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DECODING THE MEDICINAL IDENTITY OF *GARCINIA GUMMI GUTTA (L). N. ROBSON* ROOT THROUGH PHARMACOGNOSTIC ANALYSIS

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ABSTRACT

This study aimed to standardize the root of *Garcinia gummi-gutta (L.) N. Robson* (Clusiaceae) through detailed pharmacognostical and physicochemical evaluation. The plant was authenticated by Dr. V. Rama Rao, Research Officer (Botany), Central Ayurveda Research Institute, Bengaluru. Microscopic studies of the root transverse section revealed a circular outline with an outer brown cork, followed by 4–5 layers of phellogen and a thin phelloderm. A broad cortex composed of parenchymatous cells with embedded pericyclic fibers was observed, while the inner region showed phloem, irregularly arranged medullary rays, xylem vessels, and starch-containing parenchyma cells. Powder analysis confirmed that the root powder is brown in color, and microscopy revealed the presence of cork cells (surface view), bordered pitted vessels, xylem fibers, brachysclereids, starch grains, and various types of crystals, including clustered, rosette, and prismatic forms. Physicochemical parameters such as Moisture content, ash values, extractive values and fluorescence analysis were determined to support quality assessment. These parameters serve as reliable markers for the identification and standardization of the plant and provide essential data for future research and applications.

KEYWORDS: *Garcinia gummi gutta* Morphology Microscopy Physico chemical parameters.

1. INTRODUCTION

The World Health Organization defines traditional medicine as the accumulated knowledge, skills, and practices that originate from the cultural theories, beliefs, and experiences of various communities. These methods whether scientifically validated or not are employed to sustain health and to aid in the prevention, diagnosis, and treatment of physical and mental conditions.[1] Since ancient times, plants have been used for medicinal purposes. Various plant-derived products, including foods, herbal mixtures, and powders, have been traditionally used to help treat and prevent illnesses, with different levels of effectiveness.[2]

Garcinia is the largest genus of the Clusiaceae family comprising nearly 250 species. *Garcinia gummi-gutta (L.) Roxb.* (Syn.*: Garcinia cambogia (Gaertn.)* Desr; Common name: *Malabar tamarind*), is one of the most important members of the Clusiaceae family.[3] Nine Garcinia species were distributed wildly in the Western Ghats region *(G. gummi-gutta, G. imberti, G. indica, G. morella, G. pushpangadaniana, G. rubro echinata, G. talbotii, G. travancorica and G. wighti).*[4]

Among the different *Garcinia* species, *G. gummi-gutta* is the most widely distributed *Garcinia* species in Kerala, south India. The fruit is used as culinary spice, preservatives and also as a source of several nutraceutical products. The fruit contains 10% to 30% (-) hydroxycitric acid (HCA), a well-known hypo-lipidemic

agent and an important constituent of food supplement for weight management. The species is a rich source of the bioactive benzophenones camboginol (garcinol) and cambogin (isogarcinol).

Different plant parts of *Garcinia* species, mostly fruit, fruit rind, leaves and bark have been used worldwide as traditional medicine in the treatment of various ailments such as obesity, inflammation, microbial infection, abdominal pain, dysentery, diarrhea, infected wound, leucorrhea, chronic ulcer, gonorrhea, oxidative stress and cancer.

Numerous pharmacological activities such as anticancer, antiobesity, diuretic, anti-inflammatory, antibacterial, antiviral, antifungal, anti-HIV, antidepressant and antioxidant have been reported for the *Garcinia* species. Previous chemical investigations on the leaves, bark and fruits of *Garcinia* species have shown that the major constituents included biologically active biflavonoids, xanthones, benzophenones and organic acids and the minor constituents were terpenoids, steroids, flavonoids and phenolic acids.[5]

Rooting habit: The root is taproot type, consisting of a thick central root with several lateral branches. It has a brownish color, a woody structure, and a firm texture, providing strong support and efficient nutrient absorption for the plant.

