

FLORISTIC DIVERSITY, ECOSYSTEM FUNCTIONING AND BIOLOGICAL SPECTRUM AT CHALAMA AREA OF NALLAMALA FOREST, KURNOOL DISTRICT, A.P., INDIA.

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ABSTRACT: The present study is aimed to prepare the floristic biological spectrum and to estimate the functioning of ecosystem at Chalama region of Nallamala forest. The study revealed the presence of 302 species that belongs to 218 genera, distributed in 74 families. The families Fabaceae and Poaceae are represented with 20 species in each. Forty one families are represented with a single species in each. It indicates the well operated and dynamic community. 155 species of herbaceous flora among 302 species indicates the efficient utilization and withholding of nutrients. In the present exploration, phanerophytes and therophytes showed maximum divergence. Percentage of phanerophytes is showing similarity with normal biological spectrum indicates humid bio climate of the area. Therophytes showed highest deviation from the normal spectrum. Chamaephytes, cryptophytes and hemi cryptophytes are showing fewer departures. It is concluded that the study area is showing Phanero – Therophytes due to sub tropical climate. The study area is furnishing with high percentage (37.7) of therophytic life form and less percentage of other life forms is probably due to anthropogenic activities and fire catchment disturbed the area so that annual therophytes re-established in the area when it is receiving rainfall.

KEY WORDS: Floristic diversity, Life – forms, Biological Spectrum, Dynamic community, Anthropogenic activities etc.

INTRODUCTION:

In vegetation analysis life form is an important widely used physiognomic character because it is determined by plants adaptation to certain ecological conditions (Meera et al. 1999). A life form is evolved directly in response to the environment. The concept of life forms was first formulated by Humboldt (1806) based on the location of perennating buds or organs. Later on, the life form spectrum was formulated by Raunkiaer (1934), which indicates phyto climate of the habitats and micro- and macro- climate. According to increased protection of the renewing buds, five major classes i.e. phanerophytes, chamaephytes, hemi cryptophytes, cryptophytes and therophytes were arranged in his classification. Mueller Dombois and Ellenberg (1974) was modified Raunkier's classification including plant features in the favorable season. Though, it is strongly criticized, Raunkier's system is still simplest and the most satisfying classification of plant life – forms.

Raunkiaer (1934) proposed "biological spectrum" which indicates the percent representation of the number of species belonging to each life form in a given flora. He also constructed a "normal spectrum" which acts as a 'null model' to identify the life form that characterizes the phyto climate or the vegetation under study.

The "floristic biological spectrum" prepared with species list carries same weight to every species. In "vegetation biological spectrum" that prepared by taking the number of individuals of each life form, each class has the weight by its abundance (Godron et al., 1969). Since it is problematic to count all plant individuals in a survey "frequency spectrum" was proposed by Raunkiaer (1934) where the weight was given to number of sampling units in which the species is present. It is important to study the floristic composition and life forms of different plants, since structure and rate of composition are sensitive indicators of whole environment. Pandeya (1954) demonstrated that the biological spectrum is the most potent environmental factor representing the ecosystem. Fekete & Laeze (1971) examined how the essence of Raunkier's biological spectrum becomes a tool in studies of phyto geography and plant ecology.

The work on this aspect in the study area i.e. at Chalama area of Nallamala forest located in Kurnool district, Andhra Pradesh, India has not been carried out so far. Thus, the present study has been carried out.

Our aim is to prepare biological spectrum with assemblage of different life forms at the study area, since analysis of geographical distribution and floristical investigation is most important for each region to manage and protect the existing inhabited stocks and species.

MATERIALS AND METHODS:

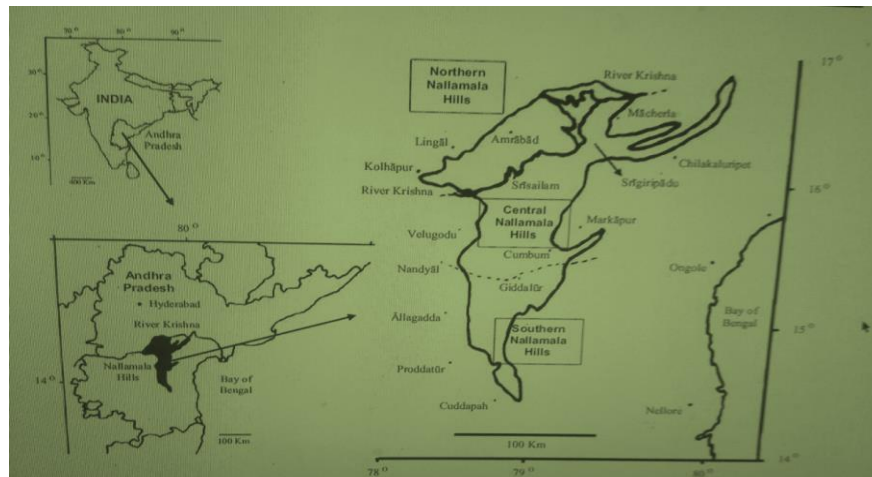
STUDY AREA:

Nallamalas are a section of Eastern Ghats, run in a nearly North – South alignment (N - 14° 24' - 16° 31' and E 78° 30' - 80° 10') between the rivers Krishna – and Pennar. The average elevation today is about 520m. Average annual rainfall of the

area is about 90 – 100 cm. concentrated in the months of June – September. Winters are mostly cool and dry with the average temperature around 25⁰ C. Temperatures rise up to 43 – 45⁰ C during May and drops to 8 – 12.5⁰ C in December.

