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Review Article

Common threatened medicinal plants of Odisha, India: diversity, traditional uses and conservation perspectives

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Abstract: Odisha, located on the eastern coast of India, is recognized as one of the floristically rich states of the country owing to its varied physiography, climate and cultural traditions. The state harbours a remarkable diversity of medicinal plants that form the backbone of traditional healthcare systems such as Ayurveda, folk medicine and indigenous healing practices. However, increasing anthropogenic pressures, habitat loss, overexploitation, climate change and lack of sustainable management have pushed many valuable medicinal plant species towards threatened categories. The present study provides a comprehensive account of some common threatened medicinal plants of Odisha, India, with particular emphasis on their habit, family affiliation and traditional medicinal uses. Based on secondary data compiled from published literature, highlighting some threatened tree, shrub, herb and climber species such as *Saraca asoca*, *Rauvolfia serpentina*, *Pterocarpus santalinus*, *Cycas* species and several others that play a crucial role in human health and local livelihoods. The study discusses methodological approaches for documenting threatened medicinal plants, analyzes their ethnomedicinal significance and evaluates conservation challenges. Future research directions and conservation strategies were proposed to ensure sustainable utilization and long-term survival of these invaluable biological resources.

Keywords: Biodiversity conservation, ethnomedicine, Odisha, sustainable use, traditional knowledge

Introduction

India is globally recognized as one of the twelve mega-biodiversity countries of the world, harbouring nearly 8 % of the world's recorded species within just 2.4 % of the global land area (Chitale et al., 2014). Among Indian states, Odisha occupies a prominent position due to its rich floral diversity and long-standing tradition of plant-based medicine (Kumar et al., 2021; Behera et al., 2025). The state lies at

the confluence of the Eastern Ghats (Panda et al., 2020), the Chhota Nagpur plateau (Ghosh and Bera, 2023), coastal plains (Bera and Sourabh, 2024) and riverine ecosystems (Kumar et al., 2018), creating a mosaic of habitats that support a wide range of medicinal plant species. According to various floristic and ethnobotanical studies, Odisha supports thousands of vascular plant species, a significant proportion of which are used in traditional healthcare systems (Aradhana et al., 2022; Marndi et al., 2024; Pradhan et al., 2025). Medicinal plants have been integral to the cultural heritage and healthcare practices of indigenous and rural communities in Odisha (Nayak and Kumar, 2023). Tribal groups such as the Kondh, Santal, Bonda, Juang and Saora possess extensive traditional knowledge related to the identification, harvesting and therapeutic application of medicinal plants (Nayak and Kumar, 2023). This knowledge has been transmitted orally across generations and continues to provide primary healthcare to a large segment of the population, particularly in remote and forest-dominated regions (Kumar, 2015). Despite their immense value, many medicinal plants of Odisha are currently facing serious threats. Rapid deforestation, mining activities, agricultural expansion, urbanization, unsustainable harvesting practices and commercial exploitation have resulted in habitat degradation and population decline of several species (Ranjan et al., 2025). Many slow-growing trees and climbers with high medicinal demand are now categorized as threatened species. The erosion of traditional knowledge and lack of scientific validation further amplify the conservation crisis. In this context, documenting threatened medicinal plants and understanding their medicinal significance is a crucial step toward conservation planning. The present article focuses on selected threatened medicinal plants of Odisha, summarizing their habit, medicinal uses and importance in traditional medicine. Synthesizing information from published literature, the study aims to create awareness about the urgent need for conservation and sustainable utilization of these valuable plant resources.

Methodology

The present study is based on an extensive review of secondary data obtained from peer-reviewed research articles related to threatened plants of Odisha and their medicinal uses. Relevant literature was collected from scientific journals, books, conference proceedings and online databases such as PubMed, ScienceDirect, Google Scholar and ResearchGate (Dash et al., 2017; Jena et al., 2021; Kumar, 2025; Devi et al., 2025; Rani et al., 2025).

