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Original Research Article

The Effectiveness of Kersen Leaf Extracts (*Muntingia calabura L.*) on Cutting Wounds Infected with Sthapylococcus Aureus Bacteria

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Abstract

One of the plants that has been used by the community is cherry (*Muntingia calabura L.*) which is a lush plant, easy to breed, often on the side of the road, allowed to grow as a shade tree. Traditionally used to treat bleeding wounds, festering and burns, inflammation of the walls of blood vessels accompanied by blood clots in their channels. Fresh or dried cherry leaves are used as a medicine for wounds by finely grinding them and placing them on the wound. The use of cherry leaves directly in the treatment of wounds is not liked by the community, so they tried to formulate it in the form of cream preparations. Based on this, the researchers conducted a phytochemical screening and formulation of cherry leaf extract in cream preparations as well as tested its effectiveness for treating wounds. Extraction was carried out by percolation using 80% ethanol. Phytochemical screening was carried out on fresh leaves, simplicia, and ethanol extract of cherry leaves. And formulated into cream preparations with concentrations of 2.5%, 5% and 7.5%. The effectiveness for wound healing was carried out on artificial incisions on the back skin of male guinea pigs infected with *Staphylococcus aureus* bacteria. Measured decrease in wound diameter and observation of the width of the pus and the amount of edema. The results of the phytochemical screening test showed that there were the same groups of chemical compounds in fresh leaves, simplicia, and ethanol extract of cherry leaves, namely alkaloids, flavonoids, tannins, triterpenoids/steroids. The greater the concentration of EEDK in the cream, the faster the wound will heal. On the 16th day, 5% EEDK; 7.5%; and gentamicin provide 100% perfect wound healing. Means that the ethanol extract of cherry leaves at a concentration of 5% has a very good ability to heal incisions infected with *Staphylococcs aureus.*

Keywords: Cherry leaves, ethanol extract, phytochemical screening, wound healing, *Shapylococcus aureus*.

1. PRELIMINARY

Indonesia is rich in medicinal plants that have potential as traditional medicines or as raw materials for medicines or as a source of efficacious medicinal chemical compounds, but there are still many that are only used traditionally with empirical evidence, not yet proven through scientific research. The use of plants as medicinal ingredients has its own advantages, which are relatively safer and cheaper than drugs derived from synthetic chemical raw materials (Kabumainin and Ranuatmaja, 2008). With the diversity of medicinal plants, there are several plants that have the same name even though the types are different. This is because some plants have not been fully identified and are not widely known by the public. Therefore it is necessary to introduce the types of plants and how to use them so that they can be used in medicine. In addition, medicinal plants are a potential wealth that needs to be protected because they can be used as a supporter of the Indonesian people's economy (Dalimartha and Andrian, 2013).

One of the plants that has been known and used by the community for its medicinal properties is the kersen plant or talok (*Muntingia calabura L.)* which is a type of plant that has wet and leafy stems, easily grows on fertile soil, often grows wild on roadsides, ditches, or appears in the middle of a crack in a floor or fence wall, grows quickly, is usually left to grow as a shade plant on the side of the road. Traditionally used to treat bleeding wounds and burns, inflammation of the walls of blood vessels accompanied by blood clots in their channels (Dalimartha, 2000).

A wound is a damage to the continuity of the skin, mucous membranes and bones or other organs, a disturbance from the normal condition of the skin (Taylor, 1997; (Kozier, 1995). According to the

experience passed down from generation to generation, people in several areas in North Sumatra, especially the people of South Tapanuli , cherry leaves can be used as a wound medicine by applying fresh leaves or dried leaves after finely grinding to the wound. The use of cherry leaves directly on the skin or infected wounds is less desirable, so it needs to be formulated into a preparation, for example formulated in a dosage form cream, salve or gel. Cream preparations are widely liked by the public because they are easy to use and wash with water.

Formulation of natural ingredients directly into a preparation certainly requires a large volume or concentration to obtain effective properties. For this reason, volume reduction efforts need to be made, one of which is by making it into an extract. In the process of making the extract there is a possibility of damage to the chemical compounds contained in it, so to ensure that there are still chemical compounds, especially those that have potential as antibacterial so that they can treat infected wounds such as polyphenols, flavonoids, and tannins, in cherry leaf extract a phytochemical screening is carried out on the leaves. Fresh cherries, simplicia and cherry leaf extract.

