ECO-FLORISTIC SURVEY OF JALPAIGURI TOWN

Jalpaiguri is a district situated with northern part of West Bengal in the Duars (Fig.1 & 2). Duars is famous for its wide range of forested vegetation (Champion and Seth, 1968) which are floristically extremely rich (Chaudhuri, 1969; Mukherjee, 1972) and include a large number of endemics (Das, 1986).

Tropical humid climate is characeristic for this district. The east wind which blows during the greater part of the year is full of moisture. The dry west wind sets in with the spring and prevails from March to May. In general the weather is pleasant with heavy rainfall (annually an average of 108 days), abundant humidity on an average from 80.0% with a range of 68.0 – 88.0% at 8.30 hrs. to 66.0% with a range of 43.0 – 81.0% at 17.30 hrs., the temperature never exceeding 31.6^{0}C during the summer season (Table 1). The mean temperature for the district is 24.1^{0}C ranging between 10.8^{0}C (January) minima and 31.6^{0}C (April) maxima. The mean rainfall has been recorded as 271.6 mm, which prevails round the year with a maxima during the following months – May, 349.6mm; June 661.6mm; July 968.1mm; August 662.3mm and September 470.6mm; and minimum in between November-March and exceeding low (5.0mm) in February (Table 1).

Table 1 : Average Meteorological data of Jalpaiguri from 1995-1997.

	Temperature (^{0}C)		Rainfall	Relative humidity (%)	
Months	**Minimum**	**Maximum**		**0830 Hrs.**	**1730 Hrs.**
January	10.8	23.4	12.8	87	59
February	12.7	25.2	5.0	82	50
March	16.4	29.6	19.0	69	43
April	20.4	31.6	22.2	68	50
May	22.9	30.9	349.6	80	69
June	24.3	30.6	661.6	87	79
July	25.0	30.6	968.1	88	81
August	24.9	30.8	662.3	87	81
September	24.4	30.7	470.6	87	79
October	21.4	30.0	60.5	82	71
November	16.2	27.7	14.5	82	66
December	12.1	25.0	13.1	86	63

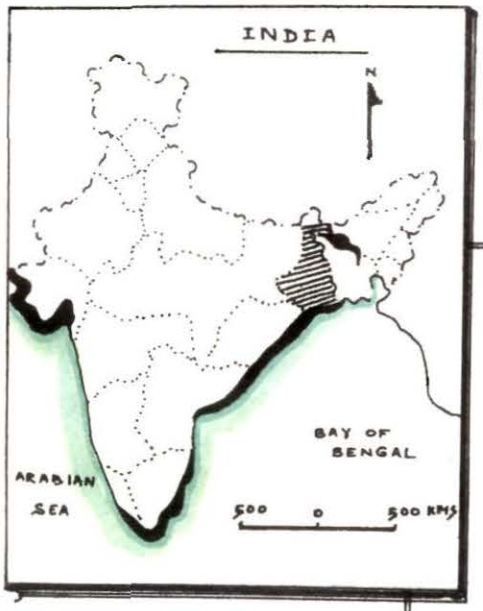


Fig 1: Map of West Bengal showing Jalpaiguri district

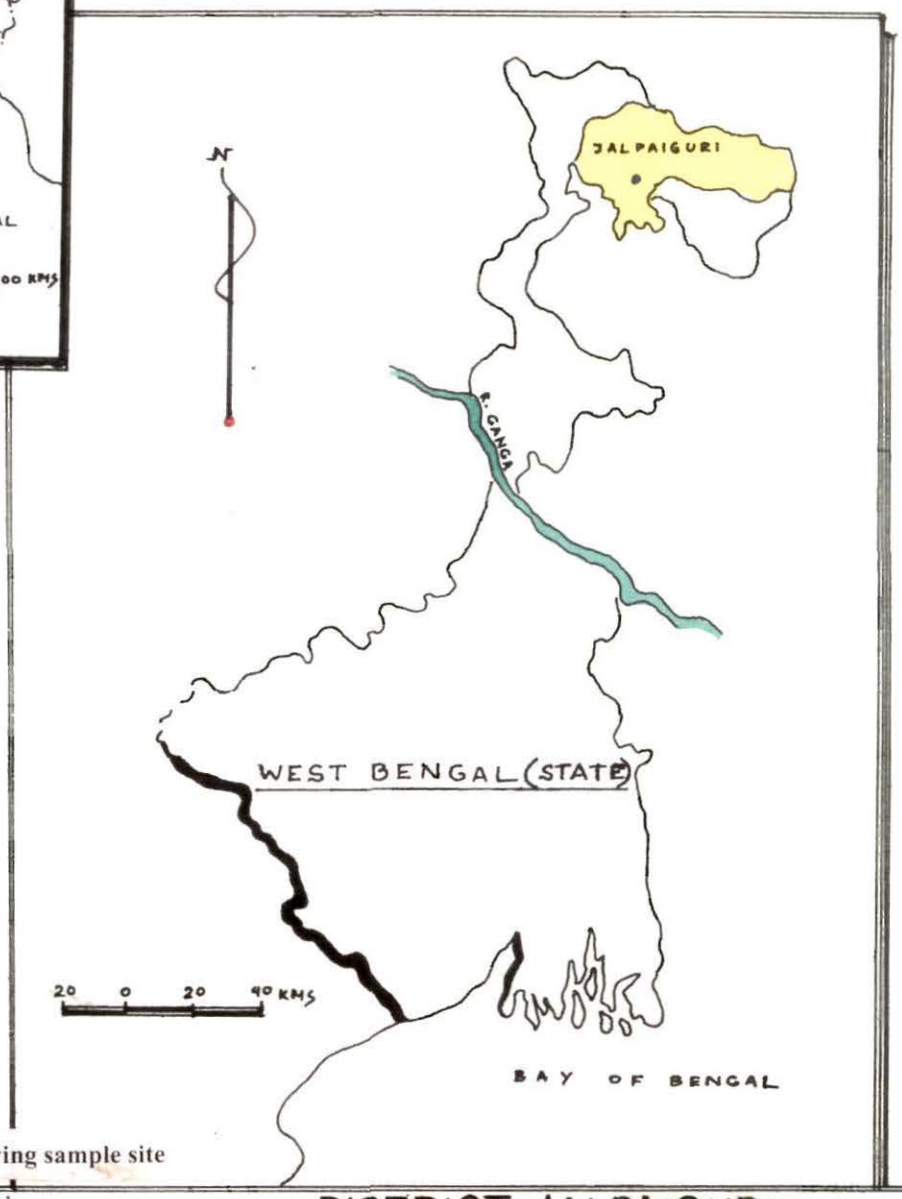
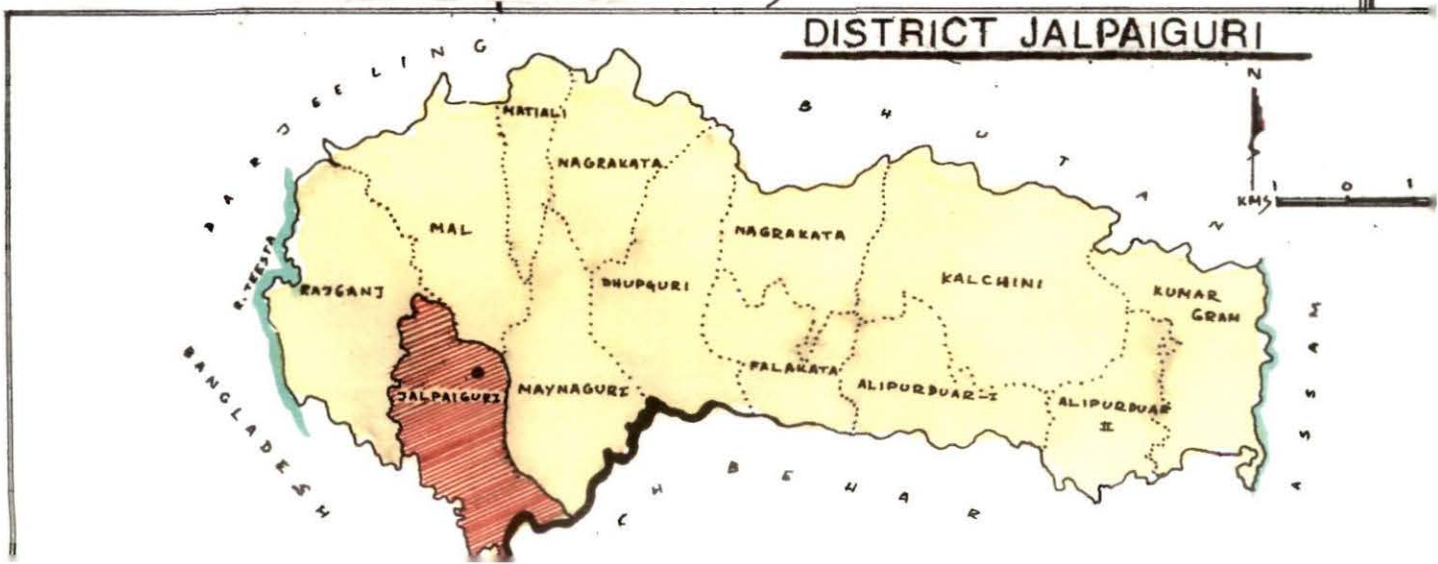


Fig 2: Map of Jalpaiguri district showing sample site



Considering the duration of the rainfall and temperature, the climate of Jalpaiguri district can be broadly divided into two seasons – Summer (which is monsoon dominated), and Winter. However, looking into the different phases of the life-cycles of plants and the meteorological parameters (Table 1) five seasons can be recognized, e.g.

