

Species

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Diversity of flowering plants in the Sathuragiri hills, Tamil Nadu, Southern Western Ghats, India

Karnan Jeyaprakash^{1,3*}, Natesan Balachandran²

ABSTRACT

This study enumerates the diversity of vascular plants found in the Sathuragiri Hills which is situated in the Madurai district of Tamil Nadu, India. The study site spans an area of 158.85 square kilometers and forms a part of the southern Western Ghats, is one of the recognized biodiversity hotspot of the World. A total of 316 plant species have identified, belonging to 230 genera and 76 families. The most species rich families are Fabaceae (43 species), Malvaceae (17 species), Acanthaceae and Apocynaceae (15 species each), Rubiaceae (13 species), Amaranthaceae (11 species) and Lamiaceae and Euphorbiaceae (10 species each). Based on the documentation, different kinds of endemic species, viz. endemic to southern Western Ghats, South India, Peninsular India and between India and Sri Lanka has recorded. The study has also highlights a number of IUCN red listed species, of which 78 species are categorized as Least Concern, seven as Vulnerable, two as Endangered and one as Data Deficient. The occurrence of these species indicates the ecological value and significance of the Sathuragiri Hills, which emphasizing the urgent need for conservation to mitigate the ongoing anthropogenic pressures in these forest areas.

Keywords: Plant diversity, Sathuragiri forest, Tamil Nadu, Southern Western Ghats, India.

1. INTRODUCTION

The Western Ghats is recognized as one of the eight 'hottest hotspots' of biological diversity of the world and it is a home for rich endemic flora and fauna (Myers et al., 2000). This mountainous range stretches over 1,600 km aligned with the western coast of India, it spans six different states. The southern segment of the Western Ghats, particularly the hills in the state Tamil Nadu have harbors an extraordinary diversity of flowering plants that contribute significantly to the ecological stability and biodiversity of the region (Nayar, 1996). This area is characterized by diverse ecosystems, ranging from tropical wet evergreen forests to dry deciduous forests from 200 to 1275 Meter from Sea Level and each has supporting distinct plant communities. Variations in climatic conditions lead to diverse plant formations and high species richness (Pascal et al., 2004). The varied habitats of these hills create

favorable conditions for the growth of numerous flowering plants, including many rare, endemic and medicinally important species (Gadgil, 2011).

Although ecologically important, the Sathuragiri Hills are under threat from various factors that endanger their rich biodiversity. Habitat fragmentation, illegal logging, over-exploitation of medicinal plants (Reddy et al., 2008) and aggressive colonization of invasive species are some of the significant challenges that confronting to this region (Singh & Pandey, 1998). These anthropogenic pressures necessitate urgent conservation efforts to protect and preserve the unique flora of Sathuragiri Hills.

Extensive literature review (Eluvakkal, 1991; Reddy et al., 2008; Gurusamy et al., 2016; Aadhan & Anand, 2017; Mutheeswaran et al., 2021) reveals that there is no detailed information about the plant diversity of the area, except the People Biodiversity Register. Hence this study has focused to enumerate the diversity of native vascular plants, their IUCN status and to know the invasive species.

2. MATERIALS AND METHODS

Study area

Sathuragiri Hills, also known as Chathuragiri, is not only a biodiversity hotspot but also a region of cultural and spiritual importance. The name 'Sathuragiri' means 'Square Hill' in Tamil, referring to its distinct shape. Pilgrims hold a strong belief that the presence of Siddhas in the Shiva temple and the surrounding forest makes the entire hill sacred. This deep-rooted cultural reverence underscores the need to protect the region's natural heritage. Sathuragiri Hills are located in the Saptur Reserve Forest, Peraiyur Taluka in the Madurai District of Tamil Nadu (Figure 1). It is located between 9.4622° N latitude and 77.7244° E longitude. The characteristic features of the hills are rugged terrain with varying altitudes, temperature and rainfall, which contributes a diverse range of habitats (Figure 2). These hills are admired with unique floral composition and have been a subject of interest for botanists and conservationists (Rao, 2010).

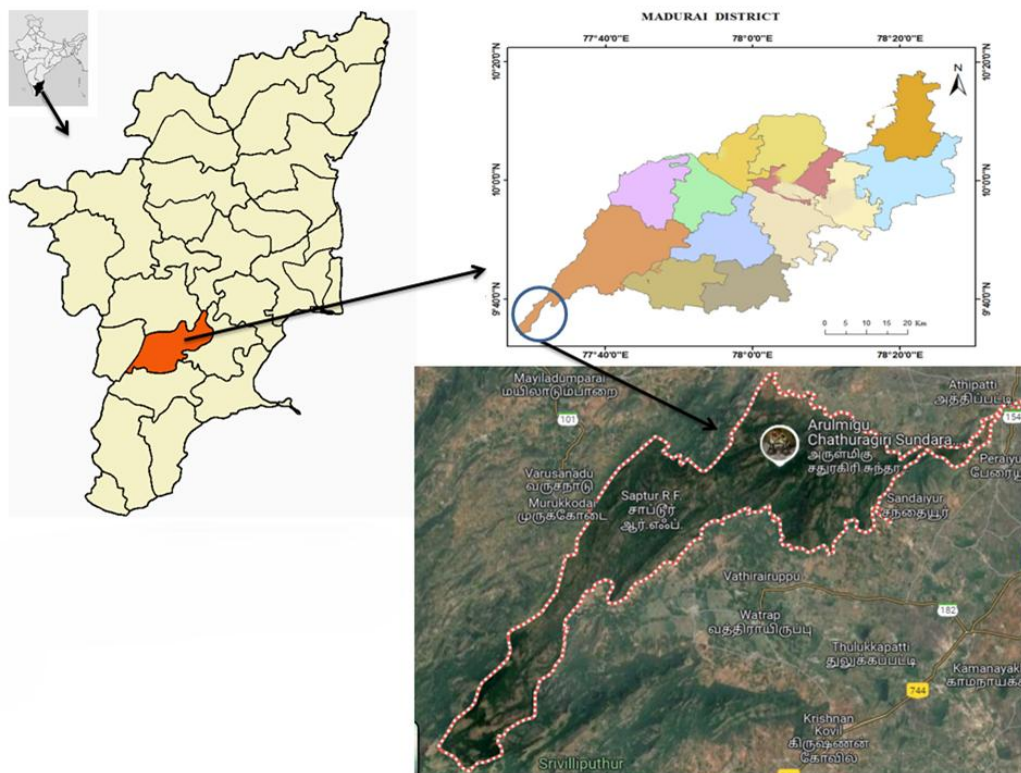


Figure 1: Location map of the study area



Figure 2. Vegetation of the Sathuragiri hills

Field Studies

Field surveys had conducted, documented and collected samples from June to December 2018 and between January and September 2022, across various seasons to capture the temporal variations in plant diversity at regular intervals in different areas of Sathuragiri forest, Madurai District. Standard procedures have adopted for collection and preserving the specimens (Jain & Rao, 1977). The plants with reproductive stage, viz. flowers and fruits are collected, photographed and processed into herbarium. The survey includes interviews with local inhabitants to record the local Tamil names of documented plant species in the field book. The herbarium specimens are identified with the help of regional and national floras (Matthew 1981-88; Shetty & Singh 2000) and online floras. The voucher specimens are deposited at the Institute of Natural Science Research (INSciR), Devadanapatti, for future reference. The documented plants were arranged in alphabetical order (Table 1) and their conservation status was referred from the IUCN Red List (2024, Version 2) and Narasimhan & Irwin (2021) for native and endemic categories. The nomenclature follows the online source Plants of the World Online.

3. RESULTS

Documentation of plant diversity

The Sathuragiri hills host a wide range of plant species, including angiosperms, pteridophytes, algae, fungi and bryophytes. Our survey from the study area recorded 316 taxa belonging to 230 genera and 76 families (Table 1). The most species rich family is Fabaceae, it comprises 26 genera and 43 species followed by Malvaceae (11 genera with 17 species), Apocynaceae (13 genera with 15 species), Acanthaceae (10 genera with 15 species), Rubiaceae (12 genera and 13 species), Amaranthaceae (eight genera with 11 species), Euphorbiaceae (seven genera with 10 species), Lamiaceae (five genera with 10 species). The families Phyllanthaceae, Cucurbitaceae, Poaceae, Convolvulaceae, Verbenaceae, Asteraceae, Boraginaceae, Rutaceae and Capparaceae are significant contributors in terms of genera and species (Figure 3). The remaining 56 families contributed varying numbers of genera and species, but each with fewer than three species.

For life form, herbaceous habit is dominant (136 species) than trees (66 species), Shrubs (57 species) and climbers are 53 species (Figure 4). Among the 316 plants, 90 species are coming under red listed category; in which 79 taxa are recorded as Least Concern (LC), seven as Vulnerable, three as Endangered (*Tectona grandis*, *Pterocarpus santalinus* and *Ochna gamblei*) and one species (*Diospyros ebenum*) as Data deficient (Figure 5). From the enumeration, has found three mono generic dicot families viz., Alangiaceae, Leeaceae, Moringaceae and one monotypic *Pistia stratiotes* L. (Araceae) were recorded. The occurrences of 28 invasive species have also recorded.

