

FORMULATION AND STABILITY TEST OF OINTMENTS FROM PURSLANE LEAF EXTRACT (*Portulaca oleraceae*)

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A B S T R A C T

Purslane (*Portulaca oleracea*) is a plant that has many benefits and useful content. The purpose of this study is to find out the formulation of ointment preparations from purslane leaves (*Portulaca oleracea*). This study is to determine the physical stability of ointment preparations from purslane leaf exta (*Portulaca oleracea*) which can be seen from organoleptic tests, pH tests, dispersibility tests and homogeneity tests. The method used to test the stability of the ointment is the freeze-thaw cycle method. This method is used to evaluate the stability of ointment preparations by means that ointment preparations are stored at 4°C for 24 hours and then placed at 40°C for 24 hours during which storage of the two temperatures is considered one cycle. The test was carried out for 6 cycles, the parameters of the test included organoleptic, homogeneity, pH, and dispersibility Based on the results of the study, all formulations of purslane leaf ointment (*Portulaca oleracea*) with concentrations of 10% (FI), 15% (FII), and 20% (FIII) showed physical characteristics that met the quality criteria of topical preparations.

INTRODUCTION

The use of plants as medicinal ingredients is being promoted in Indonesia. The use of traditional medicine in the community has been going on for a long time from generation to generation. Indonesia has many types of plants that can be used as a source of medicinal ingredients. Wild plants that grow freely around the yard or in the garden can even be used as medicine (Parwanto *et al.*, 2013). The use of plants in the pharmaceutical field is currently being encouraged. Research on several plants has been conducted, one of which is purslane herb (*Portulaca oleracea* L) which has been proven to have antibacterial efficacy due to its flavonoid content (Artini, 2022).

Wounds are very susceptible to the presence of bacteria, therefore one of the ways to heal wounds is by inhibiting the growth of bacteria. So that the wound closure process does not take long (Fauziah *et al.*, 2019).

Purslane (*Portulaca oleracea*) is a plant that is traditionally used as a processed food and ornamental plant. The results of the latest study show that purslane has strong antibacterial activity so it can be developed for testing wound healing activity related to its flavonoid content (Source) *et al.*, 2021).

In previous research on purslane leaves, antibacterial activity tests have been carried out Purslane herbal ethanol extracts produced from various extraction methods, such as percolation, soklet and reflux maceration, have been proven to have significant antibacterial activity. Tests were conducted on extracts concentrations of 20, 25, 30, and 35% and the results showed that the extracts were able to inhibit the growth of various types of test bacteria. The antibacterial activity found in purslane herbal ethanol extract provides an indication of the plant's potential as a natural antibacterial agent that can be further developed (S. M. Sari *et al.*, 2021).

The results of the phytochemical profile test of the content of purslane herbal extract qualitatively, showed the antibacterial activity of purslane herbal extract that purslane herbal extract contains flavonoid saponins, and tannins (Judha Karlina *et al.*, 2013).

The preparation of ointment from purslane leaves (*Portulaca oleracea*) is based on the potential content of active compounds that the plant has, such as flavonoids, alkaloids, saponins and omega-3 fatty acids, which are known to have anti-inflammatory, antibacterial and antioxidant activity Purslane leaves have traditionally been used to treat various skin disorders such as minor wounds, itching and irritation. By making it in the form of an ointment, the active compounds from purslane leaves can be more easily applied directly to the affected areas of the skin, thus speeding up the healing process locally. In addition, the form of the ointment allows the active ingredient to last longer on the surface of the skin due to its semi-dense and occlusive consistency thus increasing its therapeutic effectiveness.

METHOD

Research Design

The research was carried out through a series of experiments/observations in the laboratory starting with the extraction of purslane leaves using ethanol solvents, followed by the formulation of the extract into an ointment. Stability tests will be carried out by storing the ointment under different conditions to monitor its physical changes such as organoleptic tests, homogeneity tests, dispersion tests and pH tests.

Research Time and Place

The time for this research is scheduled to take place from July to August by considering the stages of preparation, data collection, and analysis needed, so that the entire research process can run systematically. This research will be carried out in two locations, namely the Baubau Polytechnic Pharmacy Laboratory and the Bina Husada Campus. The selection of the two locations was carried out because both support research needs, both in terms of laboratory facilities and academic environment.

