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**PUBLISHED PAPER'S TITLE : A REVIEW ON
ACTIVE PRINCIPLE OF PLANT EXTRACTS IN
RELATION TO WOUND HEALING**



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Review Paper

A REVIEW ON ACTIVE PRINCIPLE OF PLANT EXTRACTS IN RELATION TO WOUND HEALING

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Declaration

The Declaration of the author for publication of Research Paper in Asian Journal of Modern and Ayurvedic Medical Science (ISSN 2279-0772) Awadhesh Kr. Pandey ,Prof. M. Sahu ^{and} Pathak Meenakshi S.N the authors of the research paper entitled A Review on Active Principle of Plant Extracts in relation to Wound Healing declare that ,we take the responsibility of the content and material of my paper as we ourself have written it and also have read the manuscript of our paper carefully. Also, we hereby give our consent to publish our paper in ajmams , This research paper is our original work and no part of it or it's similar version is published or has been sent for publication anywhere else.we authorise the Editorial Board of the Journal to modify and edit the manuscript. we also give our consent to the publisher of ajmams to own the copyright of our research paper.

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ABSTRACT

India has a rich tradition of plant-based knowledge on healthcare. A large number of plants/plant extracts/decoctions or pastes are used by people in India for treatment of cuts, wounds, and burns. The present review thus attempts to analyze the ancient and modern knowledge for treatment of cuts and wounds .

Pharmacological reports available on Indian medicinal plants employing various wound healing models and its underlying molecular mechanism, wherever available, has also been briefly reviewed.

This pharmacological validation on Indian medicinal plants is very limited and a large number of plants used in tribal and folklore with enormous potential have not been validated for their wound healing activity.

This review therefore attempts to bridge the lacunae in the existing literature and offers immense scope for researchers engaged in validation of the traditional claims and development of safe and effective and globally accepted herbal drugs for cuts and wounds.

Keywords: Wounds, healing,plant extracts, active principle, Ayurveda



Introduction

Wounds are major concerns for the patients as well as Clinician . They affect a large number of patients and seriously influence their quality of life. Current estimates indicate that nearly 6 million people suffer from chronic wounds worldwide. There are very few Indian studies on the epidemiology of chronic wounds. The prevalence of chronic wounds in the community was reported as 4.5 per 1000 population whereas that of acute wounds was nearly doubled at 10.5 per 1000 population (Gupta et al., 2004).

Both Traditional and Western systems of medicine for wound healing suffer from lack of resources and awareness . Research on wound healing agents is one of the developing areas in modern biomedical sciences. Many traditional practitioners across the world particularly in countries like India with ancient medical practices have valuable information of many unknown wild plants used by them for treating wounds and burns. Several drugs made of plant, mineral or animal origin are described in Ayurveda for their healing properties under the term 'Vranaropaka'. Besides the classical systems of Indian Medicine, the folk and the tribal medicine also employ a number of plants and animal products or treatment of cuts, wounds and burns.

Pathology of wounds by Both Traditional and Western systems of medicine

Wounds are physical injuries that result in an opening or break of the skin. Proper healing of wounds is essential for the restoration of disrupted anatomical continuity and disturbed functional status of the skin. Healing is a complex and intricate process initiated in response to an injury that restores the

function and integrity of damaged tissues. \

Wound healing involves continuous cell-cell and cell-matrix interactions that allow the process to proceed in three overlapping phases viz. inflammation (0-3 days), cellular proliferation (3-12 days) and remodeling (3-6 months) (Glynn, 1981; Clark, 1996; Martin, 1996). Healing requires the collaborative efforts of many different tissues and cell lineages (Martin, 1997). It involves platelet aggregation and blood clotting, formation of fibrin, an inflammatory response to injury, alteration in the ground substances, angiogenesis and re-epithelialization. Healing is not complete until the disrupted surfaces are firmly knit by collagen (Buffoni et al., 1993).

The basic principle of optimal wound healing is to minimize tissue damage and provide adequate tissue perfusion and oxygenation, proper nutrition and moist wound healing environment to restore the anatomical continuity and function of the affected part (Pierce and Mustoe, 1995).

