



Research Article

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MACRO-MICROSCOPICAL EVALUATION ON PERICARP OF *TERMINALIA CHEBULA* RETZ. AND ITS MARKETED FORMULATIONS

Nartunai Govindarajan ^{1*}, Susikumar Sundharamoorthy ², Arunachalam Chinnapillai ¹, Ilavarasan Raju ³

¹ Research Officer, Department of Botany/Pharmacognosy, Captain Srinivasa Murthy Regional Ayurveda Drug Development Institute, Chennai, Tamil Nadu, India

² Research Scholar, Department of Botany/Pharmacognosy, Captain Srinivasa Murthy Regional Ayurveda Drug Development Institute, Chennai, Tamil Nadu, India

³ Assistant Director (S-4), Department of Pharmacognosy, Captain Srinivasa Murthy Regional Ayurveda Drug Development Institute, Chennai, Tamil Nadu, India

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*Corresponding author

E-mail: gnartunai@gmail.com

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ABSTRACT

The present study is to evaluate macro-microscopically the pericarp of *Terminalia chebula* Retz. and its marketed formulations. The fruit sample used for the study was purchased from raw drug market, Chennai. The Macro-microscopic characterization was carried by following appropriate method published by standard/official books. The plant material after cleaning and drying properly powdered and passed through sieve No.80 for powder microscopic study. The mounting and staining were carried out by standard methods of prescribed books. Sections were observed and reported as per guidelines and photographed under different magnifications with the help of Fluorescence microscopic unit (Olympus BX51) fitted with camera. The marketed formulations of tablets and Curna comply macro-microscopically with the Pharmacopoeial standards. Pegged fibres, tannin containing cells, starch grains, rosette and cluster crystals of calcium oxalate, sclereides are of various size and shape, abundant stone cells with narrow lumen and branched pits (ramiform) through thick cell wall and vessels with spiral, pitted and reticulate thickenings are the unique diagnostic characters observed under microscope. The study sets the specific macro-microscopic protocols for standardization of the pericarp of *Terminalia chebula* Retz. and its marketed formulations.

Keywords: *Terminalia chebula*, Haritaki, Kadukai, Macro-microscopy, Market survey

INTRODUCTION

The family Combretaceae contains 1779 species among 414 accepted species and the genus *Terminalia* is popular for the characteristic of presence of tannin in the fruits and barks. The fruits of *Terminalia chebula* Retz. commonly known as Haritaki in Sanskrit, Kadukkai in Tamil and Myrobalan in English. The trees of *Terminalia chebula* Retz. is found throughout the deciduous forests of India^{1,2}. The pericarp excluding endocarp of *Terminalia chebula* Retz. is extensively used in Ayurveda, Siddha, Unani and Homoeopathic medicine for a long time for various medicinal purposes like Constipation (Vibandha), Upward movement of gases (Udavarta), Abdominal lump (Gulma), Diseases of abdomen (Udararoga), Piles (Arsa), Anaemia (Pandu), Inflammation (Sotha), Chronic fever (Jirnajvara), Intermittent fever (Visamajvara), Increased frequency and turbidity of urine (Prameha), Diseases of head (Siroroga), Cough (Kasa), Bronchial asthma (Tamaka svasa) and Heart disease (Hrdroga)³⁻⁶.

Actually, the part used is the dried flesh surrounding the seed (pericarp excluding endocarp) rather than fruits as mentioned in many literatures. The pericarp excluding endocarp contain about 20-40% of tannin, β -sitosterol, anthraquinones and fixed oil containing esters of palmitic, oleic and linoleic acids⁷. Haritaki is one of the main ingredients in the Ayurvedic Formulations Abhayarista, Agastya haritaki, Rasayana, Citraka haritaki, Dasamula haritaki, Brahma rasayana, Triphala curna, Triphaladi

curna and Vaisvanara curna^{3,4}. Haritaki, Bibitaka and Amalaki together used in 219 herbal formulations⁸. The estimated annual trade of *Terminalia chebula* Retz. (Fruit) is 5000-10000 Metric tons among the list of 178 medicinal plant species in high volume trade in India⁹. The price of Haritaki fruits is Rs. 50 per Kg, powder form cost Rs.400 per Kg and Haritaki tablets (500 mg) 100 No. cost Rs. 134 in Chennai market in the year 2017.