1. **Summer (May-June)**, characterized for temperature ranging from 22.9^{0}C – 30.9^{0}C, average RH range between 69-87.0, average rainfall of 505mm and accompanied by dusty high winds.
2. **Rains (July-September),** is known for heavy rainfall with an average of 760mm, maximum in July (968.1mm) which is almost 46% of the total rainall, average temperature during the period ranges between 24.4^{0}C to 30.8^{0}C and RH between 79-88.
3. **Autumn (October),** is known for moderate temperature 30.0^{0}C maximum and 21.4^{0}C minimum, moderate RH and rainfall.
4. **Winter (November-February),** is distinguished by low temperature ranging from 10.8 – 23.4^{0}C, low rainfall and moderate humidity.
5. **Spring (March-April),** is the season of moderate temperature ranging from 16.4 – 31.6^{0}C, low RH and rainfall.

The township of Jalpaiguri is the headquarter for the district of Jalpaiguri. This is a very old settlement initiated probably in the last part of eighteenth century. The population structure of the area was extremely low at that time. However, presently townshisp is quite large with an area of 503.06 hectares and population is 2,80,927.

The township has developed replacing a very rich forested vegetation of Duars and at the same time, there are large number of introduced plants. Progress of habitation induced the introduction of numerous exotic plants (Das 1995, 2002) and that in one hand enrich the flora of a place and on the other hand extend much pressure on the local biodiversity.

The effects of urbanization are generally easily visible if its flora is analyzed properly. Different people have different types of likings on preferences for plants. This generally goes in favour of ornamental and fruit plants. In addition, the recently increasing interest on medicinal plants is also causing the introduction of many new species.

The habit, habitat preference, phenology, mode of pollination, abundance, etc of the plants are variable. The mode of pollination (in other words the method of pollen dispersal) and the flowering period have direct impact on the aeropalynology of a place. Keeping this in mind, the flora of the township area of Jalpaiguri with a radius of roughly 10 km. was studied round the year. The flowering calendar was prepared from the direct observation in the field.

The flowering calendar of Jalpaiguri town is presented in Table 2 along with habit, abundance, flowering period and mode of pollination. Families of Magnoliopsida (Dicotylendons) and Liliopsida (Monocotyledons) are presented and the genera and species under those families are presented alphabetically in the table 2. Realising that the list will be used mostly by non taxonomists, no particular system of classification was followed. However, correct nomenclature along with proper author citation for all the recorded plants have been provided.

Table 2 : Enumeration of the Flora of Jalpaiguri Township Area in West Bengal

Abbreviations used (except Author Citation): **Habit:** AH = Annual Herb, PH = Perennial Herb, GH = Geophytic Herb, SH = Saprophytic Herb, Sf = Suffrutescent Herb, US = Undershrub, S = Shrub, L = Liana, SC = Shrubby Climber, AC = Annual Climber, GC = Geophytic Climber, T = Tree, E = Epiphyte, RP = Root Parasite, SP = Stem Parasite; **Abundance:** A = Abundant, C = Common, LC = Less Common, R = Rare; **Flowering Period:** 1 = January to 12 = December; **Mode of Pollination:** An = Anemophilous, E = Emtomophilous, A/E = Amphiphilous, O = Ornithophilous, M = Melachophilous. **[Some of the photographs of the common plants of Jalpaiguri has been provided in Photograph I]**

TAXA	Habit	Abundance	Flowering period	*Mode of pollination*
MAGNOLIOPHYTA				
Magnoliopsida				
Acanthaceae				
Andrographis paniculata (Burm.f.) Wall. ex Nees	AH	A	1 – 12	*E*
Indoneesiella echioides (L.) Sreem.	AH	LC	1 – 12	*E*
Barleria cristata L.	AH	LC	10 – 12	*E*
Dicliptera roxburghiana Nees	AH	A	10 – 4	*E*
Gendarussa vulgaris Nees	S	A	10 – 2	*E*
Hygrophila auriculata (Schum.) Heine	AH	C	10 – 2	*E*
Hygrophila phlomoides Nees	AH	C	9 – 1	*E*
Hygrophila polysperma (Roxb.) T. Anderson	AH	A	10 – 4	*E*
Adhatoda justicia Medic.	S	A	4 -6, 10-11	*E*
Justicia diffusa Willd.	AH	A	1 – 12	*E*
Justicia japonica Thunb.	AH	LC	6 – 10	*E*
Lepidagathis incurva Buch.-Ham. ex D.Don	Sf	C	9 – 4	*E*
Nelsonia canescens (Lam.) Sprengel	AH	R	10 – 3	*E*
Phaulopsis imbricata (Forsk.) Sweet	AH	A	10 – 5	*E*
Rungia pectinata (L.) Nees	AH	A	9 – 5	*E*
Amaranthaceae				
Alternanthera paronichioides St. Hil.	AH	R	1 – 12	*A*
Alternanthera pheloxeroides (Mart.) Griseb.	PH	A	10 – 3	*A*
Alternanthera sessilis (L.) R.Br. ex DC.	AH	C	1 – 12	*A*
Amaranthus hybridus L.	AH	A	7 – 10	*A*
Amaranthus spinosus L.	AH	A	1 – 12	*A*
Amaranthus tricolor L.	AH	A	11 – 12	*A*
Amaranthus viridis L.	AH	A	1 – 12	*A*
Achyranthes aspera L.	AH	A	9 – 4	*A*
Achyranthes bidentatus Bl.	AH	A	9 – 4	*A*
Celosia argentia L.	AH	LC	10 – 2	*A*
Celosia cristata L.	AH	C	1 – 12	*A*
Deeringia amaranthoides (Lamk.) Merrill	SC	LC	9 – 12	*A*
Gomphrena celosioides Mart.	AH	LC	8 – 5	*A*
Gomphrena globosa L.	AH	C	12 – 4	*A*
Pupalia lappacea (L.) Juss.	PH	LC	10 – 3	*A*
Anacardiaceae				
Anacardium occidentale L.	T	R	3 – 4	*E*
Choreospondias axillaris (Roxb.) Burtt. & Hill	T	A	2 – 4	*E*
Lannea coromendelica (Houtt.) Merrill	T	C	12 – 4	*E*
Mangifera indica L.	T	A	2 – 4	*E*

Annonaceae

Anona reticulata L.	S	A	5 – 7	*A*
Anona squamosa L.	S	A	5 – 7	*A*
Artabotrys hexapetalus (L.f.) Bhandari	T	LC	4 – 8	*A*
Polyalthia longifolia (Sonn.) Thw.var. *longifolia*	T	A	2 – 3	*A*

Apiaceae

Centella asiatica (L.) Urb.	AH	A	3 – 5	*A*
Coriandrum sativum L.	AH	A	2 – 5	*A/E*
Daucus carrota L.	AH	LC	NR	*A/E*
Foeniculum vulgare Mill.	AH	A	12 - 3	*A/E*
Hydrocotyle sibthorpioides Lamk.	AH	A	1 – 12	*A*
Oenanthe javanica (Blume) DC.	AH	LC	4 – 10	*A*
Seseli indicum Wt. et Arn.	AH	LC	4 – 5	*A/E*

Apocynaceae

Aganosma caryophylla G. Don	L	LC	4 – 6	*E*
Allamanda cathertica L.	L	C	4 – 6	*E*
Alstonia scholaris (L.) R.Br.	T	A	10 – 2	*E*
Catharanthus roseus (L.) G. Don	US	A	1 – 12	*E*
Holarrhena pubescens (Buch.-Ham.) G. Don	T	C	4 – 6	*E*
Ichnocarpus frutescens (L.) R.Br.	SC	C	9 – 11	*E*
Nerium indicum Mill.	S	A	1 – 12	*E*
Plumeria rubra L.	T	A	1 – 12	*E*
Rauvolfia tetraphylla L.	Sf	R	1 – 12	*E*
Tabernaemontana divaricate (L.) R. Br.	S	A	1 – 12	*E*
Tabernaemontana gamblei Subr. Ex Henry	S	A	6 – 11	*E*
Thevetia peruviana (L.) Lippold	T	A	1 – 12	*E*
Wrightia arborea (Dennstaedt) Mabberley	T	R	4 – 6	*E*

Aristolochiaceae

Aristolochia tagala Cham.	GC	R	5 – 6	*E*

Asclepiadaceae

Calotropis gigantean (L.) R. Brown	S	A	3 – 11	*E*
Hemidesmus indicus R. Br.	GC	R	12 – 2	*E*
Hoya longifolia Wight	E	C	5 – 6	*E*
Hoya parasitica (Roxb.) Wight	E	C	5 – 6	*E*
Marsdenia tenacissima (Roxb.) Moon.	T	LC	5 – 6	*E*

Asteraceae

Acmella calva (DC.) Jansen	AH	A	1 – 12	*E*
Ageratum conyzoides L.	AH	A	1 – 12	*A/E*
Ageratum haustonianum (D. Don) DC.	AH	A	8 – 4	*A/E*
Artemisia vulgaris Clarke	PH	LC	9 – 1	*A/E*
Bidens pilosa L.	AH	A	1 – 12	*E*
Blumea hieracifolia (D. Don) DC.	AH	A	10 – 2	*E*
Blumea lacera (Burm.f.) DC.	AH	A	2 – 5	*E*
Caesulia axillarae Roxb.	AH	A	11 – 2	*E*
Chromolaena odoratum L.	Sf	A	10 – 1	*A/E*
Conyza leucantha (D. Don) Ludlow & Raven	AH	R	7 – 8	*E*
Cotula anthelmoides L.	AH	LC	7 – 8	*E*
Echinops echinatus Roxb.	AH	LC	8 – 1	*A/E*
Eclipta prostrata (L.) L.	AH	A	1 - 12	*E*
Elephantopus scaber L.	AH	A	10 – 2	*E*
Emilia sonchifolia (L.) DC.	AH	A	1 – 12	*E*
Enydra fluctuens Lour.	AH	A	11 – 3	*E*
Erigeron canadensis L.	AH	A	1 – 12	*A/E*

