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Benefits Of Bay Leaf (Syzygium Polyanthum) For Healing Of Grade Ii A Burns

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Abstract

The incidence of burns in Indonesia is 2.5 million people experience burns every year. Medical management can be carried out when a person is in an urban area or close to a health facility; however, remote rural communities usually do not fully depend on modern medicine or synthetic drugs because of geographical factors that do not allow for the availability of medications. Bay leaf (Syzygium polyanthum) can heal wounds because it contains essential oils, flavonoids, and saponins. This study aims to prove the comparison of preparations Simplicia and extract macerated bay leaf on the healing of second-degree burns in vivo. This research design is true experimental with method Pre-post test control group design. This study consisted of 3 groups, namely one control group, one treatment group with Simplicia bay leaf, and one treatment group with extract bay leaf with a total sample of 15 mice. Data analysis using Kruskal Wallis test. Test Kruskal Wallis showed p-value = 0.042, value p <0.05, then there is a significant difference between dosage botanicals and extracts of leaves of the healing of burns Grade II-A. This study is a crude drug preparation, and bay leaf extract has the distinction, although both significantly affect wound healing.

Keywords: Simplicia, Maceration Extract, Bay Leaf, Burns.

A. INTRODUCTION

Burns is a form of tissue damage caused by contact with heat sources such as fire, hot water, chemicals, electricity, and radiation. Symptoms include pain, swelling, redness, blisters due to increased blood vessel permeability (Indriani et al., 2020; Hasan et al.,2020). Burns is a form of tissue damage or loss. This can be caused by contact with heat sources such as fire, hot water, chemicals, electricity, and radiation. High morbidity and mortality require special management from the beginning (the shock phase) to the late-stage (Dewijanti et al.,2018; Damayanti et al.,2021).

The development of progress in burn care is growing very rapidly. Infection control and management of inhalation injury can reduce the death toll from burns. Comprehensive management can be carried out if a person is in an area close to good health care facilities.

Such conditions are often found in urban areas (Berawi et al.,2016; Dunia, 2020). People in remote villages are not completely dependent on synthetic drugs. Geographical conditions that do not allow for drug availability. Some use traditional medicine in response to this situation (Sari et al.,2020; Widjajakusuma et al.,2019). Natural preparations that are efficacious for treating burns include bay leaf (Syzygium polyanthum).

Bay leaf (Syzygium polyanthum) is believed to heal wounds (Setianingrum, 2019). Other studies have shown that bay leaf extract can reduce blood glucose levels in mice, and the effectiveness of bay leaf extract is better at a dose of 1000 mg/kg BW compared to a dose of 250 mg/kg BW and a dose of 500 mg/kg BW (Linda et al., 2020; Widharna et al.,2015). further investigated the effect of bay leaves in healing burns with the research title "Comparison of Simplicia Preparations and Maceration Extracts of Salam Leaves on Healing Grade IIA Burns In Vivo."

B. METHOD

This type of research is true experimental research with pre-post test control group design. The pre-test is used to assess the burn area where all samples must be the same, while the post-test is used to determine wound healing with the parameters of the color of the wound being the same as the color of the surrounding skin (Harun et al.,2021). This study had a control group with code (K), a simplicia bay leaf treatment group (P1), and a bay leaf extract treatment group (P2).

The population in this study used white mice with the Mus musculus Albinus strain. The population consisted of 15 mice of the same type aged 2-3 months with a bodyweight of 20-30 grams. The sampling technique used is random sampling (random sample selection). Researchers want the confidence of the sample to the population of 99% or an error rate of 1%, so the number of samples taken is 15 mice, according to Sugiyono (2013). Representatives of 15 mice were divided into three groups with five mice.

$$\frac{Z^2.N.P.Q}{d^2\ (N-1)+Z^2.P.Q}$$

Description: Z^2 with dk = 1, the error rate can be 1%, 5%, 10%.

