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POTENTIAL OF HERBS TOWARDS WOUND HEALING: A COMPREHENSIVE REVIEW

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ABSTRACT

Following an injury, a wound is an anatomical and functional disturbance of the skin. Wound healing is a complicated process of tissue repair or remodelling that occurs in response to an injury. Plants and plant-derived elements have long been used to treat and manage many kinds of wounds. Different kinds of biopolymers are now being studied in order to establish a cost-efficient, long-lasting, stable, and effective delivery method for wound therapy. The purpose of this study is to compile a list of medicinal plants that have been shown to be beneficial in the treatment of wounds. Plant constituent-based wound dressings have also been thoroughly discussed, with patented formulations from various inventors included.

Keywords: Wound Healing, Herbs, Anti-Inflammation, Injury

INTRODUCTION

Wound healing is described as a complicated process in which injured tissue regenerates or is rebuilt [1]. The typical wound healing response is a coordinated series of processes that starts with an injury. When platelets come into touch with exposed collagen, a healing cascade begins, resulting in platelet accumulation and the release of coagulating factors, which leads to the development of a fibrin clot at the injury site. The fibrin clot acts as a temporary matrix, establishing the tone for the actions that follow healing [2]. If wound healing does not proceed in a progressive fashion, it might lead to chronic wound expansion. Various herbal compositions assist expedite wound healing and are beneficial in wound therapy, according to patents and papers.

The worldwide medicinal market is dominated by medicinal plant materials and herbal treatments developed from them. Throughout human history, herbal treatments and medications have played an important role in the treatment of ailments. Despite the abundance of literature on their curative powers, there are no standard processes for quality control of plant materials in terms of

identification (phytochemical, pharmacological, and therapeutic activity). Ulcers, wound healing, skin infections, inflammation, scabies, leprosy, and venereal disease are among disorders that herbal medicines have the ability to treat and cure. Disinfection, debridement, and creating a moist environment that encourages the establishment of an adequate natural healing climate are all examples of herbal medicines used in wound therapy or care. A large range of plants are used in folklore cultures to cure cuts, wounds, and burns [3].

The review article begins with a categorization of wounds, then moves on to numerous elements that impact the wound healing process, as well as the mechanism, which is detailed in detail. Various medicinal plants and their herbal components that are effective in wound management and treatment have been thoroughly discussed in text and tabular form. Finally, there is a list of plant-based dressings and patented methods.

Table 1: List of medicinal plants that exhibited the wound healing activity

PLANT NAME	FAMILY	EXTRACT	METHOD	RESULT	REF
Curcuma longa (turmeric)	Zingiberaceae	Ethanolic extract	Rhizomes for wound healing activity through topical route on excision wound model.	Ethanolic extract of curcuma longa rhizomes was found to have better and faster wound healing effect than standard drug povidone iodine ointment on excision wound model.	[4]
Zingiber officinale (ginger)	Zingiberaceae	Ethanolic extract	Fifteen Swiss Wistar albino rat, divided into three groups of five rats.	Microbial examination for bacterial count, histological examination for the presence of inflammatory cells and collagen and healing percentage measured by	[5]
Rosmarinus officinalis (rosemary)	Lamiaceae	Both aqueous extract and essential oil	Two full thickness round wounds were created in the dorsal area of each mouse.	Transparent ruler. Reduced inflammation and enhanced wound contraction, re-epithelialization, regeneration of granulation tissue, angiogenesis and collagen deposition were detected in the treated wounds.	[6]
Boswellia serrata (Indian olibanum)	Burseraceae	Standardised extracts of Boswellia serrata.	Diabetes was induced in Sprague Dawley rats by streptozotocin and wounds were created on the dorsal surface of the hind paw.	Inhibition of oxidative-inflammatory markers, increased collagen synthesis, angiogenesis, promoting growth factors, inhibition of apoptosis to accelerate wound healing in experimental delayed diabetic foot ulcer.	[7]
Rosa canina (dog rose)	Rosaceae	Aqueous and ethanol extract	Inhibitory activity against inflammatory models	To isolate and define the active constituent	[8]
Salvia officinalis (sage)	Lamiaceae	Hydro-ethanolic extract	About 105 healthy Wistar rats were inflicted with wound by excision and incision were randomly divided into five experimental groups.	Topical application of S. officinalis extract, especially higher dose, significantly ($p < 0.05$) increase the percentage of wound contraction, a period of re-epithelialization. S. officinalis 5% were significantly promoting wound healing effect.	[9]
Persea Americana (avocado)	Lauraceae	Persea Americana fruit extract.	The rats used in the excision wound model were divided into four groups of five each and received either topical or oral treatment.	In the excision wound model, complete healing was observed on average on day 14 in the rats who received oral or topical treatment.	[10]
Acacia catechu	Leguminosae	Hydroalcoholic extract	Acacia catechu (400 mg/kg/day) was	Extremely significant ($p < 0.0001$) increase in granuloma	[11]

