Innovare Academic Sciences

International Journal of Pharmacy and Pharmaceutical Sciences

ISSN- 0975-1491 Vol 7, Issue 2, 2015

Review Article

TERMINALIA CHEBULA: AN EPHEMERAL GLANCE

M U KHAN*, HABIBULLAH KHALILULLAH, JAWED AKHTAR, GAMAL OSMAN ELHASAN

Unaizah College of Pharmacy, Qassim University, Kingdom of Saudi Arabia.
Email: mo.khan@qu.edu.sa

Received: 05 Jun 2014 Revised and Accepted: 07 Aug 2014

ABSTRACT

Herbal drugs represent a major allocation of all the recognized systems of health in the world. Also, the medicinal plants have been regarded as valuable and cheap sources of various phytoconstituents which are used extensively in the development of drugs against various diseases. Terminalia chebula, commonly called as black myrobalan, ink tree, or chebulic myrobalan, is a deciduous tree belonging to the family Combretaceae, has been regarded as one of the most important medicinal plants used in medicines of ayurveda, siddha, unani and homeopathy. Numbers of phytochemical constituents have been found to be associated with the drug such as tannins, chebulinic acid, ellagic acid, gallic acid, punicalagin and flavonoids. Moreover, *Terminalia chebula* has been well reported to possess antioxidant, antidiabetic, antibacterial, antiviral, antifungal, anticancerous, antiulcer, antimutagenic and wound healing activities. In addition, *Terminalia chebula* has been used extensively in the preparation of many Ayurvedic formulations for infectious diseases like chronic ulcer, leucorrhoea, pyorrhoea and fungal infections of the skin. The present review article has been designed to elucidate data on phytochemistry, pharmacognostic characters and pharmacological activities associated with Terminalia

Keywords: Herbal drugs, Terminalia chebula.

INTRODUCTION

World Health Organization (WHO) stated that approximately 80% of world's population in all developing countries believe in traditional system of medicine for their primary healthcare needs at major levels [1]. Also, the traditional healing system has been using the herbal remedies globally, is an important base for the new modern drugs invention [1-2]. *Terminalia chebula*, a moderate tree used in traditional medicines, belongs to family combretaceae. It is commonly called as Black myrobalan, Ink tree (or) Chebulic myrobalan. *Terminalia chebula* is a widely traditional medicine that is not only used in India but also in other countries like Asia and Africa [3]. Moreover, the plant has a history to be used commonly in unani, ayurveda and homeopathic medicine due to its wide spectrum of pharmacological activities associated with the biologically active chemicals present in this plant [2-4]. Additionally, the pant has been extensively used for the treatment of the diseases like cardiovascular diseases, cancer, paralysis, leprosy, ulcers, gout, arthritis, etc. Furthermore, the plant has been well reported to possess antioxidant, antidiabetic, antibacterial, antiviral, antifungal, anticancer, antiulcer, antimutagenic, wound healing activities [5-7]. Also, the ayurvedic formulations have been extensively prepared from the plant for the treatment of infectious diseases such as chronic ulcers, leucorrhoea, pyorrhoea and fungal infections of the skin [8-9]. The plant has also a history to be used in order to prevent aging and impart longevity, and immunity [8-10]. The present review article aims to discuss about the phytochemistry, and therapeutic activities associated with *Terminalia chebula*.

Terminalia chebula: a fleeting view

Taxonomy of *Terminalia chebula* Retz

- **Kingdom:** Plantae-Plants;
- **Subkingdom:** Tracheobionta-Vascularplants;
- **Super division:** Spermatophyta-seed plants;
- **Division:** Magnoliophyta- flowering plants;
- **Class:** Magnoliopsidadicotyledons;
- **Subclass:** Rosidae;
- **Order:** Myrtales;
- **Family:** Combretaceae-Indian almond family;
- **Genus:** Terminalia L-tropical almond;
- **Species:** T. chebula [11]

