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Antioxidant Activity of Lotion From *Sonneratia caseolaris* Leaves and *Trigona* sp. Propolis Extract

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ABSTRAK

Aktivitas luar ruangan dapat memicu radikal bebas akibat polusi udara. Salah satu sediaan yang dapat membantu melindungi adalah lotion yang terbuat dari bahan alam. Bahan alam seperti daun Sonneratia caseolaris dan propolis lebah Trigona sp. masih sedikit pemanfaatan nya dalam bentuk sediaan kombinasi lotion. Tujuan dari penelitian ini adalah mengekplorasi aktivitas antioksidan lotion kombinasi daun S. caseolaris dan propolis lebah Trigona sp. Pengujian aktivitas antioksidan menggunakan teknik DPPH dengan kombinasi formula lotion daun S. caseolaris dan propolis lebah Trigona sp. F1 (1:1), F2 (2:1) dan F3 (1:2) disertai uji stabilitas fisik lotion. Hasil penelitian menunjukan sedian F1, F2, F3 memiliki antioksidan kuat pada rentang konsentrasi 60-100 ppm. Ketiga formula tersebut memenuhi kriteria sediaan lotion yang stabil. Formula lotion kombinasi tersebut memiliki potensi dalam pengembangan produk kosmetik dari bahan alam.

Kata kunci: *Antioksidan, Lotion, Sonneratia caseolaris, Trigona sp., Propolis*

ABSTRACT

Daily activities can trigger free radicals due to air pollution and increase the decline in skin health. One of the prevention efforts by using a lotion that made from natural ingredients. Natural ingredients such as Sonneratia caseolaris leaves and Trigona sp. bee propolis are still limited used in the form of lotion combination preparations. The purpose of this study was to explore the antioxidant activity of a combination lotion of S. caseolaris leaves and Trigona sp. bee propolis. Antioxidant activity was detemine by used the DPPH technique with lotion formula combination of S. caseolaris leaves and Trigona sp. bee propolis. F1 (1:1), F2 (2:1) and F3 (1:2) accompanied by a physical stability test of the lotion. The results showed that preparations F1, F2, F3 had strong antioxidants in the concentration range of 60-100 ppm. The three formulas met the criteria for a stable lotion preparation. The combination lotion formula has potential in the development of cosmetic products from natural ingredients.

Keywords*: Antioxidant, Lotion, Sonneratia caseolaris, Trigona sp., Propolis*

1. INTRODUCTION

Air pollution and UV rays can cause free radicals in the human body, these free radicals cause several degenerative diseases such as cancer, aging, rheumatoid arthritis, autoimmune, neurodegenerative. One of the causes of skin damage is free radicals in the form of ultraviolet rays and air pollution.

Antioxidants play a vital role in skin health, particularly in the physiological and chemical contexts of free radical damage.

Free radicals, generated by UV exposure, pollution, and normal metabolic processes, can cause cellular damage that contributes to premature aging and various skin disorders. This damage occurs as free radicals attack critical components of the skin, such as collagen and elastin, leading to loss of firmness and

elasticity[1]. By neutralizing free radicals, antioxidants like vitamins C and E not only protect the skin from oxidative stress but also support cellular repair processes and reduce inflammation[2].

In excessive conditions, UV rays can cause several skin problems, ranging from redness, pigmentation, and in the long term can cause the risk of cancer. Therefore, consuming antioxidant-rich foods and using skincare products containing these compounds are essential strategies for maintaining healthy skin and preventing signs of aging. Skin care is very necessary so that the skin is not exposed to excessive free radicals effect. One way to overcome this problem is to use a lotion as moisturizer to prevent free radical effect. The active substances contained in lotion preparations is a moisturizer[3].

Lotion contains ingredients that can moisturize the skin. Lotion consists of moisturizers, emulsifiers, cleansers, active ingredients, solvents, fragrances and preservatives. The advantages of lotion are that with a fairly large air content, the lotion dosage form is easy to apply, the spread and penetration power are quite high, it does not cause an oily feeling, has a cooling effect, and is also easy to use. to wash with air. There are many lotions circulating in the community that contain various benefits, one of which is that it can moisturize the skin[4].

