

## The Usage of Extract of Purple Fleshed Sweet Potato (*Ipomoea batatas* L.) as Color of Lipstick

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### ABSTRACT

Purple fleshed sweet potato (*Ipomoea batatas* L.) is one of the natural ingredients that contain natural color pigments. The natural color pigments are anthocyanin. Anthocyanin is a water-soluble pigment which is naturally found in various type of plants. This study aimed to make lipstick preparations using the purple-fleshed sweet potato extract (*Ipomoea batatas* L.) as a natural dye. The method is used to get anthocyanin as a color of lipstick by using the maceration extraction method. The weight of the sample was 250 grams of dried fleshed purple sweet potato. The liquid for maceration was 95% ethanol. The condition of maceration was acidic by using 2% of citric acid. The filtrate of the maceration process must be evaporated. The basis of lipstick components consisted of cera alba, lanolin, cetyl alcohol, paraffin solid, oleum ricini, propylene glycol, and nipasol. The concentrations of fleshed purple sweet potato extract were 0%, 2.4%, 4.5% and 14.6%. The result of the research showed that the lipstick was easy to apply, an unstable color, homogenous, melting point above 50°C, pH of 6, and all lipstick had a breaking point when loaded at 330 grams. Based on the obtained results, the extract of purple-fleshed sweet potato can be used as a pigment color in the manufacture of lipstick. However, additional materials are needed that can keep the color of lipstick stable.

**Keywords:** lipstick; lipstick components; maceration; Purple fleshed sweet potato (*Ipomoea batatas* L.)

### INTRODUCTION

Indonesia is rich in various floras which can be used as a source of natural ingredients, one of which is purple sweet potato bulbs (*Ipomoea batatas* L.). Bulbs of purple sweet potato (*Ipomoea batatas* L.) can be used as a source of natural dyes. Natural color substances are increasingly needed because they are considered safer than synthetic dyes (Hanum, 2000).

Lipstick is used to beautify the lips with attractive colors, protect the lips from drying out, and can make a brighter color and disguise the bad on the shape of the lips (Mulyaningsih, 2012). Synthetic dyes can last longer on the lips, are more uniform, and cheaper than natural dyes. The dye that is often added is Rhodamin B, which is relatively cheap, and the color produced is relatively interesting. This color agent can cause irritation to the respiratory tract and is a carcinogenic substance, and liver damage (BPOM RI, 2007). The use of natural dyes on lipstick is one way to reduce the use of synthetic dyes on lipstick. Natural dyes are obtained from plants, animals, or mineral sources (Andarwulan & Faradilla, 2012).

For this reason, we need to find alternative natural dyes such as anthocyanin. Anthocyanin is a class of flavonoid compounds that includes naturally soluble pigments. The pigments provide

red, blue, violet, and also act as antioxidants (Li, 2009). Anthocyanin is a natural dye that is widespread in plants. In this research, anthocyanin has been a concern to be used as a dye, because it is natural and healthy compared to synthetic dyes (Yamakawa *et al.*, 2009).

Anthocyanin is a water-soluble pigment that is naturally found in various plants. As the name implies, this pigment gives color to flowers, fruits, and green plants. This pigment has been used as a natural dye in various food products and other applications (Kumalaningsih, 2006).

Anthocyanin comes from the Greek word "Anthos" which means flower and "kyanos" which means dark blue and is included in flavonoid compounds (Kumalaningsih, 2006). This anthocyanin concentration causes several types of purple yams to have different purple shades (Hardoko *et al.*, 2010). The purple color of the tuber, the higher the anthocyanin content (Widjanarko, 2008).

