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Physical Evaluation Test Of Serum Facial Ethanol Extracts Of Purple Passion Fruit Peel (*Passiflora edulis* Sims)

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Abstract

A *facial serum* is a slightly viscous liquid that contains active ingredients to treat skin problems. Purple passion fruit peel extract is proven to contain flavonoids and tannins, which have antibacterial activity that causes acne. Hence, it is necessary to test the formula (F) of facial serum with the composition of ethanol extract of purple passion fruit peel, niacinamide, carboxymethylcellulose sodium, and distilled water. The concentration differences in the percentage of ethanolic extract of purple passion fruit peel were 4%, 5%, and 6%. This type of research is quantitative with a pre-experimental design. A phytochemical screening test was carried out on the presence or absence of flavonoids and tannins. Physical stability tests were carried out by organoleptic, homogeneity, pH, and viscosity tests for 30 days of storage. Data analysis was performed with a descriptive test. The phytochemical screening test on the flavonoid test was positive, and the tannins were positive. The results of the physical stability test only yielded stability until the 5th day, when the organoleptic test did not change color and smell; F1 was pale yellow, F2 was yellow, and F3 was dark yellow and had a distinctive aroma of the extract. pH test results at F1 4% (6.22-6.28), at F2 5% (5.93-6.28), and at F3 6% (5.41-5.82). In the viscosity test, F1 4% (1.833-5.667 cP), F2 5% (3.333-8.000 cP), and F3 6% (4.167-12.000 cP). The homogeneity test for the three formulas showed homogeneous results. In this study, the best formula cannot be achieved because, during stability testing for 5 days of storage, the viscosity decreased with a percentage of 67% F1, 58% F2, and 65% F3. It can be found that the facial serum preparation became liquid and unstable.

Keywords: Facial serum: purple passion fruit peel extract: Physical Stability Test: Passiflora edulis sims

Introduction

Acne vulgaris or acne is an inflammation characterized by blackheads, pustules, and papules, which usually appear on the neck, face, chest, and upper arms or back (Duru & Örsal, 2021). Acne vulgaris can be caused by the bacteria *Propionibacterium acnes*, *Corynebacterium acnes*, *Pityrosporum ovale*, and *Staphylococcus aureus*. These bacteria are bacteria that can cause inflammation, blockages, and the occurrence of acne vulgaris on the skin. Acne vulgaris can have a significant impact, both physically and psychologically, because it can cause a lack of self-confidence, anxiety, and depression for sufferers (Tyasari *et al*., 2022). So far, efforts to overcome the problem of acne vulgaris caused by *P.acnes* are by administering synthetic antibiotics such as doxycycline, tetracycline, and clindamycin. Synthetic antibiotics are given because antibiotics can kill or inhibit *P. acnes* bacteria. However, prolonged use of synthetic antibiotics can cause quite severe side effects, such as damaged organs, irritation, and resistance (Harefa *et al*., 2022).

Referring to the impact and problems caused by acne vulgaris, researchers are trying to prevent acne vulgaris, namely by making product innovations using natural raw materials that have potential as antibacterials. Natural ingredients may be developed as antibacterial among others by using the skin of purple passion fruit (*Passiflora edulis*). The antibacterial potential of purple passion fruit peel is due to secondary metabolites such as flavonoids and tannins (Anabel *et al*., 2020). The study of antibacterial activity test against *Propionibacterium acnes* bacteria conducted by Harefa *et al.* (2022) stated that the use of purple passion fruit peel extract extracted using 70% ethanol solvent with variations extract concentrations of 5%, 10%, and 15% obtained an average inhibition zone in each extract of 14.9; 15.3; 17.2mm. Based on research, Nugraha *et al.* (2019) investigated the antibacterial activity test of 96% ethanol extract of purple passion fruit peel against Staphylococcus aureus bacteria with extract concentrations of 5%, 7.5%, and 10%. The results obtained inhibition zone diameters of 11.43, 12.37, and 14.2 mm. Based on this background, researchers are interested in making a facial serum formulation using the ethanol extract of purple passion fruit peel as the active substance with concentrations of F1 4%, F2 5%, and F3 6% and knowing the physical characteristics of each formula.

