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DECODING NATURE'S PHARMACY: PHARMACOGNOSTICAL PROFILING OF *ALLAMANDA BLANCHETII* ROOT

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ABSTRACT

In the present study, pharmacognostical investigations were undertaken on the root of *Allamanda blanchetii*. The plant was identified and authenticated by Dr. V. Rama Rao, Research Officer (Botany), Central Ayurveda Research Institute, Bengaluru. Macroscopical examinations of the root were subsequently carried out. Detailed pharmacognostical evaluation of the root was carried out to establish diagnostic features for identification and authentication. Transverse section revealed an exfoliating brownish cork followed by multiple layers of phellogen and a tangentially arranged phelloderm. The cortex was broad, composed of compact parenchymatous cells containing simple to compound starch grains and prismatic crystals. Beneath the cortex, phloem tissue was observed with uni- and biseriate medullary rays, also embedded with starch grains. Xylem vessels were diffuse porous, evenly distributed, and surrounded by fibres. Longitudinal section exhibited bordered pitted vessels and abundant starch grains. Root powder appeared creamish in colour. Powder microscopy confirmed the presence of cork cells, fibres, pitted stone cells, pitted tracheids, starch grains, crystal fibres, prismatic crystals, and crystal aggregates. These anatomical and microscopic characteristics serve as reliable pharmacogenetic markers for the root drug, supporting its quality control and standardization.

KEYWORDS: *Allamanda blanchetii* Morphology Microscopy Physico-chemical parameters.

1. INTRODUCTION

Traditional medicine, as described by the World Health Organization, encompasses the collective knowledge, skills, and practices rooted in the theories, beliefs, and cultural experiences of different communities. Whether scientifically explained or not, these practices are applied to maintain health and to prevent, diagnose, improve, or treat physical and mental illnesses.[1]

For many centuries, people have relied on plants for healing. Plant-based products whether consumed as food or prepared as botanical potions and powders have been used throughout history, with varying degrees of success, to treat and prevent diseases.[2]

Allamanda is an angiosperm commonly found in all parts of world. These plants are evergreen shrubs, commonly found in all parts for their beautiful inflorescence. This plant consists of approximately 15 species, namely *Allamanda augustifolia, A. blanchetii, A. caccicola, A. cathartica, A. doniana, A. laevis, A. martii, A. nobilis, A. oenotherifolia, A. polyantha, A. puberula, A. schottii, A. setulosa, A. thevetifolia, and A. weberbaueri*. The specimen *Allamanda violacea* belongs to the kingdom Plantae, Family Apocynaceae, Sub- family Rauvolfioideae, Genus *Allamanda* and Species

Violaceae. The leaves of this plant are arranged opposite in whorls. The inflorescence is compound cyme, which contains five loabed sepals. The fruit is schizocarp which contain two and occasionally four.[3] Based on the length and width *Allamanda blanchetii* have the largest flowers (10.6–12.8 × 9.1–11.4 cm). *Allamanda blanchetii* have reddish lavender color flower bud and yellowish pink color flower.[4] The substances plumericin, isoplumericin, and 5, 6-dimethoxy coumarin were isolated using *Allamanda blanchetii* (unckalin). The roots also contain a number of powerful phytochemicals that have been found. *Allamanda blanchetii* shows antioxidant, cytotoxic, thrombolytic, membrane-stabilizing, and antimicrobial properties.

Brine shrimp lethality bioassay was conducted to identify cytotoxic potential of the extractives. The test samples were also involved in thrombolytic and membrane stabilizing activity assays to evaluate their abilities to promote clot lysis and to stabilize erythrocyte membrane under hypotonic and heat induced conditions. The extractives were involved in disc diffusion assay to measure their ability to give zones of inhibition in cultured bacterial medium.[5] Develops a fibrous root system. The plant propagates easily through both seeds and vegetative means via stem cuttings and natural layering.[6]

According to the reports *Allamanda blanchetii* acts as Laxatives, antibiotics treatments for malaria, jaundice, an enlarging spleen, coughing, anti-inflammatory properties, purgative antioxidant qualities, cytostatic and cytotoxic activity, anti-dyslipidemic activities, anti-diabetic activities, thrombolytic activities, membrane stabilizing and antimicrobial activities, the plant is also known to deal with heat and different toxic products it activates blood circulation and diuresis.[7]

Due to the scarcity of scientific data on *Allamanda blanchetii* root, this study undertook macroscopical, microscopical, and quantitative analyses. Microscopical examinations involved transverse section (T.S.), longitudinal section (L.S.), and powder drug analysis of the root. Quantitative evaluation of the crude dried powder included determination of moisture content, total ash, water-soluble ash, acid-insoluble ash, sulphated ash, florescence analysis, and both water- and alcohol-soluble extractive values.

