OBSERVATIONS ON IMPORTANT MICROSCOPIC CHARACTERS FOR AUTHENTICATION OF AN ETHNO-MEDICINAL PLANT ABELMOSCHUS FICULNEUS (L.) WIGHT AND ARN

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Abstract

***Abelmoschus ficulneus* (L.) Wight and Arn. belonging to family Malvaceae is used as medicine to control early seminal ejaculation by the local tribals and to dissolve urine stone. The internal structure of root, stem, petiole and leaves were studied. Root shows presence of calcium oxalate crystals in the cortex and mucilage cells in vascular region. Stem also shows presence of mucilage cells and calcium oxalate crystals in the cortical cells. Petiole shows presence of vascular bundles in a ring. Cortical cells and pith cells contain calcium oxalate crystals and mucilage cells. Leaf shows calcium oxalate crystals in the palisade and thick walled mucilage cells towards lower epidermis.**

This genus is characterized by well developed trichomes which are glandular at the base in stem. They are thick walled, unicellular and un-branched. The glands are surrounded by epidermal cells.

Trichomes, stomata, calcium oxalate crystals, starch grains, fibers, vessels, mucilage canals and volatile oils are the microscopic characters of this plant and they are useful for identification of this plant.

Keywords: *Abelmoschus*, drug, mucilage, trichome, calcium oxalate

Introduction

Abelmoschus ficulneus (L.) Wight and Arn belonging to family Malvaceae , common on bunds of fields, waste lands and hill slopes.

Plant is wild, erect, annual, much-branched herb. 80-120 cm tall. Stems covered with tubercle based hairs or prickles. Leaves simple, petiolate, alternate. Inflorescence solitary, axillary. Flowers large, white, complete, bisexual, actinomorphic, hypogynous and pentamerous. Capsule elongated.Seeds smooth, round and black.

Root, fruits and seeds are used medicinally. Fruits richer in vitamin C than those of *A . esculentus*. Aromatic seeds used in Arabia for perfuming coffee. (Ambasta, 1986) Root powder or fresh root of this plant is used to control early seminal ejaculation by the local tribals. Decoction of fruits is effective in dissolving urine stone. (Patil, 2002 and Pade, 1973) Seeds used in asthma (Asolkar, Kakkar and Chakre, 1992) Root powder with honey and sugar is used for blood purification. (Pade, 1973).

Material and method:

Plants were collected and important parts like root, stem, petiole and leaves were preserved in 4 % formalin. The ethno-medicinal information about the plant was obtained through interrogation and literature survey followed by thin section study of individual plant parts. All the sections were stained in safranin and dehydrated following the usual method of Johansen (1940) and mounted in D.P.X. for microscopic observation. To study the stomatal complex and hairs from leaves, epidermal peelings of fresh leaves were directly done mechanically by forceps. The peels were stained with safranin by mounting in glycerine.

Anatomical observations:

T. S. Root

Outline circular, Periderm multilayered, cells parenchymatous, rectangular, thick walled,

compactly arranged without intercellular spaces, measuring about 68 x 12 μm in size. Cortex multilayered, cells parenchymatous, oval, thin walled, isodiametric, measuring about 62 x 38 μm, enclosing small intercellular spaces. Cortical cells contain crystals of calcium oxalate. Endodermis indistinct. Pericycle multilayered, parenchymatous, containing patches of sclerenchyma .Secondary growth shows vascular cylinder. Secondary phloem in form of an outer continuous ring. Phloem fibres are present in patches. Secondary xylem form inner wide cylinder traversed by medullary rays. Xylem vessels are radial measuring about 64 x 60 μm, in groups of 2 or 3. Outline is circular. Cells of medullary rays elongated, contain granular inclusion, measuring 30 x 16 μm in size. Mucilage cells are present in vascular cylinder. Pith small, homogeneous, cells parenchymatous, small, oval, compactly arranged without intercellular spaces.

T. S. Rootlet

Outline circular. Epidermis single layered, cells parenchymatous, oval, compactly arranged without intercellular spaces, measuring about 28 x 20 μm in size. Cortex multilayered, cells parenchymatous, oval, thin walled, isodiametric, enclosing small intercellular spaces, measuring about 60 x 36 μm in size. Endodermis indistinct. Pericycle parenchymatous with patches of sclerenchyma. Vascular bundles are radial comprising 5 patches of xylem alternating with phloem. Xylem vessels large and circular in outline, measuring about 103 x 73 μm in size, Pith small, cells parenchymatous, small and oval, compactly arranged without intercellular spaces.

