

A Review: Wound Healing

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ABSTRACT

More number of different biologically active and therapeutic potential phytochemicals is drowning from plant kingdom. The utilization of those natural substances for human ailments as well as animals begins from time immortal. The therapeutic efficacies of many indigenous plants for various diseases have been described by traditional herbal medicine practitioners. Natural products are a source of synthetic and traditional herbal medicine. Wound healing is the process of repair that follows injury to the skin and other soft tissues. Wounds are inescapable events in life. Wounds may arise due to physical, chemical or microbial agents. Healing is survival mechanism and represents an attempt to maintain normal anatomical structure and function. These natural agents induce healing and regeneration of the lost tissue by multiple mechanisms. The purpose of writing this review was to compile the wide range of plants used for wound healing with special focus on wound type and its phases.

Keywords: Wound healing, herbs, Phyto-medicinal plant.

1. INTRODUCTION

India has a rich flora that is widely distributed throughout the country. Medicinal plants have been the basis of treatment and cure for many diseases and physiological conditions in traditional methods practiced such as Ayurveda, Unani and Siddha. Herbal medicines have rich tradition of plant-based knowledge in healthcare. Plant based therapy not only accelerate healing process but also maintains the aesthetics. More than 70% of wound healing pharma products are plant based, 20% are mineral based and remaining containing animal products as their base material. The plant base materials are used first aid – antiseptic coagulants and wound wash. In recent times, focus on plant researchers has increased all over the world and large body of evidence has collected to show immense potential of medicinal plants used in various traditional systems. More than 13,000 plants have been studied during the last five years period. [1]

These reviews are used for finding wound healing activity of some medicinal plants are highlighted here. Nearly 2000 of natural drugs have reported for various pharmacological activities, out of these 1600 are from plant origin. Medicinal plants have a vital role in the management of various diseases and which are found in the forest areas throughout South Asia, in

the high Himalayan region of tropical and sub-tropical belts and arid regions of Thar Desert. India recognizes more than 2500 plant species have medicinal value, Srilanka about 1400 and Nepal about 700. Current estimation indicate about 6 million people are suffering from chronic wounds worldwide. The prevalence of chronic wounds in the community was reported as 4.5 per 1000 population, whereas an acute wound was about 10.5 per 1000 populations. Plant products are potential agents for wound healing, and largely preferred because of their widespread availability and effectiveness as crude preparations. A large number of plant extracts and their pastes are equally used by tribes and folklore traditions in India for treatment of cuts, wounds, and burns. Many herbal plants have a very important role in wound healing process because they promote their repair mechanism in the natural way. The healing process is measured by the assessment of wound contraction. The herbal medicines for wound healing are very cheap and affordable and are safe as hypersensitive reactions. A lot of people are developing diabetes at a very younger age due to stressful life. It was reported that a lot of children having this chronic and fatal disorder. Long occurrence of these fatal disorders increases the chance of non healing wounds. Hence, this encouraged to develop a list

of plants having the power to heal these conditions. [2]

Wounds generally termed as physical injuries that result in an opening or breaking of the skin. There are different types of wounds which range from mild to potentially fatal. Wound healing is impaired in diabetic. Wounds are physical injuries that results in an opening and break of the skin that cause disturbance in the normal skin anatomy and function. They result in the loss of continuity of epithelium with or without the loss of underlying connective tissue. Wound may be produced by physical, chemical, thermal, microbial or immunological insult to the tissues. [2]

A wound which is disturbed state of tissue caused by physical, chemical, microbial (or) immunological insults (or) typically associated with loss function. According to the wound healing society wounds are physical injuries that results in an opening (or) break of the skin that cause disturbance in the normal skin anatomy and function. Current estimates indicate the worldwide nearly 6 million people suffer from chronic wounds. Unhealed wounds constantly produce inflammatory mediators that produce pain and swelling at the wound site. Wounds are a substrate for infection and prolong the recovery of injured patients. Chronic wounds may even lead to multiple organ failure of death of the patients. [3-5]

1.1. Factor Affecting Wound Healing [6,7]

- Improper diet.
- Infection at the wound site.
- Insufficient oxygen supply and tissue perfusion to the wound area.
- Drugs.
- Elderly age.
- Diabetes and other diseases conditions.

