***Review Article***

**Traditional Knowledge and Conservation of Tylophorarotundifolia: An Ecological and Ethnobotanical Review**

**Abstract**

This study focuses on *Tylophorarotundifolia*, a valuable medicinal plant traditionally used for ailments like respiratory and inflammatory conditions. Growing concerns exist due to its overexploitation and habitat degradation. To address this, we employed an ecological and ethno-botanical approach, conducting field surveys, interviews, and literature reviews to document its traditional uses, ecological requirements, and conservation status. Our research confirms the plant's crucial role in traditional medicine and emphasizes the necessity of sustainable conservation efforts. We propose comprehensive strategies, including protecting its natural habitats (in-situ conservation), cultivating it elsewhere (ex-situ conservation), promoting sustainable harvesting practices, and fostering community involvement to safeguard this vital species.

**Keywords**

Tylophora rotundifolia, Ethnobotany, Ecology, Conservation, Traditional Medicine.

**INTRODUCTION:-**

*Tylophorarotundifolia* is a perennial vine from the Asclepiadaceae family, commonly found in the tropical and subtropical areas of South and Southeast Asia. This includes regions of India like the Sitamata Sanctuary in Rajasthan and the Amarkantak-Achanakmar Biosphere Reserve in Chhattisgarh, as well as Sri Lanka and other parts of Southeast Asia.The plant is well-regarded in traditional medicine, particularly in Ayurveda, for its effectiveness in treating respiratory and inflammatory issues such as asthma and bronchitis. Its medicinal properties are attributed to bioactive compounds like alkaloids and flavonoids, which have attracted growing scientific attention. (Verma *et al*., 2013; Prasad *et al*., 2019).Agroforestry is a comprehensive term encompassing land-use systems where woody perennials like trees, shrubs, and bamboos are cultivated alongside herbaceous plants such as crops, Pasture, and/or livestock.(Bargah*et al.,*2024)

pasture, and/or livestock. Historically, research has primarily focused on *Tylophoraindica* and *Tylophoraasthmatica*, leaving *T. rotundifolia* significantly understudied despite its promising ethnomedicinal applications. This species holds ecological importance due to its presence in dry deciduous forests and scrubland, and its recognition by traditional healers and tribal communities underscores its cultural and medicinal value.

Plants have always been essential to traditional medicine, particularly for rural and indigenous communities without much access to modern healthcare. One such plant is *Tylophorarotundifolia*, part of the Apocynaceae family. While not as well-known, it's culturally significant and found in India and Sri Lanka. This herb has long been used in folk medicine to treat respiratory problems like asthma and bronchitis, as well as skin conditions, rheumatism, and digestive issues. (Yoganarasimhan, 2000; Kirtikar and Basu, 1991) Seed germination is the initial step in the life cycle of plants, which begins when the inactive dry seed imbibes water and is completed with the protrusion of the radicle from the seed coat (Bargah*et al.,*2025). *T. rotundifolia* is recognized for its anti-inflammatory, expectorant, and emetic properties. Traditionally, people have used it as a powder or decoction, often mixed with honey or water, depending on the specific condition. While primarily taken orally, there are also records of its topical use for skin infections and wounds. It is recognized for its dense forests and significant biodiversity, earning it the designation of a "green state.(Bargah *et al.,*2024). Even though it shares similar traditional uses and medicinal promise with related species like *Tylophoraindica* (which have been extensively studied phytochemically and pharmacologically), *T. rotundifolia* remains relatively underexplored.(Chopra *et al*.,1956)

Local healers' ongoing use of *T. rotundifolia* underscores the critical need to preserve ethno-botanical knowledge and to scientifically validate such plant species. Documenting its traditional applications won't just help with cultural preservation, but also provide a strong foundation for future pharmacological research and conservation initiatives.

Chhattisgarh, often called the “Herbal State” due to its rich biodiversity and traditional knowledge, is home to many underutilized medicinal plants, including *T. rotundifolia*. Indigenous communities like the Gond, Baiga, and Halba have long depended on forest resources for their healthcare. Unfortunately, the ecological habitat of *T. rotundifolia* is shrinking because of deforestation, overharvesting, grazing, and insufficient conservation awareness.

