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WOUND HEALING PROPERTIES OF *SYMPLOCOS RACEMOSA*

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Introduction:-

India has a rich variety of flora that is widely distributed throughout the country. Herbal medicines have been the basis of treatment and cure for various diseases and physiological conditions in traditional methods practiced such as Ayurveda, Unani and Siddha. Medicinal components from plants play an important role in traditional as well as western medicine. Plant derived drugs has played an important role in the evolution of human, healthcare for thousands of years. Plant based drugs were commonly used in India and China. Today a substantial number of drugs are developed from plants which are active against a number of diseases.

Ayurveda is considered as the oldest medical science of the Indian Subcontinent. It has been practiced since 1000 B.C., with the objective to accomplish physical, mental, social and spiritual well-being, by adopting health-promoting and holistic approach towards life (Patwardhan *et al.,* 2005). In today's contemporary era, main emphasis is given on plant research. This is because of the fact that large evidence has been made available to show the huge potential of medicinal plants in various traditional systems (Bora *et al.,* 2011)

Symplocos racemosa or Lodhra is a common indigenous drug, mentioned in Ayurvedic classics as a remedy for various human ailments. In Sanskrit "Lodhra" means 'Propitious'& 'Tilaka', since the bark of the tree was used in making the Tilaka mark on the forehead (De Silva et al., 1979). Lodhra is even mentioned to as "DIVYA AUSHADHI" (Divine herb). Symplocos racemosa is a critically endangered medicinal plant attaining a height up to 10 m.Bark: Bark is smooth or rough, grey or in

young parts yellowish. Leaf: Leaves are simple, alternate, lanceolate-oblong, oblong, elliptic or elliptic-lanceolate, margin serrate, crenate, serrulate or entire, apex acute to acuminate or obtuse at both ends, surface glabrous or slightly pilose on the midrib.

General information:

Sanskrit Names: Lodhra, Tilva, Tiritaka, Kramuka, Shavara, Pattika, Galanasthula valkala, Jeerna patra, Brhatpatra, Patti, Lakshaprasadana.**English Name:** Lodh bark tree.**Hindi Name:** Lodha, Bodhra.**Gujrathi** - Lodhai; Lodal:**Kannada-** Lodhra, Balalodduginamara, Pachettu.**Malayalam-** Pachotti. **Marathi-** Lodhra, Lodh.

Ayurvedic Properties:

Rogaghnata- Shotha, Vrana, Netrabhishyanda, Karnasrava, Atisara, Raktatisara, Pravahika, Yakridvikara, Raktavikara, Raktapitta, Kasa, Garbhashayashotha, Pradara, Atyartava, Garbhasrava, Charmaroga, Jwara, Visha

Fig.1: *Symplocos racemosa* plant

Uses of *Symplocos Racemosa* Roxb. :

Bark of plant contains three principal alkaloids, viz. loturine, loturidine and colloturine. Decoction of the bark is used as a gargle for bleeding gums. The drug is useful in digestive disorders, eye diseases and ulcer. ***It is also used in plasters and applied on wounds for promoting maturation of wounds***. Its bark is cooling, light and is useful in treating dropsy, Elephantiasis, bowel complaints, eye diseases, ulcers, menorrhagia, and leucorrhoea. The astringent properties of the bark are used in treating diarrhea, dysentery, liver complaints, dropsy, excessive bleeding during menstruation and other uterine disorders. It is also used in the treatment of various eye-related disorders such as conjunctivitis, etc. Much attention has been given to *S. racemosa* due to its anti-fibrinolytic activity and inhibitory activity against snake-venom and certain phenolic compounds. It also acts as a potential candidate for the therapy of arthritis.

Plant derived drugs have been a part of the evolution of human, healthcare for thousands of years. Plant based drugs were commonly used in India and China (Perumal et al., 2008). Today a substantial number of drugs are developed from plants which are active against a number of diseases (Fabricant *et al.*, 2001). The majority of these involve the isolation of the active ingredient (chemical compound) found in a particular medicinal plant and its subsequent modification (Priya *et al.*, 2002). One of the survey conducted by the WHO reports that more than 80% of the world's population still depends upon the traditional medicines for various diseases (Steenkamp *et al.*, 2004). In the developed countries 25 percent of the medical drugs are based on plants and their derivatives and the use of medicinal plants is well known among the indigenous people in rural areas of many developing countries (Principe, 1991).

