

Spatial distribution of members of Rubiaceae in South Chotanagpur, Jharkhand

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ABSTRACT

The family Rubiaceae represents one of the largest angiosperm families globally, holding significant ecological, ethnobotanical, and aluminum-tolerance relevance. However, the flora of the South Chotanagpur region in Jharkhand, India, remains understudied despite facing anthropogenic pressure from open-cast mining and land fragmentation. This study documents the floristic diversity, habit distribution, and spatial patterns of Rubiaceae taxa across five districts (Ranchi, Khunti, Gumla, Lohardaga, and Simdega) from July 2022 to October 2024 using random field sampling and Q-GIS mapping. A total of 31 taxa belonging to 17 genera were recorded, comprising 18 native wild species, 8 cultivated exotic taxa, and 5 naturalized weeds.

Key Words - Rubiaceae, South Chotanagpur, Spatial Distribution, Floristic Diversity

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INTRODUCTION

The state Jharkhand was formed in the year 2000, by comprising 18 districts from Bihar. It is located in the Eastern part of India, and majority of the state covers the Chotanagpur Plateau (Champion & Seth, 1968). The plateau is divided into 5 administrative divisions, in the South which comprises of Gumla, Khunti, Lohardaga, Ranchi and Simdega District. The climate varies from humid tropical in North to tropical wet dry in South-East (Champion & Seth, 1968). The region predominantly falls under Chota Nagpur dry and moist tropical deciduous forests, characterized by Sal canopies, bamboos and thick undergrowth (Haines, H. H. (1921–1925). Botany of Bihar... - Google Scholar, n.d.). The Forests are dense and continuous along the Odisha and Chhattisgarh borders in Simdega, while in Khunti and Gumla the high forest density is mixed with hilly terrain and

river valleys. The forest cover in Lohardaga is dominated by plateau topography interspersed with deciduous patches, while Ranchi shows fragmented forest covers (Kumar & Saikia, 2020). The forest covers mostly comprises of trees such as *Shorea robusta* C.F.Gaertn., *Terminalia elliptica* Willd., *Mallotus philippensis* (Lam.) Müll.Arg., *Butea monosperma* (Lam.) Kuntze, and *Madhuca longifolia* (L.) J.F.Macbr., with prominent shrubs *Clerodendrum infortunatum* L., *Flemingia macrophylla* (Willd.) Kuntze ex Merr., *Chrozophora oblongifolia* (Delile) A.Juss. ex Spreng. and *Vitex negundo* L. The herbs show diversity in *Euphorbia hirta* L., *Asparagus racemosus* Willd., and *Elephantopus scaber* var. *scaber* (Document Details Document Title Biodiversity Survey Draft Report Document Subtitle Final Survey Report Location Bankura and Purulia, 2023). The forests in

Jharkhand are also referred as ecological corridors, as they serve as inter-wildlife migration route for animals, maintains gene flows and biodiversity, by preventing inbreeding depression and ensures genetic diversity (Roy *et al.*, 2025; Sharma *et al.*, 2026).

Rubiaceae is one of the largest angiosperm family which holds both ethnobotanical, floricultural and economical significance. It also holds maximum numbers of species that helps in aluminum tolerance (Jansen *et al.*, n.d.). Jharkhand is one of the major producers of Aluminum, and the open-cast mining and processing, contributes to the threatening of the ecological corridors (Giri *et al.*, 2025). In addition to this, the flora of Jharkhand remains poorly explored and studied. Thus, this study was conducted to understand the distribution of Rubiaceae plants and its floristic diversity in South Chotanagpur Jharkhand.

METHODOLOGY

To study the distribution of Rubiaceae members, 5 districts were surveyed from July 2022 to October 2024 using random sampling methods, and the survey was done in the months of Late June to late February. The members were collected for herbarium and the GPS location was recorded using GPS Camera App from cellular device. The plants were identified using the Floras available, such The Flora of Bihar and Orissa, The Flora of Parasnath, The Flora of West Bengal, The Flora of Palamu. The software Q-GIS was used to mark the GPS points in a map to understand the distribution of plants (Moyroud & Portet, 2018).

