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**Author Affiliation:**
Taxonomy and Floristic Laboratory, Department of UG, PG and Research in Botany, Karnatak University's, Karnatak Science College, Dharwad- 580001, Karnataka, India

*Corresponding Author
Taxonomy and Floristic Laboratory, Department of UG, PG and Research in Botany, Karnatak University's, Karnatak Science College, Dharwad- 580001, Karnataka,
India
Email: ningarajsm18@gmail.com

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# An annotated checklist of endemic plants from Haveri District, Karnataka

**Ningaraj S Makanur*, Kotresha K**

## ABSTRACT

The Haveri district is a gateway for the northern districts of Karnataka. The present documentation reveals a total of 46 endemic taxa belonging to 24 families, were enlisted along with their botanical name, family, habit, phenology, and IUCN status. Distributional analysis showed that Western Ghats (WG) elements were dominant (40%) with 18 taxa, followed by, Indian endemics (16), Southern India (6) and Peninsular India (3) and 3 taxa narrowly endemic to Karnataka. The family Acanthaceae harbours the maximum (6) endemic taxa. Critically Endangered (CR) species *Ceropegia bhatii* S.R.Yadav & Shendage, find its extended distributional record next to its type locality. Hence the forests of the districts need special attention for conservation.

**Keywords:** Endemic flora; Threatened plants; Extended distribution, Conservation, Diversity, Karnataka

## 1. INTRODUCTION

Endemic species are completely dependent on a unique geographical area for their survival and are most vulnerable to their restricted ranges (Myers, 1988). Globally 'botanically interesting' areas are rich in endemics (Richardson, 1978). The endemism in the flora of a country or geographical region provides an important insight into that region's biogeography and the centres of diversity and adaptive evolution of the floristic components of that region (Nayar, 1996). Regions with high concentrations of endemic species are classified as 'Biodiversity Hotspots' by the Conservational International (CI). Out of the 34 global hotspots, the following four hotspots (*viz*, 1. Indo-Burma, 2. Himalaya, 3. The Western Ghats, and 4. The Sundaland) fall within the Indian political boundaries (Mittermeier et al., 2004).

India possesses abundant biodiversity owing to its larger climatic and topographic gradient. Indian forests cover 22.5% of the country's geographical area Chitale et al., (2014), representing 11% of the world's flora in about 2.4% of the global land mass. An early report by accounted for about 20,074 taxa of angiosperms from India, approximately 5752 (29%) of the total Indian flora and 33% of angiosperms occurring in the country are endemic (Nayar, 1996; Irwin and Narasimhan, 2011). Roy et al., (2013) observed that highly fragmented forests across the Indian landscape

harbour a number of endemic species, which need to be conserved. Higher rates of human population growth in India put these ecoregions at risk of extinction due to over-increasing human interference, fragmentation, deforestation, and expansion of agricultural lands in the forested landscapes (Cincotta et al., 2000).

Singh et al., (2015) based on their extensive literature survey and interpretation of herbarium data estimated a total of 4303 species of angiosperms are strict endemics in India. The latest estimate of Plant diversity in India stands at 55387 taxa, including 22108 angiosperms. It accounts for about 40 per cent of the total Plant species known from India. Sanjappa and Sringeswara, (2019) enumerated a total of 5009 species belonging to 1535 genera and 191 families. It includes 116 species that are narrowly endemic to the state of Karnataka. The latest report by enlisted a total of 6771 angiosperms including wild and cultivated belonging to 213 families, including 1491 endemic taxa from the Karnataka state.

## 2. MATERIALS AND METHODS

**Study area**

Haveri district is situated in the central part of Karnataka state and located between North latitudes 14° 16′ 52″ to 15°21′ 01″ and East longitudes 75° 0′35″ to 75° 49′23″ which covers a total geographical area of 4848 km2. It is surrounded by Dharwad in the North, Gadag in the North-East, Bellary in the East, Davanagere in the South, Shimoga in the South-East and Uttara Kannada in the West-North-West position. It had 8 talukas such as Byadagi, Hangal, Haveri, Hirekerur, Ranebennur, Rattihalli, Savanur and Shiggaon. A map of the study area was procured by (Nayak and Jamakhandi, 2020) (Figure 1). The landmass of the district is situated between the elevations of 515 m to 732 m above MSL. As per the classification of Indian Forests by Champion and Seth, (1968), the forests of Haveri Division fit into the following types of forests, Southern dry mixed deciduous (5A/C3), Southern Thorn Forests (6A/CI) and Secondary Dry Deciduous Forest (5/DS1).