P = Q = 0,5 d = 0,05 N = Population S = Number of Samples

This research was conducted at the Microbiology Laboratory of STiKes Kusuma Husada Surakarta. This study was conducted for one month from February-March 2012. Data were taken from the area, healing time, and the process of healing burns in the control group (K), the treatment group with bay leaf Simplicia (P1), and the maceration group with bay leaf extract. (P2). Data can be in the form of numbers (burn size, healing time, a dose of bay leaf extract) and descriptive (ignite healing process).

Data were taken from the extent of burns and the time of healing of burns in each sample from the three groups. Data editing is done by separating and grouping data from existing models according to their groups. Data that has gone through the editing process is given a data code. The data code for the sample is the control group (K), the simplicia bay leaf treatment group (P1), and the macerated bay leaf extract treatment group (P2). Data that has been coded is entered in the MS. Excel application program to make it easier to enter the SPSS analysis system. The data entered into the ms. Excel application program is collected into one so that there are three groups of data with the distribution of pre-post test.

Univariate analysis was used to analyze the characteristics of the sample based on gender, age, and burn area. This study uses the SPSS system analysis using the One way ANOVA statistical test to test the comparative hypothesis. Still, the One way ANOVA test can be performed if the normality test of the data is normally distributed and homogeneous data have the same variance. If the normality test is not normally distributed, the difficulty is replaced with Kruskal Wils. LSD test to see which group has the most influence on burn healing.

P-value> 0.05, then H0 is accepted, and H1 is rejected so that there is no comparison between Simplicia preparations and maceration extract of bay leaf on the healing of second-degree burns in vivo.

P-value < 0.05, then H0 is rejected, and H1 is accepted. There is a comparison between Simplicia preparations and maceration extract of bay leaf on the healing of second-degree burns in vivo.

C. RESULT AND DISCUSSION

All 15 samples were given the same wound using styrofoam iron measuring 2x2 cm, which was wrapped with gauze and then boiled until the water boiled. The time of attachment of styrofoam iron to the skin of mice was 20 seconds. Wounds that arise due to the extension of styrofoam iron are the skin color of the mice looks pale red accompanied by small bullae in the burn area. The sign of healing in the control group was the dry condition of the wound. The wound gradually became smaller with a diameter of 0.4 cm until it peeled and left a red mark;

after two days, the skin was the same color as the initial skin. The sign of healing in the simplicia group was the wound that dries up and then peels off and is white; after two days, the wound is the same color as the beginning. The signs of healing in the extract group were indicated by dry, dark black wounds caused by the bay leaf extract, which then peeled and turned white; after two days, the skin was the same color as originally.

Table1. Distribution of Samples by Gender

Classification	Frequency	Percentage (%)
Male	15	100
Female	0	0
Total	15	100

Source: data proceed

Table 2. Distribution of Samples by Age

Classification	Frequency	Percentage (%)
0-2 month	0	0
2-4 month	15	100
>4 month	0	0
Total	15	100

Source: data proceed

Table 3. Distribution of Samples by Area of Injury

Classification	Frequency	Percentage (%)
1 cm	0	0
2 cm	15	100
>2 cm	0	0
Total	15	100

Source: data proceed

Table 4. Grade IIA Burn Healing Results in Days

No	Healing in days					
	Control	Day	Simplicity	Day	Extract	Day
1	K1	14	P11	16	P21	15
2	K2	22	P12	21	P22	18

3	K3	22	P13	14	P23	16
4	K4	22	P14	13	P24	12
5	K5	21	P15	14	P25	16
Mean		20.2		15.6		15.4

Source: data proceed

From the results of the comparison of the average wound healing values of the three groups, it can be concluded that:

a. The simplicia preparation of bay leaf affects the healing of second-degree burns in vivo with a comparison of the average healing value of 15.6 days, so it is faster than the healing value of the control group with an average healing value of 20.2 days.
b. The preparation of bay leaf extract affected the healing of burns grade IIA in vivo compared to the average healing value of 15.4 days, so it was faster than the healing value of the control group with an average healing value of 20.2 days.
c. The group that had the most influence on the healing of second-degree burns in vivo was the bay leaf extract group, with an average healing value of 15.4 days. The simplicia group with an average healing value of 15.6 days, and the last group was the control group with an average healing value of 20.2 days.

