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Available online at: [www.jparonline.com](http://www.jparonline.com)**Evaluation of Wound healing activity of *Pterocarpus marsupium* (Roxb.) leaves extract in Albino rats**

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**ABSTRACT: Background:** *Pterocarpus marsupium* is well-known traditional use plant in Asian possesses several medicinal values like headache, inflammations, as antipyretic, anti-helminthic, aphrodisiac, mental aberrations and ulcers. **Aim:** The present study was aimed to evaluate the wound healing activity of leaves extract of *P. marsupium* (Roxb). **Methods:** The ethanolic extract of leave of *P. marsupium* was examined for wound healing activity in the form of ointment in the excision wound model using Albino rats. **Results:** The extract ointments showed efficient response in the excision wound model as comparable to the standard drug Povidone iodine (10% w/w) ointment and control group. **Conclusion:** The wound closure time and epithelialization period the extract of *P. marsupium* revealed that this plant exhibits significant wound healing property. This was evident by decrease in wound closure ( $P < 0.005$ ) and epithelialization period.

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**INTRODUCTIONS:**

The *Pterocarpus marsupium* is known by different names in different regions, like Piasal in Odisha, Malabar in Bengal and Bijiyasal in western Nepal. The leaves, bark, and gum of Indian kino is used for curing a number of ailments because of its medicinal properties. Wound is the interruption of the continuity in tissue resulting from the opening or break of the skin. Wound may arise due to physical, chemical or microbial agents. The healing of wound is essential in order for the restoration of the tissue continuity and disturbed skin status<sup>[1]</sup>. Plants are indispensable to man for his life. The history of herbal medicine is as old as human civilization. The wealth of India is stored in the

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enormous natural flora which has been gifted to her. Endowed with a wide diversity of agro-climatic conditions, India is virtually herbarium of the world. The importance of medicinal and aromatic plants has been emphasized from time to time. It is believed that the drugs of natural origin shall play an important role in healthcare particularly in the rural areas of India [2]. *P. marsupium* Roxb is grown in deciduous and evergreen forests of central, western and southern regions of India. It is found mostly in the states of Gujrat, Madhya Pradesh, Bihar and Orissa [3,4]. It is of moderate size to large tree. The height ranges from 15 to 30 m. The stem is stout and crooked with widely spreading branches. The bark is thick and dark brown to grey in colour. Leaves are compound and imparipinnate. Leaflets are 5 to 7, coriaceous, oblong, obtuse, emarginated or even bilobed at the apex and glabrous on both surfaces. The flowers are very numerous, white, with a small tinge of yellow. Seeds are single and reniform [5]. Traditionally, the plant material has been used as a cooling external application for headache, inflammations, as antipyretic, antihelminthic, aphrodisiac, mental aberrations and ulcers. The bark is used for the treatment of stomachache, cholera, dysentery, urinary complaints, tongue diseases and toothache [6]. The heartwood and bark of *P. marsupium* are known for their antidiabetic activity [7].

A variety of flavonoids and their derivatives have been isolated from different parts of the plant. It also showed its antimicrobial activity against *Pseudomonas aeruginosa*, *Staphylococcus aureus* and *Klebsiella pneumonia* [8]. The literature survey revealed that systemic evaluation of this plant is still lacking. Therefore, the present research work was aimed to evaluate the wound healing activity of the *P. marsupium* Roxb. leaves.

## MATERIALS AND METHODS:

### Plant collection and Authentication:

The plant was identified, confirmed and authenticated by the Biju Patnaik Medicinal Plants Garden and Research Centre, Dr. M. S. Swami Nathan Research Foundation, Jeypore, Koraput (District), Odisha (Letter No. MJ/SS/P-615/18, dated 9.2.2018. After authentication leaves were collected in bulk and washed under running tap water to remove adhering dirt. Then the leaves were shade dried. The dried materials were made into coarse powder by grinding in mechanical grinder and stored in a closed air tight container for further use.

### Preparation of Extracts:

The coarse powder was taken in Soxhlet apparatus and extracted successively with ethanol, petroleum ether as solvents. A total amount of 250 g coarse powder was extracted with 500 ml of each solvent. For each solvent, 10 cycles were run to obtain thick slurry. Each slurry was then concentrated under reduced pressure to obtain crude extract. All crude extracts were kept in closed air tight containers under cool and dark place for further study [7,8].

### Evaluation of Wound healing activity:

#### Animal:

Healthy adult Wister strain of albino rats weighing approximately 180 to 250 g were used. They were housed in standard conditions of temperature of  $25 \pm 2$  °C at 12 h light per day cycle, relative humidity of 45 to 55 % in animal house of Jeypore College of Pharmacy. They were fed with standard pellets of food and water. Animals were kept and all operation on animals was done in aseptic condition.

#### Experimental protocol:

Animals were selected, weighed and divided in to three groups (n=6), namely control, standard drug and three groups belonging to four different extract of *P. marsupium*. All the studies conducted were approved by the Institutional Ethical Committee (1906/PO/Re/S/16/CPCSEA), Jeypore College of Pharmacy, Jeypore, Odisha according to prescribed guidelines of the Committee for the Purpose of Control and Supervision of Experiments on Animals (CPCSEA), Government of India.

