Evaluation of wound healing effects between *Salvadora persica* ointment and Solcoseryl jelly in animal model

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Abstract: In this research study very first time a herbal ointment contain 10% *Salvadora persica* extract was compared with Solcosseryl jelly 10% and blank Vaseline to evaluate wound healing effects using excision wound healing model in animals. Three groups of rats (n-6) were experimentally wounded on the back of their neck. Group I was dressed with Vaseline containing 10% test drug, Group II was treated with thin layer of Solcoseryl jelly 10% as reference drug while Group III was dressed with thin layer of blank Vaseline as control group. The effect of vehicle on rate of wound healing were assessed and in all cases there were progressive decreased in wound area with time but wound dress with Vaseline containing *S. persica* extract and wound treated with Solcosseryl jelly significantly healed earlier than those treated with Vaseline. It is concluded that *S. persica* extract significantly enhance the acceleration rate of wound enclosure in rats.

Keywords: *S. persica* extract, Socosseryl jelly, vaseline, wound healing, rats.

INTRODUCTION

Wounds and healing are two important events/factors in animals and human life. A wound can be defined as the disruption of living tissue integrity. The healing process is the survival mechanism and represents an attempt to maintain normal anatomical structure and function (Nayeem *et al.,* 2009). The aim of treating a wound is to promote wound healing in short period required with minimal pain discomfort to the patient. Several medicinal plants are reported as wound healer because they promote the repairing mechanism in natural way (Chitra *et al.,* 2009). *Salvadora persica* belongs to family Salvadoracea (Marwat *et al.,* 2008). Several pharmacological properties have been reported for this plant (Monforte *et al.,* 2002; Khatak *et al.,* 2010; Sulaiman *et al.,* 2006, Ahmad *et al.,* 2011) but no wound healing. In this study wound healing activity of *S. persica* was reported prior to us.

MATERIAL AND METHODS

Plant material

The plant material *S. persica,* twigs were purchased from local market and identified by the plant taxonomist. Voucher specimen was deposited in the herbarium of Department of Pharmacognosy, University of Karachi (specimen number: SP-06-9102006). Each plant sample was cut into small pieces and then finally grinded to make powder. The extract was prepared by mixing 2kg plant powder and 8L ethanol in dry screw caped bottles for 6 weeks then filtered and ethanol was evaporated under reduce pressure in a rotary evaporator.

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Chemical and drugs

The chemicals used for this study includes analytical grade of ethanol, Vaseline (Petroleum jelly brand), Lignocaine HCl 2% (Barrett Hadgson) and Solcoseryl jelly (ICN Switzerland AG).

Formulation

The ointment of *S. persica* extract was prepared by mixing with Vaseline in a concentration of 10% (w/w).

Animal selection

Before proceeding to study animals i.e. eighteen albino male rats (180-200g) reared at animal house of PCSIR Labs Complex Karachi, were selected and grouped accordingly. The animals were divided into three groups of six rats each. All these were individually housed in plastic cages with sliding perforated stainless steel covers under strict observation for the period of two weeks before the start of experiment with allowing free access to normal food and water. Any animal showing laziness, sluggish movements or any sign of illness was replaced by healthy animals.

Wound healing activity

A circular wound of about 150mm^2 was made on depilated dorsal thoracic region of rats according to reported method (Mahmood *et al.,* 2005). The areas of wounds were measured immediately by aid of placing vernier caliper and this was taken as initial wound area reading and treatments with the ointment started immediately after wound creation. Group I was dressed with Vaseline containing 10% test drug, Group II was treated with thin layer of Solcoseryl jelly 10% as reference drug while Group III was dressed with thin

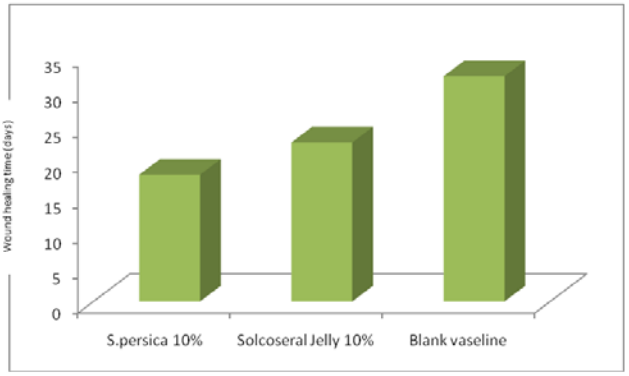
layer of blank Vaseline as control. All samples were applied once daily until the complete healing of wound and the observations was made every 4th day of post wounding day. The wound contraction was calculated as percentage reduction in wound area with respect to initial wound area while the epithelization time was noted as the number of days after wound required for scar to fall off leaving no raw wound behind.

STATISTICAL ANALYSIS

Results were expressed as Mean ± S.M.E. The data were analyzed by student *t*-test and $p<0.05$ was considered significant.

RESULTS

In excision wound model closure of wound area was calculated on every 4th post-wounding days. The significant promotion in the wound-healing activity was observed in the test group animals treated with *S. persica* ointment that showed faster wound epithelialization than the animals of standard and control groups (table 1). Wound treated with 10% *S. persica* extract possesses better healing as completely wound healed within 18±2.19 days, where as wound treated by application of Solcoseryl jelly in standard group demonstrated similar effects on 22.6±2.06. But control group that received the application of blank Vaseline only did not reveal significant activity and the period of epithelialization was 32±2.44 days (fig. 1).



