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Therapeutic Activity Test of n-Hexane Fraction of Avocado Leaf Extract (*Persea americana* Mill.) on Burn Wounds in Rabbits (*Oryctolagus cuniculus*)

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Abstract

Background: Indonesia's vast biodiversity serves as a significant reservoir for medicinal plants, such as the avocado tree (*Persea americana* Mill.), which contains bioactive compounds like flavonoids, saponins, and tannins known for their potent anti-inflammatory and tissue-regenerating properties. **Objectives:** Research has been conducted to examine the therapeutic activity of the n-hexane fraction of avocado leaf extract (*Persea americana* Mill.) on the healing of burn wounds in rabbits (*Oryctolagus cuniculus*). **Methods:** This research is experimental and was carried out at the Pharmacognosy-Phytochemistry Laboratory and the Pharmaceutical Biology Laboratory of Sandi Karsa Polytechnic, using a burn wound treatment testing method on rabbit test animals. The extract used is the result of avocado leaf fractionation, which is known to contain flavonoid compounds suspected to have potential as burn wound healing agents. **Key findings:** Results of the analysis based on burn wound diameter measurements indicate that the avocado leaf fraction extract has an effect on the burn wound healing process. The administration of extract with concentrations of 5%, 10%, and 20% showed different healing levels, where the 20% concentration gave the best results with a healing percentage of 93%. Meanwhile, the positive control showed higher healing effectiveness with a percentage reaching 100%. **Conclusions:** Based on these results, it can be concluded that the avocado leaf fractionation extract is influential in accelerating burn wound healing in rabbits. The 20% concentration is the most effective concentration, although its healing effect is still lower compared to the positive control in the form of bioplacenton.

Keywords: Avocado leaves, Burn wounds, *Persea americana* Mill.

Introduction

Indonesia possesses a wealth of medicinal plants efficacious in treating various diseases, which have been utilized for generations by a large part of the community. The utilization of medicinal plants in Indonesia has been ongoing since hundreds of years ago. Indonesia is known as the country with the second-highest level of biodiversity in the world after Brazil, reflected in the abundance of native medicinal plants. As an archipelagic country consisting of thousands of islands, Indonesia has very high biological diversity. The area of Indonesia's tropical rainforest reaches approximately 143 million hectares and serves as a habitat for approximately 80% of the world's medicinal plants. It is estimated that there are around 28,000 plant species in Indonesia's tropical forests, with 1,845 of these species having the potential to be developed as medicinal ingredients. This number has the opportunity to continue increasing along with the rise in inventory activities and research on various plant species that have not been widely studied before [1].

The skin is the largest organ in the human body, acting as a protector by forming a physical boundary between the external environment and the internal body environment. This organ functions to protect and maintain the body's balance. Structurally, the skin is composed of the epidermis and dermis layers, along with accessory organs including epithelial tissue, connective tissue, the nervous system, and sweat and oil glands [2].

Burn wounds are a condition of damage or loss of body tissue due to exposure to heat sources, such as fire, hot water, chemicals, electricity, or radiation. This injury can cause an increase in blood vessel permeability, so that body fluids, chloride, and proteins leak from the blood vessels into the surrounding tissue. This process can cause edema and potentially develop into hypovolemia and haemoconcentration [3]. Burn wounds are injuries occurring from exposure to high-temperature objects or chemicals, such as strong acids and bases. Besides being caused by accidents, burn wounds can also occur due to other events, such as acts of terrorism, riots, or natural disasters. The assessment of a burn wound condition is based not only on the area affected but also on the depth of the tissue damage. The degree of a burn wound is determined based on the location of damage from the skin layers to deeper tissues, such as muscle and bone.

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Burn wounds are classified into three levels. Level one (I) burn wounds are injuries that only affect the outermost layer of the skin, the epidermis, and are characterized by redness in the exposed area. A commonly encountered example is a burn wound due to sunlight exposure. Level two (II) burn wounds involve the dermis layer and are characterized by redness, darker skin color changes, and the appearance of blisters. Meanwhile, level three (III) burn wounds are more severe injuries, characterized by redness accompanied by blackish color and deep blisters, and can involve tissues under the skin such as muscle and bone [4].

