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Pharmacognostic Study On the Root of the Gliricidia Sepium

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Key words:

Gliricidia sepium, marphology, microscopy, physicochemical parameters

Abstract:

In the present study, an attempt was made to investigate Pharmacognostical studies on the Root of *Gliricidia sepium* (Fabaceace). The plant was identified and authenticated by Dr. V. Rama Rao, Research officer (Botany), Central Ayurveda Research Institute, Bengaluru. The macroscopical studies have been carried out on the Root. The Characters of transverse section of root shows Periderm consisting of cork, phellogen and phelloderm. Cork layers are rectangular thin walled, compactly arranged, followed by some thin walled slightly round or oval shaped parenchymatous cells consisting of phloem fibers. Xylem region contains xylem fibers, xylem vessels, xylem parenchyma and uniseriate medullary rays. Pith- loosely arranged Parenchymatous cells with intercellular spaces. The longitudinal section shows scalariform xylem vessels, cells filled with starch grains, elongated thin fibers, fusiform initial and ray initials. powder microscopy showing different root part fragments like starch grain, thick and thin-walled lignified polygonal shaped pitted lumen sclereid cell groups (stone cells). Calcium oxalate prismatic crystals, fragments of rectangular cells of cork region with disintegrated cortex cells, few phloem fibers, cork outer layer filled with tannin, pitted xylem vessels, disintegrated cortical cells with intercellular space, cells with filled starch grains, fibers filled with crystals. Physicochemical parameters such as moisture content, total ash value, sulphated ash value, Acid insoluble ash value, water-soluble ash value and extractive value fiber length and widh were determined. These can serve in qualifying and differentiating the plant. This research provides valuable insights that will benefit future researchers in their endeavors.

Introduction:

The use of medicinal plants is widespread and has a long history in both industrialized and developing nations. Eighty percent of people worldwide primarily rely on traditional medicines that use plant extracts or their active ingredients, according to a World Health Organization research[1].

Gliricidia sepium is a multipurpose legume plant that is a member of the Fabaceae family, a large flowering plant species with substantial commercial and therapeutic value that is known for its fruit (legume). The Fabaceae family is the third largest after the Orchidaceae and Asteraceae families, with

over 700 genera and about 20,000 species[2].

The Latin name for the genus, Gliricidia, means "mouse killer," referring to the rodenticide properties of its poisonous seeds and bark. It has been observed that the thermostable non- protein amino acid toxin canavanine (2-amino-4-guanidooxy-butyric acid), which is present in Gliricidia seeds and barks, causes plant poisoning that kills mice within a week of eating[3].

Gliricidia sepium contains numerous bioactive components, including saponins, flavonoids (astragaline, robinine, trifoline), essential oils (coumarins), hydroquinone, myrtenol, and maltol. The plant contains a variety of phytochemicals, including flavones, chalcones, coumarin, o-coumaric acid, melitolic acid, ceryl alcohol, kaempherol glycosides, hydrocarbons, quercetin glycosides, canavanin, triterpinoid saponins, and rotenoids[4].

Because *Gliricidia sepium* root lacks scientific data, the plant used in this study was selected for macroscopical, microscopical, and quantitative analyses. Microscopical examinations involved the analysis of T.S., L.S., and powder drugs in root. Moisture content, total ash, water soluble ash, acid insoluble ash, sulphated ash, fiber length, fiber breadth, and water and alcohol soluble extractive value were all determined through quantitative analysis of the drug's crude dried powder form.

Taxonomical classification:[5]

- **Kingdom** : Plantae
- **Division** : Tracheophytes
- **Phylum** : Spermatophytes
- **Subphylum** : Angiosperms
- **Class** : Dicotyledonae
- **Order** : Fabales
- **Family** : Fabaceae
- **Sub family** : Faboideae

- **Tribe** : Robinieae
- **Genus** : Gliricidia
- **Species** : sepium

Synonyms:[6]

- Mexican lilac
- Glory cedar
- Mother of cocoa
- Gliricidialambii Fernald
- Quick stick
- Robinia sepium Jacq.
- Robinia rosea Mill.

