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THE BENEFICIAL WOUND-HEALING ACTIVITY OF *ALOE VERA* WITH β -GLUCAN IN WISTER ALBINO RATS

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ABSTRACT

Physical limitations are frequently caused by wounds. Wound healing is the orderly evolution of a sequence of events that restore the damaged tissues integrity. Constipation, colitis, asthma, irritable bowel syndrome, diabetes, peptic ulcer, inflammation, heartburn, stress, and other ailments are treated using *Aloe vera* leaves pulp from *Aloe arborescens* species. Experimental evaluation of β -glucans with *Aloe vera* leaves pulp on wound healing activity via topical route on an excision wound model was carried out in this work. On an excision wound model, *Aloe vera* leaves pulp with β -glucans was discovered to have a better and faster wound healing effect than *Aloe vera* alone.

KEYWORDS

Excision wound model, *Aloe vera*, Wound healing activity and β -glucans.

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INTRODUCTION

Physical limitations are frequently caused by wounds. Healing is a survival process that aims to keep anatomical structure and junctions as normal as possible¹. Wound healing is slowed by immunosuppressants, cytotoxins, and nonsteroidal anti-inflammatory medications. Wound healing management is a time-consuming and costly process². Damaged tissue (wound) restoration is an important process that is critical to live survival. It is on the verge of becoming the foundation for all surgical manipulations³. Many plants have been

shown to have considerable wound-healing capabilities in a variety of situations.

The rate of wound healing can be accelerated by using plants that have antiseptic, astringent, anti-inflammatory, and antibacterial properties⁴. By delivering numerous important compounds required at various stages of wound healing, such a plant can speed up tissue recovery. Plants are less expensive and safer than allopathic pharmaceuticals, thus they may be valuable in veterinary practise, particularly in India, where they are plentiful⁵. Its pulp is used to treat constipation, colitis, asthma, irritable bowel syndrome, diabetes, peptic ulcer, inflammation, heartburn, and stress, among other ailments⁶⁻⁸.

The activation of immunological and cutaneous cells by β -glucan molecules promotes moist wound healing and repair. Homeostasis, re-epithelization, granulation, tissue creation, and extracellular matrix remodelling are all part of the wound healing process⁹. As a result, a multi-modal therapeutic method may help the wound heal faster. The current study aims to examine the wound healing activity of β -glucan with *Aloe vera* leaves pulp based on the above source of information.

MATERIAL AND METHODS

Collection and Extraction of Plant Material:

Aloe vera mature leaves were acquired fresh from a local nursery garden. Fresh mature leaves were cleansed with distil water from the outside to remove dirt and foreign impurities if any were present. With the help of a sanitised knife, the rind was removed. The colourless pulp was ground in a blender, and the resulting pulp, was placed in an airtight container and stored in a cool, dry location. Later, this pulp was employed for phytochemical research and pharmacological testing.

Preliminary Phytochemical Analysis

The extract was subjected to a preliminary phytochemical screening, which revealed the presence of aloin, alkaloids, steroids, terpenoids, flavonoids, saponins, tannins, glycosides, carbohydrates, phytosterols, and proteins.

Animals

Adult albino rats (wistar strain) weighing 180-200g of either sex were used. They were housed in

polypropylene cages in a regulated room environment ($25^{\circ}\text{C}\pm 2^{\circ}\text{C}$) with a natural day-night cycle and ad libitum access to laboratory food and water.

Wound Healing Activity

The animals were divided into three groups, each with six animals. Before each dressing, all wounds in the control and test groups (β -glucan alone and with *Aloe vera*) were washed with sterilised normal saline solution and gently dried with sterile gauze. The control group was maintained untreated, the test group-1 (*Aloe vera*) was treated with *Aloe vera*, and the test group II was treated with β -glucans with *Aloe vera*. For 15 days, an excision wound model was used to measure wound healing activity using a topical route of administration.