The Nallamala hill ranges are divided into 3 zones – (i) The Northern Nallamala Hills. (ii). The Central Nallamala hills. (iii.) The Southern Nallamala hills. The central Nallamala hill ranges between the river Krishna and the British railway track between Nandyal and Guntur passing through Chalama, Bogada and Diguvametta. Chalama region is included in GBM Metta Wild life sanctuary which has been set aside to conserve the rich biodiversity of this tract. This area is selected for the present study. The map collected from Srinivasulu, C and Indraneil Das (2008) is showing the site of study area. (Figure -1).

Figure 1. Maps showing the location of the Nallamala Hills, Andhra Pradesh, south-eastern India. On top left, map of India, showing Andhra Pradesh State; on bottom left, map of Andhra Pradesh, showing location of Nallamala Hills; and on right, the Nallamala Hills, with study site.



METHODOLOGY:

Periodical floristic survey was conducted during the years 2016 – 2018 in different sites of the study area. Plant specimens were collected and the list of species is prepared from research plots of different sizes (50 x 50; 25 x 25; 10 x 10 m²) and their surroundings. All species of vascular plants were collected, identified and enumerated. The voucher specimens were identified with the help of local floras and e-floras. The mounted specimens are deposited in Department of Botany, Rayalaseema University, Kurnool. The data collected is analysed for family wise distribution of the species and given in table - 1. Habitat wise distribution is given in table – 2. Based on Raunkier's (1934) guidelines, life form for each species is recognized and assigned a suitable life form such as Therophytes (Th.), Phanerophytes(Ph.), Chamaephytes (Ch.), Hemi cryptophytes (H), and Cryptophytes (C). (Table – 3). The percentage life form was calculated by using the following formula –

$$\% \text{ Life - form} = \frac{\text{Number of species in any life form}}{\text{Total Number of species of all life forms}} \times 100$$

Biological spectrum of the study area is prepared and coupled with the Raunkier's (1934) Normal Biological Spectrum (Table – 4).

RESULTS & DISCUSSION:

The present study revealed the presence of 302 species that belongs to 218 genera, distributed in 74 families (Table – 1) The families Fabaceae and Poaceae are represented with 20 species in each followed by Rubiaceae (14), Acanthaceae (12), Euphorbiaceae (9), Asteraceae (8), Apocynaceae and Lamiaceae (7 in each), Sterculiaceae (6), Convolvulaceae and Malvaceae (5 in each), Caesalpiniaceae and Commalinaceae (4 in each), Amaranthaceae, Asclepiadaceae, Boraginaceae, Capparidaceae, Combretaceae, Cyperaceae, Menispermaceae, Mimosaceae, Scrophulariaceae, Teliaceae, Verbenaceae and Vitaceae (3 in each), Anacardiaceae, Annonaceae, Bursaraceae, Liliaceae, Lythraceae, Meliaceae, Olacaceae, Orchidaceae, Rhamnaceae and Rutaceae (2 in each). The remaining 41 families are represented with a single species in each indicates a lot of diversity of species in the area and a well functioning, highly productive community.

In an ecosystem comprising higher herbaceous species richness than that of longer – lived perennials, the nutrient retention and nutrient use efficiency are maximized (Hooper et al., 2005). Thus the study area may be highly significant in nutrient use efficiency and retention because it comprises 155 species of herbaceous flora among 302 species that are identified (Table -2). These species rich ecosystems have a higher probability of containing species with high levels of functioning. They may have longer food chains and complicated food web because the area is flourishing with different floral traits facilitating food resources to various kinds of insects (Meerabai, 2017). In a community, evolutionary success is commonly measured as the number of species in combination with phenotypic disparity or diversity (Hunter 1998; Schluter 2000). The study area is represented with a single species in about 41 families among the total of 74 families indicates that the area is highly evolved.

Different researchers of India have been worked out on biological spectra of different regions (Meher Homji, 1964; Pandey and Parmar, 1993, Sharma and Dhakre, 1993; Reddy et al., 1999, 2002; Rana et al., 2002; Pattanaik et al., 2007; Sudhakar Reddy et al. 2011). This kind of studies is useful to compare climatic adaptability of plant communities located in different regions of the world. The life form composition of the community contributes to community architecture since it is the

manifestation of the adaptations of its component species to the climatic condition (Jamir et al. 2006). Thus the data collected from study area given in table – 3 showing different habitués and life forms of the species is used to prepare biological spectrum of the study area and compared with normal biological spectrum. In the present investigation, phanerophytes and therophytes showed maximum divergence. Percentage of phanerophytes is showing similarity with normal biological spectrum indicates humid bio climate of the area. Therophytes showed maximum divergence from the normal spectrum. The higher proportion of therophytes is unique to arid and semiarid regions as compared to floristic spectrum (Pandey and Parmar, 1993). Chamaephytes, cryptophytes and hemi cryptophytes are showing less divergence.

CONCLUSION:

In present study it is concluded that the study area is showing Phanero – Therophytic climate due to sub tropical climate. Presence of such phytoclimate indicated that the maintenances of diversity and functioning of the ecosystem are influenced by the Phanerophytic phytoclimate, which is of vital importance influencing ecosystem processes. Prasad *et al.* (1998) found Thero-Phanerophytic spectrum for disturbed wooded areas like forests in Kerala. According to Cain (1950) Therophytes developed especially in areas where native vegetation has been disturbed.

The life forms and biological spectra of Indian region has been studied by various workers such as Bharucha & Ferreira (1941), Meher Homji (1964), Rao (1968), Pandey & Parmar (1993), Sharma & Dhakre (1993), Reddy *et al.* (1999), Rana *et al.* (2002), Reddy *et al.* (2002), Joshi & Janarthanam (2004), Nazir & Malik (2006) and Pattanaik *et al.* (2007) with a conclusion of phanerophytic climate in the study areas. The study area is furnishing with high percentage (37.7) of therophytic life form and less percentage of other life forms is probably due to anthropogenic activities and fire catchment disturbed the area so that annual therophytes re-established in the area when it is receiving rainfall.

