

# Formulation Of Eye Shadow Cream With Ethanol Extract Of Red Spinach (*Amaranthus tricolor* L.) Leaves As A Dye

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**Formulation Of Eye Shadow Cream With Ethanol Extract Of Red Spinach (*Amaranthus tricolor* L.) Leaves As A Dye**

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ABSTRACT

**Keywords :**

Formulation, Eye shadow cream, Red spinach leaf ethanol extract, Dye.

Anthocyanin is one of the chemical compounds contained in red spinach leaf (*Amaranthus tricolor* L.) and plays an important role in providing color. The red spinach leaf ethanol extract is very well used as a natural dye in eye shadow cream preparations. The purpose of this study was to formulate eye shadow cream preparations using ethanol extract of red spinach leaves as a dye, find out whether the preparation of eye shadow cream with ethanol extract of red spinach leaves meets the quality requirements and evaluate the irritation test on the skin. The eye shadow cream was formulated using talc, titanium dioxide, beeswax, Na<sub>2</sub>EDTA, glycerin, methyl paraben, propyl paraben, parfum, and paraffin liq with varying concentrations of ethanol extract of red spinach leaf ethanol extract 0%, 6%, 10%, and 14%. Physical quality examination includes organoleptic test, homogeneity test, smear test, cream type test, spreadability test, pH test, viscosity test, stability test and irritation test and preference test for eye shadow cream preparations. The results of research conducted <sup>1</sup> a concentration of 0% gave a white color, a concentration of 6% gave a pink color, a concentration of 10% gave a light pink color, and a concentration of <sup>3</sup> 14% gave a deep pink color. The conclusion of this study is ethanol extract of red spinach leaves can be used as a colorant in eye shadow cream preparations, meets the quality requirements of the preparation and does not cause irritation when used.

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**1. INTRODUCTION**

In an increasingly advanced era, the needs of each individual in various aspects of life are also growing. Cosmetics itself has become a necessity for various groups. Cosmetics are a mixture of ingredients that are applied to the outer part with the aim of increasing attractiveness and improving a better appearance than before. The main function of using cosmetics is to beautify the user to look more attractive [1].

Cosmetics comes from the Greek word “kosmetikos” which means decorating and arranging skills. According to the Regulation of the Head Of the Food and Drug Supervisory Agency of the Republic of Indonesia Number 19 of 2015 concerning Cosmetic Technical Requirements, it is stated that the definition of cosmetics is a material or preparation intended for use on the external parts of the human body (epidermis, hair, nails, lips and external genital organs), or the teeth and mucous membranes of the mouth, especially for cleaning, perfuming, changing appearance, and/or correcting body odor or protecting and maintaining the body in good condition [2].

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Preparations in the form of creams have advantages including good dispersion on the skin surface, cooling effect on the skin due to evaporation of water, being able to adhere to the surface where it is used for a long time. The form of the cream can give a shiny, oily, moisturizing effect and is easily spread evenly, easy to wipe and easy to wash with water [3].

Red spinach leaves have good coloring properties and high biomass to produce anthocyanins compared to other amaranthus species. The anthocyanin pigment in red spinach leaves is a natural pigment that can produce several colors such as blue, purple, violet, magenta, red and yellow. Anthocyanins can also cause a red color at low pH ranging from 2-4, while at high pH can produce yellow, blue and even colorless. Anthocyanins are stable with a red color at pH 3.5 and at 50°C have a molecular weight of 207.08 grams/mol [4].

Natural dyes are colors obtained from animals such as: pink in flamingos and salmon, while from plants such as caramel, chocolate and suji leaves [5]. Natural dyes are an alternative to dyes that are non-toxic, renewable, easily degraded and environmentally friendly [6]. The use of natural dyes in the formulation of eye shadow cream is one solution to avoid harmful synthetic dyes. Moreover, seeing that cosmetics have become a daily necessity for women, it is necessary to be more careful in choosing any type of cosmetics. Based on this, researchers are interested in conducting research using red spinach leaves as a natural dye in the preparation of eye shadow cream with the title "Formulation of eye shadow cream with ethanol extract of red spinach leaves (*Amaranthus tricolor* L.) as a dye" and with concentrations of 0%, 6%, 10% and 14%.

