

# Chapter V

## ***Terminalia bellirica* (Gaertn.) Roxb. (Combretaceae): a medicinal tree of India**

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### ABSTRACT

*Terminalia bellirica*, commonly known as Belleric Myrobalan, is a significant medicinal tree native to India and other parts of Southeast Asia. Esteemed in traditional medicine systems such as Ayurveda and Unani, *T. bellirica* is renowned for its diverse therapeutic properties. The tree is rich in bioactive compounds, including tannins, flavonoids, phenolic acids, saponins, and triterpenoids. These compounds impart a wide range of pharmacological activities, including potent antioxidant, anti-inflammatory, antimicrobial, hepatoprotective, and hypolipidemic values. The present study highlights the importance of *T. bellirica* in traditional medicine and modern therapeutic applications.

**Keywords:** *Terminalia*, therapeutic potential, pharmacological uses, bioactive compounds

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### INTRODUCTION

*Terminalia bellirica* is recognized as one of the ancient medicinal plants (Nayak and Kumar, 2023) found in India, Pakistan, Nepal, Bangladesh, Sri Lanka, and Southeast Asia. Its therapeutic applications have been documented across various traditional medicinal practices, including Ayurveda, Unani, Siddha, and Traditional Chinese Medicine (Gupta et al.

2022). *T. bellirica* is found in deciduous forests across a greater portion of India, excluding arid areas. Its presence is noted in the upper Gangetic plains, Chota Nagpur, Bihar, Odisha, West Bengal, Konkan, Deccan, and the majority of South India (Kumar and Khurana, 2018). It is a large deciduous tree characterized by its broadly elliptical leaves. It possesses antibacterial, antioxidant, and anthelmintic properties. It is an Ayurvedic herb employed for both preventive and therapeutic applications. An important Ayurvedic formulation, Triphala consists of Bahada, Amla, and Harada (Gilani et al. 2008). Herbal medicines are derived from various plant components, including leaves, stems, roots, and bark. These preparations predominantly consist of biologically active compounds and are primarily utilized for the treatment of mild to chronic health conditions. In India, Ayurvedic remedies are widely practiced, with several Ayurvedic formulations used to cure colds, coughs, dysentery, and poor appetite (Yadav et al. 2012; Sharma et al. 2021). It is utilized in traditional medicine due to the extensive range of pharmacological effects linked to the biologically active secondary metabolites found in this plant. A diverse array of phytochemicals has been extracted from different parts of the plant, including alkaloids, coumarins, flavonoids, steroids, lignans, tannins, glycosides, terpenoids, and saponins which are responsible for various pharmacological activities like anti-diabetic, anti-microbial, anti-salmonella, anti-biofilm, anticancer, hepatoprotective, anti-pyretic and anti-diarrheal (Kumari et al. 2017; Rashed, 2021). This study focuses on the investigation of this medicinal tree, examining its morphology as well as its medicinal and pharmacological potentials.



**Plate 1:** Vegetative parts of *T. bellirica* (Photo credit: Sweta Mishra)

## MORPHOLOGY

*Terminalia bellirica*, typically grows to a height of 20 to 35 meters, with a straight trunk that can measure up to 2 meters in diameter. The leaves of *T. bellirica* are simple, alternate, and broadly ovate, measuring about 10 to 15 cm in length and 7 to 10 cm in width. They have a glossy surface with a rounded or heart-shaped base, and the leaf margin is smooth. The leaves are arranged in a spiral pattern towards the ends of branches, creating a dense canopy. Flowers of *T. bellirica* are small, yellowish-white, and arranged in spikes that are about 10 to 15 cm long. These flowers are bisexual, meaning they contain both male and female reproductive organs. The flowering season generally occurs from April to June. The fruit is a distinctive feature of *T. bellirica*. It is a drupe, oval or ellipsoid in shape, and measures about 2 to 4 cm in length. The fruit is green when unripe and turns a yellowish-brown or greyish color upon maturity. The surface of the fruit is covered with fine, velvety hairs. Inside the fruit is a single, large seed that is hard and dark brown (Saxena and Brahman, 1995; Gupta et al. 2020; Kumar et al. 2022; Plate 1).

