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Antiinflamation Effect Test Of A Gel Service Of Kunyit Room Extract (*Curcuma domestica Val*) ON MIT (*Mus musculus*) Induced With Egg Albumins

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Abstrak
Inflammation is the body's protective response to attacks by disease or foreign microorganisms. Turmeric rhizome contains the compound curcumin which acts as an anti-inflammatory. The research that has been carried out is on the anti-inflammatory effect of turmeric (*Curcuma domestica Val*) rhizome extract gel preparations on mice (*Mus musculus*) induced by egg albumin. The aim is to determine the anti-inflammatory effect of turmeric rhizome extract made into a gel preparation. The extract was formulated into a gel with concentrations of 8%, 10% and 12%. The gel made was tested for the physical quality of the gel with homogeneous results, pH 7, spreadability 5-6 cm, adhesion power 4-7.28 seconds and viscosity 3000-5000 cps. Then the anti-inflammatory effect was tested on 25 mice using the artificial edema method on the soles of the feet induced by 0.1 ml egg albumin. Test animals were grouped into 5 groups, namely negative control group (Gel without extract), positive control (Flamar gel) and treatment group (8%, 10% and 12% concentration gel) administered topically. Edema volume measurements were carried out every 30 minutes for 120 minutes after egg albumin induction and the anti-inflammatory effect value was calculated. Then data analysis was carried out. The research results showed that turmeric rhizome extract gel met the requirements for testing the physical quality of good preparations. Concentrations of 8%, 10% and 12% have anti-inflammatory effects of 75.99%, 87.10% and 91.03%. F3 reduced the greatest edema.

Keywords**:** Anti-inflammatory, egg albumin, turmeric rhizome

1. Introduction

Inflammation is the body's protective response to tissue injury. The injury causes the release of three chemicals - kinins, prostaglandins and histamine - which stimulate a vascular response that encourages fluid and white blood cells to flow to the site of injury. Nerve endings are stimulated by brain signals that an injury is occurring to that part of the body. Anti-inflammatories work by inhibiting the action of cyclooxygenase and lipogenase enzymes thereby inhibiting the synthesis of PGs (prostaglandins) and leukotrienes. This inhibition can lead to increased cell stability, reduced membrane permeability (reduced udem) [7].

Symptoms of inflammation can include redness, swelling (Udem), heat, pain, and loss of normal function [7]. There are two types of anti-inflammatory drugs, namely steroidal and nonsteroidal anti-inflammatory drugs. Nonsteroidal anti-inflammatory drugs can cause bleeding in the stomach, anemia, and kidney disorders while steroidal anti-inflammatory drugs can cause stomach ulcers, osteoporosis, decreased immunity to infection, increased

intraocular pressure and adipose tissue, and diabetes [9].

The development of anti-inflammatory drugs derived from plants is based on the effects of anti-inflammatory drugs. The medicinal materials used are fruits, leaves, bark, rhizomes and flowers. Various pharmacological effects of turmeric have been reported, namely as anti-inflammatory, wound healing, antioxidant, antibacterial, antiviral, antifungal, antimalarial, anticarcinogenic. Another anti-inflammatory effect is the use of white rats with reduced swelling results [10].

Turmeric rhizome extract, which has anti-inflammatory effects, will then be developed into a topical dosage form to be used locally as an anti-inflammatory. Gel is a semisolid system consisting of a suspension made of small inorganic particles or large organic molecules and penetrated into a liquid [15]. The selection of this gel preparation form is based on the statement according to Ansel 2005 [1], namely that gel preparations can provide a cool feeling on the skin so as to provide a sense of comfort to the skin when applied where desired and the preparation is easy to dry and also easy to wash with water.

Based on the description above, the authors are interested in conducting research on the test of the anti-inflammatory effect of turmeric rhizome extract gel preparation (*Curcuma domestica Val*) on mice (*Mus musculus*) induced by egg albumin. Gel preparations were chosen because they are preferred as well as easy application and can provide comfort to the skin.

