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Plants Havings Wound Healing Property: A Review

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Abstract:

Our skin offers functions of Homeostasis, protection from microorganism, impact, etc. For maintaining their functions after injury or skin damage various medicinal agents are required. For ancient times various traditional medicinal plants are successfully used for wound healing purposes as well as various other management of diseases. Currently, a lot of pharmaceutical products are available to treat wound injury but with different side effects. Medicinal plants can be alternatively used to combat the resistance offered by allopathic medicines. The medicinal plants are using from ancient times to contribute to wound healing and tissue regeneration by various mechanisms. This review enumerates various medicinal plants and their active constituents which showed wound healing property with evidence of their research. There is a lot of phytoconstituents available in medicinal plants as active constituents for treating various ailments. For wound healing, chief active constituents are Flavonoids, triterpenes, Terpenoids, Glycosides, Saponins etc.

Keywords: Wound Healing, Phytoconstituents, Extracts, Neutrophils, collineation.

INTRODUCTION

Plants have been used for the treatment of various ailments since the prehistoric period. Medicinal plants may be defined as the plants used for the treatment of specific diseases. These plants are either wild plant species grown naturally or Domesticated plant species grown through human action [1].

The medicinal plants or herbs have attained a chief role in the health care system all over the world. These plants are not only used for treating the diseases but also for maintaining health and body conditions [2]. From the records, various synthetic drugs have been used for the treatment of various diseases but there are many diseases for which safer drugs are yet to be found. Due to inadequate supply of synthetic drugs, their high cost of treatment, side effects, resistance problems led to the use of medicinal plants for various varieties of ailments. As per W.H.O about 80% of people worldwide use herbal medicines and more than 21000 plants species are having the various medicinal property. Medicinal plants containing various phytoconstituents are used for wound healing purposes.

The major constituents having antibacterial and antifungal properties are Flavonoids, Tannins, Saponins, Terpenes, terpenoids etc [3].

Wound and Wound Healing Process:

The Wound may be defined as the disruption of tissues which is due to physical, chemical, microbiological, thermal damage. After an injury, if there is bacterial growth then it becomes chronic wound, Antibiotics are used to heal that wound. In the past, many antibiotics were successfully used to stop the microbial growth on wounds but due to antibiotics resistance with prolonged use, the use of antibiotics is limited. Now many herbal plant parts are used in the treatment of the wound. Various studies have shown that the wound healing effect of the herbal plant is very effective and non toxic [4-6].

There are four main non-discrete phases involved in wound healing; alternatively, these steps may be titled as principles for the healing of wounds.

Inflammation is the natural response to injury which is an initial step as it begins within a few seconds after injury and blood cells at wounded area contracts to form a clot. Once the homeostasis level is reached then dilation of blood vessels occurs to secrete the histamine through mast cells and injured tissue. Neutrophils migrate to the injury site by attraction towards Chemoattractive agents, complement components, TGF-β, Peptides, C3a, C5a. The main task of neutrophils is to destroy and remove bacteria, debris. After completing their task neutrophils dies leaving behind an enzyme exudates. During this period macrophages clean the wound bacteria, debris, and dead cells by phagocytosis. After this epithelial cell moves from the wound margin, thereby forming a thin layer over the wound. This process continues for about 2 days [7-9].

Proliferation Phase lasts from 24-72 hrs.The fibroblast occurs in the deeper layer of the wound which primarily synthesizes a small amount of collagen and ultimately synthesized into large amounts after 4-5 days of the injury. Proteoglycans enhanced the formation of collagen fibers and within 2-3 weeks wounds are capable to resist normal stresses but strength continues to build that lasts from 15-20 days.10,11 After 15-20 days wound enters into maturation phase and in that phase fibroblast is about to leave the wound & collagen is again modeled into a more organized manner. The healed wound cannot regain its original strength as of uninjured skin. They can regain max. of 80% of its original strength [12,13].

Phytoconstituents and their mechanism of actions in wound healing[14-18]

Phytoconstituents	Chief Mechanism of action
Tannins, Flavonoids, β-carotene	Stimulation of Wound contraction, Increases tensile strength,as well as hydroxyproline content, Antioxidant, stimulates homeostasis
Glycosides	Decreased wound closure time, Increased epithelialization.
Vitamins, Minerals	Increased wound healing rate, Wound contraction, Reduces infection.
Steroids, Triterpenes	Increased epithelialization, Incresed wound contraction, Increased collagenisation.
Glycosides	Homeostasis, Stimulates granulation tissues.

