

## EVALUATION OF POWDER MICROSCOPY OF FRUIT RIND AND SEED OF HARITAKI(*TERMINALIA CHEBULA* RETZ.)

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### ABSTRACT

The fruit of *Terminalia chebula* Retz (Haritaki) is the most popular herbal drug which is a highly valuable, common and widely used medicine in Indian systems of medicine. In this manuscript botanical Description, Chemical constituents, Ayurvedic properties, Dosakarma, Recent researches on Haritaki are described. The present work deals with the powder microscopy of fruit of *Terminalia chebula* Retz. The powder characteristics of fruits of *Terminalia chebula* are studied by classical pharmacognostical method. Organoleptic studies of the air dried coarse powdered fruit rind revealed characters like yellowish brown in colour, astringent taste and characteristic odour. In powder

microscopic study of fruit rind, it shows lignified tissues of pink to purple colour. Aleurone grains of green colour, and oil globules of orangish yellow stain and powder microscopic of seed of haritaki shows lignified tissues of dark pink to purple colour and green to brown colour hemicelluloses embedded in endospermic wall. Aleurone grains of light green to yellow colour and oil globules of orangish pink stain.

**KEYWORDS:** *Terminalia Chebula*, Powder microscopy, Organoleptic study, Haritaki.

### INTRODUCTION

The fruit is the prominent herbal drug which is a highly valuable, common and widely used medicine in Indian system of medicine. It is one of the major drugs among alterative or rejuvenation (Rasayana) medicines and frequently employed in a large number of formulations. This is most popular drug which is used in very large number of diseases.<sup>[1]</sup>

Dry fruit is used in asthma, sore throat, vomiting, eye diseases, diseases of heart and the

bladder, bleeding piles, typhoid fever, constipation, gout, elephantiasis. The unripe fruit is astringent and aperients, useful in dysentery and diarrhoea. The ripe fruit is purgative, tonic, carminative. The ripe fruit is use in diseases of the spleen, diseases of eye, piles etc. A fruit, coarsely powdered and smoked in a pipe, affords relief in a fit of asthma. A decoction of the fruit is a good astringent wash. Water in which the fruits are kept for the night is considered a very cooling wash for the eyes. The ashes mixed with butter form a good ointment for sores. The fruit in combination with other drugs is prescribed for snake-bite and scorpion sting.<sup>[2]</sup>

### **Botanical description**

**Habitat:** It is found throughout the greater parts of India, from Ravi eastwards to West Bengal and Assam, ascending to an altitude of 1500 m in the Himalayas, also in Bihar, Orissa, Madhya Pradesh, Maharashtra, Deccan and South India.<sup>[3]</sup>

**Habit:** A moderate sized or large deciduous tree, attaining 25-30 meters in height.

**Leaves:** 7-20 cm. by 4-8 cm., glabrous or nearly so when mature, not clustered, distant, alternate or sub-opposite, elliptic-oblong, acute, rounded or cordate at base, penninerved, secondary nerves of 6-8 pairs, arching, prominent; petioles 2-5 cm. Long, pubescent, usually with glands near the top.

**Flowers:** Flowers all hermaphrodite, 4mm. across sessile, dull-white or yellow, with an offensives small.

Spikes-sometimes simple, usually in short panicles, terminal and in the axils of the uppermost leaves. Bracts- Exceeding the flowers, subulate or lanceolate, hairy, conspicuous among the buds but soon deciduous. Calyx-companulate, 3mm. long, flat at the base expanding a little towards the mouth; glabrous outside, hairy within; teeth 5 short, sometimes obscure.

Bark- 6 mm. thick, dark brown with many generally shallow vertical cracks. Wood very hard, brownish grey with a greenish or yellowish ring, with irregular, small dark purple heartwood, close-grained.

**Fruit:** Drupes ellipsoidal, obovoid or ovoid, yellow to orange brown, and hard when ripe, 3-5cm long, 5 ribbed on drying.

**Seeds:** Hard, pale yellow.

Flowering and fruiting time-Rains to summer season.<sup>[4]</sup>

### Chemical Constituentes

Anthraquinone glycoside, Chebulinic acid, Chebulagicacid, Tannic-acid, Terchebin, tetrachebulin, vitaminc(fruit); arachidic, Behenic, Linoleic, Oleic, Palmitic and Stearic acids (fruitkernels); chebulin (flowers);2- -hydroxymicromeric acid, maslinic acid and 2-œ - hydroxyursolic acid(leaves).<sup>[5]</sup>

### Ayurvedic properties<sup>[6]</sup>

<b>Rasa</b>	-	Kashaya, Amla, Madhura, Tikta, Katu.
<b>Guna</b>	-	Laghu, Ruksha.
<b>Virya</b>	-	Ushna.
<b>Vipaka</b>	-	Madhura.
<b>Dosakarma</b>	-	Tridosahara.

