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Pharmacognostical Studies On the Stem Bark of *Gliricidia Sepium*

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Abstract:

In the present study, an attempt was made to investigate Pharmacognostical studies on the stem bark 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 stem bark. The Characters of transverse section of stem bark shows periderm, consisting of several layers of cork, phellogen and Phelloderm. Cork cells having brown pigments in the outermost layer. The cortex region shows the presence of compact, thin-walled, medium-sized parenchymatous cells. Group of stone cells in patches found in the cortex, cortex consists of thin-walled parenchymatous cells embedded with a dispersed stone cell, prismatic crystal of calcium oxalate and sclerenchymatous cells patches with crystal sheath. The longitudinal section shows 3-4 layers of rectangular shaped cells of outer cork followed by globular shaped cells of cortex region with stone cells embedded in it. Towards the middle part some fibers are shown with crystals known as crystal fibers. Medullary rays found crossed the crystal fibers. Powder of bark showing different fragments of cells as 3 cells group of sclereid cells with shining prismatic crystals of calcium oxalate, long fiber with tapering end, crystal fibers, elongated thick lignified walled narrow lumen sclereid cells and broad lumen lignified pitted sclereid cells. . 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.

Key Words:

Gliricidia sepium, morphology, microscopy, physicochemical parameters

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1. Introduction:

For thousands of years, nature has been a major source of traditional medicine, and many contemporary medications have been derived from natural sources[1]. Natural compounds made from plants have a very high potential for use as medications[2]. One such plant is *Gliricidia sepium*, belonging to the genus gliricidia and family fabaceae(legume family). It is a very large family of plants, comprising about 700 genera and more than 20,000 species. Gliricidia (*Gliricidia sepium*) is a medium size, semi-deciduous tree that typically grows to 10 cm (33ft)(Occasionally reaching 15 m [50ft] in height) with a broad canopy.

Gliricidia sepium is used extensively in many different fields, including shade trees for cocoa tree plantations, nitrogen-fixing plants, and cattle and poultry feed. It contains a variety of phytoconstituents from different parts of the plant, including leaves, flowers, fruits, stems, bark, seeds, and roots, including saponins, flavonoids, terpenes, tannins, glycosides, and volatile oils[4].

Saponins, flavonoids, volatile oils, and other chemicals have been regarded as significant phytochemical compounds in *Gliricidia sepium* from various parts of it including leaves, flowers, fruits, stems, seeds and roots[5].

Gliricidia sepium is a folk remedy for some of inflammation related diseases fractures, gangrene, head-ache, itch, prickly heat, rheumatism, urticaria, and wound[6]. According to reports, *Gliricidia sepium* possesses cytotoxic, antimicrobial, antibacterial, anti-inflammatory, anti-oxidant, thrombolytic, anti-sickling, wound-healing, larvicidal, and anthelmintic properties that are particularly significant in the medical field[7].

Because *Gliricidia sepium* bark lacks scientific data, the plant used in this study was selected for macroscopical, microscopical, and quantitative analyses. T.S., L.S., and powder drug analysis of bark were conducted in microscopical investigations. Moisture content, total ash, water soluble ash, acid insoluble ash, sulphated ash, fiber length, fiber width ,water and alcohol soluble extractive value were all measured in quantitative analyses of the drug's crude dried powder form.

Taxonomical classification:[8]

- **Kingdom** : Plantae
- **Division** : Tracheophytes
- **Phylum** : Spermatophytes
- **Subphylum** : Angiosperms
- **Class** : Dicotyledonae
- **Order** : Fabales
- **Family** : Fabaceae
- **Sub family** : Faboideae
- **Tribe** : Robinieae
- **Genus** : Gliricidia
- **Species** : sepium

Synonyms:[9]

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

Vernacular names:[10]

- 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

2. Materials and methods:

Collection of plant material:

In Dec 2024, the plant material was gathered from Malavalli in the Mandya region of Karnataka, India. Dr. V. Rama Rao, Research Officer (Botany), Central Ayurveda Research Institute, Bengaluru, identified and verified the plant. For future use, a herbarium voucher specimen was kept in the Pharmacognosy department of the Bharathi College of Pharmacy inBharathinagar.

Drying and size reduction of the bark:[11]

After being dried in the shade and further ground into a powder, *Gliricidia sepium* bark is put through sieve number 80 and kept in an airtight container for later use.

3. Expeimental procedure:

Macroscopical studies: [12]

Gliricidia sepium stem bark was examined macroscopically to determine its color, texture, size, shape, fracture, odor, and taste. Placing the individual raw components on a white paper surface allowed for a macroscopic assessment of the crude medication using the naked eye.