Wound healing is a biological process in human body. Many factors can affect this process and lead to improper and impaired wound healing. A thorough understanding of these factors and their influence on wound healing is important for better therapeutic activity for wound treatment.

1.1.1. Improper Diet

Wound healing is an anabolic process which requires both energy and nutritive substrates. It is reported that serum albumin level of 3.5gm/dl or more is essential for proper wound healing. Protein is necessary for collagen synthesis on wound site. A state malnutrition may produce an inadequate amount of protein and this can reduce

the rate of collagen synthesis wound tensile strength or increased chance of infection.

1.1.2. Infection at the wound site

Wound infection is likely the most common reason of impaired wound healing. Streptococcus aureus, Escherichia coli, streptococcus pyogenes, and pseudomonas aeruginosa.

1.1.3. Insufficient oxygen supply and

Tissue Perfusion to the Wound Area, Adequate blood supply and tissue perfusion is very important for wound healing. Excessive pain, anxiety and cold can cause local vasoconstriction and increased healing time. Smoking and intake of tobacco reduces tissue perfusion and oxygen tension in wound.

1.1.4. Drugs

Many drugs are known to impair wound healing. Chemotherapeutic drugs are utilized in cancer are the largest group well known to slow wound repair. Systemic glucocorticoids interferes normal healing process by decreasing collagen synthesis and fibroblast proliferation.

1.1.5. Elderly age

Elderly age is found to associate with slow wound healing. It is reported that the fibroblast growth, activity diminishes and collagen production, wound contraction is slow in the older individuals.

1.1.6. Diabetes and other diseases conditions

Diabetic patients are more susceptible to wound healing. In the study wound infection rate was found 11% higher in diabetic patients than in general patient's population. Acute and chronic liver diseases are also associated with delay wound healing. Patients with altered immune function have an increased susceptibility to wound infection.

1.2. Common plants having wound healing property

1.2.1. Allium cepa Linn

The plant Allium cepa Linn. Belonging to family Liliaceae. Contains kaempferol, ferulic acid, sitosterol, myricic acid, prostaglandins. The constituents are used as abortifaciant, bulb extract shown to have ecobolic effect in rats. Allium cepa Linn. Is reported to have the anti-diabetic, antioxidant, anti-hypertensive, antithrombotic, hypoglycemic, antihyperlipidemic.

1.2.2. Aloe Vera Leaf

Is one of the oldest healing plants known to human. Used topically for cuts, burns, , bruises, acne and blemishes, insects stings, poisoning, welts, skin lesions, eczema, sunburns, also

traditionally used for stomach and intestinal disorders and also it has to enhance immune systems. Aloe Vera leaf contains Vitamin C, Vitamin E and amino acids which are essential for wound healing.

1.2.3. *Musa sapientum* (Plantain banana)

Musa sapientum var. *paradisial* belong to family Musaceae. It consists of flavonoids (leucocyanidin) sterylacyl glycosides and sitoindosides I-IV. Sitoindoside IV was reported to mobilize and activate peritoneal macrophages with increase in DNA and [3H] thymidine uptake. Flavonoids are known to reduce lipid peroxidation flavonoids are also known to promote the wound healing process mainly due to their astringent and

antimicrobial property, which results to be responsible for wound contraction and increased rate of epithelialisation.

1.2.4. *Tectona grandis* Linn

Tectona grandis Linn. Is commonly known as Indian teak, and belongs to family Verbinaceae. It contains mainly carbohydrates, tannins and anthraquinone glycosides. *Tectona grandis* is used as anti-inflammatory agents and also used topically for the treatment of burns. It is mainly used for the injuries like burn, inflicted wound and skin ulcers. The extract applied topically or given orally promoted the breaking strength, wound contraction and collagenation.

