

# Physical Stability Test Of Ethanol Extract *Cyperus Rotundus* Linn Tuber 20% Gel Using Microwave Assisted Extraction

Anindya Oktafiani<sup>1</sup>, Prasetyadi Mawardi<sup>1</sup>, Muhammad Eko Irawanto<sup>1</sup>

<sup>1</sup>(Dermatovenereology Department, Dr. Moewardi Hospital, Sebelas Maret University, Surakarta)

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## Abstract:

**Background :** *Cyperus rotundus* Linn (*C. Rotundus* L) is an grass-like weed, reproduction through rhizomes and tubers that can be used for herbal treatment as an antidiarrheal, antibacterial antioxidant and anti-inflammatory. Microwave Assisted Extraction (MAE) is a technique of extracting dissolved materials inside plant material with the help of microwave energy. The advantages of the MAE method are having a short extraction time, less energy and solvent consumption and higher yield.

**Materials and Methods:** This research is a laboratory experimental research of *C. Rotundus* L tubers with extraction process uses the MAE method with 95% pro-analysis ethanol solvent through three stages such as drying stage, extraction stage and evaporation stage. The formulation of ethanol extract *C. rotundus* L tuber 20% gel was tested for physical properties, namely organoleptic tests, homogeneity tests, pH tests, dispersion tests and adhesion tests.

**Results:** The results of organoleptic tests on ethanol extract *C. rotundus* L tuber 20% gel obtained a characteristic smell of ethanol of *C. rotundus* L tubers, brown in color, homogeneity test in a homogeneous state with pH 5.16, dispersion power 3.65 cm and adhesion 6.25 seconds.

**Conclusion:** Based on the overall test results, stable physical test results are obtained in accordance with the requirements of the physical properties of gel preparations.

**Key Word:** *Cyperus rotundus* linn, Microwave assisted extraction

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## I. Introduction

A significant part of all conventional medical systems includes herbal medicine. Both developed and developing nations utilize plant materials as over-the-counter medications, home cures, and raw materials for the pharmaceutical industry, accounting for a sizable share of the worldwide medicine market.<sup>1</sup> Traditional herbal remedies use the rhizomes and tubers of *Cyperus rotundus* Linn (*C. Rotundus* L) for their antidiarrheal, antioxidant, antibacterial, and anti-inflammatory properties. *Cyperus rotundus* Linn is a grass-like weed with fibrous roots that can grow up.<sup>2</sup>

Gel is a colorless, semi-solid preparation with high dispersion properties that helps to enhance absorption. One advantage of the gel's dosage form is that it can be applied cold and is rapidly absorbed by the skin.<sup>3</sup> Carbopol is the ideal gel-forming substance since it enhances viscosity and forms gels well. Carbopol, which has a concentration range of 0,5% to 2,0%, is used to make clear gels. One benefit of using Carbopol as a gelling agent is that it may be combined with a variety of active ingredients and has a high viscosity at low concentrations.<sup>4</sup>

The process of extracting dissolved components from plant material using microwave energy is known as microwave assisted extraction, or MAE. The MAE method of extraction has a shorter extraction time, uses less energy and solvent, and produces a greater yield. Mass transfer can be enhanced by the energy that microwaves convey through materials.<sup>5</sup> This study aims to determine the physical stability of *C. Rotundus* L tuber ethanol extract gel preparations at a concentration of 20% which was extracted using the MAE method.

## II. Material And Methods

This is laboratory experimental research conducted at the Pharmacy Laboratory of Setia Budi University, Surakarta, Indonesia, from November to December 2023. *Cyperus Rotundus* L tubers, weighing 350 grams, were obtained from the Center for Research and Development of Medicinal Plants and Traditional Medicine Research.

**Procedure extraction of *Cyperus Rotundus* Linn**

There are several stages involved in making *C. rotundus* L tuber extract. The drying stage begins with a thorough washing of the 350 grams of *C. rotundus* L roots, followed by the cutting of the root fibers until the tubers remain. Next, we dry the tubers from *C. rotundus* L at 80°C for 2–24 hours, allowing them to dry or evaporate. After the tubers are dry, they are cut into small pieces and mashed using a mash.

The second is the extraction stage. The extraction stage begins by inserting pieces of *C. rotundus* L tuber simplisia into a glass tube, then adding 95% pronalysis ethanol solvent with a raw material-solvent ratio of 1: 5, then stirring and closing the tube using aluminum foil and perforating it using a needle. Microwave the tube at 50 °C for 15 minutes. The results after extraction are filtered so that a separate filtrate is obtained from the pulp, and the remaining pulp is added to petroleum ether. Filtration and liquid extract are then obtained. The liquid extract obtained is de-saponified to remove the saponin content by heating using a heat coat, and then the foam is removed after it is formed.