## 2. METHOD

This research was conducted experimentally. The research phase includes: making simplicia, extract making, phytochemical screening, formulation of eye shadow cream, physical quality examination of the preparation, irritation test of the preparation and hedonic test on the variety of preparations made. The research was conducted at the Pharmacy Laboratory of Sari Mutiara Indonesia University, Jl. Kapten Muslim No. 79 Medan, 20123. The time required for this research is 3 months in March – May 2022.

Plant identification was carried out at the Medanense Herbarium Laboratory (MEDA) Department of Biology, Faculty of Mathematics and Natural Sciences, University of North Sumatra (USU). The population of this research is red spinach leaves (*Amaranthus tricolor* L.) obtained from the district of Medan Deli, North Sumatra. The sample used in this study was red spinach (*Amaranthus tricolor* L.) leaves. The tools used in this research are laboratory glassware, analytical balance, spatula, small mortar and stempor, rotary evaporator, spatula, dropper, porcelain cup, watch glass, and eye shadow cream container.

### Preparation of red spinach leaf extract (*Amaranthus tricolor* L.)

The extraction process used extraction and maceration methods with a ratio of 1:10 [7]. A total of 1.5 kg of fresh simplicia red spinach leaves that have been mashed with a blender, macerated with 11.25 L 96% ethanol solvent which has been mixed with 40 grams of citric acid, covered and left for 1 night protected from light while stirring occasionally, filtered with gauze, the filtrate is collected (first filtrate). Then the pulp was macerated again with 3.75 L of 96% ethanol (mixed with 10gr citric acid), covered and left for 1 day protected from light while stirring occasionally, filtered with gauze, the filtrate is collected (second filtrate). The results obtained were mixed with the first filtrate and the second filtrate and then evaporated with the help of a rotary evaporator at a temperature of 40-50°C until no solvent was left and then evaporated to obtain a thick red spinach extract.

### Making Eyeshadow Cream Formula With Red Spinach Leaf Extract (*Amaranthus tricolor* L.) As Colorant In Various Concentrations

The formula chosen in this study has the following composition [8].

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Table 1. Eye shadow cream formulation

Composition	Preparation (grams)			
	F0	F1	F2	F3
Red spinach leaf extract	0	6	10	14
Talcum	5	5	5	5
Titanium Dioxide	10	10	10	10
Beeswax	10	10	10	10
Na <sub>2</sub> EDTA	0,1	0,1	0,1	0,1
Glycerin	5,5	5,5	5,5	5,5
Methyl Paraben	0,18	0,18	0,18	0,18
Propyl Paraben	0,02	0,02	0,02	0,02
Parfume ( <i>Oleum rosae</i> )	5 q.s	q.s	q.s	q.s
Paraffin liq	ad. 100	ad. 100	ad. 100	ad. 100

### Procedure for making eye shadow cream

First, weigh each ingredient according to the formulation. In the manufacture of eye shadow cream is divided into 2 phases. Phase 1 (glycerin, titanium dioxide, beeswax, liquid paraffin and propyl paraben) was heated to a temperature of 70-75°C. Phase 2 (talcum, Na<sub>2</sub>EDTA and methyl paraben). Then phase 1 and phase 2 are mixed in a hot mortar while grinding until completely homogeneous. After that, red spinach leaf ethanol extract and oleum rosae were added, ground until a homogeneous cream mass was formed. Then put it in the eye cream container. Then an evaluation test is carried out.

