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DETAILED PHARMACOGNOSTICAL EVALUATION OF ROOT OF *CASSIA MIMOSOIDES* L. ALONG WITH THE WHOLE PLANT POWDER MICROSCOPY

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ABSTRACT

India has one of the richest medicinal plant resources in world. Many plants are well studied for its uses and application in Ayurveda texts but many plants are used by traditional medicinal practitioners, which are not mentioned in classical texts. These drugs are scientifically unexplored. One such plant used in Gujarat is *Aaval ni Jaat* which is botanically identified as *Cassia mimosoides* L. belonging to sub-family Caesalpiniaceae. The root of this plant is used in diarrhea and spasm of stomach and the whole plant is sometimes used medicinally as a cure for colic pain. Review revealed that the plant has not been explored from pharmacognostical view including its whole plant powder microscopy but analytical study has been published. Hence in this research article focuses on detailed microscopy of root along with root powder, whole plant powder microscopy and micrometry of *C. mimosoides*. Macroscopically root is Dark brown coloured having fibrous fracture. Diagrammatic T.S. of root is circular to irregular in outline. Outer cork is followed by cortex, endodermis, pericycle & centrally located stellar region. Root powder is slight astringent in taste, having rhomboidal, twin crystals and prismatic crystals, starch grains with hilum. The whole plant powder is yellowish green in colour having microscopical characters like prismatic and rhomboidal crystals and stomata. The results obtained from pharmacognostical study can be helpful in further standardization of the plant as well as monograph preparation.

KEYWORDS: *Cassia mimosoides* L., Caesalpiniaceae, Root microscopy, Pharmacognosy, Whole plant.

INTRODUCTION

Cassia mimosoides L. belonging to sub-family Caesalpiniaceae, locally known as *Aaval ni Jaat* in Gujarati[1] and Neloponna in Tamil.[2] The plant is available in the rainy season throughout India ascending up to 2000 m in the Himalayas[3], Dang (Subir and Malegaon Forests)[4], Pakistan and Bangladesh.[5]

The plant is erect or diffuse herb or under shrub having curved hairs on stem, greenish to brown with proper nodes and internodes. Leaves compound, unipinnate; petiole short, subulate with a filiform tip; rachis with erect or somewhat curled hairs; leaflets opposite and sensitive to light, linear, mucronate, glabrous with prominent midrib. Flowering and Fruiting occurs in month of August – October.[6] The flowers are solitary cyme, pentamerous, yellow in colour, stamen 5, bisexual and hypogynous. Fruit Pods linear in shape with minute strigose.

Review of literature revealed many folklore claims are reported, the root of this plant is used by the folk people in diarrhea and spasm of stomach.[3] The whole plant is sometimes used medicinally as a cure for colic pain.[2] Review also revealed that the plant has not been explored from pharmacognostical view including its whole plant powder microscopy but analytical study has been published.[7] Hence in this research article an effort has been made to obtain detailed microscopy of root along with root powder and whole plant powder microscopy and micrometry of *C. mimosoides*.

MATERIALS AND METHODS

Collection and authentification

Fresh plants of *C. mimosoides* L. were uprooted from the natural habitat from Jamnagar, Gujarat. The collected samples were identified, authentified from Pharmacognosist of the Institute by cross verifying it with available floras as *Cassia mimosoides* Linn. A specimen of the sample herbarium is deposited in Pharmacognosy laboratory, I.P.G.T. & R.A. (Specimen No. Phm/6164/Nov. 2015) for further references. (Fig. 1).

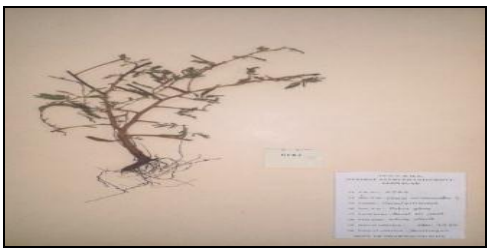


Fig. 1

Root powder preparation

Root was separated, shade dried, powdered by mechanical mixer grinder and sieved through 80 # sieve and stored in air tight glass container for further powder microscopy.[8]

Whole plant powder preparation

Leaves, stem and roots were separated, shade dried, powdered individually, mixed in equal quantity and pass through 80 # sieve for further powder microscopy.[8]

Pharmacognostical Evaluation

Morphology of *Cassia mimosoides* L.

