Wound Healing Activity of Dioscorea bulbifera Linn

St.Peter’s Institute of Pharmaceutical Sciences, Vidya nagar, Hanamakonda, Warangal – 506001, Andra Pradesh, India.

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ABSTRACT

The tubers of Dioscorea bulbifera are used as a folk remedy to cure the wounds, leucoderma and boils. The present investigation was undertaken to verify the effect of the tubers of Dioscorea bulbifera on experimentally induced excision wound model in rats for period of 22 days. The studies of wound healing model reveals significant wound healing activity, high rate of wound contraction and decrease in the period for epithelisation of the extracts of tubers that are comparable with standard ointment.

Key words: Dioscorea bulbifera; wound healing; excision wound model; leucoderma

INTRODUCTION

Wound may be defined as a loss or breaking of cellular and anatomic or functional continuity of living tissue; the causative factors for wound may be physical, chemical thermal and electrical [1]. Wound healing is an important biological process involving tissue repair and regeneration. Wound healing process involved four stages namely inflammatory stage, debridement stage, proliferation stage and maturation/remodeling stage. When an injury occurs, the vascular integrity of the injured area is disrupted leading to extravasations of blood into the surrounding tissue or plasma when the damage is minor. The inflammatory stage is directed at preventing further loss of blood by platelet adhesion/accumulation at the site leading to coagulation those results in the formation of thrombus. The debridement stage occurs from the third to the sixth day after injury and involves the appearance of neutrophils to clear contaminating organisms. The proliferation or repair stage is characterized by endothelial budding in the nearby blood vessels forming new capillaries that penetrate and nourish the injured tissue. The maturation stage commences from the tenth day to several months depending on wound severity during which the number of capillaries decreases and wound changes from pink to white [2].

Management of under healing of wounds is a complicated and expensive program and research on drugs that increase wound healing is a developing area in modern biomedical sciences. Several drugs obtained from plant sources are known to increase the healing of different types of wounds. Though some of these plant drugs have been screened for evaluation of their wound healing activity, the potential of many of the traditional used herbal agents remains unexplored. In few cases active chemical constituents were identified [3].

Dioscorea bulbifera (the air potato) is a yam species. It is also known as Barahi kanda, Varahi, Karu kand, Kaachil and Dukkar kand. It is a perennial vine (3-50m) with broad leaves and two types of storage organs. The plant forms bulbils in the leaf axils of the twining stems, and tubers beneath the ground. These tubers are like small, oblong potatoes, and they are edible and cultivated as a food crop, especially in Africa, Asia. The tubers often have a bitter taste, which can be removed by boiling. They can then be prepared in the same way as other yams, potatoes, and sweet potatoes. The air potato is one of the most widely-consumed yam species [4, 5].

Air potato tuber is bitter, pungent, fattening tonic alternative, aphrodisiac, stomachic, anthelmintic and improve appetite; useful in ulcers, conjunctivitis, diarrhea, dysentery, leucoderma, dyspepsia, urinary discharges, jaundice, diabetes, asthma, bronchitis, piles, tumors, stranogay and vata biliousness [6, 7].

The tubers have been used as a folk remedy to cure the wounds, leucoderma and boils. But no scientifically validated study has been carried out to justify its potential in wound healing. In the present study we investigated the ethanol extract of Dioscorea bulbifera for its wound healing activity in excision wound model wister rats.

MATERIALS AND METHODS

Plant material

The tubers (aerial & ground) of Dioscorea bulbifera were collected from Nandgaon and Atgaon of Shapur Taluk of Maharashtra and authenticated by Dr. Jayaraman, Plant Anatomy Research Center (PARC), Sakthi Nagar, West Tambaram, Chennai. The collected tubers were shade dried and powdered to coarse consistency in grinder.

Extraction and preliminary phytochemical analysis

The dried coarse powder of tubers (aerial & ground) each 250 gms were subjected for ethanolic extraction using a soxhlet apparatus. The ethanolic extracts were concentrated and evaporated under vacuum pressure and finally kept in the desiccator. The yield of the aerial tuber extract and ground tuber extract were 13.8 % and 12.56 % respectively. Preliminary phytochemical analysis was conducted for extracts by different methods of phytochemical analysis.

Experimental animals

Male albino wistar rats weighing between 180-210gm were used. The animals were caged individually after wounding for treatment till completion of wound healing. In each group of different models six animals were used. The experimental protocol was approved by institutional animals ethics committee and animals were maintained under standard conditions approved by committee for the purpose of control and supervision on experiments on animals (CPCSEA).

Acute-toxicity studies

Healthy adult wistar albino rats of either sex, starved overnight, were divided into groups (n=6) and were orally fed with increased dose of ethanol extracts. Total ethanol extracts administered orally in doses of up to 2g/Kg, did not produce any sign of toxicity and mortality in rats when observed for 7 days after administration [8].

Wound healing activity studies

In the present study, excision wound model was employed to study the rate of wound contraction and epithelization.

Work Plan

Adult wistar albino rats of either sex, weighing between 180–210 gm were used for evaluation of wound healing activity, The animals were divided into four groups.

Group I: Received 2% sodium algenate
Group II: Received Nitrofurazone ointment (0.2%)
Group III: Received 3% Aerial tuber ethanolic extract ointment
Group IV: Received 5% Ground tuber ethanolic extract ointment

*Corresponding author.

T.Panduraju
St.Peter’s Institute of Pharmaceutical Sciences,
Vidya nagar, Hanamakonda,
Warangal – 506001,
Andra Pradesh, India.
Tel.: + 91-9849862776
E-mail:pandurajxs100@yahoo.co.in
The hairs were removed from the dorsal thoracic region of the rats using depilator and Anne French hair removing cream. A full thickness excision wound of circular area of 500mm² and 2mm in depth was created along the markings under mild anesthesia. Six animals each served as control and treated group; simple ointment and ointment containing the extracts were applied everyday topically from 0 to 22 day post wounding or till complete epithelization, starting from the day of excision. The areas of the wounds were measured by tracing the wounds on to a graph paper on the day of wounding and subsequently on 4th, 8th, 12th, 16th and 22nd day post wounding. The number of days required for falling of the scar without any residual raw wound, gave the period of epithelization. The observations of the percentage wound contraction were made on 4th, 8th, 12th, 16th and 22nd day post wounding days. All the values were statistically analyzed by unpaired student t test comparing with control [7, 10].

RESULTS AND DISCUSSION

Wound Healing activity study

In the acute oral toxicity studies, no mortality and no macroscopical vital organ abnormality/damage were observed. Acute toxicity studies showed that Dioscorea bulbifera tuber extracts was safe up to maximum dose of 2g/Kg body weight of the animal.

In an excision wound model, animals treated with ethanol extracts of tubers of Dioscorea bulbifera showed a significant decrease in epithelization period as evidenced by shorter period for fall of escher as compared to control. The changes in wound area were measured at fixed time intervals, viz 4th, 8th, 12th, 16th and 22nd days post wounding. Period of epithelization was 22nd days for the treatment groups, whereas it was 30 days for control group animals. The results of wound healing are presented in the Table.1.

In conclusion, the results of study showed that the ethanolic tuber extracts of Dioscorea bulbifera effectively stimulates wound contraction (excision wound) as compared to control group. These finding could justify the inclusion of this plant in the management of wound healing.

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