

**REVIEW: SOME TYPICAL MEDICINAL PLANTS AND THEIR ACTIVE  
CONSTITUENT'S ABILITY FOR WOUND HEALING**

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**ABSTRACT:**

*A wound is a physical and functional reaction that occurs in the skin after an injury. The intricate process of restoring or repairing tissue after an injury is known as wound healing. A wound occurs when tissues that are alive, including skin, mucous membranes, and organs. An injury triggers a coordinated series of events that normally results in wound healing. The alleviate cascade occurs This causes platelets to accumulate and release the clotting process, eventually forming a fibrin clot at the site of injury. The fibrin clot acts as a cross-linking matrix, creating a framework for action during healing. A significant chunk of the world-wide medicinal market is made up of plant materials and herbs are important in many treatments. Throughout history, people have used plants and plant components to treat and control various ailments. Many kinds of biopolymers are currently being studied in order to create a stable, affordable, long lasting and efficient delivery system for wound care.*

**Key words:** *Disruption, herbal remedies, remodelling, coagulation*

**INTRODUCTION**

In general, injury is categorized based on the main reasons for its development:

**Serve injury:**

Serve injury can cause tissue damage or injury, most progress towards a timely and decisive stage that leads to steady improvement of anatomical and functional quality. A cut or surgery is often the source of the pain.

**Chronic injury:**

A wound is considered to be chronic if the treatment is atypical, timely and compatible or if after three months the healing process is unable to restore the wounds anatomical and functional integrity.

**Closed wound:**

In a closed wound, blood leaves the body but remains in the body. Cracking is the first sign of this.

**Incised wound:**

There is some tissue damage in the wound, but there is no tissue loss. Sharp objects such as knives and scalpels are the cause of this condition.

**Tear or laceration wound:**

Non-surgical trauma combined with other injuries can cause tissue loss and damage. Superficial wound: Wear occurs due to slipping on rough surfaces. During this time, the epidermis (top layer of skin) is shed, exposing nerves and causing serious damage.

**Mechanism of Wound Healing****Phases of Wound Healing:**

Four overlapping but separate biological processes - Proliferation, remoulding, homeostasis and inflammation achieve overall wound healing. When combined, these stages form the wound healing cascade, and any imbalance in one of these stages could prevent the body from healing wounds.

**1.Homeostasis:**

The first phase of wound healing, called homeostasis, can last up to two days. When a wound occurs, the blood vessels in the wound become compressed, reducing blood flow. We refer to vasoconstriction. Concurrently at the site of wound, clotting factors are released to coagulate with fibrin producing a thrombus or blood clot as it is more widely known. Blood clots act as seals on damaged blood vessels to prevent blood loss.

**2.Inflammatory phase:**

The second phase of wound healing is called the inflammatory phase. Phagocytes release reactive oxygen species, which can remain in the body for up to 7 days in acute injuries and more in wounds that persist. To eradicate microorganisms with the intention of preventing infection. White blood cells and certain enzymes penetrate the wound region at this time, clearing detritus and preparing the wound for the growth of new tissue. This stage is characterized by the following symptoms; pain, edema, and redness or swelling of the injury.

**3.Proliferative phase:**

This stage, which is the third of wound healing, entails packing and sealing the incision. As inflammatory cells die, the wound healing process moves into the proliferative phase. The formation of granulation tissue, angiogenesis, wound contraction, and the epithelialization process are the features that define this phase. Inflammatory factors typically result in the reddish-purple appearance of the new tissue. The cells called fibroblasts are responsible for the production of collagen in tissues and for regulating the rate of tissue regeneration. The wound will take four days to three weeks or more to heal at this point.

**4.Remodeling:**

The development of scar tissue is a hallmark of the last remodeling stage, also known as maturation. Treatment times might range from several months to years, depending on the location and cause of the wound as well as the selected course of action.