Avocado leaves are composed of a petiole and leaf blade without a sheath or stipule. Mature leaves are generally dark green, while leaf shoots are light green to slightly reddish. Avocado fruit does not undergo the ripening process while still on the tree because it contains certain compounds that inhibit fruit ripening. In several countries, there are avocado varieties that produce leaves with high oil content, and this oil can be extracted every 2–3 years. Avocado leaves are known to have analgesic and anti-inflammatory activities. Research conducted by Kambiz Larijani and colleagues showed that the main chemical components in avocado leaf essential oil are β-caryophyllene at 43.9% and valencene at 16.0% [5]. Avocado leaves have been tested in various studies and are known to contain active compounds, including flavonoids, saponins, and steroids. The content of these compounds provides various pharmacological activities, such as being diuretic, antihypertensive, anti-inflammatory, analgesic, and playing a role in helping to balance hormones [6].

According to Soni and Singhai (2012), saponin, tannin, sterol, and polyphenol compounds have potential in the burn wound healing process [7]. Saponins act as effective cleaning agents so they help heal open wounds, while tannins function in preventing wound infection because they have antiseptic activity and act as burn wound healing agents. Additionally, flavonoids, saponins, and tannins are also known to have antioxidant and proangiogenic activities, and are able to increase the supply of oxygen and nutrients to damaged skin tissue [8].

Flavonoids are simple phenolic compounds widely found in plants and play a role in pigment formation. These compounds generally exist in plants in a form bound with sugar as glycosides. As flower pigments, flavonoids have an important function in attracting birds and insects as pollinating agents (Robinson, 1995). In the burn wound healing process, flavonoids act as anti-inflammatory agents by inhibiting the activity of cyclooxygenase and lipoxygenase enzymes, thereby limiting the number of inflammatory cells migrating to the wound tissue. Thus, the inflammatory phase can last for a shorter duration. Furthermore, flavonoids also function as powerful antioxidants in granulation tissue, thus being able to protect the area around the wound from damage due to free radicals that can inhibit the healing process through the degradation of lipids, proteins, collagen, proteoglycans, and hyaluronic acid [7-8].

Materials and Methods

The research methodology employed in this study follows an experimental approach aimed at evaluating the therapeutic burn wound healing activity of Avocado Leaves (*Persea americana* Mill.). This study utilized rabbits (*Oryctolagus cuniculus*) as test animals and was conducted over a period from August to December 2025 at the Pharmacognosy-Phytochemistry Laboratory and the Pharmaceutical Biology Laboratory of Sandi Karsa Polytechnic.

The experimental process involved a comprehensive array of tools, including hair clippers, a mesh 40 sieve, stirring rods, porcelain dishes, separating funnels, and vernier calipers. Specialized equipment such as a rotary evaporator, a water bath, and a soldering iron with a 2 cm diameter plate tip were also utilized for extraction and wound induction. The primary materials for the study consisted of avocado leaf extract, various concentrations of alcohol (70% and 96%), amyl alcohol, distilled water, ether, and chemical reagents like concentrated HCl and $FeCl^3$. For comparison and base formulations, Bioplacenton ointment and white vaseline were included. The research focused on a population of male rabbits weighing between 1 and 3 kg.

Material Preparation and Extraction

The data collection process began with the procurement of avocado leaves from Tamaona Village, Tombolo Pao District, Gowa Regency. These leaves underwent wet sorting under running water to remove impurities, followed by washing, draining, and cutting into small pieces. The samples were then air-dried until they reached a state where they could be easily crushed. Once dry, the leaves were weighed, ground into a fine powder using a blender, and sifted through a mesh no. 40 sieve.