The third is the evaporation stage. Evaporation with a slope of 30-40<sup>0</sup>C to the table with an arrangement consisting of a heating device, an evaporated storage flask, a rotary evaporator, and a cooling tube. The extraction results are then transferred to the storage flask. Rotary evaporators, cold water pumps, vacuum pumps, and aquades heaters are turned on at 60<sup>0</sup> and ethanol is allowed to evaporate. The results of ethanol evaporation are condensed into the ethanol storage flask so that they are not mixed with the evaporation results. The concentrated extract in the form of pellets is attached to the glass flask so that it is given a small amount of 95% ethanol at the base of the glass flask so that the extract melts slightly and is easily removed. After being transferred into a smaller glass container, the crude extract is put in the oven to reduce the amount of water remaining and cooked for fifteen minutes to remove any remaining ethanol. The simplisia extract obtained is made in gel form with *C. rotundus* L 20% content using carbopol as a gel base.

**Statistical analysis**

The data was analyzed using SPSS version 26. The Friedman test is used to ascertain the significance of the difference between the average values of the results during the six days of examination.

Plant determination is carried out to determine the correctness of the type of plant. The determination was carried out using organoleptic test methods, with the results showing that the samples used were *the Cyperaceae family, Cyperus Rotundus species* with the synonym *Chlorocyperus rotundus (L) Palla.*

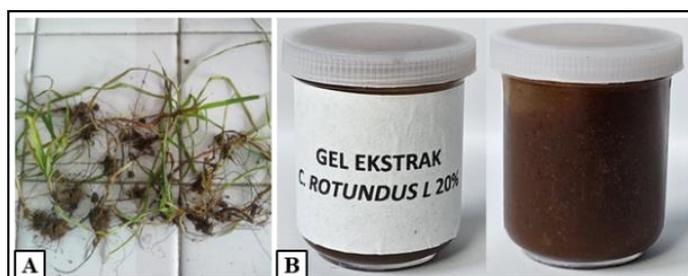
Organoleptic testing is the evaluation of the authenticity of plants by confirming them based on color, taste, aroma, and size. The color and texture of ethanol extract *C. rotundus* L tuber 20% gel were visually observed.<sup>6</sup> Organoleptic testing for 6 days on a ethanol extract *C. rotundus* L tuber 20% gel preparation at each repetition had a characteristic tuberous ethanol odor and was brown in color. The resulting odor and color from ethanol extract *C. rotundus* L tuber 20% gel (**Table 1**).

**Table 1.** Organoleptic test results and homogeneity of ethanol extract *C. rotundus* L tuber 20% gel

Gel characteristics	Formula 1 (Cycles 1-6)	Formula 2 (Cycles 1-6)	Formula 3 (Cycles 1-6)
<b>Organoleptic</b>			
<b>Color</b>	Light brown	Light brown	Light brown
<b>Construction</b>	Tuber scent	Tuber scent	Tuber scent
<b>Preparation</b>	Semi solid	Semi solid	Semi solid

Repeating each ethanol extract *C. rotundus* L tuber 20% gel for 6 days did not appear to have coarse grains on the object glass, and an even color was obtained when observed, and the gel in this study was a homogeneous gel (**Table 1**).

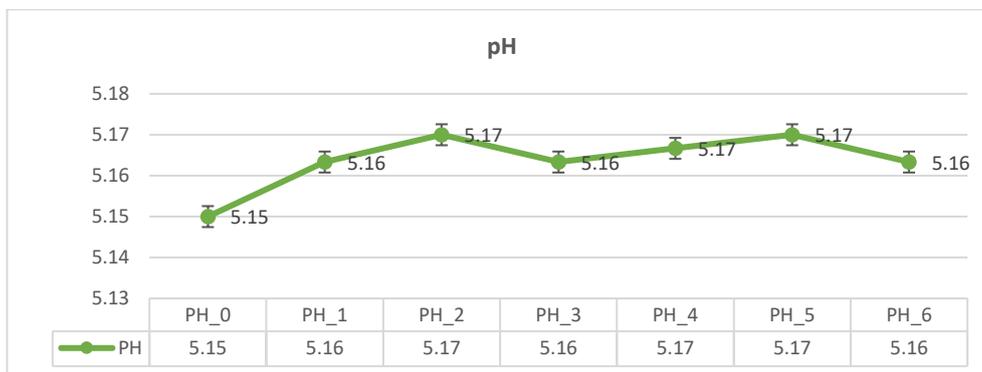
pH measurement aims to determine the acidity level of the preparation to match the pH of the topical preparation. A good topical preparation is one that is neither too acidic nor too alkaline so that it does not cause skin irritation (**Table 2**).<sup>7</sup>



**Figure 1.** (A) Simplisia preparations. (B) Ethanol extract *C. rotundus* L tuber 20% gel

**Table 2.** Statistical results based on pH test

	Day to							p value
	0	1	2	3	4	5	6	
<i>Mean</i>	5.15	5.16	5.17	5.16	5.17	5.17	5.16	0.526
<i>Standard Deviation</i>	0.04	0.01	0.00	0.01	0.01	0.00	0.01	



**Figure 2.** pH test results for 6 cycles

In this study, the average result of gel dispersion was 3.65 cm, with a p value > 0.05. These results are in accordance with the minimum gel dispersion requirement of 3-5 cm, so the gel preparation in this study meets the requirements for minimum coverage for gel spreading (**Table 3**).

