



## **Macroscopic and Microscopic Evaluation of Hareethaki and Hareethaki Churna (Powder of Dried Fruit Rind of *Terminalia Chebula* Retz.)**

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**ABSTRACT:** Haritaki (*Terminalia chebula* Retz.), a highly valued Ayurvedic drug known as the “King of Medicines,” is widely used for its rasayana, digestive and tridosha pacifying properties<sup>1</sup>, with the fruit rind being the therapeutically active part commonly used as churna. The present study was undertaken to establish the pharmacognostical identity and quality of Haritaki and its powdered form through macroscopic and microscopic evaluation. Authenticated dried fruits were processed to prepare Haritaki churna from the fruit rind, and both the whole drug and powder were subjected to detailed examination. Macroscopically, the dried fruits were ovoid to ellipsoid drupes with five longitudinal ribs, dark brown to black in colour, a fibrous pericarp, granular fracture, and a strongly astringent, bitter-sour taste, while the churna was yellowishbrown, fine in texture, and possessed a characteristic odour and taste. Microscopic analysis of the fruit revealed a thick-walled cubical epidermis and a broad mesocarp containing compact parenchyma, abundant lignified stone cells, rosette crystals of calcium oxalate, and simple starch grains. Powder microscopy showed characteristic elements including tracheids, pitted vessels, epidermal cells, unicellular hairs, lignified stone cells, fibres, calcium oxalate crystals, and abundant simple and compound starch grains. These diagnostic features were consistent with the descriptions given in the Ayurvedic Pharmacopoeia and confirm the identity, purity, and standard quality of *Terminalia chebula* Retz., thereby supporting its reliability for therapeutic use.

**KEYWORDS:** *Terminalia chebula* Retz., Haritaki churna, Powder microscopy

### **INTRODUCTION**

Haritaki (*Terminalia chebula* Retz.), belonging to the family Combretaceae, is one of the most highly revered medicinal plants in Ayurveda and is popularly known as the “King of Medicines” and “King of Herbs.” It has been in continuous use since ancient times as a fundamental component of Ayurvedic therapeutics. Haritaki is especially noted for its affinity toward vata and kapha<sup>2</sup>, though it is essentially tridoshahara. It possesses five rasas (kashaya, amla, katu, tikta and madhura), lacking only lavana, and is described as laghu, Ruksha, Ushna, Deepana, Pachana, Rasayana and Vayasthapana.<sup>3</sup> Classical Ayurvedic literature extensively documents the therapeutic value of Haritaki. Botanically, Haritaki is the dried fruit of *Terminalia chebula*

Retz., characterized by its ovoid-ellipsoid shape, longitudinal ribs, fibrous pericarp, and distinctive astringent, bitter-sour taste. In Ayurveda, the fruit rind is considered the most therapeutically important part and is commonly used in powdered form as Haritaki choorna. Pharmacognosy plays a vital role in the scientific standardization of medicinal plants by establishing their identity, purity and quality through macroscopic and microscopic evaluation. In the present study, Haritaki and its churna (powder of dried fruit rind of *Terminalia chebula* Retz.) were subjected to detailed pharmacognostical investigation. This included macroscopic examination of the whole dried fruit and powder, as well as microscopic and powder microscopic analysis, to authenticate the drug and to ensure its conformity with classical descriptions and standards of the Ayurvedic Pharmacopoeia.<sup>4</sup> Such studies are essential for maintaining the reliability, safety, and therapeutic efficacy of this widely used Ayurvedic drug.

## **MATERIALS AND METHODS**

### **Collection of the drug**

The drug, Haritaki (fruits of *Terminalia chebula* Retz.), was collected and its identity was authenticated by the faculty of the Department of Dravyaguna Vijnanam, Government Ayurveda College, Tripunithura. Further verification was carried out by the Department of Botany, St. Albert's College, where a herbarium specimen was deposited under voucher number 604 for future reference.