Synonyms

- **China:** Zhang-Qin-Ge, Hezi
- **France:** Myrobalan in dien
- **Germany:** Myrobalane
- **India**
  - Assamese – Shilikha
  - Bengali – Haritaki
  - Gujarati–Hirdo, Himaja, Pulo-harda
  - Hindi – Harre, Harad, Harar
  - Kannnada – Alalekai
  - Kashmiri–Halela
  - Malayalam – Katukka
  - Marathi - Hirda, Haritaki, Harda, Hireda
  - Oriya – Harida
  - Punjabi – Hakeka, Harar
  - Sanskrit – Haritaki, Abhaya, Kayastha, Siva, Pathya
  - Tamil – Ammai, Amutam, Aritaki, Pethiyam, Varikkai
  - Telugu – Karakkaya; Urdu – Halela}
- **Srilanka –** Aralu terminalia [12-13].

Habitat

It grows in India, Myanmar, Bangladesh, Iran, Egypt, Turkey, China etc. In India, Haritaki tree grows in deciduous forests and found in North India and South words toward the Deccan table lands at 1000 to 3000 ft.

In Myanmar, it grows up to 5000 ft, which consists of pericarp of a mature fruit of Terminalia chebula, whereas, a moderate sized or large tree is found throughout India chiefly in deciduous forests and areas of light rain fall. The flowers appear from April to August and fruits ripen from October to January [2,9].

Macroscopic characters

Various macroscopic characters associated with the plant are as follows

- **Tree**

It is a deciduous tree, younger stems glabrescent and woody.

- **Leaves**

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 [14].

- **Fruit**

These are a drupe, glabrous, sub globose to ellipsoid, 2.5 – 5.0 cm by 1.5-2.5 cm, usually smooth or frequently 5-angulate, ridged, wrinkled, turning blackish when dry. Fruits contain astringent substances - tannic acid, Chebulinic acid, gallic acid etc. Resin and a purgative principle of the nature of anthraquinone and sennoside are also present [1].

- **Seed**

These are single, rough, ellipsoid, 1.0-2.0 cm by 0.2 -0.7 cm and without ridges [14].

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. Mesocarp, 2 or 3 layers of collenchymas followed by a broad zone of parenchyma with fibres and sclereids in groups and vascular bundles, scattered; fibres, simple pitted walls; porous parenchyma; sclereids, various shapes and sizes, mostly elongated; tannins and aggregate crystals of calcium oxalate in parenchyma; starch grains simple rounded or oval in shape, measuring 2-7 µm in diameter [15]. Endocarp consists of thick walled sclereids of various shapes and sizes, mostly elongated. Fibres, sclereids and vessels appear lignified. Testa, one layer of large cubical cells, followed by a zone of reticulates parenchyma and vessel; tegmen 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 [2,15-16].

Phytochemistry

Terminalia chebula contains high phenolic content, especially hydrolyzable tannins, anthraquinone, flavonol,carbohydrates, glucose and sorbitol [17]. The triterpenes have been reported which are arjun glucoside 1, arjungenin and the chebulosides 1 and 2. Other constituents contains tannins up to 30%, chebulic acid 3-5%, chebulinic acid 30%, tannic acid 20 40%, ellagic acid, 2,4-chebulyi–β-D-gluco pyranose, gallic acid, ethyl gallate, punicalagin terflavin A, terchebin, some purgative of the nature of nthraquinone, flavonoids like luteolin, rutins, and quercetin etc [18]. Ellagitannin such as punacalagin, casurarinin, corilagin and terchebulin and others such as chebulanin, neochebulinic acid, chebulagic acid and chebulinic acid have been reported to be associated with the plant [17-19].

Potent Pharmacological Effects

The extract of *Terminalia chebula* have been widely investigated for its various pharmacological effects. The plant has been known to possess multiple 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 [20-21].

