

MEDICINALLY IMPORTANT PLANTS OF COFFEE FAMILY



**Ghodke Anita Suresh Rao
Sugimani Marndi
Bidhan Chandra Roy
Sanjeet Kumar**

Medicinally Important Plants of Coffee Family

**Ghodke Anita Sureshrao
Sugimani Marndi
Bidhan Chandra Roy
Sanjeet Kumar**



Editors

Ghodke Anita Sureshrao

Amaltas Institute of Ayurved Dewas Madhya Pradesh, India

Sugimani Marndi

Ambika Prasad Research Foundation, Odisha, India

Bidhan Chandra Roy

Department of Botany, Dinabandhu Mahavidyalaya, Bongaon, West Bengal, India

Sanjeet Kumar

Ambika Prasad Research Foundation, Odisha, India

Title – Medicinally important plants of Coffee Family

ISBN: 978-81-984754-3-5

Published by: APRF Publishers, Odisha

An institutional publication of Ambika Prasad Research Foundation, India
Medicinally important plants of Coffee Family

First Edition: 2025

Copyright © Ambika Prasad Research Foundation

The content of this book tries its best to provide authenticated information. All the references necessary are listed. All attempts have been made to publish reliable information and acknowledge the copyright holders. If any copyright material(s) have not been acknowledged, please inform us so we may rectify it in our future reprints.

Cover Page: *Ixora pavetta*

Back Page: *Tarenna asiatica*

Designed by: Sugimani Marndi

Price: Rs. 950 /-

Citation: Ghodke AS, Marndi S, Roy BC, and Kumar S. (2025). Medicinally important plants of Coffee Family. APRF Publishers, India.

CONTRIBUTORS

Alok Ranjan Sahu, Department of Botany, Vikash Degree College, Bargarh, Odisha, India

Anuradha Das, Department of Botany, Sindri College Sindri B.B.M.K. University, Dhanbad Jharkhand, India

Ashish Patel, Govt. Degree College Pushprajgarh, Anuppur, Madhya Pradesh, India

Bhagwati Prashad Sharma, Department of Botany, Sidharth Government College, Nadaun, Himachal Pradesh, India

Bidhan Chandra Roy, Department of Botany, Dinabandhu Mahavidyalaya, Bongaon, West Bengal, India

Brajesh Kumar Sahu, P.M. College of Excellence Government College Vidisha, Madhya Pradesh, India

D. Chothe, Dravyaguna Vigyan, Government Ayurved Mahavidyalaya Nanded, Maharashtra, India

Ghodke Anita Sureshrao, Amaltas Institute of Ayurved Dewas Madhya Pradesh, India

Kadambini Das, University Department of Botany Babasaheb Bhimrao Ambedkar Bihar University Muzaffarpur, Bihar, India

Manvi Malwal, Department of Botany, Post Graduate Government College for Girls 11, Chandigarh, India

N. Anil Kumar, Department of Botany, SYTR Government Degree College, Madakasira, Sri Sathya Sai, Andhra Pradesh, India

Nihar Ranjan Nayak, Department of Botany, Maa Manikeshwari University, Bhawanipatna, Kalahandi, Odisha, India

Rajesh Kumar Verma, Department of Dravyaguna, Naiminath Ayurvedic Medical College and Research Centre, Agra, Uttar Pradesh, India

Rajkumari Supriya Devi, Ambika Prasad Research Foundation, Odisha, India

S.S. Shekokar, Dravyaguna Vigyan, Government Ayurved Mahavidyalaya
Nanded, Maharashtra, India

Sanjeet Kumar, Ambika Prasad Research Foundation, Odisha, India

Saraswati Majhi, Department of Botany Shailabala Women's Autonomous
College, Cuttack affiliated to Ramadevi women's University, Bhubaneswar,
Odisha, India

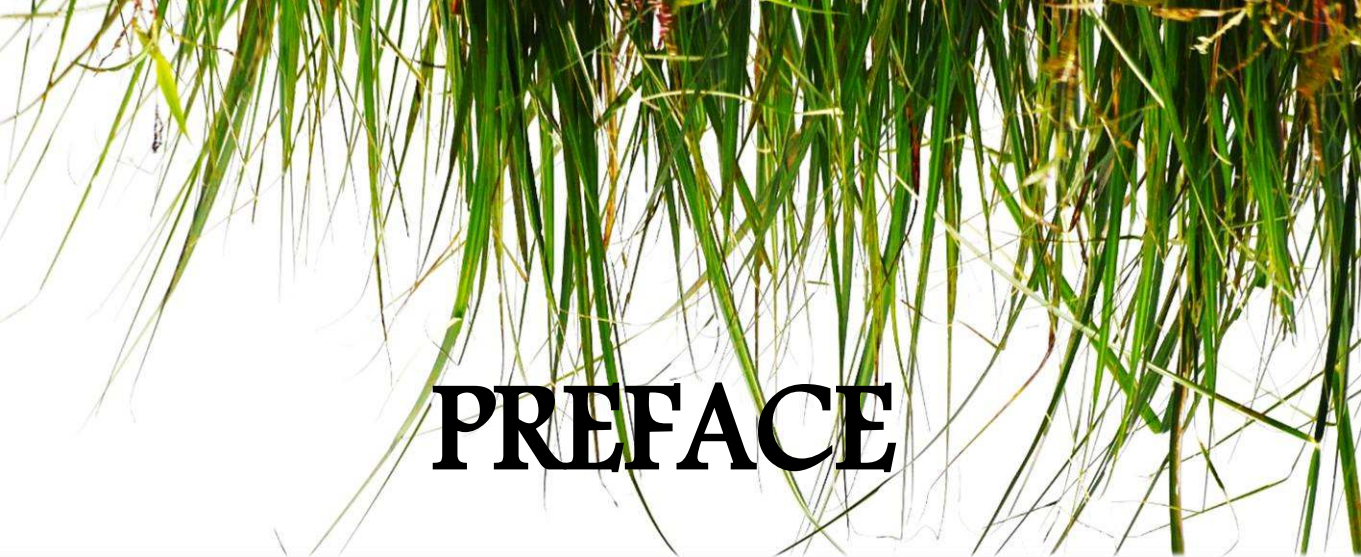
Smita Gajanan Basole, Department of Botany, Balbhim College, Beed,
Maharashtra India

Sohan Lal, School of Studies in Botany, Shaheed Mahendra Karma
Vishwavidyalaya Bastar, Jagdalpur, Chhattisgarh, India

Subhalakshmi Rout, Ambika Prasad Research Foundation, Odisha, India

Sugimani Marndi, Ambika Prasad Research Foundation, Odisha, India





PREFACE

India, with its rich biodiversity, is home to a vast array of rubiaceae species, many of which have been used for centuries in traditional medicine and cuisine. Despite their potential, many of these species remain underutilized and understudied. This book, "Medicinally important plants of coffee family", aims to bridge this knowledge gap by providing a comprehensive overview of the food and medicinal values of various aspects of rubiaceae species found in India. This volume brings together leading experts in the field of plant botanists to share their research and insights on the phytochemical, pharmacological, and nutraceutical properties of select Rubiaceae family. The chapters in this book cover a range of topics, from the food and medicinal values of wild species like the *Benkara malabarica*, *Dentella repens*, *Canthium diccocum*, *Gardenia latifolia*, *Haldinia cordifolia*, *Meyna spinosa*, *Mitragyna parvifolia*, *Neolamarckia cadamba*, *Paedaria foetida*, and *Tamilnadu uliginosa*, to the phytochemical profiling and pharmacological potential of wild species. Through this book, we hope to promote a greater understanding and appreciation of the diverse range of Rubiaceae family species found in India and to highlight their potential contributions to food security, healthcare, and sustainable development. We believe that this volume will serve as a valuable resource for researchers, students, and practitioners in the fields of taxonomists, food science, and medicine, and will inspire further research and innovation in the years to come.

(Editors)

BACKGROUND

The Coffee family- a treasure trove of medicinal wonders. Rubiaceae family is also called the Madder family, bedstraw family, or coffee family. It is among the six largest angiosperm families with 637 genera and 10700 species. 611 genera comprising 13,143 species came under the fourth largest angiosperm family. In India, it is represented by 551 species of which 67% taxa (365 spp.) are endemic. Rubiaceae shed light on the evolution of this highly diverse angiosperm family and can serve as a framework for ecological and evolutionary studies. Rubiaceae are assigned to 71 tribes of which 68 are classified into two subfamilies. It exhibits a remarkable diversity of forms, ranging from herbaceous plants to shrubs and trees. The Rubiaceae family encompasses a wide array of plants with diverse therapeutic properties has been a rich source of traditional and modern medicinal applications across cultures. The plants in coffee family shows a huge diversity of substances of bioactive compounds. Various bioactive compounds found withing Rubiaceae plants including alkaloids, terpenoids, and phenolic compounds, which contribute to their therapeutic properties. Ethnobotanical data of Rubiaceae family shows that most of the members of the family have great medicinal value and ecological significance and are being used since ages for the cure of various human ailments. From the ancient times Rubiaceae plants offer a fascinating glimpse into nature's pharmacy. Rubiaceae compounds in addressing contemporary health challenges, such as infectious disease, inflammatory conditions, and neurological disorders. Rich tapestry of pharmacological values which includes antimalarial properties, antioxidant effects, anti-inflammatory, neuroprotective, and antimicrobial effects.



However, this traditional knowledge is diminishing day by day and there is a need for systematic research and documentation of its medicinal, and pharmacological values. This book, “**Medicinally important Plants of Coffee family**”, aims to address this knowledge gap by providing a comprehensive overview of ethnomedicinal uses and pharmacological values of some Rubiaceae family found in India. The book brings together leading experts in the field of plant taxonomists to share their research and insights on the phytochemical, pharmacological, and nutraceutical properties of select Rubiaceae species. By highlighting the potential contributions of some Rubiaceae family species to healthcare and sustainable development, this book aims to promote a greater understanding and appreciation of these valuable resources.



CONTENTS

Chapter	Title	Authors	Page Numbers
Chapter 1	Ethnopharmacological aspects of <i>Benkara malabarica</i> (Lam.) Tirveng (Phiriki)	Ghodke Anita Sureshrao, S.S. Shekokar, and D. Chothe	1-8
Chapter 2	<i>Gardenia latifolia</i> Aiton (Indian Boxweed): a medicinal ornamental tree of India	Ghodke Anita Sureshrao, S.S. Shekokar, and D. Chothe	9- 20
Chapter 3	<i>Dentella repens</i> (creeping Lickstoop): a medicinal wetland herb of India	Sugimani Marndi, Sanjeet Kumar, Bidhan Chandra Roy and Sohan Lal	21- 27
Chapter 4	<i>Haldinia cordifolia</i> (Roxb.) Ridsdale: A Valuable Tree Species in Indian Traditional Medicine - A Review of its Pharmacognosy, Pharmacology, and Toxicology	Anuradha Das, Manvi Malwal, Bidhan Chandra Roy, and Sanjeet Kumar	28- 38
Chapter 5	Pharmacological values of <i>Mitragyna parvifolia</i> (True cadamba)	Rajesh Kumar Verma, Kadambini Das, Brajesh Kumar Sahu, Sohan Lal, Sanjeet Kumar and Sugimani Marndi	39- 49
Chapter 6	Medicinal and ecological uses of <i>Psydrax dicoccos</i> Gaertn.: a water indicating tree of India	Ashish Patel, Kadambini Das, Sanjeet Kumar and Sugimani Marndi	50- 58

Chapter 7	A tree of Lord Krishna [<i>Neolamarckia cadamba</i> (Roxb.) Bosser]: ethnomedicinally, culturally and pharmacologically important species	Smita Gajanan Basole, N. Anil Kumar, Sanjeet Kumar and Sugimani Marndi	59- 70
Chapter 8	<i>Meyna spinosa</i> : a medicinal tree and leafy vegetables of tribal India	Alok Ranjan Sahu, Rajkumari Supriya Devi, and Sugimani Marndi	71- 81
Chapter 9	Medicinal uses and propagation methods of <i>Paedaria foetida</i> : a threatened medicinal plant	Alok Ranjan Sahu, Sugimani Marndi, Nihar Ranjan Nayak, and Rajkumari Supriya Devi	82- 91
Chapter 10	Divine Jasmine (<i>Tamilnadu uliginosa</i>): a NTFP of India and its medico- food values	Bhagwati Prashad Sharma, Saraswati Majhi, Sugimani Marndi, and Subbalakshmi Rout	92- 103

CHAPTER 1

Ethnopharmacological aspects of *Benkara malabarica* (Lam.) Tirveng (Phiriki)

Ghodke Anita Suresh Rao^{1*}, S.S. Shekokar² and D. Chothe²

¹Amaltas Institute of Ayurved Dewas, Madhya Pradesh, India

²Dravyaguna Vigyan, Government Ayurved Mahavidyalay Nanded, Maharashtra, India

*Email id: anitaghodke24@gmail.com

DOI: <https://doi.org/10.5281/zenodo.14944069>



Licensed under a Creative Commons Attribution 4.0 International License

Abstract: Rubiaceae is the fourth largest family of flowering plants by several genera with several distinctive characteristics. Rubiaceae is a global family of diverse importance. The chapter comprises a brief literature and field survey on *Benkara malabarica*, a thorny shrub on its ethnomedicinal and pharmacological aspects in different parts claimed by tribal communities. The result revealed that the work carried out on roots, stems, and leaves has various pharmacological aspects. Therefore, further studies are required to provide more comprehensive data for future purposes.

Keywords: Rubiaceae, traditional knowledge, tribal communities, ethnobotany, pharmacological

INTRODUCTION

The Rubiaceae family is also called the Madder family, the Bedstraw family, or the Coffee family. Mongrand et al. (2005), reported that Rubiaceae is among the six largest angiosperm families with 637 genera and 10700 species. In India, it is represented by 551 species, of which 67% taxa (365 species) are endemic (Mongrand et al., 2005; Barbhuiya et al., 2014). Leaves are arranged in whorls of three or more. Flowers are usually tubular; five fused petals can be solitary or arranged in clusters. Fruits are usually berries, drupes, and capsules. It exhibits a remarkable diversity of forms, ranging from herbaceous plants to shrubs and trees. It also has a significant place in ecological niches and economic values. Some are used for medicinal purposes to cure certain diseases, inflammation, toothache, and skin diseases. As for ecological services, it plays a crucial role in providing food and habitat

for numerous faunal species. Economically important species of this family mostly produce sources of coffee (*Coffea* spp.) and sources of the quinine antimicrobial alkaloid (*Cinchona* spp.). Ornamental species planted in Cayman gardens include *Ixora coccinea* L. and *Pentas* Benth, *Rothmannia* Thunb. (POWO, 2024; Razafimandimbison and Rydin, 2024). Most of the Rubiaceae family plants exhibit antimalarial, antimicrobial, antihypertensive, antidiabetic, antioxidant, anti-inflammatory, antitumor, larvicidal, gastrointestinal, anti-ulcer, and hepatoprotective activities. Rubiaceae shed light on the evolution of this highly diverse angiosperm family and can serve as a framework for ecological and evolutionary studies. Rubiaceae are assigned to 71 tribes, of which 68 are classified into two subfamilies (Razafimandimbison and Rydin, 2024). As per Ridsdale's review of thorn problems in the Rubiaceae, *Benkara* is an odd genus, as here there appears to be one bud at each of the leaf axils, which variously develops into thorns, short shoots, inflorescences, or lateral plagiotropic branches. At present, it is monotypic. In 1983, Tirvengadam noted some other Asiatic species of "Randia" that, after further analysis, may belong to *Benkara* (Ridsdale, 2007; Tirvengadam, 1983). *Benkara* is a genus of flowering plants in the Rubiaceae family. It is found in tropical and subtropical Asia from India east to China and the Ryuku Islands, South to Java, and the Philippines. *Benkara malabarica* is a thorny shrub with spines in axillary pairs. Flowers in umbel-like corymbs, at the ends of the branches, white cream colour. Bark is yellowish in colour with short, simple, or branched thorns with a grey colour. *B. malabarica* is commonly known as Phiriki, Pedda, and Pedalli in Odia; in English, *B. malabarica* from the Rubiaceae family is one among the 83 species, and medicines prepared from the leaves and bark of the plant are used by Paliyar Tribal to treat various ailments such as cough, phlegm, throat infection, toothache, skin disorder, and body pain (Muthiah and Balakrishnan, 2022). *B. malabarica* has a high value in medicinal and industrial importance.

METHODOLOGY

The two standard surveys were literature and field surveys, which were carried out in selected places in India. Field survey methodology refers to the systematic process of collecting data directly from the field. A semi-structured questionnaire was conducted (Figure 1). After the field survey, it summarises the findings and concludes further literature surveys. A tentative literature survey was carried out. This chapter was conducted through a comprehensive search of existing literature on the ethnomedicinal of *B. malabarica* during

2023-2025, focusing on their medicinal, pharmacological, and traditional uses along with reported bioactive compounds. A literature survey comprises PubMed, Scopus, and Web of Science. Relevant articles and books published were selected and reviewed (**Kumar et al., 2012**).



Figure 1: Information collected from tribal communities on uses of *B. malabarica*

MORPHOLOGY

It is a rigid, grey, thorny shrub with divaricate branches and many abbreviated branchlets or leaf fascicles. Leaves subsessile or shortly petiolate, oblanceolate or obovate or some elliptic-oblong, entire with slightly recurved margins, obtuse or rounded, shining coriaceous, secondary nerves 3-8 with ciliate glandular hairs in their axils beneath. Flowers are white, salver-shaped, in dense sessile corymbs or subumbellate cymes; the rachis or corymbs are very short; pedicels are 6-7.5 mm, bracteate, and sheathed at the base with 2 connate bracteoles. Calyx tubular, lobes very short deltoid; calyx deciduous, separating by a transverse crack from the apex of the ovary. Corolla tube, petals oblong. Berries are scarlet, globose, with depressed areole, 2-celled; seeds are 1-several in each cell (**Saxena and Brahman, 1995; Figure 2-4**).



Figure 2: Habit and habitat of *B. malabarica*



Figure 3: Thorny stems of *B. malabarica*



Figure 4: Fruit of *B. malabarica*

BIOACTIVE COMPOUNDS

Active bioactive compounds are phenol, flavonoid, alkaloid, stilbenes, scopoletin, and glycosides (Muthiah and Balakrishnan, 2022; Vanitha et al., 2018). Two steroidal compounds, i.e., 1-octacosanol and β -sitosterol (Shanthamani and Ulagi, 2019). *B. malabarica* of leaf and leaf callus contains alkaloids, flavonoids, tannins, steroids, triterpenoids, N-Hexadecanoic acid, Eicosanoic acid, Octadecanoic acid, Tridecanoic acid, L-(+)-Ascorbic acid, 2,6-dihexadecanoate, Tetradecanoic acid, Pentadecanoic acid, and Dodecanoic acid (Vanitha et al., 2018). Stem bark and root bark contain carbohydrates, steroids, glycosides, saponins, tannins, and flavonoids (Nakum et al., 2021).

ETHNOMEDICINAL USES

According to World Health Organisation (WHO) reports, approx. 65-80% of the world's population uses traditional medicine to treat various diseases. As per the report, 50% of all modern clinical drugs are of natural product origin (Khajapeer et al., 2018). Many tribal communities in India claimed various medicinal values of *B. malabarica* that could lead to the isolation of new and novel compounds for further pharmacological evaluation (Table 1; Shanthamani and Ulagi, 2018).

Table 1: Ethnomedicinal uses of *B. malabarica* claimed by different tribal communities over India

Parts consumed	Ethnomedicinal uses	Sources
Leaves and bark	Cough	Muthiah and Balakrishnan, (2022)
Whole Plant	Arthritis	Vanitha et al., (2018)
Leaves	Joint pain	Vanitha et al., (2018)
Root bark	Joint pain	Gritto et al., (2015)
Stem and bark	Bronchitis and asthma	Nakum et al. (2021)

Root and bark	Abdominal pain, throat infection, wound healing, rheumatic pain	Nakum et al. (2021); Kumar et al., (2019)
---------------	---	---

PHARMACOLOGICAL ASPECTS

Pharmacological *B. malabarica* has shown promising pharmacological activities in various studies. It possesses anti-inflammation, antifungal, antioxidant, anticonvulsant, and anticancer properties (Table 2; Shanthamani and Ulagi, 2018). More work needs to be done to evaluate the therapeutic potential of *B. malabarica*.

Table 2: Pharmacological activity of *B. malabarica*

Parts used	Pharmacological activity	Sources
Leaves	Antimicrobial	Shanthamani and Ulagi, (2018)
Leaves	Antioxidant and cytotoxicity	Muthiah and Balakrishnan, (2022)
Root	Anticonvulsant	Mishra et al., (2010)
Whole plant	Antitumor	Shanthamani and Ulagi, (2019)
Leaves and bark	Antifungal	Khajapeer et al., (2018)
Leaves	Anti-inflammation	Vanitha et al., (2018)
Leaves	Anti-cancerous	Vanitha et al., (2018)
Leaves	Antidiabetic	Vanitha et al., (2018)
Leaves	Anti-CML	Khajapeer et al., (2018)

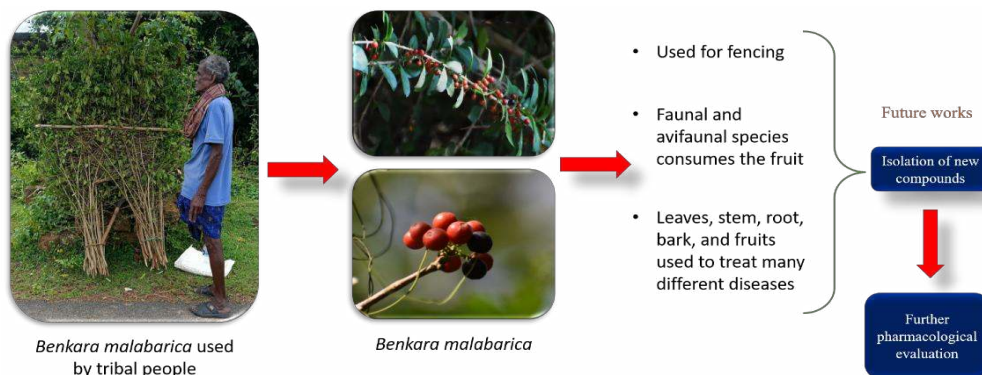


Figure 5: Future works carried out on *B. malabarica*

CONCLUSION

Benkara malabarica, a prominent member of the Rubiaceae family, has long been revered in traditional Indian medicine for its diverse therapeutic properties. This study has provided a comprehensive overview of *B. malabarica*, encompassing its botanical characteristics, ethnomedicinal uses, phytochemical analysis, and pharmacological activities. It represents a promising avenue for drug discovery and development to unlock the full potential of this remarkable plant for human health and well-being (Figure 5).

REFERENCES

- Barbhuiya HA, Dutta BK, Das AK, Baishya AK. (2014). The family Rubiaceae in Southern Assam with special reference to endemic and Rediscovered plant Taxa. *Journal of Threatened taxa*. 6(4): 5649-5659.
- Gritto MJ, Nanadagopalan V, Doss A. (2015). Ethnomedicinal survey of medicinal plants used by traditional healers in Shobanapuram village of Pachamalai hill, Tamilnadu. *Advances in Applied Science Research*. 6(3): 157-164.
- Khajapeer KV, Biswal R, Baskaran R. (2018). Evaluation of Anti-CML activity of methanol and aqueous extracts of *Benkara malabarica* (Lam.) Tirveng plant leaves. *International Journal of Pharmacy and Pharmaceutical Sciences*. 10(5): 112-118.
- Kumar S, Tripathy PK, and Jena PK. (2012). Study of wild edible plants among tribal groups of Simlipal Biosphere Reserve Forest, Odisha, India; with special reference to Dioscorea species. *International Journal of Biological Technology*. 3(1): 11-19.
- Kumar SJU, Chaitanya KMJ, Semotiuk AJ, Krishna V. (2019). Indigenous knowledge of medicinal plants used by ethnic communities of South India. *Ethnobotany Research and Applications*. 18(4): 1- 112.

- Mishra N, Oraon A, Dev A, Jayaprakash V, Basu A, Pattnaik AK, Tripathi SN, Akhtar M, Ahmad S, Swaroop S, Basu M. (2010). Anticonvulsant activity of *Benkara malabarica* (Linn.) root extract: In vitro and in vivo investigation. *Journal of Ethnopharmacological*. 128(2): 533-536.
- Mongrand S, Alain B, Patouille B, Lacomblez C, Bessoule JJ. (2005). Chemotaxonomy of the Rubiaceae family based on leaf fatty acid composition. *Phytochemistry*. 66(5): 549-559.
- Muthiah K and Balakrishnan V. (2022). Estimation of Antioxidant and Cytotoxicity activities of extracts obtained from the leaves of folk medicinal plant *Benkara malabarica* (Lam). *Indian Journal of Pharmaceutical Education and Research*. 56(3): 838.
- Nakum SB, Jani S, Acharya R, Harisha CR, and Shukla VJ. (2021). Pharmacognostical and preliminary phytochemical evaluation of stem and root bark of *Benkara malabarica* (Lam.) Tirveng. *International Journal of Botany Studies*. 6(1): 145-149.
- POWO. (2024). Plants of the World Online. Royal Botanic Gardens, Kew. Available from: <http://www.plantsoftheworldonline.org/> (accessed 27 February 2025).
- Razafimandimbison SG and Rydin C. (2024). Phylogeny and classification of the coffee family (Rubiaceae, Gentianales): Overview and outlook. *Taxon*. 73(3): 673-717.
- Ridsdale CE. (2007). Thorny problems in the Rubiaceae: *Benkara*, *Fagerlindia* and *Oxyceros*. *A Journal on Taxonomic Botany, Plant Sociology and Ecology*. 12(4): 289-300.
- Saxena HO and Brahmam M. (1995). The Flora of Orissa. Flora of Orissa. Orissa Forest Department Corporation Ltd & Regional Research Laboratory, Bhubaneswar, Odisha. 809-810.
- Shanthamani M and Ulagi R. (2018). Antimicrobial studies on the extract of *Benkara malabarica* (Lam.) triveng and *Tarenna asiatica* (L.) kuntze Ex K. schum. *Journal of Pharmacognosy and Phytochemistry*. 7(4): 08-11.
- Shanthamani M and Ulagi R. (2019). Isolation of steroid compounds from *Randia malabarica* (Triveng) and their biological activity. *Asian Journal of Chemistry*. 31(1): 135-138.
- Tirvengadam DD. (1983). New taxa and name changes in tropical Asiatic Rubiaceae. *Nord. Journal of Botany*. 3: 455-469.
- Vanitha A, Chinnadurai V, Kalimuthu K. (2018). A comparative study of phytochemical constituents of *Benkara malabarica* (Lam.) leaf and leaf callus extracts. *International Journal of Pharma Research and Health Sciences*. 6(2): 2401-09.

