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Physical quality test of jamblang fruit ethanol extract antioxidant cream (Syzygium cumini (l.) Skeels)

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ABSTRACT

Background: Antioxidants are compounds that can protect against oxidative stress caused by free radicals, both from inside the body (endogenous) and outside (exogenous). Many plants have antioxidant properties, including gambling (Syzygium cumini (L.) Skeels). This plant is known to have various bioactive components that can capture and neutralize free radicals; Jamblang fruit has antioxidant activity caused by the content of flavonoid compounds in it. These compounds can be utilized as topical preparations for skin care products.

Objective: This study aims to determine the effect of ethanol extract concentration of jamblang fruit (Syzygium cumini (L.) Skeels) on the physical stability of the cream.

Methods: This research is conducted in an experimental laboratory. Jamblang fruit extract was obtained using the maceration method using 96% ethanol. The extract was then formulated in the form of a m/a type cream preparation with concentration variations of 1% (FI), 2% (F2), and 3% (F3). The physical stability test of the cream includes viscosity, spread, adhesion, and pH value tests. The data is analyzed to determine the effect of adding extracts and the storage time on the physical stability of the cream.

Results: The test showed that an increase in the concentration of ethanol extract from jamblang fruit led to a decrease in pH value, viscosity value, and adhesion and could increase dispersion. It was concluded that the variation in the concentration of ethanol extract from jamblang fruit influenced the physical properties of M/A cream.

Conclusion: It can be concluded that the variation in the concentration of ethanol extract of jamblang fruit affects the physical properties of the oil cream in water (M/A). The effects caused include a decrease in pH value, a reduction in viscosity, a decrease in adhesion, and an increase in dispersion. These changes will ultimately affect the physical stability of the cream preparation.

Keywords: jamblang fruit, M/A cream, physical properties.

INTRODUCTION

Antioxidants are molecules that can slow down or prevent the oxidation process. Oxidation is a chemical reaction that can produce free radicals. Continuous exposure to free radicals such as sunlight, air pollution, drugs, and cigarette smoke will cause the skin to appear dry and dull, skin lesions, and premature ageing (Thevamirtha *et al.*, 2023). Jamblang fruit, as an antioxidant, has many benefits for body health, especially in fighting free radicals that can cause cell damage. Jamblang fruit is known to have relatively high antioxidant activity, with an activity level of 53.8% or around 139-145 mg/100g (Rauf *et al.*, 2021). This antioxidant content makes jamblang useful in supporting body health, including in preventing various diseases caused by oxidative stress (Mahindrakar and Rathod, 2020).

Antioxidants themselves have an essential role in health. Namely, they can prevent and treat degenerative diseases like diabetes and cancer. This is because of the content of anthocyanins, a good source of antioxidants for the body. Flavonoids, tannins, polyphenols, vitamin C, vitamin E, and carotenoids are a group of compounds from natural ingredients that have the potential to be antioxidants (Mandal *et al.*, 2023). Plants that contain these compounds are widely formulated as natural antioxidants. These compounds can be used in oral preparations, such as vitamins and topical preparations for skin care (Widyastuti and Hilaliyati, 2021). Topical formulations of ineffective creams can deliver antioxidants into the skin to protect cells from free radical attacks (Rahayu, Monica and Yulinda Cesa, 2023). Cream is a semi-solid preparation containing one or more dissolved or dispersed medicinal ingredients in a suitable base ingredient (Lumentut, Edi and Rumondor, 2020). The advantages of cream preparations include that they are easier to apply, comfortable to use, non-sticky and easy to wash with water (Ariem, Yamlean and Lebang, 2020). Compared to ointments, gels and pastes, it can penetrate the skin at high speed and comfort in long-term use (Akmal, Tanjung and Afrizki, 2023).

Cream is an emulsion in which one type is oil in water (Aini, Tiadeka and Naimah, 2024). So, in its manufacture, an emulator is needed (Zam Zam and Musdalifah, 2022). The selection of an emulator is an essential consideration in manufacturing cream preparations because it will play a role in forming a suitable emulsion and a stable cream preparation. One of the conditions that must be met for a good cream preparation is that it is physically and chemically stable. Based on the above, it is necessary to research to make a cream preparation of jamblang fruit extract that meets the physical requirements and stability of the cream (Putriana Rahman, . and H, 2022).

