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# The morphology, extractions, chemical constituents and uses of *Terminalia chebula:* A review

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***Abstract*** *— Trust on traditional medicines in the treatment of ailment is at a halt and a lot of population, especially rural population, still believes on herbs due to their easy accessibility and cost effectiveness. Due to greater attentiveness concerning significance of conventional medicine in health care, research on medicinal plants would be valuable. The plants of genus Terminalia, comprising of 250 species, are widely distributed in tropical areas of the world. Fruits of Terminalia chebula (Family: Combretaceae) commonly known as black Myroblans in English and Harad in Hindi, are widely grown in Pakistan and India among many Asian and African countries and is a popular folk medicine. T. chebula has been studied for its homeostatic, antitussive, laxative, diuretic and cardiotonic activities. This article gives a vivid account of T. chebula as a natural product and aims to (i) to refresh the importance of T. chebula to the medicinal plant researchers and (ii) to presents new information such of T. chebula.*

***Keywords*** *— Terminalia chebula, conventional treatment, mother of medicine.*

## I. INTRODUCTION

*Terminalia chebula* plant is a native plant in India and Southeast Asia and is extensively cultivated in Taiwan. It is a dried ripe fruit, also called as Terminalia fruit, (Hua- Yew et al., 2003). *T. chebula* belongs to the family Combretaceae and is found throughout India especially in deciduous forests and areas of light rainfall (Naik et al., 2004). *T. chebula* is a medium to large deciduous tree, attaining a height of up to 30 m with wide spreading branches and a broad disk-shaped crown (Chattopadhyay and Bhattacharyya, 2007). *T. chebula* is commonly known as black myroblans in English and harad in Hindi. The *Terminalia* consists of 250 species and widely distributed in tropical areas of the world (Ammar et al., 2002). The fruit of *T. chebula* is consider as the "king of medicines" by Tibetans and second-tonone by ayurvedic apothecaries, and also held in high regard by other folk medicinal practitioners (Karel et al., 2004). The Sanskrit name `ikatiraH" is rich with meaning, referring to the yellowish dye (haritak) that it contains, as well as indicating that it grows in the abode of god siva (Hari, that is the Himalayas) and that it cures (harayet) all diseases. Its other commonly used Sanskrit name, Abhaya, refer to the „fearlessness" it provides in the face of the disease (Chattopadhyay and Bhattacharyya, 2007).

During the last five decades, apart from the chemistry of *T. chebula* compounds, considerable development has been achieved concerning the biological activity and medicinal applications of *T. chebula*. It is now considered a valuable source of unique natural products for develop- ment of medicines against various diseases and also for the development of industrial products (Chattopadhyay and Bhattacharyya, 2007). Recently, myrobalan (fruit of *T. chebula*), a component of reputed ancient Indian herbal formulation "trifla" meaning three nuts (*T.*

*chebula*, *Terminalia belliric* (*Belliric myrobalan*) and *Emblica officinalis* dried nut) could effectively reduce genotoxicity of lead and aluminium in Allium test (Prathna, 2007). Some common names of *T. chebula* are described in Table 1.

*Table 1. Common names of Terminalia chebula.*

| **Common names of *Terminalia chebula*** | |
|---|---|
| Cambodia | Sa mao tchet |
| Filipino | Chebulic myrobalam |
| French | Myrobalan noir |
| Malay | Manja puteri |
| Thai | Samo thai |
| Vietnamese | Chieu lieu xanh |
| Hindi | Harad |

## II. PLANT AND FRUIT MORPHOLOGY

*T. chebula* is a medium-sized deciduous tree with a height of up to 30 m, wide spreading branches and a broad roundish crown. It grows in the altitude of 1500 to 2000 m in mostly clayey as well as shady soils. The leaves are elliptic rhombus, with an acute tip, cordate at the base, outskirts entire, glabrous above a yellowish pubescence below. The flowers are monoecious, mono- tonous white to yellow, with a strong unlikable odor, born in terminal prickle or short panicles. The fruit are glabrous, ellipsoids ovoid drupes, yellow to orange brown in colour, encloses a single angle stone as shown in Figure 1 (Chattopadhyay and Bhattacharyya, 2007). *T. chebula* is of three types - actually these are the different stages of maturity of fruits (a) small Myrobalan- the immature fruit; (b) yellow Myrobalan- after development of seed, the mature stage of the fruit; (c) large Myrobalan- the fully matured fruit (Chattopadhyay and Bhattacharyya, 2007).