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TABLE – 1 SHOWING NUMBER OF GENERA AND SPECIES IN EACH FAMILY AT THE STUDY AREA

S.No.	Name of the Family	No. of genera	No. of species
1.	Acanthaceae	12	18
2.	Adiantaceae	1	1
3.	Alangiaceae	1	1
4.	Amaranthaceae	3	3
5.	Amaryllidaceae	1	1
6.	Anacardiaceae	2	2
7.	Annonaceae	2	2
8.	Apocynaceae	7	7
9.	Araceae	1	1
10.	Asclepiadaceae	3	3
11.	Asparagaceae	1	1
12.	Asteraceae	8	9
13.	Bignoniaceae	1	1
14.	Bombacaceae	1	1
15.	Boraginaceae	3	4
16.	Burseraceae	2	2
17.	Caesalpiniaceae	4	9
18.	Capparidaceae	3	5
19.	Celastraceae	1	1
20.	Cochlospermaceae	1	1
21.	Combretaceae	3	3
22.	Commelinaceae	4	5
23.	Convolvulaceae	5	7
24.	Cordiaceae	1	1
25.	Cucurbitaceae	4	4
26.	Cyperaceae	3	3
27.	Dioscoreaceae	1	3
28.	Ebenaceae	1	2
29.	Erythroxylaceae	1	1
30.	Euphorbiaceae	9	19
31.	Fabaceae	20	41
32.	Flindersiaceae	1	1
33.	Gentianaceae	1	1
34.	Hernandiaceae	1	1
35.	Hypoxidaceae	1	1
36.	Lamiaceae	7	7

37.	Liliaceae	2	2
38.	Lobeliaceae	1	2
39.	Loganiaceae	1	1
40.	Loranthaceae	1	1
41.	Lythraceae	2	2
42.	Malvaceae	5	7
43.	Meliaceae	2	2
44.	Menispermaceae	3	3
45.	Mimosaceae	3	3
46.	Molluginaceae	1	1
47.	Moraceae	1	1
48.	Nyctaginaceae	1	2
49.	Olacaceae	2	2
50.	Oleaceae	1	1
51.	Onagraceae	1	1
52.	Opiliaceae	1	1
53.	Orchidaceae	2	2
54.	Oxalidaceae	1	1
55.	Plumbaginaceae	1	1
56.	Poaceae	20	24
57.	Polygalaceae	1	1
58.	Polygonaceae	1	1
59.	Rhamnaceae	2	4
60.	Rubiaceae	14	21
61.	Rutaceae	2	2
62.	Sapindaceae	1	1
63.	Sapotaceae	1	1
64.	Schizaeaceae	1	1
65.	Scrophulariaceae	3	3
66.	Simaroubaceae	1	1
67.	Solanaceae	1	1
68.	Sterculiaceae	6	6
69.	Taccaceae	1	1
70.	Tiliaceae	3	9
71.	Ulmaceae	1	1
72.	Verbenaceae	3	3
73.	Violaceae	1	1
74.	Vitaceae	3	5
	TOTAL	218	302

TABLE – 2 SHOWING THE NUMBER OF DIFFERENT HABITUES

S.No.	Habit	Number	% of the habit
1.	Trees	88	29.14
2.	Shrubs	30	9.93
3.	Herbs	155	51.33
4.	Climbers	20	6.62
5.	Stragglers	7	2.32
6.	Epiphytes	1	0.33
7.	Parasites	1	0.33

TABLE – 4 SHOWING NUMBER OF DIFFERENT LIFE FORMS AT THE STUDY AREA AND A COMPARISON OF BIOLOGICAL SPECTRUM OF THE AREA WITH NORMAL BIOLOGICAL SPECTRUM

S.No.	Name of the Life-form	Number of each Life Form	% of each Life form	Normal spectrum (%)
1.	Therophytes	114	37.748	13
2.	Chamaephytes	20	6.622	9
3.	Cryptophytes	8	2.649	6
4.	Hemi cryptophytes	19	6.291	26
5.	Phanerophytes	141	46.688	46
	TOTAL	302	99.998 = 100	