Jamblang fruit (Syzygium cumini (L.) Skeels), also known as duvet or guava, is widely found in Indonesia. This fruit is well-known for its content of active compounds, including flavonoids, tannins, and anthocyanins, which have potential as antioxidants (Hidayah *et al.*, 2022). Antioxidants protect the body from oxidative damage caused by free radicals, which can lead to various degenerative diseases such as cancer and heart disease (Chaudhary *et al.*, 2023). Ethanol extract from jamblang fruit has been tested and shown significant antioxidant activity, making it an attractive ingredient for the formulation of cosmetic products such as creams. Antioxidant creams based on jamblang fruit extract can protect skin from free radical damage and premature ageing. The physical quality test of the cream is an essential step in ensuring that the product has quality that meets the standards in terms of stability, homogeneity, viscosity, pH, and other physical parameters. These tests aim to ensure the safety and effectiveness of the product and ensure user comfort and satisfaction in daily use (Alves *et al.*, 2021). This study will add knowledge and as reference material for future research on the effect of 1%, 2% and 3% ethanol extracts of jamblang fruit (Syzygium cumini (L.) SKEELS) on the physical stability of the cream. The study results are expected to be helpful information for students about the ethanol extract of jamblang fruit (Syzygium cumini (L.) SKEELS) on the physical stability of the cream, as information material for future authors who have the same study and become information material in developing science. This study aims to determine the effect of ethanol extract concentration of jamblang fruit (Syzygium cumini (L.) SKEELS) on the physical stability of the cream.

RESEARCH METHODOLOGY

Type of Research

This research is a type of research that is conducted in an experimental laboratory.

Location and Time of Research

This research was conducted at the Karsa Polytechnic Laboratory and the Makassar College of Pharmaceutical Sciences from May to July 2024

Population and Sample

The population of this study is Jamblang Fruit (Syzigium cumini) (L.) Skeels. The sample used was jamblang fruit (Syzigium cumini) (L.) Skeels) collected from Biringkanaya District, Makassar, South Sulawesi Province.

Tools and materials used

The tools used in this study were porcelain cups, hot plates (Maspion 5.304), pH meters (Laqua), pH meters (Sartorius), analytical scales (Henherr JGS-K), ultrapure homogenizers (Wisd HS-5-A), a set of extraction tools, a set of glass tools (Pyrex Iwaki) and a Brookfield viscometer. The materials used in this study are aquadest, cetyl alcohol, dmdm hydantoin, ethanol 96%, FeCl3, concentrated HCl, and liquid paraffin. The sample used was jamblang fruit (Syzigium cumini) (L.) SKEELS) collected from Biringkanaya District, Makassar, South Sulawesi Province.

Extract Manufacturing

Simplisia of jamblang fruit (Syzygium cumini L.) is 500 grams. Then, it is macerated using 96% ethanol. After that, it is filtered with filter paper to separate the residue and filtrate. Roses maceration is carried out for three days, then filtered. The process was repeated in three replications. The filtrate obtained is then evaporated using a vacuum rotary evaporator at a temperature of 500C to produce a viscous extract.

Cream making

Each ingredient in the oil and water phases is heated sequentially in a dish until it reaches a temperature of 70°C, according to the melting rate of each. After melting, the water and oil phases are mixed, and the mixture is stirred using a hot mortar until it forms a creamy mass. After the formation of the cream mass, the active substance is added gradually and stirred until homogeneous.

Evaluation of the physical stability of cream supplies

The cream obtained is stored at a temperature of 25°C-30°C and tested for its physical stability, including organoleptic parameters, homogeneity, viscosity, flow type, spreadability, adhesion, pH, and the kind of cream during storage.