Traditionally, herbs have been used to treat wounds. For 5,000 years, medicinal plants have been used as first-line treatment for burns, pain, inflammation and surgery. They are rich in naturally occurring bioactive compounds that promote rapid healing and promote tissue regeneration. Listed below are some examples of herbs and how they can be used to treat wounds

**Table no.1 Medicinal plants with wound healing effects.**

Sr.	Scientific	Family	Local identity	Active Parts
1	<i>Aloe barbadensis</i> Miller	Liliaceae	Aloe vera	Aloe vera gel and leaves
2	<i>Centella asiatica</i> or	Apiaceae	Gotu kola	Whole plant
3	<i>Curcuma longa</i>	Zingiberaceae	Turmeric	Rhizome, powder
4	<i>Tribulus Terrestris</i>	Zygophyllaceae	Gokhru	Fruits, Leaves
5	<i>Arcitum lappa</i>	Asteraceae	Jungali kuth	Fruits and roots
6	<i>Azadirachta indica</i>	Meliaceae	Neem	Aqueous leaves extract
7	<i>Ocimum sanctum</i>	Lamiaceae	Tulsi	Leaves
8	<i>Glycyrrhiza glabra</i>	Fabaceae	Licorice	Root
9	German chamomile	Asteraceae	Chamomile	Flower
10	<i>Calendula Officinalis</i>	Asteraceae	Pot marigold	Flower oil
11	<i>Sphagneticola trilobata</i>	Asteraceae	Bay	Leaves
12	<i>Panax ginseng</i>	Araliaceae	Indian winter cherry	Roots and rhizome
13	<i>Hibiscus rosa-sinensis</i>	Malvaceae	China rose	Flower
14	<i>Celosia argentea</i>	Amaranthaceae	Silver cocks comb	Leaf extract
15	<i>Camelia sinensis</i>	Theaceae	Tea	Leaf extract
16	<i>Piper betle</i>	Piperaceae	Pan	Leaves
17	<i>Moringa oleifera</i>	Moringaceae	Drum stick	Bark, leaf extract
18	<i>Bryophyllum pinnatum</i>	Crassulaceae	Panfuti, miracle leaf	Leaf
19	<i>Tridax procumbens</i>	Asteraceae	Coat buttons	Leaves
20	<i>Blumea balsamifera</i>	Asteraceae	Sambong,	Leaves
21	<i>Punica granatum</i>	Lythraceae	Pomegranate	Leaves and peel extract.
22	<i>Withania somnifera</i>	Solanaceae	Ashwagandha	Leaves and roots.
23	<i>Boswellia sacra</i>	Burseraceae	Olibanum tree	Resin oil
24	<i>Eucalyptus</i>	Myrtaceae	Nilgiri	Leaves
25	<i>Embilica officinalis</i>	Phyllanthaceae	Indian gooseberry Amla	Berries of the tree

### 1. Aloe vera:

Since 1500 BC, aloe vera was used as medicine in numerous nations, including Greece, China, and Mexico. For centuries, it has correspondingly utilized as a conventional medicine to address a variety of disease and membrane disorders.

Aloe vera is a cactus-like plant that belongs to the Liliaceae family. Aloe vera gel can increase the collagen content in wounds and accelerate wound healing by changing the composition of collagen. Since water makes up 99% of the gel, scientific studies have demonstrated that it can both reduce skin fragility and increase skin flexibility. Many studies have shown aloe vera to be effective in healing wounds, including psoriasis, burns, cancer, ulcers, diabetes, and herpes. Anti-tumour, anti-inflammatory, anti-diabetic, antibacterial, antiviral, antiseptic and wound healing qualities of aloe vera are well known.



