Pharmacognosy of a South Indian market sample of parpataka *Rungia repens* (L.) Nees

B. JYOTHI, G. SUDARSANAM, BULUSU SITARAM AND G. PRASADA BABU

**SUMMARY**

*Rungia repens* is used in Ayurvedic drugs for the treatment of fevers, cough and fungal skin diseases. The botanical, macro, microscopic characters, macerate, histochemical studies and physico-chemical studies are presented.

Key words: Macro, Microscopic characters, Nacerate, Histochemical, Physico chemical studies

In Ayurveda parpataka is one of the important drug used in fevers particularly. The drug is diuretic, antihelmintic and bitter (Nadkarni, 1996). It is used in the treatment of haemorrhage, thirst and burning sensation (Lakshmipati, 1973). In spite of its manifold uses the drug remains controversial because several plants are used and sold under the name parpataka in different parts of the country and in local markets. The accepted source of the drug is *Fumaria indica* (Hassk.) Pug. (Anonymous, 1978). Whole plant possess medicinal properties (Sharma, 1983 and Nesamony, 1985). Some of the plants used as parpataka are *Polycarpaea corymbosa* (L) Lam. *Glinus oppositifolius* (L) A.DC., *Mollugo nudicaulis* Lam. and its allied species, *Hedyotis corymbosa* (L) Lam and its allied species, *Glossocardia bosvallea* (L.f) DC. and *Rungia repens* (L.). Nees. (Chunekar, 1999; and Vaidya, 1982).

The genus *Rungia repens* distributed in India and Srilanka. It belongs to family Acanthaceae. It is used as a substitute for parpataka in Ayurveda (Yoganarasimhan, 2000). In Gujarat and Maharastra it is used as parpataka. Whole plant dried and pulverized is given in fevers and cough by the local tribes. Leaf paste also used to cure fungal skin diseases (Vedavathy, 1992). Hence, there is an urgent need to identify the market sample of parpataka macro-and microscopically.

A perusal of the literature revealed that no pharmacognostical work has been carried out on this taxon (Gurudeva and Yoganarasimhan, 2009). During critical studies on the South Indian market samples of crude drugs, it was found by the authors that a totally different drug is sold in the markets of South India and used by the physicians in the name of parpataka. It is entirely different from the accepted source. Hence, the present study was initiated to identify the South Indian market sample and analyse its botanical macro-, microscopic and physico-chemical details which helps to differentiate this drug from the accepted source.

**MATERIALS AND METHODS**

The plant material was collected in Tirupati from Chittoor District. The herbarium specimen was processed and followed by standard methods (Jain and Rao, 1977) and deposited in the Herbarium of the Department of Botany, S.V. University, Tirupati.

Macro and microscopical studies were carried out (Johansen, 1940 and Wallis, 1985) during the year 2005. Physical constants were carried out by standard methods (Kokoski et al., 1958; Chase and Pratt, 1949; Krebs et al., 1969) and fluorescence studies followed by standard procedures (Khandelwal et al., 1996).

**Taxonomy**:


Herbarium specimen examined:
Author (214) collected on 23rd November 2006, Tirupati, Chittoor district of Andhra Pradesh and it is authenticated with Rangacharyulu (1991) deposited at the Herbarium of S.V. University, Tirupati.

RESULTS AND DISCUSSION
The findings of the present study as well as relevant discussion have been summarized under following heads:

Root:
Taproot elongated, many wiry lateral roots are present, outer zone not peelable, smell pleasing and no specific taste.

Microscopical characters:
Both young and mature roots were studied. Transverse section of the root is circular in outline ruptured and shows epidermis, cortex and vascular bundle. Epidermis is made up of single layer of rectangular thin walled cells. Outer cortex is made up of 1 or 2 layered thin walled parenchyma cells. Inner cortex consists of wide reticulation of air chambers. Air chambers are divided by multicellular filaments (Fig.1.1-2).

Vascular system consists of dense smooth compact cylinder of secondary xylem and secondary phloem. Xylem cylinder is 400 µm diameter in thin root, whereas in mature root it is 750 µm diameter. Primary xylem present towards the centre of the secondary xylem cylinder. Secondary xylem elements are in regular radial rows. Secondary xylem comprises of vessels, xylem fibres and xylem rays. Secondary xylem mostly solitary or occasionally in radial multiples. Vessels 50-90 µm in diameter. Vessels narrow, circular or elliptic and thick walled. Xylem fibres are thick walled, lignified with narrow lumen. Secondary phloem comprises of sieve elements, phloem parenchyma and phloem fibers (Fig. 2, 1-2).
Root-diagnostic characters:
- Presence of single layered epidermis.
- Outer cortex made up of parenchymatous cells with thin cell walls.
- Presence of inner cortex with large air chambers.
- Presence of thick walled narrow vessels.
- Presence of lignified xylem fibres with narrow lumen.