Some Medicinal Plants having Wound Healing Property

S.NO	Name of Plant	Plant Part Used	Preparation Used	Chief Phytoconstituent to cure Wound	Animal Model/ Human skin
1.	Neem [19]	Neem Leaves	Ethanolic extract of Neem leaves	Vitamin, Minerals, Amino Acids.	Rat
2.	Aegle marmelos (Bael) [20,21]	Aegle Marmelos Seeds, Leaves, Fruits	1.Methanolic Extract ointment 2. Aqueous Extract ointment 3. Methanolic Leaf Extract	Flavonoids, Tannins, Alkaloids	Rat
3.	Alium sativum (Garlic) [22,23]	Garlic Bulb	1. Hydroalcoholic Extract 2. Aqueous Extract	Flavonoids, carbohydrates.	Wister Rat
4.	Ceylon cinnamon [24,25]	1. Whole Plant 2. Bark	1. Ethanolic Extract 2. Essential Oil	Essential Oils	1. Wister Rat 2. Mice
5.	Flaxseed [26]	SEED	Extract of Hexane, Dichloromethane, metane	Essential Oil, Carbohydrates, Proteins	Rabbit
6	Rubia cardifolia [27]	Aerial Part	Aqueous Extract	Tannins, Anthraquinones	Swiss Albino Mice
7.	Angelica dahurica [28]	Herb	Ethanolic Extract		Rat
8.	Calendula officinalis [29]	Flower	n-hexane, Ethanolic Extract	Flavonoids, Carbohydtrates, Triterpenes	human immortalized keratinocytes and human dermal fibroblasts
9.	Curcuma longa (Turmeric) [30]	Rhizome	Ethanolic, Methanolic Extract	Flavonoids, Curcumin, Polyphenols	Diabetic Induced Rat, Non diabetic Rat
10.	Jsminum auriculatum [31]	Leaves	Ethanolic Extract	Flavonoids, Triterpenoids,Tannins.	Albino Rat
11.	Ginkgo biloba [32]	Leaves	Normal Saline Extract	Flavonoids	Rat
12.	Eucalyptus citriodora [33]	Leaves	Ethyl Acetate and Ethanol	Flavonoids, Alkaloid, Tannins, Carbohydrates,Glycosides.	Rat
13.	Roman chamomile [34]	Flower	Ethanolic Extract	Sesquiterpenes, Flavonoids	Rat
14.	Moltkia coerulea [35]	Aerial Part including leaves and flowers	Hydroethanolic Extract	Flavonoids, Phenols	Rat
15.	Rosmarinus officinalis L. (Rosemary) [36]	Flowering Leaves and Summits	Essential Oil	Essential Oil	Mice
16.	Vitis vinifera [37]	Dried Stem	Ethanolic Extract	Resveratrol (Phytoalexin)	Mice
17.	Pistacia atlantica [38]	Gum	Ethanolic Extract	Flavonoids, Phenols	Rabbit
18.	Astragalus membranaceus [39]	Roots	Hydroethanolic	Polysaccharides, Saponins	Mice
19.	Datura alba [40]	Leaves	Alcoholic Extract	Saponins, Triterpenoid, sesquiterpene	Albino Rat
20.	Piper betle Linn [41]	Leaves	Methanolic Extract	Phenol, Chavicol	Rat
21	Annosa squamosa [42]	Leaves	Ethanolic Extract	Flavonoids, Tetrahydroisoquinoline Alkaloid	Diabetic Rat
22	Moringa oleifera Linn [43]	Leaves	Aqueous Extract	Vitamin E, Carotenoid	Albino Rat
23	Tagetes patula L. [44]	Flower petals	Methanolic Extract	Carotenoids, Flavonoids, Monoterpenoids.	Mice
24	cassia fistula [45]	Leaves	Alcoholic Extract	Anthraquinones, Flavonoids	Rat
25	Hypericum mysorense [46]	Stem	Methanolic Extract	Quercetin, Amentoflavone	Rat
26	Ixora Coccinea [47,48]	Flowers	Ethanolic Extract	Flavonoids, Steroids, Terpenes	Rat
27	Leucas hirta [49]	Leaves	Methanolic Aqueous	Flavonoids, Alkaloids, Tannins, Saponins, glycosides, steroids.	Wister Rat
28	Pentas lanceolata [50]	Flowers	Ethanolic Extract	Tannins, Saponins	Rat
29	Plantain banana [51]	Fruit	Methanolic Extract	Triterpenes, Alkaloids ,Flavonoids	Albino Rat
30	Acacia catechu [52]	Bark	Alcoholic Extract Aqueous Extract	Glycosides, Carbohydrates, Tannins etc.	Rat
31	Alternanthera brasiliana kuntz [53]	Leaves	Methanolic Extract	Alkannin, Vitamin C, Carbohydrates	Rat
32	Arnebia densiflora[54]	Root	n-hexane	Napthoquinone, Alkannin, Shikonin	Albino Rat

