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

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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, antehelmintic and bitter (Nadkarni, 1996). It is used in the treatment of haemorragea, 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 posess medicinal propreties(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.

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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 :

Rungia repens (L.) Nees in Wallich, Pl. As Rar. 3: 110. 1832; Wight, Icon. Pl. Ind. orient. t. 465. 1841; Hook. f. Brit. India 4: 549. 1885; Gamble, Fl. Madras 2: 1070 (750). 1924; Matthew, Mat. Fl. Tamil Nadu Carnatic 297. 1981 and III Fl. Tamil Nadu Carnatic t. 541. 1982. *Justicia repens* L. sp. pl. 15. 1753.

A decumbent or erect herb, upto 30 cm tall. Leaves elliptic lanceolate puberulous, acute at both ends. Flowers in terminal spikes. Calyx-lobes 5, linear, sub-equal, shortly connate and valvate. Corolla pinkish, bilipped, 2+3 imbricate. Stamens 2, at the juncture of 2 lips. Ovary globose, style, hairy, stigma minutely 2-fid, capsule elliptic to oblong, pubescent. Seeds 4 concentrically ridged.

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:

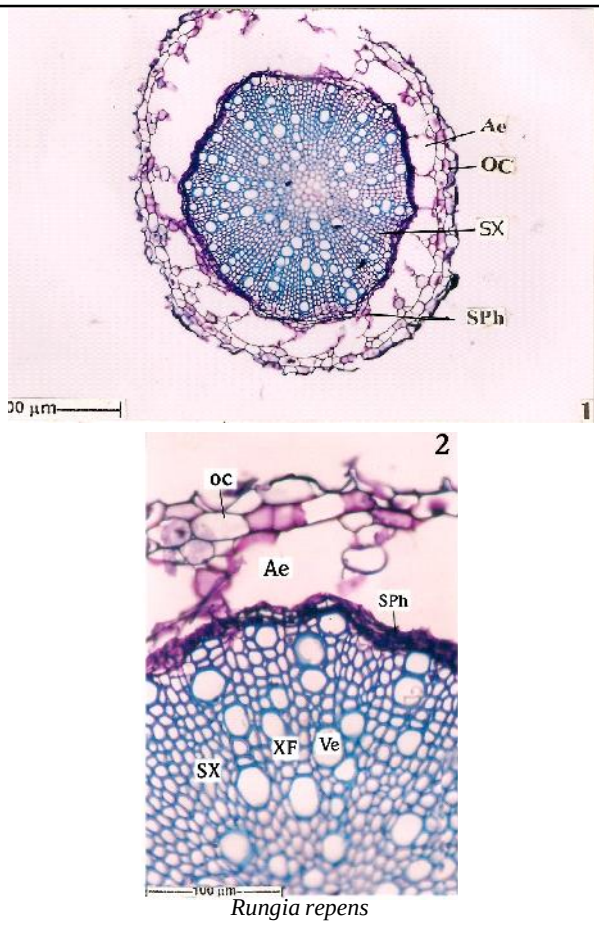
Root :

Taproot elongated, many wiry lateral roots are present, outerzone not peelable, smell pleasing and no specific taste.

Microscopical characters:

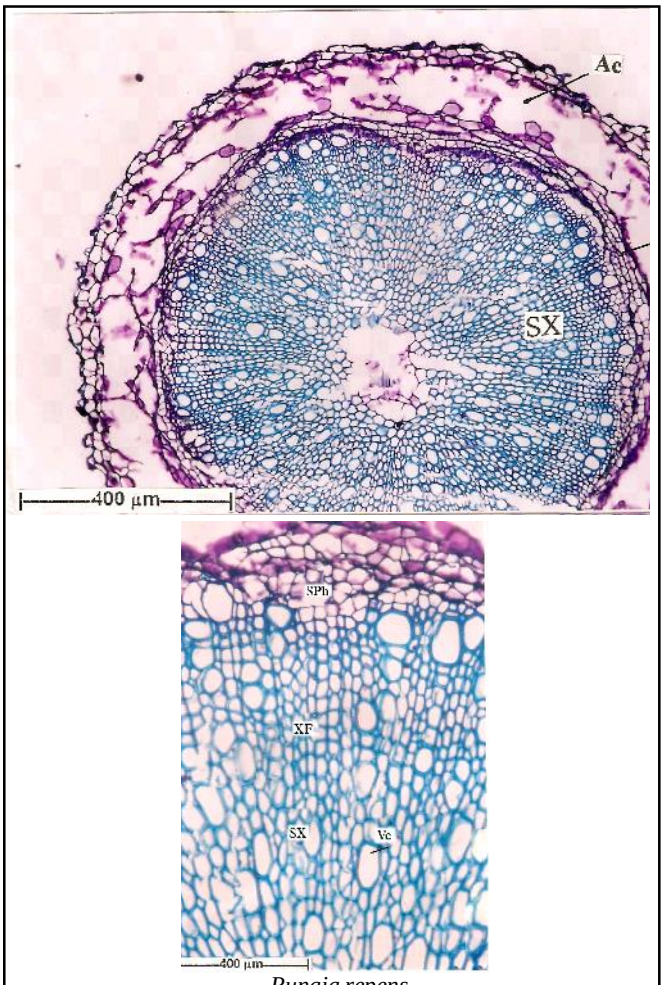
Both young and mature roots were studied. Transverse section of the root is circular in outline ruptured and shows epidermis, cortex and vascular bundle. Epidermis is made up of single layer of rectangular thin walled cells. Outer cortex is made up of 1 or 2 layered thin walled parenchyma cells. Inner 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).



Rungia repens

Fig. 1 : Microscopical characters of young root
1. T.S. of root – Entire view
2. T.S. of root – A sector enlarged



Rungia repens

Fig. 2 : Microscopical characters of mature root
1. T.S. of root – Entire view
2. T.S. of root – A sector enlarged

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.

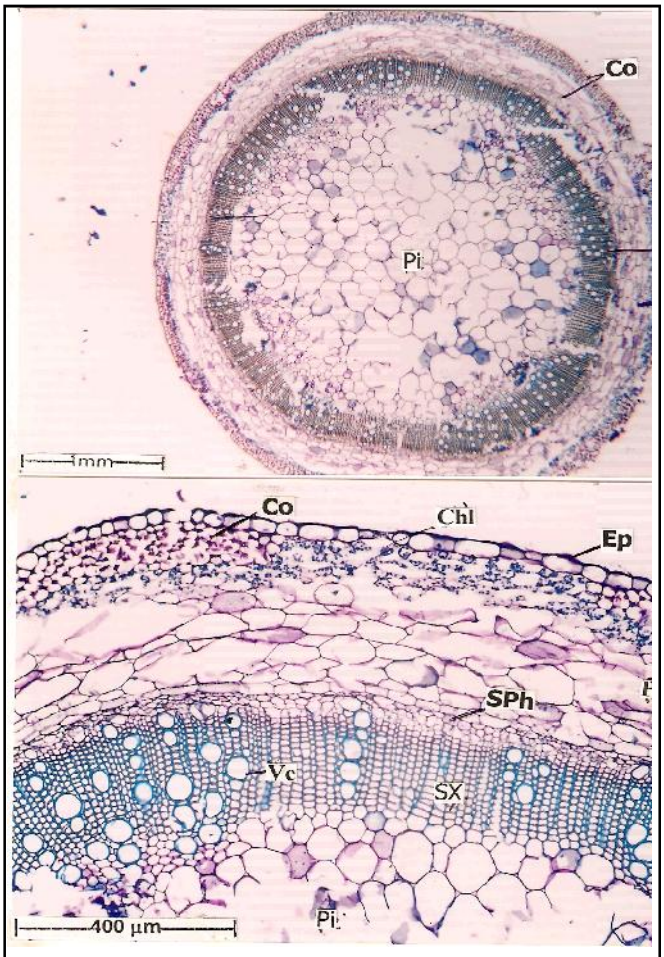
– Presence of lignified xylem fibres with narrow lumen.

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 out line with even surface and shows epidermis, cortex and well developed vascular cylinder with wide pith (Fig. 3.1).