### **Preparation of Haritaki churna (Powder of dried fruit rind of *Terminalia chebula* Retz.)**

Collected fresh fruits of *Terminalia chebula* Retz. were thoroughly washed with clean water to remove physical impurities and examined for insect infestation, with any affected fruits being discarded. The seeds were separated from the fruit rind of the healthy fruits, and the rinds were shade dried on a clean mat for one month. The mat was replaced daily, washed, sun dried, and reused. After complete drying, the fruit rinds were finely powdered and sieved through an 85mesh sieve. To preserve its quality, the powdered drug was carefully stored in an airtight container.

### **Procedure**

#### **I. Macroscopic evaluation of *Terminalia chebula* Retz.**

##### **A. Macroscopic evaluation of *Terminalia chebula* Retz. dried fruit a. Aim**

To identify the macroscopic features of dried fruit of *Terminalia chebula* Retz. **b. Materials**

*Terminalia chebula* Retz. dried fruit, magnifying lens and digital camera. **c. Procedure**

The dried fruit of *Terminalia chebula* Retz. was taken for the macroscopic evaluation. The macroscopic characters of fruit such as Type, Shape, size, Surface, Odour and Taste were identified with sensory perceptions. Following that, photographs of the fruit were captured with a digital camera.

##### **B. Macroscopic evaluation of Powder of dried fruit rind of *Terminalia chebula* Retz.**

###### **a. Aim**

To identify the characteristic features of Haritaki choorna (powder of dried fruit of *Terminalia chebula* Retz.) with the help of powder macroscopic features.

###### **b. Materials**

Haritaki churna (powder of dried fruit of *Terminalia chebula* Retz.), magnifying lens, white paper, digital camera.

###### **c. Procedure**

The Haritaki churna (powder made from the fruit of *Terminalia chebula* Retz.) was spread on white paper for visual inspection using both a magnifying lens and naked eye. Its color, smell, texture and taste were evaluated using a macroscopic examination. Its colour, texture, odour, and taste were assessed through a macroscopic examination. The colour was evaluated by direct observation, while the texture was judged by touching the

powder with fingers to assess its fineness and uniform consistency. The powder was then smelled and tasted to assess its odour and taste. Photographs of the powdered drug were captured using a digital camera.

## **II. Microscopic evaluation of fruit of *Terminalia chebula* Retz.**

### **A. Microscopic evaluation of *Terminalia chebula* Retz. dried fruit**

#### **a. Aim**

To identify the histological characteristics of the transverse section of the dried fruit of *Terminalia chebula* Retz. with microscopic evaluation.

#### **b. Materials**

Dried fruits of *Terminalia chebula* Retz., a safety razor blade, dissecting needles, watch glasses, No. 2 thickness three-quarter cover slips, petri dishes, a medium-sized camel hair brush, glass slides, a dropper, safranin stain, glycerin, a digital microscope, a compound microscope, and a digital camera.

#### **c. Procedure**

The microscopic examination of the dried fruit of *Terminalia chebula* Retz. involves a series of steps, including softening of the tissue, preparation of thin sections either by hand or using a microtome, staining with appropriate reagents, and subsequent observation under a microscope. After soaking the *Terminalia chebula* Retz. fruits in water to soften them, thin cross-sections were cut by hand using a razor blade. The cut sections were placed in a Petri dish filled with water. In a watch glass, a few drops of safranin were added to water to prepare the staining solution. A very thin section was carefully removed from the petri dish and placed into a watch glass containing a special staining solution to ensure thorough staining. Once the section was adequately stained, it was delicately transferred to a clean slide using a fine hair brush. The section was placed in the middle of the slide, and a small drop of glycerin water was added over it. A cover slip was then placed on top, ensuring that no air bubbles were trapped underneath. The prepared slides were then placed onto the stage of the compound microscope and secured with clips. The mirror was adjusted to direct light through the microscope and illuminate the mounted slides. Starting with a 10X magnification, the lenses were adjusted to visualize the histological parameters of the section. For more detailed examination, the power was further adjusted to 40X to observe finer details. Images of the sections were captured with a digital camera at both 10× and 40× magnifications.

