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ORIGINAL RESEARCH

FORMULATION AND EVALUATION OF LIPSTICK PREPARATION FROM *BUNI FRUIT EXTRACT (Antidesma bunius* (L.) Spreng.) AS A NATURAL COLORANT

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Abstract

Background: Buni fruits (Antidesma bunius (L.) Spreng.) are wild plants which contains anthocyanin pigments that can provide red, blue or violet natural colorant. Lipstick is one of the decorative cosmetics used as a colorant on the lips. **Purpose**: The aim of the study was to formulate and to evaluate lipstick products using Buni fruit extract as a natural colorant. **Method**: The extract was obtained by maceration using 96% ethanol. Lipstick formulations were developed with three varying concentrations of ethanol Buni fruit extract: F1 (8%), F2 (12%), and F3 (16%). The lipstick formulations were evaluated for organoleptic properties, homogeneity, pH, melting point, spreadability, stability, and irritation. **Results**: All lipstick formulations exhibited a distinct Buni fruit ectract aroma, homogeneous with purple color appearance. The pH values of lipstick F1, F2 and F3 were 6.30; 4.06; and 5.74, respectively, melting point of 60°C within 15 minutes. Stability test at 5° C, 28°C and 40° C temperatures for 1 month showed all of lipstick formulas were stable during storage. Patch test on the volunteers showed no signs of skin irritation for all formula. **Conclusion**: This research demonstrated that Buni fruit can be used as a natural colorant for lipstick preparations.

Background

Cosmetic products such as lip formulations are widely used. Lipstick is primarily a decorative cosmetic used to add color and definition to the lips, enhancing their appearance. Lipstick offering aesthetic appeal and can also provide therapeutic benefits, like moisturization and protection [1]. Colorants are a crucial ingredient in lipstick preparations. Colorants consist of synthetic and natural dyes [2]. Currently on the market there are dangerous cosmetics that contain *mercury*, *hydroquinone*, *rhodamin B*, and *methanyl yellow*. Rhodamine B is found in lipstick, blush, and eyeshadow. Rhodamine B, used as a synthetic dye, causes irritation to the respiratory tract, liver damage, and carcinogenic [3]. An alternative to synthetic dyes is natural dyes, which are relatively safer because they come from plants, animals, and minerals [4].

Buni fruits (Antidesma bunius L) are wild plants belonging to the Euphorbiaceae family originally from Southeast Asia and southern Australia. Buni fruits are rich in nutritional components such as carbohydrates, sugars, organic acids, proteins, minerals, vitamins, anthocyanins, flavonoids and phenolic acids [5]. Anthocyanins which belong to the widespread class of phenolic compounds, i.e flavonoids are natural pigments which cause red, orange, purple and blue flowers and abundant in fruits [6]. Previously it was reported that buni fruit was used as a colorant in lip cream and blush preparations [7]. Based on previous research conducted by Ritana et al [8], using buni fruit extract as a natural dye for

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the formulation of lip cream preparations with concentrations of 8%, 12%, 16%. Lipstick formulation involves

considering several key factors: texture, color, wearability, and safety. The choice of waxes, oils, and pigments determines the lipstick's feel, color intensity, and how long it lasts on the lips [1]. This study aims to determine the characteristics of the formulation of solid lipstick preparations using buni fruit extract at various concentrations and to evaluate the resulting product's physical attributes and safety

Method

The sample of buni fruit were collected from Mustika Jaya district, Bekasi, West Java. The leaves, trunks, fruit and flower were sent to Research Center Institut Teknologi Bandung (ITB) for plant determination.

Processing Samples and Extraction

The dried buni fruit then mashed until it became powder. Further more it was stored in an airtight container at room temperature and protected from direct sunlight. Powdered BUNI fruit was extracted by maceration using 96% ethanol solvent l (1:10) for 1X24 hours. Maserat is concentrated with a rotary evaporator at a temperature of 40-60°C [9].

Screening of Secondary Metabolite

The ethanol extract of buni fruit were obtained qualitatively by phytochemical screening. Alkaloid, flavonoid, steroid or terpenoid, tannin and anthocyanins were tested in phytochemical screening [10].

Formulation Design of Lipstick

Tabel 1. Formula of Lipstick

Ingredients	Formula concentration (%)				Function
	F0	F1	F2	F3	
Buni fruit extract		8	12	16	Active ingredient
Cera Alba	15	15	15	15	Emulgator
Carnauba wax	5	5	5	5	Base
Propylene glycol	3	3	3	3	Solvent
cetil alcohol	1	1	1	1	Emulgator
Nipagin	0,18	0,18	0,18	0,18	Preservative
Oleum ricini	1,5	1,5	1,5	1,5	Emolien
Fragrance	qs	qs	qs	qs	Fragrance
Vaselin album	Ad 50	Ad 50	Ad 50	Ad 50	Base

Preparation of Buni Fruit Extract Lipstick

The processed begin by melting Cera Alba, Carnauba wax, and oleoum ricini using a water bath. Once these components have melted, add Vaselin album and Propylene Glycol to the mixture, stirring continuously until the mixture is homogeneous (Mixture A). In a separate container, dissolve the Buni Fruit Extract and Nipagin then mix until homogeneous (Mixture B). Slowly add Mixture B to Mixture A while stirring continuously. Pour the combined mixture into molds while it is still warm and allow it to cool and solidify.