Table 1. Diversity of plant species in the Sathuragiri hills

Abbreviations: H=Herb; S=Shrub; C=Climber; T=Tree. Endemic status: I & SL=India & Sri Lanka; PI=Peninsular India; SWG=Southern Western Ghats, SI=South India, I=India and *=Invasive. Red listed status: LC=Least Concern, VUL=Vulnerable, EN=Endangered, DD=Data Deficient

Family	Botanical name	Habit	Voucher number	Endemic status – Endemic to	Red listed status
Acanthaceae	<i>Andrographis echioides</i> (L.) Nees	H	328	I & SL	-
	<i>Andrographis elongata</i> (Vahl) T.Anderson	H	267	PI	-
	<i>Andrographis paniculata</i> (Burm.f.) Nees (Figure 6.A)	H	252	-	-
	<i>Asystasia gangetica</i> (L.) T.Anderson	H	181	-	-
	<i>Barleria acuminata</i> Wight ex Nees (Figure 6.B)	S	232	PI	-
	<i>Barleria buxifolia</i> L.	H	326	I & SL	-
	<i>Blepharis maderaspatensis</i> (L.) B.Heyne ex Roth	H	438	-	-
	<i>Barleria nitida</i> Nees	H	175	I & SL	-
	<i>Dicliptera cuneata</i> Nees (Figure 6.C)	H	239	PI	-
	<i>Dicliptera paniculata</i> (Forssk.) I.Darbysh.	H	234	-	-
	<i>Elytraria acaulis</i> (L.f.) Lindau	H	427	-	-
	<i>Justicia glauca</i> Rottler	H	004	PI	-
	<i>Lepidagathis scariosa</i> Nees (Figure 6.D)	H	058	-	-
	<i>Nicotaba betonica</i> (L.) Rafin	S	178	-	-
	<i>Phlogacanthus grandis</i> Bedd.	S	471	SWG	-
<i>Ruellia prostrata</i> Poir.	H	251	I & SL	-	
Amaranthaceae	<i>Achyranthes aspera</i> L.	H	072	-	-
	<i>Aerva javanica</i> (Burm.f.) Juss. ex Schult.	H	413	-	-
	<i>Aerva lanata</i> (L.) Juss. ex Schult.	H	064	-	-
	<i>Allmania nodiflora</i> (L.) R. Br. ex Wight	H	096	-	-
	* <i>Alternanthera ficoidea</i> (L.) Sm.	H	036	-	-
	* <i>Alternanthera paronychioides</i> A.St.-Hil.	H	035	-	-
	* <i>Alternanthera pungens</i> Kunth	H	431	-	-
	* <i>Amaranthus viridis</i> L.	H	074	-	-
	<i>Celosia polygonoides</i> Retz.,	H	006	I & SL	-
	<i>Digera muricata</i> (L.) Mart.	H	196	-	-
	<i>Psilotrichum patulum</i> (Willd.) I.M.Turner (Figure 6.E)	H	502	-	-
	<i>Pupalia lappacea</i> (L.) Juss.	H	187	-	LC
Anacardiaceae	* <i>Anacardium occidentale</i> L.	T	332	-	LC
	<i>Lannea coromandelica</i> (Houtt.) Merr.	T	478	-	LC
	<i>Nothopegia colebrookiana</i> (Wight) Blume	T	307	I & SL	-
Annonaceae	<i>Alphonsea lutea</i> (Roxb.) Hook.f. & Thomson	T	276	-	LC
	<i>Miliusa eriocarpa</i> Dunn. ex Gamble (Figure 6.F)	T	274	I & SL	LC

Apocynaceae	<i>Boucerosia umbellata</i> (Haw.) Wight & Arn.	H	063	-	-
	<i>Caralluma adscendens</i> var. <i>attenuata</i> (Wight) Gravely & Mayur.	H	065	I & SL	-
	<i>Ceropegia juncea</i> Roxb. (Figure 7. A)	C	019	-	-
	<i>Carissa carandas</i> L.	S	324	-	-
	<i>Carissa spinarum</i> L.	S	419	-	LC
	<i>Holarrhena pubescens</i> (Buch.-Ham.) Wall. ex G. Don	T	493	-	-
	<i>Cynanchum viminale</i> (L.) L., subsp. <i>viminale</i>	C	237	-	-
	<i>Gymnema elegans</i> Wight & Arn. (Figure 7.B)	C	003	PI	-
	<i>Gymnema sylvestre</i> R. Br.	C	236	-	-
	<i>Hemidesmus indicus</i> (L.) R.Br.	C	453	-	-
	<i>Ichnocarpus frutescens</i> (L.) W.T.Aiton	C	042	-	-
	<i>Oxystelma esculentum</i> (L.f.) Sm. LC	C	383	-	LC
	<i>Pergularia daemia</i> (Forssk.) Chiov.	C	488	-	-
	<i>Secamone emetica</i> (Retz.) R.Br. ex Sm. (Figure 7.C)	C	500	PI	-
	<i>Telosma pallida</i> (Roxb.) Craib	C	455	-	-
<i>Wrightia tinctoria</i> (Roxb.) R.Br.	T	044	-	-	
Aristolochiaceae	<i>Aristolochia indica</i> L. (Figure 7.D)	C	050	-	-
Asparagaceae	* <i>Dracaena angolensis</i> (Welw. ex Carrière) Byng & Christenh	H	285	-	-
	<i>Asparagus racemosus</i> Willd.	C	447	-	-
Asteraceae	<i>Blainvillea acmella</i> (L.) Philip. (Figure 7.E)	H	028	-	-
	<i>Blumea obliqua</i> (L.) Druce	H	078	-	-
	* <i>Eclipta prostrata</i> (L.) L.	H	070	-	LC
	<i>Elephantopus scaber</i> L.	H	477	-	-
	<i>Kleinia grandiflora</i> (Wall. ex DC.) N.Rani	H	247	-	-
	* <i>Tridax procumbens</i> L.	H	489	-	-
Bignoniaceae	<i>Dolichandrone falcata</i> (Wall. ex DC.) Seem	T	472	-	-
	* <i>Millingtonia hortensis</i> L.f.	T	316	-	LC
	<i>Stereospermum colais</i> (Buch.-Ham. ex Dillwyn) Mabb.	T	473	-	LC
Bixaceae	<i>Cochlospermum religiosum</i> (L.) Alston	T	469	-	LC
Boraginaceae	<i>Cordia monoica</i> Roxb. (Figure 7.F)	T	284	-	LC
	<i>Ehretia microphylla</i> Lam	S	467	-	-
	<i>Heliotropium currasavicum</i> L.	H	081	-	-
	<i>Euploca ovalifolia</i> (Forssk.) Diane & Hilger	H	082	-	LC
	<i>Euploca strigosa</i> (Willd.) Diane & Hilger	H	080	-	-
	<i>Trichodesma indicum</i> (L.) Sm.	H	085	-	-
Burseraceae	<i>Commiphora caudata</i> var. <i>pubescens</i> (Wight & Arn.) K.M.Matthew (Figure 8. A)	T	470	PI	-
Capparaceae	<i>Cadaba fruticosa</i> (L.) Druce	S	076	-	-
	<i>Capparis sepiaria</i> L.	S	190	-	LC
	<i>Capparis brevispina</i> DC. (Figure 8.B)	S	312	I & SL	-
	<i>Capparis grandis</i> L.f.	T	305	-	-

