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Review Article

WOUND HEALING POTENTIAL OF GUMS & OLEO-GUM-RESINS: A BRIEF REVIEW

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ABSTRACT

Wound care is a sequential and progressive approach, either in surgically or traumatic injury. Healing process might be delayed or failed; if proper care is not taken. Though many sources are available to manage wound, application of oleo-gum-resins results in early wound contraction and wound strengthening because of their wound healing, antibacterial, anti-inflammatory properties. Oleo-gum-resin are usually derived from the plants growing in dry and arid regions. In Pharmaceutical, and Food industries, these are used as emulsifier, thickener, binding and coating agent. In Ayurveda, *Niryasa* (exudates) is used in wound care as *Dhoopana karma* (fumigation) in condition of profuse discharge, and in painful condition of wound. In this review, various available oleo-gum-resins like *Boswellia serrata* Roxb., *Shorea robusta* Gaertn. *Cochlospermum religiosum* Linn.,*Copaifera langsdorffii* Desf., *Dracaena cochinchinensis* (Lour.) S.C, *Pistacia atlantica* Desf. etc**.** were evaluated for their wound healing activity. They are scientifically proven in experimental animals by accelerating the healing phases via collagen synthesis and wound contraction.

KEYWORDS: Oleo-Gum-Resin, *Niryasa*, Wound Healing, Wound, *Dhoopana karma*.

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INTRODUCTION:

Gum, resins are natural products that play a significant role in human health in relation to the prevention and treatment of inflammatory conditions. Gum resins containing essential oils are more used for therapeutic purposes and incense. Gum and resins are metabolic by-product of plant tissue that as a result of natural exudation or injury to bark of certain plants. Oleo-Gum-resins contain trace of essential oils. They are usually derived from the plants growing in dry and arid regions. Some of the commonly used oleo-resins are *Commiphora myrrha* Nees., *Boswellia serrata* Roxb and *Commiphora wightii* (Arn.) Bhandari (Giri SK *et al.*, 2008) were used in food, medicine and or protective coating.

In the reference to wound, presence of foreign bodies, tissue maceration, ischemia, infection, malnutrition, diabetes, and renal disease are associated factors that results in impaired wound healing. Reduction in tissue growth factors, imbalance between proteolytic enzymes and their inhibitors, and the presence of senescent cells are responsible in delayed or improper healing chronic wounds (Harding KG *et al.*, 2002). Wound contraction and tensile strength is essential to retain the healthy scar.

In Ayurveda, *Niryasa* (exudates*)* is used in wound care as *Dhoopana karma* (fumigation) as a part to reduce microbial load. Acharya *Sushruta* mentioned that *Vata Dosha* predominant, Painful and profusely discharging wound should be treated with *Dhoopana karma* (Shastri A. 2007). Use of *Niryasa* will help in controlling infection, promoting wound contraction resulting in proper healing.

In this review, an attempt has been made for reviewing the wound healing potentials of available Gums & Oleo-gum-resins. For this purpose, various available Gums & oleo-gum-resins like *Boswellia serrata* Roxb., *Shorea robusta* Gaertn. *Cochlospermum religiosum* Linn.,*Copaifera langsdorffii* Desf., *Dracaena cochinchinensis* (Lour.) S.C, *Pistacia atlantica* Desf. etc**.** were evaluated for their wound healing activity.

MATERIAL AND METHODS:

In food, paper industries Gum, resins are commonly used as emulsifier, thickener, stabilizer, and as binding agent in pharmaceutical industries. The following species like *Acacia arabica* Willd., *Acacia catechu* Willd., *Anogeissus latifolia* Wall, *Boswellia serrata* Roxb. *Butea monosperma, Commiphora* mukul, *Daemenorops draco* Blume., *Dracaena cochinchinensis, Eucalyptus glubulus* Labill., *Garcinia morella* Desr., *Moringa oliefera, Picea abies, Pistacia atlantica, Pterocarpus marsupium* Roxb, *Shorea robusta* Gaertn., *Sterculia urens* Roxb., *Styrax benzoin* Dryand., *Vateria indica* Linn., *Salmalia malabarica* Schott., and *Cochlospermum religiosum* etc. are source of either Gum, resin, or oleo-gum-resin. Only few are reported either experimentally or clinically for their wound healing activity. Published wound healing studies on oleo-gum-resin were evaluated from available sources like literatures, and open access journals and from indexing portals like Google scholar, Pubmed, DHARA, AYUSHPORTAL etc..

