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HERBAL REMEDY FOR WOUND MANAGEMENT: A REVIEW

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ABSTRACT: Since from prehistoric times the practice of herbal medicine has existed as the primary form of medicine. India is one of leading bio-diversity center with the presence of over 50,000 different plant species. Many plants are unexplored though they were used from ancient times in traditional system of medicine. At the same time, several plants activity was proven scientifically, and its resurgence as herbal medicines was started in the past few years. Many countries have included herbal products, in their national health programs and national health schemes, as an important alternative for the treatment of various diseases. In day to day life, people came across accidental wounding and management of wound is a complicated process. Wound healing is a complex and dynamic process of restoring damaged tissue that involves a series of independent and overlapping stages. Many plants have the potential to heal the wounds owing to a vast array of medicinal compounds they can synthesize. In most of the countries, a great number of plants are used by tribal and folklore for the treatment of wounds and burns. These natural agents induce healing and recovery of the lost tissue by several mechanisms. These phytomedicines are not only cheap and affordable but are also harmless. The presence of a wide range of life-sustaining constituents in plants has insisted scientists to examine these plants to define potential wound healing properties. The current article provides a glance on plants identified from various ethnobotanical surveys and folklore medicinal survey possessing wound healing activity and their formulations.

INTRODUCTION: Since from ancient time man has taken help of nature in the treatment and prevention of many diseases. The medicinal preparations derived from nature were either in the simple form of plant parts or in the more complex form of crude extracts, mixtures, etc. Herbal products are fast becoming a part of the integrative healthcare systems of the developed nations, known as complementary and alternative systems of medicine.

In this era of advanced technology, herbal medicines still flourish and are finding exceptional acceptance in both the developing and the developed countries due to their natural origin and lesser side effects. In ancient literature, we got a reference, that plants are a rich source of a variety of chemicals, with nutritive and therapeutic properties. Herbs may be used directly as decoction or extracts, and they may be used in the production of medications.

In India, about 2000 drugs have been used to cure human diseases. Out of them, the only 1/10th are of animal and mineral origin; rest are of plant origin. The plants have healing properties due to the presence of several complex chemical substances of different compositions, e.g. secondary metabolites (Tannins, alkaloids, flavonoids, glycosides, etc.).

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Therefore, herbal remedies can sometimes offer access to drugs or combinations of drugs, that the pharmaceutical industry has not yet exploited. Herbal medicines not only provide nutrients but also strengthen and support the action of the digestive system, speeding up the rate of processing food and improving the absorption of nutrients.

The drugs of natural origin constitute very important and valuable segments of modern medicine. Traditional medical practitioners and scientists are turning towards medicinal plants for curing ailments such as inflammation, rheumatoid arthritis, cancer, diabetes and many more because they possess lesser side effects owing to their natural origin. These extracts are formulated into different formulations for ease of administration. The novel formulations offer benefits over conventional plant actives and extract formulations. These benefits are like improved solubility, pharmacological action, bioavailability, and stability; reduced toxicity; better tissue macrophages distribution and sustained delivery of the drug. In developed countries too around 25% of medicinal drugs are of plant origin or their derivatives. The use of medicinal plants is well known among the local people in rural areas of many developing countries. World health organization (WHO) has been promoting traditional medicine as a source of less expensive, comprehensive medical care, especially in developing countries. WHO also recognized the importance of traditional medicine in the health care system. More than 80% of the world's population still depends upon traditional medicines for various dermatological problems¹.

In day to day life, people come across accidental wounding and management of wound is a complicated process. The wound healing process involves well organized biochemical and cellular events leading to the growth and regeneration of wounded tissue specially. Healing of wounds is an important biological process involving tissue repairs and regeneration. It involves the activity of an intricate network of blood cells, cytokines, and growth factors which ultimately leads to the restoration to the normal condition of the injured skin or tissue. Wound and wound associated complications are critical issues in developing countries because of poor hygienic conditions.

Traditional medicine is an important source of potentially useful new compounds for wound healing property. Wound care aims at wound healing in the shortest possible time with minimal pain, discomfort, and damage to the patients. It must occur in a physiologic environment conducive to tissue repair and regeneration².

Wound and Wound Types: A wound is defined as damage or disruption to the normal anatomical structure and function. This can range from a simple break in the epithelial integrity of the skin, or it can be deeper, extending into subcutaneous tissue with damage to other structures such as tendons, muscles, vessels, nerves, parenchymal organs, and even bone.