Morphological characters of *Cassia mimosoides* whole plant were studied as per visual observation, following the standard procedure of taxonomy and verified with existing floras for authentification.[9]

Microscopical evaluation of root

Thin free hand transverse sections of root of *C. mimosoides* were taken and sections were first observed in distilled water with help of Quasmo binocular microscope. Histochemical test were performed on thick sections of root was treated with various reagents to locate chemical constituents *i.e.* Tannin, mucilage, lignin and calcium etc.[8],[10],[11],[12]

Organoleptic characters of root powder

The colour, odour and taste of root powder and whole plant powder were recorded separately through visual and sensory observation following standard protocol.[8]

Microscopic evaluation of root powder

The powder samples were studied under the microscope with distilled water and also examined after staining with different suitable reagents *i.e.* phloroglucinol along with hydrochloric acid and ferric chloride.[8]

Micrometric evaluation root powder

Micrometric measurements of T.S. of Root and different characters of root powder and whole plant powder were noted down by preloaded micrometric scale.[8]

RESULTS AND DISCUSSION

Morphology of *Cassia mimosoides* L.

Taxonomically the plant is placed under the subfamily Caesalpiniaceae, available all over India after the rainy season. The plant is herbaceous with compound leaves, a common specific character of Caesalpiniaceae. Unipinnate, Paripinnate compound leaf was observed in *Cassia mimosoides.* Inflorescence solitary cyme, most of the Caesalpiniaceae members bears yellow coloured flowers *i.e., C. fistula, C. tora* etc. *C. mimosoides* also possess bright yellow coloured flowers; exhibit the dominant character of the family. *C. mimosoides* the number of stamens is 5 indicating presence of perfect / fertile stamens. Fruits of the Caesalpiniaceae are usually legume. *C. mimosoides* has simple legume with many seeds. (Fig. 2 & Fig. 3).

Fig. 2

Fig. 3

Macroscopy of root

Root tap root system, mother root deeply rooted in the soil with secondary and tertiary roots measures about 10-18 cm. Dark brown in colour, rounded, hard inner creamish, fracture fibrous.

Microscopy of root

Diagrammatic T.S. of root is circular to irregular in outline measure about the diameter 11.2 μm^2. Outer cork is followed by cortex, endodermis, pericycle & centrally located stellar region (Fig. 4, 4.1). Detailed T.S. shows the outer most 1-2 layers of tangentially elongated lignified cork cells filled with brown content (Fig. 4, 4.3). Cortex region is composed of loosely arranged 5-7 layers of parenchyma cells, which are embedded with isolated simple starch grains, rhomboidal and prismatic crystals of calcium oxalate and tannin content. Some of the isolated pericyclic fibers pockets were observed in the cortical region. Cortex ends with single layered of parenchymatous layered endodermis (Fig. 4, 4.3). Vascular bundles are of open collateral type and radially arranged. Phloem is situated beneath the pericyclic region

followed by xylem. Xylems consist of xylem parenchyma and fibers. Some xylem vessels are filled with yellowish brown content (Fig. 4, 4.4 & 4.6). Medullary rays consist of rectangular to oblong shaped cells, uni-triseriate arising from central region and extended up to inner layers of the phloem region, loaded with some starch grains, brown content and rhomboidal crystals of calcium oxalate (Fig. 4, 4.4).

The micrometric measurements of the T.S. are shown in the table no.1.