For the extraction, 200 grams of the leaf powder was macerated in 96% ethanol at a 1:5 ratio. The mixture was stirred for six hours, allowed to stand for 18 hours, and then filtered. This process was repeated, and the resulting liquid was concentrated using a rotary evaporator and a water bath until a thick extract was formed. The final yield was calculated based on the weight of the obtained extract compared to the weight of the starting sample.

Fractionation and Formulation

A portion of the thick extract was further processed through fractionation using n-hexane and distilled water in a 1:1 ratio. This mixture was homogenized in a separating funnel and allowed to separate before the n-hexane fraction was concentrated at 45°C. Following extraction, test formulations were prepared by mixing the extract with a Vaseline base to achieve total weights of 10 grams per sample. These included concentrations of 20% (2 grams of extract), 10% (1 gram of extract), and 5% (0.5 grams of extract).

Phytochemical and Burn Wound Testing

To identify active compounds, phytochemical screening was performed. The alkaloid test involved heating the extract with 2N HCl and water, followed by the addition of

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Mayer, Bouchardat, and Dragendorff reagents, where a positive result was indicated by the formation of precipitates. Flavonoids were identified by the appearance of yellow, orange, or red colors in an amyl alcohol layer after reaction with concentrated HCl and Mg powder. Tannins were confirmed by a dark blue or blackish-green color when treated with $FeCl^3$, and saponins were identified by the formation of a permanent foam after shaking the extract with hot water and HCl.

For the burn wound evaluation, male rabbits were acclimatized for one week to minimize stress and mortality. Each rabbit was housed in a clean cage at room temperature with sufficient lighting and provided daily food and water. To induce wounds, the hair on the rabbit's back was shaved, the area was cleaned with 70% alcohol, and local anesthesia was administered via ether. A heated metal disc (2 cm diameter) was then applied to the skin for 5 seconds without pressure to create a level II burn wound.

The test animals were divided into five groups: a negative control receiving white Vaseline, a positive control receiving Bioplacenton gel, and three treatment groups receiving 5%, 10%, or 20% avocado leaf extract. Treatments were applied twice daily for 14 days. Macroscopic observations and diameter measurements were taken every three days using vernier callipers. The percentage of healing was calculated using a standard equation based on the change in wound diameter from the initial day to the measurement day.

Analytical and Operational Standards

Statistical analysis was performed using SPSS software to evaluate the impact of the extract on healing. Data collected over the 14-day period was tested for homogeneity and normality before undergoing a one-way ANOVA. If significant differences were observed ($P < 0.05$), post-hoc analysis was conducted to identify specific variations between groups. Operationally, the study defined the ethanol extract as the product of maceration and fractionation as the separation of compounds based on solubility in non-mixing solvents. The rabbits utilized specifically belonged to the *Oryctolagus cuniculus* species.

Results and Discussion

This study aims to determine the therapeutic activity of the n-hexane fraction of avocado leaf extract (*Persea americana* Mill.) in the burn wound healing process in rabbits. Preparation of avocado leaf extract began with picking fresh leaves directly from the plant. Collected avocado leaves then underwent a wet sorting process with running water to remove adhering dirt and dust, followed by washing, draining, and weighing. Leaves were then cut into small pieces and air-dried until dry, marked by the leaves easily crushing when squeezed. After the drying process, dry sorting was done to remove dirt remaining from the process. Dry simplicial was then weighed back, ground using a blender, and sifted with a mesh number 40 sieve to obtain a homogeneous powder.

The extract can be obtained through the maceration method using 96% ethanol solvent with a ratio of 1:5. 200 grams of avocado leaf simplicial powder was weighed, put into a beaker glass, then 500 ml of 96% ethanol was added. During the maceration process, compounds soluble in 96% ethanol will be extracted from the avocado leaf simplicial. During soaking, plasmolysis occurs causing cell wall damage due to the pressure difference between the inside and outside of the cell. This allows compounds contained in the cytoplasm to dissolve into the solvent. Soaking duration is directly proportional to extraction efficiency; the longer the soaking, the more complete the obtained extraction results [9]. According to Sulastri et al. (2015), the choice of 96% ethanol as a solvent is based on its safety level, ease in the evaporation process, and its ability to dissolve various types of compounds, whether polar, semi-polar, or non-polar, so it can extract flavonoid compounds optimally [9]. The thick extract obtained from this process has a weight of 49.1 grams with a yield of 24.5%.

