

EFFECTIVENESS OF TAMPALA BAJAKAH WOOD (SPATHOLOBUS LITTOTALIS HASSK) ETHANOL EXTRACT IN WOUND HEALING: PRECLINICAL TEST

Diyane Irene Komalig ^{1*} and Mardiana Ahmad ²

¹ Midwifery Study Program, Graduate School of Hasanuddin University, Indonesia.

² Midwifery Department, Graduate School, Hasanuddin University, Indonesia.

*Corresponding Author Email: komaligdi23p@student.unhas.ac.id

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Abstract

Objective: Analyze the effectiveness of tampala bajakah wood (*Spatholobus littoralis* Hassk) ethanol extract on wound healing through preclinical trials. **Method:** Study using a literature review approach based on national and international scientific journals regarding the effectiveness of Bajakah Tampala stem (*Spatholobus Littoralis* Hassk) ethanol extract on wound healing. Published between 2018 - 2023 in several databases, namely the PubMed, Science Direct, Scilit, Google Scholar, and Semantic Sholar databases with keywords using Indonesian and English with the keywords bajakah tampala, secondary metabolites, and wounds. This literature review was compiled by searching scientific articles with the keyword "effectiveness of tampala bajakah wood (*Spatholobus Littoralis* Hassk) ethanol extract in wound healing" and 124 articles were found. **Results:** Five articles were found that met the inclusion criteria. five articles examined secondary metabolite compounds in the Bajakah tampala plant (*Spatholobus Littoralis* Hassk) with 96% ethanol extract and one article used 70% ethanol extract for wound healing. Previous research showed that the results of the 96% extra ethanol phytochemical screening test for Bajakah Tampala (*Spatholobus littoralis* Hassk) contained secondary metabolites, namely alkaloids, flavonoids, saponins, terpenoids, phenolics and tannins. Furthermore, other research used 70% extra ethanol containing secondary metabolites of flavonoids, saponins, steroids, terpenoids, tannins and phenols. But it does not contain alkaloid compounds. Extra 70% ethanol heals wounds in male white rats. **Conclusion:** The incision area of male white rats smeared with ointment-based 70% ethanol extract had a relatively better healing time (10%) than the area smeared with 20% and 40% concentration extract.

Keywords: Bajakah Tampala, Secondary Metabolites, Wounds.

INTRODUCTION

Perineal injuries that are not treated properly can increase the risk of infection. Infection of the perineum can spread to the bladder or birth canal, resulting in complications of bladder infection and birth canal infection. Delayed treatment of complications can result in maternal death after childbirth. One treatment for healing perineal wounds can be given complementary therapy. Complementary therapy is also known as traditional medicine or traditional medicine which comes from knowledge that has been passed down from generation to generation in various communities before the advent of modern medicine. The World Health Organization (WHO) estimates that 65% of developed countries and 80% of the population of developing countries have used herbs. Therefore, WHO recommends "Back to Nature" to encourage the reuse of traditional medicines and develop traditional medicines to accompany modern medicines. (Adeliana et al., 2021). Government Regulation Number 103 of 2014 concerning traditional health services states that traditional health services play a role in the life cycle or continuum of care from pregnancy to old age, provided both with skill methods and herbs. Traditional Health Services have quite great potential for national health development. According to the Minister of Health Regulation Number 13 of 2022, indicators related to traditional health are included as

