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TEST OF THE EFFECTIVENESS OF SWEET WOOD (Cinnamomum burmanii) ON HEALING OF WOOD Wounds IN WISTAR RATS

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ABSTRACT

Incised wounds are disruptions of skin integrity that require effective treatment to accelerate healing. Cinnamon (Cinnamomum burmanii), rich in secondary metabolites such as eugenol, cinnamaldehyde, and flavonoids, is known for its potential as an anti-inflammatory, antioxidant, and antibacterial agent. This study aims to evaluate the effectiveness of cinnamon extract ointment in healing incised wounds in Wistar rats. This experimental study used a post-test only control group design. A total of 30 Wistar rats were divided into five groups: a negative control (ointment base), a positive control (gentamicin ointment), and three treatment groups with cinnamon extract ointments at concentrations of 10%, 20%, and 40%. Observations of wound length and healing percentages were conducted over 14 days. Data were analyzed using the Kruskal-Wallis and Mann-Whitney tests. The results showed a significant reduction in wound length in the 40% cinnamon extract ointment group (19.6 mm) compared to the negative control (12.8 mm) and were close to the effectiveness of gentamicin ointment (20 mm). The highest wound healing percentage was also achieved in the 40% concentration group (98.2%), comparable to gentamicin ointment (100%). Cinnamon extract ointment at a concentration of 40% effectively accelerates the healing of incised wounds in Wistar rats, with effectiveness comparable to gentamicin ointment. Further research is needed to evaluate its safety and clinical potential.

KEYWORDS *Incised wounds, cinnamon extract, wound healing, Cinnamomum burmanii, anti-inflammatory, antioxidant, antibacterial.*

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INTRODUCTION

All activities in daily life can pose a risk of injury to the body (Megawati et al., 2020). Wounds are the discontinuity of the anatomical structure of body tissues that vary from the simplest such as the epithelial layer of the skin, to deeper layers such as subcutis tissue, fat and muscle and even bone along with other structures such as tendons, blood vessels and nerves (Primadina et al., 2019). This situation can be caused by sharp or blunt trauma, temperature changes, chemicals, explosions, electric shock or animal bites (Maan et al., 2020).

Wounds that occur due to trauma from sharp objects such as knives, razors or broken glass are referred to as cuts (vulnus scissum) (Bunganaen, et al., 2019). The prevalence of wounds in Indonesia has increased almost every year. The results of the 2018 Basic Health Research stated that the prevalence of injury patients increased by 9.2% compared to 2013 of 8.2%. Central Sulawesi Province ranked the highest for wound incidence at 13.8% with acute wounds including abrasions (65.4%), cuts (25.8%), and burns (1.5%) (Susanto et al., 2023). With the high prevalence of cuts in Indonesia, it is necessary to know the appropriate treatment (Bunganaen, et al., 2019).

Wound healing can be defined as a complex process of change in the form of restoring anatomical continuity and function (Tamuntuan et al., 2021). Wound healing is essential to restore its integrity as soon as possible and is a complex and dynamic process with predictable patterns (Megawati et al., 2020). Currently, one of the most commonly used drugs in wound treatment is gentamicin. Gentamicin ointment is an antibiotic drug of the aminoglycoside group that is effective for aerobic gram-negative bacilli bacterial infections and is used by the community in wound healing (Maan et al., 2020). Topical antibiotics have been known to have a prophylactic effect on wounds (Bunganaen, et al., 2019).

Indonesia is a country rich in plants. In tropical forests, there are an estimated 30,000 species of plants. Of these, it is known that 9,600 plant species have medicinal properties and 200 other species are medicinal plants that are important for the traditional medicine industry because they are used as raw materials for drugs, including cinnamon (Cinnamomum burmannii (Nees & T. Nees) Blume) (Fadhilah et al., 2022). This plant is one of the many herbal spices that have long been utilized by people around the world (Gusriati et al., 2023).

