# Formulation And Quality Testing Of Cream Of Ethanol Extract Of Purslane (*Portulaca Olerachea* L.) Herbs

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**Abstract.** Purslane (*Portulaca olerachea* L.) is a weed or wild plant that contains phenol, tannin, flavonoid, saponin, and alkaloid and some vitamins that can potentially act as antioxidants, anti-inflammatories and antibacterials. The purpose of this study was to determine a good cream formula and meet the requirements of a cream preparation. This study used a series of purslane herb extract concentrations of 0.5%, 1% and 1.5% which aimed to determine the best cream formula with various levels of active substance concentration. The preparation formula was tested in various predetermined parameters to find a good cream preparation form including organoleptic tests, homogeneity tests, pH tests, spreadability tests, adhesion tests, and cream type tests in this quality test. The results of a good cream preparation are formula 3 because it has a soft texture, good color and is quickly absorbed into the skin. The results of the study showed that the best cream formula was formula 3 with an extract concentration of 1.5% because the cream preparation had a soft texture, dark green color, a distinctive odor of purslane, a pH of 6, an average spreadability test of 6.54 cm and an adhesion test of 3,4 seconds. This shows that the formula meets the physical requirements of the cream preparation.

**Key words**: krokot, cream, cream quality test

## INTRODUCTION

Purslane (*Portulaca olerachea* L.) is a wild weed plant known as *krolan* (US and Australia), *rigla* (Egypt), *pigweed* (England), *pourpier* (France), and *Ma-Chi-Xian* (China) (Purwanto, 2021). Purslane (*Portulaca olerachea* L.) contains phenols, tannins, flavonoids, saponins, and alkaloids and several other compounds (Fatmasari Afriyanti, Rani Rubiyanti, 2023). According to Uddin *et al.*, (2012) this purslane plant also contains omega-3, calcium, phosphorus, iron. According to Yuniastri *et al.*, (2020) purslane plants have nutritional content such as fatty acids, flavonoid compounds, carotene, phenolics, vitamins C and E. The vitamin content in purslane plants has the potential as antioxidants, anti-inflammatories, and antibacterials.

Antioxidants are known as compounds that can inhibit free radicals that have negative effects on the body. Antioxidant levels of purslane plant extract using the DPPH method ranged from 1.30 ± 0.04 mg / mL to 1.71 ± 0.04 mg / mL and antioxidant activity values equivalent to ascorbic acid ranged from 229.5 ± 7.9 mg / mL to 319.3 ± 8.7 mg / mL (Uddin et al., 2012). From the research results (Yuniastri et al., 2020), the highest antioxidant concentration was found in purslane growing on the side of the road (K3) which had an antioxidant content of 60.45c±0.62%, purslane growing on the banks of rivers (K1) had an antioxidant content of 50.26a±0.67% and purslane growing on sidewalks (K2) had an antioxidant content of 54.78b±0.67%.

Purslane plants also have the potential as anti-inflammatory. The results of the study *Agyare et al.*, (2015) showed that methanol extract from Purslane leaves and stems (*Portulaca olerachea* L.) had an anti-inflammatory effect in experiments using chicks as test animals. The results of the study showed significant at doses of 100 ($p < 0.05$), 200 ($p < 0.01$), and 400 ($p < 0.01$) mg/kg induced by carrageenan with a comparison using aspirin as a positive control. The results of the study (Andayani et al., 2018) statistical data with one way anova obtained a significant value of $0.00 < 0.05$, this means that purslane herb extract has an anti-inflammatory effect on male rats induced by carrageenan. The anti-inflammatory power of sodium diclofenac was 32.95%, ethanol extract of purslane at a dose of 400 mg was 30.20%, ethanol extract of purslane at a dose of 200 mg was 20%, ethanol extract of purslane at a dose of 100 mg was 16.73%.

