



## Medicinal Plants with Potential Wound Healing Activity: A Review Article

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### Abstract

Wound is common biological injury due to internal and external cut of skin. Wound is subsequently problem of immunological reactions, such as inflammation, necrosis, and which effect of cell injury. The wound healing is a natural process where in the medications applied on the wound site may reduce the rate of healing. The Nature has gifted us herbal plant based drugs with potential to wound healing. Which play an important role in wound healing. Herbal Plants play an essential role in wound healing, there are many herbal plants in nature have wound healing activities such as *Azadirachta indica*, *Curcuma domestica*, *Olea europaea*, *Ocimum sanctum*, *Bryophyllum pinnatum*, *Punica granatum*, *Elephantopus scabre*, *Alternanthera versicolor*, *Arnebia densiflora*, *Carallia brachiata*, and in the various phytochemical active constituent present in different parts of plant which is effective for wound healing pharmacological activities. Such as tannins, flavonoids, alkaloids, and glycoside of the wound healing potential. This review highlights all the plants which are traditionally and scientifically proven for the used in treated of wounds and wound care. It also covers the list of the plants and its part of plant used traditionally and scientifically for wound care.

**Keywords:** Wound Healing; Medicinal Plant; Phytoconstituent; Plant Extract

### Introduction

Wounds are the primary cause of physical injury. Diseases result from physical, chemical, microbial (or) immune (or) tissue disorders, often associated with dysfunction [1]. According to the Medical Centre, a wound is a physical injury that causes damage (or tearing) of the skin, resulting in disruption of the body's physical and functional functions. Wound healing is the interaction of a combination of cellular and biochemical healing effects to restore process and function while restoring the strength of injured tis-

sue. Includes cell-cell and cell-matrix interactions; inflammation allows processes to occur in many overlapping phases and processes, including wound healing, tissue reepithelialisation, new repair, and angiogenesis and granulation tissue formation [3]. There are many factors that can delay (or) slow the wound healing process, including bacterial infection, necrotic tissue, blood flow obstruction, lymphatic congestion, and diabetes. can be improved [4]. In addition, painkillers are cheap, easily available and have few side effects. Despite the great success of allopathic medicine, the use

of herbal medicines has become increasingly popular due to the dangers and side effects of allopathic medicine. Alkaloids, tannins, flavonoids, and phenolic chemicals are examples of bioactive secondary metabolites with interesting pharmacophores related to the effects of medicinal plants. Traditional medicine practices have expanded rapidly over the past few decades. Approximately 20% of modern allopathic medicines are derived from plants. Medicines made from plants are safer in the treatment of many diseases. Since traditional knowledge is lost for many reasons, it must be preserved for the benefit of future generations. There is greater demand for new, better medicines made from natural ingredients [6]. Diseases such as stomach ache, wound healing, skin diseases, inflammation, itching, leprosy and sexually transmitted diseases can be treated and cured with herbs. Herbs are used to cleanse wounds, remove dead tissue, and provide a moist environment that supports optimal health. In folklore, many plants are used to heal burns, wounds and cuts [7]. Antibacterial coagulants and wound cleansers are made from plant ingredients and are used in first aid. Treat plants with wounds. Treatment can be achieved through a variety of mechanisms, including modification of wound healing, reduction of bacterial count, improvement of collagen deposition, and stimulation of fibroblasts and fibroblasts [8].

### Classification of wound

Wounds can be classified in number of ways, depending on healing time they can be acute or chronic.

#### Acute wounds

Acute pain is defined as disruption of the normal structure and function of tissue that has not recently been injured. Acute wound healing is a regulated series of cellular, humoral and molecular events that are activated during injury, resulting in a time-dependent but predictable pattern of tissue repair [9].

#### Chronic wounds

Chronic wounds are defined as wounds that do not heal the body with appropriate and timely procedures before treatment and cannot function properly or cannot provide their anatomical functions and functions effectively [10].

According to the effect of the skin system, there will be external wounds that are only epidermal damage. Some cortical lesions

damage the epidermis and deeper dermis, including blood vessels, sweat glands, and hair follicles. Full-thickness wounds occur when the underlying subcutaneous fat or deep tissue is damaged.

### Process of wound healing

Process of wound healing may be considered as a dynamic process in which cellular and matrix components act together to re-establish the integrity of damaged tissue and replace lost tissue. Regardless of the source or the extent of tissue damage, under normal conditions the wound healing process occurs in predictable fashion in four stages: inflammation, migration, proliferation and maturation (remodelling). Wound Healing is considered to complete when the skin surface has reformed and has regained its tensile strength [11].

### Stages of wound healing

#### Haemostasis and coagulation

In wound healing the platelets act as utility workers sealing off the damaged blood vessels. The blood vessels themselves constrict in response to injury, but this spasm ultimately relaxes. The platelets secrete vasoconstriction substances to this process but their prime role is to form a stable clot sealing the damaged vessel [12,13].

