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ROLE OF PHYTOCHEMICAL SCREENING OF GUGGULU TO SUBSTANTIATE ITS VRANAHARA (WOUND HEALING) ACTION

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ABSTRACT

Introduction:*All medicinal plants are a rich source of various bioactive chemical constituents. Phytochemical analysis of these plants has a major role in determining the pharmacological action. Some of the main phytochemicals that medicinal plants contain includes alkaloids, polyphenols, steroids, etc. Guggulu, oleo gum resin of the plant Commiphorawightii, is an extensively using Ayurvedic drug, owing to its varied therapeutic effects like anti-inflammatory,anti-obesity,anti-arthritic,wound healing etc. One of its major pharmacological action is vranaharatvam, which can be correlated to wound healing property.*

Aim:*This paper attempts to substantiate this activity with the help of phytochemical evaluation and Ayurvedicperspective.*

Materials and Methods:*Guggulu was collected from its natural habitat and preliminary phytochemical screening including qualitative analysis of metabolites,High performance thin layer chromatography,Atomicabsorbtion Spectroscopy was performed.*

Results:*Phytochemical analysis revealed the presence of tannins,flavonoids,alkaloids,iron,sugars and steroids like guggulsterone E & Z. All the phytochemicals has established and proven effects on wound healing. Karma of Guggulu as per Ayurvedic literatures indicates that Guggulu is beneficial as vranashodhana-ropana-sandhana. This was suggestive of its vranaharaviz wound healing property as revealed through extensive literature surveys done for the study.*

Conclusion:*The present study unveils the vranaharaviz wound healing action of Guggulu by Phytochemical analysis and Ayurvedic pharmacology. It was recognized that a drug's pharmacological actions can be interpreted from the phytochemical analysis.*

Keywords*: Phytochemical analysis, Guggulu, wound healing or vranahara action*

INTRODUCTION

Plants have been a chief source of medicines from thousands of years. According to the latest report of WHO, more than 80% people are completely relying on the herbal medicines. These medicinal plants are a good source of chemically diverse phytoconstituents. The phytochemical investigations of medicinal plants have shown up the diversified useful chemical entities like alkaloids,steroids,flavonoids,saponins,etc. These have significant

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pharmacological actions in human body like anti-inflammatory, analgesics, antioxidants, antimicrobial etc.. The biological function of phytochemicals are shown in Table 1. In the present study role of phytochemicals in wound healing w.s.rGuggulu is being discussed

Table 1. Functions of different phytochemicals

Group of Compounds	Pharmacological action	Biological function
Flavanoids	Anti oxidant Anti inflammatory Anti microbial	• Increase production of collagen. • Anti angiogenesis • Increase epithelialisation • Stimulates fibroblast activity • Anti cancer
Tannins		• Haemostatic • Wound contraction • Dries up secretion
Steroids		• Collagenation of granulation tissue • Increase tensile strenghth of the fibres
Alkaloids		• Stimulates migration of fibroblasts • Stimulates production of leucocytes from bone marrow and Modulates inflammatory phase
Phenols		• Detoxifying agent • Inhibitor of tumourogenesis
Saponins		• Haemolytic • Reduces inflammation

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Wound Healing Mechanism

Wounds are the result of damages or injuries that disturb the normal structure of body tissue. It can be found anywhere in the body both internally and externally. Externally wounds are mainly found in the skin, the largest organ of the body. Healing of wound is a very complex process and occurs naturally.. Wound healing mechanism encompasses of 4 major phases namely Haemostasis,Inflammation,Proliferation and Remodelling.Each phase comprises of several sub events.(Table 2)

Table 2. Normal wound healing process

Phase	Cellular and bio physiologic events
Haemostasis	**1. Vascular constriction**
	2. Platelet aggregation
	3. Fibrin formation
Inflammation	**1. Vasodilation**
	2. Monocyte infiltration and differentiation to macrophages
Proliferation	**1. Fibroplasia**
	2. Re epitheliasation
	3. Angiogenesis
	4. Collagen synthesis

	5. ECM formation
	6. Wound contraction
Remodelling	**1. Collagen remodelling**
	2. Vascular regression(Anti angiogenesis)

Concept of vrana as per Ayurveda

In Ayurveda, concept of wound is coming under the term Vrana. Vrana is defined as the destruction,break or discontinuity of the body tissue. The stages of vrana are Vranasopha(inflammation), vrana(wound) and vranavastu(scar formation). Another classification of vrana are Dushtavrana (Unhealthy/infected wound),Suddhavrana(clean wound),ruhyamanavrana(healing wound) and roodhavrana(healed wound). In aim of wound care, ayurvedic classics mentioned many herbs for vranashodhana,ropana and sandhana.

Guggulu as Vranahara

Guggulu.Oleogum resin of the plant Commiphorawightii(fig 1), is a renowned drug in Ayurveda with various pharmacological actions.Guggulu has katu-tikta-kashaya-madhurarasa,ushnavirya and katuvipaka. Guna of Guggulu are laghu,sara,snigdha,tikshna,snigdhha and picchila.Karma of GugguluincludesTridoshaharatwa,rasayana,sandhanakrit,lekhana,etc.It is indicated in various clinical conditions like Sotha,anavata,granthi,vrana etc. Guggulu has been mentioned in various classical texts as dhoopana and pana in the treatment of vrana. In folklore tradition, there is a practice of external application of paste Guggulu in wounds. It is stated in AshtangaHridaya,thatGuggulu is the best medicine for vrana. Substantiation of Vranaharaviz Wound healing activity of Guggulu is a less explored area in terms of modern and Ayurvedic perspective.