Wounds are classified on the underlying cause of wound creation and the basis of physiology of wound healing as,

1. Open wounds
2. Closed wounds
3. Acute wounds
4. Chronic wounds

The Phases of Wound Healing are: In the wound healing process, both cellular and matrix compounds work to reestablish the integrity of damaged tissue and replacement of lost tissue. These overlapping series can be classified into four stages:

1. Hemostasis
2. Inflammation
3. Proliferation or granulation
4. Remodeling or maturation

Hemostasis: Hemostasis occurs within minutes of the initial injury except there are underlying clotting disorders. In hemostasis, the first response to injury is bleeding. Bleeding is an effective way to wash out bacteria that are on the surface of the skin. Vasoconstrictive substances are discharged by platelets to assist wound healing process. Under the influence of ADP leaking from damaged tissues the platelets aggregate and adhere to the exposed collagen. They also secrete factors which interact with and motivate the intrinsic clotting cascade through the creation of thrombin, which in turn initiates the formation of fibrin from fibrinogen.

Fibrin strengthens platelet aggregation into a strong hemostatic plug. Finally, platelet-derived growth factors (PDGF) are also secreted. The clot dries out and creates a hard surface over the wound that protects tissues underlying³.

Inflammation Phase: This stage starts almost at the same time as hemostasis. It occurs from between few minutes to up to 24 min after injury. In this stage, histamine and serotonin are released into wound area and activate phagocytes to enter the wound area and engulf dead cells⁴.

Proliferative Phase (Proliferation, Granulation, and Contraction): The granulation stage starts about four days after wound and usually continues until day 21. The epithelial cells and fibroblasts move into the injured area and grow rapidly under the hard scab to replace the damaged tissue. In proliferative phase granulation tissue is formed by the growth of capillaries, lymphatic vessels enter into the wound, and the synthesis of collagen starts providing form and strength to the injured tissue. Collagen secreted by fibroblasts acts as a framework for further dermal regeneration. Specialized fibroblast is responsible for wound contraction. Angiogenesis takes place.

Remodeling or Maturation Phase: In this stage, the shape of the final scar is determined by the formation of cellular connective tissue and strengthening of the new epithelium⁵.

The Factors Affecting Wound Healing: Two types of factors influencing the wound healing.⁶

1. Local Factors:

- Infection by tissue organization which delays healing.
- Vascularity: A wound in very vascular parts of the body heals quickly due to well-supplied blood.
- Restricted movement of the affected part.
- Exposure of ionizing radiation.
- Exposure to UV light.

2. Systemic Factors:

- Age
- Improper diet

- Insufficient oxygen supply and tissue perfusion to the wound area.
- Hematological abnormalities also affect healing.
- Diabetes and other disease conditions.
- Administration of glucocorticoids (anti-inflammatory) delay healing⁷.

Ayurveda Remedies for Healing of Wounds:

Ayurveda is based on experiential knowledge of the observations and the experience over eras. More than 1000 medicinal plants are involved in the diverse managing forms of diseases⁸. A large number of indigenous plants having healing activities are recorded in Ayurvedic literature. According to Ayurveda healing of the wound is "Vranaropaka." The first reference of the wound was in Agnibesha Samhita by Maharshi Agnibesha (Varna). Maharshi Sushruta in Sushruta Samhita enlightened the healing process of the wound. According to the Ayurveda, the wound is the disruption of the lining membrane that after healing leaves a mark.

Similarly, Vranashothai inflammation is considered, to be an early phase in the wound pathogenesis. In Ayurveda wound was of classified into six types based on the reason, maybe endogenous in origin due to a defect in human functional units, or exogenous because of trauma, such as Viddha (punctured wound), Chinna (cut wound), Bhinna (perforated wound), Picchita (contusion), Kshata (lacerated wound), and Ghrista (abrasion wound). According to Sushrutasamhita, 60 beneficial steps were mentioned for the management of wounds, starting with an a sterile dressing of the affected part of the body and ending with the restoration of the normal structure and function.

These therapeutic measures were concentrated not only to hasten the healing process but also to preserve the quality and aesthetics of the healing. Many herbals play a very significant role in the wound healing process because of their ability to promote and improve the repair mechanisms in the natural way. Herbal medicines in wound management involve disinfection, debridement and providing a moist environment to encourage the formation of a suitable atmosphere for natural healing processes⁹.

