ISSN 2548-6462 (online), ISSN 2088-8740 (print)

DOI: 10.30644/rik.v14i1.956

Formulation of soothing gel ethanol extract of Red Shoot Leaves (Syzigium myrtifolium Walp) as an antioxidant

Uce Lestari[1,*], Muhaimin Muhaimin[2], Maimum Maimum[1] ,Yuliana Yuliana[3]
[1]Department of Pharmacy, Faculty of Medicine and Health Sciences, Universitas Jambi
[2]Department of Pharmaceutical Biology, Faculty of Pharmaceutical Biology, Faculty of Pharmacy, Universitas Padjadjaran
[3]Department of Nursing, Faculty of Medicine and Health Sciences, Universitas Jambi
*Corresponding author's email: ucelestari@unja.ac.id

Accepted: 05 January 2025; revision: 27 January 2025; published: 31 January 2025

Abstract

Background: Natural antioxidant cosmetic products in the form of shooting gel from EEDPM (Syzigium myrtifolium Walp) with polyphenol and flavonoid content are able to fight free radicals and reduce oxidative damage to skin cells. Soothing gel works quickly absorbed, giving a fresh and comfortable effect on the skin without a sticky feeling.
Method: The purpose of the study was to determine the comparison of the physical properties and stability of Ethanol Extract of Green Red Shoot Leaves (EEDPMH) and Ethanol Extract of Red Shoot Green Leaves (EEDPMM) soothing gels and formulas that have very strong antioxidant activity potential. Comparison of evaluation physical properties and stability include organoleptic, homogeneity, pH, sedimentation rate, viscosity, adhesion and spreadability with concentrations of 1%, 2% and 3%. Antioxidant activity test with the DPPH method using a UV-Visible spectrophotometer.
Results: The results of the analysis showed that the EEDPMMH and EEDPMM soothing gels have a light yellowish brown color with a rose odor, a semi-solid form with a thick and homogeneous consistency, pH 7.916 to 7.956; viscosity 20.173 cps to 20.370 cps; spreadability 3.966 to 4.766 cm with adhesion time > 1 second for the entire formula. The higher the concentration of EEDPMH and EEDPMM, the stronger the antioxidant activity.
Conclusion: It can be concluded that F3 Soothing Gel EDPMH and EDPMM are the best in terms of physical properties and stability and have a stronger IC50 than other formulas.

Keywords: antioxidants; red shoot leaves; soothing gel.

INTRODUCTION

Free radicals have a significant impact on facial skin health because they can cause oxidative damage to skin cells, resulting in changes in the structure of skin cells and collagen tissue. This can lose skin brightness and moisture. In addition, free radicals trigger inflammation of the skin which has the potential to cause redness and burning sensation on the skin. Therefore, protecting the skin from exposure to free radicals by using natural cosmetic products as skin care containing antioxidants is very important to maintain the health and beauty of facial skin (1).

Natural antioxidants are found in abundance in natural plants that grow around us and play a major role in protecting the body from damage caused by free radicals. Free radicals are unstable molecules that can damage cells and contribute to facial skin damage, loss of skin brightness, burning sensation and redness (2). Some sources of natural antioxidants that are rich in polyphenols and flavonoids are red shoot leaves (Syzigium myrtifolium Walp) which are one of the plants that have the potential as a source of natural antioxidants that are widely used and planted along the road to overcome air pollution that causes free radicals that are not only harmful to body health but also harmful to facial skin health (3,4,5).

Based on the results of preliminary tests on the antioxidant activity of the ethanol

extract of green red shoot leaves (EEDPMH) has an IC50 of 6.164 ppm while the ethanol extract of red red shoot leaves (EEDPMM) has an IC50 of 8.572 ppm which is categorized as having very strong antioxidant activity and approaching and exceeding the IC50 of vitamin C of 7.412 ppm so that it can be further developed into a pharmaceutical preparation of soothing gel as an antioxidant or free radical scavenger.