In support, the aqueous extract of the fruits of *Terminalia chebula* showed antioxidant activity as evident by the fact that the extract form the plant showed significantly decreased lipid peroxidation effects [21]. Moreover, the antioxidant potential associated with the plant helped it in order to possess hepatoprotective effects which was further evidenced by reductions in biochemical observations along with the histopathological studies [22]. Also, the cytoprotective effect of the plant was investigated, the results of which showed that the chebulinic acid, tannic acid and ellagic acid were found to be the most growth inhibitory phenolics of *Terminalia chebula* fruit extract [23]. The extract form the *Terminalia chebula* has been further investigated for the antidiabetic and renoprotective effects. The methanolic extract of *Terminalia chebula*, *Terminalia belerica*, *Emblica officinalis* and their combination named 'Triphala' has been demonstrated to inhibit the lipid peroxide formation and forage the hydroxyl and superoxide radicals in the diabetic rats, which further confirmed their antidiabetic potential [24]. Also, the renoprotective effects of the chloroform extract of *Terminalia chebula* Retz. seeds was investigated in streptozotocin-induced diabetic rats, which showed that the seeds produced dose-dependent reduction in blood glucose of diabetic rats compared with standard drug [25].

The extracts from *Terminalia chebula* retz. Showed the isolation of two potent antimicrobial substances, gallic acid and its ethyl ester, which decreased the score of methicillin-resistant strains of *Staphylococcus aureus*, that confirmed the antimicrobial potential of the plant [26]. Furthermore, the antibacterial effect of the *Terminalia chebula* extract was investigated for the the antibacterial activity against *Helicobacter pylori*, which showed that the plant extracts reduced the colony formation of the bacteria confirming its antibacterial potential [27]. Also, the aqueous extract of *Terminalia chebula* was evaluated for the anticaries effect, which strongly inhibited the growth, sucrose-induced adherence and glucan-induced aggregation of S. mutans. It has been widely accepted that proper gastric emptying is associated with the correct therapeutic effects shown by the drug therapy. The oral administration of *Terminalia chebula* showed stimulatory effects on gastric emptying, which showed that extrct from the plant possess potent prokinetic properties [28].

Moreover, the antiarthritic potential of *Terminalia chebula* has been evaluated in the mouse model of arthritis, in which the suppression of the onset and progression of collagen-induced arthritis was inhibited the plant extracts confirming its antiarthritic potential (fig. 1).

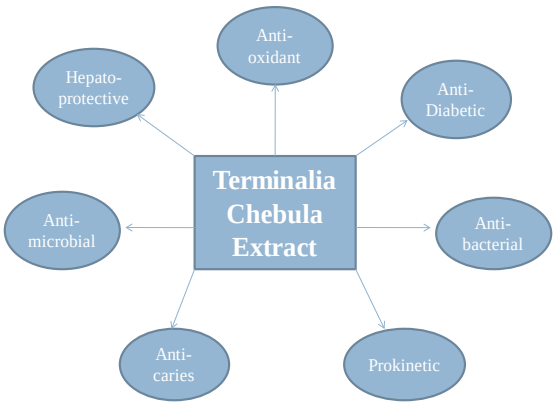

Fig. 1: Potent phamacological properties of *terminalia chebula*

Theraputical studies on *terminalia chebula*

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 antioxidant, antidiabetic, renoprotective, hepatoprotective, anticancer, antianaphylactic, immunomodulator and prokinetic [5-7] have been found to be associated with the plant (Table 1).

In addition, the plant has been significantly used in people having leprosy, anemia, chronic intermittent fever, heart disease, diarrhoea, anorexia, cough and excessive secretion of mucus and a range of other complaints and symptoms [29-30].