### Eye Shadow Cream Physical Quality Check

Examination of the physical quality of eye shadow cream preparations included: organoleptic test, homogeneity test, smear power test, cream type test, spreadability test, pH test, viscosity test, and stability test for eye shadow cream preparations ethanol extract of red spinach leaves.

### Organoleptic Test

Observations were made by naked eye including shape, color, and smell. Observations were made at the beginning of the eye shadow cream preparation.

### Homogeneity Test

Homogeneity examination was carried out using an object glass.

### Oil Power Test

Examination was carried out on each preparation that was made and applied to the skin on the back of the hand with five smears. The requirement for good greasing provides an intensive, even and homogeneous color when applied to the skin

### Cream Type Test

This is done by placing a number of preparations on an object glass, then adding 1 drop of methyl blue, stirring with a stirring rod. If the methyl blue is evenly distributed, it means that the type of cream produced is oil in water (O/W), if blue spots appear, the cream produced is water in oil (W/O) type.

### Spreadability Test

A total of 1 gram of eye shadow cream from the formulation was weighed and placed on a petri that had been coated with graph paper, given a petri dish on top and left for 1 minute, the area of the

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preparation was calculated. Then given a load of 125 grams each, left for 60 seconds and then calculated the area of the resulting preparation.

#### 5 pH test

Testing the pH value is a characteristic that needs to be considered in a topical formulation. The pH test aims to determine whether the pH value of a preparation is acceptable to the skin. The recommended pH value for a topical preparation is in the range of 4.5-6.5.

#### Viscosity Test

Measurement of the viscosity of the preparation using spindle no. 6 and using a Brookfield viscometer. The viscosity value is obtained from the result of multiplying the reading scale with a specific correction factor (f) for each spindle speed. Measurements were made on the first day of manufacture and after storage for 4 weeks.

#### Stability Test

The eye shadow preparation containing red spinach leaf extract was evaluated for its stability which included organoleptic (color, smell, and shape). The stability of the eye shadow cream preparation was carried out for 28 days of storage at room temperature, and observed on days 1, 7, 14, 21, and 28.

#### 1 Irritation Test

Irritation test is carried out on the preparations made with the aim of knowing that the eye shadow preparations made can cause irritation to the skin or not [9]. The method used in this irritation test was an open patch test on the back of the ear to 12 panelists who agreed and agreed to the statement. The open sample test is carried out by applying the preparation to the attachment location, leaving it open and observing the reaction that occurs. This test was carried out 3 times a day for 2 consecutive days, then observed the reaction caused to the skin.

#### 5 Preference Test

This preference test was carried out in order to determine the level of preference of the panelists for the eye shadow preparations made. This preference test was carried out visually on 12 panelists who were willing and gave scores on the assessment sheet. Parameters observed in the preference test were the intensity of the color, smell and texture of the eye shadow cream preparation when applied to the skin on the back of the hand. Then the percentage level of preference for each preparation is calculated.

### 3. RESULTS AND DISCUSSION 1

The results of plant identification were carried out at the Herbarium Medanense (MEDA) Department of Biology, FMIPA, University of North Sumatra. Biotechnology Road No. 1 USU Campus, Medan. The results of the identification of the plants studied were red spinach (*Amaranthus tricolor* L.), the *Amaranthaceae* tribe. The results of sorting from 1.5 kg of red spinach leaves (*Amaranthus tricolor* L.) obtained 68 grams of extract which was purplish red.

#### Phytochemical Screening

Examination of the active substance content in red spinach leaf simplicia was carried out by means of phytochemical screening, aiming to determine the compounds contained in red spinach leaf extract (*Amaranthus tricolor* L.). The results of simplicia phytochemical screening of red spinach leaves can be seen in the table.