TABLE – 3 SHOWING DIFFERENT LIFE - FORMS AT CHALAMA AREA OF NALLAMALA FOREST

S.No.	Family	Name of the plant	Habit	Life Form
1.	Acanthaceae			
		1. <i>Andrographis nallamalayana</i> J.L.Ellis	Herb	Therophyte
		2. <i>Andrographis paniculeta</i> (Burm.f.) Wall. ex.	Herb	Therophyte
		3. <i>Blepharis maderaspatensis</i> (L.)	Herb	Therophyte
		4. <i>Dipteracanthus prostratus</i> (Poir.)	Herb	Therophyte
		5. <i>Elytraria acaulis</i> Lindau	Herb	Therophyte
		6. <i>Eranthemum roseum</i> (Vahl.) R.Br.	Shrub	Phanerophyte
		7. <i>Justicia betonica</i> L.	Shrubby herb	Chamaephyte
		8. <i>Justicia glabra</i> Koen. Ex. Roxb.	Herb	Therophyte
		9. <i>Justicia glauca</i> Rottl.	Herb	Therophyte
		10. <i>Justicia neeri</i> Raman Saldanha & Nicolson	Herb	Therophyte
		11. <i>Justicia procumbens</i> L.	Shrub	Phanerophyte
		12. <i>Lepidagathis subarmata</i> (Clarke) Gamble	Herb	Cryptophyte
		13. <i>Peristrophe paniculata</i> (Forsk.)	Herb	Therophyte
		14. <i>Rhinacanthus nasutus</i> (L.)	Herb	Therophyte
		15. <i>Rostellularia crinita</i> (Nees)	Herb	Therophyte
		16. <i>Rostellularia vahlii</i> (Roth.)	Herb	Therophyte
		17. <i>Ruellia petula</i> Jacq	Herb	Therophyte
		18. <i>Staurogyne glauca</i> (Nees.)	Herb	Therophyte
2.	Adiantaceae			
		1. <i>Adiantum incisum</i> Forsk.	Herb	Chamaephyte
3.	Alangiaceae			
		1. <i>Alangium salviifolium</i> Wang	Tree	Phanerophyte
4.	Amaranthaceae			
		1. <i>Achyranthes aspera</i> L.	Herb	Therophyte
		2. <i>Aerva lanata</i> (L.) Juss. Ex. Schult	Herb	Chamaephyte
		3. <i>Alternanthera sessilis</i> (L.)	Herb	Therophyte
5.	Amaryllidaceae			
		1. <i>Amaryllis vittata</i> Ait.	Herb	Cryptophyte
6.	Anacardiaceae			
		1. <i>Buchanania lanzan</i> Spreng.	Tree	Phanerophyte
		2. <i>Lannea coromandelica</i> (Houtt.) Merr.	Tree	Phanerophyte
7.	Annonaceae			
		1. <i>Miliusa tomentosa</i> (Roxb.)	Tree	Phanerophyte
		2. <i>Polyalthia cerasoides</i> Roxb.	Tree	Phanerophyte
8.	Apocynaceae			
		1. <i>Carissa carandus</i> L	Shrub	Phanerophyte
		2. <i>Gymnema sylvestre</i> Retz	Shrub	Phanerophyte
		3. <i>Hemidesmus indicus</i> L.(R.Br.)	Twiner	Phanerophyte
		4. <i>Holarrhena antidysenterica</i> Wall	Tree	Phanerophyte
		5. <i>Holarrhena Pubescens</i> (Buch – Ham)	Tree	Phanerophyte
		6. <i>Wrightia arborea</i> Dennst	Tree	Phanerophyte
		7. <i>Wrightia tinctoria</i> (Roxb.) R.Br.	Tree	Phanerophyte
9.	Araceae			
		1. <i>Theriophonum minutum</i> (Willd.)	Herb	Chamaephyte

10.	Asclepiadaceae			
		1. <i>Cryptolepis buchanani</i> Roem. & Schult.	Climber	Phanerophyte
		2. <i>Telosma pallida</i> (Roxb.)	Climber	Phanerophyte
		3. <i>Tylophora indica</i> (Burm. f.)	Climbing Shrub	Phanerophyte
11.	Asparagaceae			
		1. <i>Asparagus recemosus</i> Willd	Climbing Shrub	Phanerophyte
12.	Asteraceae			
		1. <i>Ageratum conyzoides</i> L.	Herb	Therophyte
		2. <i>Bidens biternata</i> (Lour.)	Herb	Therophyte
		3. <i>Blumea lacera</i> L.	Herb	Therophyte
		4. <i>Eclipta prostrata</i> (L.)	Herb	Therophyte
		5. <i>Legascea mollis</i> Cav.	Herb	Therophyte
		6. <i>Pulicaria wightiana</i> DC	Herb	Therophyte
		7. <i>Tridax procumbens</i> L.	Herb	Hemicryptophyte
		8. <i>Vernonia cinerea</i> L.	Herb	Therophyte
		9. <i>Vernonia divergence</i> (DC) Edgew.	Herb	Therophyte
13.	Bignoniaceae			
		1. <i>Dolichandrone falcata</i> Seem.	Tree	Phanerophyte
14.	Bombacaceae			
		1. <i>Bombax ceiba</i> L.	Tree	Phanerophyte
15.	Boraginaceae			
		1. <i>Coldenia procumbens</i> L.	Herb	Chamaephyte
		2. <i>Cordia dichotoma</i> Frost.F	Tree	Phanerophyte
		3. <i>Trichodesma indicum</i> (L.)	Herb	Therophyte
		4. <i>Trichodesma zeylanicum</i> Burm	Herb	Therophyte
16.	Burseraceae			
		1. <i>Boswellia serrata</i> Roxb.	Shrub	Phanerophyte
		2. <i>Garuga pinneta</i> Roxb.	Tree	Phanerophyte
17.	Caesalpiniaceae			
		1. <i>Cassia absus</i> L.	Shrub	Phanerophyte
		2. <i>Cassia auriculata</i> L.	Shrub	Phanerophyte
		3. <i>Cassia fistula</i> L.	Tree	Phanerophyte
		4. <i>Cassia pumilla</i> Lam.	Herb	Therophyte
		5. <i>Cassia tora</i> L.	Herb	Therophyte
		6. <i>Cassia uniflora</i> Mill	Shrub	Phanerophyte
		7. <i>Hardwickia binata</i> Roxb.	Tree	Phanerophyte
		8. <i>Pterolobium hexapetalum</i> Roth.	Tree	Phanerophyte
		9. <i>Tamarindus indica</i> L.	Tree	Phanerophyte
18.	Capparidaceae			
		1. <i>Capparis divaricata</i> Lam.	Tree	Phanerophyte
		2. <i>Capparis zeylanica</i> Auct. Non.L.	Shrub	Phanerophyte
		3. <i>Cleome tenella</i> L.f.	Herb	Chamaephyte
		4. <i>Cleome viscosa</i> L.	Herb	Chamaephyte
		5. <i>Crataeva magna</i> Lour	Tree	Phanerophyte
19.	Celastraceae			
		1. <i>Maytenus emarginata</i> (Willd.)	Shrub	Phanerophyte
20.	Cochlospermaceae			
		1. <i>Cochlospermum religiosum</i> (L.) Alston OR <i>Cochlospermum gossypium</i> Dc	Tree	Phanerophyte
21.	Combretaceae			
		1. <i>Anogeissus latifolia</i> (Roxb.ex DC.)Wall ex.Guillisper	Tree	Phanerophyte
		2. <i>Combretum albidum</i> G.Don.	Climbing shrub	Phanerophyte
		3. <i>Terminalia bellarica</i> Roxb	Tree	Phanerophyte
22.	Commelinaceae			
		1. <i>Amischophacelus axillaris</i> (L.)	Herb	Therophyte
		2. <i>Commelina attenuata</i> Koen.	Herb	Therophyte