Chemically all anthocyanins are derivatives of a single aromatic compound, cyanidin. At pH less than 2, anthocyanin is in the form of a cation, but at a slightly acidic pH, the quinonoid form is formed. This form is oxidized rapidly by air and is easily damaged, therefore anthocyanin extraction is safely carried out in an acidic solution because anthocyanin is stable at pH 2 and a temperature of 50°C (Winarti, *et al.*, 2008). In the solution which has the color acid

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Table I. Lipstick formulation (%)

Composition	I	II	III	IV
Purple sweet potato tuber extract	0	2.4	4.5	14.6
Cera alba	12	12	12	12
Paraffin wax	11.5	11.5	11.5	11.5
Cetyl alcohol	8	8	8	8
Adeps lanae	10	10	10	10
Propylen glycol	10	10	10	10
Tween 80	8	8	8	8
Talk	20	20	20	20
Nipasol	0.2	0.2	0.2	0.2
Oleum ricini	25	25	25	25
Aquadest ad	100	100	100	100

formed it will tend to be red (Wijaya *et al.*, 2009).

One type of plant that content of anthocyanin was the extract of purple sweet potato tuber (*Ipomoea batatas L.*). Various studies suggest that anthocyanin in purple tuber has high stability compared to anthocyanin in other plants (Andarwulan & Faradilla, 2012). The availability of abundant sweet potato plants in Indonesia causes these tubers to have the potential to be developed as dyes in lipstick preparations. The purpose of this study was to prove that purple sweet potato tuber extract (*Ipomoea batatas L.*) can be used as a natural dye in the manufacture of lipstick preparations.

## METHODOLOGY

### Materials

The sample used in this study was purple sweet potato (*Ipomoea batatas L.*) tuber extract which had sufficient harvest time in Tipar, Rawalo District, Banyumas Regency. While other chemicals, including 95% of ethanol, 4% of citric acid, cera alba, adeps lanae, cetyl alcohol, solid paraffin, oleum ricini, propylene glycol, nipasol, talc, and tween 80.

### Methods

#### Determination of plants

Determination of the *Ipomoea batatas L.* plant aims to ensure that the sample was *Ipomoea batatas L.*

#### Anthocyanin extractions

A number of 250 grams of mashed purple sweet potato tubers were extracted with 500 mL 95% ethanol which acidified by 2% citric acid was added, until the pH of the solution was in the range 1-3 (Wijaya *et al.*, 2009). Extraction was done by maceration for 3 days while stirring occasionally.

The ethanol extract obtained was collected. The collected extract was then evaporated using a water bath.

#### Manufacturer of lipstick

Solid paraffin, cera alba, adeps lanae, and cetyl alcohol were melted on the water bath at 50°C (Mass A). In the other solution, the extract and propylene glycol are mixed until homogeneous in the mortar. Add the talk and stir until homogeneous. Add nipasol and stir until homogeneous (Mass B). Castor oil was weighed and put into a heated mortar. Mass A which had melted was then poured, and homogenized with a warm stemper. Mass B was poured in a mortar that has been filled with castor oil. Mass A and B were poured into a heat porcelain dish, stirred using an iron spatel to melt perfectly. The mixture was poured into the mold. Lipstick preparations are made with the formulas listed in Table I.

#### Evaluation of lipstick

The test of the physical properties of lipstick preparations is the breaking point of lipstick, homogeneity test, smear test, melting point, pH test, and stability testing of lipstick color.

#### Breaking point

Observations are made when the lipstick is broken. The weight of a broken lipstick was breaking point value (Lauffer, 1985).

#### Homogenous test

Each lipstick preparation made from Jati leaf extract was examined for homogeneity by applying a certain amount of preparation on a transparent glass. The preparation should show a homogeneous arrangement and no visible coarse grains (Ditjen POM, 1979).

#### *Smear test*

A smear test was done by applying the lipstick on the back of the hand then was observed the number of the colors attached to 5 times (Keithler, 1956).

#### *Melting point of lipstick*

The lipstick melting point was determined by heating the lipstick over the water bath in the container and a thermometer is placed in it to determine the temperature at which the lipstick melts (Chabib *et al.*, 2000).

#### *pH test of lipstick*

Determination of the pH of lipstick was done by weighing 1 gram sample then melted over a water bath, after melting the pH stick and let it show the pH value of lipstick (Rawlins, 2003).

