

## Microscopic characters of *Alpinia galanga* (Linn.) Willd

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### Abstract

*Alpinia galanga* (Linn.) Willd belonging to family Zingiberaceae is used medicinally, as a condiment and as a source of an essential oil. Dried rhizome of this plant constitutes the drug. It is used as tonic deodorant and disinfectant. The drug is depressant of the cardio-vascular system. It is mostly used for curing bronchial catarrh, respiratory complaints, rheumatism, for controlling urine and in diabetics. The genus *Alpinia galanga* (Linn.) Willd is characterized by well developed, unicellular, unbranched root hairs. The microscopic characters of rhizome petiole and leaf were studied. It showed that drug mainly consists of stomata, starch grains, fibers, vessels and volatile oil, resins, tannins and glycosides. Due to reserve food starch and oil rhizome are edible and due to presence of secondary metabolites such as tannins, resins, oils and glycosides rhizomes and other parts are used medicinally.

**Keywords:** *Alpinia galanga*, Oils, Rhizome, Resins.

### 1. Introduction

*Alpinia galanga* (Linn.) Willd is cultivated through India mainly for its aromatic rhizomes. It is a perennial rhizomatous herb, which attains a height upto 1.75-2.25 m. Rhizomes are tuberous, deep orange-brown in colour, measuring about 1-3 cm. in diameter and 10-40 cm long. Leaves are short petiolate oblong with parallel venation. Flowers greenish white in terminal panicle.

Whole plant is medicinal. Rhizomes are used as a condiment and source of an essential oil [1]. Dried rhizome of this plant constitute the drug. It is used as tonic, deodorant and disinfectant. It possesses a stimulant aroma like ginger. It is used to treat bronchial catarrh, respiratory complaints and rheumatism. The drug is a depressant of the cardio-vascular system. The rhizomes are also carminative and against stomachache [2-3].

Leaves yield volatile oil [2]. The flowers are eaten raw and seeds are used as spice [1] the seeds have the same uses as that of rhizome, used as flavoring agent [4].

### 2. 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 [5] 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 forcep. The peels were stained with safranin by mounting in glycerine.

### 3. Observations and Results

**3.1 T.S. Root:** Outline circular, Epidermis is single layered, cuticularized, cells oval, parenchymatous, compactly arranged without intercellular spaces and stomata, measuring about 38 x 20  $\mu\text{m}$  in size. Cortex is multilayered, cells oval, parenchymatous, thin walled, with small intercellular spaces, measuring about 90 x 50  $\mu\text{m}$  in size. Thick walled oil cells are present. Endodermis is single layered, cells barrel shaped without intercellular spaces measuring about 100 x 40  $\mu\text{m}$  in size. Inner tangential and radial walls are thickened. Pericycle is indistinct, parenchymatous, lateral roots arise from pericycle. Vascular tissue consists of xylem and phloem. Vascular bundles are radial and polyarch. The xylem forms discrete strands alternating with the phloem strands. The parenchymatous conjunctive tissue is found in between and around the xylem and phloem. Xylem strand 14 in number. Xylem exarch. Vessels in radial rows, circular in outline. Metaxylem measuring about 88 x 70  $\mu\text{m}$  in size. Protoxylem measuring about 44 x 28  $\mu\text{m}$  in size. Pith is small, homogeneous, cells parenchymatous, thin walled, isodiametric with small intercellular spaces, measuring about 36 x 40  $\mu\text{m}$  in sizes.

**3.2 T.S. Rootlet:** Outline circular. Many. unicellular and unbranched root hairs arise from epidermis.. Wall is smooth and thin, hair with pointed end, arises from single epidermal cells, measuring about 220 x 10  $\mu\text{m}$  in size. Epidermis is single layered, cells oval, parenchymatous, compactly arranged without intercellular spaces and stomata, measuring about 38 x 20  $\mu\text{m}$  in size. Cortex is multilayered, cells parenchymatous, oval, with small intercellular spaces, measuring about 40 x 32  $\mu\text{m}$  in size. Cortex contains thick walled oil cells. Endodermis is single layered, cells barrel shaped, without intercellular spaces, measuring about 100 x 40  $\mu\text{m}$  in size. Inner and radial walls are thickened. Pericycle is indistinct, parenchymatous. Vascular bundles are radial, xylem exarch. Alternating with xylem vessels phloem is present below pericycle near periphery.

