

Terminalia chebula Retz. (Harad): A medicinal tree of India

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Abstract

Terminalia chebula Retz. (Harad), a member of the family Combretaceae, is one of the most important medicinal tree species of Bihar and Jharkhand states of India. Widely distributed in tropical and subtropical forests, it holds a prominent place in traditional healthcare systems such as Ayurveda, Siddha, Unani, and Chinese medicine. The species is valued for its dried fruits, which are extensively used in the treatment of gastrointestinal, respiratory, cardiovascular, and metabolic disorders. Phytochemical investigations have identified nearly 149 bioactive compounds, including tannins, phenolic acids, flavonoids, lignans, and triterpenes, which contribute to diverse pharmacological activities such as antioxidant, anti-inflammatory, antimicrobial, anticancer, hepatoprotective, neuroprotective, and antidiabetic effects. Beyond its medicinal significance, it plays a vital ecological role by providing food and habitat for wildlife, facilitating seed dispersal, enhancing soil fertility, and supporting biodiversity conservation. The species also possesses considerable economic value through its use in herbal pharmaceuticals, leather tanning, natural dye production, and rural livelihoods. Owing to its multifaceted importance, *T. chebula* represents a valuable forest resource requiring sustainable management and conservation to ensure its continued contribution to human well-being, biodiversity conservation, and ecosystem stability.

Keywords: Biodiversity Conservation, Harad, Medicinal Plants, Phytochemistry

Introduction

Terminalia chebula Retz., commonly known as Harad, is a highly valued medicinal tree belonging to the family Combretaceae (Bag et al., 2013). The species is widely distributed across the tropical and subtropical regions of South and Southeast Asia, including India, Nepal, Sri Lanka, Bangladesh, Myanmar, Thailand, and southern China (Hassan et al., 2022). In India, it occurs naturally in deciduous and mixed forests, extending from the Himalayan foothills to Central India, the Eastern and Western Ghats, and several forest landscapes of Bihar and Jharkhand. Owing to its remarkable medicinal efficacy and long history of use, Harad occupies a distinguished position in traditional healthcare systems such as Ayurveda, Siddha, Unani, and Traditional Chinese Medicine (Gao et al., 2024). In Ayurveda, it is revered as the “King of Medicines” and is considered

one of the most important rejuvenating herbs. The dried fruits of *T. chebula* have been used for centuries to treat a wide range of ailments, including gastrointestinal disorders, respiratory diseases, skin conditions, metabolic syndromes, and infectious diseases (Maruthappan and Shree, 2010). Recent scientific investigations have further validated many of these traditional claims by revealing the presence of diverse bioactive compounds with significant pharmacological properties. Growing interest in plant-based therapeutics, natural products, and evidence-based traditional medicine has renewed attention toward this species as a promising source of novel bioactive molecules and healthcare products. Despite its immense medicinal, ecological, and economic importance, information on *T. chebula* is often scattered across ethnobotanical, pharmacological, and ecological literature. Therefore, a comprehensive review is essential to consolidate existing knowledge and provide an updated understanding of the species. Such a synthesis is particularly important for researchers, conservation biologists, forest managers, pharmaceutical scientists, and policymakers working in the fields of medicinal plant conservation and sustainable utilization. This review aims to present a concise yet comprehensive account of the taxonomy, distribution, botanical characteristics, traditional uses, phytochemistry, therapeutic potential, ecological significance, and economic value of *T. chebula*.

Distribution and habitat

T. chebula is widely distributed across the Indian subcontinent. It grows naturally in mixed deciduous forests, dry forests, and moist deciduous forests. The species thrives in regions receiving annual rainfall between 750 and 2500 mm and can tolerate a wide range of soil conditions, including sandy loam, lateritic, and alluvial soils. The tree is commonly found at elevations up to 1500 meters above sea level. It is a common tree species of forest areas (Hassan et al., 2022).

Morphology

T. chebula is a medium to large-sized deciduous tree attaining a height of 15–30 m with a straight cylindrical bole and spreading crown. The bark is dark brown to blackish, longitudinally cracked, and exfoliates in irregular scales. The inner bark is yellowish-brown. Leaves are simple, opposite or sub-opposite, elliptic to ovate, measuring 7–20 cm long and 4–10 cm broad. They possess a glossy upper surface and are borne on short petioles. Small glands are often present near the leaf base. Flowers are small, yellowish-white, and arranged in terminal or axillary spikes (Figure 1). They emit a characteristic strong odour and bloom during April to June. The fruit is an ovoid to ellipsoid drupe, 2–5 cm long, with five distinct longitudinal ridges. Fruits turn yellow to brown upon maturity and contain a single hard seed (Figure 2). Fruiting generally occurs from November to February (Saxena and Brahmam, 1995).