CHAPTER 2

***Gardenia latifolia* Aiton (Indian Boxweed): a medicinal ornamental tree of India**

Ghodke Anita Suresh Rao¹, S. S. Shekokar² and D. Chothe²

¹Amaltas Institute of Ayurved Dewas Madhya Pradesh, India

²Dravyaguna Vigyan, Government Ayurved Mahavidyalay Nanded, Maharashtra, India

*Email-Id: anitaghodke24@gmail.com

DOI: <https://doi.org/10.5281/zenodo.15032184>



Licensed under a Creative Commons Attribution 4.0 International License

Abstract: *Gardenia latifolia* is one of the important medicinal trees among traditional healers due to its immense medicinal properties. It is a versatile plant with medicinal and ornamental potential. Beyond its aesthetic value, it has a rich history of traditional medicinal uses, which include various plant parts to cure certain diseases such as fever, skin diseases, rheumatism, and stomach problems. Scientific validations have revealed the presence of bioactive compounds such as flavonoids, tannins, steroids, and saponins. The chapter comprises the bioactive compounds, ethnomedicinal uses, pharmacological activities, and ecological significance.

Keywords: Bioactive compounds, ecological significance, Rubiaceae, traditional knowledge

INTRODUCTION

The Rubiaceae family of plants is important for its medicinal, economic, and ecological value. All plant parts of Rubiaceae family species have a broad spectrum of bioactive compounds, which have great potential to cure different ailments (Roy et al., 2024; Martins and Nunez, 2015). Some species are used for timber, food, and dye (Geetanjali and Jadhav, 2023). Apart from human benefits, it also has a significant role in ecological terms. As due to the long, tubular flower of some Rubiaceae family, it attracts pollinators like hummingbirds and bumblebees (Raju and Radhakrishna, 2018). *Gardenia* is one of the largest genera with 142 species of evergreen shrubs and small trees distributed in tropical and subtropical regions of Africa, Asia, Madagascar, Australia, and Oceania (Raju et al.,

2022). The genus *Gardenia* belongs to the family Rubiaceae and has more than 80 species spread among tropical and subtropical regions of the world. The genus was named by Carl Linnaeus after Dr. Alexander Garden (1730-1791), a Scottish-born American naturalist (**Parmar et al., 2000**). The plants of the *Gardenia* genus have high medicinal value and hence are of commercial importance. Some exotic species are grown in gardens. Several *Gardenia* species yield timber, which is used as a substitute for boxwood. *Gardenia* species play an important role as a fragrance modifier (**Parmar et al., 2000**). The leaf buds and the young shoots of *Gardenia gummifera* and *Gardenia lucida* yield a resinous exudation commercially known as Dikamali gum (**Parmar et al., 2000**). The *Gardenia* genus has high medicinal and commercial value (**Parmar et al., 2000**). *Gardenia latifolia* Aiton is a medium-sized deciduous tree or large shrub. It is commonly known as Indian boxwood, Ceylon boxwood (English), papda, papura, paphar (Hindi), and kurku (Odia) (**Kumar et al., 2022**). It is mostly found in open forests or rocky hills from 400 to 900 m altitude at some point in India (**Parvej et al., 2022**). The flowering period is in the month of March–April, and the fruiting period is in December–June. It is native to India, however, and is also observed in tropical and subtropical areas of Asia, Africa, Australia, and Madagascar (**Parvej et al., 2022**). It is found in the forests of Madhya Pradesh, Orissa, and Haryana in India (**Bharti and Sharma, 2024; Kumar et al., 2022**). Different plant parts of *G. latifolia* are used to treat different ailments such as fever, skin diseases, stomach diseases, snake bites, and diabetes in humans, and ephemeral fever in livestock; its fruit is used to make perfume (**Raju et al., 2022**). Fruit is consumed as raw (**Kumar and Shiddamallayya, 2021**). *G. latifolia* fruit extract is used as dye and food additives due to the high content of yellow pigments (**Reddy et al., 2021**). In tribal communities, stem and bark are used for fish poisoning (**Sundar and Habibur, 2019**). It is also having economical uses (**Raju et al., 2022**). Some insect species visiting the flower for mainly pollination and nectar feeding of *G. latifolia*, such as *Xylocopa pubescens*, *Xylocopa latipes*, *Nectarinia asiatica*, *Nectarinia zeylanica*, *Mylabris phalerata*, and *Pteropus medius* (**Raju et al., 2022**). Foragers visiting the flower are mainly bats, birds, and bees (**Nagireddy et al., 2021**).

METHODOLOGY

The survey was carried out on the basis of a field and literature survey. The field survey was carried out in 2022-2024 in selected areas. A systematic semi-structured questionnaire was

carried out in tribal communities. The literature comprises PubMed, Scopus, and Web of Science. Relevant articles and books published were selected and reviewed.

MORPHOLOGY

It is a small deciduous tree or large shrub. Bark is greenish-grey, bud resinous. Leaves that are oppositely arranged or whorled have short stalks, are oval to obovate, smooth, and have a small hairy gland in the axils of the veins on the underside, and a glandular hairy in the axils beneath, with a base narrowed. Flowers appear singly at the end of branches., white, large, solitary, usually borne when the leaves are small; peduncles are short. Calyx somewhat mealy and pubescent, somewhat ridged by the decurrent calyx-lobes; calyx-lobes very unequal, subulate, apiculate. Corolla—tube, funnel-shaped above, hairy lobes. Anthers partly exserted. Fruit globose, slightly scabrous (Saxena and Brahmam, 1995; Figure1-5).



Figure 1: Bark of *G. latifolia*

BIOACTIVE COMPOUNDS

G. latifolia, a plant rich in traditional medicinal uses, contains a variety of bioactive compounds responsible for its pharmacological effects. The main key bioactive compounds in *G. latifolia* are saponins, alkaloids, phenolic compounds, flavonoids, terpenoids, and steroids (Table 1). These compounds belong to the different chemical classes, each contributing to the plant's overall therapeutic potential.



Figure 2: Habit of *G. latifolia*



Figure 3: Flower of *G. latifolia*



Figure 4: Fruits of *G. latifolia*



Figure 5: Leaves of *G. latifolia*

Table 1: Bioactive compounds of *G. latifolia*

Plant parts	Bioactive compounds	Sources
Leaf and bark	Steroids, phenolic compounds, and flavonoids	Lakshmi and Jaganmohanreddy, (2011)
Bark	Beta sesterol, hederagenin, Me-esters of oleanic and gypsogenic acids	Lakshmi and Jaganmohanreddy, (2011)
Bark	Saponins, alkaloids, glycosides, terpenoids, phenolic compounds, carbohydrates, flavonoids, diterpins among which flavones	Lakshmi and Jaganmohanreddy, (2011); Ansar et al., (2019); Reddy et al., (2021); Patel et al., (2021)
Root	Gardenins	Lakshmi and Jaganmohanreddy, (2011)

Stem and bark	Hederagenin, D-mannitol, sitosterol, siaresinolic, episiaresinolic, oleanolic and spinosic acid	Lakshmi and Jaganmohanreddy, (2011); Reddy et al., (2021)
Leaves	Phenols, tannins, terpenoids, resins, flavonoids, glycosides, phytosterols, steroids, fats and oils	Vindhya et al., (2014)

ETHNOMEDICINAL USES

Present investigation through literature and field survey reveals that it possesses numerous traditional uses (Table 2). The tribal communities in Bargarh district in Odisha use *G. latifolia* to treat rheumatism. The Gond tribes of Bhandara district in Maharashtra consume the powder of the seeds along with *Piper nigrum* for regularising irregular menstruation (Deb et al., 2018). In Bangladesh, the tribal communities use the decoction of the stem and bark to treat tooth decay (Deb et al., 2018).

Table 2: Ethnomedicinal claims of *G. latifolia*

Plant parts	Mode of uses	Diseases	Sources
Root	Infusion	Indigestion	Lakshmi and Jaganmohanreddy, (2011)
Fruit	Paste	Breast diseases	Bharti and Sharma, (2024)
Pulp	Paste	Fever	Lakshmi and Jaganmohanreddy, (2011)

Stem and fruit	Juice	Stomach pain	Lakshmi and Jaganmohanreddy, (2011)
Fruits	Decoction	Sores of hand and feet	Lakshmi and Jaganmohanreddy, (2011)
Stem and bark	Decoction	Tooth decay	Lakshmi and Jaganmohanreddy, (2011)
Seed	Powder	Irregular menstruation	Deb et al., (2018)
Bark	Paste	Skin diseases	Lakshmi and Jaganmohanreddy, (2011)
Fruits	Decoction	Haemorrhage	Reddy et al., (2021)
Leaves and stem	Decoction, infusion, and paste	Skin diseases, kidney stone, stomach troubles and constipation	Jadhav and Pawar, (2022)
Resinous sap	Paste	Sores of hand	Sundar and Habibur, (2018)
Gum	Paste	Cutaneous disease	Sundar and Habibur, (2018)
Fruit	Paste	Amoebiasis	Sundar and Habibur, (2018)
Latex	Paste	Eczema	Sundar and Habibur, (2018)
Stem and fruit	Decoction	Stomach pain	Purushothaman et al., (2000)
Whole plant	Decoction	Skin diseases and high blood pressure	Nayak and Kumar, (2023)

PHARMACOLOGICAL ASPECTS

Table 3 concluded that mostly plant parts such as leaves, bark, and fruit possess various pharmacological activities in different extracts performed by many researchers. As per literature and field surveys, it concludes that *G. latifolia* shows a great number of pharmacological activities, including antidiabetic, antioxidant, antibacterial, anticancer, and anti-inflammation activity (**Table 3**). Less work was carried out on fruit, flowers, and seeds.

Table 3: Pharmacological activity of *G. latifolia*

Plant parts	Pharmacological activity	Sources
Leaves	Cytotoxicity activity	Vindhya and Leelavathi, (2014)
Bark	Antioxidant, antidiabetic, and anti-inflammation activity	Ansari et al., (2019); Bharti and Sharma, (2024)
Fruit	Antioxidant and antimicrobial activity	Reddy et al., (2021)
Leaves	Analgesic, antipyretic, α -amylase enzyme inhibition, membrane stabilizing, antioxidant effect and antimicrobial potentials	Arif et al., (2019)
Leaves	Antioxidant and anti-inflammation activity	Chourasiya et al., (2020)
Leaves	Antidiabetic activity	Tamilselvi et al., (2018)
Bark	Antibacterial activity	Deb et al., (2018)
Leaves and bark	Anticancer activity	Mehboob et al., (2024)
Leaves and fruit	Antioxidant activity	Sundar and Habibur, (2018)

ECOLOGICAL SIGNIFICANCE

Some insect species visiting the flower for mainly pollination and nectar feeding of *G. latifolia*, such as *Xylocopa pubescens*, *Xylocopa latipes*, *Nectarinia asiatica*, *Nectarinia*

zeylanica, *Mylabris phalerata*, and *Pteropus medius*. The sunbirds are just robbers of nectar from *G. latifolia*, and this nectar-robbing activity reduces nectar reward and increases variability in nectar standing crop. Bat, *Pteropus medius* collecting pollen. The bat visiting the flowers of *G. latifolia* collects pollen as a source of protein, which would make an excellent balance in its diet with the sugar and water provided by nectar collected from other floral sources (Raju et al., 2022). In 2021, Kumar et al. reported that *Nectarinia* species also used *G. latifolia* as a nectar source; they made punctures at the base of the corolla tube to collect nectar, and hence they acted as nectar robbers but not as pollinators. *Nectarinia* species were treated to be mostly nectar robbers (Kumar et al., 2021).

ECONOMICAL VALUES

Though it possesses medicinal and ecological significance, it also contributes to economic values. Fruits are used for making perfumes (Vindhya and Leelavathi, 2014; Kala, 2009). In market areas, it sold in many areas. Due to aesthetic appeal, it is widely cultivated for ornamental value in gardens and landscapes.

CONCLUSION

G. latifolia is a captivating plant renowned for its artistic appeal and valuable medicinal properties. It emerges as a multifaceted plant with significant potential in both ornamental and medicinal domains. Moreover, the plant's rich ethnomedicinal history reveals a treasure trove of bioactive compounds. *G. latifolia* presents a promising avenue for the development of novel natural remedies.

REFERENCES

- Ansari F, Khare S, Dubey BK, Joshi A and Dhakad S. (2019). Phytochemical analysis, antioxidant, antidiabetic and anti-inflammatory activity of bark of *Gardenia latifolia*. Journal of Drug Delivery and Therapeutics. 9(1): 141-145.
- Arif M, Ruhul KM, Torequl IM and Mohammed I. (2019). Evaluation of *in vivo* and *in vitro* biological activities of *Gardenia latifolia* Ait leaf. GSC Biological and Pharmaceutical Sciences. 07(03): 116-123.
- Bharti N and Sharma R. (2024). Phytochemical study and spectroscopic analysis of *Gardenia latifolia*. Journal of Medicinal Plants Studies. 12(6): 107-110.
- Bharti N and Sharma R. (2024). Studies on the phytochemistry and antibacterial efficacy of *Gardenia latifolia*. International Journal of Herbal Medicine. 12(6): 11-14.

- Chourasiya S, Yadav Y, Jain S and Shukla K. (2020). Evaluation of anti-inflammatory activity of methanolic leaves extract of *Gardenia latifolia* using formalin-induced paw edema model. *Asian Journal of Pharmaceutical Education and Research*. 9(1): 20-28.
- Deb NK, Deb J and Abhik S. (2018). Screening of antibacterial properties of crude extract of *Gardenia latifolia* Ait. Bark. *International Journal of Herbal Medicine*. 6(5): 01-04.
- Geetanjali PS and Jadhav DM. (2023). Ethnomedicinal documentation of some important plants of the family Rubiaceae. *International Journal of Scientific development and Research*. 8(1): 372- 374.
- Jadhav DM and Pawar GS. (2022). Ethnobotanical documentation of Rubiaceae flora from Kinwat region of Maharashtra. *Journal of Emerging Technologies and Innovative Research*. 9(2): 898-901.
- Kala CP. (2009). Aboriginal uses and management of ethnobotanical species in deciduous forests of Chhattisgarh state in India. *Journal of Ethnobiology and Ethnomedicine*. 5:20.
- Kumar GMP and Shiddamallayya N. (2021). Nutritional and anti-nutritional analysis of wild edible plants in Hassan district of Karnataka, India. *Indian Journal of Natural Products and Resources*. 12(2): 281-290.
- Kumar S, Mishra S, Mishra AK and Kumar SN. (2022). Floral Diversity of Koira & Barsuan ranges of Bonai Forest Division, Odisha, Divisional Forest Officer, Bonai Forest Division. Ambika Prasad Research Foundation.
- Kumar SS and Raju SAJ. (2021). Pollination ecology of the rare tropical deciduous tree species, *Maerua apetal* (roth) m. Jacobs (Capparaceae) in the Southern eastern ghats forest of Andhra Pradesh, India. *Annali Di Botanica*. 11: 33-42.
- Lakshmi BJ and Jaganmohanreddy K. (2011). Screening of secondary metabolites in methanolic leaf and bark extracts of *Gardenia resinifera* and *Gardenia latifolia*. *Bioscience Biotechnology Research Communications*. 4(1): 23-28.
- Martins D and Nunez CV. (2015). Secondary metabolites from Rubiaceae species. *Molecules*. 20(7): 13422-13495.
- Mehboob Z, Sharif S, Lodhi MS, Shah AB, Romman M and Nayila I. (2024). Phytochemical profiling and anticancer potential of *Gardenia latifolia* extracts against arsenic trioxide induced liver fibrosis in rat model. *Frontiers in Pharmacology*. 15: 1389024.
- Nagireddy L, Parveen NS, Rao CP and Raju SAJ. (2021). Flowering and flower- visitors of deciduous plant species in the dry deciduous forest ecosystem in Andhra Pradesh. *Species*. 22(70): 274-279.
- Nayak S and Kumar S. (2023). Medicinal plants used by tribals of Odisha. State Medicinal Plants Board. Ambika Prasad Research Foundation. 246-247.
- Parmar VS, Sharma SK and Poonam. (2000). Novel constituents of *Gardenia* species- a review. *Journal of Scientific & Industrial Research*. 59: 893-903.

- Parvej SH, Rushikesh CD, Avinash GB, Vishal GP and Ganesh AK. (2022). A review on pharmacognostic, phytochemical and antioxidant studies of *Gardenia latifolia* Aiton. *World Journal of Pharmaceutical research*. 11(2): 499-524.
- Patel A, Soni V and Jain SK. (2021). Comparative qualitative and quantitative phytochemical screening of hydroalcoholic extract of *Gardenia latifolia* and *Gardenia resinifera* leaves and bark extract. *Journal of Advanced Scientific Research*. 12(3): 281-286.
- Purushothaman S, Viswanath S and Kunhikannan C. (2000). Economic valuation of extractive conservation in a tropical deciduous forest in Madhya Pradesh, India. *Tropical Ecology*. 41(1): 61-72.
- Raju AJS, Kumar SS, Grace LK, Punny K, Raliengoane TP and Prathyusha K. (2022). Zoophily and nectar-robbing by sunbirds in *Gardenia latifolia* Ait. (Rubiaceae). *Journal of Threatened Taxa*. 14(8): 21642-21650.
- Raju SAJ and Radhakrishna J. (2018). Pollination ecology of the annual herb, *Hedyotis brachlata* (Rubiaceae). *Annali Di Botanica*. 8: 9-16.
- Reddy YM, Kumar SPJ, Saritha KV, Gopal P, Reddy M and Gandara JS. (2021). Phytochemical profiling of methanolic fruit extract of *Gardenia latifolia* Ait. By LC-MS/MS analysis and evaluation of its antioxidant and antimicrobial activity. *Plants*. 10: 545.
- Roy D, Brar S, Bhatia R and Rangra NK. (2024). An insight into the ethnopharmacological importance of Indian subcontinent medicinal plant species of Rubiaceae family. *Advances in Traditional Medicine*. 24: 947-969.
- Saxena HO and Brahmam M. (1995). *The Flora of Orissa*. Orissa Forest Department Corporation Ltd & Regional Research Laboratory, Bhubaneswar, Odisha.
- Tamilselvi K, Ananad SP and Doss A. (2019). Evaluation of In- vitro antidiabetic activity of *Gardenia latifolia* Ait. *International Journal of Health Sciences and Research*. 8(8): 226- 230.
- Vindhya K and Leelavathi S. (2014). In-vitro cytotoxicity activities of leaf extract of *Gardenia latifolia* Ait. And *Gardenia gummifera* Linn. *International Journal of Pharmaceutical Sciences and Research*. 5(11): 4977-4980.
- Vindhya K, Kumara SKK, Neelambika HS and Leelavathi S. (2014). Preliminary phytochemical screening of *Gardenia latifolia* Ait. And *Gardenia gummifera* Linn. *Research Journal of Pharmaceutical, Biological and Chemical*. 5(2): 527-532.

CHAPTER 3

***Dentella repens* (creeping Lickstoop): a medicinal wetland herb of India**

Sugimani Marndi¹, Sanjeet Kumar¹, Bidhan Chandra Roy² and Sohan Lal^{3*}

¹Ambika Prasad Research Foundation, Odisha, India

²Department of Botany, Dinabandhu Mahavidyalaya, Bongaon, West Bengal, India

³School of Studies in Botany, Shaheed Mahendra Karma Vishwavidhyalay Bastar, Jagdalpur, Chhattisgarh, India

*Email-Id: sohangurupanch2753@gmail.com

DOI: <https://doi.org/10.5281/zenodo.15032032>



Licensed under a Creative Commons Attribution 4.0 International License

Abstract: Nature has been an incredible cradle of medicinal agents for ages, where a striking number of modern drugs have been obtained from natural resources. *Dentella repens* is a promising medicinal herb used to cure various diseases. It grows primarily in the wet tropical biome. It possesses therapeutic properties to cure certain diseases such as constipation and blood related problems. It is also used for the culinary purposes. The chapter summarises its morphology, ethnomedicinal uses, secondary metabolites and pharmacological values of *D. repens*.

Keywords: Medicinal herb, secondary metabolites, traditional knowledge, therapeutic agent

INTRODUCTION

In this evolving world, 80 % of people depend upon traditional medicines to treat major health problems (Smith et al., 2012). Since long ago, plants have been exploited as medicines. Medicinal plant-based drug discovery continues to give lead compounds against various diseases. Whole plants or plant parts basically grip the system of crude drugs, for instance, teas, poultices, powders, and herbal formulations. The plants of Rubiaceae family

are known and occurs in all major regions of the world. The tribals use these plants for their general utility, like food, fodder, and medicines. This family is characterised by producing bioactive metabolites with prodigious pharmacological potential. Among the plants of this family, *Dentella* belongs to the tribe Hedyotideae of the subfamily Cinchonoideae. Only two species, namely *Dentella repens* J. R. and G. Forst and *D. serpyllifolia* Wall ex Airyshaw, are known to occur in India. As per the reported information, it states that *D. repens* and *D. serpyllifolia* are a single species, but later, many researchers worked on its taxonomic aspects, and concluded that both are different species (**Devi and Raju 1980**). *D. repens* (**Figure 1**) is herbs and mostly found near water bodies. The flowering period is from April to October, and fruiting is most of the year. It occurs throughout tropical Asia to Australasia, from Sri Lanka through India, Bangladesh, Myanmar, and Nepal to southern China and south through Indochina, Peninsular Malaysia, the Philippines, Indonesia, Australia, Micronesia, and Polynesia (**Razafimandimbison and Manjato 2019**).



Figure 1: Habit and habitat of *D. repens*

In India, it spreads throughout Andhra Pradesh, Assam, Bihar, Tamil Nadu, Tripura, Uttar Pradesh, Odisha, and West Bengal. It is commonly known as Creeping dentella or Creeping lickstoop. It can be characterised by a small prostrate herb, rooting at nodes, looking

attractive with its small white flowers borne singly on stalks. *D. repens* are highly medicinal plants used by tribal communities in India (Kumar et al., 2022). It also has a significant role in ecological aspects, as it is one of the indicators of a natural salt lick area inside the forest (Nayak and Kumar, 2023). Present study highlights its importance as medicinal food to bring attention towards its sustainable utilization.

METHODOLOGY

Literature and field surveys were carried out in selected places in India during 2024-2025. During the field survey, morphological characters, habit and habitat was observed in Odisha, Chhattisgarh and West Bengal (Saxena and Brahman, 1995). A tentative literature survey was carried out to gather its uses focusing on their traditional uses, reported bioactive compounds and pharmacological potentials. A literature survey comprises PubMed, Scopus, and Web of Science. Relevant articles and books published were selected and reviewed (Kumar et al., 2022).

MORPHOLOGY

It is a small prostrate herb. Stems are somewhat 4-angled. Leaves are elliptic or oblong or inverted lance-shaped, but short-pointed at both ends, acute, or obtuse. About 1 cm long, the tube is yellowish, the petals are white, and the throat is hairy. The flowers are often borne between branches in the V-shaped fork and are nearly stalkless.



Figure 2: Morphology of *Dentella repens* (L.) J.R. Forst. & G.Forst.

Flowers axillary, solitary, sessile. Calyx teeth subulate. Corolla long, lobes ovate, obliquely ellipsoid, plano-spherical, or oblong-obovoid, slightly dorsiventrally compressed, faintly 5-ribbed, glabrous. Fruits are hairless or covered with glassy hairs, globose, indehiscent, bulbous-tipped trichomes, with many small angular seeds. Seeds are minute, angular, brown, and rugose (Saxena and Brahmam, 1995; Figures 1-2).

BIOACTIVE COMPOUNDS

As per the literature review, it concludes that less work was carried out on the phytochemical analysis. Very few words have been carried out in the leaves of *D. repens*. In 2024, Shaikh et al. reported bioactive compounds in the leaf as tannins, phenolics, glycosides, steroids, terpenoids, and alkaloids (Table 1).

Table 1: Bioactive compounds and their probable utilization in *D. repens*

Bioactive compounds	Utilization	References
Alkaloids	Possess anti-inflammatory effects, analgesic, emetic, anticholinergic, antitumor, diuretic, antiviral, antihypertensive, anticancer, antidepressant, muscle relaxant, antimicrobial and antiulcer.	Rajput et al., (2022); Shaikh et al., 2024
Flavonoids	Inhibition of key enzymes in mitochondrial respiration, protection against coronary heart disease antitumor, anti-inflammatory, and antimicrobial activities.	Ullah et al., (2020); Shaikh et al., 2024
Phenolic compounds	Possess antioxidant activity, anti-inflammatory effect, antibacterial effect, cardiovascular complication.	Kumar et al., (2022); Shaikh et al., 2024

Glycosides	Possess cardiovascular, antibacterial, anticancer, anti-inflammatory, and neurodegenerative illnesses.	Riaz et al., (2023); Shaikh et al., 2024
Tannins	Antimicrobial, anti-cancer, anti-nutritional and cardio-protective properties.	Smeriglio et al., (2016); Shaikh et al., 2024
Steroids	It is potent anti-inflammatory and immune-modulating properties.	Neilsen and Kaye, (2014); Shaikh et al., 2024

ETHNOMEDICINAL USES

Ethnomedicinal plants are a potent source of medicines for different ethnic people. Traditional knowledge is very important for the sustainable utilisation of medicinal plants (Modi et al. 2023). Tribal healers are acquainted with using forest products as a major source of food and medicinal prospects. It shows the highest uses for constipation, blood clearing, and high blood pressure (Table 2). The parts are mostly consumed as leaves in various forms, as a decoction or paste. In some parts of India, it consumed as for culinary purposes.

Table 2: Ethnomedicinal potentials of *D. repens*

Parts used	Medicinal uses	Sources
Leaves	Constipation	Begum and Mandal, (2016)
Leaves and stems	Constipation	Jadhav and Pawar, (2014)
Leaves	Blood clearing	Samanta 2024
Leaves	High blood pressure	Snehalatha et al., (2023)
Leaves	Eczema	Snehalatha et al., (2023)
Leaves	Loose motion	Snehalatha et al., (2023)
Leaves	Eyesight	Singh and Ali, (2012)
Leaves	Toothache and vomiting	Campilan et al., (2019)

Leaves	Poulticing sores	Swapna et al., (2011)
--------	------------------	-----------------------

PHARMACOLOGICAL ANALYSIS

Few researchers have reported its pharmacological uses of *D. repens*. Shaikh et al. (2024) reported *D. repens* possess anti-inflammatory, anthelmintic and antioxidant potential.

CONCLUSION

Dentella repens is a multifaceted herb boasting a rich history of traditional applications and remarkable pharmacological promise. Its bioactive profile, comprising flavonoids, alkaloids, and triterpenoids, underpins its therapeutic potential. Beyond its medicinal value, *D. repens* also holds significant ecological and culinary importance, underscoring its versatility and value in various contexts. Based on these findings, the present study recommends further research in ethnomedicinal and ethnopharmacological studies to fully explore the potential of this plant.

REFERENCES

Begum N and Mandal S. (2016). A contribution to the medicinal plants used by the tribal people of Lateritic belt of West Bengal. *World Journal of Pharmacy and Pharmaceutical Sciences*. 5(8): 1420-1431.