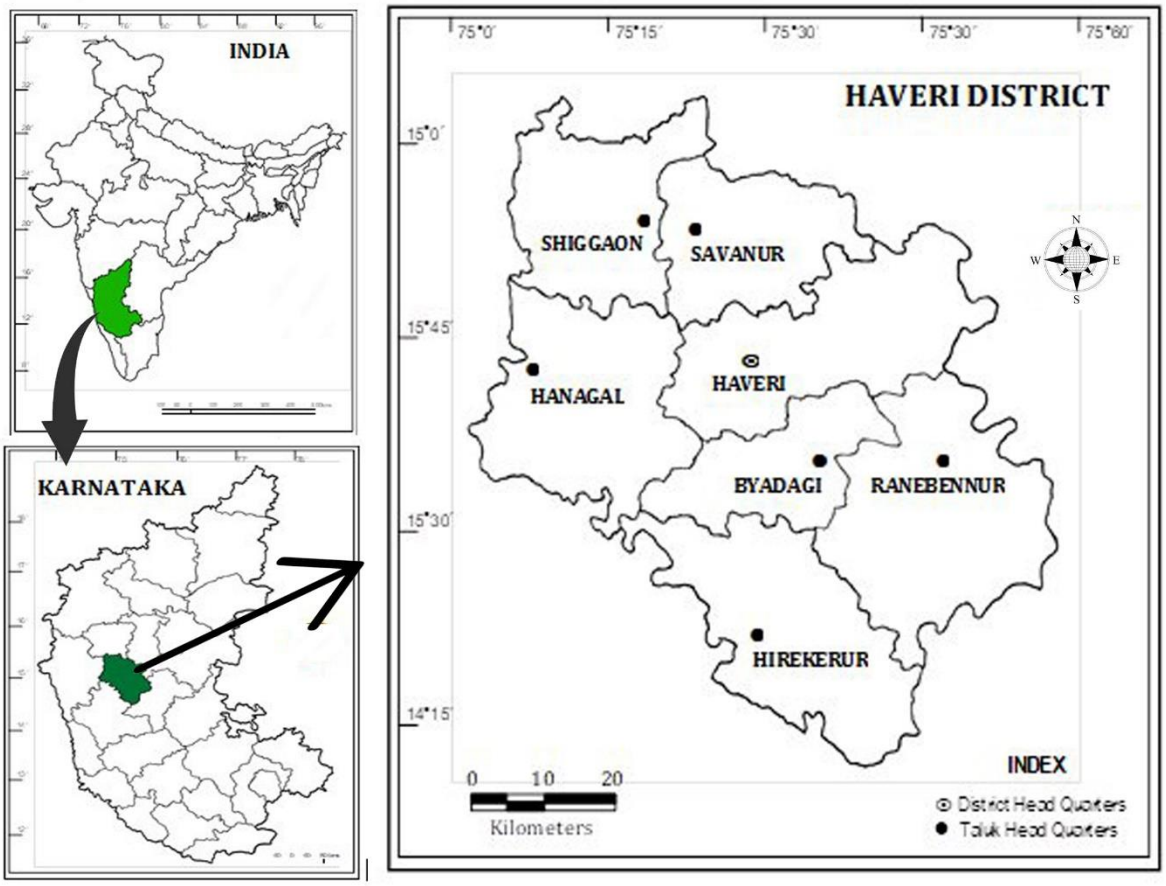


**Figure 1** Map of the Haveri district

**Field work and data collection**

The plant specimens were collected from different localities in the study area and from different habitats from December 2019 to August 2023. During the field visit on the spot, some notable observations were recorded in the field notebook (Jain and Rao, 1977). Photographs were made with Canon EOS 200 D II and on mobile. All the collected specimens were identified and confirmed with the aid of previously published literature and flora Hooker, (1872-1897), Cooke, (1958), Saldanha and Nicolson, (1976), Sharma et al., (1984), Saldanha, (1984), Saldanha, (1996), Bhat, (2014), Sanjappa and Sringeshwara, (2019) Online nomenclature databases were also consulted.