(cutch tree)			evaluated for its wound healing activity in albino rats using excision and incision wound models.	breaking strength was observed.	
Allium sativum (garlic)	liliaceae	Ethanollic extract	The isolates of the bulbs of allium sativum was screened for wound healing activity on the swiss albino rats by excision wound model. Incision wound model respectively.	Wound healing activity of the extract, which is comparable with the reference control framycetin the isolates of alium sativum show significant activity on all wound models.	[12]
Azadirachta indica (neem)	meliaceae	Aqueous leave extracts	Twenty male wistar rats of average wt 150-200g were used for this study these were applied on the wound of experimental rats while normal saline was used on the control rats.	The extracts of azadirachta indica significantly increased ($p < 0.05$) the day of complete wound closure in experimental group compared to control group. wound healing activity through increase	[13]
Bacopa monnieri (brahmi)	Plantagina-ceae	Methanolic extract	Its isolated constituent bacoside-A were screened for wound healing activity by excision, incision and dead space wound on swiss albino rats.	The histological examination of the granuloma tissue of the bacoside –A treated group showd increase cross linking of collagen fibers and absence of monocytes.	[14]
Adhatoda vasica (vasaka)	acanthaceae	Methanol, Ethanol, ethyl Acetate, chloroform, hexane.	Excision wound model on swiss albino mice was used to assess the wound healing activity of the leaves.	Remarkable wound healing activity was observed with the ointment formulation of the methanol extract at 1% conc.	[15]
Sida acuta (tea wead)	malvaceae	Methanolic extract.	Sida acuta ointment was studied respectively on 2 types of wound models in rats. 1) The excision 2) The incision Wound model.	The extract facilitates the healing process as evidenced by increase in the tensile strength in the incision model. The result were also comparable to those of a standard drug nitrofurazone.	[16]
Ocimum sanctum L (tulsi)	lamiaceae	Aqueous extract	Albino rates of either sex were divided into 2 groups. Group-1: wounded control rats. Group-2: wounded rats administered.	Increased wound breaking strength, de-crease epithelization period, increase percentage contraction, increase granulation tissue wt and hydroxyprolin conc.	[17]
Olea europaea (olive)	oleaceae	n- hexane and aqueous extract	Prepared from the dried leaves of olive, were evaluated for their wound healing	The antioxidant activity assay showed that aqueous extract has higher scavenging ability then the n- hexane extract.ma-	[18]

			activity by using in vivo wound models of linear incision and circular excision.	major active compound according to high performance liquid chromatography analysis of the aqueous extract.	
Cassia fistula linn (golden shower)	Caesalpinia-ceae	Alcohol extract	To investigate the potential of cassia fistula to treat the infected wound on albino rat model formulated ointment was	Better wound closure, improved tissue regeneration at the wound site,	[19]
Elephantopus scaber linn (elephant's foot)	asteraceae	Aqueous, ethanol extract.	E.scaber linn was evaluated on excision, incision and dead space wound models in rats.	The ethanol extract and the isolated constituent deoxy elephantop-in of e-scaber promoted wound healing activity in all the three wound models. The wound healing activity was more significant in deoxyelephantopin treated animals.	[20]
Berberis asiatica (chutro, rasanjan)	Berberidaceae	Aqueous extract	Were tested for their putative antimicrobial activity against a battery of microorganisms by disk diffusion and agar dilution method.	The activity of the fractions was compared with that of berberin, the major alkaloid of the plant.	[21]
Ribes nigrum (black current)	Grossularia-ceae	Methanol extract, ethyl acetate subextract.	Wounds were surgically induced on the dorsal parts of the rats and mice prepared herbal ointment were	R.nigrum extracts significantly increased wound	[22]

CONCLUSION

Wound healing has been a difficult clinical problem for wound management since ancient times. Multiple cell types, the extracellular matrix, and soluble mediators including growth factors and cytokines all play a role in wound healing. Wound care has received a lot of attention in Ayurveda, with a focus on innovative therapeutic procedures and the progress of acute and

chronic wound therapy treatments (herbal). Improved quality control procedures for identifying, screening, and quantifying herbal components, as well as well-designed preclinical and clinical trials, will pave the way for new research avenues in wound care treatment.

CONFLICT OF INTEREST

Authors declare no conflict of interest

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