Campilan JRH, Tumamac MC and Dorado EL. (2019). Quantitative ethnobotanical Study, phytochemical screening and antibacterial plants of T'boli in Lemsnonon, Tboli, South Cotabato. *International Journal of Pharmacology, Phytochemistry and Ethnomedicine*. 13: 45-61.

Devi HM and Raju PVSNGK. (1980). Embryology of two species of *Dentella* (*Dentella repens* and *Dentella serpyllifolia*). *Proc. Indian Acad. Sci. (Plant Sci.)*. 89(3): 213-218.

Hall CS, Larsen HO and Pouliot M. (2012). People, plants and health: a conceptual framework for assessing changes in medicinal plants consumption. *Journal of Ethnobiology and Ethnomedicine*. 8:43.

Jadhav DM and Pawar GS. (2022). Ethnobotanical documentation of Rubiaceae flora from Kinwat region of Maharashtra. *Journal of Emerging Technologies and Innovation Research*. 9(2): c898-c901.

Kumar A, Khan F and Saikia D. (2022). Phenolic compounds and their biological and pharmaceutical activities. *The Chemistry Inside Spices and Herbs: Research and Development*. 204-234.

Kumar S, Mishra S, Mishra AK, Kumar SN. (2022). *Floral Diversity of Koira & Barsuan ranges of Bonai Forest Division, Odisha*. Divisional Forest Officer, Bonai Forest Division. Ambika Prasad Research Foundation.

- Modi G, Gupta D and Babita. (2023). A review on ethnomedicinal plants and their traditional uses in India. European Chemical Bulletin. 12(Special issue 8): 8442-8452.
- Nayak S and Kumar S. (2023). Medicinal plants used by tribals of Odisha. State Medicinal Plants Board. Ambika Prasad Research Foundation. 246-247.
- Neilsen W and Kaye AD. (2014). Steroids: Pharmacology, complications, and practice delivery issues. The Ochsner Journal. 14(2): 203-207.
- Rajput A, Sharma R and Bharti R. (2022). Pharmacological activities and toxicities of alkaloids on human health. Materials Today: Proceedings. 48(5): 1407-1415.
- Razafimandimbison S and Manjato N. (2019). First record of *Dentella repens* (Rubiaceae) from Madagascar. Candollea. 74(1): 43-45.
- Riaz T, Akram M, Laila U, Zainab R, Khalil MT, Iftikhar M, Ozdemir FA, Solowski G, Altable M, Sfera A, Ibrahim HK and Parmar P. (2023). Therapeutic applications of glycosides obtained from medicinal plants. IAIM. 10(8): 30-38.
- Samanta SK. (2024). Traditional uses of medicinal plants by ethnic peoples of Salboni block in the Paschim Medinipur district, West Bengal, India. Ecology, Environment and Conservation. 30: S295-S298.
- Saxena HO and Brahman M. (1995). *The Flora of Orissa*. Orissa Forest Department Corporation Ltd & Regional Research Laboratory, Bhubaneswar, Odisha.
- Shaikh FK, Talole SD, Bradosty SW and Hallur RLS. (2024). Biological activity assessment and GC-MS screening of phytoconstituents in *Dentella repens* leaf methanolic extract. 5th International Conference on Biomedical and Health Sciences. 485-495.
- Singh P and Ali SJ. (2012). Ethnomedicinal plants of family Rubiaceae of Eastern U.P. Indian Journal of Scientific Research. 1(2): 83-86.
- Smeriglio A, Barreca D, Bellocco E and Trombetta D. (2016). Proanthocyanidins and hydrolysable tannins: occurrence, dietary intake and pharmacological effects. British Journal of Pharmacology. 174(11): 1244-1262.
- Snehalatha VR, Jena N and Kumar S. (2023). Creeping lickstool (*Dentella repens* (L.) J.R.Forst. & G.Forst.): a medicinal creeper of India. Medico Bio-wealth of India. 12: 18-21.
- Swapna MM, Prakashkumar R, Anoop KP, Manju CN and Rajith NP. (2011). A review on the medicinal and edible aspects of aquatic and wetland plants of India. Journal of Medicinal Plants Research. 5(33): 7163-7176.
- Ullah A, Munir S, Badshah SL, Khan N, Ghani L, Poulson BG, Emwas AH and Jaremko M. (2020). Important flavonoids and their role as a therapeutic agent. Molecules. 25(22): 5243.

CHAPTER 4

***Haldina cordifolia* (Roxb.) Ridsdale: A Valuable Tree Species in Indian Traditional Medicine - A Review of its Pharmacognosy, Pharmacology, and Toxicology**

Anuradha Das¹, Manvi Malwal², Bidhan Chandra Roy³, Sugimani Marndi^{4*} and Sanjeet Kumar⁴

¹Department of Botany, Sindri College Sindri B.B.M.K. University, Dhanbad Jharkhand, India

²Department of Botany, Post Graduate Government College for Girls, Sector 11, Chandigarh, India

³Department of Botany, Dinabandhu Mahavidyalaya, Bongaon, West Bengal, India

⁴Ambika Prasad Research Foundation, Odisha, India

*Email-id: sugimani2marndi@gmail.com

DOI: <https://doi.org/10.5281/zenodo.15152270>



Licensed under a Creative Commons Attribution 4.0 International License

Abstract: *Haldina cordifolia* is a fascinating tree that holds a place in medicinal and cultural significance. It belongs to the Rubiaceae family, which includes coffee and gardenias. Keeping the importance of this tree in mind, significant information was collected and presented in this chapter. Results revealed that it contains alkaloids, flavonoids, saponins, terpenes, tannins, and carbohydrates. Plant parts are used traditionally for treating rheumatism, stomach-ache, headache, toothache, fever, cold, and conjunctivitis. Plant parts of *H. cordifolia* also possess antidiabetic, anti-inflammatory, anti-amoebic, antiulcer, and antibacterial activity. The chapter highlights the pharmacognosy, pharmacology, and toxicological aspect of *H. cordifolia*.

Keywords: *Haldinia cordifolia*, Rubiaceae, medicinal, cultural, ecological, pharmacological

INTRODUCTION

Since the prehistoric period, humans have relied on plant-based medicines. In fact, most of the pharmacopoeia of modern scientific medicine was developed from traditional herbal knowledge collected in the 20th century (Upton 2022). Many drugs in current use have

botanical origins. Nearly a quarter of all prescriptions filled in the most advanced nation include traditional medicinal plant ingredients. Some are derived from plant extracts, while others are synthetic analogues of these substances. Rubiaceae is an important family in the flowering plants belonging order Gentianales (Davis et al., 2009). Among many plants from the Rubiaceae family, *Haldina cordifolia* is one of them with numerous medicinal, ecological, and cultural values. According to the history of *H. cordifolia* also known as *Adina cordifolia* (synonym), it can be traced a long time back to the Vedas, Puranas, and Samhita. In the Vedic period, the root and branches of the plant was used for dantadhavana. It is mentioned as Nipa in the Panineeya Asthadhyayi, Pathanjali Mahabhashya, Gubhilagruhya sutra, and Shulwa Prathishakhya (Negi et al., 2022). It is also known as Yellow Teak and Saffron Teak (Dash et al., 2019). It is a deciduous tree species native to India and some parts of Southeast Asia (Nayak and Kumar, 2023). It is distributed from the outer ranges of the Himalayas eastwards to Sikkim, Bhutan, and Myanmar; southwards through Central India and South India to Sri Lanka; and China, Vietnam, and Thailand. It can be identified by heart-shaped leaves and small, fragrant yellow flowers. It is found in moist deciduous forests and favors well-drained soil and sunlight. Flowering period June to July and fruiting period November to March (Saxena and Brahmam, 1995). As per ethnomedicinal values claimed by different researchers, the reported plant parts contain bioactive compounds that helps to treat different diseases such as rheumatism, fever, cold, wounds, headache, eczema, toothache, jaundice, and urinary infections (Dalu et al., 2021). The recorded pharmacological activities of *H. cordifolia* are anti-diabetic, anti-inflammatory, antiulcer, antiamoebic, and anti-nociceptive activity. It is a multi-use plant, which includes the use of wood for its durability for making furniture, construction, and flooring (Muthupandiyan et al., 2019). It is also valued in Hindu rituals and ceremonies. In many sacred places, it is one of the most planted species. It also holds a place in traditional medicine for its anti-inflammatory, antidiabetic, and antimicrobial properties (Roshan and Verma, 2021; Muthupandiyan et al., 2019). In addition to commercially accessible pharmacological options such as insulin, sulfonylureas, biguanides, thiazolidinediones, and others due to their fewer side effects and improved acceptance. It also contributes to economic values and plays an important role in agroforestry. Leaves and young twigs are used as fodder, and wood are used for timber and fuelwood (Muthupandiyan et al., 2019). Wood is also used for pencil manufacturing (Warrier et al., 2023).



Figure 1: Leaves of *Haldina cordifolia*

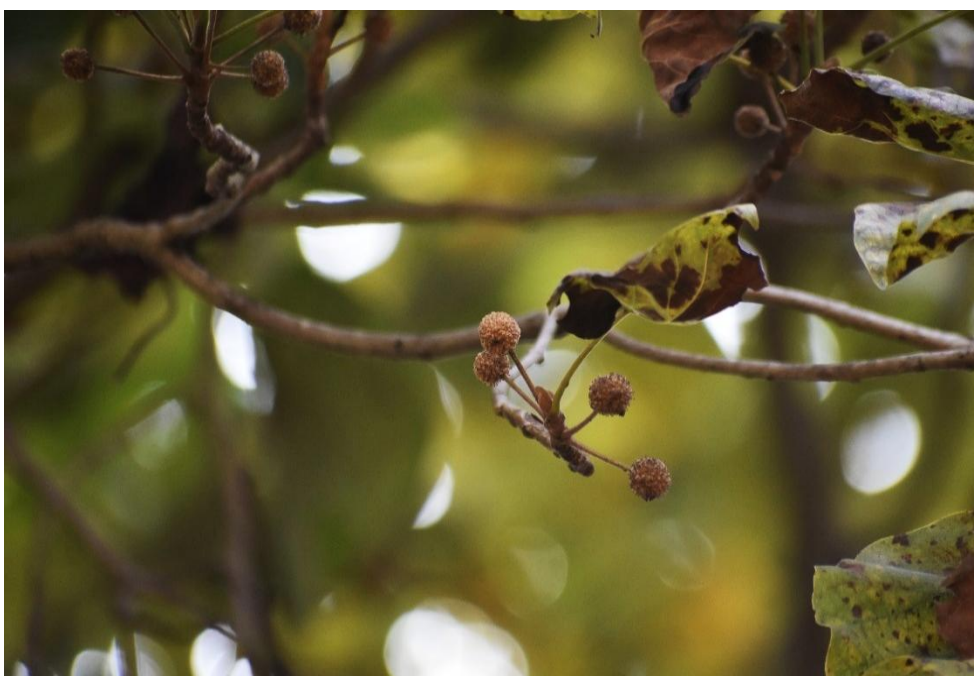


Figure 2: Fruit of *Haldina cordifolia*

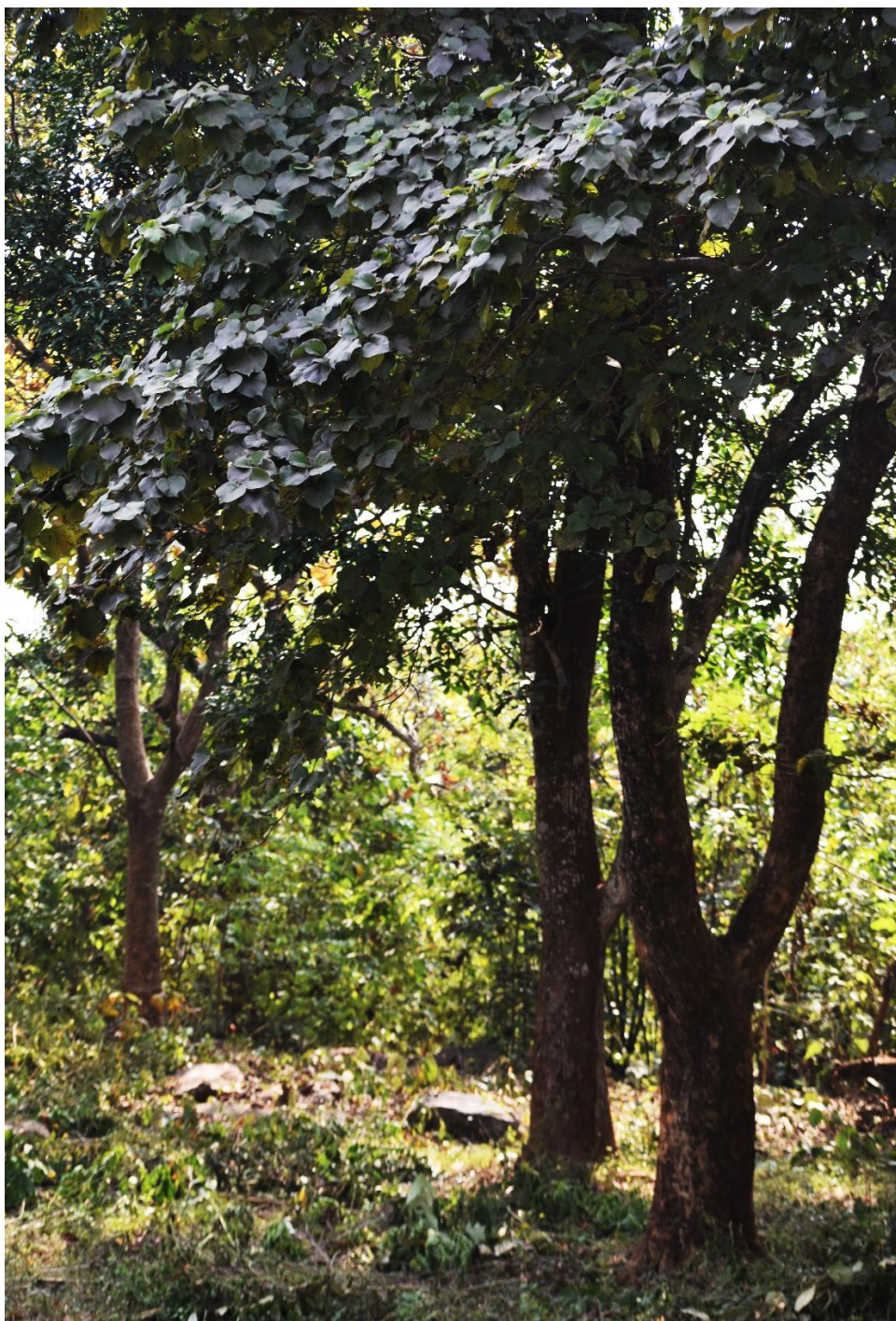


Figure 3: Habit and habitat of *Haldina cordifolia*

METHODOLOGY

The survey was carried out based on field and literature survey. The field survey was carried out to collect photographs of the plant from 2022-2024 in Odisha state. The plant was identified by the authors in field followed by flora book (Saxena and Brahmam, 1995). The literature survey was carried out through websites like PubMed, Scopus, and Web of Science. Relevant articles and published books were selected for the review process.

MORPHOLOGY

It is tree with smooth bark, light coloured, exfoliating in patches. Leaves broadly ovate, shortly abruptly acuminate, glabrescent to minutely pubescent above, pubescent to tomentose beneath; petiole 5-8 cm, glabrescent or tomentose; stipules suborbicular, enclosing the terminal bud. Heads 1.9-2 cm diameter, yellow, axillary, usually in vertical rows of three; peduncles, with 2 small caducous bracts towards the end; bracteoles filiform, hairy and somewhat expanded upward. Calyx -lobes linear. Corolla 5 mm, tube pubescent. Fruiting heads dry, 1-1.5 cm diameter (Saxena and Brahmam, 1995; Figure 1-3).

ETHNOMEDICINAL USES

It is one of the most common yet traditional medicinal tree used by tribal healers and by commoners. It is used to treat chronic cough, jaundice, stomach-ache, appetite, and stomach swelling (Table 1). Root used to treat astringent, constipation, diarrhoea, and dysentery. Bark is used to treat aphrodisiac, tonic, diuretic (Roshan and Verma, 2021).

Table 1: Ethnomedicinal uses of *Haldina cordifolia*

Part uses	Mode of uses	Diseases	Source
Leaves	Juice	Boils and conjunctivitis	Subba et al., (2024)
Flower	Paste	Headaches	Subba et al., (2024)
Stem and Bark	Juice	Rheumatism	Subba et al., (2024)

Bark	Maceration	Stomach-ache	Subba et al., (2024); Rokade and Pawar, (2013)
Leaves	Paste	Wounds and cuts	Subba et al., (2024)
Flowers	Paste	Headache	Singh et al., (2019)
Leaves	Paste	Wounds	Singh et al., (2019)
Bark	Decoction	Eczema	Rokade and Pawar, (2013)
Bark	Decoction	Urinary problems	Rokade and Pawar, (2013)
Latex	Paste	Toothache	Rokade and Pawar, (2013)

PHARMACOGNOSY

Researchers have done work in this aspect using the plant parts of *H. cordifolia* and reported several bioactive compounds (**Roshan and Verma, 2021**). Root and bark consist of oleoresin, essential oil, cellulose, β -sitosterol 13 and sitosterol (**Dash et al., 2019; Roshan et al., 2021**). The leaves of *H. cordifolia* contains glycosides, carbohydrates, proteins, amino acids, sterols, triterpenes, total phenolic compounds, flavonoids, and saponin (**Tiwari and Soni, 2023**). Bark of *H. cordifolia* contains cadambine, triterpenoids. Heartwood contains 3,4,5,7- tetracetyl quercetin. 7- hydroxycoumarin and 7- β -D glucosylcoumarin contains in bark and root. Leaves possess anthocyanins, coumarin, phenol, flavonoid, phytosterol, fatty acid, tannin, saponin, alkaloids, anthaquinone and sugar (**Das et al., 2022**). Heartwood of *H. cordifolia* possess adinin belonging to naphthaquinone groups of pigment. Root bark contains a new coumarin glycoside adicardin, characterized as 7-apiglucoside of umbelliferone (**Singh et al., 2019**).

PHARMACOLOGY

It is a broad field that studies comprise on the interactions of drugs with living organisms, including their actions, mechanisms, and effects. It includes both natural and synthetic drugs. Many researchers reported on its pharmacological values (**Table 2**). It has been used as anti-amoebic, anti-inflammatory, antinociceptive, ant fertility (**Dash et al., 2019; Dalu et al., 2021**). Leaves possess antimicrobial activity (**Dash et al., 2023**). Stem part possesses anticancer and antibacterial activity (**Rao et al., 2020**), antiulcer activities, hepatoprotective effect (**Ravi et al., 2012**), anti-inflammatory effect, antifertility activities, antidiabetic activity (**Chaudhary et al., 2012**), anti-amoebic (**Iqbal et al., 2009**), antinociceptive activity (**Jain et al., 2006**). In 2021, Roshan and Verma reported cytotoxicity activity in the crude extract of bark.

Table 2: Pharmacological activities of *Haldina cordifolia*

Part used	Pharmacological activities	Sources
Leaves	Antimicrobial activity	Dash et al., (2023)
Bark	Antimicrobial	Singh et al., (2019)
Stem	Anticancer and antibacterial activity	Rao et al., (2020)
Leaves	Antioxidant and hepatoprotective activity	Roshan and Verma, (2021); Mishra et al., (2022)
Leaves, bark, root	Antioxidant activity	Roshan and Verma, (2021)
Stem and bark	Hepatoprotective activity	Ravi et al., (2012)
Bark	Anti-inflammatory and analgesic activity	Roshan and Verma, (2021); Jain et al., (2006); Jakaria et al., (2015)

Stem	Anti-ulcer	Roshan and Verma, (2021); Baral et al., (2016)
Leaves	Antidiabetic activity	Chaudhary et al., (2012); Singh et al., (2019)
Root and bark	Antiamoebic activity	Iqbal et al., (2009); Baral et al., (2016)
Leaves	Anti-neoplastic activity	Mishra et al., (2022)
Bark	Anti-nociceptive activity	Jain et al., (2006)
Leaf, bark, and root	Antioxidant activity	Baral et al., (2016)
Stem and bark	Anti-inflammatory and antipyretic activities	Kiran et al., (2011)
Leaves	Anti-fertility	Singh et al., (2019)
Stem bark	Antimalarial	Singh et al., (2019)

TOXICOLOGY

Toxicology is a broader field that examines the adverse effects of chemical, biological, or physical agents on living organisms. The acetone and aqueous extract show hepatoprotective activity against Wister rats with liver damage induced by ethanol at a dose of 500 mg/kg body weight exhibited hepatoprotective effect by lowering the Serum Glutamate Pyruvate Transaminase (SGPT), Serum Glutamate Oxaloacetate Transaminase (SGOT), alkaline

phosphate and total bilirubin to a significant extent and significantly increased the levels of total protein (Sharma et al., 2012). Some studies also include acute toxicity assessments, which involve administering high doses of the plant extract to animals to observe any immediate adverse effects (Warrier et al., 2023).

CONCLUSION

This study heightens the therapeutic potential of *Haldina cordifolia* in different aspects and their constituents in the prevention or treatment of disease. From this study it aimed to attract the attention of researchers seeking new drug formulation from *H. cordifolia* and its chemical constituent.

REFERENCES

- Baral P, Dubey A, Tewari S, Vasmatkar PT and Verma AK. (2016). Total polyphenolic contents and antioxidant activity of leaf, bark and root of *Adina cordifolia* Benth. & Hook. Journal of Pharmaceutical, Chemical and Biological. 4(3): 394-401.
- Chaudhary P, Goel B and Ghosh AK. (2012). Antidiabetic activity of *Adinia cordifolia* (Roxb) leaves in alloxan induced diabetic rats. Asian Pacific Journal of Tropical Biomedicine. 2(3): S1630-S1632.
- Dalu AP, Zagare VS, Avchar PE, Kadam MP, Ingole AS, Nagrik SU and Patil PA. (2021). A pharmacological potential of *Adina cordifolia*. Journal of Drug Delivery and Therapeutics. 11(2-s): 132-135.
- Dash PP, Kumar S, Mishra A and Srivastava S. (2023). Antimicrobial activity of *Haldina cordifolia* (Roxb) Ridsdale and *Thevetia peruviana* (Pers.) Schum. leaf extract against multidrug resistant microbes. Annals of Phytomedicine: An International Journal. 12(1): 431-439.
- Dash PP, Kumar S, Mishra A and Srivastava S. (2022). Phytochemical characterization and investigation of *Haldina cordifolia* leaf extract as potential herbal drug. 21(6): 319- 336.
- Dash PP, Sarkar S and Mishra A. (2019). *Haldina cordifolia*: a potential plant in drug discovery research. Journal of Pharmacognosy and Phytochemistry. 8(6): 311-314.
- Davis AP, Govaerts R, Bridson DM, Ruhsam M, Moat J and Brummitt NA. (2009). A global assessment of distribution, diversity, endemism, and taxonomic effort in the Rubiaceae. Annals of the Missouri Botanical Garden. 96: 68-78.
- Iqbal PF, Bhat AR and Azam A. (2009). Antiamoebic coumarins from the root bark of *Adina cordifolia* and their new thiosemicarbazone derivatives. European Journal of Medicinal Chemistry. 44(5): 2252-2259.
- Jain AP, Pawar RS and Singhai A. (2006). Anti-inflammatory and anti-nociptive activity of *Adina cordifolia* Bark. Nigerian Journal of Natural Products and Medicine. 10: 90-93.

- Jakaria M, Parvez M, Zaman R, Arifujjaman, Hasan MI, Sayeed MA, and Ali MH. (2015). Investigations of analgesic activity of the methanol extract of *Haldina cordifolia* (Roxb.) bark by using *in vivo* animal model studies. Research Journal of Botany. 10(2): 1- 6.
- Kiran YR, Manjunath C, Kumar UA and Brahmaiah Y. (2011). Studies on the anti-inflammatory and antipyretic properties of *Haldinia cordifolia*. Biomedical and Pharmacology Journal. 4(2)
- Mishra S, Kumar A, Jain V, Pandey A, Saluja MS. (2022). In vitro antioxidant and anti-neoplastic activity of leaves extract of *Adina cordifolia*. International Journal of Medical and Biomedical Studies. 6(11): 22-29.
- Muthupandiyam S, Gireesan K and Warriar KCS. (2019). *Haldinia cordifolia* (Roxb.) Ridsdale – a promising tree for domestication. International Journal of Agricultural, Environment and Biotechnology. 12(3): 225-228.
- Nayak S and Kumar S. (2023). Medicinal Plants used by Tribals of Odisha. State Medicinal Plants Board, Odisha and Ambika Prasad Research Foundation, Odisha, India.
- Negi S, Negi A and Mishra MK. (2022). A review on pharmacological and phytochemical spectrum of “traditional medicinal plants *Adina cordifolia*” family – Rubiaceae. International Journal of Scientific Development and Research. 7(4): 216- 222.
- Rao PK, Srinivasulu S, Nadh MR, Babu BV, Reddi MS and Krishna A. (2020). Anticancer and antibacterial activity of green synthesized silver nanoparticles using *Adina cordifolia*. Materials Today: Proceedings. 43 (Part 2): 1700-1706.
- Ravi KY, Manjunath C, Balasubramannian T, Gnanasekaran D, Kumar AU and Brahmaiah Y. (2012). Evaluation of hepatoprotective activity of *Haldinia cordifolia* against paracetamol induced liver damage in rats. Der Pharmacia Lettre. 4(3): 768-774.
- Rokade Y and Pawar SP. (2013). A comprehensive review on *Adina cordifolia*. International Journal of Pharmaceutical Sciences Review and Research. 18(2): 13-16.
- Roshan A and Verma NK. (2021). Pharmacological activity of *Adina cordifolia*: a review. Asian Journal of Research in Pharmaceutical Sciences and Biotechnology. 9(4): 162-168.
- Saxena HO and Brahmam M. (1995). The Flora of Orissa, Volume 2. Regional Research Laboratory & Orissa Forest Department Corporation Limited, Bhubaneswar, Odisha.
- Sharma A, Sangameswaran B, Jain V and Saluja MS. (2012). Hepatoprotective activity of *Adina cordifolia* against ethanol induce hepatotoxicity in rats. International Current Pharmaceutical Journal. 1(9): 279-284.
- Singh S, Singh RK and Dwivedi KN. (2019). An extensive review on medicinal uses of Haridru (*Adina cordifolia* (willd. ex roxb.) benth. & hook.f.Ex brandis). Pramana Research Journal. 9(6): 988- 992.
- Subba S, Ram M, and Jha SS. (2024). *Haldinia cordifolia*: a potential agroforestry species. AgriGate- an International Multidisciplinary e- Magazine. 4(8): 575- 581.

- Tiwari S and Soni G. (2023). Hepatoprotective activity of *Adina cordifolia* leaves against hepatotoxicity in rats. *Journal of Survey in Fisheries Sciences*. 10(3): 241-247.
- Upton R. (2022). Traditional herbal medicine, pharmacognosy, and pharmacopoeial standards: a discussion at the crossroads in the age of COVID. *Evidence-Based Validation of Herbal Medicine (Second Edition): Translational Research on Botanicals*. Elsevier. 109-148. DOI: 10.1016/B978-0-323-85542-6.00003-2
- Warrier KCS, Abinaya R, Gireesan K and Jayakumar M. (2023). Wood fibre properties and genetic divergence in *Haldina cordifolia* (Roxb.) Ridsdale. *International Journal of Environment and Climate Change*. 13(11): 617-627.