Soothing gel is one of the skin care products that is increasingly popular today, this is because it has a light texture and is quickly absorbed and provides a refreshing sensation on the skin without leaving a sticky feeling (7). This product often contains menthol which provides a cooling and calming effect, as well as other ingredients that help maintain skin moisture and repair damaged skin conditions, one of which is ethanol extract of red shoot leaves. This makes shooting gel the main choice as an effective skin care in hot weather conditions or for everyday use (6,8).

Based on the background above, it is necessary to conduct research on the formulation of soothing gel preparations from EEDPMH and EEDPMM as natural antioxidants. The formulation of the problem in this study is how the antioxidant activity of soothing gel EEDPMH is compared to soothing gel EEDPMM and the best physical properties and stability tests from the variations of 3 formulas each. Based on the problems that have been mentioned, the purpose of this series of studies is to determine the characteristics of the stability of physical properties and the potential of the soothing gel delivery system of EEDPMH and EEDPMM which are tested in-vitro as antioxidants compared to the antioxidant activity of pure extract of red shoot leaves.

The problem-solving approach above is where the best cosmetic delivery system currently is in the form of a soothing gel preparation as a natural antioxidant sourced from natural ingredients, namely red shoot leaves (9,11). This soothing gel formulation will deliver bioactive compounds (polyphenols and flavonoids) which function as natural antioxidants quickly into skin cell tissue because of its ability to work quickly and quickly absorb into skin cell tissue (10,12).

The state of the art and novelty of this research is that no soothing gel preparation has been found from natural ingredients, namely EEDPMH and EEDPMM, which are used as antioxidants and the delivery system is faster because it is quickly absorbed into the skin tissue.

METHOD

Tools

The tools used are analytical scales (KERN: ABS 220-4), UV-Vis spectrophotometer (Hitachi U-2900), pH meter (Mark-901), Brookfield Viscometer (B-One Plus), adhesive force tool, spreading force tool, measuring cup (pyrex), beaker glass (pyrex) spatula, magnetic stirrer, hotplate, stirring rod, evaporator cup, watch glass, object glass, mortar and stamfer.

Materials

The materials used are EEDPMH and EEDPMM which have been extracted in the pharmaceutical biology laboratory of Padjadjaran University, Bandung. Red top leaves obtained from Rano Village, Muara Sabak Barat District, East Tanjung Jabung Regency, Jambi Province. The chemicals used are Carbomer 940, triethanolamine, DMDM, Na Metabisulfite, oleum rosae, aquadest all obtained from CV Kisbiokim Medilab

Detailed Procedure

The initial step in this study was to formulate EEDPMH and EEDPMM into soothing gel preparations which were divided into 3 variations of formulas, namely with concentrations of 1%, 2% and 3%. The formulas for the soothing gel preparations of EEDPMH and EEDPMM can be seen in the table below:

Table 1. Soothing gel formula EEDPMH and EEDPMM

Materials	F1 PH	F2 PH	F3 PH	F1 PM	F2 PM	F3 PM
EDPMH	1	2	3	-	-	-
EDPMM	-	-	-	1	2	3
Carbomer 940	0,5	0,5	0,5	0,5	0,5	0,5
Trietanolamin	1	1	1	1	1	1
DMDM	0,5	0,5	0,5	0,5	0,5	0,5
Na Metabisulfit	0,9	0,9	0,9	0,9	0,9	0,9
Oleum Rosae	0,075	0,075	0,075	0,075	0,075	0,075
Aquadest	ad 100	ad 100	ad 100	ad 100	ad 100	ad 100

The method of making soothing gel is to develop carbomer 940 using 20 times distilled water which is developed in a beaker glass using a magnetic stirrer. After that add triethanolamine and aquadest to taste. Add a few drops of DMDM, oleum rosae, Phenoxy ethanol and Na metabisulfite that have been dissolved. Add little by little EEDPMH and EEDPMM, then add the remaining distilled water (13).

