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## Phyto-pharmacological review of *Terminalia chebula* Retz.

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### ABSTRACT

In the present study Herbal drug *Terminalia chebula* Retz. Commonly known as *Myrobalan* cultivated throughout India mainly for its multipurpose use, was selected for review. *Terminalia chebula* is used commonly as a constituent of *Triphala churna* – an herbal formulation. The plant is traditionally used for treatment of chronic ulcers, wound, as a gargle in stomatitis & as laxative. It also has antidiabetic, anticarcinogenic antiviral and antibacterial activity. In this review we have explored the phyto-pharmacological properties of *T. Chebula* and compiled its vast pharmacological applications to comprehend and synthesize the subject of its potential image of multipurpose medicinal agent.

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### KEYWORDS

*Terminalia chebula*;  
Antibacterial;  
Medicinal plant.

### INTRODUCTION

Man has been using plant and herbal products for combating diseases since time immemorial<sup>[1]</sup>. Plants are nature's remedies and have been used on the earth as food and medicine since ancient times. Herbal traditions have been passed down and refined with scientific understanding, providing information to assist in health maintenance. Today the global movement towards the more natural lifestyle has brought about resurgence of interest in herbs. Herbs glorified in ancient medicinal science of Ayurveda have gentle yet powerful effects in enhancing the health and beauty of human being. Herbs are valuable sources of natural medicine vitamins minerals and phytochemicals that have remarkable history of curative effects, when used under the supervision of an experienced and knowledgeable practitioner are generally safe and do not produce side effects<sup>[2]</sup>. In view of the widespread interest on

Combretaceae plants this work reviews the scientific information of the species *Terminalia chebula* Retz.

*Terminalia chebula* is called the "King of Medicines" and is always listed first in the ayurvedic materia medica because of its extraordinary powers of healing with a wide spectrum of biological activity.

### TAXONOMY

#### Common names

Chebulic myrobalan, Harde, Haritaki

#### Vernacular names

Sans: Haritaki, Hindi: Harana, Guj: Hirado, Tel: Karitaki, Kan: Pachetu Mar: Divya.

#### Habit and habitat

*Terminalia chebula* is found in the sub-Himalayan tracts from the Ravi eastwards to West Bengal and

Assam, ascending up to an altitude of 1,500 m. in the Himalayas. In high-level rocky and dry places in the outer Himalayas and in the hills of Deccan and South India it is a small tree<sup>[3]</sup>. In Madhya Pradesh, it is particularly common on metamorphic rocks in open forests or villages, and also occurs on other geological formations. In Maharashtra, it is common on the Deccan trap, and on the laterite of Mahabaleshwar plateau at an altitude of 1,370 m., it is one of the principal constituents of the low elfin-wood forest<sup>[3]</sup>.

### Propagation and cultivation

It grows on variety of soils but thrives best in clay and sandy soils. The fruit ripen from November to March depending upon the locality. Mostly fallen fruits are collected in first half of January, they are dried and the seeds can stored for one year. The germinative capacity of the seeds is low because hard cover and seed requires presowing treatment<sup>[4]</sup>.

### Morphology

A big tree, 25 to 30 mtrs in height. Its wood is hard and bulky. Leaves are 10-30 cm in length and are pointed. The vasculature of the leaves has 6 to 8 pairs of veins. The inferior aspect of the leaves show two small nodules near its attachment with the stalk. The flowers have short stalks, white or yellow in colour and have a strong smell. Fruits are 3 to 6 cms in length. Initially these are green but on ripening, they become yellowish brown. Each fruit contains one seed. Seeds are oval and hard. On breaking the shell of the seed, an oval shaped pulp is obtained<sup>[5]</sup>.

### Varieties

Bhavamisra describes seven different varieties of *Terminalia chebula*<sup>[6]</sup>

Varieties of fruits	Uses
Vijaya	all disease
Rohini	wound healing
Putana	external application
Amrta	purification procedure
Abhaya	eye disorders
Jivanti	all disease
Chetaki	all disease

### Description

#### Macroscopic

Intact fruit yellowish-brown, ovoid, 20-35 mm long, 13-25 mm wide, wrinkled and ribbed longitudinally; pericarp fibrous, 3-4 mm thick, non-adherent to the seed; taste, astringent<sup>[7]</sup>. Externally it is shining and is adorned with longitudinal ridges. Internally the fruit is light yellow.<sup>[8]</sup>