Furthermore, a phytochemical screening test was conducted, which is a preliminary test on a sample in both practice and research, to identify the content of secondary metabolites. These secondary metabolites are usually candidate chemical compounds potentially having biological activity. The phytochemical screening test aims to qualitatively check the presence of various classes of secondary metabolites. Examples include examination of alkaloids, flavonoids, saponins, steroids, tannins, terpenoids, coumarins, glycosides, and other compounds [10].

Based on Table 1, avocado leaf extract is proven to contain the chemical compounds alkaloids, flavonoids, saponins, and tannins. In the alkaloid test, according to the reference, the result is said to be positive if at least two out of three reagents produce a precipitate. Testing results showed all three reagents formed precipitates according to the reference, so avocado leaf extract was declared positive for containing alkaloids. The flavonoid test is said to be positive if a yellow, orange, or red color forms in the amyl alcohol layer. In this test, a red color formed in that layer, indicating the presence of flavonoids in the extract. The saponin test showed a positive result, marked by the formation of permanent foam according to the reference. Meanwhile, the tannin test was also positive because the test produced a blackish-green color consistent with the literature. Subsequently, fractionation was performed with the aim of separating the active components contained in the avocado leaf extract so that fractions based on their polarity and specific gravity are obtained. Non-polar compounds will dissolve in non-polar solvents, while polar compounds will more easily dissolve in polar solvents [11].

Table 1. Results of Phytochemical Screening

Test	Result	Description
Alkaloid	1. Reddish-brown precipitate	+
	2. White precipitate	+
	3. Brown precipitate	+
Flavonoid	Red color in the amyl alcohol layer	+
Saponin	Permanent foam	+
Tannin	Bakish-green color	+

This study used test animals in the form of rabbits (*Oryctolagus cuniculus*) because they have a structure and

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physiology relatively similar to humans. Before the experiment, test animals were acclimatized for one week to allow the rabbits to adapt to the experimental environment. This is important because stress in rabbits can affect research results. Burn wounds were induced on the rabbit's back area using a metal coin that had been heated over a Bunsen flame for 1 minute, then pressed on the rabbit's back for 5 seconds. The resulting burn wound was circular with a diameter of about 2 cm. Before burn wound induction was performed, the rabbit's back that had been shaved was first anesthetized using ether to reduce pain. Burn wound induction causes damage to the epidermis and part of the dermis. This is characterized by features such as the appearance of blisters, skin becoming dry, and the wound base being red. Based on these characteristics, it can be concluded that the burn wound formed on the rabbit's back belongs to a level II burn wound. In this research a level II burn wound was chosen because level I burn wounds tend to heal faster, even without special treatment. Meanwhile, level III burn wounds are very severe and require special care over a longer period.

Table 2. Results of Burn Wound Diameter Measurement in Rabbits

Treatment	No	Initial (cm)	Day (cm)					Average (cm)
			3	6	9	12	14	
Control (-)	1	2	1,98	1,93	1,82	1,70	1,65	1,81
	2	2	1,95	1,87	1,77	1,65	1,61	1,77
	3	2	1,98	1,90	1,84	1,75	1,57	1,80
Control (+)	1	2	1,45	1,32	0,54	0,25	0	0,71
	2	2	1,42	1,30	0,50	0,20	0	0,68
	3	2	1,41	1,22	0,47	0,13	0	0,64
Extract 5%	1	2	1,90	1,70	1,29	1,02	0,73	1,32
	2	2	1,80	1,56	1,15	0,85	0,70	1,21
	3	2	1,79	1,47	1,09	0,90	0,85	1,22
Extract 10%	1	2	1,70	1,51	1,23	0,77	0,53	1.17
	2	2	1,67	1,48	1,01	0,74	0,30	1,04
	3	2	1,62	1,27	0,97	0,74	0,46	1,01
Extract 20%	1	2	1,50	1,25	1,19	0,65	0,17	0,95
	2	2	1,55	1,37	1,11	0,59	0,27	0,97
	3	2	1,48	1,37	0,86	0,20	0	0,78