Due to the limited scientific data available on *Garcinia gummi-gutta* root, the present study was undertaken to carry out detailed macroscopical, microscopical, and quantitative evaluations. The microscopical examination included transverse sections (T.S.), longitudinal sections (L.S.), and analysis of the powdered root. Quantitative analysis of the dried crude powder involved determining moisture content, total ash, water-soluble ash, acid-insoluble ash, sulphated ash, fluorescence analysis as well as extractive values in water and alcohol as a solvent.

Taxonomical classification

Kingdom : Plantae
Division : Tracheophytes
Class : Magnoliopsida
Order : Malpighiales
Family : Clusiaceae
Genus : *Garcinia*
Species : *G. gummi gutta*
Common name: *Malabar tamarind, kudampuli, brindle berry, upagi mara, simai hunase, Kodakkapuli.*

Synonyms

- *Cambogia gummi-gutta L.*
- *Cambogia gutta L.*
- *Garcinia affinis.*
- *Garcinia cambogia Desr.*
- *Garcinia gutta Roxb.ex wall.*
- *Mangostana cambogia Gaertn.*[6]

Vernacular names

- Kannada- *Upagi mara, simai hunase.*
- Telugu- *Simachinta*
- Marathi- *Dharambe*
- Tamil- *Kodakkapuli*
- Sanskrit-Vrukshamlah
- Hindi- Bilatti-amli
- Malayalam - *Kadumpuli, kodapuli, marapuli, meenpuli, perumpuli, pinumpuli, pinar.*[7]

2. MATERIALS AND METHODS

Collection of plant material

In October 2025, the plant material was collected from Ponnampet in the southern part of the Kodagu district, Karnataka, India. The plant was identified and authenticated by Dr. V. Rama Rao, Research Officer (Botany), Central Ayurveda Research Institute, Bengaluru. An herbarium voucher specimen was prepared and preserved in the Department of Pharmacognosy, Bharathi College of Pharmacy, Bharathinagara, for future reference.

Drying and size reduction of the root

The collected root of *Garcinia gummi-gutta* were shade-dried at room temperature until a constant weight was obtained. The dried material was then coarsely powdered using a mechanical grinder, passed through sieve No. 80 to obtain a uniform particle size, and stored in an airtight container in a cool and dry place for further experimental studies.

3. Experimental procedure

Macroscopical studies[8]

The root of *Garcinia gummi-gutta* were examined macroscopically to determine their color, texture, size, shape, fracture, odor, and taste. The crude drug was evaluated with the naked eye by placing the individual raw samples on a clean white paper surface for proper observation and assessment.

Microscopical studies[9]

Free-hand transverse sections of fresh root were prepared for microscopic studies. The sections were washed with water, stained with safranin, and examined under a microscope.

Similarly, the powdered drug is stained with safranin, and observed under the microscope for powder microscopy analysis.

Physicochemical constants[10,11,12,13]

Physicochemical constants were determined according to the standard procedures prescribed in the Indian Pharmacopoeia. The evaluated parameters included percentage of moisture content, total ash, acid-insoluble ash, water-soluble ash, sulphated ash, water-soluble and alcohol-soluble extractive values, and loss on drying.

Preliminary phytochemical studies[14]

Preliminary phytochemical screening of the root of *Garcinia gummi-gutta* was carried out using standard procedures described by Kokate C.K., Purohit A.P., and Gokhale S.B. The tests were performed to identify the presence of various phytochemical constituents in the plant material.

4. RESULTS AND DISCUSSION

Macroscopical studies

Fig. 1.1 A. Measurement of Fresh roots. B. Root Powder.

