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Effectiveness of Garlic (Allium Sativum L.) Skin Extract Cream on the Healing of Rabbit (Orytolagus Cuniculus) Burn Wounds

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ABSTRACT

Garlic Tuber Skin (Allium sativum L.) contains flavonoids, alkaloids, saponins and tannins. The content of flavonoids, alkaloids, saponins and tannins contained in garlic bulb skin can have an effect on healing skin that has damaged cell tissue due to burns. This study aims to make a cream formulation of garlic bulb peel extract (Allium sativum L.) with various concentrations of 10%, 15% and 20% using adeps lanae cream base, liquid paraffin, stearic acid for the oil phase and TEA, nipagin for the oil phase. water which was then tested for its effectiveness in healing burns in rabbits (Orytolagus cuniculus). The negative control used cream base and the positive control used MEBO cream. The effectiveness test on burns was carried out on the back of a rabbit with a diameter of 1 cm. The wound was smeared twice a day with lidocaine cream and the healing effect was observed for 14 days. The results showed that from the 1st to the 14th day of observation, the burn wound decreased in diameter. It was concluded that cream concentrations of garlic bulb peel extract 10%, 15% and 20% had the fastest healing and wound healing effect on cream with a concentration of 20%.

Keywords: Burns, Cream, Extract, Garlic (Allium sativum L.) Skin, Rabbit (Orytolagus cuniculus)

INTRODUCTION

Burns are the most severe type of injury compared to other types of injuries, with the complexity of the problem and high mortality and morbidity rates (Jailani, 2014). According to WHO (2009), every year there are more than 300,000 people who die from burns, and there are millions more people who suffer from disabilities that affect psychological, social and economic effects. Some of these things make burns one of the main causes of injury. Around 73% of deaths in the first five days after burning are caused by complications of infection. The cause of burns is contact with heat sources such as water, fire, chemicals, electricity and radiation which results in not only skin damage but in patients with extensive (major) burns the body is no longer able to compensate so that various complications arise that require special treatment (Insani et al, 2017). The diversity of plants in Indonesia makes people able to think more creatively to utilize a plant for various aspects of life. One example is the use of natural medicine to heal burns. In an effort to prevent cell death and accelerate the healing of burns, people can utilize waste from garlic bulb skin. Waste is considered as something that is 1 4 useless and if left too long there will be a lot of accumulation, an unpleasant view and also as a nest of disease and research on its functional properties is very limited (Nisak and Karyaningrum, 2013; Rahmawati et al., 2019). In the market, many garlic bulbs are sold with peeled or unpeeled skin . Garlic with unpeeled skin can last longer during storage than peeled garlic bulbs. This shows that garlic skin has active compounds that protect the bulbs. The results of research conducted with garlic skin raw materials state that garlic skin can be used as a coating on fruits and vegetables (Hershko et al, 1998), producing bioethanol (Valeri et al, 2015), garlic skin extract has antioxidant and antimicrobial activity (Ifesan et al, 2014). Garlic skin also contains sulfur compounds, carbohydrates, cellulose,

protein (Sugave, 2014), qualitative phytochemical tests prove that garlic skin contains alkaloids,flavonoids, steroids, saponins, tannins and polyphenols (Wijayanti and Rosyid, 2015), have strong antioxidant activity (Ichikawa et al, 2003). Cream is one of the topical dosage forms generally used for local therapy. The cream dosage form is preferred by the public because it is easy to clean and easy to spread (Ansel, 1989). The use of cream preparations can also provide a cooling, shiny and moisturizing effect on the skin. O/A type cream preparations are made by dispersing oil in water. The advantage of the O/A type is that it provides an optimum effect because it is able to increase the concentration gradient of active substances that penetrate the skin so that percutaneous absorption increases (Kurniasih, 2016). Research is needed on the content of active compounds in garlic bulb skin so that it is more economically valuable and its use as an alternative treatment, one of which is in healing burns. Researchers want to know the effectiveness of garlic bulb skin extract cream (Allium sativum L.) on healing rabbit burns.