Based on the description above, the researchers made an ethanol extract of cherry or talok leaves (*Muntingia calabura L*.), carried out a phytochemical screening of fresh leaves, simplicia and ethanol extract of cherry leaves. Furthermore, the ethanol extract of cherry leaves was formulated into cream preparations with various concentrations, tested for the physical quality of the preparations, and tested for the healing of artificial wounds infected with bacteria on the skin of male guinea pigs. Because the bacteria that are abundant on the skin are normal flora, and which can infect injured skin is *Staphylococcus aureus*, in this study *Staphylococcus aureus* was selected as a bacterium to infect the skin of male guinea pigs as experimental animals.

1.2 Research Purposes

1. Formulating cherry leaf extract into a cream preparation that is of good quality and does not irritate the skin.
2. Received information that cream preparations containing ethanol extract of cherry leaves can heal infected incisions.
3. Indirectly utilizing cherry plants so that the community can cultivate and be effective for improving the community's economy.

II. LITERATURE REVIEW

2.1 Cherry Plants

Cherry is a shrub or tree, up to 12 m high, although generally only about 3-6 m, flowers and bears fruit throughout the year. The tree's branches lay flat, and hang down at the ends; form a shady shade. Fine-haired twigs mixed with glandular hairs. The leaves lie flat, alternate; Leaf blade asymmetrical, ovoid lanceolate, serrated edges and pointed tip, 1-4 × 4-14 cm, dense gray hair below, short stem. The supporting leaves are tapered in the form of threads, approximately 0.5 cm. After a while, they dry out and fall off. Cherry blossoms appear among the leaves, in bundles, containing 1-3(-5) florets, located in the axillary slightly above the leaf growth; long-stemmed; androgynous number 5; crown flat-brimmed, obviate, thin white, glabrous. The blooming flowers stand out, onto the blades of leaves; after becoming a fruit hanging down, hidden under the leaves. Generally only one or two flowers become fruit in each file. The fruit is hidden under the leaves in the form of a buni fruit, almost perfectly round, 1-1.5 cm in diameter, green, yellow and red when ripe, crowned with the remains of a pistil that does not fall out like a five-pointed black star. Contains several small, smooth, yellowish-white seeds; immersed in meat and sweet juice, loved by people, especially children. This fruit can also be used as jam. Kersen trees in Indonesia are easy to find, usually used as shade trees. The fruit is hidden under the leaves in the form of a buni fruit, almost perfectly round, 1-1.5 cm in diameter, green, yellow and red when ripe, crowned with the remains of a pistil that does not fall out like a five-pointed black star. Contains several small, smooth, yellowish-white seeds; immersed in meat and sweet juice, loved by people, especially children. This fruit can also be used as jam. Kersen trees in Indonesia are easy to find, usually used as shade trees. The fruit is hidden under the leaves in the form of a buni fruit, almost perfectly round, 1-1.5 cm in diameter, green, yellow and red when ripe, crowned with the remains of a pistil that does not fall out like a five-pointed black star. Contains several small, smooth, yellowish-white seeds; immersed in meat and sweet juice, loved by people, especially children. This fruit can also be used as jam. Kersen trees in Indonesia are easy to find, usually used as shade trees. This fruit can also be used as jam. Kersen trees in Indonesia are easy to find, usually used as shade trees. This fruit can also be used as jam. Kersen trees in Indonesia are easy to find, usually used as shade trees.

Figure 2.1: Cherry plants

2.1.1 Benefits of Cherry Leaves

Some of the benefits of cherry leaves and fruit for health include: as an antibacterial, treat infections or antiseptics treat wounds, cure coughs, and treat inflammation. anti-tumor, treats spasms or stiffness in the digestive tract due to gastritis and diarrhea, lowers uric acid levels in the blood, cholesterol levels, blood sugar levels, high blood pressure, relieves flu symptoms, increases body resistance, relieves headaches.

2.1.2 Cherry Plant Taxonomy

In the systematics of plant growth, cherry plants are classified as follows (Indonesian Wikipedia, the encyclopedia):

Kingdom : Plantae
Subkingdom : Tracheobionta
Super Division : Spermatophyta
Division : Magnoliophyta
Class : Dicotylrdonae
Order :Malvales
Family :Muntingiaceae
genus :*Muntingia*
Species :*Muntingia calabura*L.