T. S. Stem

Outline circular. Trichomes unicelluar, unbranched, conical, pointed at apex. Base swollen, wall thick, measuring about 280 x 60 μm in size. Epidermis single layered, cells parenchymatous, barrel shaped, compactly arranged without intercellular spaces, measuring about 30 x 20 μm in size. Cuticle thick. Cortex multilayered, outer cortex 2 to 3 layered, cells collenchymatous, polygonal, small, thickened at corners, compactly arranged without intercellular spaces, measuring about 20 x 16 μm in size. Inner cortex 4 to 5 layered, cells parenchymatous, oval, thin walled, isodiametric enclosing small intercellular spaces, measuring about 30 x 24 μm in size. Large mucilage cells are present in cortex measuring about 110 x 95 μm in size. Cortical cells contain crystals of calcium oxalate. Endodermis indistinct. Pericycle 2 to 3 layered, continuous, parenchymatous, containing patches of sclerenchyma. Vascular cylinder is in form of a ring. Phloem in outer continuous ring. Xylem in continuous cylinder, vessels in radial rows, circular in outline, measuring about 16 x 13 μm in size. Pith wide, homogeneous, cells parenchymatous, oval, thin walled, isodiametric, enclosing small intercellular spaces, measuring about 41 x 31 μm in size. Pith cells contain crystals of calcium oxalate. Mucilage cells are also present in pith, measuring about 93 x 88 μm in size.

Stem with secondary growth – Vascular cylinder with secondary phloem in outer continuous ring. Secondary xylem in inner continuous ring. Vessels are in radial rows, circular in outline measuring about 38 x 32 μm in size. Inner xylem vessels are large and circular in outline measuring about 80 x 80 μm in size. Mucilage cells present in inner secondary xylem cylinder. Pith cells contain red coloured inclusions towards peripheral region.

T.S. Stem (node) : In nodal region vascular cylinder is not continuous. It is broken to vascular bundles of different sizes. Towards lateral side smallest vascular bundle goes to the leaf separated by parenchyma cells. On both side of leaf trace two medium sized bundles are present. In the middle portion two largest vascular bundles are present. Pith cells contain inclusion. Calcium oxalate crystals are present towards peripheral region of cortex as well as in the pith region.

In nodal region vascular cylinder bifurcates and form leaf traces. Cortical region also bifurcates and goes to the leaf. Leaf gap is present in between in leaf trace.

T. S. of Petiole

Outline circular. Trichomes few in no. Epidermis single layered, cells parenchymatous, rectangular, compactly arranged without intercellular spaces, measuring about 20 x 16 μm in size. Cuticle thick. Cortex multilayered,

cells parenchymatous, oval, thin walled, isodiametric, enclosing small intercellular spaces, measuring about 28 x 24 μm in size. Endodermis indistinct. Pericycle 2 to 3 layered, parenchymatous, containing patches of sclerenchyma. Vascular bundles present in a single ring separated by parenchymatous medullary rays. Each vascular bundle is conjoint and collateral. Phloem in the form of patches to the outer side of xylem. Xylem vessels in radial rows, circular in outline measuring about 16 x 12 μm in size. Pith homogeneous, cells parenchymatous, thin walled, isodiametric, enclosing small intercellular spaces. Cells adjoining xylem small and compact, measuring about 44 x 40 μm in size.

Cortical cells and pith cells contain calcium oxalate crystals and mucilage cells.

Leaf, surface view.

Epidermal cells parenchymatous, polygonal, compactly arranged without intercellular spaces. End walls and lateral walls are straight, measuring about 57 x 32 μm in size. Leaf is amphistomatic Stomata many, 2 to 4 cell apart, anisocytic. Guard cells measuring about 24 x 8 μm in size. Pore oval, measuring about 12 x 4 μm in size.

T. S. Leaf

Trichomes many, glandular, unicellular, unbranched, conical, pointed at apex, broad at the base. Wall is thick, smooth and colourless. Gland is present at the base. Base is surrounded by epidermal cells. Cytoplasm of trichome is pink coloured, measuring about 389 x 31 μm in size .Both epidermis are single layered. Cells parenchymatous, rectangular, compactly arranged without intercellular spaces measuring about 30 x 18 μm in size. Cuticle thick. Mesophyll is differentiated into palisade and spongy parenchyma. Palisade is single layered. Below upper epidermis cells are columner, elongated, compactly arranged with their long axis at right angle to the leaf epidermis without intercellular spaces, measuring about 58 x 10 μm in size. Below mesophyll spongy parenchyma is multilayered. Cells are parenchymatous, oval, thin walled, enclosing small intercellular spaces, measuring about 16 x 12 μm in size. Vascular bundles conjoint, collateral and closed, run parallel in lamina. Midrib is parenchymatous. Towards lower side large vascular bundle is present in form of an arc. Vessels are radial and circular in outline. In between palisade calcium oxalate crystals are present. Towards the lower epidermis thick walled mucilage cells are present.

