



## **ENDEMIC TAXA OF RANIPURAM HILLS IN THE SOUTHERN WESTERN GHATS OF KASARAGOD DISTRICT, KERALA**

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The present study is an attempt to explore endemic taxa occurring in the Ranipuram hills in the Southern Western Ghats region of Kasaragod district and to identify habitat preference and diversity of life form type and current threat status of the plants. A total of 46 endemic taxa were culled out of 302 taxa enumerated from the study area. The maximum number of endemic taxa belongs to Acanthaceae (13%) followed by Lauraceae and Gesneriaceae (8% each). Analysis of the habit reveals that among the endemics 35% (16 Spp.) of plant species were herbs, 30% (14 Spp.) were trees, 26% (Spp.) were shrubs and 9% (4 Spp.) were Climbers. Present study also identifies two near threatened and one vulnerable species. The Identification of endemic taxa is important in the biodiversity conservation and they have specific ecological niche.

**Key words:** Endemic, Ranipuram, Southern Western Ghats, Biodiversity

### **Introduction**

Endemics are taxonomic unit that are restricted to a particular phytogeographic range because of geographical, ecological or temporal barriers. Endemic taxa which are restricted to a particular geographical region may be a remnant of an ancient wide spreading taxon amidst of geological and climatic changes<sup>1</sup>. As endemic species depends on a specific area for their survival, degree of endemism in an area is often cited as a measure of the distinctiveness of the flora and analysis of which leads to prioritizing sites for their conservation<sup>2</sup>. The specific topographic and bioclimatic features of Southern Western Ghats favor high percentage of endemism<sup>3</sup>.

Western Ghats forms a strip of undulating hill ranges lying along the west coast of Peninsular India parallel to the Arabian Sea. It extends from river Thapti in Gujarat to Kanyakumari in the Southwest tip of peninsula, covering a distance about 1600 km<sup>4</sup>. Out of this length 450 km comes within the political boundary of Kerala. Studies in endemism in India and Western Ghats have attempted by many researchers. Of the 11,124 species evaluated by Chatterjee<sup>5</sup>, 61.5 percent was endemic and concentrated in Himalayas, South India and Burma. Sri Lanka was connected to India during the Pleistocene ice ages, but later a disruption is caused by the sea level rise<sup>6</sup>. The biodiversity of Sri Lanka shows high affinity to Western Ghats of Indian peninsula<sup>7</sup>. A major

percentage of flora and fauna found in the wet evergreen forest of western Ghat and Sri Lanka forms endemic clades<sup>8</sup>.

Endemism of the flora of Western Ghat have been discussed by several authors<sup>9-13</sup>. So this region may be the center of origin of some species or their wild relatives which later domesticated. A floristic survey of endemic plants of the Western Ghats region in Goa resulted in the collection of 113 endemic species<sup>14</sup>. According to Singh *et al.*<sup>15</sup> there are 2116 plants which are endemic to Western Ghats of which 1278 species is exclusively found in Southern Western Ghats. Occurrence of large number of paleoendemics and the affinities of the existing flora to that of the Indo Malaysian and Afro tropical realms suggests that the evolution of Western Ghat flora has been originated from ancient Gondwana land.

Reddy *et al.*,<sup>16</sup> censused on endemic flowering plants of Kerala recorded 344 endemic taxa. Prasad and Raveendran<sup>17</sup> reported 81 endemic plants from the various sacred groves of Kasaragod district. A check list of endemic trees from Wayanad district was published by Volga *et al.*,<sup>18</sup> with 136 species under 38 families. As part of the documentation of flowering plants of Kerala by Sasidharan<sup>19</sup>, recorded 5091 taxa of which 1709 taxa included under endemic and 493 taxa under Rare and Endangered category. In the case of distribution of exclusively narrow endemic taxa Kerala comes in the second position with 357 narrow endemic species<sup>1,15</sup>

The recognition of the significance of endemism for conservation purposes and awareness of the region of high endemism has grown but still remains inadequate for their proper maintenance and conservation based programmes. The present study is conducted to document the endemic and RET plants of the Southern Western Ghats of Ranipuram hills.