Vernacular names:[7]

- Africa : abgookmaniye
- Marathi : giripushpa
- Kannada : gobbarda mara, gobbaradgidda
- English : Mexican lilac, mother of cocoa
- Spanish : Madre de cacao
- Telugu : madri
- Bengali : sarangi
- Malayalam : seemakonna
- Konkani : Saarayajaad

Materials and methods:

Collection of plant material:

The plant material was collected in December 2024 from Malavalli, which is located in the Mandya area of Karnataka, India. The plant was identified and confirmed by Dr. V. Rama Rao, Research Officer (Botany), Central Ayurveda Research Institute, Bengaluru.

Drying and size reduction of the root:[8]

The root of *Gliricidia sepium* is placed through sieve number 80, dried in the shade, and then further processed into a powder before being stored in an airtight container for later use.

Expeimental procedure:

Macroscopical studies:[9]

The macroscopical examination of the root of *Gliricidia sepium* revealed its color, texture, size, shape, fracture, odor, and taste. The crude medicine might be evaluated macroscopically with the naked eye by arranging the separate raw ingredients on a white paper surface.

Microscopical studies:[10]

Microscopical investigations have been conducted using free-hand slices of fresh root. Thin sections were washed with water and a chloral hydrate solution, then stained with safranin and seen under a microscope. The dried root powder was also treated with a chloral hydrate solution, rinsed with water, and stained with safranin before being viewed under a microscope. Microphotographs were taken with a CatCam microscope camera that is mounted on the microscope. (OLYMPUS CX31 model).

Physicochemical constants:[11]

Physicochemical constants such as the percentage of moisture content, total ash, acid insoluble ash, water soluble ash, sulphated ash, water and alcohol soluble extractives, and weight loss upon drying, fiber length, fiber width and size of the starch grain were calculated using the normal procedures of the Indian Pharmacopoeia.

Priliminary phytochemical studies:[12]

The root of *Gliricidia sepium* underwent first phytochemical testing, and chemical contents were discovered, using standard procedures described by Kokate C.K., Purohit A.P., and Gokhale S.B.

Results and discussion :Table 1. Macroscopical character of root of *Gliricidia sepium*

Colour	Creamish
Odour	Characteristic
Taste	Distinct
Size	12cm length,3-6cm diameter (Varies)
Shape	Long irregular
Fracture	Horizontal fracture