Galinsoga parviflora Cav.	AH	A	11 – 3	*E*
Grangea maderaspatana (L.) Poiret	AH	A	12 – 5	*E*
Gynura nepalensis DC	US	R	12 – 2	*E*
Ixeris polycephala Cass.	AH	A	7 – 12	*E*
Laggera alata (D. Don) Sch.-Bip. ex Oliver	AH	A	12 – 4	*E*
Mikania micrantha Kunth	SC	A	8 – 2	*A/E*
Pseudoconyza viscosa (Miller) d'Arcy	AH	A	12 – 4	*A/E*
Pseudognaphalium affine (D. Don) Anderberg	AH	A	12 – 3	*A/E*
Pulicaria foliolosa DC.	AH	LC	1 – 3	*E*
Senecio nudicaulis Buch.-Ham. ex D. Don	AH	LC	4 – 6	*E*
Siegesbeckia orientalis L.	AH	C	9 – 2	*E*
Sonchus asper (L.) Hill	AH	C	9 – 5	*E*
Sonchus wightianus DC.	AH	C	10 – 5	*E*
Synedrella nodiflora (L.) Gaertn.	AH	A	10 – 5	*E*
Tagetes patula L.	AH	A	1 – 12	*E*
Tithonia diversifolia (Hemsl.) A. Grey	Sf	LC	11 – 2	*E*
Tridax procumbens L.	AH	A	1 – 12	*E*
Vernonia cinerea (L.) Less.	AH	A	1 – 12	*A/E*
Vernonia silhetensis (DC.) Kerr.	AH	LC	10 – 4	*A/E*
Vicoa vestita (Wall. ex DC.) Ling	AH	LC	12 – 3	*E*
Wedelia chinensis (Osbeck.) Merr.	PH	C	7 – 11	*E*
Xanthium strumerium L.	AH	A	10 – 2	*E*
Youngia japonica L.	AH	A	12 – 4	*E*
Zinnia elegans Jacq.	AH	A	1 – 12	*E*
Balsaminaceae				
Impatiens balsamina L.	AH	A	1 – 12	*E*
Bignoniaceae				
Jacaranda mimosifolia D. Don	T	A	3 – 5	*E*
Millingtonia hortensis L.	T	C	12 – 3	*E*
Oroxylum indicum L.	T	C	7 – 9	*E, O*
Pyrostegia venusta (Ker-Grawl.) Miers	L	C	4 – 5	*E, O*
Spathodea campanulata P. Beauv.	T	A	4 – 6	*O*
Stereospermum colais (Dillwyn) Maberley	T	LC	5 – 7	*E*
Tabebuia argentea Britton	T	LC	5	*E, O*
Tecoma gaudichaudi DC.	S	LC	4 – 6	*E*
Tecoma stans (L.) Humboldt, Bonpland & Kunth	S	C	4 – 6	*E*
Bombacaceae				
Bombax ceiba L.	T	A	4 – 5	*O*
Ceiba pentandra L.	T	LC	5 – 6	*E*
Boraginaceae				
Cyanoglossum lanceolatum Forsk.	AH	A	11 – 3	*E*
Heliotropium indicum L.	AH	A	10 – 5	*E*
Brassicaceae				
Brassica juncea L	AH	A	2 – 5	*E*
Brassica rapa L.	AH	A	4 – 5	*E*

Cardamine flexuosa Withering	AH	A	12 – 5	*E*
Raphanus sativus L.	AH	A	2 – 4	*E*
Rorippa indica L.	AH	A	9 – 4	*E*
Buddlejaceae				
Buddleia asiatica Lour.	S	LC	1 – 5	*E*
Burseraceae				
Garuga pinnata Roxb.	T	C	4 – 5	
Cactaceae				
Cereus hexagonus L.	S	LC	6	
Opuntia dillenii (Ker-Gawl.) Hains.	S	LC	6 – 7	
Caesalpiniaceae				
Bauhinia acuminata L.	S	C	6 – 7	*E*
Bauhinia purpurea L.	T	C	4 – 5	*E*
Bauhinia vahlii Wt. et Arn.	L	C	5 – 6	*E*
Bauhinia variagata L.	T	C	3 – 5	*E, O*
Caesalpinia bonduch (L.) Roxb.	S	R	8 – 9	*E*
Caesalpinia pulcherrima (L.) Swartz	S	C	5 – 11	*E*
Cassia alata L.	S	LC	7 – 2	*E*
Cassia grandis L.f.	AH	C	3 – 4	*E*
Cassia fistula L.	T	A	1 – 12	*E*
Cassia mimosoides L.	AH	A	8 – 11	*E*
Cassia nodosa Buch.-Ham. ex Roxb.	T	A	3 – 4	*E*
Cassia occidentale L.	AH	A	5 – 9	*E*
Cassia siamea Lamk.	T	A	8 – 11	*E*
Cassia sophera L.	AH	A	6 – 9	*E*
Cassia tora L.	AH	A	7 – 12	*E*
Delonix regia (Boj.) Raf.	T	A	3 – 9	*E*
Peltophorum pterocarpum (DC.) Baker ex K. Heyne	T	A	4 – 10	*E*
Tamarindus indica L.	T	A	6 – 7	*E*
Campanulaceae				
Wahlenbergia gracilis (Forst.) DC.	AH	C	11 – 2	*E*
Capparaceae				
Capparis zeylanica L.	AH	R	5 – 6	*E*
Crataeva nurvala Buch.-Ham.	T	LC	4 – 5	*E*
Caprifoliaceae				
Sambucus canadensis L.	S	R	2 – 8	*E*
Caricaceae				
Carica papaya L.	S	A	1 – 12	*E*
Caryophyllaceae				
Cerastium glomeratum Thuill	AH	R	12 – 3	*A*

Drymaria diandra Blume	PH	A	8 – 3	*A*
Drymaria villosa Cham. et Schult.	AH	C	11 – 2	*A*
Polycarpon loeflingiae (Wt..et Arn.) Benth.	AH	A	5 – 11	*A*
Stellaria alsinae Hoffm.	AH	R	12 – 2	*A*
Stellaria wallichii Benth.	AH	A	1 – 3	*A*
Casuarinaceae				
Casuarina equisetifolia L.	T	C	3 – 5	*A*
Cannabinaceae				
Cannabis sativa L.	AH	A	5 – 10	*A*
Ceratophyllaceae				
Ceratophyllum demersum L.	AH	LC	9 – 12	*W*
Chenopodiaceae				
Chenopodium album L.	AH	A	1 – 5	*A*
Chenopodium ambrosoides L.	AH	A	2 – 7	*A*
Spinacea oleracea L.	AH	A	3 – 5	*A*
Cleomaceae				
Cleome rutidosperma DC.	AH	A	1 – 12	*E*
Cleome speciosa Jacq.	AH	LC	3 – 5	*E*
Cleome viscosa L.	AH	A	1 – 12	*E*
Clusiaceae				
Mesua ferrea L.	T	LC	3 – 4	*A/E*
Cochlospermaceae				
Cochlospermum religiosum L.	T	R	4 – 5	*E*
Combretaceae				
Combretum decundrum Roxb.	L	A	3 – 5	*E*
Quisqualis indica L.	L	A	5 – 10	*E*
Terminalia arjuna (Roxb. *ex* DC.) Wt. *et* Arn.	T	A	4 – 5	*E*
Terminalia belerica (Gaertn.) Roxb.	T	R	7 – 8	*E*
Terminalia catappa L.	T	R	7 – 8	*E*
Terminalia chebula Retz.	T	R	6 – 7	*E*
Terminalia tomentosa Roxb. *ex* DC.	T	C	4 – 5	*E*
Convolvulaceae				
Argyreia roxburghii Choisy	SC	A	9 – 11	*E*
Evolvulus nummolarius (L.) L.	AH	C	1 – 12	*E*
Ipomoea aquatica Forsk.	PH	A	6 – 10	*E*
Ipomoea carnea Jaque.	S	A	7 – 11	*E*
Ipomoea eriocarpa R. Brown	AC	C	9 – 2	*E*
Ipomoea hederifolia L.	AC	C	9 – 1	*E*
Ipomoea obscura (L.) Ker-Gawl.	AC	LC	10 – 1	*E*
Ipomoea quamoclit L.	AC	A	7 – 12	*E*
Merremia tridentata (L.) Hallier f.	AC	LC	10 – 3	*E*

Merremia hirta (L.) Merrill	AC	C	9 – 1	*E*
Merremia vitifolia (Burm.f.) Hallier f.	AC	C	1 – 4	*E*
Crassulaceae				
Kalanchoe integra (Medikus) Kuntze	PH	A	12 – 3	*E*
Kalanchoe pinnata (Lamk.) Pers.	PH	A	12 – 3	*E*
Sedum multicaulis Wall. *ex* Lindl.	PH	R	4 – 5	*E*
Cucurbitaceae				
Bryonopsis laciniosa (L.) Naud.	AC	C	7 – 9	*E*
Citrullus vulgaris Schrad. ex Eckl. Et Zryh	AC	LC	5 – 6	*E*
Coccinea grandis (L.) Voigt	SC	A	1 – 12	*E*
Cucumis melo L.	AC	C	5 – 8	*E*
Cucurbita maxima Duch ex Poiret	AC	A	1 – 12	*E*
Luffa acutangula (L.) Roxb.	AC	A	5 – 10	*E*
Luffa aegyptiaca Mill.	AC	A	7 – 9	*E*
Momordica charantia L.	AC	A	1 – 12	*E*
Momordica dioica Willd.	GC	A	7 – 9	*E*
Trichosanthes cordata Roxb.	GC	LC	8 – 9	*E*
Mukia maderaspatana (L.) Roem.	AC	A	7 – 10	*E*
Trichosanthes cucumerina L.	L	LC	7 – 8	*E*
Trichosanthes dioica Roxb.	GC	C	3 – 9	*E*
Trichosanthes lepiniana (Naud.) Cogniaux	GC	A	7 – 9	*E*
Zanonia indica L.	GC	A	7 – 10	*E*
Cuscutaceae				
Cuscuta chinensis L.	SP	R	9 – 2	*E*
Cuscuta reflexa Roxb.	SP	A	10 – 2	*E*
Dilleniaceae				
Dillenia indica L.	T	R	6	*E*
Dillenia pentagyna Roxb.	T	LC	3 – 4	*E*
Dipterocarpaceae				
Shorea robusta Gaertn. f.	T	LC	2 – 3	*E*
Droseraceae				
Drosera burmanii Vahl	AH	LC	11 – 5	*E*
Ebenaceae				
Diospyros sp	T	R	NR	*E*
Ehretiaceae				
Cordia myxa Forst.f.	T	LC	9 – 10	*E*
Ehretia serrata Roxb.	T	C	4 – 5	*E*
Elatinaceae				
Bergia ammanoides Roth.	AH	C	8 – 9	*E*
Euphorbiaceae				
Acalypha indica L.	AH	A	1 – 12	*A*

