

A review on *Terminalia chebula*

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Abstract

Terminalia chebula Retz (Combretaceae) is a medicinal plant widely distributed throughout India, Buma, and Srilanka. Many Indian plants have been used from time immemorial to treat various diseases and infections in traditional medicinal systems. This plant commonly used in traditional systems of medicinal in India sub-constituent. *Terminalia chebula* is called as 'King of medicine' in Tibet and is always listed at the top of the list in Ayurvedic material medica due to its extraordinary power of healing. This review attempts to summarize the various pharmacological and biochemical studies on *Terminalia chebula* which gives a wide knowledge about the herb and their importance in personal health care and hygiene.

Keywords: *Terminalia chebula*, tri-terpinoids, anti-cancer activity, carcinogenic.

1. Introduction

Medicinal plants are part and parcel of human society from the dawn of civilization to combat diseases and have been considered valuable and cheap source of unique phyto constituents which are used extensively in the development of drugs against various diseases. Hundreds of plants are used medicinally mainly as herbal preparations in the indigenous systems of medicine in different countries which have stood the test of time, and therefore, modern medicines has not been able to replace most of them. The estimation of World Health Organization reported 80% of the world population are chiefly depends on traditional medicals i.e. involving the use of plant extracts or their active chemical constituents. Thus, the economic importance of medicinal plants is much more in countries like India & rest of the world. In the last few decades, the position of herbal medicine is getting popularized in both developed and developing countries. This is due to the herbal medicines are, economic, natural origin with higher safety margins and lesser or no side effects [1].

2. Plant profile[2]

2.1 Biological source: It consists of dried fruit, root, bark of plant known as *Terminalia chebula*.

2.2 Geographical Source: Dhaka, Bangladesh.

2.3 Family: Combretaceae

2.4 Common name: Haritaki

2.5 Synonyms:

- **China:** Zhang-Qin-Ge, Hezi
- **Germany:** Myrobalane
- **Bengali:** Haritaki
- **Hindi:** Harre, Harad, Harar
- **Malayalam :** Katukka
- **Marathi :** Hirda, Haritaki, Harda, Hireda
- **Punjabi:** Hakeka, Harar
- **Tamil:** Ammai, Amutam, Aritaki, Pethiyam, Varikkai
- **Telugu:** Karakkaya;
- **Urdu:** Halela.

3. Taxonomy

- **Kingdom:** Plantae-Plants
- **Subkingdom:** Tracheobionta-Vascular plants
- **Super division:** Spermatophyta-seed plants
- **Division:** Magnoliophyte- flowering plants
- **Class:** Magnoliopsida dicotyledons
- **Subclass:** Rosidae
- **Order:** Myrtales
- **Genus:** Terminalia
- **Species:** *Terminalia chebula*.

4. Macroscopic characters

It is a deciduous tree, younger stems glabrescent and woody. These are 10 – 20 cm long, sub – opposite, simple; exstipulate; petiolate; laminae broadly elliptic to elliptic oblong, rarely ovate, the bases obtuse, the margins entire, the tips acute, glabrescent. Resin and a purgative principle of the nature of anthraquinone and sennoside are also present. These are single, rough, ellipsoid, 1.0-2.0 cm by 0.2 -0.7 cm and without ridges.

5. Microscopic characteristics

Transverse section of the fruit shows epicarp composed of a layer of epidermal cells, the outer tangential wall and upper portion of the thick radial walls. Testa, one layer of large cubical cells, followed by a zone of reticulates parenchyma and vessel; tegument consists of collapsed parenchyma. Cotyledon folded and containing aleurone grains, oil globules and some rosette aggregate crystals. The powder of the plant is brown in color, shows a few fibers under the microscope, vessels with simple pits and groups of sclereids [3].

6. Chemical constituents

Total phyto-constituents of *Terminalia chebula* are hydrolysable tannins (which may vary from 20-50%) and they are responsible for pharmacological activities. The tannin content varies with the geological variation. Flavonol glycosides, tri-terpenoids, and coumarin conjugated compounds with gallic acid called as chebulin, and also phenolic compounds are isolated. Total eight compounds viz. Gallic acid, methyl gallate, ethyl gallate, chebulagic acid, tetra-O-galloyl- β -D-glucose, and ellagic acid, chebulinic acid and penta-O galloyl- β -D-glucose from *Terminalia chebula* were isolated and checked out the reverse phase chromatography. There are seven varieties of *Terminalia chebula* all of which are more or less used in similar fashion but vary in specific usages and quality [4].

7. Traditional uses:

- Fruits effectively reduce the swelling, hasten the healing and cleanse the wounds and ulcers.