Taxonomical classification[3]
Kingdom: Plantae
Division: Tracheophytes
Phylum: Magnoliopsida
Class: Equisetopsida
Order: Fabales
Family : Apocynaceae
Sub family: Rauvolfioideae
Genus: *Allamanda*
Species: *Allamanda blanchetii*
Synonyms: *Allamanda violacea Gardn.*

Common name: *Cherry allamanda, Purple allamanda, Violet allamanda.*
Vernacular Names:[4] Kannada : *Allamanda* English : *Purple Allamanda* Sanskrit: *Pilaghanti*
Portuguese: *Alamanda-purpura, Alamanda-roxa*
Brazil: *Alamanda-de-Jacobina*
Tamil: *Pilagantiyum*

2. MATERIALS AND METHODS

Collection of plant material

In October 2025, the plant material was gathered from Mandya, Karnataka, India. Dr. V. Rama Rao, Research Officer (Botany), Central Ayurveda Research Institute, Bengaluru, identified and authenticated the plant. For future use, an herbarium voucher specimen was prepared and preserved in the Pharmacognosy department of the Bharathi College of Pharmacy, Bharathinagara.

Drying and size reduction of the root

The collected plant material was shade-dried and subsequently ground into a coarse powder. The root powder of *Allamanda blanchetii* was then sieved using sieve number 80 and preserved in an airtight container for further use.

3. EXPERIMENTAL PROCEDURE

Macroscopical studies[8]

Macroscopic evaluation of *Allamanda blanchetii* root was carried out to assess their colour, texture, size, shape, fracture, odour, and taste. For this purpose, the crude plant material was placed on a white paper background, allowing direct visual examination of the raw drug with the unaided eye.

Microscopical studies[9]

Free-hand slices of fresh root have been used for microscopical studies. After being cleaned water, thin sections were stained with safranin and examined under a microscope. Additionally, the dried root powder with water was examined under a microscope and stained with safranin, microphotographs were captured.

Physicochemical constants[10-13]

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 on drying.

Preliminary phytochemical studies[14]

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

4. RESULTS AND DISCUSSION

Macroscopical studies

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

Table 1: Macroscopical character of Roots *Allamanda blanchetii* includes. (Fig. 1.1)

colour	Light brown to brown
Odour	Fresh groundnut
Taste	bitter
Size	12 to 18 inches in depth, spread horizontally
Shape	Oblong-ovate to elliptic
Fracture	Develop robust and somewhat woody
Texture	Firm and fibrous

Microscopical Character

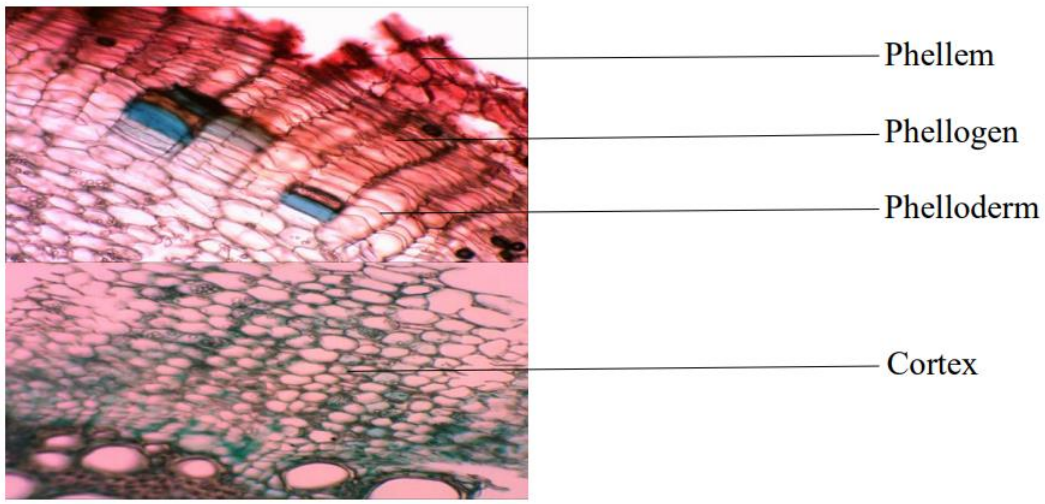


Fig. 1.2 TS of Root.

