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Atlas for authentication of *Curcuma longa* Linn.

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ABSTRACT

Introduction: *Curcuma longa* Linn. (Turmeric/Haridra) is a spice native to India. Historically, turmeric has been used throughout India, China and Indonesia as a spice and medicinal agent. It is one such medicinal plant explained extensively in Indian material medica. It is also used worldwide because of its high medicinal as well as market values, the pharmacognostical characters of its rhizome were studied. The current study is aimed to evaluate characters for authentication of *C. longa* rhizome. **Methods:** Rhizomes were collected from Hassan, Karnataka; its macroscopic, microscopic and HPTLC were studied following standard procedures. **Results:** Microscopically, transverse section of rhizome shows epidermis with thick-walled, cubical cells, cortex, few layers of cork, brick-shaped parenchyma, oleo-resin cells, globules of volatile oil, starch grains of 4-15 μ in diameter were seen. By HPTLC characteristics fingerprint have been derived. **Conclusion:** The atlas will be useful in the identification and standardization of the *Curcuma longa* Linn. rhizome.

KEYWORDS

Haridra, Macro-microscopy Atlas, Pharmacognosy.

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Man has been using herbs and plant products for combating diseases since times immemorial. The Indian subcontinent is enriched by a variety of flora- both aromatic and medicinal plants. This extensive flora has been greatly utilised as a source of many drugs in the Indian traditional system of medicine.^[1] Turmeric is an ancient spice, a native of South East Asia, used from antiquity as dye and a condiment. It is cultivated primarily in Bengal, China, Taiwan, Sri Lanka, Java, Peru, Australia and the West Indies.^[2] Turmeric (Haridra) is one such medicinal plant explained extensively in Indian material medica (Dravyaguna Sastra). It is an auspicious beauty spot, daily applied on the forehead by Hindu females. Application of turmeric a paste to the bride is an essential procedure of Hindu rituals.^[3] In Ayurveda, turmeric has been well documented for its therapeutic potentials and described in Dashemani Lekhaniya (emaciating), Kusthagna (anti-dermatosis), Visaghna (anti-poisonous).^[4]

Botanically identified dried rhizomes was procured from a local market of Hassan, Karnataka and authenticated by Department of Dravyaguana, SDM College of Ayurveda & Hospital, Hassan. The rhizomes were powdered, passed through mesh no. 80, and preserved in an air-tight glass container and utilized for powder microscopy and preliminary physico-chemical analysis. The external features of the test samples were documented using Canon IXUS digital camera. Sample was preserved in fixative solution. The fixative used was FAA (Formalin-5ml + Acetic acid-5ml + 70% Ethyl alcohol-90ml). The materials were left in FAA for more than 48 hours. The preserved specimens were cut into thin transverse section using a sharp blade and the sections were stained with saffranine. Transverse sections were photographed using Zeiss AXIO trinocular microscope attached with Zeiss AxioCam camera under bright field light. Magnifications of the figures are indicated by the scale-bars. A pinch of powder was warmed with drops of chloral hydrate on a microscopic slide and mounted in glycerine. Slides observed under microscope and diagnostic characters were observed and photographed using Zeiss AXIO trinocular microscope attached with Zeiss AxioCam camera under bright field light. Magnifications of the figures are indicated by the scale-bars.^[5] One gram of powder was extracted with 10 ml of ethanol. 6, 12 μ l of the above extract was applied on a pre-coated silica gel F₂₅₄ on aluminum plates to a band width of 7 mm using Linomat 5 TLC applicator. The plate was developed in toluene: ethyl acetate (7:1). The developed plates were visualized under short UV, long UV and white light and then derivatised with vanillin sulphuric acid and scanned under UV 254 and 366 nm. R_f, colour of the spots and densitometric scan were recorded.^[6]

Rhizomes ovate, oblong or pyriform (round turmeric) or cylindrical, often short branched (long turmeric), former about half as broad as long, latter 2-5 cm long and about 1-1.8 cm thick, externally yellowish to yellowish-brown with root scars and annulations of leaf bases, fracture horny, fractured surface orange to reddish brown, central cylinder twice as broad as cortex: odour and taste characteristic (Figure 1). Transverse section of rhizome shows epidermis with thick-walled cubical cells of various dimensions, cortex characterized by the presence of mostly thin-walled rounded parenchyma cells, and scattered collateral vascular bundles; few layers of cork developed under epidermis and scattered

Figure 1. Macroscopic features of rhizome of *Curcuma longa* Linn.