Cinnamon is native to South Asia, Southeast Asia and mainland China (Anggraini et al., 2021). This plant is widely found in West Sumatra, North Sumatra, Jambi, Bengkulu. Cinnamon has made an important contribution to the culinary world as a spice that provides distinctive flavor and aroma in various food dishes. The field

of phytochemistry studies chemical compounds in plants, and cinnamon contains secondary metabolites that are beneficial to health (Yuwanda et al., 2023).

Plant secondary metabolites assist wound healing in the hemostasis phase, inflammation phase, proliferation phase, and remodeling phase through various mechanisms. The activities of secondary metabolites that play a role in assisting wound healing are anti-inflammatory, antioxidant, and antimicrobial activities (Irawan et al., 2023). The largest chemical secondary metabolites contained in cinnamon are eugenol, cinnamate, coumarin, cinnamic acid, cinnamaldehyde, anthocinin and essential oils with the content of sugar, protein, simple fat, pectin and others (Rasyid et al., 2020). Eugenol and sinamaldehyde compounds have potential as antibacterial and antibiofilm (Faizah, 2024).

In vivo and invitro studies have shown that cinnamon has pharmacological effects, including as anti-fungal, anti-cardiovascular, anti-cancer, anti-inflammatory, anti-ulcer, anti-diabetes, anti-viral, anti-hypertension, antioxidant, fat and cholesterol lowering (Gusriati et al., 2023). Cinnamon bark, leaves, and roots can be used as medicines with the properties of farting (carminative), sweating (diaphoretic) and pain relievers (analgesic). The results of research conducted in Sweden state that consuming one tablespoon of cinnamon powder before meals can withstand the increase in blood sugar levels because cinnamon powder prevents the suction of sugar on the intestinal wall (Yuwanda et al., 2023).

In addition, cinnamon is also beneficial in wound healing. This can be seen from the results of previous studies which state that the administration of cinnamon extract ointment at doses of 10%, 20% and 40% is effective in the wound healing process as evidenced by the increase in granulation tissue thickness compared to other treatment groups (Rasyid et al., 2020). Another study conducted by Faizah, (2024) on 30 postpartum women also stated that the administration of cinnamon (Cinnamomum burmani) decoction had an effect on reducing perineal wounds in postpartum women at PMB Bidan Sumarya, Kedung Kandang District, Malang City.

In addition, cinnamon extract also has antioxidant properties. It can be seen from the results of previous studies that the ethanol extract of cinnamon showed antioxidant activity values of DPPH, ABTS, and iron III reduction respectively of 1.939 ± 0.055 µg/mL; 2.235 ± 0.014 µg/mL; and 1415.705 ± 38.609 mg ascorbic acid/gram extract. The antiradical activity of cinnamon ethanol extract was lower than that of vitamin C which was 0.554 ± 0.003 µg/mL (DPPH) and 0.813 ± 0.028 µg/mL (ABTS). The antioxidant activity provided by the ethanol extract of cinnamon is influenced by the content of total phenolics and total flavonoids, respectively 75.685 ± 1.408 % EAG and 60.546 ± 0.670 % EK (Antasionasti & Jayanto, 2021). Nevertheless, cinnamon has several side effects of cinnamon including swollen gums, skin irritation, dizziness,

and causing too large a drop in blood sugar. These side effects can occur if cinnamon is consumed more than the recommended dose (Gusriati et al., 2023).

Based on this background, the author is interested in conducting research with the title "Test of the Effectiveness of Cinnamon on Wound Healing in Wistar Rats".

RESEARCH METHOD

This study is a true experiment using a post-test only control group design, which measures the treatment effect after the intervention is completed. The research was conducted in various laboratories of the University of North Sumatra, with stages including the manufacture of ointments and cinnamon extracts, maintenance of Wistar rats, and examination of rat skin tissue. Samples were calculated using the Federer formula (Rasyid et al., 2020), resulting in a total of 30 samples randomly divided into five treatment groups. These groups consisted of negative control (vaseline), positive control (gentamicin ointment), and three groups of cinnamon extract ointment with concentrations of 10%, 20%, and 40%. Inclusion and exclusion criteria ensure samples are in optimal physiological conditions, such as a certain body weight and age, to generate valid data (Anggraini et al., 2021; Antasionasti & Jayanto, 2021).