The details of the evaluation of the physical properties of soothing gel EEDPMH and EEDPMM consist of:

Organoleptic and homogeneity tests. Includes checking the color, odor, shape and consistency of each soothing gel formula. Homogeneity test, soothing gel is applied to a glass object and covered with a cover glass. A preparation with good homogeneity must show no air bubbles, lumps and separate particles and no foreign objects (14,15,16).

pH test. The prepared preparation is dipped with the electrode of the pH meter in each formula, wait until the screen shows a stable number. Record the results (14,15,16).

Viscosity test. Determination of viscosity is carried out using a Brookfield Viscometer. The preparation is put into a 250 ml beaker, then the spindle is lowered into the preparation to the specified limit and then record the results (14,15,16).

Spreadability test. Take 0.5 grams of the preparation and place it in the middle of the petri dish. Add a load of 50, 100, 200 and 250 grams on the petri dish for 1 minute for each additional load. Measure the diameter of the spreading preparation. The addition of the load is stopped when the preparation no longer spreads (14,15).

Adhesion test. Take 0.5 grams of the preparation and place it on the object glass in the adhesion tester, then add the load for 15 minutes, after that the load is lifted and press the tool, when the tool is pressed the stopwatch is also turned on until the object glass is released and turn off the stopwatch, record the time used by the preparation to release from the object glass, based on the parameter that good adhesion data is more than one second (14,15).

Stability test at room temperature. All formulas were evaluated for physical properties during storage for 3 months at room temperature, then tested for pH using a pH meter. With the aim of determining the effect of temperature on pH. For further testing of storage stability, the preparation was taken and then physical changes were observed for 3 months starting from organoleptic observations, homogeneity, pH, spreadability, adhesiveness and viscosity (17,18).

Preparation of DPPH solution

The antioxidant test refers to the method developed by Taslim and Pratama (2020), first a DPPH solution (1,1-diphenyl-2-picrylhydrazyl) was made. DPPH was weighed as much as 10 mg which was then dissolved with 100 ml of ethanol pa to obtain a solution with a concentration of 1000 ppm. Pipette 3.5 ml and dilute with ethanol pa to 100 ml to obtain a concentration of 35 ppm (19).

Determination of antioxidant activity of soothing gel

The preparation of the sample stock solution began with the method where the soothing gel EEDPMH and EEDPMM were made by weighing 0.1 gr of each soothing gel EEDPMH and EEDPMM and dissolved in

ethanol until the 100 ml limit mark was obtained 1000 ppm which was then diluted again to 100 ppm. Continued by making sample test solutions with several concentrations where the test solutions from samples with several concentrations, from the 100 ppm sample stock solution were diluted by pipetting as much as (0.5; 1; 1.5; 2) ml. Ethanol was added up to 20 ml to obtain a concentration of (2.5; 5; 7.5; 10) ppm. The test solution of each concentration was taken as much as 1 ml, put into a test tube wrapped in aluminum foil and each test tube was added with DPPH 35 ppm as much as 2 ml. Left for 30 minutes and the absorbance that occurred at the maximum wavelength was measured. For comparison, namely vitamin C, the same thing was done with the sample treatment (19).

RESULTS

Physical properties test of Soothing Gel EEDPMH and EEDPMM

The following are the results of the physical properties test of soothing gel EEDPMH and EEDPMM starting from the organoleptic physical properties test, pH, viscosity, adhesion, spreadability and stability.

Stability test of physical properties of Soothing Gel EEDPMH and EEDPMM before 3 months storage at room temperature

Table 2. Recapitulation of physical properties of Soothing Gel EEDPMH and EEDPMM before 3 months of storage at room temperature

Characteristics of physical properties test o	Soothing Gel EDPMH			Soothing gel EDPMM*		
	F1	F2	F3	F1	F2	F3
Organoleptic	Organoleptic Light yellowish brown* Rose * Semi solid * Thick *	Light brown Rose Semi solid Thick	Dark brown Rose Semi solid Thick	Light brown * Rose * Semi solid * Thick *	Dark brown Rose Semi solid Thick	Very dark brown Rose Semi solid Thick
Homogeneity	Homogeneous*	Homogeneous*	Homogeneous*	Homogeneous*	Homogeneous*	Homogeneous*
pH	8,196±0,020	8,113±0,030	8,076±0,015	8,066±0,015	7,956±0,005*	7,916±0,005*
Viscosity	202598,12±216,40*	202622,87±104,79*	201733,18±63,58*	203042,38±141,42*	203700,57±20,97*	203455,04±255,77*
Adhesion	3,953 ±0,141*	2,46±0,433*	4,273±1,111*	5,436±3,389*	2,226±0,235*	2,98±0,07*
Spreadability	4,50±0*	3,966±0,057*	4,4±0,4*	4,766±0,251*	4,266±0,251*	4,466±0,152*

