



**Indicative Flora of Eco-Sensitive Zone of  
Nakti Dam Bird Sanctuary,  
Jamui district, Bihar**

**Submitted by**

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Botanical Survey of India, Howrah**

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**INDICATIVE FLORA OF ECO-SENSITIVE ZONE  
OF NAKTI DAM BIRD SANCTUARY,  
JAMUI DISTRICT, BIHAR**

**Office order no: BSI-281/19/2017-Tech dated 11<sup>th</sup> July, 2017**

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**Kumar Avinash Bharati**

## 1. About the project

- Title of the project** : Indicative flora of Eco-Sensitive Zone of Nakti dam Bird Sanctuary, Jamui district, Bihar.
- Office order** : **Do No: BSI-281/19/2017-Tech dated 11<sup>th</sup> July, 2017**
- Name, designation and affiliations of executing official** : **Kumar Avinash Bharati**  
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P.O. - Botanic Garden, Shibpur, Howrah-711103.
- Duration of field tour** : **15.11.2017 to 18.11.2017**
- Study site** : The Nakti Dam Bird Sanctuary is situated in Jamui District of Bihar and lies between latitude N 24.50' and N 24.51' and longitude E 86.26' and extends over an area of 337.85 hectare or 3.3875 square kilometres. The sanctuary with the water body of the reservoir and surrounding tract is the habitat of many important migratory and resident bird species including the Bar-Headed Goose, Lalsar, Brahmny Duck, Snake bird, Cormorant, Open Bill Stork, Hoopoe, White Breasted Kingfisher, Pied kingfisher, Red-vented Bulbul and Grey Horn Bill, Barn Owl, Falcon, Ibis, etc.
- Outcome** : The Eco-Sensitive Zone of Nakti Dam Bird Sanctuary was surveyed during the above mentioned period. A total of 179 species of flowering plants have been documented. The photographs of most of the plants were taken and GPS data of waypoints pathway were recorded.

## 2. Background

### 2.1 Creation of eco-sensitive zone

In the XXI meeting of the Indian Board for Wildlife held on 21<sup>st</sup> January 2002, a “Wildlife Conservation Strategy-2002” was adopted. It state that lands falling within 10 Km of the boundaries of National parks and Sanctuaries should be notified as eco-fragile zones under section 3 (v) of the Environment (Protection) Act and Rule 5 Sub rule (viii) & (x) of the Environment (Protection) Rules. The National Wildlife Action Plan, 2002-2016 indicates that “Area outside the protected area network are often vital ecological corridor links and must be protected to prevent isolation of fragments of biodiversity which will not survive in the long run. Land and water use policies will need to accept the imperative of strictly protecting ecologically fragile habitats and regulating use elsewhere” (<http://www.moef.gov.in>).

Keeping above in view, the eco-sensitive zones have been created around National Parks and Sanctuaries for the purpose of protection of the protected areas. The eco-sensitive zones works as “shock absorber” and function as transition zone from area of high protection to the areas of lesser protection. The eco-sensitive zones has immense role in the conservation of wild resources of the National Parks and Sanctuaries because it regulates the anthropogenic activities in close vicinity to the boundaries.

### 2.2 Nakti Dam Bird Sanctuary

The sanctuary is situated in Jamui District of Bihar and lies between latitude N 24.50’ and N 24.51’ and longitude E 86.26’ and extends over an area of 337.85 hectare or 3.3875 square kilometres (**Map 1**). The dam is built in 1983 on the river Nakti for the storage of runoff water during rainy season and provides sustainable source of water for irrigation through canals downwards. It also supports local natural vegetation, control soil erosion and recharges ground water. In the year 2016, the *Nakti Dam Bird Sanctuary* notification was published in the Gazette of India (Gazette of India, 2016). The sanctuary with the water body of the reservoir and surrounding tract is the habitat of many species of



0 30 60 120 kilometers



**Map 1:** Location of the Eco-Sensitive Zone (Nakti Dam Bird Sanctuary, Jamui, Bihar)

fishes (36 spp.), amphibians, reptiles (16 spp.) and Birds (133 spp.). important migratory and resident bird species including the Bar-Headed Goose, Lalsar, Brahmny Duck, Snake bird, Cormorant, Open Bill Stork, Hoopoe, White Breasted Kingfisher, Pied kingfisher, Red-vented Bulbul and Grey Horn Bill, Barn Owl, Falcon, Ibis, etc.

### *2.3 Extent and boundaries of Eco-Sensitive Zone*

(1) The Eco-sensitive Zone is spread over an area of 23.29 square kilometres around the boundary of the Nakti Dam Bird Sanctuary with an extent varying from 0 to 500 meters from the boundary of Nakti Bird Sanctuary.

(2) The Eco-sensitive Zone is spread across six villages. Following villages falling within the Eco-sensitive Zone are: Tola Katbajra, Tola Kusauna, Tola Bhelbinda, Tola Kubri, Tola Saraiah and Tola Baijala.

### *2.4 Geography*

The study area is the part of Chotanagpur plateau. The small foot hills are found at some places. Some of the sources claim that the hills around the dam are the extension of Vindhya range (<https://jamui.nic.in/about-district/>). The soil is reddish and full of gravels and pebbles and found on the slopes and around river beds. At some places soil are mixture of sand and clay and such areas are under cultivation. The year can be divided in to 4 seasons, i.e. winter from middle of November to middle of March, summer from middle of March to June, and monsoon from July to September, October to middle of November are transitional months (autumn season). The hottest month is May (33 °C average temperature) and coldest month is January (16 °C average temperature) and the annual rainfall is 660.4 mm per year. The relative humidity varies 80%-20% depending on the season. Except monsoon area face less humidity and the average humidity is 48%. (<https://www.timeanddate.com/weather/india/jamui/climate>).

The vegetation of the area is Tropical dry deciduous (Champion & Seth, 1968). The natural vegetation is present at few places with presence of *Boswellia serrata*, *Anogeissus latifolia*, *Madhuca longifolia*, *Ipomoea* spp., *Ziziphus jujuba*,



*Datura metel*, *Achyroathus aspera*, *Mikania micrantha*, *Lantana camara*, etc. However, within the eco-sensitive zone about 5 acres of a patch is covered by natural Dry Sal forest. The patch is dominated by *Shorea robusta*, *Diospyros melanoxylon*, *Anogeissus latifolia* and *Barleria prionitis*.