In the research regarding the influence of avocado leaf extract (*Persea americana* Mill.) on burn wound healing, observation was done on days 3, 6, 9, 12, and 14 with a three-day interval. Research results showed that the increase in the percentage of burn wound healing is inversely proportional to the area of the wound; the higher the healing percentage, the smaller the remaining wound area [12].

Based on statistical analysis using One Way ANOVA, the administration of avocado leaf extract showed a significant difference against the average burn wound size in rabbits, with a significance value $P<0.05$. Before performing the One Way ANOVA test, data must meet two assumptions first, namely normality and homogeneity. The normality test was done using Shapiro-Wilk, which showed data normally distributed with a P-value > 0.05, specifically 0.620. Furthermore, the homogeneity test was done using Homogeneity of Variances, which showed homogeneous data distribution with a P-value > 0.05, specifically 0.50. Because both assumptions were met, the One Way ANOVA test can be used to see significant differences between treatment groups. ANOVA test results showed a P-value < 0.05, specifically 0.026, indicating real differences between groups. After knowing a significant difference exists, a Post Hoc test was performed to determine which treatment groups differ significantly. Statistical analysis results showed that each treatment group differed significantly from one another.

In the positive control group given Bioplacenton, the healing percentage reached 100%, and no other treatment group exceeded the positive control's effectiveness. Treatment group 3, which received the highest concentration of avocado leaf fractionation extract, 20%, showed a burn wound healing percentage of 93%. Based on these results, it can be concluded that avocado leaf extract with 20% concentration has a significant influence on burn wound healing, with effectiveness approaching the positive control group. The 10% avocado leaf fractionation extract concentration also showed a healing effect, with a percentage of 78.5%, followed by the 5% concentration with a healing percentage of 66.5%. Meanwhile, the negative control group smeared with Vaseline album only showed a healing level of 19.5%.

After a wound occurs, the body will respond with an inflammatory process or inflammatory phase. This process starts from arachidonic acid activity, which is an unsaturated fat widely present in phospholipid form in the body. When inflammation occurs, arachidonic acid will be

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converted into prostaglandins and leukotrienes with the help of cyclooxygenase and lipoxygenase enzymes. Prostaglandins act as mediators in the occurrence of pain, lymphocyte cell activation, and vasodilation. Meanwhile, leukotrienes function in neutrophil cell chemotaxis and increase blood vessel permeability. Flavonoid compounds, especially quercetin, have anti-inflammatory properties with the ability to inhibit lipoxygenase and cyclooxygenase pathways in arachidonic acid metabolism, so prostaglandin and leukotriene synthesis is disrupted. Besides flavonoids, saponin compounds also play a role in accelerating the wound healing process by stimulating collagen formation, which is an important structural protein in the proliferation phase of wound healing [13].

Table 3. Average burn wound healing with a 3-day time interval

Treatment	Day				
	3	6	9	12	14
Control (-)	1,97	1,90	1,81	1,70	1,61
Control (+)	1,42	1,28	0,50	0,19	0
Extract 5%	1,83	1,57	1,17	0,92	0,76
Extract 10%	1,66	1,42	1,07	0,75	0,43
Extract 20%	1,51	1,33	1,05	0,48	0,14

