

WOUND HEALING ACTIVITY OF SOME MEDICINAL PLANTS IN INDONESIA – A  
REVIEW

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**ABSTRACT**

In hospitals, there is a growing incidence of skin injuries that necessitate effective treatment. Antimicrobial reliance is costly and, at times, ineffective, necessitating the development of alternative methods. As an alternative, medicinal plants with wound-healing properties could be utilized. A number of indigenous Indonesian medicinal plants, such as *Anredera cordifolia*, *Sansevieria trifasciata*, *Psidium guajava*, *Curcuma longa*, *Centella asiatica*, *Annona muricata*, and *Ocimum basilicum*, have been scientifically validated to possess wound-healing properties via various mechanisms. Therefore, this review article is aimed to describe the potential therapeutic attributes of a variety of indigenous Indonesian plants that promote wound healing.

**KEYWORDS:** Wound healing, Medicinal plants, *Anredera cordifolia*, *Sansevieria trifasciata*, *Psidium guajava*, *Curcuma longa*, *Centella asiatica*, *Annona muricata*, *Ocimum basilicum*.

**INTRODUCTION**

A wound is defined as a disturbance in the continuity of cells and tissues, resulting in harm to their protective or physiological functions. It can be induced by various factors, such as physical, chemical, microbial, thermal, or immunological damage to the affected tissue.<sup>[1]</sup> Following an injury, cells beneath the dermis initiate an inflammatory response and increase collagen production. Epithelial tissue subsequently undergoes regeneration.<sup>[2]</sup> The body undergoes a natural process of wound healing in order to reinstate the structural and functional integrity of damaged tissue.<sup>[3]</sup> The objective of this dynamic and intricate process is to substitute impaired cellular structures and tissue strata.<sup>[4]</sup> The wound healing process consists of three distinct phases: inflammation, proliferation, and regeneration remodeling.<sup>[2]</sup> In the event of an injury, inflammatory cells will secrete reactive oxygen species (ROS) and lysosomal enzymes, which aid in the removal of diverse cell debris.<sup>[5]</sup> Following this, a proliferative phase ensues, which is distinguished by the formation of granulation tissue, angiogenesis, collagen deposition, epithelialization, and wound contraction. Angiogenesis is the process by which endothelial cells generate new blood vessels. In the interim, fibroblasts secrete collagen and fibronectin to generate a novel extracellular matrix (ECM) during the process of granulation tissue formation. Following this, epithelial cells will traverse the wound bed in order to cover it.<sup>[6]</sup> During the proliferation phase, myofibroblasts are generated, and they are known to have a significant

impact on wound contraction. Due to the fact that contraction results in wound closure, it is a crucial process in the healing of wounds.<sup>[7]</sup> Among the variables that influence the rate of wound healing are the area's blood supply, the magnitude of the wound, the existence of an infection, and the presence of foreign objects. Conversely, wound care may involve systemic and local drug administration. Furthermore, to expedite the process of wound healing, it is imperative to utilize a variety of growth factors, such as platelet-derived growth factor, macrophage-derived growth factor, and monocyte-derived growth factor.<sup>[8]</sup> Minimizing the occurrence of undesired complications and accelerating the healing process are the objectives of wound care.<sup>[9]</sup> In the meantime, over 75% of the global population, including Indonesia, uses medicinal plants to treat wounds.<sup>[10-12]</sup>

In certain instances, medicinal plants are the sole and most vital source of wound treatment. This is due to the fact that medicinal plants are readily available, inexpensive, and culturally acceptable in comparison to modern medicine.<sup>[13-15]</sup> Indonesia ranks second globally in terms of forest biodiversity, accounting for 2,500 medicinal plant species among its 28,000 plant species.<sup>[16-18]</sup> Research endeavors are currently focusing on developing novel anti-wound medications derived from natural sources. Indigenous populations in different regions of Indonesia have historically employed botanical medicines, which contain active compounds, to treat wounds.<sup>[19-21]</sup> The objective is to identify novel anti-

wound compounds characterized by minimal toxicity and mild side effects so as to prevent patient harm.<sup>[22-24]</sup> Therefore, this review article is aimed to describe the potential therapeutic attributes of a variety of indigenous Indonesian plants that promote wound healing.

#### ***Anredera cordifolia***

Binahong (*Anredera cordifolia*) is an herbal plant that is most often used to cure various diseases in a number of Asian countries, such as Vietnam, Taiwan, China, and Korea.<sup>[25]</sup> Some parts of this plant, especially the leaves, are often used as herbal medicine.<sup>[26]</sup> People in Indonesia have proven that this plant can treat diabetes mellitus, tuberculosis, rheumatism, gout, asthma, typhoid, hypertension, hemorrhoids, and use as a diuretic, postpartum recovery, wound healing, ulcers, colitis, and cancer.<sup>[25]</sup> Other activities of this plant are as a hepatoprotector, antiobesity, increasing breast milk, and lowering blood pressure.<sup>[27]</sup> Administration of *A. cordifolia* extract ointment with concentrations of 2.5%, 5%, and 10% for 14 days was reported to accelerate the healing process of burn wounds on rat skin by increasing collagen deposition, polymorphonuclear infiltration, angiogenesis, and fibrosis in injured skin tissue.<sup>[28]</sup>

