

ANATOMICAL PECULIARITIES OF CASSIA OCCIDENTALIS LINN.

Dr. P. N. Pawade¹, Swati J. Jane²

¹Associate Professor, Department of Botany, Arts, Commerce & Science College, Kiran Nagar, Amravati, Maharashtra, India

²Research Scholar, Department of Botany, Arts, Commerce & Science College, Kiran Nagar, Amravati, Maharashtra, India

Abstract

The present investigation has been carried out to determine the anatomical features of whole plant of Cassia occidentalis an important medicinal plant used in traditional systems of medicine. It shows anatomical peculiarities like midrib of leaf is shallow depressed on upper sides. The mesophyll differentiated into adaxial zone of palisade cells and abaxial zone of spongy parenchyma cells. Upper epidermis shows druses. Petiole shows 6 vascular bundles arranged in rings and two lateral bundles depart to the wings. Stone cells fairly abundant in secondary phloem in root. This plant is used for the treatment of different diseases of human beings. Cassia occidentalis is popularly known as 'BadiKasondi'. Traditionally it is used as purgative, wound healing, diuretic, antipyretic, hepatoprotective, antidiabetic and in asthma and scorpionsting.

Keyword: Anatomy, Cassia occidentalis, leaf, root, petiole

1. INTRODUCTION

The present investigation deals with the detail study of anatomy of the complete plant of Cassia occidentalis. This study was aimed to provide valuable and reliable illustrated anatomical description of Cassia Occidentalis. Plant anatomy deals with the structure, contents and development of cells and tissues. It is of primary importance for all aspects of research in plant sciences such as morphogenesis, physiology, ecology, taxonomy, evolution, genetics, reproduction etc. (Fahn, 1990). The systematic anatomy is mainly aimed towards relating structure particularly of vegetative organs to taxonomic classification of plants in which the

characters are exemplified. Application of systematic anatomy can also be extended to detection of adulterants and substitutes (Metcalfe C. R. and Chalk L. 1979). Anatomical data have been used to good effects of all leaves of the taxonomic hierarchy as well as for identification and assessment of the taxonomic relationships among taxa of the flowering plants. (Stuessy, 1990). Genus Cassia (family – Caesalpiniaceae) were used as ornamental, food and traditional medicine in several countries. Due to the similar morphology and vernacular name, the identification of their species is perplexed. Cassia occidentalis L. is an Aruvedic medicinal plant used as a traditional medicine for the treatment of various diseases. This plant extracts are known to have antibacterial, antifungal, antimalarial, antiinflammatory, antioxidant, hepatoprotective and immuno suppression activity.

The present study aims to investigate the anatomical peculiarities of Cassia occidentalis. Cassia occidentalis Linn. usually grows in the southern part of India which is known as 'Kasmard' in Sanskrit, 'Kasondi' in Hindi and coffee 'Senna' in English. The plant belongs to Caesalpiniaceae family. The common name is 'ponnavarai' in Tamil. The roots, leaves and seeds are the parts of the plant used. It is an erect herb, commonly found by road sides, ditches and waste dumping sites. Cassia occidentalis has been widely used as traditional medicine. Entire parts of the plant have medicinal values. It possess wound healing properties. (Mohammed M, Aboki MA, Saidy HM, Victor O, Tawakality A, Maikano SA., 2012)

2. MATERIALS AND METHODS

The specimens for the present study were collected from healthy plants along road sides to some places in Amravati. The collected specimens were identified with

the help of flora, manuals, monographs. Fresh material stem, leaves and root were fixed in formalin (FAA) for 48 hours, washed in several changes of distilled water dehydrated through alcohol series (30, 50,70, 90 and 100 %), 2 hours in each solution and embedded in wax. Sections in each case were cut on a Leica 2125 rotary microtome at thickness of 5 micron. The sections were dewaxed with pure xylene and rehydrated in alcohol series following Cutler (1978) with modifications. Staining was achieved by dipping the slides in 1% alcian blue (light green) for about 5 minutes, washed with distilled water and counter stained with 1% safranin for 2 minute. The stained sections were dehydrated through alcohol series and mounted permanently in DPX. A light microscope (Getner) was used to view the slides and adjusted to finest resolution. The microphotographs of selected slides were obtained using coslab (scope image 9.0) digital PC – microscope. Camera focused through the eye piece. The photographs of same anatomy were examined with respect to their peculiarities and put forward for further examination. The terminology of Metcalf and Chalk (1950) was used for anatomical designations.