Tools and Materials

The tools used in this study are analytical scales, porcelain cups, measuring cups, glass beaker, transparent glass, pH sticks, containers, spatulas, hot plates, electric ovens, stirring rods, tube clamps, watch glass, sudip, aluminum foil and lumpang and pestle.

The materials used in this study include purslane leaves (*Portulaca oleraceae*), Vaseline album, adeps lanae, aquadest, 70% ethanol.

Sampling

Purslane leaves (*Portulaca oleraceae*) used as samples in the study were obtained from the top stones.

Working Procedure

Sample Preparation.

The sample used is 2 kg purslane leaves, the sample will be taken in the upper rock area. First it is separated from the stalk, after being separated from the stalk, then washed with clean water (running water), then the sample is dried by aerating the midian dioven using an electric oven. After the sample is dry, then the sample is blended, 70% ethanol is added, then put into a glass jar for 3-5 days.

Purslane Leaf Extraction (*Portulaca oleraceae*)

Purslane leaf simplicia (*Portulaca oleraceae*) that has been left for 3-5 days is then filtered using filter paper and the filtrate is taken. Then the filtrate obtained is concentrated with an evaporator until a thick extract is obtained from purslane leaf samples (*Portulaca oleraceae*).

Purslane Leaf Extract Formulation (*portulaca oleraceae*)

Table 1. Formulation of ointment preparations from purslane leaves (*Portulaca oleraceae*)

Yes	Formula	Concentration (%)			Function
		Formulation I (10%)	Formulation II (15%)	Formulation III (20%)	
1	Purslane leaf extract (<i>portulaca oleraceae</i>) (gram)	2	3	4	Active substances
2		2,97	2,805	2,64	Emollients and emulsifiers
3	Adeps lanae (gram)	16,83	15,895	14,96	Occlusive/emollient base material
	Vaseline albums (grams)	20	20	20	
	M.f ointment (gram)				

Information

- FI : Formulation of purslane leaf ointment preparation with a concentration of 10%.
FII : Formulation of purslane leaf ointment with a concentration of 15%.
FIII : Formulation of purslane leaf ointment preparation with a concentration of 20%.

Preparation of ointment from purslane leaves (*Portulaca oleraceae*)

The preparation of ointment is done by melting album vaseline and adeps lanae until evenly mixed. After the two basic ingredients are completely melted, the mixture is transferred to a pond, then purslane leaf extract (*Portulaca oleraceae*) is gradually added while continuing to stir until evenly and homogeneously. After the mixing process is complete, the formed ointment is put in a clean pot of ointment. In this study, the ointment formulation contained purslane leaf extract with concentration variations of 10%, 15%, and 20% and each preparation was made with a total weight of 20 grams each.

Physical Stability Testing of Ointment Preparations

The physical stability of hydrocarbon-based and water-soluble ointments using the freeze-thaw cycle method for 12 days (6 cycles). The parameters tested included organoleptic, homogeneity, pH and dispersibility (Lasut et al., 2019). One of the tests carried out in the preparation of the ointment is the homogeneity test, which aims to evaluate the distribution of the active ingredients from purslane leaves in the ointment evenly. In addition, a pH test is also carried out to ensure that the ointment from purslane leaves has an acidity level that is appropriate to the skin condition and does not cause irritation. Then the spreadability test is very important to determine the ointment's ability to spread evenly on the surface of the skin. Finally, organoleptic tests are performed to evaluate the sensory properties of the ointment, such as color, smell and texture.

The following are some physical stability tests that will be carried out on the preparation of ointment from purslane leaves (*Portulaca oleraceae*):

Organoleptic test

Organoleptic testing is carried out by observing the ointment preparation from the shape, smell and color of the preparation. The specification of the ointment that must be met is to choose a semi-solid form, the color must be in accordance with the specifications at the time of initial manufacture of the ointment and the smell is not rancid (B. P. Sari et al., 2017).

pH Test

The purpose of pH testing is to determine the pH suitability of ointment preparations made with the pH of the skin. The pH test was carried out on both formulas by testing a total of 0.5 g of ointment samples diluted with aquades as much as 50ml, then dipped in the pH strip into the sample, the pH stated was recorded. The pH of topical preparations is generally said to be good if the pH of the preparation is in the skin pH range, which is 4.5-6.5 (Source) et al., 2013).

