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# Formulation of Purple Sweet Potato Extract (*Ipomoea batatas* L.) Cream Blush as a Natural Colorant

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## ABSTRACT

The use of synthetic dyes such as Red K.3 (CI 15585), Red K.10 (Rhodamine B), and Orange K.1 (CI 12075) is hazardous to health. Natural dyes can serve as an alternative to synthetic dyes, as they are significantly safer and more environmentally friendly. One plant that can be used as a natural dye is purple sweet potato (*Ipomoea batatas* L.). This study aims to identify the presence of anthocyanin compounds in purple sweet potato extract (*Ipomoea batatas* L.), evaluate the physical properties of blush on cream formulations based on this extract, and determine the most preferred concentration through a hedonic test. This study used an experimental technique. Purple sweet potatoes were extracted using the maceration method. The study involved preparing purple sweet potato extract-based blush on cream with varying extract concentrations of 8%, 9%, and 10%, as well as a negative control. Physical evaluation tests were conducted, including organoleptic testing, homogeneity testing, pH testing, and spreadability testing. A hedonic test was also performed. The test results showed that purple sweet potato extract contains anthocyanin compounds. The anthocyanin content indicates that purple sweet potato extract has the potential to be used as a natural dye. The cream blush formulations met all physical testing requirements. Based on the hedonic test, F2 (8%) and F3 (10%) cream blush were preferred by the panelists in terms of color, aroma, and texture.

***Keywords:*** *Cream blush, natural colorant, purple sweet potato extract.*

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## INTRODUCTION

According to data from the Coordinating Ministry for Economic Affairs, there is an increase in the number of cosmetics companies in Indonesia by 21.9% from 913 companies in 2022, to 1,010 companies by mid-2023. The beauty industry in Indonesia continues to grow with the emergence of local cosmetic brands as a result of the increasing young population who are aware of the importance of skincare and the use of halal-labelled cosmetics, thus encouraging the presence of local brands that use natural ingredients in beauty products.(1)

Cosmetics are materials or preparations used on the outside of the body, divided into skin care cosmetics (skin care) and makeup cosmetics (make-up). Decorative cosmetics are used to beautify and cover skin imperfections. In decorative cosmetics, colourants and fragrances have a very important role.(2) One of the cosmetic products that use colourants is blush. Blush (blush or rouge) aims to improve the appearance of the face to make it look more beautiful, fresh, and dimensional. Based on its shape, blush has various types including compact, powder, stick, cream, powder ball and liquid. Blushes are available in a wide variety of colours, ranging from red, orange, pink, to brownish colours, which can be derived from synthetic or natural dyes.(3)

Synthetic dyes have the advantages of being more stable and resistant to various environmental conditions, more intense colouring ability, wider colour variations, and do not fade easily and produce bright colours.(4) In cosmetic products, there is a list of prohibited ingredients regulated in the NA-DFC Regulation No. 23 of 2019 concerning Technical Requirements for Cosmetic Ingredients in Appendix V. One of the prohibited ingredients is colourants including Red K.3 (CI 15585), Red K.10 (Rhodamine B), and Orange K.1 (CI 12075). These dyes are often misused in lipstick, eye shadow or blusher products, because they produce bright colours. These synthetic dyes are more commonly used in the paper, textile, or ink industries, and are carcinogenic, especially Rhodamine B in high levels can cause damage to the liver.(5)

Natural dyes can be an alternative to synthetic dyes because they are safer and more environmentally friendly. Various plant parts such as skin, stem, fruit, leaves, flowers, seeds,

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tubers, roots, twigs, and sap can be used as a source of natural dyes. One of them is purple sweet potato (Ipomoea batatas L.), a food crop that is easy to cultivate, seasonless, and can grow in various regions of Indonesia. Apart from being a source of carbohydrates, purple sweet potato is rich in anthocyanin pigments, which are polyphenols that give fruits, vegetables, roots and tubers their red, blue or purple colour. Compared to other varieties, purple sweet potatoes have higher anthocyanin levels than purple cabbage, blueberries, and red corn. These anthocyanins are antioxidant, help fight free radicals, and strengthen the body's defences.(6)