The research procedures included the preparation of cinnamon simplisia powder, extracts, and ointments based on standard formulas (Megawati et al., 2020). The test rats underwent a 7-day adaptation period prior to wound incision and ointment application twice a day on the wounds of each group. The parameters observed were wound length and healing percentage for 14 days, with measurements using sliding calipers (Maan et al., 2020; Megawati et al., 2020; Susanto et al., 2023). Data analysis was performed univariately for variable description and bivariate using one-way ANOVA and LSD post hoc test to compare groups.

Research ethics involves ethical clearance and application of the 3R (Replacement, Refinement, Reduction) principle, ensuring humane treatment of experimental animals. It involves minimal but optimal animal utilization, good husbandry, and treatment without causing excessive pain. This ethic safeguards animal welfare during research, providing assurance of compliance with animal ethics standards (Djuddawi et al., 2022). This study aims to contribute to the development of cinnamon-based products as effective wound healing agents.

RESULT AND DISCUSSION

Research Results

Wound Length

Some indicators of incision wound healing are measuring the length of the wound. This measurement was observed for 14 days in all Wistar rat test animals in

each group. The results of the study on the length of the incision wound can be seen in Table 1 below.

Table 1. Mean Length of Wound Incision in Wistar Rats

Group	Length of incision wound (mm) $\bar{x} \pm SD$							
	Day							
	0	2	4	6	8	10	12	14
Gel base	20,0	15,8± 0,73	14,7± 1,36	12,5± 2,28	11,6± 2,19	10,5± ,2,75	8,3± 4,52	7,2± 4,52
Gentamicin	20,0	16,9± 1,00	15,0± 0,39	12,0± 2,18	7,02± 5,86	4,4± 5,20	2,6± 2,90	0
10% ointment	20,0	16,2± 1,36	14,7± 1,66	12,1± 2,56	9,1± 2,90	3,6± 4,68	3,0± 4,79	1,7± 2,87
20% ointment	20,0	17,4± 0,90	15,0± 1,24	13,13 ±1,56	10,6± 3,24	7,3± 4,53	4,9± 3,55	1,0± 1,63
40% ointment	20,0	17,1± 1,47	15,2± 1,16	12,8± 2,71	8,9± 5,00	5,6± 5,53	3,6± 3,62	0,4± 0,98

Based on Table 1 above, the results showed that all groups had the same length of incision wound on day 0. After the 14th day of observation, the length of the incision wound decreased with the smallest average in the group of Wistar rats given cinnamon extract ointment (Cinnamomum burmanii) 40% concentration of 0.4 ± 0.98 mm followed by cinnamon extract ointment (Cinnamomum burmanii) 20% concentration of 1.0 ± 1.63 mm and 10% of 1.7 ± 2.87, while the positive control, gentamicin ointment, had wound closure and negative control gel base with a mean wound length of 7.2 ± 4.52 mm.

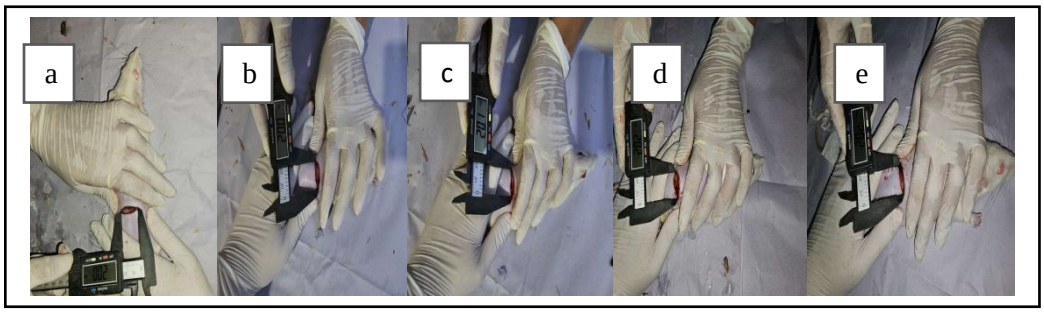

Figure 1. Day 0 Wound Length of All Groups (a) gel base (b) Gentamicin (c) 10% Ointment (d) 20% Ointment (e) 40% Ointment