#### *Stability test*

The stability test of the lipstick was done at each dosage of lipstick. The aim of this test was to determine whether there is a change of forms, color, and smell during storage in room temperature for 1, 5, 10, 15, 20, 25 and 30 days (Vishwakarma, 2011).

## **RESULTS AND DISCUSSION**

#### *Determination of plants*

The determination was carried out at the Plant Taxonomy Laboratory of the Faculty of Biology, Jendral Sudirman University. The results of the determination stated that the plants used in this study were true purple sweet potato (*Ipomoea batatas* L.).

#### *Anthocyanin extractions*

Based on the results of the study, the yield of thick extracts from the tubers of purple sweet potatoes was obtained by 12.5%. The yield of extract produced in this study was more than 10% (MOH, 2018) due to the coarse particle size of purple sweet potato tubers. The size of the yield indicates the effectiveness of the extraction process. The effectiveness of the extraction process is influenced by the type of solvent, the size of the simplisia particles, and the period of the extraction (Permawati, 2008). The color of the extract was red (Figure 1). Anthocyanins give color purple, red, blue, or brown (Syah, 2005).

#### *Evaluation of lipstick*

##### *The breaking point of lipstick*

The lipstick was broken by a load that functions as a pressure. If a break occurs, it is a breaking point value (Risnawati, 2012). The breaking point of lipstick is influenced by the



Figure 1. Results of extraction by 95% ethanol which is acidified by 2% of citric acid

composition of lanolin (Barel *et al.*, 2001). Each lipstick contains adeps lanae 10%. Adeps lanae are also called lanolin. Lanolin is often used in topical preparations and cosmetics. Adeps lanae is used as a carrier of hydrophobic substances and is a substance that is practically insoluble in water (Rowe *et al.*, 2009). Adeps lanae is usually used as a moisturizer, increases the strength of the lipstick, and prevents the tendency of the oil to separate (Jellinek, 1970). The result of the breaking point test of lipstick can be seen in Table II.

Based on Table II, it can be seen that formula I showed the highest strength of 400 grams. Apparently, the addition of extract to the formula makes lipstick preparation weaker (break at the load of 330 g). The large yield of thick extract (12.5%) affects the strength of the lipstick.

#### *Homogeneity test*

Each lipstick preparation made from Purple fleshed sweet potato (*Ipomoea batatas* L.) extract was examined for homogeneity by applying a certain amount of preparation on a transparent glass. The preparation should show a homogeneous arrangement and no visible coarse grains (Ditjen POM, 1979).

The results of the homogeneity tests of the four formulas I, II, III, IV showed that all lipstick preparations did not show coarse grains when the lipstick is applied to transparent glass. This indicates that the lipstick made has a homogeneous arrangement (Ditjen POM, 1979).

#### *Smear test*

A topical test is done by applying lipstick on the back of the arm, then observing the number of

Table II. Breaking point of lipstick

Formula	Breaking point (gram)
I	400
II	330
III	330
IV	330

Table III. Results of Smear Test of Various Lipstick Formulas

Formula	Parameter				
	Homogeneity	Texture	Luster	Sticky power	Sticking color
I	Homogeneous	Rather smooth	Glitter	Sticky	There is no color attached
II	Homogeneous	Rather smooth	Glitter	Sticky	There is no color attached
III	Homogeneous	Rather smooth	Glitter	Sticky	There is no color attached
IV	Homogeneous	Rather smooth	Glitter	Sticky	There is no color attached

Table IV. Melting point analysis results

Formula	Melting point (°C)
I	55
II	53
III	53
IV	53

Table V. pH analysis results

Formula	pH
I	5
II	6
III	6
IV	6

colors attached to the treatment with 5 times applying (Alfrida, 2016).

Based on the results of the analysis, it showed that all lipstick formulas did not show color on the skin, but the preparations remain homogeneous, textured rather smooth, have gloss, and were attached to the lips. These four lipstick formulas were more appropriately referred to as lip balm or lip gloss, because they did not give color to the lips, only give moisture and give a glossy effect on the lips. The results of the smear test can be seen in Table III.