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Table 2. Results of simplicia phytochemical screening of red spinach leaves

Secondary Metabolic Compound	Simplified Results
Alkaloids	+
Flavonoids	+
Glycoside	+
Tannins	+
Saponins	+
Steroids/triterpenoids	+
Anthocyanin Test	+

Description : + = contains a group of compounds  
- = does not contain compounds

The results of the phytochemical screening of simplicia leaves of red spinach (*Amaranthus tricolor* L.) contain alkaloids, flavonoids, glycosides, tannins, saponins, steroids/triterpenoids and contain anthocyanins. Compounds that affect the color of red spinach are flavonoids, namely anthocyanins. In the examination of these metabolites, an anthocyanin test was carried out to determine that it was true that anthocyanins were present in red spinach leaves. Anthocyanins are a class of flavonoid compounds, which are broadly divided into plant polyphenols. Anthocyanins play a role in providing dyes in flowers, leaves and plant flowers. Purple pigment compounds contained in red spinach leaves are formed into eye shadow cream.

### Physical Quality Evaluation of Eye Shadow Cream

#### Organoleptic Test Results

The results of organoleptic research were carried out on the preparation of eye shadow cream with ethanol extract of red spinach leaves by looking at the texture, color and smell.



Figure 1. eye shadow cream with ethanol extract of red spinach

Table 3. Organoleptic Test Results for Eye Shadow Cream with Red Spinach Leaf Extract

Formula	Shape	Color	Smell
F0	Semi solid	White	Rose oil
F1	Semi solid	Pink	Rose oil
F2	Semi solid	Light pink	Rose oil
F3	Semi solid	Deep pink	Rose oil

The results of organoleptic observations showed that the eye shadow cream produced had a semi-solid form, the color produced at each concentration was different and the odor produced was the distinctive aroma of rose oil.

#### Results of the Homogeneity of Preparations

In the homogeneity examination of the eye shadow cream, the ethanol extract of red spinach leaves showed homogeneous results.

Table 4. Results of Homogeneity Test for Eye Shadow Cream with Red Spinach Leaf Extract

Formula	Homogeneity				
	Done	7 days	14 days	21 days	28 days
F0	H	H	H	H	H
F1	H	H	H	H	H
F2	H	H	H	H	H
F3	H	H	H	H	H

Description : H = Homogeneous

The results of the homogeneity (color dispersion) examination conducted for 4 weeks showed that the preparations were evenly dispersed and there were no different or uneven colors when placed on the slide.

#### Oil Power Test Results

The eye shadow cream preparation produces a good polish so that the preparation provides an intensive, even and homogeneous color when applied to the skin on the back of the hand.

Table 5. Test Results of Eye Shadow Cream Applying Red Spinach Leaf Extract

Formula	Observation of Oil Power
F0	Equally
F1	Equally
F2	Equally
F3	Equally

The polishing test showed that the preparations that produced good polishing were preparations with a concentration of 10% and 14%. This is indicated by three times the preparation of the preparation gives a good color. The preparation with a concentration of 6% gives a pale and homogeneous color with four to five times of polishing on the skin on the back of the hand. At a concentration of 6%, this was due to the lack of dye in the preparation, causing the color not to come out when applied to the back of the hand. It can be seen that the higher the concentration, the better the color will be.

#### Cream Type Test Results

Tests on the type of cream that have been carried out on eye shadow cream with methylene blue added to the object glass.

Table 6. Test Results for Eye Shadow Cream Type Red Spinach Leaf Extract

Formula	The solubility of methylene blue in the preparation	
	Yes	No
F0	-	√
F1	-	√
F2	-	√
F3	-	√

The results of the cream type test showed that the four eye shadow cream preparations were of the water-in-oil type because methylene blue was insoluble or not evenly distributed in the preparations.

#### Spreadability Test Results

The spreadability test was carried out with the aim of knowing the cream was able to spread when applied. The spreadability of the cream preparation is inversely proportional to the viscosity of the preparation. The greater the viscosity of the preparation, the smaller the spreadability, and vice versa.