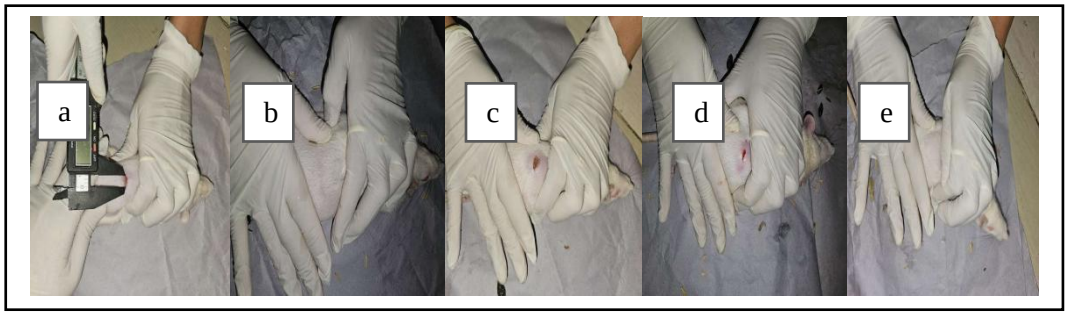

Figure 2. Day 14 Wound Length of All Groups (a) gel base (b) Gentamicin (c) 10% Ointment (d) 20% Ointment (e) 40% Ointment

Based on the figure above, it can be seen that there is a decrease in the incision wound of Wistar rats before and after being treated with the test material in each group. Gentamicin and 40% ointment had the smallest wound length compared to the other groups on day 14.

The difference in the mean reduction of cut wounds after the administration of cinnamon extract ointment (*Cinnamomum burmanii*) concentrations of 10%, 20%, and 40% in this study using the *Kruskal-Wallis* test. This is because the Shapiro-Wilik normality test and *Levene Test* homogeneity stated that the data were not normally distributed and not homogeneous ($p<0.05$). The complete research results can be seen in Table 2 below.

Table 2. Differences in Mean Wound Severity After Application of *Cinnamon* Extract Ointment (*Cinnamomum burmanii*) 10%, 20%, 40%

Group	Decrease in incision wound length (mm) $\bar{x} \pm SD$	*p value*
Gel base	12,8±4,52	0,009*
Gentamicin	20,0±0,00	
10% ointment	18,3±2,87	
20% ointment	19,0±1,63	
40% ointment	19,6±0,98	

*Significant *Kruskal-Wallis*

Based on Table 2 above, there is a decrease in the length of the incision wound between day 0 and day 14 in the gel base group by 12.8 mm, gentamicin by 20 mm, 10% cinnamon extract ointment by 18.3 mm, 20% cinnamon extract ointment by 19 mm, and 40% cinnamon extract ointment by 19.6 mm. The results of the *Kruskal-Wallis* statistical test showed that there was a significant difference in the average change in the incision wound of Wistar rats after treatment (*p value=0*.009; p<0.05). The application of cinnamon extract ointment (*Cinnamomum burmanii*) concentrations of 10%, 20%, and 40% is effective on wound healing in Wistar rats.

Data analysis was continued using the *Mann-Whitney* statistical test which aims to determine the difference in the mean reduction of incision wounds after the administration of cinnamon extract ointment (*Cinnamomum burmanii*) concentrations of 10%, 20%, and 40% between two different groups. The complete research results can be seen in Table 3 below.

Table 3. Differences in Mean Wound Severity After Application of *Cinnamon* Extract Ointment (*Cinnamomum burmanii*) 10%, 20%, 40% between Two Groups

Group		*Mean difference* Wound length	*p value*
Gel base	Gentamicin	-7,2	0,007*
	10% ointment	-5,5	0,038*
	20% ointment	-6,2	0,020*
	40% ointment	-6,8	0,013*
Gentamicin	10% ointment	1,7	0,140
	20% ointment	1,0	0,140
	40% ointment	0,4	0,317
10% ointment	20% ointment	-0,7	0,849
	40% ointment	-1,3	0,400
20% ointment	40% ointment	-0,6	0,528