Previous research showed that purple sweet potato extract (Ipomoea batatas L.) with concentrations of 20%, 25%, and 30% can be used as a natural colourant in blush formulations, where blush sticks with a concentration of 25% were the most preferred by panelists in terms of colour, aroma, and texture.(7) However, the stick form has disadvantages such as uneven colour distribution and is easily broken, so blush cream can be an alternative because it has a soft texture, is easy to blend, and produces a more even colour distribution. The results of other studies also prove that other natural ingredients, such as caramunting fruit extract (Melastoma malabathricum L.), can be formulated in the form of blush cream with concentrations of 8%, 9%, and 10% that meet physical evaluation standards.(8) Based on these considerations, researchers are interested in utilising purple sweet potato extract as a natural colourant in blush cream preparations with variations in concentrations of 8%, 9%, and 10%. This study aims to identify the presence of anthocyanin compounds in purple sweet potato extract (Ipomoea batatas L.), determine the results of the physical test of the blush cream preparation produced, and determine the concentration of purple sweet potato extract that is most preferred by panellists based on the results of hedonic tests on blush cream products.

## MATERIAL & METHODS

This research is a laboratory experimental research and was conducted at the Pharmacognosy Laboratory and Pharmaceutical Technology Laboratory of the Department of Pharmacy, Polytechnic of the Ministry of Health Jakarta II in March - June 2025, while


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the hedonic test was conducted in June 2025. The tools used include knives, blenders, maceration vessels, Buchner funnels, vacuum devices, filter paper, measuring cups, analytical scales, pH meters, porcelain cups, watch glasses, water baths, spatulas, stirring rods, thermometers, glass funnels, beaker glasses, mortar, stampers, drop pipettes, sudips, wooden tongs, hot plates, pans, and blush containers. The main ingredient used is purple sweet potato obtained from plantations in the Bogor area, while additional ingredients include propylene glycol, titanium dioxide, nipagin, BHT, beeswax, sodium metabisulfite, Tween 80, Span 80, distilled water, VCO, oleum rosae, citric acid, kaolin, and 96% ethanol.

Purple sweet potato (Ipomoea batatas L.) that has been collected, sorted, then weighed as much as 500 grams then washed with running water, drained, then mashed using a blender and continued with the extraction process. Extraction was carried out by maceration method and used 96% ethanol solvent as much as 2.5 litres which had added 2% citric acid to maintain anthocyanin stability, and 0.1% sodium metabisulfite to prevent oxidation. The mixture of simplisia and solvent was kept in a closed container, protected from direct light, and allowed to stand for five days while occasionally stirring to maximise the extraction process. After five days, the mixture was filtered using filter paper to obtain the filtrate. The filtrate was then evaporated using a water bath at a temperature of about 50°C until a thick extract of dark purple sweet potato was obtained.(7)

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In this study, variations in extract concentrations of 8%, 9%, and 10% were used, with the formulation composition as follows (8):

**Table 1.** Weighing of Materials

| Material | Function | Unit | Quantity | | | |
|---|---|---|---|---|---|---|
| | | | F0 | F1 | F2 | F3 |
| Purple Sweet Potato Extract | Coloring agents | g | - | 0,8 | 0,9 | 1 |
| Propilen glikol | Humectants | g | 0,5 | 0,5 | 0,5 | 0,5 |
| Kaolin | Adhesives and thickeners | g | 0,9 | 0,9 | 0,9 | 0,9 |
| Titanium dioksida | White pigments | g | 0,1 | 0,1 | 0,1 | 0,1 |
| BHT | Antioxidants | g | 0,05 | 0,05 | 0,05 | 0,05 |
| Nipagin | Preservatives | g | 0,03 | 0,03 | 0,03 | 0,03 |
| Beeswax | Base materials and brighteners | g | 2 | 2 | 2 | 2 |
| VCO | Emollients | g | 3 | 3 | 3 | 3 |
| Tween 80 | Emulsifiers | g | 0,185 | 0,185 | 0,185 | 0,185 |
| Span 80 | Emulsifiers | g | 0,415 | 0,415 | 0,415 | 0,415 |
| Oleum Rose | Fragrances | g | qs | qs | qs | qs |
| Aquadest | Solvents | g | 2,82 | 2,02 | 1,92 | 1,82 |
| **Total** | | | **10 g** | | | |

**Description** = F0: Formulation without purple sweet potato extract, F1: Formulation with 8% purple sweet potato extract, F2: Formulation with 9% purple sweet potato extract, and F3: Formulation with 10% purple sweet potato extract.