		3. <i>Commelina erecta</i> L.	Herb	Therophyte
		4. <i>Cyanotis tuberosa</i> (Roxb.) Schultt & Schultt.f	Herb	Cryptophyte
		5. <i>Murdannia nudiflora</i> (L.)	Herb	Therophyte
23.	Convolvulaceae			
		1. <i>Argyreia setosa</i> (Roxb.)	Straggler	Hemicryptophyte
		2. <i>Evolvulus alsinoides</i> (L.)	Herb	Therophyte
		3. <i>Ipomoea hederifolia</i> L.	Herb	Therophyte
		4. <i>Ipomea pestigridis</i> L.	Climber	Phanerophyte
		5. <i>Ipomoea obscura</i> (L.)	Herb	Therophyte
		6. <i>Merremia aegyptica</i> (L.)	Herb	Therophyte
		7. <i>Rivea hypocrateriformis</i> (Desr.)	Shrub	Phanerophyte
24.	Cordiaceae			
		1. <i>Ehretia laevis</i> Roxb	Tree	Phanerophyte
25.	Cucurbitaceae			
		1. <i>Coccinia grandis</i> (L.)	Twiner	Phanerophyte
		2. <i>Cucumis trigonus</i> Roxb.	Herb	Therophyte
		3. <i>Diplocyclos palmatus</i> (L.)	Twiner	Phanerophyte
		4. <i>Mukia maderaspatana</i> (L.)	Climber	Therophyte
26.	Cyperaceae			
		1. <i>Cyperus tenuispica</i> Steud.	Herb	Therophyte
		2. <i>Kyllinga triceps</i> Rottb.	Herb	Cryptophyte
		3. <i>Mariscus cyperinus</i> (Retz.)	Herb	Therophyte
27.	Dioscoreaceae			
		1. <i>Dioscoria hispida</i> Dennst.Schluss	Herb	Cryptophyte
		2. <i>Dioscoria oppositifolia</i> L.	Climber	Phanerophyte
		3. <i>Dioscorea pentaphylla</i> L.	Climber	Phanerophyte
28.	Ebenaceae			
		1. <i>Diospyros chloroxylon</i> Roxb.	Tree	Phanerophyte
		2. <i>Diospyros melanoxylon</i> Rottl	Tree	Phanerophyte
29.	Erythroxylaceae			
		1. <i>Erythroxylum monogynum</i> Roxb	Tree	Phanerophyte
30.	Euphorbiaceae			
		1. <i>Antidesma ghaesembilla</i> Gaertn.	Tree	Phanerophyte
		2. <i>Breynia retusa</i> (Dennst.)	Shrub	Phanerophyte
		3. <i>Bridelia montana</i> Willd.	Shrub	Phanerophyte
		4. <i>Bridelia retusa</i> (L.)	Tree	Phanerophyte
		5. <i>Cleistanthus collinus</i> Roxb.	Tree	Phanerophyte
		6. <i>Cleistanthus parvifolius</i> Hook.f	Tree	Phanerophyte
		7. <i>Cleistanthus patulus</i> Roxb	Tree	Phanerophyte
		8. <i>Euphorbia elegans</i> Spreng.	Herb	Therophyte
		9. <i>Euphorbia hirta</i> L.	Herb	Therophyte
		10. <i>Euphorbia linearifolia</i> Roth.	Herb	Therophyte
		11. <i>Euphorbia tirucalli</i> L.	Tree	Phanerophyte
		12. <i>Joannesia princeps</i> Vell.	Tree	Phanerophyte
		13. <i>Phyllanthus amarus</i> Schum. & Thonn.	Herb	Therophyte
		14. <i>Phyllanthus debilis</i> J.G.Klein	Herb	Therophyte
		15. <i>Phyllanthus emblica</i> L.	Tree	Phanerophyte
		16. <i>Phyllanthus maderaspatensis</i> L.	Herb	Therophyte
		17. <i>Phyllanthus virgatus</i> Forst.	Herb	Therophyte
		18. <i>Sebastiania chamaelea</i> (L.)	Herb	Therophyte
		19. <i>Securinega virosa</i> (Roxb. Ex Willd.)	Shrub	Phanerophyte
31.	Fabaceae			
		1. <i>Abrus precatorius</i> L.	Shrub	Phanerophyte
		2. <i>Alysicarpus heterophyllus</i> (Benth. ex Baker)	Herb	Therophyte
		3. <i>Alysicarpus scariosus</i> (Rottl.ex Spr.)	Herb	Therophyte
		4. <i>Alysicarpus vaginalis</i> (L.) DC.	Herb	Therophyte
		5. <i>Atylosia scarabaeoides</i> (L.)Benth	Herbaceous twiner	Chamaephyte
		6. <i>Bauhinia racemosa</i> Lam.	Tree	Phanerophyte

