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**CUTANEOUS WOUND HEALING ACTIVITY OF THE ETHANOLIC EXTRACTS OF THE LEAF OF *SENNA ALATA* L. (FABACEAE)**

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**ABSTRACT**

*Senna alata* L, (Fabaceae) also known as Craw-Craw plant, Candle bush or bush fire is a plant used to treat Ringworm, Scabies, and Ulcers, swelling and inflammation conditions, skin parasites and a wide assortment of diseases. The aims of this study is to investigate the wound healing effects of the leaf ethanolic extract of the plant on excision wound in laboratory Rats. 5 groups (n= 6 per group) were used. A wound area of 2 x 2cm was experimentally induced at the depilated dorsal portion of the animals. There concentrations of 125, 250 and 500mg of the leaf extracts were slated for the treatment of the wound topically. Group 1 2 and 3 were treated with the ethanolic leaf extract, group 4 was treated with spray plus (as standard drug) while group 5 was left untreated which served as the control group. Wounds were measured from the day of excision and every other 2 days interval till complete epithelialisation. The wound size in animals treated with the leaf extracts were significantly reduced ( $p < 0.05$ ) when compared with the negative control group. This study showed that the ethanol leaf extracts of *Senna alata* promoted significant wound healing in excision wound model compared to the negative control.

**Keywords:** *Senna alata, Ethanolic Extracts, cutaneous, wound healing.*

**INTRODUCTION**

Plants have been used for medicinal purposes over the years, which have provided mankind with a source of essentials of life such as food, medicine and raw materials for clothing and shelter (1). The use of herbal medicine predates the introduction of antibiotics, and predates social, economic and religious barriers (2). Natural products from plants are a source of synthetic and traditional herbal medicine. Herbal medicine sometimes referred to as herbalism, phytotherapy or botanical medicine is the use of herbs for their therapeutic or medicinal values. Herb is a plant or plant parts valued for their medicinal, aromatic or savoury qualities. Medicinal plants provide the basic raw materials for different industries such as pharmaceutical, cosmetic, perfumery and food (3). The presence of various life sustaining constituents in plants have urged scientist to examine various plants with a view to determine their potential wound healing properties (4). They form the basic primary health care system in some parts of World (5). Extracts from dried or wet flowers and leaves of plants are applied as a paste on wound in some rural communities. Plants used for traditional medicine contain a wide range of substances that can be used to treat chronic as well as infectious diseases (6).

Wounds are the physical injuries that result in an opening and breaking of the skin and appropriate method for healing of the wound is essential for the restoration of the disrupted anatomical continuity and disturbed functional status of the skin (7). Wound is one of the major obstacles to the establishment of infections by bacterial pathogens in the internal tissues, when bacteria breach this barrier, infection can result (8). Wound healing involves a complex series of interactions between different cell types, cytokine mediators

and the extracellular matrix. The phases of normal wound healing include haemostasis, inflammation, proliferation and remodelling (9). In folklore medicine, medicinal plants have been used widely in facilitating wound healing with high degree of success (10). In this study we ethanolic leaf extract of *Senna alata* was investigated for pro-wound healing activity on excision wound model. *Senna alata* L (Fabaceae) also known as Ringworm cassia or Candle bush, Bush fire, is an ornamental shrub which grows well in the forest area of West Africa (11). The plant has been identified as a medicinal plant used in the treatment of many ailments in many parts of the World (12). The sap of the leaves is a well known remedy for ringworm, scabies, and ulcers, swelling and inflammation conditions and skin parasites (13). Decoction from the leaves, flowers, barks and wood of the plant is reported to be effective in the treatment of skin diseases such as purities, eczema and allergy (14). Other preliminary study on the therapeutic uses of *Senna alata* are those by Sonares *et al.*, (15) and Somehit *et al.*, (16).