### Recent Researches on Haritaki<sup>[7]</sup>

#### 1. Antioxidant

a) Aqueous extract of the fruits (rind) was found to exhibit significant antioxidant activity, when evaluated by inhibition studies in radiation induced lipid peroxidation in rat liver microsomes by estimating thirobarbituric acid reactive substance. The extract also restored themedian value of the antioxidant enzyme SOD.<sup>[8]</sup>

b) Various extract (water, methanol, ethyle acetate, butanol etc.) and four pure constituents (casuarinin, chebulanin, chebulinic acid and 1,6-O-galloyl-β-Dglucose) of the fruit were identified as the active constituents displaying antioxidant activities to varying degrees in different test systems.<sup>[9]</sup>

#### 2. Hypotensive activity

a) In enzyme inhibition studies, methanolic extract of the fruit displayed high inhibition (>82%; standard protocol) of the rate of angiotensin converting enzyme, an assay for screening compounds with hypotensive activity.<sup>[10]</sup>111

b) Ellagic acid and chebullin, constituent of the fruit rind, have hypotensive activity.<sup>[11,12]</sup>

### 3. Anti-inflammatory activity

a) Aqueous extract of the fruits exhibited a concentration dependant inhibition of inducible NO production in lipo-polysaccharide stimulated mouse macrophages. This has bearing on the traditional usage of the drug in case of inflammation.

b) Gallic acid which occurs in the fruits is known to possess anti-inflammatory activity.<sup>[13]</sup>

### 4. Wound healing

Alcohol extract of leaves of *T. chebulawas* demonstrated to possess beneficial action on healing of rat dermal wounds in vivo. Extract treated wounds healed faster (improved rates of concentration and decreased period of epithilisation) and the total protein and collagen contents increased in the granulation tissue of treated wounds.<sup>[14]</sup>

### 5. Antibacterial activity

a) Alcoholic (80%) extract of *T. chebula* fruit (in DMSO) exhibited significant antibacterial activity against *Bacillus subtilis* at 6.25 mg/ml concentration (total inhibition) and against *Staphylococcus aureus* at 12.5 mg/ml concentration (total inhibition).<sup>[15]</sup>

b) Gallic acid and ethylegallate, constituents of chebula fruit, have been identified as the antibacterial compounds and were shown to be effective against methicillin resistant strain of *Staphylococcus aureus*.<sup>[16]</sup>

c) Aqueous extract of the fruit (black variety) displayed significant antibacterial activity (MIC, 0.125-0.15 mg/ml) against *Helicobacter pylori*, organism implicated in the pathogenesis of peptic ulcers.<sup>[17]</sup>

### 6. Antifungal activity

a) Methanol extract of the fruits showed potent antifungal activity against *Candida tropicalis*.<sup>[18]</sup>

b) Aqueous extract of chebula fruits has potent antifungal activity against cutaneous pathogens and chebulinic acid, a constituent of the fruits has shown to be at least one of the active agents.<sup>[19]</sup>

**7. Antiviral activity:** *T. Chebula* fruit has been shown to have antiviral activity against a range of viruses.

a) Fruit decoction was demonstrated to protect an epithelial tissue cell culture line (MDCK) against cytopathic effects of Influenza A virus.<sup>[20]</sup>

b) Hot water extract of *T. Chebula* fruits exhibited antiviral action against Herpes simplex virus in in vivo. The extract inhibited replication of human and murine cytomegalovirus (CMV) in vitro studies. An in vivo anti-CMV (murine) action was demonstrated in immunosuppressed (by treating mice subcutaneously with cyclosporine) mice.<sup>[21]</sup>

c) Ethyle acetate soluble fraction of hot water extract of fruits on bioassay-directed fractionation led to the isolation of compounds with inhibitory action on HIV-1 integrase, a key enzyme in the life cycle of this virus.<sup>[22]</sup>

**8. Purgative:** Purgative principles of the *T. Chebula* fruits have been shown to be hydroxyanthraquinones glycosides. This product (4 mg/kg) exerted a well-defined purgative action in albino rats as per method of Lou.