In this present investigation, the pericarp excluding endocarp of *Terminalia chebula* Retz. purchased from local market studied macro and microscopically to establish its identity in the raw drug and its powdered form. The marketed formulation of Curna and tablet form also tested for the presence of its genuineness of ingredient.

MATERIAL AND METHODS

The fruit sample used for the study was purchased from raw drug market, Chennai. The Macro-microscopic characterization was carried by following appropriate method published by standard/official books¹⁰⁻¹³. The plant material after cleaning and drying properly powdered and passed through sieve No.80 for powder microscopic study. The mounting and staining were carried out by standard methods of prescribed books¹³⁻¹⁵. Plant transverse sections were observed and reported as per guidelines and photographed under different magnifications with the help of Fluorescence microscopic unit (Olympus BX51) fitted with camera.

Table 1: Macro-morphology of *Terminalia chebula* fruit

S. No.	Macroscopic character	Fruits of <i>Terminalia chebula</i>
1.	Colour, odour and taste	Yellowish brown to blackish brown in colour externally and darker with dirty white patches internally; Characteristic odour and astringent in taste
2.	Surface	longitudinally wrinkled and shiny
3.	Size and shape	Round to ovoid, upto 4 cm in length and 2.5 cm wide; pericarp excluding endocarp upto 4 mm in thickness
4.	Texture and fracture	Hard and rough, fracture granular



Figure 1: Fruits



Figure 2: Pericarp excluding endocarp

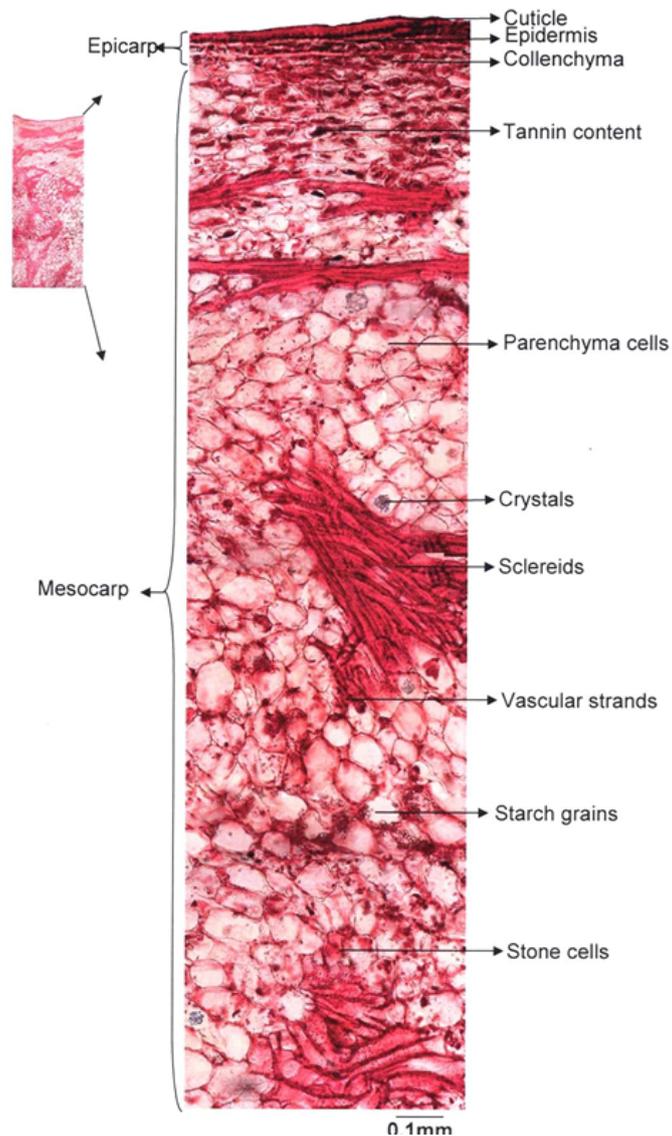


Figure 3: T.S of Haritaki (*Terminalia chebula* Retz.) – Pericarp excluding endocarp