The Need for Work: The management of wound healing is a complicated and lengthy process. Certain factors that influence wound healing include bacterial infection, movement of wound edges, drugs, obesity, nutritional deficiency and site of a wound. Microbial infection of wounds poses a challenge to the treatment of wounds and the process of wound healing. The main problem with wounds is the high risk of infection, hence, if an agent active against these microorganisms causing the infection is used in the healing process, it will then help to decrease the risk of infection and the overall time for wound healing can be reduced significantly. For example, it is very easy for bacteria to enter through the broken skin and penetrate the rest of the body. Bacteria colonize wounds within 48 h after injury and bacteria such as *Staphylococcus aureus*, *P. aeruginosa*, and *Streptococcus spp.* may cause infection and this may prolong the inflammatory phase of wound healing.

It necessitates the use of antimicrobial agents either topically or systematically to prevent infection of wounds and to speed up the process of wound healing. Several drug classes have been used in the management of wounds, major among these are the antibiotics. Medicinal plants represent a rich source of antimicrobial agents and natural antioxidants. Antioxidants play a determining role in the progression of wound healing. Also, anti-inflammatory agents act as a key role in the wound healing process and preventing exacerbating wound conditions. Antimicrobial agents are also useful in the management of microbial infection which may concomitantly occur in severe and chronic wounds. The topical application of antimicrobial agents or extracts is considered as an efficient therapy for destroying microbial populations.

It owes to availability of the active at wound sites enhancing healing activity. Herbal medicines in wound management involve disinfection, debridement and providing a moist environment to encourage the formation of the appropriate environment for the natural healing process. A folklore tradition in India uses a large number of plants for the treatment of cuts, wounds, and burns. The medicinal property of plants used in traditional systems is because of phytoconstituents present within them which are responsible for physiological action. It has inspired many researchers to validate the claims and to discover the mechanisms which possibly could explain the potentials of these herbs on wound repair processes. Many natural products laboratories are now focusing their efforts mainly to identify the numerous phytopharmaceuticals. For the discovery of new potent drugs, the selection of herbal extracts has been of great curiosity to the scientists. Several reports have appeared in the literature concerning the antibacterial, wound healing activity and anti-inflammatory activity of various plants, but the huge majority has yet to be explored. There is a need for availability of collective information regarding medicinal plant and their wound healing activity along with development and evaluation of herbal formulations for safe, effective and universally accepted use.

The present article contains the collective data of plants having wound healing activity and their formulations. Many wound healing formulations are available in diverse dosage forms which are having their advantages and disadvantages. An exhaustive literature survey was conducted for research articles on wound healing activity from the last ten years; the collected data were summarized.

TABLE 1: LITERATURE EXPLORING WOUND HEALING ACTIVITY OF MEDICINAL PLANTS

S. no.	Author's name	Year	Title of paper	Plant name	Type of formulation
1	Avinash S, Gowda DV, Suresh J, Aravind Ram A S, Atul Srivastava ¹ and Riyaz Ali M. Osmani ¹⁰	2016	Formulation and evaluation of topical gel using <i>Eupatorium glandulosum</i> michx. for wound healing activity	<i>Eupatorium glandulosum</i> michx.	Gel
2	M A Muqem Nasir, N. Lal Mohammed, S. Roshan, Mohd. Wasif Ahmed ¹¹	2016	Wound healing activity of poly herbal formulation in albino rats using Excision wound model, incision wound model, dead space wound model and Burn wound model	<i>Curcuma longa</i> , <i>Eclipta alba</i> , and <i>Tridax procumbens</i>	Gel
3	Rajput Rekha T, Gohil Kashmira J, Singh Poonam,	2015	Development of wound healing herbal formulation	leaves of <i>Ficus religiosa</i> , <i>Mentha arvensis</i> , roots of	ointment

