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EFFECT OF ANGSANA BARK EXTRACT (PTEROCARPUS INDICUS) ON RE-EPITHELIALIZATION IN EXPERIMENTAL RATS (SPRAGUE-DAWLEY) INCISION WOUND MODEL

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Abstract

Injury is a damage to the continuity of body tissues or loss of epithelial makeup of the skin. One factor that can accelerate wound healing is treatment with antiseptics, including povidone iodine. Antiseptic ingredients in povidone iodine are known to be effective in killing microbes, but on the other hand the content of substances in this material can also cause irritation to wounds because of its irritative and toxic properties when used more than 10%. 1 Therefore, the use of herbal ingredients is one of the alternative treatments in the inflammatory process and wound healing because it is considered safer and has fewer side effects caused than non-herbal medicinal preparations. 2 It is known from several studies on angsana to contain active compounds that play a role in controlling inflammation and antibacterial that help the wound healing process. 3,4 In this study, an assessment was conducted on the effect of angsana bark extract (Pterocarpus indicus) on re-epithelialization in rat experimental animals (Sprague-Dawley) incision wound models. This research is an experimental laboratory research using the randomize controlled parallel method. The study was conducted with rats grouped into: groups given angsana bark extract (P1) consisting of 3 heads terminated on days 7 and 3 tails on day 14 and groups given povidone iodine (P2) consisting of 3 heads terminated on day 7 and 3 tails on day 14. Furthermore, rat skin tissue was made histological preparations with HE staining and re-epithelialization observations were made. The average measurement of re-epithelialization on day 7 was P1= 161.92 µm, P2= 157.59 µm and on day 14, P1=128.67 µm, P2= 139.27 µm with $p>0.05$ in each group. This showed that there was no significant difference in the two groups. So that angsana bark extract can be used as an alternative medicine for wound healing.

Keywords: Angsana bark extract (Pterocarpus indicus), povidone-iodine, incision wound, Sprague-Dawley rat, re-epithelialization

INTRODUCTION

In everyday life often experience unavoidable conditions, namely accidents (trauma) both mild and severe, this can cause injuries. Injury is a damage to the continuity of body tissues or can be defined as loss of epithelial arrangement of the

skin, caused by several factors including: sharp object trauma, blunt objects, temperature changes, chemicals, explosions, electric shocks or animal disturbances. This damage can interfere with the function of the skin barrier so that it cannot carry out its function adequately. 5 Furthermore, in damaged tissues, the body naturally has a mechanism for a healing process. Wound healing is the body's physiological response in restoring the structure and function of tissues that experience injury. The process consists of three phases, namely: (1) haemostasis and inflammatory phases, (2) proliferative phases, (3) maturation phases (epithelialization and remodeling phases). This phase will take place overlapping and lasts from the beginning of the wound, until it reaches the peak of the proliferation phase where the re-epithelialization process will occur. 6 Re-epithelialization describes the process of resurfacing the wound with new epithelial tissue. Cellular and molecular processes are involved in incision, maintenance, and completion of epithelialization processes that play an important role in the wound healing process. 7 One factor that can accelerate wound healing is wound treatment with antiseptics, one of which is povidone iodine. In wound care in general, povidone iodine 10% is used because if used excessively it can cause inhibition of the process of granulation tissue formation in wound healing. 1 Therefore, the use of herbal medicinal preparations is one of the alternative treatments in the inflammatory process and wound healing, one of which is the use of angsana bark extract. Angsana plants are known to have properties as traditional medicine, which can treat dental and oral diseases such as stomatitis, and canker sores. 33 Namun some people also use angsana sap as an external medicine to treat wounds. 8 It is known from several studies on angsana trees that angsana bark extract contains flavonoid active compounds that act as anti-inflammatory and anti-bacterial that help the wound healing process. 9,10,11 Therefore, this topic attracted researchers' attention to further research the effect of Angsana bark extract on re-epithelialization in rat experimental animals (Sprague Dawley) incision wound models..

RESEARCH METHODS

This research is an experimental laboratory research using the randomize controlled parallel method. This research began in July 2022 to September 2022 at the Medical Pharmacy Laboratory, Faculty of Medicine, University of Indonesia, THCT (Tarumanagara Human Cell Technology) Laboratory, and Integrated Laboratory, Faculty of Medicine, Tarumanagara University.

Prtotokol this research received approval from the Health Research Ethics Committee of FKUI/RSCM, with number 014.KEPH/UPPM/FK/VI/2022. Certificate of passing the Ethics Review from KEPH.