According to Ayurveda, Vrana (wounds or ulcers) is the discontinuation of lining membrane that after healing leaves a scar for life closely resembling the modern definition. Similarly, inflammation is considered to be an early phase in the pathogenesis of wounds termed Vranashotha. Different types of wounds are mentioned in Ayurveda due to trauma, such as Chinna (cut wound), Bhinna (perforated wound), Viddha (punctured wound), Kshata (lacerated wound), Picchita (contusion), and Ghrista (abrasion wound) .

Etiological factors causing wound have striking similarities as described in Ayurvedic and Modern medicine (Fig. 1). Classical management of wounds



according to Sushruta Samhita follows 60 therapeutic steps, starting with an aseptic dressing of the affected part and ending with the rehabilitation of the normal structure and function. These therapeutic measures were aimed not only to accelerate the healing process but also to maintain the quality and aesthetics of the healing.

People of developed countries are seeking alternative to modern therapies of wound healing like antibiotics, corticosteroids, etc. obviously due to its side effects. In chronic wounds two inseparable aspects, pathogenesis and failure to heal, have intensified search of herbal drugs as wound healing agents.

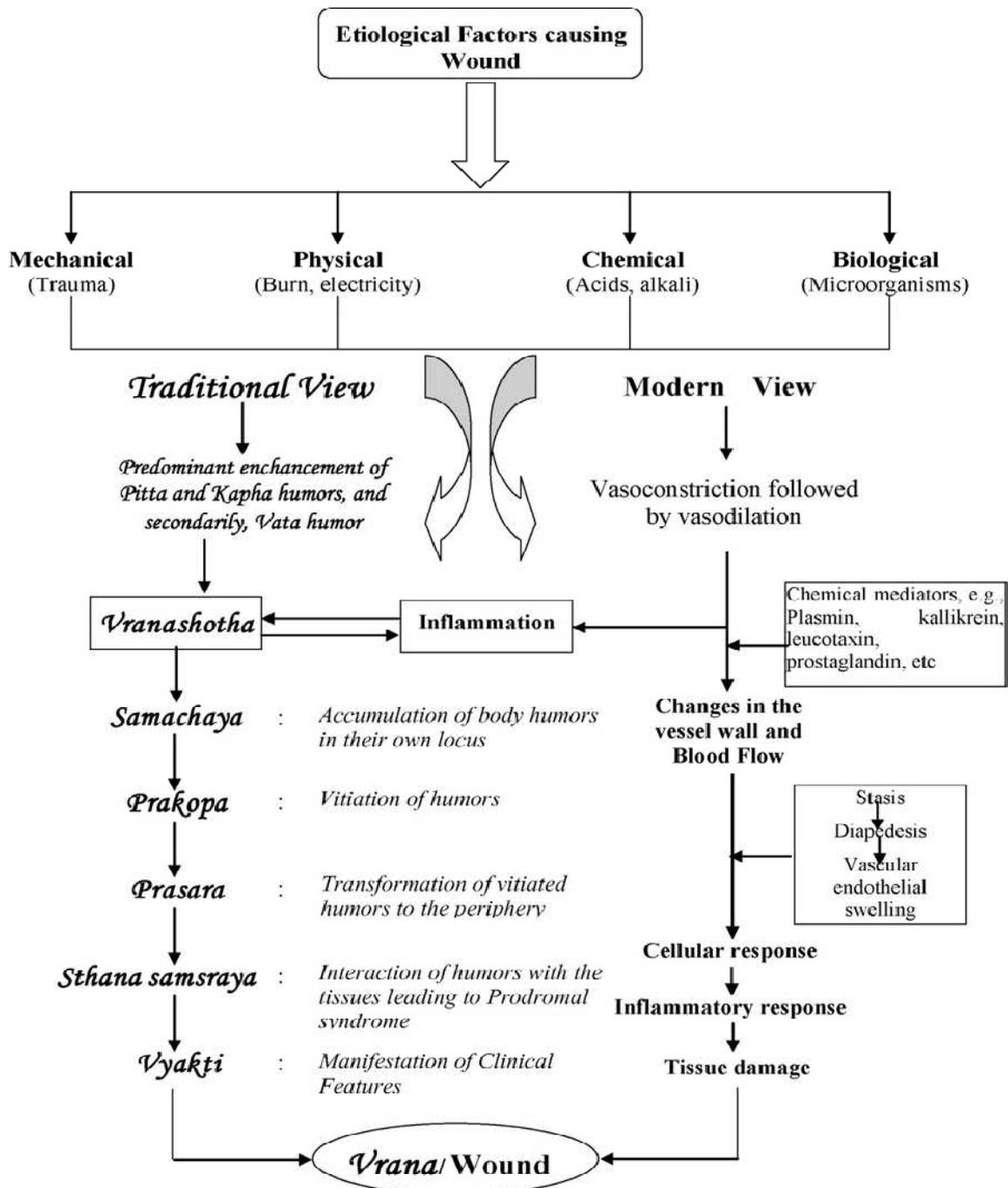


Fig. 1. Comparative representation of etiopathogenesis of wound in Ayurvedic and Modern medicine.

Important pharmacologically validated plants for their wound healing activity on different model.

In the current review, we have presented such plants which are extensively used in both traditional and folk systems of medicine of India and have been reported in ethnobotanical literature for use in the healing of wounds. We have also indicated the same along with the part that have been reported to be used in the healing of the wound. The part used becomes all the more important because of the fact that while providing the ethnopharmacological evidence towards these plants, researchers must ensure that they use that particular part mentioned in traditional medicines rather than random screening.