In Indonesia it is called kersen. In several regions, several names are known: Jakarta is named after cherry, Madura is called baleci. Other names in some countries are datiles, aratiles, manzanitas (Philippines); mât sâm (Vietnam); khoom sômz, takhôb (Lao); takhop farang (Thailand); goods krâkhôb (Cambodia); and Siamese kerukup (Malaysia). capulin blanco, cacaniqua, nigua, niguito (Spain); Jamaican cherry, and Singapore cherry (English). The Dutch call it Japanse kers ("Japanese cherry").

2.1.3 Chemical Content of Cherry Leaves

The chemical compounds of secondary metabolites in cherry leaves are alkaloids, flavonoids, tannins, saponins, steroids/triterpenoids, and glycosides. In every 100 grams of cherry leaves contains 77.8 grams of water, 0.384 grams of protein, 1.56 grams of fat, 17.9 grams of carbohydrates, 4.6 grams of fiber, 1.14 grams of ash, 124.6 milligrams of calcium, 84 milligrams of phosphorus, 1.18 milligrams of iron, 0.019 grams of carotene, 0.065 tannins grams, 0.037 grams of riboflavin, 0.554 grams of niacin, and 80.5 milligrams of vitamin C. (Team Karya Tani, 2010).

2.2 Wound

Wound is a state of interruption of tissue continuity due to injury. The cause of acute injuries due to external factors, due to exposure to hard or sharp objects.

Many plants have been proven to have wound healing activity and can be used as an alternative wound healing therapy. The test results show that various plants contain secondary metabolites of flavonoids, alkaloids, tannins, saponins, terpenoids and steroids, and some of them are very supportive for wound healing, especially flavonoids, tannins and saponins.

The process of wound healing is a biological process starting from the presence of trauma and ending with the formation of scars.

Flavonoids are natural compounds that contain an aromatic ring in which the hydroxy or alkoxy groups can be substituted. This compound is found in all plants such as leaves, fruit, wood, and bark. There are ten types of flavonoids, namely anthocyanins, leukoanthocyanidins, flavonols, flavans, glycoflavones, biflavonyls, chalcones, aurons, flavones, and isoflavones. Flavonoids have activity as an antiseptic which can prevent infection in the wound.

Saponins are strong surface active compounds and foam when shaken with water. The types of saponins are triterpenoid glycosides and certain steroidal glycosides which have a spirotecal chain. Steroid saponins are composed of a steroid nucleus (C27) with a carbohydrate molecule. Steroid saponins are hydrolyzed, producing aglycones known as seroponins. Hydrolyzed triterpenoid saponins produce an aglycone called sapogenin (Robinson 1995). Saponins are compounds that can spur/stimulate the formation of collagen, resulting in wound healing.

Tannins are complex compounds, usually a mixture of polyphenols which are difficult to separate because they are not in crystalline form. Tannins function as a defense in plants, help repel plant predators, have antioxidant activity that inhibits tumor growth and denatures proteins. Tannins contain phenol groups, have an astringent taste and have the ability to tan the skin. According to its limitations, tannins can react with proteins to form stable copolymers that are not soluble in water. Tannins are active antimicrobials, and can trigger wound contraction.

2.2.1 Plants have Wound Healing Potential

Plants that have an astringent taste, for example snake fruit and its skin, areca nut seeds, contain tannins that have the potential to heal wounds. Plants that have a sharp odor, for example lemongrass stems and leaves, ginger rhizome and leaves, turmeric leaves and rhizome, kecombrang flowers and leaves, betel nut, tembelekan flowers and leaves, chicken dung flowers and leaves, have the potential as antibacterials to treat infections so they can heal wound.

2.2.2 Wound Healing Process

The process of wound healing occurs through several stages/phases:

1. Inflammatory Phase

Inflammatory phase is the presence of vascular and cellular responses that occur as a result of injury that occurs in soft tissue. The process achieved is to stop bleeding and clean the wound area from foreign

bodies, dead cells and bacteria to prepare for the start of the healing process.

