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EVALUATION OF WOUND HEALING ACTIVITY OF *CROSSANDRA INFUNDIBULIFORMIS* FLOWER EXTRACT ON ALBINO RATS

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ABSTRACT

Crossandra infundibuliformis belonging to family Acanthaceae is well known medicinal plant in various region of India. This plant is one of the most chosen variety for folk medicine. Flower extract used in various conditions like fever, headache, aperitif, pain etc. Present study is concern mainly with evaluation of wound healing activity of flower ethanollic extract in Wistar rats using excision wound model in the form of ointment using two concentrations (2 and 4%w/w ointment) of flower extract in simple ointment base. Both concentration of ethanollic extract showed significant response in both the wound type tested when compared with control group. 4% w/w concentration has showed better significant value than the standard drug. Nitrofurazone ointment (0.2%w/w) was used as standard drug.

INTRODUCTION: Wound healing is a complex and dynamic process of restoring cellular structures and tissue layers. The human adult wound healing process can be divided into 3 distinct phases: the inflammatory phase, the proliferative phase, and the remodeling phase ¹. Within these 3 broad phases is a complex and coordinated series of events that includes chemotaxis, phagocytosis, neocollagenesis, collagen degradation, and collagen remodeling.

Wound healing is a mechanism which is utmost important in daily life as we get encountered to many injuries and wounds. Many biological dressings and indigenous medicines have been reported to possess wound healing properties.

However, none of these has been completely effective and free of side effects. *Crossandra infundibuliformis* is supposed to be one of the most reliable herbs which is found to have high significant wound healing activity.

The normal physiology of wound healing depends on low levels of reactive oxygen species and oxidative stress, an over exposure to oxidative stress leads to impaired wound healing. Antioxidants are postulated to help control wound oxidative stress and thereby accelerate wound healing ².

The reported anti-oxidant potency of *Crossandra infundibuliformis* was the main evidence and triggering for initiating this activity ³. There was also evidence of folk medicine for wound healing activity on flowers ⁴.



FIGURE 1: *CROSSANDRA INFUNDIBULIFORMIS*

Crossandra is a tropical shrub that often reaches 2 foot or more in pot culture. They are native to southern India and Sri Lanka.

Blooming Time: Late Winter to Late Autumn. The tube-shaped blossoms are flattened into a 5-lobed disk.

Culture: Crossandra infundibuliformis need part shade to full sun. The compost should consist of equal parts of loam and peat moss with sand added for drainage. The compost should be kept moist but not overly wet. Fertilize weekly with a balanced fertilizer diluted to ½ the strength recommended from March to October. The temperature should never drop below 55 degrees or the leaves will turn black. While this doesn't seem to harm the plant, it does make it unsightly. Trim the plants often to keep a desired form. Repotting should be done in February.

Propagation: Crossandra infundibuliformis are easily propagated by cuttings taken in March or by seed⁵.

MATERIALS AND METHODS:

Collection of plant materials: The plant was procured from Nomula village (Andhra Pradesh).

Experimental animals: Healthy adult albino rats of Wistar strain weighing 150-200g were used in the present study. The experiment was performed after the granting of the institutional animal ethical committee approval. The animals were properly housed under natural photo periodic conditions and atmospheric conditions along with access to food and water *ad libitum* throughout the study.

Preparation of Extract: The whole extraction process was carried out at GSN Pharma Pvt. Ltd. Fresh Crossandra flower tops were used for extraction. Crossandra flowers (263.7 g) were extracted with 1,200 cc ethyl alcohol 70%. For this, the flowers were placed in an Erlenmeyer flask and the alcohol was added. This flask was stoppered and sealed and then placed in a dark room at room temperature and shaken every day for 1 week. Then the dark liquid was decanted. A rotary device was used for the next step. Ten days later, we

had the oily extract of Crossandra flowers. A 6% yield was extracted⁶.

Excision Wound Model: The animals were divided into four groups of six animals each. The group 1 was considered as control (treated with simple ointment base B.P.), group 2 was reference standard and treated with 0.2% w/w Nitrofurazone ointment. The group 3 animal weretreated with 2% w/w ethanolic extract ointment and group 4 were treated with 4% w/w ethanolic extract ointment of flower extract. The fur was removed by epilator and a circular wound about 2.5 cm diameter was made on depilated dorsal thoracic region of animal under light ether anesthesia.

The observation of percentage wound closer was made on 4th, 8th, 12th and 16th post wounding days. Number of days required for disappearance of the scar without any residual raw wound gave the period of epithelization. The ointment of flower extract, reference standard and simple ointment (control) was applied to wound twice daily, until recovery to respective group of animals⁷.

Statistical analysis: The results are expressed as mean \pm SE of six animals in each group. The data were evaluated by Student's ttest and value of $p < 0.01$ were considered statistically significant.

RESULTS: The effect of ethanolic flower extract ointment of Crossandra on incision model, the wound healing contracting ability in different concentration was significantly greater than that of control (simple ointment treated group). The 4% w/w treated group showed significant wound healing from 4th day onwards, which was comparable to that of standard drug Nitrofurazone ointment treated group. The wound closer time was lesser, as well as the percentage of wound contraction was more with the 4% w/w extract ointment treated group (18 \pm 1 days for 100% contraction which was greater to that of Nitrofurazone treated group), the 2% w/w extract ointment treated group showed significant wound contraction from 8th day onwards and achieved 100% with the wound closer time of 20 \pm 2 days (**Table 1**).

TABLE 1: EFFECT OF ETHANOLIC EXTRACT OINTMENT OF FLOWER OF CROSSANDRA INFUNDIBULIFORMIS ON % WOUND CLOSER OF EXCISION WOUNDS

Treatment	4 th day	8 th day	12 th day	16 th day	Period of epithelization
Control	15.80 \pm 0.66	27.22 \pm 1.04	48.22 \pm 1.80	68.50 \pm 2.60	26

(simple ointment base)					
Nitrofurazone 2% (ref. std)	36.28±0.16	76.88±0.18	88.88±0.58	97.12±0.48	19
Ethanollic extract (4%)	35.42±1.01	76.80±1.24	84.32±2.36	98.56±2.10	17*
Ethanollic extract (2%)	22.16±1.02	39.33±1.83	67.40±2.79	84.12±2.38	23

Value's are \pm SE, $P < 0.01$ vs control by students t-test



FIGURE 1: ANIMAL BEFORE EXCISION WOUND MODEL



FIGURE 2: ANIMAL (WOUND ON 4TH DAY) EXCISION WOUND MODEL



FIGURE 3: ANIMAL (WOUND ON 8TH DAY) EXCISION WOUND MODEL



FIGURE 4: ANIMAL (WOUND ON 12TH DAY) EXCISION WOUND MODEL



FIGURE 5: ANIMAL (WOUND ON 16TH DAY) EXCISION MODEL

DISCUSSION: Wound healing is fundamental property to tissue injury that results in restoration of tissue integrity. This is mainly achieved by synthesis of connective tissue matrix. Collagen is a major protein of extracellular matrix and is major component that mainly contribute to wound strength. Tannins promote wound healing through several cellular mechanisms.

Chelating reactive radical reactive species of oxygen, promoting contraction of wound and increasing formation of capillary vessel and fibroblast is the major action of this plant.

CONCLUSION: With the above activity and results, we can conclude that, the flower extract of *Crossandra infundibuliformis* possessed highly significant wound healing activity.

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