INDONESIAN PHARMACOPEIA JOURNAL

IPJ Vol. 2 No. 2, Tahun 2026
Online ISSN : 3032-5455

RESEARCH ARTICLE OPEN ACCESS

Lotion Quality in Terms of Physical and Chemical Properties at Different Concentrations Butterfly Pea Flower Extract

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ABSTRACT

Butterfly pea flowers were chosen because they contain active substances suchsuch as flavonoids and anthocyanins, recognized for their potent antioxidant effects and are suitable for use in topical products such as lotions. This research intended to develop and assess the chemical and physical quality testing of lotion formulations derived from extract of ethanol from butterfly pea blossoms (Clitoria ternatea L.). Extractionwas carried out using a maceration technique with 96% ethanol. Three different lotion formulations were made using different levels of butterfly pea flower extract: 0.5%, 1%, and 1.5%. Formulation assessment was carried out through physical and chemical quality examinations, which included organoleptic evaluation, homogeneity test, pH measurement, viscosity analysis, adhesion test, and dissemination assessment. The results of the test indicated that, each formulation met the physical and chemical quality standards required for topical products. The formulation containing 1.5% extract showed the greatest viscosity and adhesion, but had the lowest spreadability. Conversely, the formula with 0.5% extract showed the best spreadability despite having a lower viscosity. pH assessment confirmed that all formulations were within the skin-safe range (4.5–8). Changes in the concentration of ethanol extract derived from butterfly pea flowers impacted the physical attributes of the lotion formulations, such as viscosity, spreadability, adhesion, and acidity. However, the acidity of the lotion formulations was still below the skin's acidity standards.

Key words: Clitoria ternatea L., Lotion, Physical quality test**,** Chemical Quality test

INTRODUCTION

The The skin functions as an organ that covers the entire outer surface of the body, working to protect the external body, factors, including physical, mechanical, and chemical damage. As a tropical country, Indonesia experiences skin problems caused by high humidity and intense sunlight, which result in the creation of freeextremists and make the skin more susceptible to dullness and dryness (Yuniarsih et al, 2023).

Preventing cell damage and aging resulting from free radicals requires the advancement of cosmetic products that incorporate antioxidant ingredients that can combat oxidation (Nadzifah, 2024). Research conducted by Nadzifah and Budi Riyanta (2024) showed that qualitative tests revealed the presence of flavonoid compounds withinextract of butterfly pea flower (Clitoria ternatea L.), as evidenced by a color

change to orange. Furthermore, the highest antioxidant activity, indicated by the IC50 value, was observed in the 96% ethanol fraction at 25.84 µg/mL.

Ethanol extraction from butterfly pea blossoms contains flavonoids, anthocyanins, tannins, alkaloids, and saponins. Flavonoids are natural substances that can function as protective agents against light due to their ability to absorb UV radiation and can function as antioxidants suitable for inclusion in lotions (Sumartini and Ikrawan, 2020).

The lotion works by drawing moisture from the air that penetrates the outer layers of the skin, lotion was selected due to its emulsion structure, making it easy to rinse off with water and less tacky compared to other topical products. Using lotion after a bath will replenish lost hydration and assist in keeping skin moisture levels up during the day (Yuniarshih et al., 2023). A quality lotion should strike a balance between product excellence and its standards, guaranteeing that the final lotion adequately fulfills user requirements. Compliance with the standards can be assessed by evaluating the tangible and molecular, properties of the generated lotion. Physical quality assessment encompasses organoleptic evaluation, uniformity, viscosity, adhesion, and spreadability. Testing for chemical quality involves pH assessment (Syam & Marini, 2020).

The decisions regarding variations in formula concentration in the lotion was determined by a study (Jayanti et al., 2021) which showed that antioxidant evaluation of Ethanol extraction of butterfly pea blossoms at concentrations of 0.05%, 0.1%, and 0.5% demonstrated very strong antioxidant properties, as indicated by the IC50 value. From the description provided, researchers transformed butterfly pea flowers into a lotion product, which subsequently underwent physical and chemical quality assessments.