		7. <i>Bauhinia variegata</i> L.	Tree	Phanerophyte
		8. <i>Canavalia gladiata</i> (Jacq.) DC.	Shrub	Phanerophyte
		9. <i>Crotalaria hirsuta</i> Willd.	Shrub	Phanerophyte
		10. <i>Crotalaria medicaginea</i> Lam.	Herb	Therophyte
		11. <i>Crotalaria mysorensis</i> Roth.	Herb	Therophyte
		12. <i>Crotalaria prostrata</i> Rottl.	Herb	Therophyte
		13. <i>Dalbergia latifolia</i> Roxb	Tree	Phanerophyte
		14. <i>Dalbergia paniculata</i> Roxb.	Tree	Phanerophyte
		15. <i>Derris scandens</i> (Roxb.)	Tree	Phanerophyte
		16. <i>Desmodium gangeticum</i> L.	Herb	Chamaephyte
		17. <i>Desmodium laxiflorum</i> DC.	Shrub	Phanerophyte
		18. <i>Desmodium pulchellum</i> (L.) Benth.	Shrub	Phanerophyte
		19. <i>Desmodium velutinum</i> (Willd.) DC	Herb	Therophyte
		20. <i>Erythrina indica</i> Lam.	Tree	Phanerophyte
		21. <i>Indigofera barberi</i> Gamb.	Shrub	Therophyte
		22. <i>Indigofera cordifolia</i> Roth	Herb	Therophyte
		23. <i>Indigofera cassioides</i> Rottl. ex DC.	Herb	Therophyte
		24. <i>Indigofera linnaei</i> Ali	Herb	Therophyte
		25. <i>Indigofera linifolia</i> Retz	Herb	Therophyte
		26. <i>Indigofera trita</i> L.F.	Herb	Therophyte
		27. <i>Milletia racemosa</i> (Wight & Arn.)	Climber	Phanerophyte
		28. <i>Mucuna hirsuta</i> Wight & Arn.	Twiner	Phanerophyte
		29. <i>Mucuna pruriens</i> (L.) DC.	Twiner	Therophyte
		30. <i>Phaseolus polystachios</i> (L.)	Climber	Phanerophyte
		31. <i>Pterocarpus marsupium</i> Roxb.	Tree	Phanerophyte
		32. <i>Tephrosia pumila</i> (Lam.)	Herb	Chamaephyte
		33. <i>Tephrosia purpurea</i> (L.)	Herb	Chamaephyte
		34. <i>Rhynchosia bracteata</i> Benth.	Climbing herb	Phanerophyte
		35. <i>Rhynchosia capitata</i> Roth	Slender climber	Phanerophyte
		36. <i>Rhynchosia minima</i> (L.) DC.	Herb	Therophyte
		37. <i>Rhynchosia viscosa</i> (Roth) DC.	Herb	Therophyte
		38. <i>Uraria picta</i> Desv.	Shrub	Phanerophyte
		39. <i>Vigna aconitifolia</i> (Jacq.)	Herb	Therophyte
		40. <i>Vigna radiata</i> (L.)	Herb	Therophyte
		41. <i>Zornia gibbosa</i> Span.	Herb	Therophyte
32.	Flindersiaceae			
		1. <i>Chloraxylon swietenia</i> DC	Tree	Phanerophyte
33.	Gentianaceae			
		1. <i>Conscora pauciflora</i> Dalzel	Herb	Therophyte
34.	Hernandiaceae			
		1. <i>Gyrocarpus americanus</i> Jacq.	Tree	Phanerophyte
35.	Hypoxidaceae			
		1. <i>Curculigo orchioides</i> Gaertn	Herb	Cryptophyte
36.	Lamiaceae			
		1. <i>Acrocephalus indicus</i> (Burm.f.) Kunz	Herb	Therophyte
		2. <i>Anisomeles indica</i> (L.) Kuntze	Shrub	Phanerophyte
		3. <i>Endostemon viscosus</i> (Roth.)	Herb	Therophyte
		4. <i>Hyptis suaveolens</i> (L.) Poit.	Shrub	Phanerophyte
		5. <i>Leonotis nepatifolia</i> (L.)		
		6. <i>Lucas aspera</i> Willd	Herb	Therophyte
		7. <i>Orthosiphon thymiflorus</i> (Roth)	Shrub	Phanerophyte
37.	Liliaceae			
		1. <i>Chlorophytum tuberosum</i> (Roxb.)	Herb	Chamaephyte
		2. <i>Gloriosa superba</i> L.	Shrub	Phanerophyte
38.	Lobeliaceae			
		1. <i>Lobelia alsinoides</i> Lam.	Herb	Therophyte
		2. <i>Lobelia heyneana</i> Roem. & Schult.	Herb	Therophyte
39.	Loganiaceae			
		1. <i>Strychnos potatorum</i> L.f.	Tree	Phanerophyte
40.	Loranthaceae			

