



Evaluation of ecological status of natural vegetation of Diana forest range under Jalpaiguri division, West Bengal, India

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Abstract

Forest vegetations are the most diverse in the vegetation structure and composition which directly or indirectly responsible for the existence of other ecosystem. All forest regions are being affected by several means and thus scientific and ecological monitoring is obligatory for conservation of the forest. Angiospermic plants are a typical and important component of most of the forests and contribute considerably to biodiversity. Thus proper ecological analysis of angiospermic plants provide the elementary status of the vegetation. The present investigation is aimed to reveal the phytosociological and ecological status of the angiospermic plants of Diana Forest Range under Jalpaiguri Forest Division.

Keywords: Angiospermic Plant, Phytosociology, Community Index, Quadrata, Dominance.

Introduction

Diana forest range is worldwide renowned for its natural beauty and unique biodiversity with some endemic and endangered plants and animals. Basically it is a territorial forest recommended for woody trees. The forest range belongs to Jalpaiguri forest division of West Bengal, India. The geographical position of forest is quite different. It is actually a transition area between Duars and Terai region. It is very close to Indo-Bhutan hills. A significant part of the Diana river, which originates in Samtse province of Bhutan and flows southwestward into Jalpaiguri, falls within the forest. This forest range is very adjacent to Murti Wild Life Beat of Gorumara National Park and Chapramari Wildlife Sanctuary. The forest is also famous for Elephant disturbances.

As the forest is at transition of different geographical entities, it shows a great diversity and ecological specificity. Biodiversity shows variety and variability within and among living organisms, their community structure, their associations and habitat-oriented ecological interactions. Interest in biodiversity has recently increased in response to the damage caused to ecosystems by anthropogenic activities¹. The biodiversity of the forest is heavily affected through along time, by the cycles of natural calamities and human activity such as fire, agriculture, technology and trade.

To evaluate the ecological status of any vegetation it is obligatory to determine the phytosociological status of that vegetation. Like many territorial forests scientific studies on biodiversity and ecological aspect have not been conducted in

this forest. Till date only preliminary information of biodiversity patterns is available in the range. The scientific documentation regarding the ecological status of plants especially the non timber herbaceous and shrubby plants is almost unavailable till date. Such a lack of information severely hampers the management and conservation of forest. Information on composition, diversity of plant species and species-rich communities is of primary importance in the planning and implementation of biodiversity conservation efforts. The present work deals with the evaluation of ecological status of angiospermic plants in Diana Forest Range.

The quantitative characters with reference to density, frequency, dominance and their relative values could well act as indicators of anthropogenic disturbances that are affecting the various types of vegetation including forest vegetation. Such studies would also help in understanding the threats that are being faced by the tropical forests and would help in deriving conservation policies².

Materials and methods

Study site: The present work has been carried out in four beat forests of Diana Forest Range of Jalpaiguri Forest Division, West Bengal, India. The forest beats are named as Khairkata Beat, Sulka Para Beat, Carrong Beat and Tollgate Beat. This region has a very rich floral diversity and a treasure of valuable natural resources. For sampling mainly natural high forest sites and very old plantation sites were chosen and recent plantation sites were avoided. The study sites are partially hilly and partially reverine. Due to this the flora shows a huge diversity.

The vegetation varies considerably with the change in altitude, soil, temperature, humidity, rainfall and presence of water passages from Diana river and form Kuchi Diana River. The aquatic vegetation of the forest range is also very enriched.

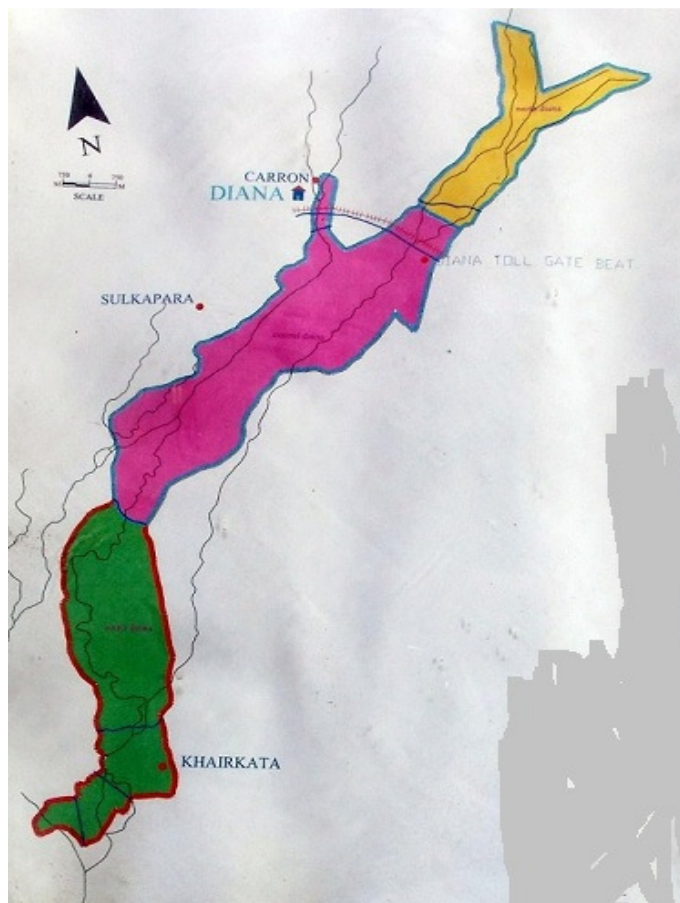


Figure-1: Map of Diana Forest Range.

Field Investigation and Data Collection: The composition of plant community of the Diana Forest Range was investigated in between the January, 2015 and February, 2017. Regular field trips to the study sites were carried out at seasons representing pre monsoon, monsoon and post monsoon. A total of 64 quadrats 16 in each of the four forest beats were selected which were laid at 100 m interval along 1000m long line transects having quadrat size of 20m x 20 m(400m²) following Esmailzadeh *et al.* We further systematically placed five 5m×5m shrub quadrates (one at the centre and the other four at the corners) to investigate shrubs, and five 1m×1m herb quadrates were fixed to the upper left corner of each shrub quadrat to investigate herbs in each plots, including 320 shrub quadrates and 320 herb quadrates from natural forest sites. Plant species found within each sampling plot were photographed and identified by their vernacular and scientific names using various book³, articles⁴⁻¹⁰ and internet. Knowledgeable persons and experts of traditional herb healer, gardeners and forest guards were contacted and information was collected through

interviews, observations and discussions held during field surveys.

During field visits, plant species were identified, phytosociological studies were carried out and specimens were collected. Plant materials collected were made into herbarium specimens following standard herbarium techniques¹¹ and are deposited at Herbarium of the Department of Botany, Dukhulal Nibaran Chandra College, Aurangabad, Murshidabad, West Bengal, India, for reference. In order to analyze the diversity of vegetation Frequency, Relative frequency, density and Relative density were calculated. Importance Value Index was calculated by adding Relative frequency Relative density and Relative Height¹²⁻¹⁶. This index is used to determine the overall importance of each species in the community structure.

Frequency (%): Frequency refers to the degree of dispersion of individual species in an area and usually expressed in terms of percentage. It is calculated by the formula:

$$\text{Frequency (\%)} = \frac{\text{No. of plot in which the species is present}}{\text{Total No. of plot sampled}} \times 100$$

Relative Frequency (%): Relative frequency is the degree of dispersion of individual species in an area in relation to the number of all the species occurred. It can be determined by the equation

$$\text{Relative Frequency (\%)} = \frac{\text{Frequency of the species}}{\text{Frequency of all the species}} \times 100$$

Density: Density is an expression of the numerical strength of a species where the total number of individuals of each species in all the quadrates is divided by the total number of quadrates studied. Density is determined by the formula:

$$\text{Density} = \frac{\text{No. of individual of the species}}{\text{Total No. of plots sampled}}$$

Relative Density (%): Relative density is the study of numerical strength of a species in relation to the total number of individuals of all the species. It can be calculated as:

$$\text{Relative Density} = \frac{\text{Density}}{\text{Density of all the species}} \times 100$$

Relative Dominance (%): Dominance of a species is determined by the value of the basal area at chest height (for trees and high shrubs) or Height/Length (for herbs and small shrubs). Relative dominance is the dominance value of a species with respect to the sum of coverage of the rest of the species in an area.

$$\text{Relative Dominance} = \frac{\text{Dominance value of the species}}{\text{Sum of the Dominance value of all the species}} \times 100$$

Abundance: Abundance is the study of the number of the number of individuals of different species in the community per

unit area. By quadrat method, samplings are made at random at several places and the number of individuals of each species was summed up for all the quadrates divided by the total number of quadrates in which the species occurred. It is represented by the formula

$$\text{Abundance} = \frac{\text{No. individuals of the species}}{\text{Total No. of plots in which the species is present}}$$

Importance Value Index: Importance value index is used to determine the overall importance of each species in the community structure. To calculate the index, the percentage values of the relative frequency, relative density and relative dominance are summed up together.

$$\text{IVI} = \text{Relative Frequency} + \text{Relative Density} + \text{Relative Dominance}$$

Data processing and Phytosociological Analysis: All the data both spatial and especial collected from different sources has been tabulated and analyzed separately. The data collected were used to compute community indices like–

Species diversity (H'): Species diversity of different tree species; it was calculated using the Shannon-Weiner Index¹⁷

$$(H') = - \sum [(ni / N) . \ln (ni / N)]$$

Where: 'ni' is the IVI of individual species and N is the total IVI of all the species.