Baccurea ramiflora Loureiro	T	LC	NR	*A*
Breynia vitis-idaea (Burm.f.) Fischer	S	LC	4 – 7	*A*
Bridelia retusa (L.) Sprengel	T	LC	4 – 5	*A*
Codaeum variegatum (L.) Blume	S	A	4 – 7	*A*
Croton bonplandianum Baill.	AH	A	1 – 12	*A*
Croton caudatus Geischer	SC	R	5 – 7	*A*
Drypetes roxburghii (Wall.) Hurusawa	T	C	5 – 6	*A*
Embelica officinale Gaertn.	T	A	4 – 5	*A*
Euphorbia antiquorum L.	S	LC	12 – 2	*A*
Euphorbia heterophylla L.	AH	LC	7 – 10	*A*
Euphorbia hirta L.	AH	A	1 – 12	*A*
Euphorbia hypericifolia L.	AH	LC	1 – 12	*A*
Euphorbia millii Ch.-des-Moulins	US	LC	3 – 6	*A*
Euphorbia heyneana Sprengel	AH	A	1 – 12	*A*
Euphorbia tirucallii Forsk.	S	C	NR	*A*
Fluggea virosa (Roxb. ex Willd.) Voigt	S	LC	4 – 6	*A*
Jatropha curcus L.	S	LC	5 – 6	*A*
Jatropha gossypifolia L.	AH	C	8 – 4	*A*
Jatropha panduraefolia Andr.	S	LC	1 – 12	*A*
Manihot esculenta Crantz	S	C	NR	*A*
Pedillanthus tethymeloides (L.) Poiret	S	A	2 – 4	*E*
Phyllanthus amarus Schum. et Thonn.	AH/P	VC	1 – 12	*A*
Phyllanthus asperulatus Hutch.	PH	A	1 – 12	*A*
Phyllanthus reticulata Poiret	SC	LC	6 – 7	*A*
Phyllanthus simplex Retz.	AH	A	6 – 9	*A*
Phyllanthus urinaria L.	AH	A	1 – 12	*A*
Poinsettia pulcherrima R. Grah	S	C	9 – 5	*E*
Ricinus communis L.	S	A	1 – 12	*A*
Trewia polycarpa Benth.	T	C	4 – 5	*A*
Flacourtiaceae				
Casearia graveolens Dalz.	S	LC	5	*E*
Fumariaceae				
Fumaria indica (Haussk.) Pugsley	AH	R	12 - 4	*E*
Gentianaceae				
Canscora diffusa (Vahl) Roemer & Schultes	AH	C	2 – 4	*E*
Erythrea roxburghii D. Don	AH	LC	12 – 5	*E*
Exacum tetragonum Roxb.	AH	LC	1 – 4	*E*
Hoppea dichotoma Heyne ex Willd.	AH	C	1 – 3	*E*
Hydrophyllaceae				
Hydrolea zeylanica L.	AH	C	10 – 2	*E*
Hypericaceae				
Hypericum japonicum Murr.	AH	A	1 – 12	*E*
Icacinaceae				
Natsiatum herpeticum Arnott	SC	A	4 – 5	*A*

Lamiaceae

Anisomeles indica (L.) O. Ktz.	AH	A	10 – 5	*E*
Colebrookia oppositifolia J.E. Smith	S	A	2 – 4	*E*
Dysophylla verticillata Benth.	AH	A	9 – 4	*E*
Hyptis suaveolens (L.) Poiret	AH	A	1 – 12	*E*
Leucas indica (L.) R. Br. ex Vatke	AH	A	1 – 12	*E*
Mentha piperata Stokes	PH	LC	NR	*E*
Ocimum basilicum L.	AH	LC	11 – 5	*E*
Ocimum gratissimum Forsk.	US	R	5	*E*
Ocimum sanctum L.	US	A	12 – 4	*E*
Perilla frutescens (L.) Britton	AH	LC	12 – 3	*E*
Pogostemon andersonii (Prain) Panigrahi	AH	A	2 – 3	*E*
Rabdosia strigosa (Bentham) Hara	AH	C	10 – 3	*E*
Salvia coccinea Etlinger	AH	C	2 – 6	*E*
Teucrinum viscidum Blume	AH	LC	9 – 10	*E*

Lauraceae

Cinnamomum tamala Nees	T	C		*A*
Cinnamomum zeylanicum Blume	T	R	NR	*A*
Litsea glutinosa (Lour.) Robinson	T	C	5 – 6	*A*
Litsea monopetala (Roxb.) Pers.	T	A	4 – 6	*A*

Lecythidaceae

Careya arborea Roxb.	T	LC	3 – 5	*A/E*
Couroupita guianensis var. *surinanensis* Eyma	T	LC	1 – 12	*E*

Leeaceae

Leea guinensis G. Don	S	C	9 – 10	*A/E*

Lentibulariaceae

Utricularia bifida L.	AH	LC	12 – 2	*E*
Utricularia striatula Smith	AH	LC	7 – 11	*E*

Lineaceae

Linum usitatissimum L.	AH	C	3 – 4	*E*

Lobeliaceae

Lobelia alsionoides Lam.	AH	C	3 – 5	*E*
Lobelia heyneana Roem. et Schult.	AH	C	2 – 5	*E*

Loganiaceae

Mitrasacme indica Wt.	AH	R	9 – 12	*E*
Mitrasacme pygmaea R. Br. var. *pygmaea*	AH	R	9 – 12	*E*

Loranthaceae

Dendrophthoe falcata (L.f.) Ettingshausen	SP	R	4 – 5	*E*
Helixanthera parasitica Loureiro	SP	R	NR	*E*
Macrosolen cochinchinensis (Lour.) van Tieghem	SP	R	5	*E*
Viscum album L.	SP	LC	NR	*A/E*

Lythraceae

Ammania buccifera L.	AH	A	7 – 9	*E*
Lagerstroemia indica L.	S	A	1 – 12	*E*
Lagerstroemia parviflora Roxb.	T	C	5	*E*
Lagerstroemia reginae Roxb.	T	A	4 – 5	*E*
Lagerstroemia thorelii Gagnep.	T	A	6 – 8	*E*
Rotala cordata Koehne	AH	LC	10 – 11	*E*
Rotala rotundifolia (Buch.-Ham.) Koehne	AH	A	1 – 3	*E*

Magnoliaceae

Magnolia grandiflora L.	T	LC	5 – 6	*E*
Michelia champaca L.	T	C	6 – 10	*E*

Malpighiaceae

Hiptage madhabolata Gaertn.	L	LC	4	*E*

Malvaceae

Abutilon indicum (L.) Sweet	AH	LC	9 – 1	*E*
Gossypium hirsutum L.	S	LC	5 – 10	*E*
Hibiscus mutabilis L.	S	C	5 – 9	*E*
Hibiscus cannabinus L.	AH	C	8 – 10	*E*
Hibiscus rosa-sinensis L.	S	A	1 – 12	*E*
Malva verticillata L.	AH	A	12 – 2	*E*
Sida acuta Burm.f.	AH	A	8 – 1	*E*
Sida cordata (Burm.f.) Borssum	US	C	9 – 3	*E*
Sida cordifolia L.	AH	LC	1 – 12	*E*
Sida rhombifolia L.	PH	A	9 – 5	*E*
Urena lobata L.	AH	A	9 – 4	*E*

Martyniaceae

Martynia annua L.	AH	LC	7 – 9	*E*

Meliaceae

Azadirachta indica A. Juss.	T	A	4 – 5	*E*
Aglaia spectabilis (Miquel) Jain & Bennet	T	LC	NR	*E*
Melia azadirach L.	T	C	4 – 5	*E*
Swietenia macrophylla King	T	LC	4 – 5	*E*
Swietenia mahagoni L.	T	C	NR	*E*
Toona ciliata Roem.	T	C	4 – 5	*E*

Menispermaceae

Cissampelos pereira L.	GC	LC	7 – 9	*A*
Stephania japonica (Thunb.) Miers.	GC	C	6 – 10	*A*
Tinospora cordifolia (Willd.) Hook.f. & Thoms.	SC	LC	5 – 6	*A*

Mimosaceae

Acacia auriculoformis Benth.	T	A		*A/E*
Acacia catechu (L.f.) Willd.	T	LC	8 – 9	*A/E*
Adenanthera pavonina L.	T	LC	5 – 6	*A/E*
Albizia chinensis (Osbeck) Merrill	T	C	6 – 7	*A/E*