1. *Aegle marmelos* Methanolic extract of plant (stem bark) on Excision and incision wound model (Jaswanth et al. (2001)
2. *Areca catechu* Betel nut extract and its two constituents arecholine and polyphenols on Excision, Incision and dead space wound model (Padmaja et al. (1994)
3. *Argemone mexicana* Ethanolic extract on Excision, incision and dead space wound model (Patil et al. (2001)
4. *Aloe vera* (Hegggers et al., 1996; Davis et al., 1989),
5. *Azadirachta indica* Pure neem oil and neem ointment on Incised and dead space wound model in bovine calves (Bhardwaj and Sharma (1997)
6. *Bryophyllum pinnatum* Leaf, alcoholic and water extracts on Excision, incision and dead space wound model (Khan et al. (2004)
7. *Butea monosperma* Alcoholic bark extract on Excision wound model (Sumitra et al. (2005)
8. *Calotropis procera* Latex on Excision wound model (Rajesh et al. (2005)
9. *Carica papaya* Latex on excision wound model (Mikhalchik et al., 2004),
10. *Cassia fistula* Alcoholic leaf extract on Excision wound model (Senthil Kumar et al. (2006)
11. *Centella asiatica* Ethanolic extract on Incision, excision, and dead space wound model (Suguna et al. (1996), Shetty et al. (2006)
12. *Cinnamomum zeylanicum* Ethanolic extract of bark on Excision, incision and dead space wound model (Kamath et al. (2003)
13. *Curcuma longa* Powder of the tuberous Rhizome (Mehra et al., 1984),
14. *Cyperus rotundus* Extract of tuber on Excision, incision and dead space wound model (Puratchikody et al. (2006)
15. *Datura alba* Alcoholic leaf extract on Burn rat wound model (Priya et al. (2002)
16. *Euphorbia neriifolia* Aqueous extract of latex on Excision wound model (Rasik et al. (1996)