#### Microscopic

Transverse section of pericarp shows epicarp consisting of one layer of epidermal cells, inner tangential and upper portions of radial wall thick; mesocarp, 2-3 layers of collenchyma, followed by a broad zone of parenchyma in which fibres and sclereids in group and vascular bundles scattered; fibres with peg like out growth and simple pitted walls; sclereids of various shapes and sizes but mostly elongated, tannins and raphides in parenchyma; endocarp consists of thick-walled sclereids of various shapes and sizes, mostly elongated; epidermal surface view reveal polygonal cells, uniformly thick-walled, several of them divided into two by a thin septa; starch grains simple rounded or oval in shape, measuring 2-7  $\mu\text{m}$  diameter, found in plenty in almost all cells of mesocarp<sup>[7]</sup>.

#### Powder

Brownish in colour; under microscope shows a few fibres, vessels with simple pits and groups of scleroids<sup>[7]</sup>.

#### Chemical constituents

*Terminalia chebula* are an important source of tannin (25-32 %). The tannins are of pyrogallol type (hydrolysable tannins), which on hydrolysis yield chebulic acid and d-galloyl glucose. It also contains glucose and sorbitol (about 3.5%). During the maturation of the tree, the amount of tannin decreases, whereas the acidity of the fruits increases<sup>[9]</sup>.

They also contain  $\beta$ -setosterol, anthraquinones and fixed oil containing principally esters of palmitic, oleic and linoleic acids. The tannins of anthraquinone constituents make the drug both astringent and cathartic in action<sup>[10]</sup>. 14 components of hydrolysable tannins were found from fruits of *Terminalia chebula*-gallic acid, chebulic acid, punicalagin, chebulanin, corilagin, neochebulinic acid, ellagic acid, chebulegic acid,

## Review

chebulinic acid, 1,2,3,4,6-penta-O-galloyl- $\beta$ -D-glucose, 1,6-di-O-galloyl-D-glucose, casuarinin, 3,4,6-tri-O-galloyl-D-glucose, terchebulin.

### Uses

Externally, in the treatment of chronic ulcers, wound, as a gargle in stomatitis, laxative, relieves headache, it is a chief ingredient of triphala<sup>[1]</sup>. The fruit is dry and heating; tonic, carminative, expectorant, anthelmintic, antidiysenteric, alterative; sore throat, thirst, vomiting, hiccough, eye diseases, diseases of the heart and the bladder, vesicular calculi, urinary discharges, ascites, inflammations, tumours, typhoid fever, leucoderma, dyspnoea, itching, pain, anaemia, gout, elephantiasis, delirium<sup>[11]</sup>

The unripe fruit is astringent and aperient, useful in dysentery and diarrhoea. The ripe fruit enriches the blood; good in ophthalmia, diseases of the spleen, piles, cold in the head; strengthens the brain, the eye, the gums; used in paralysis. The fruits are used as a medicine for sore throat<sup>[11]</sup>.

A fruit, finely powdered, is used as dentifrice. A fruit, coarsely powdered and smoked in a pipe, affords relief in a fit of asthma. 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<sup>[11]</sup>

Bala Haritaki is found to be effective in reducing the levels of total lipids, serum TG, serum cholesterol, LDL, and VLDL significantly. On the other hand level of HDL is increased, significantly. *Terminalia chebula* fruit extracts inhibited ATPase activity in the cardiac muscle of frog in a dose-dependent manner<sup>[12]</sup>

## PHARMACOLOGICAL ACTIONS

### Antidiabetic activity

The aqueous methanolic extract of *Terminalia chebula* fruit was found to have potent rat intestinal maltase inhibitory activity, whereas neither intestinal sucrase nor isomaltase activity was inhibited by this extract hence inhibitory effect on  $\alpha$ -glucosidase suggest its use for managing Type 2 diabetes<sup>[13]</sup>.

### Anticarcinogenic activity

The inhibitory action on cancer cell growth by the

phenolics of *Terminalia chebula* fruit was found and that chebulinic acid, tannic acid and ellagic acid were the most growth inhibitory phenolics of the fruit<sup>[14]</sup>.

### Antiviral activity

*Terminalia chebula* fruits afforded four immunodeficiency virus type 1 (HIV-1) integrase inhibitors, gallic acid and three galloyl glucoses. Their galloyl moiety plays a major role for inhibition against the 3'-processing of HIV-1 integrase of the compounds<sup>[15]</sup>.