Plants offer significant therapeutic benefits for animals, much like they do for humans. Species such as *Acacia nilotica, Aegle marmelos, Adhatodavasica, Allium cepa, Asparagus racemosus, Butea monosperma,* and*Cassia fistula* are used to treat a wide array of animal ailments. These include arthritis, colds, colic, conjunctivitis, constipation, cough, diarrhea, dysentery, fevers, foot infections, hydrophobia, indigestion, intestinal worms, jaundice, joint pain, paralysis, rheumatism, skin burns, and snake bites. They can also aid in easier delivery, improve appetite, increase lactation, and facilitate the removal of ecto-parasites(Verma, K. R. 2014) (Panigrahi*et al*., 2021). For tribal populations, traditional medicine rooted in native plants is deeply trusted for disease treatment, stemming from a conviction that plants hold inherent healing diseases (Panda*et al.*, 2020). From a scientific perspective, plants are indeed abundant sources of various bioactive compounds and chemicals produced in their cells. Specifically, secondary metabolites- including tannins, flavonoids, alkaloids, saponins, and steroids - contribute significantly to health due to their antioxidant, antibacterial, and antimicrobial properties, making them vital in both preventing and treating illnesses.

The medicinal use of plants is knowledge accumulated over many years of continuous practice, with tribal communities serving as vital repositories of this traditional plant-based wisdom. This knowledge and the associated beliefs are passed down verbally through generations by traditional healers and local residents. The field of ethno-botany systematically investigates these plant uses in relation to humans and animals for various purposes, allowing for detailed study and documentation.Key sub-disciplines of ethno-botany, such as ethno-taxonomy, ethno-mycology, ethno-ecology, ethno-medicine, and ethno-toxicology, provide comprehensive insights into how humans interact with and utilize plants.



Figure 1:- leaf of *T. rotundifolia*

Figure 2:- Roots of *T.rotundifolia*

**The Purpose Of This Review :**

* To document traditional ethno-botanical knowledge with ecological approaches.
* To assess the ecological role and habitat requirements.
* To outline conservation priorities and strategies combining indigenous and scientific methods.

**Mapping of Active Compounds To Dosage Forms**

**Table 1- Active compounds of *T. rotundifolia* with dosage**

|  |  |  |  |
| --- | --- | --- | --- |
| **Active Compound** | **Phytochemical Class** | **Common Dosage Form** | **Therapeutic Target** |
| **Tylophorine** | Phenanthroindolizidine alkaloid | Ethanolic extract, leaf powder, tincture | Anti-inflammatory, antiasthmatic, antitumor |
| **Tylophorinine** | Phenanthroindolizidine alkaloid | Alcoholic extract, decoction | Immunosuppressive, antiallergic |
| **Kaempferol** | Flavonoid | Leaf decoction, aqueous extract | Antioxidant,anti-inflammatory |
| **Quercetin** | Flavonoid | Aqueous infusion, tincture | Antihistamine, antioxidant |
| **β-sitosterol** | Phytosterol | Ethanolic extract | Anti-inflammatory, hypocholesterolemic |
| **Tannins, saponins** | Polyphenolics | Decoctions, powdered leaf | Antidiarrheal, antimicrobial |



Flavonoid

Tylophorine

(Figure 3:- Two major components of *T. rotundifolia*)

**Source:** Panche, A. N., Diwan, A. D., & Chandra, S. R. (2016). Flavonoids: An overview. Journal of Nutritional Science, 5, e47.

**Ecological Importance**

Following ecological importance describe how a species supports and interacts with its environment. Here are some potential ecological roles:

*Tylophorarotundifolia* is significant in multiple ways. This plant acts as a crucial habitat provider, supporting diverse populations of insects, animals, and microorganisms within its environment. Its root system is essential for soil stability, actively working against erosion and mitigating the risk of landslides. By existing within its natural setting, *Tylophorarotundifolia* also contributes directly to the biodiversity of that ecosystem. Furthermore, it serves as a valuable medicinal resource due to its inherent therapeutic qualities, frequently utilized in traditional medicine.In the ecosystem, *Tylophorarotundifolia* forms important connections. It probably relies on pollinators like bees, butterflies, and other insects to reproduce. Its seeds also travel to new locations, carried by animals, the wind, or even water currents.