Methods

This study used a pre-experimental design with a descriptive analysis method. This research was conducted at the Pharmaceutical Technology Laboratory, and the phytochemical screening test for flavonoids and phenols was carried out at the Phytochemical Laboratory.of STIKes Mitra Keluarga Bekasi in February-March 2023. The population and sample in this study are purple passion fruit peel (*Passiflora edulis* Sism), which was from a supplier of extracts from

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Palapa Muda Perkasa, Depok. The variable in this study was the independent variable. The independent variables in this study were organoleptic, pH, homogeneity, viscosity, and phytochemical screening.

Plant determination was performed at Bogorinse Herbarium, BRIN Cibinong. Purple passion fruit peel was extracted using the maceration method. 1531 g of purple passion fruit peel simplicia powder was macerated by soaking it in 5 L of 96% ethanol. The powder was soaked for 3 days at room temperature (25-30°C). Further, the extract was filtered. The filtrate obtained from the maceration process was then concentrated with a rotary evaporator at a temperature of 40°C to remove unwanted solvents to obtain 125.3 g of thick purple passion fruit peel extract. The flavonoid test was carried out by putting ethanol extract of purple passion fruit peel, then putting it in a test tube, adding sufficient pieces of Mg band, and adding a few drops of concentrated HCl solution. Positive test results from the flavonoid test will produce red, yellow, or orange. The Tanin test was carried out by putting 5 ml of ethanol extract of purple passion fruit peel into a test tube and then adding a few drops of $FeCl_3$ solution. The result will show a black-green color if the sample is positive tannin.

The preparation was carried out by taking 100mL of aquadest and putting it in a beaker, then heating it using a hot plate until the temperature reaches 90, then putting 2 g of CMC-Na into the beaker glass, adding the aquadest little by little stir using a mixer until a serum base is formed (mixture 1), then dissolve 2 g of niacinamide with 10 mL of aquadest separately (mixture 2), after that slowly add mixture 2 into mixture 1 little by little, finally add 4, 5, and 6 grams of purple passion fruit peel ethanol extract into a beaker glass, stir until evenly distributed then add aquadest ad 100 ml (Ariyanti *et al*., 2020). The formulation of Fase Serum can be seen in table 1.

Table 1. Face Serum Formulation

Material	Face Serum Formula (%)			Function
	F1	F2	F3	
Purple Passion Fruit Pell Extract	4	5	6	Active ingridient
Ni Niacinamide	2	2	2	Active Substance
CMC-NA	2	2	2	Gelling Agent
Aquadest Ad (mL)	100	100	100	Solvent

Facial Serum evaluation tests include organoleptic tests, pH tests, viscosity tests, and homogeneity tests. The organoleptic test was carried out by observing the color and aroma of the face serum, which was stored at room temperature (25±2°C) for 30 days. The pH test is done by dipping the calibrated pH meter into the face serum mixture. After that, read the pH value present in the pH meter indicator. The purpose of the pH test is to see the acidity level of facial serum so it can guarantee the safety of the product when applied to the skin. Homogeneity tests are done by dripping the facial serum onto the surface of a glass, flattening it, and then feeling if there are still rough particles. A homogeneous facial serum is when there are no more rough particles inside the mixture. Viscosity tests are performed by dipping most parts of the spindle connected to the viscometer. The purpose of this test is to look at the viscosity level of the facial serum so it can determine whether the facial serum viscosity goes into a good viscosity range.