Discussion:

The genus *Abelmoschus ficulneus* (L.) Wight and Arn. is characterized by well developed trichomes which are glandular at the base in stem. They are thick walled, unicellular and unbranched. The glands are surrounded by epidermal cells. In addition to this mucilage cells are predominantly observed in cortex , phloem as well as pith region of root, stem and petiole. The cortical and pith region of stem and petiole is infested with raphides composed of calcium oxalate crystals. Even in the leaf mesophyll tissue these crystals are found to be present. These mucilage cells contain volatile oils, fatty acids and vitamin C. It is because of he rich content of vitamin C, the fruits of the present taxon are edible.

Trichmes,stomata, tracheids, vessels, calcium oxalate crystals and mucilage canals are microscopic characters of this plant. These mcroscopic characters are used in Identification of the plant.

References:

Ambasta, S. P (1986). *The useful plants of India. P.I.D. New Delhi ; 1*

Asolkar, L.V.; Chakare, O.J.; Kakkar, K.K. (1992). *Second supplement of Glossary of Indian Medicinal Plants with Active Principles.* Publication and information Directorate (CSIR), New Delhi ; 1 to 44.

Johnson D.A.(1940) *Plant Microtechnique* Newyork,U.S.A. Mc Graw Hill. Book co.Inc.

Pade, S. D.(1973). *Vanoushadhi – Gunadarsh. Raghuwanshi*, G. V. 242(B) Shukravar Peth, Pune 2,354

Patil, S. H. and Yadav, S.S. (2002). Traditional Medicinal Plants of Satpuda, Nandurbar District, Maharashtra state. *The Indian Forester*, 129(11) : 1379-1384.

Habit

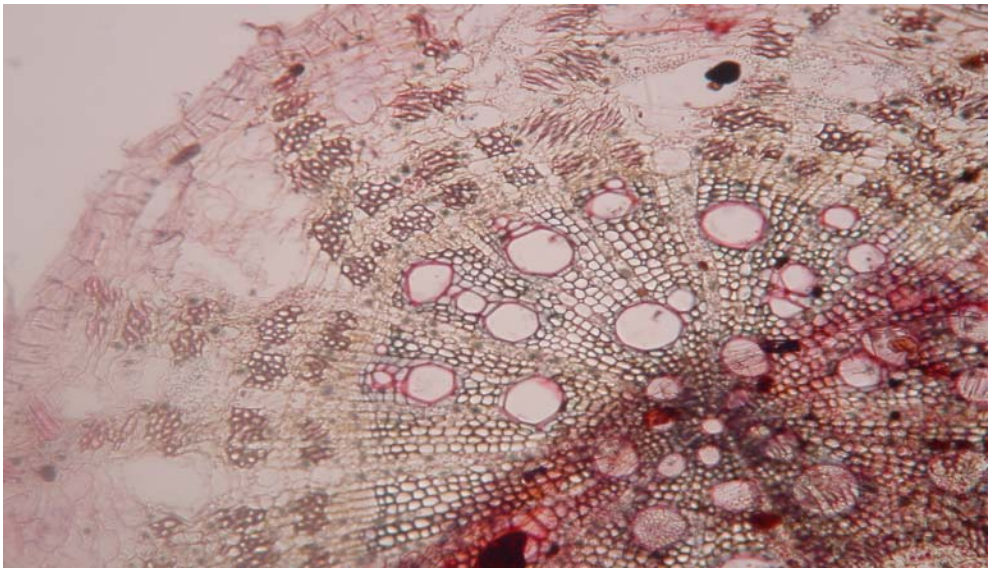


Fig. T.S. of root (magnified). Cortical cells show presence of calcium oxalate crystals and mucilage cells in vascular cylinder. x 640