Garlic (Allium sativum) is a bulb from the Allium sativum plant belonging to the Liliaceae family. Garlic contains volatile oil of approximately 0.2% consisting of 60% allyl propyl disulfite, and a small amount of diethyl disulfite diallyl polysulfite, allinin and allicin. This oil has a spicy odor and is brownish yellow in color. The actual smell of garlic is thought to come from diallyl polysulfite (Mariana, 2010). Garlic can be used as a traditional medicine to treat respiratory disorders, urinary tract disorders, high blood pressure, cholesterol, headaches, flu, hemorrhoids, constipation, bruises, worms, insomnia, and others. Several scientific studies have been conducted stating that garlic can be used as an antidiabetic drug (Mathew and Augusti 1973), antihypertensive (Foushee et al. 1982), anticholesterol, antiatherosclerosis (Yarnell, 1999), antioxidant 10 (Borek, 2001), antiplatelet cell aggregation (Agarwal, 1996), fibrinolysis stimulant, antiviral, antimicrobial (Nok et al. 1996; Zhang 1999; Ohta et al. 1999; Mabey et al. 1988) and anticancer (Howe, 1997; Bordia et al. 1996; Mabey et al. 1988).

Cream is a semi-solid dosage form containing one or more dissolved or dispersed medicinal ingredients in a suitable base material. This term has traditionally been used for semi-solid preparations that have a relatively liquid consistency formulated as a water-in-oil or oil-in-water emulsion (Anonymous, 2014). Cream contains no less than 60% water and is intended for external use (Anonymous, 1979). Cream is a semi-solid emulsion system with a non-clear appearance. Its consistency and properties depend on the type of emulsion, whether it is water-in-oil or oil-in-water (Lachman, et al., 1994). Cream preparation emulsifiers can be anionic, cationic and non- ionic surfactants. For water-in-oil type creams, span, adeps lanae, cholesterol, cera are usually used and for oil-in-water type creams , triethanolamine, sodium stearate, potassium stearate, ammonium stearate are commonly used . 25 Antioxidants and preservatives are added to stabilize the cream. Preservatives that are often used are nipagin 0.12-0.18% and nipasol 0.02-0.05 % (Anief, 2010).

METHODS

Tools

The tools used in this study were chamber, analytical balance, Erlenmeyer flask, measuring cup, cup, oven, water bath, funnel, dropper, spatula, stirring rod, glass object, graduated glass, pH meter, blender, stamper, mortar, horn spoon, filter paper, hot plate, electric stove.

Materials

The materials used in this study were garlic bulb skin (Allium sativum L.) obtained from Pahing Market, Kediri City which had been made into simplicia, 96% ethanol, stearic acid, triethanolamine, adeps lanae, liquid paraffin, nipagin, aquades and mebo. The test animals used in this study were rabbits (Orytolagus cuniculus).

Table I. Formulation

Material	FI	FII	FIII	K (+)	K(-)
Tuber skin ekstrak alium	10	15	20	-	-
Stearat Acid	15	15	15	-	15
TEA	3	3	3	-	3
Adeps Lanae	30	30	30	-	30
Parafin liquid	25	25	25	-	25
Nipagin	0,2	0,2	0,2	-	0,2
Aquades	Ad 100	Ad 100	Ad 100	-	Ad 100
MEBO Krim				100	

: K + (Negative Control) : MEBO Cream K - (Positive Control) : Cream formulation without MEBO extract FI : Cream formulation with 10% extract concentration F II : Cream formulation with 15% extract concentration F II : Cream formulation with 20% extract concentration.

