Shodh Sari-An International Multidisciplinary Journal

2025, Vol. 04, Issue 03, 144-157
ISSN: 2959-1376
DOI: https://doi.org/10.59231/SARI7843

A Comprehensive Assessment of Fabaceae Family Plant Diversity and Ecological Dynamics at Raichur District Karnataka, India

Deenadayal, Theophilus[1] and Aalum, Khursheed [2]

[1]Research Scholar, Department of Botany, Sunrise University, Alwar, Rajasthan, India

[2]Assistant Professor, Department of Botany, Sunrise University, Alwar, Rajasthan, India

ORCID: 0009-0005-9548-2907

Abstract

The Fabaceae family, also known as the Leguminosae, is one of the most ecologically and economically significant plant families. It plays a crucial role in biodiversity conservation, soil fertility enhancement, and agricultural sustainability. The present study aims to document and analyze the distribution and diversity of Fabaceae species in Raichur District, Karnataka, India. Understanding the floristic composition and ecological preferences of this family is essential for effective conservation planning and sustainable land use management. A total of 88 species belonging to the Fabaceae family were recorded across diverse ecological habitats, including forests, grasslands, agricultural fields, and roadside vegetation. The species were identified using standard taxonomic methods, and their spatial distribution was analyzed to assess habitat preferences and environmental adaptability. Key genera recorded in the study include Albizia, Crotalaria, Indigofera, Senna, Tephrosia, and Vigna, among others. The findings highlight that Fabaceae species contribute significantly to nitrogen fixation, soil stabilization, and serve as fodder and medicinal resources. While many species are widely distributed, some are habitat-specific and require targeted conservation measures. The study also identifies major threats to Fabaceae diversity, such as habitat destruction due to agricultural expansion, urbanization, and deforestation. Conservation recommendations include habitat protection, afforestation initiatives, and sustainable land-use policies to maintain ecological balance and biodiversity. This research serves as a baseline for future ecological studies and biodiversity conservation strategies in Raichur District and beyond. The documentation of Fabaceae species distribution and habitat preferences

@2025 International Council for Education Research and Training 2025, Vol. 04, Issue 03, 144-157
ISSN: 2959-1376 DOI: https://doi.org/10.59231/SARI7843

provides valuable insights for policymakers, conservationists, and researchers striving to protect plant biodiversity in semi-arid regions.

Keywords: Fabaceae, Biodiversity, Raichur, Indigofera, Conservation

Introduction

The Fabaceae family, also known as Leguminosae, is one of the largest and most economically significant families of flowering plants. It comprises approximately 19,500 species across 765 genera globally, making it the third-largest plant family after Orchidaceae and Asteraceae [1]. Members of the Fabaceae family are widely distributed across various ecosystems, ranging from tropical rainforests to temperate grasslands, playing a pivotal role in maintaining ecological balance and biodiversity [2]. One of the most remarkable characteristics of Fabaceae species is their ability to fix atmospheric nitrogen through symbiotic relationships with rhizobia bacteria in root nodules. This biological nitrogen fixation enhances soil fertility and reduces dependence on chemical fertilizers, making Fabaceae species indispensable for sustainable agriculture [6]. In addition to their ecological benefits, these plants serve as a crucial source of food, fodder, timber, and medicinal products. Leguminous crops such as pulses (e.g., chickpeas, lentils, and beans) contribute significantly to global food security, providing essential proteins and nutrients, particularly in developing countries [7, 9]. Moreover, several species within the family possess pharmacological properties and have been traditionally used in herbal medicine for their antibacterial, anti-inflammatory, and antioxidant activities [11].