Rungia repens

Fig. 3 : Microscopical characters of stem
1. T.S. of root – Entire view
2. T.S. of root – A sector enlarged

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 :

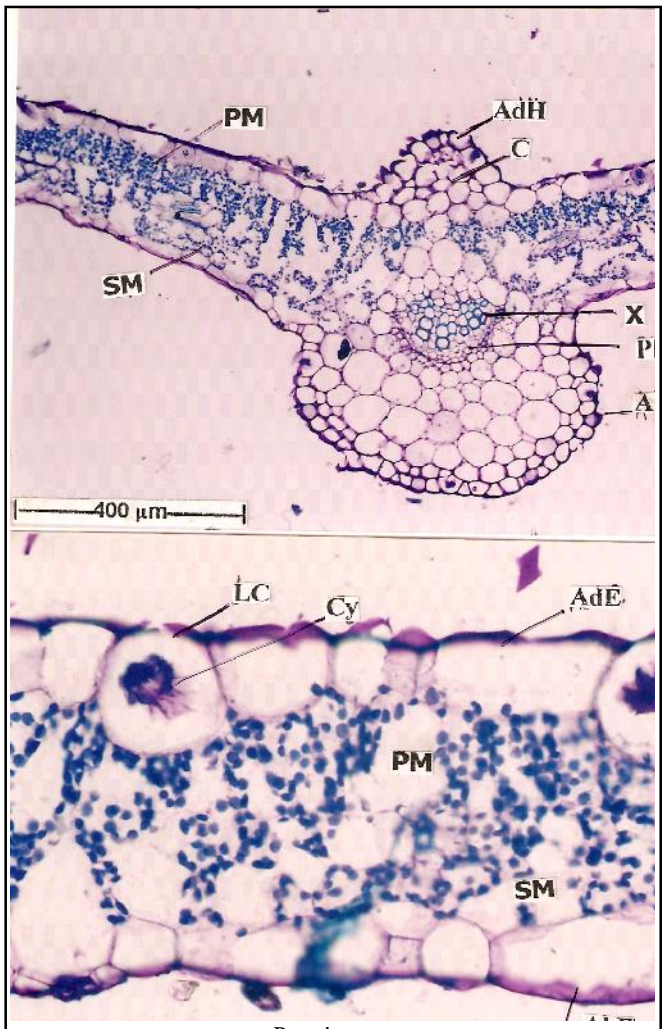
Leaves opposite, elliptic lanceolate, 2 - 4 x 2 cm, acute at both ends, petiole 0.4 cm, entire, no specific taste and smell.

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.

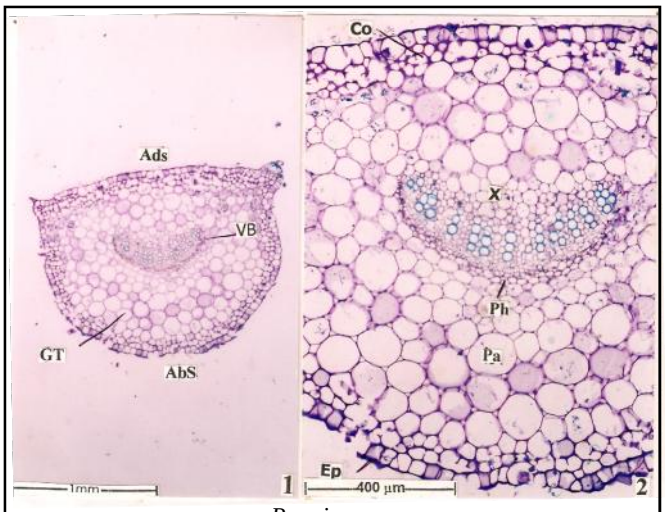
Lamina (Fig. 4.2):

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.