Texture	Rough

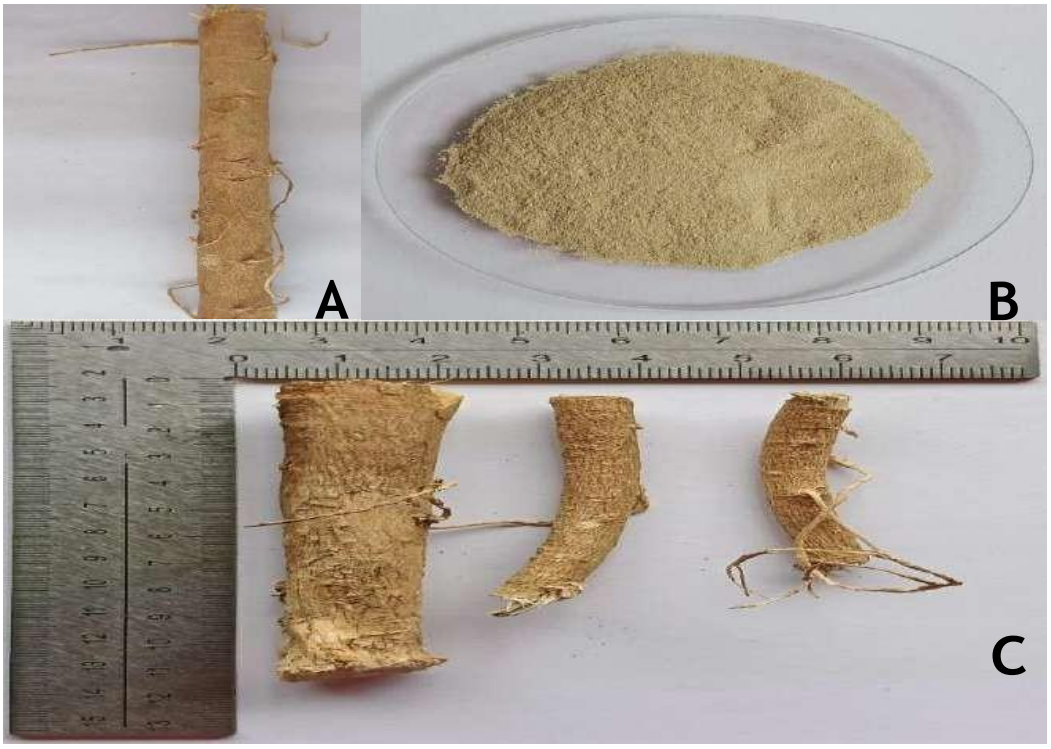
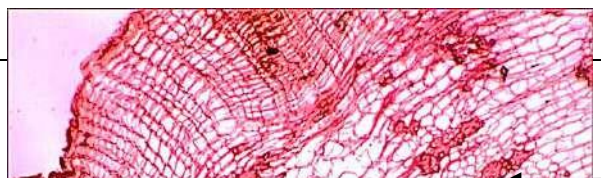


Fig. 1 – A. Fresh root,Root powder, C. Root

Microscopical Character:

Transverse section of the root:

Periderm consisting of cork, phellogen and phelloderm. Cork layers are rectangular thin walled, compactly arranged, followed by some thin walled slightly round or oval shaped parenchymatous cells consisting of phloem fibers. Phloem fibers surrounded by some crystals of calcium oxalate. The middle part is mostly composed of xylem tissues. Xylem region contains xylem fibers, xylem vessels, xylem parenchyma and uniseriate medullary rays. Pith- loosely arranged Parenchymatous cells with intercellular spaces (Fig 2).



Phloem fibers

Vascular cambium Xylem Fibers

Xylem vessel

Fig.2 A.T.S. of Mature root part (10x view)

Xylem fibers

Xylem vessel Pith
Medullary rays

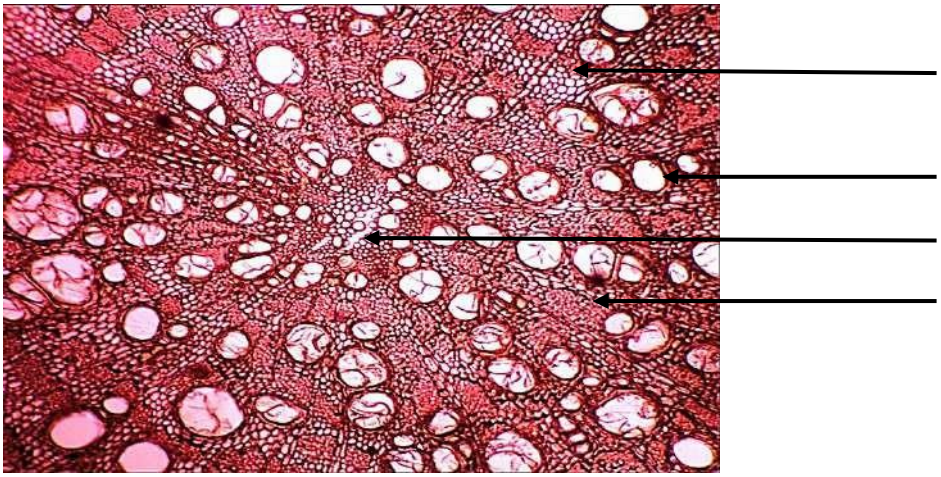


Fig. 2 B-T.S. of Root showing Central pith region (10x view)