Table 1: Theraputical studies on terminal chebula

S. No.	Pharmacological activity	Extract type	Organisms
1.	Anticonvulsant	Ethanolic, chloroform, aqueous extract	Rats
2.	Antidiabetic	Chloroform extract	Diabetic rats
3.	Wound healing	Hydroalcoholic extract	Diabetic rats
4.	Antiviral	Aqueous extract	Hepatitis B virus
5.	Cardioprotective	95% of ethanol extract	Adult albino male Rats
6.	Cytotoxic	Acetone extract	Cancer cell lines
7.	Immunodulatory	Alcohol extract	Male wistar rats
8.	Antiulcer	Methanolic extract	Wistar albino Rats
9.	Radioprotective	Aqueous extract	Rats
10.	Antioxidant	95% of ethanol extract	Adult male albino rats
11.	Antimutagenic	Chloroform, aqueous extract	Salmonella typhimurium
12.	Antifungal	Aqueous, alcoholic, ethyl acetate extract	Aspergillus niger, Alternaria alternata
13.	Antibacterial	Ethanol extract	Salmonella typhi,Staphylococcus aureus
14.	Anticancer	70% of methanol	Human(MCF-7), Mouse (S115) breast cancer cell lines etc

CONCLUSION

Terminalia chebula has been used since decades because of its rich ethnomedical significance. Due to this, numerous pleiotropic effects have been exhibited by the plant including antioxidant, antidiabetic, renoprotective, hepatoprotective, antianaphylactic, immune modulator and prokinetic effects. However, much has been investigated about the chemotherapeutic effects associated with *Terminalia chebula* but further investigations on identification of the active principles and their mechanism of action are warranted to completely explore the ethnomedical importance of the plant.

CONFLICT OF INTERESTS

Declared None

REFERENCES

1. Das ND, Jung KH, Park JH, Mondol MA, Shin HJ, Lee HS, *et al*. *Terminalia chebula* extract acts as a potential NF-κB inhibitor in human lymphoblastic T cells. Phytother Res 2011;25:927-34.
2. Ratha KK, Joshi GC. Haritaki (Chebulic myrobalan) and its varieties. Ayu 2013;34:331-4.
3. Baliga MS, Meera S, Mathai B, Rai MP, Pawar V, Palatty PL. Scientific validation of the ethnomedicinal properties of the ayurvedic drug triphala: areview. Chin J Integr Med 2012;18:946-54.
4. Baliga MS. Triphala, Ayurvedic formulation for treating and preventing cancer: a review. J Altern Complement Med 2010;16:1301-8.
5. Suchalatha S, Devi CS. Antioxidant activity of ethanolic extract of *Terminalia chebula* fruit against isoproterenol–induced oxidative stress in rats. Ind J Biochem Biophy 2005;42:246-9.
6. Rao NK, Nammi S. Antidiabetic and renoprotective effects of the chloroform extract of *Terminalia chebula* Retz seeds in streptozotocin-induced diabetic rats. BMC Complement Altern Med 2006;6:17.
7. Kannan P, Ramadevi SR, Waheeta Hopper. Antibacterial activity of *Terminalia chebula* fruit extract. Afr J Microbiol Res 2009;3:180-4.
8. Vaibhav A, Wahi AK. Immunomodulatory activity of alcohol extracts of *Terminalia chebula* Retz combretaceae. Trop J Pharm Res 2011;10:567-75.
9. Baliga MS, Meera S, Mathai B, Rai MP, Pawar V, Palatty PL. Scientific validation of the ethnomedicinal properties of the ayurvedic drug triphala: a review. Chin J Integr Med 2012;18:946-54.
10. Bag A, Bhattacharyya SK, Chattopadhyay RR, Rashid RA. The development of *Terminalia chebula* Retz. (Combretaceae) in clinical research. Asian Pac J Trop Biomed 2013;3:244-52.
11. Gandhipuram P, Kumar S, Arulselvan P, Kumar DS, Subramanian SP. Anti Diabetic activity of fruits of Terninalia chebula on Streptozotocin induced Diabetic rats. J Healt Sci 2006;52:283-91.
12. Aneja KR, Joshi R. Evaluation of antimicrobial properties of fruit extracts of *Terminalia chebula* against dental caries pathogens. Jundishapur J Microbiol 2009;2:105-11.
13. Hasani-Ranjbar S, Nayebi N, Moradi L, Mehri A, Larijani B, Abdollahi M. The efficacy and safety of herbal medicines used in the treatment of hyperlipidemia; a systematic review. Curr Pharm Des 2010;16:2935-47.
14. Lee HS, Koo YC, Suh HJ, Kim KY, Lee KW. Preventive effects of chebulic acid isolated from *Terminalia chebula* on advanced glycation endproduct-induced endothelial cell dysfunction. J Ethnopharmacol 2010;131:567-74.
15. Suchalatha S, Srinivasan P, Devi CS. Effect of T. chebula on mitochondrial alterations in experimental myocardial injury. Chem Biol Interact 2007;169:145-53.
16. Kumar M, Sinha M, Mandal BK, Ghosh AR, Kumar KS, Reddy PS. Green synthesis of silver nanoparticles using *Terminalia chebula* extract at room temperature and their antimicrobial studies. Spectrochem Acta Mol Biomol Spectrosc 2012;91:228-33.
17. Government of India. The Ayurvedic pharmacopoeia of India. New Delhi: Government of India, Ministry of Health and Family Welfare Department of Indian System of Medicine and Homoeopathy. 2001. p. 47, 143.
18. Jagetia GC, Baliga MS, Malagi KJ, Sethukumar KM. The evaluation of the radioprotective effect of Triphala (an ayurvedic rejuvenating drug) in the mice exposed to g-radiation. Phytomed 2002;9:99-108.
19. Raju D, Ilango K, Chitra V, Ashish K. Evaluation of Anti-ulcer activity of methanolic extract of *Terminalia chebula* fruits in experimental rats. J Pharm Sci Res 2009;1:101-7.
20. Saleem MA, Pihlaja K. Total phenolics concentration and antioxidant potential of extracts of medicinal plants of Pakistan. Z Naturforsch 2007;56:973-8.
21. Naik GH, Priyadarsini KI, Bhagirathi RG. Banavalikar. *In vitro* antioxidant studies and free radical reactions of triphala, an ayurvedic formulation and its constituents. Phytother Res 2009;19:582-6.
22. Tasduq SA, Singh K, Satti NK, Gupta DK. Terminalia chebula (fruit) prevents liver toxicity caused by sub-chronic administration of rifampicin, isoniazid and pyrazinamide in combination. Hum Exp Toxicol 2006;25:111-8.
23. Saleem A, Husheem M, Harkonen P, Pihlaja K. Inhibition of cancer cell growth by crude extract and the phenolics of Terminalia chebula retz fruit. J Ethnopharmacol 2002;81:327-36.

