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Coral Plant (*Jatropha multifida L)* for Postpartum Perineal Wound Care: A Literature Review

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ABSTRACT

Postpartum maternal pain increases with injuries to the birth canal. Some cases of postpartum infections are caused by improper perineal wound care, which causes bacterial growth. If the perineal wound is not treated with proper care, it can lead to infection and even death in some cases. Traditional plant as nonpharmacological therapy such as *Jatropha multifida L.* could be one of alternative therapy for wound healing. The purpose of this study was to examine the potential of secondary metabolites found in the *Jatropha multifida L.* plant as antibacterial and anti-inflammatory as an effort to heal perineal wounds in postpartum mothers. This study used the PRISMA (Preferred Reporting Items for Systematic Review and Meta Analysis) method. Five literatures was obtained from several literature search engines, namely Science Direct, Google Scholar, PubMed, ResearchGate, and ProQuest. The keywords used in the search were "*Jatropha multifida*" and "Wound healing". The results of a literature review related to *Jatropha multifida L.* showed that this plant has the potential to be used as a therapy for healing perineal wounds in postpartum mothers because it contains several secondary metabolites such as alkaloids, flavonoids, tannins, and saponins which act as antibacterial and anti-inflammatories in the wound healing process.

Keywords: *Jatropha multifida L*; wound healing; postpartum mother; phytochemical

Introduction

The postpartum period is the period that occurs after the placenta is born until 42 days after delivery and is a crucial period for the mother after giving birth, so special attention and monitoring are needed [1]. The postpartum period accompanied by perineal suture wounds increases postpartum morbidity. These suture wounds generally heal within 7 to 10 days [2]. Perineal suture wounds require proper care to prevent the growth of bacteria that will cause infection in the wound because poor wound care and monitoring is one of the factors causing maternal morbidity and mortality related to infection. Healing of perineal wounds can be done with complementary medicine based on Law Number 17 of 2023 Article 161 paragraph 1 which states that traditional health services include promotive, preventive, curative, and rehabilitative services, and/or palliative. From these regulations, efforts to heal perineal wounds can be carried out

with complementary medicine. One of the basic ingredients that can be used is coral plant (*Jatropha multifida L.*) which is also known as betadine plant, iodine plant, jarak cina, and jarak tintir. This plant contains several secondary metabolite compounds such as flavonoids, alkaloids, tannins, and saponins which play a role in the wound healing process. Flavonoids are widely found in land plants and have various functions as food components, flavonoids also provide various benefits for humans [3]. Alkaloids have therapeutic benefits as a source of superior new compounds for the development of drugs against various deadly diseases among all, indole, tropane, and isoquinoline alkaloids are recognized to have therapeutic potential for the treatment of hypertension, cancer, microbial infections, neurological disorders, and others [4]. Tannin, a polyphenol that has various medicinal properties, and acts as an antioxidant, various pharmacological properties of tannin such as antitoxic, anticancer, antiallergic and anti-inflammatory, anti-microbial, antiviral, wound healing, dysentery healing, and others [5]. Previous studies have found that the leaves and sap of the castor oil plant show antibacterial activity where the extract of the leaves and sap of this plant can play an active role against *Streptococcus D* [6].

Coral plant in various countries has been used for treatment. A decoction of coral plant bark in Columbia is used as a medicine against gonorrhea, the leaves are used to treat colic, the seeds are used for diuretics and laxatives. The Indians, Valledupar, Sierra Nevada, and La Guajira use the bark to cure stomach and liver cramps, Ecuador uses the sap to treat wounds, and Peru uses the dried seeds as a laxative [7].

Previous research on the potential of coral plant in wound healing is coral plant extract cream preparation is effective in healing wounds at a concentration of 15% coral plant extract within 9 days, in the wound healing process, tannins help accelerate the wound healing process, this is because tannins function as astringents where astringents are drugs that have the ability to precipitate proteins on the surface of cells that have low permeability, so that they can cause skin pores to close, harden the skin, stop light exudate and bleeding [8].

Other research related to coral plant is isolating coral plant leaves containing flavonoid compounds that are effective in healing wounds. Isolate active samples of coral plant leaves (*Jatropha multifida L*) with concentration variations of 10%, 15%, and 20% have wound healing effectiveness compared to positive and negative controls, although not significantly different [9].