WOUND HEALING ACTIVITY OF GUMS AND OLEO-GUM-RESINS

1. *Astragalus gummifer* Labill.

Gum Tragacanth, obtained from species of *Astragalus,* is an exudate of branches and roots. It is found in the mountain regions of the Middle East (Gentry HS. *et al.*, 1957). It is used as in food, pharmaceutical, and industrial products because of hydrophilic and colloidal properties. Gum Tragacanth is complex mixture of polysaccharides, and L-rhamnose.

In an experimental study of wound healing activity of Gum Tragacanth proves agent as accelerates skin wound healing. In this study Tragacanth gel 5% (w/v), prepared by dissolving powdered tragacanth gum extracted from *Astragalus Gummifer,* was evaluated. The extent of wound healing was evaluated by planimetric analysis on multiple occasions during the 10-day study period. On the 7th day of

the study, the percent of wound closure was significantly higher in gum tragacanth-treated specimens compared to the control samples. The results of this study showed acceleration of skin wound contraction and healing (Ehsan Fayazzadeh *et al.,* 2014).

2. *Boswellia serrata* Roxb.

Gum resin (Salai guggal) of *Boswellia serrata* is mainly extracted by tapping the stem. This is traditionally used in India to treat various types of blood disorders, inflammatory health ailments, pain and cardiac debility (Paranjpe P, 2001). Its major constituents, boswellic acids have anti-inflammatory, anti-cancerous and anti-ulcerous activities. Clinical trials with *Boswellia serrata*'s gum resin extracts indicated its non-toxic nature (Arieh *et al.,* 2010).

An experimental study of alcoholic extract *Boswellia serrata* oleo-gum-resin was reported as wound healing activity on excision model. In this study a cream was formulated by using 5%, 10%, and 15% extracts respectively. Result obtained from 15 % w/w showed greatest wound contraction. It suggest that this formulation influences on the various phases of wound healing like fibroplasias, collagen synthesis, decreasing the surface area and increasing the tensile strength resulting in faster healing (Mallik A. *et al.,* 2010).

3. *Cochlospermum religiosum* Linn.

Katira Gum is obtained from *Cochlospermum religiosum* Linn. It is a pale and semi-transparent plant exudate, which swells into a pasty transparent mass upon contact with water. It consists of d-galactose, d-galacturonic acid and l-rhamnose. Traditionally, Katira gum has been used externally for dressing burns (Ojha AK *et al.,* 2008)

An experimental study on burn wound was conducted by topical application of katira gum Gel. This gel was formulated by adding water. Study was compared with 1% Silver sulfadiazine gel. In this study author concluded that *Katira gum* Gel produced soothing effect during application. Alone katira gum gel produced significant result in burn wound contraction. The combination of Katira gum gel and silver sulfadiazine gel was found more effective than either Katira gum gel or silver sulfadiazine gel alone. Author summarized that combined use on burn wound enhanced the rate of wound contraction and epithelisation (Priti *et al.,* 2013).

4. *Copaifera langsdorffii* Desf.

Copaiba belongs to Caesalpinioideae family, is a large tree. Its exudates as oleoresin is used especially in Brazil. The oleoresin is rich in diterpenes and sesquiterpenes.

An experimental study of wound healing activity of Copaiba oleoresin on rabbits' ears was reoprted. In this study Excision wounds were taken. Created wounds assigned in five groups, were topically treated respectively with saline, control cream ,10% and 25% copaiba cream, and pure oleoresin over 21 days, and assessed on 2, 7, 14 and 21 days post-wounding by wound healing rates and histology. Author reported that all wounds were re-epithelialized except treated with pure oleoresin. Treated group with 10% copaiba cream showed higher activity as compared to the other groups which was assumed as progressive increasing of organized collagen fibers. Also reported that a group treated with pure oleoresin were developed new lesions on 2nd day, due to inflammatory reactions and delay on re-epithelisation. Finally concluded that oleoresin enhances wound contraction in excisional wounds (Masson-Meyers DS *et al.,* 2013).

Another experimental studied conducted in rats also shows wound healing potency of oleoresin (Brito *et al.,*1998; Paiva *et al.,* 2002).

5. *Dracaena cochinchinensis* (Lour.) S.C

Red resin named *Resina Draconis,* belonging to the Liliaceae, is obtained from tree stem of *Dracaena cochinchinensis* (Lour.) S.C. Chen, growing in Yunnan and Guangxi provinces in China. In Chinese medicine, *Resina Draconis* is a major component of the well-known haemostatic preparation (Huihui Liu *et al.,* 2013). Resin constitutes flavonoids, triterpenoids, steroids, cardiac glycosides, anthraquinones, carbohydrates, saponins, and saponins.