#### The melting point of lipstick

Table IV shows the melting point of lipstick preparations. The formula I lipstick has a higher melting point than lipstick formulas II, III, and IV. This is due to the presence of cera alba and other lipstick bases and the absence of extracts so that it can increase the melting point of the lipstick (Alfrida, 2016).

Based on the melting point value, the four lipstick formulas had a good melting point. According to SNI number 16-4769 (1998), that the melting point of lipstick is 50-70 °C (Alfrida, 2016). Furthermore, a good lipstick had a melting point above 50 °C (Vishwakarma *et al.*, 2011).

#### pH test

pH testing is carried out to determine the pH level of the lipstick preparation. This is because pH has a relationship with skin irritation. If the pH of the lipstick is not in accordance with the pH of the skin it can increase the risk of irritation and cause an uncomfortable feeling on the skin. The normal human skin pH ranges from 4-6 (Ali and Yosipovitch, 2013).

Based on Table V, the pH test results of lipstick preparations obtained pH that was in accordance with the pH of normal skin, where the pH test results in formulas I had a pH of 5 and formulas II to IV had a pH of 6. If the pH of the

Table VI. Stability test results for lipstick preparations

Observation	Formula	Length of observation (Days)						
		1	5	10	15	20	25	30
Color	I	W	W	W	W	W	W	W
	II	PF	PF	P	P	P	P	P
	III	SP	SP	LC	LC	LC	LC	LC
	IV	PL	PL	CN	CN	CN	CN	CN
Odor	I	DS	DS	DS	DS	DS	DS	DS
	II	DS	DS	DS	DS	DS	DS	DS
	III	DS	DS	DS	DS	DS	DS	DS
	IV	DS	DS	DS	DS	DS	DS	DS
Shape	I	G	G	G	G	G	G	G
	II	G	G	G	G	G	G	G
	III	G	G	G	G	G	G	G
	IV	G	G	G	G	G	G	G

Annotation: G: Good; DS: Distinctive Smell; CN: Chocolate Nude; LC: Light Cream; P: White; PL: Purple; SP: Soft Pink; PF: Pink Faded

lipstick is compared with the pH of normal skin, it can be said that the pH of the preparation is appropriate so that it can reduce the risk of irritation to the skin of the lips.

#### Stability testing of lipstick

Stability checks were made on changes in the shape, color, and smell of lipstick preparations made on each preparation during storage at room temperature on day 1, 5, 10 and then every 5 days until the 30th day (Vishwakarma *et al.*, 2011).

The stability test results of lipstick preparations showed that all preparations were made unstable in storage at room temperature for 30 days of observation. The parameters observed in the physical stability test include changes in the shape, color, and smell of the preparation. This can be seen in Table VI.

All formulations of lipstick preparations still have a good shape and smell from day 1 to 30. On day 10 there was a change in color from light beige to nude brown in Formula II, III, and IV. The color of lipstick was not stable in a storage test. It might be because of sugar content in the extract. As we know, purple sweet potato contains sucrose as the main sugar, fructose, glucose, and xylose. Those sugars increase the color degradation of anthocyanin by forming a polymer pigment and browning process. Moreover, anthocyanin itself is unstable and easily degraded. Its stability was reduced by sucrose (Chen *et al.*, 2019).

The anthocyanin dyes are unstable and easily degraded. Its stability is influenced by pH, storage temperature, light, enzymes, oxygenation, sugar, structural differences in anthocyanins, and concentrations of anthocyanins (Misra, 2008).

#### CONCLUSION

Extract of purple-fleshed sweet potato can be used as a pigment color in the manufacture of lipstick. Lipstick will break if given a load of 330 grams and melt above 50°C. Lipstick has homogeneous characteristics and no change of odor and shape when the lipstick is kept until 30 days. The pH of the lipstick is made, present in lip pH conditions is 4-6. Lipstick on a formula of 2.4%, 4.5%, and 14.6% of extract purple sweet potato tuber does not display color on the skin. Moreover, the extract of purple-fleshed sweet potato contains sugar. Sugar causes pigment color unstable because anthocyanin is easily degraded.

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