Conservation status of the plants as provided in the *International Union Conservation of Nature* (IUCN, 2023). The endemic status and distribution of the species were checked by referring to *Endemic Vascular Plants of India* (Singh et al., 2015). All species were labelled with recently accepted names and their families as per the recent classification of angiosperms APG IV (Chase et al., 2016). The collected plant specimens were pressed and prepared herbarium followed by the dry method of (Jain and Rao, 1977). The voucher specimens were submitted to the Herbarium of Botany Department, Karnatak Science College, Dharwad (HKCD).

## 3. RESULTS

The present study resulted in the documentation of a total of 46 endemic taxa belonging to 43 genera under 24 families from the Haveri district of Karnataka (Table 1; Figures 5, 6 & 7). This is almost 5% of the total flora of the district. Out of 46 enlisted endemic taxa, 80% were dicotyledons (37 species), and 20% were monocotyledons (9 species). The family Acanthaceae is dominant with 6 endemic species, it contributes 13% of total flora followed by the family Asteraceae with 5 species, Fabaceae and Orchidaceae with 4 species each. Bignoniaceae (3), Combretaceae, Commelinaceae, Euphorbiaceae, Gentianaceae and Lamiaceae are represented with 2 species each (Figure 2). A single species represented the remaining 14 families.

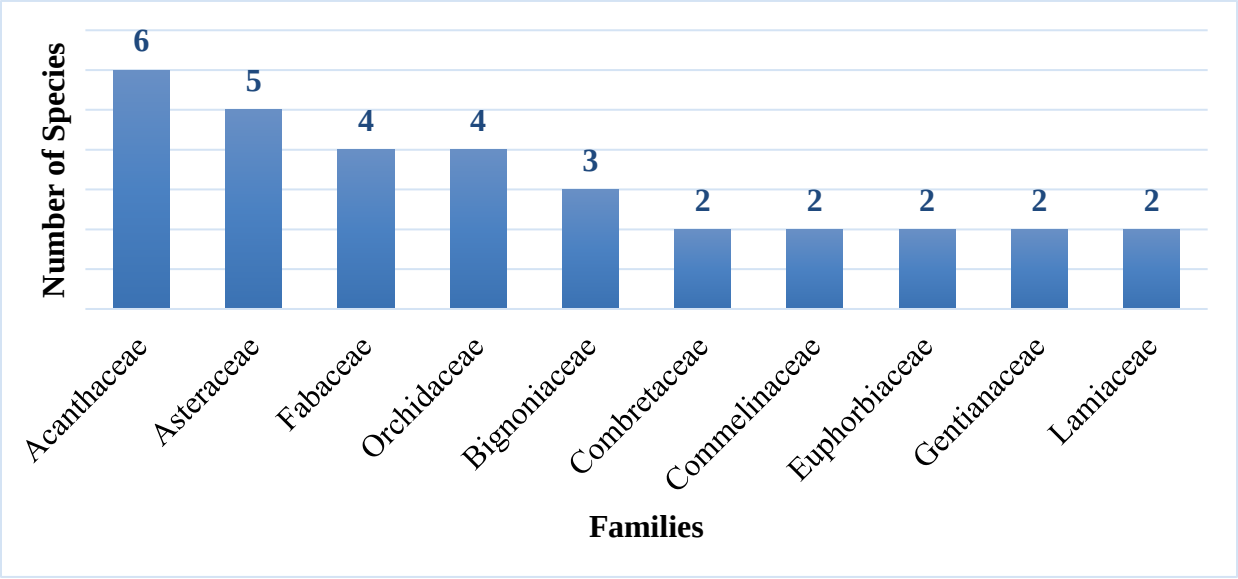


**Figure 2** Dominant families of endemic taxa in Haveri district

Analysis of Habit-wise distribution of the enumerated taxa showed that herbaceous flora was dominant with 28 species and shares more than half of the total endemics (61%), followed by trees 9 (20%), shrubs 7 (15%) and climbers 2 (4%) (Figure 3). Habitat study showed that *Helicanthes elastica* (Desr.) Danser (Loranthaceae) was the only parasitic taxa documented from the survey commonly observed on the *Mangifera indica* L. as a host. *Aerides maculosa* Lindl. and *Dendrobium ovatum* (L.) Kraenzl. (Orchidaceae) were the epiphytic taxa commonly grown on hosts like *Mangifera indica* L., *Terminalia anogeissiana* Gere & Boatwr. and *Tamarindus indica* L.