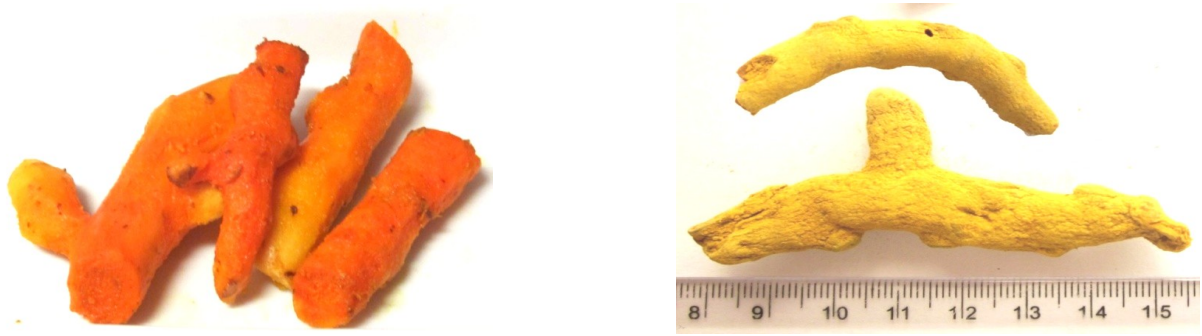


Figure 2. Detailed microscopic rhizome of *Curcuma longa* Linn.