In an experimental study of wound healing activity of ethanolic extract of *Resina Draconis* proved as wound contraction and better skin-breaking strength. In this study 5% extract in ointment base was evaluated in excision and incision wound models. Author evaluate in excisional wound that ethanolic extract significantly stimulated the contraction of wounds and decreased time to epithelialization. In incision wound, ethanolic extract showed greater tensile strength of treated wounds. In Histological analysis revealed significantly increased the fibroblast growth, collagen synthesis, and the healing process (Huihui Liu *et al.,* 2013).

6. *Picea abies* Linn.

Picea abies is a coniferous tree. Resin is an exudate obtained from it. Salves is a formulation which is being used to treat wound and skin ailments. Topical application of Salve treats complicated surgical wound in a pilot clinical trial successfully. During trial no allergic reactions were obtained (Arno Sipponen *et al.*, 2012).

7. *Pistacia atlantica* Desf.

Pistacia atlantica is a deciduous tree of Eurasia. Resin is used in medicinal purpose. Resin extract contains *alpha*-Pinene, *beta*-pinene, *trans*-verbenol, sabinene, and *trans*-pinocarveol. Wound healing efficacy of resin of *Pistacia atlantica* on burn wound was reported in an experimental study. In this study an ointment prepares from resin extract in different concentrations 5%, 10%, and 20% respectively were topically implicated for a period of 14 days. Author concluded that all concentrations revealed no significant difference in wound size, and rate of contraction but significant in capillary count analysis. *Pistacia atlantica* resin is useful for burn wound healing (Haghdoost F. *et al.*, 2013)

8. *Shorea robusta* Gaertn.

Shorea robusta is widely distributed in India, Nepal and Bhutan. The oleo-resin of the aerial parts has been reported in indigenous systems of medicine as it is also used as an ingredient of ointments to heal wounds, burns, pains, skin diseases and to control diarrhoea and dysentery (Saraswathy *et al.,* 1992; Pullaiah and Rani, 1999; Upadhyay *et al.,* 1998; Misra *et al.*1997). An experimental study of *Shorea robusta* oleoresin results faster healing in wound models. In this study wound healing activity of different extracts of oleoresin respectively essential oil, methanol extract, and triterpene-rich petroleum ether, benzene insoluble methanol were experimented as topical application in the form of ointment on excision and incision wound models of rats. Author concluded in study that all above mention fractions exhibited significant wound-healing activity in the incision wound model. In the excision wound model, all extracts of *S. robusta* oleoresin resulted in faster rate of epithelisation and faster wound contraction sequentially petroleum ether, benzene insoluble methanol extract followed by essential oil and methanol extract (M. Yaseen Khan *et al.,* 2016).

Another study also reported as wound-healing activity of 70% alcohol extract of *S. robusta* resin in albino rats and demonstrate that this extract accelerates wound contraction, increases tensile strength (Wani *et al.,* 2012).

DISCUSSION:

Oleo-gum-resins are natural substances which are known to be responsible for faster wound healing. This phenomena may be possible due to earlier collagen depositions and sequential progressing of healing phases. Topical application of formulations prepared from Gum, resins, oleo-gum-resins are responsible for early collagen tissue formation wound contraction and wound strengthening which is essential for the management of non-healing wound. For that purpose in Ayurveda classics, and wound contraction which is needed in non-healing wound management. For the purpose of wound strengthening, Acharya *Sushruta* also mentioned *Shallaki* (*Boswellia serrata*) fruit powder to use topically to increase wound strength after suturing of surgical wound. This may be due the presence of oleo-resin in Shallaki fruit.

In most of the pharmacological studies cited above, the extract were used as a basis to evaluate the wound healing activity. Extracts were topically applied in a form of either cream, or ointment in fixed concentration for certain time duration. Experimental studies are helpful to determine the drug toxicity & safety on topical application. But the limitation of these studies is that, all these studies were conducted on animals and the same effect needs to be evaluated & validated by clinical trials on human subjects to give a strong scientific footing to their efficacies.

CONCLUSION:

The extract of oleo-gum-resin in cream or ointment formulation (fixed concentration) is easy to apply on wound surface. On the basis of experimental studies, it can be concluded that Clinical trials may give positive results in wound healing and strengthening activity of gums & oleo-gum-resins.

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