Wound and wound healing:

A wound may be defined as a break in the epithelial integrity of the skin or may also be defined as a loss or breaking of cellular and anatomic or functional continuity of living tissue (Ramzi *et al.*, 1994). According to the Wound Healing Society, wounds are physical injuries that result in an opening or 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 (Strodtbeck F, 2001). Current estimates indicate the worldwide nearly 6 million people suffer from chronic wounds (Kumar *et al.*, 2007). 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 (Roberts *et al.*, 1998). Chronic wounds may even lead to multiple organ failure of death of the patients (Meenakshi *et al.*, 2006).

Classification of wounds:

Wounds are classified as open and closed wound on the underlying cause of wound creation and acute and chronic wounds on the basis of physiology of wound healing.

a) Open wounds:

In this case blood escapes the body and bleeding is clearly visible. It is further classified as: Incised wound, Laceration or tear wound, Abrasions or superficial wounds, Puncture wounds, Penetration wounds and gunshot wounds (Schultz GS, 1999).

b) Closed wounds:

In closed wounds blood escapes the circulatory system but remains in the body. It includes Contusion or bruises, hematomas or blood tumor, Crush injury etc.

c) Acute wounds:

Acute wound is a tissue injury that normally precedes through an orderly and timely reparative process that result in sustained restoration of anatomic and functional integrity. Acute wounds are usually caused by cuts or surgical incisions and complete the wound healing process within the expected time frame (Lazarus *et al.*, 1998).

d) Chronic wounds:

Chronic wounds are wounds that have failed to progress through the normal stages of healing and therefore enter a state of pathologic inflammation chronic wounds either require a prolonged time to heal or recur frequently (Menke *et al.*, 2007). Local infection, hypoxia, trauma, foreign bodies and systemic problems such as diabetes mellitus, malnutrition, immunodeficiency or medications are the most frequent causes of chronic wounds (Krishnan P, 2006).

Mechanism of Wound Healing:

The response to injury, either surgically or traumatically induced, is immediate and the damaged tissue or wound then passes through three phases in order to affect a final repair:

- The inflammatory phase
- The fibroplastic phase
- The remodeling phase

The inflammatory phase prepares the area for healing and immobilizes the wound by causing it to swell and become painful, so that movement becomes restricted. The fibroplastic phase rebuilds the structure, and then the remodeling phase provides the final form.

The Inflammatory phase:

The inflammatory phase starts immediately after the injury that usually last between 24 and 48 hrs. and may persist for up to 2 weeks in some cases The inflammatory phase launches the haemostatic mechanisms to immediately stop blood loss from the wound site. This phase is characterized by vasoconstriction and platelet aggregation to induce blood clotting and subsequently vasodilatation and phagocytosis to produce inflammation at the wound site (Li *et al.*, 2007).

The fibroplastic phase:

The second phase of wound healing is the fibroplastic phase that lasts up to 2 days to 3 weeks after the inflammatory phase. This phase comprises of three steps viz., granulation, contraction and epithelialization. In the

granulation step fibroblasts form a bed of collagen and new capillaries are produced. Fibroblast produces a variety of substances essential for wound repair including glycosaminoglycan's and collagen. Under the step of contraction wound edges pull together to reduces the defects in the third step epithelial tissues are formed over the wound site (Stadelmalmann *et al.,* 1998).

The Remodeling phase:

The remodeling phase last for 3 weeks to 2 years. New collagen is formed in this phase. Tissue tensile strength is increased due to intermolecular cross-linking of collagen via vitamin-C dependent hydroxylation. The scar flattens and scar tissues become 80% as strong as the original (Madden *et al.,* 1968) (Prockop *et al.,* 1979). The wound healing activities of plants have since been explored in folklore. 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 the natural way. Extensive research has been carried out in the area of wound healing management through medicinal plants. Herbal medicines in wound management involve disinfection, debridement and providing a moist environment to encourage the establishment of the suitable environment for natural healing process (Purna *et al.*,2000).