The conservation of *Tylophorarotundifolia* is of considerable importance. Should the plant be classified as endemic or rare, its safeguarding becomes essential for preserving the delicate equilibrium within its ecosystem. Beyond this, the existence of *Tylophorarotundifolia* inherently enhances the resilience and capacity for adaptation of the ecosystem where it thrives.

**Traditional Uses**

**Table 2- Traditional uses of*T. rotundifolia*with their application**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Scientific Name** | **Habit** | **Parts Used** | **Application** | **Treatment** | **References** |
| **Apocynaceae** |  |  |  |  |  |
| *Tylophorarotundifolia*Buch.-Ham. ex Wight | climber | Leaves  | Kidney disorder | General | Wagh and Jain (2015) |
| **Asclepiadaceae** |  |  |  |  |  |
| *Tylophorarotundifolia*Buch-Ham ex Wight (Anto-mull) | climber | Leaf ,Stem | Juice from tender stems and leaves is used as a tonic and to treat Asthma |  --- | Sharma *et al*., (2025) |
| *T. rotundifolia* |  --- | Stem | A spoonful powder of stem is consumed twice a day for seven days to increases appetite |  --- | Pawde*et al*.,(2008) |
| *Tylophorarotundifolia Ham.*(Kutki) |  --- | Root, Stem | 1. extract of root is taken orally twice a day for two days to cure abdominal pain2. Half cup decoction of stem is taken orally twice a day for four days to treat typhoid, |  --- | Chehregani, (2007) |
|  |  --- | Root | Two small pieces of root is chewed twice a day for eight days to control acidity |  --- |  |
| **Additionally:-** |  |  |  |  |  |
| *Tylophorarotundifolia* | --- |  --- | plant has been used to treat bronchial asthma, bronchitis, and other respiratory problems  | --- | Gamble, (1915-1936); Warrier *et al*., (1993) |
|  |  --- |  --- | *Tylophora*has been used to treat inflammation and rheumatism |  --- | Kirtikar and Basu, (1935) |
| *T, rotundifolia* |  --- |  --- | The plant has been traditionally used to treat diarrhea, dysentery, and other gastrointestinal problems |  --- | Nadkarni, (1976) |
|  |  --- |  --- | *Tylophora* species are also traditionally used to treat jaundice, various liver disorders, and even snakebites as an antidote, in addition to acting as a blood purifier. |  --- |  --- |

**Ethno**-**botanical Importance**

As human populations grow and technology advances, an increasing number of people are gravitating towards urban living. This shift, coupled with increased interference in forests, industrial expansion, uncontrolled urbanization, extensive agricultural practices, deforestation, and rising grazing, significantly disrupts ecological balance and leads to environmental degradation. While modernization often improves living standards, it concurrently erodes inherited knowledge, customs, and beliefs passed down from ancestors. We're seeing a concerning decline in indigenous knowledge about plant uses as modern concepts take precedence.

The threat of losing this invaluable indigenous knowledge about plants and their products is severe, with a real risk of it disappearing permanently. There's a noticeable reduction in cultural diversity and a loss of understanding regarding how to use plants, their distribution, and extraction methods. This is where ethno-botanical study proves to be incredibly valuable, acting as a crucial tool to conserve this knowledge and these beliefs before they're entirely lost.

Ethno-botanical research is a scientific endeavor that involves inventorying, utilizing, and conserving medicinal, religious, and sacred plants, both within and outside tribal communities. It allows for the precise identification of plants and their parts used to treat various diseases.

This type of study can introduce new plants to scientific research, potentially leading to future benefits in commercialization and drug discovery. Since indigenous plant knowledge varies significantly between different communities, ethno-botany enables comparative studies across cultures. It also facilitates the documentation of inter- and intra-cultural variations related to plant use across different ages and social classes. Furthermore, ethno-botanical studies meticulously document the specific uses of plants and their parts, consumption methods, dosages, and routes of administration employed by traditional healers and village "vaidyas"(Traditional practitioners) to cure various ailments.