From the recapitulation of the physical properties test of EEDPMH and EEDPMM Gels before 3 months of storage at room temperature, the best formulas and meet the requirements according to the parameters of the entire formula are F2 and F3, but seen from the appearance of good physical properties and have attractive colors and thick consistency is F1.

Standard parameters based on the literature pH that meets the requirements for the skin is around pH 5-7, for viscosity around 40,000 to 60,000 cps. The adhesive power is around more than one second while the spread power is in the range of 5-7 cm (15).

Figure 1. Soothing gel EEDPMH and EEDPMM

a b

Note :
a = Soothing gel EEDPMH
b = Soothing gel EEDPMM

ISSN 2548-6462 (online), ISSN 2088-8740 (print)

Stability test of physical properties of Soothing Gel EEDPMH and EEDPMM after 3 months of storage at room temperature

Table 3. Recapitulation of physical properties of Soothing Gel EEDPMH and EEDPMM after 3 months of storage at room temperature

Characteristics of physical properties test o	Soothing Gel EDPMH			Soothing gel EDPMM*		
	F1	F2	F3	F1	F2	F3
Organoleptic	Organoleptic Light yellowish brown* Rose * Semi solid * Thick *	Light brown Rose Semi solid Thick	Dark brown Rose Semi solid Thick	Light brown * Rose * Semi solid * Thick *	Dark brown Rose Semi solid Thick	Very dark brown Rose Semi solid Thick
Homogeneity	Homogeneous*	Homogeneous*	Homogeneous*	Homogeneous*	Homogeneous*	Homogeneous*
pH	8,00±0	8,00±0	8,00±0	7,00±0*	7,00±0*	7,00±0*
Adhesion	1,323±0,125	1,923±0,063	1,59±0,121	2±0,647	1,84±0,036*	1,16±0,085*
Spreadability	6,633±0,321	5,40±0,1	6,00±0,2	7,50±0	8,00±0*	8,00±0*

From the recapitulation of the physical properties test of EEDPMH and EEDPMM Gels after 3 months of storage at room temperature, the best formulas and those that meet the requirements according to the parameters of the entire formula are F2 and F3, but seen from the appearance of good physical properties and having attractive colors and thick consistency are F1. F2 and F3 still meet the requirements during 3 months of storage without any changes at all.

Antioxidant activity test of Soothing gel Ethanol Extract of Red Pucuk Leaves (Syzigium myrtifolium Walp) which is green and red in color

Table 4. IC50 value of antioxidant soothing gel EEDPMH

Sample	IC_{50} R1	IC_{50} R2	Average
F1 (1%)	12248.390	12341.268	122948.293
F2 (2%)	6471.189	6622.405	65467.977
F3 (3%)	4730.299	4679.601	47049.505
Vitamin C	7.503	7.321	7.412

Table 5. IC50 value of antioxidant soothing gel EEDPMM

Sample	IC_{50} R1	IC_{50} R2	Average
F1 (1%)	3750.7597	3699.8769	37253.183
F2 (2%)	2541.8586	2497.7725	25198.156
F3 (3%)	1931.4335	1894.6822	19130.579
Vitamin C	7.503	7.321	7.412

Table 6. Antioxidant strength level of DPPH method

Antioxidant activity	IC_{50} value (ppm)
Very strong	<50
Strong	50-100
Medium	101-150
Weak	151-200

From the results above, the higher the concentration of ethanol extract of red and green red shoots, the higher the antioxidant activity so that F3 soothing gel EEDPMH and EEDPMM have the best physical properties and antioxidant activity compared to other formulas.