Xylem vessel

Fibers

Medullary ray

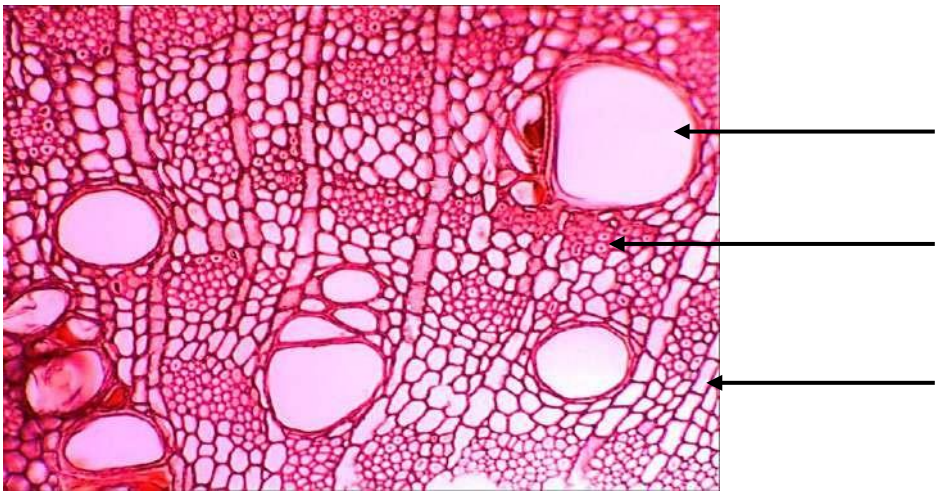


Fig. 2 C-T.S. of Root showing Xylem region (40x View)

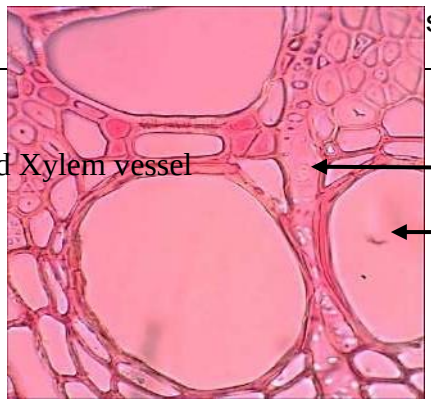


Fig. 2.D-T.S. Root middle part showing Xylem vessels (40x view)

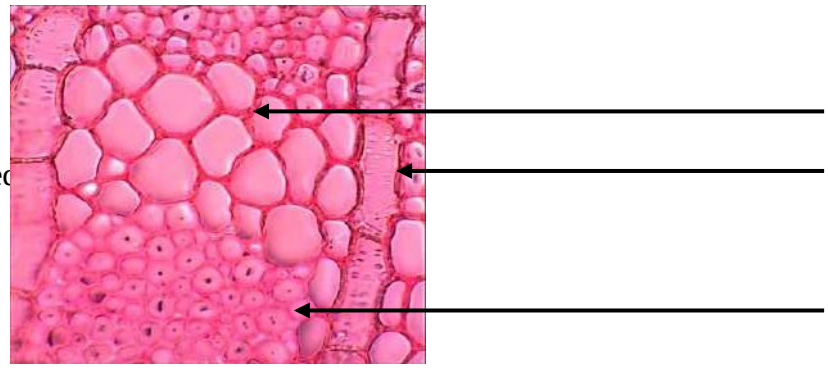


Fig. 2. E-T.S. Root middle part showing Xylem fibers (40x view)