Species dominance (Cd): Species dominance was calculated following Simpson¹⁸

$$Cd = \sum (ni/N)^2,$$

Where: ni and N are the same as those for Shannon Weiner information function.

Equitability of evenness (e): Equitability of evenness refers to the degree of relative dominance of each species in that area. It was calculated according to Pielou¹⁹

$$\text{Evenness (e)} = H'/\log S$$

Where: H'= Shannon index, S = number of species.

Species richness (D): Species richness was determined by Margalef index²⁰

$$D = (S-1)/\ln N.$$

Where: S = number of species, N= total number of individuals.

Menhinick's index (D_{mm}): Menhinick's index²¹ is expressed as

$$D_{mm} = S/\sqrt{N},$$

Where: N is the number of individuals in the sample and S is the species number.

Equitability Index: The Shannon's equitability Index²² is expressed as (EH)=H/Hmax = H/ln S

Berger-Parker Dominance Index: The Berger-Parker Dominance Index²³ is a simple measure of the numerical importance of the most abundant species and is expressed as d= Nmax/N.

N_{max} is the number of individuals in the most abundant species and N is the total number of individuals in the sample. The increase in the value of reciprocal of Berger-Parker Dominance Index reflects the increase in diversity and a reduction in dominance.

Results and discussion

The present study provides baseline data on phytosociological and ecological aspect of the Diana Forest Range. The forest is a protected primary forest which comprises of natural vegetation regulated by the combined effect of biotic and abiotic factors like topography, altitude, geology, climatic etc. Phytodiversity of the forest Range comprises different types of trees, shrubs and herbs. Floristic diversity of the study area directly helps the management to protect and conserve the biological diversity of the forest range.

The floristic composition has more impact on the distribution of wildlife of the forest. It is also necessary for proper documentation, conservation plans and sustainable utilization of the plant. This vegetation includes both exotic and native species. The degradation of habitat due to several natural or biotic stresses creates favourable grounds to some obnoxious invading species and limitation to primitive or original ones. Though the forest sites are rich in phytodiversity, they are facing climatic and anthropogenic pressures of various sorts. Changes in socio-economic conditions and land use patterns over years threatened both the floral diversity and the community structure.

Trees are the most obvious structural component of any plant ecosystem including forest canopies. Their bodyparts like trunks, branches and leaves constitute the infrastructure of the canopy and support thousands of plants and animal species. The density and size distribution of trees contribute to the structural pattern of the forest community.

In the present study 24 tree species belonging to 16 families are described with their recent botanical names, family name, Phytosociological values and Community indices (Table-1).

Among the tree species highest IVI was recorded for *Bombax ceiba* L. (12.043). IVI were also good for *Trewia nudiflora* L.(11.902), *Bischofia javanica* Blume (10.617), *Lagerstroemia speciosa* (L.) Pers. (9.277). Lowest IVI was recorded for *Cordia myxa* L.(1.332) and *Gmelina arborea* Roxb. (1.332).

Table-1: Different Phytosociological Values for Tree Species of Diana Forest Range.

Name of the Plant	Family	A	D	Fr (%)	BA	RD	RF (%)	RBA	IVI	S	Cd	E
<i>Alstonia scholaris</i> (L.) R. Br.	Apocynaceae	0.187	1.500	12.500	53.822	0.020	2.632	0.001	2.653	0.094915	0.000676	0.068768
<i>Cordia myxa</i> L.	Boraginaceae	0.062	1.000	6.250	154.140	0.013	1.316	0.003	1.332	0.056651	0.000170	0.041045
<i>Terminalia bellirica</i> (Gaertn.) Roxb.	Combretaceae	0.375	1.200	31.250	804.160	0.016	6.579	0.015	6.610	0.177325	0.004199	0.128477
<i>Terminalia alata</i> Roth.	Combretaceae	0.375	6.000	6.250	208.444	0.079	1.316	0.004	1.399	0.058828	0.008271	0.157979
<i>Shorea robusta</i> Gaertn. f.	Dipterocarpaceae	0.687	5.500	12.500	5254.955	0.072	2.632	0.100	2.804	0.098795	0.000755	0.071580
<i>Dipterocarpus gracilis</i> Blume	Dipterocarpaceae	0.125	2.000	6.250	3697.472	0.026	1.316	0.070	1.412	0.059246	0.000191	0.042925
<i>Trewia nudiflora</i> L.	Euphorbiaceae	1.187	2.111	56.250	1693.463	0.028	11.842	0.032	11.902	0.250669	0.013614	0.181616
<i>Albizia saman</i> (Jacq.) Merr.	Fabaceae	0.625	2.500	25.000	6956.955	0.033	5.263	0.133	5.429	0.156118	0.002832	0.113112
<i>Acacia catechu</i> (L.f.) Willd.	Fabaceae	0.437	1.750	25.000	697.097	0.023	5.263	0.013	5.299	0.153639	0.002832	0.113112
<i>Callicarpa arborea</i> Roxb.	Lamiaceae	0.187	3.000	6.250	728.676	0.039	1.316	0.014	1.369	0.057857	0.000180	0.041919
<i>Gmelina arborea</i> Roxb.	Lamiaceae	0.125	1.000	6.250	168.471	0.013	1.316	0.003	1.332	0.056651	0.000170	0.041045
<i>Tectona grandis</i> L.f.	Lamiaceae	0.125	2.000	6.250	3561.485	0.026	1.316	0.068	1.410	0.059182	0.000191	0.042879
<i>Litsea kharyana</i> Meisn.	Lauraceae	0.625	5.000	12.50	3300.395	0.066	2.632	0.063	2.761	0.097698	0.013939	0.182760
<i>Persea fructifera</i> Kosterm	Lauraceae	0.125	1.000	12.500	4378.205	0.013	2.632	0.083	2.728	0.096852	0.010833	0.170624
<i>Lagerstroemia parviflora</i> Roxb.	Lythraceae	1.000	5.330	18.750	487.505	0.070	3.947	0.009	4.026	0.127574	0.013614	0.181616
<i>Lagerstroemia speciosa</i> (L.) Pers.	Lythraceae	1.312	4.200	43.750	611.903	0.055	9.210	0.012	9.277	0.218045	0.008271	0.157979
<i>Bombax ceiba</i> L.	Malvaceae	1.062	1.889	56.250	9219.746	0.025	11.842	0.176	12.043	0.252248	0.013939	0.182760
<i>Aglaia spectabilis</i> (Miq.) S.S. Jain and S. Bennet	Meliaceae	0.375	3.000	12.500	548.487	0.039	2.632	0.010	2.681	0.095640	0.000690	0.069294
<i>Amoora rohituka</i> W. and A.	Meliaceae	0.312	5.000	6.250	718.551	0.066	1.316	0.014	1.396	0.058731	0.000187	0.042552
<i>Eurya acuminata</i> DC.	Pentaphylacaceae	0.312	5.000	6.250	300.156	0.066	1.316	0.006	1.388	0.058473	0.004315	0.129594
<i>Bischofia javanica</i> Blume	Phyllanthaceae	1.625	3.250	50.000	2495.418	0.043	10.526	0.048	10.617	0.235497	0.010833	0.170624
<i>Neolamarckia cadamba</i> (Roxb.) Bosser	Rubiaceae	1.687	5.400	31.250	2689.041	0.071	6.579	0.051	6.701	0.178868	0.004315	0.129594
<i>Sterculia villosa</i> Roxb.	Sterculiaceae	0.687	3.667	18.750	3325.211	0.048	3.947	0.063	4.058	0.128273	0.001582	0.092937
<i>Premna mollissima</i> Roth	Verbenaceae	0.250	4.000	6.250	409.878	0.052	1.316	0.008	1.376	0.058084	0.000181	0.042083

The forest is also found rich shrub vegetation. 17 shrub species belonging to 11 families were recorded from the study sites. Among the shrub species *Lantana camara* L. was found as the most dominant with IVI 29.454. The IVI was also good for *Coffea benghalensis* B. Heyne ex Schult. (28.783), *Ziziphus jujuba* Mill. (25.187), *Ziziphus oenopolia* (L.) Mill. (22.713)

Wrightia arborea (Dennst.) Mabb. (22.637) and *Dioscorea bulbifera* L. (22.000). IVI was least for *Ampelocissus latifolia* (Roxb.) Planch. (8.002). IVI was also less for *Citrus aurantiifolia* (Christm.) Swingle (9.889) and *Dioscorea alata* L. (10.822).

Table-2: Different Phytosociological values for Shrub Species of Diana Forest Range.