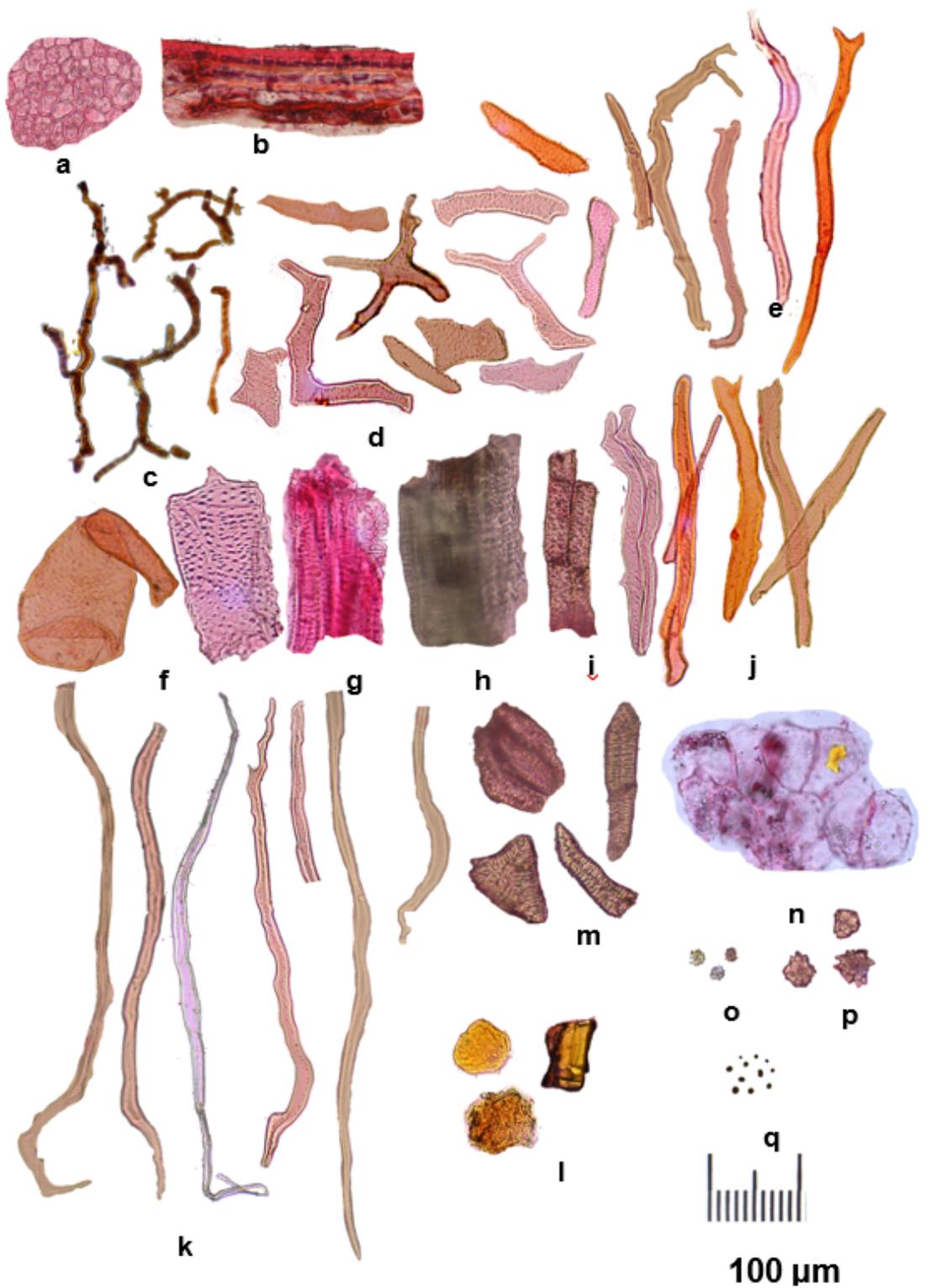


Figure 4: a, Epidermal cells in surface view; b, Epidermal cells in sectional view; c, Laticiferous cells; d, Sclereids; e, Fibre Sclereids; f, Pitted vessels; g, Spiral vessels; h, Reticulated vessels; i, Tracheids; j, Fibre tracheids; k, Fibre; l, Yellowish brown mass; m, Stone cells and sclereids; n, Parenchymatous cells embedded with starch grains and yellowish brownish content; o, Rosette crystals of calcium oxalate; p, Cluster crystals of calcium oxalate; q, Starch grains



Figure 5: Marketed formulation of *Terminalia chebula* Tablet and Powder form (Curma)

RESULTS

Macro-morphology

Macro-morphology of fruits and pericarp excluding endocarp is given in Figure 1 and 2 and Table 1.

Microscopy

Transverse section of pericarp (excluding endocarp) shows, epicarp consisting of tangentially elongated single layer of epidermal cells covered with cuticle and embedded with brownish content, followed by mesocarp consists of 2-3 layers of collenchymatous hypodermis, followed by wide zone of thin walled parenchymatous cells embedded with tannin content, starch grains, rosette and cluster crystals of calcium oxalate; sclereids, stone cells and vascular bundles of various size and shape are arranged in horizontally elongated in the peripheral region and radially running ones in the interior portion (Figure 3).

Powder Microscopy

Powder dull creamish yellow in color, fine powder (sieve No.80), smooth to touch, not free flowing and lump forming, characteristic odour and taste astringent, polygonal epidermal cells in surface view with straight anticlinal walls, fibres have peg like outgrowth and simple pitted thin and thick walls with wide lumen, sclereides are of various size and shape, irregular, pitted; abundant stone cells with narrow lumen and branched pits (ramiform) through thick cell wall; vessels with spiral, pitted and reticulate thickenings; starch grains simple isolated round to oval 6 to 10 μ in size; yellowish brown tannin masses; rosette and cluster crystals of calcium oxalate (Figure 4)

Macro-microscopic evaluation of marketed formulation

The marketed formulations of tablets and Curma comply macro-microscopically with the Pharmacopoeial standards. In the tablets due to the presence of starch as excipient, size of starch differs (Figure 5).