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| 17. | <i>Glycyrrhiza glabra</i> Ethanolic extract of root on Excision wound model (Kishore et al. (2001) | responsible for wound healing. |
| 18. | <i>Gmelina arborea</i> Alcoholic extract of leaf Excision on incision and dead space wound model(Shirwaikar et al. (2002) | Tannins from <i>Terminalia arjuna</i> (Chaudhari and Mengi, 2006),
Oleanolic acid from <i>Anredra diffusa</i> (Letts et al., 2006), |
| 19. | <i>Moringa oleifera</i> Ethyl acetate extract of dried leaf on Excision, incision and dead space wound model (Udupa et al. (1994a,b), Hukkeri et al. (2006) | Polysaccharides from <i>Opuntia ficus-indica</i> (Trombetta et al., 2006),
Gentiopicroside, sweroside and swertiamarine from <i>Gentiana lutea</i> (Ozturk et al., 2006), |
| 20. | <i>Nelumbo nucifera</i> Methanol extract of rhizomes on Excision, incision and dead space wound model (Mukherjee et al. (2000b) | Shikonin derivatives (deoxyshikonin, acetyl shikonin, 3-hydroxy-isovaleryl shikonin and 5,8-Odimethylacetyl shikonin) from <i>Onosma argentatum</i> (Ozgen et al., 2006), |
| 21. | <i>Ocimum sanctum</i> Ethanolic extract of leaves on Excision, incision and dead space wound model(Udupa et al. (2006) | Asiaticoside, asiatic acid, and madecassic acid from <i>Centalla asiatica</i> (Maquart et al., 1999; Shukla et al., 1999a,b; Hong et al., 2005), |
| 22. | <i>Oxalis corniculata</i> Alcohol and petroleum ether extracts of whole plant on Excision, incision and dead space wound model (Taranalli et al. (2004) | Quercetin, isorhamnetin and kaempferol from <i>Hippophae rhamnoides</i> (Fu et al., 2005), |
| 23. | <i>Phyllanthus emblica</i> (Suguna et al., 2000), | Curcumin from <i>Curcuma longa</i> (Jagetia and Rajanikant, 2004), |
| 24. | <i>Plumbago zeylanica</i> (Reddy et al., 2002), | Oleo-resin from <i>Copaifera langsdorffii</i> (Paiva et al., 2002), |
| 25. | <i>Pterocarpus santalinus</i> (Biswas et al., 2004), | Proanthocyanidins and resveratrol from grapes (Brakenhielm et al., 2001; Khanna et al., 2002), |
| 25. | <i>Terminalia arjuna</i> (Chaudhari and Mengi, 2006) and | Acylated iridoid glycosides from <i>Scrophularianodosa</i> (Stevenson et al., 2002), |
| 26. | <i>Terminalia chebula</i> (Suguna et al., 2002) | Phenolic acids (protocatechuic, <i>p</i> -hydroxybenzoic, <i>p</i> -coumaric, ferulic and vanillic acids) from <i>Chromolaena odorata</i> (Phan et al., 2001), |

have been extensively reported in Ayurveda systems of medicines for their wound healing potential.

The Active Principles isolated from different plants

Glycoprotein fraction from *Aloe vera* (Choi et al., 2001),



(+)-epi-alpha-bisabolol

from *Peperomia galioides* (Villegas et al., 2001),

Fukinolic acid and cimicifugic acids

from *Cimicifuga* sps. (Kusano et al., 2001)

Xyloglucan from *Tamarindus indicus* (Burgalassi et al., 2000).

CONCLUSION

There are a number of plants which are used traditionally in wound healing have not been evaluated. Most of the pharmacological reports of plant/plant extracts screens the organic soluble extracts of the dried plant for their ability to heal wounds in rats and mice, but the major concern is that the most traditional claims of the plants as wound healing agents involves application of fresh plants as pastes in water. This is a major problem when Active principle of wound healing is being validated in the organic solvent extract of dry plant material and aqueous extract of the fresh plants, the chemical constituents in both cases will be very different.

Thus, this review will help researchers of wound healing to understand Plant ,Extracts from Its different part, isolation of Active principle and thereby strengthening the pharmacological claims and building the global acceptance of the wound healing agents of plant origin.

Also there is a lack of concerted effort on the part of researchers to study the concept of synergism in wound healing. Synergistic approach of the potential plants highlighted in the current review may be combined judiciously in the development of a globally acceptable wound healing formulation, which if validated properly and proven scientifically can act as substitute or may even replace the modern wound healing agents. Thus, the major aim of the

current review is to identify and project the plants especially of Indian origin which have the potential to become the modern drug substitute.

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