**Varieties**

Seven varieties (now treated as synonyms) have been revealed (Khare, 2003):

(i) Vijaya: is gourd-shaped and can be used in any clue.

(ii) Rohini: is rounder in shape and more valuable for curative.

(iii) Putana: is small in size with large rigid seeds, useful for external plasters.

(iv) Amrita: is fleshier and better for cleansing.

(v) Abhaya: has five lobes, and is more effective for ophthalmic use (external).

(vi) Jivanti: is yellow in color and can be used in any indication.

(vii) Chetaki: has three lobes, used as a churna and has a more laxative effect than the others. Chetaki comes in two varieties - white and black (Alan et al., 2001).

All the seven varieties are now equated with *T. chebula*. In Kerala, two multiplicity of the drug, known as kattukka and karuvilla khattukaa, are accepted as haritaki. The later being either affectionate or pathogenetic seedless fruit of the same spices (Khare, 2003).

## III. CHEMICAL CONSTITUENTS

*T. chebula* contains 32% of tannin. *T. chebula* are of pyrogallol (hydrolysable) type, they contain 14 components of hydrolysable tannins (gallic acid, chebulic acid, punicalagin, chebulanin, corilagin, neochebulinic, ellagic acid, chebulegic acid, chebulinic acid , 1,2,3,4,6- penta-Ogalloyl-ß-D-glucose, 1,6,-di-O-galloyl-D-glucose, casuarinin, 3,4,6-tri-O-galloyl-D-glucose and terchebulin). The tannin content varies with the geological variation. Flavonol glycosides, triterpenoids, coumarin conjugated with gallic acid called chebulin, as well as phenolic compounds were also isolated (Chattopadhyay and Bhattacharyya, 2007). In addition, ethyl gallate and luteolin were isolated from the fruit of *T. chebula* (Karel et al., 2004). It also consists of nutrients such as vitamin C, protein, amino acids and minerals (Mahesh et al., 2007).

**Extraction of *T. chebula Alcoholic extraction***

The dried fruits of *T. chebula* are powdered separately and 100 g of powder is taken out two times in 500 ml of 75% methanol by stirring overnight and centrifuging at room temperature. The supernatant is then collected and evaporated to dryness under reduced pressure in a rotary evaporator. The extracts are solubilized in water and used *in vivo* and *in vitro*

experiment (Sabu and Ramadasan, 2002).

***Aqueous extraction***

The finely powdered (mesh size 20#) dried fruits of *T. chebula* are stirred with eight part of distilled water at about 70 to 80°C for 2 h. The liquid extract is then filtered through sieve (mesh size 200#). Next, the filtrate is concentrated up to two parts on a rotary vacuum evaporator. Finally, the concentrated liquid is spray-dried to get the dry powder of the extract. The concentration is expressed as µg/ml (Naik et al., 2004).

## IV. PHARMACOLOGICAL AND BIOLOGICAL USES

*T. chebula* is called the "the king of medicines" in the Tibet because of its astonishing power of healing with a wide range of biological and pharmacological uses (Chattopadhyay and Bhattacharyya, 2007) such as antibacterial, antifungal, antiviral, antimutagenic, adaptogenic and anti-anaphylacatic, hypolipidemic/ hypocholesterolemic, gastrointestinal motility improving and anti-ulcerogenic, hepatoprotective, cardioprotective, radioprotective, antidiabetic and retinoprotective, antispasmodic, wound healing, purgative, immunomo- dulatory and chemopreventive (Chattopadhyay and Bhattacharyya, 2007).