**Fig.1: Aloe vera**

### 2. Hydrolyte asiatica:

Hydrolyte asiatica also known as Indian pennywort. Because of its nutritional and medicinal qualities, it has a significant traditional value. Treatment recommendations for a range of skin conditions include leprosy, psoriasis eczema, and varicose ulcers. It is actually widely utilized for its wound-healing, antibacterial, and anti-inflammatory benefits. It has been shown that Indian pennywort extracts enhance the production of collagen and microcirculatory activity both of which are beneficial for the repair of wounds .<sup>1,6,9</sup>



**Fig. 2: Hydrolyte asiatica**

### 3. Turmeric:



Curcumin, the active ingredient found in the turmeric root of the ginger family has long been used as a sugar substitute and medicine. Ayurvedic medicine uses curcumin to treat skin diseases, diabetes, liver problems and respiratory diseases. During skin wound healing, curcumin supports granulation tissue growth, fibroblast proliferation and collagen deposition<sup>2</sup>. Curcumin improves the frequency at which wounds contract, hastening the healing process. It is said to greatly improve the wound area by up to 20%.<sup>22</sup>



**Fig. 3: Turmeric**

#### **4.Gokhru:**

Tribulus Terrestris's fruit has a high phenolic and tannin content. TT has been used as a demulcent, to treat nephrotic syndrome and to treat inflammatory disorders. Current research revealed that the primary Contributors to Clinical Practice of TT were the chemical constituents' flavonoids and steroids saponins which were known for their strong anti-aging and anti-swelling properties.<sup>10</sup> In several animal models, the methanolic extract of TT demonstrated a considerable capacity for wound healing.<sup>38</sup>



**Fig.4: Gokhru**

## 5. Burdock:

It has been demonstrated that root extract enhances superficial extracellular matrix metabolism, inhibits the turnover of glycosaminoglycan, and lessens the appearance of wrinkles *in vivo* in human skin. Furthermore, it has been documented to influence the  $\beta$ -catenin signalling pathway, which in turn modifies the expression of genes and adhesion to cells in canine dermal fibroblast, an important regulator of wound healing<sup>2</sup>. Burdock's acitretin ingredients are believed to have anti-inflammatory properties against diabetes and cerebral ischemia.

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**Fig.5: Burdock**

## 6.Neem:

For quick healing of wounds and scars, neem stem bark paste has long been used. Numerous chemical components of the neem tree, including its steroids, flavonoids, alkaloids, and their glycosides, proven anti-inflammatory, antifungal, antibacterial and antiviral properties<sup>12</sup>. Numerous active constituents found in neem including nimbin, nimbidin, nimbidol, have anti-inflammatory, antibacterial qualities that may aid in hastening the healing wounds. Neem also contains many vitamins, minerals and amino acids that are important for the growth of the wound healing process<sup>41</sup>



**Fig.6: Neem**



### 7. Tulsi:

Studies show that tulsi possesses a special set of properties that make it effective against a variety of diseases and conditions. These include anti-microbial, anti-viral, anti-inflammatory, antifungal anti-coagulant, anti-asthmatic, antioxidant, anti-ulcer anti-thyroid, properties. These pharmacological effects aid in the restoration of physiological function as well as the body's ability to deal with the variety of stresses.<sup>13</sup>



Fig. 7: Tulsi

### 8. Glycyrrhiza glabra:

Studies have demonstrated the anti-inflammatory, antioxidant, antibacterial, antiviral, and expectorant qualities of liquorices well as its efficacy in liver protection and detoxification. Owing to plants' many properties, particularly its analgesic, anti-inflammatory and lightning properties, it appeared that liquorice may help heal burns. Interleukin 1, interleukin6 and tumour necrosis factor alpha can all be down regulated in expression by liquorice extracts. For centuries, antifungal, anti-microbial, efficacious, antiviral and improved wound healing of gastric and oral wounds properties of liquorice roots and rhizomes have been effectively used clinically in traditional medicine.<sup>14</sup>



Fig.8: Liquorice

### 9. German chamomile:

It belongs to the Asteraceae family and contains flavonoids and phenolics, such as luteolin, quercetin, and apigenin. Apigenin, the rarest flavonoid present in chamomile plants, significantly influences the antibacterial characteristics of nanofibers, as demonstrated by in vitro experiments<sup>15</sup>. One of the most popular and widely used aromatic medicinal is German chamomile. It has broad curative benefits such as antibiotic, anti-inflammatory, antispasmodic, analgesic together with antioxidant qualities. Additionally, studies have looked into the antitumor, cholesterol-lowering, and wound healing properties of chamomile.<sup>32</sup>