Table 1: Macroscopical character of root of Garcinia gummi gutta includes. (Fig. 1.1)

Colour	Brown to dark brown externally; inner surface yellowish to light brown
Odour	Characteristic, faintly aromatic
Taste	Slightly bitter and astringent
Size	0.5-3 cm in diameter, variable length
Shape	Cylindrical, irregular, slightly tapering with lateral branches
Fracture	Short and fibrous in bark; hard in woody portion
Texture	Rough externally; hard and compact internally

Microscopical Character

Transverse Section of Root

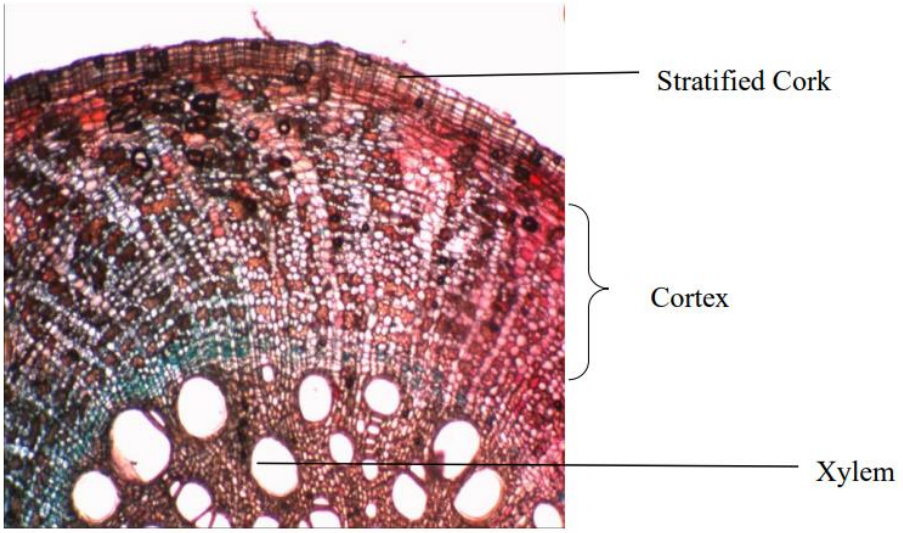

Fig.1.2 TS of Root.

TS of Root (Phelloderm, cortex)

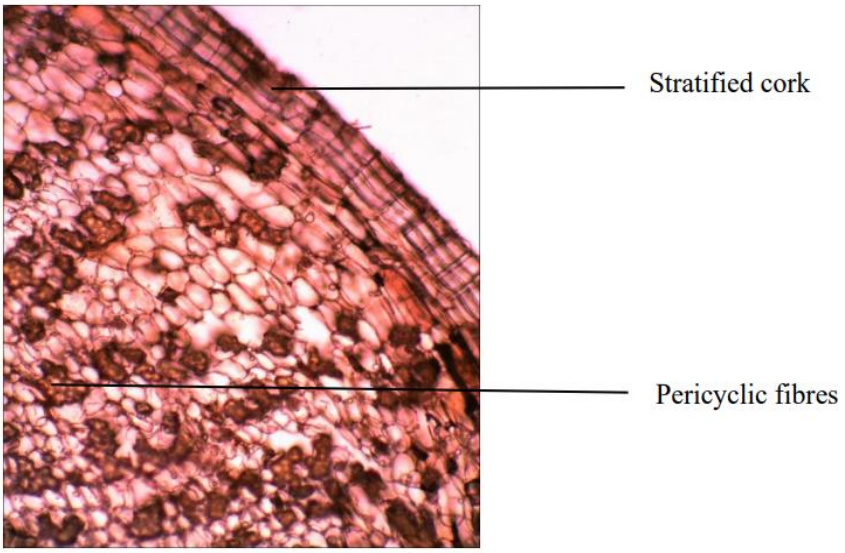

Fig.1.2.1 TS of Root (Cork, Phelloderm)

TS of Root (Phelloderm, cortex)

