

## 6

**Ethnomedicinal and ecological importance of *Hymenodictyon orixense***

**Bidhan Chandra Roy<sup>1</sup>, Bhagwati Prashad Sharma<sup>2</sup>, Kishore Thakur<sup>3</sup>,  
and Sweta Mishra<sup>4\*</sup>**

<sup>1</sup>Department of Botany, Dinabandhu Mahavidyalaya, Bongaon  
West Bengal, India

<sup>2</sup>Department of Botany, Sidharth Government College, Nadaun, Himachal  
Pradesh, India

<sup>3</sup>Department of Botany, Bhima Bhoi College, Rairakhol, Sambalpur, Odisha,  
India

<sup>4</sup>Ambika Prasad Research Foundation, Odisha, India

**\*E-mail:** swetamishra.aprf@gmail.com

**DOI:**

### ABSTRACT

*Hymenodictyon orixense* (Roxb.) Mabb. (family Rubiaceae), a medicinally significant deciduous tree widely distributed in tropical regions of India and Southeast Asia. The species has long been utilised in traditional healthcare systems for treating wounds, inflammation, infections and various systemic disorders. The plant contains diverse bioactive compounds such as iridoid glycosides and coumarins, which contribute to its pharmacological activities. Ecologically, it plays a role as a sub-canopy tree in semi-evergreen forests, contributing to forest structure and biodiversity. However, overexploitation and habitat degradation have led to population decline. This review highlights the ethnomedicinal applications, pharmacology and ecological significance of *H. orixense*, emphasising the need for conservation and sustainable utilisation.

**Keywords:** Medicinal trees, ecology, ethnomedicine, pharmacological values

### INTRODUCTION

The genus *Hymenodictyon* comprises approximately 30 species of flowering plants within the family Rubiaceae. *H. orixense* is a deciduous tree reaching 20-25 m in height, characterised by dark grey bark, simple opposite leaves, and terminal racemose inflorescences (Chakraborty et al. 2017). It is predominantly distributed in semi-evergreen forests, particularly in the

Western Ghats of India, up to an altitude of about 500 m and the Shivalik foothills of Western Himalaya upto an altitude of 800 m. It is commonly known as the Bridal Couch Tree, Bhorsal, Kadambu, Bhurkund, Kudkan, Kusan, Bhorkud, Kukurkat, Diddi Mara and Kala Bachnag in various regional languages (Chakraborty et al. 2017). The species is also found in several Asian countries, including India, China and the Philippines, with its distribution extending across the East and West Himalayan regions, Bangladesh, Cambodia, Laos, Nepal, Myanmar, Sri Lanka, Vietnam, Thailand and South-Central China (Kumari and Jain 2025). The plant has been widely used by ethnic communities across India for the treatment of numerous ailments, including skin diseases, inflammation, fever, atrophy, ulcerative wounds, sores, cholera, malaria, liver disorders, body swelling, diarrhoea, gout, menstrual disorders, snakebite and smallpox (Jain 1991; Jaina and Jain 2016). Phytochemical investigations have revealed the presence of diverse bioactive compounds, and the plant exhibits several pharmacological activities such as antioxidant, antimicrobial, antimalarial, antipyretic, anti-atherothrombotic, central nervous system depressant, cytotoxic and acetylcholinesterase inhibitory effects (Reddy and Chaturvedi 2010; Suchaichit et al. 2018). Besides this, *H. orixense* plays an important ecological role in tropical forests by contributing to habitat structure, supporting biodiversity, and enhancing nutrient cycling and carbon sequestration. Its efficient seed dispersal aids in forest regeneration, and it serves as an indicator of ecosystem health while participating in key ecological interactions (Chaturvedi et al. 2011). However, increasing anthropogenic pressures threaten its populations, highlighting the need for conservation and sustainable management.

## MORPHOLOGY

*H. orixense* is a medium-sized deciduous tree that typically attains a height of 10-20 m and is characterised by a straight bole and spreading crown. Young branchlets are glabrous or slightly pubescent and exhibit a greenish to brown colouration. The leaves are simple, opposite, and large, broadly ovate to elliptic in shape, measuring approximately 10-25 cm in length, with an entire margin, acute to acuminate apex and a rounded or cordate base. The leaf surface is glabrous above and slightly pubescent beneath, with prominent lateral veins and a well-developed reticulate venation pattern. Interpetiolar stipules are present and conspicuous (Saxena and Bramham 1995).

The inflorescence is typically terminal or axillary, arranged in lax racemes or panicles bearing numerous small flowers. The flowers are bisexual,

actinomorphic and creamy white to pale yellow in colour. The calyx is reduced, while the corolla is tubular with five lobes, consistent with the floral morphology of the family. The androecium consists of five epipetalous stamens and the gynoecium is bicarpellary with an inferior ovary. The fruit is a characteristic, elongated, pendulous capsule that dehisces longitudinally to release numerous small, flat, winged seeds adapted for wind dispersal (Reddy and Chaturvedi 2010; Figure 1).