Results and discussion

The study highlights a diverse assemblage of threatened medicinal plants from Odisha, India, representing 24 species across 18 families, with a clear dominance of tree species, followed by climbers, shrubs and a few herbs (Table 1). Trees constitute the major life form, indicating that long-lived woody taxa with slow regeneration are particularly vulnerable yet culturally important. The medicinal uses recorded are wide-ranging, addressing gastrointestinal disorders, inflammatory conditions, arthritis, skin diseases, liver and cardiovascular problems, respiratory ailments and reproductive health, reflecting the depth of traditional healthcare systems in the region. Leaves are the most frequently utilized plant part, followed by roots, heartwood, stems, ovules and whole plants, suggesting comparatively lower destructive harvesting in some cases, although root and heartwood

use poses a higher conservation risk. Several species (*Rauvolfia serpentina*, *Saraca asoca*, *Pterocarpus santalinus* and *Mesua ferrea*) have well-documented pharmacological significance and high market demand, which further intensifies pressure on their wild populations. The study highlights the dual challenge of biodiversity conservation and preservation of ethnomedicinal knowledge, emphasizing the need for sustainable harvesting, cultivation strategies and habitat protection for threatened medicinal plants of Odisha. Some threatened plants are presented in Plate 1.



Plate 1: Common threatened plants of Odisha; a) *Saraca asoca*, b) *Litsea glutinosa*, c) *Rauvolfia serpentina*, d) *Mesua ferrea*, e) *Hypericum gaitii*, f) *Gnetum edule*, g) *Homalium napaulense*, h) *Uraria picta* and i) *Lasiococca comberi*

Diversity and habit of threatened medicinal plants: The threatened medicinal plants documented in the study represent a wide range of taxonomic families and growth forms. Trees constitute the dominant habit, followed by climbers, shrubs and herbs. The predominance of tree species highlights the vulnerability of long-lived plants that require several years to reach maturity and are often subjected to destructive harvesting practices, especially for bark, heartwood and roots. The diversity of habits

indicates that medicinal knowledge in Odisha encompasses plants from different forest strata, ranging from canopy trees to understory shrubs and climbers (Table 1).

Species-wise medicinal importance: *Saraca asoca* (Fabaceae) is one of the most revered medicinal trees in India, particularly valued for its role in treating reproductive disorders in women. The bark and seeds are widely used in Ayurvedic formulations, leading to overharvesting and population decline. In Odisha, the species is increasingly rare in natural forests. *Symplocos racemosa* (Symplocaceae) is another important tree species traditionally used in liver-related disorders. The bark and leaves are integral components of several herbal preparations. Habitat destruction and unsustainable extraction have rendered this species threatened in many parts of its natural range. *Litsea glutinosa* (Lauraceae) is a medicinal tree commonly used to treat diarrhoea and digestive ailments. Its bark and leaves possess antimicrobial and anti-inflammatory properties. Growing the tree for commercial demand has contributed to its declining populations. *Rauvolfia serpentina* (Apocynaceae), a well-known medicinal herb, is globally recognized for its antihypertensive properties. The roots contain valuable alkaloids such as reserpine. Excessive uprooting for pharmaceutical use has severely depleted wild populations, making it one of the most threatened medicinal plants in India. *Mesua ferrea* (Calophyllaceae) is a large evergreen tree whose seeds and flowers are used to enhance immunity and treat inflammatory conditions. The species is also valued for timber, further increasing pressure on natural populations. The genus *Cycas*, represented by *Cycas beddomei* and *Cycas nayagarhensis*, holds both medicinal and nutritional significance. While *C. beddomei* is used in arthritis treatment, *C. nayagarhensis* has edible ovules consumed as health food. Cycads are slow-growing and highly sensitive to habitat disturbance, making them particularly vulnerable. *Heritiera fomes* (Malvaceae), a mangrove-associated tree, is traditionally used to treat gastrointestinal disorders. Coastal habitat degradation and climate-induced changes pose serious threats to this species. *Pterocarpus santalinus* (Fabaceae), commonly known as red sanders, is valued for its heartwood used in treating inflammation. Illegal logging and international trade have drastically reduced its natural populations. Shrubs such as *Hypericum gaitii* and *Uraria picta* possess significant medicinal properties, including antiviral, skin-healing and acaricidal activities.