Lotions containing antioxidants can moisturize the skin. Lotion is a preparation that is applied in liquid form which can be in the form of a dispersion or suspension, where the main ingredient is included in the type of oil-in-water emulsion so that it is easily rinsed with air and is not sticky and easy to apply to the skin so that it is quickly absorbed with even results[5]. People are increasingly interested in exploring moisturizing lotions from natural ingredients, because natural ingredients are easy to obtain and have fewer side effects, so utilizing plants to make lotions has become an innovation that is popular with the public. Natural ingredients that have the potential to moisturize the skin are the leaves of the *Sonneratia caseolaris* plant. This plant is usually used in traditional medicine, especially in the province of South Kalimantan. *Sonneratia caseolaris* has various properties that have been empirically proven to be able to cure various diseases, including wound and flu medicine[6].

Sonneratia caseolaris is very well known in Kalimantan Island because its fruit can be eaten and its leaves are also used to treat smallpox, treat diarrhea and treat bruises on the skin. *Sonneratia caseolaris* extract contains secondary metabolites which are one of the medicinal ingredients and have a molecular structure and various biological activities[7,8]. Other natural ingredients from *Trigona* sp propolis bee products are also effective as antioxidants, antitoxins, antibiotics, and improve the immune system[9]. Compounds in *Trigona* sp propolis can fight free radicals, these compounds are bioactive compounds containing phenolics and flavonoids[10,11].

This stingless bee product has not been optimally utilized, therefore this research focuses on the combination lotion formula of stingless bee propolis and *Sonneratia caseolaris* leaves as a antioxidant agent to prevent free radicals.

2. RESEARCH METHODS

The materials used in this study were *Sonneratia caseolaris* leaves and *Trigona* sp Propolis, DPPH, ascorbic acid, distilled water, stearic acid, cetyl alcohol, paraffin liquid, glycerin, triethanolamine (TEA), propyl paraben, methyl paraben, methyl paraben, carbopol 940.

Sample Preparation

Sonneratia caseolaris leaves were obtained from Sangkulirang River, East Kalimantan. Identification of the species was conducted at the Faculty of Forestry, Mulawarman University and stated that the species was *Sonneratia caseolaris* . *Trigona* sp. bee propolis was obtained from Lempake, Samarinda.

Extraction was carried out using 96% ethanol solvent. The extraction process was carried out by maceration for 3x24 hours at room temperature and re-macerated for 3 times. Then filtered until the filtrate was obtained, then evaporated using a water bath on 50^{o}C until a thick extract was obtained. Meanwhile, the manufacture of *Trigona* sp propolis extract was carried out using the same method using 96% ethanol solvent for 24 hours[12].

After obtaining both extracts from the ingredients. The next step is the preparation and manufacture of a combination lotion preparation of *Sonneratia caseolaris* leaves extract and

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Trigona sp propolis, with three formulas in Table 1. In the three formulas there are differences in the composition of *Sonneratia caseolaris* leaves extract and *Trigona* sp Propolis.

Table 1. Lotion Formula Combination of *Sonneratia caseolaris* leaves extract and *Trigona* sp Bee Propolis

Materials	Max.	F1	F2	F3	Function
S.caseolaris leaves extract : *Trigona* sp propolis extract	-	1:1	2:1	1:2	Active ingredients
Stearic acid	1-20%	2	2	2	Emulsifying agent
Cytil alcohol	2-5%	3	3	3	Emulsifying agent
Paraffin Liquid	1-12,5%	7	7	7	Emollient
Glycerin	1-30%	5	5	5	Humectant
Trietanolamin (TEA)	2-4%	3	3	3	Alkaline agent
Propyl paraben	0,01-0,6%	0,6	0,6	0,6	Preservative
Methyl paraben	0,2-0,3%	0,3	0,3	0,3	Preservative
Carbopol 940	0,5-1%	0,25	0,25	0,25	Emulsifying agent
Aquades	-	Ad 100	Ad 100	Ad 100	Solvent

Heat hot water in a beaker, after boiling, develop the carbopol in a mortar for 15 minutes, after 15 minutes stir. Heat the water phase, namely methyl paraben, propoil paraben, glycerin, TEA above a water bath at a temperature of 70-80 ℃. Mix the dissolved water phase with the carbopol that has been developed above the water bath until mass I is formed. Then heat the oil phase, namely cetyl alcohol, liquid paraffin, stearic acid at a temperature of 70-80 ℃ in a water bath and stir until dissolved (Mass II). Mass I and II are mixed, stirred using a stamper until they form a lotion base. After that, variations in the comparison concentration are added little by little, stirred until homogeneous. The preparation that has been made is put into the prepared lotion container[13].

Stability evaluation

Organoleptic Test

Organoleptic testing was conducted through visual observation of the shape, color and aroma of the lotion preparation which was carried out visually from the three lotion preparation formulations that had been made[14].

pH Test

The pH measurement test was carried out using a pH meter. The pH test was carried out by weighing 0.1 grams of *Sonneratia caseolaris* ethanol extract lotion and *Trigona* sp propolis then diluting it with 10 ml of distilled water.