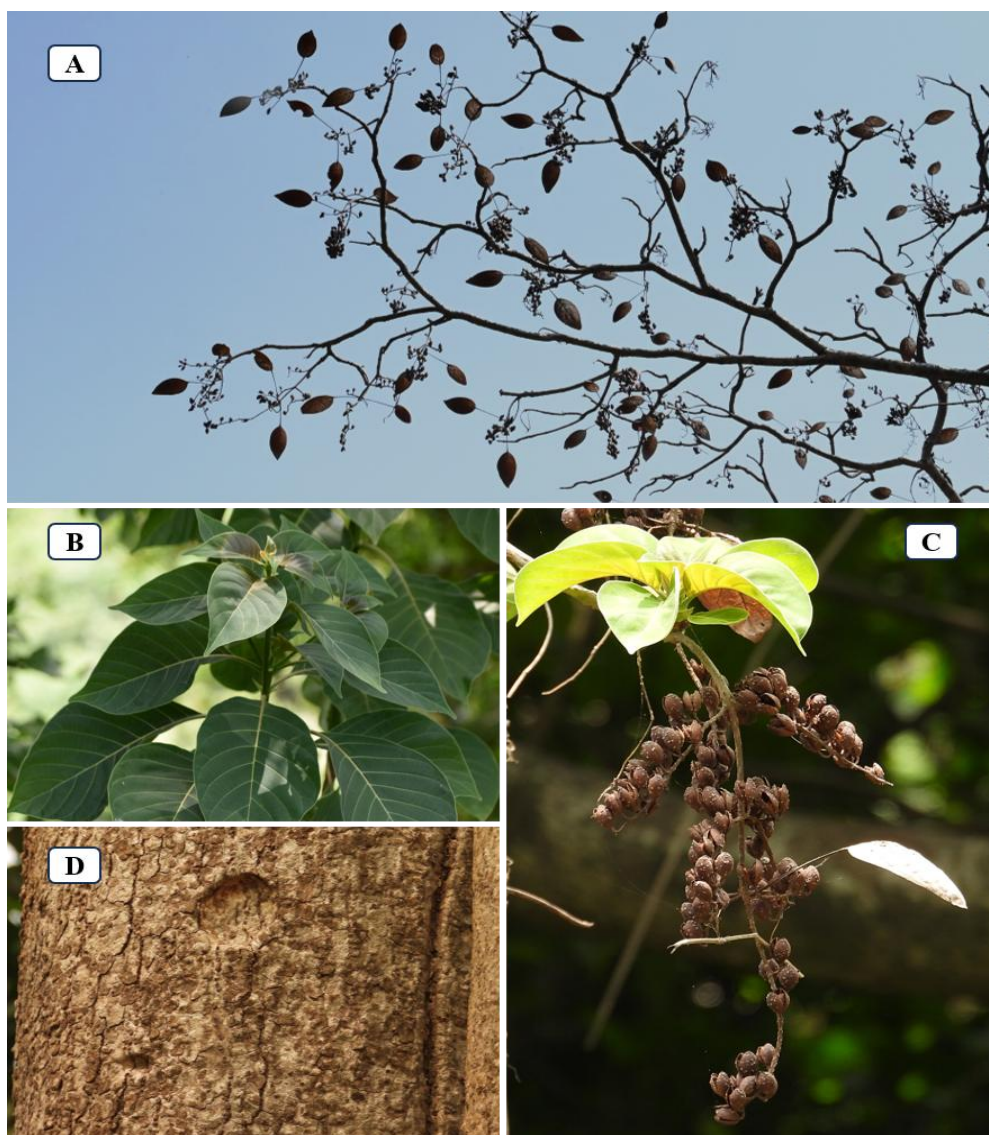


**Figure 1:** Vegetative parts of *H. orixense*; A) Canopy, B) Leaves, C) Fruits, D) Bark

## ECOLOGICAL SIGNIFICANCE

*H. orixense* plays a significant role in maintaining the structure and functioning of tropical forest ecosystems, particularly in semi-evergreen and moist deciduous forests (Figure 2). As a medium-sized deciduous tree, it commonly occurs in the sub-canopy layer, where it contributes to vertical stratification and enhances habitat complexity. This structural role is essential for supporting diverse flora and fauna, including insects, birds and small mammals, thereby promoting overall biodiversity (Pascal et al. 2004). The species also contributes to nutrient cycling through leaf litter decomposition, which enriches soil organic matter and improves soil fertility. Its broad leaves facilitate efficient photosynthesis and carbon sequestration, thus playing a role in carbon cycling and climate regulation within forest ecosystems (Chaturvedi et al. 2011). The reproductive biology of *H. orixense*, characterised by the production of numerous lightweight, winged seeds, facilitates effective wind dispersal, enabling colonisation of open or disturbed habitats and aiding in forest regeneration processes. Additionally, as a native species, it serves as an indicator of forest health and ecological stability, particularly in undisturbed or minimally disturbed habitats (Reddy and Chaturvedi 2010). The species also supports ecological interactions such as pollination and herbivory, contributing to the complexity of food webs. However, anthropogenic pressures such as deforestation, habitat fragmentation, and overharvesting for medicinal purposes have led to a decline in its natural populations, potentially disrupting these ecological functions. Therefore, conservation and sustainable management of *H. orixense* are crucial not only for preserving its medicinal value but also for maintaining ecosystem balance and biodiversity.

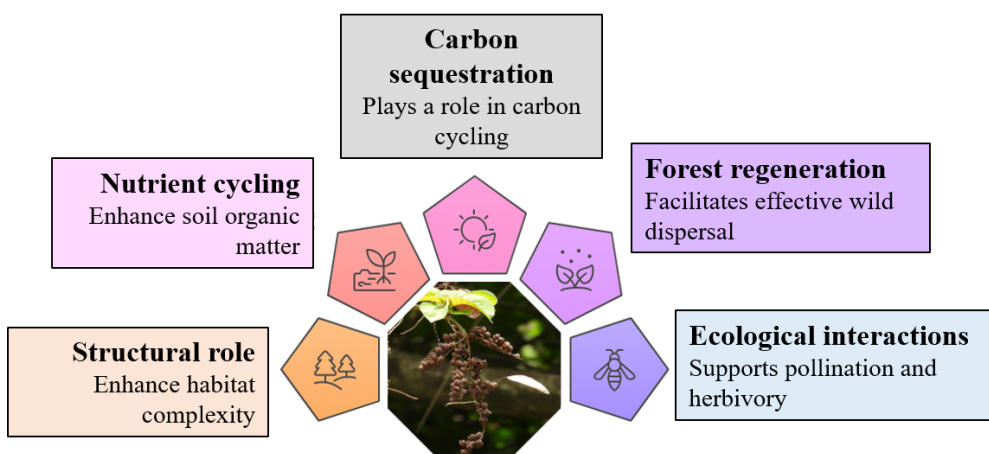