Table 1: Habit and medicinal uses of some threatened plants of Odisha, India

Name	Family	Habit	Medicinal uses
Alphonsea lutea (Roxb.) Hook.f. & Thomson	Annonaceae	Tree	Leaves have antibacterial activity (Sahu et al., 2021).
Cordia macleodii (Griff.) Hook.f. & Thomson	Boraginaceae	Tree	Leaves are useful in mouth sores (Bhide et al., 2011).
Cycas beddomei Dyer	Cycadaceae	Shrub	Useful in arthritis (Devi et al., 2025).

Cycas nayagarhensis Rita Singh, P.Radha & Khuraijam	Cycadaceae	Tree	Ovules are consumed as healthy food (Devi et al., 2025).
Gnetum edule (Willd.) Blume	Gnetaceae	Climber	It is used traditionally to treat jaundice (Jinadatta et al., 2019).
Heritiera fomes Banks	Malvaceae	Tree	It is used in gastrointestinal disorders (Mahmud et al., 2014).
Homalium napaulense (DC.) Benth.	Salicaceae	Tree	Leaves have antioxidant activity (Mahapatra et al., 2015)
Hypericum gaitii Haines	Hypericaceae	Shrub	Leaves have been used as an ointment for treating skin eruptions (Mahapatra et al., 2025).
Lasiococca comberi Haines	Euphorbiaceae	Tree	Leaves have antioxidant activities (Rani et al., 2025).
Litsea glutinosa (Lour.) C.B.Rob.	Lauraceae	Tree	Used to cure diarrhoea (Jamaddar et al., 2022).
Mesua ferrea L.	Calophyllaceae	Tree	Used to improve immunity (Chahar et al., 2012).
Mucuna gigantea (Willd.) DC.	Fabaceae	Climber	Anti-arthritic properties (Kumar et al., 2025)
Operculina turpethum (L.) Silva Manso	Convolvulaceae	Climber	It helps eliminate the toxins (Gupta and Ved, 2017).
Paederia foetida L.	Rubiaceae	Climber	Leaves are used in diarrhoea (Wang et al., 2014).
Pterocarpus santalinus L.f.	Fabaceae	Tree	Heartwood of the plant is used as an external application for treating inflammation (Bulle et al., 2016).
Rauvolfia serpentina (L.) Benth. ex Kurz	Apocynaceae	Herb	Used to treat hypertension (Alshahrani et al., 2021).
Salvadora persica L.	Salvadoraceae	Small tree	Stem is good for teeth problems (Farag et al., 2021)
Saraca asoca (Roxb.) W.J.de Wilde	Fabaceae	Tree	Reproductive disorders in women (Gupta et al., 2014).

Stemona tuberosa Lour.	Stemonaceae	Climber	Useful for lung inflammation (Lee et al., 2014).
Stereospermum chelonoides (L.f.) DC.	Bignoniaceae	Tree	Roots of this plant are one of the ingredients of “Dashamularishta”. (Sab et al., 2015)
Symplocos racemosa Roxb.	Symplocaceae	Tree	Useful in liver problems (Acharya et al., 2016).
Tritaxis glabella (Thwaites) R.Y.Yu & Welzen	Euphorbiaceae	Tree	Useful in traditional orthopaedic treatment (Devanarayana et al., 2013).
Uraria picta (Jacq.) Desv. ex DC.	Fabaceae	Shrub	It has acaricidal properties (Igboechi et al., 1989)
Xylocarpus granatum J.Koenig	Meliaceae	Tree	It is used as a treatment for diarrhoea, fevers such as malaria, viral diseases like influenza and cholera (Dey et al., 2021).

Despite their smaller size, these plants are equally threatened due to restricted distribution and habitat loss. Climbers like *Gnetum edule*, *Stemona tuberosa*, *Paederia foetida*, *Operculina turpethum* and *Mucuna gigantea* are widely used in traditional medicine for treating jaundice, lung inflammation, diarrhoea, detoxification and arthritis, respectively. Many climbers depend on forest structure for support, making them highly susceptible to deforestation. Other important tree species such as *Cordia macleodii*, *Homalium napaulense*, *Lasiococca comberi*, *Stereospermum chelonoides*, *Xylocarpus granatum* and *Alphonsea lutea* exhibit antioxidant, antibacterial, anti-inflammatory and digestive health benefits (Table 1). These species are integral to both traditional medicine and ecological stability.