OBSERVATION

The area survey included residential areas, sub-urban areas and forest covering with an elevation range of ~418m to ~650m. The plants observed are described below:

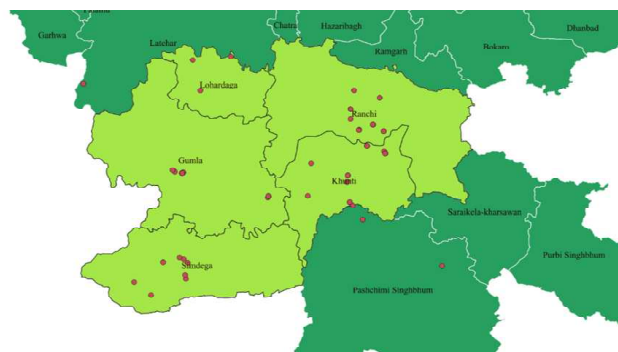


Figure 1: The dots represent the localities that were surveyed during the study

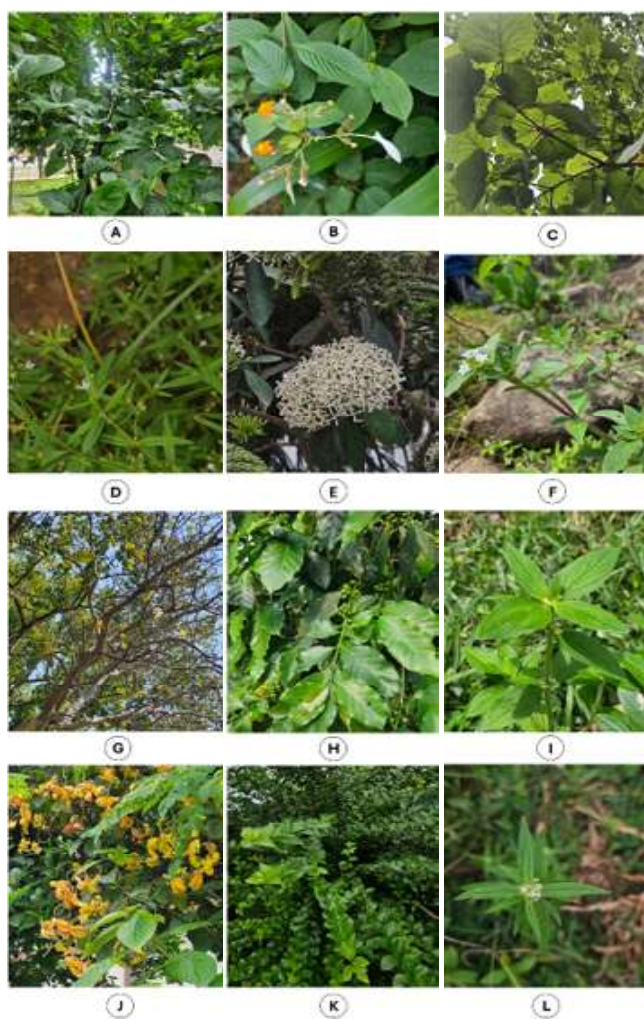


Figure 2: Members of Rubiaceae: A: *Meyna pubescens* Roxb. Ex Link, B: *Mussaenda frondosa* L. C: *Adina cordifolia* (Roxb.) Hook.f. & Benth. D: *Oldenlandia herbacea* (L.) Roxb. E: *Ixora pavetta* Roxb. F: *Richardia scabra* L. G: *Gardenia latifolia* Aiton. H: *Coffea arabica* L. I: *Mitragyna parvifolia* (Roxb.) Korth. J: *Mussaenda marmorata* K: *Catunaregam spinosa* (Thunb.) Tirveng. L: *Spermacoce pusilla* Wall.

Table: List of Plant species its Habit, Life-cycle, Flowering and Fruiting, and their locality