From the SNI 16-4399-1996 standard, the pH of the formulation is related to skin comfort when used, but the pH of the topical formulation should not be too acidic because it can cause skin irritation. The pH range that can be tolerated by the skin is 4.5-8[15].

Homogeneity Test

The homogeneity was observed by the particles of the lotion whether there were still coarse grains in the lotion preparation. This test was carried out by applying the lotion to a petri dish to evaluate the homogeneity of the lotion that had been made, with the aim of determining whether the preparation was homogeneous or not[14].

Spreading Power Test

This spreading power test was used 0.5 grams of sample. This preparation was placed in a petri dish that had been coated with scaled graph paper. Then given a glass weight load until the weight reaches 125 grams, and left for 1 minute, then measured the diameter of the lotion. The range of good lotion preparation diameter is 5-7 cm[15].

Antioxidant Activity Test

In the antioxidant activity testing stage in this study, using a combination lotion of *Sonneratia caseolaris* ethanol extract and

Trigona sp Propolis with three formulas with a comparison of concentration variations, each formula was weighed at 10 mg, then dissolved with methanol pa in 10 ml of a measuring flask, then producing a parent concentration of 1000 ppm.

Next, a dilution was carried out to make a series of test solution concentrations with a concentration range of 60, 70, 800, 90, 100 ppm. Each series of concentrations was added with 3 ml of 50 ppm DPPH solution. The solution mixture was homogenized and incubated for 30 minutes in a dark room. Absorbance was measured using a UV-Vis spectrophotometer at the maximum wavelength (517 nm) obtained from DPPH absorbance. Sample absorbance was calculated using the sample absorbance value from the DPPH absorbance value [16].

3. RESULTS AND DISCUSSION

Evaluation of the results was obtained in Table 2 with the organoleptic characteristics of formula 1, 2, 3, namely with a thick texture, distinctive aroma, light green color. This organoleptic test must show no change or separation of the emulsion phase and no color changes and the emergence of a rancid odor[17].

Table 2. Evaluation of Lotion Formula from *S. caseolaris* Leaves and *Trigona* sp. Bee Propolis Extract

Parameter	Formula		
	F1	F2	F3
Texture	Thick	Thick	Thick
Aroma	distinctive aroma	distinctive aroma	distinctive aroma
Color	Ivory white	Ivory white	Ivory white
pH	7,2	7,1	7,1
Homogeneity	Homogeneous	Homogeneous	Homogeneous
Spreadability	5,85 cm	6,3 cm	5,75 cm

The distinctive aroma found in the lotion can attract consumers in choosing the formula. The characteristics of a product, such as its scent, can significantly influence user experience and preferences, particularly in skincare products like lotions. Aroma plays a crucial role in evoking emotions and memories, which can enhance overall satisfaction with a product. Studies have shown that pleasant scents can improve mood and create a positive association with the product, leading to increased likelihood of repurchase[18].

The ivory white color of this lotion preparation is obtained from the color of the ethanol extract of *Sonneratia caseolaris* leaves that contains chlorophyll so that the resulting color is green, the color of the *Trigona* sp Propolis extract is brown, but this color does not appear too much in each preparation so that the more dominant color that appears in the preparation is ivory white, the comparison of concentrations does not show significant differences in preparations such as texture, aroma, and color[19].

The pH test shows the average of the pH of Formula 1, 2, 3. This pH test uses a pH meter that has been calibrated using pH 7. Which needs to be known that the skin pH requirement is 4.5-8 because if the lotion preparation is too acidic, the preparation will irritate human skin. Formula 1 gets an average value after 3 repetitions of 7.2, formula 2 gets an average result after 3 repetitions of 7.1, formula 3 gets a result of 7.1.

The rise and drop of pH can be caused by environmental factors, unstable temperatures and unstable extracts in the preparation. The results of pH testing of all formulas have met the pH requirements on the skin[20,21].

The homogeneity test aims to see if there are any coarse grains in the lotion preparation. The test results for formulas 1, 2, 3 showed a homogeneous preparation where the preparation was spread on a clear petri dish so that the form of the preparation did not have coarse grains. This is in line with research. Which states that a good lotion preparation does not have coarse grains[22].

This spreadability test aims to determine how widely the lotion preparation is spread. The test results show that the lotion preparation combination of *Sonneratia caseolaris* ethanol extract and *Trigona* sp Propolis from formula 1

has a diameter of 5.8 cm, formula 2 has a diameter of 6.3, formula 3 has a diameter of 5.75.