*Significant *Mann-Whitney*

Based on Table 3 above, the results showed that there was a significant difference in the decrease in the length of incision wounds in Wistar rats between the groups of cinnamon extract ointment (Cinnamomum burmanii) concentrations of 10%, 20%, and 40%, as well as Gentamicin with gel base (p<0.05), while between all concentrations of cinnamon extract ointment was not significantly different from the positive control (p>0.05). Thus, from these results it can be stated that the concentration given to cinnamon extract ointment has the effect of reducing wound length in wound healing of Wistar rats, and this effectiveness can offset the ability of gentamicin ointment.

Percentage of Wound Healing

The percentage of wound healing in this study was calculated from H+2 to H+14 by comparing the results of wound length before and after the application of cinnamon (*Cinnamomum burmanii*) extract ointment concentrations of 10%, 20%, and 40%. The average percentage of incision wound healing in Wistar rats can be seen in Table 4 below.

Table 4. Mean percentage of incision wound healing

Group	Percentage of incision wound healing (%) $\bar{x} \pm SD$						
	Day						
	2	4	6	8	10	12	14
Gel base	21,2± 3,64	27,0± 6,62	37,5± 11,28	40,8± 10,84	48,0 12,87	63,6± 20,63	71,3± 16,28
Gentamicin	16,2± 4,51	25,7± 0,88	39,5± 9,74	65,1± 29,2	77,9± 27,89	79,9± 25,50	100,0
10% ointment	19,1± 6,81	26,8± 8,27	39,8± 12,73	54,5± 14,43	80,9± 25,43	83,6± 25,56	91,7± 13,13
20% ointment	14,0± 4,43	25,5± 6,28	34,9± 7,85	47,5± 16,14	65,1± 21,20	75,7± 17,88	94,6 8,58
40% ointment	15,2± 7,39	24,6± 5,83	36,3± 13,53	55,2± 25,60	71,8± 28,37	81,6± 29,25	98,2± 4,49

Based on Table 4 above, the results showed that there was an increase in the average percentage of wound healing in Wistar rats on day 14 in all treatment groups. The sample group of wistar rats given gentamicin ointment experienced healing of the cut wound with a percentage of 100%, followed by the group of wistar rats given 40% cinnamon extract ointment at 98.2%, 20% cinnamon extract ointment at 94.6%, 10% cinnamon extract ointment at 91.7% while the gel base only experienced healing of the cut wound at 71.3%.

The mean difference in the percentage of wound healing after the application of cinnamon extract ointment (*Cinnamomum burmanii*) concentrations of 10%, 20%, and 40% in this study using the *Kruskal-Wallis* test. The complete research results can be seen in Table 5 below.

Table 5. Difference in Mean Percentage of Wound Healing After Application of *Cinnamon* Extract Ointment (*Cinnamomum burmanii*) 10%, 20%, 40%

Group	Percentage of incision wound healing (%) $\bar{x} \pm SD$	*p value*
Gel base	50,2±15,19	0,007*
Gentamicin	83,8±4,51	
10% ointment	72,5±15,18	
20% ointment	80,5±8,12	
40% ointment	81,3±4,74	

*Significant *Kruskal-Wallis*

Based on Table 5 above, it can be seen that the average percentage of wound healing between day 0 and day 14 in the gel base group was 50.2%, gentamicin was 83.8%, 10% cinnamon extract ointment was 72.5%, 20% cinnamon extract ointment was 80.5%, and 40% cinnamon extract ointment was 81.3%. The results of the Kruskal-Wallis statistical test can be stated that there is a significant difference in the mean change in the percentage of wound healing after treatment (p value=0.007; p<0.05). The application of cinnamon extract ointment (Cinnamomum burmanii) concentrations of 10%, 20%, and 40% can accelerate the percentage of incision wound healing in Wistar rats.

Data analysis was continued using the Mann-Whitney statistical test which aims to determine the difference in the mean percentage of wound healing after the application of cinnamon extract ointment (Cinnamomum burmanii) concentrations of 10%, 20%, and 40% between two different groups. The complete research results can be seen in Table 6 below.