In the initial phase, blood vessel damage will cause the release of platelets which function as hemostasis. Platelets will cover the open vascular and also secrete vasoconstrictive substances which cause the capillaries to experience vasoconstriction, then endothelial sticking occurs which will close the blood vessels. This period only lasts 5-10 minutes, and after that capillary vasodilation will occur, stimulation of sensory nerves (local sensory nerve endings), local reflex action, and the presence of vasodilator substances: histamine, serotonin and cytokines. Histamine apart from causing vasodilation also results in increased venous permeability, so that blood plasma fluid exits the blood vessels and enters the wound area and clinically tissue edema occurs and the local state of the acidotic environment (Sabiston 1997). Exudation results in the migration of leukocytes (especially neutrophils) to the extra vascular. The function of neutrophils is phagocytosis of foreign bodies and bacteria in the wound area for 3 days and then they will be replaced by macrophage cells which play a bigger role than neutrophils in the wound healing process. The functions of macrophages besides phagocytosis are:

a. Collagen synthesis.
b. Formation of granulation tissue together with fibroblasts.
c. Producing growth factors that play a role in re-epithelialization.
d. Formation of new capillaries or angiogenesis.

The formation of a clean wound, there is no infection or germs and the formation of macrophages and fibroblasts, can be used as a guide/parameter of the inflammatory phase characterized by the presence of: erythema, warmth on the skin, edema and pain lasting until the 3rd or 4th day.

2. Proliferation Phase

Proliferation phase is a process of cellular activity that is important in this phase of wound repair and healing and is characterized by cell proliferation. The role of fibroblasts is very large in the repair process, which is responsible for the preparation of producing protein structure products that will be used during the tissue reconstruction process. In normal soft tissue (without injury), exposure of fibroblast cells is very rare and usually hides in the supporting tissue matrix. After an injury occurs, fibroblasts will actively move from the tissue around the wound into the wound area, and develop (proliferate) to secrete several substances (collagen, elastin, hyaluronic acid, fibronectin and proteoglycans) which play a role in building (reconstructing) new tissue.

The more specific function of collagen is to form the forerunner of new tissue (connective tissue matrix) and by removing the substrate by fibroblasts, it indicates that macrophages, new blood vessels and also fibroblasts as a unit can enter the wound area. A number of new cells and blood vessels that are embedded in the new tissue are referred to as granulation tissue, while the proliferative process of fibroblasts with their synthetic activity is called fibroblastia. The response of fibroblasts to the process of fibroplasia is:

a. Proliferation.
b. Migration.
c. Matrix network deposits.
d. Wound contraction. Angiogenesis, a process of forming new capillaries in a wound, has an important meaning at the proliferative stage of the wound healing process.

Vascular failure due to disease (diabetes), medication, radiation or drugs (steroid preparations) results in a slow healing process due to the formation of chronic ulcers. The vascular tissue that invades the wound is a response to provide adequate oxygen and nutrition in the wound area because usually in the wound area there is a hypoxic state and a decrease in oxygen pressure.

In this phase, fibroplasia and angiogenesis are integrated processes and are influenced by substances secreted by platelets and macrophages (growth factors). The next process is epithelialization, in which fibroblasts secrete keratinocyte growth factor (KGF) which plays a role in stimulating epidermal cell mitosis. Keratinization will start from the edge of the wound and eventually form a barrier that covers the wound surface. Collagen synthesis by fibroblasts, the formation of this dermis layer will be enhanced in quality by regulating the balance of granulation tissue and dermis.

To help the new tissue close the wound, fibroblasts will change their structure to become myofibroblasts which have the capacity to contract the tissue. The function of contraction will be more prominent in wounds with extensive defects than those with minimal wound defects. The proliferative phase will end when the dermal epithelium and collagen layers have formed, the contraction process is visible and will be accelerated by various growth factors formed by macrophages and platelets.

3. Maturation Phase

This phase begins at 3 weeks after injury and lasts for approximately 12 weeks. The maturation phase is perfecting the formation of new tissue into strong and quality healing tissue. Fibroblasts have started to leave the garunalasi tissue, the redness of the tissue begins to decrease because the vessels begin to regress and the fibrin fibers of collagen multiply to strengthen the scar tissue. The strength of the scar tissue will reach its peak in the 10th week after injury. Collagen synthesis that has started since the proliferative phase will continue in the maturation phase. The formation of collagen will

also occur breakdown of collagen by collagenase enzymes.

Young collagen (gelatinous collagen) which is formed in the proliferative phase will turn into more mature collagen, which is stronger and has a better structure (re-modeling process). Excessive collagen will result in scar tissue thickening or hypertrophic scars, otherwise reduced production will reduce the strength of scar tissue and the wound will always be open.