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Table 7. The Spreadability Test Results for Eye Shadow Cream with Red Spinach Leaf Extract

Formula	Spread power measurement with 125 g	
	Diameter	
	(cm)	(mm)
F0	6,9	69
F1	6,4	64
F2	6,3	63
F3	5,8	58

The results of the spreadability test showed that the eye shadow cream preparations still met the spreadability requirements so that it was comfortable to apply. Spread or diameter is measured after 1 minute and the dispersion requirement for application to the skin is 5-7cm.

### pH Test Results

Measurement of the pH of the eye shadow cream preparation of red spinach leaf ethanol extract was carried out with a pH meter.

Table 8. pH Test Results for Eye Shadow Cream with Red Spinach Leaf Extract

Formula	pH observation					Average±SD
	Done	7 days	14 days	21 days	28 days	
F0	5,9	5,7	5,6	5,4	5,3	5,58±0,238
F1	5,7	5,5	5,5	5,4	5,2	5,46±0,181
F2	5,6	5,4	5,3	5,2	5,1	5,32±0,192
F3	5,3	5,1	5,0	4,9	4,8	5,02±0,192

During 28 days of storage of cream at room temperature, it showed that there was a difference in the resulting pH, namely a decrease in the pH of the preparation. This pH test was carried out to determine the degree of acidity of the eye shadow cream preparation. Although the pH decreased, the preparation was still in accordance with the skin pH. This shows that all eye shadow formulas of red spinach leaf ethanol extract have the same pH as the skin and are in accordance with SNI No. 06-2588 which is 4.5-6.5. So it is still safe to use and does not cause irritation to the skin.

### Viscosity Test Results

Measurement of the viscosity of the ethanol extract of red spinach leaf eye shadow preparations can be determined using a Brookfield viscometer.

Table 9. Viscosity Test Results for Eye Shadow Cream with Red Spinach Leaf Extract

Formula	Viscosity observation (cPs)					Average ±SD
	Done	7 days	14 days	21 days	28 days	
F0	17166	17000	16666	16500	16500	16766±302,6
F1	20500	19333	19166	18833	18666	19299±720,9
F2	24833	24166	24000	23833	20666	23499±1628
F3	27166	26666	26000	25500	25166	26099±821,4

The most functional formula in the F3 formula. This was due to the difference in the concentration of the red spinach leaf ethanol extract between the blank formulas, F1, F2, and F3. Causes the eye shadow preparation to become denser. The higher the concentration of red spinach leaf ethanol extract given, the higher the viscosity of the eye shadow. Significant differences also occur due to the effect of additives added to each formula. From the results of eye shadow preparations from the ethanol extract of red spinach leaves that have been made to have a good viscosity value in the range of cream preparations, namely 2000-50000 cPs.

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### Stability Test Result<sup>4</sup>

The stability of the formulation can be detected in several ways by a change in the physical appearance, color, odor, taste and texture of the formulation. In general<sup>4</sup>, an emulsion is considered physically unstable if all or part of the liquid in the internal phase is not emulsified and forms a distinct layer on the surface or bottom of the emulsion. Therefore, it is necessary to carry out an evaluation test for 28 days and it is considered as the minimum stability that must be possessed by an emulsion.

Table 10. Stability Test Results for Eye Shadow Cream with Red Spinach Leaf Extract

Formula	Observation															
	Done			7 days			14 days			21 days			28 days			
	X	Y	Z	X	Y	Z	X	Y	Z	X	Y	Z	X	Y	Z	
F0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Description:

- F0 : Formula without red spinach leaf extract (blank)
- F1 : Formula with 6% red spinach leaf extract concentration
- F2 : Formula with 10% red spinach leaf extract concentration
- F3 : Formula with 14% red spinach leaf extract concentration

- X: Discoloration
- Y: Smell change
- Z: Phase separation
- √: There is a color change

<sup>4</sup> No color change

Each formula that has been observed for 28 days gave good results, namely no change in color, odor and phase separation. This shows that the eye cream of red spinach leaf extract is stable in storage at room temperature. The stability of a preparation can be seen from the presence or absence of changes in shape, color and odor during storage.