Evaluation of Buni Fruit Extract Lipstick

The lipstick formulations were evaluated for organoleptic properties, homogeneity, pH, melting point, spreadability. Organoleptic testing assesses the physical attributes of the lipstick using the senses of sight, touch, and taste. This includes evaluating the color, flavor, shape, texture, and aroma of the product. Homogeneity testing is conducted to confirm that the formulation is evenly mixed. This is done by applying a sample of the lipstick onto a glass

slide, covering it with another slide, and checking for any lumps or inconsistencies that would indicate poor mixing. pH testing is performed to measure the acidity or alkalinity of the lipstick using a pH meter or pH indicator paper. Melting point testing is also carried out by heating a 1-gram sample of the lipstick in a water bath until it fully melts, with the temperature recorded using a thermometer to ascertain the melting point. The spreadability test is conducted visually by applying the lipstick to the skin (hand) and observing the adherent of sample.

Stability Test

The formulation of the lipstick has been evaluated for stability for 30 days under various temperature conditions mainly room temperature (25°C), higher temperatures in the oven (40°C) and refrigerator (5°C). Characteristics such as organoleptic properties and spreadability were evaluated on days 7, 14, 21 and 28 [12].

Irritation Test

The safety of lipstick formulation is evaluated using an irritation test on the skin of the inner forearm for 24 hours. To assess the irritating effect of a product or cosmetic on the skin, a scoring method based on irritation score guidelines is used**.** The 10 volunteers who served as panelists were selected with the criteria of having no scars in the irritation test area [13].

Results

The concentrated buni fruit extract appeared as a purple to purple substance with a distinct buni fruitodor t. After concentration using a vacuum rotary evaporator, 394,38 grams of thick buni fruit extract was obtained. The extract rendemen was demonstrated in Table 2.

Tabel 2. Yield of Buni Fruit Extract.

Result	Number
Buni Fruit Powdder.	1000 g
Buni Fruit Extract.	394,38 g
Extract yield	39,43 %

The results of phytochemical screening for buni fruit extract are presented in Table 3.

Tabel 3. Phytochemical Content Results

No	Group of secondary metabolite	Results
1	Alkaloid	+
	• Dragendorff	+
	• Mayer	+
	• Bourchardat	+
2	Flavonoid	+
3	Tanin	+
4	Fenol	+
5	Antosianin	+
6	Terpenoid	+
7	Steroid	-

(+) Indicates the presence of secondary metabolites
(-) Indicates the absence of secondary metabolites

The results of organoleptic evaluation test for lipstick buni fruit extract are presented in

Table 4.

Tabel 4. Organoleptic evaluatiotest results of buni fruit extract lipstick

Parameter	Formula			
	F0	**F1 (8%)**	**F2 (12%)**	**F3 (16%)**
Odor	Extract buni fruit	Extract buni fruit	Extract buni fruit	Extract buni fruit
Color	White	Purple	Red purple	Dark purple
Texture	Smooth	Smooth	Smooth	Smooth

F0 = Lipstick formula base
F1 = Lipstick formula with buni fruit extract 8 %
F2 = Lipstick formula with buni fruit extract 12%
F3 = Lipstick formula with buni fruit extract 16%

The results of homogenity, melting point and pH evaluation test for lipstick buni fruit extract are presented in Table 5.

Tabel 5. Evaluation test results of buni fruit extract lipstick

Formula	pH	Homogenity	Melting Point
F0	6,30	Homogen	60°C
F**1**	4,06	Homogen	60°C
F**2**	5,74	Homogen	60°C
F3	5,60	Homogen	60°C

Tabel 6. Irritation test results

	Reacton to skin			
Respondens	F0	F1	F2	F3
1	-	-	-	-
2	-	-	-	-
3	-	-	-	-
4	-	-	-	-
5	-	-	-	-
6	-	-	-	-
7	-	-	-	-
8	-	-	-	-
9	-	-	-	-
10	-	-	-	-

(-) = no Irritation
(+) = rritation

The results of iiritation test on inner skin are presented in Table 6.

Discussion

Determination aims to determine the truth of the plant's identity. The results of the determination Buni fruit stated that the plant used in this study is of the species (Antidesma bunius (L.) Spreng.) of the *phyllanthaceae* family.