**Fig. 9: Chamomile**

### 10. Pot marigold:

Numerous natural and biological remedies have been shown to expedite the wounds' healing. It is applied to skin conditions in conventional medicine to treat, ulcers, wounds, scars, herpes. It is primarily utilized to address a range of illness due to its numerous biological activities, which include analgesic, anti-inflammatory, anti-diabetic effects<sup>16</sup>. They can be used medicinally to treat injuries, eczema of the skin, bruises and first-degree burns, particularly as an anti-inflammatory agent.<sup>40</sup>



**Fig. 10: Pot marigold**



### 11. *Sphagneticola trilobata*:

One of the most affected plants is *Sphagnum trifolia*, also known as *Sphagnum trifolia*. Rheumatism, chronic wounds and arthritis can be treated with alcohol obtained from *Trifolia* leaves. *Sphagnum trifolia* leaves contain luteolina flavonoid that has been demonstrated to have antioxidant, neuroprotective, immunomodulatory properties. *Wedelia trilobata* leaves are used by traditional healers for treating skin wounds<sup>2</sup>. Due to combination of factors of Ent-kaura-9,16-dien-19-oic acid was isolated from leaves due to the combination of plant showed wound healing action antibiotic, fibroblast stimulation, cell proliferation and Defense of the cells against damage brought on by hydrogen peroxide, all of these things might contribute to its outcome. On the healing of tissues.<sup>28</sup>



**Fig. 11: *Sphagneticola trilobata***

### 12. *Panax ginseng*:

It has been demonstrated that ginseng root extract protects skin from UVB rays and promotes skin healing following laser burns and excisional injuries. Research has demonstrated that ginseng extract enhances the migration of keratinocytes, stimulates their growth, and augments the synthesis of collagen in human dermal fibroblasts. But research has also demonstrated that ginsenoside Rb2, which is isolated from ginseng, can stimulate the expression of fibronectin and receptors, which in turn stimulates the development of the epidermis in raft culture. All these factors are essential or crucial for healing of wounds.<sup>2</sup> A ginseng derived saponin called ginsenoside has been demonstrated to quicken the process of neovascularization in mice burn wounds, as well as raise level of vascular growth factor and interleukin, an inflammatory cytokine that is known to cause macrophages to gather at skin wound sites and quicken the healing process.<sup>37</sup>



**Fig. 12: *Panax ginseng***

**13.Hibiscus:**

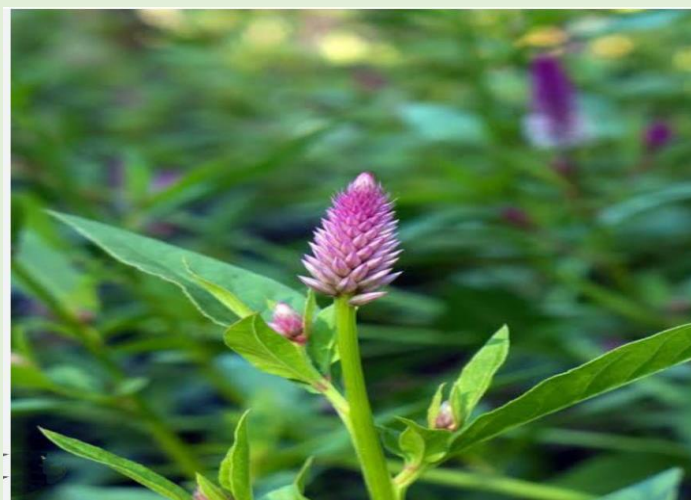
Hibiscus flowers are edible. According to traditional literature, preparing leaves and flower can stimulate hair growth and prevent off greying. Additionally, it has been discovered that hibiscus rosa-sinensis extracts possess antibacterial and wound healing qualities. They regulate VEGF and Transforming growth factor-beta1 expression, promote fibroblast proliferation and collagen deposition, and reduce inflammation<sup>2</sup>.The high flavonoid concentration of hibiscus rosa sinensis flower extract may be responsible for its wound healing ability. It has been discovered that flavonoids and terpenoids, primarily because of their antibacterial properties aid in the process of wound healing<sup>29</sup>.