Name of the Plants	Family	A	D	F	BA	RD	RF	RBA	IVI	H	CD	E
<i>Tabernaemontana divaricata</i> (L.) R.Br. ex Roem. and Schult.	Apocynaceae	0.250	1.333	18.750	1.175	4.754	5.660	1.497	11.913	0.128111	0.001577	0.104118
<i>Wrightia arborea</i> (Dennst.) Mabb.	Apocynaceae	0.125	1.000	12.500	12.000	3.566	3.773	15.297	22.637	0.194998	0.005694	0.158477
<i>Holarrhena pubescens</i> Wall. ex G.Don	Apocynaceae	0.187	1.000	18.750	7.000	3.566	5.660	8.923	18.150	0.169711	0.003660	0.137926
<i>Dioscorea bulbifera</i> L.	Dioscoreaceae	0.125	1.000	12.500	11.500	3.566	3.773	14.660	22.000	0.191602	0.005378	0.155717
<i>Dioscorea alata</i> L.	Dioscoreaceae	0.187	1.500	12.500	1.333	5.349	3.773	1.699	10.822	0.119843	0.001301	0.097398
<i>Abrus pulchellus</i> Thwaites	Fabaceae	0.375	3.000	12.500	1.333	10.698	3.773	1.699	16.171	0.157429	0.002906	0.127945
<i>Rothea serrata</i> (L.) Steane and Mabb.	Lamiaceae	0.062	1.000	6.250	6.000	3.566	1.886	7.648	13.101	0.136741	0.001907	0.111131
<i>Melastoma malabathricum</i> L.	Melastomataceae	0.687	1.833	37.500	1.545	6.537	11.320	1.969	19.828	0.179556	0.004368	0.145928
<i>Osbeckia nepalensis</i> Hook. f.	Melastomataceae	0.375	3.000	12.500	1.666	10.698	3.773	2.123	16.595	0.160129	0.003060	0.130139
<i>Ficus hispida</i> L.f.	Moraceae	0.187	1.500	12.500	3.000	5.349	3.773	3.824	12.947	0.135639	0.001863	0.110236
<i>Ziziphus oenopolia</i> (L.) Mill.	Rhamnaceae	0.312	1.250	25.000	8.400	4.457	7.547	10.708	22.713	0.195397	0.005732	0.158802
<i>Ziziphus jujuba</i> Mill.	Rhamnaceae	0.125	1.000	12.500	14.000	3.566	3.773	17.847	25.187	0.208000	0.007049	0.169044
<i>Coffea benghalensis</i> B.Heyne ex Schult.	Rubiaceae	1.687	3.000	56.250	0.866	10.698	16.981	1.104	28.783	0.224893	0.009205	0.182773
<i>Catunaregam spinosa</i> (Thunb.) Tirveng.	Rubiaceae	0.125	1.000	12.500	3.500	3.566	3.773	4.461	11.801	0.127282	0.001548	0.103444
<i>Citrus aurantiifolia</i> (Christm.) Swingle	Rutaceae	0.125	1.000	12.500	2.000	3.566	3.773	2.549	9.889	0.112485	0.001087	0.091418
<i>Lantana camara</i> L.	Verbenaceae	1.812	3.625	50.000	1.124	12.927	15.094	1.432	29.454	0.227873	0.009640	0.185195
<i>Ampelocissus latifolia</i> (Roxb.) Planch.	Vitaceae	0.062	1.000	6.250	2.000	3.566	1.886	2.549	8.002	0.096671	0.000712	0.078566

The ecological and floristic study were made to find out the infestation of different herb species. A total of 145 herb species belonging to 47 families were recorded in this study. Herb species such as *Auxonopus compressus* (Swartz.) P.Beauv., *Rungia pectinata* (L.) Nees., *Pupalia atropurpurea* (Lam.) Moq.

were found to be more common in the community with IVI values of 6.880, 6.537 and 6.537 respectively. The lowest IVI values of herb species was observed in case of *Evolvulus nummularius* (L.) L.(0.417). The families with highest number of herbs include the Asteraceae and Fabaceae.

Table-3: Different Phytosociological values for Herb Species of Diana Forest Range.

Name of The Plant	Family	A	D	Fr (%)	Ht/L.	RD	RF (%)	RHt./ RL.	IVI	H	CD	E
<i>Thunbergia grandiflora</i> (Roxb. Ex Rottl.) Roxb.	Acanthaceae	1.000	0.093	9.375	41.833	0.248	0.728	0.925	1.902	0.032087	0.000039	0.014845
<i>Rungia pectinata</i> (L.) Nees	Acanthaceae	8.769	1.781	20.312	11.000	4.715	1.579	0.243	6.537	0.083383	0.000470	0.038579
<i>Phlogacanthus thyrsoiflorus</i> Nees.	Acanthaceae	2.000	0.125	6.250	50.750	0.330	0.485	1.122	1.939	0.032588	0.000040	0.015077
<i>Asystasia macrocarpa</i> Nees	Acanthaceae	1.250	0.078	6.2500	55.800	0.206	0.485	1.234	1.926	0.032419	0.000040	0.014999
<i>Dicliptera roxburghiana</i> Nees.	Acanthaceae	1.200	0.093	7.8125	40.000	0.248	0.607	0.884	1.740	0.029870	0.000033	0.013820
<i>Lepidagathis incurva</i> Buchenau-Hamilton ex D. Don	Acanthaceae	2.857	0.312	10.937	22.150	0.827	0.850	0.489	2.167	0.035621	0.000051	0.016480
<i>Ruellia tuberosa</i> L.	Acanthaceae	1.000	0.062	6.250	23.857	0.165	0.485	0.527	1.179	0.021768	0.000015	0.010071
<i>Justicia adhatoda</i> L.	Acanthaceae	1.000	0.031	3.125	58.500	0.082	0.242	1.293	1.619	0.028185	0.000028	0.013040
<i>Justicia gendarussa</i> Burmf.	Acanthaceae	2.000	0.031	1.562	51.500	0.082	0.121	1.138	1.342	0.024213	0.000019	0.011202
<i>Achyranthes aspera</i> L.	Amaranthaceae	4.666	0.656	14.062	18.404	1.737	1.093	0.407	3.237	0.048875	0.000114	0.022613
<i>Achyranthes bidentata</i> Blume	Amaranthaceae	5.500	0.171	3.125	14.454	0.454	0.242	0.319	1.017	0.019285	0.000010	0.008922
<i>Deeringia amaranthoides</i> (Lam.) Merr.	Amaranthaceae	1.000	0.062	6.250	41.750	0.165	0.485	0.923	1.574	0.027555	0.000027	0.012749
<i>Pupalia atropurpurea</i> (Lam.) Moq.	Amaranthaceae	7.000	1.421	20.312	15.219	3.763	1.579	0.336	5.679	0.075103	0.000357	0.034748
<i>Alternanthera philoxeroides</i> (C.Martius) Grisebach	Amaranthaceae	4.000	0.125	3.125	24.500	0.330	0.242	0.541	1.115	0.020805	0.000013	0.009625
<i>Alternanthera sessilis</i> (Linnaeus) R. Brown ex DC	Amaranthaceae	3.333	0.156	4.687	19.600	0.413	0.364	0.433	1.211	0.022257	0.000016	0.010297
<i>Amaranthus spinosus</i> Linn.	Amaranthaceae	2.000	0.093	4.6875	20.500	0.248	0.364	0.453	1.065	0.020038	0.000012	0.009271
<i>Amaranthus viridis</i> Linn.	Amaranthaceae	1.000	0.015	1.5625	41.000	0.041	0.121	0.906	1.069	0.020094	0.000012	0.009296
<i>Centella asiatica</i> (L.) Urb.	Apiaceae	2.000	0.125	6.2500	21.750	0.330	0.485	0.481	1.297	0.023547	0.000018	0.010894
<i>Lasia spinosa</i> (L.) Thwaites	Araceae	1.666	0.156	9.3750	47.100	0.413	0.728	1.041	2.184	0.035837	0.000051	0.016580
<i>Colocasia esculenta</i> (L.) Schott.	Araceae	1.000	0.062	6.2500	29.500	0.165	0.485	0.652	1.303	0.023635	0.000018	0.010935
<i>Hydrocotyle sibthorpioides</i> Lam.	Araliaceae	3.857	0.421	10.937	9.1851	1.116	0.850	0.203	2.170	0.035655	0.000051	0.016496
<i>Chromolaena odoratum</i> (L.) King and H. Rob	Asteraceae	3.500	1.203	34.375	33.688	3.184	2.672	0.745	6.602	0.083993	0.000484	0.038861
<i>Ageratum conyzoides</i> L.	Asteraceae	5.111	0.718	14.062	17.239	1.902	1.093	0.381	3.377	0.050509	0.000125	0.023369
<i>Ageratum houstonianum</i> Mill.	Asteraceae	4.500	0.140	3.1250	15.888	0.372	0.242	0.351	0.966	0.018486	0.000010	0.008553
<i>Erydra fluctans</i> Lour.	Asteraceae	2.000	0.031	1.5625	20.500	0.082	0.121	0.453	0.657	0.013410	0.000004	0.006208
<i>Elephantopus scaber</i> L.	Asteraceae	1.250	0.156	12.500	45.100	0.413	0.971	0.997	2.382	0.038406	0.000062	0.017769
<i>Mikania micrantha</i> Kunth.	Asteraceae	1.000	0.109	10.937	50.666	0.289	0.850	1.120	2.260	0.036829	0.000056	0.017039
<i>Xanthium strumarium</i> L.	Asteraceae	1.428	0.156	10.937	42.700	0.413	0.850	0.944	2.208	0.036153	0.000053	0.016726
<i>Cyanthillium cinereum</i> (L.) H. Rob.	Asteraceae	2.875	0.359	12.500	18.000	0.951	0.971	0.398	2.321	0.037615	0.000059	0.017403
<i>Acmella calva</i> (DC.) R.K. Jansen	Asteraceae	1.384	0.281	20.312	27.500	0.744	1.579	0.608	2.931	0.045231	0.000094	0.020927
<i>Acmella uliginosa</i> (Sw.) Cass.	Asteraceae	1.500	0.046	3.125	35.333	0.123	0.242	0.781	1.148	0.021302	0.000014	0.009855
<i>Synedrella nodiflora</i> (L.) Gaertn.	Asteraceae	1.333	0.125	9.375	26.750	0.330	0.728	0.591	1.651	0.028636	0.000030	0.013249
<i>Bidens pilosa</i> L.	Asteraceae	3.333	0.156	4.687	24.600	0.413	0.364	0.544	1.321	0.023904	0.000019	0.011059
<i>Eclipta prostrata</i> (L.) L.	Asteraceae	1.500	0.046	3.125	19.333	0.123	0.242	0.427	0.794	0.015713	0.000006	0.007270
<i>Laphangium luteoalbum</i> (L.) Tzvelev.	Asteraceae	4.250	0.265	6.250	15.470	0.703	0.485	0.342	1.531	0.026937	0.000026	0.012463
<i>Sphagneticola trilobata</i> (L.) Pruski	Asteraceae	1.000	0.062	6.250	16.500	0.165	0.485	0.364	1.016	0.019267	0.000010	0.008914
<i>Impatiens tripetala</i> Roxb.	Balsaminaceae	2.200	0.171	7.812	28.545	0.454	0.607	0.631	1.693	0.029224	0.000031	0.013521
<i>Cynoglossum lanceolatum</i> Forssk.	Boraginaceae	1.000	0.046	4.687	46.666	0.123	0.364	1.032	1.520	0.026783	0.000025	0.012391

