Chemical Analyses and Wound Healing Activity of Stem Juice of *Musa paradisiaca* Linn.

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Plants are the source of many biologically active products and nowadays they are of great interest to the pharmaceutical industry. The plant kingdom still holds many species of plants containing substances of medicinal value which have yet to be discovered. Another important aspect of interest in plant drug research is the new concept of "No Specifically Increased Resistance" (NSIR) of an animal to diseases attributes to other substances, besides the active principles responsible for specific biological activity. In this work, we studied different ash values of dried stem powders and wound healing activity (excision wound model) of stem juice of *Musa paradisiaca* Linn. (Musaceae). Our study revealed that the stem juice of *Musa paradisiaca* Linn. has considerable wound healing activity when compared with the standard drug Nitrofurazone.

Keywords: *Musa paradisiaca,* Ash values, Excision wound model, Nitrofurazone.

Introduction

The important aspect of interest in plant drug research is the new concept of "No Specifically Increased Resistance" (NSIR) of an animal to disease attributes to other substances, besides the active principles responsible for specific biological activity. This probably justifies the use of many of the plant drugs as household remedies by natives of many countries from ancient times and hence it warrants their evaluation in more detail. Plantains are important components of food security in the tropics and they also provide income to the farming community through local trade. Morphological description has proven very useful for the identification of the large diversity of plantain cultivars that exist in the tropics[1].

The application of Chinese materia medica (CMM) as a means of medication for treatment of illness or as dietary supplements and health products has long been a practice in China and has recently become popular worldwide. To protect the health of the public, a number of quality standards have been developed to safeguard against hazardous contamination and other abnormalities of these medicinal materials. These include determination of the heavy metals, pesticide residues, mycotoxins, foreign matter, ash, water content etc., in these products. This approach has also been adopted by many official organizations in writing monographs for pharmacopoeias worldwide. In the present study measurement uncertainties for different ash contents of the stem powder of *Musa paradisiaca* (MP) was determined[2].

The skin is the largest organ of the human body. It protects against environmental influences and pathogens, regulates body temperature, and protects the body against dehydration. When the skin is injured, this process is accelerated in order to facilitate rapid wound closure to keep germs from penetrating inside the body. In medicine, a wound is a type of physical trauma wherein the skin is torn, cut or punctured (an open wound), or where blunt force trauma causes a contusion. Classical management of wounds follows various therapeutic steps, starting with an aseptic dressing and ending with the rehabilitation of the normal structure and function. These therapeutic measures are aimed

not only at accelerating the healing process but also to maintain the quality and aesthetics of healing. As described in literature, 70% of the wound healing drugs are of plant origin, 20% of mineral origin, and the remaining 10% consist of animal products.

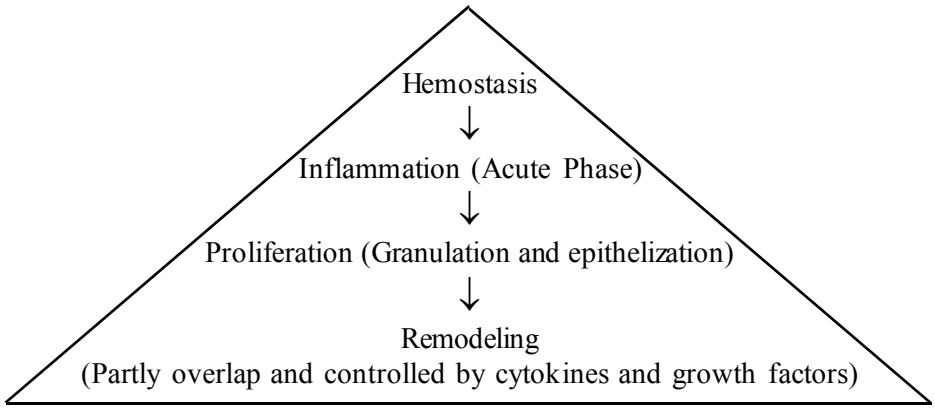

Fig. 1
The stages involved in wound healing

The plants are used as first aids, washing of wounds, extraction of pus, as coagulants and for infected wounds. Scientific investigations have been carried out to assess the wound healing properties of some active constituents in plants[3-5].

Materials and Methods

Proximate Analysis

The air – dried, powdered stem of *Musa paradisiaca* Linn. was subjected to following analytical work.