#### Ointment preparation:

An ethanolic extract of *P. marsupium* leave was used for the preparation of the ointment for topical application. Extract based ointment was prepared in concentration of 10 % using suitable ointment base, preservative and stored in refrigerator until further use.

#### Excision wound model:

Excision wound model was used for the study of rate of contraction of wound and epithelization. Animals were lightly anaesthetized with diethyl ether and the back hairs of the animals were depilated by shaving. An impression was made on the dorsal thoracic region 1 cm away from vertebral column and 5 cm away from ear on the anaesthetized rat. Excision wounds sized 200 mm<sup>2</sup> and 2 mm depth were made by cutting out layer of skin from the shaven area. Haemostasis was achieved by

blotting the wound with cotton swab soaked in normal saline. The entire wound was left open. The study comprised three different groups of six animals in each groups as follows and the treatment was done topically in all the cases as Group –I. was treated as control animals which received injury for wound formation. Group-II was treated standard animals which received injury for wound formation and treatment with povidone iodine ointment (10 % w/w). Group-III was treated tested or drug treated animals which received injury for wound formation and treatment with leave of *P. marsupium* ethanolic extract ointment (10 % w/w) [9,10].

**Table 1. Wound healing activity data of *P. marsupium* leave extract for 5 and 10 days.**

| Groups | Wound area (mm <sup>2</sup> ) |              |             |
|--------|-------------------------------|--------------|-------------|
|        | Day 0                         | Day 5        | Day 10      |
| I      | 200.0                         | 183.5±6.4*   | 157.1±12.2* |
| II     | 200.0                         | 137.1± 11.7* | 83.0±14.7*  |
| III    | 200.0                         | 143.5± 14.1* | 77.3±16.1*  |

Mean number (mm<sup>2</sup>) ± SD of wound contraction. p<0.05 compared to control (n=6 in each group). Groups I, II and III are normal, standard and test control.

**Table 2. Wound healing activity data of *P. marsupium* leave extract for 15 and 20 days.**

| Groups | Wound area (mm <sup>2</sup> ) |            |             |
|--------|-------------------------------|------------|-------------|
|        | Day 0                         | Day 15     | Day 20      |
| I      | 200.0                         | 107.5±7.5* | 31.1±8.8    |
| II     | 200.0                         | 23.1±10.9* | 0.00 ± 0.00 |
| III    | 200.0                         | 33.3±9.2*  | 0.00 ± 0.00 |

Mean number (mm<sup>2</sup>) ± SD of wound contraction. p<0.05 compared to control (n=6 in each group). Groups I, II and III are normal, standard and test control.

**Measurement of wound area:**

The progressive changes in wound area were monitored on predetermined days i.e., 0, 5, 10, 15 and 20 day. Later on, wound area was measured.

**Measurement of wound contraction:**

Wound contraction was calculated as percentage of the reduction in original wound area size. It was calculated by using following formula;

$$\text{Wound contraction (\%)} = [(A_i - A_{nth}) / A_i] \times 100 \dots (1)$$

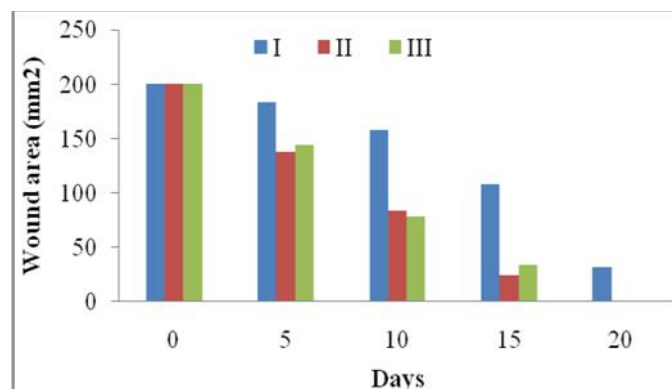
Where, A<sub>i</sub> is initial area of wound and A<sub>nth</sub> is Nth day area of wound.

**Statistical analysis:**

The results are reported as Mean and standard deviation. When probability (p) was less than 0.05 was considered as significant [11].

**RESULTS AND DISCUSSIONS:**

The ointment formulated with *P. marsupium* leave extract applied on test group has showed wound healing effect, as compare with the standard Povidone iodine ointment to the untreated control group as it promotes wound contraction and shortens epithelialization period. The percentage values demonstrated in Table 1, 2 and Fig 1, showed the healing capacity observed with the healing duration are parallel with potential of wound healing of *P. marsupium* leave extract and it has proved its remarkable rapid wound-healing associated with considerable and potent antimicrobial effect. The active constituents present in *P. marsupium* leave are alkaloids, flavanoids, saponins, phenols, steroids, glycosides, resin and tannins. Tannins, phenols and flavanoids are the major constituents that are responsible for wound healing.



**Fig 1. Percentage wound healing closure of *P. marsupium* leave extract.**

Groups I, II and III are normal, standard and test control.

**CONCLUSION:**

The results of the present study suggest that local application and systemic administration of ethanol extract of the leaf of *Pterocarpus marsupium* has shown more significant wound healing activity in excision wound models and support the popular use of plant to open wound in folk medicine. The wound healing property of *Pterocarpus marsupium* has been attributed to its antimicrobial effects.

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