	and Singh Surendra ¹²		“Herbal Wound Guard”	<i>Rauwolfia serpentina</i>	
4	Fedelic Ashish Toppo, Rajesh Singh Pawar ¹³	2015	Development, optimization, and evaluation of different herbal formulations for wound healing	<i>Aegle marmelos</i> leaves, <i>Mucunapruriens</i> seeds	gel, ointment
5	Mohammad Reza Farahpour, Peyman Emami, Sina Jangkhaha Ghayour ¹⁴	2014	<i>In-vitro</i> antioxidant properties and wound healing activity of hydroethanolic turmeric rhizome extract (Zingiberaceae)	Turmeric Rhizome	ointment
6	Dattatrya V. Kature, Sujit T. Karpe and Sohrab A. Shaikh ¹⁵	2014	Preparation and evaluation of polyherbal formulation for its wound healing activity	<i>Tridax procumbens</i> , <i>Curcuma longa</i> , <i>Aloe vera</i>	ointment
7	Trailokya Das, Jiban Debnath, Bipul Nath, Suvakanta Dash ¹⁶	2014	Formulation and evaluation of an herbal cream for wound healing activity	<i>Panax ginseng</i> , <i>Aloe vera</i> , <i>Calendula officinalis</i> , <i>Clerodendrum indicum</i> , <i>Arnica Montana</i> , <i>Rose hip oil</i> , <i>Ziziphus mauritiana</i>	cream
8	Meera Sumanth, Bhargavi YR ¹⁷	2014	Evaluation of the wound-healing effect of <i>Ziziphus mauritiana</i> L. leaf extract in rats	<i>Ziziphus mauritiana</i>	gel
9	M. Ismail Shareef, P. Jagan Mohan Reddy, Gopinath SM, Dayananda KS, Ajay Mandal, Purushotham KM ¹⁸	2014	Evaluation of wound healing activity of polyherbal formulation of roots of <i>Terminalia arjuna</i>	<i>Terminalia arjuna</i> , <i>Ficus religiosa</i> , <i>Curcuma longa</i> , <i>Tamarindus indica</i>	ointment
10	Vamsi S, Satish C, Nagaveni K, Jyothi M Joy, Latha P ¹⁹	2014	Formulation and evaluation of polyherbal wound healing ointment	<i>Lantana camara</i> (leaves), <i>Tamarindus indicus</i> (leaves), <i>Psidium guajava</i> (leaves), <i>Curcuma longa</i> (rhizomes)	ointment
11	Ashwini Singh, NPS Sengar ²⁰	2014	Evaluation of polyherbal formulation for wound healing activity using excision model	leaves of <i>Azadirchta indica</i> , <i>Cassia fistula</i> , <i>Eucalyptus globulus</i> , bulbs of <i>Allium sativum</i>	Ointment
12	Manimaran S, Nithya and Praveen TK ²¹	2014	Development and screening of topical herbal cream formulations for antimicrobial and wound healing activity	<i>Eupatorium glandulosum</i> Hook, <i>Cissus quadrangularis</i> Linn.	Cream
13	Kavitha AN, Deepthi V and Naira Nayeem ²²	2013	Design, formulation, and evaluation of a polyherbal ointment for its wound healing activity	leaves of <i>Tectona grandis</i> , <i>Ficus religiosa</i> , <i>Caesalpinia pulcherrima</i>	ointment
14	Alaa A. Abdulrasool, Zena M. Fahmi, Enas J. Khadeem ²³	2013	A relative assess on wound healing and anti-scar activity of crude <i>Echinops heterophyllus</i> extract and some of its bioactive fractions	<i>Echinops heterophyllus</i>	extract
15	Vyas Palak, Prajapati PK, Shukla VJ ²⁴	2013	An herbal wound healing gel prepared with Pachavalkala Kwatha, Nimba Kwatha and Kumari Swarasa with their physicochemical parameters	The barks of five plants viz. <i>Ficus bengalensis</i> , <i>Ficus glomerata</i> , <i>Ficus religiosa</i> , <i>Thespesia populnea</i> Soland. <i>Ficus lecor</i> Buch <i>Azadirachta indica</i> <i>Aloe vera</i> (leaf)	Gel
16	Kuldeep Ganju and A. K. Pathak ²⁵	2013	Evaluation of wound healing activity of the polyherbal and <i>Euphorbia hirta</i> formulations.	<i>Tridax procumbens</i> , <i>Euphorbia hirta</i> , <i>Eclipta alba</i> , dried rhizome of <i>Curcuma longa</i> and gel of <i>Aloe barbadensis</i>	Ointment
17	Nwala CO, Akaninwor JO, Monanu M O. ²⁶	2013	Phytochemical screening and wound healing activities of extracts of <i>Jatropha curcas</i> leaf formulated in a simple ointment Base	<i>Jatropha curcas</i> leaf extract	Ointment
18	SailajaDhanekula, Prathima	2013	Formulation and evaluation of	<i>Phyllanthus niruri</i> and	Gel