## Materials and methods

### Study area:

The present study was conducted in Ranipuram Hills of Kasaragod district, Kerala, India, which located in part of Southern Western Ghats. Ranipuram, known as the Ooty of Kerala, lies in 12.421114° N 75.350075° E and spread in 50 Km<sup>2</sup>. Ranipuram hills were previously known as 'Madathumala' till the late 70s. Kasaragod is the northernmost district of Kerala state. This district is bounded in the North by Dakshina Kannada, on the East by Coorg district of Karnataka state, on the south by Kannur District of Kerala state and on the West by Arabian Sea. It merges with the Talacauvery wildlife sanctuary on its east side. Shola forests and grassland is the vegetation type in the area. Shola forests are unique ecosystem that encloses rich flora and fauna, particularly rare, endangered and endemic taxa<sup>9,20</sup>

### Data collection:

Intensive and extensive field trips were conducted during the year 2019-2021. During the field visits, plant specimens were collected at different reproductive stages to prepare herbarium specimens and authenticate their correct identity. The collected specimens were identified taxonomically with the help of available floras<sup>21-24</sup> monographs and taxonomic revisions and by using field keys. The specimens were poisoned, pressed and the herbarium specimens prepared according to the standard instruction given by Jain and Rao<sup>25</sup>. The list of endemic plants was confirmed using available publications<sup>1,15</sup>. IUCN categories of all endemic plants were checked in the IUCN version 2021-1<sup>29</sup>. The voucher specimens were deposited in the Herbarium of Department of Botany, Bharathiar University, Coimbatore, Tamil Nadu.

## Results and Discussion

The evaluation of floristic diversity of endemic and threatened plants in Ranipuram hills records 46 endemic taxa pertaining to 44 genera of 28 families (Table-1). Out of 28 families, dicots are having 24 families, monocots with 3 families and one family belongs to gymnosperm. The maximum number of endemic taxa belongs to Acanthaceae with 6 species followed by Lauraceae and Gesneriaceae with 4 species each, Rubiaceae and Fabaceae with 3 species each and Anacardiaceae, Commelinaceae and Lamiaceae with 2 species each. The families Achariaceae, Araliaceae, Annonaceae, Apiaceae, Apocynaceae, Aristolochiaceae, Asteraceae, Balsaminaceae, Clusiaceae, Combretaceae, Elaeagnaceae, Euphorbiaceae, Gentianaceae, Gnetaceae, Lamiaceae, Marantaceae, Meliaceae, Myrtaceae, Oleaceae, Orchidaceae, Zingiberaceae are represented by single species (Figure-6). The genera *Litsea* and *Ixora* are represented by 2 species each and other 42 genera are represented by single species each.

Analysis of the habit of endemic species reveals that among the endemics 35% (16 species) of plant species were herbs, 30% (14 species) were trees, 26% (14 species) were shrubs and 9% (4 species) were Climbers (Figure-5). The habitat diversity is analyzed and 95% (44 species) of the species were terrestrial and 5 % (2 species) were epiphytes.

The similar studies were conducted by various botanists in different region of Western Ghats. Sathish *et al.*,<sup>26</sup> reported 26 endemic species from Brahmagiri WLS, out of which 9 species including *Garcinia gummi-gutta* and *Hydnocarpus pentandrus* should given high priority for conservation. Both the plants were present in our study area also. Ranipuram hills merges with the Talacauvery Wild Life Sanctuary, which is a part of Brahmagiri WLS in Coorg District of Karnataka, the above result is comparable with present results.

Nayar, 1996 reported that high degree of endemism in peninsular India is seen in Melastomataceae (57%), followed by Balsaminaceae (45%) and Acanthaceae (39%). In our study the highest number of endemic plants is contributed by Acanthaceae.