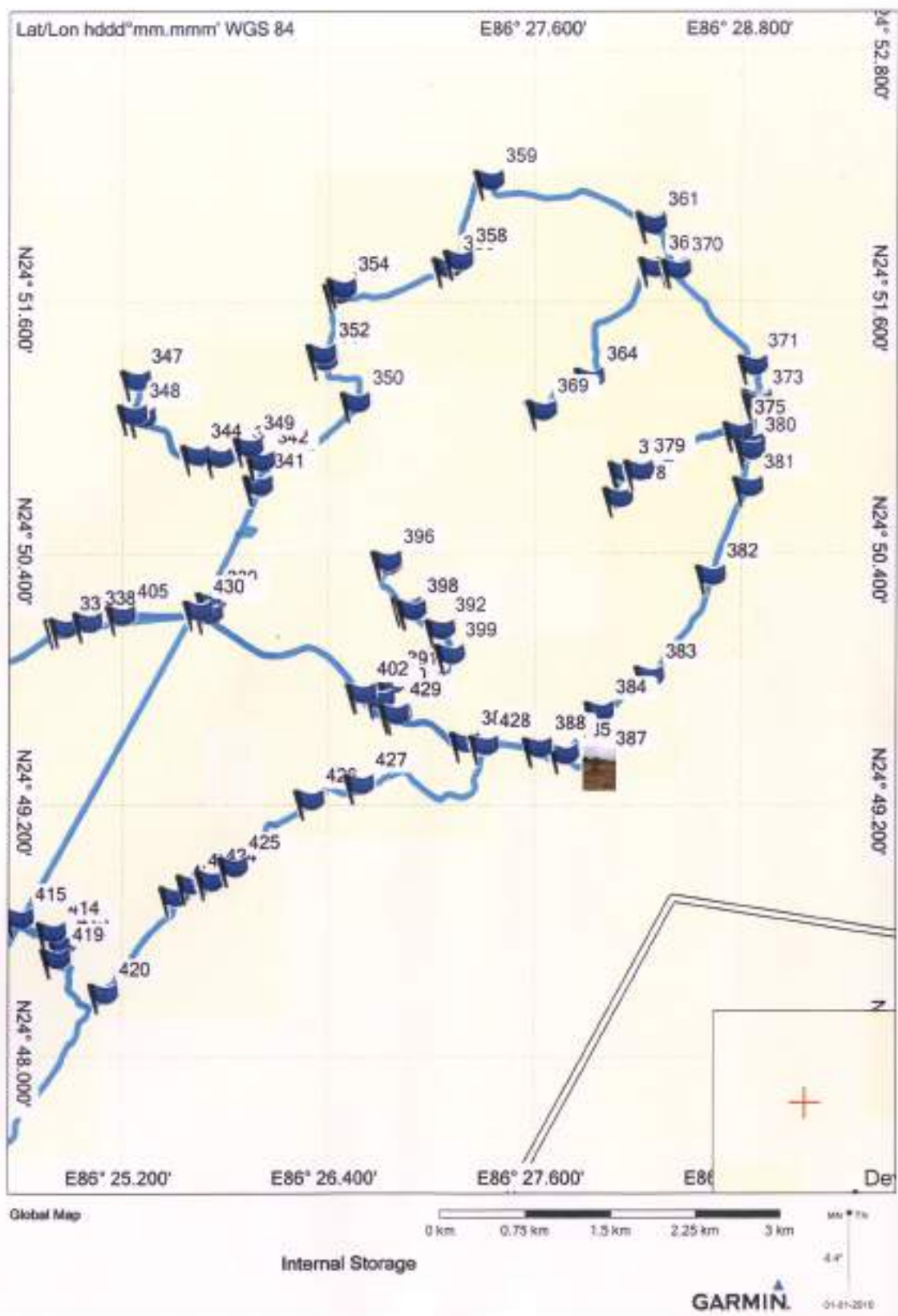
### **3. Review of Literature**

Hooker (1848) was the first botanist who had collected plants in Bihar. He was followed by Anderson (1863), who had worked on the flora of Bihar and the mountains of Parasnath. Ball (1866, 1867a, b) studied the flora of Manbhum and Hazaribagh with focused on edible plant resources of the indigenous population. Wood (1906) has published plants of Chotanagpur. Most remarkable published was "Botany of Bihar and Orissa" by Haines (1921–1925). Mooney (1941, 1944, 1947, 1950) has explored many part of the state published many literature on addition to the flora of Bihar and Orissa, supplement to Haines flora and collections from Chotanagpur plateau. The next milestone work was done by Singh et al. (2001) in form of Flora of Bihar Analysis. There are several publications are available on the state. However, significant contributions on the flora of the surrounding areas are made by Clarke (1884), Thomson (1917), Biswas & Sampathkumaran (1949), Mukherjee (1947, 1956), Bressers (1951), Ara (1954, 1960), Bharadwaja (1958), Srivastava (1958, 1959, 1961, 1964), Panigrahi (1966), Meher-Homji (1971), Majumdar & Biswas (1971), Biswas & Maheshwari (1980), Paul (1990), Paul & Prasad (1978), Paria & Chattopadhyay (2000, 2005), Sharma and Sarkar (2001) and Ranjan (2014). The flora of Jamui district has not published yet.

### **4. Methodology**

A field tour was conducted from 15<sup>th</sup> November, 2017 to 18<sup>th</sup> November, 2017 in the in the eco-sensitive zone of the Nakti Dam Bird Sanctuary (**Table 1; Map 2**). The specimens were collected from different localities to cover almost all the areas (**Map 3**). Wide range of habitats including small forest patch, degraded land, cultivated lands, orchards, ponds, and range land were explored and plants were collected in flowering and fruiting stages. The plant materials were

# ROUTE MAP



Map 2: Route followed during collection



collected with the help of secateurs and the key morphological characters were documented in the field-book. All the specimens were dried inside the blotting sheets and pressed under plant-press. The plant species were identified with the help of relevant floras: Bentham & Hooker (1862-1883), Prain (1903), Haines (1921-1925) and Mooney (1941). Identification was also cross checked by matching voucher specimens with holdings at Central National Herbarium, Botanical Survey of India, Howrah (CAL). The botanical names of the plant specimens were updated according to the Plant List ([www.theplantlist.org](http://www.theplantlist.org)).