	<i>Maerua oblongifolia</i> Forssk. (A.Rich.)	S	233	-	-
Caryophyllaceae	<i>Polycarpaea corymbosa</i> (L.) Lam. var. <i>longipetala</i> Sriniv. & D. Naras.	H	099	SI	-
Celastraceae	<i>Gymnosporia emarginata</i> (Willd.) Thwaites	S	479	-	-
Cleomaceae	<i>Cleome aspera</i> J. Koenig ex DC.	H	414	-	-
	<i>Cleome gynandra</i> L.	H	490	-	-
	<i>Cleome monophylla</i> L.	H	227	-	-
	<i>Cleome viscosa</i> L.	H	061	-	-
Clusiaceae	<i>Calophyllum austroindicum</i> Kosterm. ex P.F.Stevens	T	466	-	-
Colchicaceae	<i>Gloriosa superba</i> L.	C	454	-	LC
Combretaceae	<i>Terminalia anogeissiana</i> Gere & Boatwr.	T	449	-	-
	<i>Terminalia arjuna</i> (Roxb.) Wight & Arn.	T	300	-	-
	<i>Terminalia bellirica</i> (Gaertn.) Roxb.	T	430	-	LC
	<i>Terminalia chebula</i> Retz.	T	002	-	-
Commelinaceae	<i>Commelina benghalensis</i> L.	H	255	-	LC
	<i>Commelina ensifolia</i> R.Br.	H	254	-	-
	<i>Commelina paludosa</i> Blume	H	256	-	-
	<i>Cyanotis tuberosa</i> (Roxb.) Schult. & Schult.f.	H	428	PI	-
Convolvulaceae	* <i>Cuscuta chinensis</i> Lam.	C	095	-	-
	<i>Evolvulus alsinoides</i> (L.) L. (Figure 8. C)	H	052	-	-
	* <i>Ipomoea carnea</i> Jacq.	S	200	-	-
	<i>Ipomoea marginata</i> (Desr.) Verdc. (Figure 8.D)	C	068	-	-
	<i>Ipomoea violacea</i> L.	C	195	-	-
	* <i>Distimake dissectus</i> (Jacq.) A.R.Simões & Staples	C	302	-	-
	<i>Rivea hypocrateriformis</i> (Desr.) Choisy	C	039	-	LC
Cucurbitaceae	<i>Coccinia grandis</i> (L.) Voigt	C	097	-	-
	<i>Corallocarpus epigaeus</i> (Rottler) Hook.f.	C	402	-	-
	<i>Cucumis maderaspatanus</i> L.	C	198	-	-
	<i>Diplocyclos palmatus</i> (L.) C.Jeffrey	C	047	-	-
	* <i>Kedrostis foetidissima</i> (Lacq.) Cogn.	C	057	-	-
	<i>Momordica cymbalaria</i> Hook.f.,	C	091	-	-
	<i>Trichosanthes cucumerina</i> subsp. <i>cucumerina</i>	C	460	-	-
Cyperaceae	<i>Cyperus dubius</i> Rottb.	H	253	-	LC
	<i>Cyperus mindorensis</i> (Steud.) Huygh	H	481	-	LC
Dioscoreaceae	<i>Dioscorea bulbifera</i> L. (Figure 8.E)	C	444	-	-
	<i>Dioscorea pentaphylla</i> L.	C	315	-	-
	<i>Dioscorea tomentosa</i> Spreng.	C	001	-	-
Ebenaceae	<i>Diospyros ebenum</i> J.Koenig ex Retz. (Figure 8.F)	T	225	-	DD
	<i>Diospyros ferrea</i> (Willd.) Bakh.	T	286	-	-
	<i>Diospyros malabarica</i> (Desr.) Kostel.	T	288	-	-
	<i>Diospyros montana</i> Roxb.	T	224	-	-

Elaeocarpaceae	<i>Elaeocarpus serratus</i> L.	T	467	-	-
Erythroxylaceae	<i>Erythroxylum monogynum</i> Roxb.	S	229	-	LC
Euphorbiaceae	<i>Acalypha alnifolia</i> Klein ex Wild. (Figure 9.A)	H	012	SWG	-
	<i>Acalypha ciliata</i> Forssk.	H	018	-	-
	<i>Acalypha fruticosa</i> Forssk.	S	009	-	-
	<i>Acalypha paniculata</i> Miq.	H	017	-	-
	* <i>Croton bonplandianus</i> Baill.	S	088	-	-
	* <i>Euphorbia hirta</i> L.	H	448	-	-
	<i>Excoecaria oppositifolia</i> var. <i>crenulata</i> (Wight) Chakrab. & M.Gangop. (Figure 9.B)	S	025	PI & SL	-
	<i>Givotia moluccana</i> (L.) Sreem. (Figure 9.C)	T	280	I & SL	-
	<i>Mallotus philippensis</i> (Lam.) Müll.Arg	T	480	-	LC
* <i>Ricinus communis</i> L.	S	086	-	-	
Fabaceae	<i>Abrus precatorius</i> L.	C	463	-	-
	<i>Albizia amara</i> (Roxb.) Boiv.	T	491	-	LC
	<i>Albizia lebbeck</i> (L.) Benth.	T	492	-	LC
	<i>Alysicarpus monilifer</i> (L.) DC.	H	400	-	-
	<i>Bauhinia racemosa</i> Lam.	C	325	-	LC
	* <i>Bauhinia tomentosa</i> L.	S	333	-	LC
	<i>Canavalia cathartica</i> Thouars	C	303	-	-
	<i>Chamaecrista absus</i> (L.) H.S.Irwin & Barneby	H	279	-	LC
	<i>Clitorea ternatia</i> L.	C	197	-	-
	<i>Crotalaria angulata</i> Mill.	H	382	I & SL	-
	<i>Crotalaria calycina</i> Schrank (Figure 9.D)	H	014	-	-
	<i>Crotalaria mysorensis</i> Roth.	H	441	-	-
	<i>Crotalaria verrucosa</i> L.	H	308	-	-
	<i>Dalbergia spinosa</i> Roxb.	C	271	-	LC
	<i>Dichrostachys cinerea</i> Wight et Arn. (Figure 9.E)	S	188	-	LC
	<i>Entada pursaetha</i> DC.	C	331	-	-
	<i>Hardwickia binata</i> Roxb.	T	481	-	LC
<i>Indigofera aspalathoides</i> DC. (Figure 9.F)	H	092	I & SL	-	
<i>Indigofera colutea</i> (Burm.f.) Merr.,	H	090	-	-	
	<i>Indigofera tinctoria</i> L.	H	045	-	-
	<i>Mucuna atropurpurea</i> (Roxb.) DC. ex Wight	C	482	I & SL	-
	<i>Mucuna pruriens</i> (L.) DC.	C	261	-	-
	* <i>Pithecellobium dulce</i> (Roxb.) Benth	T	083	-	LC
	<i>Pseudarthria viscida</i> (L.) Wight & Arn	H	020	-	-
	<i>Pterocarpus santalinus</i> L.f.	T	023	-	EN
	<i>Pterolobium hexapetalum</i> (Roth) Santapau & Wagh (Figure 10.A)	S	474	-	-

	<i>Rhynchosia minima</i> (L.) DC. (Figure 10.B)	C	066	-	-
	<i>Senegalia ferruginea</i> (DC.) Pedley	T	320	-	VUL
	<i>Senegalia pennata</i> (L.) Maslin	S	417	-	LC
	<i>Senegalia wrightii</i> (Benth.) Britton & Rose	T	323	-	LC
	* <i>Senna alata</i> (L.) Roxb (Figure 10.C)	S	473	-	LC
	<i>Senna alexandrina</i> Mill.	H	089	-	LC
	<i>Senna italica</i> Mill.	H	056	-	-
	<i>Senna montana</i> (B.Heyne ex Roth) V.Singh	S	301	SWG	-
	* <i>Senna spectabilis</i> (DC.) Irwin & Barneby	S	495	-	-
	* <i>Senna uniflora</i> Mill.	H	087	-	-
	<i>Stylosanthes fruticosa</i> (Retz.)Alston (Figure 10.D)	H	046	-	VUL
	* <i>Tamarindus indica</i> L.	T	193	-	LC
	<i>Tephrosia maxima</i> (L.) Pers.	H	283	-	-
	<i>Tephrosia purpurea</i> (L.)Pers.	H	062	-	-
	<i>Vachellia leucophloea</i> (Roxb.) Maslin, Seigler & Ebinger	T	418	-	-
	<i>Vigna stipulacea</i> (Lam.) Kuntze (Figure 10.E)	C	289	-	-
	<i>Vigna vexillata</i> (L.) A. Rich	C	421	-	-
Gentianaceae	<i>Enicostema axillare</i> subsp. <i>littorale</i> (Blume) A.Raynal	H	005	-	-
	<i>Canscora diffusa</i> (Vahl) R.Br. ex Roem. & Schultes	H	440	-	-
Hypoxidaceae	<i>Curculigo orchioides</i> Gaertn.,	H	287	-	-
Icacinaceae	<i>Pyrenacantha volubilis</i> Wight (Figure 10.F)	C	048	-	-
Lamiaceae	<i>Leucas aspera</i> (Willd.) Link	H	077	-	-
	<i>Leucas biflora</i> (Vahl) Sm.	H	026	-	-
	<i>Ocimum basilicum</i> L.	H	450	-	-
	<i>Ocimum filamentosum</i> Forssk.	H	415	-	-
	<i>Ocimum gratissimum</i> L.	H	451	-	-
	<i>Ocimum tenuiflorum</i> L.	H	424	-	-
	<i>Orthosiphon rubicundus</i> (D.Don) Benth.	H	309	-	-
	<i>Orthosiphon thymiflorus</i> (Roth) Sleesan	H	033	-	-
	<i>Coleus amboinicus</i> Lour.	H	272	-	-
	<i>Tectona grandis</i> L.f.	T	321	-	EN
Lauraceae	<i>Alseodaphne semecarpifolia</i> Nees	T	485	I & SL	LC
	<i>Cinnanomum verum</i> J.Presl	T	458	-	VUL
Linaceae	<i>Hugonia mystax</i> L. (Figure 11.A)	S	220	I & SL	-
Linderniaceae	<i>Lindernia antipoda</i> (L.) Alston	H	176	-	LC
	<i>Lindernia dubia</i> (L.) Pennell	H	177	-	LC
	<i>Lindernia micrantha</i> D. Don (Figure 11.B)	H	235	-	LC
Loganiaceae	<i>Strychnos nux-vomica</i> L.	T	191	-	LC