2. Methodology

This research was conducted in September-October 2023 at the Pharmaceutical Chemistry Laboratory, Faculty of Health Sciences, University of Muhammadiyah Palopo.

Research Variables

Independent Variable: variation in the concentration of turmeric rhizome extract 8%, 10%, and 12% as an active substance in the formulation of gel preparations. Dependent variable: stability of turmeric rhizome extract gel preparation formulation which includes organoleptical test, homogeneity, pH, spreadability test, and viscosity test..

Tools and materials

The tools used in this research are erlenmeyer, measuring cups, analytical scales, digital scales, mortar and pestle, knives, cutting boards, glass jars with lids, laboratory glassware, pH meters, viscometers, and digital calipers. The materials used in this study consisted of ethanol extract of turmeric rhizome, carbomer, propylenglycol, methyl Paraben, menthol, TEA, aqua destillata, egg albumin, and mice (*Mus musculus*).

Sample Preparation

Sample preparation is done by sorting turmeric rhizomes in terms of size and physical condition. Turmeric rhizome symplisia was prepared as much as 3 kg and then processed by the sorting process. The sorting results are then cleaned with running water to remove soil and dirt that is still attached to the turmeric rhizome and then drained to remove the remaining water content from the washing process. The turmeric rhizomes that have been drained then proceed to the cutting process. The first stage is the process of making simplisia by starting the cutting process, in this process the rhizome is knitted thinly and then dried, the

turmeric rhizome is dried by drying for 8 days and then mashed with a blender and sieved [8].

Moisture Content Test

Water content is carried out to determine the constant weight of the cup by heating at 1050C for 30 minutes, then tare. After that, weigh 10 grams of simplisia powder and put it in a porcelain cup. Next, the cup containing the simplisia powder is heated in an oven at 1050C for 5 hours, then weighed again to determine the constant weight [15].

Drying Shrinkage Test

Weigh the porcelain cup before and after heating in an oven at 1050C for 30 minutes. Weigh the simplisia powder as much as 2 grams. Powdered simplisia is put into a porcelain cup. Next, heated in an oven at 1050C for 30 minutes, then weigh and determine the constant weight [15].

Extraction of Turmeric Rhizome

The preparation of the extract was carried out by weighing 500 grams of turmeric rhizome powder, then placing it in a dark glass jar (Brown) intended to be protected from sunlight, then adding 96% ethanol solvent as much as 7.5 times the weight of the powder (3750 ml). Then allowed to stand for 5 days while digojog, pengojogkan done 1-3 times a day. The macerate was filtered with a cloth and then concentrated until a thick extract was obtained.

Gel Preparation

Prepare the tools and materials to be used. Weigh each ingredient according to the calculation. Develop carbomer with hot aquadest. Put into the mortar turmeric rhizome extract and propylenglycol by dissolving a little water until homogeneous. Then add methyl paraben and grind until homogeneous, then add menthol and grind until homogeneous. After homogeneous turmeric rhizome extract mixture is put into carbomer that has expanded and crushed quickly until homogeneous, then add TEA little by little until a gel is formed.

Evaluation of Turmeric Rhizome Extract Gel Preparation

Organoleptical

Organoleptical examination of gel preparations is carried out visually to see the preparation directly in the shape, color, and smell of the gel made. A good gel preparation is usually clear with a semi-solid concentration [2].

Homogeneity

Checking the homogeneity of the gel preparation can be done by applying the gel preparation on a glass object or transparent glass evenly and thinly, the results of a good gel preparation are homogeneous preparations and no coarse grains are visible during observation [2].

pH test

Examination of the pH of the gel preparation is carried out with a universal pH device. The gel preparation is applied to pH paper and then observe the pH color on the pH stick The pH range of preparations that are acceptable to the skin is between 6-8 [5].