**Table 1:** Itinerary (15.11.2017 to 19.11.2017)

<b>S. No.</b>	<b>Date</b>	<b>Journey &amp; area surveyed</b>
1.	15.11.2017 to 15.11.2017	Journey by office vehicle to reach the Howrah railway station from CNH. Then, travelled by the train to reach the Jhajha railway station and used vehicle to reach Shivraj hotel, Jhajha.
2.	16.11.2017	In the morning, took taxi from Shivraj hotel, Jhajha to reach the Nakti dam and visited following eco-sensitive zones: Nakti dam, Kathbajra, Gotiya, Bajla & Tiwaria.
3.	17.11.2017	In the morning, took taxi from Shivraj hotel, Jhajha to reach the Nakti dam and visited following villages falls under eco-sensitive zones: Kushauna, Vellabind, Saraiya & Saraiya-Santhal.
4.	18.11.2017 to 19.11.2017	Returned to Howrah by Train.



**Plate 1: a - h. Different habitats under the study area**



**Plate 2: a - h. Different habitats under the study area**

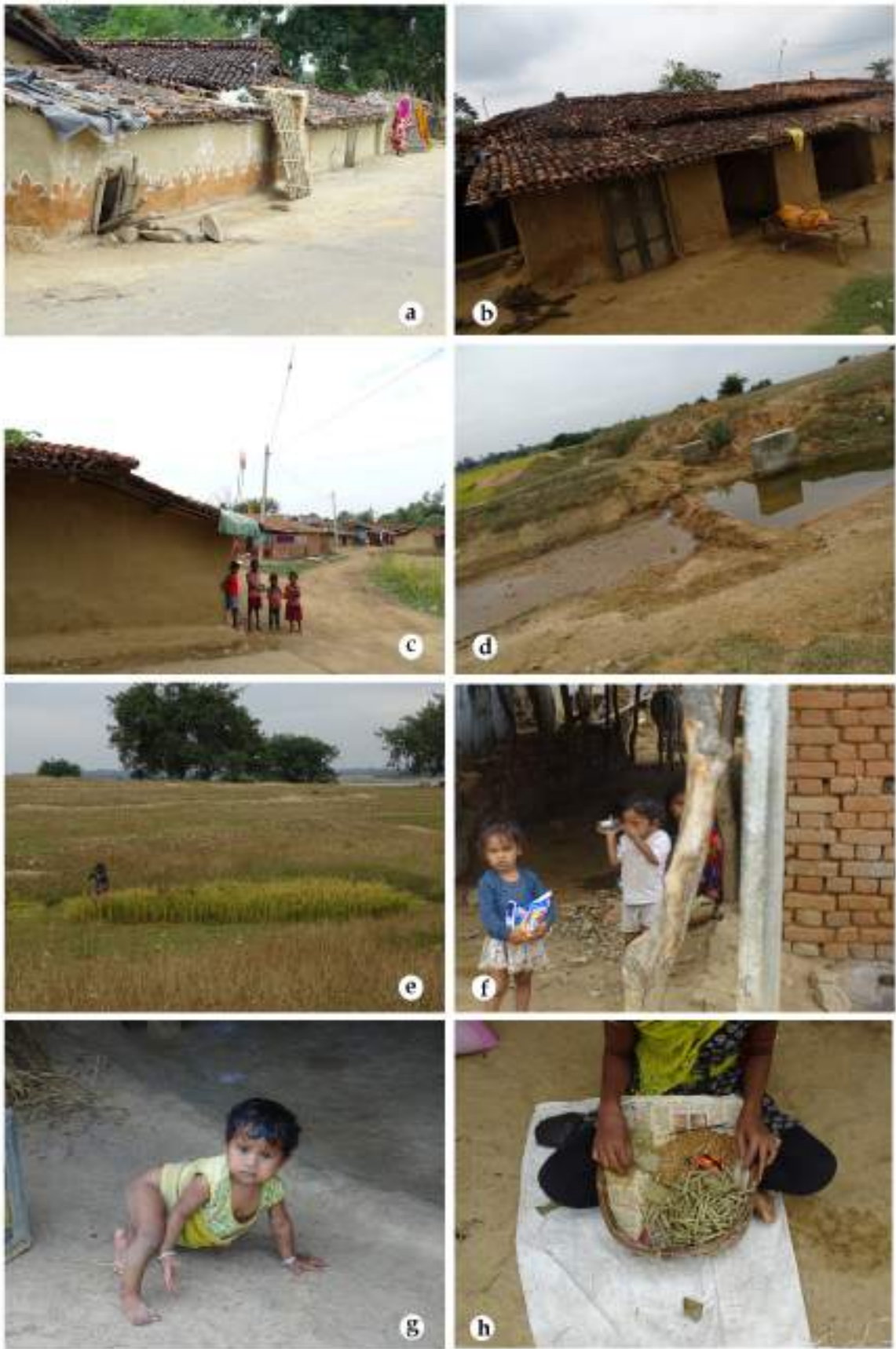


Plate 3: a - h. Villages and people in the study area



Plate 4: a - h. Different places of interest inside the study area



## 5. Enumeration of Species

A total of 179 species of angiosperms were documented in the study area and the names of the species are enlisted as per the Angiosperm Phylogeny Group (APG IV) classifications for the orders and families of flowering plants (Chase & *al.*, 2016):