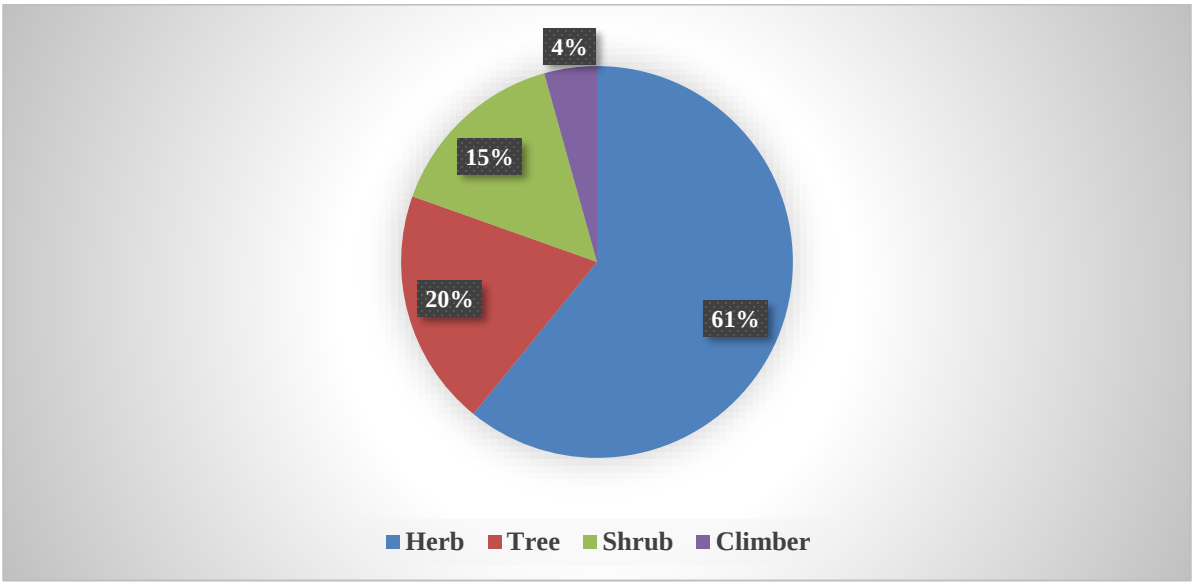


**Figure 3** Habit-wise distribution of endemic taxa.

Out of collected 46 species, 7 species were with tuberous rootstock *Ceropegia bhatii* S.R.Yadav & Shendage, *Habenaria grandifloriformis* Blatter & McCann, *Drimia polyantha* (Blatt. & McCann) Stearn, *Iphigenia pallida* Baker, *Cyanotis tuberosa* (Roxb.) Schult. & Schult.f., *Geodorum laxiflorum* Griff., and *Curcuma karnatakensis* Amalraj, Velay. & Mural. 2 species namely, *Homonoia retusa* (Graham ex Wight) Müll.Arg. and *Phyllanthus lawii* J.Graham were restricted to only riparian vegetation in the study area. Based on the distributional area of endemic taxa, they were classified into 5 different categories, Western Ghats (WG) elements were dominant with 18 taxa, followed by, Indian endemics (16), Southern India (6) and Peninsular India (3) (Figure 4).

*Geodorum laxiflorum* Griff. was formerly reported from Assam, Chhattisgarh, Gujarat, Odisha, Jharkhand, Maharashtra, Telangana and West Bengal state recently it was reported as a new addition to the flora of Karnataka from the Haveri district (Makanur and Kotresha, 2022a). 3 taxa are narrowly endemic to Karnataka state namely, *Dyschoriste vagans* (Wight) O. Ktze. was restricted to Belagavi, Chamarajanagar, Chikkamangaluru and Chitradurga districts. *Curcuma karnatakensis* Amalraj, Velay. & Mural. endemic to Belagavi, Chitradurga, Dharwad, and Uttara Kannada districts (Sanjappa and Sringeshwara, 2019). *Ceropegia bhatii* Yadav and Shendage, (2010) reported for the first time next to its type locality Davangere-Malebennur Ghat.