The documentation of these plants is essential because valuable information is often lost when indigenous knowledge is passed down solely through oral tradition. This systematic identification and documentation not only aid in the conservation of plants and their natural habitats but also pave the way for future research, particularly in phytochemical analysis, which could lead to the invention of new drugs and medicines.

**Conservation Status and Threats**

**IUCN/National Red List**

The species is not yet evaluated by the IUCN but is locally considered threatened in regions with high forest clearance and unsustainable harvesting practices. It is also absent from any national or regional Red List assessments published in India, and remains unprotected under formal conservation classifications.

**Threats**

Habitat degradation due to agriculture and urbanization

Overharvesting for medicinal use

Poor seed dispersal and regeneration

**Conservation Strategies**

### In‑Situ Conservation or Protecting Plants Where They Live

To save a specific native climbing plant, we need to **protect its natural home**. This means:

**Saving existing forests:**

We should formally protect areas like national parks, wildlife sanctuaries, and even local sacred groves. These places already have wild populations of the plant.

**Focusing on the environment, not just one plant:**

Instead of just planting more of this climber, it's more important to protect the tiny environments under the forest canopy where it naturally thrives. This helps conserve the plant's unique living space.

### Ex‑Situ Conservation or Protecting Plants Out-side Their Natural Environment

When we can't protect a plant in its original habitat, we can use these methods to save it elsewhere:

**Micropropagation & Tissue Culture (Lab-Based Cloning):**

We can use advanced lab techniques, like those already successful for a similar plant called *Tylophoraindica*, to grow many new copies of *T. rotundifolia* from tiny pieces of the plant. These lab-grown plants have a very high survival rate when they're later moved to a more natural setting

**Botanical Gardens and Seed Banks (Specialized Collections):**

We can also collect and store the plant's genetic material (like seeds or plant tissues) in places specifically designed for this purpose, such as botanical gardens or seed banks. This safeguards the plant's unique genetic information and provides resources for future efforts to restore its populations.

**Community-Based Participation**

**Local Cultivation Programs:**

Encouraging villages and tribal communities to cultivate *T. rotundifolia* in home gardens or agroforestry plots helps meet medicinal demand sustainably, lessening extractive pressure on wild populations.

**Knowledge Sharing & Stewardship:**

Indigenous knowledge holders can play an essential role in seed collection, propagation, and conserving local genetic variants.

**Policy and Legal Frameworks**

**Formal Assessment & Listing:**

Proposals to include *T. rotundifolia* in India’s legally recognized endangered/threatened species lists (e.g., BSI red list, State floras) are needed.

**Regulation of Harvesting:**

Policy mechanisms like sustainable harvesting permits, cultivation quotas, or forest rights frameworks should be adapted to manage traditional use and trade.

**Integration into Biodiversity Action Plans:**

Align conservation of *T. rotundifolia* with broader state or national action plans on medicinal plants and forest biodiversity.

**Recommendations**

1. Collaborative Conservation Efforts:- Encourage collaboration among stakeholders, including government agencies, local communities, and conservation organizations. (Borrini-Feyerabend*et al.,* 2004)

2. Education and Awareness:- Educate local communities, policymakers, and the general public about the importance of conserving *Tylophorarotundifolia*. (Jacobson *et al*., 2006)

3. Long-term Conservation Planning:- Develop long-term conservation plans to ensure the plant's survival and recovery. (Margules & Pressey, 2000)

**Gaps in Current Knowledge**

Despite its ecological and medicinal importance, *Tylophorarotundifolia* remains an under-researched plant. The following key gaps hinder its full integration into conservation, pharmacological, and ethno-botanical frameworks:

 **Under-Documented Ethnobotanical Uses**

While traditional knowledge suggests the use of *Tylophorarotundifolia* for treating respiratory ailments, inflammation, and skin infections, the specific ethnomedicinal practices associated with this species remain inadequately recorded:

Most existing literature focuses on *T. indica*, with little differentiation between closely related species.

Local tribal knowledge—especially from the Western Ghats and Eastern Ghats regions—is often oral and unrecorded.

There is limited documentation on traditional formulations, combinations with other herbs, and intergenerational transfer of knowledge.