To study the leaf architecture, the mature leaves from both fresh and herbarium materials were cleared by treating them with 5% aqueous Sodium hydroxide which was repeatedly replaced by fresh solution until

leaf material got cleared, followed by treatment with 2% acetic acid after washing thoroughly with distilled water. The herbarium material was pre- soaked in warm water and then proceeded. The lamina leaves or portion of lamina in case of large leaves after washing with distilled water stained with aqueous Safranin and mounted in glycerine or dehydrated major venation patterns were studied with the help of under lens both dissecting and compound. For minor venation pattern and details of leaf architecture compound microscopic observations were made. Terminology of Hickey (1973, 1971) is followed for describing leaf architecture. Whole lamina photographs were taken directly using photographic enlarger.

3.RESULT AND DISCUSSION

Habit

C. occidentalis grows widely immediately after the rain and started disappearing in the beginning of cold weather. It is a straight, somewhat branched, smooth, semiwoody, fetid herb, 0.8 – 1.5 m, tall, herb, stout, with a few lateral roots on mid section. The stem of the plant is reddish purple. Leaves are alternate even pinnately compound, each

Fig. No. 1: Cassia occidentalis habit



one with 4-6 pairs of nearly sessile, opposite leaflets, with a fetid smell when crushed, each leaflet 4-6 cm long, 1.5 – 2.5 cm wide, ovate or oblong, lanceolate with a pointed tip and fine white hairs on the margin.

Stipules are 5 – 10 mm long, often leaving an oblique scar. Inflorescence is a compound of axillary and terminal racemes. The flower is perfect 2 cm long with 5 yellowish green sepals with distinct red veins and 5

yellow petals. The fruit is a dry, dehiscent, transversely partitioned, faintly recurved, laterally compressed, sickle shaped legume (Pod), 7- 10 cm long, 8 – 10 mm wide with rounded tip and containing 25 – 50 seeds. Seeds are oval shaped, 3.5 – 4.5 mm wide, flattened ; pale to dark brown, smooth and with a round pointed tip.

Uses: Decoction of *C. occidentalis* roots with black pepper is quite useful for filarial disease. In the malyagirj hills, a decoction made from 15 leaves each of *C. occidentalis*, *Glycosmispentaphylla* and *Vitex negundo* is used for bathing the new born baby at the end of 7th , 12th , and 21st day, to make the baby almost immune to skin diseases by the Tanla people in Dhenkanal district of Orisa. The leaves of plant are used for the treatment of Yaws, scabies, itches and ringworm among the yourba tribe of south western Nigeria. In addition to this the leaves are also known to be effective against jaundice, headache and toothache. *C. occidentalis* leaves have ethno medical importance like wound healing, treatment of sores, itch, cutaneous disease, bone fracture, fever, ringworm and throat infection.

Root :- Stele tetrarch, Pith absent, Endodermis distinct, cortex parenchymatous. During secondary growth cambium gets established in normal fashion. Secondary phloem narrow and continues with patches of scattered stone cells. Secondary xylem is dense and compact.

Vessels are scattered circular to oval. Predominantly radially multiple, some are solitary or paired. Rays biseriate to multiseriate. Cork Cambium superficial cork 1 -3 layered.