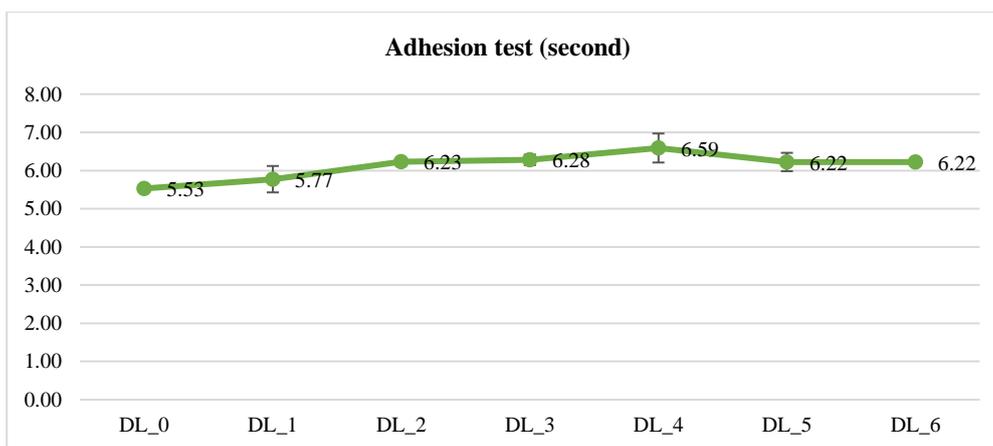
**Table 3.** Statistical results based on dispersion tests

	Day to							P value
	0	1	2	3	4	5	6	
<i>Mean</i>	3.53	3.50	3.63	3.60	3.63	3.57	3.60	0.189
<i>Standard Deviation</i>	0.06	0.10	0.06	0.00	0.06	0.06	0.00	

The test results on the adhesion of ethanol extract *C. rotundus* L tuber 20% gel were obtained on average 6.23 seconds with a p> value of 0.05 where the results met the requirements because the adhesion was more than 1 second (**Figure 3**).

**Table 4.** Adhesion test results

	Day to							p value
	0	1	2	3	4	5	6	
<i>Mean</i>	5.53	5.77	6.23	6.28	6.59	6.22	6.22	0.076
<i>Standard Deviation</i>	0.04	0.35	0.10	0.14	0.38	0.24	0.02	



**Figure 3.** Adhesion test results for 6 cycles

### III. Discussion

*Cyperus rotundus* L also known as nutgrass, purple bean, or java grass, is an upright grass-like weed with fibrous roots. The plant reproduces widely through rhizomes and bulbs, and it usually grows in tropical and subtropical regions. The rhizomes and tubers of *C. rotundus* L have long been used for herbal medicine.<sup>8</sup> Organoleptic testing is the evaluation of the authenticity of plants by confirming them based on color, taste, aroma, and size. The color and texture of the ethanol extract *C. rotundus* L tuber 20% gel were visually observed.<sup>6</sup> Organoleptic testing for 6 days on an ethanol extract *C. rotundus* L tuber 20% gel preparation at each repetition had a characteristic tuberous ethanol odor and was brown in color. The resulting smell and color come from the ethanol extract *C. rotundus* L tuber 20% gel.

Ethanol extract *C. rotundus* L tuber 20% gel has an average pH of 5.16, which meets the pH standards on the skin. If the pH value is less than 4,5, then the preparation is acidic, which can irritate the skin, and if the pH value is above 6,5, then the gel is a base that can affect dry skin.<sup>9</sup> Based on the results of statistical tests from day 0 to day 6 in the three formulations, stable results were obtained with p values > 0.05 (**Figure 2**).

When applied, dispersion assessment aims to determine the gel preparation's coverage area. Dispersion assessment is carried out by placing as much as 0.5 grams of gel in the middle of the object glass, then closing it using another object glass and giving it a 50-gram load. Then, let it stand for 1 minute until the gel can no longer spread, then a diameter measurement is carried out (**Table 3**).<sup>7</sup>

The adhesion assessment aims to measure the stickiness of the gel when it is applied. The adhesion test is carried out by placing 0.5 grams of gel on the object glass, then covering it with another object glass, and then giving it a load of 1 kg for 3 minutes. The determination of adhesion is done by assessing the time it takes until both glass objects are released, where good adhesion is obtained after more than 1 second. (**Table 4**).<sup>10</sup>

### IV. Conclusion

Ethanol extract *C. rotundus* L tuber 20% gel has good and stable physical properties, including organoleptic tests, homogeneity tests, pH tests, dispersion tests, and adhesion tests. The results of the physical tests obtained correspond to the requirements of the physical properties of the gel preparation.

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