Table 1: Micrometric measurements of T.S. of root

Sr. No.	Character	Measurement
1.	Diameter	11.2 µm^2
2.	Cork thickness	0.5 µm
3.	Cork cells	0.6 × 0.8 µm
4.	Cortex region	1.8 µm
5.	Pericyclic region	1.5 µm
6.	Phloem	1.3 µm
7.	Medullary rays	4.3 µm
8.	Pith	0.6 µm

Fig. 4

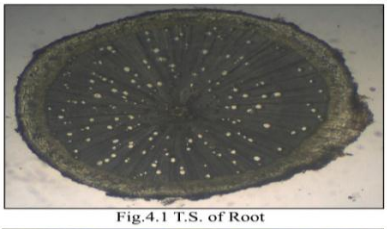


Fig.4.1 T.S. of Root

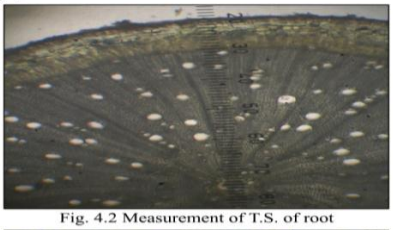


Fig. 4.2 Measurement of T.S. of root

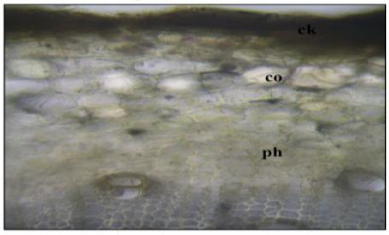


Fig. 4.3 ck=cork, co=cortex, ph= phloem

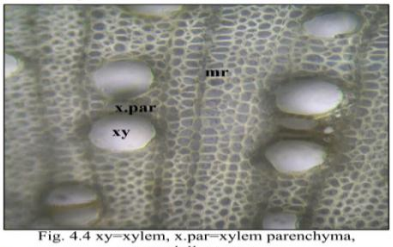


Fig. 4.4 xy=xylem, x.par=xylem parenchyma, mr=medullary rays

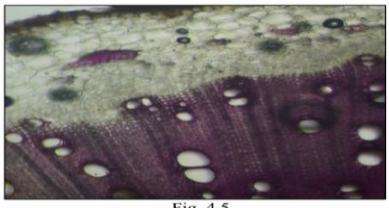


Fig. 4.5

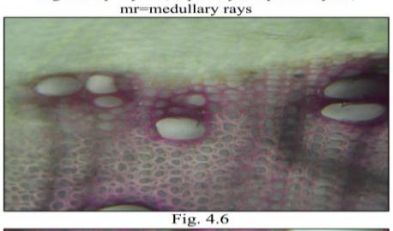


Fig. 4.6

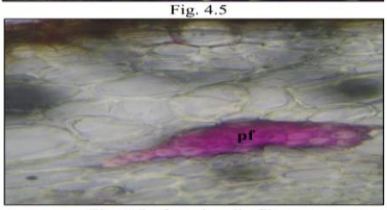


Fig. 4.7 pf=pericyclic fibres

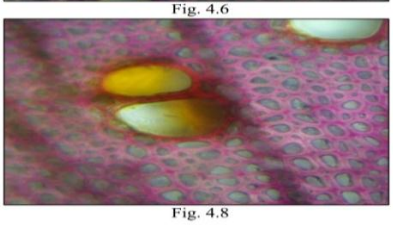


Fig. 4.8

Organoleptic characters of root powder

The organoleptic characters of *C. mimosoides* root powder are depicted in the table no. 2.

Table 2: Organoleptic characters of Root powder

Sr. No.	Characters	*C. mimosoides* (Root powder)
1.	Colour	Brown
2.	Taste	Slight astringent
3.	Odor	Characteristic
4.	Nature of powder	Coarse