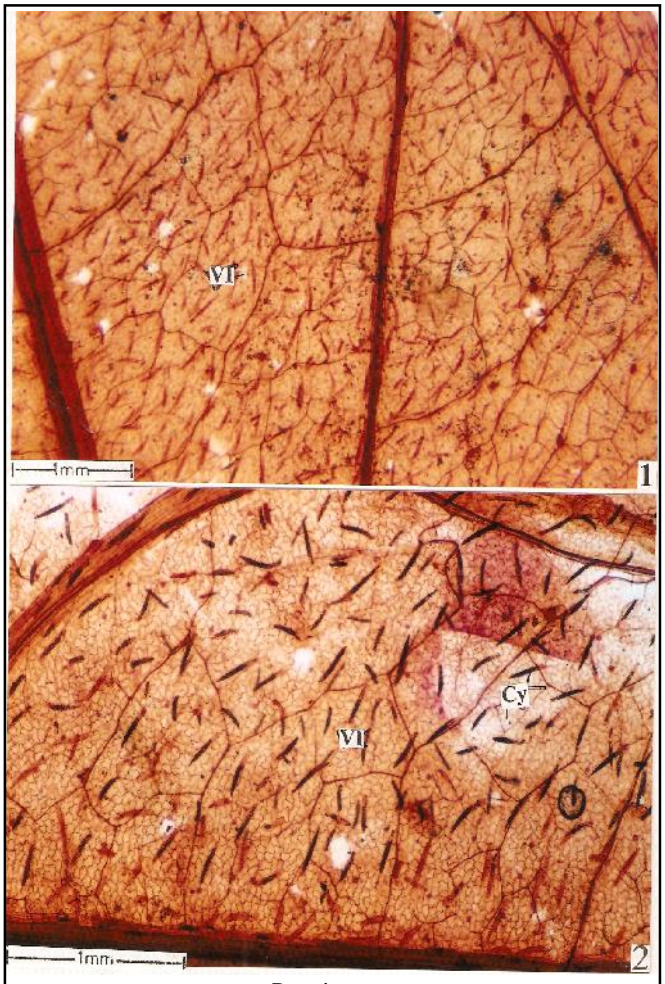
Rungia repens

Fig. 4 : Microscopical characters of leaf
1. T.S. of leaf through midrib with lamina
2. T.S. of lamina



Rungia repens

Fig. 5 : Microscopical characters of petiole
1. T.S. of petiole – entire view
2. T.S. of petiole – vascular bundle enlarged



Rungia repens

Fig. 6 : Venation pattern
1. Vein-islets under low magnification
2. Vein-islets enlarged

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.

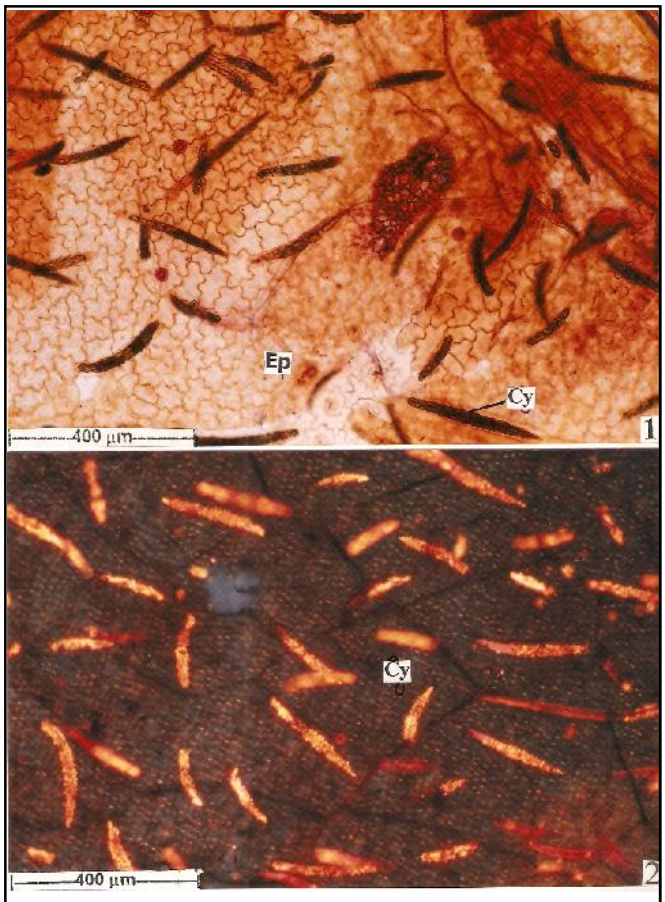
Venation (Fig. 6.1-2):

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 µm.