**3.4 T.S. Rhizome:** Outline more or less circular. Epidermis is single layered, cuticularised. Cells parenchymatous, rectangular, thin walled, compactly arranged without intercellular spaces, measuring about 14 x 12  $\mu\text{m}$  in size. Outer walls are heavily thickened. Cortex is multilayered, cells uniform, circular, thin walled, parenchymatous with small intercellular spaces, measuring about 55 x 76  $\mu\text{m}$  in size. Some cells of cortex contain red coloured inclusion. Some parenchyma cells also contain granular transparent inclusion. The most characteristic feature of the cortex is the presence of numerous scattered vascular bundles. Each vascular bundle is conjoint, collateral and of closed type. Xylem consists of thick walled hexagonal vessels measuring

about 40 x 40  $\mu\text{m}$  in size. Phloem elements are thin walled measuring about 14 x 10  $\mu\text{m}$  in size. Each vascular bundle is surrounded by a sclerenchymatous bundle sheath. Bundle sheath consists of 3 to 4 layers. Cortical bundles are secondary vascular bundles. Endodermis consists of narrow zone of thin walled cells. It separates the cortex from inner ground tissue. Ground tissue forms the central portion. It consists of thin walled, oval, parenchyma cells, measuring about 56 x 36  $\mu\text{m}$  in size. In ground tissue numerous vascular bundles are scattered. Just below the endodermis vascular bundles are more close to each other and form almost a ring just under the endodermis. These bundles are also conjoint collateral and closed as cortical bundles. Phloem elements are lesser in comparison to the cortical bundles, measuring about 8 x 4  $\mu\text{m}$  in size. Bundle sheath less thickened. Xylem vessels hexagonal in outline measuring about 54 x 10  $\mu\text{m}$  in size. Ground parenchyma cells also contain red coloured resin cells and starch cells.

**3.5 T.S. Petiole:** Outline curved. Epidermis is single layered, cells rectangular, parenchymatous, compactly arranged without intercellular spaces, measuring about 18 x 14  $\mu\text{m}$  in size. In between upper and lower epidermis parenchyma cells form the major portion of the petiole. Cells thin walled, polygonal in shape and compactly arranged without intercellular spaces, measuring about 84 x 66  $\mu\text{m}$  in size. Some cortical cells thick walled containing some inclusion. Vascular bundles are conjoint, collateral and closed. Towards the lower margin vascular bundles are arranged in a single layer whereas in the upper part, vascular bundles remain scattered throughout the petiole. Sclerenchymatous patch is present at the top of each vascular bundle. Sclerenchyma cell measuring about 4 x 4  $\mu\text{m}$  in size. Xylem vessels few in number. Protoxylem one or two in number measuring about 20 x 16  $\mu\text{m}$  in size. Metaxylem elements 5 to 6 in number, measuring about 60 x 40  $\mu\text{m}$  in size. Phloem elements thin walled, measuring about 8 x 4  $\mu\text{m}$  in size.

**3.6 Leaf, Surface view:** Epidermal cells are hexagonal in outline, parenchymatous, compactly arranged without intercellular spaces. End walls are thick and straight. Cells of upper surface are measuring about 62 x 38  $\mu\text{m}$  in size. Cells

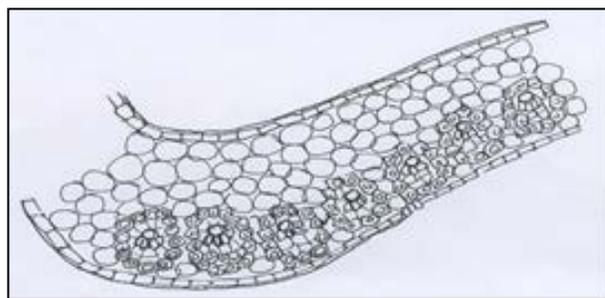
of lower surface measuring about 34 x 19  $\mu\text{m}$  in size. Epidermis is hypostomatic. Stomata are absent in upper epidermis. In lower epidermis stomata many 1 to 2 cells apart, present in longitudinal rows at right angle to the epidermal cells. Stomata paracytic. Pore is elliptical, measuring about 20 x 2  $\mu\text{m}$  in size. Guard cells kidney shaped, measuring about 26 x 7  $\mu\text{m}$  in size. Subsidiary cells are two, parallel to guard cell. Subsidiary cells contain yellow coloured inclusion.

