

## Pharmacognostic Evaluation of *Curcuma aeruginosa* Roxb.

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**Abstract** – *Curcuma aeruginosa* Roxb. (Family Zingiberaceae), commonly known as “pink and blue ginger” is widely used in Indian system of medicine since time immemorial. The plant is found well in wild habitat and cultivated in southern India. The plant is distinguished by red corolla lobes and ferruginous or greenish-blue rhizome. Rhizoma is used medicinally as anti-diarrheal, anti-fungal; external use as astringent for wounds. A detailed pharmacognostic evaluation of its rhizome showed total ash 6.1%, acid insoluble ash 1.20%, alcohol soluble extractives 3.70%, water soluble extractives 14.50%, sugar 20.93%, starch 41.85%, and tannins 0.68%. On hydro distillation, the rhizomes and sessile tubers yielded 0.17% oil.

**Keywords** – *Curcuma aeruginosa*, rhizome, pharmacognosy, standardization

### Introduction

*Curcuma aeruginosa* Roxb. (Zingiberaceae) commonly known as “pink and blue ginger” is being used in Indian system of medicine since times immemorial as anti-diarrheal and antifungal agent. The plant is native to Myanmar. In India, it is found in West Bengal, Bihar, Coromandal coast, South Karnataka and fairly common in Kerala along the coastal areas and in riverine soils also seen as undergrowth in coconut and areca nut grooves. It is known as *Mahamek*, in Hindi, and “pink and blue ginger” in English. Fresh rhizomes emit the aroma ginger-like and mildly aromatic. But if it is used externally, it has astringent effect for wounds (Watt, 1889; Nadkarni, 1954; Chopra, *et al.*, 1958, 1969). Rhizome is anti-diarrheal and anti-fungal (Jantan, *et al.*, 2003).

Although the drug is fairly important and has good economics but no pharmacognostical work have been done in details except study of essential oil by Takanoa, *et al.*, 1995, Jirovetz, *et al.*, 2000 and Jarikasen, *et al.*, 2003. Therefore the present study had been done to document its detailed pharmacognostical information, which will be utilized by the industries for the authentication of this drug.

### Experimental

The plant material was collected from Trivendrum (Kerala,

India) [Sharad, LWG 222350, 2004] and the rhizome were preserved in 70% ethyl alcohol for histological studies. Microtome sections were cut and stained with safranin and fast green and photographed with Nikon F70X camera (Johansen, 1940). Physico-chemical and phytochemical studies like, total ash, acid insoluble ash, sugars, starch and tannins were calculated from the shade dried powdered material according to the recommended procedures (Peach and Tracy, 1955; Anonymous, 1965; Anonymous 1984). The behavior of the powdered drug with different chemical reagents was also studied as per methods described by Chase and Pratt (1949) and Kokoski *et al.* (1958).

**A brief taxonomic description of the plant: (Fig. 1)** – Rhizome is large, aromatic, blue in the centre, which is highly variable. Sessile tubers are branched, root tubers many. Leafy shoots are 45 - 60 cm high. Petiole is as long as lamina; lamina 35 - 60 × 12 - 18 cm, oblong-lanceolate, a purplish patch along either side of the midrib on upper side. Inflorescence is lateral, peduncle about 15 cm long and spike about 13 cm; Coma bracts are large, pink to pinkish violet. Fertile bracts are 18 - 20, green with a pink tip. Flowers in cincinnus of 8 - 10 in a bract, equal to or slightly shorter than bracts; Corolla is pinkish, labellum yellow with a deep yellow median band; Epigynous gland two.