Purslane plants are also antibacterial. From the study (Yudha Karlina *et al.,* 2013) there was the administration of purslane extract to *Staphylococcus aureus* using 6 concentrations, namely 50%, 60%, 70%, 80%, 90%, and 100%, positive control (ampicillin) and negative control (aquades). From the results of these concentrations, the formation of an inhibition zone at a concentration of 90% was 2 cm, a concentration of 100% was 2.2 cm, while for the negative control, the concentration of purslane 50-70% had no effect. The results for *Escherichia coli* bacteria at a concentration of 90% had a radical inhibition power of 0.6 cm, a concentration of 100% was 0.9 cm, while for the negative control, a concentration of 50-70% had no effect. From these results, purslane herb extract had a greater effect on *Staphylococcus aureus* bacteria than *Escherichia coli.*

Purslane extract is formulated into a cream preparation to make it more acceptable and acceptable to the wider community. This study aims to utilize purslane herb extract to produce a cream formulation with different concentrations of active ingredients, namely using 0.5%, 1.0%, and 1.5% purslane herb extract and tested in various predetermined parameters to see the form of a good cream preparation and meet the requirements. Organoleptic test, homogeneity test, pH test, adhesion test, and spreadability test, and cream type test have become parameters for testing the cream. This underlies the research on the formulation of purslane herb extract cream.

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## METHODS

### Tools and Materials

The equipment used in making the cream is a mortar and stamfer, ACiS scales, beaker glass, measuring cup, a set of spreadability test tools, a set of adhesion test tools, spatula, stirring rod, electric stove, porcelain cup, watch glass, glass plate, weights, rotary evaporator RV 8V IKA brand, drying oven un 30 memmert, memmert waterbath, Erlenmeyer, moisture analyzer, dropper pipette.

The materials used in this study were purslane herbs obtained from the rice field area in Singopadu Village RT 02 RW 02 Sidoharjo, Sragen, Central Java and have been determined at B2P2TOOT with a determination certificate number: TL.02.04 / D.XI.5 / 16536.076 / 2023, ethanol (96%), stearic acid, cetyl alcohol, methyl paraben, propyl paraben, glycerin, triethanolamine, distilled water, methylene blue.

### Making Purslane Extract

Purslane herb that has been powdered is extracted using the extraction method. Extraction is the process of withdrawing soluble chemical content from a powdered drug. Weighed 581 grams of purslane herb powder and the extraction process with the solvent used was ethanol (96%). This process is divided into two stages, namely maceration and remaceration, the ratio used is 1:10 between purslane herb powder and ethanol solvent (96%). The maceration process uses 75 parts of ethanol (96%), and the purslane herb powder is soaked, then stored at room temperature for 3 x 24 hours with several stirrings. In remaceration, 25 parts of ethanol (96%) are used, but the soaking process is simple for 2 x 24 hours with several stirrings. The filtered mixture and the resulting filtrate are evaporated using a rotary vacuum evaporator at a temperature of 55 ° C until a thick extract is obtained (Departemen Kesehatan RI, 2014).

### Preparation of Purslane Herbal Extract Cream Formulation

The ingredients of the purslane herbal cream preparation formula in Table 1 show the ingredients of the purslane herbal extract cream, all of which are weighed first. The oil phase (stearic acid and cetyl alcohol) is heated in a *waterbath* at 70 °C (mixture A). The aqueous phase (glycerin and triethanolamine) is mixed in a porcelain cup heated at approximately 75 °C (mixture B). The two mixtures (water phase) are gradually added to the first mixture and then homogenized. Add preservatives (methyl paraben and propyl paraben) to the porcelain cup. Put both mixtures in a mortar and stir until a good cream mixture is obtained. After forming a good cream mass, add purslane herbal extract formulas 1, 2, and 3. Then stir until a homogeneous cream mass is formed (Ayun *et al.,* 2020)