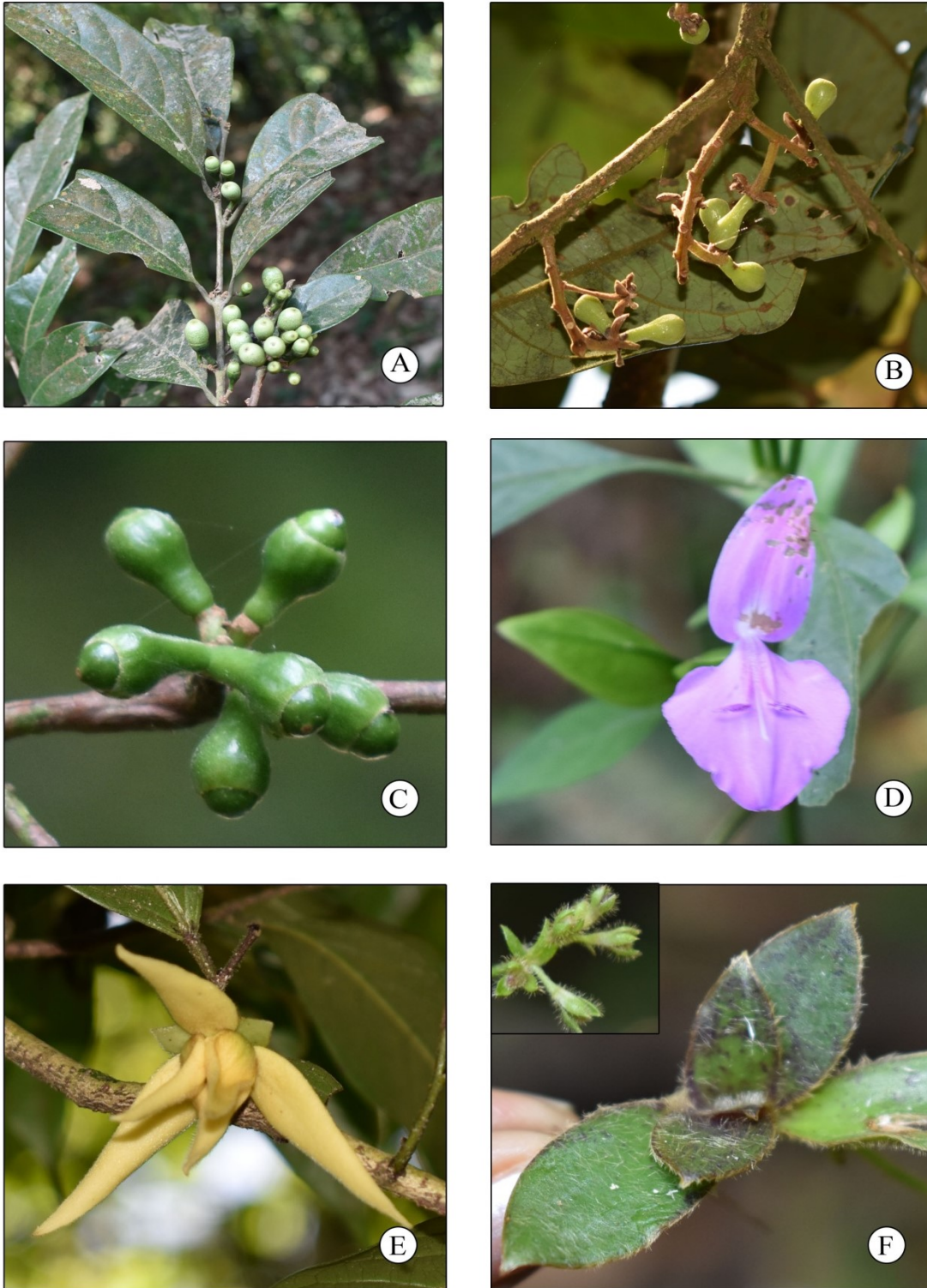
In the study area flowerings of endemic trees were observed during December to May. This pattern is similar to the flowering of trees in the tropical moist deciduous forest, which flower in dry season<sup>27</sup>. According to Borchert<sup>28</sup>, the early drought cause the water loss through transpiration which exceeds absorption by roots is related to the flowering of endemic trees. Endemic flora in Ranipuram hills is rich in herbaceous life form and their flowering is highest in the period of July to December which is in the monsoon season and shows a steady decrease from December to April. Joshi and Janarthanam<sup>14</sup> observed highest flowering of plants in the month of June- July and decrease in flowering from August to October.

The status of most of the endemic taxa from the Western Ghats is not evaluated for their diversity and threatened status at regional, national or international level so far. In our study, according to IUCN Red list version 2021-1, status of 40 species is not evaluated, 3 species includes in Least Concern (LC) category, 2 species i.e, *Litsea coriacea* (B. Heyne ex Nees) Hook.f and *Litsea floribunda* (Blume) Gamble are assessed as Near Threatened species and *Hydnocarpus pentandrus* (Buch.-Ham.) Oken as Vulnerble species. These 3 species can be depicted as 'species of elevated conservation concern'. All these plant species has a poor population in the study area which may be due to low regeneration. In this study 87% of endemic species is included in Not Evaluated category.

