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"Excision model wound healing activity of *Crossoprizalyoni* spider web ointment"

Nayan R Maheshwari, Vidya H. Makode, Namrata G. Mahajan and Manojkumar Z Chopda

Department of Zoology, Moolji Jaitha College, Jalgaon, M.S. 425001

Corresponding author: nrmaheshwari@gmail.com,mzczoo@gmail.com

Abstract

In the traditional system of India and different countries of world spider web is being used as wound healer. The ointment of common home spider with concentration of 2.5 and 5% w/wwas prepared for the wound healing activity in excision wound model in rats. There was significant reductionin the wounded area of excision wound was observed for both the concentration when compared to control, Placebo and standard ointmenttreatments. The period of epithelization for spider web treatments was lower than the standard ointment and significant when compared with control ointment treated animals. Both the concentrationof *Crossoprizalyoni* spider web ointment (2.5% and 5% w/w) exhibited similar wound healing activity. The wound healing activity of *Crossoprizalyoni* spider web is may be due to the presence of proteins init. This study gives a scientific base to the traditional use spider web as wound healer.

Keywords: *Crossoprizalyoni*, excision wound model

Introduction

India has great diversity of spiders. 1685 species from 438 genera and 60 families of spiders are found in India (Keswani, S. et al 2012). Out of these seven families of spider produces silk. Spider silk is used in material sciences as well in life sciences for varies purposes. Spider silk is one of the most versatile materials in nature with great strength and flexibility. Spider silk has been used in a wide range of applications including the agricultural as Spider silk reduces plant damage by insect pests (Edwards et al., 1976, Sunderland et al., 1986, Jeyaparvathi

et al., 2013) act as Biodegradable Carrier (Vasconcelos, A. et al, 2008). Bandages and surgical threads (Heimer, 1988), making artificial tendon or ligaments supports for weak blood vessels. (http://www.chm.bris.ac.uk/motm/spider/). Spider silk also shows Regenerative potential of silk conduits in repair of peripheral nerve injury (Allmeling, Jokuszies et al., 2006, Foelix, 1996) and pharmacological activites like inflammatory and wound healing activity (PreetiKumari et al., 2013), An Antibacterial Activity (Mohamed et al., 2012),An Antimicrobial Activity (Heimer,1988, Borders, 2001 ,Chakraborty, 2009, Wright and Goodacre, 2012) also mixture of spider dust with different medicinal plant can cure various types of diseases. Spider silk is also useful in drug delivery and releas (Lammel et al., 2010,Numata et al., 2012) and Human bone marrow stromal cell and ligament fibroblast responses on RGD (Rat Genome Database)-modified silk fibers. (Bini et al., 2006).spider silk is an innovative material in a biocompatible (Gellynck et al., 2008, Vollrath et al., 2002, Gellynck et al., 2008).

But no reference for use of spider web for healing wound except PreetiKumari et al but no specification is found about type of spider web used in their study.

So the main objective of the present study is to determine the wound healing potential of Crossoprizalyoni a common home spider's web.

Material and method

Current study is based on common home spider (*Crossoprizalyoni*) web.Spider web was collected from the inside roofing of houses and separated from spider and other insects. A weighed quantity (2.5 and 5 gm, respectively) of spider web was triturated with DMSO where most of the web dissolved.

Preparation of ointment

The DMSO dissolved spider web was suitably suspended in hot ointment base containing white soft paraffin (85%) and liquid paraffin (15%) to make a uniformly suspended ointment.

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Fig. 1 Common Home Spider *Crossoprizalyoni*

Classification of *Crossoprizalyoni*

Kingdom: Animalia (Animals)

Phylum: Arthropoda (Arthropods)

Subphylum: Chelicerata (Chelicerates)

Class: Arachnida (Arachnids)

Order: Araneae (Spiders)

Infraorder: Araneomorphae (True Spiders)

Family: Pholcidae (Cellar Spiders)

Genus:*Crossopriza*

Species:*lyoni*(*Crossoprizalyoni*)

Source:http://bugguide.net/node/view/70018

Excision wound model in rat

The experimental animals were divided into 5 groups of six animals (either sex) in each group, these are as under-

Group 1: Normal healing control (without any treatment)

Group 2: Ointment control (Base + DMSO treatment)

Group-3: 1% w/w Framycetinesulphate, consider as the standard group.

Group 4: Spider web ointment (2.5% w/w)

Group 5: Spider web ointment (5% w/w)

The animals were depilated on the vertebral area prior to creation of wounds and a predetermined area of 12-16 mm^2 skin in its full thickness was excised under ether anesthesia. Groups 2 to 5 were treated with respective test material, once daily for 16 days. Wounds were left undressed to the open environment and the animals were kept individually in separate cage. All these experiments were performed according to the international rules.