Another study made an innovation from eggshell waste and coral plant (*Jatropha multifida L*) by extracting and making it into an ointment preparation with results tested in vivo on chickens showing the results of a combination of eggshell and coral plant extract ointment with a formulation concentration of 30% is the best dose indicated by the fastest wound healing results. This is because coral plant contain active substances saponin, flavonoids, tannins, and steroids which can help preserve wound healing, saponin is a cleaning agent and antiseptic that is useful for preventing the growth of microorganisms [10].

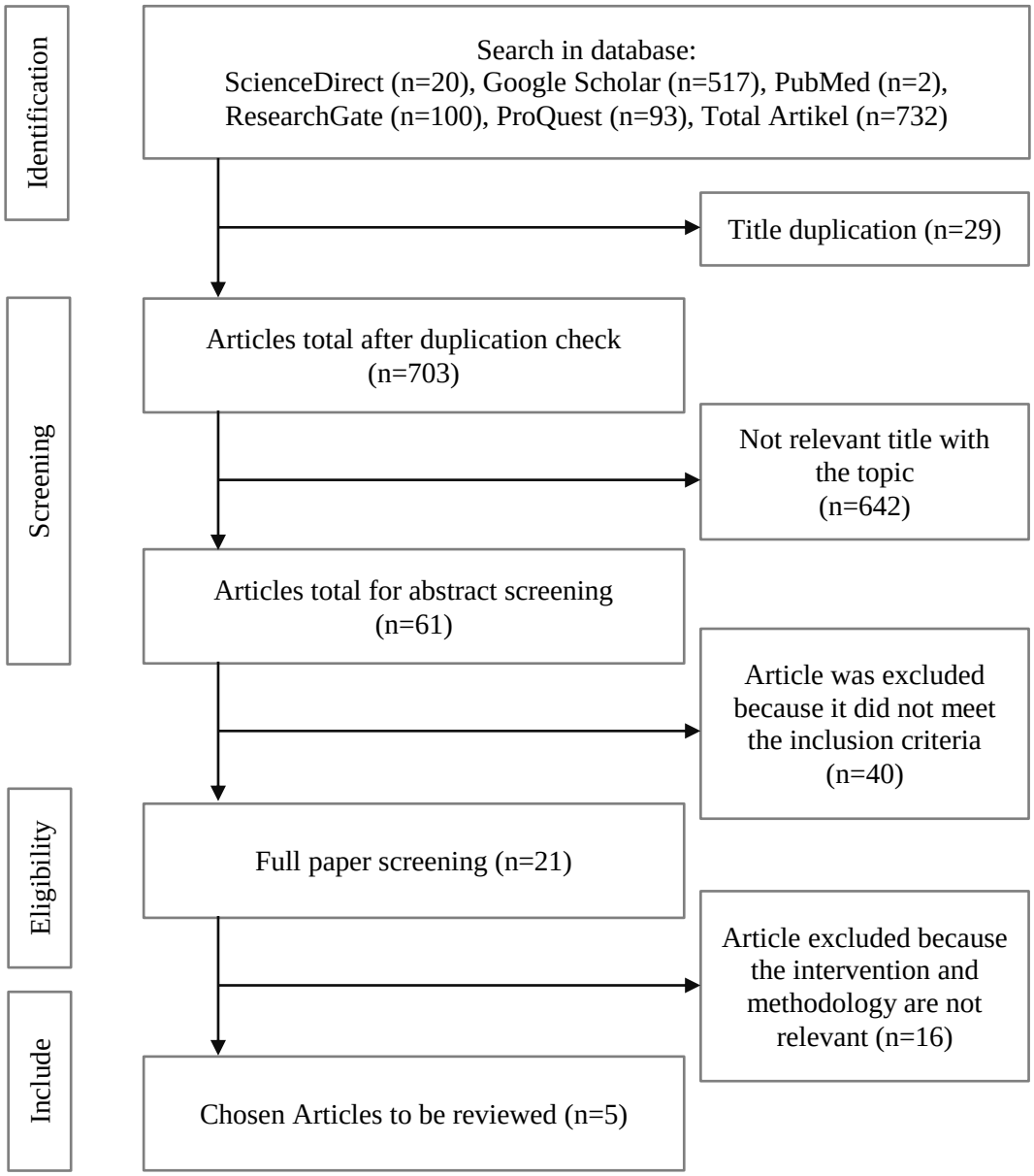
Other studies show that *Jatropha multifida L.* and *Euphorbia hirta* plant extracts contain bioactive components such as alkaloids, phenols, tannins, saponins, flavonoids, and carbohydrates which are antimicrobial, the extracts of these two plants produce a high inhibition zone against the growth of Escherichia coli bacteria [11]. Based on several data and studies, researchers are interested in conducting a literature review to examine and explore the bioactivity of the coral plant which plays a role in the healing process of perineal wounds in postpartum mothers.