19	Srinivas, Sadanandam Mamidi ²⁷ P Arulpriya And P Lalitha ²⁸	2013	herbal gels for antimicrobial and wound healing activity the wound healing potential of aerial roots of <i>Rhaphidophora aurea</i> (Linden Ex Andre) Climbed over <i>Lawsonia inermis</i>	<i>Aloe vera</i> <i>Rhaphidophora aurea</i> <i>Lawsonia inermis</i>	Ointment
20	K. Anitha, K. Jaswitha, P. Subhashini, V. Annapurna, T. Sanjeev Rao, C.K. Ashok Kumar ⁵	2013	Wound Healing Activity of <i>Salvia officinalis</i> (Sage)	<i>Salvia officinalis</i>	Extract
21	SB. Ramane, VN. Syed and KR. Biyani ²⁹	2013	Wound healing activity of polyherbal gel	<i>Azadirachta indica</i> leaves extract, <i>Carica papaya</i> fruit extract, and Honey	Gel
22	SantalaxmeVijendren, Shankar Jothe, KushhaRajandran, Vignesh Muruganandham ³⁰	2012	Assessment of <i>in-vitro</i> wound healing activity of the <i>Tinospora crispa</i> Extracts	<i>Tinospora crispa</i>	Ointments
23	Sushil S. Pimpare, Yogesh T. Sonawane, Chetan A. Chaudhari, Lalit P. Sali, Naveenkumar P. Jain and Chhaya H. Gadgoli ³¹	2012	Wound healing activity of topical application form based on herbomineral formulation	<i>Mimusops elengi</i> bark along with Yashad Bhasma	Ointment
24	Mohammed Haneefa KP, Anu Abraham, Saraswathi R, Guru Prasad Mohanta, Chandini Nayar ³²	2012	Formulation and evaluation of herbal gel of <i>Basella alba</i> for wound healing activity.	leaves of <i>Basella alba</i>	Gel
25	Pulak Majumder ³³	2012	Evaluation of wound healing potential of crude extracts of <i>Zyziphus oenolpia</i> l. Mill (Indian jujuba) in wistar rats	<i>Zyziphus oenolpia</i>	Ointment
26	Mahapatra Annada Prasad, Mishra Dipak Kumar, Panda Prabhudutta ³⁴	2012	Formulation and evaluation of cream prepared from <i>Croton sparsiflorus</i> Morong for its wound healing potential	<i>Croton sparsiflorus</i> Morong	Cream
27	Radhika Gadekar, Manoj Kumar Saurabh, GulabS.Thakur, Avinash Saurabh ³⁵	2012	Study of formulation, characterization and wound healing potential of transdermal patches of curcumin	Curcumin	Curcumin patch
28	Alexandra Gaspar, OanaCraciunescu, Lucia Moldovan, Elena Ganea ³⁶	2012	New composites collagen – polyphenols as a potential dressing for wound care	<i>Arnica montana</i> L., <i>Artemisia absinthium</i> L., <i>Urticadioica</i> L	Wound Dressings
29	Krishnamoorthy JR, Sumitira S, Ranjith MS, Gokulshankar S, Ranganathan S, Mohanty BK, Prabhakaran G ³⁷	2012	An <i>in-vitro</i> study of the wound healing effect of a poly-herbal formulation as evidenced by enhanced cell proliferation and cell migration	<i>Wrightia tinctoria</i> , <i>Aloe vera</i> , <i>Terminalia chebula</i> , <i>Curcuma longa</i>	Carbomer based gel with bees wax
30	ShindeAnilkumar J, Kade Kishorkumar M, Kadam Atul R, More Harinath N ³⁸	2011	Chitosan gel formulation for wound healing activity	Chitosan	Gel
31	Ogwang PE, Nyafuono J, Agwaya Moses, Omujal F, Tumusiime HR Kyakulaga AH ³⁹	2011	Preclinical efficacy and safety of herbal formulation for the management of wounds	<i>Zanthoxylum chalybeum</i> , <i>Warbugia ugandensis</i>	Herbal formulation (Jena)
32	Nikunjana A. Patel, Megha Patel, Rakesh P. Patel ⁴⁰	2011	Formulation and evaluation of polyherbal gel for wound healing	<i>Terminalia arjuna</i> , <i>Centella asiatica</i> , and <i>Curcuma longa</i>	Gel
33	Patil BS and Mastiholimath V ⁴¹	2011	Wound healing activity of hydrogel obtained from pigeon pea (<i>Cajanus cajan</i>) seed husk	<i>Cajanus cajan</i>	Hydrogel
34	MemfinEkpo, Herbert Mbagwu, Clement Jackson, Mary Eno ⁴²	2011	Antimicrobial and wound healing activities of <i>Centrosema pubescens</i> (Leguminosae)	<i>Centrosema pubescens</i>	Extract
35	PatilSuhas A, Joshi VG ⁴³	2011	Evaluation of antibacterial and wound healing activity of	<i>Mussaenda frondosa</i>	Extract