Table - 1: Plant having wound healing activity

Botanical name	Family	Plant part used	Reference no
<i>Acacia catechu</i> Willd.	Mimisaceae	Crushed bark	8
<i>Anacardium occidentale</i> L.	Anacardiaceae	Fruit taken orally	9
<i>Barleria prionitis</i> l.	Acanthaceae	Crushed leaves	8
<i>Brassica juncea</i>	Brassicaceae	Paste of crushed fruit	8
<i>Cassia alata</i>	Caesalpiniae	Leaves and bark	8
<i>Cisrium sinense</i>	Asteraceae	Root	10
<i>Cleome viscosa</i>	Cleomaceae	Paste of leaf	9
<i>Curcuma longa</i>	Zingiberaceae	Paste of rhizome	8
<i>Daucus carota</i>	Apiaceae	Juice of root	9
<i>Dumasia villosa</i>	Fabaceae	Whole plant part	9
<i>Euphorbia hirta</i>	Euphorbiaceae	Fresh latex	9
<i>Flabellaria paniculata</i> Cav.	Malpighiaceae	Leaves	8
<i>Gentiana lutea</i> Linn	Gentianaceae	Rhizomes	11
<i>Ginkgo biloba</i> Linn	Ginkgoaceae	Leaves	12
<i>Hiptage benghalensis</i> Linn	Malpighiaceae	Root	13
<i>Holoptelea integrifolia</i>	Urticaceae	Leaves	14
<i>Ipomoea batatas</i> (L.) Lam	Convolvulaceae	Tuber and peel	15
<i>Jasminum grandiflorum</i> Linn	Oleaceae	Leaves	16
<i>Kalanchoe pinnata</i> Lam	Crassulaceae	Leaves	17
<i>Lawsonia inermis</i> Linn	Lythraceae	Leaves	18
<i>Laurus nobilis</i> Linn	Lythraceae	leaves	19
<i>Martynia Annu</i> Linn	Martyniaceae	Leaves	20
<i>Mimusops elengi</i> Linn	Sapotaceae	Stem bark	21
<i>Napoleona imperialis</i> P.Beauv	Lecythidaceae	Leaves	22
<i>Oncidium flexuosum</i> C.Loddiges	Orchidaceae	Leaves	23
<i>Piper hayneanum</i> C.DC	Piperaceae	Leaves, root	24
<i>Plagiochila beddomei</i> Steph	Plagiochilaceae	Thallus	25
<i>Portulaca oleracea</i> Linn	Portulacaceae	Arial part	26
<i>Prosopis juliflora</i> DC	Mimosaceae	Leaves	27

<i>Quercus infectoria</i> Olivier	<i>Fagaceae</i>	Galls	28
<i>Rafflesia hasseltii</i> Suringar	<i>Rafflesiaaceae</i>	Flower	29
<i>Sambucus ebulus</i> Linn	<i>Caprifoliaceae</i>	Leaves	30
<i>Tamarix aphylla</i> (L.) karst	<i>Tamaricaceae</i>	Leaves	31
<i>Tinospora cordifolia</i> Willd	<i>Menispermaceae</i>	Root	32
<i>Verbascum mucronatum</i> Lam	<i>Scrophulariaceae</i>	Leaves, flower	33
<i>Verbascum Thapsus</i> Linn	<i>Scrophuoriaceae</i>	Flower	34
<i>Ziziphus nummularia</i> Linn	<i>Rhamnaceae</i>	Leaves	35

1.2.5. Adhatoda vasica Linn

Adhatoda vasica Linn. (Acanthaceae) known as chue Mue, grows as weed in almost all parts of the India. Leaves and stems of the plant have been reported to contain an alkaloid mimosine, leaves also contain mucilage and root contains tannins. *Adhatoda vasica* is used for its antihyperglycemic, anti-diarrhoeal, anti-convulsant and cytotoxic properties. The plant also contains turgorins, leaves and roots are used in treatment of piles and fistula. Paste of leaves is applied to hydrocele. The methanolic, chloroform and Diethyl ether extract ointment (10%w/w) of *Adhatoda vasica* has significant wound healing activity. In both extract ointment, the methanolic extract ointment (10%w/w) showed significant effect when compare to standard drug and other two extract in excision wound model.