Name of The Plant	Family	A	D	Fr (%)	Ht/L.	RD	RF (%)	RHt/ RL.	IVI	H	CD	E
<i>Heliotropium indicum</i> L.	Boraginaceae	1.000	0.031	3.125	28.000	0.082	0.242	0.619	0.944	0.018141	0.000009	0.008393
<i>Cardamine hirsuta</i> L.	Brassicaceae	3.000	0.093	3.125	14.833	0.248	0.242	0.328	0.819	0.016117	0.000007	0.007457
<i>Cannabis sativa</i> L.	Cannabaceae	1.500	0.046	3.125	50.000	0.123	0.242	1.105	1.472	0.026098	0.000024	0.012074
<i>Drymaria cordata</i> (L.) Willd. Ex. Schult.	Caryophyllaceae	5.600	1.312	23.437	12.345	3.474	1.822	0.273	5.569	0.074012	0.000342	0.034243
<i>Stellaria media</i> (L.) Vill.	Caryophyllaceae	6.181	1.062	17.187	12.264	2.812	1.336	0.271	4.420	0.062143	0.000216	0.028751
<i>Cleome rutidosperma</i> DC.	Cleomaceae	1.000	0.078	7.812	18.800	0.206	0.607	0.415	1.229	0.022536	0.000016	0.010426
<i>Chloranthus elatior</i> Link	Chloranthaceae	1.000	0.015	1.562	56.000	0.041	0.121	1.238	1.401	0.025064	0.000021	0.011596
<i>Commelina diffusa</i> Burm. f.	Commelinaceae	2.500	0.062	6.250	21.600	0.165	0.485	0.477	1.129	0.021010	0.000013	0.009720
<i>Commelina benghalensis</i> L.	Commelinaceae	1.000	0.015	1.562	18.000	0.041	0.121	0.398	0.560	0.011744	0.000003	0.005433
<i>Murdannia nudiflora</i> (L.) Brennan	Commelinaceae	5.888	0.140	14.062	10.981	0.372	1.093	0.242	1.708	0.029432	0.000031	0.013617
<i>Merremia vitifolia</i> (Burm. F.) Hallier f.	Convolvulaceae	1.000	0.093	9.375	35.000	0.248	0.728	0.774	1.751	0.030021	0.000033	0.013890
<i>Ipomoea aquatica</i> Forsskål	Convolvulaceae	1.000	0.015	1.562	18.000	0.041	0.121	0.398	0.560	0.011744	0.000003	0.005433
<i>Argyrea roxburghii</i> (Wall.) Arn. ex Choisy	Convolvulaceae	1.000	0.046	4.687	43.000	0.123	0.364	0.950	1.439	0.025617	0.000022	0.011852
<i>Evolvulus nummularius</i> (L.) L.	Convolvulaceae	4.000	0.015	1.562	11.500	0.041	0.121	0.254	0.417	0.009146	0.000001	0.004231
<i>Ipomoea triloba</i> L.	Convolvulaceae	1.000	0.031	3.125	44.000	0.082	0.242	0.973	1.298	0.023559	0.000018	0.010900
<i>Ipomoea pestigritis</i> L.	Convolvulaceae	1.000	0.078	0.078	35.000	0.206	0.006	0.774	0.986	0.018805	0.000010	0.008700
<i>Trichosanthes tricuspidata</i> Laur.	Cucurbitaceae	1.000	0.015	1.562	24.000	0.041	0.121	0.530	0.693	0.014031	0.000005	0.006492
<i>Coccinia grandis</i> (L.) Voigt	Cucurbitaceae	1.000	0.031	4.687	41.666	0.082	0.364	0.921	1.368	0.024587	0.000020	0.011376
<i>Mukia maderaspatana</i> (L.) M.Roem.	Cucurbitaceae	1.000	0.031	3.125	47.500	0.082	0.242	1.050	1.376	0.024697	0.000020	0.011426
<i>Diplocyclos palmatus</i> (L.) C.Jeffrey	Cucurbitaceae	1.000	0.031	3.125	27.500	0.082	0.242	0.608	0.933	0.017966	0.000009	0.008312
<i>Crotalaria pallida</i> Aiton	Fabaceae	1.000	0.031	3.125	19.500	0.082	0.242	0.431	0.756	0.015091	0.000006	0.006982
<i>Desmodium gangeticum</i> (L.) DC.	Fabaceae	1.200	0.093	7.8125	37.166	0.248	0.607	0.821	1.677	0.029000	0.000030	0.013417
<i>Desmodium heterophyllum</i> (Willd.) DC.	Fabaceae	4.000	0.062	1.5625	13.750	0.165	0.121	0.304	0.591	0.012272	0.000003	0.005678
<i>Desmodium trifolium</i> (L.) DC.	Fabaceae	5.944	1.671	28.125	12.028	4.425	2.186	0.266	6.878	0.086563	0.000524	0.040050
<i>Senna tora</i> (L.) Roxb.	Fabaceae	1.166	0.109	9.375	24.000	0.289	0.728	0.530	1.549	0.027191	0.000026	0.012580
<i>Senna sophera</i> (L.) Roxb.	Fabaceae	1.000	0.046	4.687	30.333	0.123	0.364	0.670	1.159	0.021468	0.000014	0.009932
<i>Flemingia strobilifera</i> (L.) W.T. Aiton	Fabaceae	1.000	0.046	4.687	41.000	0.123	0.364	0.906	1.395	0.024975	0.000021	0.011555
<i>Mimosa pudica</i> L.	Fabaceae	1.545	0.265	17.187	26.529	0.703	1.336	0.586	2.626	0.041478	0.000075	0.019190
<i>Mimosa invisa</i> Colla.	Fabaceae	1.142	0.125	10.937	78.375	0.330	0.850	1.733	2.914	0.045021	0.000094	0.020829
<i>Tephrosia purpurea</i> L.(Pers.)	Fabaceae	1.666	0.078	4.6875	21.200	0.206	0.364	0.468	1.040	0.019637	0.000011	0.009085
<i>Senna occidentalis</i> (L.) Link	Fabaceae	1.000	0.015	1.5625	41.000	0.041	0.121	0.906	1.069	0.020094	0.000012	0.009296
<i>Natsiatum herpeticum</i> Hamilton	Icacinaceae	1.333	0.062	4.6875	31.250	0.165	0.364	0.691	1.221	0.022401	0.000016	0.010364
<i>Clerodendrum infortunatum</i> L.	Lamiaceae	2.344	1.062	45.312	44.088	2.812	3.523	0.975	7.310	0.090519	0.000590	0.041880
<i>Leucas aspera</i> (Willd.) Link	Lamiaceae	1.181	0.203	17.187	17.384	0.537	1.336	0.384	2.258	0.036806	0.000056	0.017029
<i>Anisomeles indica</i> (L.) Kuntze	Lamiaceae	1.625	0.406	25.000	72.538	1.075	1.943	1.604	4.623	0.064305	0.000237	0.029752
<i>Hyptis suaveolens</i> (L.) Poit.	Lamiaceae	1.000	0.093	9.375	26.500	0.248	0.728	0.586	1.563	0.027390	0.000027	0.012672
<i>Limnophila rugosa</i> (Roth) Merr.	Lamiaceae	2.000	0.031	1.562	27.500	0.082	0.121	0.608	0.812	0.016005	0.000007	0.007405
<i>Pogostemon linearis</i> (Benth.) Kuntze	Lamiaceae	3.000	0.046	1.562	13.333	0.123	0.121	0.294	0.540	0.011380	0.000003	0.005265
<i>Clerodendrum chinense</i> (Osbeck) Mabb.	Lamiaceae	1.500	0.093	6.250	62.500	0.248	0.485	1.382	2.116	0.034946	0.000049	0.016168
<i>Clerodendrum chinense</i> (Osbeck) Mabb.	Lamiaceae	1.125	0.140	12.500	52.111	0.372	0.971	1.152	2.496	0.039852	0.000068	0.018438
<i>Torenia cordifolia</i> Roxb.	Linderniaceae	1.666	0.156	9.3750	31.300	0.413	0.728	0.692	1.834	0.031170	0.000037	0.014421