## **MATERIALS AND METHODS**

### **Plant materials**

The fresh leaves of *Senna alata* were collected from Mubi Adamawa State. Samples from the plant material were taken to the Herbarium section of the Department of Biological Sciences, Ahmadu Bello University, Zaria for authentication. The collected leaves of the plant samples were washed clean with tap water, chopped and air dried under the shade for ten (10) days. After which they are ground into powder using a mortar and pestle. 450g of the powdered plant samples were macerated with 800ml of 95% ethanol for 48 hours. The filtrate was poured into an evaporation dish and placed over water bath at a low temperature (45°C) to obtain a semi solid dry extracts. A scraper was used to scrap the dried plant extracts from the evaporating dish into a well labelled screwed capped bottle for safe keeping

### **Experimental animals**

Laboratory rats of both sexes weighing between 100-120g were procured from the Department of Pharmacology and Veterinary Medicine, Ahmadu Bello University, Zaria. They were transported to the Department of Biological Sciences of the institution and individually housed, and maintained on poultry feeds (grower's mesh) and water *ad libitum*. They were left for one week to acclimatize to the new environment. Thirty (30) Laboratory rats divided into 5 groups of 6 rats each were used during the experiment. Groups 1, 2, and 3 were treated with plant extracts. The remaining 2 groups consisting of 6 rats each were used as the negative and positive control.

### **Inducement of Experimental Wound**

An excision wound model was used to evaluate the wound healing potentials of each of the plant extracts as described by Morton and Malone (17). The animals were treated humanely during the inducement of the experimental wound. The anticipated area was shaved, marked with a permanent marker and disinfected with 80% alcohol.

New surgical blades were used for each of the animals to completely excise the tissue of the skin to its full thickness under a light anaesthesia (Lignocaine). An area of tissue of 2 by 2cm was excised from the depilated side about 5mm from the dorsal back of the rats. After achieving complete haemostasis by blotting of the wound with a cotton wool soaked in ethanol, the animals were placed singly in an individual cage.

### **Wound Treatment**

The wounds of the animals were treated topically using the extracts. Group 1, 2, and 3 were treated with the plant extracts of different concentrations of 125,250 and 500mg. Group 4 (positive group) was treated with the standard drugs (spay plus) purchased from a veterinary store. It is a broad spectrum antibiotic used in the treatment and prevention of local infections of the teat, hoof and skin diseases in animals. While group 5 which was serve as the negative control group was left untreated.

### **Wound Measurement**

The measurement of the wound areas was taken from the day of the excision of the wound and every two (2) days interval until the epithelisation of the wound was completed. Wound contraction which contributes to wound closure was studied by tracing of the site. A meter ruler was placed over the wound and the estimate taken to produce a scale calculation.

### **DATA COLLECTION**

The following parameters were studied.

**Epithelisation period** – This was monitored by noting the number of days required for the eschar to fall away leaving raw wound behind.

**Wound contraction** – This was monitored by noting the progressive changes in the wound area. Wound contractions were measured by a tracing paper on the wounded margin and the correct estimate taken. The actual value was converted into percentage value by taking the initial size of the wound (2 by 2cm) as 100%.

**Wound healing activity** – an excision wound model was used to evaluate the wound healing activity using the ethanol extract from the plants sample.

### **Statistical analysis**

The means of the wound area measured between the test and the control groups were determined using student t- test. Data were analysed using analysis of variance (ANOVA) and (p value was set at  $p < 0.05$ ).

### **RESULT AND DISCUSSION**

All plant parts synthesize some chemicals in themselves which metabolize their physiological activities. These phytochemicals are used to cure the disease in herbal and homeopathic medicine (18). Nowadays, most people like to use the traditional methods to cure general diseases (19). The phytomedicine for wound healing are not only cheap and affordable, but also safe as hypersensitive reaction are rarely encountered with the use of these agents (20). The present research work was focussed on the leaves *Senna alata* extracts using ethanol extracts. The extracts are traditionally used in Nigeria to treat dermatophytes, bacterial and fungal infections (12). The medicinal plants that are so used owe their efficacy to a direct action on wound repairs processes or the antiinflammatory and antimicrobial properties (10). Phytochemical analysis of the leaf ethanolic extracts of senn alata showed the presence of volotile oil, glycosides, alkaloids, tannins, flavonoids, saponnins, and anthrquinones (12).

Wound healing is the body's natural process of regenerating dermal and epidermal tissue. Normal wound healing response begins the moment the tissue is injured. The healing activities begin immediately following injury when platelets come into contact with exposed collagen (13). The wound healing potentials of the ethanol extracts of leaves of *S. alata* were investigated on excision wound model in Rats. They were applied topically twice daily till the complete epithelisation of the wound. There was an accelerated wound healing of the leaf extracts when compared to both positive and negative control.