Spreadability Test

The gel spreadability test is as much as 0.5 grams of gel preparation placed in the center of a round glass, then covered with another round glass. Measurement of the diamater

of the spread of the preparation longitudinally and transversely, carried out every additional weight of 200 grams. Good spreadability meets the requirements of 5-7 cm [4].

Adhesive power test

The adhesion test is carried out by placing 0.5 grams of gel on a glass object then covered with another glass object, and given a load for 5 minutes. Determination of adhesion is seen in the time required until the two glass objects are released. The requirement for adhesion is more than 1 second [18] and good adhesion is not less than 4 seconds [17].

Viscosity Test

This test was carried out using a Brookfield viscometer by pouring the sample into a 50 ml measuring cup. using a speed of 50 rpm [6].

Preparation of Egg Albumin Suspension

Preparation of 5% egg albumin is taken 0.5 ml of egg white mixed with physiological NaCl solution (NaCl 0.9% b/v) until homongen and the volume is sufficient to 10 ml.

Selection and Provision of Test Animals

The test animals to be used are male mice, weighing 20 grams to 30 grams, healthy animal conditions. The number of mice (Mus musculus) used was 25 and then divided into 5 groups, each group consisting of 5 mice.

Treatment of Test Animals

A total of 25 mice were prepared, then weighed. After that, the mice were randomly grouped into 5 groups. Group 1 was given a gel preparation without extract (negative control), group 2 (comparison) was given Flamar gel. Groups 3, 4, and 5 (Treatment) were given turmeric rhizome ethanol extract gel 8%, 10% and 12%. Before treatment, the volume of the foot was measured as the initial volume of the foot. Furthermore, all experimental animals were induced intraplantarly with 0.1 ml of 5% egg albumin. The anti-inflammatory effect was determined by measuring the volume of edema of the feet of mice (Mus musculus). Measurements were made using a digital caliper. Measurements were made on mice every 30 minutes for 120 minutes.

Anti-inflammatory Test

Before being treated, the volume of the mice's feet was measured. The volume of the mice's feet was measured to determine the initial volume (Vo). Measurements were made using a digital caliper. After the measurement, 0.1 ml of egg albumin was given intraplantar (carried on the soles of the mice's feet) to provide inflammation on the soles of the feet. Treatments with test preparations given topically to each group are:

Group 1: this group of test animals was given a gel base preparation as a negative comparator.

Group 2: this group of test animals with topical administration of flamar gel preparation as a positive comparator

Group 3: group of test animals with topical preparation of turmeric rhizome extract gel with a concentration of 8%

Group 4: group of test animals by administering topical preparations of turmeric rhizome extract gel with a concentration of 10%

Group 5: group of test animals with topical preparation of turmeric rhizome extract gel with a concentration of 12%.

Then each group was treated topically according to the group as much as 20 mg. After 30 minutes of giving anti-inflammatory gel by applying to the swollen leg, the volume of the leg was measured again using a digital caliper and then recorded as the volume of the mice's legs (Vt). Measurements were taken at every 30-minute interval, namely at the 30th, 60th, 90th, and 120th minutes.

Data Analysis

The data obtained in the form of mice leg volume, calculated the percentage of edema and the percentage of edema inhibition with the formula following Saputri and Zahara (2016) [13]:

Edema (%) = (Vt -Vo) /Vo x 100%

Description:

Vt = Volume of mice's feet after treatment

Vo = Volume of mice's feet before treatment

Edema inhibition (%) = (a - b) /a x 100%

Description:

a = Edema in the negative control group (%)

b = Edema in the test zar group (%)

Data on the percentage of edema inhibition obtained will be processed statistically using the SPSS 25 application.

3. Result and Discussion

3.1. Result

The determination of the water content test of turmeric rhizome simplisia powder aims to provide a minimum limit or range regarding the amount of water content in the simplisia, related to purity and contamination that may occur [16]. The results of this study show the percentage of water content test of turmeric rhizome powder is 10%. According to BPOM RI (2014) [3], states that the water content in simplisia is no more than 10%. This aims to avoid mold growth in simplisia. The results of the water content test can be seen in table 1.

