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Evaluation of Wound Healing Activity of Ethanolic Leaf Extract of *Sesbania grandiflora*.

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ABSTRACT

The present study was aimed at investigating the wound healing effect of methanolic extract of *Sesbania grandiflora* using excision wound model. *Sesbania grandiflora* Linn belonging to family *Leguminosae* is well known medicinal plant in various region of India. Leaf extract used in various conditions like cancer, night blindness and in treatment of ulcer, hepatoprotective, anti convulsive, antioxidant activity. Present study is concern mainly with evaluation of wound healing activity of ethanolic extract of leaves in rabbits using excision wound model in the form of ointment using concentrations (2 and 4 % w/w ointment) of leaf extract in simple ointment base. Both concentration of ethanolic extract showed significant response in the wound type tested when compared with control group. Nitrofurazone ointment (0.2%w/w) was used as standard drug.

Keywords: Wound healing, *Sesbania grandiflora*, ethanolic extract, Nitrofurazone.

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INTRODUCTION

Wound is defined as the disruption of the anatomic and cellular continuity of tissue caused by chemical, physical, thermal, microbial, or immunological injury to the tissue. Wound healing is a complex and dynamic process of restoring cellular structures and tissue layers. Wound healing involves various steps like coagulation, formation of granulation tissue, coagulation and acquisition of wound strength. Generally the human adult wound healing process can be divided into 3 distinct phases: the inflammatory phase, the proliferative phase, and the remodeling phase [1].

Wound healing is a mechanism which is utmost important in daily life as we get encountered to many injuries and wounds. Many biological dressings and indigenous medicines have been reported to possess wound healing properties [2]. Various treatment options (analgesics, antibiotics, and non steroidal anti-inflammatory drugs) are available for the wound management but majorities of these therapies produce numerous unwanted side effects [3]. In recent years, several studies have been carried out on herbal drugs to explicate their potential in wound management and these natural remedies proved their effectiveness as an alternative treatment to available synthetic drugs for the treatment of wound [4]. Many medicinal herbs are pharmacologically reported possessing wound healing activity. The present reported that *Sesbania grandiflora* has significant wound healing activity.

The history of medicine is as that old as human civilization. Nature is provided a complete storehouse of remedies to cure all ailments of mankind [5]. Indian medicinal plants also provide a rich source for medicinal values that are known to prevent/delay different diseased states. *Sesbania grandiflora* is one among them shows various pharmacological activities. *Sesbania grandiflora* Linn belonging to family *Leguminosae* found in various regions of India, Srilanka and South East Asia. Its leaf used in night blindness and in treatment of ulcer, flower used as antiseptic, antioxidant, emollient, astringent, and in relieving pain in folkloric medicinal use[6]. The literature survey revealed that no scientific study on wound healing activity of leaf extract of this plant has been reported. Their fore objective of present study was to evaluate wound healing activity of *Sesbania grandiflora* Linn leaf extract against excision wound model in rabbits.

MATERIALS AND METHODS

Plant material collection

Sesbania grandiflora leaves were collected from ponnur local area in Guntur district of Andhra Pradesh, India.

Preparation of extract

The leaves were dried and pulverized. 100 g of the powdered sample was extracted with ethanol in a Soxhlet apparatus. The ethanolic extract was filtered and the filtrate was evaporated in *vacuo*.

Preparation of drug formulation

Different concentrations of extract were prepared, viz 2%(w/w) ointment, where 2g extract was incorporated in 100g simple ointment base and 4%(w/w) ointment where 4g of extract was incorporated in 100g simple ointment base [7]. Nitrofurazone ointment [8] (0.2%w/w) was used as standard for comparing wound healing potential of extract in excision wound model.

Experimental animals

Healthy rabbits of either sex weighing (1.5-2kgs) were used for present study. The experimental protocol was approved by the Institutional Animal Ethics Committee (IAEC) of Chalapathi Institute of Pharmaceutical Sciences, Guntur, Andhra Pradesh (Approval No.: 05/IAEC/CIPS/2016-17; dt 05/04/2016) and care of the animals was taken as per guidelines of the Committee for the Purpose of Control and Supervision of Experiments on Animals (CPCSEA), Ministry of Forests, Environment and Climate Change, Government of India.