### Irritation Test Results

The irritation test on the preparation was carried out using an open patch test on the back of the ear. The patch test was carried out by applying the preparation made to a certain area of attachment, leaving it open and observing what happened to the 12 panelists.

Table 11. Irritation Test Results for Eye Shadow Cream with Red Spinach Leaf Extract

Formula	Panelists	Reaction			
		Erythema	Erythema and papules	Erythema, papules and vesicles	Edema and vesicles
F0	1	-	-	-	-
	2	-	-	-	-
	3	-	-	-	-
	4	-	-	-	-
F1	5	-	-	-	-
	6	-	-	-	-
	7	-	-	-	-
F2	8	-	-	-	-
	9	-	-	-	-
	10	-	-	-	-
F3	11	-	-	-	-
	12	-	-	-	-

Description : No reaction = -

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Each formula that has been carried out gives good results, namely not experiencing irritation. Before the irritation test was carried out on the panelists, an approval sheet was given which was affixed with the panelist's signature.

### Preferred Test Results

The data obtained from the assessment sheet (questionnaire) were tabulated and determined for each preparation by finding the average result of each panelist at a 95% confidence level. Each panelist was asked to apply each of the eye shadow cream preparations made to the skin on the back of his hand. Parameters observed in the preference test were the ease of application, homogeneity, and color intensity of the eye shadow cream when applied.

Table 12. Preference Test Results for Eye Shadow Cream with Red Spinach Leaf Extract

Panelists	Age	Preparation			
		F0	F1	F2	F3
1	23	2	5	6	6
2	20	2	6	5	5
3	24	3	2	5	8
4	24	2	5	8	8
5	22	4	5	7	7
6	22	2	6	6	5
7	22	5	6	8	8
8	23	6	6	6	6
9	24	6	8	7	8
10	21	3	5	6	5
11	22	6	7	7	8
12	22	5	7	7	7
Total		46	68	78	81

Description :

- Score 8 = Very Very Like (VVL)
- Score 7 = Really like (RL)
- Score 6 = Like (L)
- Score 5 = Just Like (JL)
- Score 4 = Do not like it much (DLIM)
- Score 3 = Slightly Dislike (SD)
- Score 2 = Do not like (DL)
- Score 1 = Very dislike (VD)

Based on the preference test data for 12 panelists, it is known that the preferred formulas 2 and 3 are red spinach leaf extract dye concentrations of 10% and 14% with a preference percentage of 5.95% for 10% and 6.05% for a concentration of 14%. Formulas 2 and 3 with a dye concentration of red spinach leaf ethanol extract gave a homogeneous color and were liked by most panelists. The percentage of preference in formula 1 with a dye concentration of 6% red spinach leaf ethanol extract with a preference percentage of 4.8%. Panelists quite like this preparation because the color of the preparation is less bright. Then the percentage of preference for formula 0 without the concentration of ethanolic extract of red spinach leaves is 2.9%. Panelists somewhat dislike this preparation, because in this preparation the color is not visible at all.

#### 4. CONCLUSION

The dye of red spinach leaf ethanol extract can be used as a dye in the formulation of eye shadow cream. Eye shadow cream with a concentration of 6% gives a pink color, cream eyeshadow with a concentration of 1% gives a light pink color, and eye shadow cream with a concentration of 14% gives a deep pink color. The results of determining the physical quality requirements of the

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preparations showed that all the preparations made were stable, did not show changes in shape, color and odor during 28 days of storage. Based on the results of the irritation test conducted on 12 panelists, it showed that the eye shadow cream preparation made did not cause irritation.

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# Formulation Of Eye Shadow Cream With Ethanol Extract Of Red Spinach (*Amaranthus tricolor* L.) Leaves As A Dye

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