**Figure 2:** Ecological significance of *H. orixense*

### MEDICINAL SIGNIFICANCE

*H. orixense* is an important ethnomedicinal tree widely utilised in traditional healthcare systems across India and Southeast Asia. Indigenous communities have long relied on this species for the treatment of a variety of ailments, particularly those related to wounds, inflammation, infections and chronic diseases. Among plant parts, bark is most widely used and has traditionally been applied to treat wounds, ulcers, skin diseases and inflammatory conditions. Bark decoctions are administered internally for fever and chronic infections, while its paste is applied externally to promote wound healing and reduce swelling (Jagdishprasad and Rao 1998; Reddy and Chaturvedi 2010).

The leaves of *H. orixense* are also widely employed in ethnomedicine, particularly for treating skin infections, cuts and burns. Fresh leaf paste is commonly applied topically to affected areas to prevent infection and accelerate healing. Such uses are consistent with experimental findings indicating significant antimicrobial activity in leaf extracts (Reddy and Chaturvedi 2010). The roots of the plant are used in the form of decoctions to treat fever, digestive disorders and general weakness, indicating their role in systemic therapy within traditional medicine. In addition, the whole plant is sometimes used as a general tonic and for managing chronic inflammatory conditions, reflecting its broader therapeutic relevance in indigenous healthcare systems (Badnale et al. 2026).

One of the most prominent ethnomedicinal applications of *H. orixense* is in wound healing. Tribal communities frequently use bark and leaf preparations to enhance wound contraction, prevent microbial infection and promote tissue regeneration. It is used in the treatment of swelling, pain and rheumatic conditions. It is traditionally employed as an antimicrobial agent against various bacterial and fungal infections, as well as an antipyretic for managing fever (Reddy and Chaturvedi 2010; Badnale et al. 2025).

### PHARMACOLOGICAL USES

The pharmacological efficacy of *H. orixense* is primarily attributed to its rich phytochemical composition, including iridoids (e.g. loganin), coumarins (scopoletin and scopolin) and other glycosidic compounds. These bioactive constituents are known to exhibit multiple therapeutic effects, including antimicrobial, anti-inflammatory, antioxidant and enzyme inhibitory activities. The wide range of pharmacological properties exhibited by *H. orixense* highlights its potential as a valuable source for the development of

novel drugs and supports its continued use in traditional and modern medicine (Badnale et al. 2026).