			leaves of <i>Mussaenda frondosa</i> Linn.		
36	Ivana Binić, Aleksandar Janković, Milan Miladinović, ĐorđeGocev, DimitrijeJanković and Zoran Vrućinić ⁴⁴	2011	Evaluation of healing effects of new herbal formulation on venous leg ulcer, a pilot study was done	<i>Allii bulbis</i> , <i>Hyperici herba</i> and <i>Calendul aeflos</i>	Ointment (Dermaplant G)
37	Prabhudutta Panda ⁴⁵	2011	Formulation and evaluation of topical dosage form of <i>Alangium salvifolium</i> linn. and their wound healing activity	<i>Alangium salvifolium</i>	Ointment & gel
38	Sainuddin T , K.P M ⁴⁶	2011	Formulation and pharmacological evaluation of herbal gel of <i>Pothos scandens</i> Linn.	<i>Pothos scandens</i>	Gel
39	V. M. Thakare, R. Y. Chaudhari, V.R. Patil ⁴⁷	2011	Wound healing evaluation of some herbal formulations containing <i>Curcuma Longa</i> and <i>Cynodon dactylon</i> extract	<i>Curcuma longa</i> and <i>Cynodon dactylon</i>	Cream
40	Attama AA, Uzor PF, Nnadi CO, Okafor CG ⁴⁸	2011	Evaluation of the wound healing activity of gel formulations of leaf extract of <i>Aspila africana</i> Fam. Compositae	<i>Aspila africana</i>	Gel
41	CananSevimli-Gür, İlyasOnbasilar, Pergin Atilla, RükanGenc., Nur , cakar, İ smet Deliloglu-Gürhana, Erdal Bedir ⁴⁹	2010	<i>In-vitro</i> growth stimulatory and <i>in vivo</i> wound healing studies on cycloartane-type saponins of <i>Astragalus</i> genus	<i>Astragalus</i> genus	Isolated compound
42	Omale James and Emmanuel T. Friday ⁵⁰	2010	Phytochemical composition, bioactivity, and wound healing potential of <i>Euphorbia heterophylla</i> (Euphorbiaceae) leaf extract	<i>Euphorbia heterophylla</i>	Ointment
43	Jagtap NS, Khadabadi SS, Farooqui IA, NalamwarVP, Sawarkar HA ⁵¹	2009	Development and evaluation of herbal wound healing formulations	Aerial parts of <i>Centella asiatica</i> (L.) Urban and rhizomes of <i>Curcuma longa</i>	Cream
44	Jain Sachin, Jain Neetesh, Tiwari A, Balekar N and Jain D K ⁵²	2009	A simple evaluation of wound healing activity of polyherbal formulation of roots of <i>Ageratum conyzoides</i> Linn.	<i>Ageratum conyzoides</i> , <i>Ageratum conyzoides</i> , <i>Ficus religiosa</i> , <i>Curcuma longa</i> , <i>Tamarindus indica</i>	Ointment
45	Md. Shafiuddin, Abdullah Khan and Sadath Ali ⁵³	2009	Wound healing activity of the traditional herbal formulation	<i>Comphora officinarum</i> (Kafoor), <i>Shorea robusta</i> (Raal), Beeswax (<i>Apis mellifera</i>), <i>Acacia catechu</i> (Katha safeed), <i>Sesamum indicum</i> (Til oil), and <i>Azadirachta indica</i> (Neem oil)	Oil
46	Akanksha D, Vikas G, Neetesh KJ, Shailendra S, Neelam B, Dinesh KJ ⁵⁴	2009	Formulated neomycin sulphate ointment containing natural wound healing agent <i>Curcuma longa</i>	<i>Curcuma longa</i>	Ointment
47	Sanjay Prahald Umachigi, Jayaveera K. Ashok kumar C.K. ⁵⁵	2009	Evaluation of wound healing potential of polyherbal formulation	<i>Quercus infectoria</i> , whole plants of <i>Couroupita guianensis</i> , <i>Anthocephalus cadamba</i>	Gel
48	Esimone CO, Nworu CS, Jackson CL ⁵⁶	2009	Cutaneous wound healing activity of a herbal ointment containing the leaf extract of <i>Jatropha curcas</i> L. (Euphorbiaceae)	<i>Jatropha curcas</i>	Ointment
49	Nainwal P, Kalra K ⁵⁷	2009	Study on the wound activity potential on the aqueous extract of the bark of <i>Myrica esculenta</i> Buch. & Ham.	<i>Myrica esculenta</i> Buch Ham. <i>Myrica esculenta</i>	Aqueous Extract