**Table 2:** Enumeration of angiosperm of eco-sensitive zone of Nakti dam Bird Sanctuary

*APG IV family no.	Family	S. No.	Species
4	Nymphaeaceae Salisb.	1.	<i>Nymphaea nouchali</i> Burm.f.
32	Hydrocharitaceae Juss.	2.	<i>Ottelia alismoides</i> (L.) Pers.
61	Orchidaceae Juss.	3.	<i>Vanda tessellata</i> (Roxb.) Hook. ex G.Don
74	Asparagaceae Juss.	4.	<i>Asparagus racemosus</i> Willd.
76	Arecaceae Bercht. & J.Presl	5.	<i>Borassus flabellifer</i> L.
		6.	<i>Phoenix sylvestris</i> (L.) Roxb.
78	Commelinaceae Mirb.	7.	<i>Commelina benghalensis</i> L.
		8.	<i>Cyanotis axillaris</i> (L.) D.Don ex Sweet
		9.	<i>Murdannia spirata</i> (L.) G.Brückn.
90	Typhaceae Juss.	10.	<i>Typha angustifolia</i> L.
98	Cyperaceae Juss.	11.	<i>Cyperus difformis</i> L.
		12.	<i>Cyperus iria</i> L.
		13.	<i>Cyperus rotundus</i> L.
		14.	<i>Kyllinga brevifolia</i> Rottb.
103	Poaceae Barnhart	15.	<i>Alloteropsis cimicina</i> (L.) Stapf
		16.	<i>Apluda mutica</i> L.
		17.	<i>Aristida adscensionis</i> L.
		18.	<i>Arthraxon lancifolius</i> (Trin.) Hochst.
		19.	<i>Arthraxon microphyllus</i> (Trin.) Hochst.
		20.	<i>Arundo donax</i> L.
		21.	<i>Bothriochloa bladhii</i> (Retz.) S.T.Blake
		22.	<i>Brachiaria reptans</i> (L.) C.A.Gardner &

			C.E.Hubb.
		23.	<i>Chloris virgata</i> Sw.
		24.	<i>Chrysopogon zizanioides</i> (L.) Roberty
		25.	<i>Chrysopogon lancearius</i> (Hook.f.) Haines
		26.	<i>Coix aquatica</i> Roxb.
		27.	<i>Cynodon dactylon</i> (L.) Pers.
		28.	<i>Dactyloctenium aegyptium</i> (L.) Willd.
		29.	<i>Desmostachya bipinnata</i> (L.) Stapf
		30.	<i>Digitaria sanguinalis</i> (L.) Scop.
		31.	<i>Echinochloa colona</i> (L.) Link
		32.	<i>Eleusine indica</i> (L.) Gaertn.
		33.	<i>Eragrostis cilianensis</i> (All.) Janch.
		34.	<i>Eragrostis minor</i> Host
		35.	<i>Heteropogon contortus</i> (L.) P.Beauv. ex Roem. & Schult.
		36.	<i>Panicum notatum</i> Retz.
		37.	<i>Pennisetum pedicellatum</i> Trin.
		38.	<i>Saccharum spontaneum</i> L.
		39.	<i>Setaria italica</i> (L.) P.Beauv.
106	Papaveraceae Juss.	40.	<i>Argemone mexicana</i> L.
140	Fabaceae Lindl.	41.	<i>Acacia auriculiformis</i> Benth.
		42.	<i>Acacia catechu</i> (L.f.) Willd.
		43.	<i>Acacia nilotica</i> (L.) Delile
		44.	<i>Albizia lebbeck</i> (L.) Benth.
		45.	<i>Alysicarpus monilifer</i> (L.) DC.
		46.	<i>Bauhinia purpurea</i> L.
		47.	<i>Butea monosperma</i> (Lam.) Taub.
		48.	<i>Cajanus scarabaeoides</i> (L.) Thouars
		49.	<i>Cassia fistula</i> L.
		50.	<i>Crotalaria albida</i> Roth
		51.	<i>Dalbergia lanceolaria</i> L.f.
		52.	<i>Dalbergia sissoo</i> DC.
		53.	<i>Indigofera cordifolia</i> Roth
		54.	<i>Indigofera linifolia</i> (L.f.) Retz.
		55.	<i>Leucaena leucocephala</i> (Lam.) de Wit
		56.	<i>Mimosa himalayana</i> Gamble

		57.	<i>Pithecellobium dulce</i> (Roxb.) Benth.
		58.	<i>Pongamia pinnata</i> (L.) Pierre
		59.	<i>Senna alata</i> (L.) Roxb.
		60.	<i>Senna occidentalis</i> (L.) Link
		61.	<i>Senna siamea</i> (Lam.) H.S.Irwin & Barneby
		62.	<i>Melilotus indicus</i> (L.) All.
		63.	<i>Senna tora</i> (L.) Roxb.
		64.	<i>Tamarindus indica</i> L.
		65.	<i>Zornia diphylla</i> (L.) Pers.
147	Rhamnaceae Juss.	66.	<i>Ziziphus jujuba</i> Mill.
		67.	<i>Ziziphus rugosa</i> Lam.
		68.	<i>Ziziphus xylopyrus</i> (Retz.) Willd.
149	Cannabaceae Martinov	69.	<i>Cannabis sativa</i> L.
150	Moraceae Gaudich.	70.	<i>Artocarpus heterophyllus</i> Lam.
		71.	<i>Ficus benghalensis</i> L.
		72.	<i>Ficus cupulata</i> Haines
		73.	<i>Ficus racemosa</i> L.
		74.	<i>Ficus religiosa</i> L.
		75.	<i>Ficus virens</i> Aiton
163	Cucurbitaceae Juss.	76.	<i>Cephalandra indica</i> (Wight & Arn.) Naudin
		77.	<i>Coccinia grandis</i> (L.) Voigt
		78.	<i>Cucumis melo</i> L.
171	Oxalidaceae R.Br.	79.	<i>Oxalis corniculata</i> L.
200	Violaceae Batsch	80.	<i>Hybanthus enneaspermus</i> (L.) F.Muell.
207	Euphorbiaceae Juss	81.	<i>Croton sparsiflorus</i> Morong
		82.	<i>Euphorbia hirta</i> L.
		83.	<i>Euphorbia neriifolia</i> L.
		84.	<i>Euphorbia prostrata</i> Aiton
		85.	<i>Ricinus communis</i> L.
211	Phyllanthaceae Martinov	86.	<i>Phyllanthus amarus</i> Schumach. & Thonn.
		87.	<i>Phyllanthus emblica</i> L.
		88.	<i>Phyllanthus simplex</i> Retz.
214	Combretaceae R.Br	89.	<i>Anogeissus latifolia</i> (Roxb. ex DC.) Wall. ex Guillem. & Perr.