**Fig. 13:Hibiscus rosa-sinensis**

**14.Celosia argentea:**

In traditional medicine, celosia argentea, commonly referred to as silver cocks comb, is used to cure skin. This leaf extracts diseases such as ulceration, infections, and breakouts have antimicrobial, antioxidant, antidiabetic properties. An alcohol extract from the plant speeds up the burns healing<sup>2</sup>.It induces hepatic asthenia, hyperpyrexia of the liver, heat in the blood, and is applied healing of various diseases in the body such as fever, mouth ulcers, wounds, jaundice, haemorrhoids and gonorrhoea. It also possesses variety of pharmacological activities, including cytoprotective, inflammation, antibacterial, antifungal, anti-infection, and antioxidant agent.<sup>33</sup>



**Fig.14:Celosia argentea**

**15. Camellia sinensis:**

The phytoconstituents in camellia sinensis, which include a high flavonoid and phenolic content as well as strong free radical scavenging activity, may be responsible for the plants ability to heal wounds. The class of chemicals known as polyphenols is mainly responsible for tea's advantageous health characteristics. The flavonoids exhibit antimicrobial, anti-inflammatory, antioxidant properties. Each of these components is essential for wound healing and maintaining human health. Applying camellia sinensis extract can reduce inflammation and speed up the healing process.<sup>7</sup>



**Fig. 15: Tea**

**16. Piper betel:**

The primary chemical constituents of betel leaves include chavicol, betel-phenol, and other phenolic compounds. These elements may have significant potential for the Beatles antifungal and antibacterial properties. Additionally betel leaf has been reported to have potential in treating various diseases and wound healing<sup>21</sup>. Extracts from piper beetle have been shown to contain bio-compounds with antibacterial, anti-inflammatory, antioxidant, and anticancer properties that can be used to treat burns, sores, mastitis and conjunctivitis.<sup>34</sup>



**Fig. 16: Piper betel.**

**17. Moringa oleifera:**

Wound healing is a consequence of a moringa plant that possesses a lot of attention. Ordinary wounds healed faster when aqueous extract of moringa oleifera bark was applied locally. In an in vitro study, it was also reported that moringa oleifera extract promoted the migration, proliferation, and viability of human dermal fibroblast



thereby enhancing wound healing<sup>17</sup>. Because of its many uses, including as a coagulant for water purification, gum, nutritional supplement, it is referred to as the drumstick tree. A huge amount of scientific research on products made from the leaves of moringa oleifera suggests that this plant controls inflammation and promotes wound healing.<sup>35</sup>



**Fig. 17: Moringa oleifera**

#### **18. Bryophyllum pinnatum:**

Their leaves were used to treat skin wounds according to traditional medicine. Numerous investigations have documented the existence of its leaves containing phenolic compounds. Among the flavonoid glycosides derived from quercetin, patulin, and eupafolin, the most common compounds are found in the leaves. It may also be employed to treat eye conditions, burns, ulcers, pain, itching, and insect bites. In addition, stomach pain and kidney stones are treated with it.<sup>36</sup>



**Fig.18: Bryophyllum pinnatum**

#### **19. Tridax procumbens:**

It has historically been used to treat malaria, dysentery, diarrhoea, hypertension and, to monitor haemorrhage from abrasions, cuts and wounds. It is also used to stop hair loss. It has anti-diabetic, antimicrobial, antioxidant, and antibacterial qualities. Tribal people have traditionally used the leaves to heal wounds. Mature leaves are crushed to create paste, which is then applied topically to the wound surface.<sup>26</sup> In India, people have traditionally utilized the fresh juice of this plant as a typical cure for cutaneous wounds. Juice from tridax procumbens leaves

administered intraperitoneally has been shown to have both pro and anti-healing effects in an excision wound model.<sup>39</sup>