S.NO	Name of Plant	Plant Part Used	Preparation Used	Chief Phytoconstituent to cure Wound	Animal Model/ Human skin
33	Arnebia densiflora (Nordm.)Ledeb[55].	Root	n-Hexane, Chloroform, Ethyl Acetate, Methanol	Napthoquinone, Alkannin, Shikonin	Sprague- Dawley Rat and Swiss Albino Mice
34	Citrus limon Extracts [56]	Peel	Ethanolic	Vitamin and Flavonoids	Rat
35	Cassia alata L. [57].	Leaves	Ethanolic Extract	Flavonoids, Saponins, Tannins, Alkaloids, Glycosides.	Rats
36	Querus Infectoria [58].	Leaves	Ethanolic Extract	Tannin, Gallic and Ellagic acid.	Rats
37	Cleome viscosa Linn. (Hurhur) [59].	Seeds	Petroleum Ether	Saponins, Terpenoids	Rats
38	Celosia argentea Linn. [60]	Leaves	Ethanol	Flavonoids, Alkaloid, Saponin, Terpenoids.	Rodents
39	Delonix elata [61].	Stem Bark	Ethanolic Extract	Flavanoid	Wister Albino Rat
40	Asparagus racemous [62].	Root	Aqueous Extract	Sapogenin	Albino Rat
41	Ficus racemosa Linn. [63].	Root	Etnaloic Extract	triterpenoid (Cycloartenol)	Albino Rat
42	Ficus racemosa Linn. [64].	Bark	Aqueous Extract	Campesterol, Kaempferol	Wister Albino Rat
43	Ocimum sanctum Linn. [65].	Leaves	Aqueous Extract	Flavonoids	Wister Albino Rat
44	Jatropha curcas Linn. [66].	Bark	Juice	Flavonoids, Tannins, Coumaric acids	Albino Rat
45	Achillea millefolium (Yarrow) [67].	Aerial Part	Hydroalcoholic	Tannins	Rabbit
46	Desmodium gangeticum [68].	Aerial Part	Aqueous Extract	Alkaloids, Flavonoids, Isoflavonoids glycosides.	Wister Rat
47	Tragia involucrate [69].	Roots	Methanolic Extract	Flavonoids, Phenols, Tannins.	Rat
48	Terminalia arjuna [70].	Bark	Hydroalcoholic Extract	Flavonoids, Tannins	Rat
49.	Aloe Vera [71].	Aloe Vera Leave	Aloe Vera Gel	Alkaloids, Tannins, Glycosides, Terpenoids.	Albino Rat
50.	Morinda citrifolia L [72].	Leaf	Ethanol	Saponins, Alkaloids, Tannins, Triterpenes, Flavonoids.	Rat

CONCLUSION:

As we knew that a large no. of plants has been used in the treatment of cuts, wounds, and burns since ancient time. In this review, the wound healing properties of various medicinal plants were studied and it concluded that plants are very useful in promoting the wound healing process. There is a lot of evidence of the plant medicinal products and many developed countries are using herbal medicines not only for wound healing process but for their other benefits also. This review also focused on various researches in which various formulations were prepared using plant extract and satisfactory results were obtained. From this review, it cleared that the main phytoconstituents which are responsible for wound healing properties are Flavonoids, Tannins, Glycosides, Vitamin C, Carbohydrates. Plants containing these phytoconstituents can be safely used for their wound healing properties. These agents act by various mechanisms mainly epithelialization, collagenization, Stimulation of tensile strength, Hemostasis. A lot of Evidence is available for plant's wound healing properties which can be easily utilized to make novel preparations for wound healing purposes.

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