### **B. Powder microscopic evaluation of dried fruit of *Terminalia chebula* Retz..**

#### **a. Aim**

To identify the powder characters of Haritaki churna (powder of dried fruit of *Terminalia chebula* Retz.) by examining its microscopic features under a microscope.

#### **b. Materials**

Haritaki churna (powder of dried fruit of *Terminalia chebula* Retz.), glass slide, watch glass, dropper, cover slips (no: 2 thickness), camel hair brush (medium-sized), spatula, Chloral hydrate, blotting paper, glycerine, HCl, phloroglucinol, digital microscope, compound microscope and digital camera.

#### **c. Procedure**

(i) A pinch of Haritaki churna (powder of dried fruit rind of *Terminalia chebula* Retz.) was taken and placed on glass slide. Distribute the powder uniformly across each slide to form a thin, even layer. A few drops of chloral hydrate solution were placed directly onto the powder on the slide. Gently heat the slides from below using a Bunsen burner. After the chloral hydrate treatment, remove excess solution from the slides if necessary, using a blotting paper. A few drops of phloroglucinol solution were added to the slide to cover the powder, and the sample was left for a few minutes to react. A few drops of dilute hydrochloric acid (HCl) were applied to the slide to cover the powdered sample. A coverslip was then carefully placed over the treated sample using a needle to avoid the formation of air bubbles. Slides were initially observed using a digital

microscope at low magnification (10×), then, as needed, the magnification was progressively increased up to 40× to examine finer details. Subsequently, photographs of the slides were captured using a digital camera.

(ii) A pinch of Haritaki churna (powder of dried fruits of *Terminalia chebula* Retz.) was taken and placed on a glass slide. A few drops of water were added to the powdered sample and gently mixed using a camel hair brush. The mixture was evenly spread across the glass slide to ensure uniform distribution of the constituents, preventing overlap and facilitating clear microscopic examination. A cover slip was placed over the slide, and the specimen was examined under a compound microscope at 10× magnification. Powder microscopy at 10X and 40X magnifications was employed to identify cellular components present in the fruit rind powder. Images were then taken using digital camera. The same procedure was repeated with safranine and glycerin instead of water.

## RESULTS

### A. Macroscopic features of the dried fruit of *Terminalia chebula* Retz.

Macroscopic features of the dried fruit of *Terminalia chebula* Retz. was assessed and listed in Table 1.

### B. Powder macroscopic evaluation of Haritaki churna (powder of dried fruit of *Terminalia chebula* Retz.)

Powder macroscopic features such as colour, texture, odour and taste of Haritaki choorna (powder of dried fruit rind of *Terminalia chebula* Retz.) were listed in Table 2.

### A. Microscopic evaluation of dried fruit of *Terminalia chebula* Retz.

#### a. Transverse section of dried fruit of *Terminalia chebula* Retz.

Transverse section of *Terminalia chebula* Retz shows epicarp and mesocarp. Outer epicarp is composed of epidermis which is made up thick walled cubical cells covered with cuticle. Mesocarp is a broad zone, composed of compactly arranged parenchyma cells, intermingled with stone cells. Simple starch grains and abundant rosette crystals of calcium oxalate are present in the mesocarp region. Wide lumened stone cells, which are lignified and elongated and some round are present.

### B. Microscopic evaluation of Haritaki churna (powder of dried fruit of *Terminalia chebula* Retz.)

Powder microscopy of *Terminalia chebula* Retz. powder shows tracheids, surface view of epidermal cells, lignified pitted vessels, reddish brown coloured content, crystals of calcium oxalate, unicellular hair, lignified stone cell with narrow lumen and non lignified fiber with narrow lumen. Round to oval, simple and compound starch grains are present abundantly.