Symplocos racemosa in wound healing:

A thorough review of research works and Ayurvedic texts have shown that different drugs, used as a single or in combination have been tested for wound healing characteristics (Sharma , 1999).*Symplocos racemosa* or Lodhra have been tested with other combined drug forms for healing the wounds and it was found to be effective in animal models. The formulation was prepared as follows 10gms each of aqueous extract of dried leaves of *Ficus lacor, Rubia cordifolia, Pterocarpus marsupium, Jasminum grandiflora,* ***Symplocos racemosa****, Ficus bengalensis, Ficus glomerat, Albizzia lebbeck* and dried roots of 12.5gms of *Curcuma longa* was mixed 60ml *Sesamum indicum* oil, 10 ml *Azadirachta indica* oil, 20ml *Cocus nucifera* oil and 10ml *Pongamia pinnata* oil.

Animals were then grouped and treated as follows:

Group I: Control, Group II: Framycetin Skin Cream, Group III: Vedic Heal Wound area was measured by tracing the wound on a millimeter scale graph paper. Percentage of wound healing was calculated as original wound size as for each animal of the group on predetermined days i.e, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22 days post-wounding. Falling of scar was taken as end point of complete epithelization and the days required for this was taken as period of epithelization.

Results showed that, in excision wound model both Vedic Heal and Framycetin Skin Cream produced a significant decrease in period of epithelization when compared to control and also showed significant decrease in wound contraction as compared to control. In the incision wound model, both Vedic Heal and Framycetin Skin Cream produced a significant increase in the breaking strength of the wound when compared with the control group.The animals were assigned into five groups (n=6). Group I was untreated group which was taken as control. Group II animals were treated with Povidone iodine ointment (0.2%) and Group III animals were treated with Cream base. Groups IV and V animals were treated with test formulations I and II respectively. Test results showed that the formulations of herbal oil into an emulsion based system proved to be stable and non-irritant. Formulation that contained 20% oil extract exhibited remarkable wound contraction proving its efficacy as a topical formulation beneficial in minor skin conditions. Haldar Pranob *et al.,* 2013 performed a study of Darvyaadi Ghrita with reference to wound healing effect. For the

preparation of Darvyaadi Ghrita, 9 drugs were used, namely: Daruharidra (*Berberis aristata* DC.), Yastimadhu (*Glycyrrhiza glabra* Linn.), Lodhra (***Symplocos racemosa*** Roxb.), Nagakesara (*Mesua ferrea* Linn.), Patola (*Tricosanthes dioica* Roxb.), Haritaki (*Terminalia chebula* Retz.), Vibhitaki (*Terminalia bellerica* Roxb.), Aamlaki (*Emblica officinalis* Gaertn.) and Go-Ghrita (Cow's Milk Fat). The Davyaadi Ghrita was prepared according to classical procedure as per text Sarangadhara Samhita.

24 albino rats were selected and grouped into 4 of 6 animals in each group. In excision wound, percentage contraction of the wound and period of epithelialization was studied. In incision wound, tensile strength or breaking strength of the wound was studied.Study showed that Darvyaadi ghrita possess superior wound healing properties than the control group.Sathish HS *et al.*, 2013 studied the wound healing activity of Jati Kalpa Ghrita in albino rats.A total of 30 adult and healthy male and female rats of 12-16 weeks old age were selected. This formulation was evaluated for wound healing activity in excision wound model. Parameters like percentage of wound contraction and days taken for complete healing were studied. The results showed percentage of wound contraction of trial drug was highly significant when compared to control group. The days taken for epithelization was also less when compared to other groups.

Formulation of the Problem:

According to the Ayurveda, Vrana (wounds or ulcers) is the discontinuation of lining membrane that after healing leaves a scar for life, closely resembling the modern definition. The study was formulated by collecting the literature reviews and studying the Ayurvedic texts. Plants used in Ayurveda have various properties that can cure many diseases that modern day medicines lack. This will lead to more dependency on Ayurveda than to modern medicines in future

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