**Fig. 19: Tridax procumbens**

#### **20. Blumea balsamifera [Aina frankincense]:**

Aina frankincense, or kakoranda, is used in Ayurveda medicine to treat fever, coughing, rheumatism, and pain. Heals dermatitis and eczema and bruises, bruise, beriberi, and skin injuries, leaf extracts are directly applied. Blumea balsamifera extracts exhibit a range of bioactivities, such as antifungal, antitumor, antimalarial, characteristics. The entire plant or its leaves were used as insect killer and to treat a variety of conditions including eczema, rheumatism, skin injuries. Leaf extracts may have antibacterial, plasmin inhibitory, free radical-scavenging and anticancer properties.<sup>31</sup>



**Fig. 20: Blumea balsamifera**

#### **21. Pomegranate:**

Pomegranate's anti-inflammatory properties facilitate faster wound healing. The proliferation phase is another crucial stage in the healing of wounds. In this phase fibroblastic cells are essential. Collagen fibers, the primary extracellular matrix proteins, produced by these cells. Fibroblast production is increased by pomegranate extract. Furthermore, enhanced neovascularization during the first week following wound damage is necessary to provide oxygen and vital nutrients to the area of the wound and to encourage the development of tissue granulation.<sup>15,19</sup>



**Fig.21: Pomegranate**

### **22.Ashwagandha:**

Numerous studies have revealed that substances originating from plants have properties that promote wound healing and anti-inflammatory effects. One of the most widely used natural remedies in traditional Indian ayurvedic medicine is ashwagandha roots and foliage, which are believed to increase immunity, physical endurance, vitality, and resistance to different stresses. Because ashwagandha roots are well-known for their ability to treat scabies, ulcers, and leukoderma, they have also been applied topically to treat skin infections and reduce swelling<sup>20</sup>.



**Fig. 22: Ashwagandha**

### **23.Boswellia sacra:**

With its antibacterial, anti-inflammatory, antioxidant and analgesic qualities, Boswellia oleo-gum-resin is a popular treatment for rheumatism, disease of the central nervous system, and skin conditions. An ointment containing frankincense is applied to the excision wound influences wound contraction and collagen synthesis at different stages of the healing process. This substance also increases the wounds tensile strength, which expedites the healing process.<sup>23</sup>





**Fig. 23: Boswellia sacra**

#### **24.Eucalyptus:**

Within the Myrtaceae family, eucalyptus is useful genus for medicinal purposes that has over 800 species that are planted across the globe. *Eucalyptus alba* has a number of pharmacological characteristics, including as antibacterial, cytotoxic, antioxidant and pesticidal activities. Eucalyptus extracts have also been used to treat respiratory conditions, such as the common cold, nasal congestion, and influenza, sore throats, urogenital tract infections. inflammation, wounds, and fungal infections. The pharmacological properties of many research investigations have been conducted on eucalyptus species, which are filled with polyphenols like routine, quercetin, chlorogenic acid, and catechins.<sup>2</sup>



**Fig.24: Eucalyptus**

#### **25.Emblica officinalis:**

One of the most famous medicines of conventional medicine system, *E. officinalis*, is said to have numerous health benefits for people<sup>25</sup>. Antioxidant, antidiabetic, antihyperlipidemic, antitumor, antimutagenic, hepatoprotective, cardioprotective, Reno protective, among the qualities exhibited by *E. officinalis* are anti-inflammatory, antimicrobial, wound-healing, and derma-protective qualities<sup>42</sup>



**Fig.25: Emblica officinalis**

## CONCLUSION

Ancient wound healing continues to be a difficult clinical problem for efficient wound care. Various cellular factors, extracellular matrix and soluble mediators such as Cytokines and growth factors are involved in the healing process. Significant research has been conducted in medicine, focusing on the development of new treatments and Ayurvedic (herbal) treatments for acute and chronic wounds. Researchers are looking into new formulas, dressings and the composition of medicinal plants to create an accurate, long-lasting, cost-effective, and efficient system for providing injury care and treatment. Innovations in nanotechnology and the availability of novel substances have led to improvements in wound care that are more patient centered and effective. Table provides an overview of the herbal plants Botanical name, Family, Local name, and Parts 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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