DISCUSSION

Stability Test of Physical Properties of Soothing Gel EEDPMH and EEDPMM before 3 months of storage at room temperature

The purpose of organoleptic testing on soothing gel preparations is to evaluate the characteristics of physical and sensory properties of soothing gel such as color, aroma, texture and appearance in order to ensure compliance with the desired specifications and consumer preferences (14). This test is important to assess the overall quality of the product, ensure stability during storage, and increase the appeal and comfort of use. In addition, organoleptic testing can also be used as an initial step in detecting changes that may occur due to the formulation, storage or distribution process (15).

Organoleptic test of soothing gel ethanol extract of red top leaves that are green and red have a visually attractive appearance is FI because the color of the soothing gel that looks not too dark. This attracts a lot of interest from consumers compared to the dark colored ones (14,15).

pH testing on soothing gel preparations is carried out to ensure that the preparation has an acidity or alkalinity level that meets the established standards so that it is safe and comfortable to use on the skin. pH testing is very important to maintain the stability of the formulation, the efficacy of the active ingredients, and the compatibility of the soothing gel preparation with the user's skin or tissue. pH testing also ensures that the preparation does not have harmful side effects and ensures that the product meets quality and regulatory requirements (15).

Normal pH parameters for Soothing gel preparations are in the pH range of 5-719. In this study, the pH of the soothing gel approaching pH 7 is the EEDPMM soothing gel with formulas F2 and F3 with concentrations of 2% and 3% in the pH range of 7.916 to 7.956.

The purpose of viscosity testing on soothing gel preparations is to ensure that the consistency and flow properties of the soothing gel preparation are in accordance with the desired specifications. Proper viscosity is essential to ensure that the preparation is not easy to use, does not spread on the skin and remains physically stable during storage. In addition, this test aims to monitor the stability of the formulation against environmental changes, such as temperature changes (19).

The viscosity parameters for soothing gel preparations are in the range of 5000 to 50,000 cps = mpa.s (SNI 16-4399-1996) because using a carbomer 940 base, the viscosity is in the range of 40,000 to 60,000 cps15. So if seen from the viscosity results that all formulas, both soothing gel EDPMH and EDPMM, are included in the parameter range, namely between 20,173 cps to 20,370 cps.

Adhesion testing on soothing gel preparations is carried out to determine how strongly the gel adheres to the skin. This is important to ensure that the product has an ideal pleasant effect, especially if the active ingredient requires a long contact time. Adhesion testing also helps determine the quality of the formula, so that the gel does not dry out easily. The results of this test can also be used to assess the stability of the preparation under various conditions of use (17).

The overall adhesion of the formula has an adhesion time of more than one second so that it can be concluded that the entire formula meets the requirements for the adhesion test, where the best adhesion test is one that has a long time so that the preparation is able to contact the skin for a long period of time (17).

The purpose of the spreadability test on the soothing gel preparation is to determine how well the gel spreads evenly on the skin surface without using excessive pressure. This test is important to ensure that the preparation has a consistency that allows the active ingredients to be used properly and provide the desired effect. In addition, the ideal spreadability reflects a formulation that meets the needs of users in terms of texture and sensation when used. The results of this test also help assess the quality and stability of the product and help improve the formulation if necessary (18,19).

The entire formula meets the requirements of the spreadability test because it falls within the spreadability range of 3-5 cm, where the entire formula of the green and red pucuk merah leaf ethanol extract gel mask is around 3.966 to 4.766 cm. This can be seen that the green and red pucuk merah leaf ethanol extract gel mask preparation has a very high or thick viscosity so that its spreadability is getting smaller (18).

It can be concluded that from the results of the best physical properties test from the existing evaluation starting from organoleptic, pH, adhesive power, spreadability and viscosity is F3 green and

red pucuk merah leaf ethanol extract gel mask, this can be seen that the pH produced in F3 is a neutral pH, which is around 7.916 and 7.956 so that it can be categorized as safe even though from the physical appearance it has a very different color from the other two formulas.