		90.	<i>Terminalia arjuna</i> (Roxb. ex DC.) Wight & Arn.
		91.	<i>Terminalia bellirica</i> (Gaertn.) Roxb.
215	Lythraceae J.St.-Hil.	92.	<i>Ammannia baccifera</i> L.
216	Onagraceae Juss.	93.	<i>Ludwigia hyssopifolia</i> (G.Don) Exell
218	Myrtaceae Juss.	94.	<i>Eucalyptus tereticornis</i> Sm.
		95.	<i>Psidium guajava</i> L.
		96.	<i>Syzygium cumini</i> (L.) Skeels
		97.	<i>Syzygium salicifolium</i> (Wight) J.Graham
238	Burseraceae Kunth	98.	<i>Boswellia serrata</i> Roxb. ex Colebr.
239	Anacardiaceae R.Br.	99.	<i>Buchanania cochinchinensis</i> (Lour.) M.R.Almeida
		100.	<i>Mangifera indica</i> L.
241	Rutaceae Juss.	101.	<i>Aegle marmelos</i> (L.) Corrêa
		102.	<i>Murraya paniculata</i> (L.) Jack
243	Meliaceae Juss.	103.	<i>Azadirachta indica</i> A.Juss.
247	Malvaceae Juss.	104.	<i>Abutilon indicum</i> (L.) Sweet
		105.	<i>Corchorus aestuans</i> L.
		106.	<i>Corchorus capsularis</i> L.
		107.	<i>Firmiana simplex</i> (L.) W.Wight [= <i>Sterculia urens</i> Roxb.]
		108.	<i>Hibiscus lobatus</i> (Murray) Kuntze
		109.	<i>Malva neglecta</i> Wallr.
		110.	<i>Sida alba</i> L.
		111.	<i>Urena lobata</i> L.
253	Dipterocarpaceae Blume	112.	<i>Shorea robusta</i> Gaertn.
256	Moringaceae Martinov	113.	<i>Moringa oleifera</i> Lam.
269	Cleomaceae Horan.	114.	<i>Cleome viscosa</i> L.
283	Polygonaceae Juss.	115.	<i>Polygonum plebeium</i> R.Br.
297	Amaranthaceae Juss.	116.	<i>Achyranthes aspera</i> L.
		117.	<i>Aerva lanata</i> (L.) Juss.

		118.	<i>Alternanthera sessilis</i> (L.) R.Br. ex DC.
		119.	<i>Amaranthus spinosus</i> L.
		120.	<i>Amaranthus viridis</i> L.
		121.	<i>Celosia argentea</i> L.
		122.	<i>Chenopodium album</i> L.
		123.	<i>Gomphrena celosioides</i> Mart.
304	Aizoaceae Martinov	124.	<i>Trianthema portulacastrum</i> L.
308	Nyctaginaceae Juss.	125.	<i>Boerhavia diffusa</i> L.
309	Molluginaceae Bartl.	126.	<i>Glinus oppositifolius</i> (L.) A. DC.
312	Basellaceae Raf.	127.	<i>Basella alba</i> L.
317	Cactaceae Juss.	128.	<i>Opuntia</i> spp.
333	Sapotaceae Juss.	129.	<i>Madhuca longifolia</i> (J.Koenig ex L.) J.F.Macbr.
334	Ebenaceae Gurke	130.	<i>Diospyros melanoxylon</i> Roxb.
335	Primulaceae Batsch ex Borkh.	131.	<i>Anagallis arvensis</i> L.
352	Rubiaceae Juss.	132.	<i>Mitragyna parvifolia</i> (Roxb.) Korth.
		133.	<i>Neolamarckia cadamba</i> (Roxb.) Bosser
		134.	<i>Spermacoce articularis</i> L.f.
		135.	<i>Spermacoce hispida</i> L.
356	Apocynaceae Juss.	136.	<i>Calotropis gigantea</i> (L.) Dryand.
		137.	<i>Calotropis procera</i> (Aiton) Dryand.
		138.	<i>Carissa carandas</i> L.
		139.	<i>Carissa spinarum</i> L.
		140.	<i>Hemidesmus indicus</i> (L.) R. Br. ex Schult.
		141.	<i>Holarrhena pubescens</i> Wall. ex G.Don
357	Boraginaceae Juss.	142.	<i>Cynoglossum wallichii</i> G.Don
359	Convolvulaceae Juss.	143.	<i>Cuscuta reflexa</i> Roxb.
		144.	<i>Evolvulus alsinoides</i> (L.) L.
		145.	<i>Evolvulus nummularius</i> (L.) L.
		146.	<i>Ipomoea aquatica</i> Forssk.
		147.	<i>Ipomoea carnea</i> Jacq.
		148.	<i>Ipomoea eriocarpa</i> R. Br.
		149.	<i>Merremia tridentata</i> (L.) Hallier f.