Rungia repens

Fig. 7 : Cystolith distribution
1. Adaxial epidermis and cystoliths under polarized light microscope
2. Cystolith under polarized light microscope

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.

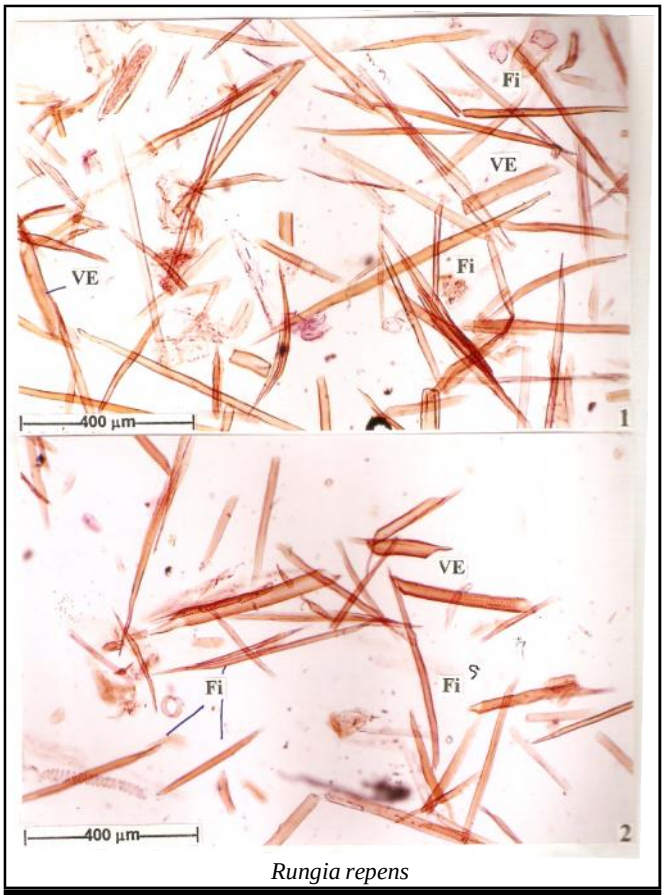
– Mesophyll tissue is made up of palisade parenchyma and 3 to 4 layers of lobed spongy parenchyma.

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 µm long, 15 µm thick , wide fibres 600µm long 20 mm thick.



Rungia repens

Fig. 8 : 1-2 Whole plant - Macerate
Fi – Fibres; VE - Vessel elements

Vessel elements (Fig. 9.1-2):

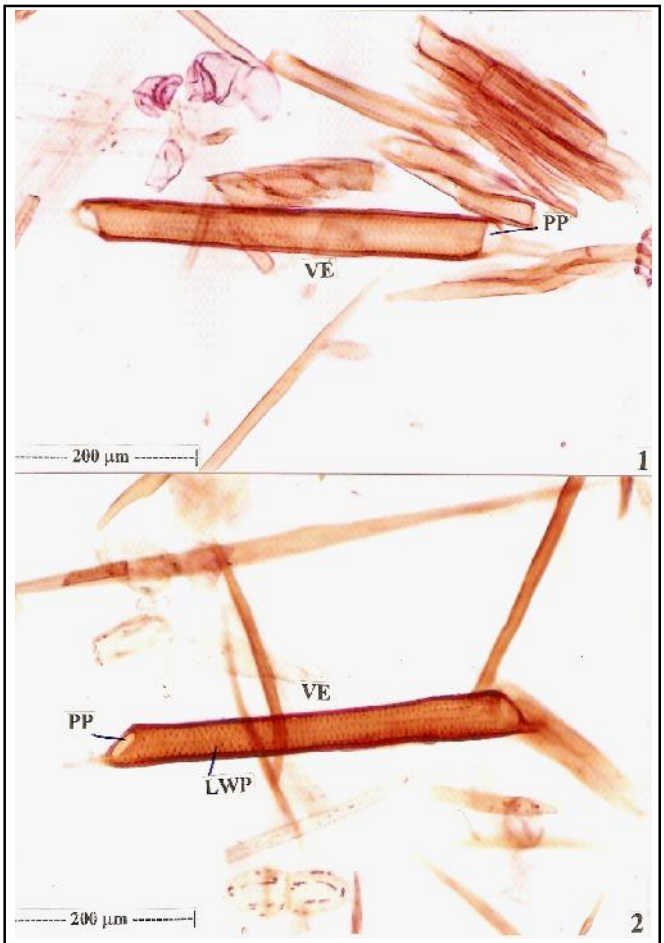
Elements narrow, long and cylindrical, length 250-380 µm 25-30 µm wide. Tailed, or tailless, tails short or long. Lateral wall pits circular dense, alternate. Perforation plate simple, slightly oblique.