III. RESEARCH METHODS

3.1 Materials and Tools

Materials

The plants used were cherry leaves, distilled water, alcohol, carboxyl methyl cellulose (CMC), pro-analytical (E-Merck) quality chemicals, namely alpha-naphthol, ammonia, glacial acetic acid, hydrochloric acid, sulfuric acid, bismuth nitric acid (III) nitrate, ethanol, ethyl acetate, ether, iron (III) chloride, iodine, isopropanol chloroform, potassium iodide, methanol, sodium hydroxide, anhydrous sodium sulfate, mercury (II) chloride, magnesium powder, zinc powder, lead (II) acetate , toluene, stearic acid, acetyl alcohol, glycerin, adeps lanae, nipagin, triethanolamine.

Tools

The tools used were laboratory glassware, distillation apparatus for the determination of water content (Azeotropy), blender (National), cover glass, freeze dryer (Edwars). animal cage, microscope, mortar and stamper, electric balance (Mattle toledo), digital animal balance (Tanita), glass object, percolator, dropping pipette, razor, pH meter, rotavapour (Buchi), gloves, 1 ml syringe (Terumo ®).

The bacteria used to infect artificial wounds on guinea pig skin are *Staphylococcus aureus* obtained from the North Sumatra Regional Health Laboratory.

3.2. Stages of Labor

a. The collection of dried cherry leaves was determined by the azeotropic method of simplicia water content.
b. Correction making.
c. Preparation of cherry leaf ethanol extract.
d. Phytochemical screening.
e. Senggani leaf extract cream formulation.
f. Testing the effectiveness of artificial wound healing on guinea pig skin infected with Staphylococcus aureus
g. Irritation test of cream preparations on the skin of volunteers.

3.3 Preparation of Cream Preparations

The base cream used is an oil-in-water type made based on the Balsam formula (1992) with the following formula:
R/ Stearic Acid 3
Cetyl alcohol 1
Glycerin 2
Adeps lanae 1
Nipagin 0, 10
Triethanolamine 0.75
Aquades to 100

In the evaporating cup, adepslanae, cetyl alcohol and heated stearic acid were melted on a water bath, mass I was obtained. In a beaker glass, nipasol, glycerin, triethanolamine, nipagin were dissolved in hot water, mass II was obtained. Into the hot mortar, mass I and mass II are added which are still hot while constantly grinding while adding hot distilled water little by little until they run out until they are homogeneous, and a liquid creamy base is obtained.

The cream formula is made with a concentration of cherry leaf ethanol extract (EEDK): 2.5%; 5%; 7.5%, cream base as blank, 100 g each.The cream preparation formulas were made as in Table 1.

Table 1: Ethanol extract cream preparation formula senggani leaves

Formulas	Composition		
	EEDK (g)	Cream base (g)	Perfume
EEDK Cream 2.5%	2,5	97.5	3 drops
EEDK Cream 5%	5.0	95.0	3 drops
EEDK Cream 7.5%	7,5	92.5	3 drops
Blank	-	100.0	

EEDK = Kersen Leaf Ethanol Extract

Into the mortar, the ethanol extract of cherry leaves is added, dripped with a few drops of 96% ethanol, and crushed until dissolved. The cream base is added little by little while grinding, until a homogeneous preparation is obtained. Homogenized perfume was added, put in a closed container and tested for the physical quality of the cream preparation including homogeneity test, stability test, pH value test, emulsion type test, skin irritation test on volunteers.

3.4 Wound Healing Effectiveness Test

3.4.1 Making standard Mc. farland

Composition:
Sulfuric Acid Solution 1% v/v
Barium chloride solution 1.175 % w/v

The two solutions were mixed until homogeneous, so the concentration of Mc Farland's suspension was equivalent to 108 colonies/ml.

3.4.2 Preparation of Bacterial Suspensions

Stphylococcus aureus bacteria were suspended with sterile 0.9% sodium chloride solution, so that the turbidity was the same as Mc.Farland standard (1x108 CFU/ml).