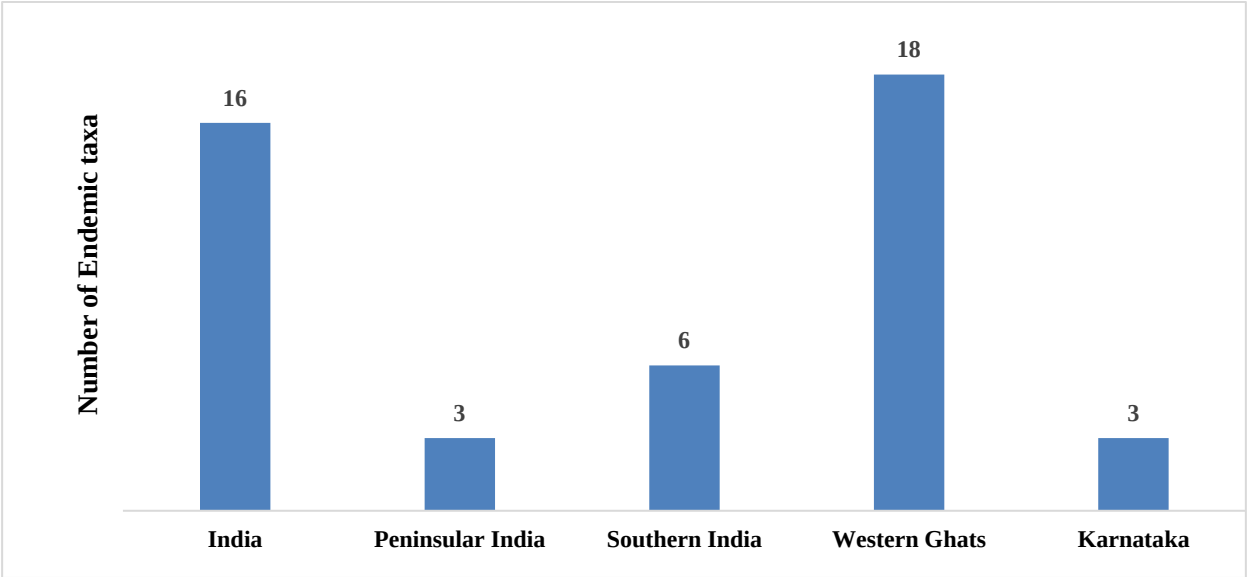


**Figure 4** Representation of the number of endemic taxa based on geographic distribution in Haveri District

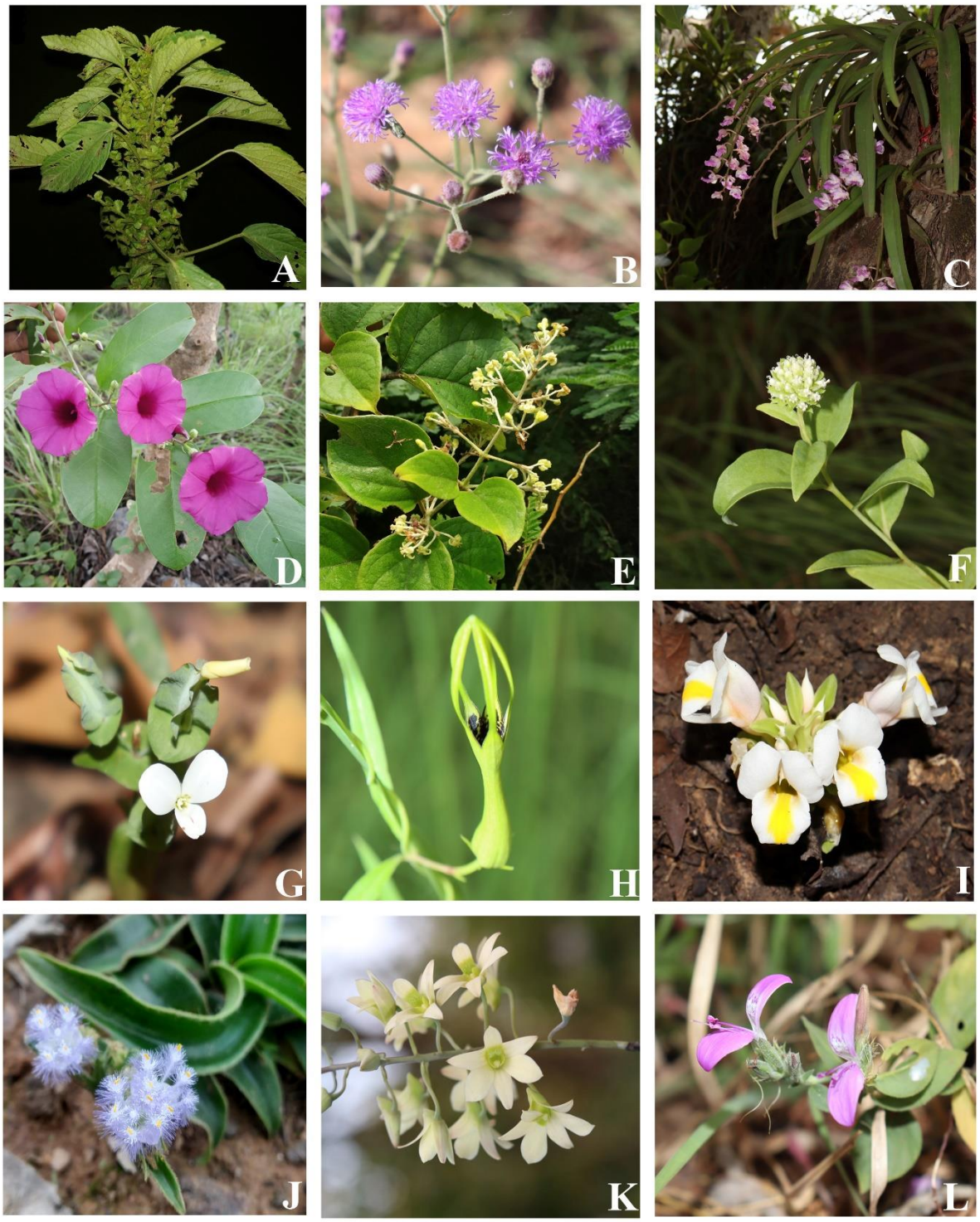


**Figure 5** A. *Acalypha malabarica* Müll.Arg.; B. *Acilepis dendigulensis* (DC.) H.Rob.; C. *Aerides maculosa* Lindl.; D. *Argyreia cuneata* (Willd.) Ker Gawl.; E. *Aspidopterys cordata* (Wall.) A.Juss.; F. *Blepharispermum subsessile* DC.; G. *Canscora perfoliata* Lam.; H. *Ceropegia bhatii* S.R.Yadav & Shendage; I. *Curcuma karnatakensis* Amalraj, Velay. & Mural.; J. *Cyanotis tuberosa* (Roxb.) Schult. & Schult.f.; K. *Dendrobium ovatum* (L.) Kraenzl.; L. *Dicliptera cuneata* Nees.


**Figure 6** A. *Dolichandrone falcata* (Wall. ex DC.) Seem; B. *Drimia polyantha* (Blatt. & McCann) Stearn; C. *Dyschoriste vagans* (Wight) O. Ktze.; D. *Eranthemum roseum* (Vahl) R.Br.; E. *Exacum lawi* C. B. Clarke; F. *Gardenia gummifera* L.f.; G. *Geodorum laxiflorum* Griff.; H. *Habenaria grandifloriformis* Blatter & McCann; I. *Helicanthes elastica* (Desr.) Danser; J. *Homonoia retusa* (Graham ex Wight) Müll.Arg.; K. *Iphigenia pallida* Baker; L. *Justicia wynaadensis* (Nees) T. Anderson


**Figure 