Table 4. Percentage of burn wound healing with a 3-day time interval

Treatment	Day				
	3	6	9	12	14
Control (-)	1,5%	5%	9,5%	15%	19,5%
Control (+)	29%	36%	75%	90,5%	100%
Extract 5%	8,5%	21,5%	41,5%	54%	62%
Extract 10%	17%	29%	46,5%	62,5%	78,5%
Extract 20%	24,5%	33,5%	47,5%	76%	93%

The scab formed on the wound surface plays a role in supporting the haemostasis process while preventing contamination by microorganisms. Wound protection is carried out by macrophages, which are white blood cells that clean the wound of unwanted microscopic particles, such as bacteria and dead cells. Additionally, flavonoids have antibacterial activity with a mechanism of action through inhibition of bacterial cell wall synthesis. Saponins are compounds capable of interacting with bacterial cells to cause damage and lysis of the bacterial cell wall. The existence of these compounds as antibacterial agents can inhibit wound infection, thus accelerating the healing process. Under the scab layer, epithelial cells migrate from the wound area toward the wound edge. The speed of scab formation in all five treatment groups reflects the wound healing rate. Scab formation itself is the early stage of the inflammatory phase in the wound healing process. The early stage of the proliferation phase involves the role of fibroblasts as collagen-producing cells. In this phase, collagen functions to connect tissues in the burn wound area thus helping to restore skin tissue strength and accelerate the healing process.

On day 7, scabs began to detach in all treatment groups except the negative control group. This scab detachment occurs along with the wound drying process, indicating the growth of new skin cells. This process plays a role in accelerating scab detachment and wound edge closure. The final stage in the burn wound healing process is the maturation or remodelling phase, characterized by the detachment of scabs and the appearance of new skin tissue. In this phase, cells still actively playing a role are fibroblasts and collagen, which function in increasing elasticity, flexibility, and maintaining skin moisture [14].

Based on research results, measurement of burn wound diameter on day 3 showed that the positive control group given Bioplacenton experienced the largest wound diameter decrease, with an average value in three rabbits of 1.42 cm and a healing percentage of 29%. Group P1 with 5% concentration had an average wound diameter of 1.83 cm with a healing percentage of 8.5%, while group P2 with 10% concentration showed an average diameter of 1.66 cm and a healing percentage of 17%. In group P3 with 20% concentration, average wound diameter was recorded at 1.51 cm with a healing percentage of 24.5%. Meanwhile, the negative control group using Vaseline album showed the largest wound diameter, 1.97 cm, with the lowest healing percentage of 1.5%. These results indicate that by day 3 the wound healing process had entered the inflammatory phase.

On day 6 observation, measurement of burn wound diameter showed a decrease in all treatment groups. The positive control group given Bioplacenton had an average wound diameter of 1.28 cm in three rabbits, with a healing percentage reaching 36%. Group P1 with 5% concentration showed an average wound diameter of 1.57 cm and a healing percentage of 21.5%, while group P2 with 10% concentration had an average diameter of 1.42 cm with a healing percentage of 29%. In group P3 with 20% concentration, average wound diameter was recorded at 1.33 cm with a healing percentage of 33.5%. Meanwhile, the negative control group using Vaseline album showed a wound diameter of 1.90 cm with a healing percentage of 5%. These results show that by day 6 the wound healing process had entered the proliferation phase.

On day 9, the positive control group showed the best proliferation phase rate of burn wound healing, marked by a wound diameter decrease in three rabbits with an average value of 0.50 cm and a healing percentage reaching 75%. Next, group P3 with 20% concentration had an average wound diameter of 1.05 cm with a healing percentage of

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47.5%, followed by group P2 with 10% concentration which showed a wound diameter of 1.07 cm and a healing percentage of 46.5%. Group P1 with 5% concentration had an average wound diameter of 1.17 cm with a healing percentage of 41.5%. Meanwhile, the negative control group using Vaseline album showed the largest wound diameter, 1.81 cm, with the lowest healing percentage of 9.5%. On this day 9, the Bioplacenton positive control group and other treatment groups still showed scab formation, while in the negative control group with Vaseline album the burn wound still appeared clearly.