Figure 1: Flowers of Harad in wild

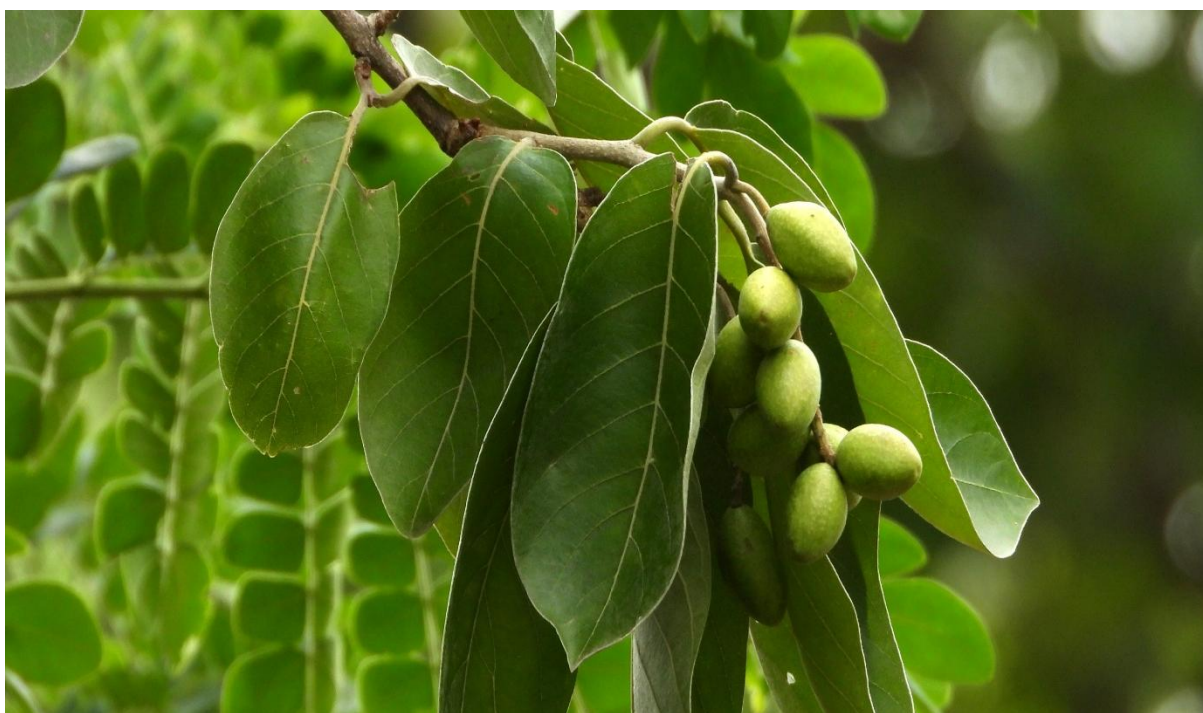


Figure 2: Fruits of Harad in wild

Traditional uses

The fruits of *T. chebula* have been widely used as both food and medicine across Asia since ancient times. According to the Chinese Pharmacopoeia, the dried mature fruits are valued for their astringent properties and are traditionally prescribed for chronic diarrhoea, dysentery, cough, sore throat, voice loss, and respiratory ailments. In the Ayurvedic and Siddha systems of medicine, *T. chebula* fruits are used to manage a wide range of disorders, including gastrointestinal diseases, asthma, ulcers, diabetes, cardiovascular ailments, skin diseases, urinary disorders, and memory-related conditions. They are also recognized for their diuretic, antitussive, and wound-healing properties (Nigam et al., 2020).

Ecological importance

It is an ecologically important tree species that contributes significantly to the structure and functioning of tropical forest ecosystems. The tree provides valuable food resources for a wide range of wildlife, including monkeys, langurs, deer, squirrels, and numerous bird species. Its nutrient-rich fruits are consumed by these animals, many of which play a crucial role in seed dispersal, thereby facilitating the natural regeneration and distribution of the species across forest landscapes. In addition, the tree offers nesting, roosting, and sheltering sites for birds and provides shade and refuge for various forest-dwelling animals. The species also plays a vital role in soil and watershed conservation. Its deep and extensive root system helps stabilize soil, reduce erosion, and maintain slope integrity, particularly in hilly and degraded areas. The annual shedding of leaves contributes substantial organic matter to the forest floor, enhancing soil fertility, improving moisture retention, and promoting nutrient cycling. Furthermore, as a native component of tropical deciduous and semi-evergreen forests, *T. chebula* supports a diverse assemblage of insects, pollinators, birds, and mammals, thereby strengthening ecological interactions and contributing to the conservation of biodiversity. Through its multiple ecological functions, *Terminalia chebula* helps maintain ecosystem stability, resilience, and overall forest health (Shabbir et al., 2016; Wang et al., 2024).

Medicinal uses and bioactive compounds

Research to date has revealed nearly 149 bioactive compounds in the plant, comprising tannins, phenolic acids, lignans, triterpenes, flavonoids, and volatile constituents. These phytochemicals are responsible for a wide range of biological properties demonstrated through both in vitro and in vivo studies, including antioxidant, anti-inflammatory, antiviral, anticancer, antibacterial,

hepatoprotective, nephroprotective, neuroprotective, and antidiabetic activities. Several of these therapeutic effects have already found applications in clinical practice (Wang et al., 2024).

Economic significance

T. chebula is an economically significant multipurpose tree species with considerable value in traditional medicine, industry, and rural livelihoods. Its dried fruits are extensively used in the Ayurvedic, Siddha, Unani, and herbal pharmaceutical industries, where they serve as a key ingredient in numerous medicinal formulations, including the renowned Triphala preparation. The fruits are rich in tannins, making them an important raw material for the leather tanning industry and for the production of natural dyes. Extracts from the fruits yield yellow to brown pigments that are utilized in textile dyeing and handicrafts. In addition, the wood of *T. chebula*, though not a major timber resource, is moderately durable and locally used for making agricultural implements, packing cases, and fuelwood. Owing to its diverse applications and sustained market demand, *T. chebula* contributes significantly to the herbal medicine trade and the livelihoods of rural communities engaged in its collection and processing (Afshari et al., 2016).

Conclusion

Harad is a medicinal forest tree of Bihar and Jharkhand. Its fruits are among the most valued herbal resources in traditional medicine systems, while the species contributes substantially to forest biodiversity, wildlife sustenance, and ecosystem functioning. Increasing anthropogenic pressures and unsustainable harvesting practices necessitate focused conservation efforts. Sustainable management, habitat protection, and large-scale plantation programmes can ensure the long-term survival and continued benefits of this remarkable medicinal tree species. Harad thus represents an invaluable component of India's forest wealth and a vital resource for both human well-being and biodiversity conservation.

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