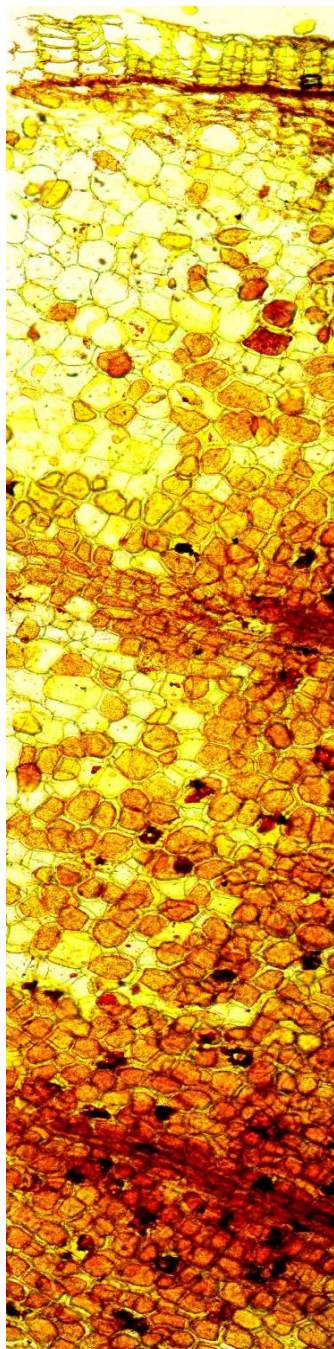


Fig 3.2 A portion enlarged

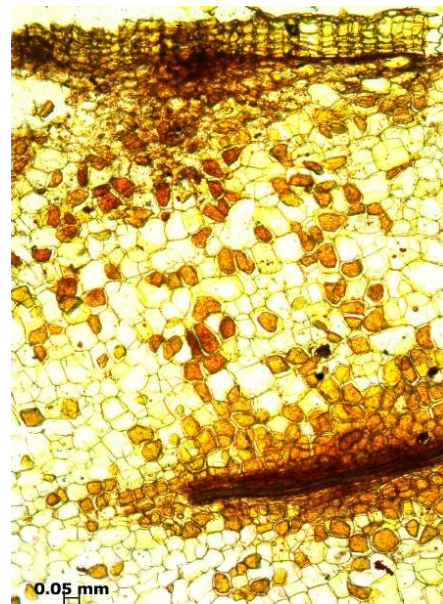


Fig 3.1 TS of rhizome

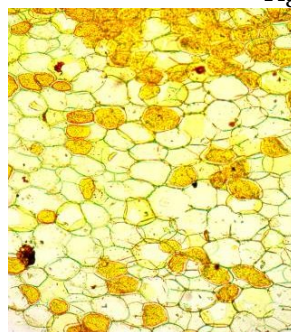


Fig3.3 Cortex

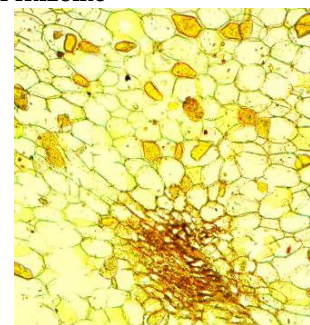


Fig 3.4 Vascular bundle

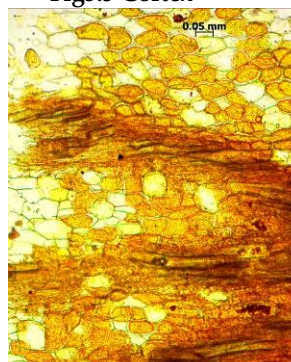


Fig 3.5 Xylem

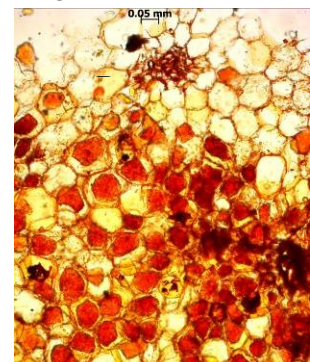
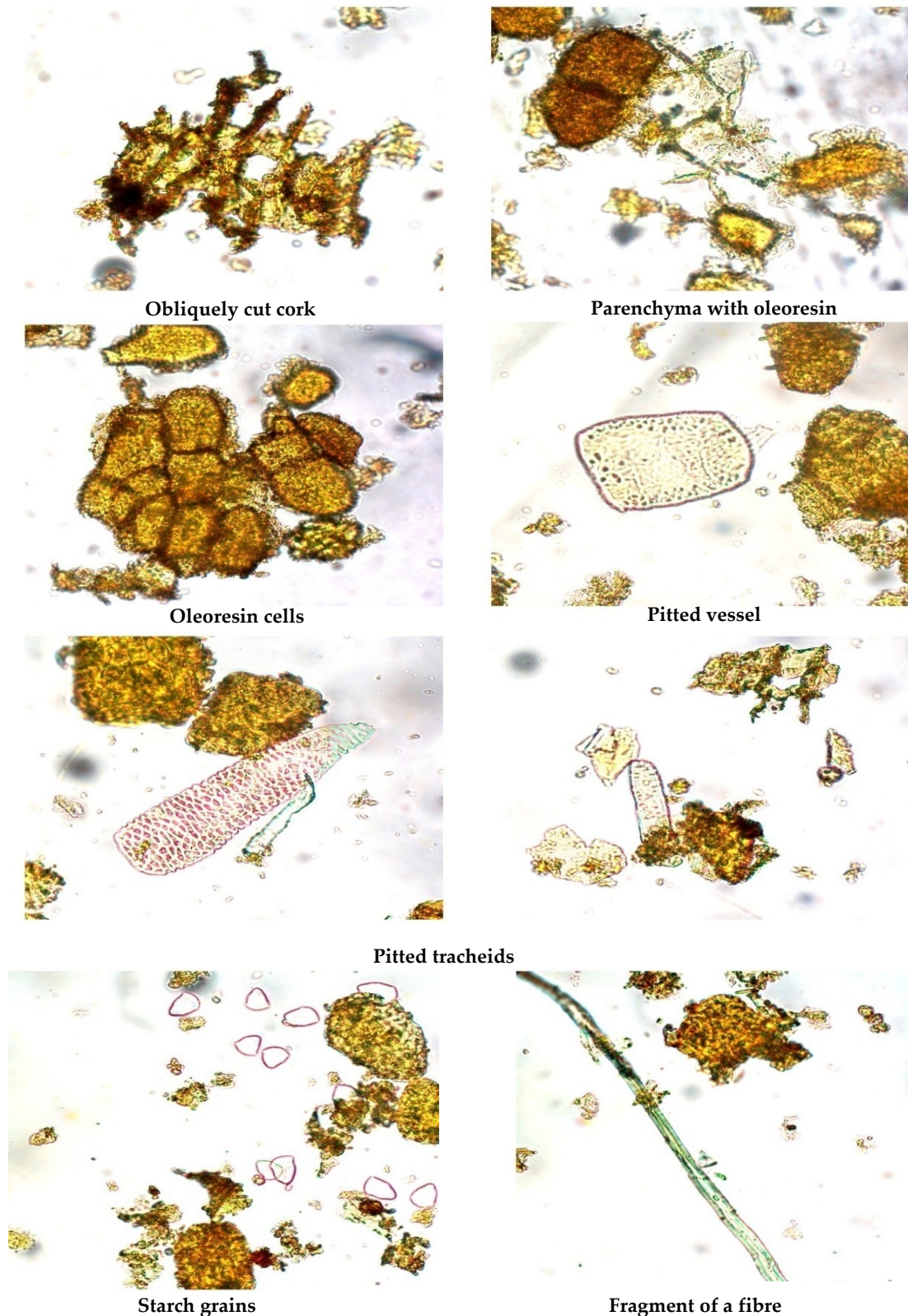