#### Inflammation

Inflammation is the body's response to injury and includes cellular and vascular reactions. The release of histamine and many other cell-mediated factors into the wound causes vasodilation increased capillary permeability, and nociception stimulation. Protein-rich exudate, containing phagocytes and other materials, is released from the blood vessels into the wound, engulfing dead cells and bacterial debris [14].

#### Migration

Growth factors in wound exudate promote the growth and migration of epithelial cells, fibroblasts, and keratinocytes to the injured area to replace damaged and lost tissue. These cells regenerate from the edges and grow rapidly from the wound underneath the dry bone. Epithelial thickening and basal cell proliferation [15].

### Proliferation

The proliferation Phase involves the development of new tissue and occurs simultaneously or just after the migration phase, lasting from 5 to 20 days. Granulation tissue is formed by infiltration of blood capillaries and lymphatic vessels into the wound and by the supporting collagen network synthesized by fibroblast. This process is known as granulation.

### Maturation

The final period of wound healing, also known as the adaptation period, involves constriction of the vascular structure and expansion of collagen fibers, which increases the tensile strength of the healing. Wound healing time generally ranges from 3 weeks to 2 years, and scar tensile strength returns to 70–90% of pre-injury tissue [16].

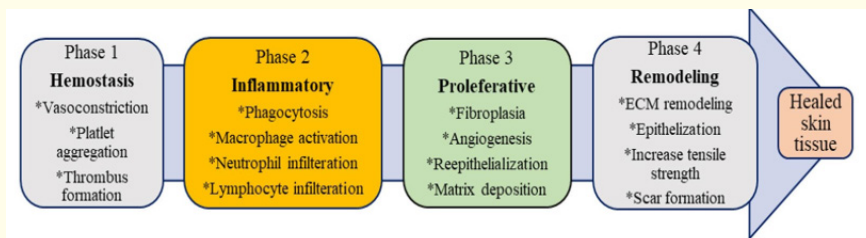


Figure 1




List of plants with wound healing activity.


| S.no | Plant name  | Part used                       | Pharmacological Model                    | Ref  |
|------|---|---------------------------------|--|------|
| 1.   | <i>Azadirachta indica (Meliaceae)</i>                           | pure neem oil and neem ointment | Incised and gap wounds in bovine calves  | [17] |
| 2.   | <i>Ocimum sanctum Linn. (Labiaceae)</i>                         | ethanolic extract of leaves     | Excision, incision and dead space        | [18] |
| 3.   | <i>Acalypha indica Linn. (Euphorbiaceae)</i>                    | whole plant ethanolic extract   | Excision and incision                    | [19] |
| 4.   | <i>Wedelia calendulacea (L.) Less. (Asteraceae)</i>             | Aqueous extract                 | Incision and excision                    | [20] |
| 5.   | <i>Vanda roxburghii R. Br. (Orchidaceae)</i>                    | Crude aqueous extract of plant  | Excision, incision and dead space        | [21] |
| 6.   | <i>Trigonella foenum-graecum Linn. (Fabaceae)</i>               | Aqueous extract of seed         | Excision, incision and dead space        | [22] |
| 7.   | <i>Aegle marmelos Corr. (Rutaceae)</i>                          | Methanolic extract of plant     | Excision and incision                    | [22] |
| 8.   | <i>Quercus infectoria Oliver (Fagaceae)</i>                     | Crude aqueous extract of galls  | Excision, incision and dead space        | [23] |
| 9.   | <i>Hevea brasiliensis Müll. Arg. (Euphorbiaceae)</i>            | Ethanol extract of flower       | Excision, incision and dead space models | [24] |
| 10.  | <i>Hypericum patulatum Thumb (Hypericaceae)</i>                 | Methanolic extract of leaf      | Excision and incision                    | [25] |
| 11.  | <i>Hyptis suaveolens (L.) (Lamiaceae)</i>                       | Ethanolic extract of leaf       | Excision, incision and dead space        | [26] |
| 12.  | <i>Nelumbo Nucifera (Nymphaeaceae)</i>                          | Methanol extract of rhizomes    | Excision, incision and dead space        | [27] |
| 13.  | <i>Embelia ribes Burm (Myrsinaceae)</i>                         | Ethanol extract of the leaves   | Excision, incision and dead space        | [28] |
| 14.  | <i>Gmelina arborea Roxb. (Verbenaceae)</i>                      | Alcoholic extract of leaf       | Excision, incision and dead space        | [29] |
| 15.  | <i>Plagiochasma appendiculatum Lehm. et Lind. (Aytoniaceae)</i> | Alcohol and ethanolic extract   | Excision and incision                    | [30] |