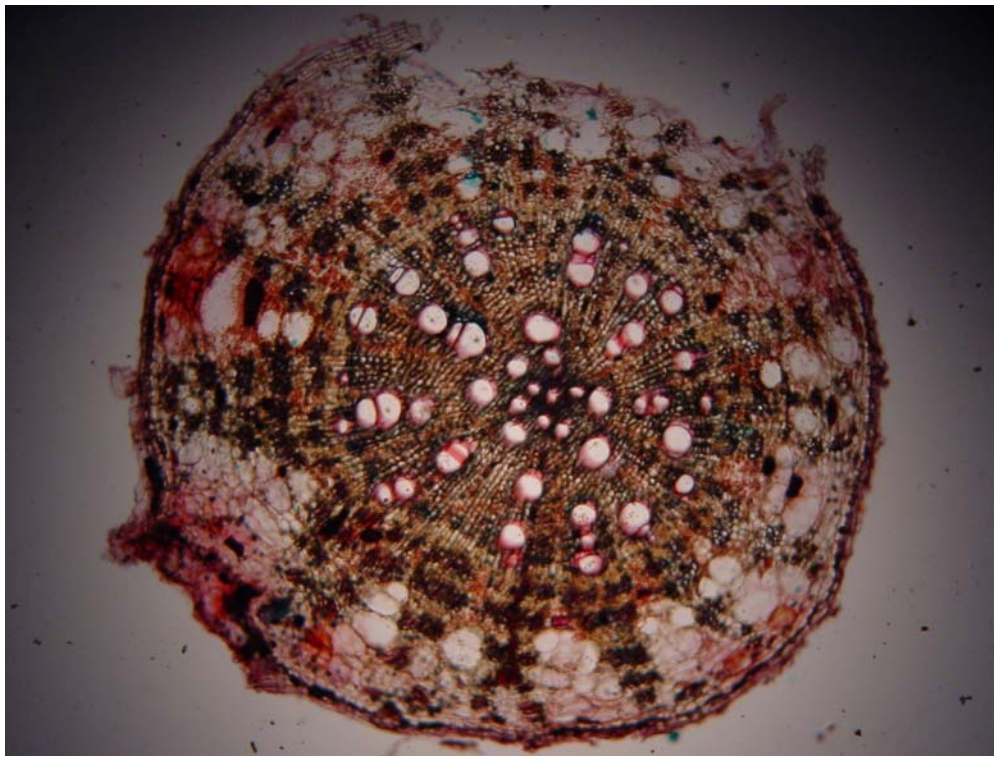
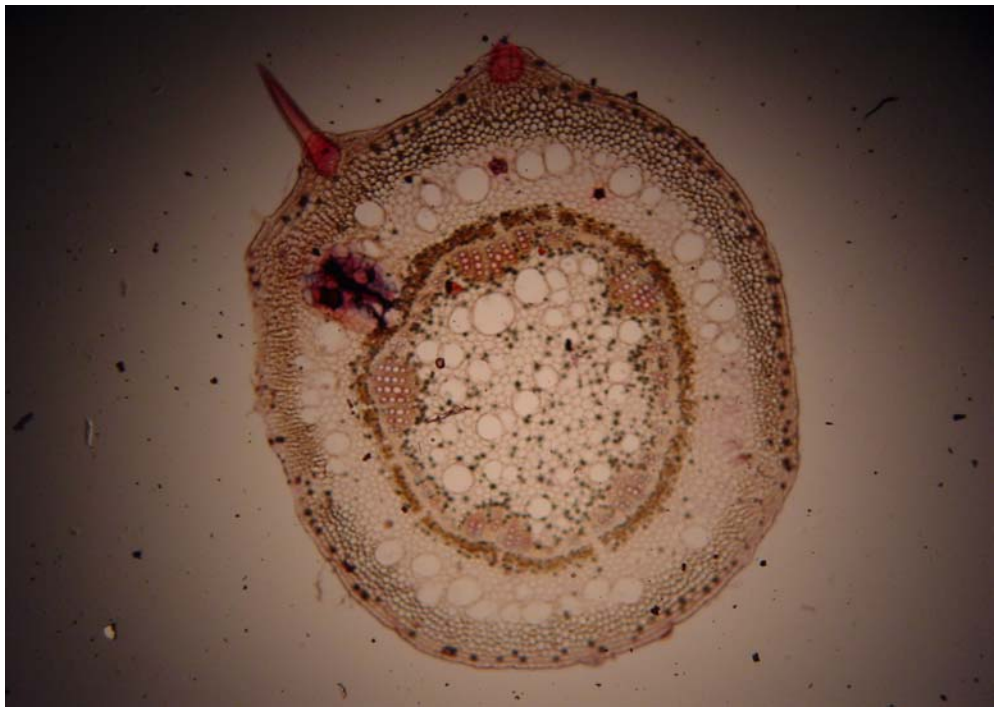