Methods

This type of research is metadata analysis using literature review to collect various literature related to the research. The literature search process used by researchers comes from Science Direct, Google Scholar, PubMed, Research-Gate, and ProQuest. In searching for journal articles, researchers use the conjunction AND and keywords to find journals in a broader scope. The keywords used in the search are "*Jatropha multifida*" AND "Wound healing".

The inclusion criteria in this study were articles published in the last 10 years (2016-2025), using Indonesian and English in nationally and internationally accredited journals and being research articles. Another criteria is that the articles are open access and can be downloaded freely.

The protocol used to conduct literature selection is PRISMA (Preferred Reporting Items for Systematic Review and Meta-Analysis). From the search, 20 articles were obtained from Science Direct, 517 articles from Google Scholar, 2 articles from PubMed, 100 articles from ResearchGate, and 93 articles from ProQuest. Of the total 732 articles, 29 articles were duplicated. After re-sorting, 642 article titles did not match the topic. 40 articles did not meet the inclusion criteria. In the end, 6 articles were obtained that were worthy to be analyzed



Picture 1.
PRISMA Diagram

Results and Discussion

Based on the results of the research article search, the content contained in the *Jatropha multifida L*. plant is useful for wound healing. The results of previous studies showed that there was fibrin formation and collagen density [12]. *Jatropha multifida L* stem sap has been tested on *Sprague-Dawley* rats for the treatment of wounds after tooth extraction in rats with the results of the group treated with *Jatropha multifida L* sap showing faster improvement compared to the group given tranexamic acid [13]. In the hydrogel kappa preparation, *Jatropha multifida L* provides a better effect in accelerating wound healing[14]. *Jatropha multifida L* compared to *Aloe vera* has the same effectiveness in terms of wound healing tested on experimental animals[15]. In addition to being used on cuts, *Jatropha multifida L* can also be used on burns. Iodine leaf sap *(Jatropha multifida L)* in gel preparation with a concentration of 6% is effective in accelerating the healing process of second degree burns in mice [16].

Table 1
Articles Review

Researcher and Title	Design and Variable	Results
Junaiddin, J., Bambungan, Y.M., Etnis, B., Untari U., Siagian, J.L.S., Wahyuni, M., Su.H.M., Arianto, M.F., Livana, P., & Amir, H. (2022). The Effect of the Treatment with Salve of Topical Tintir Castor Bark Extract *(Jatropha Multifida L)* on the Number of Fibroblast, Fibrin Formation, and Density of Collagen in the Wound Healing Process of the Rat with the Acute Injury Model [12].	This study used an experimental design with the Randomized Post Test Control Group method. The subjects of the study were 45 Wistar rats divided into 3 groups, namely: negative control (Vaseline), positive control (Oxytetracycline 30%), and treatment group (10% castor oil stem extract). The variables studied included independent variables, namely treatment with castor oil stem extract ointment (*Jatropha multifida L.*) at a concentration of 10% and dependent variables were the number of fibroblasts, fibrin formation, and density.	The results showed that 10% castor oil plant stem extract did not significantly affect the increase in the number of fibroblasts, but significantly reduced fibrin formation on day 7 and increased collagen density on day 14. On days 3, 7, and 14, there was an increase in the number of fibroblasts in all groups, but not significant on day 14. Fibrin formation and collagen density showed significant differences between the treatment and control groups at certain times, especially on day 14 for collagen.
Hendry Rusdy, Astri Suryani Pasaribu Saruksuk, Rahmi Syaflida Dalimunte, & Gostry Aldica Dohude. (2021). Efektivitas getah batang betadine *(Jatropha multifida L.)* terhadap penyembuhan luka pasca pencabutan gigi pada tikus *Sprague-Dawley* [13].	This study used a laboratory experimental design with a post-test only control group design. The subjects of the study consisted of 30 *Sprague-Dawley* rats divided into two groups: the treatment group (given betadine stem sap) and the control group (given tranexamic acid). Observations were made on days 1, 3, and 7 after tooth extraction to assess the wound healing process. The independent variables of this study were the administration of betadine stem sap (concentration 6.25%) and tranexamic acid (500 mg). The dependent variable was the wound healing process measured based on the depth of the socket wound, as well as signs of infection.	The results showed a significant difference in wound healing between the two groups with a p value = 0.037 ($p < 0.05$), indicating that coral plant sap is more effective than tranexamic acid. The mean wound depth on day 1 for the treatment group was 3.887 ± 0.8323 mm, while for the control group it was 4.660 ± 1.2299 mm. On day 3, the wound depth for the treatment group was 3.613 ± 0.8236 mm and for the control group 4.627 ± 1.4385 mm, indicating faster improvement in the group receiving betadine tree sap.
Annisa Wahyu Wardani, Sahuri Teguh Kurniawan, Saelan, S. Dwi Sulisetyawati, Galih Priambodo. (2024). Iodine Leaf Gum Gel (*Jatropha multifida Linn*) to Accelerate the Healing Process of Grade II Burn Wounds in Mice (*Mus musculus Linn*) [16].	This study used a laboratory experimental design with a post-test only control group design method. The subjects used were 24 male rats (*Mus musculus Linn)* divided into 3 groups, namely positive control (0.9% NaCl), negative control group (no treatment), and treatment group (6% iodine leaf sap gel). The independent variable of this	The results showed that the group given iodine leaf sap gel had an average healing time of 8 days with a healing percentage of 30.75% better than the positive control group (20.91%) and negative control (11.48%). Statistical tests showed a significant difference between the treatment group and the control group with a p value