360	Solanaceae Juss.	150.	<i>Datura metel</i> L.
		151.	<i>Solanum americanum</i> Mill.
		152.	<i>Solanum sisymbriifolium</i> Lam.
		153.	<i>Solanum virginianum</i> L.
370	Plantaginaceae Juss.	154.	<i>Limnophila indica</i> (L.) Druce
373	Linderniaceae Borsch, Kai Müll. & Eb.Fisch.	155.	<i>Lindernia crustacea</i> (L.) F.Muell.
376	Pedaliaceae R.Br.	156.	<i>Sesamum indicum</i> L.
377	Acanthaceae Juss.	157.	<i>Andrographis paniculata</i> (Burm.f.) Nees
		158.	<i>Barleria prionitis</i> L.
		159.	<i>Barleria strigosa</i> Willd.
		160.	<i>Justicia adhatoda</i> L.
		161.	<i>Justicia diffusa</i> Willd.
382	Verbenaceae J.St.- Hil.	162.	<i>Lantana camara</i> L.
		163.	<i>Lippia alba</i> (Mill.) N.E.Br. ex Britton & P.Wilson
383	Lamiaceae Martinov	164.	<i>Anisomeles indica</i> (L.) Kuntze
		165.	<i>Clerodendrum viscosum</i> Vent.
		166.	<i>Gmelina arborea</i> Roxb.
		167.	<i>Hyptis suaveolens</i> (L.) Poit.
		168.	<i>Leonotis nepetifolia</i> (L.) R.Br.
		169.	<i>Leucas cephalotes</i> (Roth) Spreng.
		170.	<i>Tectona grandis</i> L.f.
		171.	<i>Vitex negundo</i> L.
403	Asteraceae Bercht. & J.Presl	172.	<i>Ageratum conyzoides</i> (L.) L.
		173.	<i>Caesulia axillaris</i> Roxb.
		174.	<i>Laphangium luteoalbum</i> (L.) Tzvelev
		175.	<i>Mikania micrantha</i> Kunth
		176.	<i>Pentanema indicum</i> (L.) Ling
		177.	<i>Tridax procumbens</i> (L.) L.
		178.	<i>Parthenium hysterophorus</i> L.
416	Apiaceae Lindl.	179.	<i>Centella asiatica</i> (L.) Urb.

\*Angiosperm Phylogeny Group IV classification (Chase & *al.*, 2016)



Plate 5: a. *Acacia catechu* (L.f.) Willd.; b. *Andrographis paniculata* (Burm.f.) Nees; c. *Asparagus racemosus* Willd.; d. *Barleria strigosa* Willd.; e. *Cajanus scarabaeoides* (L.) Thouars; f. *Carissa spinarum* L.; g. *Chrysopogon zizanioides* (L.) Roberty; h. *Cleome viscosa* L.



Plate 6: a. *Croton albedia* Roth; b. *Cucumis melo* L.; c. *Dalbergia sissoo* DC.; d. *Euphorbia hirta* L.; e. *Euphorbia prostrata* Aiton; f. *Evolvulus alsinoides* (L.) L.; g. *Evolvulus nummularius* (L.) L.; h. *Glinus oppositifolia* (L.) A. DC.





Plate 7: a. *Hibiscus lobatus* (Murray) Kuntze; b. *Holarrhena pubescens* Wall. ex G.Don; c. *Hybanthus enneaspermus* (L.) F.Muell.; d. *Hyptis suaveolens* (L.) Poit.; e. *Indigofera cordifolia* Roth; f. *Indigofera linifolia* (L.f.) Retz.; g. *Ipomoea carnea* Jacq.; h. *Ipomoea eriocarpa* R. Br.



Plate 8: a. *Justicia diffusa* Willd.; b. *Lantana camara* L.; c. *Leonotis neptifolia* (L.) R.Br.; d. *Leucas cephalotes* (Roth) Spreng.; e. *Ludwigia hyssopifolia* (G.Don) Exell; f. *Merremia tridentata* (L.) Hallier f.; g. *Mikania micrantha* Kunth; h. *Mimosa himalayana* Gamble