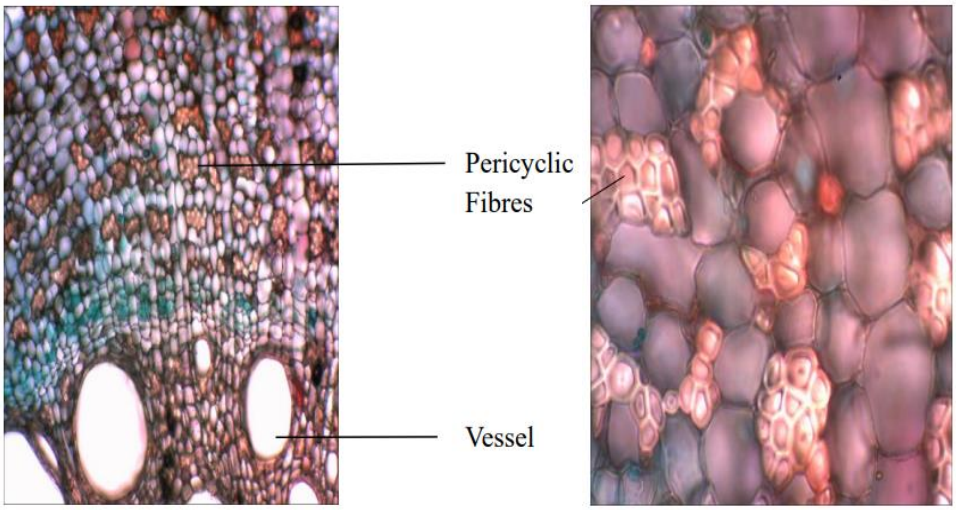

Fig. 1.2.2 TS of Root (Phelloderm, cortex).

TS of Root (Vessels, Medullary rays)

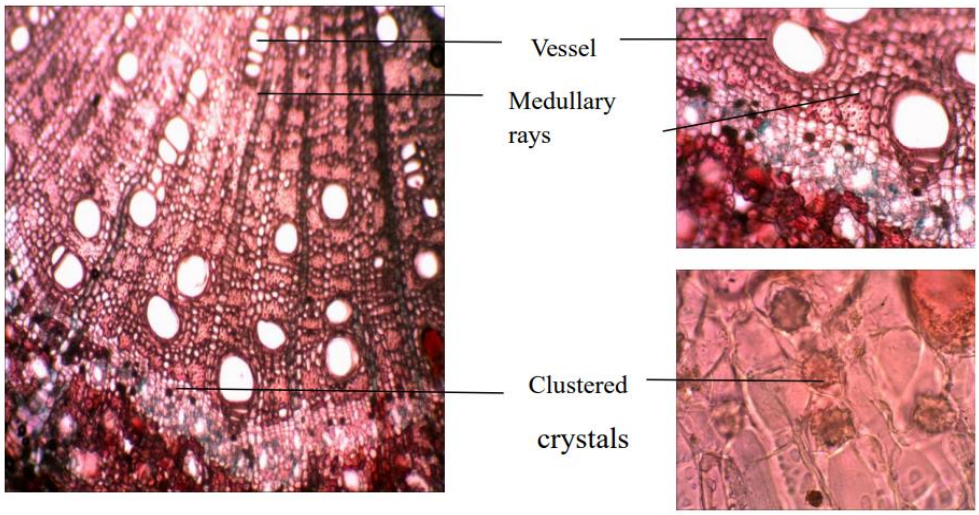

Fig. 1.2.3 TS of Root (Vessels, Medullary rays).