Of the three formulations, formula 2 is the best in terms of the spreadability value obtained compared to formulas 1 and 3. Of the three formulas that have been made, the spreadability of this lotion has met the requirements of the previous journal which states that the spreadability of topical preparations is 5-7 cm[23].

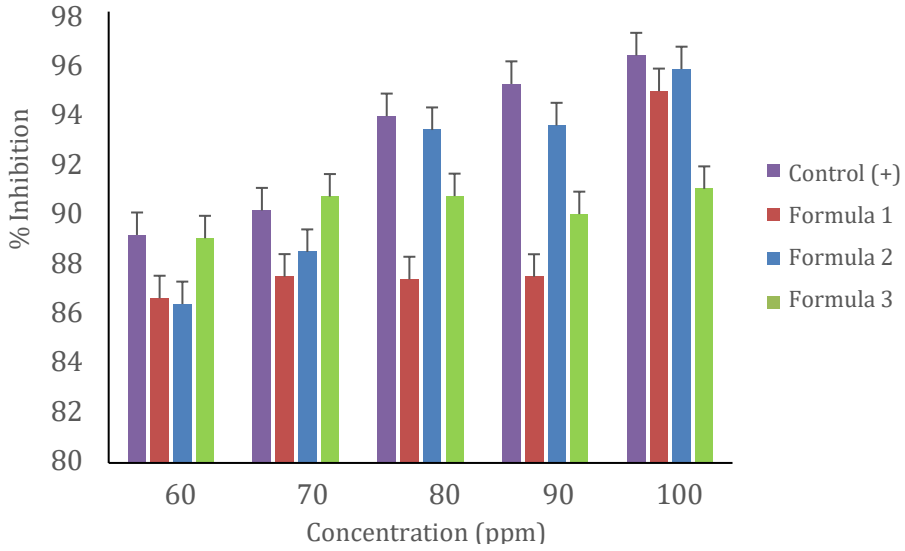

Figure 1. Free radical inhibition of lotion combination from *Sonneratia caseolaris* leaves dan *Trigona* sp Bee Propolis Extract (F1 1:1, F2 2:1, F3 1:2)

DPPH is a chemical compound that is widely used in testing antioxidant activity. When DPPH meets free radicals, it will undergo a soaking reaction with a color change from dark purple to pale yellow or colorless. In this process, it is an indication that free radicals have been captured and neutralized by the antioxidant test compound being tested [24]. The more DPPH compounds that have been stabilized by secondary metabolite compounds in the sample, the more the color intensity will change. The lower the concentration, the more the color will fade, thus reducing the antioxidant value and indicating an increase in the antioxidant value[25].

Ascorbic acid is a natural antioxidant that is widely used for its activity in preventing free radicals and avoiding oxidative damage. When ascorbic acid reacts with DPPH radicals, the reaction can be predicted well so that it can facilitate the interpretation of test results.

Ascorbic acid has strong and stable antioxidants so that it can be used in testing as a comparative sample [26]. The antioxidant activity of the combination lotion preparation of Sonneratia caseolaris and Trigona sp Propolis was tested using the DPPH method with UV-Vis Spectrophotometry at a maximum wavelength of 517 nm.

Based on the results of antioxidant testing on each preparation with Formula 1 ratio (1: 1), Formula 2 ratio (1: 2) and Formula 3 ratio (2: 1) obtained a free radical inhibition value with very strong antioxidant activity. The results of antioxidant testing at a concentration of 60 ppm showed that formula 3 was better than formula 2 and 3, while at a concentration of 100 ppm it was seen that all three formulas had almost the same inhibition ability as the positive control (ascorbic acid). The higher the concentration of the sample and positive control, the lower the absorption value and the higher the inhibition value obtained.

This shows that the higher the concentration of the sample, the free radicals will be inhibited. This result is in line with the results of the antioxidant test obtained from the ethanol extract of *Sonneratia caseolaris*, as well as the *Trigona* propolis extract [27,28]. The combination of these two natural ingredients shows increased antioxidant activity and shows similar activity after being made into a lotion[29]. This combination formula can be a reference in developing cosmetic products sourced from a combination of natural ingredients that are

superior in regions in Indonesia.

4. CONCLUSION

The lotion formula of *Sonneratia caseolaris* leaves and *Trigona* sp Propolis ethanol extract meets the satbility and physical evaluation requirements. The antioxidant potential of the three lotion formulas has the best results to be developed into cosmetic products.

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