CHAPTER 5

Pharmacological values of *Mitragyna parvifolia* (True cadamba)

**Rajesh Kumar Verma¹, Kadambini Das², Brajesh Kumar Sahu³,
Sohan Lal⁴, Sanjeet Kumar⁵ and Sugimani Marndi^{5*}**

¹Department of Dravyaguna, Naiminath Ayurvedic Medical College and Research Centre, Agra, Uttar Pradesh, India

²University Department of Botany, Babasaheb Bhimrao Ambedkar Bihar University, Muzaffarpur, Bihar, India

³P. M. College of Excellence Government College, Vidisha, Madhya Pradesh, India

⁴School of Studies in Botany, Shaheed Mahendra Karma Vishwavidhyalaya, Bastar, Jagdalpur, Chhattisgarh, India

⁵Ambika Prasad Research Foundation, Odisha, India

*Email-Id: sugimani2marndi@gmail.com

DOI: <https://doi.org/10.5281/zenodo.15163393>



Licensed under a Creative Commons Attribution 4.0 International License

Abstract: Pharmacology plays a vital role in drug discovery. Unlike other members of the *Mitragyna* genus, *Mitragyna parvifolia* contains various alkaloids that contribute to its pharmacological properties. Some of the significant alkaloids reported by many researchers include mitraphylline, rotundifoline, rhynchophylline, isorotundifoline, rhynchociline, mitragynine, and speciociliatine. It possesses some major pharmacological investigation such as analgesic, anti-arthritis, antipyretic, anti-inflammatory, and antinociceptive. The chapter summarises according to literature and field survey on the pharmacological values of *M. parvifolia*.

Keywords: Pharmacological values, active compounds, alkaloids, drug formulations

INTRODUCTION

Pharmacological activity deals with the beneficial or adverse effects of a drug on living matter. Among the various properties of chemical compounds, pharmacological play a crucial role since ages as they suggest uses of the compounds in medical applications. Plant secondary metabolites are broadly divided into three categories: terpenoids, alkaloids, and phenolics

(Ahmad et al., 2022). Each of these classes of secondary metabolites includes a huge array of compounds that have been found effective in treating different diseases. Some of these compounds are- atropine, codeine, morphine, and nicotine, coming under alkaloids; linalool comes under terpenoids, while flavonoids, lignans, and proanthocyanidins are categorized as phenolics. These bioactive phytochemicals are responsible for many pharmacological activities such as anti-inflammation, anti-cancer, anti-allergic, and antimicrobial activity (Kaushik et al., 2021).

Mitragyna species are mostly trees or shrubs. Leaves are petioled; stipules large, caducous. Flowers crowded in globose, axillary, and terminal solitary or paniced, pedunculate heads, the receptacle. Mostly, in *Mitragyna* species contains indole alkaloids, and triterpenoid saponins were reported by many researchers for phytochemical investigations on *Mitragyna* genus isolation, and mitragynine, an indole alkaloid, was the major constituent of this plant, accounting for about half of the total alkaloid contents. Some of the *Mitragyna* species are used medicinally and also for fine timber purposes (Jadhav et al., 2022). Some *Mitragyna* genus possess products to western markets. In ancient times, traditional healers used *Mitragyna speciosa* leaves, known as kratom, which have been used in herbal medicine by natives of Thailand and other regions of Southeast Asia as an herbal drug for decades. Traditionally, Kratom was mostly used as a stimulant by Thai and Malaysian labourers and farmers to overcome the burdens of hard work. Remarkably, in 2019, the United States Food and Drug Administration (FDA) reported that there is no specific evidence regarding its safety or effectiveness for any health condition (Brown et al., 2017).

Mitragyna parvifolia (Roxb.) Korth. is a tree species that primarily grows in deciduous and evergreen forests. It is mostly distributed in Asia, native to India and Sri Lanka, Nepal, Pakistan, Indonesia, Myanmar, etc. According to some ancient literature, it was presumed to possess cultural values associated with Lord Krishna in Vridavana rather than the well-known tree *Neolamarkia cadamba*, which is a highly mistaken myth. Ecological significance it holds such as the caterpillars of the commander (*Limenitis procris*), a brush-footed butterfly as a food plant (Jadhav et al., 2022).

A wide range of chemical constituents reported in the plant are pyroligneous acid, methyl acetate, ketones, and aldehydes (Kaushik et al., 2009). As per phytochemical screening of the methanolic leaf extract revealed the presence of alkaloids, terpenoids, phenols, tannins, and flavonoids. It has been identified to possess 24 phytoconstituents, including the major

alkaloid mitraphylline (**Jebaseelan et al., 2024**). Heteroyohimbinoid-type oxindole alkaloids from *M. parvifolia* (**Pandey et al., 2006**). Mitragynine, a major indole-alkaloid, is isolated from leaves (**Gong et al., 2012**). The leaves of the plant *M. parvifolia* have afforded two alkaloids, 16,17-dihydro-17 β -hydroxy isomitraphylline and 16,17-dihydro-17 β -hydroxy mitraphylline, together with two known alkaloids, isomitraphylline, dihydrocorynantheol, dihydrocorynantheol N-oxide, akuammigine, akuammigine N-oxide, rotundifoline, speciophylline N-oxide, uncarine F, uncarine, F N-oxide, and mitraphylline. The aerial parts, stem, bark, and roots of the tree contain indolic (tetrahydroalstonine, akkyamigine, hirsuteine, etc.) and oxiindollic alkaloids (**Pandey et al., 2006; Ahmad et al., 2022; Jadhav et al., 2022**).

It possesses a wide range of traditional uses of *M. parvifolia*. In Karnataka, fresh leaf sap is used by the tribals to cure jaundice. In Uttar Pradesh, the tribals of Sonaghati used the bark decoction to treat fever. In Tamil Nadu, the stem bark is used for rheumatic pain. Leaves are used to treat jaundice, fever, muscular pain, colic pain, wounds, and ulcers (**Gong et al., 2012**). The bark and root are used to treat rheumatic pain, burning sensation, gynaecological disorders, cough, and oedema. Fruit possess galacto-depurant properties. Leaves are used to treat lymphatic filariasis (**Jebaseelan et al., 2024**). *M. parvifolia* and its active compounds possess wide-reaching pharmacological actions, including antitumor, cardiovascular disease, and antibacterial activity (**Gong et al., 2012**).

METHODOLOGY

The survey was carried out based on field and literature surveys. The field survey was carried out to collect photographs of the plant from 2022-2024 in Odisha state. The plant was identified by the authors in the field, followed by flora books (**Saxena and Brahmam, 1995**). The literature survey was carried out through websites like PubMed, Scopus, and Web of Science. Relevant articles and published books were selected for the review process.

MORPHOLOGY

It is a moderate-sized deciduous tree, bark light grey, smooth. Leaves broadly elliptic or obovate, obtuse, sometimes rounded and shortly cuspidate, glabrous except near the axils of the 7-10 prominent secondary nerves, base rounded or cuneate; petiole 1.3-4.7 cm; stipules oblong, keeled, covering the buds and falling on their expansion. Heads of flowers 3 cm diam. 1-2.5 together on a short lateral axillary branch or peduncle bearing two pale-coloured leaves or bracts near the summit, persisting more or less in fruit. Flowers white, narrowly funnel-

shaped; bracteoles clavate. Fruiting heads 1.4-1.9 cm across. Capsule ellipsoid, verrucose (Saxena and Brahmam, 1995; Figure 1-3).



Figure 1: Whole plant of *M. parvifolia*



Figure 2: Leaves of *M. parvifolia*



Figure 3: Flower of *M. parvifolia*

PHARMACOLOGICAL VALUES

Researchers reported certain kinds of compounds which is responsible for certain kinds of pharmacological incidents. The leaves of the plant *M. parvifolia* have afforded two alkaloids, 16,17-dihydro-17b-hydroxyisomitraphylline and 16,17-dihydro-17b-hydroxymitraphylline, together with two known alkaloids, isomitraphylline and mitraphylline. Some of these alkaloids, particularly mitraphylline and mitragynine, possess a local anaesthetic activity (Vishal and Sanjay, 2010). Researchers studied the extracts of *M. parvifolia*, particularly ethanolic and methanolic extracts, which exhibit antimicrobial activity against certain bacterial strains, which practically suggested the potential uses in developing a novel antimicrobial agent (Jebaseelan et al., 2024). A range of indolic and oxindolic alkaloids including dihydrocorynantheol, akuammigine, mitraphylline, and rhynchophylline. have been reported from *M. parvifolia* leaves and stem barks and functional properties such as analgesic, antiarthritic, antipyretic, anti-inflammatory, antinociceptive, anticonvulsant, anxiolytic, anthelmintic, antimicrobial, antiproliferative and antioxidant activity (Choudhary and Jain, 2016; Kaushik et al., 2009; Table 1). The ethanolic extract of *M. parvifolia* fruit has been confirmed to possess anthelmintic activity (Mandrupkar et al., 2017). Due to its vast importance in every aspect of medicinal, cultural, industrial value and ecological significance, the population of this species in some places becomes endangered. However, due to such status, it is propagated through various means through micropropagation to attain pharmaceutical value (Patel et al., 2020).

Table1: Pharmacological values of *Mitragyna parvifolia*

Plants parts	Pharmacological values	Sources
Leaves	Antiarthritic	Choudhary and Jain, (2016)
Leaves	Antipyretic	Choudhary and Jain, (2016); Sahu and Roy, (2008)
Leaves	Anti-nociceptive	Choudhary and Jain, (2016); Gong et al., (2012); Gupta et al., (2009)
Leaves	Anti-inflammatory	Choudhary and Jain, (2016); Gupta et al., (2009)

Fruit	Anti-inflammatory, antimicrobial, and analgesic	Saneja et al., (209)
Leaves	Anticonvulsant	Choudhary and Jain, (2016); Kaushik et al., (2009)
Stem and bark	Anxiolytic	Choudhary and Jain, (2016); Jadhav et al., (2022)
Stem and bark	Anthelmintic activity	Choudhary and Jain, (2016); Gong et al., (2012); Vishal and Sanjay, (2010); Sahu et al., (2009)
Fruit	Anthelmintic activity	Mandrupkar et al., (2017)
Bark and leaves	Antioxidant	Choudhary and Jain, (2016); Gong et al., (2012)
Leaves	Antibacterial	Jebaseelan et al., (2024); Kaushik et al., (2009)
Stem bark	Anticancer	Kumar et al., (2021)
Leaves	Analgesic and antimicrobial activity	Kaushik et al., (2009)
Bark and leaves	Antiproliferative	Jadhav et al., (2022)
Root	Anti-hypertensive activity	Jadhav et al., (2022)
Leaves	Antifungal	Padmavathi, (2021)

According to the researchers, a range of indolic and oxindolic alkaloids has been reported from *M. parvifolia* leaves and stem barks, which includes dihydrocorynantheol, akuammigine, mitraphylline, and rhynchophylline (Ahmad et al., 2022). Mitraphylline is responsible for anti-inflammatory, antiproliferative, and anticancer activities (Rojas-Duran et al., 2012; Gimenez et al., 2010). Akuammigine is responsible for anti-adrenergic and antimalaria

activities. Dihydrocorynantheol is responsible for insecticidal and anti-inflammatory activity (Hennessy et al., 2024; Duwiejua et al., 2002; Rattan, 2010; Pozzatti et al., 2013). Rhynchophylline is responsible for neuroprotective, antihypertensive, and anti-inflammatory activities (Geetha and Ramachandran, 2021; Chen et al., 2024).

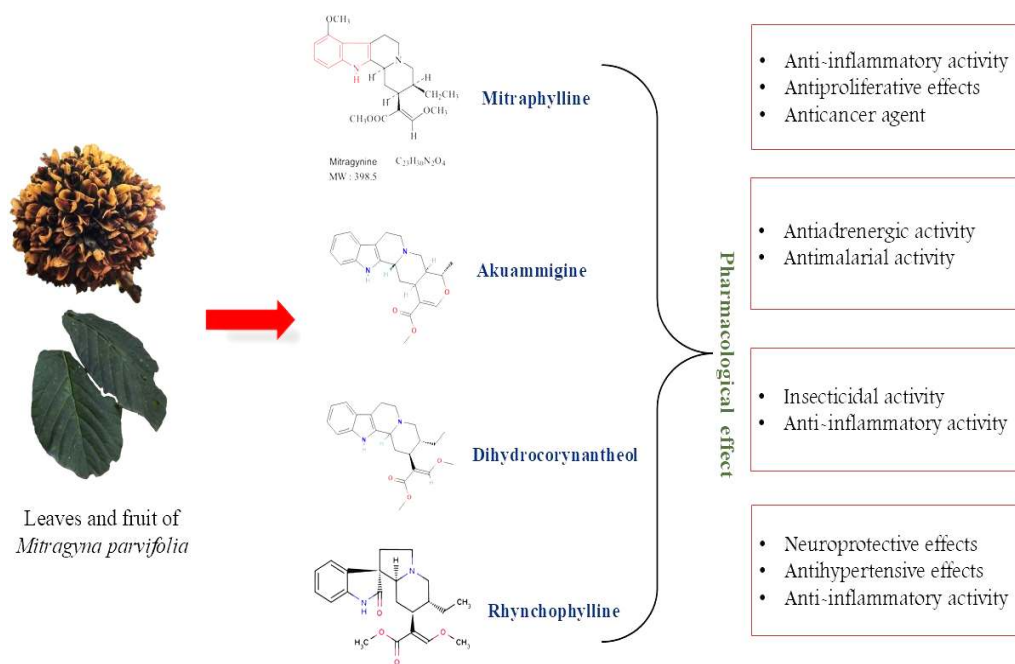


Figure 4: Pharmacological effect of *M. parvifolia*

CONCLUSION

According to literature and field surveys, it concludes that *Mitragyna parvifolia* exhibits a wide range of potential pharmacological activities (**Figure 4**). Many tribal communities heal common ailments like fever, stomach ache, and wounds. Mostly leaves, stems, bark, and root contain major kinds of alkaloid compounds. The various presence of alkaloids is likely responsible for the pharmacological effects. More comprehensive scientific studies are needed to fully elucidate the mechanisms of action and therapeutic efficacy of *M. parvifolia*.

REFERENCES

- Ahmad I, Prabowo WC, Ariuiddin M, Fadraersada J, Indriyanti N, Herman H, Purwoko RY, Nainu F, Rahmadi A, Paramita S, Kuncoro H, Mita N, Narsa AC, Prasetya F, Ibrahim A, Rijai L, Alam G, Mun'im A and Dej-adisai S. (2022). *Mitragyna* species as pharmacological agents: from abuse to promising pharmaceutical products. Life. 12(2): 193. DOI: 10.3390/life12020193

- Brown PN, Lund JA and Murch SJ. (2017). A botanical, phytochemical and ethnomedicinal review of the genus *Mitragyna* korth: implications for products sold as kratom. *Journal of Ethnopharmacology*. 202: 302-325. DOI: 10.1016/j.jep.2017.03.020
- Chen L, Liu Y and Xie J. (2024). The beneficial pharmacological effects of *Uncaria rhynchophylla* in neurodegenerative diseases: focus on alkaloids. *Frontiers in Pharmacology*. 15: 1436481. DOI: 10.3389/fphar.2024.1436481
- Choudhary GP and Jain AP. (2016). A review on *Mitragyna parvifolia* (Roxb.) Korth. - an Indian medicinal plant. *International Journal of Pharmacy and Pharmaceutical Research*. 7(1): 175-184.
- Duwiejua M, Woode E and Obiri DD. (2002). Pseudo-akuammigine, an alkaloid from *Picralima nitida* seeds, has anti-inflammatory and analgesic actions in rats. *Journal of Ethnopharmacology*. 81(1): 73-79.
- Geetha RG and Ramachandran S. (2021). Recent advances in the anti-inflammatory activity of plant-derived alkaloid Rhychophylline in neurological and cardiovascular diseases. *Pharmaceutics*. 13(8): 1170. DOI: 10.3390/pharmaceutics13081170
- Gimenez DG, Prado EG, Rodriguez TS, Arche AF and la Puerta RD. (2010). Cytotoxic effect of the pentacyclic oxindole alkaloid mitraphylline isolated from *Uncaria tomentosa* bark on human Ewing's sarcoma and breast cancer cell lines. *Plata Medica*. 76(2): 133-136.
- Gong F, Gu HP, Xu QT and Kang WY. (2012). Genus *Mitragyna*: ethnomedicinal uses and pharmacological studies. *Phytopharmacology*. 3(2): 263-272.
- Gupta V, Kumar P, Bansal P and Singh R. (2009). Anti-inflammatory and anti-nociceptive activity of *Mitragyna parvifolia*. *Asian Journal of Medicinal Sciences*. 1(3): 97-99.
- Hennessy MR, Gutridge AM, French AR, Rhoda ES, Meqbil YJ, Gill M, Kashyup Y, Appourchaux K, Paul B, Wang ZJ, van Rijn RM and Riley AP. (2023). Modified akuamma alkaloids with increased potency at the Mu-opioid receptor. *Journal of Medicinal Chemistry*. 66(5): 3312-3326.
- Jadhav U, Ghumare P and Dattatraya J. (2022). A review of *Mitragyna parvifolia* (Roxb) Korth – an important medicinal plant. *Journal of Science and Technology*. 7(3): 53-59.
- Jebaseelan J, Sadiq SB, Ravikumar AP, Annaraj J and Balakrishnan AS. (2024). *Mitragyna parvifolia* as a potential therapeutic agent for lymphatic filariasis. *Journal of Parasitic Diseases: official organ of the Indian Society for Parasitology*. 48(3): 474-484.
- Kaushik B, Sharma J, Yadav K, Kumar P and Shourie A. (2021). Phytochemical properties and pharmacological role of plants: secondary metabolites. *Biosciences Biotechnology Research Asia*. 18(1). DOI: 10.13005/bbra/2894

- Kaushik D, Khokra SL, Kaushik P, Saneja A and Arora D. (2009). Anticonvulsant activity of *Mitragyna parviflora* leaves extract. Pharmacologyonline. 3: 101-106.
- Kaushik D, Khokra SL, Kaushik P, Saneja A, Sharma C, Aneja KR, Chaudhary B and Koshy S. (2009). A study of analgesic and antimicrobial potential of *Mitragyna parvifolia*. International Journal of Pharmaceutical Sciences and Drug Research. 1(1): 6-8.
- Kaushik PR and Shreya B. (2011). Antimicrobial activity of *Mitragyna parvifolia* barks and *Butea monosperma* leaves extracts against human pathogenic microbial strains. International Journal of Dry Development and Research. 3(4): 141-147.
- Kumar PR, Sapavatu SN and Reddy MB. (2021). *In-vitro* and *in-silico* studies on selected phytoconstituents of *Mitragyna parvifolia* (Roxb.) stem bark for anticancer activity. International Journal of Pharmaceutical Sciences and Research. 12(12): 6600-6607.
- Kumar S, Mishra S, Mishra AK and Kumar SN. (2022). Floral diversity of Koira & Barsuan ranges of Bonai Forest Division, Odisha. Bonai Forest Division, Bonai, Odisha and Ambika Prasad Research Foundation, Odisha, India.
- Mandrupkar SN, Pawar RR, Bhandwalkar MJ and Doijad RC. (2017). Anthelmintic activity of *Mitragyna parvifolia* (Roxb.) Korth fruit extract. World Journal of Pharmacy and Pharmaceutical Sciences. 6(12). DOI: 10.20959/wjpps201712-10628
- Nayak S and Kumar S. (2023). Medicinal Plants used by Tribals of Odisha. State Medicinal Plants Board, Odisha and Ambika Prasad Research Foundation, Odisha, India.
- Padmavathi R. (2021). Antibacterial and antifungal activity of *Mitragyna parvifolia* leaf extracts in experimental rats. Journal of Drug Vigilance and Alternative Therapies. 1(1): 14-18.
- Pandey R, Singh SC and Gupta MM. (2006). Heteroyohimbinoïd type oxindole alkaloids from *Mitragyna parvifolia*. Phytochemistry. 67(19): 2164-2169.
- Panwar J and Tarafdar JC. (2006). Arbuscular mycorrhizal fungal dynamics under *Mitragyna parvifolia* (Roxb.) Korth. In Thar Desert. Applied Soil Ecology. 34(2-3): 200-208.
- Patel AK, Lodha D and Shekhawat NS. (2020). An improved micropropagation protocol for the *ex-situ* conservation of *Mitragyna parvifolia* (Roxb.) Korth. (Rubiaceae): an endangered tree of pharmaceutical importance. In Vitro Cellular & Developmental Biology Plant: Journal of the Tissue Culture Association. 56(6): 817-826.
- Pozzatti P, Reis GOD, Pereira DF, Horst H, Espindola L, Heller M, Micke GA, Pizzolatti MG and Frode TS. (2013). Relationship of chemical structure and anti-inflammatory activity of dihydrocorynantheol and its analogues. Pharmacological Reports. 65(5): 1263-1271.

- Rattan RS. (2010). Mechanism of action of insecticidal secondary metabolites of plant origin. *Crop production*. 29(9): 913-920.
- Rojas-Duran R, González-Aspajo G, Ruiz-Martel C, Bourdy G, Doroteo-Ortega V.H, Alban-Castillo J, Robert G, Auberger P and Deharo E. (2012). Anti-inflammatory activity of Mitraphylline isolated from *Uncaria tomentosa* bark. *Journal of Ethnopharmacology*, 143(3): 801-804.
- Sahu RK, Kumar H and Roy A. (2008). Antipyretic effect of the ethanol extract obtained from leaves of *Mitragyna parvifolia* on a pyretic model induced by brewer's yeast. *Biosciences Biotechnology Research Asia*. 5(2)
- Sahu RK, Tatewar G, Roy A and Jha AK. (2009). *In-Vitro* anthelmintic activity of leaves of *Mitragyna parvifolia*. *Biomedical and Pharmacology Journal*. 2(1)
- Saneja A, Kaushik D, Khokra SL, Kaushik P, Sharma C and Aneja KR. (2009). Evaluation of activities of *Mitragyna parvifolia* fruit extract. *Journal of Natural Products*. 2: 49-54.
- Saxena HO and Brahman M. (1995). The Flora of Orissa, Volume 2. Regional Research Laboratory, Bhubaneswar and Orissa Forest Department Corporation Ltd, Bhubaneswar, Odisha, India.
- Shellard EJ and Houghton PJ. (1971). The distribution of alkaloids in *Mitragyna parvifolia* (Roxb.) Korth in young plants grown from Ceylon seed. *The Journal of Pharmacy and Pharmacology*. 23: 245S. DOI: 10.1111/j.2042-7158.1971.tb08834.x

CHAPTER 6

Medicinal and ecological uses of *Psydrax dicoccos* Gaertn.: a water indicating tree of India

Ashish Patel¹, Kadambini Das², Sanjeet Kumar³ and Sugimani Marndi^{3*}

¹Govt. Degree College Pushprajgarh, Anuppur, Madhya Pradesh, India

²University Department of Botany, Babasaheb Bhimrao Ambedkar Bihar University, Muzaffarpur, Bihar, India

³Ambika Prasad Research Foundation, Odisha, India

*Email-id: sugimani2marndi@gmail.com

DOI: <https://doi.org/10.5281/zenodo.15224874>



Licensed under a Creative Commons Attribution 4.0 International License

Abstract: *Psydrax dicoccos*, a flowering plant species in the Rubiaceae family, is a small evergreen tree commonly known as 'Ceylon boxwood' and 'malakafe'. With a rich history of traditional medicinal use, *P. dicoccos* has been valued for its diverse therapeutic properties, including antipyretic and anti-inflammatory activities. This chapter provides a comprehensive overview of the bioactive compounds, ethnomedicinal uses, and pharmacological activities of *P. dicoccos*, highlighting its potential as a valuable medicinal plant species.

Keywords: Rubiaceae, traditionally medicine, bioactive compounds, ethnomedicinal uses

INTRODUCTION

In recent years, plant species belonging to the Rubiaceae family have been thoroughly studied from the phytochemical viewpoint. The plant shows a huge diversity of substances of bioactive compounds. Ethnobotanical data on the Rubiaceae family reveal that most of its members possess significant medicinal value and ecological importance, having been used for centuries to treat various human ailments. Natural products, especially those derived from plant biodiversity, have been less intensively investigated in the past despite being known to contain structurally diverse molecules, many of which remain unknown. The genus *Canthium* belongs to the Rubiaceae family with about 80-102 species. The genus is closely

related to *Keetia* E. Phillips and *Psydrax* Gaertn. While *Psydrax* is known to be monophyletic with defined morphological characters, it is somehow closely related to *Keetia*, as most of its characters are related to *Psydrax*, and it is also a closely related genus with *Canthium*. Due to its morphological character, *Psydrax diccocos* is placed before as *Canthium dicocum* (Chukwudulue et al., 2022). The plants of this genus are mostly effective in treating diarrhoea, worms, leucorrhoea, constipation, snake bites, diabetes, hypertension, venereal diseases, and malaria (Tchamgoue et al., 2024). *P. diccocos* Gaertn. is a synonym of *C. dicocum* (Gaertn.) Merr. It is a low-branched tree with spreading or drooping branchlets flattened at the upper part. It is commonly known as Kurma, Kumar Chikni, Dolsingh, Karuna (O), and Ceylon boxwood (E). It is distributed in India throughout the Deccan peninsula, the Coromandel coastal region (Tamil Nadu, Andhra Pradesh), Odisha, Maharashtra, Bihar, Assam, and Meghalaya. As per the IUCN Red List, it comes under the vulnerable category (Patkar and Khan, 2024). All plant parts possess promising bioactive compounds that cure many diseases, joint pain, fever, diarrhoea, and inflammation. It possesses antidiabetic, antifungal, and antioxidant properties (Meghashree and Latha, 2020). The fruit pulp of *P. diccocos* is reported to be edible (Patkar and Khan, 2024). The leaves, bark, and root are used for fish poisoning (Patkar and Khan, 2024). The plant species shows extensive uses in the form of medicinal and ecological uses.

METHODOLOGY

A comprehensive study on medicinal and ecological uses was carried out through field and literature surveys. Extensive scientific searches like PubMed, Scopus, Web of Science, and Google Scholar, research papers, peer-reviewed articles, and scientific publications. The plant was identified by the authors using published literature (Kumar et al., 2022a; Chukwudulue et al., 2022; Patkar and Khan, 2024).

MORPHOLOGY

It is a low-branched tree or large shrub with spreading or drooping branchlets flattened at the upper extremities. Bark smooth but with vertical cracks, and dark grey. Leaves are ovate or lanceolate-ovate or elliptic-ovate, acuminate, shining above, pale beneath, secondary nerves, some with gland-pits in their axils, tertiary nerves indistinct; stipules are variable, deltoid, or linear. Cymes are sessile or peduncled, pubescent or puberulous, and laxly dichasial or densely umbellate; pedicels are long with very minute bracts at their base.