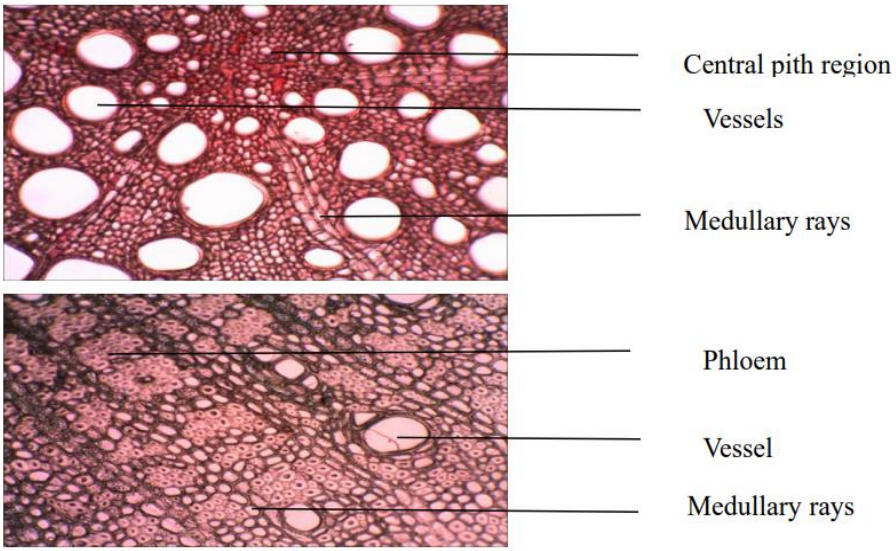

Fig.1.2.4 TS of Root (Vessels, Medullary rays).

TS of Root (Vascular Bundles)

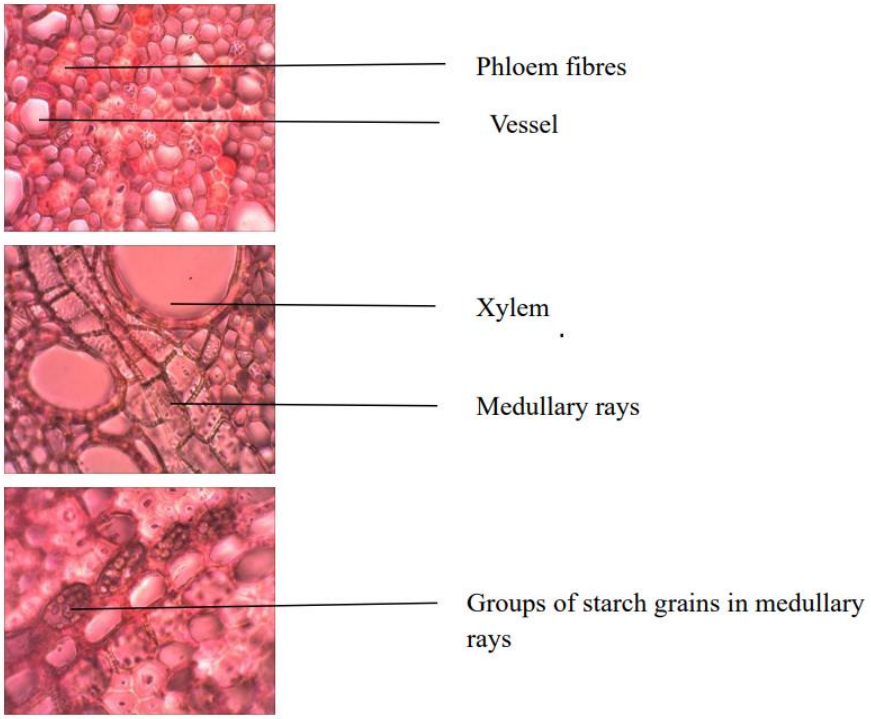

Fig.1.2.5 TS of Root (Vascular Bundles).

TS of Root

The transverse section of the root is circular in outline, with an outer brownish cork, followed by 4-5 layers of phellogen. The phelloderm layer is narrow with 1-2 layers of cells. Cortex region is wide with parenchymatous cells, embedded with pericyclic fibres. Phloem tissue present beneath the cortex is embedded with irregularly running uni, bi and tri-seriate medullary rays, xylem vessels, parenchyma cells with starch grains. (Fig.1.2, Fig.1.2.1, Fig.1.2.2, Fig.1.2.2, Fig.1.2.3, Fig.1.2.4, Fig.1.2.5)