### **Antimicrobial activity**

*H. orixense* has attracted considerable scientific attention due to its diverse pharmacological activities, which substantiate its extensive use in traditional medicine. Various studies have demonstrated that the bark and leaves exhibit significant antimicrobial activity against a broad spectrum of bacterial and fungal pathogens. This validates its traditional application in treating infections and wound-related complications (Badnale et al. 2026).

### **Anti-inflammatory activity**

The plant is also known for its pronounced anti-inflammatory activity, which is attributed to the presence of bioactive compounds such as iridoid glycosides and coumarins. These compounds help in reducing inflammation and associated pain, supporting its ethnomedicinal use in treating swelling, rheumatism and inflammatory disorders (Jagdishprasad and Rao 1998).

### **Antioxidant properties**

In addition, *H. orixense* has been reported to possess antioxidant properties, which play a crucial role in neutralising free radicals and preventing oxidative stress-related cellular damage. This activity suggests its potential role in managing chronic diseases such as cardiovascular disorders and ageing-related conditions (Badnale et al. 2026).

### **Anticoagulant activity**

It also exhibits anticoagulant activity, indicating its possible application in preventing blood clot formation and improving circulatory health (Badnale et al. 2025).

### **Neuroprotective potential**

Recent phytochemical investigations have revealed that extracts of *H. orixense* demonstrate acetylcholinesterase inhibitory activity, suggesting promising neuroprotective potential and possible application in the management of neurodegenerative diseases such as Alzheimer's disease (Suchaichit et al. 2018).

## CONCLUSION

*Hymenodictyon orixense* emerges as a plant of considerable significance due to its dual role in traditional medicine and ecosystem functioning. Ethnomedicinally, it is widely utilised by indigenous and rural communities for the treatment of wounds, infections, inflammation, and various systemic ailments, reflecting a rich body of traditional knowledge associated with this species. The presence of bioactive compounds such as iridoid glycosides and coumarins further supports its therapeutic potential, many of which have been validated through pharmacological studies. Ecologically, the species contributes to forest structure and stability as a sub-canopy tree in semi-evergreen and moist deciduous forests. However, increasing anthropogenic pressures such as overexploitation for medicinal use and habitat degradation pose a serious threat to its natural populations. Therefore, there is an urgent need to integrate traditional knowledge with modern conservation strategies to ensure its sustainable utilisation. Conservation measures, including in-situ protection, cultivation, and awareness among local communities, are essential for preserving this valuable species.

## REFERENCES

- Badnale A, Meshram S, Chalak N, Ghagare A, Patil S, Muley M, Prasad S and Itankar P. (2026). HPTLC-based quantitative analysis of scopoletin and in vitro antioxidant and antimicrobial evaluation of *Hymenodictyon orixense* Roxb. bark. Research Square. DOI: 10.21203/rs.3.rs-8549856/v1.
- Chakraborty P, Sasi S, Nair AA, Anjum N and Tripathi YC. (2017). Medicinal applications, phytochemistry and pharmacology of *Hymenodictyon excelsum* (Roxb.) Wall: A review. Organic & Medicinal Chemistry International Journal. 2(3): 555589.
- Chaturvedi RK, Raghubanshi AS and Singh JS. (2011). Carbon density and accumulation in woody species of tropical dry forest in India. Forest Ecology and Management. 262(8): 1576–1588.
- Jagdishprasad D and Subba Rao N. (1988). Anti-coagulant, anti-inflammatory and sun-screening effects of *Hymenodictyon excelsum*. Indian Journal of Pharmacology. 20: 221–222.
- Jain SK. (1991). *Dictionary of Indian Folk Medicine and Ethnobotany*. New Delhi: Deep Publications.

- Jain V and Jain SK. (2016). *Compendium of Indian Folk Medicine and Ethnobotany (1991–2015)*. New Delhi: Deep Publications.
- Kumari A and Jain V. (2025). Phytochemical composition and GC-MS analysis of *Hymenodictyon orixense* Mabb. leaves. GSC Biological and Pharmaceutical Sciences. 32(3): 156–179.
- Pascal JP, Ramesh BR and Franceschi DD. (2004). Wet evergreen forest types of the southern Western Ghats, India. Tropical Ecology. 45: 281–291.
- Reddy M and Chaturvedi AA. (2010). Pharmacognostical studies of *Hymenodictyon orixense* (Roxb.) Mabb. leaf. International Journal of Ayurveda Research. 1(2): 103–105.
- Saxena HO and Brahmam M. (1995). *The Flora of Orissa*. Bhubaneswar: Orissa Forest Development Corporation and Regional Research Laboratory.
- Suchaichit N, Kanokmedhakul S, Kanokmedhakul K, Moosophon P, Boonyarat C, Plekratoke K, Tearavarich R and Suchaichit NP. (2018). Phytochemical investigation and acetylcholinesterase inhibitory activity of bark of *Hymenodictyon orixense*. Natural Product Research. 32(24): 2936–2939.