Flowers are greenish or white. Calyx-tube with the small deltoid lobes. Corolla with campanulate tube and rotate lanceolate petals. Stamens on the mouth of the corolla; filaments short. Style long, stigma mitriform. Fruits are black, globose or sub-globose, with 2 oblong, nearly terete pyrenes (**Saxena and Brahmam, 1995; Figures 1 & 2**).



Figure 1: Leaves and flowers of *P. dicoccos*



Figure 2: Floral morphology of *P. dicoccos*

BIOACTIVE COMPOUNDS

P. dicoccos revealed the presence of carbohydrates, glycosides, saponins, terpenoids, alkaloids, phenols, flavonoids, tannins, steroids, coumarin, and volatile oils (Table 1). Terpenoids are the major chemical constituents, such as spathulenol, caryophyllene oxide, cedren -13-ol, and ledene oxide (Rajeswari et al., 2011). Flavonoids like rutin, quercetin, and coumarin are present in *P. dicoccos* (Meghashree et al., 2020b). In Table 1, through literature survey, the bioactive compounds of *P. dicoccos* in different plant parts was summarised. The presence of various bioactive compounds justifies the use of plant parts for various ailments and has pharmaceutical importance.

Table 1: Bioactive compounds reported from *P. dicoccos*

Plant parts	Bioactive compounds	Sources
Leaves	Carbohydrates, glycosides, saponins, alkaloids, phenols, flavonoids, terpenoids, tannins, steroids, and volatile oils	Rajana et al., (2019); Umaiymbigai et al., (2017a) Satyanarayana and Kumari, (2016); Rajeswari et al., (2011)
Bark	The bark contains sitosterol, quinoaic acid, acetylquinoaic acid and scopoletin ¹⁵ . Leaves contain ursolic acid, rutin, quercetin, 7-O-(6-O-benzoyl-β-glucopyranosyl)-rutin, caryophyllene oxide (19.25%), spathulenol (20.76%), cedren-13-ol (10.62%) and ledene oxide	Meghashree et al., (2020b)

Bark	Sitosterol, quinoaic acid, acetylquinoaic acid and scopoletin	Herath et al., (1979)
------	---	-----------------------

ETHNOMEDICINAL USES

Through literature and field surveys, it is reported that stem and bark powder boiled with sesame oil is used externally for rheumatic pains. The bark is used in external applications for fractures. The leaves are used for inflammation, facilitating delivery, and breast cancer cells (**Table 2**). It is used to treat shingles (herpes zoster) (**Muthukrishnan and Ramachandran, 2025**). As per literature and field surveys, the data conclude that mostly the bark and leaves are used for ethnomedicinal uses in the form of infusion, decoction, paste, and powder.

Table 2: Ethnomedicinal values of *P. dicoccos*

Part used	Disease	Sources
Bark	Rheumatic pain	Meghashree et al., (2020a); Ganesh and Sudarsanam, (2013)
Bark	Febrifuge, plasters	Rajana et al., (2019); Meghashree and Latha, (2020)
Bark	Fever	Meghashree and Latha, (2020)
Root	Diarrhoea	Meghashree and Latha, (2020)
Leaves	Inflammation	Satyanarayana and Kumari, (2016)
Leaves	Facilitate delivery	Patkar and Khan, 2024
Leaves	Breast cancer cells	Veeramuthu et al., (2023)

Root and bark	Dysentery	Arulappan et al., (2015)
---------------	-----------	--------------------------

PHARMACOLOGICAL VALUES

The important reported pharmacological properties of *P. diccocos* include antioxidant, anti-diabetic, antimicrobial, antipyretic, hepatoprotective, antihypertensive, and antifungal activities. (Table 3).

Table 3: Pharmacological potentials of *P. dicoccos*

Part used	Pharmacological aspects	Sources
Whole plant	Antidiabetic and nephroprotective activity	Meghashree and Latha, (2020)
Whole plant	Antipyretic activity	Rajana et al., (2019)
Leaves and whole plant	Hepatoprotective activity	Vakkalagadda et al., (2021); Vuyyuri et al., (2015)
Leaves	Antibacterial activity	Meghashree and Latha, (2022)
Leaves	Anticancer	Meghashree and Latha, (2020)
Leaves and bark	Antioxidant and antitubercular activity	Meghashree et al., (2020a); Patkar and Khan, (2024)
Whole plant	Anti-inflammation activity	Meghashree et al., (2020a); Vuyyuri et al., (2013)
Bark	Antioxidant activity	Patkar and Khan, (2023)
Whole plant	Anti-fungal activity	Patkar and Khan, (2023)
Leaves	Anti-fungal activity	Umaiymbigai et al., (2016); Umaiymbigai et al., (2017b)
Leaves	Antihypertensive activity	Meghashree et al., (2020a)

ECOLOGICAL ASPECTS

P. dicoccos is mostly found near water bodies. It is one of the indicators to locate perennial streams inside forest areas. Very few tree species indicate water body areas, and *P. dicoccos* is one of the species (Kumar et al., 2022a; Kumar et al., 2022b). A great variety in pollination syndromes of *P. dicoccos* flowers has revealed 38 species of various functional groups, such as butterfly, wasp, bee, moth, fly, ant, bug, spider, and a reptile (Subha and Richard, 2016).

CONCLUSION

The present study conducted a comprehensive review of *Psydrax dicoccos*, focusing on its traditional applications, phytochemistry, pharmacology, and ecological significance. The review aims to identify knowledge gaps, stimulate research interest, and explore opportunities for further investigations, particularly in drug discovery. Specifically, it highlights the need to isolate and characterize unidentified compounds from *P. dicoccos* to validate its medicinal uses and therapeutic properties, thereby unlocking its full potential for pharmaceutical applications.

REFERENCES

- Arulappan MT, Britto SJ, Ruckmani K and Kumar RM. (2015). An ethnobotanical study of medicinal plants used by ethnic people in Gingee hills, Villupuram district, Tamil Nadu, India. *American Journal of Ethnomedicine*. 2(2): 84-102.
- Chukwudulue UM, Attah AF and Okoye FBC. (2022). Linking phytochemistry to traditional uses and pharmacological of an underexplored genus-*Psydrax*: a review. *Phytochemistry Reviews*. 21: 1577-1604.
- Ganesh P and Sudarsanam G. (2013). Ethnomedicinal plants used by Yanadi tribes in Seshachalam Biosphere Reserve Forest of Chittoor district, Andhra Pradesh, India. *International Journal of Pharmacy & Life Sciences*. 4(11): 3073-3079.
- Herath WHMW, Sultanbawa MUS, Wannigama GP and Cave A. (1979). Alkaloidal and other constituents of *Uncaria elliptica* and *Canthium dicocum*. *Phytochemistry*. 18(8): 1385-1387.
- Kumar S, Mishra S, Mishra AK and Kumar SN. (2022a). Floral Diversity of Koira & Barsuan ranges of Bonai Forest Division, Odisha. Divisional Forest Officer, Bonai Forest Division, Odisha & Ambika Prasad Research Foundation, Odisha, India.

- Kumar SN, Aradhana S, Marndi S and Kumar S. (2022b). Indicator plants of perennial streams: ecological approach for the wildlife management in mining areas. *Asian Plant Research Journal*. 9(1): 1-5.
- Meghashree KS and Latha KP. (2022). Potential antibacterial activity of *Canthium dicoccum* (Gaertn.) against certain bacterial aspects. *Plant Archives*. 20(2): 8818-8820.
- Meghashree KS and Latha KP. (2020). *In vitro* anticancer activity of *Canthium dicoccum* (Gaertn.) against lung cancer cell line. *Plant Archives*. 20(2): 3464-3466.
- Meghashree KS, Latha KP and Vagdevi HM. (2020a). Antioxidant and antitubercular activities of leaf extracts of *Canthium dicoccum* (Gaertn.) and *Anischophacelus axillaris* (L.). *Indian Journal of Natural Products and Resources*. 11(4): 244-249.
- Meghashree KS, Latha KP, Vagdevi HM, Ajish AD, Jayanna ND, Arunkumar NC. (2020b). Screening of phytochemical content and *in vitro* biological investigation of *Canthium dicoccum* (Gaertn.) and *Amischophacelus axillaris* (L.). *Asian Journal of Pharmaceutical and Clinical Research*. 13(1): 109-114.
- Muthukrishnan S and Ramachandran A. (2025). Ethnobotanical study of the medicinal plants used by rural communities in the foothill villages of the Alagar hills region, Eastern Ghats, Tamil Nadu, India. *Ethnobotany Research and Applications*. 30(10): 1-41.
- Patkar SS and Khan SY. (2024). Evaluation of antioxidant activity and FTIR spectroscopic analysis of bark extract of *Psydrax dicoccos* Gaertn. *International Journal of Plant and Environment*. 10(2): 279- 285.
- Rajana L, Vinod N, Lavanya S and Kumar S. (2019). GC-MS profile and HPTLC analysis of leaf extract of *Canthium dicoccum* (Gaertn.) Teijism and Binn. *International Journal of Botany Studies*. 5(1): 39-43.
- Rajeswari RN, Lakshmi RS and Muthuchelian K. (2011). GC-MS analysis of bioactive components from the ethanolic leaf extract of *Canthium dicoccum* (Gaertn.) Teijism & Binn. *Journal of Chemical and Pharmaceutical Research*. 3(3): 792-798.
- Satyanarayana V and Kumari SJ. (2016). Preliminary phytochemical screening and TLC profile of selected four plants of Tirupati hills in Chittoor district, Andhra Pradesh. *Journal of Pharmacognosy and Phytochemistry*. 5(2): 259-264.
- Saxena HO and Brahman M. (1995). The Flora of Orissa. Flora of Orissa. Regional Research Laboratory, Bhubaneswar and Orissa Forest Department Corporation Limited, Bhubaneswar, Odisha, India.
- Subha V and Richard SS. (2016). Floral structure and the fruit-set in *Psydrax dicoccos* Gaertn. (Rubiaceae) in relation to foraging behaviours of floral visitors. *The International Journal of Plant Reproductive Biology*. 8(2): 173-185.
- Tchamgoue J, Tchokokam YRW, Ngouonpe AW, Ngandjui YAT, Tiani GLM, Msagati TAM, Ngadjui BT, Green IR and Kouam SF. (2024). The genus *Canthium*: a comprehensive summary on its traditional use, phytochemistry, and pharmacological activities. *Fitoterapia*. 172: 105754. DOI: 10.1016/j.fitote.2023.105754

- Umaiyaibigai D, Saravanakumar K and Raj GA. (2016). Phytochemical profiles, antibacterial and antifungal activity of leaves from the *Psydrax dicoccos* (Gaertn). Asian Journal of Multidisciplinary Research. 2(1): 443-452.
- Umaiyaibigai D, Saravanakumar K and Raj GA. (2017a). Free radical scavenging activity, phenol and flavonoid contents of various solvent extracts from the *Psydrax dicoccos* (Gaertn). International Journal of Applied Research. 3(1): 394-402.
- Umaiyaibigai D, Saravanakumar K Raj GA. (2017b). Phytochemical profile and antifungal activity of leaves methanol extract from the *Psydrax dicoccos* (Gaertn) Teys. & Binn. Rubiaceae family. International Journal of Pharmacology, Phytochemistry and Ethnomedicine. 7: 53-61.
- Vakkalagadda RK, Ravula P, Parameshwar K, Saraswathi K, Sindhuri P, Srikala R and Sandeep K. (2020). Protective potential of *Canthium dicoccum* methanolic extract against hepatic injury in Rats. Pharmacognosy Journal. 13(6): 1648-1655.
- Veeramuthu K, Ahuja V, Annadurai P, Gideon DA, Sundarajan B, Rusu ME, Annadurai V and Dhandayuthapani K. (2023). Chemical profiling and biological activity of *Psydrax dicoccos* Gaertn. Molecules. 28(20): 7101. DOI: 10.3390/molecules28207101
- Vuyyuri B, Bhagyalakshmi A, Rajyalakshmi R and Jagadeeswari S. (2015). Hepatoprotective activity of *Canthium dicoccum* in isoniazid and Rifampicin induced hepatotoxicity. International Journal of Pharmaceutical and Clinical research. 7(4): 239-245.
- Vuyyuri B, Tripurana R, Gangeyula J and Ali F. (2013). Anti-inflammatory activity of ethanolic extract of *Canthium dicoccum*. International Journal of Pharmaceutical and Phytopharmacological Research. 3(3): 226-230.

CHAPTER 7

A tree of Lord Krishna [*Neolamarckia cadamba* (Roxb.) Bosser]: ethnomedicinally, culturally and pharmacologically important species

Smita Gajanan Basole¹, N. Anil Kumar ², Sanjeet Kumar³ and Sugimani Marndi^{3*}

¹Department of Botany, Balbhim College, Beed, Maharashtra, India

²Department of Botany, SYTR Government Degree College, Madakasira, Sri Sathya Sai, Andhra Pradesh, India

³Ambika Prasad Research Foundation, Odisha, India

*Email-Id: sugimani2marndi@gmail.com

DOI: <https://doi.org/10.5281/zenodo.15225311>



Licensed under a Creative Commons Attribution 4.0 International License

Abstract: *Neolamarckia cadamba*, a revered tree species known as Kadamba or Kadam, boasts significant cultural, medicinal, and pharmacological importance. Its diverse bioactive compounds confer anti-inflammatory, antimicrobial, and antioxidant properties, rendering it a valuable resource in traditional medicine. The utilization of its bark, leaves, and flowers in ethnomedicinal practices underscores its therapeutic potential. This chapter provides a comprehensive overview of *N. cadamba*'s phytochemical profile and pharmacological mechanisms, aiming to inform the development of novel therapeutic agents and guide future research endeavours.

Keywords: Traditional knowledge, medicinal, cultural, ecological significance

INTRODUCTION

The botanical name of this species has been the subject of a long-term taxonomic debate beginning in the 1930. The problem arose in the year 1785, by Jean-Baptiste Lamarck described a specimen under the name *Cephalanthus chinensis*. Later, in 1984, Jean Marie Bosser created the new generic name *Neolamarckia*, honouring Lamarck, for the Asian genus which matched Richard's description of his *Anthocephalus*, transferring *Nauclea cadamba* as *Neolamarckia cadamba* (Razafimandimbison, 2002). Through a tentative taxonomic revision, it shifts from *Anthocephalus* to *Neolamarckia*, which occur as scientists gain deeper

understanding of plant relationships through ongoing research. The botanical naming of this species has been a subject of discussion. This is common in taxonomy, as science evolves. The core of the issue lies in the interpretation of historical plant specimens and application of the rules of botanical nomenclature. As botanical classification advances, particularly with the aid of modern techniques like genetic analysis, scientists determined that the genus *Anthocephalus* as previously revised by taxonomist (**Razafimandimbison, 2002; Nair et al., 2022; Zhang et al., 2023**). *Neolamarckia cadamba* (Roxb.) Bosser, is an evergreen deciduous and fast-growing tree species belongs to the *Neolamarckia* genus of the Rubiaceae family. It is commonly known as “Burflower-tree” as “Kadamba” in Sanskrit and as “Kodom” in Bengali (**Kumar, 2024**). It is widely distribution in Andaman Island, Bangladesh, Borneo, Cambodia, China South-Central, China Southeast, East Himalaya, India, Jawa, Laos, Lesser Sunda Island, Malaya, Myanmar, Nepal, New Guinea, Nicobar Islands, Sri Lanka, Sulawesi, Sumatera, Thailand, and Vietnam (**POWO, 2025**). In India’s sub- Himalayan region, stretching from one side to Nepal, another side to West Bengal and Assam, northern and south-eastern regions of India like Bihar, Chhattisgarh, Madhya Pradesh, and Andhra Pradesh, Karnataka, Uttarakhand, and Kerala (**Dwevedi et al., 2015; Singh et al., 2023**). It is mostly found in dry to moist areas specifically riverbanks, swampy, permanently flooded and periodically flooded areas. In Hindu mythology, the Kadamba tree is believed to the Lord Krishna’s favourite tree. It is often depicted in association with his playful activities. It holds a sacred place in various cultural and religious ceremonies (**Mondal et al., 2020**). It has a wide range of biological and pharmacological activities. It contains cadambine alkaloids, leaves contain alkaloids, tannins, steroids, saponins, and glycosides (**Nie et al., 2022**). Fruit peel of *N. cadamba* contains bioactive compounds due to the presence of steroids, phenolics, tannins, flavonoids, triterpenoids, glycosides, carotenoids, ellagitannins, anthocyanins, vitamin C, and essential oil. The kadam fruit has higher quantities of magnesium, zinc, calcium, essential minerals, and iron. Fruit peel contains compound such as sucrose, citric acid, quinic acid, pinitol, catechine, pcicose, glucose, chlorogenic acid, myo-inositol, and altrose (**Selvakumar et al., 2022**). Quinic acid shows astringent activity. Pinitol is an insulin mimicker with proven activities such as anti-diabetic, anti-inflammation, antioxidant, and immunomodulatory properties. The polyphenol compounds catechins and chlorogenic acid including antioxidant, UV-radiation, anti-allergenic, antiviral, hepatoprotective, cardioprotective, anti-inflammatory, anti-pyretic, anti-obesity, anti-microbial, anti-cancer, anti-hypertension, and central neural system stimulator activities. Yo-inositol is present in fruit includes depression, obsessive-compulsive disorder, and polycystic ovary syndrome. D-

psicose is a rare sugar it controls obesity, Alzheimer's disease, diabetic neuropathy and hyperglycemia (Mondal et al., 2009; Selvakumar et al., 2022). Kader et al., (2022) reported many phytoconstituents such as cadamine, quinovic acid, cadambine, cadambagenic acid, α -dihydrocadambine, isodihydrocadambine, β -sitosterol, amygdalin, phelasin, ursolic acid, linalool, and geraniol that belong to alkaloids, coumarins, terpenoids, diterpenoids, triterpenes glycosides, sterols, flavonoids, amides, and fatty acids (Singh et al., 2023). Fruit contains rich source of essential oil, linalool, geraniol, curcumene, terpinolene, camphene and myrcene (Batta and Rajput, 2021). It is used to cure many ailments such as diarrhoea, inflammation, haemoptysis, coughing, vomit, sores, ulcers, and debility (Singh et al., 2023). Bark of this plant reported to possess tonic, astringent, febrifugal, inflammation, digestive problem, diuretic, and fever. Leaves are used to treat ulcers, wounds, diabetes, and menorrhea (Verma et al., 2018). In Ganjam district, the tribal mostly use the root paste duly for antimicrobial and anthelmintic activities (Zayed et al., 2014). It plays a vital role in ecological significance as its dense foliage provides habitat and food for various species of birds, insects, and other wildlife. The flower attracts pollinators such as bees, butterflies, and beetles contributing to the biodiversity (Yadav et al., 2022). It is broadly an excellent characteristic of the fibre, nutritive, it is utilized for the wood industry and traditional medicine. It provides an ideal raw material of paper, pulp, fibreboard and plywood, etc., and is considered as an excellent source for biomass production (Zhang et al., 2023). Flowers of *N. cadamba* is extracted for preparing essential oil and are utilized in the preparation of 'attar' (Indian perfumes) (Verma et al., 2018; Batta and Rajput, 2021). Research is going to validate its traditional uses and explore its pharmacological potential.

METHODOLOGY

The survey was carried out based on field and literature surveys. The field survey was carried out in 2022-2024 in selected areas (Figure 1). A systematic semi-structured questionnaire was carried out in tribal communities. The data presented in the current chapter is accumulated from various electronic catalogues like PubMed, Scopus, Science Direct and Web of Science, Goggle scholar and library searches of journals and books. The plant list was done based on International Plant Name Index and Kew Botanical Garden Plant name databases. Relevant articles and books published were selected and reviewed (Saxena and Brahmam, 1995; Verma et al., 2018; Batta and Rajput, 2021; Kumar, 2024).

MORPHOLOGY

It is a large deciduous tree with spreading sub-whorled branches; bark smooth, dark grey. The bark is grey, smooth in young trees, rough and longitudinally fissured in old trees. Leaves elliptic-oblong or ovate, 12-28 x 10-15 cm, entire, acute or shortly acuminate, glabrous or pubescent beneath, secondary nerves 7-13, strong, base sometimes subcordate or sometimes suddenly cuneate on the petiole; petiole 2.6-7 cm; stipules 1.2- 1.6 cm. Head globose, 5-7 cm diam.; peduncle stout, 1.2- 4 cm. Flowers small orange- coloured, fragrant. Sepals erect, narrowly oblanceolate, 3 mm long. Corolla 7.4 mm long. Stigma white, far exserted. Pseudocarp large, fleshy, orange (**Saxena and Brahmam, 1995; Figures 2-3**).



Figure 1: Information collected from local communities

ETHNOMEDICINAL USES

N. cadamba is a promising species within the Rubiaceae family, characterized by its distinctive medicinal values (**Singh et al., 2023**). Various plant parts of *N. cadamba* is used to treat fever, uterine complaints, blood diseases, skin disorders, tumour, anaemia, eye inflammatory, antipyretic, diuretic, and laxative (**Pandey and Negi, 2016; Nayak and Kumar, 2023; Kumar et al., 2022**). In 2022, Singh et al., reported ethnomedicinal uses of *N. cadamba* of different plant parts in different areas of India. In Table 1, it concluded that mostly bark, leaves, fruit, and flower followed by root and stem are used in the treatment of various ailments such as diarrhoea, mouth ulcers, nausea, vomiting, fever, wounds, diabetes, urinary tract infection, anaemia, and menorrhagia.

CULTURAL SIGNIFICANCE

According to ancient literature, this is associated with Lord Krishna in Vrindavana. In Hindu mythology, the Bhagavata Purana narrates how one day, Krishna, addressing his young cowherd friends about the Kadamb Tree in the Vrinda Forest on the bank of River Yamuna, said: “Look at these beautiful trees.



Figure 2: Leaves of *N. cadamba*



Figure 3: Flower of *N. cadamba*

Table 1: Ethnomedicinal uses of *N. cadamba*

Plant parts	Mode of uses	Diseases	Sources
Aerial part	decoction	Irritable dowl syndrome	Verma et al., (2018)
Bark	Decoction	Diarrhoea	Selvakumar et al., (2022)
Bark	Decoction	Mouth ulcers	Kader et al., (2022)
Bark	Powder	Nausea and vomiting	Kader et al., (2022)
Bark	Decoction	Fever	Kader et al., (2022)
Bark	Decoction	Colitis	Kader et al., (2022)
Bark	Decoction	Gum problem	Singh et al., (2023)
Flower	Paste	Black spots and pimples	Verma et al., (2018)
Fruit	Juice	Fever	Kader et al., (2022)

Leaves	Paste	Wounds and pimples	Nie et al., (2022)
Leaves	Decoction	Diabetes	Kaur et al., (2021); Verma et al., (2018); Mondal et al., (2020)
Leaves	Juice	Leucorrhoea	Kader et al., (2022); Mondal et al., (2020)
Leaves	Juice	Menorrhagia	Kader et al., (2022)
Leaves	Juice	Stomach pain	Singh et al., (2022)
Leaves and flower	Paste	Skin diseases	Yadav et al., (2022)
Root	Decoction	Urinary tract infection	Kaur et al., (2021)
Root and bark	Decoction	Snakebite	Dwevedi et al., (2015)
Stem and bark	Dried + decoction	Anaemia, uterine complaints	Mondal et al., (2009)
Stem and bark	Paste	Inflammation	Singh et al., (2022)

They live for the benefit of others. There is not a single part of the tree which is not useful. With their beautiful foliage, fragrant flowers, cool shade, roots, bark, wood, sprouts, fruits they serve” (Nair et al., 2022). In Sanskrit shloka, “*Ayi Jagadamba Mad-Amba Kadamba Vana-Priyavaasini Haasa-Rate*”, that is, Goddess Durga likes to live in the forest of Kadamba trees (Dwevedi et al., 2015).

PHARMACOLOGICAL VALUES

It revealed some major pharmacological activities such as anti-diabetic, antioxidant, antimicrobial, anthelmintic activity, antihepatotoxic effects, antilipidemic, anti-inflammatory, etc. The dried stem and bark reported to possess astringent, mucolytic, analgesic, anti-inflammatory, febrifuge and antiseptic properties (Mondal et al., 2009). In Table 2, it concluded that plants parts of *N. cadamba* possess many pharmacological activities like

antioxidant, and anthelmintic activity. The methanol extract of *N. cadamba* barks showed significant analgesic, anti-inflammatory and antipyretic activity (Kader et al., 2022). Researchers reported the antitumor activity this tree species (Dwevedi et al., 2015).

Table 2: Pharmacological values of *N. cadamba*

Plant parts	Pharmacological values	Sources
Bark	Anthelmintic activity	Kaur et al., (2021)
Bark	Analgesic, anti-inflammatory and antipyretic	Mondal et al., (2009)
Bark	Hepatoprotective activity	Kumar, (2024)
Bark	Antiepileptic effect	Mondal et al., (2022)
Bark and leaf	Antifungal activity	Kader et al., (2022); Dwevedi et al., (2015)
Flower	Antidiarrheal activity	Dwevedi et al., (2015)
Flower	Anti-cancer activity	Kumar, (2024); Pawar and Jadhav, (2023)
Flower	Antihepatotoxic activity	Mondal et al., (2022)
Fruit	Urithiatic activity	Mondal et al., (2022)
Fruit peel	Antioxidant activity	Selvakumar et al., (2022)
Fruits	Antioxidative activity	Nie et al., (2022)
Leaves	Hepatoprotective activity	Mondal et al., (2009)
Leaves	Antifilarial and antimalarial activity	Dwevedi et al., (2015)
Leaves	Antitumor activity	Dwevedi et al., (2015)
Root	Antilipidemic	Kaur et al., (2021)

Root	Hypolipidemic activity	Dwevedi et al., (2015)
Root	Nephrotoxicity	Mondal et al., (2022)
Root	Hypolipidemic activity	Mondal et al., (2022)
Root and bark	Antivenom activity	Dwevedi et al., (2015)
Root and flower	Antidiabetic effects	Acharyya et al., (2010); Nie et al., (2022)
Stem and bark	Antidiabetic	Kader et al., (2022)

Though it reveals the presence of bioactive compounds with diverse pharmacological properties such as in leaves parts, cadamine and indole alkaloids are present which is responsible for DNA topoisomerase IB inhibitory activity (**Kumar et al., 2015**). Bark contains quinovic acid which is responsible for anticancer activity and anti-inflammatory activity (**Dietrich et al., 2014; Dietrich et al., 2015**). Flower contains essential oil such as linalool, geraniol, and geranylacetate linalyl acetate which are responsible for anti-inflammation, analgesic activity and antioxidant activity (**Santos et al., 2022; Figure 4**).