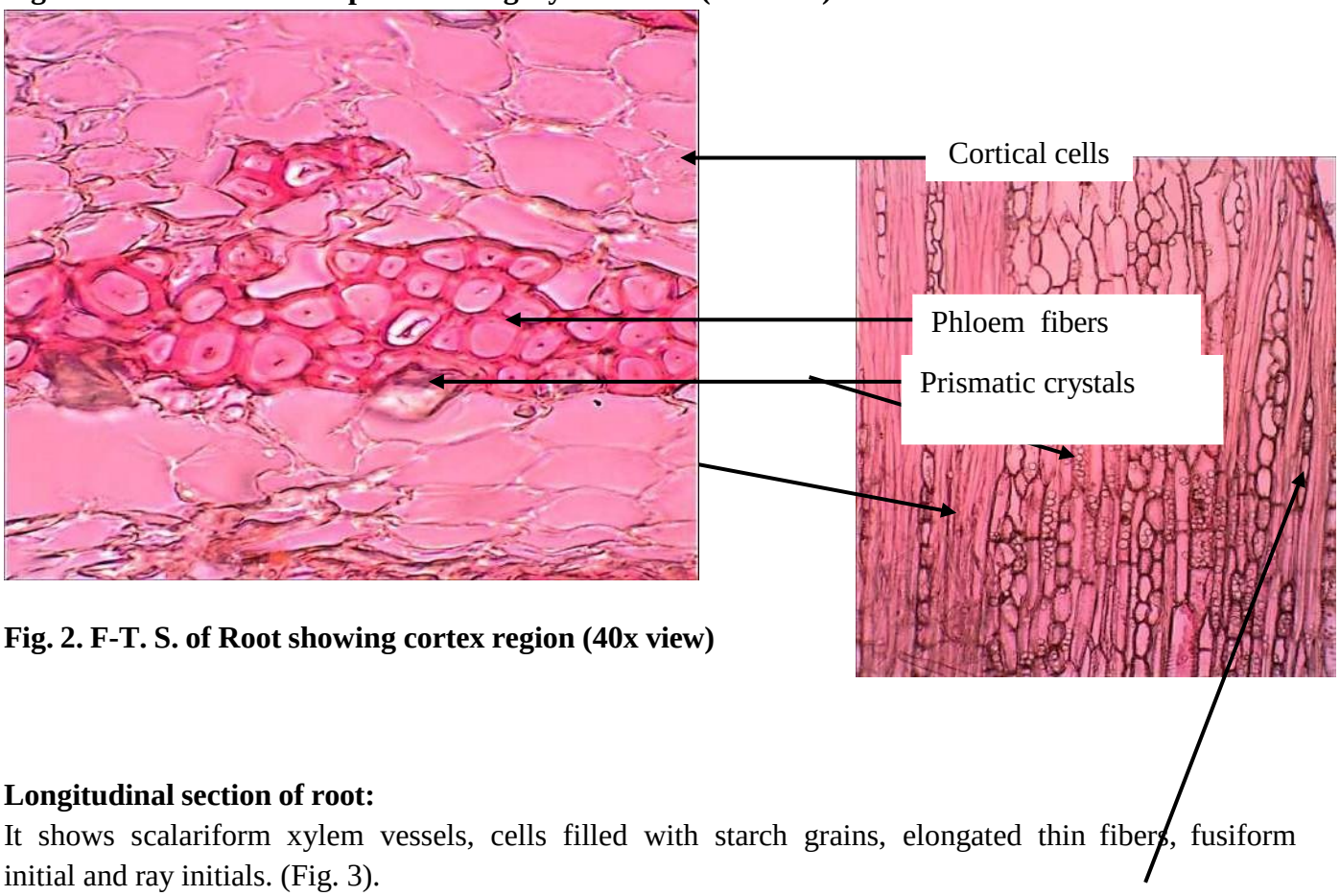


Fig. 2. F-T. S. of Root showing cortex region (40x view)

Longitudinal section of root:

It shows scalariform xylem vessels, cells filled with starch grains, elongated thin fibers, fusiform initial and ray initials. (Fig. 3).