Data analysis

The normality analysis of the stability data of the ethanol extract cream of jamblang fruit was carried out by the Shapiro-Wilk test at a confidence level of 95%. If the p-value > 0.05, the distributed data is average; If the p-value < 0.05, the data is not normally distributed. Average undistributed data was tested with the Wilcoxon test, while average data was followed by the Paired Samples Test (p-value < 0.05 showed significant differences between formulas). Organoleptic, homogeneity, and cream-type analyses were performed descriptively. This should include the exact method of observation or experiment. Mathematical and statistical methods must be mentioned, and any general computer package must be specified.

RESULT

The evaluation of the physical properties of cream preparations aims to determine the physical properties of good cream preparations, namely semi-solid and not rancid odor. The evaluations carried out include organoleptic test, homogeneity test, pH test, dispersion test, adhesion test, cream type test, viscosity test and flow type.

Table 1. Results of organoleptic observations, homogeneity, pH measurement, and viscosity testing of the cream of ethanol extract of jamblang fruit

Formula	Observation					
	Before Storage			After Storage		
	Colour	Construction	Consistency	Colour	Construction	Consistency
F0	White Milk	Special Cream	Semi-solid	White Milk	Special Cream	Semi-solid
1	Light green	Special Extract	Semi-solid	Light green	Special Extract	Semi-solid
F2	Green	Special Extract	Semi-solid	Green	Special Extract	Semi-solid
F3	Deep green	Special Extract	Semi-solid	Deep green	Special Extract	Semi-solid

Formula	Observation	
	Before Storage	After Storage
F0	Homogeneous	Homogeneous
F1	Homogeneous	Homogeneous
F2	Homogeneous	Homogeneous
F3	Homogeneous	Homogeneous

Formula	Observation	
	Before Storage	After Storage
F0	6,39	7,27
F1	4,65	5,14
F2	4,50	4,93
F3	4,01	4,83

Based on Table 1, the results of organoleptic observations show that F0, F1, F2, and F3 did not experience any changes in consistency, colour, or aroma from the beginning of manufacture to storage for four weeks. This indicates that the cream preparations are physically stable during that storage period. The test results show that the cream on F0, F1, F2, and F3 has a homogeneous arrangement and does not contain coarse grains. This corresponds to the homogeneity requirements, where the cream must have a uniform structure without coarse particles. The pH value comparison analysis results showed a $p > 0.05$, indicating that the data was normally distributed. Therefore, a parametric Paired Samples Test was performed, which showed a significant decrease in pH in the F0 (base) formula compared to F1, F2, and F3 ($p < 0.05$), which means that the addition of the extract affects the pH value. However, there was no significant difference between F1, F2 and F3 and between F2 and F3 ($p > 0.05$), indicating that adding extracts had no significant effect on the pH values between the formulas. This shows that the storage time does not significantly affect the pH value at F0, F1, F2, and F3 (significance > 0.05).

Table 2. Results of pH, viscosity, and dispersion measurement

Formula	Observation	
	Before Storage	After Storage
F0	6,39	7,27
F1	4,65	5,14
F2	4,50	4,93
F3	4,01	4,83

Formula	Observation (Cps)	
	Before Storage	After Storage
F0	46,000	40,000
F1	37,657	30,000
F2	30,657	24,667
F3	23,000	21,333

Formula	Observation (cm)

	Before Storage	After Storage
F0	4.6	4.8
F1	5.54	5.85
F2	5.59	5.88
F3	5.90	6.24

Based on table 2. The pH value comparison analysis results showed a $p > 0.05$, indicating that the data was normally distributed. Therefore, a parametric Paired Samples Test was performed, which showed a significant decrease in pH in the F0 (base) formula compared to F1, F2, and F3 ($p < 0.05$), which means that the addition of the extract affects the pH value. However, there was no significant difference between F1, F2 and F3 and between F2 and F3 ($p > 0.05$), indicating that adding extracts had no significant effect on the pH values between the formulas. This shows that the storage time does not significantly affect the pH value at F0, F1, F2, and F3 (significance > 0.05). The results of the viscosity analysis showed average distributed data ($p > 0.05$), so it was continued with the Paired Samples Test. Before storage, there was a significant decrease in viscosity at F0 with F2 and F3, as well as F1 with F3 and F2 with F3 ($p < 0.05$), indicating the effect of adding extracts. However, there was no significant difference between F0 and F1, as well as F1 and F2 ($p > 0.05$). After storage, viscosity drops also differ between formulas. The analysis results showed that the storage time did not significantly affect the viscosity values at F0, F1, F2, and F3 (significance > 0.05).