Researcher and Title	Design and Variable	Results
	study was treatment with iodine leaf sap gel (*Jatropha multifida L.*) at a concentration of 6%. The dependent variables were the area of burns, percentage of healing, and healing time.	<0.05. The study stated that 6% iodine leaf sap gel was effective in accelerating the healing process of second-degree burns in mice.
Fetri Lestari, Amila Gadri, Gita Cahya Eka Darma, & Rikka Kartika. (2016). Efek Hidrogel Getah Jarak Cina (*Jatropha multifida Linn*.) Berbasis Karagenan Kappa dan Karagenan Iota terhadap Penyembuhan Luka Tikus Wistar Jantan [14].	This study used an experimental design with 5 treatment groups on 25 male Wistar rats divided into control and test groups. Each group was given a wound with a diameter of 1.5 cm on the back and treated with hydrogel with a concentration of 3% castor oil with variations in kappa carrageenan and iota carrageenan polymer bases. Observations were made to assess the wound drying time, scab formation time, and changes in wound diameter. The independent variable was the type of hydrogel (kappa carrageenan and iota carrageenan based). The dependent variables were the wound drying time (in hours), scab formation time (in hours), and changes in wound diameter (in cm).	The results showed that the group given *Jatropha multifida L* with kappa carrageenan-based hydrogel experienced the fastest wound healing with an average wound drying time of 16.6 ± 2.2 hours and scab formation time of 92.6 ± 2.2 hours. The change in wound diameter on day 21 for the kappa hydrogel group was 0.02 ± 0.03 cm, which was smaller than the control and iota hydrogel groups. Statistical tests showed a significant difference ($p < 0.05$) between the kappa hydrogel group and the control and iota hydrogel groups, concluding that kappa hydrogel was more effective in accelerating wound healing.
Khusnul Munika Listari, Tsarwah Az-Zahra, Amalia Hasanah, & Yessy Agistasari. (2023). *Jatropha multifida L* Stem Sap Gel Versus Aloe vera Gel to Post-Gingivectomy Healing Process [15].	This study is an experimental study with a Randomized Group Post Test Control Only design. The subjects of the study were 32 male Wistar rats aged 2-3 months weighing 250-300 grams which were divided into 4 groups, namely: Control (*Aloe Vera* gel), treatment I (*Jatropha multifida L* gel 2.5%), treatment II (Jatropha multifida L gel 5%), and treatment III (*Jatropha multifida L gel 10%).* The gel was used twice a day on the post-gingivectomy wound area, observations were made on the 3rd and 7th days. The independent variables in this study were the administration of *Jatropha multifida L* gel of various concentrations and *Aloe vera*. The dependent variables in this study were the number of fibroblasts, the number of blood vessels, and the density of collagen fibers.	The test results showed: Number of fibroblasts: There was a significant difference ($p<0.05$) in the 2.5% and 5% *Jatropha multifida L* gel groups on day 3. Number of blood vessels: There was no significant difference ($p>0.05$) between groups. Density of collagen fibers: There was no significant difference ($p>0.05$) between groups. *Jatropha multifida L* gel has the same potential as *Aloe vera* gel in accelerating the wound healing process after gingivectomy.