Wound healing activity

Wound healing activity was done by using excision wound model [1].

The animals were divided into four groups of four animals each.

- Group-I was considered as control (treated with simple ointment base B.P).
- Group-II was considered as reference standard and treated with 0.2% w/w Nitrofurazone ointment.
- Group-III was considered as Test – 1, treated with 2% w/w ethanolic extract ointment of leaf extract, and
- Group-IV was considered as Test-2, treated with 4% w/w ethanolic extract ointment of leaf extract.

The animal fur was removed by epilator and a circular wound about 1.5 cm diameter was made on depilated dorsal thoracic region of animal under light ether anesthesia.

The observation of percentage wound closer was made on 4th, 8th, 12th and 16th post wounding days. Number of days required for falling the scar without any residual raw wound gave the period of epithelization. The ointment of leaf extract, reference standard and simple ointment (control) was applied to wound twice daily, until recovery to respective group of animals.

Statistical analysis

The values are expressed as mean SEM. The data were analyzed by ANOVA followed by Tukey's test and P values <0.05 and <0.0001 were consider as significant.

RESULTS

In excision model *Sesbania grandiflora* 4% w/w treated groups showed a significant (P<0.0001) increase in wound healing activity when compared to control. But the low dose 2% w/w showed less significant (P<0.05) reduction in period of epithelialization. For 2% and 4% extract wound contractions were 81.6 % & 97.6% by 16th day as well as period of epithelialization were obtained by 20.5 & 16.7 days. The standard Nitrofurazone treated animals showed a significant (P<0.001) increase in wound contraction (96.0%) and decrease in period of epithelialization (17.0 days) when compared to control.

Table 1: Wound healing activity of ethanolic extract ointment of *Sesbania grandiflora* Linn leaves in rabbits by Excision model

Treatment	Wound contraction (%)				Period of epithelization in days
	4 th day	8 th day	12 th day	16 th day	
Group I - Simple ointment base (Control)	16.0±1.58	25.8±2.70	44.8±3.59	58.4±4.20	24.7±1.28
Group II - Nitrofurazone 0.2%	33.6±2.94	53.2±4.24	72.8±4.38	96.0±2.84	17.0 ±1.05***
Group III Ethanolic extract (2% w/w)	22.8±2.95	42.8±3.27	61.0±2.50	81.6±4.47	20.5±0.745*
Group IV Ethanolic extract (4% w/w)	34.0±1.67	57.6±1.91	75.4±2.03	97.6±1.60	16.7±0.55****

Values were mean ± SEM, n=4, *P<0.05, ***P<0.001, ****P<0.0001 vs control (one way ANOVA followed by Tukey's test).

Fig. 1: Photographical representation of wound contraction rate on different days in *Sesbania grandiflora* treatment group.



A) Day 0



B) Day 4



C) Day 8



D) Day 12



E) Day 16

DISCUSSION

Wound healing is a complex and dynamic process of restoring cellular structures and tissue layers. Wound healing involves various steps like coagulation, formation of granulation tissue, coagulation and acquisition of wound strength. Collagen is a major protein of extracellular matrix and is major component that mainly contribute to wound strength. Tannins and several other phytochemicals promote wound healing through several cellular mechanisms. Tannins promote wound healing through several cellular mechanisms. The present study was evaluated the wound healing activity of *Sesbania grandiflora* Linn leaf extract against excision wound model in rabbits. Chelating reactive radical reactive species of oxygen, promoting contraction of wound and increasing formation of capillary vessel and fibroblast is the major action of this plant.

CONCLUSION

The results obtained in the present study clearly indicate that the ethanolic leaf extract of *Sesbania grandiflora* having significant wound healing activity in rabbits. The results supported the traditional use of this plant in some painful and wound healing conditions.



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