The Fabaceae family exhibits extensive diversity in India, particularly in the peninsular region, where it forms an essential component of dry deciduous forests and scrubland ecosystems [3]. Raichur District, located in the northeastern part of Karnataka, is characterized by semi-arid climatic conditions, making it a suitable habitat for various leguminous species. The distribution and diversity of Fabaceae species in this region are of significant ecological and economic importance, influencing soil stabilization, agricultural productivity, and local livelihoods. Understanding the spatial distribution and ecological roles of Fabaceae species in Raichur

@2025 International Council for Education Research and Training
ISSN: 2959-1376
2025, Vol. 04, Issue 03, 144-157
DOI: https://doi.org/10.59231/SARI7843

District is crucial for effective conservation planning and sustainable land-use management. This study aims to assess the diversity and distribution patterns of Fabaceae species in the district, contributing valuable insights for biodiversity conservation and environmental sustainability. By documenting the presence and abundance of these plants, policymakers and conservationists can develop targeted strategies to protect native flora and mitigate the adverse effects of habitat degradation and climate change.

Study Area

Raichur District, located in the northeastern part of Karnataka, lies between 15.7°N and 77.3°E, covering an area of approximately 8,383 square kilometers. The Krishna River bounds the district to the north and the Tungabhadra River to the south, making it a significant agrarian region. Raichur experiences a semi-arid climate characterized by hot summers and moderate winters, with an average annual rainfall of 621 mm, primarily received during the southwest monsoon (June to September). The temperatures vary widely, ranging from 15°C in winter to over 42°C in summer, making water availability a critical factor influencing vegetation patterns (Fig. 1).

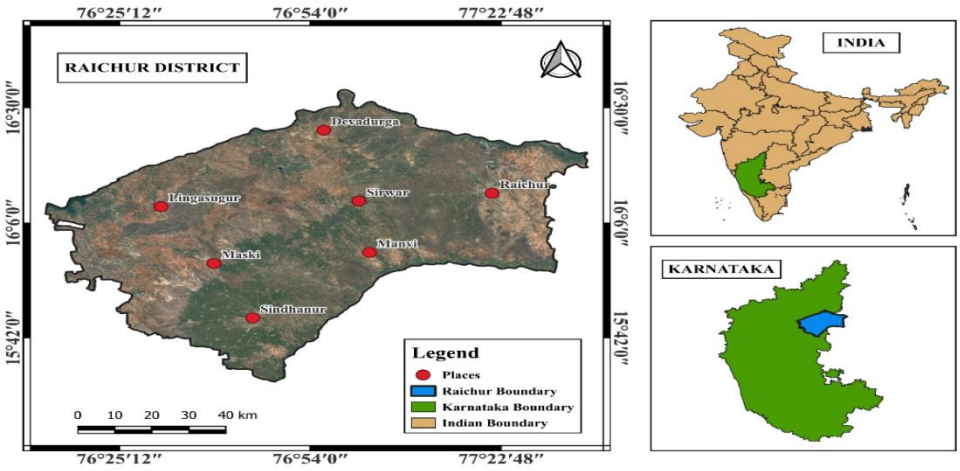


Figure 1: Study Area Map of Fabaceae Family Plants

The region features a diverse landscape that includes agricultural fields, scrub forests, and riverine ecosystems, providing suitable habitats for various Fabaceae species. The predominant soil types in Raichur include black cotton soil, red loamy soil, and alluvial

@2025 International Council for Education Research and Training
ISSN: 2959-1376
2025, Vol. 04, Issue 03, 144-157
DOI: https://doi.org/10.59231/SARI7843

deposits, each influencing plant growth differently. Agricultural lands in the district are extensively used for cultivating pulses, including pigeon pea (Cajanus cajan), chickpea (Cicer arietinum), and mung bean (Vigna radiata), which belong to the Fabaceae family and contribute significantly to the local economy. The district's natural vegetation comprises dry deciduous forests and thorny scrublands dominated by species such as Acacia nilotica, Prosopis juliflora, and various legumes. The presence of riverine ecosystems along the Krishna and Tungabhadra rivers further supports biodiversity, offering a refuge for both terrestrial and aquatic flora and fauna. Given its ecological significance and economic dependency on leguminous crops, Raichur District presents an ideal study area for examining the distribution and diversity of Fabaceae species.