Fig. T.S of root showing large vessels x 80



T.S.of petiole

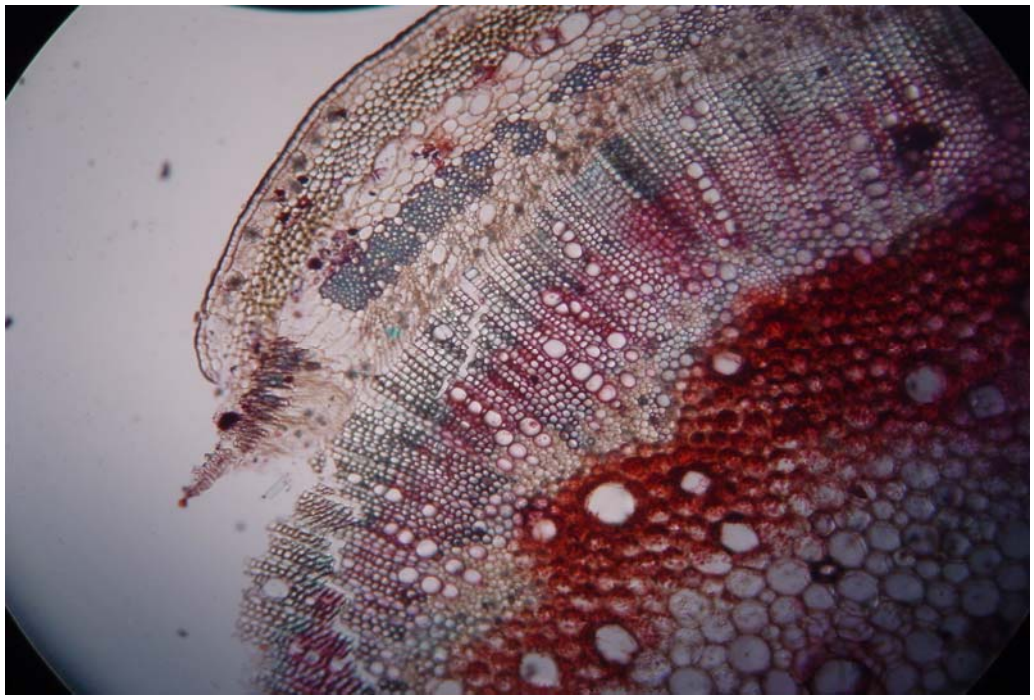


Fig. T. S. of stem showing Secondary growth x 640.