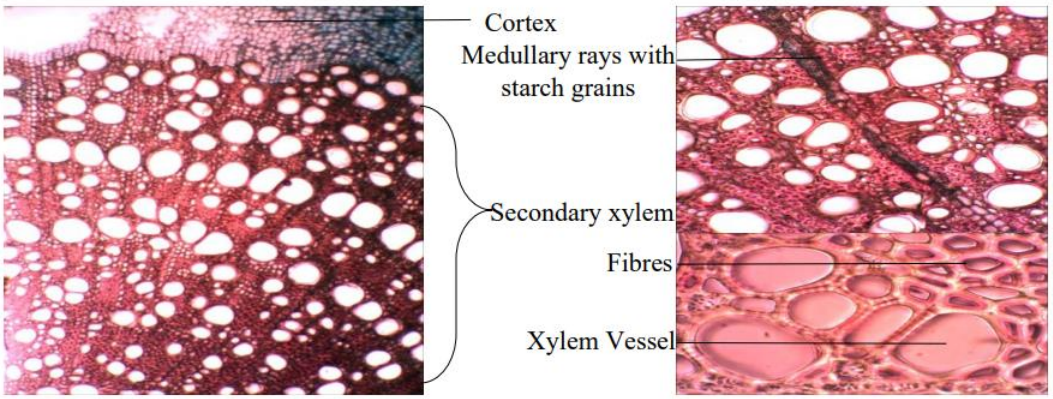
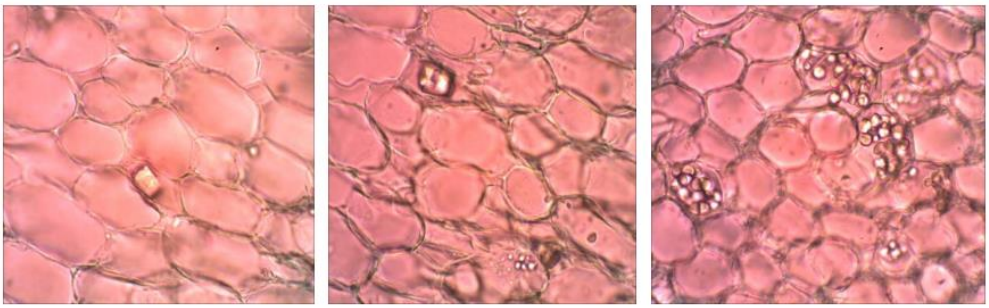


Fig. 1.2.1 TS of Root.



Prismatic crystals and starch grains in cortex region

Fig 1.2.2 TS of root.

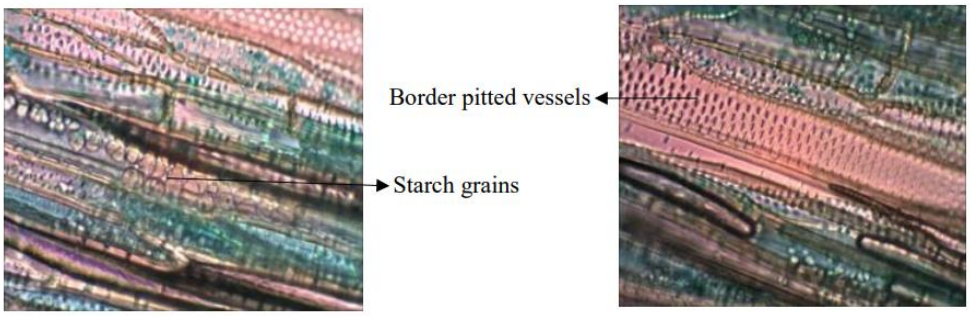


Fig. 1.3 LS of Root.

Transverse section of Root-

The transverse section of the root shows outer brownish, exfoliating cork, followed by 6-7 layers of phellogen. The phelloderm layer is composed of 4-5 layers of tangentially arranged cells. Cortex region is wide with compactly arranged parenchymatous cells, embedded with simple to compound starch grains of various sizes and also prismatic crystals. Phloem tissue present beneath the cortex, and is embedded with regularly running uni, and bi seriate medullary rays. Simple to compound starch grains are present in the medullary rays. Xylem vessels are diffuse porous and evenly arranged, surrounded by fibres. (Fig. 1.2, 1.2.1 & 1.2.2).

Longitudinal section of the root shows bordered pitted vessels and starch grains (Fig 1.3)

POWDER MICROSCOPY

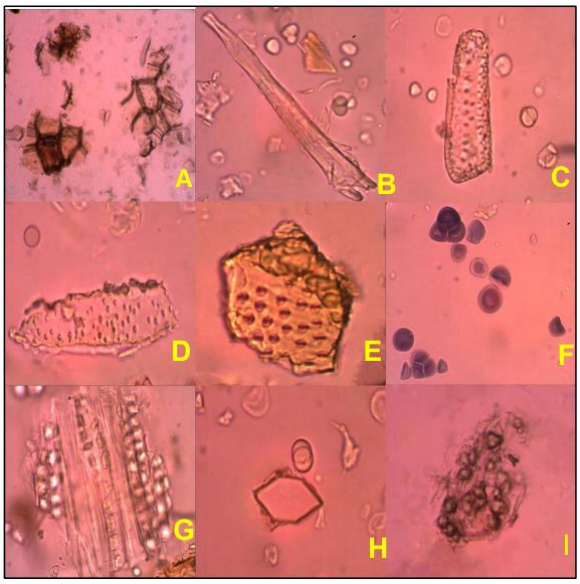


Fig 1.4 Powder Microscopy of Root.