An ecosystem with higher number of endemic and RET species is considered as unique and should give a special priority for their conservation<sup>30</sup>. Assessing the threat status and distribution of endemic species



**Fig.1:** A. *Ixora elongata* B. Heyne ex G. Don B. *Porpax jerdoniana* (Wight) Rolfe C. *Humboldtia brunonis* Wall. D. *Canscora perfoliata* Lam. E. *Haplanthodes tentaculata* var. *neilgherryensis* (Wight) J.R.I. Wood F. *Tabernaemontana alternifolia* L.



**Fig.2:** A. *Litsea coriacea* (B.Heyne ex Nees) Hook.f B. *Litsea floribunda* (Blume) Gamble C. *Actinodaphne wightiana* (Kuntze) Noltie D. *Dicliptera cuneata* Nees E. *Meiogyne pannosa* (Dalzell) J.Sinclair F. *Cyanotis vivipara* Dalzell

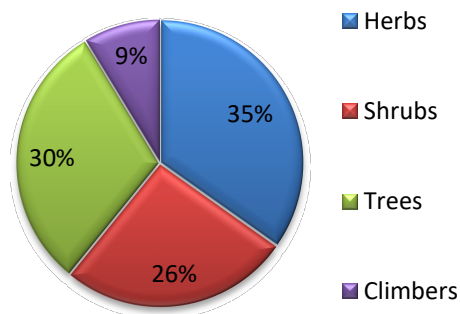


**Fig.3:** A. *Barleria courtallica* Nees B. *Zingiber cernuum* Dalzell C. *Nothopegia travancorica* Bedd. ex Hook.f. D. *Phyllocephalum scabridum* (DC.) K.Kirkman E. *Garcinia gummi-gutta* (L.) N. Robson F. *Moullava spicata* (Dalzell) Nicolson



**Fig.4:** A. *Thunbergia mysorens* (Wight) T. Anderson B. *Gnetum edule* (Willd.) Blume C. *Impatiens minor* (DC.) Bennet D. *Jerdonia indica* Wight E. *Syzygium laetum* (Buch.-Ham.) Gandhi F. *Chinanthus mala-elengi* subsp. *Mala-elengi*

will be a great contribution for their in situ and ex situ conservation planning and biodiversity management. The endemic species *Porpax jerdoniana* is included in Appendix II of Convention on International Trade of Endangered Species of Wild Flora and Fauna (CITES) which restricts its export. In Indian flora 236 genera of flowering plants are monotypic<sup>31</sup>. The present study records 3 monotypic genera *Moullava*, *Jerdonia* and *Naregamia*.



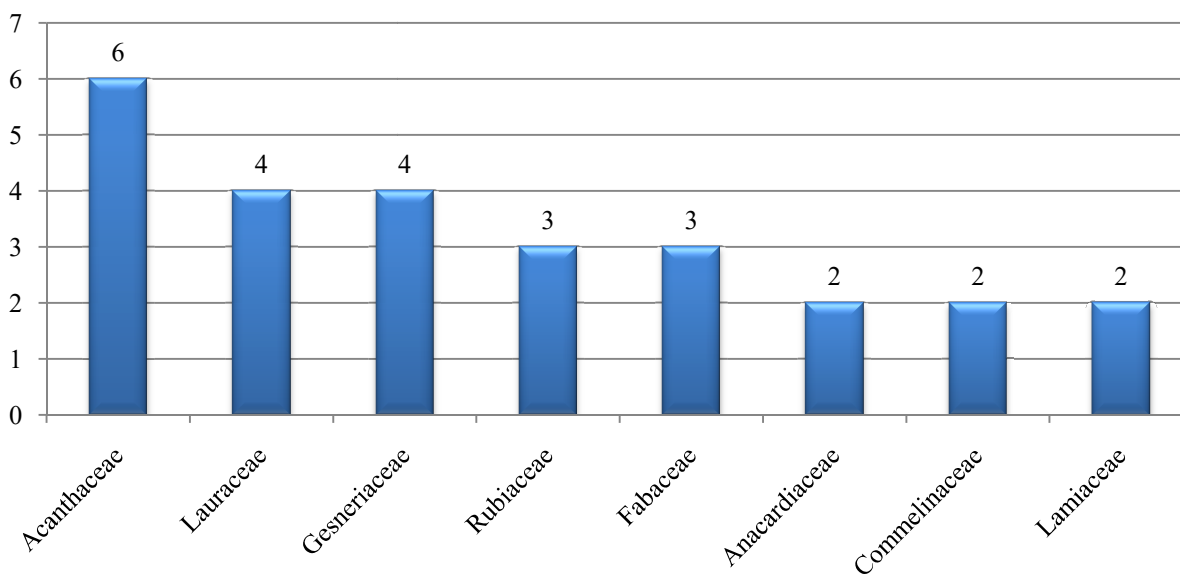
**Fig.5: Distribution of Endemic taxa based on its habit**