Sl. No.	Plant Species	Habit	Life cycle, Flowering/Fruiting	Districts
1.	<i>Adina cordifolia</i> (Roxb.) Hook.f. & Benth.	Large deciduous tree	Perennial, flowering: June to August	Ranchi, Gumla, Khunti, Simdega, Ramgarh
2.	<i>Arachnothryx leucophylla</i> (Kunth) Planch.	Shrub	Perennial, Flowering throughout the year	Ranchi
3.	<i>Catunaregum nutans</i> (Roxb.) Tirveng.	Shrub / Small tree	Perennial, Flowering: March onwards	Ranchi
4.	<i>Catunaregum spinosa</i> (Thunb.) Tirveng.	Armed shrub / Small tree	Perennial; Flowering: March to June; Fruiting: October	Ranchi,
5.	<i>Coffea arabica</i> L.	Shrub / Small tree	Perennial; Flowering: March to Mid-May; Fruiting: October onwards	Ranchi
6.	<i>Gardenia jasminoides</i> J.Ellis	Evergreen shrub	Perennial; Flowering: March to August	Ranchi
7.	<i>Gardenia latifolia</i> Aiton.	Evergreen shrub	Perennial; Flowering: March to June	Gumla-Laterhar Border
8.	<i>Hamelia patens</i> Jacq.	Evergreen shrub	Perennial; Flowering: March to December	Ranchi, Khunti
9.	<i>Ixora coccinea</i> L.	Evergreen shrub	Perennial; Flowering almost throughout the year	Ranchi, Khunti, Gumla
10.	<i>Ixora pavetta</i> Roxb.	Evergreen shrub / Small tree	Perennial; Flowering: March to May; Fruiting: April to July	Ranchi, Gumla, Khunti
11.	<i>Mitracarpus hirtus</i> (L.) DC.	Annual herb	Annual; Flowering & Fruiting: throughout the year	Ranchi, Gumla, Khunti, Lohardaga
12.	<i>Mitragyna parvifolia</i> (Roxb.) Korth.	Deciduous tree	Perennial; Flowering: March to August; Fruiting: July through December	Gumla, West Singhbhum
13.	<i>Morinda citrifolia</i> L.	Shrub / Tree	Perennial, Flowering: April to August; Fruiting: July to November	Ranchi
14.	<i>Mussaenda erythrophylla</i> Schumach. & Thonn.	Evergreen / Scandent shrub	Perennial, Flowering & throughout the year	Ranchi
15.	<i>Pseudomussaenda flava</i> Verdc.	Shrub	Perennial, Flowering: throughout the year	Ranchi, Khunti
16.	<i>Mussaenda frondosa</i> L.	Scandent shrub	Perennial, Flowering & Fruiting: throughout the year	Ranchi
17.	<i>Mussaenda philippica</i> A.Rich.	Shrub	Perennial, Flowering & Fruiting: throughout the year	Ranchi, Khunti
18.	<i>Mussaenda philippica</i> 'Doña Luz'	Shrub	Perennial, Flowering & Fruiting: throughout the year	Ranchi, Khunti,
19.	<i>Mussaenda marmorata</i>	Shrub	Perennial, Flowering: throughout the year	Ranchi, Khunti,
20.	<i>Meyna pubescens</i> Roxb. Ex Link	Shrub / Small tree	Perennial, Flowering: February to April, Fruiting: March to May	Ranchi, Khunti, Simdega, Gumla
21.	<i>Neolamarckia cadamba</i> (Roxb.) Bosser	Large evergreen / Deciduous tree	Perennial, Flowering: May to July; Fruiting: August to October	Ranchi,
22.	<i>Oldenlandia affinis</i> (Roem. & Schult.) DC.	Herb	Annual, July to early October	Ranchi
23.	<i>Oldenlandia corymbosa</i> L.	Annual herb	Annual, Throughout the year	Ranchi, Gumla, Simdega
24.	<i>Oldenlandia herbacea</i> (L.) Roxb.	Annual herb	Annual, Throughout the year	Ranchi
25.	<i>Paederia foetida</i> L.	Climbing shrub / Vine	Perennial, Flowering: July to September	Ranchi, Gumla
26.	<i>Richardia scabra</i> L.	Annual herb	Annual, Flower & fruiting: July to late November	Ranchi, Gumla, Lohardaga,
27.	<i>Spermacoce articularis</i> L.f.	Prostrate / Ascending annual herb	Annual, Flower & fruiting: July to early November	Ranchi, Khunti, Lohardaga
28.	<i>Spermacoce exilis</i> (L.O.Williams) C.D. Adams ex W.C.Burger & C.M. Taylor	Prostrate / Spreading annual herb	Annual, Flower & fruiting: July to early October	Ranchi, Khunti, Simdega
29.	<i>Spermacoce latifolia</i> Aubl.	Broad-leaved annual herb	Annual, Flower & fruiting: July to early November	Ranchi
30.	<i>Spermacoce pusilla</i> Wall.	Erect annual herb	Annual, Flowering & Fruiting: July to early November	Ranchi, Simdega
31.	<i>Pentas lanceolata</i> (Forssk.) Deflers	Herb/ Small Shrub	Perennial; Flowering June to October	Ranchi

RESULT

A total of 31 taxa (18 Wild/Native; 8 Cultivated/ Exotic; 5 Introduced weeds/ naturalized wilds) belonging to 17 distinct genera belonging to family Rubiaceae were recorded. The highest species/ cultivar richness among the different genera, shows highest value for *Mussaenda* L. (n =6), followed by *Spermacoce* (n= 4), *Oldenlandia* (n= 3), and *Gardenia* (n= 2). The remaining genera are represented by a single species across the different districts studied.