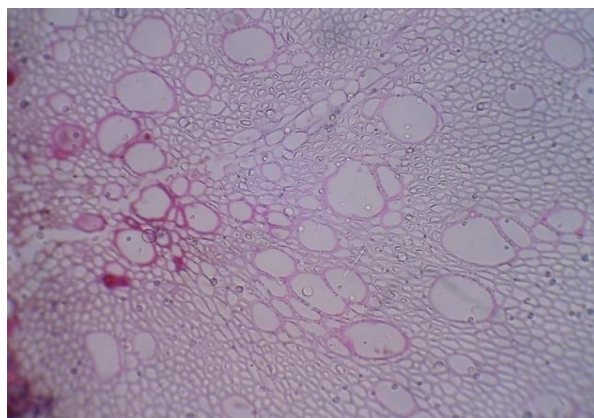


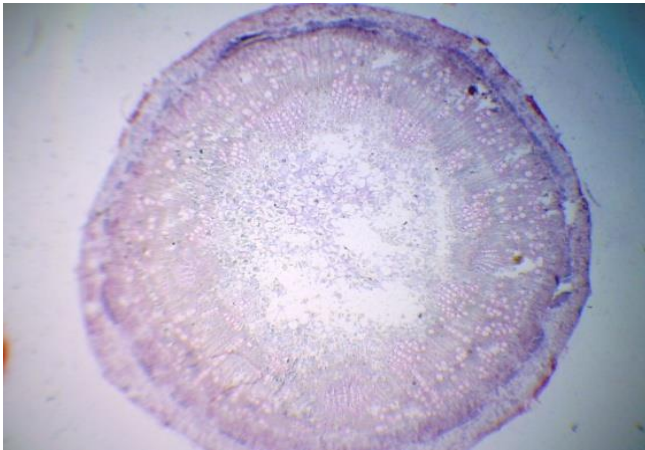
Fig. no.2: T. S. of Root

Stem :- Aerial young stem roughly angular, presence of deep grooves at four corners. Epidermis single layered with stomata, cells are some what barrel shaped closely fitted together and cuticularised. Cells have unevenly thickened walls the outer wall is much thicker than the inner wall.

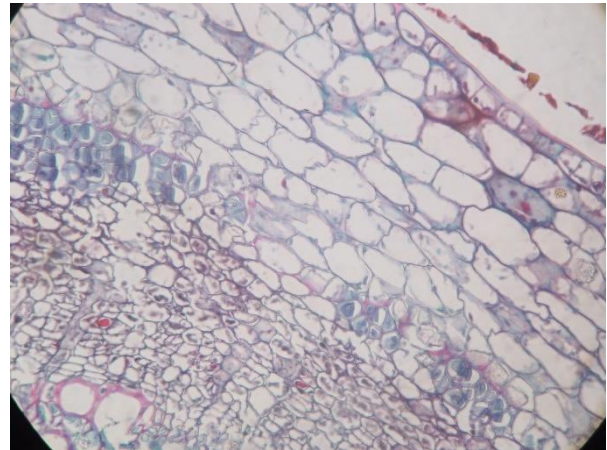


A -Fig. 3:T.S. of Young Stem (Entire view)

Following the epidermis there is heterogeneous cortex are present. Outer is collenchymatous hypodermis cells are compactly arranged. Inner cortex parenchymatous, cells thin walled, enclosing small intercellular spaces. Endodermis distinct, Pericycle almost invariably containing a composite and continuous ring of sclerenchyma. Vascular bundles arranged in rings out 17 vascular bundles, 5 larger in size and 12 small. It is interrupted by medullary rays vessels oval to circular in shape, radially multiplies to 2 to3. Pith wide presence of irregular parenchyma cells enclosing small spaces.



A



B

Fig.4: T. S. of Stem(A-entire view, B-cross section)

Epidermis single layered cell squarish, compactly arranged upper and lower wall flattened (straight) cuticularized. Outer cortex collenchymatous 4 to 5 layers showing ducts, inner cortex few layered parenchymatous. Endodermis distinct single layered, pericycle heterogenous, sclerenchymatous about 4 layer alternate with 4 to 5 layer parenchyma patches. The vascular bundle comprises outer narrow, continuous zone of sec. phloem. Sec. phloem elements are arranged in short thin compact rows. Primary phloem crushed. Secondary xylem includes major portion of thick walled tracheides.