3.4.3 Measurement of Wound Healing

Guinea pigs that have been kept and adapted to environmental conditions for 1 week. Each animal on the left or right of the spine was shaved and marked with a circle with a diameter of 2 cm. around the mark, a 0.7 ml lidocaine injection was injected subcutaneously, left for 5 minutes, and then an incision was made using a sterile scalpel as large as the mark to the dermis layer. Then the wound was cleaned with sterile 0.9% NaCl solution, and infected with 5 drops of *Staphylococcus aerus* bacterial suspension. Left for 24 hours, the occurrence of infection in the wound was marked by red inflammation, edema and pus, then randomly divided the animals into 5 groups each group of 6 animals.

Group I: Treated with EEDK cream with a concentration of 2.5%
Group II: Treated with EEDK cream concentration 5%
Group III: Treated with EEDK cream concentration 7.5%
Group IV: Treated with 1% gentamicin on the market
Group V: Treated with a cream base without EEDK (blanko)

The wound was washed again with 0.9% NaCl solution, smeared with 1 g of the test material according to the group, covered with sterile gauze and plastered, left 24 hours. Then the diameter of the wound was measured again, observing the thickness of the edema, the area of the reddish area of the wound and the amount of pus. And so on for the entire group of animals, repeatedly with an interval of 24 hours until the wound is closed/healed.

IV. RESEARCH RESULT

4.1 Results of Phytochemical Screening

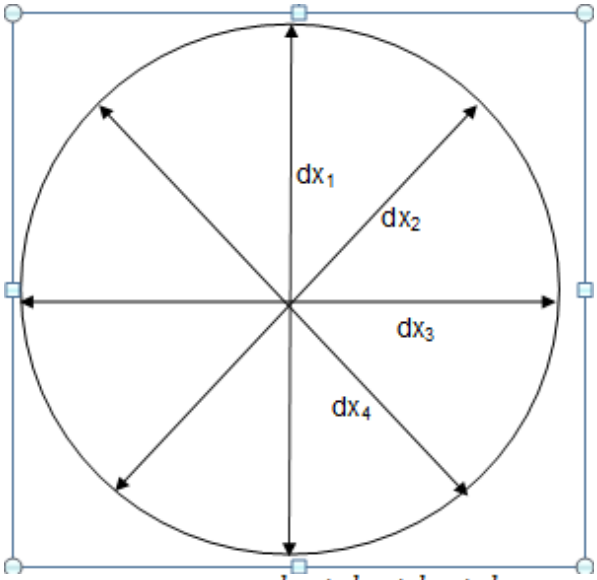
The results of the phytochemical screening test showed that fresh cherry leaves, simplicia, and ethanol extract of cherry leaves contain groups of alkaloid compounds, flavonoids, steroids, essential oils, and tannins. The content of these chemical compound groups, especially flavonoids, alkaloids, and tannins, has the potential for ethanol extract. Cherry leaves have the ability as an antibacterial and can heal wounds.

4.2 Quality test results for cream preparations

The results of the quality test of the cream formulated from the ethanol extract of cherry leaves fully meet good physical quality, are completely homogeneous, stable at room temperature for 12 weeks, pH value is around 5-7, is an oil-in-water type emulsion, and does not cause irritation to the skin volunteer.

4.3 Wound Healing Effectiveness Test Results

Wound healing was measured based on measuring the diameter of the wound after being given the test material and observing the thickness of the edema, the area of redness of the wound and the amount of pus. The average diameter of the wound is measured and calculated using the following formula:



$$\text{Wound diameter} = \frac{dx_1 + dx_2 + dx_3 + dx_4}{4}$$

The measurement results and the average percentage of wound healing can be seen in Figure 4.1 Table 4.1. Table 4.2, Figure 4.2 and Figure 4.3 as follows:

1. Day 1

2. Day 5

3. Day 10

4. Day 15

Figure 4.1: Injury to the given animal EEDK cream 7.5%

Table 4.1: Data on reduction of wound diameter

Hari	Diameter luka (cm)					
	Tanpa diobati	CMC	EEDK 2,5%	EEDK 5,0%	EEDK 7,5%	Genta misin
1	**2,00**	**2,00**	**2,00**	**2,00**	**2,00**	**2,00**
2	**1,99**	**1,98**	**1,93**	**1,89**	**1,87**	**1,84**
3	**1,94**	**1,85**	**1,82**	**1,77**	**1,79**	**1,72**
4	**1,84**	**1,78**	**1,73**	**1,65**	**1,62**	**1,56**
5	**1,79**	**1,67**	**1,65**	**1,54**	**1,57**	**1,48**
6	**1,68**	**1,64**	**1,56**	**1,36**	**1,45**	**1,29**
7	**1,60**	**1,54**	**1,45**	**1,24**	**1,34**	**1,13**
8	**1,52**	**1,43**	**1,31**	**1,08**	**1,23**	**1,00**
9	**1,44**	**1,32**	**1,16**	**0,92**	**1,08**	**0,84**
10	**1,32**	**1,11**	**1,04**	**0,74**	**0,98**	**0,64**
11	**1,21**	**0,97**	**0,92**	**0,62**	**0,86**	**0,46**
12	**1,18**	**0,85**	**0,81**	**0,48**	**0,75**	**0,33**
13	**1,06**	**0,74**	**0,68**	**0,34**	**0,57**	**0,20**
14	**0,94**	**0,65**	**0,56**	**0,23**	**0,43**	**0,06**
15	**0,87**	**0,61**	**0,48**	**0,11**	**0,02**	**0,02**
16	**0,73**	**0,55**	**0,38**	**0,02**	**0,00**	**0,00**
17	**0,59**	**0,47**	**0,31**	**0,00**	**0,00**	**0,00**

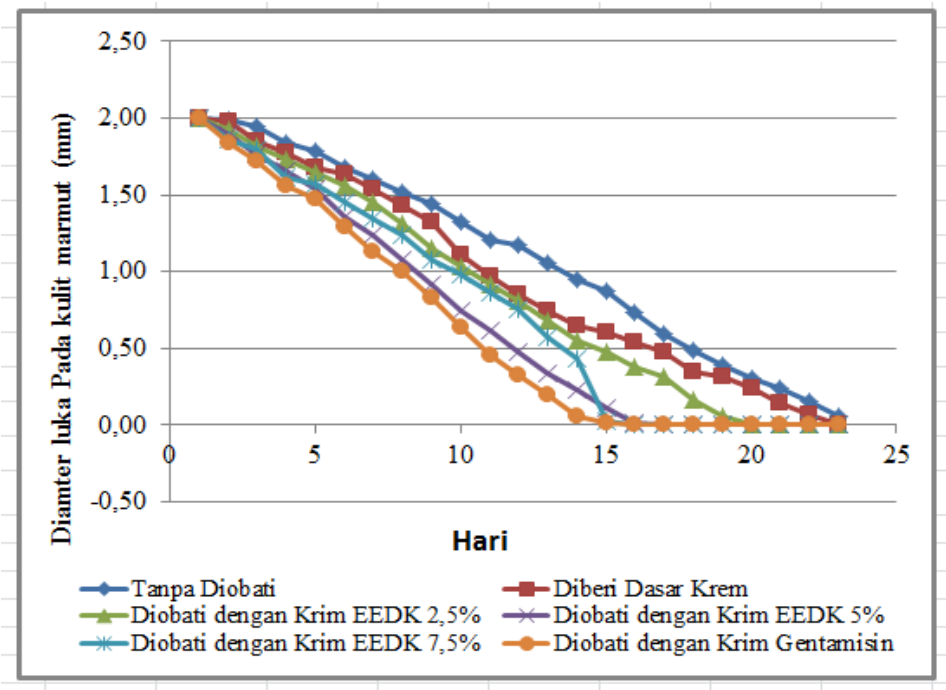


Figure 4.2: Diameter reduction chart wound

Table 4.1 and Figure 4.2 show that the greater the concentration of EEDK content in the cream, the smaller the diameter from day to day, and on day 15 the diameter of the wound treated with 7.5% EEDK was no different from that treated with gentamicin.