Determination of drying shrinkage in this study, to determine the amount of water content in turmeric rhizome powder. The table below shows that the determination of drying shrinkage of turmeric rhizome powder weighed as much as 2 grams and then dried in the oven at 105 OC with the time required for 30 minutes. qualified with the results obtained which is 10%, the drying shrinkage requirement for turmeric rhizome is less than 12% [12]. The results of the drying shrinkage test can be seen in table 2.

Organoleptical examination aims to describe the shape, color and smell of the gel preparation that has been made. The observation results include the shape, color and odor of each gel formula stored for 4 weeks. The shape color and odor of each gel formula did not change during storage. The shape, color and odor of the turmeric rhizome extract gel depends on the concentration of the extract added. The more extract content added to the gel preparation, the more intensive the distinctive smell of turmeric and the more intense the

color. The results of the organoleptical test can be seen in Table 3.

Homogeneity check is an important parameter in gel preparations. The homogeneity check has the aim of knowing the quality of the gel preparation so that the active substance must be well mixed with the base homogeneously in order to provide maximum effect. The homogeneity of the gel preparation can be determined by looking at the uniformity of the color in the base visually, if the color of the gel is evenly distributed and there are no fine particles or grains, the gel preparation is declared homogeneous. The test results can be seen in table 4. The results of the homogeneity test of the gel preparation showed that the turmeric rhizome extract gel was a homogeneous preparation. Each formula has an even color on its base, showing no coarse grains in the preparation applied on a glass plate. This shows that the preparation made has a homogeneous composition [14].

The pH value obtained is 7. The pH value of mixing the various ingredients used, where carbomer has a pH range of 2.5-4.0. Methyl parabens are in the pH range of 4-8, propylenglycol is still in the pH range of 3-6, menthol is at pH 3.4 is acidic, distilled water has a pH of 7 and most importantly TEA is at pH 10.5 which can maintain a neutral pH in gel preparations, so it can be ascertained that the gel made has a pH range that is classified as neutral pH. The pH value obtained is still within the pH range of preparations acceptable to the skin, which is between 6-8 [5]. From the turmeric rhizome extract gel formula with various concentrations, namely F0, F1, F2 and F3, it meets the pH of the skin and from these results it can be stated that the preparation of turmeric rhizome extract gel with various concentrations is safe to use. pH test results can be seen in the table 5. Theresults of the dispersion power observation showed that the preparation experienced good dispersion power expansion. The test results for formulas F0, F1, F2 and F3 range from the first week to the fourth week. The spreadability obtained in the turmeric rhizome extract gel preparation was between 5-6 cm as seen in (Table 6). A good spreadability value is between 5-7 cm [4].

Adhesion testing aims to determine the ability of the gel preparation to adhere to the area of application. The greater the adhesion of the gel, the longer the gel will be in contact with the skin so that it will be more effective in drug delivery. The results of the adhesion test can be seen in table 11. The results obtained in the F0, F1, F2 and F3 adhesion test were 4 seconds to 7.28 seconds. Fulfills the adhesion test requirements, namely more than 1 second [18] And good adhesion is not less than 4 seconds [17]. Can be seen in table 7.

The viscosity test results of F0 gel preparations and F1, F2 and F3 turmeric rhizome extract gels obtained from the research were 3000-5000 cps. Meets the requirements for a good viscosity of gel preparations, namely around 3000-5000 cps [11]. Can be seen in table 8.

The results of testing the anti-inflammatory effect of negative control, positive control, turmeric rhizome extract gel with concentrations of 8%, 10% and 12% can be seen in table 9.