## DISCUSSION

Pharmacognostical evaluation of Haritaki (*Terminalia chebula* Retz.) was carried out through macroscopic assessment of its dried fruit and choorna (powder). In addition, microscopic evaluation was conducted on the dried fruit as well as powder microscopy of Haritaki churna (Powder of dried fruit rind of *Terminalia chebula* Retz.) Upon macroscopic evaluation, the dried fruit of Haritaki (*Terminalia chebula* Retz.) was observed to be an ovoid to ellipsoid drupe with five distinct longitudinal ribs. It measured about 2 to 4 cm in length and 1.2 to 2.5 cm in width. The outer surface was dark brown to black, longitudinally wrinkled, ridged, and shiny in appearance. On cutting, the pericarp appeared fibrous with dirty-white patches, and the seed was clearly separated. The fruit was hard and rough in texture, with a granular fracture, and possessed a distinctive characteristic odour. The taste was predominantly astringent, accompanied by bitter-sour notes. These features were consistent with the descriptions provided in the Ayurvedic Pharmacopoeia of India and standard botanical references. The macroscopic evaluation of Haritaki churna (powder of dried fruit rind of *Terminalia chebula* Retz.) revealed a yellowish-brown colour, fine texture, characteristic odour, and an astringent, bitter,

and sour taste. These observations corresponded with earlier documented studies. The transverse section of the dried fruit of Haritaki (*Terminalia chebula* Retz.) revealed an outer epicarp composed of thick-walled cubical epidermal cells covered with cuticle. The mesocarp formed a broad zone composed of compact parenchymatous cells interspersed with numerous lignified stone cells of varying shapes; wide-lumened, elongated, or rounded. The mesocarp also showed abundant rosette crystals of calcium oxalate and simple starch grains. These findings conformed with standard pharmacognostic descriptions of *Terminalia chebula* Retz. Powder microscopy of Haritaki churna (Powder of dried fruit rind of *Terminalia chebula* Retz.) revealed the presence of tracheids, surface view of epidermal cells, lignified pitted vessels, reddish-brown contents, crystals of calcium oxalate, unicellular hairs, lignified stone cells with narrow lumen, and non-lignified fiber with narrow lumen. Simple and compound starch grains of round to oval shape were abundantly present. These observations were consistent with descriptions in the Ayurvedic Pharmacopoeia of India and previous pharmacognostic studies<sup>5</sup>.

## CONCLUSION

The pharmacognostical examination of Haritaki both its whole dried fruit and powdered form (churna); effectively confirms its identity, purity, and consistency with classical Ayurvedic standards. Macroscopically, the fruit displays a distinctive ovoid-ellipsoid shape with longitudinal ribs, a fibrous pericarp, hard texture, and characteristic astringent, bitter-sour taste. Thorough pharmacognostic and phytochemical analyses of the fruit rind powder (churna) confirm its identity, purity, and compliance with Ayurvedic Pharmacopoeia standards.

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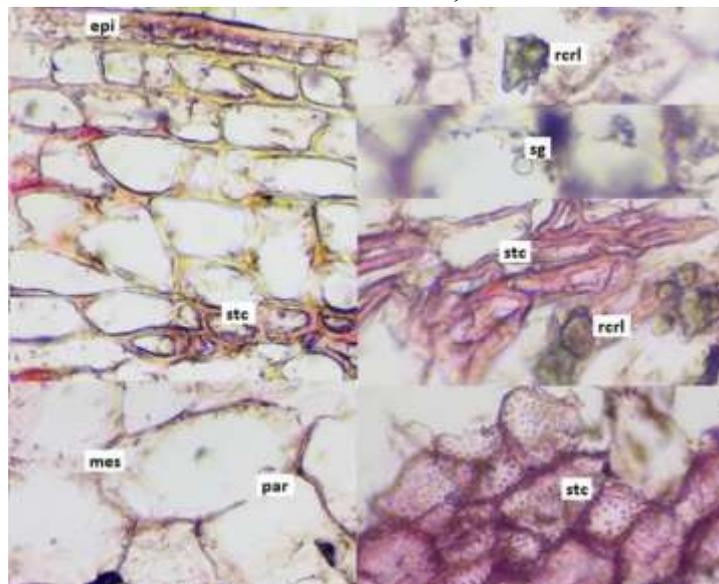
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Picture No:1 Haritaki (Dried fruit rind of *Terminalia chebula* Retz.)