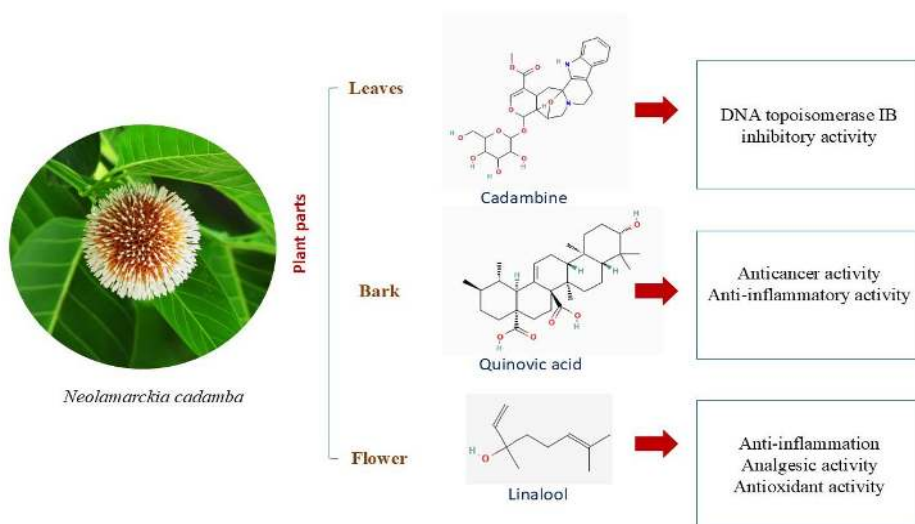


Figure 4: Plants parts of *N. cadamba* and compounds responsible for Pharmacological effects

CONCLUSION

Neolamarckia cadamba, a tree species deeply rooted in cultural and medicinal traditions, offers a wealth of opportunities for further research and development. Its diverse phytochemical profile and promising pharmacological potential underscore its significance in traditional medicine and its potential for modern therapeutic applications. The validation of traditional uses through scientific studies highlights the importance of preserving indigenous knowledge and the potential for discovering new drugs. Future research should focus on isolating and characterizing bioactive compounds, elucidating their mechanisms of action, and exploring their therapeutic potential. Additionally, sustainable cultivation and conservation practices need to be developed to ensure the long-term availability of this valuable resource. By bridging traditional knowledge with modern science, *N. cadamba* could contribute significantly to the development of novel therapeutic agents, thereby improving human health and well-being.

REFERENCES

- Alam MA, Akter R, Subhan N, Rahman MM, Majumder MM, Nahar L and Sarker SD (2008). Antidiarrheal property of the hydroethanolic extract of the flowering tops of *Anthocephalus cadamba*. *Brazilian Journal of Pharmacognosy*.18(2): 155-159.
- Batta K and Rajput H. (2021). Chemical and phytochemical properties of fresh and dry kadam (*Neolamarckia cadamba*) leaves. *Chemical Science Review and Letters*. 10(39): 330-335.
- Kumar A, Chowdhury SR, Jatte KK, Chakrabarti T, Majumder HK, Jha T and Mukhopadhyay S. (2015). Anthocephaline, a new indole alkaloid and cadambine, a potent inhibitor of DNA topoisomerase IB of *Leishmania donovani* (LdTOP1LS), isolated from *Anthocephalus cadamba*. *Natural Product Communications*. 10(2): 297-299.
- Dietrich F, Kaiser S, Rockenbach L, Figueiro F, Bergamin LS, Cunha FMD, Morrone FB, Ortega GG and Battastini AMO. (2014). Quinovic acid glycosides purified fraction from *Uncaria tomentosa* induces cell death by apoptosis in the T24 human bladder cancer cell line. *Food and Chemical Toxicology*. 67: 222-229. DOI: 10.1016/j.fct.2014.02.037
- Dietrich F, Martins JP, Kaiser S, Silva RBM, Rockenbach L, Edelweiss MIA, Ortega GG, Morrone FB, Campos MM and Battastini AMO. (2015). The Quinovic acid glycosides purified fraction from *Uncaria tomentosa* protects against Hemorrhagic cystitis induced by cyclophosphamide in Mice. *PLOSOne*. 10(7): e0131882. DOI: 10.1371/journal.pone.0131882
- Dwevedi A, Sharma K and Sharma YK. (2015). Cadamba: a miraculous tree having enormous pharmacological implications. *Pharmacognosy Reviews*. 9(18): 107-113.

- Huo M, Cui X, Xue J, Chi G, Gao R, Deng X, Guan S, Wei J, Soromou LW, Feng H and Wang D. (2013). Anti-inflammatory effects of linalool in RAW 264.7 macrophages and lipopolysaccharide-induced lung injury model. *The Journal of Surgical Research*. 180(1): e47-e54.
- Kader SA, Khan MMAA, Ahamad N, Komal, Singh S and Maheshwari RK. (2022). Phytochemical and pharmacological attributes of astonishing Kadamba tree (*Neolamarckia cadamba* (Roxb.) Bosser) for integrated healthcare. *Journal of Emerging Technologies and Innovative Research*. 9(4): 561-568.
- Kaur A, Singh AP and Singh AP. (2021). A review on Pharmacological studies on *Neolamarckia cadamba*. *World Journal of Pharmaceutical and Medical Research*. 7(3): 131-133.
- Kumar S, Mishra S, Mishra AK and Kumar SN. (2022). Floral Diversity of Koira & Barsuan ranges of Bonai Forest Division, Odisha. Divisional Forest Officer, Bonai Forest Division, Odisha and Ambika Prasad Research Foundation, Odisha, India.
- Kumar S. (2024). Medicinal properties of *Neolamarckia cadamba* (Bur flower plant): a review. *International Journal of Creative Research Thoughts*. 12(6): e761-e767.
- Mondal S, Bhar K, Mahapatra AS, Mukherjee J, Mondal P, Rahaman ST and Nair AP. (2020). "Haripriya" God's Favorite: *Anthocephalus cadamba* (Roxb.) Miq. - at a glance. *Pharmacognosy Research*. 12: 1-16.
- Mondal S, Dash GK and Acharyya S. (2009). Analgesic, anti-inflammatory and antipyretic studies of *Neolamarckia cadamba* barks. *Journal of Pharmacy Research*. 2(6): 1133-1136.
- Nair A, Pande AR, Varma R, Verma V and Durge SB. (2022). *Anthocephalus kadamba* morphological adaptations and their interpretations. *International Journal of Research and Analytical Reviews*. 9(4): 951-959.
- Nayak S and Kumar S. (2023). Medicinal Plants used by Tribals of Odisha. State Medicinal Plants Board, Odisha and Ambika Prasad Research Foundation, Odisha, India.
- Pandey A and Negi PS. (2016). Traditional uses, phytochemistry and pharmacological properties of *Neolamarckia cadamba*: a review. *Journal of Ethnopharmacology*. 181: 118-135.
- Pawar G and Jadhav DM. (2023). Preliminary phytochemistry and anticancerous activity of plants *Neolamarckia cadamba* Roxb. and *Morinda citrifolia* Linn. from Rubiaceae Family. *Journal of Emerging Technologies and Innovative Research*. 10(4): g419- g423.
- Razafimandimbison SG. (2002). "A Systematic Revision of Breonia (Rubiaceae-Naucleaeae)". *Annals of the Missouri Botanical Garden*. 89(1): 1-37.
- Santos ERQD, Maia JGS, Junior EAF and Maia CDSF. (2022). Linalool as a therapeutic and medicinal tool in depression treatment: a review. *Current Neuropharmacology*. 20(6): 1073-1092.
- Saxena HO and Brahman M. (1995). The Flora of Orissa. Flora of Orissa. Regional Research Laboratory, Bhubaneswar and Orissa Forest Department Corporation Limited, Bhubaneswar, Odisha, India.
- Selvakumar D, Vaikuntavasan P, Sampathrajan V, Manoharan B, Adhimoolam K, Nallusamy S, Arunachalam B, Senthil K and Natesan S. (2022). GC-MS- based metabolomics analysis unravels the therapeutic potential of *Neolamarckia cadamba* fruit peel. *Journal of Phytology*. 14: 100-108.

- Singh M, Kumar P, Singh H, Kumar A, Kumar A and Kumar R. (2023). *Neolamarckia cadamba*: a comprehensive review on its physiological, ecological, phytochemical and pharmacological perspectives. Ecology Environment & Conservation. 29(April Suppl. Issue): S241-S250.
- Singh RK, Garg A, Kukkar R, Kukkar MR, Saxena V and Rao S. (2022). Botanical decription, phytochemistry, traditional uses, and pharmacology of *Anthocephalus cadamba*: an update review. World Journal of biology Pharmacy and Health Sciences. 12(03): 132-145.
- Verma R, Chaudhary F and Singh A. (2018). *Neolamarckia cadamba*: a comprehensive pharmacological. Global Journal of Pharmacy & Pharamaceutical Sciences. 6(4): 555691. DOI: 10.19080/GJPPS.2018.06.555691
- Yadav JP, Maheshwari S, Kumar A, Alka, Jain N, Jain N and Kumar A. (2022). *Neolamarckia cadamba*: a comprehensive review of its botanical, ethnobotanical, phytochemical, and industrial significance. Neuroquntology. 20(8): 11281-11286.
- Zayed MZ, Ahmad FB, HO WS and Pang SL. (2014). GC- MS analysis of phytochemical constituents in leaf extracts of *Neolamarckia cadamba* (Rubiaceae) from Malaysia. International Journal of Pharmacy and Pharmaceutical Sciences. 6(9): 123-127.
- Zhang S, Dai B, Wang Z, Qaseem MS, Li H and Wu AM. (2023). The key physiological and molecular responses of *Neolamarckia cadamba* to phosphorus deficiency stress by hydroponics. Industrial Crops and Products. 202: 117065. DOI: 10.1016/j.indcrop.2023.117065.

CHAPTER 8

Meyna spinosa Roxb. ex Link (Rubiaceae): a medicinal tree and leafy vegetable of tribal India

Alok Ranjan Sahu¹, Rajkumari Supriya Devi^{2*} and Sugimani Marndi²

¹Department of Botany, Vikash Degree College, Bargarh, Odisha, India

²Ambika Prasad Research Foundation, Odisha, India

*Email-Id: supriyark91@gmail.com

DOI: <https://doi.org/10.5281/zenodo.15365813>



Licensed under a Creative Commons Attribution 4.0 International License

Abstract: Wild leafy vegetables play a significant role in food security, nutrition, and traditional medicine, particularly in rural and indigenous tribal communities. Among wild leafy vegetables, *Meyna spinosa* is a promising shrub or small tree. It is an angiosperm in the family Rubiaceae. It is used to cure various ailments including hepatic, gastrointestinal, cough and headaches. Beyond its medicinal applications, it also provides edible fruits and leaves are used as a vegetable. It possesses pharmacological activities like anti-diabetic, anti-inflammatory, and antibacterial. The chapter comprises ethnomedicinal, pharmacological, food and economic values through field survey as well as review from various research articles, books, and authenticated websites. Present study establishes a foundational dataset on *M. spinosa*, laying the groundwork for future research in various fields.

Keywords: Tribal communities, medicinal uses, food value

INTRODUCTION

Tribal communities in India have deeply rooted practices in traditional knowledge of using plants in terms of food and medicine. They possess extensive knowledge about the identification, harvesting, and preparation of wild edible plants, passed down to generations. Many plant species are used for medicinal and food purposes, and the Rubiaceae is one of the families that possesses abundant medicinal and food value, along with ecological and economic value (Reddy et al., 2007). It might not be the most common source of commercially available leafy vegetables, but it plays a vital role in the dietary practices of

tribal communities. *Meyna* is a genus of the Rubiaceae family, which includes small trees and shrubs. About 11 species are distributed from tropical Asia to Southeast Asia, two to three species are found in India. According to the researchers they documented, *Vangueria spinosa* Fl. Br. Ind. it covers a group of plants, but through tentative work done by researchers, it concludes that it has been separated and grouped into several species of *Meyna*, including *M. spinosa* and *M. laxiflora*. More works have reported on *V. spinosa* as a synonym of *M. spinosa*, while other authors have used *V. spinosa* as a synonym of *M. laxiflora* (Sen and Chakraborty, 2017). *Meyna spinosa* Roxb. Ex Link. Syn. *Vangueria spinosa* Hook. F., *Pyrostria spinosa* (Roxb. Ex Link.) Miq., *Vangueria pyrostria* Boerl., *Pyrostria spinosa* Miq., *Vangueria miqueliana* Kurz, and *Vangueria stellata* Blanco. *Meyna spinosa* is an enthralling plant with significant cultural and medicinal importance, particularly among tribal communities in India. It is commonly known as spiny meyna (English), Muyna (Hindi), manta kanta, nangal kanta, godobole, and solora (Odia). It is typically a deciduous tree, thorny shrub, or small tree. It produces edible, yellow, subglobose berries. It is distributed across tropical and subtropical regions, notably in South and Southeast Asia, including India, Nepal, Bangladesh, and Myanmar. In India, it's prevalent in the northeastern states (Arunachal Pradesh, Assam, Meghalaya) and also in southern regions (Andhra Pradesh, Karnataka, Tamil Nadu) (Singh et al., 2022).

It is mostly found in open forests or scrub forests and also in valleys near streams. Flowering period: April-May and Fruiting period: August-December. It can easily be identified through its small spiny tree or large shrub (Kumar et al., 2022). It has a rich source of bioactive compounds such as triterpenes, flavonoids, glycosides, saponins, and phytosterols. Traditionally, it is used to cure various diseases such as colds, dysentery, indigestion, skin infections, and intestinal worms (Bora et al., 2019). It also shows a wide range of pharmacological activities, such as antimicrobial, antifungal, antidiabetic, hypolipidemic, antioxidant, hepatoprotective, cytotoxic, and nephroprotective activities. It has a wide range of medicinal uses and a few works carried out for pharmacological values, but it also has a significant role as a food source. The dried fruits are directly consumed (Singh et al., 2020). Ripe fruits have a slightly sweet taste and are eaten raw (Rudrapaul et al., 2014). *M. spinosa* fruit seed oil could be a potential feedstock for biodiesel production in India (Kakati and Gogoi, 2016).



Figure 1: Leaves of *M. spinosa*



Figure 2: Fruit of *M. spinosa*



Figure 3: Flowers of *M. spinosa*

METHODOLOGY

In present study, field and literature survey was carried out during 2022-2025. The field survey was carried out for taking photographs and ground ethnobotanical information on *M. spinosa* in Odisha state, India. The data presented in the current chapter are accumulated from various electronic databases like PubMed, Scopus, Science Direct, and Web of Science. Direct and library searches for journals and books. Relevant articles and books published were selected and reviewed. A systematic semi-structured questionnaire was used to collect the information on plant from tribal communities (Jena et al., 2025).

MORPHOLOGY

It is a small-sized tree or large shrub, often armed with long, straight, supra-axillary thorns. Leaves are ovate, elliptic, or oblong, acute or acuminate or obtusely acuminate, more or less pubescent, with secondary nerves 5-7, a rounded or cuneate base, a petiole 5-10 mm, and short and broad stipules, very obtuse, caducous. Flower small, green, subglobose in dense axillary cymes; pedicels hairy. Corolla 3-3.2 mm long, tube with prominent ribs within, throat thinly villous, not densely woolly at mouth, lobes triangular, acuminate, or caudate.

Anthers, wholly or partly included, are erect. Style long; stigma grooved. Fruit subglobose, 1.8-2 cm in diameter, with 5-6 radiating flattened pyrenes or fewer by abortion (**Saxena and Brahman, 1995; Figures 1-3**).

BIOACTIVE COMPOUNDS

Plant parts contain bioactive compounds triterpenes, saponins, phytosterols, flavonoids, glycosides, fatty alcohols, fatty acids, hydroxy acid (**Singh et al., 2022**). Fruits contain hypoglycemic, hypolipidemic, and antioxidant activity due to the presence of flavonoids, ellagic acids, phenolic acids, phytosterols, gallotannins, and other related polyphenols (**Singh et al., 2020**). The stem and leaves showed the presence of alkaloids, flavonoids, phenolics, saponins, tannins, carbohydrates, glycosides, steroids, phlobatannin, terpenoids, diterpenoid, anthraquinones, carotenoids, anthocyanin, coumarin, fatty acids, proteins, amino acids, emodins and phytosterol. Stems contain relatively higher amounts of phytochemicals than leaves (**Yadav et al., 2021**). Methanol extract of *M. spinosa* leaves shows the presence of 19 α -hydroxyasiatic acid, oleanolic acid, myricyl alcohol, β -sitosterol, and 3-O- β -D-glucopyranosyl- β -sitosterol. Three new compounds, namely, 19 α -hydroxyursane-type triterpenes (2 α ,3 α ,19 α ,24,28-pentahydroxyurs-12-ene), meyanthic acid (3 β -acetoxy-2 β ,19 α ,23-trihydroxyurs-12-en-28-oic acid) and an aliphatic ester, and myricyl pentadecanoate were isolated from the plant leaves (**Sen and Chakraborty, 2017**). Oleanolic acid were isolated from the fruits of *M. spinosa*. Two new 19 α -hydroxyursane-type triterpenes, 2 α ,3 α ,19 α ,24,28-pentahydroxyurs-12-ene and meyanthic acid, 3 β -acetoxy-2 β ,19 α ,23-trihydroxyurs-12-en-28-oic acid along with one new aliphatic ester, myricyl pentadecanoate and five known compounds, 19 α -hydroxyasiatic acid, oleanolic acid, myricyl alcohol, β -sitosterol and its glycoside were isolated from the methanolic leaf extract of *M. spinosa* (**Rudrapaul et al., 2014**).

ETHNOMEDICINAL USES

During the survey, it was concluded that the leaves of *M. spinosa* were consumed as food and for medicinal uses. The leaves are used as chutney or powder mix with dal to boost immunity. The varied array of ethnomedicinal knowledge on *M. spinosa* reported by many researchers throughout India was claimed by tribal communities (**Table 1**). Ripe fruits are used for the cure of piles, cracked heels, gastritis, and hepatic and biliary congestions. Leaves are used as a remedy for skin irritation, bone fracture, diphtheria, renal diseases, and

abortion. A paste prepared from seeds is used for the removal of pimples and abortion (Singh et al., 2022). Fruit and bark have been used in the treatment of hepatic disorders, skin infection, headache, peptic ulceration, intestinal worm, dysentery, indigestion, and painful urination. In many parts of India, such as Manipur and Tripura, it is used to treat diabetes, especially unripe fruit and leaves (Singh et al., 2020).

Table 1: Ethnomedicinal values of *M. spinosa*

Plant parts	Mode of uses	Diseases	Sources
Dried fruit	Orally	Piles	Sen and Chakraborty, (2017)
Leaves	Paste (Chutney)	Immune booster	Present survey
Fruit	Orally	Cough	Singh et al., (2018)
Fruit and bark	Paste	Headache	Singh et al., (2020); Sen and Chakraborty, (2017)
Fruit and bark	Decoction	Intestinal worm	Singh et al., (2020)
Fruit and leaves	Decoction	Diabetes	Singh et al., (2020)
Fruit and leaves	Decoction	Gastrointestinal disorders	Singh et al., (2018)
Fruit and seed	Paste	Induce abortion	Sen and Chakraborty, (2017)
Leaves	Paste	Skin irritation	Singh et al., (2022)
Leaves	Paste	Bone fracture	Singh et al., (2022)
Leaves	Decoction	Peptic ulcer	Sen and Chakraborty, (2017)

Leaves	Decoction	Blood purifier	Bag et al., (2016)
Ripe fruit	Juice	Piles	Singh et al., (2022)
Ripe fruits	Paste	Biliary congestions	Singh et al., (2022)
Root and bark	Decoction	Tetanus	Ankita and Shailaja, (2023)
Seed	Paste	Abortifacient	Sen and Chakraborty, (2017); Buragohain, (2008)
Seed	Powder	Kidney stones	Bag et al., (2016)
Seeds	Paste	Removal of pimples	Singh et al., (2022)
Shoot	Macerated	Jaundice	Sen and Chakraborty, (2017)
Unripe fruits	Decoction	Diabetes	Singh et al., (2020)
Whole plant	Decoction	Dysentery	Sen and Chakraborty, (2017)

PHARMACOLOGICAL VALUES

According to the literature review, it concluded that there is less work carried out on the pharmacological activities (**Table 2**). Oleanolic acid was isolated from the fruits of *M. spinosa*, which possess antimicrobial activity against *B. subtilis*, *K. pneumoniae*, *E. coli*, *S. aureus*, and *C. albicans* (**De et al., 2015**). Pharmacological uses such as antimicrobial, antioxidant, cytotoxic, antidiabetic, nephroprotective, and hepatoprotective potential.

Table2: Pharmacological values of *M. spinosa*

Plant parts	Pharmacological values	Sources
Fruit	Anti-hyperglycaemic	Singh et al., (2020)
Fruit	Anti-microbial	De et al., (2015)
Fruits	Antifungal	Singh et al., (2017)
Leaves	Antibacterial	Sen and Chakraborty, (2017)
Leaves	Antioxidant	Sen et al., (2013)
Ripe fruit	Anti-inflammatory	Boruah et al., (2024)
Ripe fruit	Antiproliferative	Boruah et al., (2024)
Stem	Cytotoxic activity	Sen and Chakraborty, (2017)

FOOD VALUES

In many parts of India, tribal communities mainly consumed leaves of *M. spinosa* as leafy vegetables. Mostly the powder form of leaves is sold in rural market areas (**Figure 4; Nayak and Kumar, 2023**). As per the tribe, they claimed they mix the powder of *M. spinosa* in dal to enhance the immunity booster. The leaves are used for the preparation of pickle and singju (spicy salad) (**Singh et al., 2020**).

ECONOMICAL VALUES

In many selected places in India, it is used for economic purposes. It also has a significant role in other aspects, like in the production of shampoo, oil, beverages, and food preservatives (**Singh et al., 2022**). In the Nyishi community of Arunachal Pradesh, the leaf paste is used as shampoo (**Sen and Chakraborty, 2017**).



Figure 4: Dried leaves and leaf powder of *M. spinosa* sold in Market areas of Odisha, India

CONCLUSION

Meyna spinosa has been traditionally utilized by tribal communities, particularly in Odisha, India, for its culinary and medicinal properties. Researchers are increasingly interested in its ethnomedicinal potential but less documentation in pharmacological aspects. Further research could uncover the phytochemical composition and pharmacological properties for further study to validate therapeutic applications.

REFERENCES

- Ankita M and Shailaja N. (2023). A review on *Meyna spinosa* Roxb. Ex Link. International Journal of Research and Analytical Reviews. 10(2): 922-926.
- Bag GC, Devi PG and Bhaigyabati T. (2016). Phytochemical screening and antioxidant activity of *Meyna laxiflora* species found in Imphal West district of Manipur. International Journal of Pharmaceutical Sciences Review and Research. 36(1): 137-143.
- Bora R, Khakhalary S and Dutta T. (2019). Phytochemical profiling, assessment of total phenolic content, total flavonoid content, and antioxidant activity of

ethnomedicinal plant, *Meyna spinosa* from Assam. Asian Journal of Pharmaceutical and Clinical Research. 12(1): 61-63.

Boruah JL, Gogoi M, Famhawite V, Barman D, Das DJ, Puro KN, Biswas A, Mridha P, Gogoi P, Gajbhiye R and Baishya R. (2024). Phytochemical characterization, prooxidant, antiproliferative and anti-inflammatory potential of *Meyna spinosa* Roxb. Ex Link ripe fruit. Chemistry & Biodiversity. DOI: 10.1002/cbdv.202402342

Buragohain J. (2008). Folk medicinal plants used in gynaecological disorders in Tinsukia district, Assam, India. Fitoterapia. 79 (5): 388-392.

De B, Sen S, Devanna N, Chakraborty R, and Choudhury R. (2015). Antioxidant activity of flavonoid isolated from *Meyna spinosa* leaves. Asian Journal of Chemistry. 27(1): 389-390.

Jena N, Rout S, Mishra S and Kumar S. (2025). Evaluation of quantitative ethnobotanical uses in Mayurbhanj district, Odisha, India. Journal of Biodiversity and Conservation. 9(1): 1-29.

Kakati J and Gogoi TK. (2016). Biodisel production from Kutkura (*Meyna spinosa* Roxb. Ex.) fruit seed: its characterization and engine performance evaluation with 10% and 20% blends. Energy Conversion and Management. 121: 152-161.

Kumar S, Mishra S, Mishra AK and Kumar SN. (2022). Floral Diversity of Koira & Barsuan ranges Bonai Forest Division, Odisha. Divisional Forest Officer, Bonai Forest Division. Ambika Prasad Research Foundation.

Nayak S and Kumar S. (2023). Medicinal Plants used by Tribals of Odisha. State Medicinal Plants Board, Odisha and Ambika Prasad Research Foundation, India. 246-247.

Reddy KN, Pattanoik C, Reddy CS and Raju VS. (2007). Traditional knowledge on wild food plants in Andhra Pradesh. Indian Journal of Traditional Knowledge. 6(1): 223-229.

Rudrapaul P, Das N, De UC and Dinda B. (2014). New 19 α -hydroxyursane-type triterpenes from the leaves of *Meyna spinosa* (*Vangueria spinosa*), Rubiaceae. Phytochemistry Letters. 9: 7-10.

- Saxena HO and Brahmam M. (1995). The Flora of Orissa, Volume 3. Orissa Forest Department Corporation Ltd., Bhubaneswar & Regional Research Laboratory, Bhubaneswar, Odisha.
- Sen S and Chakraborty R. (2017). *Meyna spinosa* Roxb.: an unexplored ethnomedicinal plant. International Journal of Green Pharmacy. 11(3): S332- S337.
- Sen S, De B, Devanna N and Chakraborty R. (2013). Total phenolic, total flavonoid content, and antioxidant capacity of the leaves of *Meyna spinosa* Roxb., an Indian medicinal plant. Chinese Journal of Natural Medicines. 11(2): 149-157.
- Singh AD, Sharma A, Mutreja V, Sohal HS and Bhardwaj G. (2022). A review on phytochemistry and pharmacology of an unexplored ethnomedicinal plant: *Meyna spinosa* Roxb. Ex. Materials Today: Proceedings. 48(5): 1508-1516.
- Singh OJ, Babycha L and Surbala L. (2020). Anti-hyperglycaemic effects of aqueous preparation of *Meyna spinosa* Roxb. Fruit in Streptozotocin- Induced diabetic rats. International Journal of Pharmaceutical Sciences and Research. 12(7): 3827-3831.
- Singh S, Chattopadhyay P, Borthakur SK and Policegoudra R. (2018). Safety profile investigations of *Meyna spinosa* (Roxb.) and *Oroxylum indicum* (Linn.) extracts collected from Northeast India. Pharmacognosy Magazine.13: S762-8.
- Yadav P, Sheel R and Kumar B. (2021). Phytochemical profile of *Meyna spinosa* Roxb. Ex Link. International Journal of Scientific Research. 10(4): 38- 41.