Dispersion test

Weigh the preparation as much as 0.5g and place it in the middle of the glass object. Place the glass cover on top of the ointment and let it sit for 1 minute, noting the diameter of the spread. Then add a load of 50 g and let it sit for 1 minute, noting the diameter of the spread. Repeat until a load of 150 g. Then the diameter of the spreading ointment is measured (by taking panjang grata-rata diameter from several sides). The diameter of a good ointment preparation is between 5-7 cm (Sari et al., 2016).

Homogeneity test

Testing the homogeneity of the ointment preparation is carried out by applying the ointment to the glass object. A homogeneous preparation is characterized by the absence of lumps when applied, the ointment tested is taken in three places, including the top, middle and bottom of the ointment container (Sari et al., 2017).

RESULTS & DISCUSSION

As an ointment preparation, this shows that purslane leaf extract has significant potential as an active ingredient in ointment formulations. This potential opens up opportunities for further development, both in terms of therapeutic effectiveness and the use of this natural ingredient in the pharmaceutical industry.

The extraction process was carried out using the maceration method using 70% ethanol with a ratio of ingredients to solvents of 1:10 for three days and stirring every eight hours (Ilham et al., 2025). Many scientific studies are currently examining the benefits of antioxidants, looking for new sources of antioxidants. Previously, the leaves of this plant have been examined for antioxidant compounds (Hamzah et al., 2022).

A semi-solid form of the preparation that is easy to apply and use for external treatment, This preparation allows direct access to the tissues of the body through topical application, as well as having more aesthetic value, which makes it more acceptable to the patient in its use. The ointment is commonly used to treat various skin problems, such as inflammation, irritation and infection and provides an effective therapeutic effect (Usman *et al.*, 2024).

Stability testing is one of the quality parameters and is carried out to determine the ability of a drug product to survive within the specified limits throughout the storage and use period. Temperature and storage time are factors that affect the stability of the drug (Primadiamanti *et al.*, 2017).

Table 2 Organoleptic Test Results

Cycle To	Organoleptis	Formula I	Formula II	Formula III
I	Shape	Semi-solid	Semi-solid	Semi-solid
	Smell	Distinctive	distinctive	Distinctive
	Color	Brown Yellowish	Brown Yellowish	Blackish green
Cycle 1 is eligible				
II	Shape	Semi-solid	Semi-solid	Semi-solid
	Smell	Distinctive	distinctive	Distinctive
	Color	Brown Yellowish	Brown Yellowish	Blackish green
Cycle 2 is eligible				
III	Shape	Semi-solid	Semi-solid	Semi-solid
	Smell	Distinctive	distinctive	Distinctive
	Color	Brown Yellowish	Brown Yellowish	Blackish green
Cycle 3 is eligible				
IV	Shape	Semi-solid	Semi-solid	Semi-solid
	Smell	Distinctive	distinctive	Distinctive
	Color	Brown Yellowish	Brown Yellowish	Blackish green
Cycle 4 is eligible				
V	Shape	Semi-solid	Semi-solid	Semi-solid
	Smell	Distinctive	distinctive	Distinctive
	Color	Brown Yellowish	Brown Yellowish	Blackish green
Cycle 5 is eligible				
VI	Shape	Semi-solid	Semi-solid	Semi-solid
	Smell	Distinctive	distinctive	Distinctive
	Color	Brown Yellowish	Brown Yellowish	Blackish green
Cycle 6 qualified				

In Table 2 where the test is carried out by observing the preparation, namely, where in the formula 1 preparation the semi-dense form has a distinctive smell, and the color is yellowish-brown. Then in formulation 2 the shape is semi-dense, the smell has a distinctive smell, and the color is

yellowish-brown. Then in the formulation 3 it is semi-dense, the smell has a distinctive smell and is blackish-green in color.

Table 3 Homogeneity Test Results

Formula	Homogeneity Test Results on the Cycle to					
	I	II	III	IV	V	VI
FI	Homogeneous	Homogeneous	Homogeneous	Homogeneous	Homogeneous	Homogeneous
FII	Homogeneous	Homogeneous	Homogeneous	Homogeneous	Homogeneous	Homogeneous
FIII	Homogeneous	Homogeneous	Homogeneous	Homogeneous	Homogeneous	Homogeneous

In table 3 of purslane leaf ointment formulas there is an even distribution of components, there are no deposits or particles that are not mixed so that when applied it gives a smooth and comfortable texture. Based on the test results, the three ointment formulations, namely FI (10%), FII (15%), and FIII (20%) showed homogeneous properties throughout the storage cycle, starting from the initial cycle to the 6th cycle. No clumps or phase separation were found, which indicates that the process of mixing ingredients and the physical stability of the ointment is going well. So that the quality of the preparation is maintained and meets the quality requirements of topical preparations.