DISCUSSION

Macro-microscopic characters of plant raw drugs play an important role in authentication since particular macro-

microscopic features are unique for each plant. The macroscopic and microscopic characters of the plant drugs should be the first and fundamental step to identify the botanical source. The external surface characters of the plant material (Morphology) were described. The anatomical study or internal structure of organisms is microscopy. Proceeding for phyto-chemical methods of standardization and pharmacological screening will bear no value if authentic drugs are not used. Macro-microscopy is simple and cost effective.

As per the formulations of *Terminalia chebula* Retz. is concerned, the Curma and tablet form are the most popular dosage forms in the market. A detailed macro-microscopic study on pericarp of *Terminalia chebula* Retz. with photographs and evaluation of its marketed formulations was carried out and reported in this paper. The microscopic studies on transverse section of *Terminalia chebula* Retz. reported the presence of pegged fibres, groups of sclereids and stone cells, tannin containing cells, crystals of calcium oxalate, vessels with spiral, pitted and reticulate thickenings and starch grains (6-10 μ) as diagnostic characters. The microscopic description of the powder tallies with the microscopy of the transverse section of the drug. The marketed formulation also shows the presence of above mentioned microscopic diagnostic characters.

CONCLUSION

For the first time, elaborative description of transverse section and powder microscopy with photograph of pericarp (excluding endocarp) has been studied. Findings of this study may be used as monograph on quality standards of *Terminalia chebula* fruit. The marketed formulation of *Terminalia chebula*, Curma and tablets complies macro-microscopically with the characters of pericarp of *Terminalia chebula*. The results of study will be useful as macro-microscopic protocols to establish identity of the crude drug of the *Terminalia chebula* Retz. pericarp excluding endocarp and also its formulation containing it as one of the ingredients in powdered form.

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