Table 3. Adhesion test results, cream type

Formula	Observation (second)	
	Before Storage	After Storage
F0	02,23	01,61
F1	1,15	0,80
F2	0,80	0,70
F3	0,75	0,71

Formula	Observation			
	Before Storage		After Storage	
	A/M	M/A	A/M	M/A
F0		√		√
F1		√		√
F2		√		√
F3		√		√

Ket: F0: Cream formula as a negative control (base)
F1 : Concentration of jamblang fruit extract 1%
F2 : Concentration of jamblang fruit extract 2%
F3 : Concentration of jamblang fruit extract 3 %

The results of adhesion analysis showed average distributed data ($p > 0.05$). Therefore, a parametric Paired Samples Test was carried out. The results showed a significant decrease in adhesion between F0 (base) and F1, F2, and F3, and F1 with F3 ($p < 0.05$), indicating the influence of the addition of extracts. However, there was no significant difference between F1 and F2 and F2 and F3 ($p > 0.05$), indicating no effect of adding extracts on these formulas. The analysis results showed that the storage time did not significantly affect adhesion in F0, F1, F2, and F3 (significance > 0.05).

DISCUSSION

Researchers revealed that variations in the concentration of ethanol extract from jamblang fruit influence the physical properties of M/A cream. Using Jamblang fruit samples refers to research (Abriyani *et al.*, 2023). Jamblang fruit is rich in anthocyanins, which have high antioxidant power. Antioxidant compounds produced by plants are mainly in the form of phenolic compounds and flavonoids. And in line with research. Where acetyl acetate extract containing alkaloid and terpenoid secondary metabolite compounds has better antioxidant activity than

ethanol and n-hexane extracts with an IC50 value of 1754.10, this is used as a reference for the formulation of cream preparations (Setyawati, Nurasmi and Irnawati, 2021). The organoleptic test of cream preparations is carried out by observing visual and sensory characteristics, namely the cream's colour, smell, and shape (Lubis *et al.*, 2023). This test aims to ensure that the resulting cream has a soft or soft texture, a pleasant smell for the user, and an aesthetically appealing colour. A good organoleptic result indicates that the cream is fit to use and meets quality standards regarding appearance and aroma. In F0, F1, F2 and F3, in line with the research, there is no change in the consistency of shape, colour, scent or smell from the beginning of manufacture to during storage (Guo, Zhang and Devahastin, 2021).

This homogeneity test aims to evaluate the homogeneity of cream preparations to observe whether the active substances are evenly mixed with the primary and additional components during manufacturing. The goal is to ensure a uniform distribution of all ingredients in the cream preparation so that the quality and effectiveness of the product remain consistent. The test results showed that the cream had a homogeneous arrangement with no coarse grains in all formulas (F0, F1, F2, and F3). This corresponds to the homogeneity requirement, where the cream must have a uniform texture and be free of coarse particles (Yuliana *et al.*, 2023).

The pH test is a procedure carried out to determine the degree of acidity or alkalinity of a cream preparation; this test is essential because a pH not by the standard can affect the product's stability and the comfort and safety of its use on the skin. Products with a pH that is too low (acidic) or too high (alkaline) can damage the skin's natural protective layer. The pH of normal human skin ranges from 4.5 to 6.5. The pH test results of the cream of ethanol extract of jamblang fruit before storage are between pH 4.01 - 4.65 and after storage are between pH 4.83 – 5.14; this is what is expected because the pH range of topical preparations should have a pH range of 4.5-8.0. Except for (F3), it can cause skin irritation when used. While the pH test results on the M/A cream of jamblang fruit ethanol extract in the baseless formula are at the highest pH, this is because the jamblang fruit ethanol extract contains flavonoid compounds, which are the largest group of phenolic compounds that are slightly acidic, the increase in pH during storage is likely due to the influence of temperature.