50	Karodi R, Jadhav M, Rub R, Bafna A ⁵⁸	2009	Evaluation of the wound healing activity of a crude extract of <i>Rubia cordifolia</i> L. (Indian madder) in mice	<i>Rubia cordifolia</i>	Hydrogel
51	Ayyanar M, Ignacimuthu S ⁵⁹	2009	Herbal medicines for wound healing among tribal people in Southern India: Ethnobotanical and Scientific evidence	<i>Acalypha indica</i> , <i>Anacardium occidentale</i> , <i>Areca catechu</i> , <i>Calotropis gigantea</i> , <i>Cissampelos pareira</i> , <i>Cleome viscosa</i> , <i>Eupatorium odoratum</i> , <i>Euphorbia hirta</i> , <i>Ficus racemosa</i> , <i>Ixora coccinia</i> , <i>Morinda pubescens</i> , <i>Opuntia dillenii</i> , <i>Pongamia pinnata</i> , <i>Scoparia dulcis</i> and <i>Vitex altissima</i>	Extract, pastes,
52	Shikha Srivastava, Nidhi Mishra ⁶⁰	2009	Evaluation of polyherbal formulation for wound healing activity	<i>Curcuma longa</i> , <i>Tridax procumbens</i> and <i>Eclipta alba</i>	Ointment
53	Demirci S, Doğan A, Demirci Y, Şahin F ⁶¹	2008	<i>In-vitro</i> wound healing activity of methanol extract of <i>Verbascum speciosum</i>	<i>Verbascum speciosum</i>	Extract
54	R. Sudeendra Bhat, J. Shankrappa, HG Shivakumar ⁶²	2007	Formulation and evaluation of polyherbal wound treatments	<i>Azadirachta indica</i> , <i>Tridax procumbens</i> , <i>Curcuma longa</i>	Ointment & gel
55	Muthusamy Senthil Kumar, Ramasamy Sripriya, Harinarayanan Vijaya Raghavan and Praveen Kumar Sehgal ⁶³	2006	The wound healing potential of <i>Cassia fistula</i> on an infected albino rat model	<i>Cassia fistula</i>	Ointment
56	K.F. Chaha, C.A. Eze, C.E. Emuelosi, C.O. Esimone ⁶⁴	2006	Antibacterial and wound healing properties of methanolic extracts of some Nigerian medicinal plants	<i>Ageratum conyzoides</i> , <i>Anthocleista djalonenensis</i> , <i>Napoleona imperialis</i> , <i>Ocimum gratissimum</i> , <i>Psidium guajava</i>	Methanolic extracts
57	Esimone CO, Ibezim EC, Chah KF ⁶⁵	2006	The wound healing effect of herbal ointments formulated with <i>Napoleona imperialis</i>	<i>Napoleon imperialis</i>	Ointments

CONCLUSION: This review gives ready reference of plants having wound healing potential and their formulations. Maximum probable chemical constituents responsible for wound healing are tannins, phenols, few alkaloids, and flavonoids. These plants are more potent healers because they encourage the repair mechanism naturally. These phytomedicines are not only cheap and affordable but are also harmless. These plants should be subjected to preclinical and clinical studies to determine their effectiveness. Scientists from divergent fields are investigating new plants with an eye to their wound healing usefulness. This information will be helpful for the researcher to develop new Wound healing formulations for use.

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