one of the components in the indicator "percentage of districts/cities implementing the Healthy Living Community Movement (Germas) policy", namely having traditional health development activities. In 2022, the number of districts/cities that have traditional health development activities is 384 districts/cities spread across 34 provinces. One of the provinces is the city of Palangkaraya, Central Kalimantan, which has traditional health development activities, with an indicator of 71.4%. (Ministry of Health of the Republic of Indonesia, 2022). The bajakah tampala stem is brownish, has no branches, has woody bark and produces a thick liquid. (Lili Andriani et al., 2023). This plant comes from the interior of Central Kalimantan Province which has not spread to other areas. (Saputera & Ayuhecaria, 2018). In reality, this plant has been used to treat various diseases by the Dayak people. (Stephan et al., 2022). Based on preliminary tests conducted by Anshari 2012, bajakah tampala was positive in phenolic, flavonoid, tannin and saponin tests. Saponins and tannins are known to stimulate angiogenesis which is one part of the wound healing process. (Saputera & Ayuhecaria, 2018). Flavonoids function as anti-inflammatories, by inhibiting the enzymes cyclooxygenase and lipoxygenase for the treatment of symptoms of inflammation and allergies. (Andayani et al., 2021). The study also found that the n-hexane fraction extract of bajakah wood contains phytochemical compounds, namely terpenoids & flavonoids and has antibacterial activity against *Escherichia coli* with several concentrations of inhibition zone diameters, namely 100 ppm 7.72 mm, 50 ppm 5.38 mm, 25 ppm 5.81 mm, 12.5 ppm 4.24 mm, and 6.25 ppm 4.88 mm included in the moderate inhibition category, while the control (+) 20.03 mm is included in the strong inhibition category. (Nirmalasari et al., 2023).

The study also found that Bajakah root extract also has antibacterial effectiveness on *pseudomonas aeruginosa* and Bajakah root extract at a concentration of 100% has a bright zone diameter of 22.4 mm, where according to Qori Fadillah, the classification of the extract's inhibitory response to bacterial growth above >20 mm means a strong inhibitory response. (Stephan et al., 2022). Flavonoid compounds are also effective as antioxidants that can accelerate wound healing and inflammation. (Nastati & Nugraha, 2022). The duration of wound healing in male white mice in the area applied with 10% and 40% bajakah tampala extract ointment was relatively better compared to the area applied with 20% and 40% extract ointment. (Jurnal et al., 2022). The purpose of this study was to analyze the effectiveness of bajakah tampala wood (*Spatholobus Littoralis Hassk*) ethanol extract on wound healing through preclinical tests.

METHOD

This study is a literature review approach based on national and international scientific journals related to the effectiveness of bajakah tampala (*Spatholobus Littoralis Hassk*) stem ethanol extract in wound healing. Published between 2018-2023 in several databases, namely the PubMed, Science Direct, Scilit, Google Scholar, and Semantic Sholar databases with keywords using Indonesian and English with the keywords bajakah tampala, secondary metabolites, and wounds. This literature review was compiled through a search for scientific articles with the keyword "effectiveness of tampala bajakah wood (*Spatholobus Littoralis Hassk*) ethanol extract in wound healing" obtained as many as 124 articles were found. After filtering the year of publication, namely 2018-2023, 114 articles were obtained. Furthermore, a selection was carried out related to abstracts, full text, open access, type of research, and

duplication, 53 articles were obtained. The final process was reading and selecting articles based on eligibility criteria, 6 relevant articles were obtained.

RESULT

This literature review is synthesized using a narrative approach by grouping similar extracted data according to the outcomes measured to achieve the objectives. Abstracts of research journals are entered into tables according to the formula above. To further clarify the analysis, abstracts and full texts of the reviews will be read and reviewed. The summary of the evaluation will then be analyzed based on the content contained in the research objectives and research results/findings.