Methodology Field surveys were conducted across different ecological zones in Raichur District to document Fabaceae species. A systematic sampling approach was adopted to ensure comprehensive coverage of diverse habitats, including agricultural fields, scrub forests, and riverine ecosystems. GPS-based mapping was employed to record precise geographic locations of each species, enabling spatial distribution analysis. Quadrat sampling, with standard plot sizes of $1m^2$ for herbaceous plants and $10m^2$ for shrubs and trees, was used to estimate species density, frequency, and abundance.

Herbarium specimen collection was carried out to facilitate accurate species identification and verification. Fresh plant samples were carefully collected, pressed, and preserved following standard herbarium protocols. Identification of species was conducted using standard floras such as Flora of Karnataka and Flora of India, Flora of Gulbarga [16], Flora of the Presidency of Madras [8] and further cross-verified with authenticated herbarium records at regional botanical institutions. Taxonomic classification and nomenclature were aligned with the latest updates from The Plant List and the International Plant Names Index (IPNI) [4,5]. Data analysis involved evaluating species richness, relative abundance, and habitat preferences using statistical tools and GIS-based spatial modeling. The findings provide insights into the ecological distribution of Fabaceae species in Raichur District, contributing to conservation and sustainable land-use planning efforts.

Results and Discussion

@2025 International Council for Education Research and Training
ISSN: 2959-1376
2025, Vol. 04, Issue 03, 144-157
DOI: https://doi.org/10.59231/SARI7843

The study documented a total of 88 species belonging to the Fabaceae family in Raichur District (Table 1). Among these, the genera Crotalaria, Indigofera, and Senna were found to be the most diverse, exhibiting a high number of species across different ecological zones. The abundance and distribution of these species were significantly influenced by habitat conditions such as soil type, moisture availability, and anthropogenic activities.

Dry deciduous forests and scrublands were found to host a high diversity of Fabaceae species, particularly those adapted to arid and semi-arid conditions. Prosopis juliflora, an invasive species, was observed to dominate certain areas, leading to concerns about its impact on native flora. Similarly, economically significant species such as Cajanus cajan and Vigna radiata were widely cultivated in agricultural landscapes, contributing to the region's agrarian economy.

The study also highlighted the medicinal and ecological importance of several species. Abrus precatorius and Indigofera tinctoria were found to be widely used in traditional medicine, while Senna auriculata played a crucial role in soil stabilization and erosion control. Furthermore, species such as Mimosa pudica exhibited sensitivity to soil moisture variations, making them potential indicators of environmental changes [15].

Despite the ecological significance of Fabaceae species in Raichur District, habitat degradation due to agricultural expansion, deforestation, and invasive species poses a threat to their diversity. Conservation strategies such as habitat restoration, sustainable land management, and community-based conservation initiatives are recommended to mitigate these threats.

The spatial analysis of Fabaceae species distribution revealed distinct clusters of biodiversity, highlighting priority areas for conservation [20]. Areas along the Krishna and Tungabhadra rivers showed higher species richness, emphasizing the need for riparian ecosystem protection. Additionally, traditional agroforestry practices in the region were found to support legume diversity, suggesting that integrating conservation measures with local agricultural practices could yield positive outcomes. Future research should focus on genetic diversity assessments to understand intra-species variations and adaptability to changing climatic conditions. Exploring the ecological roles of Fabaceae species in nutrient cycling and pollinator attraction could further enhance conservation strategies. Additionally,

@2025 International Council for Education Research and Training
ISSN: 2959-1376
2025, Vol. 04, Issue 03, 144-157
DOI: https://doi.org/10.59231/SARI7843

participatory approaches involving local communities in conservation efforts would foster sustainable management of Fabaceae-rich ecosystems in Raichur District

Habitat Preferences

• **Grasslands and Open Fields:** Species such as Indigofera linifolia, Tephrosia villosa, and Crotalaria retusa were commonly found in open, dry habitats characterized by well-drained soils and limited canopy cover. These species exhibited adaptations such as drought tolerance and deep root systems, which enable them to survive in arid conditions. Their presence also contributes to soil stabilization and serves as a food source for herbivores.

Clitoria ternetea L.