Albizia lebbek (L.) Venth.	T	A	5 – 6	*A/E*
Albizia lucidior (Steudel) Hara	T	LC	5 – 6	*A/E*
Calliandra haematocephala Hasskarl	S	A	9 – 4	*A/E*
Leucaena leucocephala (Lamk.) de Wit	T	A	1 – 12	*A/E*
Mimosa himalayana Gamkble	S	LC	9 – 4	*A/E*
Mimosa pudica L.	AH	A	6 – 2	*A/E*
Pithecellobium dulce (Roxb.)Benth.	T	LC	4 – 5	*A/E*
Molluginaceae				
Glinus lotoides L.	AH	A	10 – 4	*A/E*
Glinus oppositifolius (L.) A.DC.	AH	A	10 – 5	*A/E*
Mollugo pentaphylla L.	AH	A	10 - 6	*A/E*
Moraceae				
Artocarpus lacucha Hamilton	T	C	12 – 1	*A*
Artocarpus heterophyllus Lamk.	T	A	1 – 12	*A*
Ficus benghalensis L.	T	VC	4 – 5	*E*
Ficus benjamina L.	T	VC	4 – 5	*E*
Ficus cunia Buch.-Ham. ex Roxb	T	C	3 – 6	*E*
Ficus elastica Roxb.	T	C	NR	*E*
Ficus racemosa L.	T	LC	NR	*E*
Ficus heterophylla L.f.	SC	R	5 – 6	*E*
Ficus hispida L.f.	T	A	1 – 12	*E*
Ficus virens Aiton	T	LC	NR	*E*
Ficus pumila L.	SC	LC	NR	*E*
Ficus rumphii Blume	T	LC	NR	*E*
Ficus religiosa L.	T	C	5 – 6	*E*
Morus australis Poiret	T	C	3 – 4	*A*
Streblus asper Lour.	T	VC	9 – 10	*A*
Moringaceae				
Moringa oleifera Lamk.	T	VC	10 – 1	*E*
Myrsinaceae				
Ardisia solanacea Roxb.	S	LC	8 – 10	*E*
Maesa indica (Roxb.) A. DC.	S	R	4 – 5	*E*
Myrtaceae				
Callistemon lanceolatus DC.	T	LC	10 – 4	*E*
Eucalyptus globulosus St.-Lag.	T	C	4 – 5	*E*
Psidium guajava L.	T	VC	1 – 12	*E*
Syzygium cumini (L.) Skeels	T	C	4	*E*
Syzygium jambos (L.) Alston	T	R	11 – 12 4 – 5	*E*
Syzygium operculinum (Roxb.) Niedenzu	T	R	2 – 3	*E*
Nyctaginaceae				
Boerhavia diffusa L.	Sf	A	1 – 12	*E*
Bougainvillea glabra Choisy	S	LC	1 – 12	*E*
Bougainvillea spectabilis Willd.	S	A	10 – 5	*E*
Mirabilis jalapa L.	PH	A	4 – 11	*E*

Nyctanthaceae				
Nyctanthes arbor-tristis L.	S	A	9 – 3	*E*
Nymphaeaceae				
Nelumbo nucifera Gaertner	PH	R	6 – 11	*E*
Nymphea stellata F. Muell	PH	LC	7 – 2	*E*
Oleaceae				
Jasminum pubescens (Retz) Willd.	SC	LC	12 – 4	*E*
Jasminum sambac (L.) Aiton	UC	C	4 – 11	*E*
Onagraceae				
Ludwigia octavalvis (Jacq.) Raven	AH	A	9 – 4	*E*
Ludwigia perennis L.	AH	A	1 – 12	*E*
Ludwigia prostrata Roxb.	AH	R	8 – 2	*E*
Papilionaceae [Fabaceae]				
Abrus praecatorius L.	SC	R	3 – 4	*E*
Abrus pulchellus Thwaites	SC	LC	3 – 4	*E*
Aeschynomene asper L.	AH	LC	9 – 10	*E*
Aeschynomene indica L.	AH	LC	9 – 2	*E*
Alysicarpus vaginalis (L.) DC.	AH	A	9 – 5	*E*
Atylosia scarabaeoides (L.) Benth.	AC	LC	8 – 12	*E*
Butea monosperma (Lamk.) Taub.	T	LC	1 – 4	*O*
Cajanus cajan (L.) Huth	AH	A	6 – 12	*E*
Cicer arietinum L.	AH	C	12 – 1	*E*
Clitorea ternatea L.	AC	C	6 – 12	*E*
Crotalaria albida Heyne ex Roth	AH	LC	6 – 10	*E*
Crotalaria calycina Schrank	AH	LC	9 – 1	*E*
Crotalaria mucronata Desv.	AH	A	1 – 12	*E*
Crotalaria prostrata (Rottl.) Roxb.	AH	C	10 – 2	*E*
Crotalaria cytisoides DC.	AH	R	12 – 2	*E*
Crotalaria retusa L.	AH	C	9 – 3	*E*
Dalbergia latifolia Roxb.	L	LC	NR	*E*
Dalbergia sissoo Roxb.	T	A	3 – 5	*E*
Desmodium gangeticum (L.) DC.	Sf	C	9 – 2	*E*
Desmodium heterophyllum (Willd.) DC.	AH	LC	8 – 4	*E*
Desmodium laxiflorum var. *variagatum* L.	Sf	LC	8 – 5	*E*
Desmodium triflorum (L.) DC.	AH	A	9 – 4	*E*
Lablab purpureus (L.) Sweet	AC	C	10 – 3	*E*
Erythrina stricta Roxb.	T	LC	2 – 3	*O*
Erythrina variegata L.	T	LC	3 – 4	*O*
Flemingia chapper Buch.-Ham.	Sf	LC	10 -2	*E*
Gliricidia sepium (Jacquin) Walpers	T	LC	5 – 6	*E*
Indigofera astragalina DC.	AH	R	8 – 10	*E*
Indigofera linnaei Ali	PH	R	10 – 6	*E*
Lathyrus aphaca L.	AH	R	1 – 4	*E*
Lathyrus sativus L.	AH	C	1 – 3	*E*
Melilotus alba Desr.	AH	C	10 – 2	*E*
Melilotus indica (L.) Allioni	AH	C	10 – 2	*E*

Mucuna pruriens L.	AC	R	2 – 3	*E*
Pachyrhizus erosus (L.) Urban	GC	R	8 – 9	*E*
Pisum sativum L.	AC	C	12 – 3	*E*
Pongamia pinnata (L.) Pierre	T	LC	6 – 7	*E*
Priotropis crotalarioides (DC.) Wight & Arnott	AH	LC	12 – 2	*E*
Pueraria phaseoloides (DC.) Bentham	Sf	C	10 – 3	*E*
Sesbania grandiflora (L.) Poiret	T	C	6 – 10	*E*
Sesbania sesban (L.) Merr.	S	LC	8 – 10	*E*
Smithia sensitiva Aiton	AH	C	10 – 4	*E*
Tephrosia candida (Roxb.) DC.	S	LC	10 – 12	*E*
Tephrosia purpurea (L.) Pers.	AH	LC	7 – 3	*E*
Vicia hirsita (L.) S.F. Gray	AC	C	1 – 4	*E*
Vicia sativa L.	AC	C	1 – 4	*E*
Zornia gibbosa Span.	AH	A	11 – 4	*E*
Passifloraceae				
Passiflora foetida L.	AC	VC	10 – 4	*E*
Passiflora grandiflora Salisb.	SC	LC	1 – 12	*E*
Pedaliaceae				
Sesamum indicum L.	AH	C	9 – 2	*E*
Peperomiaceae				
Peperomia pellucida (L.) H.B.K.	AH	A	1 – 12	*A*
Piperaceae				
Piper betle L.	SC	R	NR	*A*
Piper nigrum L.	SC	LC	12 – 2	*A*
Piper longum L.	HC	C	10 – 12	*A*
Polemoniaceae				
Phlox drummondii Hook.	AH	A	1 – 5	*E*
Polygalaceae				
Polygala chinensis A. Bennett	AH	VC	8 – 10	*E*
Polygala linarifolia Willd.	AH	R	8 – 11	*E*
Salomonia ciliata (L.) DC.	RP	C	7 – 10	*E*
Polygonaceae				
Antigonon leptopus Hook. et Arn.	SC	LC	9 – 4	*A/E*
Muehlenbeckia axillaris (Hook.f.) Endl.	S	LC	12 – 2	*A*
Persicaria barbata (L.) Hara	AH	C	8 – 1	*A/E*
Persicaria hydropiper (L.) Spach	SC	VC	7 – 2	*A/E*
Persicaria strigosa (R. Brown) Nakai	PH	C	10 – 5	*A/E*
Persicaria orientalis (L.) Spach	AH	C	11 – 5	*A/E*
Persicaria chinensis (L.) H. Gross	AH	C	10 – 6	*A/E*
Polygonum plebeium R.Br	AH	VC	2 – 5	*A/E*
Rumex dentatus L.	AH	A	1 – 5	*A*
Rumex trisetifer Stokes	AH	A	1 – 5	*A*