On day 12, the healing process was marked by scabs beginning to detach on the rabbit's back. The positive control group showed the most significant burn wound diameter decrease, with an average value from three rabbits of 0.19 cm and a healing percentage reaching 90.5%. Next, group P3 with 20% concentration had an average wound diameter of 0.48 cm with a healing percentage of 76%, followed by group P2 with 10% concentration which showed a wound diameter of 0.75 cm and a healing percentage of 62.5%. Group P1 with 5% concentration showed an average wound diameter of 0.92 cm with a healing percentage of 54%. Meanwhile, the negative control group still had the largest wound diameter, 1.70 cm, with the lowest healing percentage of 15%.

On day 14 observation, scab detachment was seen in group P3 with 20% concentration as well as in the positive control group, while in the negative control group, P1, and P2 scabs still appeared formed. The final wound diameter decrease in group P1 with 5% concentration was recorded at 0.76 cm with a healing percentage of 62%, while in group P2 with 10% concentration the wound diameter decreased to 0.43 cm with a healing percentage of 78.5%. Group P3 with 20% concentration showed a proliferation rate or wound diameter decrease of 0.14 cm with a healing percentage reaching 93%, although it had not yet exceeded the healing speed in the positive control group characterized by no found scabs or wound diameter, and a healing percentage reaching 100%. Meanwhile, the negative control group showed the slowest burn wound diameter decrease, 1.61 cm with a healing percentage of only 19.5%.

Results of analysis of burn wound diameter measurement show that avocado leaf extract influences the burn wound healing process. Treatment P3 with avocado leaf extract concentration 20% is the concentration that gives the best effect among the treatment groups. However, the burn wound healing effectiveness in the positive control group is still higher. This is suspected to be due to the 0.5% neomycin sulphate and 10% placenta extract content present in Bioplacenton, so the proliferation phase in the positive control group proceeds faster. Neomycin sulphate plays a role in preventing infection and inflammation and belongs to the aminoglycoside antibiotic class. This antibiotic works by binding to the bacterial 30S ribosome subunit, which causes tRNA misreading, thus inhibiting bacterial growth and development. Besides containing antibiotic active substances, Bioplacenton is also enriched with placenta extract which provides a comfortable effect and plays a role in regenerating skin that has suffered burn wounds until it returns to nearly normal conditions. Placenta extract is generally used as a topical preparation to accelerate healing of burn wounds, chronic wounds, as well as various other types of skin wounds. In general, compounds contained in placenta extract can increase the expression of transforming growth factor-beta (TGF-β) in the early stage of wound healing and increase vascular endothelial growth factor (VEGF) in the final stage of the wound healing process [12].

Conclusion

Based on the comprehensive results of the research investigating the therapeutic activity of the n-hexane fraction of avocado leaf extract (*Persea americana* Mill.) on burn wounds in rabbits (*Oryctolagus cuniculus*), several definitive conclusions can be drawn. The study demonstrates that the n-hexane fraction of avocado leaf extract possesses significant therapeutic activity, as evidenced by its ability to accelerate the healing process in the rabbit model. This acceleration is clearly characterized by a consistent decrease in wound diameter and a corresponding increase in the overall percentage of wound healing over the fourteen-day observation period. Among the various concentrations tested, the 20% concentration of the n-hexane avocado leaf extract showed the most potent therapeutic activity, yielding the highest rate of recovery. However, it is important to note that while this 20% concentration was highly effective, its overall performance remained slightly lower than that of the positive control group treated with Bioplacenton.

Supplementary Material

None

Author Contributions

SEK : Conceptualization, Methodology, Writing-Original Draft. **W** : Data Curation, Formal Analysis, Visualization. **MFA** : Supervision, Funding Acquisition, Writing-Review & Editing. **RYP** : Supervision, Funding Acquisition, Writing- Review & Editing.

Conflict of Interest

The authors have no financial conflicts of interest to declare.

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