7** A. *Kalanchoe olivacea* Dalzell; B. *Lavandula bipinnata* O.Kuntze; C. *Moullava spicata* (Dalzell) Nicolson; D. *Neuracanthus trinervius* Wight; E. *Phyllanthus lawii* J.Graham; F. *Polycarpaea aurea* (Wight) Wight & Arn. ex B.D.Jacks.; G. *Pulicaria wightiana* (DC.) C.B.Clarke;m H. *Radermachera xylocarpa* (Roxb.) K.Schum.; I. *Terminalia bellirica* (Gaertn.) Roxb.; J. *Terminalia paniculata* Roth; K. *Thunbergia hawtayneana* Wall.; L. *Tricholepis radicans* (Roxb.) DC.

Analysis of the IUCN status of enumerated species showed that *Ceropegia bhatii* S.R.Yadav & Shendage comes under the Critically Endangered (CR) category (Makanur and Kotresha, 2024), *Habenaria grandifloriformis* Blatter & McCann belongs to Near Threatened

(NT) category, *Garcinia indica* (Dupetit-Thouars) Choisy comes under the Vulnerable (VU) and *Eranthemum roseum* (Vahl) R.Br., *Terminalia bellirica* (Gaertn.) Roxb., *Homonoia retusa* (Graham ex Wight) Müll.Arg., *Hardwickia binata* Roxb., *Lavandula bipinnata* O. Kuntze and *Gardenia gummifera* L.f. belonged to Least Concern (LC) category. The conservation status of the remaining 37 species was not studied they come under the Not Applicable (NA) category.