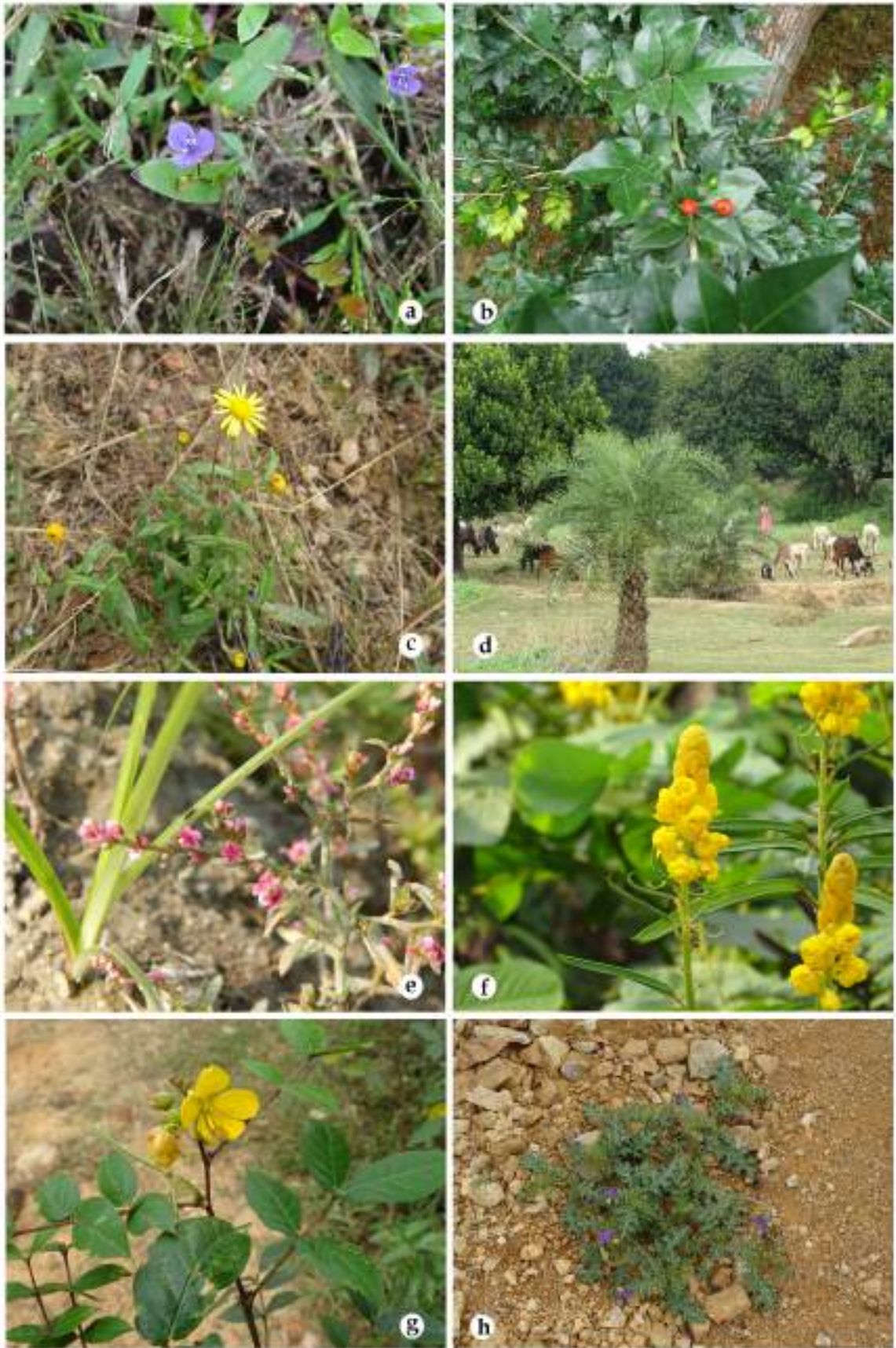


Plate 9: a. *Murdannia spirata* (L.) G.Brückn.; b. *Murraya paniculata* (L.) Jack; c. *Pentanema indicum* (L.) Ling; d. *Phoenix sylvestris* (L.) Roxb.; e. *Polygonum plebeium* R.Br.; f. *Senna alata* (L.) Roxb.; g. *Senna occidentalis* (L.) Link; h. *Solanum virginianum* L.



Plate 10: a. *Spermacoce articularis* L.f.; b. *Tamarindus indica* L.; c. *Terminalia arjuna* (Roxb. ex DC.) Wight & Arn.; d. *Tridax procumbens* (L.) L.; e. *Vitex negundo* L.; f. *Ziziphus jujuba* Mill.; g. *Ziziphus rugosa* Lam.; h. *Ziziphus xylopyrus* (Retz.) Willd.

Table 3: Distribution of species in the families

S. No.	Family	Species
1.	Fabaceae	25
2.	Poaceae	25
3.	Amaranthaceae	8
4.	Lamiaceae	8
5.	Malvaceae	8
6.	Asteraceae	7
7.	Convolvulaceae	7
8.	Apocynaceae	6
9.	Moraceae	6
10.	Acanthaceae	5
11.	Euphorbiaceae	5
12.	Cyperaceae	4
13.	Myrtaceae	4
14.	Rubiaceae	4
15.	Solanaceae	4
16.	Combretaceae	3
17.	Commelinaceae	3
18.	Cucurbitaceae	3
19.	Phyllanthaceae	3
20.	Rhamnaceae	3
21.	Anacardiaceae	2
22.	Arecaceae	2
23.	Rutaceae	2
24.	Verbenaceae	2
25.	Aizoaceae	1
26.	Apiaceae	1
27.	Asparagaceae	1
28.	Basellaceae	1

29.	Boraginaceae	1
30.	Burseraceae	1
31.	Cactaceae	1
32.	Cannabaceae	1
33.	Cleomaceae	1
34.	Dipterocarpaceae	1
35.	Ebenaceae	1
36.	Hydrocharitaceae	1
37.	Linderniaceae	1
38.	Lythraceae	1
39.	Meliaceae	1
40.	Molluginaceae	1
41.	Moringaceae	1
42.	Nyctaginaceae	1
43.	Nymphaeaceae	1
44.	Onagraceae	1
45.	Orchidaceae	1
46.	Oxalidaceae	1
47.	Papaveraceae	1
48.	Pedaliaceae	1
49.	Plantaginaceae	1
50.	Polygonaceae	1
51.	Primulaceae	1
52.	Sapotaceae	1
53.	Typhaceae	1
54.	Violaceae	1