		1. <i>Taxillus bracteatus</i> (Wall.)	Stem Parasite	Phanerophyte
41.	Lythraceae			
		1. <i>Ammannia baccifera</i> L.	Herb	Therophyte
		2. <i>Lagerstroemia parviflora</i> Roxb.	Tree	Phanerophyte
42.	Malvaceae			
		1. <i>Abutilon indica</i> (L.)	Shrub	Phanerophyte
		2. <i>Ceiba pentandra</i> (L.) Gaertn.	Tree	Phanerophyte
		3. <i>Hibiscus lobatus</i> (Murr.)	Herb	Therophyte
		4. <i>Pavonia odorata</i> Willd.	Herb	Therophyte
		5. <i>Sida acuta</i> Burm.	Herb	Chamephyte
		6. <i>Sida cordifolia</i> Linn.	Herb	Chamephyte
		7. <i>Sida rhombifolia</i> L.	Herb	Chamephyte
		8. <i>Thespesia lampas</i> (Can) Dalz & Gibs	Shrub	Phanerophyte
		9. <i>Urena lobeta</i> L	Shrub	Phanerophyte
43.	Meliaceae			
		1. <i>Azadirachta indica</i> A.Juss.	Tree	Phanerophyte
		2. <i>Soymida febrifuga</i> Roxb	Tree	Phanerophyte
44.	Menispermaceae			
		1. <i>Cissampelos pareira</i> L.	Climbing shrub	Phanerophyte
		2. <i>Cocculus hirsutus</i> L	Climber	Phanerophyte
		3. <i>Tinospora cordifolia</i> (Willd.)	Straggler	Hemicryptophyte
45.	Mimosaceae			
		1. <i>Acacia chundra</i> (Roxb.et Rottl.)	Tree	Phanerophyte
		2. <i>Acacia pennata</i> (L.) Willd.	Small tree	Phanerophyte
		3. <i>Albizia amara</i> (Roxb) Boiv.	Tree	Phanerophyte
		4. <i>Albizia lebbeck</i> (L.)	Tree	Phanerophyte
		5. <i>Albizia odoratissima</i> (L.f.) Benth.	Tree	Phanerophyte
		6. <i>Mimosa polyancistra</i> Benth.	Straggling shrub	Hemicryptophyte
46.	Molluginaceae			
		1. <i>Mollugo pentaphylla</i> L.	Herb	Therophyte
47.	Moraceae			
		1. <i>Ficus racemosa</i> L.	Tree	Phanerophyte
48.	Nyctaginaceae			
		1. <i>Boerhavia chinensis</i> (L.)	Herb	Therophyte
		2. <i>Boerhavia diffusa</i> L.	Creeping herb	Hemicryptophyte
49.	Olacaceae			
		1. <i>Olex scandens</i> Roxb.	Tree	Phanerophyte
		2. <i>Ximenia americana</i> L.	Straggler	Hemicryptophyte
50.	Oleaceae			
		1. <i>Nyctanthus arbortristis</i> L.	Shrub	Phanerophyte
51.	Onagraceae			
		1. <i>Ludwigia perennis</i> L.	Herb	Therophyte
52.	Opiliaceae			
		1. <i>Opilia amentacea</i> Roxb.	Straggler	Hemicryptophyte
53.	Orchidaceae			
		1. <i>Geodorum densiflorum</i> (Lam.) Schlech.	Herb	Cryptophyte
		2. <i>Vanda tessellata</i> (Roxb.)	Epiphyte	Phanerophyte
54.	Oxalidaceae			
		1. <i>Biophytum nervifolium</i> Thw.Enum.	Herb	Chamaephyte
55.	Plumbaginaceae			
		1. <i>Plumbago zeylanica</i> L.	Shrub	Therophyte
56.	Poaceae			
		1. <i>Apluda mutica</i> L.	Herb	Therophyte
		2. <i>Aristida adscensions</i> L.	Herb	Therophyte
		3. <i>Arundinella nepalensis</i> Trin.	Herb	Cryptophyte
		4. <i>Bambusa arundinaceae</i> (Retz)Willd.	Tree	Phanerophyte