Name of The Plant	Family	A	D	Fr (%)	Ht/L	RD	RF (%)	RHt/ RL	IVI	H	CD	E
<i>Lindernia ciliata</i> (Colsm) Pennell	Linderniaceae	5.666	0.265	4.6875	7.6470	0.703	0.364	0.169	1.236	0.022637	0.000016	0.010473
<i>Lindernia crustacea</i> (L.) F. Muell	Linderniaceae	3.545	0.609	17.187	7.5384	1.613	1.336	0.166	3.116	0.047439	0.000106	0.021948
<i>Lindernia ruellioides</i> (Colsm.) Pennell	Linderniaceae	1.000	0.046	4.6875	30.333	0.123	0.364	0.670	1.159	0.021468	0.000014	0.009932
<i>Leea asiatica</i> (Linnaeus) Ridsdale	Leeaceae	1.000	0.031	3.1250	52.000	0.082	0.242	1.150	1.475	0.026140	0.000024	0.012094
<i>Cuphea procumbens</i> Ortega	Lythraceae	5.000	0.703	14.062	12.444	1.861	1.093	0.275	3.229	0.048785	0.000114	0.022571
<i>Triumfetta rhomboidea</i> Jacq.	Malvaceae	1.222	0.171	14.062	42.363	0.454	1.093	0.936	2.485	0.039707	0.000067	0.018371
<i>Sida acuta</i> Burm.f.	Malvaceae	1.222	0.343	28.125	69.681	0.909	2.186	1.541	4.637	0.064457	0.000237	0.029822
<i>Sida rhomboidea</i> Roxb.	Malvaceae	1.666	0.156	9.375	22.000	0.413	0.728	0.486	1.628	0.028321	0.000029	0.013103
<i>Sida cordata</i> (Burm.f.) Bors. Waalk.	Malvaceae	1.333	0.062	4.687	29.250	0.165	0.364	0.646	1.176	0.021735	0.000015	0.010056
<i>Abelmoschus moschatus</i> Medik.	Malvaceae	1.000	0.015	1.562	136.000	0.041	0.121	3.007	3.170	0.048083	0.000110	0.022246
<i>Melochia corchorifolia</i> L.	Malvaceae	1.142	0.125	10.937	40.375	0.330	0.850	0.892	2.074	0.034391	0.000047	0.015912
<i>Urena lobata</i> L.	Malvaceae	1.181	0.203	17.187	42.769	0.537	1.336	0.945	2.819	0.043868	0.000086	0.020296
<i>Stephania japonica</i> (Thunb.) Miers	Menispermaceae	1.000	0.062	6.250	29.500	0.165	0.485	0.652	1.303	0.023635	0.000018	0.010935
<i>Glinus oppositifolius</i> (Linnaeus) Aug. DC.	Molluginaceae	5.000	0.078	1.562	11.000	0.206	0.121	0.243	0.571	0.011931	0.000003	0.005520
<i>Boerhavia repens</i> L.	Nyctaginaceae	3.000	0.281	9.375	16.388	0.744	0.728	0.362	1.835	0.031185	0.000037	0.014428
<i>Oxalis debilis</i> Kunth	Oxalidaceae	2.500	0.156	6.250	14.900	0.413	0.485	0.329	1.228	0.022521	0.000016	0.010419
<i>Oxalis corniculata</i> L.	Oxalidaceae	4.071	0.890	21.875	11.087	2.357	1.700	0.245	4.303	0.060887	0.000204	0.028170
<i>Biophytum sensitivum</i> (L.) DC	Oxalidaceae	1.250	0.078	6.250	14.200	0.206	0.485	0.314	1.006	0.019118	0.000010	0.008845
<i>Argemone mexicana</i> L.	Papaveraceae	1.500	0.046	3.125	24.333	0.123	0.242	0.538	0.904	0.017507	0.000009	0.008100
<i>Sauropus compressus</i> Müll. Arg.	Phyllanthaceae	1.200	0.093	7.812	24.833	0.248	0.607	0.549	1.404	0.025115	0.000021	0.011620
<i>Phyllanthus reticulatus</i> Poir.	Phyllanthaceae	1.750	0.109	6.250	44.857	0.289	0.485	0.992	1.767	0.030246	0.000033	0.013994
<i>Phyllanthus fraternus</i> G.L. Webster	Phyllanthaceae	2.333	0.437	18.750	10.285	1.158	1.457	0.227	2.843	0.044157	0.000088	0.020430
<i>Mecardon procumbens</i> (Mill.) Small	Plantaginaceae	4.000	0.312	7.812	10.800	0.827	0.607	0.238	1.673	0.028946	0.000030	0.013392
<i>Scoparia dulcis</i> L.	Plantaginaceae	1.000	0.062	6.250	15.750	0.165	0.485	0.348	0.999	0.019008	0.000010	0.008794
<i>Piper sylveticum</i> Roxb.	Piperaceae	1.125	0.140	12.500	23.777	0.372	0.971	0.525	1.869	0.031651	0.000038	0.014644
<i>Piper longum</i> L.	Piperaceae	1.000	0.031	3.125	27.000	0.082	0.242	0.597	0.922	0.017789	0.000009	0.008230
<i>Persicaria chinensis</i> (L.) H. Gross	Polygonaceae	1.000	0.140	14.062	77.888	0.372	1.093	1.722	3.188	0.048292	0.000112	0.022343
<i>Persicaria hydroiper</i> (L.) Delarbre	Polygonaceae	3.000	0.093	3.125	28.833	0.248	0.242	0.637	1.128	0.021003	0.000013	0.009717
<i>Rumex maritimus</i> L.	Polygonaceae	1.000	0.031	3.125	37.500	0.082	0.242	0.829	1.154	0.021402	0.000014	0.009902
<i>Naravelia zeylanica</i> DC.	Ranunculaceae	1.000	0.015	1.562	33.000	0.041	0.121	0.729	0.892	0.017308	0.000008	0.008007
<i>Ranunculus sceleratus</i> L.	Ranunculaceae	2.000	0.062	3.125	28.250	0.165	0.242	0.624	1.033	0.019530	0.000011	0.009036
<i>Duchesnea chrysantha</i> (Zoll. and Moritz) Miq.	Rosaceae	4.444	0.625	14.062	13.325	1.654	1.093	0.294	3.042	0.046562	0.000102	0.021543
<i>Spermacoce alata</i> Aubl.	Rubiaceae	7.666	2.875	37.500	39.619	7.610	2.915	0.876	11.402	0.124287	0.001444	0.057504
<i>Mitracarpus hirtus</i> (L.) DC	Rubiaceae	5.500	0.859	15.625	22.018	2.274	1.214	0.486	3.976	0.057307	0.000174	0.026514
<i>Dentella repens</i> (L.) J.R. Forst and G. Forst.	Rubiaceae	4.600	0.359	7.812	9.391	0.951	0.607	0.207	1.766	0.030232	0.000033	0.013987
<i>Oldenlandia lactea</i> (Willd.) DC.	Rubiaceae	3.400	0.265	7.812	10.705	0.703	0.607	0.236	1.547	0.027167	0.000026	0.012569
<i>Glycosmis pentaphylla</i> DC.	Rutaceae	2.000	0.062	3.125	59.000	0.165	0.242	1.304	1.713	0.029497	0.000032	0.013647
<i>Physalis minima</i> L.	Solanaceae	1.000	0.046	4.687	23.333	0.123	0.3644	0.516	1.004	0.019081	0.000010	0.008828
<i>Solanum aculeatissimum</i> Jacq.	Solanaceae	1.000	0.031	3.125	67.500	0.082	0.242	1.492	1.818	0.030946	0.000036	0.014318
<i>Nicotiana plumbaginifolia</i> Viv.	Solanaceae	1.500	0.078	6.250	19.833	0.206	0.485	0.438	1.131	0.021044	0.000013	0.009736