Table 4.2: Percentage reduction wound diameter

Hari	Persentase kesembuhan luka (%)					
	Tanpa diobati	CMC	EEDK 2,5%	EEDK 5,0%	EEDK 7,5%	Genta misin
1	**0,00**	**0,00**	**0,00**	**0,00**	**0,00**	**0,00**
2	**0,58**	**0,83**	**3,50**	**5,58**	**6,75**	**7,83**
3	**2,83**	**7,67**	**8,92**	**11,75**	**10,33**	**14,17**
4	**8,00**	**11,25**	**13,33**	**17,42**	**19,17**	**22,00**
5	**10,67**	**16,33**	**17,67**	**23,17**	**21,42**	**26,17**
6	**16,00**	**18,17**	**22,08**	**32,17**	**27,42**	**35,33**
7	**19,83**	**22,92**	**27,50**	**37,83**	**32,92**	**43,50**
8	**24,17**	**28,33**	**34,33**	**46,25**	**38,33**	**50,13**
9	**27,92**	**33,83**	**42,17**	**54,08**	**46,08**	**58,24**
10	**33,83**	**44,42**	**48,17**	**62,83**	**50,92**	**68,00**
11	**39,58**	**51,67**	**54,25**	**69,08**	**56,92**	**77,08**
12	**41,08**	**57,33**	**59,33**	**76,08**	**62,33**	**83,70**
13	**47,25**	**62,83**	**66,08**	**82,92**	**71,50**	**89,92**
14	**52,83**	**67,33**	**72,25**	**88,33**	**78,33**	**97,08**
15	**56,58**	**69,67**	**76,08**	**94,58**	**100,00**	**99,17**
16	**63,33**	**72,75**	**81,25**	**99,00**	**100,00**	**100,00**
17	**70,50**	**76,42**	**84,33**	**100,00**	**100,00**	**100,00**

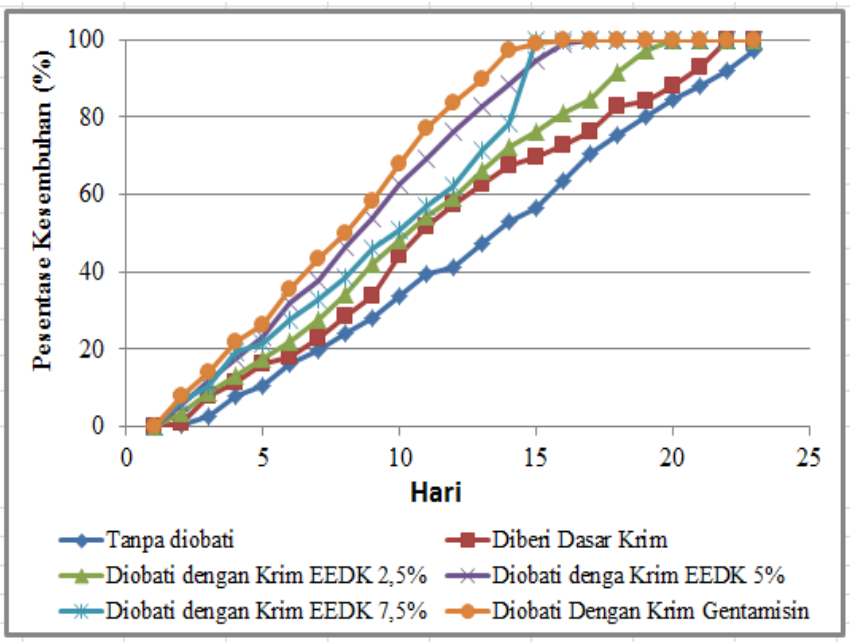


Figure 4.2: Percentage chart

Wound Healing

Table 4.2 and Figure 4.2 show that the greater the concentration of the EEDK content in the cream preparation, the greater or faster the wound healing, on the 16th day it was seen that the treatment with EEDK 5%, 7.5% and gentamicin had complete 100% wound healing. This means that the ethanol extract of cherry leaves with a concentration of 5% has the ability to heal incisions infected with *Staphylococcs aureus.*

V. CONCLUSION

Based on the overall test results it can be concluded that:

a. The results of the phytochemical screening test of fresh leaves, simplicia powder and ethanol extract of cherry leaves (*Muntingia calabura L.*) contain secondary metabolites of alkaloids, flavonoids, glycosides, triterpenoids/steroids and tannins.

b. Ethanol extract of cherry leaves in cream preparations has effectiveness for healing incisions infected with *Staphylococcs aureus.*

c. Cherry leaf ethanol extract concentrations of 5% and 7.5% provide the best healing effectiveness on incisions infected with *Staphylococcs aureus.*

VI. SUGGESTION

Based on the conclusions of the research results obtained, it is recommended:

a. It is suggested to the public to be able to use cherry leaves as an alternative medicine for healing even those that have been infected

b. It is suggested to future researchers to formulate cherry leaf extract in other dosage forms such as gels or lotions and to be tested for burns or other skin diseases.

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