Stability test of Physical Properties of Soothing Gel EEDPMH and EEDPMM after 3 months of storage at room temperature

Stability test during 3 months of storage at room temperature showed that the soothing gel of ethanol extract of red top leaves which are green and red in color is still stable in color, odor, shape, consistency and homogeneity for 3 months, there is no change whatsoever in the overall soothing gel preparation.

The normal pH of the soothing gel preparation is still in the range of pH 5-7, in this case the overall pH of the soothing gel formula experienced an insignificant decrease in pH, but there is one formula, namely FI Soothing gel EDPMM which dropped drastically from pH 8 to pH 7. The overall soothing gel formula that has a neutral pH or 7 during 3 months of storage at room temperature is Soothing gel EDPMM (ethanol extract of red top leaves).

The viscosity parameters for soothing gel preparations are in the range of 5000 to 50,000 cps = mpa.s (SNI 16-4399-1996) because using a carbomer 940 base, the viscosity is in the range of 40,000 to 60,000 cps. So if you look at the viscosity of the soothing gel of ethanol extract of red shoots which are green and red in color as a whole, it decreases or becomes thin, this is due to changes in temperature during storage at unstable room temperature, so that with a slight increase in temperature to a higher level, it causes decomposition of the bond structures in the preparation so that the bonds become weak and as a result become thin. This is also comparable to the value of the increasing spreadability during 3 months of storage at room temperature (17,18).

The overall soothing gel formula of EEDPMH and EEDPMM during 3 months of storage at room temperature still meets the requirements where the time required for adhesion exceeds 1 second (18).

Spreadability during 3 months of storage at room temperature that the spreadability is getting wider or wider, this is because the viscosity of the soothing gel preparation of ethanol extract of red shoots leaves which are green and red is getting thinner so that the spreadability widens and exceeds the specified requirements, which is 3 cm to 5 cm (15,16).

It can be concluded that from the results of the physical properties stability test that remain stable during 3 months of storage at room temperature, the best of the existing evaluations starting from organoleptic, pH, adhesive power, spreadability and viscosity is F3 soothing gel ethanol extract of red shoots leaves in green and red colors, it can be seen that the pH produced in F3 is a neutral pH which is around 7, so it can be categorized as safe and stable even though from the physical appearance it has a very different color from the other two formulas (23).

Antioxidant activity test of Soothing gel Ethanol Extract of Red Shoot Leaves (Syzigium myrtifolium Walp)

Based on the table of antioxidant activity test results, Soothing gel ethanol extract of red shoots leaves with a concentration of 1-3% still has very weak activity, from the data below that the higher the concentration of ethanol extract of red shoots leaves in green and red, the smaller the ppm concentration or IC50 and approaches the very strong category value (with IC50 <50 ppm) (20,21,22). In this case, the concentration of ethanol extract of red shoot leaves which are green and red in color with the highest concentration used is 3% which provides a visual organoleptic that is rather dark in color, if the concentration is increased to 7.5% or up to 10% so that antioxidant activity increases with a very strong category, then the physical appearance becomes

unattractive to consumers because the color becomes dark to black and will also affect the pH value which does not meet the standard skin pH parameters, namely 4.5 to 6.5.

The solution that we need to apply to this problem is to use a very small concentration with an activity that is many times greater than the use of pure extracts by changing the form of the chemical compound delivery system in the form of nanoparticles by formulating it into a nanohydrogel preparation. The highest concentration of 3% still has very weak antioxidant activity, but if the concentration is increased, the antioxidant activity will increase and the concentration will also increase, therefore so that the concentration used is not too much which has an impact on the physical appearance of the soothing gel preparation, the delivery system in the form of nanoparticles is very helpful in the future so that the concentration used is small with very strong antioxidant activity.

CONCLUSIONS

From the results above, it can be concluded that F3 Soothing Gel EDPMH and Soothing gel EDPMM are the best in terms of physical properties and stability and have a stronger IC50 than other formulas.

ACKNOWLEDGEMENTS

The authors are grateful to Jambi University for supporting this project under basic research schemesof Faculty of Medicine and Health Sciences.

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