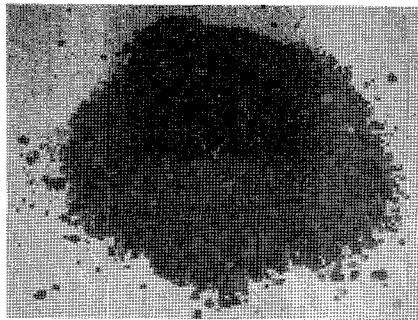
**Macroscopic characters of the rhizome (Fig. 1-2)** – *Curcuma aeruginosa* has the typical burgundy mid-stripe on the leaves as several other species, but the stripes do not fade with age as much as the others. This makes it an especially valuable foliage plant, because the tall arching

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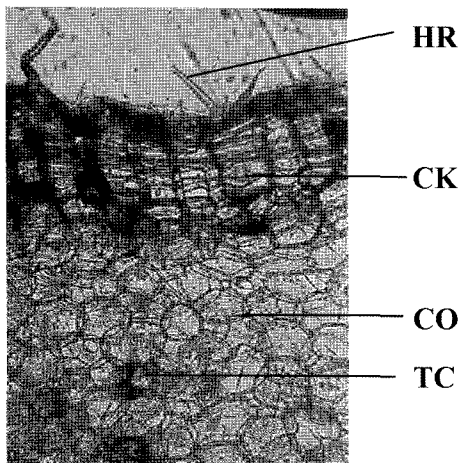
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**Fig. 1.** A flowering twig.

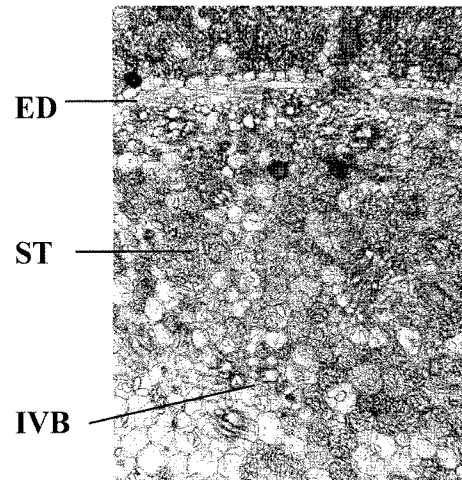


**Fig. 2.** Dried and powdered rhizome.

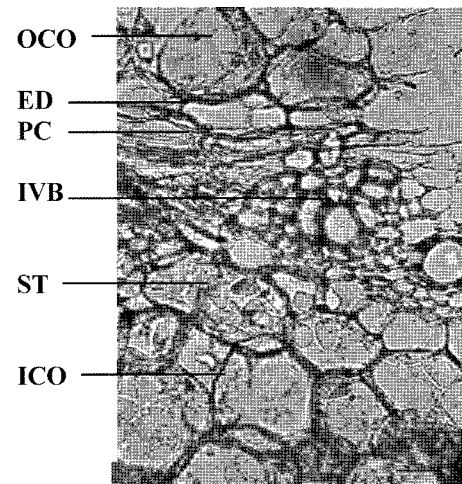


**Fig. 3.** Transverse section of rhizome showing cork and cortical zone. HR, hair; CK, cork cells; CO, cortex; TC, tannin containing cells.

leaves retain the color and shape of their midrib feather through the entire summer. Rhizome aromatic, blue in the centre with short and smooth fracture and sweet in taste.



**Fig. 4.** Transverse section of rhizome showing inner and outer cortical zone. ED, endodermis; ST, starch; IVB, inner vascular bundle.



**Fig. 5.** Transverse section of rhizome showing inner cortical. ED, endodermis; IVB, inner vascular bundle; ST, starch; ICO, inner cortex.



**Fig. 6.** Transverse section of rhizome showing starch and tannin containing cells. TC, tannin containing cells; ST, starch.

**Microscopic characters of the rhizome (Fig. 3-7)** – Transverse section of rhizome is circular in outline. Epidermal cells are rectangular in shape covered with thick cuticle, long unicellular trichomes present. Followed to these, storied suberized cork cells, 4 to 7 layered,

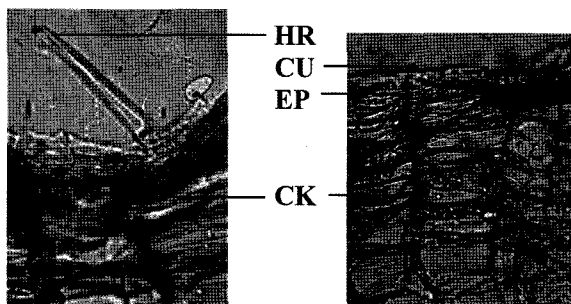


Fig. 7. Transverse section of rhizome showing cork, epidermis and unicellular hair. HR, hair; CK, cork cells; EP, epidermis; CU, cuticle.