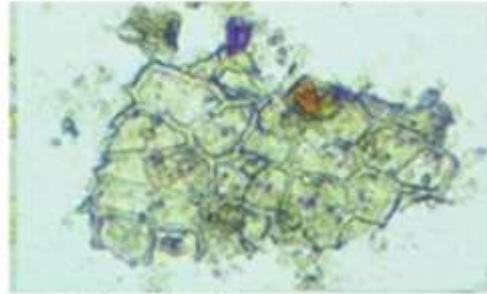
Picture No: 2 Powder macroscopy of Haritaki churna (powder of dried fruit rind of *Terminalia chebula* Retz.)



Picture No:3 Transverse section of dried fruit of *Terminalia chebula* Retz: epi: Epicarp; mes: Mesocarp; par: parenchyma; stc: Stone cells; sg: Starch grains; rcrl: Rosette crystal of calcium oxalate.



Tracheoids



Epidermal cells



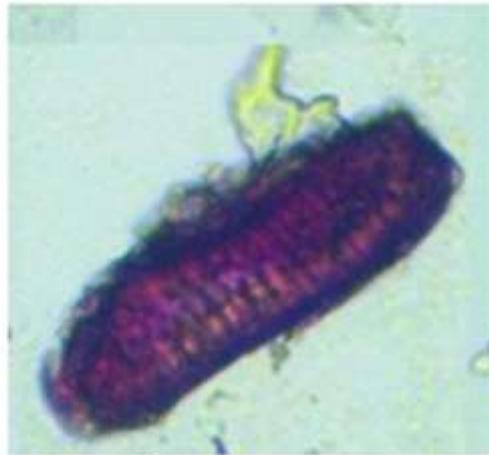
Pitted vessels



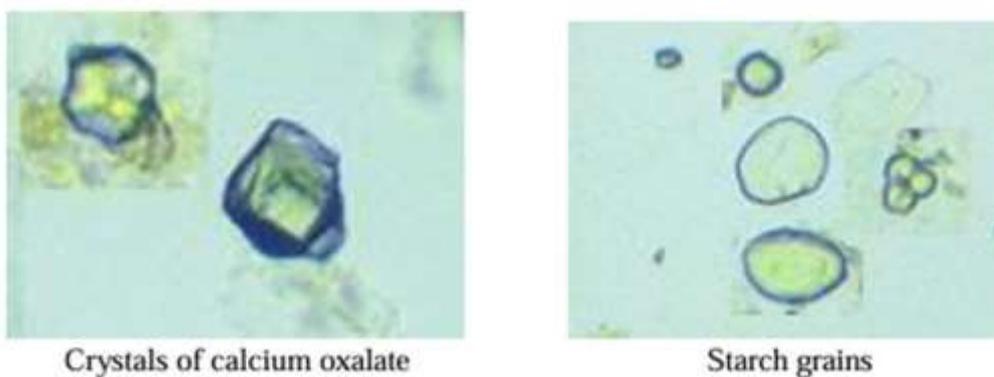
Unicellular hair



Non lignified fiber



Stone cell



Picture no.4: Powder microscopy of dried fruit rind of *Terminalia chebula* Retz.

Table No: 1 Macroscopic features of dried fruit of *Terminalia chebula* Retz

Observations	Dried fruit
Shape	Ovoid/ellipsoid drupe; 5 longitudinal ribs present
Size	2–4 cm long × 1.2–2.5 cm wide
Colour	dark brown/black
External surface	Longitudinally wrinkled/ridged, shiny
Cut surface	Fibrous pericarp, dirty-white patches, clearly separated seed
Fracture	Granular
Texture	Hard, rough
Odour	Distinctive characteristic
Taste	Highly astringent & bitter–sour

Table No: 2 Powder macroscopy of Haritaki churna (powder of dried fruit rind of *Terminalia chebula* Retz.)

Observations	Powder (Choorna) features
Colour	Yellowish-brown
Texture	Fine
Odour	Characteristic
Taste	Astringent, bitter, sour