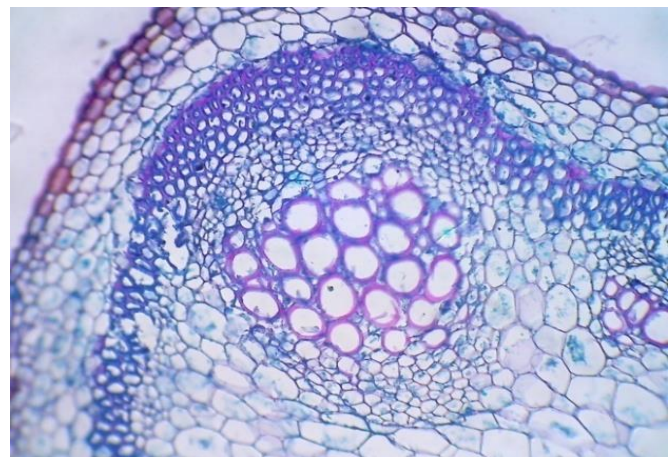
Vessels are regular, circular, polygonal, flattened, pentagonal and oval in out line. Predominant radial multiples few solitary few in groups. Secondary formed xylem with vessels predominantly in radial multiples of 5. Xylem cylinder thick consists of parenchyma, sclerenchyma. Medullary rays uniseriate.

Pith wide homogenous cells parenchymatous thin walled containing starch grain isodiametric, uneven, penta or polygonal, enclosing very small or slight small intercellular spaces at meeting corners of walls. Cells adjoining xylem, small, compact.

Petiole



A



B

Fig. 5: T.S. of Petiole(A-entire view, B-cross section)

Transectional outline through middle region, triangular abaxially, shallowly depressed, adaxially margin irregular. Adaxial and abaxial epidermis 1 – layered cells roundish oval or squarish, slight horizontally elongated barrel shaped, outer and inner walls roundish cuticle thick. Hypodermis distinguished, continuous collenchymatous 5 to 6 layered adaxially, 2 to 3 layered abaxially, cells uneven. Ground tissue parenchymatous, enclosing small intercellular spaces, cells polygonal, roundish.



Fig.7:T. S. of Midrib

Boodle and Fritsch (1908), reported that the significance of differences in the structure of the epidermis lies in the special shape of the cells or special structure of the cell walls in some cassia species.

Epidermis is cutinized and cuticularised upper epidermal cells rectangular, barrel shaped, upper and inner wall arched, lower epidermal cells radially elongated. Upper and lower epidermis interrupted by stomata, lower epidermal stomata slightly elevated. Mesophyll differentiated into palisade and spongy parenchyma (fig.6). Palisade single layered densely filled with chloroplast. Cells columnar, compactly placed. Spongy parenchyma 4 to 5 layers, cells irregular, loosely placed, filled with few chloroplast. Vein bundle embedded in spongy parenchyma, bundle sheath parenchymatous.

Midrib shallowly depressed on upper side. Epidermis cutinized and cuticularised, collenchymas 2 to 3 layer on lower side, mesophyll continues in midrib,

Pattern of Vascular bundles shows 6 vascular bundles arranged in ring 2 lateral bundles depart to the wings (fig.5A). Xylem directed towards adaxial concave side, phloem towards abaxial side. Vessels circular, oval in outline in radial multiples of mostly 4 to 5 perivascular sclerenchyma present. Collateral additional vascular bundles in wings (fig.5B).

Leaflets : -

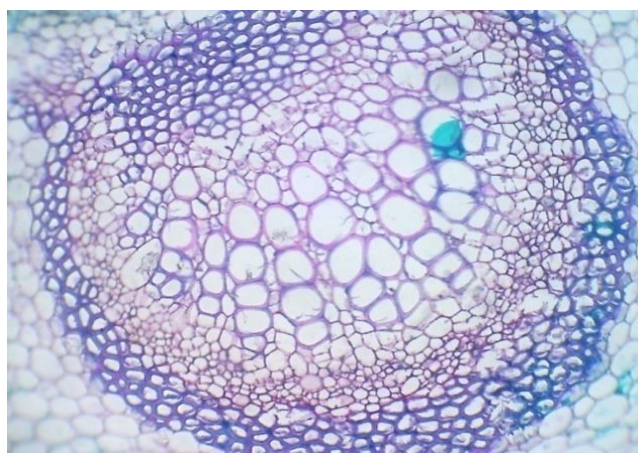


Fig.7:T. S. of Midrib

cells elongated to isodiametric. Ground tissue parenchymatous, cells thin walled, enclosing small

intercellular spaces. Vasculature roughly rounded, flattened on upper side. Phloem towards abaxial sides, sclerenchymatous bundle sheath 8 to 9 layers on adaxial sides, 5 to 6 layers in abaxial, 2 to 3 layer on lateral sides. Xylem vessels are radially multiples of 5 to 6, oval, rounded in shape (fig.7)