CHAPTER 9

Medicinal uses and propagation methods of *Paederia foetida*: a local medicinal plant

Alok Ranjan Sahu¹, Sugimani Marndi², Nihar Ranjan Nayak³
and Rajkumari Supriya Devi^{2*}

¹Department of Botany, Vikash Degree College, Bargarh, Odisha, India

²Ambika Prasad Research Foundation, Odisha, India

³Department of Botany, Maa Manikeshwari University, Bhawanipatna, Kalahandi, Odisha, India

*Email-Id: supriyark91@gmail.com

DOI: <https://doi.org/10.5281/zenodo.15369198>



Licensed under a Creative Commons Attribution 4.0 International License

Abstract: *Paederia foetida* is a fetid shrub belonging to the family Rubiaceae and has a wide range of applicability in society. It has a bitter taste with foul smell. Through a literature survey, the plant contains many bioactive compounds like asperuloside, paederosidic acid, phenolic compounds, alkaloids, and tannins. It is useful in treatment of several health problems such as hepatic diseases, rheumatoid arthritis, diabetes, constipation, coughs, dysentery, diarrhoea, toothache, bone fractures and stomach ache. Due to elimination of this plant from nature, it has become a major concern since it is one of the effective medicinal plants used by indigenous people. This chapter takes a review on the medicinal and propagation methods of *P. foetida* through the compilation of all the scientific work done by researchers.

Keywords: Indigenous knowledge, medicinal values, pharmacological aspects, propagation methods

INTRODUCTION

Over a long period of time, the Rubiaceae family, also known as the coffee or madder family, is a diverse group of flowering plants that includes many species valued for their food and medicinal properties. The Rubiaceae family plays a crucial role in both culinary and medicinal context. Its diverse range of species offers valuable resources for food and traditional medicines, contributing to the health and well-being of communities worldwide. Due to their importance, it is sometimes extorted in a heavy amount from nature, which leads

to the extinction of such species. They are a major group of angiosperms primarily distributed in Asia and North America. As per The Plant List, the genus *Paederia* consists of a total of 33 accepted plant species. The lectotype species of the *Paederia* genus i.e. *Paederia foetida* Linn. (Syn. *Paederia scandans*) is a deciduous climbing plant with a hard lignified stem (Dutta et al., 2023). *P. foetida* L. (Figure 1) is a slender perennial herb. It is known as gandhuli or prasaruni in odia; in English, skunk vine. The name is derived from the distinct odour of carbon bisulphide when the leaves are crushed. In fact, the species name, *foetida*, is Latin for “stinky” or “foul smelling” (Patel, 2017). It can be characterized by a foul aroma and the young stems are purplish or ruddy brown. It is a climbing perennial and grows in the temperate biome. It is occasionally found in mixed forests near streams, forest margins, and marginal land. Flowering period is generally from August-October. It is distributed throughout Arunachal Pradesh, Assam, Manipur, Nagaland, Mizoram, Tripura, Meghalaya, Sikkim, West Bengal, Bihar, Odisha, Andaman & Nicobar (Khushbu et al., 2010; Chanda et al., 2013), Nepal, Bangladesh, Myanmar, Malaya, Thailand, Borneo. The whole plant is used in ayurvedic medicine for the treatment of various diseases. Flowers and fruits are mostly in summer and fall; seeds may be dispersed by birds (Khushbu et al., 2010). According to the India Flora Online report, the IUCN status for the plant is “Not evaluated” and it is important to note that, as per the Global Invasive Species Database (GISD), it is again “Not evaluated” (<https://www.iucngisd.org/gisd/>). As a matter of fact, it is endangered in some countries, like Bangladesh, due to severe habitat deforestation, urbanization, industrialization, and agricultural approach. Due to the cutting down of large trees, it also has a high impact on its population since it is a climbing vine (Binto et al., 2020). Therefore, it has become a major concern for its conservation status through propagation. Specific propagation methods are constituents of asexual propagation and sexual propagation also through natural dispersal by bees, butterflies, and honey bees (Liu et al., 2006). The major classes of chemical constituents present in *P. foetida* are iridoid glycosides, sitosterol, stigmasterol, alkaloids, carbohydrates, proteins, amino acids, and volatile oils. Paederolone, paederone, -sitosterol, paederoside, asperuloside, and their associated glucosides, steroids and terpenoids, as well as 77 components in the volatile oils are also found in the plant. Leaves contain indole, carotene, and vitamin C, iridoid glycosides, paederoside, asperuloside, and scandoside; campesterol, sitosterol, stigmasterol, palmitic acid, and ursolic acid. Friedelan-3-1, epifriedelinol, and beta-sitosterol are also produced by the plants (Roy et al., 2021; Soni et al., 2013; Patel, 2017). It possesses a wide range of

medicinal values which treats several diseases including rheumatoid arthritis, constipation, diabetes, dysentery, diarrhoea, toothache, bone fractures and stomach ache. It has antidiarrheal, anti-inflammatory, analgesic, antioxidant, antibacterial, anti-hyperglycemic activity, antiulcer, sedative-anxiolytic potential, DPPH radical scavenging activity, antinociceptive activity, gastroprotective activity, cardiovascular disease, nephroprotective activity and hepatoprotective activity. *P. foetida* has antioxidant properties due to the presence of secondary metabolites, particularly flavonoids (Patel, 2016; Kakati and Sikdar, 2017; Hossain, 2007; Roy et al., 2021; Soni et al., 2013; Zaman et al., 2023; Siripiyasing et al., 2022). Leaf and tender shoots are used as leafy vegetables and as food additives in preparing certain delicacies. The tribal people of Tripura consume dry fish and leaves of *P. foetida*. In Odisha, it is cooked with rice to cure rheumatism and gout (Zaman et al., 2023). The pungent smell is due to the presence of the volatile methyl mercaptan, which is removed mostly during cooking (Zaman et al., 2023). Despite its strong odour, it has a long history of use in traditional medicine and as a culinary spice in some parts of Asia including the Indian and Hainanese cuisine. Due to the presence of essential oil, it is of great demand in markets of Assam for extraction (Patel, 2016). *P. foetida* is also culturally significant in various regions, particularly in Asia, where it is used in traditional cooking as a spice (Dutta et al., 2023). Additionally, it holds a significant place in folk medicine among ethnic tribes, often utilized in rituals and as a natural remedy for various ailments, reflecting its deep-rooted cultural importance. This chapter aims to provide a comprehensive overview of *P. foetida*, a medicinal plant and propagation methods in India.

METHODOLOGY

The field survey was carried out in Cuttack district, Odisha and literature survey was carried out using several authenticated scientific websites. The data presented in the current chapter is accumulated from various electronic catalogue like PubMed, Scopus, ScienceDirect, Web of Science, Google Scholar and library searches of scientific journals and books. The Plant List, International Plant Name Index and Kew Botanical Garden Plant name databases were some of the important websites used for literature review. Relevant articles and books published were also reviewed for the same (Jena et al., 2025).



Figure 1: Morphology of *P. foetida* at State Botanical Garden, Odisha

MORPHOLOGY

It is a fetid shrub, climbing by means of twining stems and twisted petioles. Leaves elliptic-ovate, oblong -ovate, narrow-ovate, or ovate, 5-13 to 2-8 cm acute or acuminate, glabrous, axils sometimes hairy with glands, base rounded or subcordate; petiole 2.6-8.9 cm. Flower purple, nearly sessile, tubular-funnel-shaped, 1.2 cm long, in axillary and terminal cymose, often scorpioid, 10-15 cm long, pubescent panicles. Calyx lobes 4-6, small, obtuse, or triangular, ciliolate. Corolla -lobes oblong, one fourth the length of tube, with white incurved, crisped margins, tube glandular-hairy within. Fruit elliptic-ovate or oblong, 1 cm long, compressed, 1 cm long, polished, often red; epicarp thin, fragile, veined, separating from the two thin pyrenes; pyrenes 8.7 mm long, with a broad wing all around (**Saxena and Brahmam, 1995; Figure 1**).

MEDICINAL USES

It is often used in traditional healing practices, showcasing its role in cultural health rituals. In **Table 1**, it is documented that leaves, stems, roots, fruit, and bark cures diarrhoea, jaundice, fever, and urine retention (**Figure 2**). Mostly the modes of use are decoction, paste, boiled, cooked. Because the leaves contain methyl mercaptan, indole, carotene, and vitamin C, the plant cures many diseases such as diarrhoea, joining broken bones, urine retention, stomach ache, and rheumatism. Bark is used to cure emetic piles. The whole plant is used to ease childbirth, fever, and arthritis.

Table 1: Medicinal uses of *P. foetida*

Plant parts	Mode of uses	Diseases	Sources
Bark	Decoction	Emetic	Roy et al., (2021)
Fruit	Paste	Toothache	Roy et al., (2021); Khushbu et al., (2010)
Leaves	Decoction	Diarrhoea	Asraful et al., (2010)
Leaves	Paste	Joining broken bones	Sarker et al., (2002)
Leaves	Boiled and mashed	Urine retention	Roy et al., (2021)
Leaves	Cooked	Rheumatism	Zaman et al., (2023)
Leaves	Paste	Herpes	Chanda et al., (2013)
Leaves	Decoction	Allergy	Chanda et al., (2013)
Leaves and root	Decoction	Stomach ache	Amin et al., (2003)
Roots	Decoction	Discharge gas	Roy et al., (2021)

Roots and bark	Decoction	Piles	Roy et al., (2021); Amin et al., (2003)
Seed & Stem	Decoction	Jaundice	Patel, (2016)
Whole plant	Decoction	Childbirth	Sarker et al., (2002)
Whole plant	Paste	Fever	Roy et al., (2021)
Whole plant	Decoction	Arthritis	Roy et al., (2021);
Whole plant	Decoction	Abscesses	Sharma et al., (2024)
Whole plant	Decoction	Stomach-ache	Sharma et al., (2024)
Whole plant	Infusion	Help in labour childbirth	Patel, (2016); Sarker et al., (2002)

PROPAGATION METHODS

P. foetida can be quite vigorous and potentially invasive in some regions. It is important to select the propagation methods and plantation locations. It can be propagated through both sexual (seeds) and asexual (vegetative) methods (**Figure 3**). *P. foetida* can be propagated through stem cutting or layering. Stem cuttings are typically taken in the spring or early summer, while layering involves bending a stem to the ground and covering it with soil until roots develop (**Patel, 2016**). Through vegetative propagation, stem cuttings are a rapid and effective method for propagating. Another vegetative propagation through layering is the general method for vine propagation. Sexual propagation means propagation through seeds. Tissue culture is another option, especially for large-scale production and when seed germination is poor (**Patel, 2016; Amin et al., 2003**).

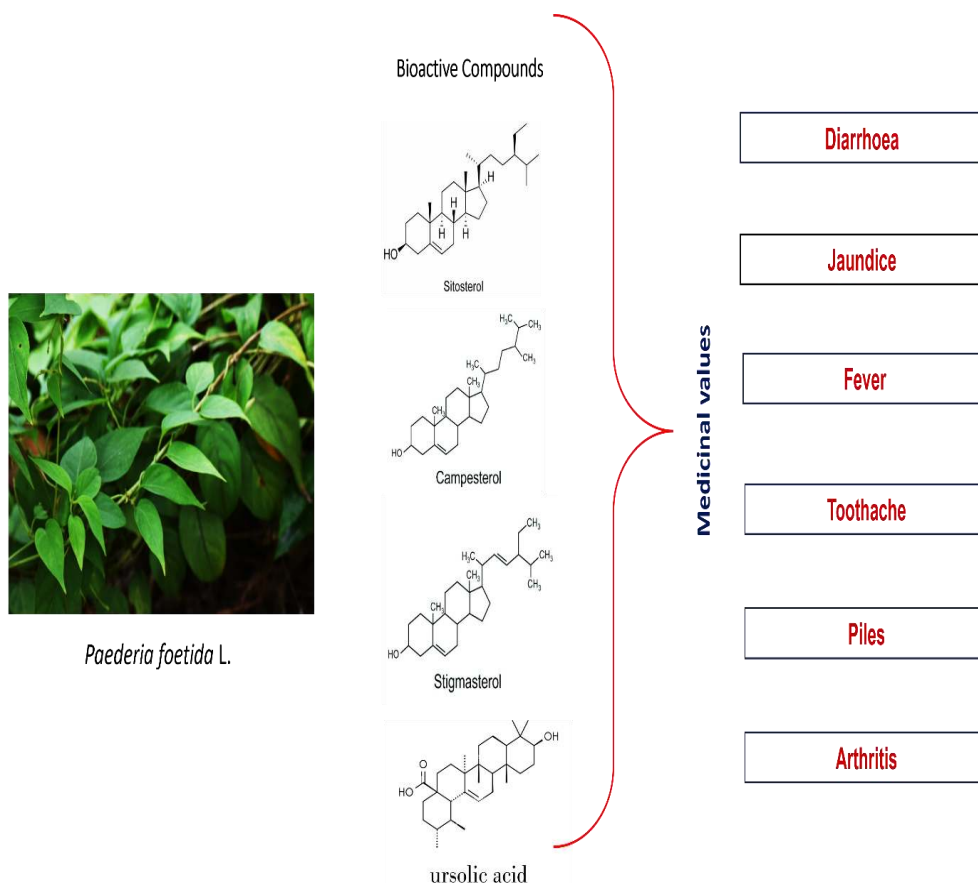


Figure 2: Bioactive compounds responsible for medicinal uses in *P. foetida*

In vitro propagation by tissue culture is a more advanced method used for rapid and large-scale propagation, often in a laboratory setting. Plant regeneration protocol via adventitious shoot organogenesis from internode explants from three explants (leaf, mature, and internode) derived from axenic shoot cultures (Behera et al., 2017). Shoot multiplication was observed, which could be a good method for *in vitro* multiplication (Alam et al., 2010). *In vitro* multiplication of shoot induction and other tissue culture studies on *P. foetida* were documented (Thirupathi et al., 2013). *In vitro* method of clonal propagation for large-scale production of this species in Bangladesh (Alam et al., 2010; Amin et al., 2003). Though conventional propagation techniques are very slow, inefficient and cannot manage with the increasing demand, *in-vitro* regeneration through tissue culture could be an alternative means

of rapid propagation. Regeneration through direct organogenesis using nodal explants (Binto et al., 2020).

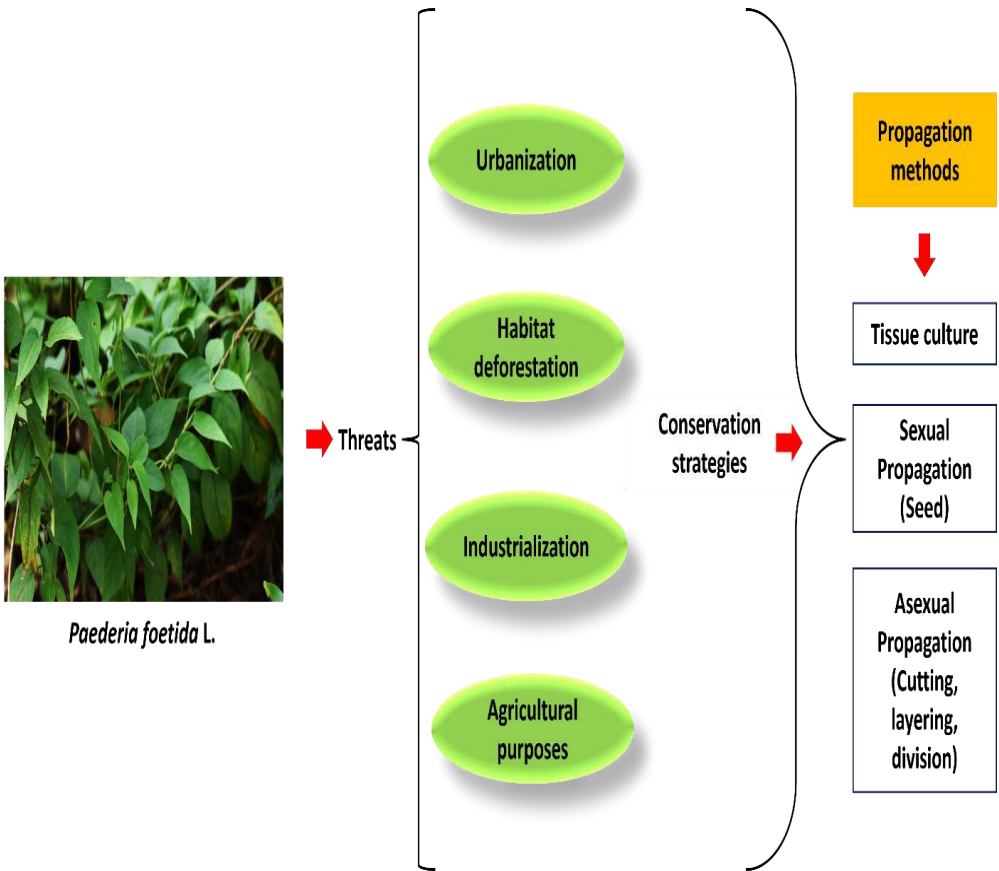


Figure 3: Conservation strategies through methods of propagation

CONCLUSION

Paederia foetida, a locally substantial medicinal plant, holds considerable therapeutic potential, predominantly for gastrointestinal ailments such as diarrhoea and dysentery, as revealed by traditional uses and scientific studies confirming its anti-diarrhoeal and anti-inflammatory properties. Its application extends to managing pain, inflammation, and other conditions like rheumatism and abdominal discomfort, highlighting its broad ethnomedicinal value. Further research into bioactive compounds, their mechanisms of action, and standardized cultivation practices will be essential to fully harness the therapeutic potential of *P. foetida* and integrate it into mainstream healthcare, thereby benefiting local

communities and beyond. For propagation, it can be effectively multiplied through mature stem cuttings, offering a practical method for cultivation and conservation efforts. *In vitro* propagation techniques have been developed for large-scale production, which is crucial for potential commercial demands and ensuring the availability of these valuable resources.

REFERENCES

- Alam MA, Azam FMS, Karim MM, Rehana F, Sharmin N, Kalpana MA, Jahan R, Rahmatullah M and Khatun MA. (2010). *In vitro* regeneration of *Paederia foetida*: a widely used medicinal vine in Bangladesh. American- Eurasian Journal of Sustainable Agriculture. 4(2): 164-169.
- Amin MN, Rahman MM and Manik MS. (2003). *In vitro* clonal propagation of *Paederia foetida* L. – a medicinal plant of Bangladesh. Plant Tissue. 13(2): 117-123.
- Behera B, Behera S, Jena PK, Barik DP and Naik SK. (2017). Adventitious shoot organogenesis and plant regeneration from internode explants of *Paederia foetida* L.: a valuable medicinal plant. Biosciences Biotechnology Research Asia. 14(3): 893-900.
- Binto SH, Ahmed JU, and Ghosh TK. (2020). Regeneration of medicinal plant *Paederia foetida* through direct organogenesis using nodal explants. Annals of Bangladesh Agriculture. 24(1): 89-98.
- Chanda S, Sarethy IP, De B and Singh K. (2013). *Paederia foetida* – a promising ethno-medicinal tribal plant of north-eastern India. Journal of Forestry Research. 24(4): 801-808.
- Dutta PP, Marbaniang K, Sen S, Dey BK and Talukdar NC. (2023). A review on phytochemistry of *Paederia foetida* Linn. Phytomedicine Plus. 3(1): 100411.
- Hossain M. (2007). Antinociceptive activity of whole plant extracts of *Paederia foetida*. Dhaka University. Journal of Pharmaceutical Sciences. 5: 67-69.
- <https://www.iucngisd.org/gisd>
- Kakati D and Sikdar AP. (2017). Qualitative study of certain phytochemical and Pharmacognostic properties of two ethnomedicinal plants used for gastrointestinal disorders: *Centella asiatica* (L.) and *Paederia foetida* (L.) of Darrang district, Assam. International Journal of Herbal Medicine. 5(2): 31-34.
- Khushbu C, Anar P, Mayuree P, Carol M, Roshni S and Subodh A. (2010). *Paederia foetida* Linn. as a potential medicinal plant: a review. Journal of Pharmacy Research. 3(12): 3135-3137.
- Liu H, Pemberton RW, and Stiling P. (2006). Native and introduced pollinators promote a self-incompatible invasive woody vine (*Paederia foetida* L.) in Florida. The Journal of the Torrey Botanical Society. 133(2): 304-311.

- Patel DK. (2016). Shoot propagation of *Paederia foetida* Linn. in herbal garden for *ex-situ* conservation. European Journal of Biotechnology & Bioscience. 4(1): 1-7.
- Patel DK. (2017). *Paederia foetida* Linn.: a potential climbing medicinal herb in Central India. International Journal of Environmental Sciences & Natural Resources. 6(5): 00118-0124.
- Roy P, Das H, Ali MS, Sarkar P and Chattopadhyay S. (2021). A review on *Paederia foetida* as a medicinal plant and its pharmacological activities. World Journal of Pharmacy and Pharmaceutical Sciences. 10(12): 637- 647.
- Sarker MR, Handique GK and Handique AK. (2002). Clonal micropropagation of *Paederia foetida* L.- a potent herbal medicinal plant. Journal of Phytochemical Research. 15(2): 125-131.
- Saxena HO and Brahmam M. (1995). The Flora of Orissa, Volume 2. Orissa Forest Department Corporation Ltd., Bhubaneswar & Regional Research Laboratory, Bhubaneswar, Odisha
- Sharma R, Singh A, Tiwari R and Gautam N. (2024). Harnessing the medicinal properties of *Paederia foetida* in Ayurveda and traditional medicine. International Journal of Creative Research Thoughts. 12(6): g921- g925.
- Siripiyasing P, Silawong K, Chaveerach A, Sudmoon R and Tanee T. (2022). Essence supports ethnomedicinal uses of *Paederia foetida*, *Paederia linearis* and *Rotheca serrata*. Asian Journal of Plant Sciences. 21: 748-757.
- Soni RK, Irchhaiya R, Dixit V, and Alok S. (2013). *Paederia foetida* Linn. Phytochemistry, pharmacological and traditional uses. International Journal of Pharmaceutical Sciences and Research. 4(12): 4525-4530.
- Thirupathi M, Srinivas D and Reddy KJ. (2013). High frequency of multiple shoots induction in *Paederia foetida* (L.) – a rare medicinal plant. Plant. 1(5): 60-65.
- Zaman AMM, Kumar A, Kumar S, Patowary L, Kushari S and Ovung L. (2023). Bioactive components of *Paederia foetida* Linn. and its role in disease management. International Journal of Pharmaceutical Sciences and Research. 14(8): 3686-3693.

CHAPTER 10

Divine Jasmine [*Tamilnadia uliginosa* (Retz.) Tirveng. & Sastre]: an NTFP of India and its medico-food values

Bhagwati Prashad Sharma¹, Saraswati Majhi^{2*}, Sugimani Marndi³ and Subhalakshmi Rout³

¹Department of Botany, Sidharth Government College Nadaun, Himachal Pradesh, India

²Department of Botany, Shailabala Women's Autonomous College, Cuttack affiliated to Ramadevi Women's University, Bhubaneswar, Odisha, India

³Ambika Prasad Research Foundation, Odisha, India

*Email-Id: lsmajhi13@gmail.com

DOI: <https://doi.org/10.5281/zenodo.15370395>



Licensed under a Creative Commons Attribution 4.0 International License

Abstract: *Tamilnadia uliginosa* (Retz.) Tirveng & Sastre, commonly known as “Divine Jasmine”, is a valuable forest product (NTFP) in India with a rich history of traditional uses for both medicinal and nutritional purposes. It is considered as edible and medicinal plants used in traditional remedies. Traditionally, the fruits are extensively used to treat gastrointestinal disorders, possess astringent properties, and are applied topically to skin ailments. The roots are valued for their cooling, diuretic, and tonic properties, while the leaves are utilized for managing leprosy, skin diseases, respiratory issue, fever, pain and kidney problems. This chapter synthesizes the review of the documented medico-food values of various plant parts. Therefore, an attempt has been made to compile the data regarding its medicinal value and NTFPs.

Keywords: Divine jasmine, NTFP, traditional knowledge, food values

INTRODUCTION

The genus *Tamilnadia* belongs to the family Rubiaceae. It consists of a single accepted species, *Tamilnadia uliginosa*. *Tamilnadia* genus is based on the name of the state of Tamil Nadu in India, “*uliginosa*” means growing in bogs and swamps. In Telugu, it is known as

Adavimanga. It is useful for treating various diseases (**Kommu et al., 2019**). It is found mostly in dry deciduous forests. It is distributed throughout Bangladesh, India, Sri Lanka, and Thailand (**Sudhakar et al., 2012**). According to Plant of the World Online (POWO), *T. uliginosa* (Retz.) Tirveng. & Sastre has several synonyms including *Gardenia uliginosa* Retz., *Catunaregam uliginosa* (Retz.) Sivar., *Randia uliginosa* (Retz.) Poir., *Posoqueria uliginosa* (Retz.) Roxb., *Solena uliginosa* (Retz.) D. Dietr., *Xeromphis uliginosa* (Retz.) Maheshw., and *Gardenia pomifera* Wall. (**Kuttarmare et al., 2023; POWO, 2025**). Flowering period extends from April to July and fruiting period from October to January. It is distributed in countries like Sri Lanka, Bangladesh, Myanmar, Thailand, Cambodia, Laccadive Islands and Vietnam (**Ranjan and Kumar, 2015**). In India, it is distributed in Sikkim, Assam, Kerala, West Bengal, and Odisha (**Komu et al., 2012; Naik et al., 2021**). It is described as a very rigid, branched large shrub to small tree, with numerous strong thorns. *T. uliginosa* contains a variety of bioactive compounds, which contribute to its traditional medicinal uses, which indicates its pharmacological properties. Particularly, phenolics, glycosides, alkaloids, steroids, and saponins (**Deepthy and Radhamany, 2015; Figure 1**). Unripe fruits contain bioactive compounds such as saponins. It is shown that alkaloids, coumarin, glycosides, and methanolic extract. It shows the presence of 15 phenolic compounds having potential anticancer and antioxidant properties (**Bagga, 2018**). The major 15 polyphenolic phytoconstituents were identified and isolated from the fruits of *T. uliginosa*. Its fruit contains triterpenoid saponins (**Sati et al., 1989**). GC-MS analysis of the fruit extract has identified compounds like phytol and n-hexadecenoic acid as major components which possess various medicinal properties, including antioxidant activity (**Deepthy and Radhamany, 2015**). Different plant parts are used to treat various ailments, particularly in fruits. It includes diarrhoea, dysentery, diabetes, fever, cough, and boils. According to scientific documentation, it indicates that the plant possesses significant pharmacological activities such as antidiarrheal, antimicrobial, anti-inflammatory, antidiabetic, anthelmintic, antiepileptic, and anticancer activities (**Kalita et al., 2023; Kommu et al., 2019**). Studies were conducted to detect the presence of elements like Mg, K, Na, Fe, Mn, Ca, Pb, Cu present in *T. uliginosa* were carried out to assess its medicinal properties (**Deeptymol and Dhar, 2018**).