## MEDICINAL USES

Various parts of the *T. bellirica* plant are used for their therapeutic properties (Chanda et al. 2013; Gupta et al. 2020; Rashed, 2021; Sharma et al. 2021):

**Fruits:** The fruits are used to treat respiratory conditions such as asthma and bronchitis, helping to clear the airways and reduce inflammation. They may have hepatoprotective properties, aiding in liver function and helping to manage hepatitis. The fruit is known for its astringent properties, which help to treat diarrhea by reducing intestinal motility. It can help to alleviate

symptoms of piles (hemorrhoids) by reducing inflammation and pain. It aids in digestion and can relieve symptoms of indigestion. They are also used to treat various eye conditions due to their anti-inflammatory and antioxidant properties. It can soothe the throat and restore normal voice in cases of hoarseness. Traditional use includes applying the fruit to neutralize venom and reduce pain from scorpion stings. The fruit is believed to promote hair growth and improve hair health. It helps in regulating menstrual cycles and alleviating related symptoms. Green fruit decoction is specifically used to treat coughs. The pulp is used to treat diarrhoea and leprosy due to its antimicrobial and astringent properties. It can be applied to reduce the symptoms of piles. The ripen fruit acts as a strong laxative, helping in clearing the bowels. It may have sedative properties, providing relief from pain and inducing sleep.

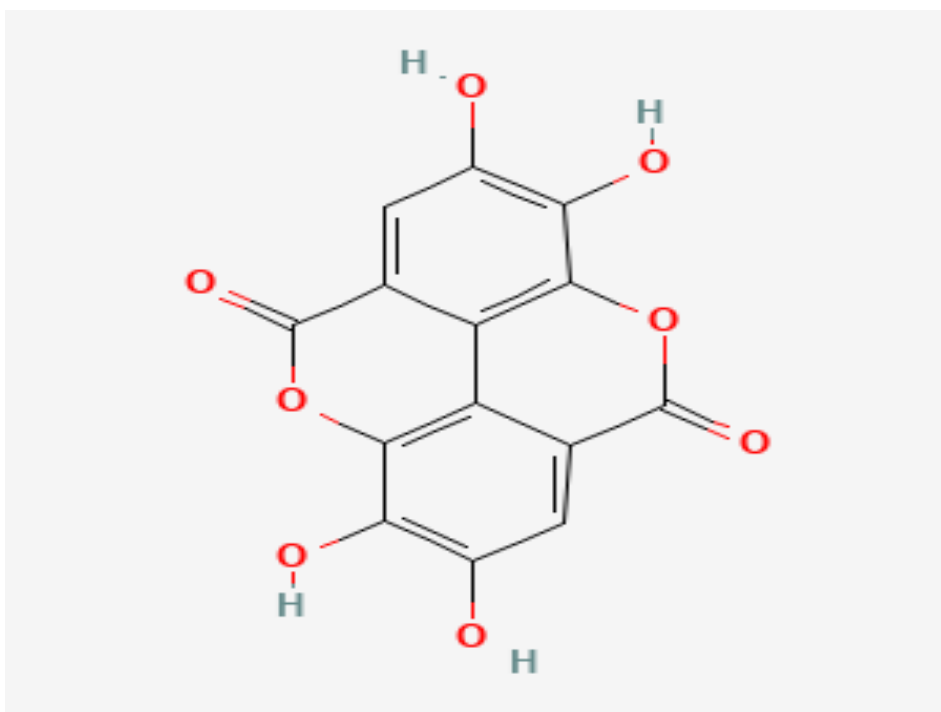
**Bark:** The gum and kernel oil are used as a laxative. These are applied to alleviate symptoms of rheumatism, such as joint pain and stiffness.

**Leaves:** The leaves can help improve appetite. They are used to treat hemorrhoids by reducing inflammation and discomfort. The leaves have properties that help in lowering cholesterol levels and blood pressure, contributing to overall heart health. They help to strengthen the immune system. The leaves have antioxidant properties, which help in slowing down the aging process.

This plant is highly valued in traditional medicine for its wide range of therapeutic uses, particularly for digestive, respiratory, and immune system health.