Venation:

The basic axes of orientation in the leaflets is apical with respect to leaf shape and size the length of whole leaflet is 4- 6 cm and width is 2.5 cm. The lamina is symmetrical ; base is slightly asymmetrical ; form is ovate, apex acute and base is obtuse. The margin entire leaf texture is membranous. The glands are present at the base of the petiole.



Fig.: 8 Leaf Venation showing midrib

Type of venation is pinnate semicraspedodromous. Primary vein (10) is stout ; its course is straight and unbranched. Secondary veins (20) are present. The angle of divergence is acute moderate (fig.8) ; upper secondary veins more obtuse than lower. Secondary veins are moderate. The course is curved uniformly ; loop forming branches are joining super adjacent secondary at an acute angle. Inter secondary veins are simple. Intra marginal veins are absent. Tertiary veins (30) are present ; angle of origin an exmedial and admedial side is RR / RR. The pattern is random reticulate. The precurrent are present. Their course is simple and forked. The relationship to midvein is oblique

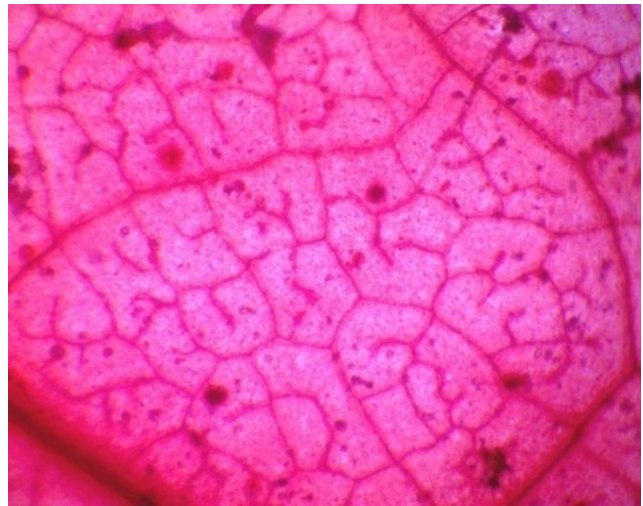


Fig.: 9 Leaf Venation showing veinlet

; angle decreasing apically; the arrangement is predominantly alternate; higher order venation forming reticulum in which vein order are distinct; Quaternary vein(40) are thin; their course is orthogonal.Quinternary veins (50) are thin; their course orthogonal.

Highest vein order of leaf is 50. The marginal ultimate venation is incomplete. Veinlets simple curved or linear, branched one or twice. Areoles are well developed; arrangement is oriented; shape quadrangular, pentagonal; size medium (fig.9)

Stomata and Trichomes:

Stomata stomata

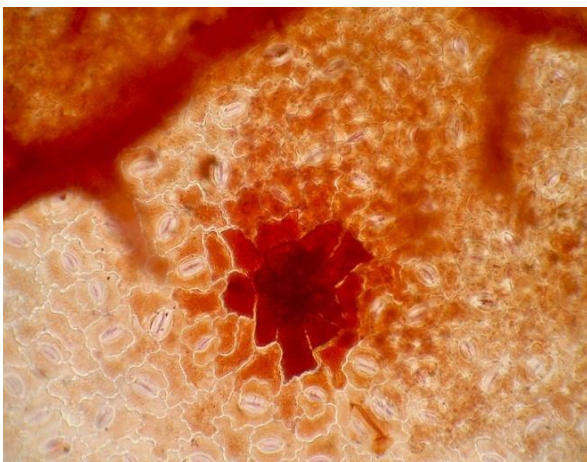


Fig.10: Leaf surface showing druses

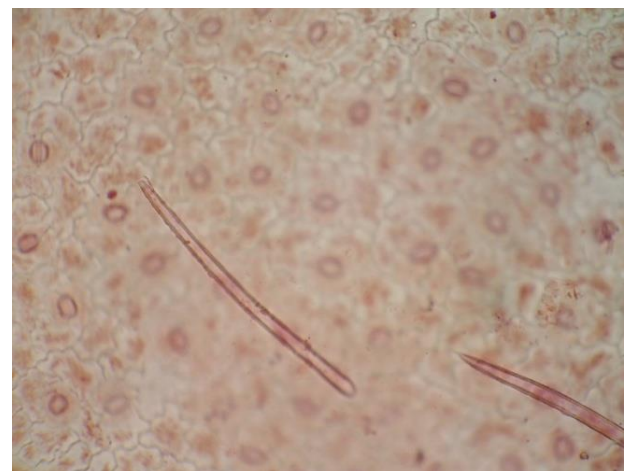


Fig.11:GlandularTrichomes



Fig.12: Leaf upper epidermis showing stomata

Adaxial epidermis cells are irregular some times elongated shows paracytic stomata generally elliptic in shape with variable sizes. Trichomes are absent but druses are present (fig.10). Epidermal cells on the abaxial surface are dome shaped; sometimes they appear polygonal sizes stomata is paracytic and anisocytic generally elliptic in shape. Trichomes are present, but there are only glandular types (fig.11), sparsely distributed, stalked multicellular types.

4.CONCLUSION

It is quite obvious that the plant is widely used in traditional medicinal system of India. The present study revealed exciting features that are helpful in the identification of species. These includes anatomical features of stem, petiole, leaf, root, types of stomata, trichome, leaf venations. These results therefore suggest diagnostic features that were found that can be employed to justify the species.

REFERENCES:

- [1] Boodle L. A. and Fritsch F. E. (1908), Soleredr's systematic anatomy of theDicotyledons, revised by Scott D H vol. I and II (Clarendon press Oxford UK).
- [2] Cutler, D. F., (1978), Applied plant Anatomy Longman Inc., New York,pp:103,New York, PP : 103.
- [3] Fahn, (1990), A. plant Anatomy. Fifth edit.Pergmon press. New York.

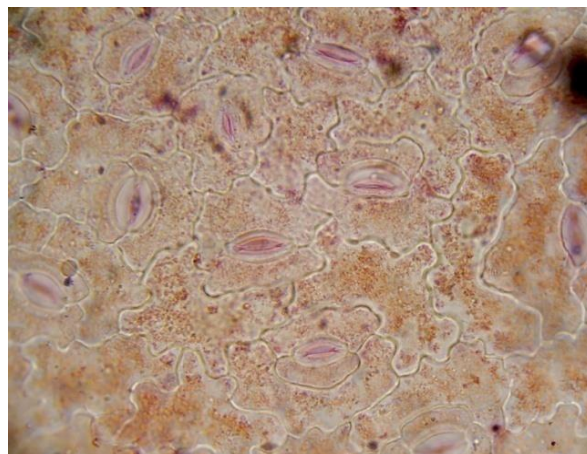


Fig.13: Leaf lower epidermis showing stomata

- [4] Hickey,L. J. (1973), Classification of architecture ofDicotyledonousLeavesAmsser. J. Bot, 60:17-33.
- [5] Hickey, L. J. (1971), Evolutionary significance of leaf architectural features inwoody Dicots Amer J. Bot, 58:469 (Abstract).
- [6] Metcalfe C. R. and Chalk L. (1950), Anatomy of the Dicotyledons. Vol I,Clarendon press.
- [7] Metcalfe C. R. and Chalk L. (1979), Anatomy of the Dicotyledons Vol. I Secondedition, Clarendon Press Oxford.
- [8] Mohammed M, Aboki MA, Saily HM, Victor O, Tawakality A, MaikanoSA., (2012), Phytochemical and some Antimicrobial Activity of Cassia occidentalisL. (Capsalpiniaecae). Int J sciTechnol; 2 (4).
- [9] Stuessy F T (1990), Plant taxonomy. The systematic Evolution of ComparativeData. Columbia University Presses. New York.