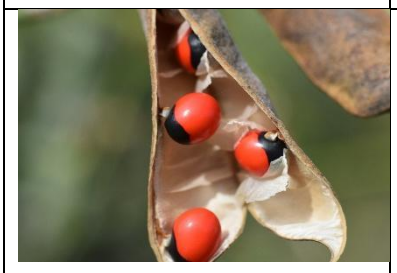
Alysicarpus vaginalis DC.

Delonix elata (L.) Gamble

Butea monosperma (Lam.) Taubert.

Alycicarpus buplerifolius (L.) Wight & Arn.

Dichrostachys cinerea Wight et Arn.



Abrus precatorius L.

Tephrosia purpurea (L.) Pers.

Senna auriculata (L.) Roxb.

Plate 1: Some of the selected Fabaceae Species

@2025 International Council for Education Research and Training
ISSN: 2959-1376
2025, Vol. 04, Issue 03, 144-157
DOI: https://doi.org/10.59231/SARI7843

• **Agricultural Fields:** Vigna aconitifolia and Sesbania bispinosa were predominantly found in cultivated lands, where they were often intercropped with cereal crops. These species play a crucial role in nitrogen fixation, enhancing soil fertility and improving crop yield. Farmers traditionally utilize them for green manure, livestock fodder, and erosion control, further highlighting their economic importance.

• **Riparian and Moist Areas:** Mimosa pudica, Neptunia oleracea, and Alysicarpus vaginalis were frequently observed near water bodies, such as riverbanks and wetlands, where soil moisture levels remained relatively high. These species have adapted to periodic waterlogging conditions and contribute to habitat stability by preventing soil erosion. Their presence also provides shelter and food for aquatic and semi-aquatic fauna.

• **Forest and Scrubland:** Albizia lebbeck, Hardwickia binata, and Senna auriculata were mainly found in dry deciduous forests, where they formed an integral part of the vegetation structure. These species are well-adapted to seasonal variations in temperature and precipitation, with features such as fire resistance, deep-rooted systems, and drought tolerance. They also provide essential resources such as timber, fodder, and medicinal compounds used in traditional remedies [19].

Ecological and Economic Importance

Several species of Fabaceae play a vital role in maintaining ecological balance and supporting economic livelihoods. One of the most crucial ecological functions of Fabaceae species is nitrogen fixation. Species such as Rhynchosia minima and Tephrosia purpurea have a symbiotic relationship with rhizobia bacteria, allowing them to convert atmospheric nitrogen into bioavailable forms that enrich soil fertility [18]. This process reduces the need for synthetic fertilizers and promotes sustainable agricultural practices. Fabaceae species also contribute significantly to soil stabilization. Crotalaria species, for instance, have extensive root systems that help prevent soil erosion, particularly in arid and semi-arid regions. These plants play a crucial role in maintaining soil structure and fertility, ensuring long-term agricultural sustainability [10].

Table 1: List of Plants in the Family Fabaceae

@2025 International Council for Education Research and Training 2025, Vol. 04, Issue 03, 144-157
ISSN: 2959-1376 DOI: https://doi.org/10.59231/SARI7843

Sl. No.	Scientific Name of the Plant	Family
1	Abrus precatorius L.	FABACEAE
2	Albizia amara (Roxb.) Boivin	
3	Albizia lebbeck (L.) Benthem	
4	Albizia procera (Roxb.) Bentham	
5	Alycicarpus buplerifolius (L.) DC.	
6	Alycicarpus vasavadae Hemadri.	
7	Alysicarphus moniliform (L.) DC.	
8	Alysicarpus hamosus Edg.	
9	Alysicarpus rugosus (Willd.) DC.	
10	Alysicarpus vaginalis DC.	
11	Aschynomene aspera L.	
12	Bauhinia racemosa Lam.	
13	Butea monosperma (Lam.) Taubert.	
14	Canavalia rosea (Sw.) DC.	
15	Chamaecrista absus (L.) Irwin & Barneby	
16	Chamaecrista pumila Lam.	
17	Cassia fistula L.	
18	Clitoria ternetea L.	
19	Crotalaria albida Heyne ex Roth	
20	Crotalaria medicaginea (Wight & Arn.) Hooker	
21	Crotalaria nana N. Burman.	
22	Crotalaria orixensis Willd.	
23	Crotalaria pallida Aiton.	
24	Crotalaria pusilla Heyne ex DC.	
25	Crotalaria ramosissima Roxb.	
26	Crotalaria retusa L.	
27	Crotalaria verrucousa L.	