Stem:
Slender, dark green in colour, internodes elongated, outer zone easily peelable, smell pleasing and no specific taste.

Microscopical characters:
Transverse section of the stem is circular in outline with even surface and shows epidermis, cortex and well developed vascular cylinder with wide pith (Fig. 3.1).

Epidermis made up of single layer of cells with stomata. Cortex heterogenous, comprises of outer zone of small patches of collenchyma and chlorenchyma 3 to 4 layered alternating with each other. Inner cortex is wide and made up of 6 to 7 layers of tangentially oblong thin walled parenchyma. Stelar zone is well developed, in which widely spaced secondary xylem is surrounded by a thin layers of secondary phloem. Secondary xylem consists of radial rows of vessels and xylem fibers. Vessels are fairly wide, circular, thick walled, with wide lumen (Fig. 3.2). Pith is wide, circular, comprises of thin walled parenchyma.

Stem-diagnostic characters:
- Presence of heterogenous cortex.
- Presence of small patches of collenchyma and chlorenchyma alternating with each other in cortex.
- Inner cortex is made up of 6 to 7 layers of thin walled parenchymatous cells.
- Secondary xylem consists of vessels and xylem fibers.
- Presence of wide circular thick walled vessels with wide lumen.
- Presence of thick walled narrow or wide fibres with long tapering ends.

Leaf:
Leaves opposite, elliptic lanceolate, 2 - 4 x 2 cm, acute at both ends, petiole 0.4 cm, entire, no specific taste and smell.

Microscopical characters:
Leaf has prominent midrib thick even and smooth surface lamina. Midrib has broad conical adaxial hump and a wide hemispherical abaxial part (Fig. 4.1). It is 650 mm in vertical axis and 500 mm in horizontal plane. Epidermis is prominent with wide squarish cells, some of them contains cystoliths. Vascular bundle is single in midrib, hemispherical with a few rows of xylem elements and an arc of phloem. Adaxial hump has collenchymatous cells and abaxial part is made up of circular, thin walled, compactly arranged parenchymatous cells with minute intercellular spaces.

Lamina (Fig. 4.2):
Lamina 150-200 mm. It has wide adaxial and abaxial epidermal layers of thin rectangular cells. Some of the epidermal cells are modified into lithocysts bearing cystoliths. Towards abaxial epidermis narrow palisade parenchyma and 3 to 4 layers of lobed parenchyma present towards abaxial epidermis.
Petiole (Fig. 5.1-2):

Petiole is planoconvex in transectional view. The adaxial side is flat and the abaxial side is semicircular. Epidermal layer is thick consisting of wide, radially oblong cells. Ground tissue consists of 1 to 2 layers of collenchyma cells towards the periphery and the remaining part is wide, circular, and filled with thin walled parenchymatous cells (Fig. 5.2). Vascular strand is broadly arc shaped having 10-15 radial files of xylem cells and a thin arc of phloem.

Epidermal cells (Fig. 5.1):

Epidermal cells in surface view are lobed but anticlinal walls are thin and wavy.

Venation (Fig. 6.1-2):

Lateral veins consists of less prominent thin vein-
islets. However, they appear as wide, in polygonal areas. Vein- terminations not evident.

**Cystoliths (Fig. 7.1-2):**
Cystoliths are abundant in the epidermal cells. They are long cylindrical bodies with tapering ends and echinate surface, 250 - 300 $\mu$m.

**Leaf-diagnostic characters:**
- Epidermis is prominent with wide squarish cells.
- Some of the epidermal cells are modified into lithocysts bearing cystoliths.
- Cystoliths are long cylindrical bodies with tapering ends and echinate surface.
- Mesophyll tissue is made up of palisade parenchyma and 3 to 4 layers of lobed spongy parenchyma.

**Whole plant - macerate:**
Macerated preparation of whole plant showed the following elements.

**Fibres (Fig. 8.1-2):**
Thin walled, either narrow or wide, lateral pits not evident, long tapering towards the end. Narrow Fibres 700 $\mu$m long, 15 $\mu$m thick, wide fibres 600$\mu$m long 20 mm thick.

**Vessel elements (Fig. 9.1-2):**
Elements narrow, long and cylindrical, length 250-380 $\mu$m 25-30 $\mu$m wide. Tailed, or tailess, tails short or long. Lateral wall pits circular dense, alternate. Perforation plate simple, slightly oblique.