**9. Hypocholesterolaemic and antiatherosclerotic activity:** *T. chebula* fruit (powder) when orally administered along with cholesterol to a group of animals (25 rabbits) for 16 weeks and the results compared with those from a similar animal group which had received cholesterol alone, it was concluded that chebula fruit has significant hypocholesterolaemic and anti-atherosclerotic actions. The drug had no effect on triglycerides or platelet adhesiveness.<sup>[23]</sup>

**10. Cardiotonic activity:** a) Various extracts (ethyle acetate, butanol, aqueous; at spot doses of 100, 300 and 500 µg) of *Chebula* fruit exhibited Cardiotonic activity when examined on normal and hypodynamic isolated frog hearts. The extract enhanced cardiac output without altering the heart rate.<sup>[24]</sup>

b) Cardioprotective effect of ethanolic extract of the fruit against experimental myocardial injury induced by isoproterenol.<sup>[25]</sup>

**11. Hypoglycaemic agent:** Oral administration of methanolic (75%) extract of fruits (100 mg/kg) showed significant hypoglycaemic activity both in normal and Alloxan diabetic rats within 4 hours. Continued daily administration of the extract sustained the activity.<sup>[26]</sup>

## MATERIALS AND METHOD

### Collection and identification of fruit of *Terminalia Chebula*

Fruit of *Terminalia Chebula* has been identified by Prof. V.K. Joshi, Department of Dravyaguna, B.H.U Varanasi u.p. Useful part of drugs was collected from their natural

habitat. The mature fruit of *Terminalia chebula* was collected from the Ayurvedic Dravyaguna garden, B.H.U.



Haritaki (*Terminalia Chebula*)



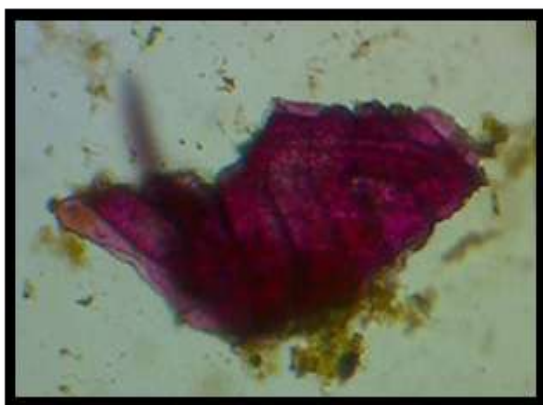
Fruit Dry fruit of Haritaki (*Terminalia Chebula*)

#### Method and preparation<sup>[27]</sup>

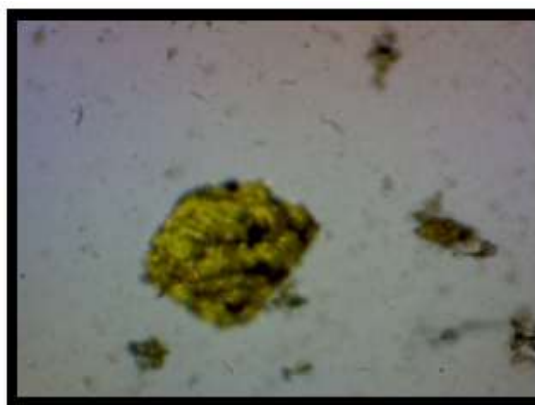
5 gm powder of Fruit of *Terminalia Chebula* was boiled separately with chloral hydrate solution in small quantity respectively. Cleaved powder was removed in separate watch glasses respectively and stained with one drop each of phloroglucinol and conc. HCL. a little of the treated powder of *Terminalia Chebula* of was mounted in Alcoholic picric acid and sudan red; the slide was observed under microscope at low power respectively.

#### Results and discussion-Powder microscopy of fruit powder of *Terminalia Chebula*

Coarse powder of greenish yellow to brown in colour. In microscopic powder study it shows lignified tissues of pink to purple colour. Aleurone grains of green colour and oil globules of orangish yellow stain.