	<i>Strychnos potatorum</i> L.f.	T	334	-	-
Lophiocarpaceae	<i>Corbichonia decumbens</i> (Forsk.) Exell	H	420	-	-
Loranthaceae	<i>Dendrophthoe falcata</i> (L.f.) Etting. var. <i>falcata</i>	S	246	-	-
	<i>Taxillus cuneatus</i> (Heyne ex Roth) Danser	S	240	I & SL	-
Malvaceae	<i>Ceiba pentandra</i> (L.) Gaertn	T	464	-	LC
	<i>Decaschistia crotonifolia</i> Wight & Arn.	S	310	-	-
	<i>Gossypium hirsutum</i> L.	H	249	-	VUL
	<i>Grewia asiatica</i> Wall.	T	257	-	-
	<i>Grewia bracteata</i> Roth.	S	228	I & SL	-
	<i>Grewia hirsuta</i> Vahl.	T	016	-	-
	<i>Grewia tenax</i> (Forssk.) Fiori (Figure 11.C)	S	024	I & SL	-
	<i>Helicteres isora</i> L. (Figure 11.D)	S	192	-	LC
	<i>Herissantia crispa</i> (L.) Brizicky	H	055	-	-
	<i>Hibiscus micranthus</i> L.f.	H	100	-	-
	<i>Hibiscus vitifolius</i> L.	S	084	-	-
	<i>Pavonia zeylonica</i> (L.) Cav.	H	475	-	-
	<i>Sida acuta</i> Burm.f	H	462	-	-
	<i>Sida cordifolia</i> L.	H	199	-	-
	<i>Sida rhombifolia</i> L.	H	013	-	-
	<i>Sterculia urens</i> Roxb.	T	219	-	LC
<i>Thespesia populnea</i> (L.) Sol. ex Corrêa	T	230	-	LC	
Meliaceae	<i>Aglaiia elaeagnoidea</i> (A.Juss.) Benth.	T	484	-	LC
	<i>Azadirachta indica</i> A. Juss.	T	075	-	LC
	<i>Naregamia alata</i> Wight & Arn.	S	335	SWG	-
Menispermaceae	<i>Anamirta cocculus</i> (L.) Wight & Arn.,	C	437	-	-
	<i>Cissampelos pareira</i> L.	C	313	-	-
	<i>Cocculus hirsutus</i> (L.) W.Theob.	C	440	-	-
	<i>Tinospora cordifolia</i> (Thunb.) Miers	C	269	-	-
Molluginaceae	<i>Glinus oppositifolius</i> (L.) Aug. DC.,	H	306	-	LC
	<i>Hypertelis cerviana</i> (L.) Thulin	H	094	-	-
	<i>Trigastrotheca pentaphylla</i> (L.) Thulin	H	098	I & SL	-
Moraceae	<i>Ficus albipila</i> (Miq.) King	T	265	-	LC
	<i>Ficus benghalensis</i> L.	T	451	-	-
	<i>Ficus mollis</i> Vahl. (Figure 11.E)	T	040	-	-
Moringaceae	<i>Moringa concanensis</i> Nimmo	T	451	-	-
Muntingiaceae	* <i>Muntingia calabura</i> L.	T	250	-	-
Myrtaceae	<i>Syzygium cumini</i> (L.) Skeels	T	459	-	LC
	<i>Syzygium gardneri</i> Thwaites	T	266	I & SL	-
Nyctaginaceae	* <i>Boerhavia erecta</i> L.	H	060	-	-
	<i>Boerhavia diffusa</i> L.	H	434	-	-
Ochnaceae	<i>Ochna gamblei</i> King ex Brands	S	263	SWG	EN
Oleaceae	<i>Jasminum auriculatum</i> Vahl	C	184	-	-
	<i>Jasminum angustifolium</i> (L.) Willd.	C	327	-	-
	<i>Jasminum sambac</i> (L.) Aiton	C	304	-	-
Opiliaceae	<i>Opilia amentacea</i> Wall. (Figure 11.F)	S	277	-	-

Orchidaceae	<i>Habenaria plantaginea</i> Lindl.	H	029	-	-	
Orobanchaceae	* <i>Striga asiatica</i> (L.) Kuntze	H	030	-	-	
Oxalidaceae	<i>Biophytum sensitivum</i> (L.) DC.	H	503	-	-	
	<i>Oxalis corniculata</i> L.	H	011	-	-	
	* <i>Oxalis debilis</i> Kunth	H	399	-	-	
Pedaliaceae	<i>Sesamum indicum</i> L.	H	037	-	-	
	<i>Pedaliium murex</i> L.	H	398	-	-	
Phyllanthaceae	<i>Meineckia parvifolia</i> (Wight) G.L.Webster (Figure 12.A)	H	262	I & SL	-	
	<i>Flueggea leucopyrus</i> Dalzell & A.Gibson,	S	222	-	LC	
	* <i>Phyllanthus amarus</i> Schumach. & Thonn.	H	423	-		
	<i>Phyllanthus emblica</i> L.	S	093	-	LC	
	<i>Phyllanthus maderaspatensis</i> L.	H	038	-	LC	
	<i>Phyllanthus reticulatus</i> G.Lodd.	S	180	-	LC	
	<i>Phyllanthus virgatus</i> G.Forst.	H	185	-	-	
Poaceae	<i>Synostemon bacciformis</i> (L.) G.L.Webster	H	010	-	-	
	<i>Apluda mutica</i> L.,	H	438	-	-	
	<i>Cymbopogon citrates</i> (DC.) Stapf	H	422	-	-	
	<i>Cynodon dactylon</i> (L.) Pers.	H	067	-	-	
	<i>Dactyloctenium aegyptium</i> (L.) Willd.	H	432	-	-	
	<i>Trachys muricata</i> (L.) Pers.	H	329	-	-	
	<i>Tragus mongolorum</i> Ohwi	H	442	-	-	
Polygalaceae	<i>Urochloa panicoides</i> P.Beauv.	H	439	-	LC	
	<i>Polygala arvensis</i> Willd.	H	425	-	-	
	<i>Polygonaceae</i>	<i>Persicaria chinensis</i> (L.) H.Gross	H	015	-	-
	<i>Portulacaceae</i>	<i>Portulaca tuberosa</i> Roxb.	H	429	-	-
	Pteridaceae	<i>Hemionitis opposita</i> (Kaulf.) Christenh.	H	401	-	-
		<i>Hemionitis arifolia</i> (Burm.f.) T.Moore	H	456	-	-
	Rhamnaceae	<i>Ziziphus oenopolia</i> (L.) Mill.	S	007	-	LC
<i>Ziziphus mauritiana</i> Lam		S	487	-	LC	
<i>Ziziphus xylopyrus</i> (Retz.) Willd.		S	499	-	-	
Rubiaceae	<i>Adina cordifolia</i> (Roxb.) Brandis	T	051	-	LC	
	<i>Benkara malabarica</i> (Lam.) Tirveng.	S	221	-	-	
	<i>Canthium coromandelicum</i> (Burm.f.) Alston (Figure 12.B)	S	486	-	-	
	<i>Cutanaregam spinosa</i> Thunb., Tirveng.	S	496	-	-	
	<i>Dentella repens</i> (L.) J.R.Forst. & G.Forst.	H	069	-	LC	
	<i>Gardenia gummifera</i> L.f.	S	264	I	LC	
	<i>Ixora pavetta</i> Andrews	S	317	-	LC	
	<i>Oldenlandia corymbosa</i> L.	H	330	-	-	
	<i>Oldenlandia herbacea</i> (L.) Roxb.	H	041	-	-	
	<i>Pavetta indica</i> L.	S	031	-	LC	
	<i>Rubia cordifolia</i> L.	H	457	-	-	
<i>Spermacoce ocymoides</i> Burm.f.	H	179	-	-		
<i>Tarenna asiatica</i> (L.) Kuntze ex K.Schum. (Figure 12.C)	S	218	-	LC		