Postpartum mothers with perineal suture wounds require proper care to prevent infection due to untreated birth wounds. Signs of perineal infection include redness of the perineal skin, discharge of pus, odor, and open or unhealed suture wounds between the two sides [17]. To achieve optimal wound healing, a supportive wound environment is needed, many studies have found that various topical therapies, antimicrobial agents, and patches are able to cover wounds, maintain optimal moisture levels, and absorb excessive exudate to support the healing process [18]. Wound healing is a complex and dynamic process that is supported and influenced by various cellular processes that must be well coordinated to repair damaged cell tissue efficiently [19]. Improper use of wound care products will cause longer inflammation and lack of oxygen at the wound site, thus prolonging the wound healing time, accompanied by decreased immunity, wounds that take a long time to heal will be more susceptible to microorganisms that cause infection [13]. One of the plants used as a traditional medicine is coral plant *(Jatropha multifida L*). The coral plant has various uses in everyday life, including the sap in the tree can be used to treat new wounds and swelling by applying the sap found in the leaves and stems to the wound [12].

Several secondary metabolites which are bioactive components can play an active role in the process of accelerating wound healing, both cuts and burns. Previous studies have shown that healing occurred when tested on mice with second-degree burns [16]. These secondary metabolites can be found in plants, one of which is *Jatropha multifida L*. The use of traditional medicine in Indonesia is part of the nation's culture and is widely used by local people [12]. *Jatropha multifida L*, also known as jarak tintir, jarak cina, jarak dokter, betadine plant, and iodine plant, is a shrub or small tree that can reach 5 meters in height and has a single trunk, dark green leaves on the upper surface and lighter on the surface of the trunk [13]. *Jatropha multifida L* is also called "Shan-Hu-Hua" in China where this plant is cultivated to take advantage of its roots, stems, leaves and seeds for traditional use in the treatment of oral candidiasis, gonorrhoeae, fever, wound healing and skin infections [20] In the research articles found that wound healing is a complex process consisting of homeostasis, inflammation, proliferation, and maturation phases. In the proliferation phase, angiogenesis, fibroblast proliferation, and collagen formation play an important role in the wound healing process, fibroblasts which are components in the wound healing process are found in the gel of *Jatropha multifida L.* stem sap with a concentration of 5% on days 3 and 7 [15]. Another component in wound healing is collagen where its formation is produced by fibroblasts along with elastic fibers to form a good skin structure [15]. Several search results found that *Jatropha multifida L*. is rich in secondary metabolites such as alkaloids, flavonoids, tannins, saponins, triterpenoids, and steroids. These bioactive components can play a good role in the wound healing process with anti-inflammatory, anti-bacterial, and antioxidant properties.

Flavonoids are important secondary metabolites found in plants, food, and medicine [3]. known as vasodilators that can improve blood circulation and as antibacterial by forming complex compounds to disrupt the presence of bacteria on cell membranes [15]. In the inflammatory phase, flavonoids reduce inflammation by reducing levels of inflammatory mediators such as PGE2 and TNF-α and increasing anti-inflammatory mediators such as IL-10. In the proliferation phase, flavonoids increase the rate of epithelialization, angiogenesis, and collagen synthesis, and play a role in increasing VEGF levels to support the formation of new blood vessels. In the maturation/remodeling phase, flavonoids play an active role as antioxidants to protect tissues during this phase from damage due to oxidation [21]. Alkaloids as organic compounds found in nature that act as anti-inflammatories and antioxidants inhibit cell division and can damage cell membranes in both gram-positive and gram-negative bacteria [22]. Alkaloids are antibacterial by affecting the components that form bacterial cells, preventing cell walls (microorganisms associated with wounds are separated directly by alkaloids) so that the layers that make up the bacterial cell walls are not formed and cause bacterial cell death [16]. In the inflammatory phase, alkaloids have anti-inflammatory properties that can reduce inflammation and redness in wounds [4].