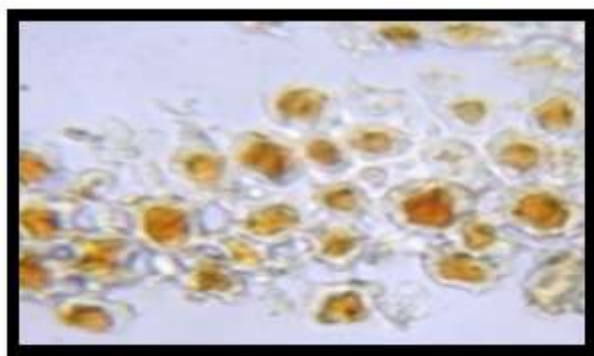


Lignified Tissues



Aleurone grains





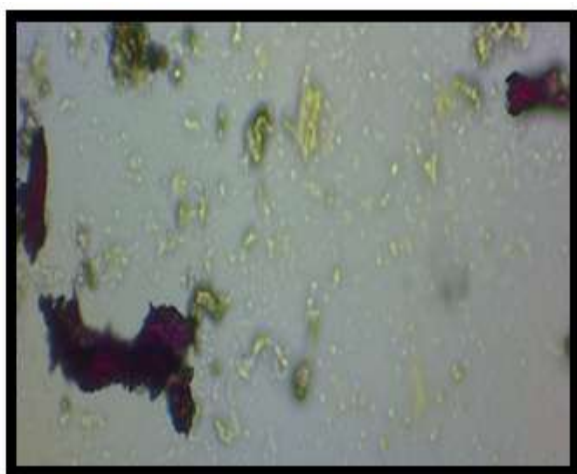
Oil globules

Fig.1: Powder Microscopy Of Haritaki (*Terminalia Chebula*) Friut PulpTable 1: Microscopically Characteristics of Powdered Haritaki (*Terminalia Chebula*)  
Fruit rind

S.NO.	REAGENTS	OBSERVATIONS	CHARACTERSTICS
1.	Phlorogucinol + con. HCL	Pink	Lignified tissues and vascular bundles
2.	Alcoholic Picric acid	Yellow	Aleurone grains
3.	Sudan Red III	Red	Oil globules and cuticles.

**Powder microscopy of seed of Haritaki**

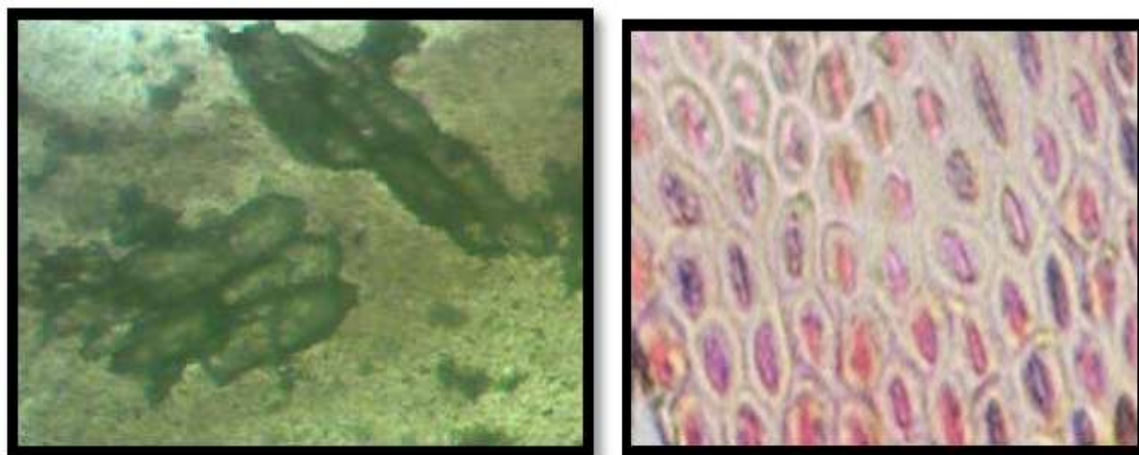
Coarse powder of greenish yellow to brown in colour. In microscopic powder study it shows lignified tissues of dark pink to purple colour and green to brown colour hemicelluloses embedded in endospermic wall. Aleurone grains of light green to yellow colour and oil globules of orangish pink stain.



Lignified Tissues



Aleurone grains



Hemicellulose-Endospermic wall

Oil globules

**Fig.2: Powder Microscopy Of Haritaki (*Terminalia Chebula*) Seed****Table 2: Microscopically Characteristics of Powdered Haritaki (*Terminalia Chebula*) Seed**

S.NO.	REAGENTS	OBSERVATIONS	CHARACTERSTICS
1.	Phlorogucinol + con. HCL	Pink	Lignified tissues and vascular bundles
2.	Alcoholic Picric acid	Yellow	Aleurone grains
3.	Dil. Iodine + conc. Sulphuric acid	Blue	Hemicellulose-Endospermic wall
4.	Sudan Red III	Red	Oil globules in the cell of endosperm, cuticles.

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