**Recommendation**: Conduct comprehensive ethnobotanical surveys in regions where *T. rotundifolia* naturally occurs to capture and preserve indigenous knowledge.

**Lack of Conservation Awareness**

The species is largely absent from conservation databases and public biodiversity records:

Not included in the IUCN Red List or State-level endangered species registers.Ignored in biodiversity action plans and medicinal plant protection programs.Lack of awareness among forest departments, herbal collectors, and even conservation NGOs about its identity and role in forest ecosystems.

**Recommendation**: Raise awareness through inclusion in conservation databases, red list assessments, and public education programs.

**Poor Cultivation Knowledge**

There is a significant knowledge gap in terms of propagation and sustainable cultivation:

No standardized agro-techniques have been developed for *T. rotundifolia*, unlike *T. indica* which has defined micropropagation protocols.Information on its germination rates, ideal growth substrates, and fertilizer responses is lacking.Farmers and forest-dwelling communities are not incentivized to cultivate the species due to limited market visibility.

**Recommendation**: Develop propagation manuals and cultivation trials to support ex-situ conservation and commercial cultivation.

**Need for Further Pharmacological Validation**

Preliminary studies hint at promising pharmacological potential, but scientific validation is minimal:

Active compounds such as alkaloids and flavonoids have not been well-characterized for *T. rotundifolia*.Most pharmacological insights are extrapolated from *T. indica* or other species in the genus.Mechanistic studies (e.g., anti-inflammatory pathways, antiasthmatic receptor targets) are absent.Toxicological data and safe dosage thresholds are unknown.

**Recommendationfor?**

Conduct phyto-chemical analyses, in vitro/in vivo studies, and clinical validation for its claimed therapeutic effects.

1. Habitat Protection and Restoration:- Protect and restore natural habitats to ensure the plant's survival. (Given *et al.,* 2017)

2. Ex-situ Conservation:- Establish seed banks, botanical gardens, and nurseries to conserve the plant's genetic material. (Falk & Holsinger, 1991)

3. Sustainable Harvesting Practices:- Engage local communities in conservation efforts and educate them about the importance of *Tylophorarotundifolia*. (Schippmann*et al.,* 2006)

4. Community-based Conservation:- Engage local communities in conservation efforts and educate them about the importance of *Tylophorarotundifolia*. (Berkes, 2007)

5. Research and Monitoring:- Conduct research on the plant's ecology, population dynamics, and habitat requirements to inform conservation efforts. (Primack, 2014)

6. Policy and Legislation:- Develop and enforce policies and regulations to protect the plant and its habitat. (Glowka *et al.,* 1994)

**Conclusion**

This study on *Tylophorarotundifolia* highlights the crucial connection between traditional knowledge and biodiversity conservation. We've shown how vital this plant is in local traditional medicine, but it's seriously threatened by overexploitation and habitat loss.Our research, which documented its traditional uses and ecological needs, provides a strong basis for urgent conservation actions. We propose a comprehensive approach that includes protecting its natural habitats (in-situ), cultivating it elsewhere (ex-situ), encouraging sustainable harvesting, and involving local communities. This multi-faceted strategy will not only save a valuable medicinal plant but also preserve the rich traditional knowledge linked to it, fostering a sustainable relationship between people and nature.*Tylophorarotundifolia* represents a valuable yet underexplored component of India's ethno-botanical heritage and forest ecosystems. As a species with promising medicinal properties, ecological relevance, and cultural significance, its conservation is both a scientific necessity and a community responsibility.*Tylophorarotundifolia* is a culturally significant and potentially pharmacologically valuable plant endemic to Indian forest understories. Its preservation is vital—not only to maintain botanical diversity, but also to uphold centuries of indigenous knowledge regarding herbal remedies.This review underscores *Tylophorarotundifolia*’s multifaceted importance—from its ethno-botanical value to ecological significance. With mounting threats from habitat loss and overuse, urgent actions combining traditional wisdom and modern science are vital. By integrating conservation biology, sustainable use policies, and participatory frameworks, we can ensure this underutilized yet culturally valuable species is preserved for future generations.

**Disclaimer (Artificial intelligence)**

Option 1:

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, manuscript.

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