Microscopic and micrometric study of root powder

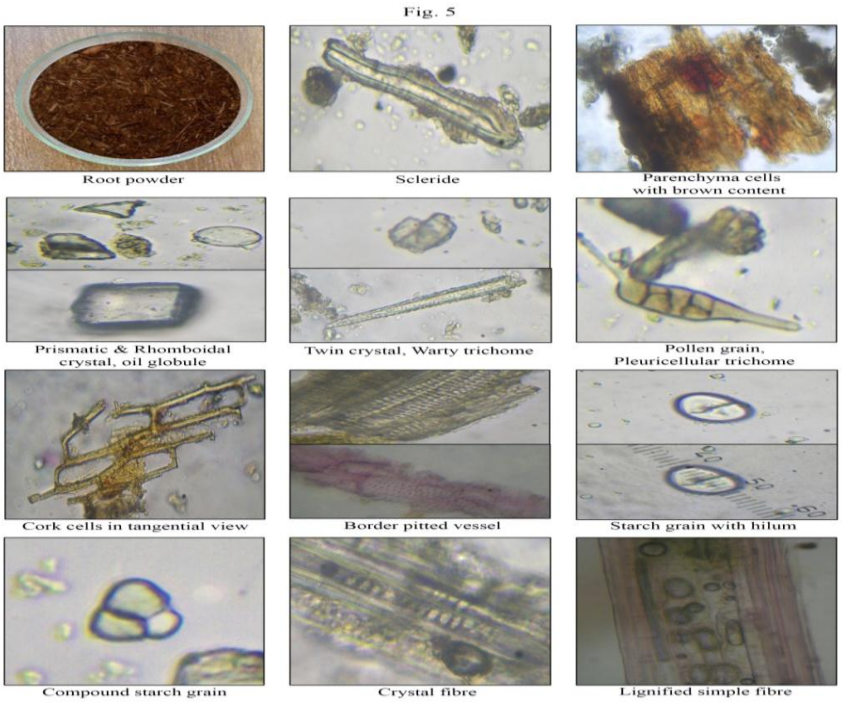
Diagnostic characters of root powder are rhomboidal crystals, prismatic crystals, green content, brown content, silica deposition, starch grains with hilum, compound starch grains, oil globules, sclerides, fragment of cork cells in tangential view, twin crystal, pleuricellular trichome, fragment of annular, spiral, pitted and bordered pitted vessels, warty trichomes, fragment of fiber and fragment of crystal fiber.(Fig. 5).

The measurement of starch grain with hilum is 0.8 × 1.1 µm. The other measurements of powder characters are described in table no. 3.

Table 3: Micrometry of Root powder

Sr. No.	Character	Measurement
1.	Silica deposition	0.5 × 0.8 µm
2.	Starch grain with hilum	0.8 × 1.1 µm
3.	Width of fragment of bordered pitted vessel	0.2 µm
4.	Brown content	0.9 × 1.3 µm

Fig. 5



Organoleptic characters of whole plant powder

The organoleptic character of *C. mimosoides* whole plant powder is depicted in the table no. 4.

Table 4: Organoleptic characters of whole plant powder

Sr. No.	Characters	*C. mimosoides* (Whole plant)
1.	Colour	Yellowish green
2.	Taste	Slightly astringent
3.	Odor	Characteristic
4.	Nature of powder	Coarse