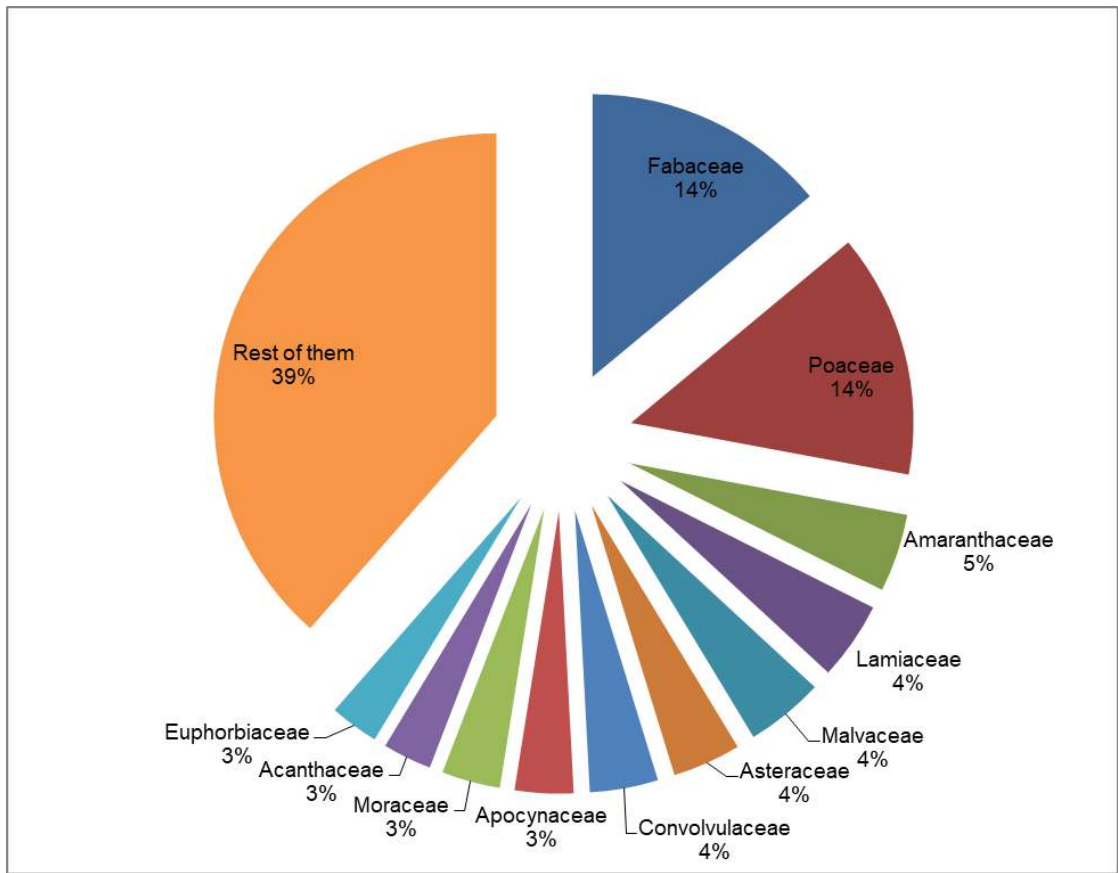


Fig. 1: Percentage share of dominating families

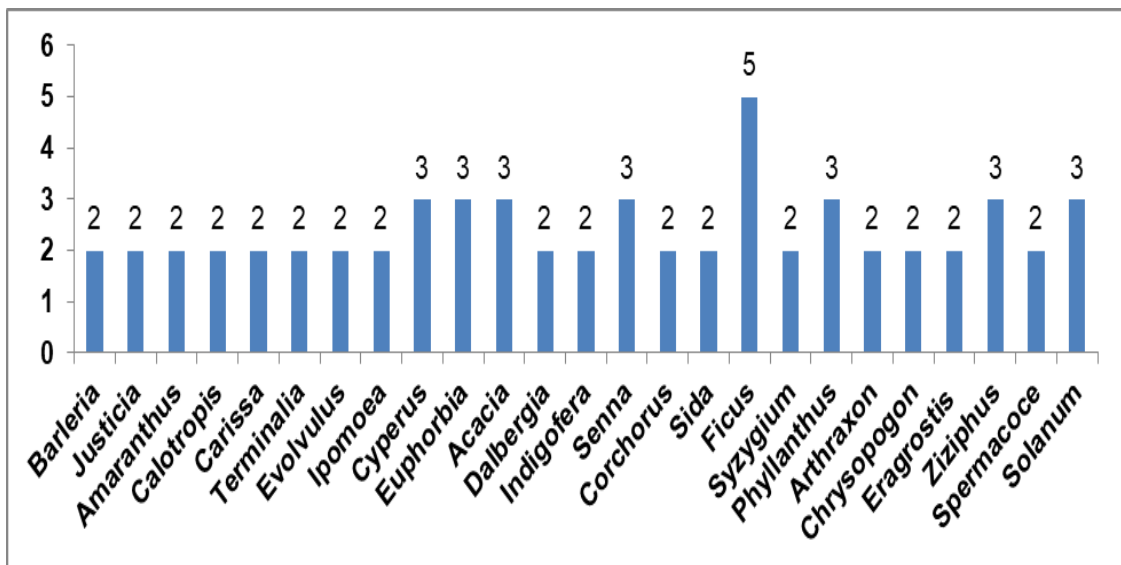


Fig. 2: Distribution of species in genus

## 7. Discussion

A total of 179 species documented in the eco-sensitive zone of Nakti Dam Bird Sanctuary (Table 2). These species are distributed in 144 genera and 54 families (Table 3; Fig. 1, 2). Out of them, 46 families, 111 genera and 141 species are belongs to dicotyledon and 8 families, 33 genera and 38 species are belongs to monocotyledon. Among the monocotyledons 63.15% are grasses and 10.5% are sedges, rests of the monocotyledons are poorly represented by members of Hydrocharitaceae (*Ottelia alismoides*), Orchidaceae (*Vanda tessellata*), Asparagaceae (*Asparagus racemosus*), Arecaceae (*Borassus flabellifer*, *Phoenix sylvestris*) and Commelinaceae (*Commelina benghalensis*, *Cyanotis axillaris*, *Murdannia spirata*), Typhaceae (*Typha angustifolia*). As for habit, it was found that 96 species were herbaceous (53.63%), 50 (27.93%) tree, 21 (11.73%) shrub and 12 (6.7%) climbers. The long, dry and hot summer is responsible for herb dominating flora in the region (Duthie, 1960). The *Mikania micrantha* and *Lantana camara* are serious threat to the natural vegetation. *Parthenium hysterophorus* is present in the area but it is not aggressive like the above two species. It may be due to *Mikania micrantha* and *Lantana camara* was introduced before *Parthenium hysterophorus* in the area therefore, given stiff completion to *Parthenium hysterophorus*.

The proportion of monocotyledons to the dicotyledons is 1:3.7 and in the Flora of Palamu district is about 1:4. The total genus to species ratio is 1:1.2. The genus-species ratio for upper Gangetic Plain is 1:2.2; 1:6 for India and 1:7 for Flora of British India (Hooker, 1904; Sarma & Sarkar, 2001). The members of



family Orchidaceae, which holds first rank in the flora of British India and but *Vanda tessellata* is the only species recorded in the present investigation.

In present survey, 11 families are represented by 5 or more members: Fabaceae & Poaceae (25 spp. each), Malvaceae, Lamiaceae & Amaranthaceae (8 spp. each), Asteraceae & Convolvulaceae (7 spp.), Moraceae & Apocynaceae (6 spp. each), Acanthaceae & Euphorbiaceae (5 spp. each) (**Table 3; Fig. 1**). All together these 11 families shares 61.45% of the species diversity of the study area. Thirty families are represented by one species, 4 families are represented by two species, 5 families are represented by three species and 4 families are represented by four species. A total of 25 genus were represented by more than one species. It has been observed that the most dominating genus is *Ficus*, represented by 5 species, followed by representation of *Euphorbia*, *Cyperus*, *Acacia*, *Phyllanthus*, *Senna*, *Ziziphus* and *Solanum* by 3 species each, 17 genus are represented by 2 species each and rest of the 119 genera are represented by one species each (**Fig. 2**).

## **8. Conclusions**

In conclusion, the present study list highlights the high diversity of wild and naturalised angiospermic species within the eco-sensitive zone of Nakti dam Bird Sanctuary, Jamui district, Bihar. While survey it was observed that *Mikania micrantha* and *Lantana camara* are serious threat to the natural vegetation. *Parthenium hysterophorus* is present in the area but it is not aggressive like the above mentioned two species.

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