**Table 1**. Herbal Cream Preparation Formula for Purslane

| Composition | F1 (g) | F2 (g) | F3 (g) |
|---|---|---|---|
| Extract Herbal Purslane | 0,5 | 1,0 | 1,5 |
| Stearic Acid | 20 | 20 | 20 |
| Cetyl Alcohol | 0,5 | 0,5 | 0,5 |
| Propyl Paraben | 0,1 | 0,1 | 0,1 |
| Triethanolamine | 2 | 2 | 2 |
| Glycerin | 10 | 10 | 10 |
| Metyl Paraben | 0,2 | 0,2 | 0,2 |
| Aquadest | 100 | 100 | 100 |

**Cream Quality Testing**

**Organoleptic Test**

The cream preparation is tested for physical characteristics using the sense of smell. This test aims to see the shape, color and odor of the cream preparation. User comfort is an indicator that the cream preparation has attractive physical characteristics of color and texture (Yuniarsih & Haryani, 2022)

**Homogeneity Test**

The homogeneity test is carried out by applying the cream to a glass plate. Then the coarse particles are observed by touching it and the cream must show a homogeneous composition and no coarse grains are visible (Astuti *et al.*, 2018)

**pH Test**

The pH test of the cream is carried out to determine whether the resulting cream is acidic or alkaline. In topical preparations, pH is related to the taste when applied, if the cream preparation is too acidic compared to the pH of the skin, it is feared that it will irritate the skin, but if it is too alkaline, it is feared that the skin will become drier. In the literature, the pH of facial skin ranges from 4.5 to 6.5 (Yuniarsih & Haryani, 2022)

**Spreadability Test**

Prepare a pair of glass bases. The cream is weighed 0.5 grams, place the cream in the middle of the glass plate in an inverted position, let it stand for 1 minute with a load of 50 grams to 150 grams every 1 minute, then measure the diameter of the cream's spreadability. The standard cream spreadability is 5 cm - 7 cm (Pratasik *et al.*, 2019)The test is carried out in three replications for each formula.

**Adhesion Test**

Weigh 0.5 grams of cream and place it on the object glass on both different sides with a load of 250 grams for 5 minutes. The load is lifted and calculate the time for the object glass to come off. The standard for a good cream adhesion test is less than 4 seconds (Erwiyani et al., 2018). The test is carried out in three replications for each formula.

**Cream Type Test**

The cream type test is carried out by weighing 1 gram of cream and applying it to a watch glass, adding one drop of methylene blue. Then do a visual observation to indicate the type of cream including oil in water (O/W) or water in oil (W/O).

## RESULTS AND DISCUSSION

Determination of purslane plants (*Portulaca olerachea* L.) in this study was carried out at B2P2TOOT Karanganyar. Determination of purslane plants was taken from the harvest results, plants used from fresh roots, stems, and leaves by matching the morphological characteristics of purslane plants according to the literature. The determination results showed that the samples used were indeed purslane plants with the results of the Portulacaceae family, the species Portulaca oleracea L., and the synonym Portulaca hostensis Rupr. Proven by the existence of a determination letter numbered TL.02.04 / D.IX.5 / 16536.076 / 2023.

Purslane plants (*Portulaca olerachea* L.) after being harvested from the rice field area are dried or the stage of making simplicia. Simplicia is a process where plants are dried for medicinal purposes and have not been processed from their original form (Silverman *et al.*, 2023). The manufacture of simplicia goes through several stages such as collecting materials, wet sorting, washing, draining, slicing, drying, dry sorting, packaging and storage (Gafur & Rizki, 2021). The purslane herb simplicia is dried using an oven at a temperature of 50°C. This drying method was chosen because a good drying method can maintain the flavonoid levels contained in the purslane herb. After the simplicia has gone through these various stages, the simplicia is ready to be ground using a blender. Then the smooth simplicia is sieved using a mesh 30 sieve to obtain simplicia powder that is ready for the extraction process. In this study, the wet simplicia of purslane herb used as much as 10 kg obtained a simplicia powder yield of 581 grams. The next stage is making a thick extract of purslane herb. The yield of thick purslane herb extract can be seen in table 2. The extract weight obtained was 37.5 grams with a yield percentage of 6.4543%.