Table 1: Extraction of Research Results

Number	Author/Year	Title	Method	Sample	Data Analysis	Result
1	Lili Andriani, et al/2023	Acute Toxicity Test of LD50 Extract of Bajakah Tampala Stem (<i>Spatholobus littoralis</i> Hassk.) and Yellow Bajakah Stem (<i>Arcangelisia flava</i> (L.) Merr.) on White Mice (<i>Mus musculus</i>).	Eksperimental	50 male and female white mice (<i>Mus musculus</i>) were divided into 5 groups.	<i>Kruskal-Wallis</i> and <i>ANOVA two way</i> .	There are differences between gender and organ weights in the lungs, stomach and liver and there are no differences between dose variations and organ weights in the lungs, heart, stomach, kidneys and liver so that the Bajakah Tampala stem is safe to use.
2	Kunti Nastati, et al/2022	Anti-inflammatory activity of bajakah wood extract (<i>Spatholobus littoralis</i> Hassk.)	Eksperimental	21 male white mice aged 2-3 months weighing 150-250 grams were divided into 7 groups.	<i>One-way ANOVA</i> .	The greatest anti-inflammatory power at a dose of 400mg/KgBB at the 240th minute with a percentage of 87.65%. Ethanol extract of Bajakah Wood (<i>Spatholobus Littoralis</i> Hassk) has anti-inflammatory activity.
3	Ruri Putri Mariska, et al / 2022	Sunscreen activity test of extract and active fraction of bajakah tampala. (<i>Spatholobus Littoralis</i> Hassk.)	<i>In vitro using UV-Vis spectrophotometry</i> .	Bajakah tampala stem (<i>Spatholobus Littoralis</i> Hassk.)	Phytochemical/Laboratory Test	The best SPF value was obtained from the ethanol extract, ethyl acetate fraction, and n-hexane fraction of bajakah tampala with a concentration of 0.1% with an SPF value of 21.53; 17.05 and 15.63. It can be concluded that bajakah tampala is suspected to be a sunscreen with an

						SPF value >15 which indicates activity as a sunscreen.
4	Dhimas Adhityas mara, et al/2022	Hepatoprotective effect of ethanol extract of bajakah tampala stem (Spatholobus Littoralis Hassk) on isoniazid-induced mice	Eksperimental	Bajakah tampala stem (Spatholobus Littoralis Hassk.)	The SGOT and SGPT data test obtained calculated the percentage decrease (%P) for each group by finding the difference in SGOT and SGPT levels on the 15th day and the 29th day.	Ethanol extract of bajakah tampala stem has hepatoprotective effect on male rats induced by isoniazid 350mg/kgBW for 14 days. The effective dose of ethanol extract of bajakah stem as hepatoprotector is 200 mg/kgBW.
5	Saparuddin Latu, et al/2023	Antibacterial Activity Test of Bajakah Wood (Spatholobus littoralis Hassk.) Against the Growth of Staphylococcus aureus	Eksperimental	Bajakah tampala stem (Spatholobus Littoralis Hassk.)	ANOVA	Bajakah Wood Extract has antibacterial activity at a concentration of 10% obtained an average inhibition zone of 7.63 ± 0.15 mm, a concentration of 20% obtained an average inhibition zone of 8.26 ± 0.28 mm and a concentration of 30% obtained an average inhibition zone of 8.83 ± 0.40 mm. The conclusion of this study is that a concentration of 10% with an inhibition zone of 7.63 ± 0.15 mm can inhibit the growth of Staphylococcus aureus.
6	Mochamad saputera, et al/2018	Testing the effectiveness of ethanolic extract of bajakah tampala stem (Spatholobus Littoralis Hassk)	Eksperimental	36 white male mice	<i>posttest only with control group</i>	Ethanol extract ointment from bajakah tampala stems is effective in healing cuts in male white mice.