Powder Microscopy of Root

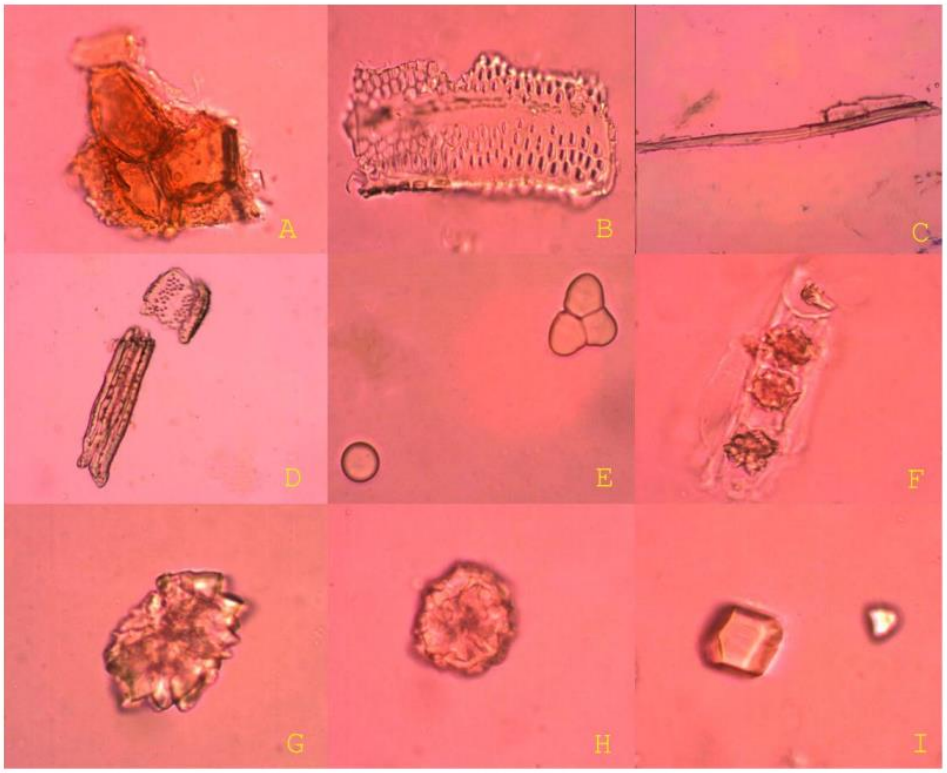

Fig 1.3 Powder Microscopy of Root.

A- Cork cells in surface view; **B**- Border pitted vessel; **C**- Xylem fibre; **D**- Brachysclereids; **E**-Starch grains; **F**-Crystals; **G**- Clustered crystal; **H**- Rosette crystal; **I**- Prismatic crystal.

Powder microscopy

Root powder brown colour (Fig.1.1)

Powder microscopy of root showed the presence of cork cells in surface view; Border pitted vessel; Xylem fibre; Brachysclereids; Starch grain; Crystals; Clustered crystal; Rosette crystal; prismatic crystal (Fig.1.3)

Physicochemical Parameters

The results are presented in Tables 2, 3 and 4. Ash values serve as an important parameter for determining the identity and purity of crude drugs. The total ash value is especially significant in assessing the presence of foreign inorganic matter such as silica, sand, or metallic salts.

Moisture content determination is a critical parameter in maintaining pharmacopeial standards. Excess moisture can promote microbial growth and chemical degradation, thereby affecting the stability, safety, and shelf life of the crude drug. Hence, the observed moisture content indicates the quality and proper storage condition of the plant material.

Fluorescence analysis is used to identify and authenticate crude drugs based on their characteristic fluorescence under Ultraviolet Light. It also helps in detecting adulteration and ensuring the quality and purity of herbal drugs.

Furthermore, extractive values are important indicators of the quantity of active constituents present in the crude drug. In the present study, the alcohol-soluble extractive value (7.2% w/w) was found to be higher than the water-soluble extractive value (3.2% w/w), suggesting that a greater proportion of phytoconstituents are soluble in alcohol. These extractive values serve as useful parameters for evaluating the solvent-soluble components and overall quality of the crude drug.

Table 2: Quantitative evaluation of the root of *Garcinia Gummi Gutta*.