|     |   |                               |   |      |
|-----|---|-------------------------------|---|------|
| 16. | <i>Cecropia peltata</i> L. (Cecropiaceae)               | Alcohol and ethanolic extract | Excision  | [31] |
| 17. | <i>Areca catechu</i> L. (Arecaceae)                     | betel nut extract             | Excision, incision and dead space   | [32] |
| 18. | <i>Butea monosperma</i> (Lam.) Kuntze (Papilionaceae)   | Alcoholic bark extract        | Excision  | [33] |
| 19. | <i>Calendula officinalis</i> L. (Asteraceae)            | Alcohol and ethanolic extract | By stimulating the proliferation and, to a higher extent, the migration of fibroblasts. | [34] |
| 20. | <i>Terminalia bellirica</i> Roxb. (Combretaceae)        | ethanol extract of fruits     | Excision and incision wounds  | [35] |
| 21. | <i>Pterocarpus santalinus</i> Linn. (Fabaceae)          | stem                          | By stimulating a growth factor or factors signal cascade system                         | [36] |
| 22. | <i>Acalypha indica</i> Linn. (Euphorbiaceae)            | whole plant ethanolic extract | Excision and incision   | [37] |
| 23. | <i>Aegle marmelos</i> Corr. (Rutaceae)                  | Methanolic extract of plant   | Excision and incision   | [38] |
| 24. | <i>Datura alba</i> (Bernh.) Rumph. ex Nees (Solanaceae) | alcoholic leaf extract        | Burn rat wound  | [39] |
| 25. | <i>Tragia involucrate</i> L. (Euphorbiaceae)            | methanol extract              | Excision  | [40] |

Table 1

Medicinal plants with wound healing effects.

| S. NO | Plant Name and Biological Sources     | Family Local identity    | Pharmacological Activity   | Images  |
|-------|---------------------------------------|--------------------------|--|---|
| 1.    | <i>Azadirachta indica</i><br>A. Juss. | Meliaceae,<br>(Neem)     | Wound healing, Antibacterial, antiviral, and anti-inflammatory.              | <br>Figure 2  |
| 2.    | <i>Curcuma domestica</i><br>Valeton   | Zingiberaceae<br>(Haldi) | It has potent anti-inflammatory and antibacterial properties & Wound healing | <br>Figure 3 |
| 3.    | <i>Olea europaea</i>                  | Oleaceae,<br>(Jaitoon)   | Anti-inflammatory property. Wound healing. antiseptic,                       | <br>Figure 4 |

|    |                             |  |  |   |
|----|-----------------------------|--|--|---|
| 4. | <i>Ocimum sanctum</i>       | <i>Lamiaceae.</i><br>(Tulsi)                 | Wound healing, Antimicrobial, antifungal, antiprotozoal, antimalarial,   |  <p style="text-align: center;">Figure 5</p>   |
| 5. | <i>Bryophyllum pinnatum</i> | <i>Crassulaceae,</i> (Panfuti, miracle leaf) | Wound healing, Antimicrobial, anti-ulcer, antihypertensive, antileishmanial, anti-cancer, antidiabetic,                      |  <p style="text-align: center;">Figure 6</p>   |
| 6. | <i>Punica granatum</i>      | <i>Lythraceae.</i><br>(Annar)                | Wound healing, Antimicrobial, anti-ulcer, antihypertensive, Antileishmanial, anti-cancer, antidiabetic,                      |  <p style="text-align: center;">Figure 7</p> |
| 7. | <i>Elephantopus scaber</i>  | <i>(Asteraceae)</i><br>(Adhomukha)           | Wound healing ability. Anticancer, antimicrobial, hepatoprotective, antioxidant, antidiabetic, anti-inflammatory, analgesic, |  <p style="text-align: center;">Figure 8</p> |




|     |                               |                               |  |   |
|-----|-------------------------------|-------------------------------|--|---|
| 8.  | <i>Alternanthera sessilis</i> | <i>Amaranthaceae</i>          | Antioxidant, anti-inflammatory, analgesic, and wound healing effects   |  <p data-bbox="1198 709 1286 737">Figure 9</p>       |
| 9.  | <i>Arnebia densiflora</i>     | <i>Boraginaceae (Arnebia)</i> | Wound healing, Antileishmanial, anti-cancer, anti-diabetic             |  <p data-bbox="1198 1201 1286 1228">Figure 10</p>   |
| 10. | <i>Carallia brachiata</i>     | <i>Rhizophoraceae Merrill</i> | Anti-inflammatory, Wound healing, Antidiabetic activity, Anti-Oxidant, |  <p data-bbox="1190 1663 1295 1690">Figure -11</p> |

Table 2

## Conclusion

This review article suggests that herbal plants have more efficacy in healing wounds. This review studies the investigation, description, and experimental study of native medicines and their biological activity with a focus on herbal plants with the capacity to heal wounds. Table provides an overview of the herbal plants. Botanical name, Family, Local name, and Parts and pharmacological model used. Specifically, *Curcuma longa*, *Ocimum sanctum*, *Centella asiatica*, *Tribulus terrestris*, *Azadirachta indica* are well liked herbal products in a number of international markets and are traditionally used for treatment of wounds.

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