DISCUSSION

A wound is a physical injury that causes damage to the skin and surrounding tissue, resulting in disruption of normal anatomical structures and loss of physiological function. (Vendrame et al., 2024). Where a condition of damage or loss of part of the body's tissue due to blunt objects, sharp objects, temperature, chemicals, explosions, animal bites, electrical short circuits, and various other causes. Damage to body tissue causes various consequences such as bleeding and blood clots, all or part of functional organs, and bacterial contamination. The cause of wounds can be from blunt and sharp trauma. Wounds caused by blunt trauma include abrasions, bruises, and lacerations. Wounds caused by sharp trauma are cuts, slashes, and stab wounds. There are several characteristics of cut wounds, namely: linear shape where the wound is usually straight or curved towards the sharp trauma that caused it, sharp edges, the edges of the cut are usually smooth, sharp, and clean because sharp trauma actually cuts the tissue. (Adrianto et al., 2024). Perineal wounds are perineal tears that occur spontaneously or through episiotomy during childbirth. (Sebayang & Ritonga, 2021). Factors that cause perineal wounds occur in childbirth with a large baby weight, a large baby's head, forehead or face presentation, breech position, incorrect pushing method, and incorrect labor leadership. During the postpartum period, perineal wounds must be treated properly so that infection does not occur because improper perineal care can result in the perineum being affected by lochia and moisture which will greatly support the growth of bacteria that can cause infection in the perineum. One way to avoid infection or accelerate the healing of perineal wounds in postpartum mothers is to carry out perineal wound care (Oktafirmanda et al., 2022). Wound healing is an important process that facilitates the recovery of damage to injured tissue; it is very important for survival that wounds heal quickly and without complications. (Vendrame et al., 2024). Wound healing is a complex process consisting of 4 overlapping phases: homeostasis (coagulation), inflammation, proliferation, and tissue remodeling (scar formation). (Vendrame et al., 2024). Inflammation is a normal protective response to tissue injury caused by physical trauma, damaging chemicals or microbiological substances. Inflammation can also be interpreted as the body's attempt to activate or destroy invading organisms, eliminate irritants, and regulate tissue repair. Signs of inflammation such as redness, swelling, heat, pain, and impaired function. (Andayani et al., 2021). Inflammation is an effort to defend the body in response to injury or disease disorders due to infection. (Nastati & Nugraha, 2022).

The inflammatory process involves the release of a complex series of mediators, enzyme activation, cell migration, and extravascularization of fluid. Excessive secretion of mediators or often known as cytokine storms such as tumor necrosis factor (TNF) and interleukins (IL-1 and 6) activates the enzyme cyclooxygenase-2 (COX-2) which triggers increased synthesis of prostaglandin E2 (PGE2) and lipoxygenase (LOX) which stimulates the secretion of other inflammatory mediators. Tissue damage during inflammation results in extravascularization so that vasodilation of the surrounding capillaries occurs and the release of leukocytes to attack foreign agents or objects. Cytokines produced by central nervous cells can stimulate the release of arachidonic acid on the phospholipid membrane with the help of the enzyme phospholipase A2.

Arachidonic acid is a precursor of prostaglandins which causes an increase in heat in the thermoregulatory center in the hypothalamus so that there is a balance of body

temperature in the injured tissue with the hypothalamus or known as fever. (Zayani et al., 2022) Based on the content of secondary metabolite compounds it contains, it is estimated that bajakah tampala has anti-inflammatory and antipyretic activity so that it can be used as a medicine to reduce inflammation and fever. (Zayani et al., 2022). Bajakah is known as a single brownish tree that creeps that looks like a large and strong trunk. These roots creep with a height of usually more than 5 meters to the other peak. Bajakah is located in the flow of peat groundwater. These roots can only live in shady places in the middle of the forest with little exposure to sunlight. (Jurnal et al., 2022).



Figure 1: Bajakah Tampala Cut (Jurnal et al., 2022)



Figure 2: Appearance of Bajakah Tampala Plant (Jurnal et al., 2022)

Extraction and Fractionation

The extraction and fractionation of bajakah tampala wood (*Spatholobus littoralis* Hassk) in 96% ethanol extract, namely: Bajakah tampala stem simplicia begins with wet sorting of the bajakah tampala stem. Then wash the bajakah tampala stem with clean water. The stem is then drained to reduce the amount of rinsing water so that the remaining dirt in the washing rinse water is also removed. The stem is weighed to obtain its wet weight. The stem is cut into pieces so that it is easy to dry and grind. The slices are then dried in direct sunlight for 3 days. Chopped using a blender until it becomes powder and then weighed according to the weight of the simplicia powder. (Hamzah et al., 2023).