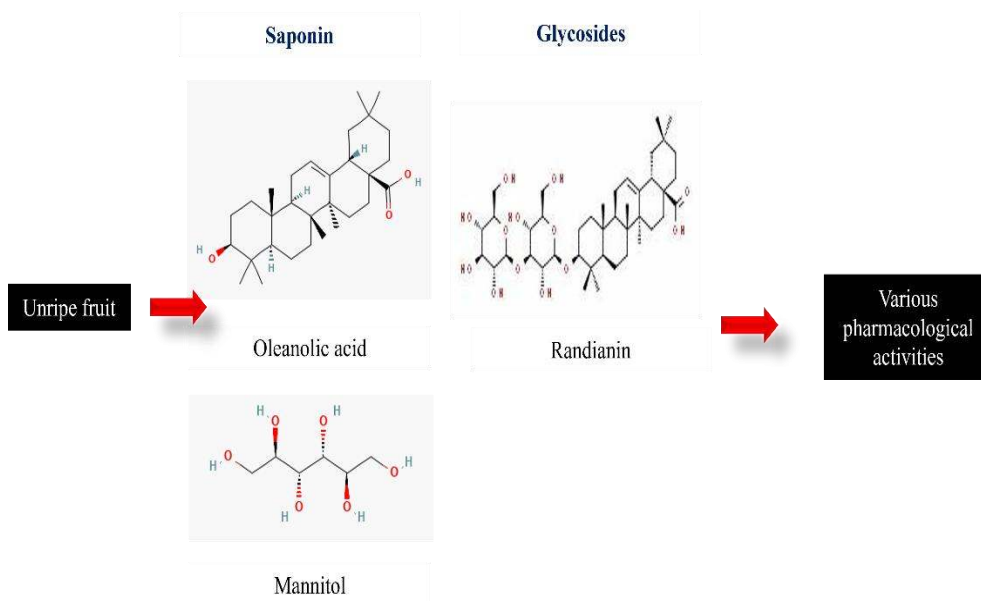


Figure 1: Some bioactive compounds present in unripe fruits

Many tribal communities, people residing in India consume the leaves and fruits after boiling and as a source of vegetables (Prusti et al., 2007). Fruits are used as wild edible fruits, as vegetables and in preparation of pickles (Kuttarmare et al., 2023; Mahapatra and Panda, 2012). Flower yields an essential oil like *Gardenia* oil (Sudhakar et al., 2012). It plays a role in the diets of faunal species. Scientific literature indicates that the leaves of *T. uliginosa* are used as fodder for deer and cattle. Therefore, wild herbivores like deer likely consume the leaves of this plant. While specific studies detailing the full range of faunal species in the wild feeding on *T. uliginosa* might be limited, its use as fodder suggests its contribution to the food resources available in its natural habitat (Sudhakar et al., 2012). Ecologically, it is also consumed by some faunal species, such as Gaur consumes the leaves of *T. uliginosa* during the winter season (Sudhakar et al., 2012; Gad et al., 2009). The IUCN Red list of threatened species has assessed status of *T. uliginosa* as Least Concern (LC). This assessment was most recently conducted in 2023 (<https://www.iucnredlist.org/en>). As per the distribution of *T. uliginosa* is listed as "Vulnerable" in Sri Lanka. According to the global assessment, it indicates that, across its entire distribution range (Indian Subcontinent to Indo-China), it does not currently meet the criteria for a threatened category.

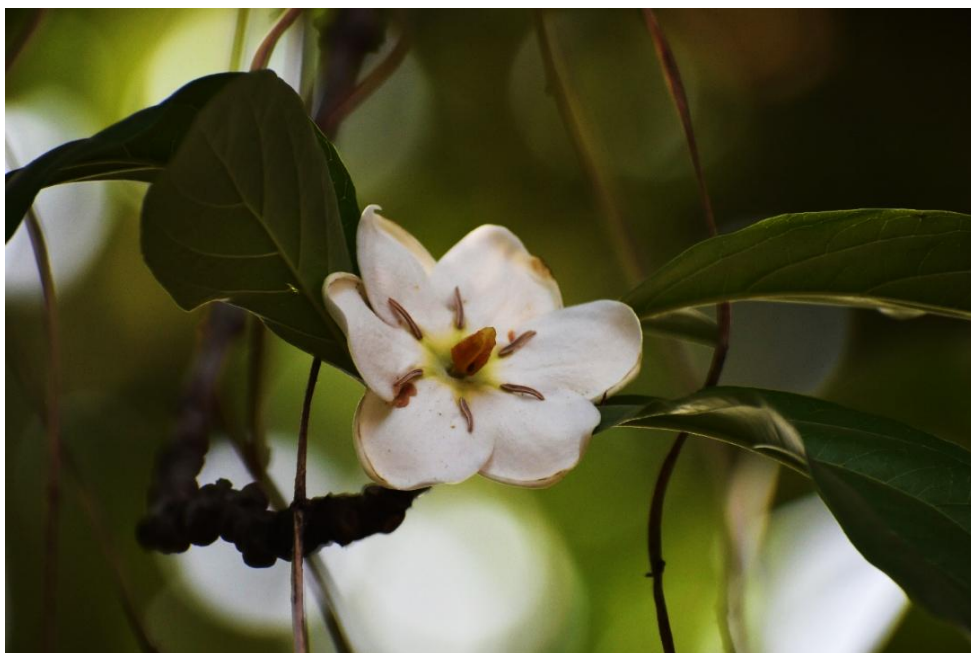


Figure 2: Flower of *T. uliginosa*

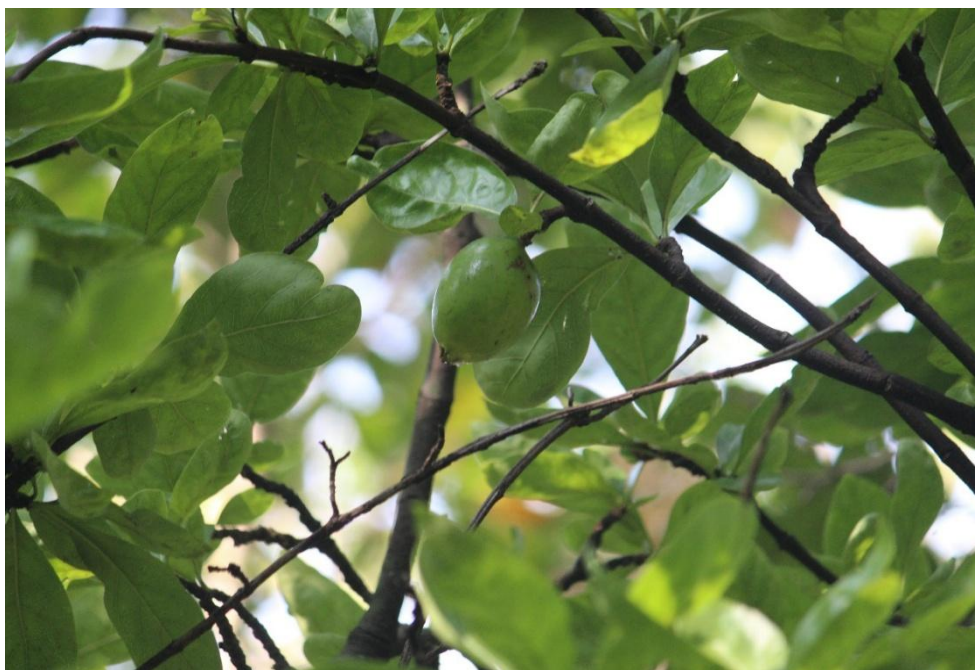


Figure 3: Fruit of *T. uliginosa*



Figure 4: Bark of *T. uliginosa*



Figure 5: Leaves of *T. uliginosa*

Therefore, based on the latest global assessment by the IUCN, *T. uliginosa* is of Least Concern (Kalita et al., 2023).

METHODOLOGY

The survey was carried out based on a field works and literature survey. The field survey was carried out in Mayurbhanj and Sundargarh districts of Odisha during 2022-2025. The data presented in the current chapter was accumulated from various electronic catalogues like PubMed, Scopus, Science Direct, Web of Science, Google Scholar and library searches of journals and books. The Plant List, International Plant Name Index and Kew Botanical Garden Plant name databases were used for identification of the plant species along with relevant published articles and books (Kumar et al., 2021; Jena et al., 2025).

MORPHOLOGY

T. uliginosa is a small thorny tree or shrub, rarely quite unarmed. Leaves petiolate, crowded towards the ends of the branchlets, obovate, oblong or elliptic, obtuse, rounded or acute, glabrous or pubescent on the nerves beneath, base narrowed, stipules broad, rounded or triangular. Flowers are white, fragrant, numerous, solitary at the ends of the suppressed branchlets, or the males corymbose, either large and sessile or small and peduncled. Calyx turbinate, lobes 5-7, very broad, obtuse or rounded. The corolla-tube does not exceed much from the calyx and lobes are orbicular. Stamens 5-7. Stigma fusiform, 2-lobed in the sessile flowers, entire in the peduncle. Fruit large, ellipsoid, or ovoid, 5-7 cm long, glabrous, smooth, yellow. Seeds are compressed, smooth, closely packed in pulp (Saxena and Brahman, 1995; Figure 2-5).

ETHNOMEDICINAL USES

In tribal communities of India, it is consumed to treat various diseases such as diarrhoea, dysentery, diuretic, boils, wounds, colds, cough, diabetes, and bone fractures. In the Eastern Ghats of Andhra Pradesh, they found that the stem bark of *Helicteres isora* Linn. along with that of *T. uliginosa* and whole plant of *Bacopa monnieri* are used in the treatment of cold and cough (Sudhakar et al., 2012; Reddy et al., 2006). According to Table 1, it is revealed that mostly fruit and leaves are used for medicinal uses to treat skin diseases, diarrhoea, dysentery, hair tonic, wounds, and reducing joint pain (Figure 6).

Table 1: Ethnomedicinal uses of *T. uliginosa*

Plant parts	Mode of uses	Diseases	Source(s)
Fruit	Paste	Skin diseases	Bagga, (2018)
Fruit	Decoction	Diarrhoea and dysentery	Nazarudeen, (2010); Kumar et al., (2022)
Fruit	Powder	Anthelmintic property	Gulnaz et al., (2014)
Fruit	Juice	Hair tonic	Gulnaz et al., (2014)
Fruit	Decoction	Migraine	Gulnaz et al., (2014)
Fruits	Paste	Boils	Bagga, (2018); Nazarudeen, (2010)
Fruits	Paste	Wounds	Bagga, (2018)
Leaves	Decoction	Kidney troubles	Babu et al., (2015)
Leaves	Paste	Carbuncles	Babu et al., (2015)
Leaves	Decoction	Reducing joint pain	Deepthy et al., (2015)
Leaves	Decoction	Continual sneezing	Deepthy et al., (2015)
Root	Decoction	Diarrhoea	Bagga, (2018)
Root	Decoction	Dysentery	Sudhakar et al., (2012)
Root	Decoction	Aphrodisiac diuretic	Bagga, (2018)
Roots	Decoction	Cooling and diuretic	Bajpai et al., (2016)
Stem	Paste	Wound healing	Babu et al., (2015)

Stem and bark	Paste	Bone fractures	Ratnam and Raju, (2008)
Stem and bark	Decoction	Cold and cough	Sudhakar et al., (2012)
Unripe fruits	Ashes	Gastrointestinal problems	Gulnaz et al., (2014)
Whole plant	Infusion	Rheumatism	Babu et al., (2015)
Wood	Decoction	Diabetes mellitus	Sudhakar et al., (2012)

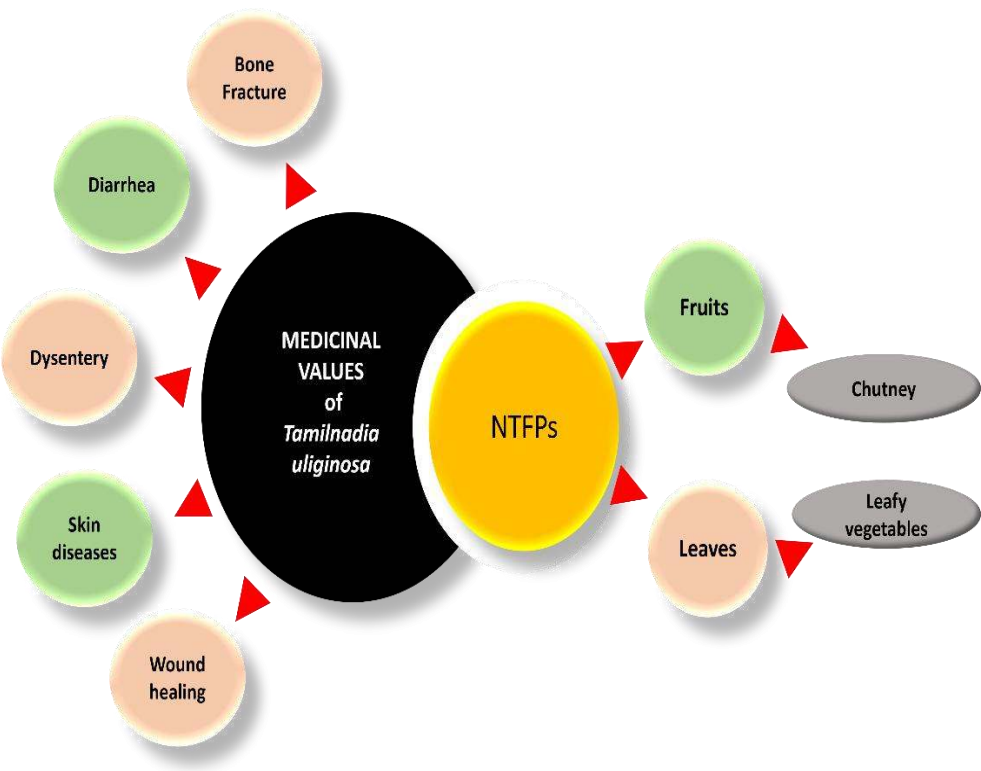


Figure 6: Importance of *T. uliginosa* in aspects of medico-food

NTFP (Non- timber Forest Product)

T. uliginosa is a source of multiple NTFPs (Non-Timber Forest Products) that contribute to the livelihoods, food security, and traditional medicine practices of communities in its distribution range. The ripe fruits are edible and consumed as vegetables (Bagga, 2018; Sudhakar et al., 2012; Figure 6). The tribes of Kerala such as Paniyar and Kattunaykkar cook the fruit by removing the seed (Nazarudeen, 2010). Unripe fruits are eaten as vegetables and leaves and boiled and consumed as a meal (Gulnaz et al., 2014). In the Wayanad Wildlife Sanctuary, Kattunaikka tribe uses tender fruits are used as vegetables (Sudhakar et al., 2012; Narayanan et al., 2011). In many tribal communities, the leaves are consumed as chutney (Deepthy et al., 2015).

CONCLUSION

T. uliginosa represents a valuable NTFP with potential medicinal and nutritional value. Sustainable harvesting practices, coupled with thorough scientific research, are essential to harness its benefits while ensuring the conservation of this resource and the livelihoods of the communities that depend on it. Further research could focus on pharmacological studies to validate traditional medicinal uses and identify novel therapeutic agents. By investing in research and sustainable practices, *T. uliginosa* can be used significantly in healthcare, nutrition, and the economic well-being of the regions where it thrives. Henceforth, further research could be explored and compounds responsible for these effects could be isolated soon.

REFERENCES

- Babu ND, Sekar M, Hussain SS, Sekhar K, Basha SH and Madhavi K. (2015). Evaluation of wound healing activity of ethanolic extract of *Tamilnadia uliginosa* ointment in rats. *Journal of Global Trends in Pharmaceutical Sciences*. 6(2): 2506-2509.
- Bagga J. (2018). *Taminadia uliginosa* (Retz) Tirveng and Sastre; (Rubiaceae): a new distributional record with ethnomedicinal uses from Palamu division of Jharkhand, India. *Bioscience Discovery*. 9(1): 97-99.
- Bajpai O, Pandey J and Chaudhary LB. (2016). Ethnomedicinal uses of tree species by Tharu tribes in the Himalayan Terai region of India. *Research Journal of Medicinal Plant*. 10(1): 19-41.

- Deepthy MMJ and Radhamany PM. (2015). GC-MS profiling in the fruits of *Tamilnadia uliginosa* (Retz.) Tirveng and Sstre (Rubiaceae). World Journal of Pharmacy and Pharmaceutical Sciences. 5(1): 890-896.
- Deepthy MMJ, Radhamany PM and Jalaj AV. (2015). Pharmacognostic studies on leaf of *Tamilnadia uliginosa* (Retz.) Tirveng & Sastre (Rubiaceae). International Journal of Advanced Research. 3(12): 118-123.
- Deepthymol MJ and Dhar PT. (2018). Element analysis of *Tamilnadia uliginosa* retz. Tirveng & Sastre (Rubiaceae). International Journal of Botany Studies. 3(2): 8-10.
- Gad SD and Shyama SK. (2009). Studies on the food and feeding habits of Gaur *Bos gaurus* H. Smith (Mammalia: Artiodactyla: Bovidae) in two protected areas of Goa. Journal of Threatened Taxa. 1(2): 128-130.
- Gulnaz AR, ELrahman MAEMA and Chauhan JB. (2014). Antimicrobial, antioxidant activities and phytochemical analysis of ethanolic extract of *Randia uliginosa* leaves. International Journal of Current Microbiology and Applied Sciences. 3(6): 200-210.
- Jena N, Rout S, Mishra S and Kumar S. (2025). Evaluation of quantitative ethnobotanical uses in Mayurbhanj district, Odisha, India. Journal of Biodiversity and Conservation. 9(1): 1-29.
- Kalita A, Bharadwaz A, Kaushik D, Kumar S, Sarma H, Kushari S, Bharali A, Deka B, Hazarika I and Laloo D. (2023). *Tamilnadia uliginosa* (Retz) Tirveng and Sastre: potential application from traditional remedies to modern therapeutics. Proceedings of the National Academy of Sciences, India Section B: Biological Sciences. 93: 1-15.
- Kommu S, Eswaraiah MC, Reddy DP and Illendula S. (2019). *In-vitro* anthelmintic activity of *Tamilnadia uliginosa* fruits. Research Journal of Pharmacy and Technology. 12(1): 321-323.
- Kumar S, Mishra S, Mishra AK and Kumar SN. (2022). Floral Diversity of Koira & Barsuan ranges of Bonai Forest Division, Odisha. Bonai Forest Division, Sundargarh & Ambika Prasad Research Foundation, Odisha, India.

- Kumar SN, Mishra S and Kumar S. (2021). Documentation of Indigenous Traditional Knowledge (ITK) on Commonly Available Plants in Koira Range, Bonai Forest Division, Sundargarh, Odisha, India. *Asian Plant Research Journal*. 8(4): 83-95.
- Kuttarmare SG, Jogi PS, and Deshmukh UB. (2023). Systematic review on phytochemical analysis and antioxidant activity of *Tamilnadia uliginosa* (Retz.) Tirveng. & Sastre (Rubiaceae). *International Journal of Researches in Biosciences, Agriculture and Technology*. 11(1): 279-282.
- Mahapatra AK and Panda PC. (2012). Wild edible fruit diversity and its significance in the livelihood of indigenous tribals: evidence from eastern India. *Food Security*. 4: 219-234.
- Naik SB, Chauhan V, Mohapatra SR and Kapoor. (2021). Floral species diversity of Colonel Sher Jang National Park, Himachal Pradesh. *Environment and Ecology*. 39(1): 32-37.
- Narayanan MKR, Mithunlal S, Sujanapal P, Kumar NA, Sivadasan M, Alfarhan AH and Alatar AA. (2011). Ethnobotanically important trees and their uses by Kattunaikka tribe in Wayanad Wildlife Sanctuary, Kerala, India. *Journal of Medicinal Plants Research*. 5(4): 604-612.
- Nazarudeen A. (2010). Nutritional composition of some lesser-known fruits used by the ethnic communities and local folks of Kerala. *Indian Journal of Traditional Knowledge*. 9(2): 398-402.
- POWO (2025). "Plants of the World Online". Facilitated by the Royal Botanic Gardens, Kew.
- Prusti AB and Behera KK. (2007). Ethnobotanical Exploration of Malkangiri District of Orissa, India. *Ethnobotanical Leaflets*. 2007(1): 14.
- Ranjan V and Kumar A. (2015). Conspectus of family Rubiaceae in West Bengal, India. *Geophytology*. 45(2): 161-174.
- Ratnam KV and Raju RRV. (2008). Traditional medicine used by the Adivasis of Eastern Ghats, Andhra Pradesh—for bone fractures. *Ethnobotanical Leaflets*. 12: 19-22.

Reddy KN, Reddy CS and Trimurthulu G. (2006). Ethnobotanical survey on respiratory disorders in Eastern Ghats of Andhra Pradesh, India. *Ethnobotanical Leaflets*. 10: 139-148.

Sati OP, Bahuguna S, Uniyal S and Bhakuni DS. (1989). Triterpenoid saponins from *Randia uliginosa* fruits. *Phytochemistry*. 28(2): 575-577.

Saxena HO and Brahman M. (1995). The Flora of Orissa, Volume 2. Orissa Forest Department Corporation Ltd., Bhubaneswar & Regional Research Laboratory, Bhubaneswar, Odisha, India.

Sudhakar K, Eswariah MC, Eshwarudu MM, Kumar PK and Nagaraju K. (2012). An updated review on *Tamilnadia uliginosa*. *International Research Journal of Pharmaceutical and Applied Sciences*. 2(5): 185-189.



INDEX

A

Antibacterial 17, 24, 25, 28, 34, 41, 45, 55, 71, 78, 84

Anti-inflammatory 2, 24, 25, 26, 28, 34, 35, 44, 45, 46, 60, 65, 66, 67, 71, 78, 84, 93

B

Bioactive compounds 3, 5, 9, 11, 14, 18, 23, 24, 33, 50, 51, 53, 59, 60, 67, 68, 72, 75, 82, 88, 89, 93, 94

E

Ecological 1, 2, 9, 17, 18, 23, 28, 29, 40, 44, 50, 51, 56, 61, 71, 94

Economic 1, 18, 29, 71, 78, 100

Ethnomedicinal 2, 5, 7, 15, 18, 25, 26, 29, 32, 54, 62, 64, 75, 76, 79, 89, 97, 98

I

Indigenous 68, 71, 82

M

Medicinal 1, 2, 3, 5, 9, 10, 11, 18, 21, 23, 25, 26, 29, 32, 44, 50, 51, 56, 62, 68, 71, 72, 75, 79, 82, 84, 86, 89, 93, 97, 100

P

Pharmacological 3, 5, 6, 7, 9, 11, 21, 22, 23, 26, 29, 34, 39, 40, 41, 44, 46, 50, 55, 59, 60, 61, 65, 66, 67, 68, 71, 72, 77, 78, 79, 82, 93, 100

R

Rubiaceae 1, 9, 10, 21, 29, 50, 60, 62, 71, 72, 82, 92

T

Traditional 3, 5, 7, 9, 11, 15, 21, 23, 25, 26, 28, 29, 32, 40, 41, 50, 56, 59, 61, 71, 82, 84, 86, 89, 92, 93, 100

Tribal communities 1, 3, 5, 10, 11, 15, 23, 46, 61, 71, 72, 74, 75, 78, 79, 94, 97, 100

AUTHOR PROFILE



Dr. Ghodke Anita Sureshrao, she is currently working as a Professor and Principal Cum Medical Superintendent in the department of Ayurveda college Amaltas Institute of Ayurved Banagar Dewas Madhya Pradesh India. She is an Ayurvedic Doctor and Researcher her Research belong to Medicinal Plants. Her educational qualification is as Bachelor of Ayurved Medical & Surgery (1997) from CSMSS Ayurved College Kanchanwadi, Dr. Babasaheb Ambedkar Marathwada University, Aurangabad, Maharashtra. She was M.D.in Ayurveda (Dravyaguna) (2002) form Govt. Ayurved College Nanded, Swami

Ramanand Teerth Marathwada University, Nanded, Maharashtra. She is PhD schooler in Dravyaguna at Govt. Ayurved Mahavidyalaya Nanded Maharashtra. Her experience Total Working Experience 21.6 Year in the subject Dravya Guna. Experience as Dean cum Medical Superintendent 7 month. Experience work as Principal Cum Medical Superintendent Exp. 4.2. Research work at Drake University, Des Moines IOWA U.S.A. M.E.T. Workshop at MUHS, Nashik, Maharashtra. Advance Research Workshop at MUHS Nasik, Maharashtra. She has worked as P.G. Guide, PhD. Guide, by Maharashtra University of Health Sciences Nasik, Maharashtra also PhD schooler at Govt. Ayurved Mahavidyalaya Nanded, Maharashtra. She attended National training program on panchakarma, at P.S. Varier Ayurved College, Kottakkal, Kerela. She has published about 16 National and international articles, 23 (conference, workshop, seminar at National and International). Two months online certificate programme on Data Analysis using Excel & SPSS Maharshi Charak Ayurveda R&D Scheme. Three online training programme attendants under Ambika Prasad Research Foundation.



Miss Sugimani Marndi, she is currently working as a Project Assistant at Ambika Prasad Research Foundation, Odisha, India. She is pursuing Ph.D. at CUTM, Odisha. She has completed a Master in Science from Rama Devi Women's University, Bhubaneswar, Odisha, India. She is working on wetland flora, aquatic plants, Saltlick, grasses, and orchid species of Odisha state. She has published about 13 Research papers and 15 chapters in the journal of national and international repute.



Dr. Bidhan Chandra Roy, is currently working as a Faculty Member at Department of Botany, Dinabandhu Mahavidyalaya, Bongaon, West Bengal, India. He is an enthusiastic botanist and researcher from India. He has completed M.Sc. in Botany (G.G.U.), B.Ed. (K.U.), M. A. in Education (K.U.), P. G. Diploma in Biodiversity from Bharathiar University, Coimbatore, India, and Ph.D. from Department of Life Science & Biotechnology, Jadavpur University, Kolkata, India. He has 11 years of academic experience in teaching. He is also the author of many book chapters, Research articles and

Two Editorial Books. He has made significance contributions to the field through his research in Bioinformatics. He is a life member of Botanical Society of Bengal, Department of Botany, University of Calcutta, Kolkata, India. He was awarded with the Best Oral Presentation, 2022 at the Department of Genetics & Biotechnology, Osmania University, Hyderabad, India.



Dr. Sanjeet Kumar, he is the founder and CEO of Ambika Prasad Research Foundation (APRF), Odisha & Institute of Biological Sciences (IBS), Odisha. He has worked with several reputed organizations & institutes such as RPRC (Regional Plant Resources Centre), Odisha, RIE (Regional Institute of Education), Odisha, IBSD (Institute of Bioresources and Sustainable Development), Imphal, Manipur, NIT (National Institute of Technology), Odisha and Forest & Environment Department, Odisha. His research interests are plant taxonomy, medicinal plants, biodiversity and

conservation, restoration of floral wealth, phytochemistry, and microbiology. He has published about 330 research papers in journals of national and international repute, 74 books (IntechOpen, Apple Academics Press, APRF, LAP Lambert Academic Publishing), with 297 book chapters and popular articles. Six PhD scholars are working under his guidance and 45 M. Sc students have submitted their Project work under his able supervision.



• Ghodke Anita Sureshrao • Sugimani Marndi • Bidhan Chandra Roy • Sanjeet Kumar