**Table 2.** Rendemen Extract

| Information | Simple Weight | Extract Weight | %Rendemen |
|---|---|---|---|
| **Maserasi and Remasrasi** | 581 gram | 37,5 gram | 6,4543% |

### Phytochemical Screening Test

Identification of active compounds in purslane herb extract was carried out qualitatively, which aims to determine the presence or absence of marker compounds in the extract (Indriyanti et al., 2018). An extract from natural materials consists of various secondary metabolites that play a role in its biological activity. These compounds can be identified with reagents that are able to provide characteristics of each group of secondary metabolites. The results of the phytochemical test showed that purslane herb extract positively contained saponins, tannins, alkaloids, flavonoids, and steroids. In this study, phytochemical screening was carried out by looking at the results of color reactions and deposits using a reagent.

**Table 3.** Phytochemical Screening Test

| Metabolic Content | Indicator | Result | Ket |
|---|---|---|---|
| **Alkaloid** | Yellowish Sediment | Brick Red Sediment | (+) |
| **Saponin** | Foam Formed | Foam Formed | (+) |
| **Tanin** | Blackish Green or Blackish Blue | Blackish Green | (+) |
| **Flavonoid** | Red -Orange Solution | Orange Yellow | (+) |
| **Steroid** | Brownish Red | Brownish Red | (+) |

**Cream Quality Testing**
**Organoleptic Test of Purslane Herbal Extract Cream**

**Table 4.** Organoleptic Test

| Formulasi | Organoleptic Test | | |
|---|---|---|---|
| | Form | Smell | Colour |
| **F1** | Cream | Typical Creamy Smell | Yellowish Green |
| **F2** | Cream | The Distintive Smell of Purslane | Light Green |
| **F3** | Cream | The Distintive Smell of Purslane | Dark Green |

Physical testing of cream preparations is carried out to determine whether the cream preparation meets the requirements of cream preparations. Physical testing of cream preparations includes organoleptic test, homogeneity test, pH test, spreadability test, adhesion test and cream type test. Organoleptic test is an examination of the physical appearance of a preparation which includes texture, odor, and color. The results of the organoleptic test obtained in table 3 all formulas have a good cream form with a water content of more than 60%. The odor in formula 1 smells of stearic acid where the odor appears because the concentration of purslane herb extract is relatively less compared to formulas 2 and 3 where the results of formulas 2 and 3 have a distinctive odor of purslane herb extract. The color that appears in each formula has a different green color because the extract content is different, the greater the concentration of the formulation the darker the color produced this is due to the large content of purslane herb extract.

**Picture 1.** Formula 1

**Picture 2.** Formula 2

**Picture 3.** Formula 3

**Homogeneity Test of Purslane Herbal Extract Cream**

**Table 5.** Homogeneity Test

| Formulasi | Homogeneity Test |
|---|---|
| **F1** | Homogen |
| **F2** | Homogen |
| **F3** | Homogen |

Observation of the homogeneity test of purslane herbal extract cream aims to see that the cream preparation is evenly mixed and does not have a rough texture so that it provides maximum quality when using the cream. The homogeneity test was carried out for each formula and the results were homogeneous, there were no coarse grains in the purslane herbal extract cream preparation when applied to the skin surface. This is also influenced by the selection of the emulsifying agent, namely Triethanolamine or TEA which can form a stable oil-in-water emulsion with the addition of stearic acid (Setyawaty et al., 2019). The combination of the two ingredients will form TEA stearate salt which can produce fine grains so as to stabilize the oil-in-water type emulsion (Goel *et al.*, 2023). A preparation with good homogeneity must show a homogeneous composition and no coarse grains are visible (Amin et al., 2013).