- Prevents accumulation of pus in skin diseases.
- Healing of wounds especially in burns.
- Fruit is also applied in conjunctivitis for relief due to its anti-inflammatory property.
- Used as a mouth rinse, is an anticancer agent.
- Used as anti-astringent.[5]

8. Pharmacological screening of *Terminalia chebula*

The extracts of *Terminalia chebula* have been widely investigated for its various pharmacological effects due to which a number of therapeutic uses have been associated with the plant. *Terminalia chebula* has been noted to possess potent antioxidant properties due to the presence of the phenolic compounds present in its extract. The aqueous extract of the fruits of *Terminalia chebula* showed antioxidant activity as evident by the fact that the extract from the plant showed significantly decreased lipid peroxidation effects. Moreover, the antioxidant potential associated with the plant helped it in order to possess a hepato-protective effect which was further evidenced by reductions in biochemical observations along with the histo-pathological studies [6].

Terminalia chebula extract (TCE) have been found to possess various pharmacological effects, a term referred to as its pleiotropic effects; due to which the herbal drug has been shown to provide a number of therapeutic uses, both experimentally and clinically. Various pleiotropic effects such as anti-oxidant, anti-diabetic, Reno protective, hepato-protective, anticancer, anti-anaphylactic, immune modulator and pro-kinetic have been found to be associated with the plant. In addition, the plant has been significantly used in people having leprosy, anemia, chronic intermittent fever, heart disease, diarrhea, anorexia, cough and excessive secretion of mucus and a range of other complaints and symptoms [7].

8.1. Anti-bacterial activity

Kannan *et al* has investigated on two anti-bacterial compounds, Gallic acid and ethyl ester against methicillin-resistant *Staphylococcus*, have been isolated from ethyl alcohol extract of fruits of *Terminalia chebula*. *Terminalia chebula* is well effective against *Helicobacter pylori*, a bacterium responsible for gastritis, ulcer and stomach cancers [8].

8.2. Anti-fungal activity

Shinde *et al* has done on the Anti-fungal activity against a number of dermatophytes and yeasts. Alcoholic and ethyl acetate extracts of *Terminalia chebula* leaves were also tested pathogenic fungi using paper disc method and were found effective compared to that of the reference standard carbendazim [9].

8.3. Anti-amoebic and immune-modulatory activities

Sohni *et al* has investigated in experimental caecalamoebias in rats to the anti-amoebic effect of a crude drug formulation of *Terminalia chebula*. In immunomodulation studies, humoral immunity was enhanced where T-cells counts remained unaffected in the animals, but cell mediated immune response was stimulated [10].

8.4. Molluscicidal activity

Upadhyay *et al* has examined on the molluscicidal activity of ethanolic extract of *Terminalia chebula* fruit powder was studied against the vector snail *Lymnaea acuminata* and was found time and concentration dependent [11].

8.5. Anti-helminthes activity

Kamaraj *et al* The study of ovicidal and larvicidal activities of ethyl acetate, acetone, and methanol extracts of dried leaves and seeds of *Terminalia chebula* were examined by the *in vitro* on *Haemonchus contortus* based on egg hatch and larval development assays at 50, 25, 12.5, 6.25 and 3.13mg/ml. The extracts of leaves and seeds of *Terminalia chebula* showed complete inhibition at 50mg/ml [12].

8.6. Anti-viral activity

Lin *et al* the extract of fruits of *Terminalia chebula* showed inhibitory effects on human immunodeficiency virus-1 reverse transcriptase. Hot water extract of *Terminalia chebula* showed anti-herpes simplex virus (HSV) activity *in-vivo* and anti-cytomegalovirus (CMV) activity both *in-vitro* and *in vivo* in a study. *Terminalia chebula* inhibited HSV-1 entry at non-cytotoxic doses in A549 human lung cells by preventing binding, penetration, and cell to cell spread, as well as secondary infection [13].

8.7. Anti-mutagenic and anti-carcinogenic activities

Ponnusankar *et al* has performed by the effect of 70% methanolic fruit extract of *Terminalia chebula* was studied on growth of several malignant cell lines. One of the fractionated compounds from ethanolic fruit extract of *Terminalia chebula*, chebulagic acid, showed potent dual inhibition against COX and 5-LOX. It also showed anti-proliferative activity against HCT-15, COLO-205, MDA-MB-231, DU-145 and K562 cell lines. A recent study has shown the ability of triphala to inhibit cytochrome P450 [14].

8.8. Anti-oxidant activity

Chen *et al* has done on the *Terminalia chebula* is an excellent anti-oxidant. In a study, 6 extracts and 4 pure compounds of *Terminalia chebula* exhibited *in-vitro* antioxidant properties of anti-lipid peroxidation, anti-superoxide radical formation and DPPH activities at different concentration. The results demonstrated that triethyl-chebulate was a strong antioxidant and free-radical

scavenger, which might contribute to the anti-oxidative ability of *Terminalia chebula* [15].