Endemic plants forms basic component of any flora and thus have a phytogeographical importance as it

determines the uniqueness of the flora. The evergreen and tropical moist deciduous forest of Western Ghats possesses high concentration of endemic plants in Peninsular India which reflects the vicariance, centers of speciation, biogeography of the area and evolution of the flora. The economic importance of endemic plants for their medicinal, Ornamental, food and fodder values and crop wild relatives can be utilized in various ways<sup>15,32</sup>.

### Conclusion

The present study area Ranipuram hills in the northern part of Western Ghats are unique, being species rich with herbaceous plants and are rich in endemics. These ephemerals are closely associated with the rainfall pattern and any changes of moisture, regime over the long term will have an impact on the distribution of these endemics. The present study on floristic diversity will be supporting for planning strategies for biodiversity conservation and protect them from the threat caused by anthropogenic activities and invasive plants.



**Fig.6: Analysis of Endemic taxa based on families**



S.No.	Binomial Name	Family	Fl. & Fr.	Habit	Habit at	Endemic to	IUCN status	References
1	<i>Asystasia dalzelliana</i> Santapau	Acanthaceae	Sept. - Jan.	H	T	WG	NE	1
2	<i>Barleria courtallica</i> Nees	Acanthaceae	Jan. - May	S	T	WG	NE	1,15
3	<i>Haplanthodes tentaculata</i> var. <i>neilgherryensis</i> (Wight) J.R.I.Wood	Acanthaceae	Jan. - Mar.	H	T	WG	NE	15
4	<i>Thunbergia mysorensis</i> (Wight) T.Anderson	Acanthaceae	Dec. - Mar.	C	T	WG	NE	15
5	<i>Justicia trinervia</i> Vahl	Acanthaceae	Jan. - Apr.	H	T	PI	NE	1
6	<i>Dicliptera cuneata</i> Nees	Acanthaceae	Nov. - Feb.	S	T	SI	NE	15
7	<i>Hydnocarpus pentandrus</i> (Buch.-Ham.) Oken	Achariaceae	Dec. - May	T	T	WG	VU (2019)	1
8	<i>Nothopegia travancorica</i> Bedd. ex Hook.f.	Anacardiaceae	Dec. - May	S	T	SWG	NE	1
9	<i>Holigarna arnottiana</i> Hook.f.	Anacardiaceae	Jan. - May	T	T	WG	NE	1
10	<i>Meiogyne pannosa</i> (Dalzell) J.Sinclair	Annonaceae	Throughout the year	T	T	WG	NE	1, 15
11	<i>Tetrataenium rigens</i> (Wall. ex DC.) Manden.	Apiaceae	Apr. - Oct.	S	T	SWG	NE	1
12	<i>Tabernaemontana alternifolia</i> L.	Apocynaceae	Apr. - Oct.	T	T	WG	NE	24
13	<i>Schefflera wallichiana</i> (Wight & Arn.) Harms	Araliaceae	Apr. - Dec.	T	T	PI	NE	33
14	<i>Phyllocephalum scabridum</i> (DC.) K.Kirkman	Asteraceae	Jul. - Dec.	H	T	WG	NE	15
15	<i>Impatiens minor</i> (DC.) Bennet	Balsaminaceae	Aug. - Dec.	H	T	SI	NE	15
16	<i>Garcinia gummi-gutta</i> (L.) N. Robson	Clusiaceae	Jan. - Sept.	T	T	WG	LC (2020)	15
17	<i>Terminalia paniculata</i> Roth	Combretaceae	Aug. - Feb.	T	T	PI	NE	15
18	<i>Cyanotis vivipara</i> Dalzell	Commelinaceae	Aug. - Dec.	H	T	WG	NE	15
19	<i>Dictyospermum ovalifolium</i> Wight	Commelinaceae	Oct. - Dec.	H	T	WG	NE	1
20	<i>Elaeagnus indica</i> Servett.	Elaeagnaceae	Dec. - Apr.	C	T	PI	NE	1
21	<i>Humboldtia brunonis</i> Wall.	Fabaceae	Jul. - Nov.	T	T	SWG	NE	15
22	<i>Moullava spicata</i> (Dalzell) Nicolson	Fabaceae	Mar. - Jan.	C	T	WG	NE	1
23	<i>Canscora perfoliata</i> Lam.	Gentianaceae	Nov. - Feb.	H	T	WG	NE	1
24	<i>Aeschynanthus perrottetii</i> A.DC.	Gesneriaceae	Nov. - Jan.	S	E	WG	NE	15
25	<i>Jerdonia indica</i> Wight	Gesneriaceae	Mar. - Jul.	H	T	SWG	NE	1
26	<i>Epithema carnosum</i> var. <i>hispida</i>	Gesneriaceae	Jul. - Oct.	H	T	WG	NE	1
27	<i>Gnetum edule</i> (Willd.) Blume	Gnetaceae	Oct. - Jun.	C	T	SI	LC (2010)	35
28	<i>Pogostemon purpurascens</i> Dalzell	Lamiaceae	Jan. - Apr.	H	T	WG	NE	1
29	<i>Actinodaphne wightiana</i> (Kuntze) Noltie	Lauraceae	Aug.- Jan	T	T	SWG	NE	1
30	<i>Litsea coriacea</i> (B.Heyne ex Nees) Hook.f	Lauraceae	Dec. - Jan.	T	T	WG	NT (2019)	1