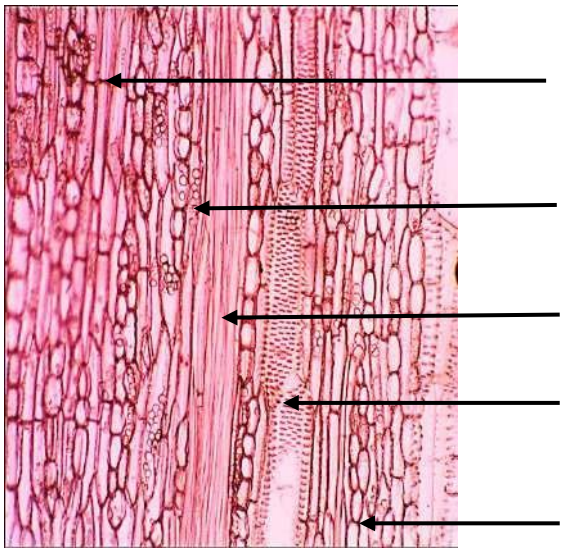
Fusiform initials

Starch grains

Fibers

Pitted xylem vessel

Ray initials

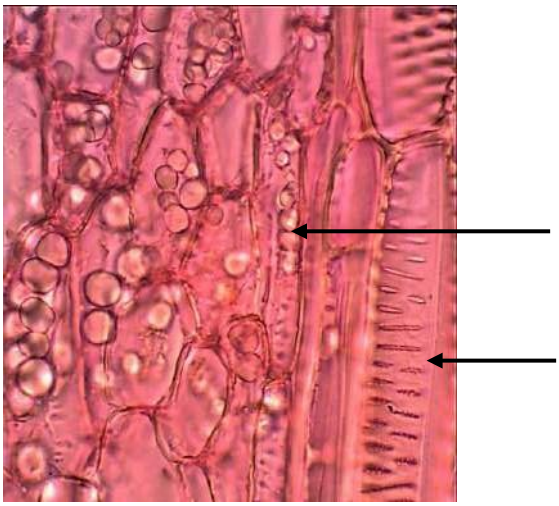


I **Fig. 3.A- L.S. of Mature Root (10x View-I & II)** II

Medullary rays

Starch grains

Scalariform xylem vessel



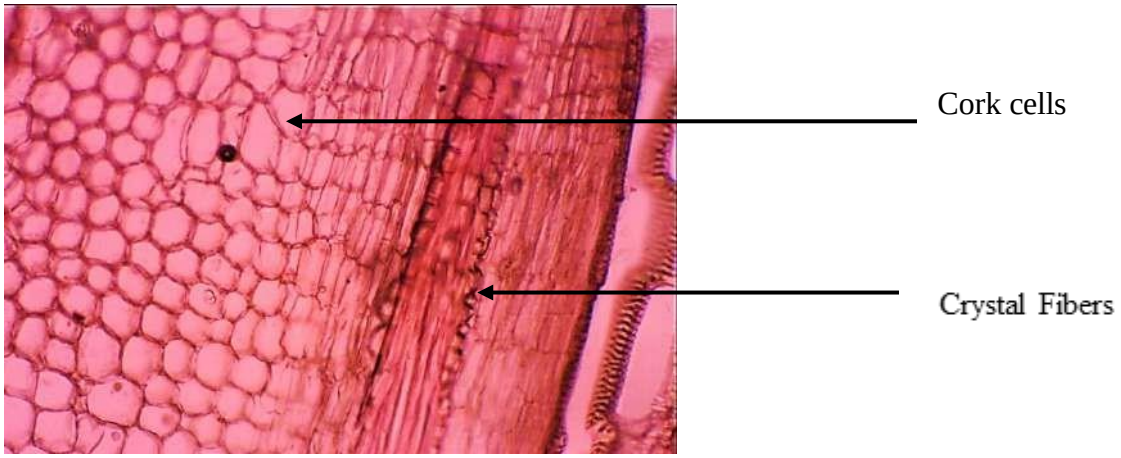


Fig. 3. C-L.S. of Root showing outer region (40x view)