		5. <i>Brachiaria ramosa</i> (L.) Stapf.	Herb	Therophyte
		6. <i>Cymbopogon coloratus</i> (Nees) Stapf.	Herb	Hemicryptophyte
		7. <i>Chrysopogon fulvus</i> (Spreng.)	Herb	Therophyte
		8. <i>Dicanthium huegelli</i> (Hack.)	Herb	Hemicryptophyte
		9. <i>Dicanthium pseudoischaemum</i> (Nees ex Steud.)	Herb	Hemicryptophyte
		10. <i>Digitaria ciliaris</i> (Retz) Koel	Herb	Therophyte
		11. <i>Digitaria longiflora</i> (Retz)Pers	Herb	Therophyte
		12. <i>Eragrostis pilosa</i> (L.) Beauv.	Herb	Therophyte
		13. <i>Eragrostis tenella</i> (L.) Beauv.	Herb	Therophyte
		14. <i>Eragrostis uniolodes</i> (Retz.)	Herb	Therophyte
		15. <i>Eragrostiella brachyphylla</i> (Stapf.)	Herb	Hemicryptophyte
		16. <i>Eremopogon foveolatus</i> (Del.) Stapf.	Herb	Hemicryptophyte
		17. <i>Eulalia trispicata</i> (Schult.)	Herb	Hemicryptophyte
		18. <i>Hackelochloa granularis</i> (L.)	Herb	Therophyte
		19. <i>Oplismenus burmannii</i> (Retz.) P.	Herb	Hemicryptophyte
		20. <i>Paspalidium flavidum</i> (Retz.)	Herb	Therophyte
		21. <i>Paspalum scorbiculatum</i> L.Mant.	Herb	Therophyte
		22. <i>Rottboellia exaltata</i> L.f.	Herb	Hemicryptophyte
		23. <i>Sehima nervosum</i> (Rottl. Ex Willd.)	Herb	Therophyte
		24. <i>Themeda triandra</i> Forsk.	Herb	Hemicryptophyte
57.	Polygalaceae			
		1. <i>Polygala chinensis</i> L.	Herb	Therophyte
58.	Polygonaceae			
		1. <i>Polygonum plebeium</i> R.Br.	Herb	Therophyte
59.	Rhamnaceae			
		1. <i>Ventilago denticulata</i> Willd.	Straggler	Hemicryptophyte
		2. <i>Ziziphus mauritiana</i> Lam.	Tree	Phanerophyte
		3. <i>Ziziphus oenoplia</i> (L.) Mill	Shrub	Phanerophyte
		4. <i>Ziziphus xylopyrus</i> (Retz.)	Shrub	Phanerophyte
60.	Rubiaceae			
		1. <i>Anthocephalus cadamba</i> (Roxb.) Miq.	Tree	Phanerophyte
		2. <i>Anthocephallus chinensis</i> (Lam.)	Tree	Phanerophyte
		3. <i>Borreria articularis</i> (L.f.)	Herb	Therophyte
		4. <i>Borreria hispida</i> L	Herb	Therophyte
		5. <i>Borreria pusilla</i> (Wall.) DC.	Herb	Therophyte
		6. <i>Catunaregam spinosa</i> (Thunb.)	Tree	Phanerophyte
		7. <i>Ceriscoides turgida</i> (Roxb.)	Tree	Phanerophyte
		8. <i>Gardenia gummifera</i> L.f.	Tree	Phanerophyte
		9. <i>Gardenia latifolia</i> Ait.	Tree	Phanerophyte
		10. <i>Gardenia resinifera</i> Roth	Tree	Phanerophyte
		11. <i>Haldina cordifolia</i> (Roxb.) OR <i>Adina cordifolia</i> (Roxb.)	Tree	Phanerophyte
		12. <i>Ixora pavetta</i> Andrews	Tree	Phanerophyte
		13. <i>Mitragyna parviflora</i> (Roxb.) Korth.	Tree	Phanerophyte
		14. <i>Morinda tomentosa</i> Heyne ex.Roth.	Tree	Phanerophyte
		15. <i>Oldenlandia affinis</i> (Roem. & Schult.)	Herb	Therophyte
		16. <i>Oldenlandia umbellata</i> L.	Herb	Therophyte
		17. <i>Pavetta indica</i> L.	Herb	Therophyte
		18. <i>Randia uliginosa</i> (Retz.) Poir.	Tree	Phanerophyte
		19. <i>Spermacoce hispida</i> L	Tree	Phanerophyte
		20. <i>Spermacoce latifolia</i> Aublet.Hist.	Herb	Hemicryptophyte
		21. <i>Wendlandia tinctoria</i> (Roxb.) DC.	Tree	Phanerophyte
61.	Rutaceae			
		1. <i>Aegle marmelos</i> (L.) Corr.	Tree	Phanerophyte
		2. <i>Feronia elephantum</i> Cor. OR <i>Limonia acidissima</i> L.	Tree	Phanerophyte
62.	Sapindaceae			
		1. <i>Cardiospermum halicacabum</i> L.	Herb	Therophyte
63.	Sapotaceae			
		1. <i>Madhuka indica</i> Gmel.	Tree	Phanerophyte

64.	Schizaeaceae	1. <i>Lygodium flexosum</i> L.	Herb	Chamaephyte
65.	Scrophulariaceae	1. <i>Buchnera hispida</i> Ham.ex. D. 2. <i>Limnophila indica</i> (L.) 3. <i>Striga gesneriodes</i> (Willd.)	Herb Herb Herb	Therophyte Therophyte Hemicryptophyte
66.	Simaroubaceae	1. <i>Ailanthus excelsa</i> Roxb.	Tree	Phanerophyte
67.	Solanaceae	1. <i>Solanum incanum</i> L.	Herb	Therophyte
68.	Sterculiaceae	1. <i>Byttaria herbacea</i> Roxb. 2. <i>Eriolaena lushingtonii</i> Dunn. 3. <i>Helicteres isora</i> L 4. <i>Melochia corchorifolia</i> L. 5. <i>Sterculia urens</i> Roxb 6. <i>Waltheria indica</i> L.	Herb Tree Shrub Herb Tree Herb	Therophyte Phanerophyte Phanerophyte Therophyte Phanerophyte Chamaephyte
69.	Taccaceae	1. <i>Tacca leontopetaloides</i> (L.) O. Kuntze.	Herb	Chamaephyte
70.	Tiliaceae	1. <i>Corchorus aestuans</i> L 2. <i>Corchorus fascicularis</i> Lam. 3. <i>Corchorus solitorius</i> L. 4. <i>Grewia flavescens</i> Juss 5. <i>Grewia hirsuta</i> Vahl . 6. <i>Grewia latifolia</i> Muell 7. <i>Grewia rothii</i> DC. 8. <i>Grewia tiliifolia</i> Vahl. 9. <i>Triumfetta pentandra</i> A.Rich.	Herb Herb Herb Tree Tree Tree Tree Tree Tree Herb	Therophyte Therophyte Therophyte Phanerophyte Phanerophyte Phanerophyte Phanerophyte Phanerophyte Phanerophyte Chamaephyte
71.	Ulmaceae	1. <i>Holoptelea integrifolia</i> (Roxb.)	Tree	Phanerophyte
72.	Verbenaceae	1. <i>Gmelina arborea</i> Roxb. 2. <i>Premna tomentosa</i> Willd. 3. <i>Tectona grandis</i> L.f	Tree Tree Tree	Phanerophyte Phanerophyte Phanerophyte
73.	Violaceae	1. <i>Hybanthus enneaspermus</i> (L.) Muell.	Herb	Chamaephyte
74.	Vitaceae	1. <i>Amphelocissus latifolia</i> Roxb 2. <i>Cayratia auriculata</i> (Roxb.) Gamble. 3. <i>Cayratia trifolia</i> (L.) Domin. 4. <i>Cissus pallida</i> Planch 5. <i>Cissus vitiginea</i> L.	Climber Climber Climbing shrub Tree Climbing shrub	Phanerophyte Phanerophyte Phanerophyte Phanerophyte Phanerophyte

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