Name of The Plant	Family	A	D	Fr (%)	Ht/L.	RD	RF (%)	RHt/ RL.	IVI	H	CD	E
<i>Solanum torvum</i> Sw.	Solanaceae	1.000	0.031	7.812	55.400	0.082	0.607	1.225	1.915	0.032264	0.000039	0.014927
<i>Cardiospermum helicacabum</i> L.	Sapindaceae	1.000	0.031	3.125	33.000	0.082	0.242	0.729	1.055	0.019875	0.000012	0.009195
<i>Smilax ovalifolia</i> Roxb. ex. D. Don.	Smilacaceae	1.000	0.046	14.062	46.666	0.123	1.093	1.032	2.249	0.036687	0.000054	0.016974
<i>Boehmeria nivea</i> (L.) Gaud.	Urticaceae	1.666	0.234	14.062	35.800	0.620	1.093	0.791	2.505	0.039963	0.000068	0.018489
<i>Laportea interrupta</i> (L.) Chew	Urticaceae	1.428	0.156	10.937	64.500	0.413	0.850	1.426	2.690	0.042275	0.000079	0.019559
<i>Pouzolzia zeylenica</i> (L.) Benn.	Urticaceae	3.000	0.187	6.250	15.416	0.496	0.485	0.340	1.323	0.023923	0.000019	0.011068
<i>Dendrocnide sinuata</i> (Blume) Chew	Urticaceae	1.000	0.046	4.687	69.666	0.123	0.364	1.540	2.029	0.033791	0.000044	0.015634
<i>Phyla nodiflora</i> (L.) Greene	Verbenaceae	5.000	0.234	4.687	9.533	0.620	0.364	0.210	1.195	0.022018	0.000015	0.010187
<i>Stachytarpheta indica</i> (L.) Vahl.	Verbenaceae	1.250	0.078	6.250	24.400	0.206	0.485	0.539	1.232	0.022571	0.000016	0.010443
<i>Ampelocissus tomentosa</i> (B. Heyne and Roth.) Planch.	Vitaceae	1.000	0.046	4.687	26.666	0.123	0.364	0.589	1.078	0.020227	0.000012	0.009358
<i>Tetrastigma serrulatum</i> (Roxburgh) Planchon	Vitaceae	1.000	0.046	4.687	29.666	0.123	0.364	0.656	1.144	0.021243	0.000014	0.009828
<i>Hedychium spicatum</i> Sm. in A.Rees	Zingiberaceae	2.000	0.031	1.562	55.000	0.082	0.121	1.216	1.420	0.025343	0.000022	0.011725
<i>Globba racemosa</i> Sm.	Zingiberaceae	1.000	0.109	10.937	25.571	0.289	0.850	0.565	1.705	0.029387	0.000031	0.013596
<i>Curcuma caesia</i> Roxb.	Zingiberaceae	1.000	0.093	9.375	55.166	0.248	0.728	1.220	2.196	0.036006	0.000053	0.016659
<i>Cheilocostus speciosus</i> (J.Koenig) C.D.Specht	Zingiberaceae	1.000	0.031	3.125	65.000	0.082	0.242	1.437	1.763	0.030187	0.000033	0.013966
<i>Kyllinga monocephala</i> Thunb.	Cyperaceae	3.307	0.671	20.312	12.488	1.778	1.579	0.276	3.633	0.053461	0.000146	0.024734
<i>Cyperus rotundus</i> L.	Cyperaceae	4.333	0.406	9.375	12.076	1.075	0.728	0.267	2.071	0.034353	0.000047	0.015894
<i>Bulbostylis densa</i> (Wall.) Hand.-Mazz.	Cyperaceae	3.000	0.093	3.125	10.166	0.248	0.242	0.224	0.715	0.014407	0.000005	0.006666
<i>Axonopus compressus</i> (Swartz.)P.Beauv.	Poaceae	6.470	1.718	26.562	12.009	4.549	2.065	0.265	6.880	0.086584	0.000524	0.040059
<i>Cynodon dactylon</i> (L.) Pers.	Poaceae	5.769	1.171	20.312	12.506	3.102	1.579	0.276	4.958	0.067805	0.000272	0.031371
<i>Digitaria bicornis</i> (Lam.) Roemer and J.A .Schultes ex Loud	Poaceae	5.166	0.484	9.375	12.903	1.282	0.728	0.285	2.296	0.037296	0.000057	0.017255
<i>Digitaria sanguinalis</i> (Linn.) Scop.	Poaceae	5.222	0.734	14.062	12.234	1.943	1.093	0.270	3.307	0.049700	0.000121	0.022994
<i>Coix lachryma-jobi</i> Linn.	Poaceae	1.000	0.046	4.687	46.000	0.123	0.364	1.017	1.505	0.026572	0.000025	0.012294
<i>Oplismenus burmanni</i> Beauverd	Poaceae	4.846	0.984	20.312	12.317	2.605	1.579	0.272	4.457	0.062541	0.000219	0.028935
<i>Imperata cylindrica</i> (L.) Raeusch.	Poaceae	7.000	0.546	0.078	20.314	1.447	0.006	0.449	1.902	0.032097	0.000039	0.014850
<i>Saccharum spontaneum</i> L.	Poaceae	1.857	0.203	10.937	69.923	0.537	0.850	1.546	2.934	0.045261	0.000094	0.020940

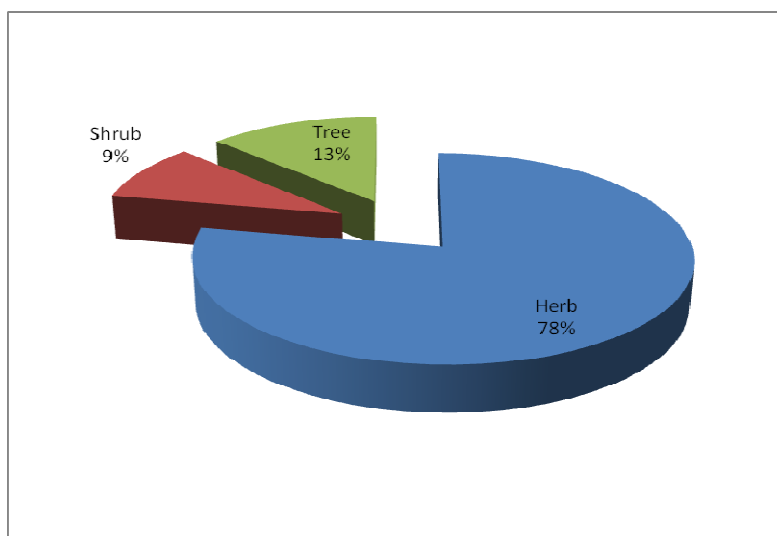


Figure-2: Relative percentage of Tree, Shrub and Herb community.

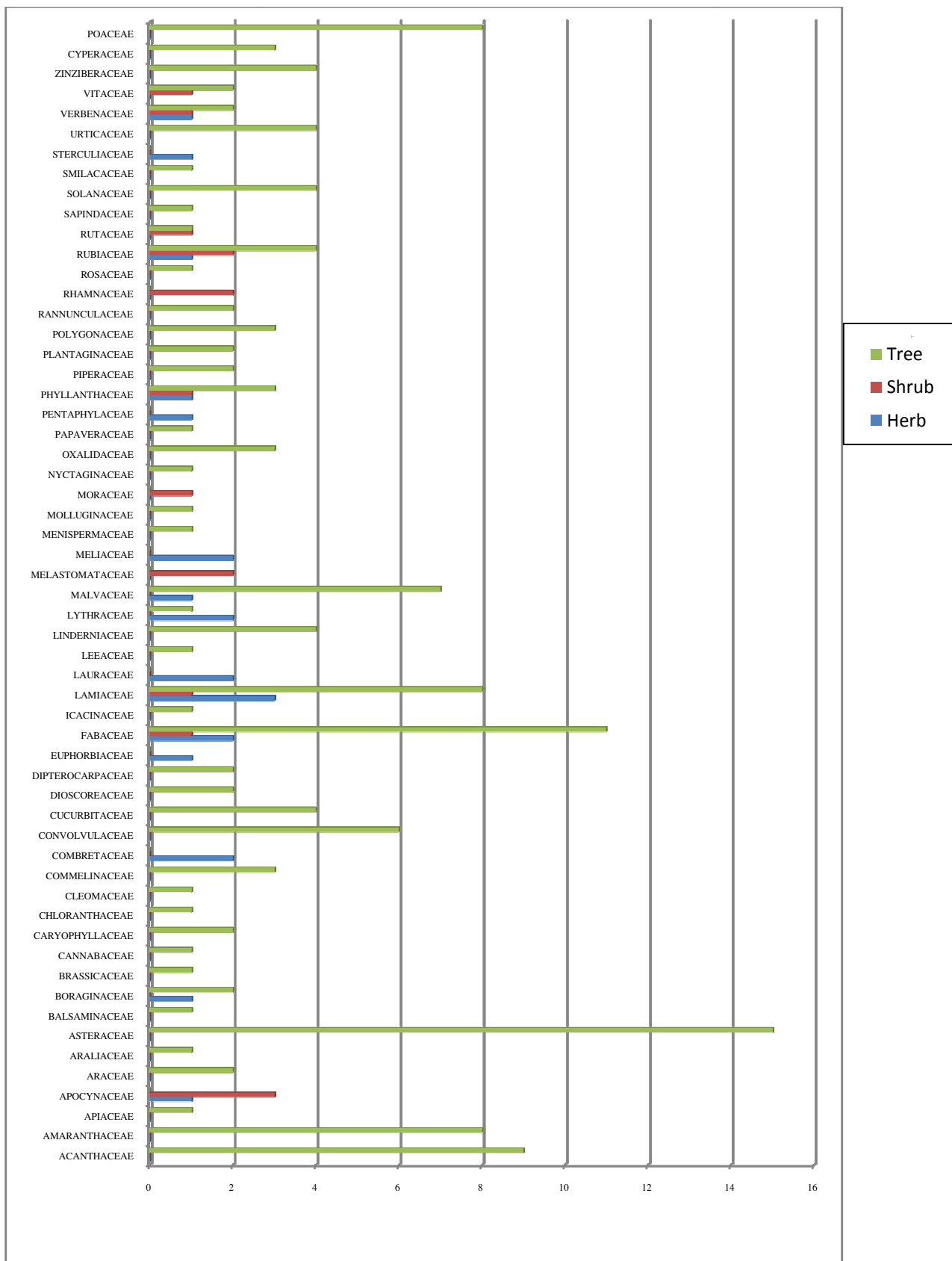


Figure-3: Family wise status of tree, shrub and herb vegetation of Diana Forest range.