Ethanol extract of Bajakah tampala stem is made using the maceration method. A total of 250 g of simplicia powder is put into a maceration container. Add 2.5 L of 96% ethanol (ratio 1:10) or until completely submerged. Store in a place protected from sunlight for 3x24 hours while stirring occasionally. The macerate is separated by filtration. Remaceration is carried out by adding 2 L of 96% ethanol. Remaceration is carried out for 3x24 hours. The filtrate is then evaporated using a rotary evaporator at a temperature of 50°C to accelerate the separation of the solvent from the efficacious extract. The extract that has been half evaporated is evaporated again using a water bath at a temperature of 50°C to ensure that there is still residual solvent in the extract so that it becomes a thick extract. (Hamzah et al., 2023).

Fractionation: The ethanol extract is dissolved in hot water, stirred until dissolved, then continued by adding n-hexane solvent with a ratio of 1:1 and shaken, let stand for ± 30 minutes until there are 2 separate layers. The results of the n-hexane fraction obtained in the upper layer are separated by flowing. Repeat 3 times. The top layer (n-hexane layer) that has been collected is evaporated using a rotary evaporator to obtain the n-hexane fraction. Furthermore, ethyl acetate is added to the water layer in the lower layer and shaken, let stand for ± 30 minutes until there are 2 separate layers, the ethyl acetate layer that has been collected is evaporated using a rotary evaporator to obtain the ethyl acetate fraction.

Continue adding n-butanol solvent using the same method as the solvent in n-hexane and ethyl acetate. (Mariska et al., 2022). Making bajakah tampala wood extraction (*Spatholobus littoralis* Hassk) in 70% ethanol extract, namely: The powder obtained is soaked (macerated) for 3 days in 70% ethanol solvent (1: 3). Then filtered to obtain a filtrate whose solvent is evaporated using a rotary vacuum evaporator at a temperature of 50°C. At the end of this process, the ethanol extract of the bajakah tampala stem is obtained which is brownish in color. The results of this extract are used as test materials. (Saputera & Ayuchecaria, 2018). Phytochemical screening of bajakah tampala wood (*Spatholobus littoralis* Hassk) with 70% ethanol extract, namely:

Table 2: Results of chemical compound identification tests (Saputera & Ayuchecaria, 2018)

Number	Test	Result
1	Alkoid	-
2	Flavonoid	+
3	Saponin	+
4	Steroid	+
5	Terpenoid	+
6	Tanin	+
7	Fenol	+

Based on the table above, the ethanol extract of bajakah tampala stems contains secondary metabolite compounds in the form of flavonoids, saponins, terpenoids, tannins, phenols and steroids. But this plant does not contain alkaloid compounds. This is because each plant has different secondary metabolite compounds. (Saputera & Ayuchecaria, 2018). Bajakah tampala simplicia was extracted and fractionated. The yield of ethanol extract, n-hexane fraction, ethyl acetate fraction, butanol fraction, and residual fraction were obtained.

The extract obtained an extract yield of 8.26% which indicates that the yield value is in accordance with the requirements of the Indonesian Herbal Pharmacopoeia Edition II standard.

The yield results obtained can be caused by several factors including the extraction method and type of solvent used, the length of extraction time, the environment, and the comparison of the number of samples with the amount of solvent. The high yield value obtained indicates that the more extract value obtained has no less than 8.1%. The yield results obtained can be caused by several factors including the extraction method and type of solvent used, the length of extraction time, the environment, and the comparison of the number of samples with the amount of solvent. The high yield value obtained indicates the greater the extract value obtained. (Mariska et al., 2022).

CONCLUSION

The wound area of the incision of male white mice smeared with 70% ethanol extract based on ointment had a relatively better healing time (10%) compared to the area smeared with 20% and 40% concentration extract.

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