A- Cork cells in surface view; **B-** Fibre; **C-** Pitted stone cell; **D-** Pitted tracheid; **E-** Border pitted vessel; **F-** Starch grains; **G-** Crystal fibres; **H-** Prismatic crystals; **I-** Group of crystals.

Root powder is creamish colour (Fig. 1.1 B)

Powder microscopy of root showed the presence of Cork cells in surface view; Fibre, pitted stone cell; pitted tracheid; Starch grains; Crystal fibres; Prismatic crystal and group of crystals (Fig.1.4).

Physicochemical Parameters

The results of the Physicochemical Parameters are summarized in Tables 2 and 3. Ash values also play a significant role in the evaluation of crude drugs. The total ash value provides an estimate of the total inorganic content present in the sample. It is particularly useful in detecting the presence of foreign inorganic matter such as silica, sand, soil, or metallic salts, which may indicate contamination or adulteration.

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 (6.4% 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: showing results for quantitative evaluation of root *Allamanda blanchetii*.

SI. NO.	EVALUATION PARAMETER(%W/W)	ROOT (%W/W)
1.	**Moisture content** Fresh sample Powdered sample	 58 6.6
2.	Total ash	10.44
3.	Acid insoluble ash	1.44
4.	Water soluble ash	9.44
5.	Sulphated ash	7.11

Table 3: Extractive Values of root *Allamanda blanchetii*.

EVALUATION PARAMETER(%W/W)	ROOT (%W/W)
Alcohol soluble extractive value	6.4
Water soluble extractive value	3.2

Table 4: Fluorescence analysis of root powder *Allamanda blanchetii*.

SI.NO.	SOLVENTS	DAY LIGHT	254 nm	366 nm
1.	Distilled water	woody	Light blue	Dark blue
2.	Concentrated HNO_3	Yellowish red	Violet	Dark purple
3.	1 % KOH	ellowish woody	Grey	Sky blue
4.	1 N aqueous NaOH	ellowish woody	Greenish blue	Sky blue
5.	50 % H_2SO_4	Light brown	Sky blue	Dark blue
6.	50 % HNO_3	Light woody	Grey	Sky blue
7.	50 % Hcl	Light woody	Grey	Sky blue
8.	Methanol	Light woody	Purple	Dark purple
9.	Benzene	ellowish woody	Blackish purple	Purple

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.

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

Table 5: Percentage of root extract *Allamanda blanchetii*.

SI.NO.	SOLVENTS	PERCENTAGE YIELD (%)
1.	Petroleum ether	8.01
2.	Chloroform	8.49
3.	Ethyl acetate	9.97
4.	Methanol	20.87

Fig. 1.5.1 Root extracts.

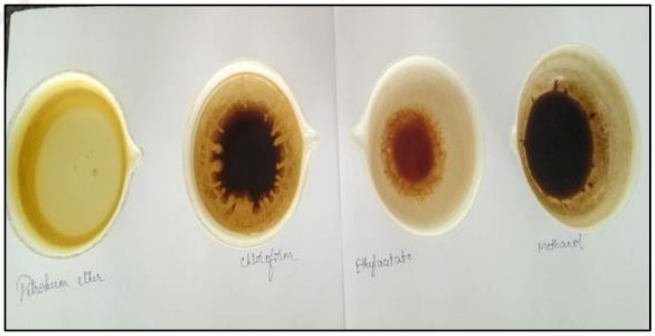


Fig. 1.5 Soxhlet apparatus.

Preliminary Phytochemical Studies[15]

The preliminary phytochemical investigation of the petroleum ether, chloroform, ethyl acetate, methanol extract of root of *Allamanda blanchetii* 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 *Allamanda blanchetii*.

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

In pharmacognosy, the standardization of crude drugs has emerged as a crucial priority to ensure reliable identification and uniform quality. Such standards are primarily derived from detailed investigations into the physicochemical attributes and microscopic features of plants. Before a plant can be officially recognized in the Pharmacopoeia, these parameters must be clearly established, as they provide the foundation for safeguarding the quality of crude drugs and the therapeutic efficacy of their formulations. This study focuses on developing pharmacognostical benchmarks including macroscopic and microscopic observations along with physicochemical constants to reinforce Ayurvedic medicine and enhance the credibility of traditional healing practices. Defining these standards may also encourage researchers to rigorously examine and substantiate the traditional claims associated with medicinal plants.

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CONFLICTS OF INTEREST: No conflicts of interest.

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