Results and Discussions

The results of the research on the formulation of face serum purple passion fruit peel extract consist of determination, phytochemical screening, and physical stability test. The result of physical stability tests includes organoleptic, pH, viscosity, and homogeneity tests. Determination of plants in this study was carried out at the Herbarium Bogoriense, Botany Field, Research Center for Biology BRIN, Cibinong. The results of the determination confirmed that the sample of the type of Passiflora edulis Sims in the family of Passifloraceae. Based on the results of phytochemical screening, it can be seen that the flavonoid test and tannin test showed positive results. There is no best formula because the face serum is only stable for 5 days within the requirements of 30 days of storage. The organoleptic test result can be seen in **Table 2.**

Table 2. Face Serum Organoleptic Results

Formula	Color	Aroma
F1	Pale Yellow	Aromatic Extract
F2	Yellow	Aromatic Extract
F3	Dark Yellow	Aromatic Extract

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The viscosity test is carried out to see whether the viscosity level of a facial serum preparation has entered the required range, namely 3,000-50,000 cP. The viscosity test on F1 4%, F2 5%, and F3 6% showed instability on the fifth day. The results of the facial serum viscosity test can be seen in **Table 3.**

Table 3. Viscosity tests

Day	Viskosity (Cp)		
	F1	F2	F3
	Average ± SD	Average ± SD	Average ± SD
0	5.667 ± 289	8.000 ± 500	12.000 ± 500
2	3.333 ±289	4.833 ± 764	5.833 ± 289
5	1.833 ± 289	3.333 ± 289	4.167 ± 289

All formulas enter the pH range of the skin. The results of the purple passion fruit peel facial serum pH test are shown in **Table 4.**

Table 4. pH tests

Day	pH		
	F1	F2	F3
	Average ± SD	Average ± SD	Average ± SD
0	5.667 ± 289	8.000 ± 500	12.000 ± 500
2	3.333 ±289	4.833 ± 764	5.833 ± 289
5	1.833 ± 289	3.333 ± 289	4.167 ± 289

The results of homogeneity showed that all formulas are homogeneous. The result of our facial serum homogeneity test can be seen in **Table 5.**

Table 5. Homogeneity tests

	Day-1	**Day-15**
F1	Homogeneous (no rough particles)	Homogeneous (no rough particles)
F2	Homogeneous (no rough particles)	Homogeneous (no rough particles)
F3	Homogeneous (no rough particles)	Homogeneous (no rough particles)

Formulation research and evaluation of purple passion fruit peel (*Passiflora edulis* Sims) ethanol extract facial serum with variations in concentrations of purple passion fruit peel ethanol extract aims to obtain the best formula in terms of physical stability of the formulated facial serum. This research was carried out in several stages, which are purple passion fruit peel preparation, purple passion fruit extraction, phytochemical screening of purple passion fruit peel extract, formulation, and evaluation of facial serum. The evaluations are organoleptic test, pH test, Viscosity test, and homogeneity test. Extraction of purple passion fruit peel was carried out with maceration method with 96% ethanol as a solvent. The maceration method was chosen because of the blending method; the tools used are simple, and this method is an extraction located suitable for the active substance contained in strawberry fruit that is not resistant to high heat (Handoyo, 2020). The 96% ethanol solvent is chosen because it has the same polarity as the active substance contained in purple passion fruit peel.

Phytochemical screening is the initial stage to provide an overview of the compounds contained in the plant. In this study, phytochemical screening was carried out on the active compounds contained in purple passion fruit peel, which are flavonoids and tannin. The flavonoid test was performed by adding concentrated Magnesium (Mg) and HCl bands to the reaction tubes already available. The addition of concentrated HCl and Magnesium (Mg) bands aims to reduce the benzopyran core present in the structure of flavonoids so that flavilium salts form and undergo discoloration (Dewi *et al*., 2021). The positive result of flavonoids is the formation of yellow, red, or orange. In this test, the color of the sample changed from pale yellow to concentrated yellow, indicating that the sample of purple passion fruit skin ethanol extract contained flavonoid compounds. Tannin testing is performed by adding a 10% FeCl solution. In accordance with previous studies, the positive results of the tannin test will be marked with blackish green (Wahid & Safwan, 2020). The working mechanism of the tannin test reaction using a 10% FeCl3 reagent is that when a 10% FeCl3 is added, the sample containing tannin forms a complex Fe3+-tannin with a coordination bond, resulting in a blackish-green change as a sign of the phenol group contained in the sample (Yanti & Vera, 2019).