*Fig.1. Fruit of Terminalia chebula.*

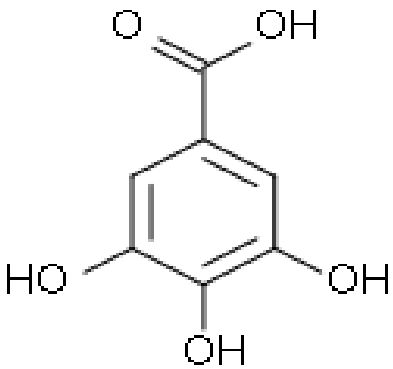


*Fig.2. Chemical structure of gallic acid.*

**Antioxidant activity of *T. chebula***

High performance liquid chromatography (HPLC) analysis confirmed that the fruit of *Terminalia* extract contains phenolic compounds. Since these compounds are good scavengers of free radicals, the aptitude of the extract to deactivate the free radicals such as 1,1- diphenyl-2-picrylhydrazyl (DPPH) radicals has been studied. DPPH is a stable free radical having a maximum absorption at 517 nm. In the presence of compounds able of scavenging hydrogen (H) atom or an electron, its free radical nature is lost; hence, a decrease in absorption at 517 nm is seen. The decrease in DPPH absorption in the presence of varying concentration (3.5 to 23 µg/ml) of the extract has been monitored and it can be seen that the absorbance due to DPPH decreases continuously up to 23 µg/ml (Naik et al., 2004).

***Gallic acid***

Gallic acid (3, 4, 5-trihydroxybenzoic acid; Figure 2) is one of the main endogenous phenolic acids found in plants in a free or esterified form. Gallic acid has been found to be a pharmacologically active compound which possesses antioxidative, antimutagenic, anticarcinogenic, anti-inflammatory, and hepatoprotective activities. 4-O- Methylgallic acid has been reported to be the major metabolite of gallic acid. Other minor metabolites such as 3-O-methylgallic acid, 3, 4-O- dimethylgallic acid and pyrogallol (both the conjugated and unconjugated forms) have been reported as well. Glucocorticoids are the most effective drugs for preventing and repressing inflammation caused by mechanical, chemical, infectious and immunological stimuli. One major mechanism for glucocorticoids to exert their activity is through binding to the glucocorticoids receptor resulting in either activation or repression of a large set of glucocorticoids responsive genes. Gallic acid and its metabolites is also a glucocorticoids receptor agonist, which on binding with these receptors shows potent anti-inflammatory activity (Feng-Lin et al., 2007).

**Cosmetic uses**

***Melanin inhibition***

Depigmenting agent like kojic acid has been found to have carcinogenic effect. So, safe agents like plant extract of *T. chebula* should be developed as a depigmenting ingredient in cosmetic industry.

Extract of

*T. chebula* have great potential as safe effective depigmenting agent. The methanolic extract of *T. chebula* showed a melanin inhibitory effect higher than 90% at 100 ppm (Jin et al., 2006).

***Anti-inflammatory activity***

Gallic acid (3, 4, 5-trihdroxybenzoic acid) is one of the main endogenous phenolic acids found in *T. chebula* plant, which posses the anti-inflammatory activity (Feng- Lin et al., 2007).

***Cellular aging***

The ethanol extract from the fruit of *T. chebula* exhibited significant inhibitory effect on cellular aging (Nam et al., 2004).

***Astringent***

In allopathy, *T. chebula* extract is used as an astringent (Thomas et al., 2000).

## V. MISCELLANEOUS USES

In Unani system, it is used as a blood purifier. The pulp of the fruit is given in piles, chronic diarrhea, dysentery, costiveness, flatulence, asthma, urinary disorder, vomiting, hiccup, intestinal worms, ascites and enlarged spleen and liver (Thomas et al., 2000) The word mordant has been consequent from Latin word „modere" which means to nibble, as it nibble the surface of a substrate and helps to fix a dye on the substrate. The leaves and fruits of *T. chebula* are also used as mordant (Kumar and Sinha, 2004).

## VI. CONCLUSIONS

The rapid increase in utilization of herbal remedies worldwide has been inspired by several factors, including the concept that all herbal products are safe and effective and so investigation on medicinal plants is increasing day by day. *T. chebula* is known as the mother of medicine as it has a biodiversity of both nutritional as well as medicinal components. It is suggested that any herb or plant ingredients taken must be tested before being used as a remedy. Therefore, a range of advanced cell biological, biochemical, molecular biological and *in vitro* cell culture procedures should be taken into account. Scientific exploration of *T. chebula* is needed so that the hidden potential of this medicinal plant could be exposed and the ill community gets maximum benefits from conventional system of medicine. Hopefully, this review will encourage more awareness towards research and more confidence towards utilization of herbal medicines.

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