Fig 3.6 Oleoresin cells

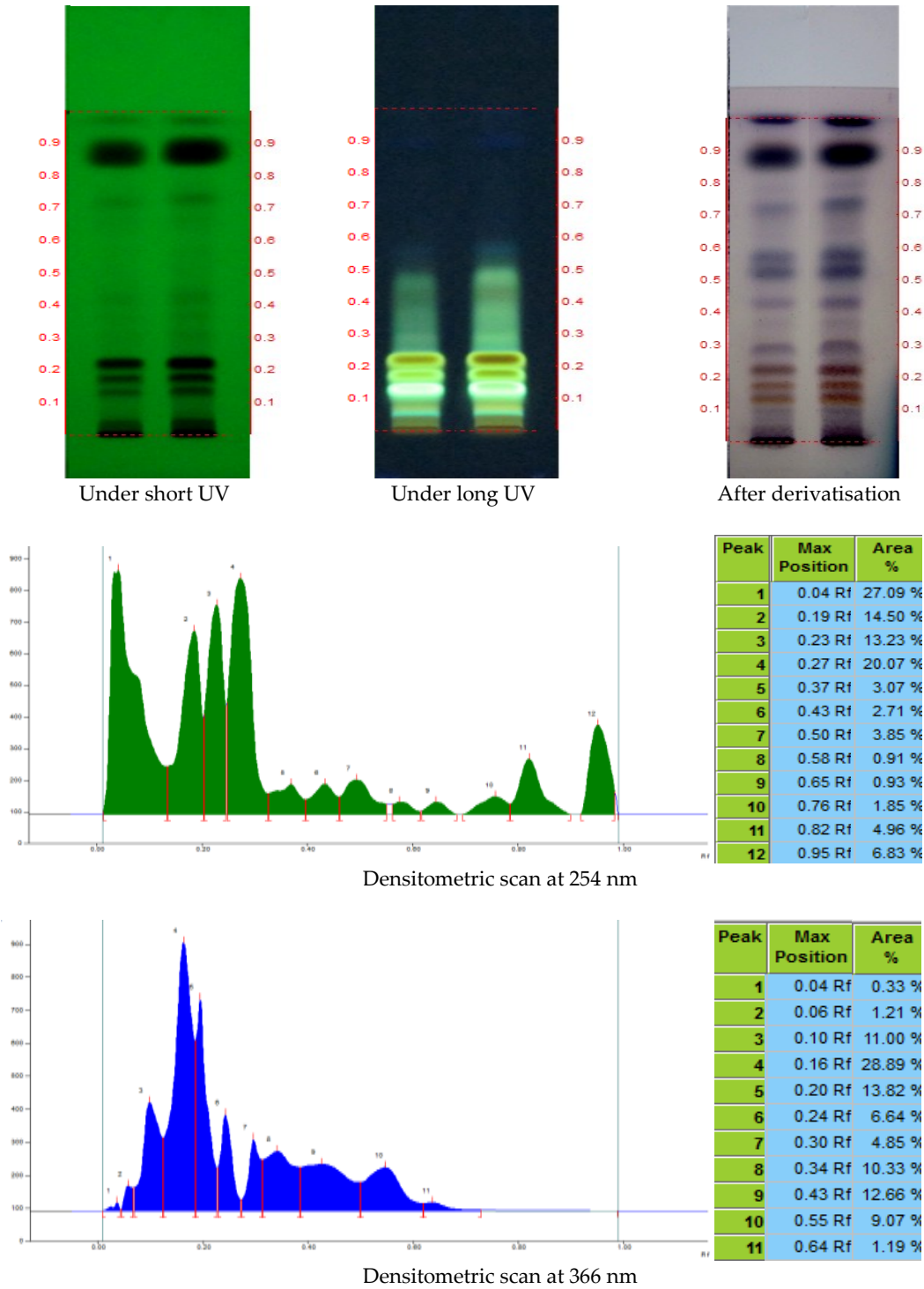
Figure 3. Powder microscopy of *Curcuma longa* Linn.



oleo-resin cells with brownish contents; cork generally composed of 4-6 layers of thin-walled, brick-shaped parenchyma, cells of ground tissue contain starch grains of 4-15 μ in diameter, oil cell with suberised walls containing either orange-yellow globules of volatile oil or amorphous resinous matter, vessels mainly spirally thickened, a few reticulate and annular (Figure 2). Organoleptic characters of powder show dark orange color, aromatic odour, astringent taste, and smooth touch. The diagnostic character *Curcuma longa* shows obliquely cut cork, parenchyma with oleoresin, oleoresin cells, pitted vessel, pitted tracheids, starch grains and fibres (Figure 3).