1.2.6. Catharanthus roseus Linn

Catharanthus roseus Linn is a member of the Apocyanaceae also known as Vinca Rosea, is native to the Caribbean Basin and has historically been used to treat a wide assortment of diseases. *Catharanthus roseus* has more than 400 known alkaloids, some of which are approved as anti-neoplastic agents to treat leukemia, Hodgkin's disease, malignant lymphomas, neuroblastoma, rhabdomyosarcoma, Wilms' tumor, and other cancers. Its vasodilating and memory-enhancing properties have been shown to alleviate vascular dementia and Alzheimer's disease. Extracts from the dried or wet flowers and leaves of plants are applied as a paste on wounds in some rural communities. An ethanol extract of *Catharanthus roseus* flower has properties that render it capable of promoting accelerated wound healing activity compared with placebo controls.

2. CONCLUSION

Many Ayurvedic herbal plants have a very important role in the process of wound healing. Plants are more potent healers because they promote the repair mechanisms in a natural way. The present review clearly revealed that nature provides huge number of plants that show significant wound healing activities.

These natural agencies are rich target for the development of alternatives to synthetic drugs. So far, very few studies have been carried out on medicinal plants which present the wound healing activity. The aim of the review is to list out the medicinal plants which is reported already. The demand of herbal drugs is increasing day by day in developed as well as developing countries because they are safer and well tolerated as compared to those allopathic drugs. These plants should be subjected to animal and human studies to determine their effectiveness.

3. REFERENCES

1. Lucindo J. Quintans-Júnior. A Systematic Review of the Wound-Healing Effects of Monoterpenes and Iridoid Derivatives. **Molecules**, 2014; 19: 846-862
2. Gulzar Alam, Manjul Pratap Singh and Anita Singh. Wound healing potential of some medicinal plants. **International Journal of Pharmaceutical Sciences Review & Research**, 2011; 9(1): 136-146.
3. Kumarasamyraja D, Jeganathan NS and Manavalan R. A Review on Medicinal Plants with Potential Wound Healing Activity. **International Journal of Pharma Sciences**, 2012; 2(4): 105-111
4. Logeeswari K and Shubashini K. Sripathi. Wound Healing Medicinal Plants: A Review. **International Journal of Chemical, Environmental and Pharmaceutical Research**, 2012; 3(3): 199-218
5. Purnima Kumari, Poonam Yadav and Priya Rani Verma. A review on wound healing properties of indian medicinal plants. **Indian Journal of Fundamental and Applied Life Sciences**, 2013; 3(1): 220-232.
6. Yogesh Sharma, Jeyabalan G, Ramandeep Singh and Alok Semwal. Current Aspects of Wound Healing Agents From Medicinal Plants: A Review. **Journal of Medicinal Plants Studies**, 2013; 1(3): 1-11
7. Pulak Majumder and Paridhavi M. An ethnophytochemical and pharmacological review on novel indian medicinal plants used in