Research Instruments

The tools and materials to be used in this study are experimental animal cages, places to eat, drinking places, underpads, sterile wood shavings, electric shavers, manual shavers, scissors, scalpels, syringes measuring 1 cc (Terumo Syringe Sterile), object glass, surgical board, medical cap, mask, hand scoop, cotton, sterile gauze, camera, digital scales, pipettes, tweezers, stopwatch, history pearl, arcadia H, arcadia C, microtome, and microscope, male Rattus norvegicus Sprague-Dawley strain rats with 10 weeks of age and angsana bark extract (Pterocarpus indicus). The reagents to be used are ethanol 70%, ethanol 80%, ethanol 95%, ethanol 100%, xylene, aquades, formalin, haematoxylin, eosin, xylol, absolute ethanol, alcohol 96%,

alcohol 70%, alcohol 50%, povidone-iodine, ketamine, and paracetamol. Data obtained from measuring the average thickness of the epithelium using the image application. The data obtained were carried out statistical tests (SPSS), normolity tests (Shapiro-Wilk), homogeneity tests (Lavene Statistics), Parametic tests using independent T-tests.

RESULT AND DISCUSSION

This study discusses the effectiveness test of angsana extract preparation (*Pterocarpus indicus*) on healing incision wound models in rats (Sprague-Dawley) by judging from the thickness of re-epithelialization in scars. In wound healing, the occurrence of re-epithelialization can be one of the assessments in the wound closure process, because if the occurrence of re-epithelialization is faster, the wound closure period will be faster. [12] The wound healing process will be influenced by substances that have the ability to improve the healing process, namely the content of drugsgiven to experimental animal wounds . [13] There are various ways to heal wounds, one of which is by using medicinal plants as an alternative [treatment,14] Among others, by utilizing angsana plants. In GC-MS (Gas *Chromatography–Mass Spectrometry*) analysis of methanol and acetone bark extract, angsana revealed the presence of many biologically active compounds with potential medicinal properties, especially antimicrobials and antioxidants, one of which is flavonoids, then angsana can be considered as a potential medicinal tree for the treatment of various infectious diseases and bark extract can be considered for product development skin care. [15] PThere was a 7th day wound healing found to have begun to form re-epithelialization to cover wound tissue in the entire group of mice. This indicates that there has been healing of epithelial tissue which will further produce an intact epidermal layer and can prove that re-epithelialization is already formed on day 7. Evidenced pthere is figure 1 histological dosage picture showing several layers on the epidermis. This indicates that the epidermis layer has formed in the closure of the wound. [16.17] Dsee in table 1 there is an image of an IS microscope with a magnification of 400x which has been measured using the *imageJ* application on the 7th day obtained the average thickness at P1 (angsana bark extract) which is 161.92 µm while at P2 (*Povidone iodine*) which is 157.59 µm. In this study, it was found that incision wounds carried out by intervention using angsana bark extract resulted in a thicker layer of re-epithelialized tissue on day 7 compared to the results of treatment using *povidone iodine*, this proves that in angsana bark extract there are active substances that work effectively on wound healing. On the histological preparation of day 14 seen from table 1 the average epithelial thickness was greater in the treatment group using povidone iodine, but statistically there was no significant difference ($p > 0.05$), namely at P1 of 128.67 µm and P2 of 139.27 µm. Table 2 proves that both treatments obtained a significance result of $p>0.05$ which means there is no significant difference. It states that the use of angsana bark extract can be an alternative treatment besides the use of *povidone iodine*.