Table 6. Difference in Mean Percentage of Wound Healing after Application of *Cinnamon* Extract Ointment (*Cinnamomum burmanii*) 10%, 20%, 40% between Two Groups

Group		*Mean difference* Percentage of incision wound healing	*p value*
Gel base	Gentamicin	-33,6	0,004*
	10% ointment	-22,3	0,037*
	20% ointment	-30,3	0,010*
	40% ointment	-31,1	0,004*

Gentamicin	10% ointment	11,3	0,078
	20% ointment	3,3	0,522
	40% ointment	-8,8	0,423
10% ointment	20% ointment	-8,0	0,337
	40% ointment	-8,8	0,200
20% ointment	40% ointment	-0,8	0,873

*Significant *Mann-Whitney*

Based on Table 6 above, the results showed that there was a significant difference in the percentage of incision wound healing in Wistar rats between groups of cinnamon extract ointment (Cinnamomum burmanii) concentrations of 10%, 20%, and 40%, as well as Gentamicin with gel base ($p<0.05$), while between all concentrations of cinnamon extract ointment was not significantly different from the positive control ($p>0.05$). Thus, from these results it can be stated that the best wound healing percentage was gentamicin ointment followed by 40% ointment, 20% ointment, and 10% ointment. Statistically, the healing ability of cinnamon extract ointment is as good as gentamicin ointment.

Discussion

Cinnamon is a type of plant that grows in tropical and sub-tropical regions, which has traditionally been used by many people in various places as a flavoring ingredient in food. In addition, cinnamon is believed to contain many useful bioactive compounds (Marissa Rijoice & Saragih, 2022). This study aims to examine the effectiveness of cinnamon on wound healing using 30 Wistar rats according to the inclusion and exclusion criteria. All test animals were then divided into five (5) groups, namely gel base (negative control), gentamicin ointment (positive control), cinnamon extract ointment (Cinnamomum burmanii) with concentrations of 10%, 20% and 40%. One of the wound healing parameters studied in this study is wound length.

Wound length was measured using a caliper from the edge of the wound from the left side to the right side in millimeters (mm) starting on day 0 before treatment until day 14 after treatment. Based on the results of the study, it was obtained a decrease in the length of the incision wound in the gel base group by 12.8 mm, gentamicin by 20 mm, 10% cinnamon extract ointment by 18.3 mm, 20% cinnamon extract ointment by 19 mm, and 40% cinnamon extract ointment by 19.6 mm.

The higher the concentration of cinnamon extract ointment in this study, the greater the decrease in the length of the incision wound in Wistar rats. This can be due to the greater the concentration of ointment, the more extract contained in it so that the higher the active substance. This active substance will work on histamine which can

trigger high levels of histamine when experiencing wounds which can be associated with the inflammatory process during injury. As a result, wound healing can be accelerated (Suryandari et al., 2021).

The largest chemical active compounds contained in cinnamon include eugenol, cinnamate, coumarin, cinnamic acid, sinamaldehyde, anthocinin and essential oils with the content of sugar, protein, simple fat, pectin and others (Rasyid et al., 2020). In addition, cinnamon bark also contains secondary metabolites of terpenoids, tannins, alkaloids, flavonoids, steroids, saponins (Djarot et al., 2021). Flavonoids work on the process of inhibiting the growth of microorganisms in skin tissue and relieving inflammation through the stages of inhibiting the activity of the cyclooxygenase enzyme (Carvalho et al., 2021; Shazeli et al., 2020). Alkaloids play a role in the process of reducing the number of cytokines so that they can reduce inflammation during injury. These two secondary metabolites can work together in the process of inhibiting the biosynthesis of prostaglandin and leukotriene formation which will have an effect on reducing the number of leukocytes that accumulate in the wound (Wang et al., 2019).