Microscopic and micrometric study of whole plant powder

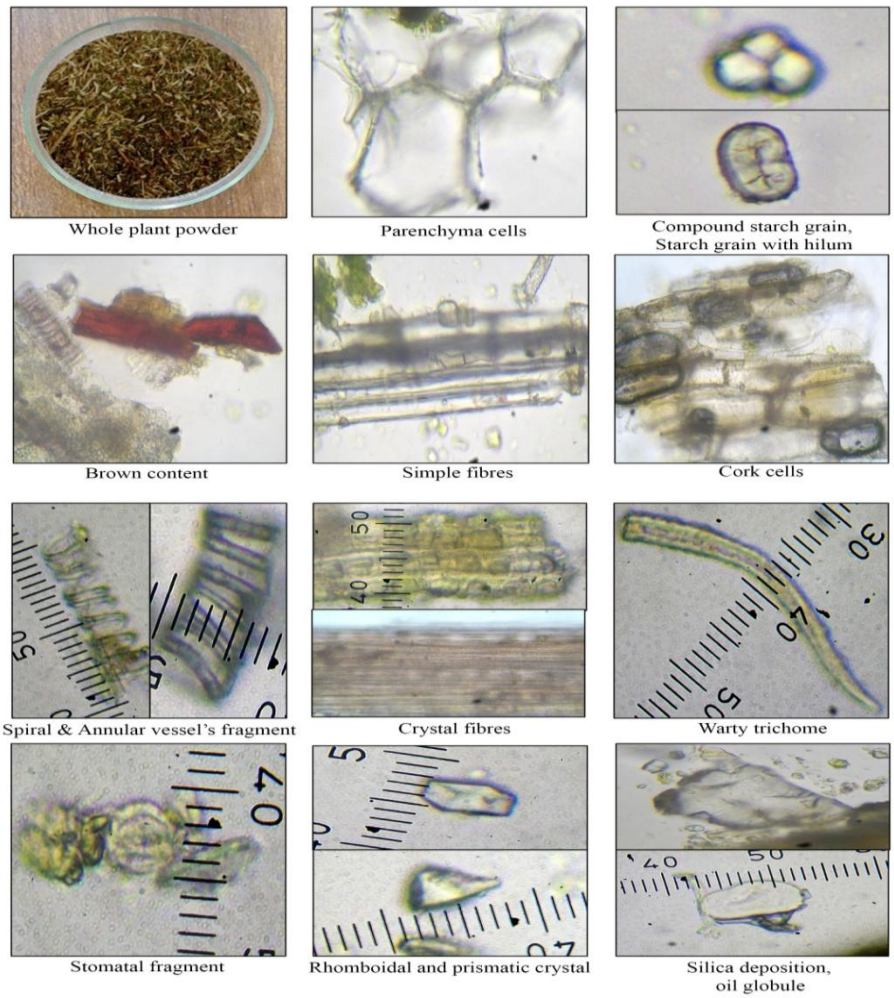
Diagnostic powder microscopy shows unicellular warty trichomes, fragment of annular vessel, brown contents, cork cells in tangential view, simple fibers, crystal fibers, green contents, oil globules, parenchyma cells, prismatic crystals, rhomboidal crystals, simple starch grains, starch grains with hilum, silica depositions, fragment of spiral vessel, stomata and fragment of group of vessels.(Fig. 6).

Measurement of trichome is 3 × 0.3 µm. The measurements of other powder characters are shown in table no. 5.

Table 5: Micrometry of whole plant powder

Sr. No.	Character	Measurement
1.	Trichome	3 × 0.3 µm
2.	Width of cork in tangential view	3.3 µm
3.	Width of crystal fiber	1.1 µm
4.	Width of simple fiber	0.8 µm
5.	Stomata	0.4 × 0.6 µm
6.	Simple starch grain	0.1 µm
7.	Starch grain with hilum	0.6 × 0.8 µm
8.	Prismatic crystal	0.6 × 0.4 µm
9.	Rhomboidal crystal	0.5 × 0.3 µm
10.	Width of fragment of spiral vessel	0.5 µm
11.	Width of fragment of annular vessel	0.5 µm
12.	Oil globule	1.1 × 0.8 μm^2
13.	Brown content	0.8× 0.9 µm

Fig. 6



DISCUSSION

Root anatomy of *Cassia mimosoides* plant shows well developed cork, xylem and phloem, irregularly distributed parenchymatous fibers along with medullary rays. All these characters were similar to root anatomy of Caesalpiniaceae family.[13]

Root powder possesses slight astringent taste and brown in colour. Diagnostic characters of root powder were rhomboidal and prismatic crystals[13], silica deposition, oil globules, sclerides, fragment of tannin containing cork cells in tangential view[14], twin crystal, pleuricellular trichome, fragment of annular, spiral, pitted and bordered pitted vessels, warty trichomes, fragment of fiber and fragment of crystal fiber, starch grains with hilum, compound starch grains,. This may be because root acts as a storage organ.

The whole plant powder was in yellowish green in colour with slight astringent taste. The diagnostic characters were unicellular warty trichome from stem, crystal fibre, rhomboidal

crystal from root and prismatic crystals from stem[13], simple starch grains and paracytic stomata from leaf.

CONCLUSION

The powder microscopy of whole plant resembled the characters of individual powder characters of root, stem and leaf; presence of pollen grains marks the floral part present in the powder. These characters are helpful in identifying the plant and also its part in powder form. The results obtained from above studies can be helpful in further standardization of the plant.

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