In the process of making blush cream, all ingredients were weighed based on the formula. Next, the oil phase consisting of beeswax and VCO (mass I) and the water phase, namely aquadest and propylene glycol (mass II) were put into a vaporiser cup and melted at 70°C. Then, the two phases were combined in a preheated mortar, and tween 80 and span 80 were added while rapidly grinding until the mixture became homogeneous and formed a cream base. Once the cream base is formed, add BHT, titanium dioxide, kaolin, and nipagin, and grind until all ingredients are homogeneously mixed. When the temperature has dropped, add the purple sweet potato extract and stir until the colour is evenly distributed. Finally, put the finished cream into a container. Then repeat it as many as triplo for each formula, then conduct physical evaluation.(8)

**Evaluation of Preparations**

**Organoleptic Test**

Testing is done by observing the shape, colour, and aroma of the preparation. By observing the shape, colour and aroma using the five senses.(9)



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**Homogeneity Test**

The homogeneity test aims to determine whether the carrier particles and dyes can blend or mix well. A number of preparations are applied to a piece of glass until evenly distributed. If there are no lumps and have a uniform colour from the starting point of application to the end point of application, then the preparation is said to be homogeneous.(9) Homogeneity also affects the resulting effectiveness, because this concerns the concentration of the active substance which is expected to be the same at each use or application.(10)

**pH test**

The pH test is carried out to ensure that the preparation is safe to use and does not cause irritation to the skin. This test uses a pH meter. A sample of preparation weighing 1 gram is diluted using distilled water to reach a volume of 10 mL. It is said to meet the **Spreadability Test**

The spreadability test is carried out visually by applying the blush preparation to the skin of the back of the hand, then observing the intensity of the colour that sticks after five applications. The blush preparation is said to have good spreadability if the colour attached to the skin looks a lot and evenly distributed, even with only a few applications and light pressure.(12)

**Spreadability Test**

Spreadability testing aims to assess the softness or softness of the preparation, so that the preparation is easily applied to the skin surface. This test method is carried out between two clear glass plates. The plate is then loaded, then left for approximately 1 minute until the preparation stops spreading. Next, the diameter of the spread is measured. After that, an additional load of 50 grams was applied gradually until it reached 100 grams and 150 grams, and each time after 1 minute, the diameter of the spread was measured again. This test was carried out three times for each preparation sample. Spreadability is qualified if it is in the range of 3 - 5 cm.(8)

**Hedonic Test**


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The hedonic test or liking test aims to determine the level of respondents' liking for blush cream with varying concentrations of purple sweet potato extract. This study involved 30 panelists who assessed the texture, colour, and aroma of each preparation using a questionnaire in about 30 minutes..(13) The assessment was carried out using a 1-5 scale scoring method, namely 1 (very dislike), 2 (dislike), 3 (neutral), 4 (like), and 5 (very like).(14) Inclusion criteria include level I or II students of the Pharmacy Department of the Poltekkes Kemenkes Jakarta II, women aged 18-30 years, and physically and mentally healthy, while the exclusion criteria are having a history of allergic diseases.

## RESULT & DISCUSSION

### Phytochemical Identification Test of Purple Sweet Potato Extract

**Table 2.** Phytochemical Identification Test of Purple Sweet Potato Extract

| No | Compound Identification | Reagent | Result | Description |
|---|---|---|---|---|
| 1. | Alkaloid | 1 ml NaOH + 5 drops $H_2SO_4$ + 1 ml reagent Dragendorff | Orange-red sediment | + |
| 2. | Flavonoid | 3 ml etanol 96% + 0,1 Mg powder + 2 drops concentrated HCl | Red sediment forms on the ethanol layer | + |
| 3. | Tanin | 10 ml aquadest + 2 ml $FeCl_3$ 1% | Produces a greenish-brown color | + |
| 4. | Saponin | 10 ml aquadest | Foam forms | + |
| 5. | Antosianin | HCl 2 M heat at 100°C for 5 minutes | Red color | + |
| | | NaOH 2 M added gradually | Green color slowly fades | + |

**Description :** + = These compounds are contained in and - = There is no content of that compound.



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## Physical Test Results for Purple Sweet Potato Extract Cream Blush