@2025 International Council for Education Research and Training 2025, Vol. 04, Issue 03, 144-157
ISSN: 2959-1376 DOI: https://doi.org/10.59231/SARI7843

28	Crotolaria hebecarpa (DC.) Rudd.	
29	Cullen corylifolium (L.) Medick	
30	Grona heterophylla (Willd.) H.Ohashi & K.Ohashi	
31	Grona triflorum (L.) DC.	
32	Dichrostachys cineria (L.) Wight & Arn.	
33	Guilandina bonduc L.	
34	Hardwickia binata Roxb.	
35	Indigofera caerulea Roxb.	
36	Indigofera cordifolia Heyne ex Roth	
37	Indigofera coultea (Burm.f.) Merr.	
38	Indigofera glandulosa J.C. Wendl.	
39	Indigofera hirsuta L.	
40	Indigofera linifolia (L.f.) Retzius.	
41	Indigofera linifolia var. cambelli Wight ex Baker	
42	Indigofera linnaei Ali.	
43	Indigofera nummularifolia (L.) Livera	
44	Indigofera tinctoria L.	
45	Indigofera trifoliata L.	
46	Indigofera trita L.f.	
47	Macroptilium lathyroides (L.) Urban	
48	Mimosa hamata Willd.	
49	Mimosa pudica L.	
50	Neptunia oleracea Loureiro.	
51	Neptunia triquetra (Vahl) Banthem	
52	Pongamia pinnata (L.) Pierre	
53	Prosopis cineraria (L.) Druce	
54	Prosopis juliflora (Sw.) DC.	

@2025 International Council for Education Research and Training 2025, Vol. 04, Issue 03, 144-157
ISSN: 2959-1376 DOI: https://doi.org/10.59231/SARI7843

55	Rhynchosia capitata (B. Heyne ex Roth) DC.	
56	Rhynchosia minima (L.) DC.	
57	Rhynchosia rufescens (Willd.) DC.	
58	Rhynchosia viscosa DC.	
59	Rothia indica (L.) Druce	
60	Senna alexandrina Mill.	
61	Senna auriculata (L.) Roxb.	
62	Senna occidentalis (L.) Link.	
63	Senna uniflora (Mill.) H. S. Irwin & Baeneby	
64	Senegalia chundra (Roxb.ex Rottler) Maslin	
65	Sesbania bispinosa (Jacquin) W.F. Wight	
66	Stylosanthes fruticose (Retz.) Alston	
67	Stylosanthes hamata (L.) Taub.	
68	Tamarindus indica L.	
69	Taverniera cuneifolia (Roth) Arnott	
70	Tephrosia pumila (Lam.) Pers.	
71	Tephrosia purpurea (L.) Pers.	
72	Tephrosia strigose (Dalz) Santapau & Mahesh.	
73	Tephrosia villosa (L.) Pers.	
74	Vachellia eburnea (L.f.) P.J.H.Hurter & Mabb.	
75	Vachellia farnesiana (L.) Wight & Arn	
76	Vachellia horrida (L.f) Willd.	
77	Vachellia leucophloea (Roxb.) Maslin	
78	Vachellia nilotica (L.) P.J.H.Hurter & Mabb.	
79	Vigna aconitifolia (Jacq.) Marechal	
80	Vigna trilobata (L.) Verdcourt	
81	Vigna vexillata (L.) A. Rich.	
82	Zornia gibbose Span.	