## BIOACTIVE COMPOUNDS

*T. bellirica* is renowned for its medicinal properties in traditional medicine, particularly in Ayurveda. This tree's therapeutic potential is largely attributed to its diverse range of bioactive compounds, including tannins, flavonoids, phenolic acids, saponins, and triterpenoids (Kumar et al. 2023). Among the tannins, ellagitannins and gallotannins are especially significant, known for its potent antioxidant, anti-carcinogenic, and anti-inflammatory properties. Flavonoids, particularly quercetin and rutin, further enhance its medicinal value (Kumar et al. 2010; Sharma et al. 2010). The phenolic acids, mainly gallic and ellagic acids (Figure 1), known for antioxidant and anti-inflammatory capabilities, contributing to its role in traditional remedies for various ailments.



**Figure 1:** Structure of ellagic acids (Source: PubChem)

Saponins, exhibit antimicrobial and immunomodulatory properties, making them effective against a wide range of pathogens, including bacteria, fungi, and viruses (Kumari et al. 2017). Triterpenoids, including belleric acid and beta-sitosterol, also play a vital role in the plant's therapeutic efficacy. *T. bellirica* stands as a remarkable example of nature's pharmacy, offering a wealth of bioactive compounds with significant health benefits that continue to be harnessed both in traditional practices and modern pharmacology (Gupta et al. 2020).

### PHARMACOLOGICAL ACTIVITIES

*T. bellirica* exhibits a wide range of pharmacological activities. The fruits are rich in bioactive compounds such as tannins, flavonoids, phenolic acids, and triterpenoids, which contribute to its diverse therapeutic properties (Saraswathi et al. 2012). One of the most prominent pharmacological activities of *T. bellirica* is its antioxidant capacity, primarily due to the presence of compounds like ellagic acid and gallic acid (Khan and Gilani, 2010; Sharma et al. 2021). These antioxidants help in neutralizing free radicals, thereby reducing oxidative stress and preventing cellular damage, which is crucial in managing chronic diseases like cancer, diabetes, and cardiovascular disorders (Kumar et al. 2010). Additionally, *T. bellirica* possesses significant anti-inflammatory activity, which is beneficial in treating conditions associated with inflammation, such as arthritis, asthma, and gastrointestinal disorders. The anti-inflammatory effect is largely attributed to its ability to inhibit pro-inflammatory mediators and enzymes (Nag and De, 2011; Saraswathi et al. 2012). Moreover, *T. bellirica* has demonstrated potent antimicrobial properties, effective against a wide range of pathogens, including bacteria,

fungi, and viruses, making it useful in treating infections and promoting wound healing. The fruit also exhibits hepatoprotective activity, protecting the liver from damage caused by toxins and diseases, which is supported by its traditional use in managing liver disorders (Chanda et al. 2013; Hanem et al. 2015). Furthermore, *T. bellirica* shows hypolipidemic activity, aiding in the reduction of cholesterol levels and thus playing a role in cardiovascular health. Its immunomodulatory effects, which enhance the body's immune response, further contribute to its therapeutic potential (Sabnis, 2014). Overall, the pharmacological activities of *T. bellirica* make it a valuable medicinal resource in preventing and treating various health conditions (Madani and Jain, 2008).

## CONCLUSION

*T. bellirica* is a prominent medicinal tree with a rich heritage in traditional Indian medicine. Its therapeutic efficacy is largely attributed to its complex array of bioactive compounds. Despite its established traditional uses, continued scientific research is essential to fully elucidate and validate these medicinal properties, potentially leading to the development of new therapeutic agents. The integration of *T. bellirica* into modern pharmacological practices could offer valuable insights into natural remedies and promote its use in contemporary healthcare systems.

## REFERENCES

- Chanda S, Menpara D and Desai D. (2013). Antimicrobial activity of *Terminalia bellirica* leaf and stem collected from two different sites. American Journal of Phytomedicine and Clinical Therapeutics. 1(9): 721-733.