Conclusion

It may be concluded that the Diana forest range has a great mosaic of species distribution. The total number of plant species and phytosociological data recorded in this study showed that the Diana Forest Range is a rich area in term of floral diversity and species richness. The plant community of the region includes both native and exotic species. Some of them are sources of extremely valuable medicine. Some of the plant species assume ecologically very significant. The study also revealed that the diversity of trees is least in comparison to herbs and shrubs. Some of the economically and ecologically important plants are extremely threatened. Increases in the prices of such plants may threaten the entire vegetation due to overexploitation and ecological balance. Moreover the study site is highly affected by the flood in Diana river and faunal disturbances. These groves are abode of various floristic elements and necessary efforts need to be taken to protect the forest to prevent the loss of biodiversity. In addition regular monitoring is required to evaluate the loss of diversity. The protection of the forest and conservation of their valuable biodiversity and cultural diversity can be achieved through the better management of conservation.

It can be concluded that Species Diversity is being regulated by factors like community stability and evolutionary time as heterogeneity of both micro and macro environment. All the conditions of environment results the diversification among different communities. The values of vegetation parameters obtained for most of the sites in the present study reveal that herbaceous vegetation is more heterogenous than shrub and tree vegetation. The diversity indices and the vegetation study also help to conclude about critical impact on community structure. Here the diversity index of herb vegetation was found as 4.759473, where as it was 2.766366 for shrub vegetation and 2.885859 for tree vegetation. On the other hand Species

Dominance was recorded for tree vegetation as 0.116780 and for shrub vegetation as 0.066680 and for herb as 0.010750. This work reflects that Herb vegetation is more diverse than tree and shrub vegetation in Diana range forest. The evenness index showed that there was a very little difference in evenness in between the herb, shrub and tree community of the forest range. The evenness index was found maximum in case of shrub community. The Margalef Index value was found quite higher in case of herbs than the shrubs and tree. This reveals that the herb community was more rich in species diversity in the study site. Menhinick index and Berger-Parker Dominance Index revealed the similar trend like that of evenness index. The study further suggested to the followers for the study of soil seed bank and allelopathic interactions among the plant species as well as other and also among plants and microbes in the forest range. It is also suggested for the study of succession pattern of plant community in the forest range.

Table-4: Different Community indices Value for Herb, Shrubs and Tees of Diana Forest Range.

Community indices Value	Herb	Shrub	Tree
Species Diversity (H')	4.759473	2.766366	2.885859
Species dominance (Cd)	0.010750	0.066680	0.116780
Equitability of Evenness(e)	2.202065	2.248257	2.090882
Species Richness (d)	18.584479	3.623692	4.445957
Menhinick's Index (D _{mm})	0.059280	0.155963	0.108597
Equitability Index	0.956344	0.976405	0.307233
Berger-Parker Dominance Index	0.046606	0.266055	0.122171

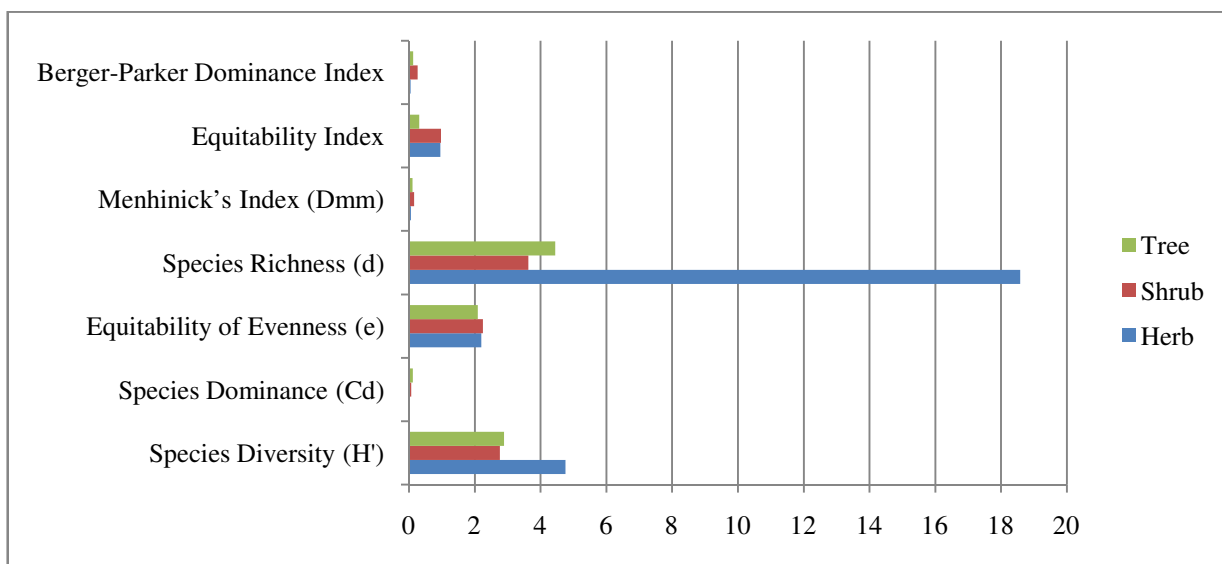


Figure-4: Community indices Value for Tree, Shrub and Herb community.

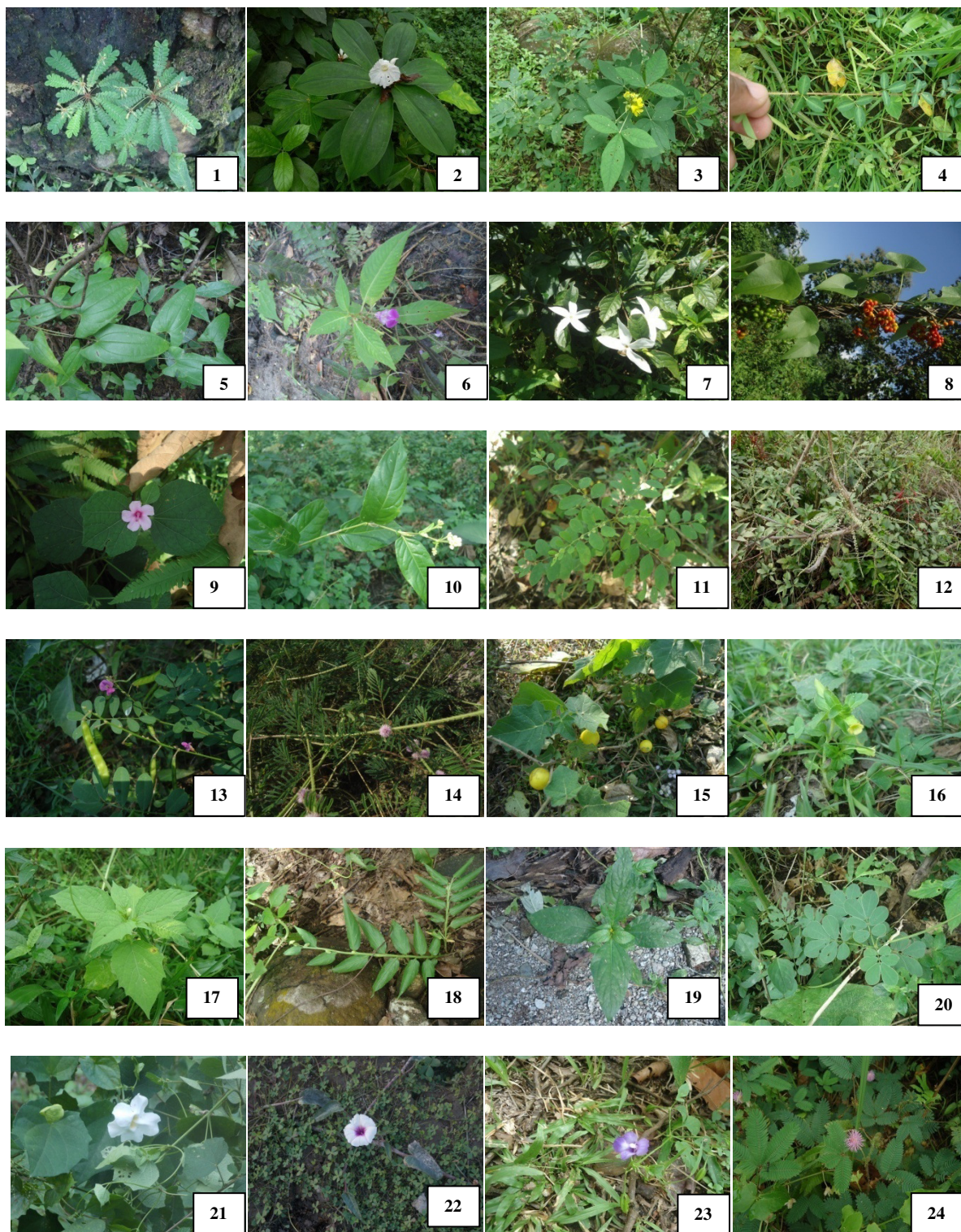


Figure-5: 1. *Biophytum sensitivum* (L.) DC, 2. *Cheilocostus speciosus* (J.Koenig) C.D.Specht, 3. *Crotalaria pallida* Aiton. 4. *Desmodium heterophyllum* (Willd.) DC., 5. *Dioscorea alata* L. 6. *Impatiens tripetala* Roxb., 7. *Coffea benghalensis* B.Heyne ex Schult. 8. *Stephania japonica* (Thunb.) Miers. 9. *Urena lobata* L., 10. *Persicaria chinensis* (L.) H.Gross 11. *Sauropus compressus* Müll.Arg. 12. *Deeringia amaranthoides* (Lam.)Merr., 13. *Tephrosia purpurea* (L.)Pers. 14. *Mimosa invisa* Colla. 15. *Solanum viarum* Dunal 16. *Mecardon procumbens* (Mill.)Small, 17. *Physalis minima* L. 18. *Globba racemosa* Sm. 19. *Synedrella nodiflora* (L.)Gaertn. 20. *Senna tora* (L.)Roxb., 21. *Thunbergia grandiflora* (Roxb. Ex Rottl.) Roxb. 22. *Ipomoea aquatica* Forsskal 23. *Torenia cordifolia* Roxb., 24. *Mimosa pudica* L.