**Table 1** List of endemic species collected from the Haveri District.

| Botanical name | Family | Habit | Phenology | Distribution | IUCN Status | Accession |
|---|---|---|---|---|---|---|
| *Acalypha malabarica* Müll.Arg. | Euphorbiaceae | H | Aug-Nov | WG | NA | 20340 |
| *Acilepis dendigulensis* (DC.) H.Rob. | Asteraceae | H | Aug-Feb | PI | NA | 20642; 643 |
| *Aerides maculosa* Lindl. | Orchidaceae | H | May-Oct | I | NA | 20611; 833 |
| *Argyreia cuneata* (Willd.) Ker Gawl. | Convolvulaceae | S | Aug-Feb | WG | NA | - |
| *Aspidopterys cordata* (Wall.) A.Juss. | Malpighiaceae | C | Aug-Jan | SI | NA | 20447 |
| *Blepharispermum subsessile* DC. | Asteraceae | H | Aug-Jan | I | NA | 20876; 877 |
| *Blumea eriantha* DC. | Asteraceae | H | Nov-May | I | NA | 20970 |
| *Canscora perfoliata* Lam. | Gentianaceae | H | Oct-Apr | WG | NA | 20746 |
| *Capparis grandiflora* Wall. ex Hook.f. & Thomson | Capparaceae | S | Mar-Apr | WG | NA | 20334 |
| *Ceropegia bhatii* S.R.Yadav & Shendage | Apocynaceae | C | Sep-Nov | K | CR | 20907; 908 |
| *Crotalaria pusilla* Heyne ex Roth | Fabaceae | H | Jul-Jan | I | NA | 20656 |
| *Crotalaria vestita* Baker | Fabaceae | H | Nov-Feb | I | NA | 20603; 604 |
| *Curcuma karnatakensis* Amalraj, Velay. & Mural. | Zingiberaceae | H | Aug-Dec | K | NA | 20442 |
| *Cyanotis tuberosa* (Roxb.) Schult. & Schult.f. | Commelinaceae | H | Aug-Dec | SI | NA | - |
| *Dendrobium ovatum* (L.) Kraenzl. | Orchidaceae | H | Sep-Mar | I | NA | 20662 |
| *Dicliptera cuneata* Nees | Acanthaceae | H | Nov-Feb | WG | NA | 20682 |
| *Dolichandrone atrovirens* (Roth) Sprague | Bignoniaceae | T | TY | WG | NA | 20426 |
| *Dolichandrone falcata* (Wall. ex DC.) Seem. | Bignoniaceae | T | TY | I | NA | 20250 |
| *Drimia polyantha* (Blatt. & McCann) Stearn | Asparagaceae | H | Mar-Jul | WG | NA | 20849 |
| *Dyschoriste vagans* (Wight) O. Ktze. | Acanthaceae | H | Jun-Feb | K | NA | 20608; 699 |
| *Eranthemum roseum* (Vahl) R.Br. | Acanthaceae | H | Nov-Jan | I | LC | 20616 |