**Table 1: The Mean percentage effects of ethanolic leaf extracts of *Senna alata* on excision wound healing on Rats.**

| Test Group | Treatment (days) |        |        |        |        |        |        |        |        |        |        |       | Healing Period [Days] |
|------------|------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|-------|-----------------------|
|            | 3                | 5      | 7      | 9      | 11     | 13     | 15     | 17     | 19     | 21     | 23     |       |                       |
| SALE 125mg | Mean             | 11.67  | 20.00  | 35.83  | 42.50  | 48.33  | 60.00  | 78.33  | 86.67  | 94.17  | 0.00   | 0.00  | 19.73b                |
|            |                  | ±1.108 | ±1.86  | ±1.537 | ±1.708 | ±3.073 | ±4.630 | ±2.789 | ±2.108 | ±1.537 | ±0.00  | ±0.00 |                       |
| SALE 250mg | Mean             | 15.83  | 23.33  | 31.67  | 45.00  | 55.00  | 65.83  | 76.67  | 88.83  | 0.00   | 0.00   | 0.00  | 17.46c                |
|            |                  | ±1.537 | ±1.057 | ±2.472 | ±2.236 | ±2.582 | ±3.516 | ±2.208 | ±1.667 | ±0.00  | ±0.00  | ±0.00 |                       |
| SALE 500mg | Mean             | 19.17  | 30.83  | 40.00  | 50.99  | 68.83  | 80.83  | 90.00  | 0.00   | 0.00   | 0.00   | 0.00  | 16.46c                |
|            |                  | ±1.537 | ±2.007 | ±3.162 | ±2.887 | ±2.108 | ±1.537 | ±1.827 | ±0.00  | ±0.00  | ±0.00  | ±0.00 |                       |
| Positive   | Mean             | 23.33  | 34.17  | 45.00  | 60.83  | 77.50  | 95.00  | 0.00   | 0.00   | 0.00   | 0.00   | 0.00  | 14.60c                |
|            |                  | ±2.472 | ±1.537 | ±2.582 | ±3.516 | ±2.141 | ±1.826 | ±0.00  | ±0.00  | ±0.00  | ±0.00  | ±0.00 |                       |
| Negative   | Mean             | 7.50   | 15.00  | 27.50  | 33.33  | 45.00  | 51.67  | 66.67  | 78.83  | 85.83  | 91.67  | 0.00  | 22.91a                |
|            |                  | ±1.708 | ±2.236 | ±1.708 | ±2.472 | ±3.162 | ±2.789 | ±3.375 | ±2.713 | ±1.537 | ±1.667 | ±0.00 |                       |

Mean with the same letter are not significantly different ( $p \leq 0.05$ )

KEY Sale = *Senna alata* leaf extract

The topical application of the ethanol extracts of *senna alata* on the excision wound in Rats caused significantly ( $p < 0.05$ ) higher rate of wound healing and reduced epithelialisation period. The application of the extracts with highest concentration produced highest rate of wound healing, reducing the epithelialisation period to 16.46 days compared to the negative control group with the epithelialisation period of 22.91 days, (Table 1). The wound healing properties of the ethanol extracts of *S. alata* may be attributed to the antimicrobial effect of the leaf extract and also the phytoconstituents present in them. There are many reports of the positive effects of the wound healing potentials of medicinal herbs published in literature. Nayak and Lexley (4) have showed that an ethanol extract of *C. roseus* flower has properties that render it capable of promoting accelerated wound healing activity, Somashekar *et al* (21) studied the wound healing effect of alcoholic and aqueous extracts of *Ocimum sanctum* in rats. Topocer *et al.* (22) demonstrated the positive effect of *Atropa balladonna* on aseptic surgical wound healing.

## CONCLUSION

The ethanolic extracts of *Senna alata* plant is effective in wound care and should be explored in harnessing the potentials of the plant in the treatment of topical diseases. The herbal extracts maybe used to prevent infection that could lead to a high risk of sepsis and thereby prevent prolongation of inflammatory phase.

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