IJIRR

International Journal of Information Research and Review
Vol. 09, Issue, 02, pp.7406-7408, February, 2022

RESEARCH ARTICLE

ANGIOGENIC POTENTIAL OF *XANTHIUM STRUMARIUM* LEAVES METHANOLIC EXTRACT

***Bhanoo Pratap Singh, Piyush Chahal, Garima Gupta, Ajit Kiran Kaur, Anil Kumar and Akanksha Sharma**

School of Pharmacy, Monad University, Hapur, U. P., India

ARTICLE INFO

Article History:
Received 26th November, 2021
Received in revised form
19th December, 2021
Accepted 20th January, 2022
Published online 28th February, 2022

Keywords:
Chorioallantoic Membrane Model,
Wound Healing, *Xanthium Strumarium.*

ABSTRACT

Wound healing activity of methanolic extract of leaves of *Xanthium strumarium* was studied by Chorioallantoic membrane (CAM) model (In vitro) in 12days old embryonated chicken eggs. The extract also promoted angiogenesis as evidenced by CAM model. The results suggested that methanolic extract of Xanthium strumarium possess significant wound healing potential in normal wound.

INTRODUCTION

A wound may be defined as a break in the epithelial integrity of skin or loss of cellular anatomic or functional continuity of living tissue. Wounds are a major case of physical disabilities. When skin is torn, cut, or punctured it is term as an open wound & when blunt force trauma causes a contusion, it is called closed wound, whereas the burn wounds are caused by fire, radiation, chemicals, heat, sunlight or electricity. Normal wound healing begins immediately after the tissue injured. In undamaged skin, the epidermis (surface layer) and dermis (deeper layer) form a protective barrier against the external environment. When the barrier is broken, a regulated sequence of biochemical events is set into motion to repair the damage. The wound healing involves different phases including hemostasis, inflammation, fibro genesis, granulation, wound construction, neo-vascularization and epithelization. The various natural & synthetic drugs are available for the treatments of wounds and are commonly known as wound healing agents. Use of herbal extract in place of crude herbs started with the aim to control quality and precise dosage for better results. The plant extracts being more efficacious, free from undesirable side effects compared to their pure active principle revalidated the therapeutic benefits of herbs due to totality of constituents rather than the single molecule. *Xanthium strumarium* common medicinal plant belongs to Asteraceae.

Corresponding Author:** ***Bhanoo Pratap Singh,
School of Pharmacy, Monad University, Hapur, U. P., India.

The plant occurs all over Pakistan, India, China, Eurasia and also in America. Local name of *Xanthium strumarium* is Common Cocklebur and Chota dhatura. The 20,000 species of its 950 genera are found worldwide as herbs, shrubs, trees and climbers [50]. It is a commonly found as a weed in roadsides, rice fields, hedges throughout the tropical parts of India. *Xanthium strumarium* is an annual herb, up to 1 m in height. *Xanthium strumarium* has stout stems, green, brownish or reddish-brown in color, often red-spotted that are rough and hairy. These medicinal properties are due to presence of chemical constituents such as steroids, alkaloids, flavonoids, triterpenoids, terpenoids, tannins, saponins, quinone, fatty acid, coumarin, protein, sugar and gum.The extract of *Xanthium strumarium* exhibited effect antibacterial, antitumor, antitussive, antifungal, anti-inflammatory, antinociceptive, hypoglycaemic, antimitotic, antioxidant, antitrypanosomal, CNS depressant activity, diuretic effects, contact dermatitis, insecticidal and herbicidal activities. Although the local traditional healers have ethnomedical knowledge on the value of this plant, there have been no biological studies on the wound healing activity of this plant. Hence, the present study was undertaken to evaluate the wound healing activity of the methanolic extract of the leaves of this plant by CAM model.

PLANT MATERIALS

The leaves of *Xanthium strumarium* L. (Asteraceae) were collected from medicinal plants garden School of Pharmacy, Hapur, Uttar Pradesh, India in July 2021 from healthy plants. Herbarium of the plant material was prepared and authenticated

by Dr. (Mrs.) Sunita Garg (Chief scientist, raw materials herbarium and museum, NISCAIR, New Delhi, India) having voucher specimen no. NISCAIR/RHMD/Consult/2021/3858-59 dated 18 Aug. 2021

Preparation of methanolic extract: The fresh leaves were subjected to size reduction with the help of stainless-steel grinder and collect the fine power of the leaves. Extraction was done with hot soxhletextraction process using methanol as solvent then the extracts were concentrated to dryness with the help of water bath and finally air dried. The obtained dried extracts of *Xanthium strumarium* L. leaves were weighed and extractive value was calculated. It was kept in an air tight container and stored in adesiccator and used for investigation of their potential.

Phytochemical screening: Phytochemical screening of the extract was carried out by standard method**.** Phytochemical screening of the methanolic extract of *Xanthium strumarium* revealed the presence of alkaloid by Wagner's and Dragendroff's test, steroid by Salkowski's and Lieberman Burchardt's test, triterpenes by Salkowski's and Lieberman Burchardt's test, carbohydrate by Molisch's test and Fehling's test, proteins and amino acids by Biuret test.

***In-Vitro* wound healing model:** Chorioallantoic membrane (CAM) model was used as *to* evaluate wound healing potency [100]. In this method, embryonated chicken eggs (12 days old) were selected and a small window (1 cm^2) was made in the shell. Through the window, a sterile disc of methyl cellulose treated with 200 or 400 µg of methanolic extract of *Xanthium strumarium* leaves was placed inside triplicate sets of egg at the junction of two blood vessels. The window was resealed and the eggs were incubated at 37°C in a well humidified chamber for 72 hrs. The window was then opened and the growth of new capillary blood vessels were observed and finally compared with the control eggs containing sterile discs without any extract of the plant.

The methanolic extract of *Xanthium strumarium* leaves had shown activity from slight to mark which was dose dependent high dose of extract (400mg) showed the marked increases in blood vessels. Angiogenesis play a crucial role in wound healing by forming new blood vessels from preexisting vessels by invading the wound clot & organizing into a micro vascular network through the granulation of tissue. Angiogenesis is an essential component of wound healing. Vessel growth is controlled by the local actions of chemical mediators, the extracellular matrix, metabolic gradients, and physical forces. Manipulation of some of these factors can improve healing in experimental wounds. During wound healing, angiogenic capillary sprouts invade the fibrin/fibronectin-rich wound clot and within a few days organize into a microvascular network throughout the granulation tissue. As collagen accumulates in the granulation tissue to produce scar, the density of blood vessels diminishes.

CONCLUSION

In conclusion, it can be interpreted that topical application of *Xanthium strumarium* has a positive influence on different phases of wound healing, including wound contraction, fibroblastic deposition, angiogenesis and therefore, has a beneficial role in wound healing. However, identification and elucidation of the active constituents in this plant may provide useful leads to the development of new and effective drugs against different types of wounds.

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