Data Collection Procedure 1. Plant Determination Plant determination is carried out to determine the truth of the plants that will be used as test materials. Determination of the skin of 47 garlic bulbs (Allium sativum L.) used for this study was carried out at UPT Materia Medica Indonesia, Batu, Malang, East Java. 2. Collection of Garlic Bulb Skin Samples (Allium sativum L.) The skin of the garlic bulbs (Allium sativum L.) used in this study was obtained from Pahing Market, Kediri City. 3. Preparation of Garlic Bulb Skin Extract (Allium sativum L.) a. Collection of Garlic Bulb Skin (Allium sativum L.) b. Garlic Bulb Skin (Allium sativum L.) is cleaned and then rinsed. c. A total of 1000 g of garlic bulb skin that has been mashed d. Garlic Bulb Skin (Allium sativum L.) was macerated using 10,000 ml of 96% ethanol for 5 days (stirred every day) e. then filtered using flannel cloth f. the filtrate was evaporated in a rotary evaporator at a temperature of 50°C at a speed of 100 rpm until it became a thick extract 4. Phytochemical Screening a. Flavonoids A 3 ml extract sample was added to 5 ml of 70% ethanol then heated briefly and filtered. The filtrate obtained was then added with Mg metal and 2 drops of 2N HCL. If there is a yellow-red color change, it indicates a positive result containing flavonoids (Sulistyoningdyah & Ramayani, 2017; Dewi et al, 2021). 48 b. Alkaloids A 3 ml extract sample was placed in a porcelain cup then 5 ml of 2 M HCL was added, stirred and then cooled at room temperature. After the sample was cold , 0.5 g of NaCL was added, stirred and filtered. The obtained filtrate was added with 3 drops of 2 M HCL, then separated into 3 parts. The first tube functions as a blank which is added with 2N HCL, the second tube was added with 3 drops of Dragendorff's reagent and the third tube was added with 3 drops of Mayer's reagent. Positive results for the presence of alkaloids are indicated by the formation of an orange precipitate in the second tube and a yellow precipitate in the third tube (Sapri et al, 2014; Dewi et al, 2021). c. Saponin A 2 ml extract sample was put into a test tube then 10 ml of distilled water was added and shaken for 30 seconds, the changes that occurred were observed. If a stable foam is formed (does not disappear for 30 seconds) then the identification shows the presencesaponin (Sulistyoningdyah & Ramayani, 2017; Dewi et al, 2021). d. Tannin Examination of tannin compounds was carried out by adding 5 drops of 1% FeCl3 to 1 ml of thick extract. The color

change of the solution to dark blue or greenish black that was formed 49 indicated the presence of tannin (Nofitarini et al, 2019; Sulistyoningdyah & Ramayani, 2017; Sastrawan et al., 2013). 5. Making garlic (Allium sativum L.) skin extract cream a. Weighing all the ingredients needed. The ingredients in the formula are separated into two groups, namely the oil phase and the water phase. b. The oil phase, namely stearic acid, liquid paraffin, adeps lanae, is transferred into a porcelain cup, heated above a water bath at a temperature of 70 ° C until melted. c. The water phase, namely Triethanolamine and distilled water, was heated on a water bath at a temperature of 70°C until melted. d. The water phase was slowly added to the oil phase then added nipagin with constant stirring until a homogeneous cream mass was obtained. e. Adding the extract to the cream base with a concentration of 10%, 15% and 20%, grind it until homogeneous then put it in a container. 6. Physical Quality Test of Garlic Skin Extract Cream (Allium sativum L.) a. Organoleptic Test The test was carried out in 3 preparations by directly observing the shape, color, and odor of the garlic skin extract cream made (Dhase et al., 2014). b. Homogeneity Test The test was carried out in 3 preparations by applying a sufficient amount of garlic extract cream to the object glass then observing it visually. A cream preparation must show 50 homogeneous compositions, that is, no solid material or grains are felt on the glass (Rahman et al., 2013). c. pH Test Weigh 1 gram of cream preparation, dissolve the sample with 10 mL of sterile distilled water. Clean the pH indicator using tissue then dip it into the cream preparation and leave it for a few seconds, check the pH of the cream preparation (Megantara et al., 2017). d. Spreading Power Test Weigh 500 mg of cream preparation. Place it on a round glass scale, place another glass on top and leave it for 1 minute. The hydrogel spread diameter is measured after 1 minute. After that, 50 g, 100 g, 150 g, 200 g and 250 g of additional load are added and left for 1 minute. Measure the constant diameter (Dewantari and Sugihartini, 2015). e. Adhesion Power TestWeigh the cream preparation as much as 0.25 grams. The cream is placed on a glass object.

RESULTS

From the results of the phytochemical screening test of garlic bulb skin extract (Allium sativum L.) it is positive for containing flavonoid compounds with a yellow-red color change. Positive for containing alkaloid compounds with an orange color change. Contains saponin compounds with the formation of foam and contains tannin compounds with a bluish-black color change . Based on organoleptic observations, variations in the concentration of garlic (Allium sativum L.) skin extract did not affect the shape, color , and odor of the cream preparation. The form of the garlic (Allium sativum L.) skin extract cream preparation was semi-solid. The color of the garlic (Allium sativum L.) skin extract cream preparation was brown. The odor of the garlic (Allium sativum L.) skin extract cream preparation was the typical aroma of garlic skin.Based on the results of observations, the cream formulation showed homogeneous results , marked by the absence of coarse grains that clumped together on the glass object and spread evenly.