**Trichomes (Fig. 10.1):**
Epidermal trichomes fairly common, multicellular, unbranched, uniseriate. 2-4 celled, basal cell wide, terminal cell pointed. Cell walls thin, smooth, length 700 $\mu$m, basal cell 140 $\mu$m, terminal cell 50 $\mu$m.

**Cystolith (Fig. 10.2):**
Cystoliths are long cylindrical bodies.

Powder microscopy:
Powder of the plant when viewed under microscope showed cystoliths, pollen grains and starch grains. Cystoliths are spindle shaped bodies with worty surface (Fig. 11.1). Pollen grain is elliptical with smooth exine (Fig. 11.2). Starch grains are either circular with central hilum or elliptic with arc shaped dark zone (Fig. 11.3).

Histochecmical tests:
The sections were treated with different reagents and the observations are provided in Table 1.

Powder analysis:
Fine powder is green in colour, it has no characteristic smell and taste. The observations are given in Table 2.

Physico-chemical constants:
Physical constants:
The physical constants determined by standard methods are given in Table 3.

<table>
<thead>
<tr>
<th>Table 1 : Histochemical tests</th>
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<tbody>
<tr>
<td>Drug</td>
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<tr>
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<tr>
<td>Section</td>
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<td>Section</td>
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<td>Section</td>
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+ = Present; - = Absent

Fluorescence analysis:

Fluorescence analysis was carried out by standard procedures. The results are given in Table 4.

Conclusion:

Rungia repens is one of the botanical source of the drug parpataka. It is used in the treatment of fevers, fungal skin diseases and burning sensation. Hence, this paper covers the morphology, macro and microscopical studies of the root, stem, leaf, whole plant macerate, histochemical tests, powder microscopy, physico-chemical constants and fluorescence studies.

Table 2: Powder analysis

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Observation</th>
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<tbody>
<tr>
<td>Powder treated with water</td>
<td>Non-sticky</td>
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<tr>
<td>Powder shaken with water</td>
<td>Foam like froth</td>
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<tr>
<td>Powder treated with 5% aqueous NaOH</td>
<td>Green</td>
</tr>
<tr>
<td>Powder treated with 60% aqueous sulphuric acid</td>
<td>Brown</td>
</tr>
<tr>
<td>Powder pressed between filter paper for 24 hours</td>
<td>No oil stain</td>
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</tbody>
</table>

Table 3: Physical constants

<table>
<thead>
<tr>
<th>Ash values (%)</th>
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<tbody>
<tr>
<td>Total ash%</td>
</tr>
<tr>
<td>Water soluble ash%</td>
</tr>
<tr>
<td>Alkanity of water soluble ash%</td>
</tr>
<tr>
<td>Acid in soluble ash (%)</td>
</tr>
<tr>
<td>Extractive values (%)</td>
</tr>
<tr>
<td>a) Alcohol soluble extract</td>
</tr>
<tr>
<td>b) Water soluble extract</td>
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<tr>
<td>c) Hexane soluble extract</td>
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<td>d) Chloroform soluble extract</td>
</tr>
</tbody>
</table>

Table 4: Fluorescence analysis of Rungia repens

<table>
<thead>
<tr>
<th>Experiments</th>
<th>Visible / Day light</th>
<th>UV Light</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>254 nm</td>
</tr>
<tr>
<td>Drug powder</td>
<td>Green</td>
<td>Green</td>
</tr>
<tr>
<td>Drug powder + 1 N NaOH (aq.)</td>
<td>Green</td>
<td>Yellowish green</td>
</tr>
<tr>
<td>Drug powder + 1 N NaOH (alc.)</td>
<td>Green</td>
<td>Yellowish green</td>
</tr>
<tr>
<td>Drug powder + 1 N HCl</td>
<td>Brown</td>
<td>Green</td>
</tr>
<tr>
<td>Drug powder + 50% H₂SO₄</td>
<td>Brown</td>
<td>Green</td>
</tr>
<tr>
<td>Drug powder + 50% HNO₃</td>
<td>Orange</td>
<td>Green</td>
</tr>
<tr>
<td>Drug powder + Picric acid</td>
<td>Green</td>
<td>Yellowish green</td>
</tr>
<tr>
<td>Drug powder + Acetic acid</td>
<td>Dark olive (green)</td>
<td>Yellowish green</td>
</tr>
<tr>
<td>Drug powder + Ferric chloride</td>
<td>Green</td>
<td>Yellowish green</td>
</tr>
<tr>
<td>Drug powder + HNO₃ + NH₃</td>
<td>Reddish orange precipitate</td>
<td>Yellowish green</td>
</tr>
</tbody>
</table>
REFERENCES

Controller of Publications, New Delhi.


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