**3.7 T.S. of Leaf:** Both epidermis are single layered, cells rectangular, thin walled, parenchymatous, compactly arranged, measuring about 20 x 16  $\mu\text{m}$  in size. Mesophyll cells parenchymatous, polygonal in shape, compactly arranged. In midrib vascular bundles are not scattered. In between large vascular bundle small vascular bundles are present, measuring about 80 x 60  $\mu\text{m}$  in size. Vascular bundle is conjoint, collateral and closed. Sclerenchymatous patch is present at the top of each bundle. Xylem consists of protoxylem and metaxylem towards the upper side measuring about 60 x 40  $\mu\text{m}$  in size. Protoxylem measuring about 20 x 16  $\mu\text{m}$  in size. Phloem is thin walled towards lower side, measuring about 8 x 4  $\mu\text{m}$  in size.

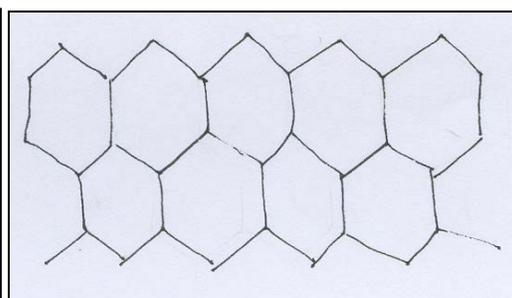
#### 4. Discussion

The genus *Alpinia galanga* (Linn.) Willd. is characterized by well-developed and prominent root hairs which are thin walled, unicellular and unbranched. It arises from single epidermal cells. Cortex region of rhizome is broad, consists of starchy parenchyma and numerous scattered secretion sacs containing yellowish volatile oil and reddish brown amorphous substance even the leaf subsidiary cells contain yellow coloured volatile oil and some epidermal cells contain a reddish brown amorphous substance resin.

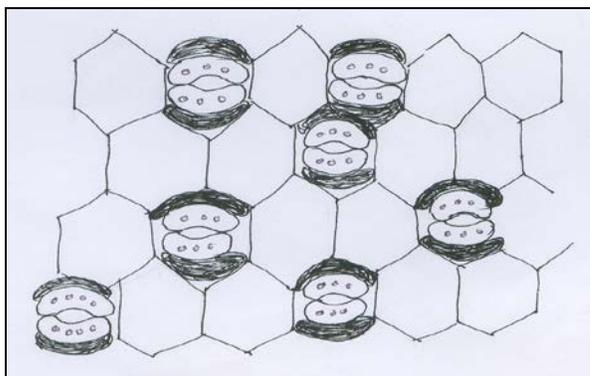
Microscopic characters are useful in identification of drug. Drug mainly consists of stomata, starch grains, fibres, vessels and volatile oils, resins, tannins, and glycosides. Due to reserve food starch and oils rhizomes are edible and due to presence of secondary metabolites such as tannins, resins, oils, and glycosides rhizomes and other parts are used medicinally.