| | | | | | | |
|---|---|---|---|---|---|---|
| *Exacum lawi* C. B. Clarke | Gentianaceae | H | Sep-Nov | WG | NA | 20926; 927 |
| *Garcinia indica* (Dupetit-Thouars) Choisy | Clusiaceae | T | Nov-Aug | WG | VU | - |
| *Gardenia gummifera* L.f. | Rubiaceae | T | Dec-Aug | WG | LC | 20635 |
| *Geodorum laxiflorum* Griff. | Orchidaceae | H | Jun-Sep | I | NA | 20889 |
| *Habenaria grandifloriformis* Blatter & McCann | Orchidaceae | H | Jun-Nov | WG | NT | 20377 |
| *Hardwickia binata* Roxb. | Fabaceae | T | Aug-Jan | I | LC | - |
| *Helicanthes elastica* (Desr.) Danser | Loranthaceae | H | Apr-Dec | WG | NA | 20628; 629 |
| *Homonoia retusa* (Graham ex Wight) Müll.Arg. | Euphorbiaceae | S | Jan-Aug | WG | LC | 20785 |
| *Iphigenia pallida* Baker | Colchicaceae | H | Jul-Sep | SI | NA | 20381 |
| *Justicia wynaadensis* (Nees) T.Anderson | Acanthaceae | S | Nov-Mar | WG | NA | 20749 |
| *Kalanchoe olivacea* Dalzell | Crassulaceae | H | Jan-Apr | WG | NA | - |
| *Lagerstroemia microcarpa* Wight | Lythraceae | T | Jun-Feb | WG | NA | 20843; 844 |
| *Lavandula bipinnata* O.Kuntze | Lamiaceae | H | Sep-Feb | I | LC | 20152 |
| *Leucas clarkei* Hook.f. | Lamiaceae | H | Sep-Jan | I | NA | - |
| *Moullava spicata* (Dalzell) Nicolson | Fabaceae | S | Oct-Mar | WG | NA | 20591 |
| *Murdannia dimorpha* (Dalzell) G.Brückn. | Commelinaceae | H | Jul-Nov | WG | NA | - |
| *Neuracanthus trinervius* Wight | Acanthaceae | H | Dec-Mar | I | NA | 20768 |
| *Phyllanthus lawii* J.Graham | Phyllanthaceae | S | Dec-May | I | NA | 20638 |
| *Polycarpaea aurea* (Wight) Wight & Arn. ex B.D.Jacks. | Caryophyllaceae | H | Aug-Feb | I | NA | 20637 |
| *Pulicaria wightiana* (DC.) C.B.Clarke | Asteraceae | H | Jul-Feb | PI | NA | 20137 |
| *Radermachera xylocarpa* (Roxb.) K.Schum. | Bignoniaceae | T | Feb-Apr | SI | NA | 20980; 981 |
| *Terminalia bellirica* (Gaertn.) Roxb. | Combretaceae | T | Mar-Dec | I | LC | - |
| *Terminalia paniculata* Roth | Combretaceae | T | Aug-Jan | SI | NA | 20573 |
| *Thunbergia hawtayneana* Wall. | Acanthaceae | S | TY | SI | NA | 20736; 737 |
| *Tricholepis radicans* (Roxb.) DC. | Asteraceae | H | Aug-Feb | PI | NA | 20947; 948 |

Abbreviations: C-Climber; H-Herb; S-Shrub; T-Tree; TY-Throughout the year; I-India; PI-Peninsular India; SI-Southern India; WG-Western Ghats; CR- Critically Endangered; LC- Least Concern; NA-Not applicable; NT-Near Threatened; VU-Vulnerable.

**Threats and Conservation**

The endemic fora of Haveri district is vulnerable to anthropogenic pressure and is also impacted by other factors. The main threats are invasive alien species, forest fires, overgrazing and encroachment of agricultural lands. Human-induced threats within and around the sanctuary appear to have significantly affected the vegetation composition and structure resulting in the depletion of forests (Barve et al., 2005). A study by Murali and Siddappa, (2001) showed that invasion by weeds such as *Lantana camara* L. and *Chromolaena odorata* (L.) R.M.King & H.Rob. in the dry deciduous to moist deciduous forests is of major concern. The study area harbours 2 sanctuaries namely, Ranebennur Blackbuck Sanctuary (RBS) and Bankapura Peacock Conservation Reserve (BPCR).

A study on medicinal plants of RBS, enumerated 41 species that were effective remedies against 37 different ailments as revealed by the local herbal healers (Makanur and Kotresha, 2022b). Geographically BPCR covers an area of 140 acres (0.566 km2), out of this 52.10 acres of land is reserved in the name of *Mayuravana* to protect peafowl. 141 species belonging to 118 genera and 43 families were documented, which were utilized by local people for various purposes (Makanur and Kotresha, 2022c). In RBS, an area of 14.87 Km2 in Hullathi Block was notified as a 'core area' on 21-10-1982. Apart from this, the Forest Department of Haveri Division has undertaken periodical removal of invasive species such as *Lantana camara*. This should also expanded to the eradication of other major weed species like *Ageratum conyzoides* L., *Parthenium hysterophorus* L. and *Chromolaena odorata* (L.) R.M. King & H.Rob.

## 4. CONCLUSION

The present study yielded that 46 species under 23 families from Haveri district are endemic to different regions of India. Western Ghats (WG) elements were dominant (40%). Herbaceous flora is dominant in the district (61%). Proper fencing of the forest area of the Haveri district is recommended to overcome the threat of habitat loss by anthropogenic activities.

**Conflicts of interests:**

The authors declare that there are no conflicts of interests.

**Funding:**

The study has not received any external funding.

**Ethical approval**

The ethical guidelines for plants & plant materials are followed in the study for species collection & identification.

**Data and materials availability**

All data associated with this study are present in the paper.

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