Analysis of the study results was carried out using the SPSS system with One-Way ANOVA analysis. The normality of the data from the control group was 0.002, Simplicia 0.110, and extract 0.607; the results were seen from the normality test using Shapiro-Wilk, but the control group was not normally distributed, so that the analysis test used Krukils Wils. The data homogeneity is seen from the p-value of 0.681 so that all data is homogeneous because the p-value is >0.5 (Appendix Table 4.5 Data Homogeneity). Effect of Simplicia and Extract Groups on In Vivo Healing of Grade II A Burns.

Table 5. Comparison of Simplistic and Maceration Extract of Salam Leaves

	Day	
	Chi-Square	4.766
	Df	2
	Asymp.	.042
Sig		

a. Kruskal Wallis Test
b. Grouping Variable: Group

Source: data proceed

The results of the Kruskal Willis test showed p-value = 0.042, p-value < 0.05, so there was a significant difference between simplicia preparations and bay leaf extract on the healing of second-degree burns A. Simplicia preparations and bay leaf extract had an average healing value of 15, 6 days in the simplicia group and 15.4 days in the extract group so that both have significant differences because they have an average difference of 0.2 days of healing, but both have a considerable effect on wound healing by comparing the average healing value of the treatment group with the treatment group. The control group is 20 days for the control group and 15 days for the treatment group—the value of the group that has the most influence on wound healing.

Table 6. Most Influential Group (LSD)

(I) Sample	(J) Sample	Mean Difference (I-J)	Std. Error	Sig.	955% Confidence Interval	
					Lower Bound	Upper Bound
K	P1	4.600*	1.908	.033	.44	8.76
	P2	4.800*	1.908	.027	.64	8.96
P1	K	-4.600*	1.908	.033	-8.76	-.44
	P2	.200	1.908	.918	-3.96	4.36
P2	K	-4.800*	1.908	.027	-8.96	-.64
	P1	-.200	1.908	.918	-4.36	3.96

Source: data proceed

From the results of the study, it was found that there was a significant effect from both the Simplicia group and the Extract group on the healing of IIA degree burns in vivo so that there were three main points of discussion, including In the control group, the duration of wound healing occurred physiologically through several stages, namely the inflammatory phase which started from the onset of the disease. Wound until the fifth day. Immediately after the injury, the broken blood vessels will contract and retract, accompanied by a hemostatic reaction due to the aggregation of platelets that thicken the blood together with the fibrin mesh. The second phase of wound healing processes is the proliferative or fibroplasia phase.

The methods of cellular activity that are important in this phase are repair, wound healing, and cell proliferation. The remodeling or maturation phase is the last and longest phase of the wound healing process. A dynamic process occurs in collagen remodeling, wound contraction, and scar maturation in this phase. Collagen synthesis and degradation activities are in balance. This phase lasts from 3 weeks to 2 years ((Rahmayati & Chrystiana, 2019).

In the control group, the average length of wound healing was 20.2 days. At the same time, the theoretical review in Noer (2013) stated that second-degree burns could heal spontaneously within 10-14 days, but in this study, the average wound healing occurred within 20 days. Differences can influence the healing value that differs between theory and research in the type of sample, immune and physiological functions of the model, and the extent of burns because, in theory, there is no detailed description of wound characteristics regarding the type of sample, immune and physiological functions of the model and the extent of the burn.

Mechanism of Healing Burns Grade IIA Simplicia Group. In the simplicia group, the duration of wound healing was very significant, with an average value of 15.6 days; the ingredients influenced this in Simplicia bay leaves such as essential oils, tannins, flavonoids, and saponins. The mechanism of the workings of bay leaf ingredients in healing wounds is as follows:

Essential oils that are active as antibacterial and contain proxeronine generally contain hydroxyl (-OH) and carbonyl functional groups. Essential oils as antibacterial derivatives of phenol interact with bacterial cells through an adsorption process involving hydrogen bonds. At low levels, phenol protein complexes are formed with weak bonds and immediately decompose, followed by phenol penetration into cells and causing precipitation and protein denaturation by disrupting the process of developing membranes or cell walls so that they are not formed or formed imperfectly. At high levels of phenol, it causes protein coagulation and cell membrane lysis so that bacterial cells die (Suparta, 2020; Sandikapura et al.,2018)).