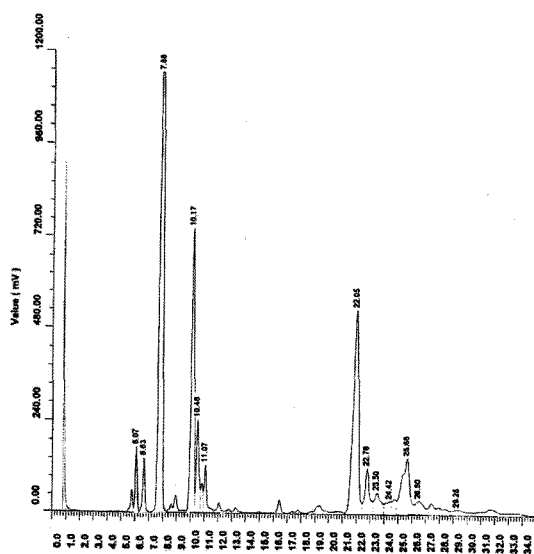


Fig. 8. GLC profile of *C. aeruginosa* rhizome.

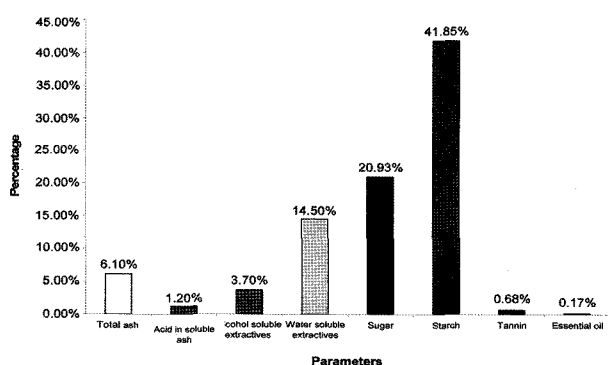


Fig. 9. Physiochemical parameters of the rhizome of *C. aeruginosa*.

interrupted by lysigenous oil glands are present. A wide cortex having irregularly scattered vascular bundles are present. Each vascular bundle is enclosed within a prominent fibrous sheath, inner limit of cortex marked by endodermis, and pericycle followed by vascular bundles which devoid of bundle sheath, arranged in a ring; schizogenous canals and abundant tannin containing cells

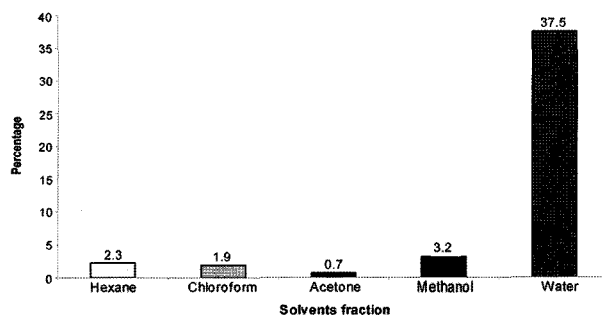


Fig. 10. Successive soxhlet values of the rhizome of *C. aeruginosa*.