Measurement of wound area

The progressive changes in wound area were measured in mm^2 by tracing the wound boundaries around it on a transparent polythene paper each day with an interval of four days, that

is, on 4th, 8th, 12th and16th day. The polythene paper is placed on the graph paper and traced it. Effective area was measured. Wound contraction was expressed as percentage reduction of original wound size. Changes in wound area were calculated, giving an indication of the rate of wound contraction.

Healed area calculated by subtracting from the original wound area.

$$\text{Per cent of wound contraction} = \frac{\text{Healed area}}{\text{Total wound area}} \text{ X } 100$$

Number of days required for falling of eschar without any residual raw wound gave the period of epithelization.

Statistical Analysis

The data are expressed as mean ± SD using analysis of variance (one way ANOVA) followed by Dunnett's t-test and Bonferroni's Multiple Comparison Test by using GraphPadsoftaware. Significance is calculated by compairing test versus control. The value of $p<0.05$ were considered significant. The percentage of wound contraction was calculated as a percentage of the corresponding 0 days (first day original) wound area in mm^2.

Result and Discussion

In excision wound repair model, the results of wound contraction and epithelization period after topical application of the spider web ointment are reported in Table 1. A significant reduction in the wound area was observed by the spider web ointment treatment at 2.5 and 5% w/w concentrations from 4, 8, 12 and 16 post wounding days when compared to normal healing and ointment control groups. The standard framycetineSulphate ointment (1% w/w) treatment was found to be less effective compared to the spider web treatment. The observed period of epithelization in Spider web ointment is less as compare with standard Normal and Placebo. So we can predict that this formulation can be used as wound healing if active components are isolated.

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Although healing is a physiological process which does not normally require much help, but still wounds cause discomfort and are susceptible to infection and other complications. Therefore, use of agents expediting healing is indicated. Further, some disorders such as diabetes, immunocompromised conditions, ischemia and conditions like malnourishment, ageing, local infections and local tissue damage due to burn or gun-shot leads to delay in healing or incomplete wound healing is resulted in severe complications. Such conditions specially require the use of agents which can facilitate healing.

Wound healing process consists of different phases as granulation, collagenation, collagen maturation and scar maturation which are concurrent but independent to each other. In the present study, two models were used to assess the effect of spider web on wound healing based on its traditional use.

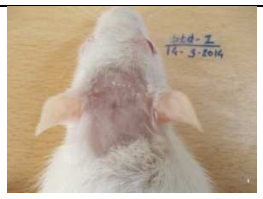
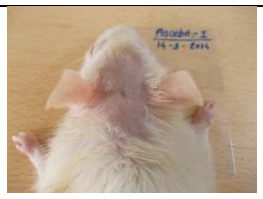
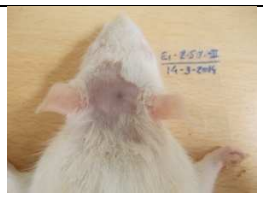
	Control	Standard	Placebo	E-I (S.W.O. 2.5%)	E-II (S.W.O. 5%)
O day					
12th day					

Fig. 2 Progress of wound healing on 0th and 12th day

Table 1 Day wise statistical analysis of Excision wound

	Control	Standard	Placebo	E-I (S.W.O. 2.5%)	E-II (S.W.O. 5%)
0 day	16.17 ± 0.6009	15 ± 0.5164 ^{ns}	15.17 ± 0.3073 ^{ns}	16.17 ± 0.4773 ^{ns}	15.5 ± 0.4282 ^{ns}
4th day	13.83 ± 0.9804	11.67 ± 0.6667^{ns}	6.333 ± 0.6667^{B}	9.667 ± 0.6146^{C}	9.5 ± 1.232^{C}
8th day	8.333 ± 0.8433	6.333 ± 0.8433^{ns}	1.167 ± 0.1667^{A}	4.667 ± 0.7149^{C}	3.333 ± 0.6667^{B}
12th day	1.167 ± 0.1667	1 ± 0^{ns}	0.5 ± 0.2236^{D}	1 ± 0^{ns}	0.5 ± 0.2236 ^{D}

ns= Not significant, A= P value < 0.0001, B= P value < 0.001, C= P value < 0.01, D = P value < 0.1

In excision wound, animals treated with 2.5 and 5% w/w spider web ointments exhibited significant increase in the rate of wound contraction and period of epithelization. It is known that collagen not only confers strength and integrity to the tissue matrix, but it also plays an important role in homeostasis and epithelization at a later phase of wound healing.

Hence, enhanced collagen synthesis by the spider web in rats may contribute significantly to healing and also provide necessary strength to repair the tissue(s).

Conclusion

In conclusion, the wound healing properties of spider web significant increase in wound contraction rate.The wound healing action may probably be due to the proteins present in the spider web.The present study provides a proof of the traditional use of spider web in India and other countries.There is a need for further studies to identify the active ingredients of spider web and to elucidate its mode of action.

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