Conservation status and threats

The threatened status of these medicinal plants can be attributed to multiple factors, including overharvesting, habitat fragmentation, lack of cultivation practices and inadequate legal protection. In many cases, medicinally important plant parts such as roots, bark and heartwood are harvested destructively, leading to plant mortality. Additionally, climate change is emerging as a significant threat by altering species distribution and regeneration patterns.

Future works

Future research and conservation initiatives on threatened medicinal plants of Odisha should adopt an integrated, multidisciplinary approach that combines ethnobotany, ecology, pharmacology and conservation biology. Comprehensive field-based surveys are urgently needed to assess the current

population status, distribution patterns, regeneration capacity and habitat specificity of threatened species across different forest types and agro-climatic zones of the state. Such baseline data will be essential for accurate threat assessment and prioritization of species for conservation action. Detailed phytochemical profiling and pharmacological validation of traditionally used plant parts should be strengthened using modern analytical and molecular techniques. While many species are widely used in folk medicine, scientific evidence supporting their efficacy and safety remains limited. Future studies should focus on isolating bioactive compounds, understanding mechanisms of action and evaluating toxicity to facilitate the development of standardized herbal formulations and potential drug leads. Conservation-oriented research should emphasize both *in situ* and *ex situ* strategies. Establishment of medicinal plant conservation areas, strengthening of protected habitats and restoration of degraded forest ecosystems will support natural regeneration. Simultaneously, *ex situ* conservation through botanical gardens, seed banks, tissue culture and nursery development should be expanded, particularly for slow-growing and endemic species such as *S. asoca*, *R. serpentina* and *Cycas* species. Promotion of cultivation, domestication and agroforestry-based models for high-demand medicinal plants should be a major future focus to reduce pressure on wild populations. Community-based conservation programs, involving local and indigenous people as key stakeholders, can enhance sustainable harvesting practices while ensuring livelihood security. Capacity-building initiatives and awareness programs will further strengthen community participation in conservation efforts. Finally, future work should also address policy integration and knowledge preservation. Documentation of traditional medicinal knowledge, protection of intellectual property rights and development of benefit-sharing mechanisms are essential to prevent biopiracy and ensure equitable use of resources. Integrating scientific research outcomes with state and national biodiversity action plans will play a pivotal role in ensuring the long-term conservation and sustainable utilization of threatened medicinal plants of Odisha.

Conclusion

The medicinal plant wealth of Odisha represents a vital intersection of biodiversity, traditional knowledge and public health. The threatened plant species discussed in the study, ranging from trees and shrubs to herbs and climbers, play a crucial role in indigenous healthcare systems and have demonstrated significant pharmacological potential for treating a wide spectrum of ailments, including reproductive disorders, gastrointestinal diseases, inflammation, hypertension, infections and immune-related conditions. However, increasing anthropogenic pressures such as habitat destruction, overexploitation, illegal trade, climate change and erosion of traditional knowledge have placed many of these valuable species at risk of extinction. The predominance of tree species among the threatened medicinal plants highlights the urgent need for sustainable harvesting practices and long-term conservation planning, as these species are slow-growing and highly vulnerable to destructive extraction of bark, roots and heartwood. The continued reliance of local communities on forest resources further highlights the importance of integrating conservation efforts with livelihood security and community participation. To ensure the long-term survival and sustainable utilization of these medicinal plants, a multipronged approach is essential. This should include systematic documentation of ethnomedicinal knowledge,

scientific validation of traditional uses, promotion of cultivation and domestication of high-demand species and implementation of effective *in situ* and *ex situ* conservation strategies. Strengthening policy frameworks, enhancing awareness among stakeholders and fostering collaboration between researchers, forest managers and indigenous communities will be critical. The conservation of threatened medicinal plants of Odisha is not only a biological imperative but also a socio-cultural and economic necessity. Protecting these species will help preserve traditional healthcare systems, support biodiversity conservation and ensure that the therapeutic benefits of these plants remain available for future generations.

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