A viscosity test is carried out to measure the viscosity of the cream preparation that has been formulated. Viscosity is one of the critical parameters that affect the characteristics of the cream, including the comfort of application, spread on the skin, and the stability of the product (Witanti and Endriyatno, 2024). The viscosity of a good cream ranges from 2000-50000 cps. A suitable viscosity range also affects the comfort of use, the stability of the formulation, and the effectiveness of its active ingredients. Viscosity test results on the jamblang fruit cream formula the viscosity test results of the cream show that before storage, the viscosity ranges from 23,000-37,657 cP (centipoise), and after storage, it decreases to between 21,333-30,000 cP. These results still meet the viscosity requirements expected for cream preparations. In addition, these results show a decrease in viscosity and an increase in the concentration of ethanol extract from jamblang fruit. This decrease in viscosity can be caused by the interaction of the extract's active components with the base of the cream, which affects its structure and consistency (Latif, Sugihartini and Guntarti, 2021).

When applied, the spreadability test evaluates the cream's ability to spread on the skin. Good spreading power makes it easy to apply the cream, ensures that the cream can be easily flattened, and provides comfort when used on the skin. According to SNI 1996, the spreadability requirement for topical preparations is 5-7 cm. The results of the cream spreadability test before storage ranged from 5.5-5.9 and, after storage, 5.8-6.2, and it was found that the four formulas met the requirements of the spreadability test. At F3, the highest spreadability value was obtained. The results of the dispersion test of jamblang fruit ethanol extract cream showed that the increase in the concentration of the extract was directly proportional to the increase in dispersion. This is related to a decrease in the viscosity of the cream, which is observed along with an increase in the concentration of the extract. Since the spreadability of creams is closely related to viscosity,

creams with lower viscosity tend to have greater spreadability. With low viscosity, the cream becomes more accessible to flow and spreads evenly over the skin's surface, allowing for wider spreads with less pressure. The study results show that jamblang fruit cream preparations have good spreadability. This shows that the cream is easy to apply and spreads evenly on the skin to increase the effectiveness of use and comfort (Anggara, Fauziyah and Ilmi, 2021).

The adhesion test determines the cream's ability to stick to the skin after application. Good adhesion to topical preparations is essential so that the drug can stick longer and does not come off quickly. The ideal adhesion requirement for topical preparations is more than 4 seconds. The adhesion test results of the cream of ethanol extract of jamblang fruit showed that the cream sequence with the longest adhesion was F0, followed by F1, F2, and F3. The adhesion of each formula has decreased along with the increase in the concentration of ethanol extract from Jamblang fruit. This is likely due to a decrease in the viscosity of the cream, which results in the cream becoming less sticky and detaching faster from the skin's surface. According to the study results, A decrease in viscosity affects adhesion, whereas lower viscosity causes the adhesion time to be faster. The cream type test aims to identify the type of cream in the preparation and whether it belongs to the oil category in water (M/A) or oil (A/M). This test ensures that the cream has a structure and consistency that matches the desired formulation. The test results showed that the type of cream obtained was an oil-in-water (M/A). This means that the oil is dispersed in the water phase, which usually results in a cream with a light consistency and is easily absorbed by the skin (Tungadi, Sy. Pakaya and D.as'ali, 2023).

CONCLUSION

Based on the study, it can be concluded that the variation in the concentration of ethanol extract of jamblang fruit affects the physical properties of the oil cream in water (M/A). The effects caused include a decrease in pH value, a reduction in viscosity, a decrease in adhesion, and an increase in dispersion. These changes will ultimately affect the physical stability of the cream preparation. Conducting a solution test on antioxidant cream preparations is necessary to determine the release of active substances from the preparation base. An irritation test on the skin is required to determine whether irritation occurs after the cream preparation is applied. The use of Jamblang fruit extract as an active ingredient in the formulation of antioxidant creams opens opportunities for the development of safe and effective natural ingredient-based cosmetic products.

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Conflict of Interest

none

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