Ash Values

- Determination of Total Ash: About 2 g of powdered drug was weighed accurately in a tarred silica crucible, which was previously ignited, cooled in a desiccator and weighed. The drug was scattered in a fine even layer on the bottom of the dish and incinerated by gradually increasing the heat, not exceeding dull red hot until free from carbon. It was cooled and weighed. The percentage of ash with reference to air-dried drug was calculated.
- Determination of Water Soluble Ash: The total ash was boiled with 25 ml of water and it was filtered through an ash less filter paper, followed by washing with hot water. The filter paper was ignited in the silica crucible, cooled and the water insoluble matter was weighed. The water-soluble ash was calculated by subtracting the water insoluble matter from the total ash.
- Determination of Acid Insoluble Ash: The ash obtained in the above method was boiled for 5 min with 25 ml of diluted hydrochloric acid (HCl). The residue was collected on ash less filter paper and washed with hot water, ignited and weighed. The percentage of acid insoluble ash was calculated with reference to air-dried drug.
- Determination of Sulphated Ash: About 2 g of powdered drug was weighed in a silica crucible and incinerated to get the ash. The total ash so obtained is moistened with 1 ml of concentrated sulphuric acid (H_2SO_4), ignited, cooled, again added with few drops of concentrated sulphuric acid, re-ignited, cooled and washed. The percentage of sulphated ash was calculated with reference to the air-dried drug[6, 7].

TABLE 1
Ash Values of Powdered Drug of *Musa paradisiaca* Linn.

Ash value (%w/w)			
Total ash	**Water soluble ash**	**Acid-insoluble ash**	**Sulphated ash**
4.5±0.129	5.1±0.014	7.90±0.140	5.8±0.214

Values are mean ± S.E.M (Average of three values).

Preparation of Plant Material for Wound Healing Activity

The stem juice of the plant material was obtained by crushing the stem of *Musa paradisiaca* Linn., by using this stem juice, two types of cream formulations were prepared. Nitrofurazone Ointment (0.2% w/w, Smithkline Beecham) was used as standard drug for comparing the wound healing potential of the test drug.

Animals Used

Wistar Albino rats (150-180 gms) were selected for this study and six rats were taken for each group. The rats were used after an acclimatization period of 7 days in the laboratory environment. They were provided with food and water *ad libitum*.

Excision Wound Model

Four groups with six animals in each group were anaesthetized with ether. The rats were depilated on the back. A circular piece of skin of full thickness (~600 mm^2) was cut off from depilated area on the back of the rat, the wound was left undressed to open environment. Then the drugs, i.e., the reference standard, (0.2% w/w) Nitrofurazone (NFZ) Ointment, ointment base B.P. Test ointment (5% v/w), Test ointment (10% v/w) was applied once daily till the wound contraction and wound closure time. Wounds were traced on 1 mm^2 graph paper on the day of wounding and subsequently at a gap period of 2 days until healing was complete. Change in the wound area was calculated giving an indication of the rate of wound contraction.

The progressive changes in wound area were monitored planimetrically by tracing the wound margin on graph paper every alternate day (Fig. 2). Number of days required for falling of eschar without any residual raw wound indicated the period of epithelization[8]. The values are given in Table 2.

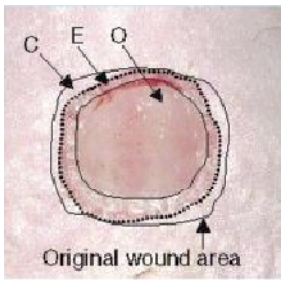

Fig. 2
wound closure analysis:
(C) Wound contraction, (E) re-epithelialization and (O) open surface.

TABLE 2
Wound Healing Activity

Post wounding days	Simple ointment (control) mm^2	Nitrofurazone ointment 0.2% mm^2	Test ointment 5% mm^2	Test ointment 10% mm^2
0	584±0.132	586±0.257	588±0.198	586±0.125
2	535±1.12	500±0.187	520±1.258	503±0.254
4	444±1.58	435±1.250	427± 0.125	400±1.247
6	328±1.285	298±0.287*	320±1.214*	250±3.54**
8	215±2.178	147±0.245**	250± 0.017**	156±1.147**
10	175±1.254	78±2.35**	180±1.235**	42±1.57**
12	157±0.078	29±1.17**	80±2.314**	12±1.235**
14	121±2.145	13±0.157**	20±1.258**	0.0±1.012**
16	80±1.258	0.0±0.014**	0.0±0.169**	0.0±0.231**

Values are mean ± S.E.M (average of six values)
*P< 0.01, **P<0.001 Vs respective control by Student t-test.

Results and Discussion

The ash contents were high but within the range reported for most non-woods. For instance a value of 13.5% was reported for wheat straw and 9.2% was reported for rice straw. The studies on excision wound healing model revealed that all the four groups showed decreased wound area from day-to-day. While comparing with the control, the wound healing activity of the juice was found to be considerably good when compared with standard drug Nitrofurazone.

Conclusion

Studies on traditional medicines especially on plants revealed that the economically backward people of all over the world prefer folk medicine due to low cost and sometimes it is a part of their social life and culture. Right now traditional healers are very old, sometimes are reluctant to percolate their useful information to next generation. There is a likelihood of losing this wealth of knowledge in the near future due to lack of interest among the younger generation as well as their propensity to migrate to cities for money-spinning jobs. The active principle is extracted and purified from plant material for as long as that process remains economically viable compared with chemical synthesis.

Ethical Clearance

The protocol used in this study for the use of animals was approved by the Institutional Animal Ethics Committee.

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