Tannins have antibacterial activity, broadly speaking, the mechanism of tannin toxicity can damage bacterial cell membranes so that the cell walls of bacterial cell membranes shrink so that it interferes with cell permeability. Tannin astringent compounds can induce the formation of a complex bonding compound to enzymes or microbial substrates and the construction of a tannin bond complex to metal ions, increasing the toxicity of tannins (Yuka et al., 2021; Lister et al.,2021). Tannins function as antioxidants to prevent oxidative DNA damage in two ways, namely binding to metals, especially iron, to prevent excess iron in the liver so that liver damage can be avoided and the body's antibody formation process to fight bacteria

can function optimally and directly eradicate free radicals so that no damage occurs. Extensive network due to free radical electrons (Dewanti & Wahyudi, 2011; Inoue & Cracker, 2014).

In the proliferative and tissue remodeling phase, flavonoids play a role in increasing vascularization so that the supply of oxygen and nutrients to injured tissues and cells can be maximized as well as increasing collagen synthesis which functions to increase the formation of new tissue to accelerate the wound healing process (Soediono, 1989). increase the strength of collagen fibers so that it helps the cell maturation process (Thakur et al., 2011), flavonoids stimulate platelet-derived growth factor (PDGF), which plays a role in encouraging and regulating fibroblast migration, mitogenic for fibroblasts, smooth muscle cells, and endothelial cells (Sundaram et al.,2009). These processes will increase the speed of epithelialization of wound tissue so that new tissue formation is faster and the wound healing process is more immediate.

Flavonoids function as antioxidants, serve to capture free radicals, and prevent chain reactions to avoid more severe cell damage (Heidari et al., 2019). These antioxidants are divided into metabolic antioxidants and nutrient antioxidants. Metabolic antioxidants, including endogenous antioxidants, are produced by body metabolism, such as lipoic acid, glutathione, L-arginine, coenzyme Q10, melatonin, uric acid, bilirubin, metal-chelating protein, transferrin (Huy et al., 2008; Al Chalabi et al.,2020). While antioxidant nutrients, which include exogenous antioxidants, are components that cannot be produced by the body and can only be obtained from food or supplements, such as vitamins A, C, and E, as well as several kinds of nutritional substances, including carotenoids, flavonoids, tannins and several other phytochemicals (Heidari et al. al., 2019) trace metals (selenium, manganese, zinc), omega-3, and omega-6 (Huy et al., 2008). Free radicals are atoms or molecules with an unpaired electron arrangement, which are very unstable. To become stable, free radicals attack cells for electron pairs, and a chain reaction occurs that causes extensive tissue damage. The main molecules in the body damaged by free radicals are DNA, fat, and protein (Praveen et al., 2007). Flavonoids capture free radicals and prevent chain reactions due to unstable electrons that ultimately avoid extensive tissue damage. Free radicals can damage DNA, fat, and protein. Still, in the presence of flavonoids, the DNA is not damaged so that DNA damage does not occur, which can cause gene mutations that can aggravate wounds because all proteins are used to make gene replication while the wound healing process requires high protein to form tissue. - new network. Fat serves as an alternative to fulfill cell nutrition by converting it into fatty acids that can be used for cell metabolism in creating new tissues (Rasal et al., 2008).