Powder shows creamish brown in colour (Fig.1). powder microscopy showing different root part fragments like starch grain, thick and thin-walled lignified polygonal shaped pitted lumen sclereid cell groups (stone cells). Calcium oxalate prismatic crystals, fragments of rectangular cells of cork region with disintegrated cortex cells, few phloem fibers, cork outer layer filled with tannin, pitted xylem vessels, disintegrated cortical cells with intercellular space, cells with filled starch grains, fibers filled with crystals. (Fig. 4)

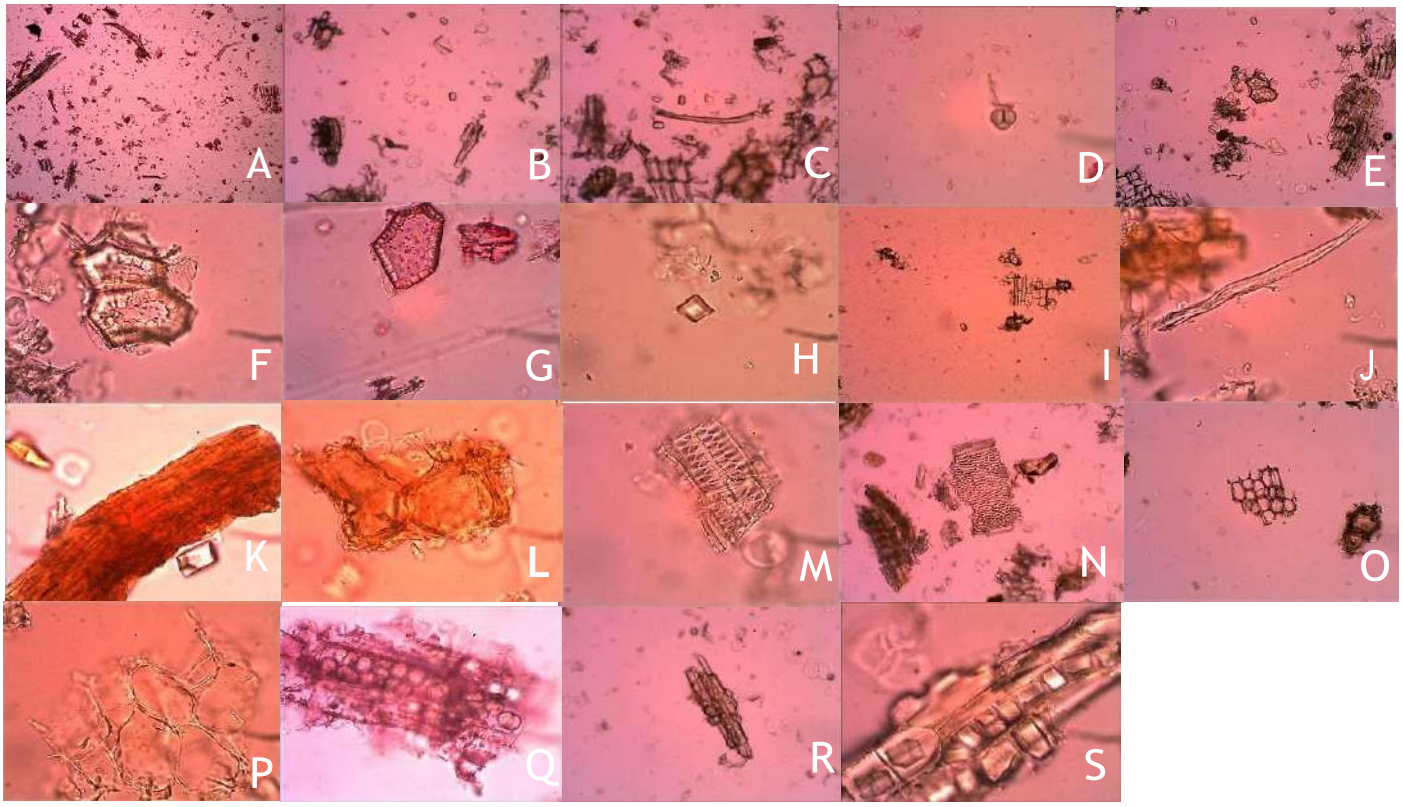


Fig. 4-Powder microscopy of Root showing different root fragments- A. Root powder showing different root fragments (4x view); B. & C. Root powder showing different root fragments like fiber, crystals and cells (10x view); D. Starch grain (10x view); E. & F. Thick walled lignified pitted Sclereid cells group (10x & 40x view respectively); G. Thin walled lignified pitted Sclereid cell (40x view); H. Prismatic crystals of Ca oxylate (40x view); I. Root cortex cells along with cork (40x view);

