Reepithelialization and Wound Healing Effect of Aqueous Extract of Tetrapleura Tetraptera on Mature Rabbits

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ABSTRACT
Re-epithelialization and wound healing effect of aqueous extract of Tetrapleura tetraptera on extensive full thickness skin wound was studied in rabbits. The extract of Tetrapleura tetraptera was used in dressing cutaneous wounds. On day two, fibrin and fibronectin cross-linked together and formed a plug which trapped proteins and prevented further blood loss. Dressing of wound commenced on the second day when the bleeding had stopped. Granulation of tissue set in after initial inflammatory process had settled. In seven days fibrin and fibronectin plug peeled off exposing granulation tissue with new and younger epithelial cells growing into the wound surface from the surrounding edges. This occurred until the whole wound surface was covered with epithelial cells leaving no area of scar formation. Aqueous extract of Tetrapleura tetraptera enhances epithelialization of wound most probably due to its effect on mitotic process of the cells, collagen and melanin.

Keywords: Tetrapleura tetraptera, fibrin, fibronectin, granulation and epithelialization.

INTRODUCTION
Tetrapleura tetraptera commonly known as Aridan (fruit) in South Western Nigeria is a medicinal plant of the Mimosaceae family. The plant is locally known as Uyayak in Ibibio; Edeminang in Efik; Osakirisa or Oshosho in Igbo; Dawo in Hausa and Aidan in Yoruba (all in Nigeria) (1). The fruits consist of a freshly pulp with little, dark brown seeds. The fruit is used for the management of convulsions, leprosy, inflammation and rheumatism (2). The spice is a source of minerals such as calcium, phosphorous, potassium, zinc and iron, while the phytochemical screening revealed the presence of tannins, phenolic compounds, saponins, alkaloids, steroids and flavonoids (1).

Wound healing is a fundamental response to tissue injury that results in restoration of tissue integrity. It mainly depends on the repairing ability of the tissue type, extent of damage and general state of the health of the tissue (3). Wound healing represents a major health problem both in terms of morbidity and mortality, thus this work was aimed at determining the dose response wound healing effect of the aqueous fruit extract fraction of Tetrapleura tetraptera plant in rats.

MATERIALS AND METHODS
The dried fruits of Tetrapleura tetraptera were purchased from Uyo main market in Akwa Ibom State, Nigeria. The fruits were thoroughly washed, air-dried at room temperature and then chopped into smaller pieces with the aid of a crater. About 500 g was put into 1 litre of distilled water and boiled for about 30 min. The mixture was left to cool and then filtered. The resulting filtrate was put into clean bottle and labeled aqueous extract of Tetrapleura tetraptera.

ANIMALS
Rabbits weighing 20-25 kg were used in this study. They were kept in single cages and acclimatized to laboratory environment for more than 10 days. They were fed with standard rodent diet and water ad libitum. Approval for the use of animals in the study was obtained from the Animal Ethics
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Committee, faculty of pharmacy, University of Uyo, Akwa Ibom State and was in compliance with the guidelines established in the guide for care and use of laboratory animals in research.

FULL THICKNESS SKIN WOUND

The rabbit’s dorsal skin were cleaned with isopropyl alcohol and shaved. The rabbits were anaesthetized using diethyl ether. The choice of the site was to prevent the animal from licking the wounds. The skin was incised about 10 cm in diameter down to the level of subcutaneous tissue with sterile surgical blade. Bleeders were clamped and ligated with chronic 2-0 catgut suture materials. The wounds were all left open and the animals taken to their individual cages till the following day.

APPLICATION OF DRESSING

After the wounds had been exposed for more than 20 h, with fibrin and fibronectin cross-linking together to form plug that stoped the bleeding. Wound dressing was initiated using sterile guaze. The wounds were dressed daily during the first one week. Thereafter, the wounds were dressed on alternate days, by this time deposition of collagen as started. This was done until the wound was completely healed.

RESULTS AND DISCUSSION

The results of the effects of aqueous extract of Tetrapleura tetraptera used in dressing of extensive wounds infected with cutaneous incision have been extensively studied. Aqueous extract of Tetrapleura tetraptera used in dressing the wounds elicted profound healing and repairs based on the parameters used to assess incision wound repairs; fibrin fibronectin plug [scab] removal, extensive granulation tissue surrounding the wounds, falling off of scars in area surround the wound and the growth of new ones in the wound area and areas surrounding the wounds.

We believed spectacular canes observed follow profound effect aqueous extract of Tetrapleura tetraptera as on collagen and soluble factors to induce collagenase expression keratinocytes via epidermal growth receptor [4,5]. This process is associated with angiogenesis also called neovascularisation and with fibroblast proliferation as endothelial cells migrate to the area of the wound [6]. This was the tissue looked red following falling of the scab or fibrin fibronectin cross-linkages. Since the activity of fibroblasts and epithelial cells requires oxygen, neovascularisation is important in all stages of wound healing inducing epidermal and fibroblast migration.

It is believed tat in order to form new blood cells and provide oxygen and nutrient to the healing tissues Tetrapleura tetraptera extract exert profound effect in the stem cells of endothelial cells originating from parts of uninjured blood vessels making them to develop pseudopodia and pus through extracellular matrix into the wound site. Through this process new blood vessels were established [7,8];

Extract of Tetrapleura tetraptera produced a most prominent healing process in which the whole scabs fell off exposing surface of granulation tissue with epithelial cells penetrating the exposed surface from the surrounding edges. This dramatic healing process is not usually found in other wound dressing solutions.

Following the formation of granulation tissue, thus for effective and fast re epithelialization of the wound, with effective and efficient migration of epithelial cells migrating across the new granulation tissue forming a barrier between the wound and the environment. (8) as the process of re epithelialization was going on based keratinocytes from the wound edges and dermal appendages such as hair follicles, sweat glands and sebaceous (oil) glands were the main cells responsible for the epithelialization phase wound healing (9,10)

Epithelial cells climb over one another to migrate (9). This growing sheet of epithelial cell is called growing epithelial tongue (11) the first cell to attach to the basement membrane form stratum basale. This basal cell continues to migrate across the wound X and the epithelial cells above them them slide along as well (Barl Kova J, Gron B, Dabelsteen E and Bartek J 2003). The more quickly this migration occurs, the less of the scar there will be (Son Park J, C 2005). In reality it therefore follows that Tetrapleura tetraptera quickens all process and stages of wound healing.

Maturation phase of tissue repairs is said to begun when the levels of collagen production and degradation equalize . The maturation phase can last for one year or longer depending on the size of
the wound and whether it was originally closed or left open [12]. During maturation, type III collagen, which is prevalent during proliferation, is gradually degraded and the stronger type I collagen is laid down in its place [13]. As the phase progresses, the tensile strength of the wound increases, with the strength approaching 50% that of normal tissue [12].

**CONCLUSION**

*Tetrapleura tetraptera* is seen to enhance phase of wound healing in predictable and timely manner. It also quickens all the stages of wound healing and thereby making the wound to heal with scar. This action of the aqueous extract of *Tetrapleura tetraptera* may provide a new therapeutic roles in the treatment of cases like burns, diabetic foot ulcer, peptic ulcer disease (PUD), keloids and all other kinds of non-cancerous wounds.

**REFERENCES**


