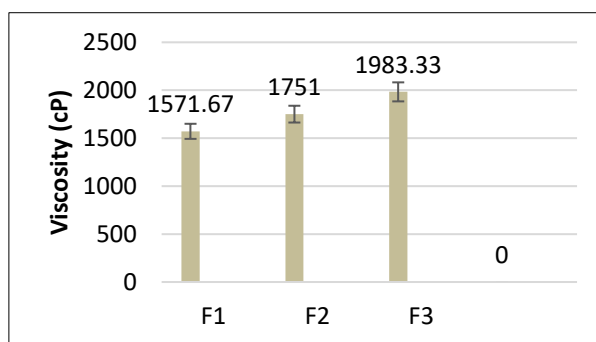


Figure 2. Viscosity value chart.

Based on the graph in Figure 2, the viscosity is directly proportional to the concentration of glycerin used. The higher the concentration of glycerin used, the higher the viscosity. This follows the research conducted by Sukmawati (2013). Glycerin, as a humectant, can increase the viscosity of the preparation. This is because glycerin can bind water, so the size of the molecular unit will increase. Increasing the size of the molecular unit will cause the resistance to flow and spread to increase (Sumule et al., 2020).

Spray Pattern Test Results

The results of the spray pattern test of the three experimental formulas varied. Formula 1 has a larger diameter than Formula 2 and Formula 3. Formula 1 has a lower viscosity, so spraying will be easier. The results of testing the diameter of the spray pattern can be seen in Figure 3.

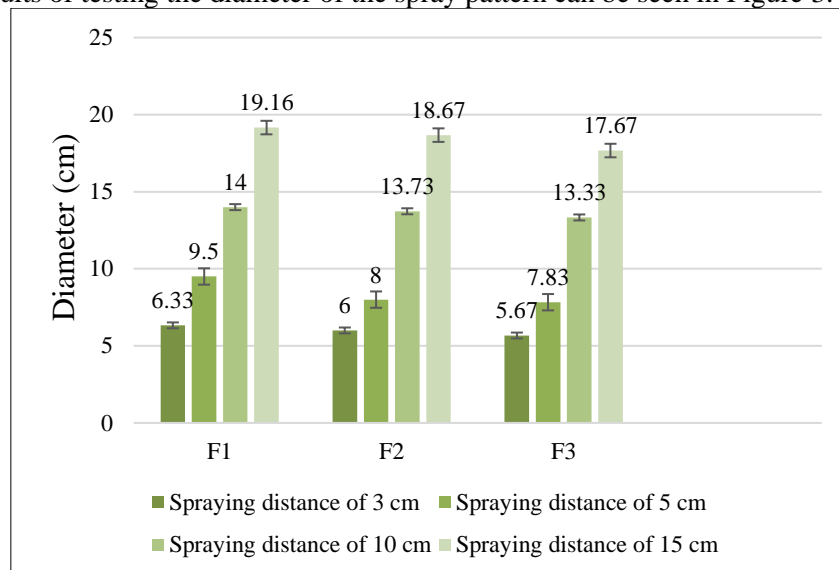


Figure 3. Graph of spray pattern diameter value

This study is in line with research (Salwa et al., 2020) that Formula 1 produces a wider spray pattern diameter than Formula 2 and Formula 3. The viscosity of the preparation of each formula affects the formation of the spray pattern of the sunscreen spray preparation.

Halal Critical Point for Sunscreen Spray Preparation

The characteristics of halal cosmetic products are cosmetic ingredients that must not contain the following ingredients: carrion, pigs, reptiles, blood, insects, predatory animals, and human body parts. It is permissible to use this material if it is slaughtered according to Islamic law and regulations. The concept of halal cosmetics is also seen in the process of preparation, manufacture, storage, maintenance of cleanliness, and transportation of halal cosmetic products (Sara et al., 2022). The halal status of the ingredients used in spray sunscreen preparations can be seen in Table 3.

Table 3. Halal critical point formulation ingredients

No.	Material Name	Material Source	Halal Status
1.	Methylparaben	Methylparaben is chemically synthesized and functions to prevent the growth of fungi (Jaswir et al., 2020).	Halal
2.	Propylparaben	Propylparaben is chemically synthesized, which functions to prevent the growth of microbes or fungi (Jaswir et al., 2020).	Halal
3.	Glycerin	Included in the group of fatty acid esters (stearic acid) are those made by the hydrolysis reaction method of animals or oil with the addition of lipase or HCL enzymes derived from animals or plants (Jaswir et al., 2020).	Syubhat
4.	Propylene glycol	Propylene glycol is an organic compound and is chemically synthesized. The liquid is clear, colorless, viscous, and slightly bitter (Jaswir et al., 2020).	Halal
5.	Carbopol 940	Carbopol 940 was used as a gelling agent on cosmetics because of its complexity and stability.	Halal

No.	Material Name	Material Source	Halal Status
6.	BHT	It is used to inhibit oxidation reactions to prevent the decomposition of preparations caused by these reactions (Jaswir et al., 2020).	Halal
7.	TEA	Inorganic acid is chemically synthesized from ethanol compounds and tertiary amine substrates. TEA provides an alkaline (alkaline) atmosphere for the stability of a product (Jaswir et al., 2020).	Halal
8.	Green dye	Green dye is used in coloring. These additives can be used safely to dye foods and food supplements in the number appropriate to good manufacturing practices. This coloring additive is included in the halal positive list of MUI materials.	Halal
9.	Ethyl vanillin	Ethyl vanillin is a preparation flavoring (Jaswir et al., 2020).	Halal
10.	Aquadest	Aquadest is the most widely used component for living things. It must be used sterile.	Halal
11.	Alcohol (Ethanol)	Derived from the Khamr industry, the fermentation industry (Khamr industry), and chemical synthetics, Materials originating from the Khamr industry are haram (unclean).	Syubhat

Cosmetics are a necessity for humans. Therefore, it is clear that humans, in the process, must be holy from unclean (halal). In the explanation of LPPOM MUI, alcohol consists of materials such as ethanol and methanol, butanol, propanol, and so on. Ethanol is one of the basic ingredients most often used in production, such as drinks, food, medicines, and cosmetics. Determination of the alcohol content that may be used is based on the reference to the hadith of the Rasulullah that Ibn Abbas made infused water. MUI analyzed the alcohol content of each ingredient, and each ingredient has different levels, such as dates, which have an alcohol level of 0.33%, wine at 0.76%, and apple juice at 0.32%. So, the MUI concluded that the decision was in the middle, namely a maximum of 0.5% because above that limit was considered alcohol (Annisa, 2020). This is in line with research conducted by Albab & Mahfudh (2020), which states that according to the Indonesian Ulema Council, the use of alcohol in cosmetics is permissible as long as it does not come from the wine industry, but now many cosmetics are labeled alcohol-free. Then glycerin is classified as problematic because it is included in the oils, fats, and processed products group. However, glycerin produced in Indonesia can be a halal ingredient produced using crude palm oil (CPO) and palm kernel oil (PKO), and it is processed from palm oil as the basic ingredient. This is in line with the statement by Halal Watch World (2021), which states that glycerin is widely considered halal because most of it comes from plants. Based on LPPOM MUI (2020), alcohol (ethanol) and glycerin are allowed as ingredients for making cosmetics and food according to predetermined levels.

CONCLUSION

Based on the data from this study, all tests met the acceptance criteria. The more glycerin used, the more the pH and viscosity of the sunscreen spray preparation will increase. It is known that if the pH produced does not match the skin's pH, it can irritate. Viscosity is an important parameter so consumers can accept the preparation and be easily applied.

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