Table 4.8 pH Test Results

Formula	pH Test Results Cycle to						pH Standard Values	Skin pH
	I	II	III	IV	V	VI		
FI	5	6	5	5	5	5	4-5	4,5-6,5
FII	6	5	6	6	6	6		
FIII	4	5	6	6	6	5		

In Table 5, it is done to ensure the accuracy of the pH of the ointment formula so that it can minimize the risk of irritation. The pH range for topical preparations is 4.5-6.5. Based on the test results, the FI formulation (10%) has an initial pH of 5 and tends to be stable in the range of 5-6 during the duration of the storage cycle. The FII formulation (15%) had an initial pH of 6 and remained stable in the range of 5-6 with a predominance of pH 6 throughout the test. The FIII formulation (20%) had an initial pH of 4 which was below the ideal range at cycle 0-1, but increased to 5-6 from the 2nd cycle to the end of storage. Good pH stability in FI and FII indicates the compatibility of the extract composition with the ointment base. Based on the criteria, FI and FII are pH qualified for topical preparations from the start, while FIII is only qualified from the 2nd cycle so it requires pH adjustment or maturation time before use. Overall, all three formulations are ultimately within the skin's pH range, but FIIs show the best pH stability during storage and are rated the most ideal for use.

Table 5 Dispersion Test Results

Formula	Dispersion test results in Cycle to						Good dispersion of the ointment
	I	II	III	IV	V	VI	
FI	6	5	5	5	6	5	5-7
FII	5	5	5	5	5	6	
FIII	6	5	6	6	6	5	

In Table 5, the dispersion test was carried out to determine the ability of purslane leaf ointment to spread on the surface of the skin, which was measured through the diameter of the spread. A good ointment preparation has a spread power of between 5-7 cm so that it can provide ease of application and comfort of use. Based on the test results, the FI formulation (10% purslane leaf extract) had a dispersion power diameter of 6 cm in the initial cycle, then suffered a slight decrease to 5-6 cm during storage but remained within the ideal range. The FII formulation (15%) showed an initial dispersal diameter of 5 cm and tended to be stable at 5 cm for most of the storage cycle. The FIII formulation (20%) had a dispersion of 6 cm at the beginning, experienced a slight decrease to 5 cm in some cycles, and returned to stability at 5-6 cm at the end of storage. Overall, all three formulations meet the criteria for a good dispersion of topical preparations, but FI and FIII tend to provide a wider dispersion so that they have the potential to provide a more comfortable sensation of the wearer, while FII is more stable in size but is at the lower limit of ideal dispersibility.

COVER

As a result of the research that has been carried out, it can be concluded that the formula of the ointment preparation from purslane leaves (*Portulaca oleraceae*) can be formulated as an ointment preparation. This shows that purslane leaf extract has the potential as an active ingredient in ointment makers so that it can be further developed for pharmaceutical use. The test results showed that the entire formula had a semi-solid shape, a stable distinctive odor, and a color equal to the concentration of the extract. pH tests showed that all formulas had a pH within the ideal range for skin (4.5-6.5), with the FII formula (15%) showing the best stability. The spreadability of all formulas meets the standard (5-7 cm), with FII being more stable despite being at the lower limit. Semuz formula shows good homogeneity in the absence of clumps or phase separation. Uj physical stability during six-cycle storage also shows that all formulas remain stable. Overall, the FII formula of 15% purslane leaf extract is the best formula because it shows the most optimal balance between pH stability, dispersion and homogeneity, serta has the physical characteristics that qualify as a topical ointment preparation. This formula has the most potential to be further developed as a safe and effective herbal ointment product.

Based on the results of the research on the formulation of ointment from purslane leaf extract (*Portulaca oleracea*), it is recommended that further research be carried out by testing pharmacological activity in vivo or clinical trials to determine the effectiveness of ointment in healing wounds and other skin disorders.

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