The results of the obtained viscosity measurements are known that in each formulation, it decreases with storage for 5 days at room temperature. The decrease in viscosity as storage time progresses can also be due to mixing factors using mixers with too large rpm since CMC-Na is a gelling agent with pseudoplastic flow properties. This pseudoplastic flow property has a property that, as the shear rate increases, decreases the viscosity of the gel (Ramadhani *et al*., 2022). In addition, additional factors, such as suspending agents, have a considerable influence on viscosity. Suspending agents such as PGA are used because they can increase the stability of the preparation by increasing the viscosity of a

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preparation. Research conducted by Wijaya and Lina (2021) proved that using PGA as a suspending agent results in good quality properties and viscosity values after 4 weeks of storage despite a decrease but not very significant and still falls under the requirements.

Another factor that can cause a decrease in viscosity is the storage factor. In this study, the preparation of facial serum was not kept in an airtight container and thus affected the viscosity of the facial serum. Facial serum stored in airtight containers will reduce the inflow of air from the outside, which can lead to increased gel moisture in the facial serum (Rinaldi *et al.*, 2021). Organoleptic test results of facial serum, F1 produced pale yellow facial serum with aromas of extract. F2 produced yellow with aromas of extract. Furthermore, F3 produced dark yellow facial serum with aromas of extract. The difference in color in F3 6% is darker in yellow compared to F1 4% and F2 4%. The difference in pale yellow to dark yellow color due to the increasing number of extracts used will result in a darker color serum (Iskandar *et al*., 2021). This is in line with the research done by Raharjeng *et al.* (2021), where the study used a variation in extract concentration of 5%, 10%, and 15%, producing a more concentrated color if the extract concentration was more excellent.

pH results of facial serum showed that pH values remained in the range of 4.5–6.5 after 5 days of storage. Based on the results of the tests, the preparation of the facial serum at the time of the stability test at room temperature showed an increase and decrease in pH during 5 days of storage. The increase and decrease in facial serum pH is attributed to environmental factors, such as poor storage and unstable room temperature, that can change the intake condition to slightly acidic but still fall within the skin pH requirements (Ariyanti *et al*., 2020). Another factor that can cause a decrease in the pH of each formulation is the release of hydrogen ions or ion contamination in a 5-day stored serum (Raharjeng *et al*., 2021).

Homogeneity results Facial serum homogeneity testing is carried out to determine whether or not the active ingredients and excipients are evenly mixed so that each part of the preparation contains the same amount of active substances and excipients. Based on the results of a 5-day homogeneity test at room temperature indicating that all three formulations did not show any rough grains when applied to the object glass, this indicates that the facial serum preparation of purple marquis fruit skin extract had homogeneous results. The results have met the homogeneity requirements, namely that the gel preparation does not have rough grains or clumps in the preparation following SNI requirement No. 1. 06–2588 (Putri *et al*., 2019).

Conclusions

The facial serum preparation stability test at F1 4%, F2 5%, and F3 6% was conducted for 30 days, but on the 5th day of the test, there was a decrease in the 5th day in F1 4% by 67%, F2 5% by 58% and F3 6% by 65%, where on the 5th day the texture became liquid. Thus the preparation formulation test results in physical instability on the 5th day so that this preparation has no potential to be developed into a product of perfarmacy innovation. The suggestions from this study, the formula F1 4%, F2 5%, and F3 6% had unstable physical stability, therefore it is recommended to reformulate facial serum preparations with the addition of other additional ingredients such as suspending agents so that they can produce good physical stability.

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