	<i>Wendlandia tinctoria</i> (Roxb.) DC. (Figure 12.D)	T	456	-	LC
Rutaceae	<i>Aegle marmelos</i> (L.) Corrêa	T	433	-	LC
	<i>Atalantia monophylla</i> (Roxb.) A. DC.	T	278	-	-
	<i>Chloroxylon swietenia</i> DC.	T	468	I & SL	VUL
	<i>Murraya paniculata</i> (L.) Jack	S	022	-	-
	<i>Zanthoxylum asiaticum</i> (L.) Appelhans, Groppo & J.Wen	S	452	-	-
Salicaceae	<i>Flacourtia indica</i> (Burm.f.) Merr	S	050	-	-
Salvadoraceae	<i>Azima tetracantha</i> Lam	S	465	-	LC
Sandalaceae	<i>Osyris quadripartita</i> Salzm. ex Decne	S	314	-	LC
	<i>Santalum album</i> L.	T	231	-	VUL
Sapindaceae	<i>Cardiospermum corindum</i> L.	C	049	-	-
	<i>Cardiospermum halicacabum</i> L.	C	059	-	LC
	<i>Dodonaea viscosa</i> subsp. <i>angustifolia</i> (L.f.) J.G.West	S	043	-	LC
	<i>Sapindus emarginatus</i> Vahl	T	319	-	-
Sapotaceae	<i>Mimusops elengi</i> L.	T	273	-	LC
Scrophulariaceae	<i>Stemodia viscosa</i> Roxb.	H	073	I & SL	-
	<i>Scoparia dulcis</i> L.	H	194	-	-
Solanaceae	<i>Physalis angulata</i> L.	H	021	-	LC
	<i>Solanum nigrum</i> L.	H	034	-	-
	<i>Solanum pubescens</i> Willd.	H	053	-	-
	<i>Solanum virginianum</i> L.	H	071	-	-
Ulmaceae	<i>Celtis philippensis</i> Blanco	T	270	-	LC
	<i>Holoptelea integrifolia</i> (Roxb.) Planch.	T	282	-	LC
Urticaceae	<i>Pouzolzia zeylanica</i> (L.) Benn. & R. Br.	H	260	-	-
Verbenaceae	<i>Gmelina arborea</i> Roxb.	T	318	-	LC
	<i>Gmelina asiatica</i> L. (Figure 12.E)	S	226	-	LC
	* <i>Lantana camara</i> L.	S	443	-	-
	<i>Lantana veronicifolia</i> Hayek	S	054	-	-
	<i>Premna latifolia</i> var. <i>henryi</i> Narasim.	S	275	-	-
	<i>Vitex altissima</i> L.f.	T	281	-	LC
	<i>Vitex negundo</i> L.	S	483	-	LC
Vitaceae	<i>Cayratia pedata</i> (Lam.) Juss. ex Gagnep.	C	248	-	VUL
	<i>Cissus quadrangularis</i> L.	C	238	-	-
	<i>Cissus repanda</i> var. <i>repanda</i> (Figure 12.F)	C	258	-	-
	<i>Cissus vitiginea</i> L.	C	501	-	-
	<i>Leea indica</i> (Burm.f.) Merr.	S	494	-	LC
	<i>Tetrastigma leucostaphylum</i> (Dennst.) Alston	C	259	-	-
Zygophyllaceae	<i>Tribulus terrestris</i> var. <i>terrestris</i>	H	322	-	-
	<i>Tribulus subramanyamii</i> P.Singh, G.S.Giri & V.Singh	H	446	PI	-

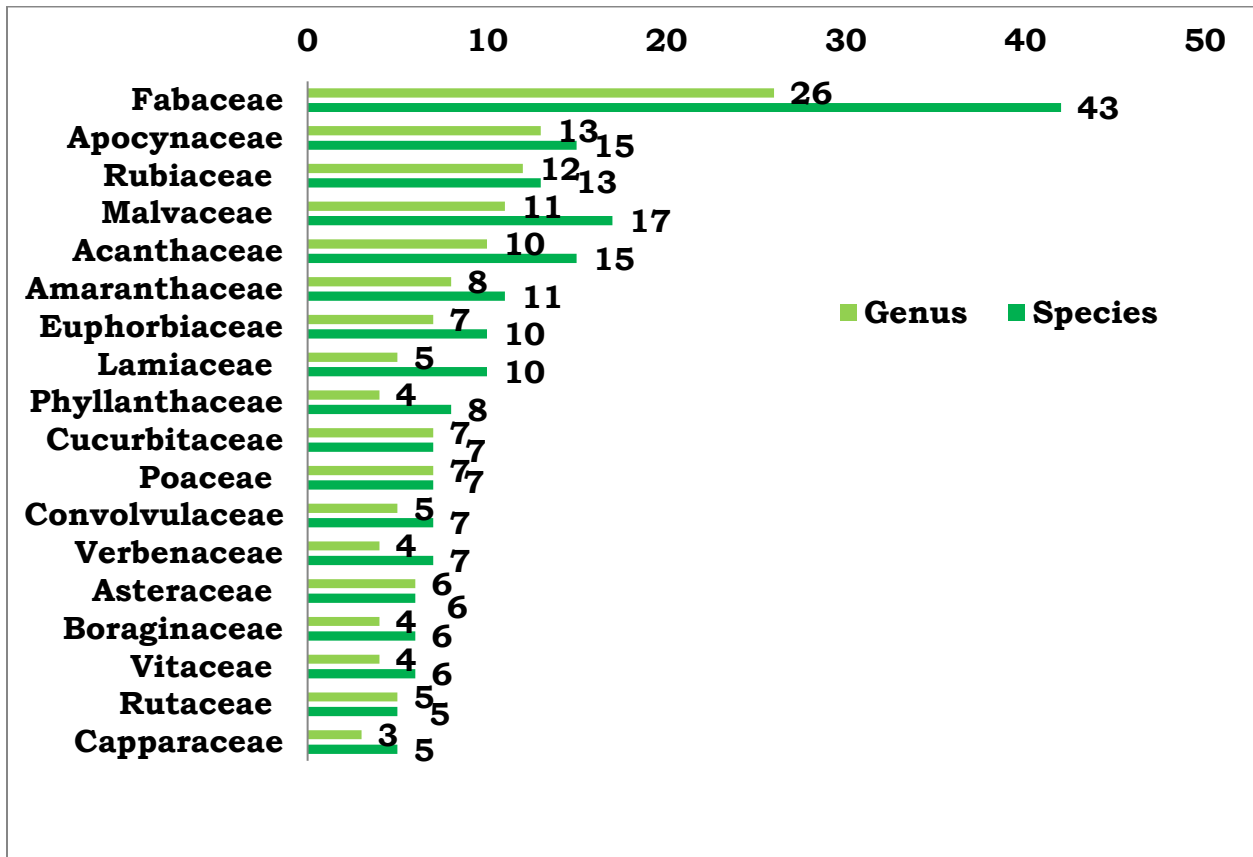


Figure 3. Top dominant families in the study area

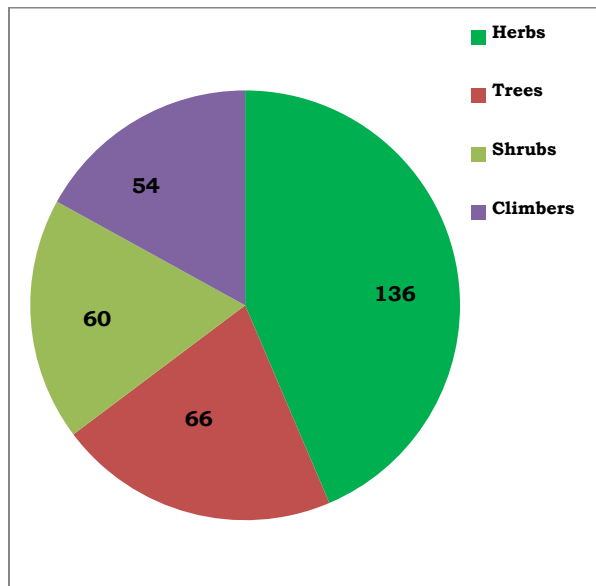


Figure 4. Life forms in the study area

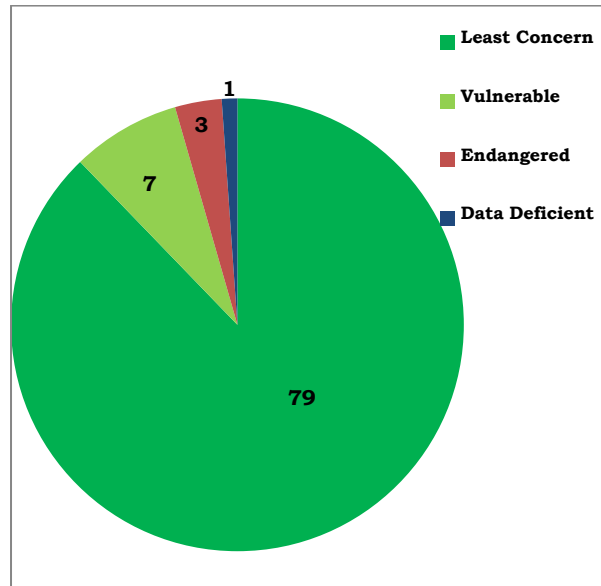


Figure 5. Red listed species in the study area

Endemic status

Among the documented plants, *Phlogacanthus grandis*, *Commiphora caudata* var. *pubescens*, *Acalypha alnifolia*, *Senna montana*, *Naregamia alata* and *Ochna gamblei* are endemic to Southern Western Ghats; *Polycarpaea corymbosa* var. *longipetala* is endemic to South India; *Andrographis elongata*, *Cyanotis tuberosa*, *Dicliptera cuneata*, *Gymnema elegans*, *Justicia glauca* and *Tribulus subramanyamii* are endemic to peninsular India and *Gardenia gummifera* is endemic to India. The *Andrographis echioides*, *Barleria buxifolia*, *Barleria nitida*, *Rostellularia prostrata*, *Celosia polygonoides*, *Nothopegia colebrookiana*, *Miliusa eriocarpa*, *Caralluma adscendens* var. *attenuata*, *Capparis brevispina*, *Excoecaria crenulata*, *Givotia moluccana*, *Crotalaria angulata*, *Indigofera aspalathoides*, *Mucuna atropurpurea*, *Alseodaphne semecarpifolia*, *Hugonia mystax*, *Taxillus cuneatus*, *Grewia bracteata*, *Grewia rhamnifolia*, *Trigastrotheca pentaphylla*, *Syzygium gardneri*, *Breynia quadrangularis*, *Chloroxylon swietenia* and *Stemodia viscosa* are endemic to India as well as Sri Lanka.