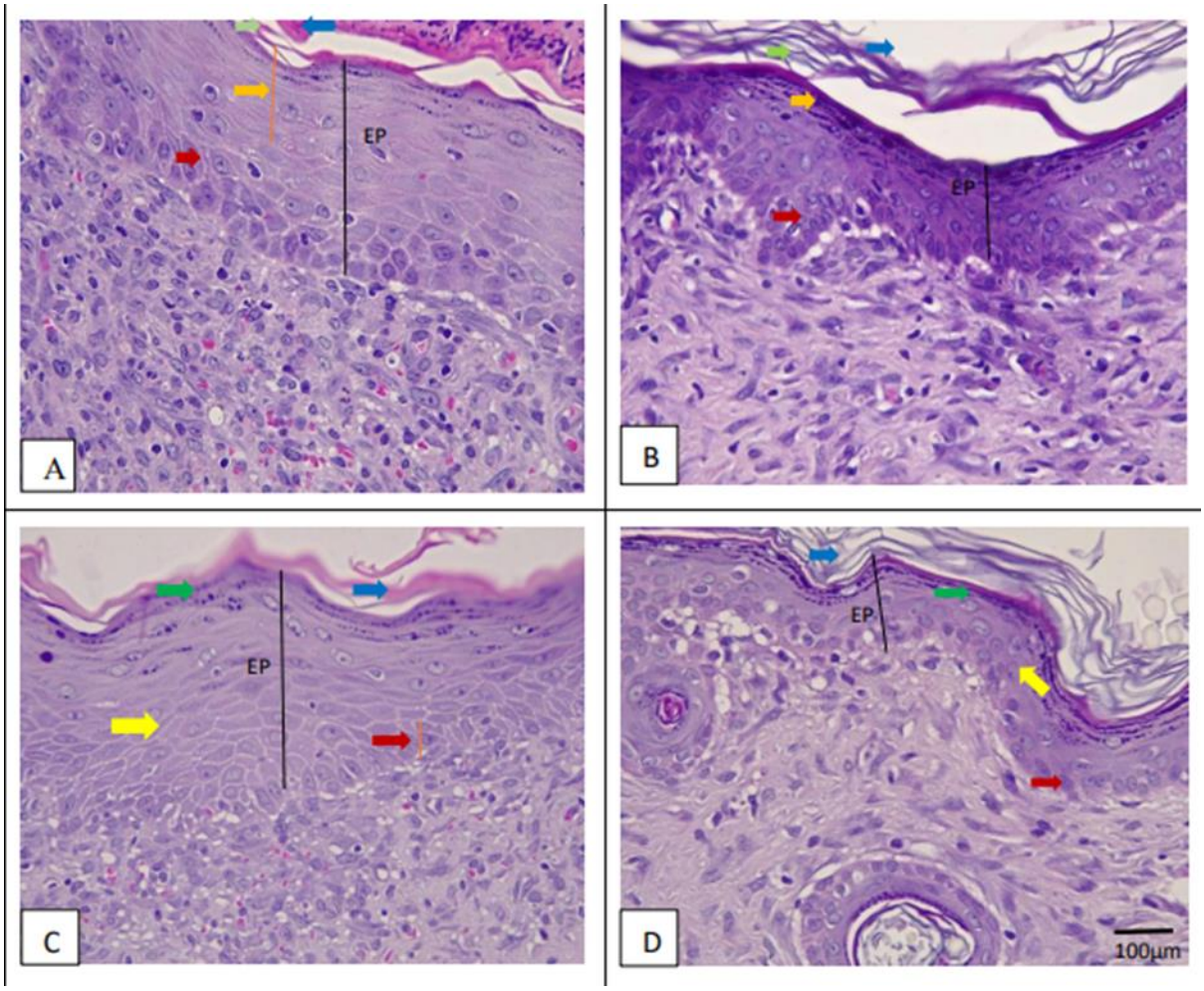

Figure 1 Histological description of epithelia

Figure 1 Histological description of epithelial thickness measurements in wounds given bark extract on day 7 (A) and day 14 (B) and those given povidone iodine on day 7 (C) and day 14 (D). preparations with HE staining. 400x magnification; scale bar = 100 µm. The measurement of the thickness of the newly formed epithelium is indicated by a vertical line on the epidermis (EP). In both groups already formed stratum *corneum* ( ), stratum granulosum ( ), in stratum spinosum ( ) consisting of keratinocyte cells , and stratum basal ( ).

Table 1 Average Results of Re-epithelialization Thickness

Group	Average Thickness (µm)	
	Day 7	Day 14
P1	161.92	128.67
P2	157.59	139.27

Description: Treatment groupn P1 (Angsana bark extract); P2 (*Povidone Iodine*).

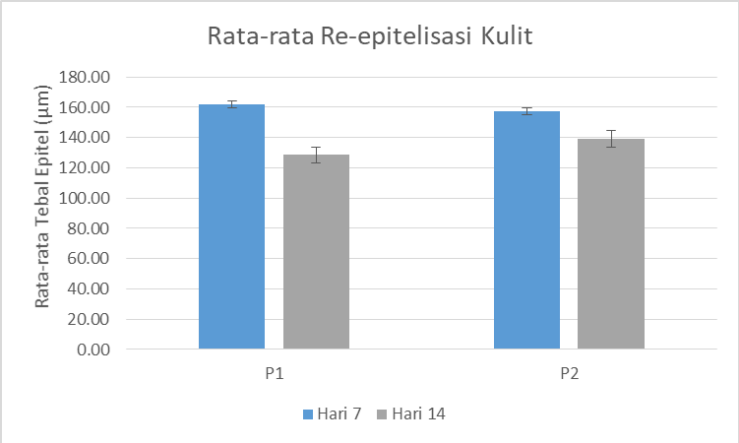

Figure 2 Diagram of Average Re-epithelialization Thickness P1 and P2

Table 2 Results of Research Data Acquisition Based on *Independent T-test Method*

Treatment		N	*Mean*	*Std. Deviation*	*P value*
H 7	P1	6	161.92	4.91	0.861
	P2	6	157.59	4.79	
H 14	P1	6	128.67	15.52	0.182
	P2	6	139.27	11.60	

Description: H-7 treatment group (Day 7); H-14 (Day 14); P1 (Angsana bark extract); P2 (Povidone Iodine)

CONCLUSION

Based on the results of the study, the conclusions obtained were: Angsana bark extract provided the same incision model skin re-epithelialization effect as povidone iodine in Sprague-Dawley male rats day 7 and day 14. Angsana bark extract has potential that can be used as an alternative medicine for wound healing.

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