An organoleptic test for an extract uses human senses to assess the quality and characteristics of a substance. This involves evaluating aspects like appearance, color, odor, taste, and texture. The concentrated buni fruit extract appeared as a purple to purple substance with a distinct buni fruitodor. Buni fruit extract produced a yield of 39.43%. A high yield means a greater amount of secondary metabolite products were obtained. The extraction yield is influenced by the type powder, particle size, shape of the simple substance, type of solvent and method used in the extraction process. Phytochemical screening is a methodological approach aimed at identifying and characterizing the diverse chemical compounds present in plant materials. Identification of phytochemical compounds in plants helps predict potential pharmacological activities present in the plant [14]. The results of phytochemical screening tests for Buni fruit extract positively contained secondary metabolite compounds, namely alkaloids, flavonoids, tannins, phenols, anthocyanins, and terpenoids. The results of phytochemical screening in previous research conducted by [11], namely that Buni fruit contains alkaloids, flavonoids, tannins, phenols, anthocyanins, and terpenoids.

Physical properties and stability are important things that must be considered in formulation to ensure its quality [15]. In the process of making lipstick product, cera alba and carnauba wax are used to give the lipstick its shape and keep it solid. The waxes most used for cosmetic products are beeswax, carnauba and candelilla. Natural waxes commonly used in cosmetics are carnauba wax and candelilla wax. Both are harder and have higher melting points, making them more stable and suitable for dry goods [16]. Propylene glycol functions as a solvent, cetyl alcohol uses as a thickener in lipstick, nipagin functions as a preservative to prevent and protect lipstick preparations from the growth of microorganisms that can cause unpleasant odors, color changes [17]. Dyes or colorants are mainly used to give cosmetic products a distinct appearance. Colorants must be on the list of certified colorants under the Drugs and Cosmetics Act. Natural colours from various plant and fruit sources. The most important feature of colorants is compatibility with other ingredients and drugs. It must not have the unpleasant taste and smell of cashmere wool, and must be readily available and inexpensive [18]. Buni (Antidesma bunius) which contains anthocyanins can be an alternative of synthetic dyes. Anthocyanins have found considerable potential in the food industry as safe and effective food colorants. Anthocyanins have many health benefits including has anticarcinogenic activity and antioxidant capacity. Anthocyanins have reported showed the greatest stability in acidic pH [19].

Organoleptic testing assesses the physical attributes of the lipstick using the senses of sight, touch, and taste. Formulation F1, F2 and F3 exhibited a purple to dark purple color, semi-solid texture, and a distinct aroma. The homogenity results showed that the buni fruit extract lipstick formulations F1, F2 and F3 homogenous. In the tests conducted, none of the three formulations exhibited any coarse particles when applied to a transparent glass surface, indicating that the lipsticks were uniformly mixed [20]. The pH values of lipstick formulations F1, F2 and F3 were 6.30; 4.06; and 5.74, respectively. According to the Indonesian National Standard (SNI) 16-4769-1998, an ideal lip balm should have a pH range between 4.5 and 7.5. The melting point is a crucial parameter for determining the storage and usability of the lip balm, ensuring it retains its shape and consistency during use. The melting point of of lipstick formulations F1, F2 and F3 was determined and found to be in range 60°C within 15 minutes. A lipstick has good application power if the color adheres to the back of the hand and spreads evenly after several applications.

Lipstick formulas 1, 2, and 3 with 8%, 12%, and 16% buni fruit extract concentrations did not adhere to the lips. The lipstick tended to adhere less as the extract concentration increased [21].

The purpose of the stability test is to prove the stability of lipstick preparations that have been stored for 28 days in different room conditions. At room temperature (25°C) the lipstick formula F1 produces a light purple color, F2 produces a reddish purple color, while the preparation formula F3 produces a deep purple color, all three formulas are solid and smell of vanilla with pH values of F1 (5.52), F2 (5.54), and F3 (5.25), with a melting point of 55°C. Data analysis on lipstick preparations was carried out using One Way ANOVA for the pH test showing a p value <0.05, this indicates that there are differences between each preparation.

The results of the irritation test on the inner arm skin, as shown in the four lipstick formulations made from buni fruit extract (F0, F1, F2, and F3), can be said to be non-irritating to the skin. This is because the concentration of each compound used in the formula is still within the tolerable range, so it does not affect the appearance of an irritation reaction [22[.

Conclusion

Based on the results formulation and evaluation of buni fruit extract (Antidesma bunius (L.) Spreng.) as a natural dye, where the buni fruit was extracted using a maceration method, producing a deep purple color. The physical evaluations, including organoleptic, homogeneity, pH, melting point, and spreadability, met the standards, Stability test at 5°C, 28°C and 40°C temperatures for 1 month showed all of lipstick formulas were stable during storage. Skin Irritation testing with pacth test showed no signs of skin irritation.

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