**Table 3.** Physical Test Results for Purple Sweet Potato Extract Cream Blush

| Parameters | F0 | F1 | F2 | F3 | Requirements | MS / TMS |
|---|---|---|---|---|---|---|
| **Organoleptic** | **Color:** Bone white | **Color:** Light pink | **Color :** Pink | **Color :** Slightly darker pink | No rancid odor.(15) | MS |
| | **Aroma:** Rose and a hint of purple sweet potato | | | | | MS |
| | **Texture:** Soft | | | | | MS |
| **Homogeneity** | Homogeneous | | | | Homogeneous.(15) | MS |
| **pH** | 6,28 ± 0,089 | 4,42 ± 0,086 | 4,16 ± 0,016 | 4,08 ± 0,053 | 4 – 7.(16) | MS |
| **Spreadability** | **Without burden:** 3,69 ± 0,074 cm **50 g :** 3,90 ± 0,046 cm **100 g :** 4,18 ± 0,029 cm **150 g :** 4,35 ± 0,016 cm | **Without burden:** 3,31 ± 0,107 cm **50 g :** 3,61 ± 0,125 cm **100 g :** 3,82 ± 0,103 cm **150 g :** 4,00 ± 0,128 cm | **Without burden:** 3,28 ± 0,024 cm **50 g :** 3,40 ± 0,131 cm **100 g :** 3,55 ± 0,200 cm **150 g :** 3,76 ± 0,209 cm | **Without burden:** 3,25 ± 0,113 cm **50 g :** 3,29 ± 0,083 cm **100 g :** 3,44 ± 0,164 cm **150 g :** 3,58 ± 0,176 cm | 3 – 5 cm.(14) | MS |
| **Application Test** | After two coats, the color adheres and spreads evenly | | | | After five coats, the color adheres to the back of the hand and spreads evenly..(17) | MS |

**Description:** F0 does not contain purple sweet potato extract, F1 contains 8% purple sweet potato extract, F2 contains 9% purple sweet potato extract, and F3 contains 10% purple sweet potato extract.

## Hedonic Test Results for Purple Sweet Potato Extract Blush On Cream

**Table 4.** Hedonic Test Scoring Results for Purple Sweet Potato Extract Blush On Cream

| Parameters | Texture | Color | Aroma |
|---|---|---|---|
| **F0** | 3 | 3 | 4 |
| **F1** | 3 | 4 | 4 |
| **F2** | 4 | 4 | 4 |
| **F3** | 4 | 4 | 4 |

**Description:** F0 does not contain purple sweet potato extract, F1 contains 8% purple sweet potato extract, F2 contains 9% purple sweet potato extract, and F3 contains 10% purple sweet potato extract.

This study formulates blush cream using purple sweet potato extract (Ipomoea batatas Lamk.) as a natural colourant. The sample was determined at Lansida Herbal Technologi and the results were correct that the sample used was purple sweet potato (Ipomoea batatas

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Lamk.). Purple sweet potato contains dominant anthocyanin pigments in the form of cyanidin (blue) and peonidin (red) with natural antioxidant properties that are easily degraded by air, temperature, pH, and processing.(6) To minimise degradation, fresh samples were extracted directly by maceration method. Qualitative identification results showed the extract was positive for anthocyanins, flavonoids, alkaloids, tannins, and saponins, giving it potential as a natural colourant.

Physical quality evaluation includes organoleptic tests that show all formulas have a soft and moist texture due to VCO and propylene glycol, a dominant aroma of rose flowers from oleum rosae, and a bone white colour in F0 and purplish pink in F1 to F3 as the concentration of extract increases the colour produced will be more intense.(8) ll formulas are homogeneous without coarse grains. The resulting pH range of 4.08 - 6.28 meets the requirements, but the pH decreases as the extract increases because the extract is acidic due to the addition of citric acid and sodium metabisulphite which functions to maintain the stability of anthocyanins.(7)

Spreadability of 3.25 - 4.35 cm met the criteria, although consistency increased at high extract concentrations so that spreadability decreased slightly. The spreadability test showed that all formulas adhered well in two applications, with colour variations according to extract concentration. The addition of titanium dioxide makes the purple colour lighter, beeswax gives gloss, and kaolin helps the preparation adhere to the skin.(8)

The hedonic test on 30 panelists showed that F2 and F3 received the highest score of category 4 or 'Like' in terms of colour, aroma, and texture. Overall, purple sweet potato extract blush cream meets the physical quality requirements, but further research is recommended to analyse more specific anthocyanins, the addition of nipasol (0.01-0.03%) with nipagin to synergise in preventing the growth of fungi and yeast, the selection of preservatives is an important factor in the safety and stability of pharmaceutical preparations and long-term stability tests to ensure the quality of the preparation during storage.(15)

## CONCLUSION



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Based on the results of phytochemical identification testing, purple sweet potato extract is positive for anthocyanin compounds that have the potential to be used as natural colourants. The blush cream preparation with these extracts in the four formulas showed organoleptic test results, homogeneity, pH, spreadability, and spreadability that met the physical quality requirements. Hedonic test results showed that formulas F2 and F3 with extract concentrations of 9% and 10% were preferred by panelists, both in terms of colour, aroma, and texture.

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