METHOD

The research method employed is laboratory-based empirical investigation. Thisstudy was conducted at the Pharmaceutical Biology, Pharmaceutical Technology, and Pharmaceutical Chemistry laboratories of the Bachelor of Pharmacy Study Program, Faculty of Health Sciences, Dr. Soebandi University, Jember, between June and July 2025.

This study is descriptive and seeks to assess the physical and chemical quality of lotion formulations with various levels of butterfly pea flower extract.The population consists of lotion formulations containing different concentrations of butterflies. The samples utilized are lotion formulations featuring different extract from pea flowers.

Instruments And Supplies

Within the devices used included maceration bottles, measuring cylinders (Pyrex), Erlenmeyer flasks (Pyrex), funnels (Pyrex), filter paper, beakers (Pyrex), analytical balances, mortars, stampers, cups, stirring rods, wooden tongs, spatulas, parchment paper, plastic pots, pH meters (Hanna HI98107), spreadability testers, adhesion testers, slides, vacuum evaporators (IKA HB10 basic), glass slides, and ovens (memmert).

The supplies utilized in this research were ethanol extracts from butterfly pea flowers at concentrations of 0.05%, 0.1%, and 0.5%, 96% ethanol, distilled water

74,15gram, propylparaben 0,1gram, cetyl alcohol 5gram, stearic acid 6gram, glycerin 8gram, methylparaben 0,1gram, orange essence 0,15gram, and TEA 3gram.

Producing Ethanol Extract from Blue Pea Blooms

Extract from butterfly pea flowers is obtained through maceration. For the extraction, 300 grams of butterfly pea flower powder is blended with 1500 mL of 96% ethanol (1:5) (Cahyaningsih et al., 2019). The outcomes of maceration are strained and concentrated.

Lotion Formulation

All oil-phase components (stearic acid, lanolin, acetyl alcohol, propylparaben) are dissolved in a water bath at 65°C-75°C. The water phase components (aquadest, glycerin, triethanolamine, methylparaben) are dissolved separately at 65°C-75°C. Incorporate The water phase the mortar while mixing until an emulsion is created. The mixture was infused using butterfly pea flower extract and orange essence. The lotion mixture was subsequently placed in a container and assessed for its physical and chemical properties (Aljanah et al., 2022).

Assessment of Lotion's Physical Quality

Organoleptic evaluation

Organoleptic evaluation involves examining the lotion formulation, focusing on its color, scent, and flavor upon application to the skin.

Uniformity evaluation

A 0.1 g quantity of lotion is using butterfly pea flower extract and, subsequently spread uniformly and covered with an additional glass slide. Examine with a magnifying glass and look for large particles.

Viscosity evaluation

The viscosity of every lotion formulation was assessed using a rion viscometer with the correct spindle (spindle/rotor 1). An optimal viscosity range for lotion formulations is approximately 20-500 dPa.S (Vinaeni et al., 2022).

Adhesion evaluation

A 0.1 g portion of lotion is positioned in the middle of a glass plate and sheltered with an additional glass slide. Determine the duration required for both slides to separate from the testing apparatus, noting the adhesion time of the dosage form.

Spreadability evaluation

The spreadability test involved weighing 0.5g of the lotion formulation and positioning it at the middle of a graduated circular pane. A moment, pre-measured glass cover was positioned over the preparation, permitted to remain seated for 1 minute, and the widthof the distribution was noted. A 50g mass was positioned on the cover slip, permitted to rest for1 minute, and the width of the spread was recorded.

Extra weights were included in 50g increments until a total of 200g was attained, after which the spread diameter and area were measured.

Assessment of Lotion's Chemical Qualityis

pH

To conduct the pH test, 1 g of the lotion formulation was measured and mixed with 10 milliliters of purified water. A meter for measuring pH was subsequently employed to determine the acidity level of the lotion formulation (Syam & Marini, 2020).