31	<i>Litsea floribunda</i> (Blume) Gamble	Lauraceae	Dec. – Apr.	T	T	PI	NT (2019)	15
32	<i>Machilus macranthus</i> Nees	Lauraceae	Dec. – May	T	T	PI	NE	34
33	<i>Naregamia alata</i> Wight & Arn.	Meliaceae	Aug. – Dec.	H	T	WG	NE	15
34	<i>Syzygium laetum</i> (Buch.-Ham.) Gandhi	Myrtaceae	Dec. – Jul.	T	T	WG	NE	1
35	<i>Chionanthus mala-elengi</i> (Dennst.) P.S. Green Subsp. <i>Mala-elengi</i>	Oleaceae	Dec. – Apr.	T	T	PI	NE	15
36	<i>Porpax jerdoniana</i> (Wight) Rolfe	Orchidaceae	Jul. – Sept.	H	E	WG	NE	15
37	<i>Ixora elongata</i> B.Heyne ex G.Don	Rubiaceae	Nov. – Feb.	S	T	WG	NE	1
38	<i>Ixora polyantha</i> Wight	Rubiaceae	Mar. – May	S	T	WG	NE	24
39	<i>Psychotria dalzellii</i> Hook. f.	Rubiaceae	Mar. – Nov.	S	T	WG	NE	1
40	<i>Zingiber cernuum</i> Dalzell	Zingiberaceae	Jul. – Aug.	H	T	WG	LC (2009)	15
41	<i>Thottea siliquosa</i> (Lam.) Ding Hou	Aristolochiaceae	Throughout the year.	S	T	WG & SL	NE	32
42	<i>Blachia umbellata</i> (Willd.) Baill.	Euphorbiaceae	Feb. – Apr.	S	T	SI & SL	NE	32
43	<i>Cajanus lineatus</i> (Wight & Arn.) Maesen	Fabaceae	June – Jan.	S	T	WG	NE	32
44	<i>Rhynchoglossum notonianum</i> (Wall.) B.L.Burtt	Gesneriaceae	Jul. – Dec.	H	T	SI & SL	NE	32
45	<i>Plectranthus malabaricus</i> (Benth.) R.H.Willemse	Lamiaceae	Aug. – Dec.	H	T	SI & SL	NE	32
46	<i>Indianthus virgatus</i> (Roxb.) Suksathan & Borchs.	Marantaceae	Jun. – Mar.	S	T	SI & SL	NE	32

WG: Western Ghats, SWG: Southern Western Ghats, PI: Peninsular India, SI: South India, SL: Sri Lanka

IUCN Status - NE: Not Evaluated, LC: Least Concern, NT: Near Threatened, V: Vulnerable

**Table 1.** List of endemic taxa of the Ranipuram hills, Southern Western Ghats.

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