**pH Test of Purslane Herbal Extract Cream**

**Table 6.** pH Test

| Formulasi | pH Test |
|---|---|
| **F1** | 6 |
| **F2** | 6 |
| **F3** | 6 |

The pH test of the purslane herbal extract cream was carried out by dipping each formula in universal indicator paper. Topical preparations have a pH that matches the normal skin pH of 4.5-6.5. The pH test is carried out to determine whether the resulting cream preparation is acidic or alkaline, seen from the pH value obtained. In topical preparations, pH is related to the taste when applied to the skin. If the pH produced is too acidic or alkaline, it will cause skin irritation, so it is necessary to match the cream preparation with the skin pH (Saryanti *et al.*, 2019). Based on the results obtained, each formula has a pH value of 6, from this pH value each formulation meets the cream pH requirements for topical use on the skin. The recommended pH value for the skin ranges from 4.5-6.5 if the pH value is above 6.5 it can cause scaly or dry skin, the skin becomes irritated if the pH is below 4.5 (Yuniarsih & Haryani, 2022).

**Spreadability Test of Purslane Herbal Extract Cream**

**Table 7.** Spreadability Test

| Formulasi | Replication | Spreadability Test (cm) | | | | Average |
|---|---|---|---|---|---|---|
| | | 0g | 50g | 100g | 150g | |
| **F1** | 1 | 4.25 | 4.6 | 4.95 | 5.35 | 4.80 |
| | 2 | 4.5 | 4.8 | 5.4 | 5.55 | 5.06 |
| | 3 | 5.5 | 5.8 | 6.15 | 6.65 | 6.025 |
| | **Average** | | | | | 5.30 |
| **F2** | 1 | 4.85 | 5.75 | 6.35 | 6.75 | 5.925 |
| | 2 | 4.8 | 5.55 | 6.1 | 6.85 | 5.825 |
| | 3 | 5 | 5.15 | 6.05 | 6.6 | 5.7 |
| | **Average** | | | | | 5.82 |
| **F3** | 1 | 5.1 | 5.8 | 6.65 | 6.7 | 6.06 |
| | 2 | 5.8 | 6.55 | 7.45 | 7.55 | 6.84 |
| | 3 | 5.9 | 6.45 | 7.05 | 7.45 | 6.71 |
| | **Average** | | | | | 6.54 |

The spreadability test on this purslane herbal extract cream aims to determine the speed of the cream spreading when applied to the skin (Saryanti *et al.*, 2019). A good cream has a large spreadability so that it can be applied to the surface of the skin without excessive pressure. The spreadability of the cream is related to how much skin surface area is in contact with the preparation when applied. The wider the spreadability, the wider the surface area of the skin in contact with the cream and the active ingredients will be well distributed (Prabawati, 2015). Glycerin functions as a humectant that can maintain the level of water content in the cream by reducing water evaporation so that the cream is easier to spread and maintains its moisture (Goel *et al.*, 2023). Based on the results obtained, it can be seen in table 4 with an average of formula 1 of 5.30 cm; formula 2 of 5.82 cm; and formula 3 of 6.54 cm. Table 4 shows the results of the spreadability test in each cream formula experiencing different spreads because they are influenced by the amount of purslane herbal extract added. The requirements for a good spreadability test for a cream formulation are 5 to 7 cm, so it can be said that the cream has a good spreadability base, the greater the spreadability test, the faster it spreads evenly on the skin surface, and makes it easier to apply to the skin (Gurning *et al.*, 2016).