4. DISCUSSION

A botanical survey conducted in the Sathuragiri Hills, located in the southern part of the Western Ghats within Madurai District, Tamil Nadu, revealed substantial plant diversity. These findings emphasize the ecological importance of the region and are consistent with the Western Ghats global recognition as a biodiversity hotspot.

Species Richness and Dominant Plant Families

The study recorded 316 plant species, belonging to 230 genera and 76 families. Among these, the Fabaceae family emerged as the most species rich, contributing 43 species. Other notably represented families included Malvaceae, Acanthaceae, Apocynaceae and Rubiaceae, which collectively accounted for a significant portion of the recorded diversity. This distribution pattern mirrors trends observed in other parts of the Western Ghats, such as the Madukkarai Hills, where Fabaceae and Euphorbiaceae were also prominent (Jayanthi & Rajendran, 2014). The abundance of Fabaceae species reflects the family's ecological adaptability (Rao, 2010).

Life Forms and Habitat Types

The dominance of herbs (136 species) over trees (66), shrubs (60) and climbers (54) indicates the heterogeneity of microhabitats in the Sathuragiri Hills. This distribution reflects the broad ecological amplitude and dynamic succession stages of the forest ecosystems, typical of the mid-altitude forests found between 200–1275 Meter from Sea Level in the Western Ghats (Champion & Seth, 1968; Pascal et al., 2004).

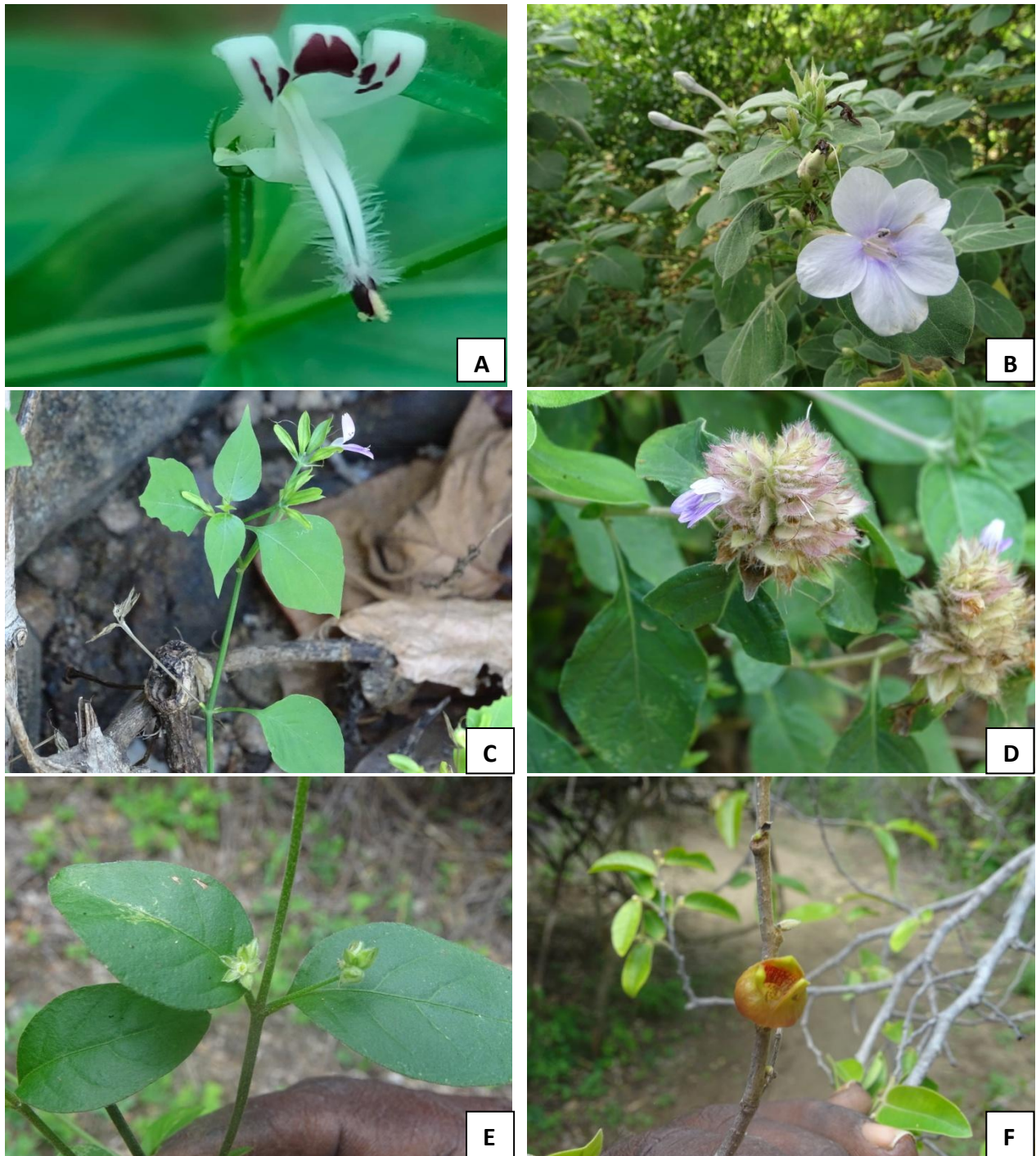


Figure 6. A. *Andrographis paniculata*, B. *Barleria acuminata*, C. *Dicliptera cuneata*, D. *Lepidagathis scariosa* E. *Psilotrichum patulum* and F. *Miliusa eriocarpa*