The pH test aims to determine the acidity of the preparation when used so that it does not irritate the skin. The pH value of the skin is around 6 - 7. Based on the results of the pH test of the garlic skin extract cream preparation (Allium sativum L.), it shows that the pH of the cream preparation has an average value ± SD of Formulation I 6.33 ± 0.58, Formulation II 6.33 ± 0.58 and Formulation III 6.33 ± 0.58. The pH value of the white onion skin extract cream preparation (Allium sativum L.) has an average that meets the requirements for the skin pH value, which is in the range of 6-7. The data is continued with a normality test to determine the data is normally distributed in formulations I, II and III. The results of the normality test show that the data is normally distributed as indicated by a significant value of 0.314> 0.05. The data is continued with a homogeneity test showing that the data has the

same variance (homogeneous) with a significant value of 0.315> 0.05. Furthermore, the data was tested for one-way ANOVA statistical analysis to see whether there was a difference in pH values of the three formulations. The results of one-way ANOVA obtained a significant value of 0.749>0.05, which indicated that there was no significant difference in pH values of the three formulations.

The results of the spreadability test of the 3 formulations decreased. Based on the results of the spreadability test of the garlic (Allium sativum L.) skin extract cream preparation, it showed that the spreadability test of the cream preparation had an average value ± SD in Formulation I of 5.87 ± 0.37, 66 Formulation II of 5.36 ± 0.18 and Formulation III of 5.21 ± 0.12. The test results showed that the cream made had met the requirements for a spreadability test that was comfortable for the skin. The data was continued with a normality test to determine whether the data was normally distributed in formulations I, II and III. The results of the normality test showed that the data was normally distributed as indicated by a significant value of 0.062> 0.05. The data was continued with a homogeneity test showing that the data had the same variation (homogeneous) with a significant value of 0.472> 0.05. Furthermore, the data was tested for one way anova statistical analysis to see whether there was a difference in the spreadability values of the three formulations. The results of one way ANOVA obtained a significant value of 0.390>0.05 indicating that there was no significant difference in the spreadability values of the three formulations.

The adhesion test is used to determine the maximum ability of the cream preparation to adhere to the application area, namely the skin. The results of the adhesion test meet the adhesion test requirements of not less than 4 seconds. Based on the results of the adhesion test of the cream preparation of white onion skin extract 67 (Allium sativum L.), it shows that the adhesion test of the cream preparation has an average value ± SD in Formulation I of 58.7 ± 3.5, Formulation II of 60.0 ± 3.6 and Formulation III of 63.7 ± 5.1. The test results indicate that the cream made has met the requirements for a good adhesion test. The data is continued with a normality test to determine whether the data is normally distributed in formulations I, II and III. The results of the normality test show that the data is normally distributed as indicated by a significant value of 0.056> 0.05. The data is continued with a homogeneity test showing that the data has the same variation (homogeneous) with a significant value of 0.147> 0.05. Furthermore, the data was tested to one way anova statistical analysis to see whether there was a difference in the adhesive power value of the three formulations. The results of one way anova obtained a significant value of 0.072>0.05 indicating that there was no significant difference in the adhesive power value of the three formulations.

The data obtained from the measurement of the diameter of the burn wound were then processed statistically using SPSS. Statistical analysis and measurement data of the diameter of the wound include normality test, homogeneity test, one way ANOVA test. The measurement data of the diameter of the burn wound on the 14th day was tested for its normality with the Shapiro-Wilk test, it was found that the measurement results of the burn wound were normally distributed for all treatment groups with (P 0.05) namely P = 0.101. The normally distributed data were then tested for homogeneity using the Leavene test, it was found that the measurement results of the diameter of the burn wound were homogeneous data with a value of (P> 0.05) which was P = 0.978. The results of the analysis of the measurement data of the diameter of the burn wound on the 14th day obtained from the one way ANOVA test showed a significant value (P> 0.05) namely P = 0.992 which means that there was no significant difference in each treatment group.