Fig.1 

AIMS AND OBJECTIVES

- To perform the preliminary phytochemical evaluation of Guggulu.
- To substantiate the wound healing activity of Guggulu with the help of phytochemical evaluation.
- To substantiate the wound healing activity of Guggulu with the help Ayurvedic perspective.

MATERIALS AND METHODS

1. **Literature Review**
   A systematic and thorough literature survey about actions of Phytochemicals in wound healing activity and Ayurvedic pharmacology of Guggulu was done.
2. **Sample Collection**
   Guggulu was collected from its natural habitat and was authenticated by the Botanist, Pharmacognosy Unit, Poojappura, Thiruvananthapuram
3. **Study Setting**
   Drug Standardisation Unit,Govt.AyurvedaCollege,Thiruvananthapuram

4. Preliminary Phytochemical Analysis

4.1 Qualitative Analysis.

The methanolic extract of Guggulu was prepared and analysed for the presence of phenols,tannins,alkaloids,saponins and flavonoids as per the standard procedures mentioned in API

4.2 Quantitative Analysis

Quantitative analysis of the following were performed as per the standard procedures mentioned in API

i. Total sugar content
ii. Volatile oil content
iii. pH value
iv. Iron content by Atomic absorbtion spectroscopy
v. Estimation of guggulsterone E &Z by High Performance Thin Layer Chromatography

RESULTS

The results obtained from the Preliminary phytochemical evaluation are as follows.

1. Qualitative Analysis

Steroid	**Phenol**	**Saponin**	**Alkaloids**	**Flavanoids**	**Tannins**
Present	Absent	Absent	Present	Present	Present

2. Quantitative Analysis

pH Value	5.52 at 36^0c
Total Sugar Content(%)	20
Volatile Oil Content(%)	2.8
Iron Value(mg/g of drug)	0.42
Gugulsterone E(%w/w)	15
Guggulsterone Z(%w/w)	26

DISCUSSION

The study revealed the presence of various phytochemicals such as tannins,flavonoids,alkaloids,steroids,Iron,Volatile oil and Sugars in Guggulu. These phytochemicals play a major role in the wound healing mechanism.All these phytochemicals have anti oxidant, anti inflammatory and antimicrobial actions. Each phytochemicals has specific action on wound healing process. Tannins are one of the important phytoconstituents responsible for wound healing mainly due to their Astringent,Haemostatic,
Antiinflammatory,Antioxidant and Antimicrobial activity.Astringent are group of substances that cause the contraction or shrinkage of tissues that dry up secretions. Alkaloids help to increase the migration of fibroblasts to the wounded area.Studies have shown flavonoids helps in the stimulation of fibroblast activity ,production of collagen and fibronectinand in anti angiogenesis. Due to the anti angiogenic action, it is beneficial in the last stage of wound healing and prevents the formation of hypertrophic scar. Alkaloids modulate the inflammatory phase and helps in increasing the migration of wounded area. Steroids helps to increase the tensile strength of the wound base.Major steroids present in Guggulu are Guggulsterone E&Z, which are the principle chemical compound responsible for the pharmacological actions of Guggulu. They are antagonist of FXR activity and are capable of inhibiting scarring and also promote wound contraction. Studies reported that Guggulsterone Z is more potent than Guggulsterone E.

Sugar content of Guggulu act as an energy source for fastening the healing process.They provide energy for leucocytes and macrophages, stimulates fibroblast growth and also stimulates the production of collagen. Iron is required for collagen metabolism. It also induce pro inflammatory macrophages.Volatile Oil present in the Guggulu act as an potent anti microbial agent.

Wound infection by microbes is a common reason for impaired wound healing. So for proper care of wound,it is also essential to decrease the microbial burden. SeveralInvitro studies revealed the antimicrobial activity of Guggulu especially against Streptococcus aureus which is the main pathogen associated with wound infection. Acidic nature (pH-5.52) of Guggulu prevents colonization and bacterial growth in tissues

Ayurvedic Perspective of vranahara karma of Guggulu

Gugguluis believed to pacify 3 vitiated doshas – Vata,Pitta and Kapha. Inflammation(sopha) gets reduced by by pacified vata and pitta and enhance the wound healing. Katu. Katu rasa pacifies kapha and cures sopha and act as a abrasive to hypergranulationinwounds.Tikta rasa pacifies pitta and kapha causes drying up of kleda(slimy slough). Kashaya rasa pacifies pitta and kapha and purifies blood and helps in ropana and brings down kleda(slimy slough). Lekhana property helps in desloughing and preparing the wound for healing.Tikshnaguna and Ushnavirya contributes to krimihara property which helps to reduce infection in the wound. Sukshmaguna of Guggulu helps to penetrates to minute channels and promotes Vranaropana.Thus, revealed that Guggulu has excellent properties to heal the wound by virtue of its sodhaneeya,ropaneeya and sandhaniya properties.

CONCLUSION

The present study unveils the vranaharaviz wound healing action of Guggulu by Phytochemical analysis and Ayurvedic pharmacology. While focusing wound care, ayurvedic dugs should have vranashodhana-ropana-sandhana properties. Phytochemical analysis revealed the presence of various compounds like flavonoids,tannins,alkaloids,steroids,iron and sugar content. These phytochemicals play a major role in improving wound healing mechanism.Thesephytoconstituents with antioxidant,anti-inflammatory amd antimicrobial activities were found to promote wound healing. Hence, it can be concluded that, a drug's pharmacological actions can be interpreted from the phytochemical analysis.

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