### Cardiotonic activity

Various extracts prepared from the fruit rind of *Terminalia chebula* have shown cardiotonic activity when tested on normal as well as hypodynamic isolated frog hearts. The extracts increased the force of contraction and cardiac output without altering the heart rate<sup>[16]</sup>.

### Antibacterial Activity

Study of in vitro antibacterial activity of extracts from the plant of *Terminalia chebula* was carried out by the disk diffusion technique. All showed such activity against human pathogenic Gram positive and Gram negative bacteria. The widest spectrum of antibacterial activity was shown by *Terminalia chebula*. It was also most potent

### Antioxidant activity

The fruits of *Terminalia chebula* exerts antioxidant and radioprotective activity in rats. Protective effects of an aqueous extract of *Terminalia chebula* fruit on the tert-butyl hydroperoxide (t-BHP)-induced oxidative injury observed in cultured rat primary hepatocytes and rat liver has also been documented<sup>[17]</sup>.

### Cytoprotective activity

The ethanolic extract of fruit of *Terminalia chebula* exhibited a notable cytoprotective effect on the HEK-N/F cells. In addition its extract exhibited significant cytoprotective effect against UVB-induced oxidative damage. These observations were attributed to the inhibitory effect of *Terminalia chebula* on the age dependent shortening of the telomere length as shown by the Southern Blots of the terminal restriction fragments (TRFs) of DNA extracted from sub-culture passages<sup>[18]</sup>

### Gastrointestinal motility

The administration of decoction of *Terminalia chebula* fruits significantly increased gastric emptying in rats.<sup>[19]</sup>

### Wound healing activity

Topical administration of an alcoholic extract of *Terminalia chebula* leaves on the healing of rat dermal wounds showed that *Terminalia chebula* treated wounds healed faster as indicated by improved rate of contraction and decreased period of epithelialization<sup>[20]</sup>

### Laxative property

The laxative property of *Terminalia chebula* is studied in one of the clinical studies. Symptoms other than frequency, evacuation and consistency were improved with *Terminalia chebula* fruit powder (6gm) given after meals for seven days. Total response of the drug was excellent in 20% cases and good in 80% cases of simple constipation. No side effects reported<sup>[21]</sup>

### Hypolipidemic activity

The hypolipidemic action of ethyl acetate soluble fraction of the alcoholic extract of *Terminalia chebula* stem in normal and Triton-treated rats is reported<sup>[22]</sup>

### Triphala

Triphala is a formulation containing *Terminalia chebula*, *Terminalia bellerica* and *Emblia officinalis*.

### In vitro antimicrobial efficacy of Triphala

Ethanol and acetone extracts of Triphala consisting of *Terminalia chebula*, *Terminalia bellerica* and *Emblia officinalis* showed excellent activity against *Salmonella typhi*, *Shigella dysenterica*, *Vibrio cholerae*, *Staphylococcus aureus* and *Klebsiella aerogenes*<sup>[23]</sup>.

Benzene and n-hexane extracts were resistant to all tested fungi.

### Toxicology

LD<sub>50</sub> of chebulin is reported to be 550 mg/kg in mice.<sup>[4]</sup>

### Substitutes and adulterants

*Terminalia citrina* Roxb. ex Flem., found in the foothills of Himalayas from Nepal eastwards to Assam is called *Haritaki* in Bengali language and its fruits have

medicinal properties similar to that of *Terminalia chebula*. Hence they used medicinally as those of *Terminalia chebula*.<sup>[4]</sup>

### Formulations and preparations

Abhayamodaka, Abharishta, Pathyadi vati, Pathyadi kvatha, Vyaghriharitaki, Haritaki leha, Chitrakaharitaki, Agastiharitaki, Dantiharitaki, Haritaki khanda, Pathyadi churna, Abhyadi guggulu, Abhyadi kalka, Amritharitaki, Abhayamalakiya rasayana, Triphala churna.<sup>[4]</sup>

### CONCLUSION

The demand for the plant derived drugs by population seems to increase, as the septism against synthetic drugs & their side effect grows. Further the continuous use of potent drugs is associated with gradual decay of the body's resistance mechanism & these as well as the harmful side effect of these medicines have led to proscription of many standard remedies in recent years. In this regard thorough literature survey revealed that *Terminalia chebula* has multiple uses and having properties such as antibacterial and wound healing. So more emphasis should be given in this regard in exploring *Terminalia chebula* as a potential antimicrobial agent.

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