RESULT AND DISCUSSION

Assessment of Lotion's Physical Quality

The extract was obtained through the process of maceration extraction, a sum of 300 grams of blue pea flowers flower powder resulted in the production of 67.2 grams of extract yielding 22.4%.The extraction yield of the final product fulfilled the standards for an adequate extract yield, which is greater than 10%. A greater yield correlates with an increased presence of the desired compounds in the starting material, like flavonoids, anthocyanins, and phenolics (Senduk et al., 2020).

Organoleptic

Organoleptic evaluation findings regarding the hue of the ethanol extract lotion formulations derived from butterfly pea flowers: F1 resulted in a pale green lotion formulation, F2 resulted in a green lotion formulation, and F3 resulted in a marginally darker shade of green. The variation in the color of the lotion arises from the level of concentration of each extract used in the formula.

The more concentrated the extract in the lotion blend, the deeper the color that is produced (Arantika & Hidayati, 2024). All formulations have the same texture or semi-solid texture and the same aroma, namely the aroma of citrus essence.

Uniformity

The outcomes of the uniformity assessment for the lotion made from butterfly pea flower extract indicated that all three lotion mixes were uniform, marked by a consistent coloration and a lack of large particles or clumps. According to the Indonesian National Standard Regulation (SNI) 16-0218-1987, consistent outcomes can lead to identical and optimal therapeutic benefits.

The uniformity assessment seeks to establish whether the lotion blends in the three formulations are mixed correctly, confirming that the primary components in the lotion are uniformly distributed (Syam & Marini, 2020).

Viscosity

Viscosity test results for Formula I showed an average viscosity of 56.3 dPa.S, Formula II an average viscosity of 58.7 dPa.S, and Formula III an average viscosity of 61.0 dPa.S. The viscosity value increased with the addition of higher concentrations of Moringa leaf extract to the lotion (Ulandari & Sugihartini, 2020). All three formulas produced viscosities that fulfilled the criteria for a good lotion viscosity, which is

between 20-500 dPa.S, according to a journal (Vinaeni et al., 2022) and grounded in theStandar Nasional Indonesia, Regulation (SNI) 16-0218-1987.

The normality test for F1 and F2 showed (Sig. 0.000 <0.05), indicating no difference. Meanwhile, the normality test for F3 showed (Sig. 1.000 >0.05), indicating a difference. Since there was no difference between the two formulations, the The Kruskal-Wallis test was performed. The outcomes of the Kruskal-Wallis test for F1, F2, and F3 showed (Asymptotic Sig. 0.26 <0.05), showing notable distinctions among the threecompositions. The Maan-Whitney test subsequently proceeded with F1 compared to F2, F1 compared to F3, and F2vs. F3, which showed (Asymptotic Sig. (2-tailed) <0.05), indicating significant differences.

Adhesion

All three formulas showed strong sticking power and passed the sticking test standards. The stickiness of a preparation depends on how thick and sticky it is. The more sticky each lotion becomes, the better it sticks, and this is because the emulgel becomes thicker (Abdullah et al., 2023).

Studies show (Syam & Marini, 2020) and follow the Indonesian National Standard (SNI) 16-0218-1987 that a good lotion sticks for more than 4 seconds. This is because the longer the adhesion, the more time the active ingredient has to go through the skin, which helps it get absorbed better. The normality test showed (Sig. The F1 value is 0.463, F2 is 0.739, and F3 is 0.122, which is greater than 0.05, showing a significant difference. So, the ANOVA test kept going, and it showed a significance value of 0.000.

Spreadability

The test to see how well the ethanol extract of butterfly pea flower lotion spreads showed an average score of 6.1 for Formulation 1, 5.7 for Formulation 2, and 5.2 for Formulation 3.