Figure-6: 25. *Piper betle* L. 26. *Melastoma malabathricum* L. 27. *Oxalis debilis* Kunth. 28. *Mukia maderaspatana* (L.) M. Roem., 29. *Justicia adhatoda* L. 30. *Stachytarpheta indica* (L.) Vahl. 31. *Mitracarpus hirtus* (L.) DC 32. *Clerodendrum infortunatum* L., 33. *Tetrastigma serrulatum* (Roxburgh) Planchon 34. *Lindernia ciliate* (Colsm) Pennell, 35. *Flemingia strobilifera* (L.) W.T. Aiton 36. *Boehmeria nivea* (L.) Gaud. 37. *Dioscorea bulbifera* L., 38. *Centella asiatica* (L.) Urb. 39. *Drymaria cordata* (L.) Willd. Ex. Schult. 40. *Cardamine hirsuta* L., 41. *Merremia vitifolia* (Burm. F.) Hallier f. 42. *Tabernaemontana divaricata* (L.) R.Br. ex Roem. & Schult., 43. *Phlogacanthus thyrsoiflorus* Nees. 44. *Citrus aurantiifolia* (Christm.) Swingle 45. *Murraya koenigii* (L.) Spreng., 46. *Scoparia dulcis* L. 47. *Leucas aspera* (Willd.) Link 48. *Duchesnea chrysantha* (Zoll. & Moritzi) Miq.



Figure-7: 49.*Stellaria media* (L.) Vill. 50 *Laphangium luteoalbum* (L.) Tzvelev. 51 *Pouzolzia zeylenica* (L.)Benn. 52.*Cuphea procumbens* Ortega 53.*Lasia spinosa* (L.)Thwaites 54.*Lepidagathis incurva* Buchenau-Hamilton ex D. Don, 55.*Triumfetta rhomboidea* Jacq. 56.*Hedychium spicatum* Sm. in A.Rees 57.*Oplismenus burmanni* Beauverd, 58.*Ziziphus oenopolia* (L.) Mill. 59.*Lindernia ruellioides* (Colsm.)Pennell 60.*Holarrhena pubescens* Wall. ex G.Don, 61. *Ipomoea triloba* L. 62. *Sphagneticola trilobata* (L.) Pruski 63.*Cynoglossum lanceolatum* Forssk. 64.*Rothea serrata* (L.) Steane & Mabb. 65.*Desmodium gangeticum* (L.)DC. 66.*Ageratum conyzoides* L. 67.*Senna sophora* (L.)Roxb., 68.*Cardiospermum helicacabum* L. 69.*Heliotropium indicum* L. 70.*Solanum torvum* Sw. 71.*Acemella calva* (DC.) R.K.Jansen, 72.*Ageratum houstonianum* Mill.

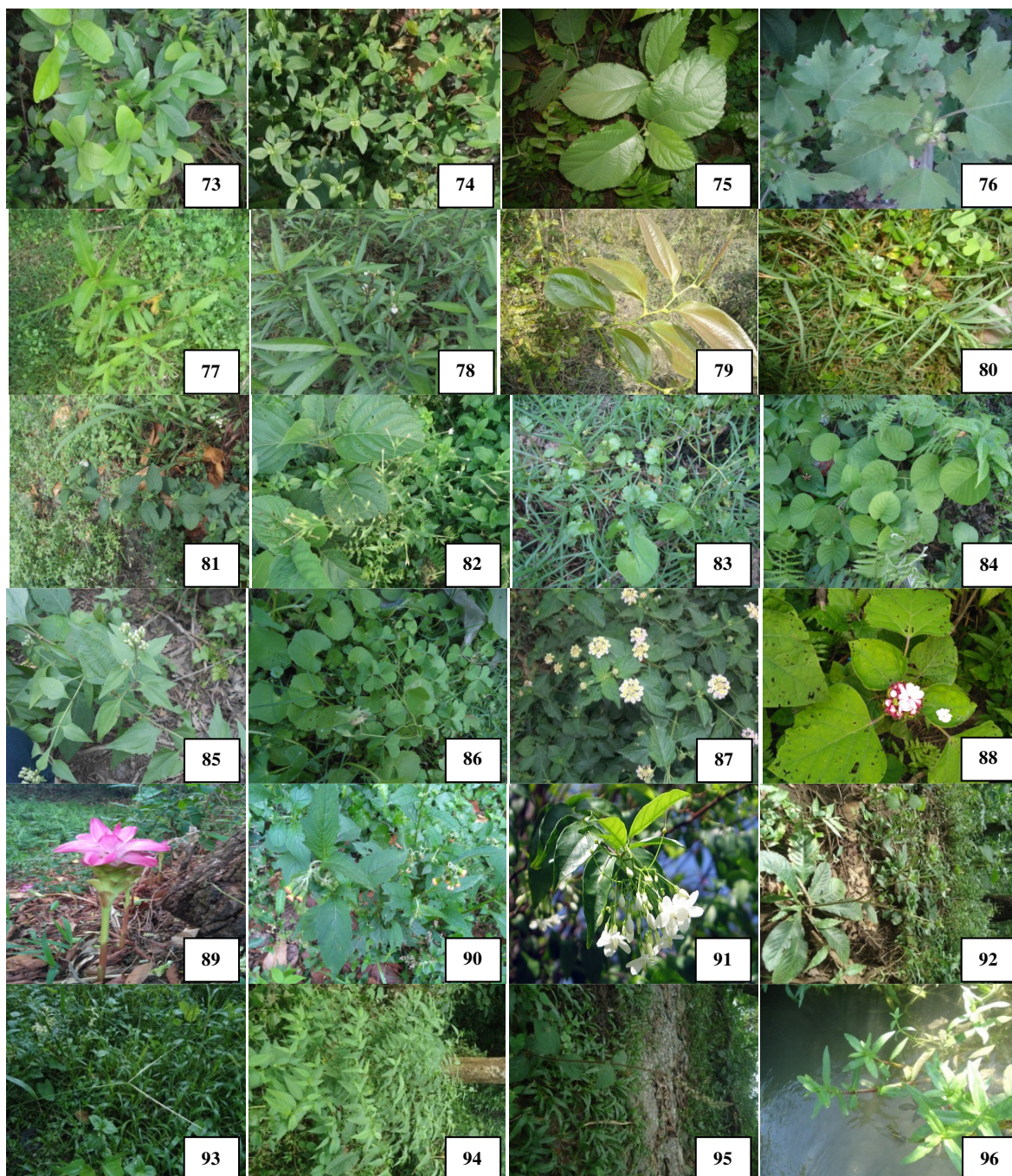


Figure-8: 73.*Glycosmis pentaphylla* DC. 74*Spermacoce alata* Aubl. 75. *Ficus hispida* L.f. 76*Xanthium strumarium* L. 77.*Persicaria hydroiper* (L.) Delarbre 78. *Justicia gendarussa* Burm.f. 79.*Smilax ovalifolia* Roxb. ex. D.Don., 80.*Cynodon dactylon* (L.) Pers. 81.*Sida rhomboidea* Roxb. 82.*Nicotiana plumbaginifolia* Viv. 83.*Hydrocotyle sibthorpioides* Lam., 84.*Argyreia roxburghii* (Wall.) Arn. ex Choisy 85.*Chromolaena odoratum* (L.) King & H.Rob, 86.*Oxalis corniculata* L. and *Centella asiatica* (L.) Urb. 87.*Lantana camara* L. 88.*Clerodendrum chinense* (Osbeck) Mabb, 89.*Curcuma caesia* Roxb. 90.*Bidens pilosa* L. 91.*Wrightia arborea* (Dennst.) Mabb. 92.*Elephantopus scaber* L. , 93.*Digitaria bicornis* (Lam.)Roemer & J.A. Schultes ex. Loud 94 .*Sida acuta* Burm.f. 95.*Pupalia atropurpurea* (Lam.)Moq., 96.*Enydra fluctuans* Lour.



Figure-9: 96. *Commelina diffusa* Burm. f. 97. *Argemone mexicana* L. 98. *Abelmoschus moschatus* Medik. 99 *Abrus pulchellus* Thwaites, 100-118. Different study sites 119. Anthropogenic disturbance

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