@2025 International Council for Education Research and Training 2025, Vol. 04, Issue 03, 144-157
ISSN: 2959-1376 DOI: https://doi.org/10.59231/SARI7843

83	Delonix regia (Boj. ex Hook.f.) Raf.	
84	Delonix elata (L.) Gamble	
85	Pithecellobium dulce (Roxb.) Benth	
86	Peltophorum pterocarpum (DC.) K. Heyne	
87	Samanea saman (Jacq.) Merr.	
88	Gliricidia sepium (Jacq.) Steud.	

addition to their ecological significance, many Fabaceae species hold great economic value due to their medicinal properties. Cassia fistula, commonly known as the golden shower tree, has been traditionally used in Ayurvedic medicine for its laxative, antibacterial, and antifungal properties. Indigofera tinctoria, another valuable species, is renowned for its role in producing natural indigo dye, which has been historically important in textile industries across the world [17].

Beyond their medicinal and soil-enriching properties, several Fabaceae species are widely used as fodder crops. Species such as Vigna aconitifolia and Sesbania bispinosa are cultivated for their high-protein content, making them a valuable resource for livestock feed. These species not only support local agricultural economies but also ensure food security for livestock-dependent communities. Furthermore, Fabaceae plants play an essential role in local economies by providing timber, fuelwood, and non-timber forest products. Albizia lebbeck, for example, is a fast-growing tree species used for timber production, while Pongamia pinnata seeds yield an oil that is used for biofuel production. Such resources contribute to rural livelihoods by offering alternative income-generating opportunities beyond conventional farming.

Overall, the ecological and economic importance of Fabaceae species in Raichur District underscores the need for conservation and sustainable management practices. Protecting these species and their habitats is crucial for maintaining ecosystem health, enhancing agricultural productivity, and supporting the well-being of local communities.

Conservation Status and Threats

@2025 International Council for Education Research and Training
ISSN: 2959-1376
2025, Vol. 04, Issue 03, 144-157
DOI: https://doi.org/10.59231/SARI7843

Several Fabaceae species in Raichur District face significant threats due to human activities and environmental changes. Species such as Hardwickia binata and Senegalia chundra are experiencing habitat loss caused by agricultural expansion, deforestation, and urbanization. The conversion of natural forests and scrublands into farmlands has led to the depletion of native plant populations, while overgrazing by livestock has further exacerbated habitat degradation [12].

Apart from direct habitat destruction, climate change also poses a severe challenge to Fabaceae species. Erratic rainfall patterns, prolonged droughts, and rising temperatures influence the survival and reproductive success of several species. Invasive species like Prosopis juliflora also compete with native Fabaceae species for resources, leading to a decline in their populations [13].

To counteract these threats, conservation strategies must be implemented at multiple levels. Habitat protection through the establishment of protected areas and community-managed conservation zones can help preserve native Fabaceae biodiversity. Afforestation and reforestation programs focusing on native leguminous species can aid in habitat restoration and improve ecosystem resilience. Additionally, sustainable land management practices, such as agroforestry and controlled grazing, can minimize the impact of human activities on Fabaceae populations [14]. Public awareness and community involvement are also crucial for conservation success. Educating local farmers and communities about the ecological and economic importance of Fabaceae species can encourage sustainable harvesting practices and the adoption of conservation-friendly agricultural techniques. Government policies and incentives for biodiversity conservation can further support these efforts.

By integrating scientific research, policy measures, and community engagement, effective conservation frameworks can be established to protect the rich Fabaceae biodiversity of Raichur District. Future studies should focus on genetic diversity assessments and in-situ conservation programs to ensure the long-term survival of these ecologically and economically valuable species.

Conclusion

The study on Fabaceae species in Raichur District underscores their ecological and economic significance, particularly in nitrogen fixation, soil stabilization, and medicinal applications. The documentation of 88 species

@2025 International Council for Education Research and Training
ISSN: 2959-1376
2025, Vol. 04, Issue 03, 144-157
DOI: https://doi.org/10.59231/SARI7843

across diverse habitats highlights the importance of conservation efforts, as habitat destruction due to agricultural expansion, urbanization, and invasive species threatens biodiversity. To mitigate these challenges, strategies such as habitat protection, afforestation, and sustainable land-use practices must be prioritized. Additionally, community engagement and policy interventions can play a vital role in preserving Fabaceae biodiversity, ensuring long-term ecological balance and agricultural sustainability in the region.