Studies by Syam and Marini in 2020, along with the Indonesian National Standard (SNI) 16-0218-1987, show that a good lotion should spread between 5 to 7 centimeters. Spreadability is inversely proportional to the viscosity. The normality test showed (Sig. F1 = 0.463, F2 = 1.000, and F3 = 0.780 >0.05), indicating a significant difference. Therefore, the ANOVA test showed (Sig. 0.004 <0.05), indicating a significant difference. Then, the post-hoc LSD test showed (Sig. <0.05) that all formulas showed significantly different spreadability values. Therefore, it can be seen that increasing the extract concentration causes the spreadability value to decrease.

Assessment of Lotion's Chemical Quality

pH

The pH analysis revealed that the pH levels measured for the three lotion formulations averaged 7.9 for F1, 7.1 for F2, and 6.7 for F3. The average pH levels suggested that as the concentration of extract increased, the pH values decreased. This happens due to the anthocyanins found in the ethanol extracted from the butterfly pea flower, which release hydrogen ions. Anthocyanin substances in plants are commonly utilized as natural indicators of pH, as seen in the butterfly pea flowers and their vividly colored petals (Santoso & Sri Mulyono, 2020).

The results of the lotion pH test were analyzed using SPSS, the normality test for F1 and F2 showed (Sig. 0.000 <0.05), indicating no difference. Meanwhile, the F3 normality test showed (Sig. 0.637 >0.05), indicating a difference. Since there was no difference between the two formulations, a Kruskal-Wallis test was conducted. The Kruskal Wallis test results for F1, F2, and F3 showed (Asymptotic Sig. 0.26 <0.05), indicating a significant difference between the three formulations. The Maan-Whitney test then continued with F1 vs. F2, F1 vs. F3, and F2 vs. F3, which showed (Asymptotic Sig. (2-tailed) <0.05), indicating a significant difference.

The results of the pH test on the lotion preparation showed that the pH value obtained met the pH standards for skin moisturizers based on the Indonesian National Standard (SNI) 16-0218-1987, which is in the range of 4.5–8.0. However, this value does not fully align with the skin's physiological pH range, which is 5.0–6.5 (Wulanawati, 2019).

CONCLUSION

Skin pH standards.Differences in the concentration of ethanol extract from butterfly pea flowers influence the physical properties of the lotion formulation, such as viscosity, spreadability, adhesive strength, and pH; however, the pH of the lotion does not align with the necessary.

ACKNOWLEDGEMENT

The author would like to express sincere gratitude to Universitas dr. Soebandi Jember for providing the facilities and permission to conduct this research.

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TABLE

Table 1. Formula for Lotion

Ingredient	Function	Composition		
		F 1	F 2	F 3
Angsana leaf extract	Active substance	0,5	1	1,5
TEA	Emulsifier	3	3	3
Asam Stearat	Emulsifier	6	6	6
Setil Alkohol	Emolien	5	5	5
Lanoline	Emolien	3	3	3

Gliserin	Humektan	8	8	8
Metil Paraben	Preservative	0,1	0,1	0,1
Propil Paraben	Preservative	0,1	0,1	0,1
Essens Jeruk	Air freshener	0,15	0,15	0,15
Aquades	Solvent	74,15	73,65	73,15

Table 2. Organoleptic

Formula	Texture	Color	Aroma
F1	Semi solid	Light Green	Orange Essence
F2	Semi solid	Green	Orange Essence
F3	Semi solid	Slightly Old Green	Orange Essence

Table 3. Uniformity

Formula	Uniformity
F1	Homogeneous
F2	Homogeneous
F3	Homogeneous

Table 4. Viscosity

Formula	Viscosity
F1	56,3±0,57
F2	58,7±0,57
F3	61,0±1,0

Table 5. Adhesion

Formula	Adhesion
F1	9,19±0,08
F2	10,14±0,11
F3	10,47±0,18

Table 6. Spreadability

Formula	Spreadability
F1	6,1±0,21
F2	5,7±0,17
F3	5,2±0,12

Table 7. pH

Formula	pH
F1	7,6±0,12
F2	7,1±0,12
F3	6,7±0,15