The results of calculating the percentage of edema in the graph above show a comparison of the edema of experimental animals in each group. The negative control group after administration of 0.1 ml egg albumin experienced an increase in edema volume up to 120 minutes with a percentage of 75.85%, while the positive control and turmeric rhizome extract gel at concentrations of 8%, 10% and 12% respectively experienced a decrease in

edema volume. . The positive control decreased by 5.21%, F1 by 18.21%, F2 by 9.78% and F3 experienced a decrease not much different from the positive control, namely 6.80%. These results indicate that the egg albumin induction was successful.

The results of the edema inhibition calculation showed that the positive control value provided an anti-inflammatory effect of 93.13%. At a concentration of 8% it gives an anti-inflammatory effect of 75.99%, then at a concentration of 10% it gives an anti-inflammatory effect of 87.10% and a concentration of 12% gives the greatest effect, not much different from the positive control, with a calculated result of 91.03%. From the results of the calculations and graphs above, it can be concluded that the turmeric rhizome extract made into a preparation, namely a gel preparation with a concentration of 12%, provides the greatest anti-inflammatory effect compared to concentrations of 8% and 10%. This shows that the positive control group and the group with varying doses of turmeric rhizome extract can have an anti-inflammatory effect on the feet of mice that have been induced with egg albumin. Giving a concentration of 12% is better and greater than concentrations of 8% and 10%.

3.2. Discussion

From the research that has been carried out, the results of the water content test are obtained which meet the water content test requirements, namely no more than 10%. According to BPOM (2014) [3]. Then the drying shrinkage test yielded results that also met the drying shrinkage test requirements, namely 10%. After testing the water content and drying loss, the dosage was made according to the formulation, then the first turmeric rhizome ethanol extract gel test was carried out, namely the organoleptic test with the results obtained, namely a thick, odorless preparation (preparation without extract). Typical aroma (turmeric rhizome extract gel preparation 8%, 10% and 12%) and clear color (gel without extract) orange (turmeric rhizome extract preparation 8%, 10% and 12%). In the homogeneity test, homogeneous results were obtained that met the requirements for a good gel preparation, there were no fine grains and the base was mixed evenly with the active substance.

The pH test on the turmeric rhizome extract gel preparation obtained a result of 7, fulfilling the pH test requirements that can be accepted by the skin, namely 6-8. In the spreadability test, the results obtained were 5-6 cm, fulfilling the requirements for the spreadability test of gel preparations, namely 5-7 cm. Then the adhesion test obtained was 4 seconds to 7.28 seconds, fulfilling the adhesion test requirements for gel preparations. Then the results obtained from the gel preparation viscosity test were 3000-5000 cps, fulfilling the gel preparation viscosity test requirements, namely 3000-5000 cps. After testing the preparation, the anti-inflammatory effect was tested on mice (Mus musculus) and the results obtained were that the 12% turmeric rhizome extract gel preparation was better than the 8% and 10% turmeric rhizome extract gel preparation.

4. Conclusion

Turmeric rhizomes (Curcuma domestica Val) can be formulated into gel preparations because they meet good stability standards including organoleptic tests, which do not experience changes in shape, color and odor during 4 weeks of storage and testing. The

homogeneity test meets the homogeneity requirements, namely there are no fine particles and the gel color is even. The pH test during the 4 week test met the pH requirements that the skin can accept, namely 6-8. In the spreadability test obtained during testing, namely 5-6 cm, it meets the requirements for the spreadability test, namely 5-7 cm. then the adhesion test obtained for more than 4 seconds meets the adhesion test requirements, namely not less than 1 second and more than 4 seconds. And the viscosity test also meets the viscosity test requirements, namely around 3000-5000 cps, the viscosity test obtained is 3000-5000 cps.

Ethanol extract of turmeric rhizomes (Curcuma domestica Val) which is formulated into gel preparations with different concentrations, can provide anti-inflammatory effects. The results of the anti-inflammatory effect test using different concentrations, namely 8% had an anti-inflammatory effect of 75.99%, then a concentration of 10% gave an anti-inflammatory effect of 87.10% and a concentration of 12% gave the greatest anti-inflammatory effect, namely 91.52%.

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