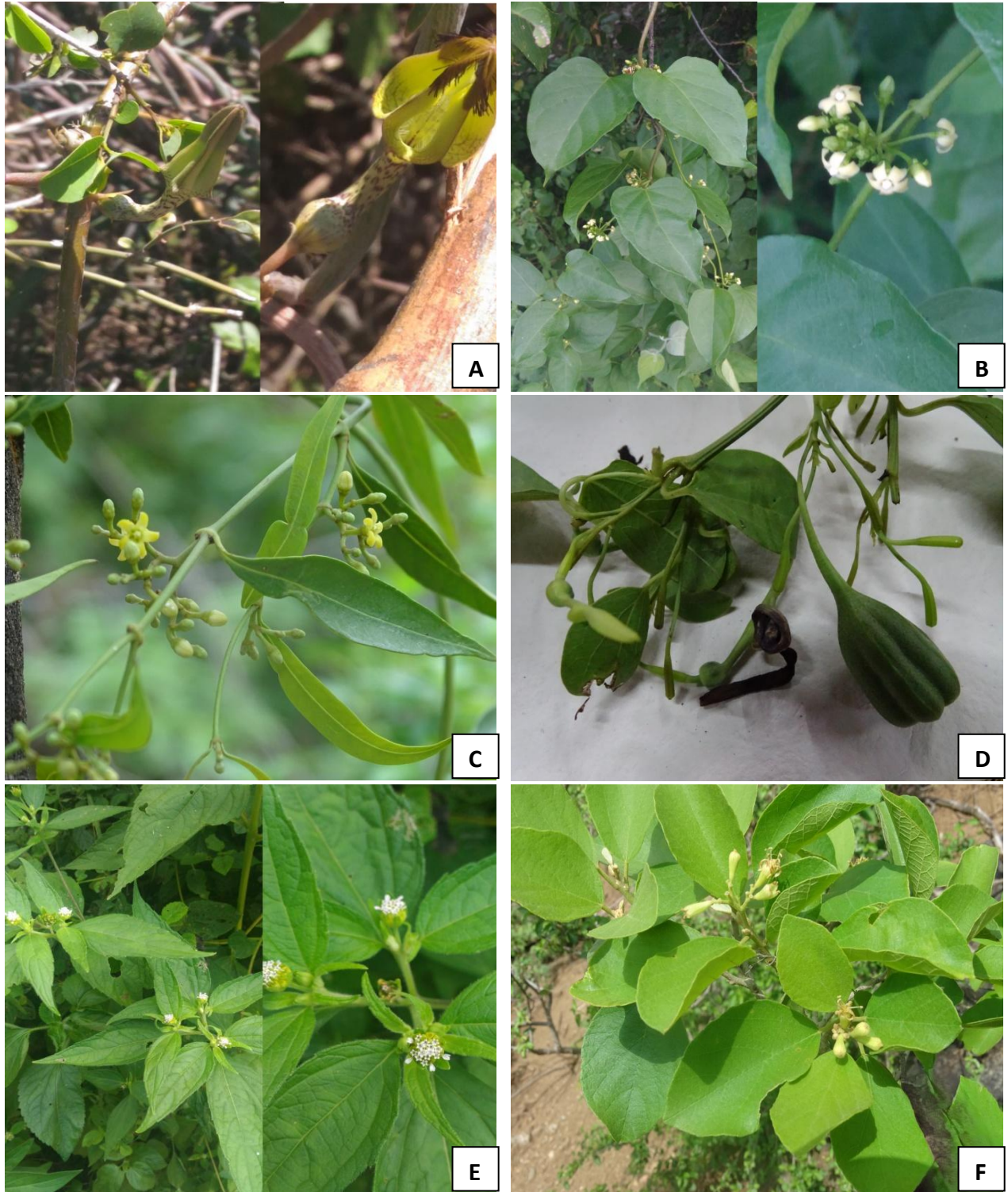


Figure.7. A. *Ceropegia juncea*, B. *Gymnema elegans*, C. *Secamone emetica*, D. *Aristolochia indica*, E. *Blainvillea acmella* and F. *Cordia monoica*.



Figure.8. A. *Commiphora caudata* var. *pubescens*, B. *Capparis brevispina*, C. *Evolvulus alsinoides*, D. *Ipomoea marginata*, E. *Dioscorea bulbifera* and F. *Diospyros ferrea*

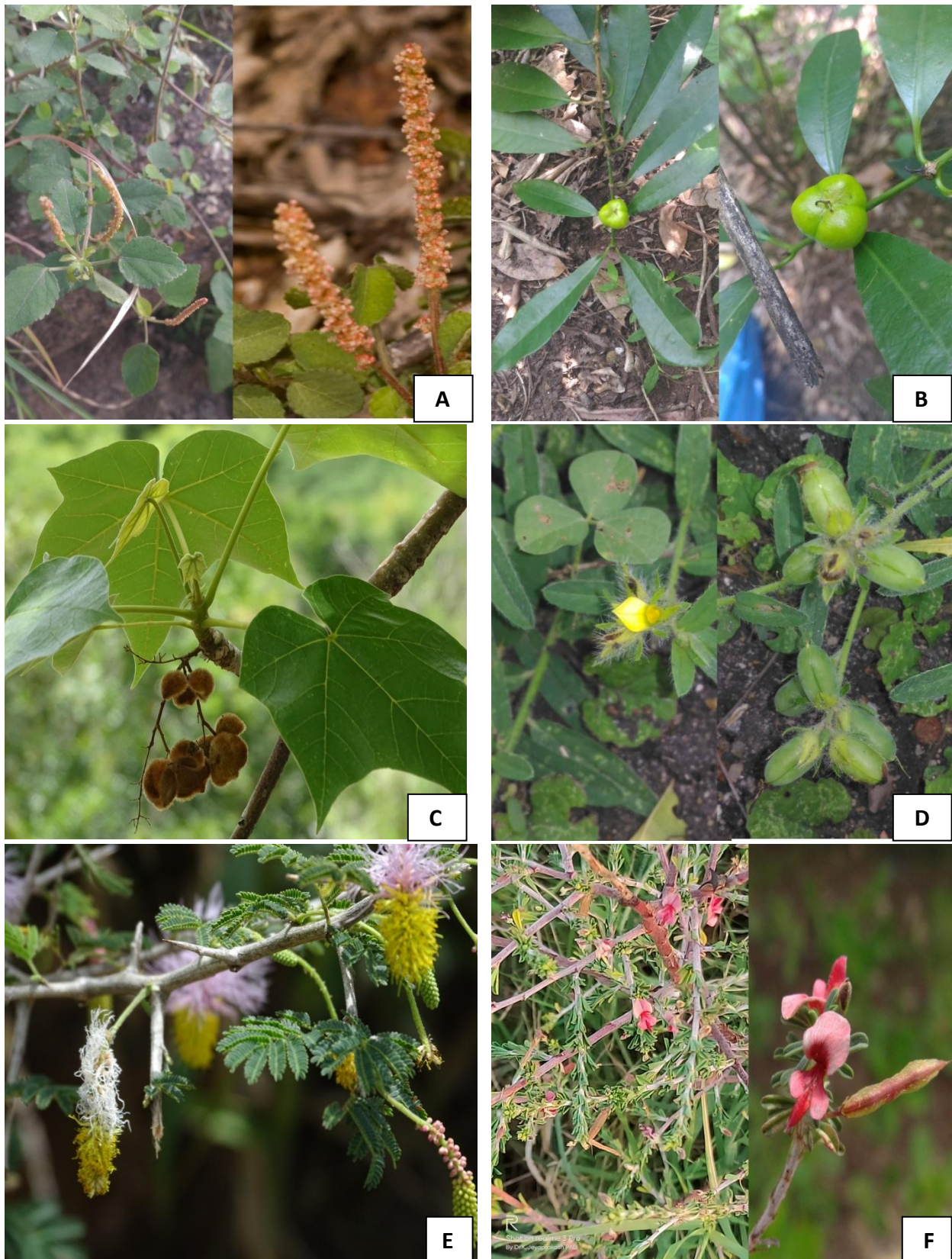


Figure.9. A. *Acalypha alnifolia*, B. *Excoecaria oppositifolia* var. *crenulata*, C. *Givotia moluccana*, D. *Crotalaria calycina* , E. *Dichrostachys cinerea* and F. *Indigofera aspalathoides*



Figure. 10. A. *Pterolobium hexapetalum*, B. *Rhynchosia minima*, C. *Senna italica* D. *Stylosanthes fruticosa*, E. *Vigna stipulacea*, F. *Pyrenacantha volubilis*

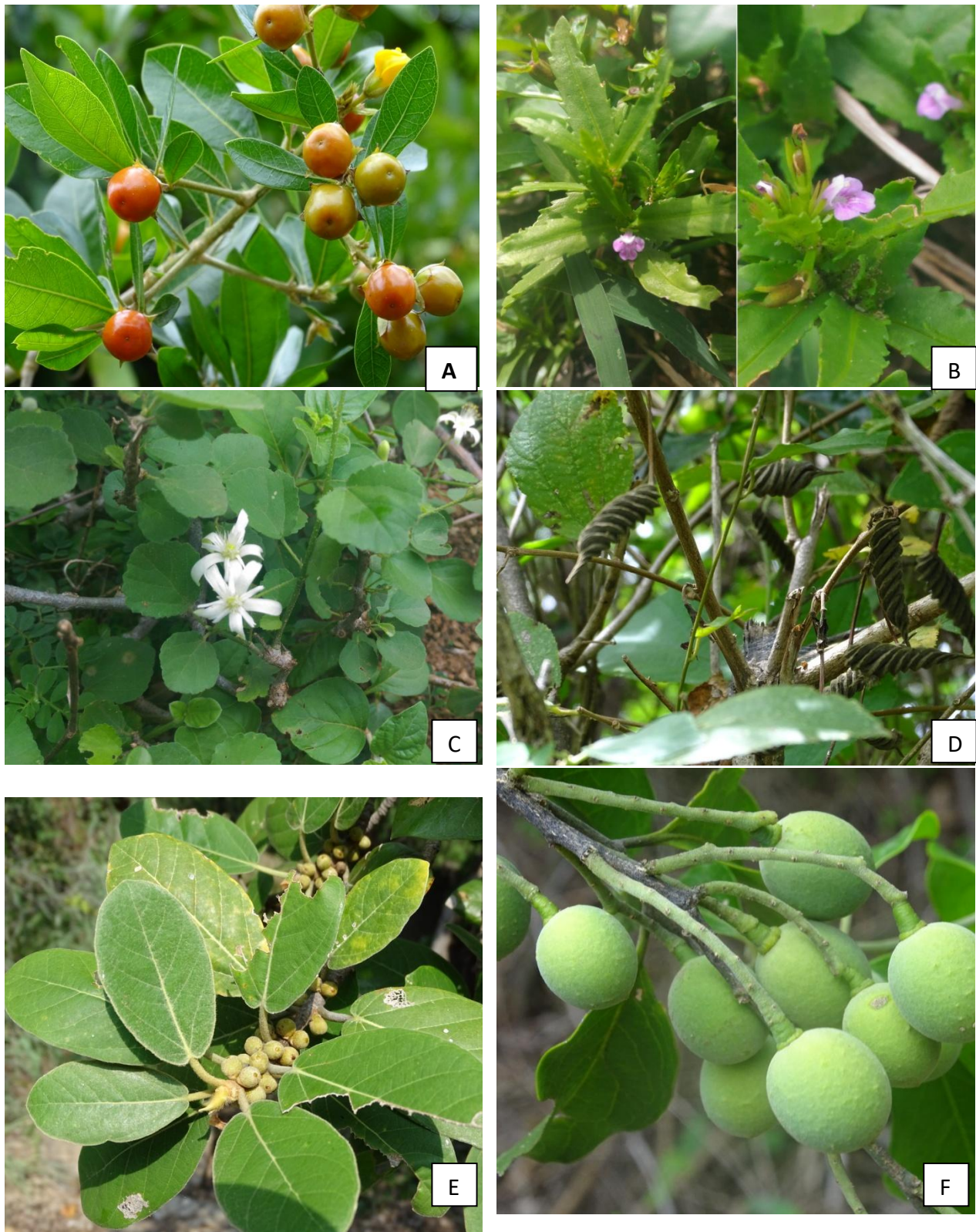


Figure.11. A. *Hugonia mystax*, B. *Lindernia micrantha*, C. *Grewia tenax* D. *Helicteres isora* E. *Ficus mollis*, F. *Opilia amentacea*