Physicochemical Parameters:

The results were reported in **Table 3** & **4**. Ash value is a criterion to judge the identity and purity of crude drugs. The total ash is particularly important when evaluating the purity of crude pharmaceuticals, i.e., whether or not there are foreign inorganic elements like silica or metallic salts. Extractive value is useful for the evaluation of a crude drug as it gives idea about the nature of chemical constituents present in it and is useful for estimation of chemical constituents, soluble in that particular solvent used for extraction. The alcohol yielded a higher extraction value (20% W/W) than water (16% W/W). Determining the moisture content shows the stability of the medicine and is essential for maintaining pharmacopoeial standards.

TABLE 2: LENGTH AND WIDTH OF THE FIBERS AND SIZE OF THE STARCH GRAINS

Length of the fiber (µ)	Width of the fiber (µ)	Size of the starch grains (µ)
272	53.33	20.8

TABLE 3: SHOWING RESULTS FOR QUANTITATIVE EVALUATION OF THE ROOT OF *GLIRICIDIA SEPIUM*.

Evaluation parameter(%W/W)	**Root (%W/W)**
Moisture content	65.33±1.82
Total ash	3.44 ±1.6
Acid insoluble ash	1.8 ± 0.01
Water soluble ash	2.66 ± 0.44
Sulphated ash	3.77 ± 0.26

TABLE 4: EXTRACTIVE VALUES OF ROOT OF *GLIRICIDIA SEPIUM*

Evaluation parameter(%W/W)	**Root (%W/W)**
Alcohol soluble extractive value	8 ± 0.62

Water soluble Extractive value	5.6 ± 0.27

Preliminary Phytochemical Studies:

The preliminary phytochemical investigation of the petroleum ether, chloroform, ethyl acetate, methanol extract of stem bark of *Gliricidia sepium* showed the presence of alkaloids, glycosides, saponin, flavonoid, carbohydrate, fat and oil, proteins and amino acid, steroid, triterpenoid presented in **Table 4.**

TABLE 5: QUALITATIVE ANALYSIS OF PHYTOCHEMICALS IN STEM BARK OF *GLIRICIDIA SEPIUM*

Phytoconstituents	**PE**	**CL**	**EA**	**ME**
Alkoloids	-	-	-	++
Glycosides	-	++	+	+
Saponin	-	+	+	++
Flavonoid	-	-	-	++
Carbohydrates	-	+	-	-
Fat and oil	+	-	-	-
Proteins and amino acid	-	-	-	+
Steroid and Triterpinoid	++	-	+	-

Note: + = Present; - = Absent; PE- Petroleum ether; CL- Chloroform; ME-Methanol; EA-ethyl acetate

Conclusion:

The current issue of attention is standardizing crude drugs in order to give them a unique identification and quality. Based on a plant's physicochemical constants and microscopy, the majority of the standard parameters were discovered. The standards for the plant should be developed prior to its inclusion in the

Pharmacopoeia. Therefore, standardization is crucial for ensuring the quality of the crude drug and the treatment that contains it. In an effort to improve ayurvedic medicine and increase the efficacy of traditional medical procedures, the current work aims to develop pharmacognostical standards for the same, such as macroscopical and microscopical features and physicochemical constants. These criteria may encourage serious and eager scientists to look into the traditional claims made by plant medicines.

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CONFLICTS OF INTEREST:

No conflicts of interest.

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