Microscopical studies:[13]

Free-hand slices of fresh stem bark have been used for microscopical studies. After being cleaned with a chloral hydrate solution and then water, thin sections were stained with safranin and examined under a microscope. Additionally, the dried bark powder was examined under a microscope after being treated with a chloral hydrate solution, followed by water, and stained with safranin. Using a CatCam microscope camera that is attached to the microscope, microphotographs were captured. (Model: OLYMPUS CX31).

Physicochemical constants:[14]

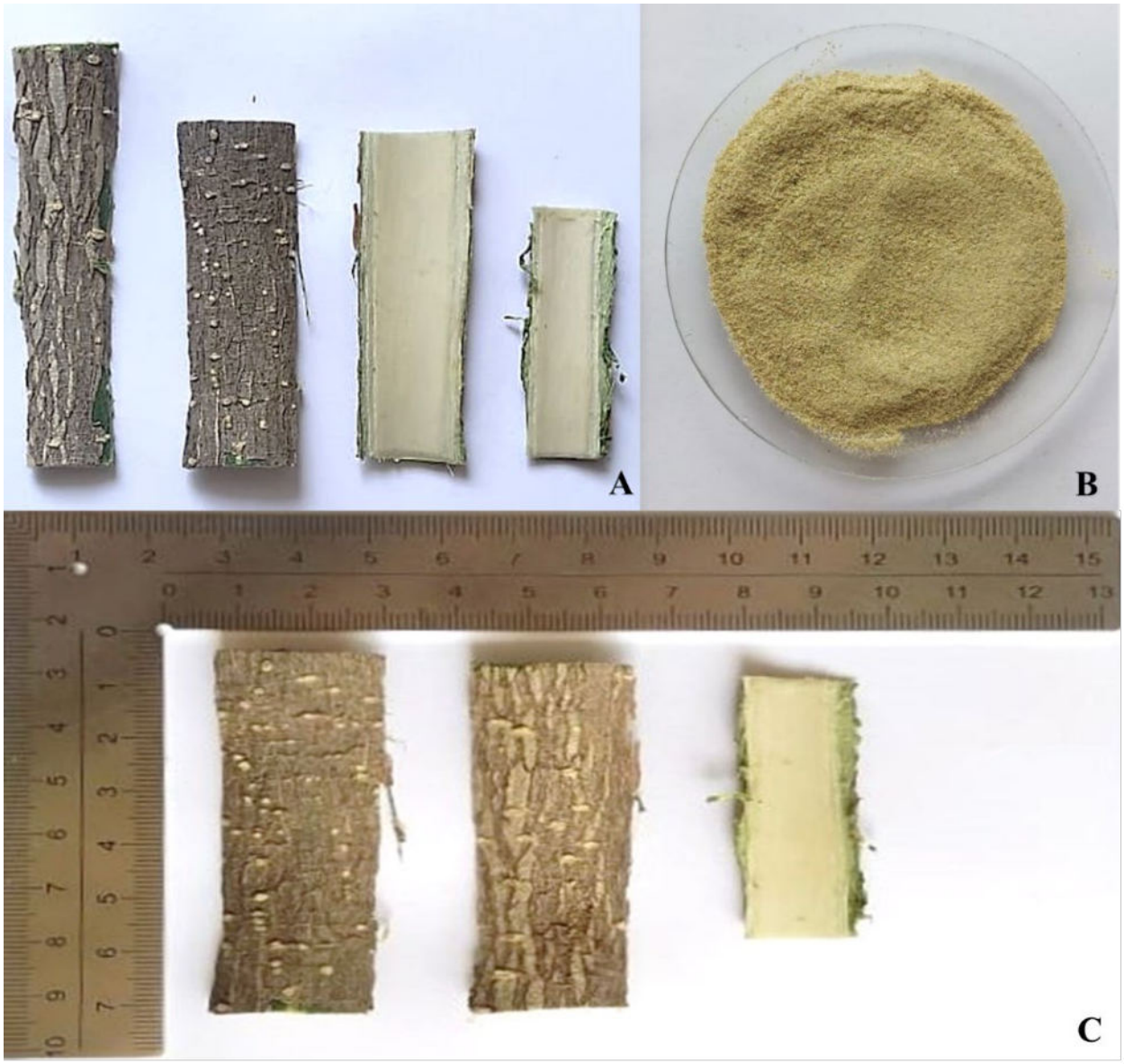
The Indian Pharmacopoeia's standard processes were used to calculate physicochemical constants like the percentage of moisture content, total ash, acid insoluble ash, water soluble ash, sulphated ash, water and alcohol soluble extractives, and weight loss upon drying.