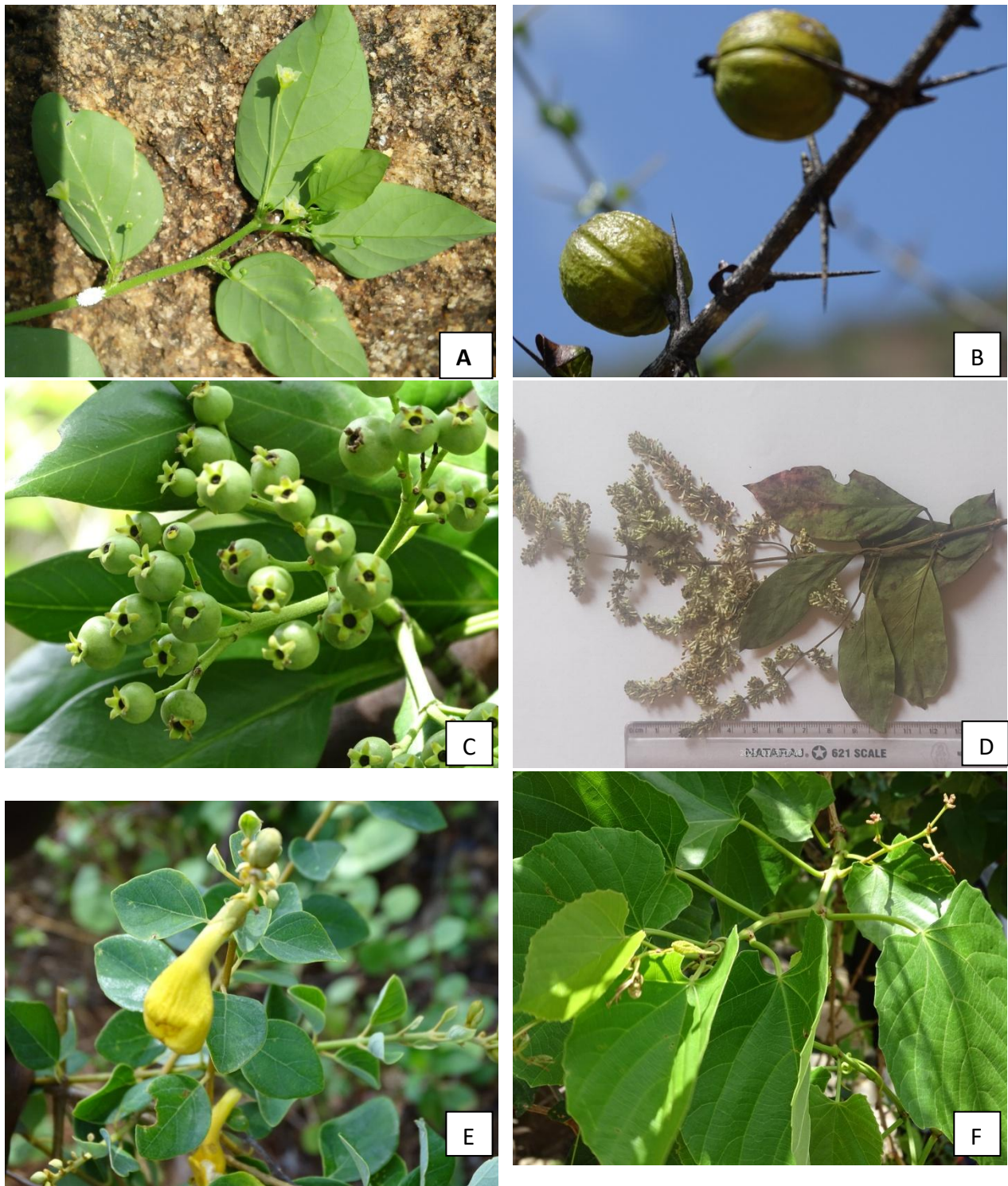


Figure.12. A. *Meineckia parvifolia*, B. *Cutanaregam spinosa*, C. *Tarenna asiatica* D. *Wendlandia tinctoria* E. *Gmelina asiatica*, F. *Cissus repanda* var. *repanda*

Endemism and Biogeographical Significance

Among the recorded taxa, several species are found to be endemic to the Southern Western Ghats (e.g., *Phlogacanthus grandis*, *Naregamia alata*, *Ochna gamblei*), Peninsular India (e.g., *Gymnema elegans*, *Justicia glauca*) and the India–Sri Lanka region (e.g., *Barleria buxifolia*,

Crotalaria angulata). This highlights the distinctive bio-geographic identity of the area, which supports nearly 38% of India's endemic plant species (Nayar, 1996; Gadgil, 2011).

The high endemism also indicates that the Sathuragiri Hills function as a critical refuge and evolutionary center for plant diversification. This finding supports earlier studies highlighting the Southern Western Ghats as a central phytogeographic region with ancient lineages and speciation centers (Subramanyam & Nayar, 1974).

Threatened and Invasive Species

Based on the IUCN (2024 ver. 2) conservation status the survey records reveals that three species treated as endangered (*Ochna gamblei*, *Pterocarpus santalinus* and *Tectona grandis*), seven vulnerable species (*Cayratia pedate*, *Cinnamomum verum*, *Chloroxylon swietenia*, *Gossypium hirsutum*, *Sandalum album*, *Stylosanthes fruticose* and *Senegalia ferruginea*), one data deficient species (*Diospyros ebenum*) and 79 are least concern species.

The presence of 28 invasive species, including *Lantana camara* and *Senna spectabilis*, highlights the urgent need for habitat conservation, as these species are known to displace native plants and disrupt natural forest ecosystems (Reddy et al., 2008; Singh & Pandey, 1998).

Anthropogenic Pressures and Conservation Needs

Human-driven activities such as the illegal harvesting of medicinal plants, unregulated religious tourism and overgrazing have led to the fragmentation of ecosystems in the region (Eluvakkal, 1991; Gadgil & Guha, 1992). These pressures not only threaten rare and endangered species but also interfere with essential ecological functions like seed dispersal and pollination.

Although Sathuragiri Hills hold deep religious and cultural significance, their ecological fragility underscores the need for sustainable approaches to pilgrimage and forest resource use. Integrating traditional ecological knowledge (Aadhan & Anand, 2017) with modern conservation practices while empowering local communities as stewards of biodiversity can offer a holistic model for long-term protection.

Comparative Regional Importance

When compared with other well studied Western Ghats localities such as Agasthyamalai or Silent Valley, the plant density and endemism in Sathuragiri are comparable, though smaller in area. It indicates that even relatively more minor forest patches, if undisturbed, can serve as reservoirs of biodiversity (Myers et al., 2000).

5. CONCLUSION

The Sathuragiri Hills have a unique blend of natural beauty, a treasure trove of biodiversity for nature lovers, spiritual solace, cultural importance and a challenging trek for adventure enthusiasts. The floristic study of Sathuragiri hills provides a valuable insight into the ecological richness of the Southern Western Ghats. Protecting this sacred and ecologically fragile landscape is vital for preserving its natural beauty and cultural value for future generations. The diverse plant assemblages and distinctive species underscore the area's ecological importance. High levels of endemism and the presence of threatened taxa emphasize its role in biodiversity conservation. Nonetheless, the region faces significant conservation challenges that call for collaborative efforts among researchers, conservationists and local communities. Long-term research and sustainable conservation practices are vital to protect the rich plant diversity and maintain the ecological balance of the Sathuragiri Hills.

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Authors Contributions

Conceptualization: KJ; Data curation: KJ, NB; Formal analysis: KJ, NB; Investigation: KJ; Methodology: KJ, NB; Writing –original draft: KJ; Writing – review and editing: KJ, NB.

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Conflict of Interest

The author declares that there are no conflicts of interests.

Informed consent

Not applicable.

Ethical approval & declaration

In this article, as per the plant regulations followed in the Institute of Natural Science Research (Registered under Indian Trust Act-1882), Devadanapatti-625602, India, the authors are documented the Diversity of flowering plants in Sathuragiri Hills, Tamil Nadu, Southern Western Ghats, India. 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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