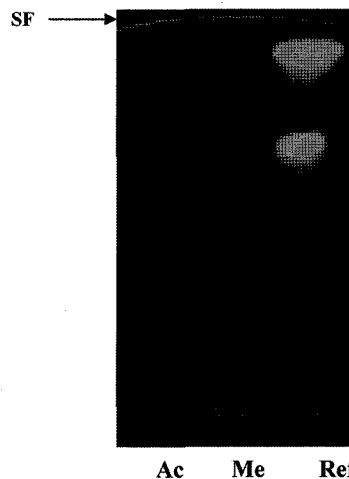


Fig. 11. HPTLC profile and chromatogram of *Curcuma aeruginosa* and reference sample (Under UV- 366). 1. HPTLC profile of *Curcuma aeruginosa* Rhizome (Acetone Fraction), 2. HPTLC profile of *Curcuma aeruginosa* Rhizome (Methanol Fraction), 3. Reference sample of curcumin. Ac, acetone fraction; Me, methanol fraction; REF, curcumin reference.

with suberized walls are also found in central region of cortex. Most of the parenchymatous cells are filled with starch grains, which are oval-ellipsoidal, sometimes polygonal in shape, 10 to 65  $\mu\text{m}$ , simple, hilum circular or 2 to 5 rayed cleft, lamellae distinct and concentric. Vascular bundles in the central cylinder are similar to those in the cortex, scattered, closed, collateral, surrounded by thick

walled bundle sheath. Secondary wall thickening reticulate, fibres thin walled with lignified narrow central lumen.

**Study of essential oils** – On hydro distillation, the rhizomes and sessile tubers yield 0.17% oil. The characters of the oil are as follow : colour : light yellow; odour : aromatic; monoterpenoids/hydrocarbons : 59.26%; sesquiterpenoids/oxygenated compounds : 40.74%; gas liquid chromatogram : Fig. 8; components identified (%) :  $\alpha$ -pinene (2.41), sabinene (2.40),  $\alpha$ -terpine (31.50), camphor (15.58), borneol (4.84), isoborneol (2.53), tumerone (2.71), ar-tumerone (1.50), zerumbone (8.75).

**Physico-chemical studies** – Different physico-chemical values obtained are recorded in Fig. 9 and Fig. 10.

**HPTLC studies (Fig. 11)** – A densitometric HPTLC analysis was also performed for the development of characteristic fingerprint profile, which may be used as markers for quality evaluation and standardization of the drug. The bands in the sample were obtained at  $R_f$ s 0.22, 0.56, 0.64, 0.78 & 0.94 (Acetone Fraction) and 0.18, 0.54, 0.74 & 0.94 (Methanol Fraction), which can be used as identifying markers. When compared both the profile with curcumin as a reference, it was present only in traces in both the extracts.

## Discussion

From the above studies rhizome can easily be differentiated on the basis of organoleptic characters for example the odour and taste of rhizome is quite characteristic and is aromatic with sweet taste. On microscopical examination rod shaped starch grains and fibres are observed in the rhizome. Similarly number of curcumin containing cells is least, almost in negligible amount in the rhizome.

Physicochemical values *viz.* percentage of moisture, total ash, acid insoluble ash, alcohol and water-soluble extractives are observed. The total ash and acid insoluble ash, which are considered to be an important and useful parameter for detecting the presence of inorganic substances like silicate ion, it was found 6.1% and 1.20% respectively. Similarly the alcohol and water-soluble extractives, which are indicators of the total solvent soluble components, are 3.70% and 14.50% respectively. Likewise the essential oil, which is an important parameter for identification and authentication it was found to be 0.17%, having  $\alpha$ -pinene (2.41), sabinene (2.40),  $\alpha$ -terpine (31.50), camphor (15.58) borneol (4.84), isoborneol (2.53), tumerone (2.71). ar-tumerone (1.50), zerumbone (8.75).

Successive Soxhlet extraction from non-polar to polar

solvents *viz.* hexane, chloroform, acetone, alcohol and water were also carried out. It is interesting to note that *C. aeruginosa* rhizome possessed an exceptionally low amount of acetone extractives i.e. 0.70%, which may be due to the lesser percentage of curcumin which is purely soluble in acetone.

Thus on the basis of aforesaid studies it can be concluded that the above parameters are very useful for the identification of this species which may be useful to pharmaceutical industries for the authentication of the commercial samples.

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