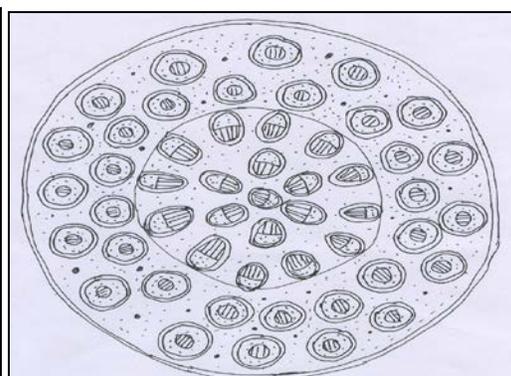
T.S. of leaf



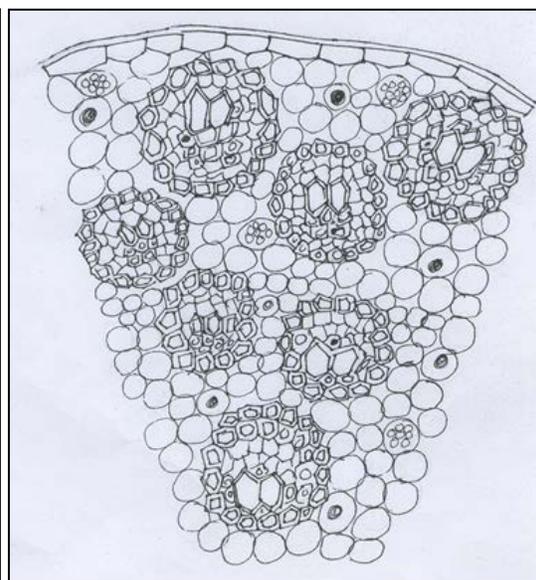
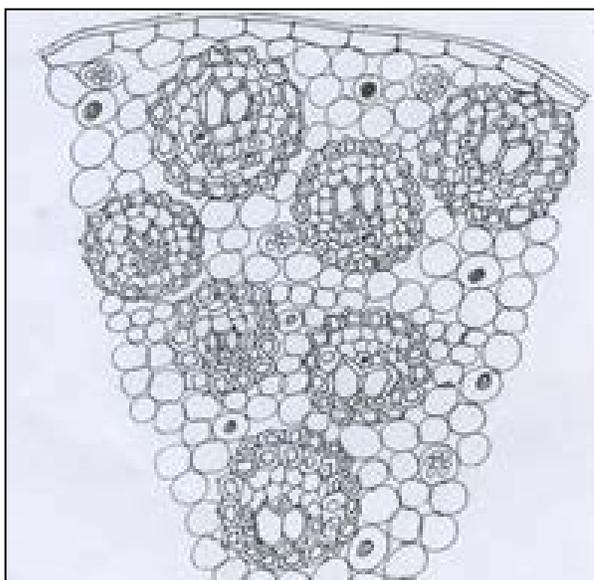
Upper epidermis



Lower epidermis



T. S. of rhizome (diagrammatic)



T.S. of rhizome (sector magnified)



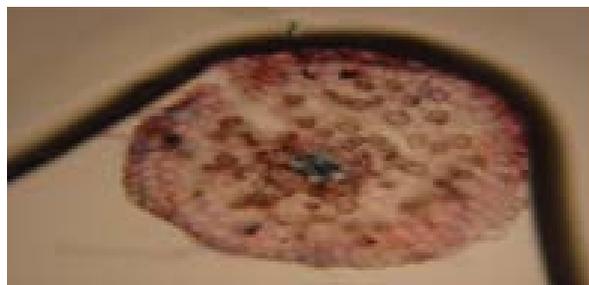
Habit



Habit (root and rhizome)



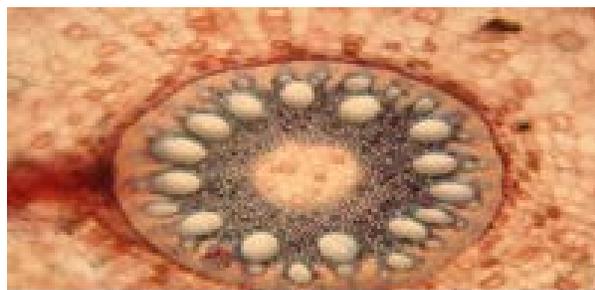
T.S. Petiole X 80



T.S. of rootlet x 80



T.S. of root x 80



T.S. of root x 680

#### 4. References

1. Sambhamurthi AVSS. *Taxonomy of Angiosperms*, I.K. International Pvt. Ltd. New Delhi, 2005, 561.
2. Bhattacharjee SK. *Hand Book of Medicinal Plants*. Indian Agricultural Research Institute. New Delhi; 1998, 1-474.
3. Singh MP, Dey S. *Indian Medicinal Plants*. Satish Seria Publishing house, New Delhi; 1-436.
4. Kapoor LD. *Hand book of Ayurvedic Medicinal plants*. CRC Press Boca Raton Landon. New York Washington; 1990, 325.
5. Johansen DA. *Plant Microtechnique* New York U. S. A. Mc. Graw Hill Book Co. Inc. 1940.