EVALUATION PARAMETER(%W/W)	ROOT (%W/W)
Moisture content Fresh sample	41
Powdered sample	8
Total ash	8.5
Acid insoluble ash	1.3
Water soluble ash	5.5
Sulphated ash	7.9

Table 3: Extractive Values of root of *Garcinia Gummi Gutta.*

EVALUATION PARAMETER(%W/W)	ROOT (%W/W)
Alcohol soluble extractive value	7.2
Water soluble Extractive value	3.2

Table 4: Fluorescence analysis of root powder of *Garcinia Gummi Gutta.*

SI.NO	SOLVENTS	DAY LIGHT	254 nm	366 nm
1.	Distilled water	Woody	Woody	Light woody
2.	Concentrated HNO_3	Reddish brown	Black	Black
3.	1 % KOH	Light yellow	Light black	Grey
4.	1 N aqueous NaOH	Light yellow	Light black	Purplish black
5.	50 % H_2SO_4	Woody	Green	Light black
6.	50 % HNO_3	Reddish brown	Black	Black
7.	50 % Hcl	Woody	Light green	Light purple
8.	Methanol	Light brown	Voilet	Blackish grey
9.	Benzene	Light brown	Blackish purple	Grey

Preparation of Root Extracts

Preparation of root extracts by Soxhlet apparatus using different polar and non polar solvents such as petroleum ether, ethyl acetate, chloroform, methanol.

Percentage yield = $\frac{\text{Weight of the extract}}{\text{weight of packing material}} \times 100$

Table 5: Percentage of root extract of *Garcinia Gummi Gutta.*

SI.NO	SOLVENTS	PERCENTAGE YIELD (%)
1.	Petroleum ether	8.06
2.	Chloroform	7.87
3.	Ethyl acetate	8.82
4.	Methanol	20.86

Fig.1.4. Soxhlet apparatus.

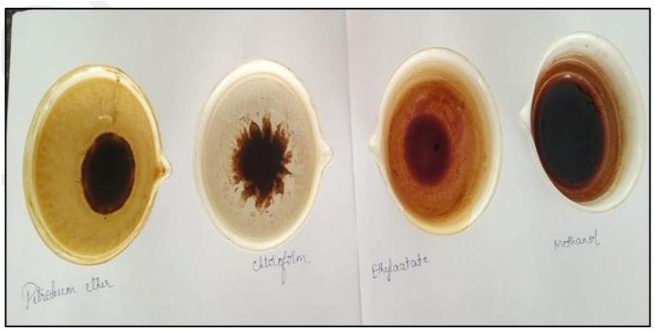

Fig.1.4.1. Root extracts.

Preliminary Phytochemical Studies[15]

The preliminary phytochemical investigation of the petroleum ether, chloroform, ethyl acetate, methanol extract of root of *Garcinia gummi gutta* showed the presence of alkaloids, glycosides, saponin, flavonoid, carbohydrate, fat and oil, proteins and amino acid, steroid, triterpenoid presented in Table 6.

Table 6: Qualitative Analysis of Phytochemicals in root of *Garcinia Gummi Gutta.*

PHYTOCONSTITUENTS	PE	CL	EA	ME
Alkaloids	-	-	-	++
Glycosides	-	-	-	++
Saponin	-	-	-	+
Flavonoid	-	-	-	++
Carbohydrates	+	-	-	++
Fats and oil	++	-	-	-
Proteins and amino acid	-	-	+	++
Steroid and Triterpenoid	-	-	-	+

Note: (+) = Present; (-) = Absent

PE-Petroleum ether, **CL**- Chloroform, **EA**- Ethyl acetate, **ME**- Methanol

5. CONCLUSION

Standardizing crude drugs is essential to ensure their unique identification and quality. Most standard parameters are determined through a plant's physicochemical properties and microscopic features. Before inclusion in the Pharmacopoeia, plants should have established standards. Therefore, standardization is crucial for maintaining the quality of crude drugs and their formulations. This study aims to develop pharmacognostical standards such as macroscopic and microscopic characteristics and physicochemical constants to support the efficacy of Ayurvedic medicine and encourage further scientific investigation into traditional plant-based claims.

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CONFLICTS OF INTEREST: No conflicts of interest.

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