Portulacaceae				
Portulaca oleracea L.	AH	A	1 – 12	*E*
Portulaca quadrifida L.	AH	LC	10 – 6	*E*
Primulaceae				
Anagalis arvensis L.	AH	C	2 – 6	*E*
Proteaceae				
Grevillea robusta A. Cunn. ex R. Br.	T	C	4 – 5	*O*
Punicaceae				
Punica granatum L.	S	VC	4 – 7	*E*
Ranunculaceae				
Delphinium ajacis L.	AH	C	1 – 4	*E*
Naravelia zeylanica (L.) DC.	SC	R	NR	*E*
Nigella sativa L.	AH	LC	1 – 3	*E*
Ranunculus sceleratus L.	AH	VC	9 – 11	*E*
Rhamnaceae				
Zizyphus mauritiana Lamk.	T	VC	9 – 10	*E*
Zizyphus oenoplia (L.) Mill.	S	R	9 – 11	*E*
Rosaceae				
Duchesnea indica (Andrews) Focke.	AH	R	1 – 3	*E*
Rosa hybrida Hortorum	S	A	1 – 12	*E*
Rosa indica L.	SC	C	11 – 5	*E*
Rubiaceae				
Adina cordifolia (Roxb.) Hook.f. ex Brand.	T	LC	5 – 8	*E*
Anthocephalus chinensis (Lam.) Rich. ex Walp.	T	A	5 – 9	*E*
Borreria alata (Aubl.) DC.	AH	A	8 – 10	*E*
Borreria ocymoides (Burm.f.) DC.	AH	A	7 – 10	*E*
Borreria pusilla (Wallich) DC.	AH	LC	8 – 10	*E*
Coffea bengalensis Roxb.	S	A	2 – 5	*E*
Dentella repens (L.) J. et G. Forst.	AH	A	8 – 11	*E*
Gardenia augusta (L.) Merrill	S	C	11 – 3	*E*
Hamelia patens Jacq.	S	VC	1 – 12	*E*
Hedyotis corymbosa (L.) Lamk.	AH	A	1 – 12	*E*
Hedyotis diffusa Willd.	AH	A	6 – 9	*E*
Hedyotis racemosa Lamarck	AH	R	10 – 12	*E*
Hedyotis scandens Roxb.	Sf	LC	9 – 12	*E*
Ixora coccinea L.	S	A	1 – 12	*E*
Ixora javanica (Blume) DC.	S	C	1 – 12	*E*
Ixora parviflora Vahl	S	C	1 – 12	*E*
Kohautia gacilis (Wallich) DC.	PH	R	10 – 3	*E*
Meyna spinosa Link	S	LC	4 – 6	*E*
Mirtacarpus verticillatus (Schumm. *et* Thonn.) Vatke	AH	A	1 – 12	*E*
Morinda citrifolia L.	T	LC	3 – 4	*E*

Mussaenda philippica A. Rich.	S	A	10 – 6	*E*
Mussaenda roxburghii Hook.f.	S	R	6 – 8	*E*
Paederia foetida L.	SC	C	8 – 10	*E*
Pentas lanceolata (Forsk.) K. Schum.	S	LC	10 – 6	*E*
Randia dumetorum (Link) DC.	S	LC	5 – 7	*E*

Rutaceae

Aegle marmelos (L.) Correa	T	LC	4 – 5	*E*
Citrus limon (L.) Burm.f.	S	C	4 – 5	*E*
Citrus maxima (Burm.) Merr.	T	VC	3 – 4	*E*
Clausena excavata Burman	S	LC	4 – 5	*E*
Clausena dentata (Willd.) Roemer	S	LC	3 – 4	*E*
Glycosmis pentaphylla (Retzius) DC.	S	C	3 – 8	*E*
Murraya koenigii (L.) Burm.f.	S	A	4 – 6	*E*
Murraya paniculata (L.) Jack.	S	A	4 – 6	*E*

Sapindaceae

Allophyllus chartaceus (Kurz) Radlkofer	S	R	4 – 5	*A/E*
Cardiospermum helicacabum L.	AC	R	1 – 12	*E*
Dodonea viscosa (L.) Jack.	S	LC	1 – 3	*E*
Lichi chinensis Sonner.	T	VC	1 – 3	*E*

Sapotaceae

Bassia latifolia Roxb.	T	R	4 – 5	*E*
Manilkara achras (Mill.) Fosberg	T	LC	1 – 12	*E*
Mimusops elengi L.	T	C	1 – 12	*E*

Scrophulariaceae

Antirrhinum majus L.	AH	VC	12 – 4	*E*
Centrathera humifusca Wall. ex Benth.	RP	VC	7 – 9	*E*
Limnophylla polyantha Hook.f.	AH	VC	10 – 1	*E*
Limnophylla repens (Bentham) Bentham	AH	A	10 – 1	*E*
Limnophylla sessiliflora (Vahl) Blume	AH	C	10 – 1	*E*
Lindenbergia indica (L.) Vatke	AH	VC	1 – 12	*E*
Lindernia ciliata (Colsm,) Pennell	AH	A	6 – 3	*E*
Lindernia crustacea (L.) F. Muell.	AH	A	1 – 12	*E*
Lindernia viscosa (Hornemann) Bolgingh	AH	A	7 – 10	*E*
Lindernia multiflora (Roxb.) Mukherjee	AH	A	6 – 10	*E*
Lindernia parviflora (Roxb.) Haines	AH	A	7 – 1	*E*
Macardonia dianthera (Mill.) Small	AH	C	8 – 10	*E*
Mazus pumilus (Burm.f.) Steenis	AH	A	1 – 12	*E*
Russelia juncea Zucc.	US	C	10 – 4	*E*
Scoparia dulcis L.	Sf	A	1 – 12	*E*
Striga asiatica (L.) Kuntze	RP	LC	1 – 3	*E*
Torenia asiatica L.	RP	C	6 – 8	*E*

Sphenocleaceae

Sphenoclea zeylanica Gaertn.	AH	C	7 – 9	*A*

Simaroubaceae

Ailanthus excelsa Roxb.	T	VC	10 – 4	*A/E*
Ailanthus integrifolia Lamarck	T	C	10 – 2	*A/E*

Solanaceae

Browalia americana L.	AH	LC	9 – 11	*E*
Brunfelsia pauciflora (Chamisso & Schlecht.) Benth.	S	C	10 – 5	*E*
Capsicum annuum L.	AH	A	1 – 12	*E*
Cestrum nocturnum L.	S	A	5 – 7	*E*
Datura metel L.	AH	A	1 – 12	*E*
Datura suaveolens Humb.	S	LC	1 – 12	*E*
Lycopersicum esculentum Mill.	AH	A	11 – 6	*E*
Petunia hybrida Vilmorin	AH	A	1 – 5	*E*
Physalis minima L.	AH	VC	6 – 10	*E*
Physalis peruviana L.	AH	R	6 – 10	*E*
Solanum anguivi Lamarck	S	LC	1 – 12	*E*
Solanum viarum Dunal	AH	A	1 – 12	*E*
Solanum melongena L.	AH	A	1 – 12	*E*
Solanum nigrum L.	AH	A	1 – 12	*E*
Solanum torvum Swartz	S	VC	8 – 11	*E*
Solanum tuberosum L.	GH	C	2 – 5	*E*
Solanum villosum Miller	AH	C	1 – 12	*E*

Sterculiaceae

Abroma augusta (L.) L.f.	S	LC	7 – 11	*E*
Firmiana colorata (Roxb.) R. Brown	T	LC	3 – 4	*E*
Melochia corchorifolia L.	AH	A	5 – 9	*E*
Pentapetes phoenicea L.	AH	LC	8 – 9	*E*
Pterygota alata (Roxb.) R. Brown	T	LC	12 – 1	*E*
Pterospermum acerifolium (L.) Willd.	T	LC	4 – 6	*E*
Sterculia villosa Smith	T	C	1 – 3	*E*
Theobroma cacao L.	T	LC	1 – 12	*E*
Waltheria indica L.	AH	LC	9	*E*

Theaceae

Camellia japonica var. *rusticana* (Honda) T.L. Ming	S	LC	12 – 2	*E*
Camellia sinensis (L.) O. Kuntze var. *sinensis*	S	A	9 – 11	*E*
Camellia sinensis var. *asssamica* (Masters) Kitamura	S	A	9 – 11	*E*

Tiliaceae

Corchorus aestuans L.	AH	LC	7 – 10	*E*
Corchorus capsularis L.	AH	A	7 – 8	*E*
Grewia asiatica L.	T	C	5 – 6	*E*
Grewia optiva Burret	T	LC	9 – 11	*E*
Triumfetta pilosa Roth	AH	LC	8 – 10	*E*
Triumfetta rhomboidea Jacq.	AH	VC	8 – 10	*E*

Ulmaceae				
Trema orientalis (L.) Blume	T	A	10 – 2	*A*
Urticaceae				
Boehmeria platyphylla D. Don	S	LC	7 – 1	*A*
Elatostema reptans Hook.f.	AH	LC	6 – 12	*A*
Elatostema rupestre (D. Don) Weddell	AH	R	7 – 12	*A*
Laportea interrupta (L.) Chow	AH	VC	8 – 10	*A*
Pilea microphylla (L.) Lieb.	AH	A	7 – 11	*A*
Pouzolzia hirta (Blume) Hasskarl	PH	LC	10 – 12	*A*
Pouzolzia zeylanica (L.) Bennett	AH	A	1 – 12	*A*
Verbenaceae				
Callicarpa arborea Roxb.	T	C	8 – 10	*E*
Clerodendrum chinense (Osbeck) Mabberley	Sf	LC	12 – 2	*E*
Clerodendrum indicum (L.) Kintze	S	A	1 – 3	*E*
Clerodendrum innerme (L.) Gaertn.	S	LC	9 – 10	*E*
Clerodendrum japonicum (Thunberg) Sweet	Sf	LC	6 – 8	*E*
Clerodendrum thomsonae Balfour f.	SC	LC	1 – 12	*E*
Clerodendrum viscosum Vent.	Sf	A	1 – 4	*E*
Duranta repens L.	S	A	5 – 6	*E*
Gmelina arborea Roxb.	T	A	4 – 5	*E*
Holmskioldia sangunea Retzius	SC	LC	12 – 2	*E*
Lantana camara L.	S	A	1 – 12	*E*
Phyla nudiflora (L.) Greene	AH	LC	1 – 5	*E*
Premna mucronata Roxb.	T	C	5 – 6	*E*
Stachytarpheta indica (L.) Vahl	Sf	LC	2 – 4	*E*
Tectona grandis L.f.	T	A	9 – 10	*E*
Vitex negundo L.	S	LC	5 – 7	*E*
Vitaceae				
Ampelocissus sikkimensis (Lawson) Planchon	SC	A	6 – 8	*A/E*
Cayratia trifolia (L.) Domin.	SC	A	5 – 8	*A/E*
Cissus quadrangularis L.	SC	R	NR	*A/E*
Tetrastigma bracteolatum (Wallich) Planchon	SC	LC	7 – 9	*A/E*
Tetrastigma serrulatum (Roxb.) Planchon	SC	LC	7 – 9	*A/E*
Tetrastigma leucostaphylum *(Dennstedt) Mabberley*	SC	LC	NR	*A/E*