Priliminary phytochemical studies:[15]

Using conventional protocols outlined by Kokate C.K., Purohit A.P., and Gokhale S.B., preliminary phytochemical testing was conducted for the stem bark of *Gliricidia sepium*, and chemical constituents were identified.

4. Results and Discussion:

Macroscopical studies:



3.1- A. Fresh bark, B. Bark powder, C. Bark

Table 1. Macroscopical character of stem bark of *Gliricidia sepium* includes. (Fig. 1)

Colour	Creamish green
Odour	Characteristic
Taste	woody
Size	3 to 25 ft tall, 2 to 15 wide (Varies)
Shape	Flat
Fracture	Fibrous
Texture	Rough

Microscopical Character:

Transverse section of the stem bark:

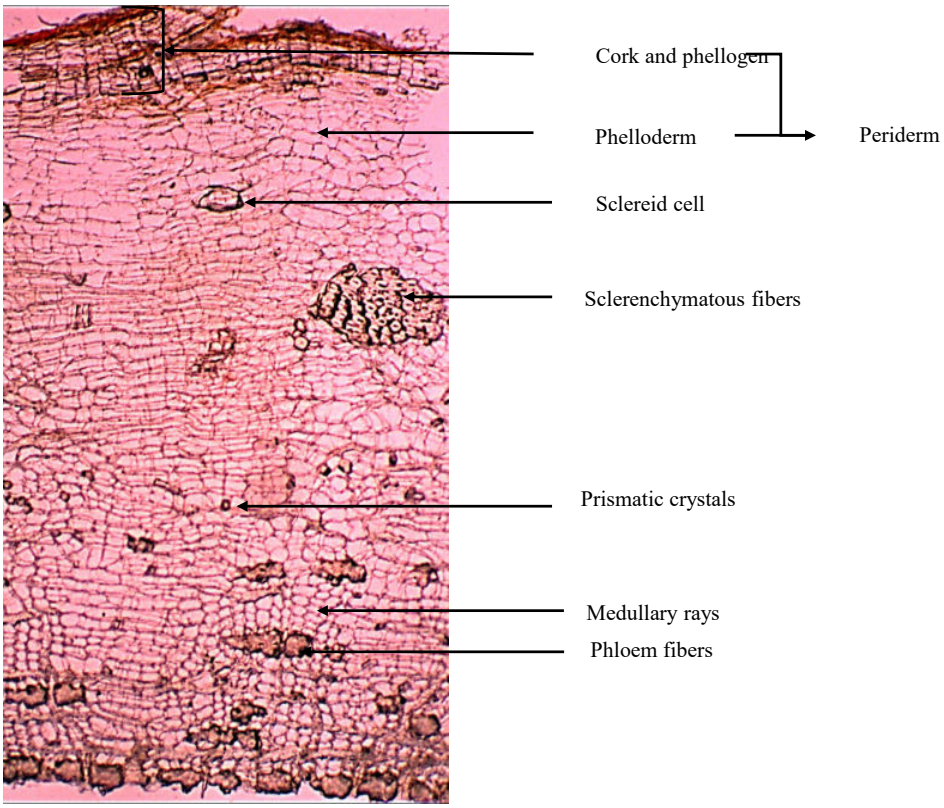


Fig.2. Transverse section of the stem bark

The transverse section of stem bark shows periderm, consisting of several layers of cork, phellogen and Phelloderm. Cork cells having brown pigments in the outermost layer. The cortex region shows the presence of compact, thin-walled, medium-sized parenchymatous cells. Group of stone cells in patches found in the cortex, cortex consists of thin-walled parenchymatous cells embedded with a dispersed stone cell, prismatic crystal of calcium oxalate and sclerenchymatous cells patches with crystal sheath. Medullary rays were present, thin-walled, elongated, rectangular and gradually increasing in dimension towards the outer ends. These are bi, tri or multiseriates in the region of the inner secondary phloem. Phloem fibers are also surrounded by Calcium oxalate crystals some are rectangular in shape.(Fig.2)

Longitudinal section of stem bark:

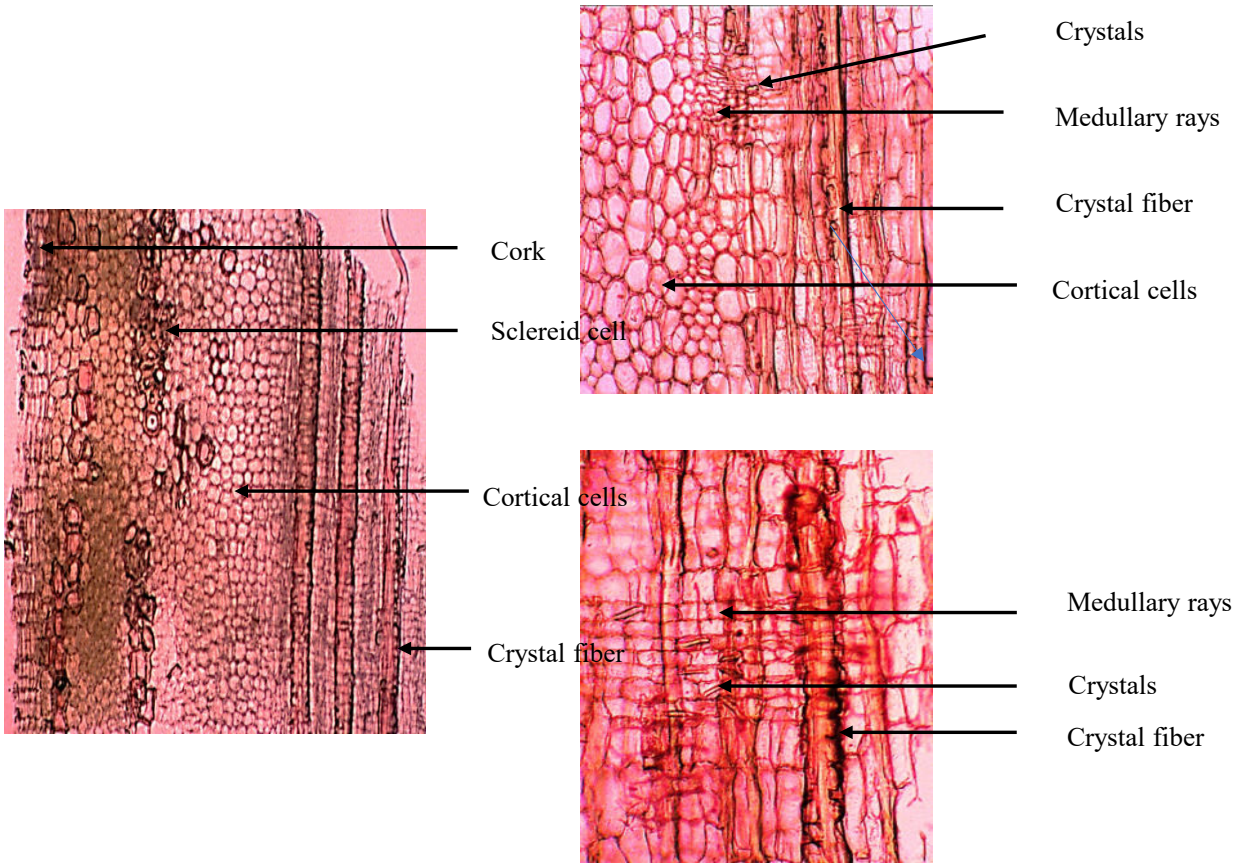


Fig.3 Longitudinal section of stem bark

It shows 3-4 layers of rectangular shaped cells of outer cork followed by globular shaped cells of cortex region with stone cells (sclereid cell) embedded in it. Towards the middle part some fibers are shown with crystals known as crystal fibers. Medullary rays found crossed the crystal fibers.(Fig.3)

Powder microscopy of stem bark:

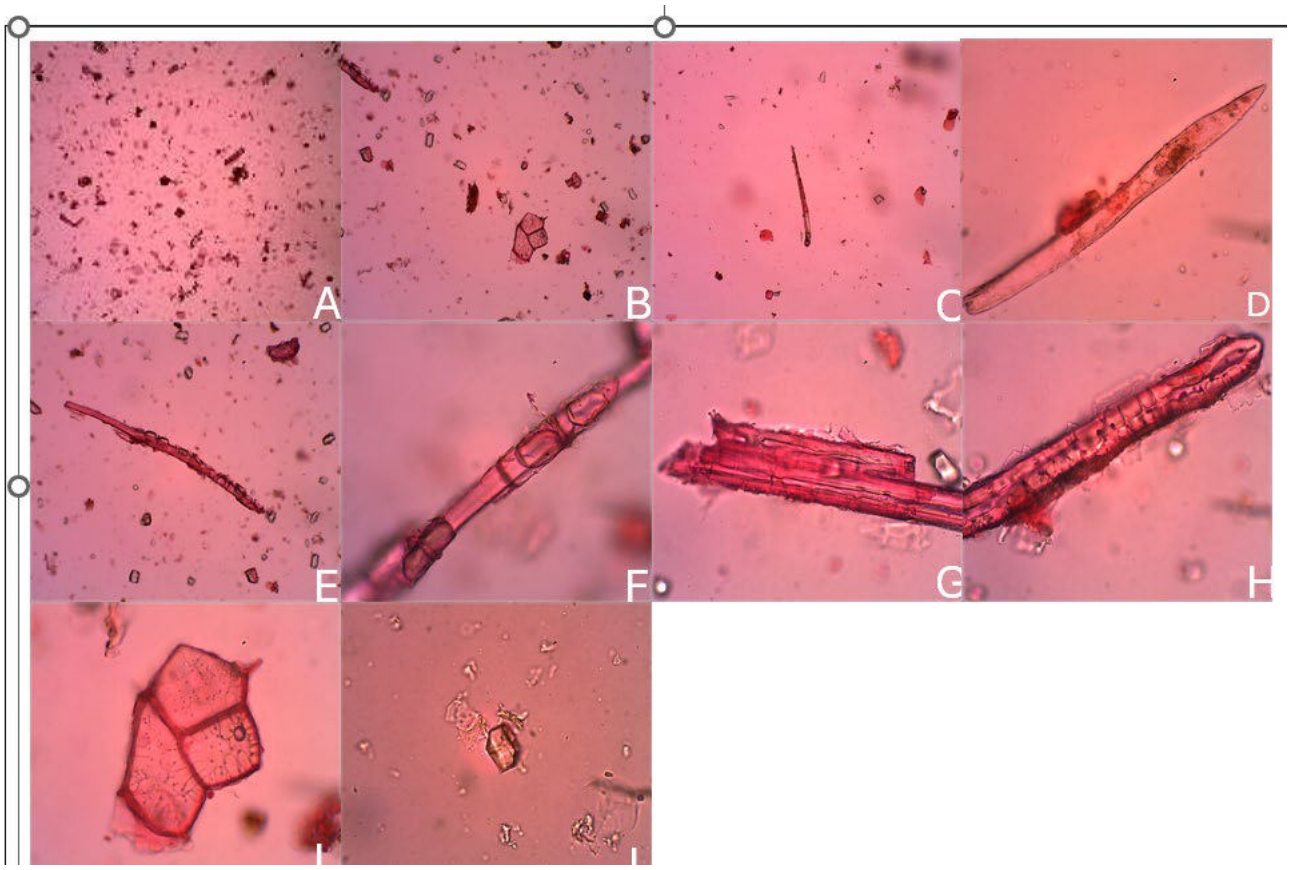


Fig. 4. Powder microscopy of Bark showing differet fragments- A. Bark powder showing different fragments ; B. Bark powder showing sclereid cells group, crystals ; C. Fiber ; D. Fiber ; E. Crystal fiber F. Crystal fiber ; G. Phloem fibers group ; H. Elongated lignified thick walled Sclereid cell ; I. Polygonal lignified thick walled pitted sclereid cells ; J. Ca oxylate prismatic shape crystal

Stem bark powder is slightly creamish green in colour (Fig 3.1 B). Powder of bark showing different fragments of cells as 3 cells group of sclereid cells with shining prismatic crystals of calcium oxalate, long fiber with tapering end, crystal fibers, elongated thick lignified walled narrow lumen sclereid cells and broad lumen lignified pitted sclereid cells. (Fig. 4)

Physicochemical Parameters: The results were reported in **Table 2** & **3**. Determining the moisture content is crucial for upholding pharmacopoeial standards and demonstrates the drug's stability. The total ash values are equally essential for evaluating crude medicines. When assessing the purity of crude drugs—that is, whether or not there are foreign inorganic materials like silica or

metallic salts—the total ash is especially crucial. When compared to water (16% W/W), the alcohol produced a higher extraction value (20% W/W). The extractives that were soluble in alcohol and water served as markers for the overall solvent-soluble component.

TABLE 2: SHOWING RESULTS FOR QUANTITATIVE EVALUATION OF THE STEM BARK OF *Gliricidia sepium.*

Evaluation parameter(%W/W)	Stem Bark(%W/W)
Moisture content	72.66
Total ash	13.22
Acid insoluble ash	0.7
Water soluble ash	4.5
Sulphated ash	15.88

TABLE 3: Extractive Values Of Stem Bark of *Gliricidia Sepium*

Evaluation parameter(%W/V)	Stem Bark(%W/V)
Alcohol soluble extractive value	20
Water soluble Extractive value	16

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 4: 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

5. 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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