HPTLC fingerprint documented for *Curcuma longa* using toluene - ethyl acetate 7:1 as mobile phase showed 9 spots each under short UV (0.03 D green, 0.13 D green, 0.18 D green, 0.22 D green, 0.31 L green, 0.36 L green, 0.42 L green) and long UV (0.03 F yellow, 0.05 F green, 0.07 F yellow, 0.13 F yellow, 0.18 F yellow, 0.22 F yellow, 0.31 F yellow, 0.56 F yellow, 0.89 F violet). After derivatisation with vanillin sulphuric acid there were 12 spots (0.03 Purple, 0.09 Purple, 0.15 Yellow, 0.18 Yellow, 0.22 Yellow, 0.31 Purple, 0.36, 0.42 Blue, 0.53 Blue, 0.58 Blue, 0.73, 0.89 D blue). The densitometric scan at 254 and 366 nm showed 12 and 11 peaks respectively (Figure 4).

Figure 4. HPTLC of *Curcuma longa* Linn.



Solvent system: toluene: ethyl acetate (7:1)

The macro-microscopy and HPTLC study of *Curcuma longa* Linn. revealed diagnostic features that will be useful for identification and authentication of the drugs. The atlas can be used as reference standards in the future for comparative studies on other *Curcuma* spp.

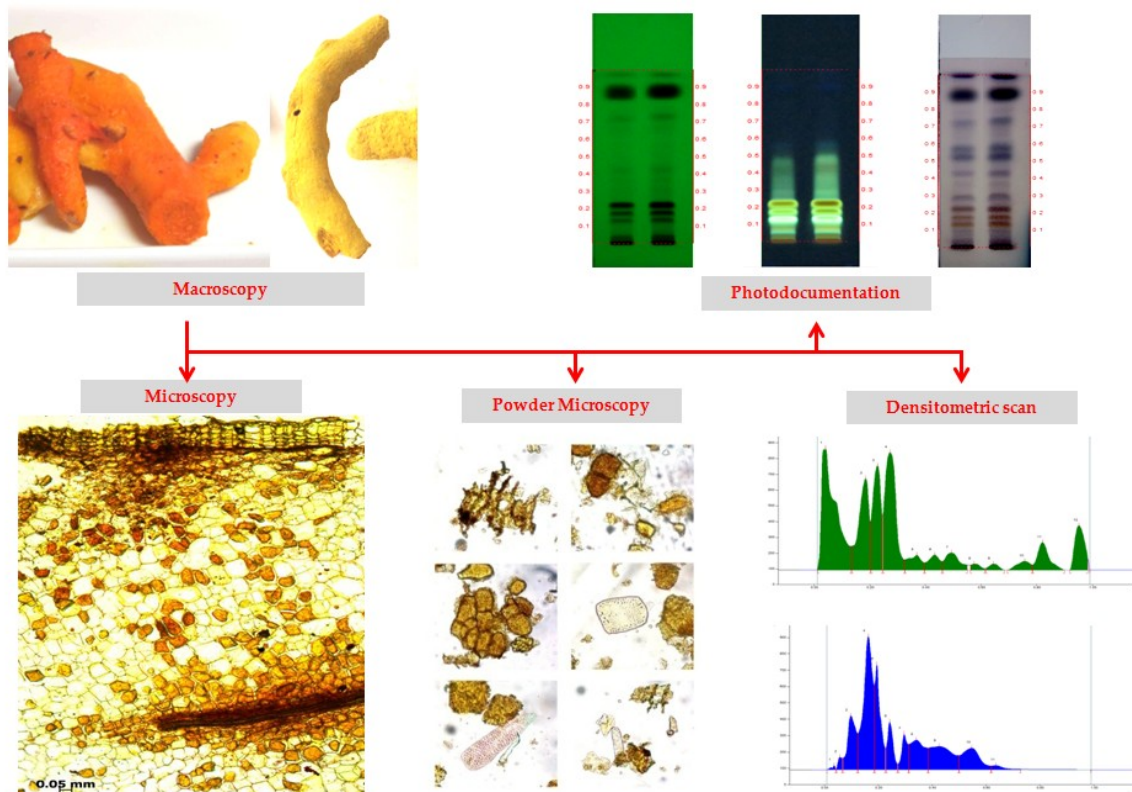
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GRAPHICAL ABSTRACT



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