MAGNOLIOPHYTA	Habit	Abundance	Flowering Period	*Mode of Pollination*
Liliopsida				
Acoraceae				
Acorus calamus L.	GH	LC	6 – 7	*A*
Agavaceae				
Agave sisalana Perrine	S	LC	11 – 2	*E*
Amaryllidaceae				
Crinum asiaticum L.	GH	LC	5 – 6	*E*

Hippaestrum spp.	GH	C	5 – 7	*E*
Polianthes tuberosa L.	GH	C	1 – 12	*E*
Zephyranthes rosea Lindl.	GH	VC	5 – 8	*E*
Araceae				
Alocasia macrorrhiza (L.) G. Don	GH	A	NR	*E*
Amorphophallus campanulatus (Roxb.) Bl. ex Decne	GH	A	5 – 6	*E, M*
Caladium bicolor Vent.	GH	A	5 – 7	*E*
Colocasia esculenta (L.) Schott	GH	A	6 – 7	*E, M*
Colocasia fallax Schott	GH	A	6 – 7	*E, M*
Pistia strateotes L.	HA	LC	7 – 10	*E*
Pothos scandens L.	E	C	8 – 10	*A/E*
Scindapsus officinale (Roxb.) Schott	E	LC	NR	*A/E*
Typhonium trilobatum (L.) Schott	GH	A	6 – 8	*E, M*
Arecaceae				
Areca catechu L.	T	A	1 – 12	*A*
Areca sp	T	C	1 – 12	*A*
Borassus flabellifer L.	T	LC	5 – 6	*A*
Calamus rotang L.	L	LC	NR	*A*
Caryota urens L.	T	LC	2 – 3	*A*
Cocos nucifera L.	T	A	1 – 12	*A*
Phoenix sylvestris L.	T	C	4 – 5	*A*
Roystonia regia (H.B.K.) O.F. Cook	T	C	5 – 7	*A*
Bromeliaceae				
Ananus sativus Schult.f.	PH	A	1 – 12	*E*
Burmanniaceae				
Burmannia coelestis D. Don	AH	R	12 – 2	*E*
Cannaceae				
Canna edulis Ker Gawler	GH	C	11 – 3	*E*
Canna indica L.	GH	C	1 – 12	*E*
Commelinaceae				
Amischophacelus axillaris (L.) Rao et Kamm.	AH	LC	10 – 11	*E*
Amischotolype hookeri (Hassk.) Hara	AH	LC	9 – 11	*E*
Aneilema hamiltonianum Wall. ex C.B.Cl.	AH	VC	8 – 10	*E*
Commelina benghalensis L.	AH	VC	7 – 11	*E*
Commelina difusa Burm.f	PH	A	1 – 12	*E*
Commelina paludosa Blume				
Commelina suffruticosa Blume	PH	C	8 – 10	*E*
Cyanotis tuberosa (Roxb.) J.A. et J.H . Schult.	PH	LC	8 – 10	*E*
Cyanotis vaga J.A. et J.H. Schult.	AH	VC	7 – 10	*E*
Floscopa scandens Laurerio	AH	LC	8 – 9	*E*
Murdannia nudiflora (L.) Brenan	AH	A	7 – 10	*E*
Murdannia vaginata (L.) Brueck.	AH	LC	7 – 9	*E*

Costaceae				
Costus speciosus (J. Koenig) Smith	GH	VC	8 – 9	*E*
Cyperaceae				
Bulbostylis barbata (Rottb.) Kunth	AH	VC	6 – 11	*A*
Carex indica L.	AH	LC	8 – 10	*A*
Carex wallichiana Spr.	PH	R	8 – 10	*A*
Cyperus rotundus L.	GH	A	5 – 11	*A*
Cyperus compressus L.	AH	A	7 – 10	*A*
Cyperus laxus Lam.	AH	LC	8 – 10	*A*
Cyperus iria L.	AH	A	7 – 10	*A*
Cyperus pseudo-kyllingoides Kukenthal	PH	VC	7 – 10	*A*
Diplacrum caricinum R. Br.	PH	LC	8 – 9	*A*
Elaeocharis atropurpurea Retz	AH	C	7 – 11	*A*
Elaeocharis congeota D. Don	AH	A	7 – 11	*A*
Fimbristylis bisumbellata (Fork.) Bub.	AH	C	6 – 10	*A*
Kyllinga brevifolia Rottb.	PH	A	8 – 12	*A*
Pseudomariscus cyperoides (Roxb.) Bennet et Ricz.	AH	VC	7 – 10	*A*
Scirpus articulatus L.	AH	LC	7 – 11	*A*
Schoenoplectus grossus (L.f.) Palla	AH	LC	7 – 10	*A*
Scleria biflora Roxb.	AH	C	7 – 10	*A*
Dioscoreaceae				
Dioscorea alata L.	GH	C	7 – 8	*A*
Dioscorea bulbifera L.	GH	C	7 – 8	*A*
Dioscorea pentaphylla L.	GH	LC	7 – 9	*A*
Dioscorea prazeri Prain et Burkill	GH	LC	7 – 8	*A*
Eriocaulaceae				
Eriocaulon quinquangulare L.	AH	A	8 – 11	*A*
Eriocaulon xeranthemum Mart.	AH	A	8 – 11	*A*
Haemodoraceae				
Sansevieria trifasciata Prain	GH	VC	7	*E*
Hydrocharitaceae				
Blyxa roxburghii Rich.	AH	A	8 – 10	*E*
Ottelia alismoides L.	AH	A	9 – 01	*E*
Vallisneria spiralis Hook.	AH	A	9 – 11	*W*
Hypoxidaceae				
Curculigo orchioides Gaertn	PH	VC	9 – 3	*E*
Molineria capitulata (Lour:) Herb.	PH	LC	6 – 12	*E*
Iridaceae				
Belacmanda chinensis (L.) DC.	PH	C	9 – 11	*E*
Juncaceae				
Juncus bufonius L.	AH	R	9 – 10	*A*

Lemnaceae				
Spirodela polyrhiza (L.) Schleid.	AH	VC	5	*W*
Liliaceae				
Allium cepa L.	GH	VC	12 – 3	*E*
Hemerocallis fulva L.	GH	VC	5 – 7	*E*
Marantaceae				
Maranta aurandanacea L.	GH	VC	6 – 7	*E*
Musaceae				
Heliconia rostrata Ruiz et Pav.	GH	C	5 – 7	*E, O*
Musa balbisiana Colla	GH	VC	1 – 12	*C*
Musa coccinea Andr.	GH	R	5 – 10	*C*
Ravenala madagascariensis J.F. Gmel.	T	R	NR	*O, C*
Najadaceae				
Najas kurziana Rendle	AH	LC	9 – 10	*W*
Najas graminea Del.	AH	LC	9 – 10	*W*
Orchidaceae				
Aerides multiflora Roxb.	E	A	3 – 6	*E*
Bulbophyllum triste Reichb.f.	E	A	4 – 6	*E*
Cymbidium aloefolium L.	E	C	4 – 7	*E*
Dendrobium amoenum Wall. ex Lindl.	E	C	5 – 6	*E*
Phaius nanus Hook.f.	PH	LC	2	*E*
Rhynchostylis retusa Bl.	E	A	5 – 7	*E*
Cloeisostoma appendiculatum (Lindl.) Benth. et Hook.f. ex Jackson	E	R	4 – 7	*E*
Papilionanthe teres (Roxb.) Schltr.	E	A	1 – 3	*E*
Zeuxine membranacea Lindl.	PH	R	11 – 12	*E*
Pandanaceae				
Pandanus nepalensis St. John	T	VC	10	*A*
Poaceae				
Alloteropsis cimicina L.	AH	VC	8 – 10	*A*
Axonopus compressus (Sw.) Pal.-Beav.	PH	A	5 – 11	*A*
Brachiaria reptans (L.) Garden. et Hubb.	AH	C	5 – 10	*A*
Chloris barbata sensu Sw.	AH	VC	7 – 9	*A*
Chrysopogon aciculatus (Retz.) Trin.	PH	A	4 – 11	*A*
Coix lachrymal-jobi L.	AH	C	3 – 12	*A*
Cymbopogon pendulus Wats.	PH	C	9 – 1	*A*
Cynodon dactylon (L.) Pers.	PH	A	3 – 9	*A*
Dactyloctenium aegypticum (L.) Willd.	AH	VC	6 – 10	*A*
Digitaria sanguinalis (L.) Scop.	AH	A	7 – 9	*A*
Echinochloa crus-galli (L.) P. Beauv.	AH	A	5 – 10	*A*
Eleusine indica L.	PH	A	5 – 12	*A*
Eragrostis gangetica (Roxb.) Steud.	AH	A	5 – 1	*A*
Eragrostis nigra Nees ex Steud.	AH	LC	5 – 10	*A*