8.9. Anti-diabetic activity

Murali *et al* has investigated on 75% methanolic extract of *Terminalia chebula* (100 mg/kg body weight) reduced the blood sugar level in normal and alloxan diabetic rats significantly within 4 h by the oral administration. The chloroform extract of *Terminalia chebula* seeds (100, 200 and 300 mg/kg body weight) produced dose-dependent reduction in blood glucose of diabetic rats in both short term and long term study (300 mg/kg body weight for 8 weeks).[16]

8.10. Anti-anaphylactic activity

Shin *et al* has Study on the *Terminalia chebula* along with several other medicinal plants helps to resist against a number of stressors in different ways. *Terminalia chebula*, when given following anaphylactic shock, reduces the serum histamine levels showing a strong Anti-anaphylactic activity [17].

8.11. Anti-nociceptive activity

Kaur *et al* has done on the concentrations of *Terminalia chebula* fruits extracted from the petroleum ether, chloroform, and ethanol and water extracts of were evaluated for the analgesic activity by using the tail immersion method in mice. The ethanolic extract of the plant exhibited analgesic response at 200,400 and 800mg/kg body weight day [18].

8.12. Anti-ulcerogenic activity

Sharma *et al* has examined on the animals pretreated at 200 and 500 mg/kg body weight with hydro alcoholic extract of *Terminalia chebula* showed reduction in lesion index, total affected area and percentage of lesion in comparison with control groups in the aspirin, ethanol and cold restraint stress induced ulcer models [19].

8.13. Anti-arthritis activity

Nair *et al* has investigated on the hydro-alcoholic extract of *Terminalia chebula* produced a significant inhibition of joint swelling as compared to control in both formaldehyde-induced and CFA-induced arthritis. *Terminalia chebula* treatment also reduced serum TNF- α level and synovial expression of TNF-R1, IL-6 and IL-1 β [20].

8.14. Wound healing activity

Choudhary *et al* has done on the alcoholic extract of the leaves of *Terminalia chebula* caused much faster healing of rat dermal wounds *in-vivo* due to improved rates of contraction and a decreased period of epithelialization for the topical administration. Biochemical studies revealed increase in total protein, DNA and collagen contents in the granulation tissues of treated wounds [21].

8.15. Cyto-protective activities

Manosroi *et al* Has performed on the different concentrations of gallic acid and chebulagic acid, isolated from fruit extract of *Terminalia chebula*, blocked cyto-toxic T lymphocyte (CTL)-mediated cyto-toxicity. Granule exocytosis in response to anti-CD3 stimulation was also blocked by the above phyto-chemicals at the equivalent concentrations [22].

8.16. Radio-protective activity

Gandhi *et al* has estimates on the aqueous extract of the fruit of *Terminalia chebula* (50µg) was able to neutralize 1, 1-diphenyl-2picrylhydrazyl, a stable free radical by 92.9% and protected the plasmid DNA pBR322 from undergoing the radiation-induced strand breaks [23].

8.17. Cardio-protective activity

Suchalatha *et al* has done on the Cardio-protective effect of ethanolic extract of *Terminalia chebula* fruits (500 mg/kg body weight) was investigated in isoproterenol induced myocardial damage in rats. It was reported that the pre-treatment with *Terminalia chebula* extract had cardio-protective effect due to the lysosomal membrane stabilization preventing myocardial necrosis and inhibition of alterations in the heart mitochondrial ultra-structure and function in the experimental rats [24].

8.18. Hepato-protective activity

Tasduq *et al* has investigated on the 95% ethanolic extract of *Terminalia chebula* fruit showed hepato-protective activity against anti-tuberculosis (anti-TB) drug induced toxicity which could be attributed to its prominent anti-oxidative and membrane stabilizing activities [25].

8.19. Anti-Spermatogenic activity

Gupta *et al* has performed on the oral administration (300 mg/kg body weight for 28 days) of bark of *Terminalia chebula* extracted in acetone, methanol, 50% ethanol, and in aqueous solvents caused histological alterations in seminiferous tubules in testes of treated mice [26].

9. Conclusion

In conclusion, it can be said that the antioxidant, analgesic and cyto-toxic activities shown by the *Terminalia chebula Retz*. Fruit extract lend credence in favour of the various uses of *Terminalia chebula Retz* in folk medicine. However, extensive pharmacological studies in molecular level are required to understand underlying mechanism of these actions and eventually to isolate active compounds responsible for each activity of *Terminalia chebula* fruit extract.

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