Steroids work by inhibiting the phospholipase A2 enzyme and can dissolve in lipids to form clumps in the bacterial cell wall which has a role as an antibacterial agent (Sani et al., 2022). Saponins act as antibacterial and anti-inflammatory agents that have a mechanism of action to inhibit the release of pro-inflammatory substances such as INOS, IL, and TNF-α so that there will be a decrease in exudate fluid and inhibit the permeability of the vascular system (Pakpahan et al., 2020; Tagousop et al., 2018). Finally, tannins have a function as an astringent that can precipitate proteins on the surface of cells with low permeability so that it helps the process of closing skin pores, hardening the skin, reducing exudates and minor bleeding (Pakpahan et al., 2020).

The results of the Kruskal-Wallis statistical test showed that there was a significant difference in the mean change in the incision wound of Wistar rats after treatment (p value=0.009; $p<0.05$). The application of cinnamon (Cinnamomum burmanii) extract ointment at concentrations of 10%, 20%, and 40% is effective on wound healing in Wistar rats. The ointment base preparation material in this study is gel. Gel has advantages over other preparations, namely having high viscosity and adhesion so that it can stick well to the skin surface, does not leave marks, forms a film layer when used, is easily washed with water and gives a cool feeling when used. Compared to other preparations, the penetration ability of the gel is very good for areas with hair so that absorption of active ingredients is better than with creams or other preparations (Sani et al., 2022).

Another wound healing parameter examined in this study was the percentage of wound healing. Based on the results of the study, cinnamon extract ointment (Cinnamomum burmanii) concentrations of 10%, 20%, and 40% showed a greater

percentage of wound healing than the gel base as a control. Cinnamon extract ointment with a concentration of 40% has the largest percentage of wound healing, namely 98.2% compared to other ointment concentrations, so that wound healing is faster. Schink et al., (2018) reported that cinnamon bark extract has excellent anti-inflammatory properties. Trials have been conducted on rat samples, and the results show relatively rapid healing of inflammation suffered by rats. However, under certain conditions, mast cells if given high concentrations of drugs will increase the permeability of blood vessels to plasma fluid and cause an inflammatory process (Suryandari et al., 2021). So, it is necessary to test the toxicity of this test material to determine its safety level if applied clinically.

The results of the Mann-Whitney follow-up test in the study can statistically state that all concentrations of cinnamon extract ointment (Cinnamomum burmanii) concentrations of 10%, 20%, and 40% are not significant with gentamicin ointment. This shows that cinnamon extract ointment has the same effectiveness as the positive control. Gentamicin ointment is an antibiotic drug of the aminoglycoside group that is effectively given for aerobic gram-negative bacilli bacterial infections and is used by the community in wound healing (Maan et al., 2020). Gentamicin gel forms have the advantage of having a therapeutic effect, being aesthetically more attractive to patients, non-sticky characteristics, more occlusive and can be designed to provide a sustained release of the drug so that the frequency of use is minimal (Zainal et al., 2024).

Based on research conducted by Helena Vaustina, by testing incision wounds in white rats and gentamicin ointment as a comparison in the study, found that wound healing using gentamicin ointment took 12 days (Anu et al., 2019). The results of Josef Satrida Yustino Maan's research, which also used gentamicin ointment, found that healing of mice (Mus musculus) skin incision wounds took up to 7 days (Maan et al., 2020). Rosi Jasmadi's research showed that testing second-degree burns using gentamicin ointment required an average healing time of 21 days (Zainal et al., 2024). From the results of this study, it was found that Wistar rats given gentamicin ointment had experienced total incision wound healing on day 14.

CONCLUSION

Based on the results of the research that has been done, it can be concluded that: 1. The mean length of the incision wound in the gel base group was 12.8 mm, gentamicin was 20 mm, cinnamon extract ointment 10% was 18.3 mm cinnamon extract ointment 20% was 19 mm, and cinnamon extract ointment 40% was 19.6 mm. 2. The mean percentage of wound healing in the gel base group was 50.2%, gentamicin was 83.8%, cinnamon extract ointment 10% was 72.5%, cinnamon extract ointment 20% was 80.5%, and cinnamon extract ointment 40% was 81.3%. 3. There is effectiveness of cinnamon on wound healing in Wistar rats. Cinnamon extract ointment

(Cinnamomum burmanii) 40% concentration is the most effective concentration in healing wounds.

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