Rats were anaesthetized with ether. On the dorsal thoracic region, 5cm away from the ears and 1cm away from the spinal column, a round wound (500mm² area) was created. Individual cages were utilised to house the animals. Starting on the day of the operation, the test and standard preparations were administered topically once a day until epithelialisation was complete. On the day of wounding, the wounds were traced on 1mm² graph paper, and then on the 4th, 8th, 12th, and 16th post wound days, and then daily until healing was complete. The percentage of wound contraction or wound closure, as well as the duration of epithelialisation were investigated¹⁰⁻¹³.

RESULTS AND DISCUSSION

Preliminary Studies

Table No.1 shows the results of preliminary phytochemical screening investigations for pulp of fresh mature *Aloe vera* leaves. Phytoconstituents such as Aloe emodin, arabinose, polysaccharides, gums, saponins, steroids, amino acids, and anthraquinones were found in the *Aloe vera* leaves pulp extract.

Pharmacological Screening

In living organisms, wound healing is a highly dynamic integrated sequence of cellular physiological and biochemical processes¹⁴. Traditional medicine is used by the majority of the world's population for health treatment. This is also

true when it comes to wound care. Many studies have suggested that herbal medications with antiseptic, antibacterial, antioxidant, and anti-inflammatory characteristics can aid wound healing. The excision wound model is used in this study to assess the wound healing activity of the pulp of fresh mature *Aloe vera* leaves used as a topical application.

Wound healing was measured by the rate of wound contraction in mm². There was no significant difference in wound healing between the three groups when the trial began on day 0. However, as demonstrated in Table No.2, the combination group's healing process was faster than the control group's after day 9. ANOVA and Dunnet's multiple comparison tests were used for statistical analysis. The results are shown as SEM or each group, with n=6 in each. At (p<0.01), a significant difference was found when compared to the control group. The results demonstrate that test group III has faster wound closure and wound contraction in the topical route, and the differences are significant (p<0.01) when compared to control.

The use of β-glucans for topical treatments is on the rise, thanks to their pluripotent qualities. During wound healing, the main target cells of β-glucans are macrophages, keratinocytes, and fibroblasts. β-glucans aid wound healing by promoting macrophage infiltration, which promotes tissue granulation, collagen deposition, and re-epithelialization. β-glucans wound dressings are a good wound healer because they are stable and resistant to wound proteases. However, these promising results point to the necessity for more research and clinical trials to determine the safety and efficacy of *Aloe vera* with β-glucan in humans.

Table No.1: The presence of phytoconstituents in pulp of fresh mature leaves of *Aloe vera*

S.No	Extract	Presence of Phytoconstituents
1	Pulp of leaves of <i>Aloe vera</i>	Amino acids, anthraquinones, lignins, Aloe emodin, arabinose, carbohydrates, gums, saponins, steroids,

Table No.2: Effect of topical administration of pulp of fresh mature leaves of *Aloe vera* and β-glucan on excision wound model

S.No	Comparative mean wound area of different groups (in mm ²)			
	Post wounding days	Group-I (control)	Group-II (<i>Aloe vera</i>)	Group III (<i>Aloe vera</i> and β-glucan)
1	0	234.65 ± 1.79	234.86 ± 1.94	239.96 ± 1.03
2	3	176.62 ± 1.96	143.86 ± 1.86	112.06 ± 1.45
3	6	133.04 ± 1.10	113.01 ± 1.74	45.11 ± 1.62
4	9	97.78 ± 1.07	64.58 ± 1.56	07.45 ± 0.43
5	12	57.58 ± 1.66	6.06 ± 1.56	0.00 ± 0.00
6	15	27.46 ± 1.22	0.00 ± 0.00	0.00 ± 0.00

N = 6, Values are expressed as mean ± SD

**P < 0.001 vs. control. Independent t-test

CONCLUSION

The current investigation found that *Aloe vera* with β -glucan possesses features that make it capable of stimulating wound healing activity faster than placebo controls. Further research into the topical treatment and management of wounds with *Aloe vera* and β -glucan is needed due to wound contraction and enhanced tensile strength.

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CONFLICT OF INTEREST

We declare that we have no conflict of interest.

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