Upon categorization of the plant taxa documented during the survey, the taxa show 4 different growth forms/ habits, which are trees, shrubs/Sub-shrubs, herbs/ weed groundcovers, and climbers. The habit percentage represents the relative frequency of species within each growth form category relative to the total floral composition. Of the 31 plants recorded, shrub & sub-shrubs (n = 13), holds the highest habitat percentage of 41.94%, followed by herbs & weeds (n=10) 32.26%, trees (n=7) 22.58%, and climbers represented by one-species, showing least contribution i.e. 3.22%.

On the basis of their ecological status, the plants can be grouped into Native (Wild), Exotic (Naturalized/Weedy) and Cultivated (Exotic/ Horticultural) status. Out of the 7 tree species 4 are native to Jharkhand i.e. *Adina cordifolia*, *Mitragyna parvifolia*, *Gardenia latifolia*, *Catunaregum spinosa*, while *Neolamarkia cadamba*, *Morinda citrifolia* and *Coffea arabica* are cultivated. Out of the 12 Shrubs, the ratio of cultivated to native is 10:3, where only *Catunaregum nutans*, *Meyna pubescens*, and *Ixora pavetta* belong to native species, while the *Mussaenda* species are cultivated. The herbs can be grouped into native species mostly comprising of *Oldenlandia* species, and *Spermacoce pusilla*. While most of the *Spermacoce* species, *Mitracarpus hirtus*, *Richardia scabra* are naturalized species; and *Pentas lanceolata* is a cultivated exotic herb. The climber *Paederia foetida* is a native to Jharkhand. Based on the sampling locations, the ecological classification of the 31 recorded Rubiaceae taxa can

be categorized into: Urban & Peri-Urban Zones, Sub-Urban & Forest Cover Zones, and Open Field & Disturbed Zones, which is described as follows:

Urban and Peri-urban Zone (Ranchi and Khunti Districts): The dominated taxa mostly comprise of introduced exotic horticultural shrubs and avenue trees, which is concentrated in managed urban spaces, institutions, campuses and residential gardens, eg: Bariatu, Morabadi, Pithoria. It consists of *Mussaenda species* (all six cultivars / Species), *Ixora (I.coccinea & I. pavetta)*, *Hamelia paten*, *Pentas lanceolata*, *Gardenia jasminoides*, *Arachnothryx*, *Neolamarkia cadamba*. Most of these plants are almost exclusively mapped within managed urban landscapes.

Sub-Urban & Forest Cover Zone: The area comprises of restressed to semi-natural forest tracts, hill slopes, and riparian corridors, eg.: Raidih, Bishunpur, Kurdeg, Latehar border. These areas hold indigenous forest tree and shrub species which are found in clustered spatial patterns along tropical moist-to-dry deciduous forest tracts. *Adina cordifolia* and *Mitragyna parvifolia* is mapped along undulating forest slopes, riverine boundaries and valley. *Meyna pubescens* "Katai- saag" is mostly localized along forest margins, highlighting its preservation in native agro-forestry zones, due to local consumption. *Gardenia latifolia* is restricted to dry deciduous forest patches and rocky hillock habitats in peripheral forest zones of Latehar/Garu border. *Catunaregum spinosa* and *C. nutans* are mapped in semi-wild understory tracts and forest edges.

Open Field & Disturbed Agro-Ecosystems: It is widespread across all 5 districts, with ubiquitous spatial dispersion along roadside verges, agricultural fallows, and disturbed agricultural. It is found in Kanke Dam edge, Nakum Torpa/ Murhu roadsides. It comprises of high prevalence of aggressive exotic naturalized weeds, which is represented by *Spermacoce* species, *Oldenlandia* species, *Mitracarpus hirtus*, *Richardia scabra*, *Paederia foetida*.

CONCLUSION

The floristic documentation of 31 Rubiaceae taxa provides a crucial baseline for the poorly explored flora of South Chotanagpur, Jharkhand. It emphasizes a dual ecological landscape: native deciduous forests tracts harboring valuable indigenous tree flora and traditional edible species (“Katai-Saag”), juxtaposed against urban and roadside environments increasingly dominated by exotic cultivars and invasive weeds. The monitoring and management of invasive species will help in preserving native floral diversity and protecting the natural forest regeneration and maintaining ecological balance. Moreover, ethnobotanical species such as *Meyna pubescens* should be promoted in community forestry initiatives to preserve the local biodiversity and indigenous knowledge.

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