The protective effect of flavonoids in biological systems is their capacity to transfer electrons to free radicals so that electrons in free radicals can have pairs and prevent electron

chain reactions from occurring with surrounding tissues in search of electron pairs, bind metal catalysts by neutralizing excess iron ions in the liver so that Liver damage due to iron overload can be overcome, activate enzymatic antioxidants to capture electrons from free radicals and then transfer electrons to free radicals and finally electrons in free radicals have pairs of flavonoid electrons, reduce a-tocopherol radicals, and inhibit oxidation (Heim et al., 2002). The ability to scavenge free radicals is mainly due to the high reactivity of flavonoid hydroxyl groups with the following reactions:

F-OH + R = F-O + RH

The effect of flavonoids is neutralizing iron ions from excess iron in liver cells, thereby inhibiting oxidative damage. The reaction of ferrous iron with hydrogen peroxide produces hydroxyl radicals that oxidize the surrounding biomolecules. This is known as the Fenton reaction, which corresponds to the concentration of copper or iron. Fenton reaction is strongly inhibited by flavonoids (Heim et al., 2002).

Flavonoids are phenolic compounds, while phenolic compounds can act as protein coagulators and as antibacterials by forming complex compounds against extracellular proteins that disrupt the integrity of bacterial cell membranes. The mechanism is by interfering with the peptidoglycan constituent components in bacterial cells so that the cell wall layer is not fully formed and causes the cell's death (Sibi et al., 2012).

Saponins have a high level of toxicity against fungi. Fungicidal activity against Trichoderma viride has been used to identify saponins. The mechanism of action of saponins as antifungals is related to the interaction of saponins with fungal membrane sterols so that the fungal cell membrane undergoes autolysis and eventually dies; in the end, the fungal infection reaction does not occur, and the growth of new tissue can be optimal (Faure, 2002).

Saponins are secondary components found in many plants and can form stable foams in aqueous solutions, such as soap. Chemically, saponins include glycosylated steroids, triterpenoids, and steroidal alkaloids. Saponins as antioxidants have reducing power and have a radical-scavenging activity to prevent tissue damage due to a chain reaction by unstable electrons from free radicals; saponins also have metal-binding activity, especially iron, to neutralize excess iron in the liver and prevent liver damage so that antibody production can be produced optimally so that it can fight infection (Syafitri, 2019).

In the extract group, the average length of wound healing was 15.4 days, so it was faster than the other groups. In this bay leaf extraction process using the maceration method using

70% ethanol which serves to optimize the content so that it is maintained during the extraction process so that the active compounds in the bay leaf are more than the simplicia preparations so that the bay leaf maceration extract preparation is more useful than other groups in increasing epithelialization process and prevent infection by using antibacterial and antifungal principles and minimizing tissue damage with antioxidant principles. This bay leaf extract is free from ethanol so that the wound healing process is not influenced by ethanol but is influenced by the content of bay leaves.

There is a significant difference between simplicia preparations and extracts on the healing of grade IIA burns because the value of wound healing differs by 0.2 days. After all, it is influenced by the higher levels of bay leaf content in the extract preparations so that there are more antibacterial, antioxidant. Antifungal properties in helping the wound healing process even though The concentration of Simplicia preparations is more dilute than the extract preparations, the simplicia preparations are easily absorbed by cells but with relatively fewer active compounds than the bay leaf extract preparations. Comparison of the number of active compounds in the two groups caused differences in the average cure in the two groups.

The research environment was maintained at room temperature to maintain the physiological functions of the sample animals that were adapted to that temperature. Bay leaf extract preparations were stored at a low temperature of 160 C to keep the extract structure from being destroyed by heat so that the contents of the bay leaf extract were maintained and functioned optimally, while the simplicia preparations were made directly at room temperature; however, the bay leaf was washed using hot water to minimize bacterial contact.

D. CONCLUSION

Based on the results of the research that has been carried out, it can be concluded that: 1) Administration of Simplicia preparations and maceration extract of bay leaves can heal second-degree burns 6-10 days faster; 2) Healing of IIA degree burns by administering Simplicia preparations and maceration extract of bay leaves affects healing IIA degree burns; and 3) Comparison of Simplicia preparations and maceration extract of bay leaves on the healing of second-degree burns, there is a significant difference because both are significant in healing second-degree burns.

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