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 µm, basal cell 140 µm, terminal cell 50 µm.

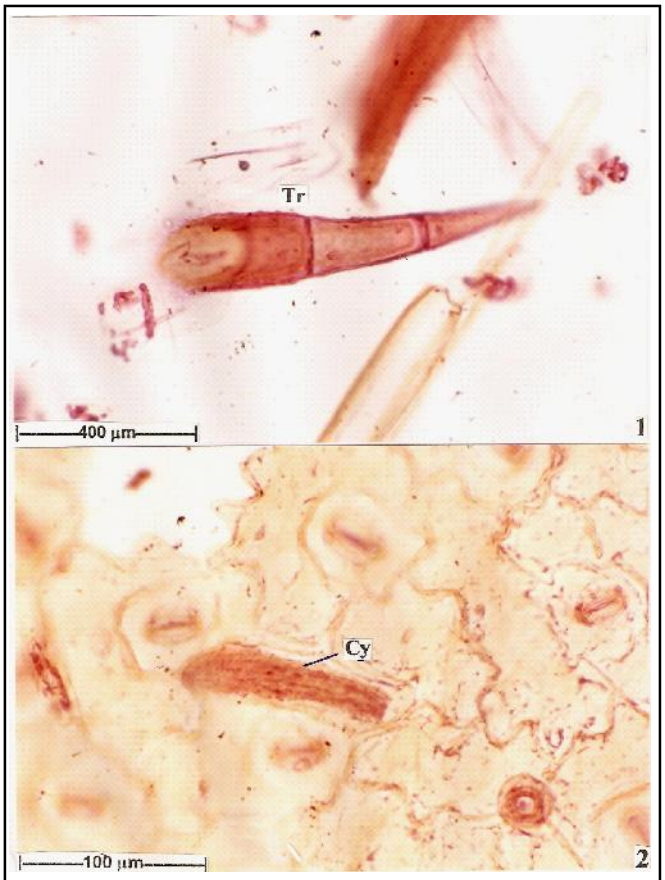
Cystolith (Fig. 10.2):

Cystoliths are long cylindrical bodies.



Rungia repens

Fig. 9 : 1-2 Whole plant - Macerate
VE - Vessel element; PP – Perforation plate; LWP – Lateral wall pits



Rungia repens

Fig. 10 : 1-2 Whole plant - Macerate
1. One epidermal trichome enlarged
2. Abaxial epidermis showing a cystolith and stomata
Tr – Trichome; Cy - Cystolith

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).

Histochemical 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:

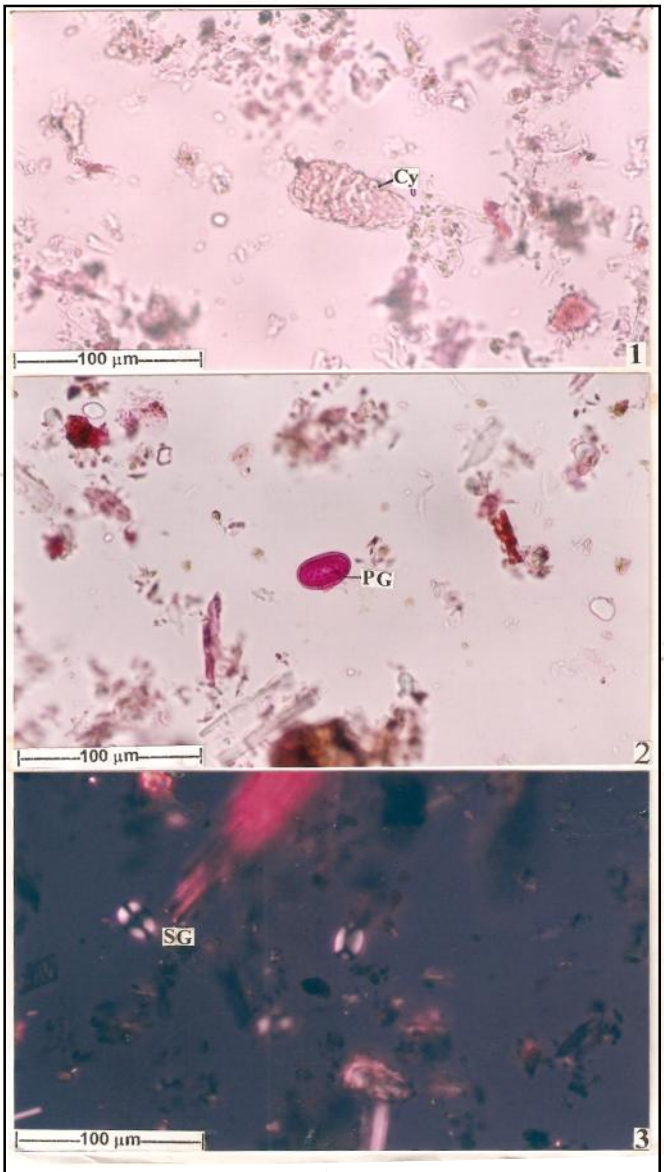
Physical constants:

The physical constants determined by standard methods are given in Table 3.

Table 1 : Histochemical tests

Drug	Reagents	Test for	Reaction	Results
Section	Iodine solution	Starch	Blue colour	+
Section	Ferric chloride solution	Tannin	Black	+
Section	Sudan III solution	Oil globules	No Effervescence	-
Section	Phloroglucinol + dil. HCl + Alcohol	Lignin	Magenta	+
Section	Conc. HCl	Crystals	No Effervescence	+

+ = Present ; - = Absent



Rungia repens

Fig. 11 : 1-3 Powder Microscopy
Cy – Cystolith; PG – Pollen grain; SG – Starch grain

Table 2 : Powder analysis

Treatments	Observation
Powder treated with water	Non-sticky
Powder shaken with water	Foam like froth
Powder treated with 5% aqueous NaOH	Green
Powder treated with 60% aqueous sulphuric acid	Brown
Powder pressed between filter paper for 24 hours	No oil stain

Table 3 : Physical constants

Ash values (%)	
Total ash%	21.32
Water soluble ash%	9.84
Alkanity of water soluble ash%	11.08
Acid in soluble ash (%)	1.24
Extractive values (%)	
a) Alcohol soluble extract	1.10
b) Water soluble extract	2.01
c) Hexane soluble extract	0.25
d) Chloroform soluble extract	0.76

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 4 : Fluorescence analysis of *Rungia repens*

Experiments	Visible / Day light	UV Light	
		254 nm	365 nm
Drug powder	Green	Green	Black
Drug powder + 1 N NaOH (aq.)	Green	Yellowish green	Black
Drug powder + 1 N NaOH (alc.)	Green	Yellowish green	Green
Drug powder + 1 N HCl	Brown	Green	Black
Drug powder + 50% H_2SO_4	Brown	Green	Pale green
Drug powder + 50% HNO_3	Orange	Green	Black
Drug powder + Picric acid	Green	Yellowish green	Yellowish green
Drug powder + Acetic acid	Dark olive (green)	Yellowish green	Pale green
Drug powder + Ferric chloride	Green	Yellowish green	Black
Drug powder + HNO_3 + NH_3	Reddish orange precipitate	Yellowish green	Green

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