References:

1. Cook, B. G., Pengelly, B. C., Brown, S. D., Donnelly, J. L., Eagles, D. A., Franco, M. A., Hanson, J., Mullen, B. F., Partridge, I. J., Peters, M., & Schultze-Kraft, R. (2005). *Tropical Forages: An interactive selection tool*. CSIRO, DPI&F(Qld), CIAT and ILRI.
2. Deenadayal, T., & Jain, T. (2025). *Assessment of plant life-form diversity and ecological dynamics in Guntagola Forest Lingasugur taluk Raichur District Karnataka, India*.
3. Dr Kumar, P. (2020). Plant species diversity in Kolanki hills of Raichur, Karnataka, India. *Int. J. Home Sci.*, *6*(3), 506–510.
4. Gamble, J. S., & Fischer, C. E. C. (1915–1936). *Flora of the presidency of madras*. Adlard & Son Ltd.
5. Graham, P. H., & Vance, C. P. (2003). Legumes: Importance and constraints to greater use. *Plant Physiology*, *131*(3), 872–877. https://doi.org/10.1104/pp.017004
6. Harisha, C. R., & Padmavathy, S. (2015). Conservation status of Fabaceae species in Karnataka. *Journal of Environmental Botany*, *12*(1), 45–53.
7. International Plant Names Index (IPNI). (2024). *Global Plant Taxonomy Database*. http://www.ipni.org
8. Joshi, P. N., & Bhat, K. G. (2019). Legume diversity and their ecological significance in semi-arid zones of Karnataka. *Indian Journal of Plant Science*, *45*(2), 189–203.
9. Lewis, G., Schrire, B., Mackinder, B., & Lock, M. (2005). *Legumes of the world*. Royal Botanic Gardens, Kew.
10. Mathad, P., Rajasamarsen, K., & Modi, A. (2015). Phytodiversity study in the Gavisiddalingeshwara sacred grove, Chintanpalli of Yadgir District,

@2025 International Council for Education Research and Training
ISSN: 2959-1376
2025, Vol. 04, Issue 03, 144-157
DOI: https://doi.org/10.59231/SARI7843

Karnataka, India. *International Journal of Environmental Sciences*, *4*(1), 14–23.

11. Murthy, G. S. R., & Raju, V. S. (2001). Endemic leguminous plants of peninsular India. *Journal of Economic and Taxonomic Botany*, *25*(3), 581–590.
12. The plant list. (2024). *A Working List of All Plant Species*. http://www.theplantlist.org
13. Ramesh, B. R., & Pascal, J. P. (1997). *Atlas of endemics of the Western Ghats*. French Institute of Pondicherry.
14. Rao, R. S. (1983). *An annotated bibliography on Fabaceae of India. Botanical survey of India*.
15. Reddy, C. S., Pattanaik, C., Reddy, K. N., & Raju, V. S. (2018). Biodiversity and endemicity of legumes in India. *Taiwania*, *63*(3), 234–249.
16. Savita, R., & Kotresha, K. (2022). A floristic diversity of Maraladinni village forest Raichuru District, Karnataka. *J. Plant Sci. Res*, *9*(1), 217.
17. Seetharam, Y. N., Kotresha, K., & Uplaonkar, S. B. (2002). *Flora of Gulbarga District, Karnataka. Gulbarga University Gulabarga*.
18. Sharma, B. D., & Sanjappa, M. (2012). *Leguminosae of India. Botanical survey of India*.
19. Shrishail, H. C., Kakkalameli, S., Madhura, S., & Yogashree, G. D. (September 2020). Floristic diversity of Raichur fort Karnataka India. *International Journal of Scientific and Engineering Research (IJSR)*, *9*(9), 188–191.
20. Singh, N. P., Lakshminarasimhan, P., Karthikeyan, S., & Prasanna, P. V. (2001). Flora of India, *3*. *Botanical survey of India*.

Received on Feb 28, 2025
Accepted on April 20, 2025
Published on July 01, 2025