- Gilani AH, Khan AU, Ali T and Ajmal S. (2008). Antispasmodic and bronchodilatory properties of *Terminalia belirica* fruit, Journal of Ethnopharmacology. 116: 528-538.
- Gupta A, Kumar R, Bhattacharyya P, Bishayee A and Pandey AK. (2022). *Terminalia bellirica* (Gaertn.) roxb. (Bahera) in health and disease: A systematic and comprehensive review. Phytomedicine. <https://doi.org/10.1016/j.phymed.2020.153278>.
- Hanem AM, Fathalla AA and Mohamed AM. (2015). Evaluation of Total Phenol, Anticancer and Antioxidant Properties by Different Extracts of *Terminalia Belerica* Roxb. Leaves: An in vitro Analysis. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 6(3):360-67.
- Khan AK and Gilani AH. (2010). Antisecretory and analgesic activities of *Terminalia bellirica*, African Journal of Biotechnology. 9(18): 2717-2719.
- Kumar A, Gupta RK and Kumar A. (2023). *Terminalia Bellirica*: A wonderful Medicinal Tree. Just Agriculture. 3(10): 457-459.
- Kumar B, Divakar K, Tiwari P, Salhan P and Goli D. (2010). Evaluation of anti-diarrhoeal effect of aqueous and ethanolic extracts of fruits pulp of *Terminalia bellirica* in rats. International Journal of Drug Development and Research. 2(4):769-779.
- Kumar N and Khurana SMP. (2018). Phytochemistry and medicinal potential of the *Terminalia bellirica* Roxb. (Bahera). Indian Journal of Natural Products and Resources. 9(2): 97-107.
- Kumar S, Mishra S, Mishra AK and Kumar SN. (2022). Floral diversity of Koira & Barsuan Ranges Bonai Forest Division, Odisha. Bonai Forest Division and Ambika Prasad Research Foundation, Odisha; APRF Publishers, India.
- Kumari S, Joshi AB, Gurav S, Bhandarkar AV, Agarwal A, Deepak M, Gururaj GM. (2017). A pharmacognostic, phytochemical and pharmacological review of *Terminalia bellerica*. Journal of Pharmacognosy and Phytochemistry. 6(5): 368-76.

- Madani A and Jain SK. (2008). Anti-salmonella activity of *Terminalia bellirica*: in vitro and in vivo Studies. Indian Journal of Experimental Biology. 46: 817-821.
- Nag G and De BR. (2011). Acetylcholinesterase inhibitory activity of *Terminalia chebula*, *Terminalia bellerica* and *Emblica officinalis* and some phenolic compounds. International Journal of Pharm Pharm Sciences. 3(3):121-4.
- Nayak S and Kumar S. (2023). Medicinal plants used by tribals of Odisha. State Medicinal Plants Board, Odisha, India & Ambika Prasad Research Foundation, Odisha, India.
- Rashed K. (2021). *Terminalia bellerica* Roxb: an important medicinal plant: A review. South Asian Journal of Agricultural Sciences. 1(2): 102-105.
- Sabnis S. (2014). Antimicrobial efficacy of *Terminalia bellerica* against virulence factors of respiratory pathogens. International Journal of Current Microbiology and Applied Sciences. 3:215-21.
- Saraswathi MN, Karthikeyan M, Kannan M and Rajasekar S. (2012). *Terminalia bellirica* Roxb.-A phytopharmacological review. International Journal of Pharmacy & Biomedical Research. 3(1): 96-99.
- Saxena HO and Brahman M. (1995). The flora of Orissa, Orissa Forest Development Co. Ltd., Bhubaneswar, Vol-II. p-668.
- Sharma P, Verma KK, Raj H and Thakur N. (2021). A review on ethnobotany, phytochemistry and pharmacology on *Terminalia belerica* (Bibhitaki), Journal of Drug Delivery and Therapeutics. 11(1-s): 173-181.
- Sharma US, Sharma UK and Singh A. (2010). Screening of *Terminalia bellirica* fruits extracts for its analgesic and antipyretic activities. Jordan Journal of Biological Sciences. 3(3):121-4.
- Yadav S, Singh S, Sharma P, Thapliyal A and Gupta V. (2012). Antibiofilm formation activity of *Terminalia bellerica* plant extract against clinical isolates of *Streptococcus mutans* and *Streptococcus sobrinus*: Implication in oral hygiene. International Journal of Pharmaceutical and Biological Archive. 3(4): 816-821.