24. Sabu MC, Kuttan R. Anti-diabetic activity of medicinal plants and its relationship with their antioxidant property. J Ethnopharmacol 2002;81:155-60.
25. Rao NK, Nammi S. Antidiabetic and renoprotective effects of the chloroform extract of Terminalia chebula Retz. seeds in streptozotocin-induced diabetic rats. BMC Complement Altern Med 2006;6:17.
26. Sato Y, Oketani H, Singyouchi K. Extraction and purification of effective antimicrobial constituents of Terminalia chebula RETS. Against methicillin-resistant Staphylococcus aureus. Biol Pharm Bull 1997;20:401-4.
27. Malekzadeh F, Ehsanifar H, Shahamat M, Levin M. Antibacterial activity of black myrobalan (Terminalia chebula Retz) against Helicobacter pylori. Int J Antimicrob Agents 2010;18:85-8.
28. Tamhane MD, Thorat SP, Rege NN, Dahanukar SA. Effect of oral administration of Terminalia chebula on gastric emptying: anexperimental study. J Postgrad Med 2007;43:93-5.
29. Kadir MF, Bin Sayeed MS, Mia MM. Ethnopharmacological survey of medicinal plants used by indigenous and tribal people in Rangamati, Bangladesh. J Ethnopharmacol 2012;144:627-37.
30. Zinjarde SS, Bhargava SK, Kumar AR. Potent alpha-amylase inhibitory activity of Indian Ayurvedic medicinal plants. BMC Complement Altern Med 2011;11:5.