**Adhesion Test of Purslane Herbal Extract Cream**

**Table 8.** Adhesion Test

| Formulasi | Replication | Adhesion Test (s) |
|---|---|---|
| **F1** | 1 | 3,1 |
| | 2 | 4,1 |
| | 3 | 3,2 |
| **F2** | 1 | 4,0 |
| | 2 | 3,4 |
| | 3 | 3,2 |
| **F3** | 1 | 3,0 |
| | 2 | 3,3 |
| | 3 | 3,4 |

The adhesion test was conducted using an adhesion tester. Two transparent slides, a stopwatch, and a gram weight were used. A sufficient amount of cream was applied to the slide, then a 250-gram weight was applied and pressed for 5 minutes. The weight was then lifted, and the two transparent slides

were removed, and the time until the slides were removed was recorded. The adhesion test results for the purslane herbal extract cream from the three formulas showed a time of 3-4 seconds. The requirement for a good adhesion test for a cream is 2-300 second (Lumentut *et al.,* 2020) Therefore, the cream's adhesion can be considered good. The spreadability and adhesion of a cream are interrelated; if a cream has a high spreadability, its adhesion will be shorter, and vice versa (Erwiyani *et al.,* 2018)

**Test Type of Purslane Herbal Extract Cream**

**Table 9.** Test Type

| Formulasi | Test Type |
|---|---|
| **F1** | M/A |
| **F2** | M/A |
| **F3** | M/A |

From the results of the test of the type of purslane herbal extract cream after being given a few drops of methylene blue, the results that appear in each formula are well dispersed in a greenish blue color, which means that the type of cream produced is M/A or Oil in Water. The volume of the dispersed phase (oil phase) used in the cream is smaller than the dispersing phase (water phase), so that the oil particles will be dispersed into the water phase and form an M/A type emulsion (Nonci *et al.,* 2017). The advantage of the oil-in-water cream type is that it has a high water content so that it can provide a hydration effect that increases the penetration of active substances (Nofriyanti & Wildani, 2019).

Purslane plants (*Portulaca oleraceae* L.) contain alkaloid and flavonoid compounds. Alkaloids are secondary metabolites that have benefits in the fields of pharmacy and medicine. The mechanism of action of alkaloids as antibacterials is by damaging the components of peptidoglycan in bacterial cells so that the cell wall layer cannot form perfectly and the cells will die (Pokhrel, 2024). Flavonoids can be found in plants in the roots, stems, flowers, and fruits. Flavonoids have a biological role for humans as antioxidants, antiviruses, anti-inflammatories, antitumors, antibacterials. Flavonoids are phenolic compounds that can kill bacterial cells by changing proteins and damaging the semipermeability of cell membranes, so that cells become permeable and cause plasmolysis. Flavonoids can also act as protectors of coronary disease and help in vascular activity (Anghel *et al.,* 2013).

Purslane plants (*Portulaca oleracea* L.) have antioxidant activity. Antioxidants are very useful as prevention of aging and degenerative diseases. Antioxidants can fight free radicals in the body, which are obtained from metabolism, air pollution, food contamination and sunlight (Giacco & Brownlee, 2010). In this study, the preparation of purslane herbal extract cream can also be an alternative to prevent free radicals from entering the body. Purslane plants (*Portulaca oleracea* L.) can also be anti-inflammatory. Inflammation is a form of body protection against tissue damage caused by infectious agents or tissue damage that causes the body to produce cells and molecules to the site of foreign agent damage (Kumar, 2022). Purslane plants (*Portulaca oleracea* L.) are included in traditional medicines to cure skin diseases such as ulcers, boils, dermatitis, and scabies (Dalimartha, 2009). This shows that purslane plants have various pharmacological effects including antioxidants, anti-inflammatories, antibacterials and as wound healers.

## CONCLUSION

Based on the results of the evaluation of the quality of the cream, all formulations meet the requirements of the cream test. The results of this study showed that the best cream formula was formula 3 with a concentration of 1.5 grams of the cream preparation because it had a soft texture, dark green color, a distinctive odor of purslane, a pH of 6, an average spreadability test of 6.54 cm and an adhesion test of 3,4 seconds. This shows that the formula meets the physical requirements of the cream preparation.

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