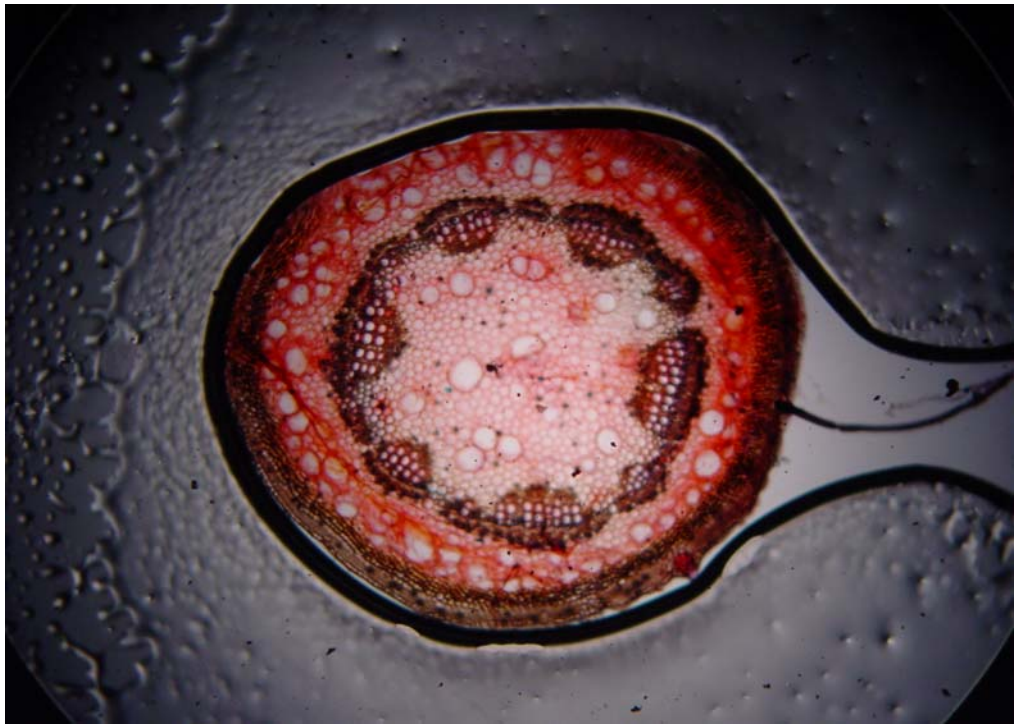
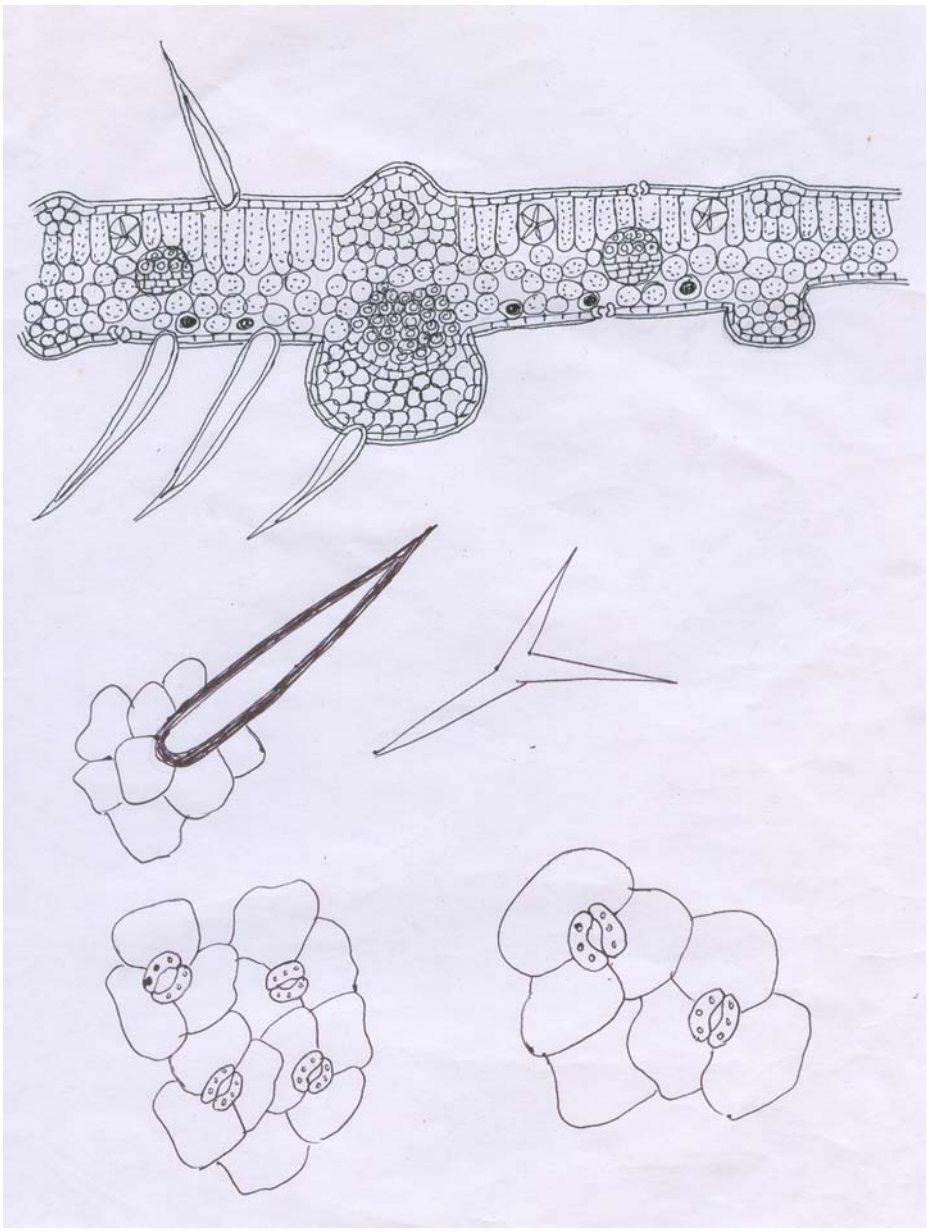


Fig. T.S. of petiole showing mucilage cells and calcium oxalate crystals in cortex and pith80



T.S. of leaf ,trichomes and stomata