Graph 1: showing wound healing time (days) of test, standard and control groups

DISCUSSION

Wound healing is a process in which injured/damaged tissues are repaired by definable process to bring its normal state. The possible process of wound healing involves acute inflammatory process, regeneration of parenchymal cells, migration and proliferation of both parenchymal and connective tissue cells, synthesis of extra cellular matrix, protein remodeling of parenchymal and connective tissue and acquisition of wound strength (Minakshi and Sushma, 2006). Beside all these the bioactive compounds of plants like alkaloids, flavonoids, tannins, and phenolic compounds also play a major role in wound healing (Minakshi and Sushma, 2006; Wipke-Tevis, 1998; Zaheer *et al.,* 2012). The observations of this current study exhibited that *S. persica* possesses wound healing properties. There is more fast decrease in the wound area on the application of *S. persica* ointment (test group) as compared to animals treated with Solcoseryl jelly (standard group) and animals treated by application of blank Vaseline (control group) (table 1, fig. 1).

Fig. 1: Showing excision wound on beck of neck of albino rats on 1st day

The decrease in time of post wounded days and increase in epithelialization rate of wounds treated with *S. persica* ointment may be due to some possible reasons. Previously we reported haemostatic activities of *S. persica* (Ahmad *et al.,* 2011). Haemostasis plays a vital role in wound healing as it arrest the bleeding from damaged blood vessel, initiation of tissue repair and prevents tissue death through haemorrhage (Attama *et al.,* 2011). Furthermore, wound-healing activity of *S. persica* may be enhance due to certain phytochemicls that are responsible for wound healing activity and also present in *S. persica* (Ahmed *et al.,* 2008; Rajesh *et al.,* 2009). The constituents like flavonoids, saponin, sterol and tannins enhance wound healing process mainly due to their astringent, antimicrobial and anti-inflammatory activities that promotes wound construction by increasing the rate of epithelialization and promote wound healing in shortest period of time (fig. 1) (James and Friday, 2010; Nayeem *et al.,* 2009; Okoli *et al.,* 2007).

S. persica also possesses significant antioxidant activity (Mariod *et al.,* 2009) and antioxidants are reported to play significant role in wound healing process. The topical application of compounds with antioxidant properties on patients or animals to significantly improve wound healing and protect tissue from oxidative damage is also reported, therefore this is the another possible reason of

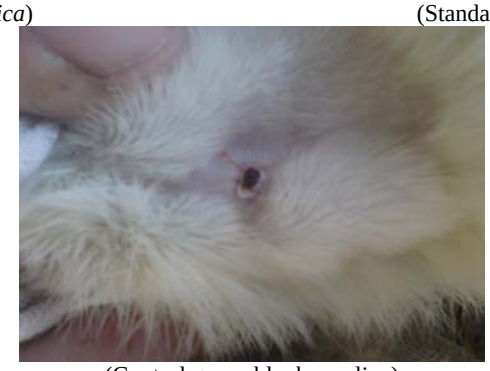
Table 1: Showing wound healing effects of *S. persica* extract on Albino male rat

Animal Groups	% of wound healing (original wound area =150 mm2								Healing time (days)
	4th day	8th day	12th day	16th day	20th day	24th day	28th day	32nd day	
Group-III S. persica	108.3 ±24.1	71± 22.3	22.3± 13***	3.66± 4.9***	100%	100	100	100	18±2.19
Group-V (standard) Solcoseral Jelly	70.83± 19.4***	56.66 ±26.8*	15.83± 5.45***	5.33± 3.5***	1.5± 1.76***	100	100	100	22.6±2.06
Group-IV (control)	120.66 ±13.8	89.33 ±12.5	66.8± 14.6	47.3± 11.9	28.1± 11.73	14.5 ±7.5	3.8± 4.5	0.8± 1.3	32±2.44

Values are Mean ± S.E.M. n=6, $p < 0.05$

(Test drug *S.persica*)

(Standard drug Solcoseral Jelly)



(Control group blank vessline)

Fig. 2: Showing healing of excision wound of beck of neck of albino male rats after 16th day in test, standard and control groups.

increase wound healing effect of test drug as compare to other groups (Mahmood *et al.*, 2005; Abdulla *et al.*, 2009). Another important factor in wound healing process is the synergistic effects of certain mineral salts like copper, Manganese, Zinc etc. The detailed chemical analysis of *S. persica* exhibited the presence of these and other elements like Vitamin C, Ni, Mn, Co, Fe, Hg, Cd, Ce, V, Ti and Mo. *S. persica* also contain essential and non essential amino acids e.g. Arginine Leucine, Proline, Glutamine etc (Khatak *et al.*, 2010). It is also interesting to note that these elements someway or others help in wound healing process by providing stimulation, exhibiting anti-inflammation, preventing/ blocking the production of histamine, enhancing cell division, strengthening the cell membrane and antioxidation process (Bassetti and Sala, 2000). Therefore *S. persica* exhibit fast wound healing properties as compared to control and standard groups. Along with other pharmacological properties of *S. persica* its wound healing property can also be utilized as a suitable dressing agent for wounds.

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