

Comparative Efficacy of Acacia Honey and *Aloe Vera* Gel on Healing of Induced Lacerated Wound in Rabbits

Arsalan Khan^{a*}, Khurram Ashfaq^b, Jalal ud Din^b, Amjad Ali^a, Ambrina Tariq^b,
Sheeraz Ghani^a, Najeeb Ullah^c, Yasir Sulaman^b, Muhammad Farooq Ahmad^b

^{a,d,f}Livestock & Dairy Development (Research), Khyber Pakhtunkhwa, Peshawar-25000-Pakistan

^{b,c,e,h,i}Department of Clinical Medicine & Surgery, University of Agriculture, Faisalabad-38040-Pakistan

^gLivestock & Dairy Development (Extension), Khyber Pakhtunkhwa, Peshawar-25000-Pakistan

^aEmail: drarsalankhandvm@gmail.com

Abstract

Wound is an injury as a result of trauma and break in the integrity of skin. For restoration of the continuity of skin, the disrupted skin and anatomical continuity should be managed appropriately for normal and efficient wound healing. Therefore, the study was designed to analyze the comparative efficacy of Acacia honey and *Aloe vera* gel on lacerated wound induced in rabbits. For this purpose, a total of 18 healthy male rabbits were selected and divided randomly into three groups i.e. Group A, B and C. Lacerated wounds were induced in these rabbits aseptically by sharp blunt scissor, post anesthetization with ketamine hydrochloride @40mg/kg body weight. Rabbits of group A were treated with commercially available Acacia honey applied topically twice daily, group B rabbits were treated with *Aloe vera* gel topically twice daily while group C served as control and treated with standard treatment pyodine. The efficacy of the treatments was evaluated in terms of wound contraction, wound healing, and tensile strength. Wound contraction was found higher in group A and B compared to group C and increased at day 10. Significant tensile strength was recorded in honey treated group. Healing time of group A and B was lower and statistically significant than the control.

Keywords: Acacia honey; *Aloe vera*; lacerated wound; tensile strength; wound healing.

1. Introduction

Wound is the break and discontinuation in the integrity of the skin and soft tissues as a result of any trauma and any physical, thermal and chemical injury.

* Corresponding author.

For restoration of the continuity of the skin integrity, appropriate management is essential to recover the anatomical and physiological status of the skin [1]. Wound healing is a complicated process including series of intercalated circumstances mediated through a number of phases of cellular and chemically coordinated processes along with hormonal influences [2]. Wound healing has four stages including coagulating, inflammatory, proliferative and remodeling phase, which determine the strength and healing of the tissue [3, 4]

Natural products including herbals and medicinal plants have been frequently used in the treatment of various diseases worldwide, for centuries [5]. Above 80% of the population throughout the world is still dependent upon these traditional medicines for cure of their maladies. Among these products, honey and *Aloe vera* have significance in wound healing [6].

Honey has known antimicrobial activity due to acidic pH, generating hydrogen peroxide and low water activity [7]. Due to its high osmolarity, it draws the fluids into the wound resulting in the formation of viscous solution that acts as a defensive barrier against the infections [8]. It provides optimal fibroblast activity, activates angiogenesis thus increasing the nutrient and oxygen flow to the site, hastens epithelialization, enhances collagen synthesis and improves tensile strength [9].

Aloe vera contains enzymes such as bradykinase, carboxypeptidase which have analgesic and anti-inflammatory effects. In *Aloe vera* some polysaccharides, notably pectic acid or glucomannans are found to have wound healing properties, immuno-stimulatory, antimicrobial and antioxidant activities therefore, it is widely used for therapeutic purposes [10, 11].

2. Materials and Methods

1. **Experimental animals:** A total of 18 healthy male rabbits were selected in this study and were randomly divided into three groups (A, B and C). All the rabbits were maintained on a uniform feeding.

2. **Preparation of the operative site:** Hairs were removed from the operating site with the help of razor and antiseptic solution was applied to the site. The animals were anesthetized with ketamine hydrochloride @40 mg/kg body weight.

3. **Treatment protocols:** Wounds were introduced with the help of sharp blunt scissor. Rabbits of group A were treated topically with commercially available Acacia honey twice a day. Group B were treated topically with *Aloe vera* gel twice a day. After applying the treatments, the wound area was covered with sterilized cotton bandages to protect the wounds from environment contamination. Rabbits of group C served as control group and were treated with pyodine.

4. **Evaluation criteria**

2.1 Wound contraction rate %

Wound contraction was expressed as a reduction in percentage of the original wound size. Measurement of the dimensions of wound was carried out with the help of Vernier caliper 34 on day 5, 10, 15, 20 and was compared with the area of respective wound on day zero. The percent contraction was then calculated using the following formula [12].

$$\text{Contraction \%} = 100 - \frac{(\text{Area of wound on that day})}{\text{Area of wound at day 0}} \times 100$$

Area of wound at day 0

2.2 Tensile strength

Tensile strength of healed wound tissue of different treatment groups were measured by using a tensiometer. After complete healing, animals were slaughtered (six rats in each group). Dorsal skin was excised at the deep fascia and put immediately in normal saline to prevent drying. Then, a narrow strip (8 cm in length and 1 cm in width) was attached to tensiometer holders. The tissue stress (maximum force tensile leading to skin rupture) was evaluated [13].

2.3 Healing time

The time between wound creation and the day that each wound healed were evaluated and compared with other treatment groups [14].

3. Results and Discussion

1. **Wound contraction rate %:** Wound contraction rate was higher in both groups A and B compared to the group C (control group). Increased wound contraction was observed on day 10. Wound contraction of groups A and B was completed at day 20. Our results coincide with a study in which significant increase in wound contraction was found by the treatment of wound using both Acacia honey and Aloe vera gel, compared to the control group [15]. Similar results were obtained by Ali and his colleagues (2011) in which it was observed that honey significantly promoted wound contraction.
2. **Tensile strength:** An increased tensile strength was observed in the honey treated group (group A) and significant as compared to the control group. Group B was higher value of tensile strength and significant than the control group. A study revealed that honey treated group had significantly higher mean tensile strength than the other groups [12]. It was also reported that honey accelerate the wound healing as well as tensile strength [13].
3. **Healing time:** Healing time of group A and B was lower and statistically significant as compared to the control group (group C). Group B was significant as compared to the group C. Animals in Group A healed faster as compared to the other groups. It was reported that the honey treated groups healed much faster than the control group [14]. In a study, observed that the wounds treated with acacia honey healed faster than the Aloe vera gel and control group [15]. A research work also demonstrated that honey treated wounds healed quicker [16].

4. Conclusion

The study revealed that wounds treated with honey healed promptly compared to the other treatments. The hyper tonicity and acidic pH of the honey are considered to be the main factors responsible for accelerating the healing of wounds. Honey may accelerate the wound healing by enhancing glycolytic enzyme activities and

delivering enough energy for cellular restoration. Contraction rate and tensile strength of the wounds was higher in the rabbits treated with honey. Therefore, honey can be regarded as economical, easily available, safe, and potent topical agent in treatment of wounds.

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Figure 3.1: Lacerated wounds induced by sharp blunt scissor in rabbit.



Figure 3.2: Lacerated wound after Acacia honey and *Aloe vera* application at day 10



Figure 3.3: Lacerated wound after Acacia honey and *Aloe vera* application at day 20