#### ***Sansevieria trifasciata***

*Sansevieria trifasciata* is a plant that has the potential to be developed as a source of medicine. This plant has been used traditionally since ancient times.<sup>[29]</sup> Many studies have been carried out to prove its pharmacological effects and determine the chemical content of this plant.<sup>[30]</sup> Phytochemical studies show the presence of trifasciatine C dihydrochalcone derivatives, steroidal saponins such as trifasciatoside A-I, trifasciatosides K-N, 1,2-(dipalmitoyl)-3-O- $\beta$ -D-galactopyranosylglycerol, aconitic acid, 1-methyl aconitic acid, Neoruscogenin, ruscogenin, sansevierigenin, luvigenin, homoisflavonoid trifasciatin A-B, pregnane glucoside, alkaloid 1-acetyl- $\beta$ -carboline, methyl pyrophaeophorbide A, and oliveramine, and flavonoids such as (2S)-3', 4'-methylenedioxy-5, 7-dimethoxyflavan, monoterpene digiprolactone, phenolic methyl gallate, and the fatty acid tricosanic acid.<sup>[31-35]</sup> Pharmacological studies show that this plant has several properties, such as wound healing, anthelmintic, antimicrobial, and cytotoxic.<sup>[36]</sup> Administration of *S. trifasciata* extract hydrogel with concentrations of 15%, 20%, and 25% for 15 days was reported to accelerate the wound healing process in a mouse model that received incisional wounds by activating cell migration in keratinocytes and fibroblasts, reducing inflammatory cell infiltration, inducing the expression of transforming growth factor- $\beta$  (TGF- $\beta$ ), as well as increasing angiogenesis, collagen deposition, and cell regeneration in injured skin tissue.<sup>[37]</sup>

#### ***Psidium guajava***

*Psidium guajava*, usually known as guava, is a medicinal plant that has been used traditionally for a long time in tropical countries, including Indonesia. *P. guajava* is a

plant belonging to the *Myrtaceae* family that can be used as an anti-inflammatory, analgesic, antidiabetic, antihypertensive, anti-microbial, antioxidant, antibacterial, and antitumor drug.<sup>[38, 39]</sup> Administration of *P. guajava* extract at a concentration of 100% for 9 days was reported to accelerate the wound healing process in a mouse model that received incisional wounds by increasing the formation of new epithelial cells and the formation of scar tissue on injured skin.<sup>[40]</sup>

#### ***Curcuma longa***

*Curcuma longa* is a medicinal plant belonging to the *Zingiberaceae* family. This plant is widely cultivated in Asia, especially in India and China. *C. longa* is a sterile plant and does not produce any seeds. This plant grows 3-5 feet tall, and the flowers are yellow. The rhizome is a thick and fleshy underground stem.<sup>[41, 42]</sup> *C. longa* has been widely reported as a medicinal plant that can help control inflammation and pain because this plant contains at least three natural polyphenols, namely curcumin, demethoxycurcumin, and bisdemethoxycurcumin, which are known as curcuminoids.<sup>[43, 44]</sup> Administration of *C. longa* extract ointment at a concentration of 5% for 15 days was reported to accelerate the wound healing process in a rat model that received excisional wounds by increasing the formation of granulation tissue, which in turn facilitates re-epithelialization by providing a stable foundation for epithelial cells to grow and migrate and heal wound gaps.<sup>[45, 46]</sup>

#### ***Centella asiatica***

*Centella asiatica* is a plant belonging to the *Apiaceae* family that is used as traditional medicine in several countries, including Indonesia. This plant is acknowledged to contain triterpenoids and saponins as the main elements, which are believed to be responsible for its wide therapeutic action, such as healing wounds, leprosy, lupus, varicose ulcers, eczema, psoriasis, diarrhea, fever, amenorrhea, and diseases of the genitourinary tract in women, as well as eliminating anxiety and improving cognition.<sup>[47, 48]</sup> Administration of *C. asiatica* extract with concentrations of 0.1%, 0.5%, and 1% for 10 days was reported to accelerate the wound healing process in a rat model that received excisional wounds by increasing the processes of angiogenesis and epithelialization in the wound tissue.<sup>[49]</sup>

#### ***Annona muricata***

*Annona muricata* is a tropical plant with dark green, oval-shaped leaves and white-fleshed fruit with spiny green skin. This plant has fruit, which is often used in making juice, ice cream, or as an additional ingredient in food.<sup>[50, 51]</sup> The *A. muricata* plant is reported to have properties for treating several diseases such as cancer, gout, tumors, hypertension, diabetes mellitus, ulcers, diarrhea, and allergies.<sup>[52]</sup> Administration of *A. muricata* extract at concentrations of 5% and 10% for 15 days was reported to accelerate the wound healing process in a rat model that received excisional wounds by increasing the

processes of epithelialization and collagen synthesis in the wound tissue.<sup>[53]</sup>

### ***Ocimum basilicum***

*Ocimum basilicum* is a species in the *Lamiaceae* family that is known for having various medicinal properties.<sup>[54]</sup> Traditionally, this plant is used as an antimalarial, antirheumatic, anticholesterol, antihypertensive, painkiller, and for the treatment of stroke.<sup>[55, 56]</sup> Administration of *O. basilicum* extract ointment at a concentration of 3% for 30 days was reported to accelerate the wound healing process in a mouse model that received incisional wounds by increasing collagen deposition, angiogenesis, fibrosis, and the epithelialization process in the wound tissue.<sup>[57]</sup>

### **CONCLUSION**

Scientists have evaluated these plants and empirically proven their ability to accelerate wound healing. The active compounds in these plants, each with unique wound-healing mechanisms, inextricably link to this. It is hoped that research on medicinal plants can be used for wound care.

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