- herbal formulations. **International Journal of Pharmacy and Pharmaceutical Sciences**, 2013; 5(4), 74-83.
8. Patil SB, Naikwade NS, Kondawar MS, Magdum CS and Awalel VB. Traditional uses of plants for wound healing in the Sangli district, Maharashtra. **International Journal of Pharm Tech Research**, 2009; 1(3): 876-878.
 9. Ayyanar M, Ignacimuthu S, Herbal medicines for wound healing among tribal people in Southern India: Ethnobotanical and Scientific evidences. **International Journal of Applied Research in Natural Products**, 2009; 2(3): 29-42.
 10. Bhardwaj S and Gakhar SK. Ethnomedicinal plants used by the tribals of Mizoram to cure cuts & wounds. **Indian Journal of Traditional Knowledge**, 2005; 4(1): 75-80.
 11. Olugbuyiro JA, Abo KA, Leigh OO. **Journal of Ethnopharmacology**, 2010; 127: 786.
 12. Bairy KL and Rao CM. **Journal of Natural Remedies** 2001; 1: 25.
 13. Gandhimathi R, Nagamani A, Nagendrababu P, Ramyakrishna V and Sumalatha N. **International Journal of Pharmacology Research**, 2012; 2: 56.
 14. Reddy BS, Kiran Kumar Reddy R, Naidu VGM, Madhusudhana K, Agwane SB, Ramakrishna S and Diwan PV. **Journal of Ethnopharmacology**, 2008; 115: 249.
 15. Panda V, Sonkamble M and Swati Patil. Functional Foods in Health and Disease, 2010; 10: 403.
 16. Mishra SB, Mukerjee A, Vijayakumar M, Pharmacologyonline, 2010; 3:35.
 17. Shivananda Nayak B, Marshall JR and Isitor G. **Indian Journal of Experimental Biology**, 2010; 48: 572.
 18. Sakarkar DM, Sakarkar UM, Shrikhande VN, Vyas JV, Mandavgade S, Jaiswal SB and Purohit RN. **Natural Product Radiance**, 2004; 3: 406.
 19. Nayak S, Nalabothu P, Sandiford S, Bhogadi V, Adogwa A. **BMC Complementary and Alternative Medicine** 2006; 6: 1.
 20. Lodhi S and Singhai AK. **Asian Pacific Journal of Tropical Biomedicine**, 2011: 421.
 21. Gupta N. and Jain UK. **African Journal of Traditional Complementary and Alternative Medicines**, 20011; 8: 98.
 22. Esimone CO, Ibezim EC and Chah KF. **Journal of Pharmaceutical and Allied Sciences**, 2005; 3: 294.
 23. Fernanda OGG, Santos GMT, Moraes CP, Mendonca JS, Testa M, Foglio MA, Carvalho JE, Passarini JR, Esquisatto MAM and Mendonca FAS. **Evidence-Based Complementary and Alternative Medicine**, 2011; 1.
 24. Bastos MLA, Houly RLS, Conserva LM, Andrade VS, Rocha EMM and Lemos RPL. **J. Chem. Pharm. Res.** 2011; 3: 213.
 25. Manoj GS and Murugan K. **Indian Journal of Experimental biology**, 2012; 50: 551.
 26. Rashed AN, Afifi FU and Disi AM. **Journal of Ethnopharmacology**, 2003; 88: 131.
 27. Mathias E, Rangnekar DV, McCorkle CM. Ethnoveterinary Medicine: Alternatives for Livestock Development. **Proceedings of an International Conference held in Pune, India**, 1998.
 28. Jalalpure SS, Patil MB and Alagawadi KR. **Journal of Natural Remedies** 2002; 2: 54.
 29. Abdulla MA, Hassandarvish P, Ali HM, Noor SM, Mahmoud FH, Bashah NSA, Rokik RH and Khalil WI. **Research Journal of Medical Sciences**, 2009; 3: 75.
 30. Suntar IP, Akkol EK, Yilmazer D, Baykal T, Kirmizibekmez H, Alper M and Yesilada E. **Journal of Ethnopharmacology**, 2010; 127: 468.
 31. Yusufoglu HS and Alqasoumi SI. **International Journal of Pharmacology**, 2011; 7: 829
 32. Nema A, Gupta N and Jain UK. **Der Pharmacia Sinica**, 2012; 3: 126.
 33. Akdemir Z, Kahraman C, Irem Tatlı I, Akkol EK, Suntar I and Keles H. **Journal of Ethnopharmacology**, 2011; 136: 436.
 34. Mehdinezhad B, Rezaei A, Mohajeri D and Safarmashaei S. **American-Eurasian Journal of Toxicological Sciences**, 2012; 4: 24.
 35. Zahra AA, Kadi FA, Mahmood AA, Al hadi AA, Suzy AA, Sabri SZ, Ketuly KA and Latif II. **Journal of Medicinal Plants Research**, 2011; 5: 2551.