Tannins in this plant have hemostatic bioactivity that will increase coagulation, fibrinolysis inhibition, and smooth muscle constriction [23]. In the hemostasis phase, tannins act as astringents to shrink skin pores and stop exudate and minor bleeding. In the proliferation phase, tannins increase the formation of fibroblasts and capillaries by increasing VEGFA expression which accelerates wound contraction. Tannins have the same ability to precipitate bacterial proteins as phenolic compounds, so one of their strongest pharmacological functions is as an antibacterial [24]. Saponins work as antibacterial by denaturing proteins, the saponin surface regulates the surface tension of bacterial cell walls and reduces the

permeability of bacterial membranes until they are damaged, resulting in disrupted bacterial survival due to damage to the cell membrane [25]. Saponins contained in the sap of *Jatropha multifida L* can stimulate the formation of Vascular Endothelial Growth Factor (VEGF) and activate fibroblasts in scar tissue by increasing the production of cytokinase which can stimulate TGF-b and have an impact on the proliferation, differentiation, and migration of fibroblast cells so that it can cause collagen formation [15]. VEGF is one of the significant factors in the wound healing process that occurs immediately after injury. VEGF potentially reduces tissue hypoxia and metabolic deficiency by increasing angiogenesis and endothelial function [26].

Jatropha multifida L sap in hydrogel-kappa preparations provides a faster wound healing effect compared to hydrogel-iota [14]. The use of *Jatropha multifida L* plants can also be made into ointment preparations with various concentrations with quality assurance through organoleptic tests, spread ability tests, pH tests, homogeneity tests, and in vivo tests [10]. Application of topical ointment of 10% *Jatropha multifida L* stem extract has the effect of reducing fibrin formation and increasing collagen production [12]. *Jatropha multifida L* ethanol extract ointment also has a high level of epithelialization almost approaching calmoseptin and has no toxic effects on test animals because they do not show signs of stress and severe and prolonged pain [27].

The stem of *Jatropha multifida L*. is also rich in its unique compounds such as multifidone, japodagrone, multidione, multifolone, jatrogrossidentadione, and macrocyclic diterpenoids where these compounds have antibacterial properties. The sap of this plant contains jatrophine alkaloids, cyclic peptides, phenolics, and glucosides which can produce wound healing with hemostatic effects [28]. The antibacterial activity of this plant can also be seen from a study that revealed that the extract of leaves and sap of *Jatropha multifida L* was active against *Staphylococcus aureus* and *Streptococcus D* bacteria in tests carried out by forming strains, this shows the antimicrobial potential of leaves and sap of *Jatropha multifida L* so that it is widely used in traditional medicine with many secondary metabolites found in it [6]. Another research article wrote that secondary metabolites contained in *Jatropha multifida L* are active against *Pseudomonas aeruginosa* and *Staphylococcus aureus* in in vitro tests where the maximum anti-inflammatory effect occurs after administration of histamine and carrageenan, this proves that this plant has antibacterial and anti-inflammatory activity which is the basis for the use of the *Jatropha multifida L* plant for traditional wound treatment [29]. Another research article also explains that the extract of leaves and sap of the Chinese coral plant *(Jatropha multifida L.)* has been proven effective in inhibiting the growth of *Staphylococcus aureus* bacteria in vitro, this study supports the use of medicinal plants as an alternative in the treatment of bacterial infections, especially amidst increasing resistance to conventional antibiotics[30]. Postpartum mothers with perineal suture wounds require secondary metabolites (flavonoids, alkaloids, tannins, and saponins) contained in *Jatropha multifida L*. to support recovery in each phase of perineal wound healing, namely the hemostasis phase, inflammation phase, proliferation phase, and maturation phase. Based on these articles, there are facts stating that healing of perineal wounds in postpartum mothers can be done with non-pharmacologic therapy by utilizing the *Jatropha multifida L.* plant which is rich in secondary metabolites. The content of bioactive components in these plants can play an active role in the wound healing process by forming fibroblasts that increase collagen production to make wounds close faster so that wounds will heal faster and not be infected by bacteria that cause infection.

Conclusion

The bioactive components of secondary metabolites found in the *Jatropha multifida L* plant, such as alkaloids, flavonoids, tannins, and saponins, show significant potential as alternative (non-pharmacologic) treatments or therapies in healing perineal wounds in postpartum mothers. These compounds have various biological activities that support the healing process, from reducing inflammation and pain in the inflammatory phase, accelerating the hemostasis process, to encouraging tissue regeneration and collagen formation in the proliferation phase. In addition, the ability of these secondary metabolites to improve the quality of scar tissue and accelerate the maturation process makes it an attractive choice for a more natural wound healing therapy with minimal side effects. Thus, the use of *Jatropha multifida L* can be used as a source of effective and safe alternative therapy for postpartum mothers in healing perineal wounds, as well as improving the quality of life of postpartum mothers during the recovery period. Therefore, further research on the formulation and application of this plant is needed to optimize its use in the health or obstetrics sector.

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