Optimal wound management has driven the rapid development of science about wounds, healing, and wound management. Burns are the most severe type of injury compared to other types of injuries, with the complexity of the problems and high mortality and morbidity rates. The maintenance and development of traditional medicine as a cultural

heritage of the nation continues to be improved and its development is encouraged through the exploration, testing and discovery of new drugs. One example is the use of natural medicine for healing burns (Prasetyo et al, 2010; Jailani, 2014). Currently, the use of natural medicine to replace chemical drugs has been widely used. One effort to accelerate the healing of burns, the community can utilize the skin of garlic bulbs (Allium sativum L.). Compounds found in the skin of garlic bulbs (Allium sativum L.) include flavonoids, alkaloids, saponins, and tannins. Chemically, flavonoids, alkaloids and saponins have strong antiseptic and antioxidant activity (Harborne, 1987; Ichikawa et al, 2003; Wijayanti and Rosyid, 2015). While tannins and their derivatives work by shrinking the mucous membrane in the wound channel. In wound care, tannins can accelerate the formation of new tissue while protecting against infection or as an antiseptic (Tyler, 1976). 70 68 This study used a cream preparation because it has several advantages such as being able to provide a cooling effect, shiny, moisturizing the skin, easy to clean and easy to spread (Ansel, 1989).

DISCUSSION

The formulation of the cream preparation will affect the amount and speed of the active substance that can be absorbed. The active substance in the cream preparation enters the base or carrier that will bring the drug to contact the skin surface. The carrier used for topical preparations will have a very beneficial effect. In addition, the selection of cream in this study was because it was indicated for the skin and mucosa of the skin so that it was able to release the drug from the cream base and could absorb the drug faster so that it could provide maximum therapeutic effects. The skin of the garlic bulb (Allium sativum L.) obtained was then determined at the Indonesian Materia Medica Center, Batu, Malang Regency, East Java. Plant determination needs to be carried out as an initial stage of research to obtain the truth of the identity of the plant being studied.avoid errors in collecting the main ingredients and prevent the possibility of mixing the plants studied with other plants (Indiarto et al, 2017). The identification results prove that the plant used in this study is the garlic skin plant (Allium sativum L.). The preparation of garlic skin simplicia (Allium sativum L.) which was previously collected in a fresh condition, then sorted and purified to separate dirt or foreign materials attached to the garlic skin (Allium sativum L.) so that it does not participate in the test material. The garlic skin is then dried in the sun. The dried garlic skin is then powdered to expand the surface area in contact with the solvent liquid so that the chemical content dissolved in the extraction process is greater and the extraction takes place more perfectly (Ministry of Health, 1986). The extraction chosen is maceration, because the method of work and the method used are simple and easy to do (Anonymous, 1986). The principle of this maceration is to extract active compounds that can dissolve in solvents based on the polarity of the solvent or known as like dissolve like (polar compounds will dissolve with polar solvents and non-polar compounds will dissolve with non-polar solvents) (Halimah, 2010). The solvent will penetrate the cell wall and enter the cell cavity containing the active compound. The active compound will dissolve because of the difference in concentration between the active compound solution inside and outside the cell, so the hypertonic fluid will enter the hypotonic fluid, so that balance occurs. Stirring is needed to even out the concentration of the solution outside the powdered simplicia grains so that the smallest degree of difference in concentration is maintained between the solution inside and outside the cell. The solvent used is 96% ethanol because ethanol has the ability to extract with wide polarity ranging from non-polar compounds to polar compounds (saefudin et al., 2006). Ethanol is very effective in dissolving flavonoids, alkaloids, saonins and tannins so that the dissolved interfering substances are only limited (Anonymous, 1986). The filtrate from the maceration of garlic (Allium sativus L.) skin was blackish green. The extract was then subjected to phytochemical screening tests for compounds.

CONCLUSION

Based on the results of the research that has been done, it can be concluded that: 1. Garlic skin extract cream (Allium sativum L.) is effective in healing burns on rabbits (orytolagus cuniculus). 2. Garlic skin extract cream (Allium sativum L.) at a concentration of 20% is most effective in healing burns on rabbits (orytolagus cuniculus) compared to concentrations of 10% and 15%.

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