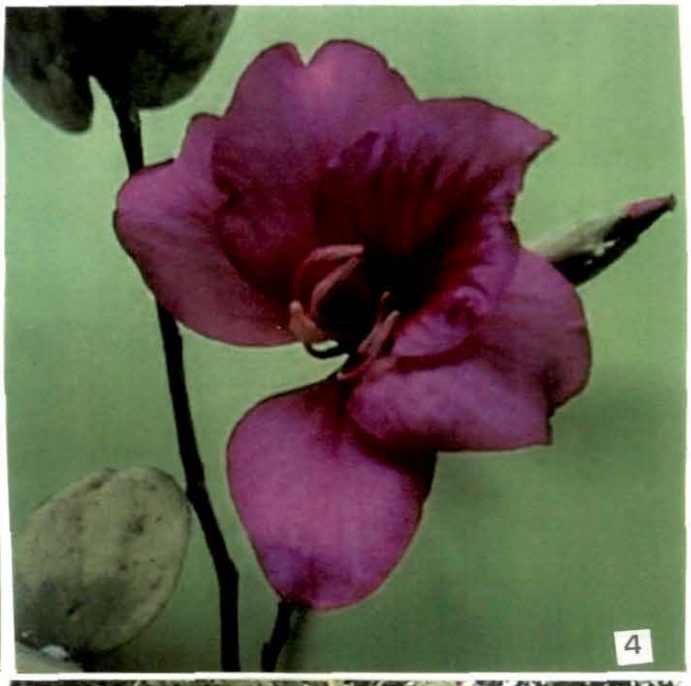
Eragrostis tenella L.	AH	A	4 – 10	*A*
Imperata cylindrica (L.) Raeus	PH	A	4 – 11	*A*
Isachne albens Trin	AH	R	7 – 2	*A*
Ischaemum indicum (Houtt.) Merr.	AH	LC	10 – 12	*A*
Oplismenus compositus L.	AH	A	8 – 12	*A*
Oplismenus burmanii P. Beauv.	AH	A	2 – 10	*A*
Oryza rufipogon Griff.	AH	VC	9 – 1	*A*
Paspalidium flavidum (Retz.) A. Camus	AH	VC	4 – 9	*A*
Paspalum conjugatum Berg.	PH	VC	8 – 12	*A*
Paspalum scrobiculatum L.	PH	VC	4 – 10	*A*
Pennisetum pedicellatum Trin.	AH	C	12 – 2	*A*
Pogonatherum paniceum (Lam.) Hack.	AH	C	2 – 7	*A*
Saccharum narenga (Nees ex Steud.)Hack.	PH	LC	10 – 12	*A*
Saccharum spontaneum L.	PH	A	9 – 1	*A*
Setaria glauca (L.) P. Beauv.	AH	A	3 – 12	*A*
Setaria palmifolia (J. Koenig)Staff.	AH	A	6 – 2	*A*
Sporobolus indicus L. var. *fertilis* Jovet et Guedes	PH	A	3 – 12	*A*
Thamnocalamus aristatus E.G. Camus	S	C	NR	*A*
Thysanolena maxima O. Ktze	US	C	12 – 8	*A*
Vetiveria zizanoides L.	Sf	LC	8 – 10	*A*
Pontederiaceae				
Eichhornia crassipes Solms	AH	VC	10 – 2	*E*
Monochoria hastata (L.) Solms	AH	C	7 – 10	*E*
Monochoria vaginalis (Burm.f.) K.B. Presl	AH	C	7 – 10 0	*E*
Smilacaceae				
Smilax zeylanica L.	GC	LC	12	*A/E*
Zingiberaceae				
Curcuma aromatica Salisb.	GH	VC	4 – 7	*E*
Curcuma longa L.	GH	VC	4 – 7	*E*
Globba racemosa Smith	GH	C	5 – 8	*E*
Hedychium coronerium L. Konig	GH	VC	8 – 10	*E*
Zingiber officinale Roscoe	GH	C	NR	*E*
Zingiber sp.	GH	R	NR	*E*

Photograph 1.

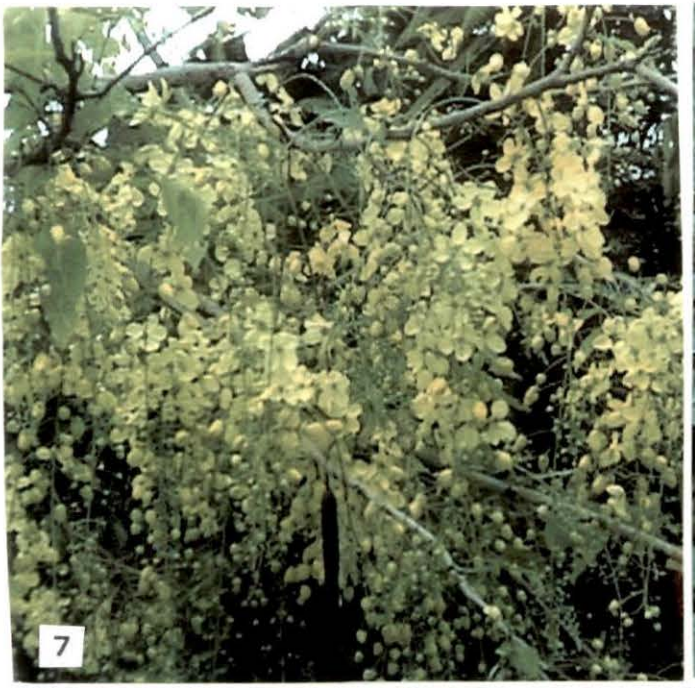
Photographs of some common plants of Jalpaiguri district

1. *Peltophorum pterocarpum*
2. *Butea monosperma*
3. *Chromolena odorata*
4. *Bauhinia purpurea*
5 *Albizia chinensis*
6. *Azadirachta indica*
7. *Cassia fistula*
8. *Spathodea campanulata*
9. *Trichosanthes lepiniafe*
10. *Mimosa pudica*
11. *Acmella calva*
12. *Heliotropium indicum*
13. *Dillenia pentagyna*
14. *Nyctanthes arbor-tristis*
15. *Thea sinensis*
16. *Melastoma malabathricum*
17. *Clerodendrum viscosum*
18. *Triumfeta rhomboidea*
19. *Bidens pilosa*
20. *Costus speciosus*
21. *Corchorus aestuens*
22. *Peperomia pellucida*
23. *Kyllinga monocephala*
24. *Cyanotis axillaris*
25. *Cleome rutidosperma*
26. *Argyreia roxburghii*
27. *Mirtacarpus verticillatus*
28. *Barleria cristata*
29. *Rumex maritimus*
30. *Leucas indica*

Photograph 1: Some common plants of Jalpaiguri



Photograph 1(Contd.): Some common plants of Jalpaiguri



Photograph 1(Contd.): Some common plants of Jalpaiguri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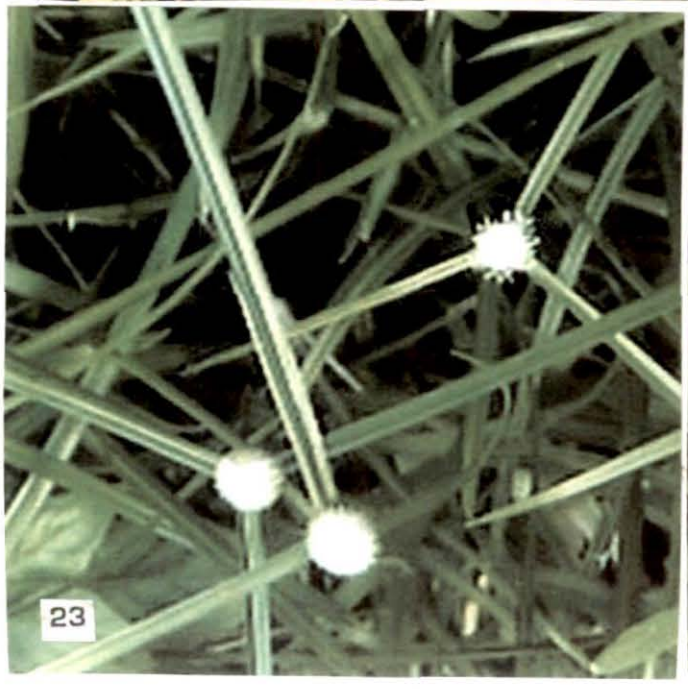
Photograph 1(Contd.): Some common plants of Jalpaiguri



Photograph 1(Contd.): Some common plants of Jalpaiguri

Analysis of the flora

Constituted over a very rich basic flora, the present angiospermic flora of the Jalpaiguri town area is quite rich. It is to be accepted that the basic flora has suffered extensive change. However, table 3 is presenting the numerical distribution of angiospermic taxa in the flora.

Table 3 : Numerical distribution of angiospermic taxa in the flora of Jalpaiguri township area.

Taxa	Dicots	Monocots	Total
Families	105	29	134
Genera	385	106	491
Species	574	135	709

The record of the occurrence of 709 species within the limit of a busy township like Jalpaiguri may be considered as very rich. Taxonomic distribution (Table 3) of all plants in 105 dicotyledonous and 29 monocotyledonous families and under 491 genera (385 dicots & 106 monocots) also express the wide range diversity in the flora (Table 3).

Out of the recorded families, Papilionaceae (i.e. Fabaceae) is best represented with 47 species and is followed by Asteraceae (41 species), Poaceae and Euphorbiaceae (30 species each), Rubiaceae (25 species), Caesalpiniaceae (18 species), Scrophulariaceae, Cyperaceae and Solanaceae (17 species each) etc (Table 2 & 5). Instead of treating Papilionaceae separately, if Leguminosae (comprising of Papilionaceae, Caesalpiniaceae and Mimosaceae) is taken as a single family, then the 76 species occurring in Jalpaiguri counting 43 genera. On the other hand, there are 36 dicotyledonous and 12 monocotyledonous families which are represented in the flora with single species (Table 2). However, apart from the ten dominant families, other well represented families include Acanthaceae, Amaranthaceae, Apocynaceae, Convolvulaceae, Cucurbitaceae, Lamiacae, Moraceae etc (Table 2). Migration or extension of human civilization always cause the introduction of exotic elements in the flora (Das 1995, 2002). Many of these introduced plants get naturalized and behave like natural elements of a flora. The present flora under discussion is not an exception.

There are at least 103 dicotyledons and 19 monocotyledons species of exotic nature found in Jalpaiguri township area. These exotics are elements from widely distributed areas including tropical America, Australia, China, Japan, Europe etc. and were introduced for different reasons like food, ornamentals, fibre, medicine, halucinogenic agent, etc. However, common weeds like *Galinsoga parviflora,*

Alternanthera paronichioides, Mikania micrantha, etc. are probably migratory weeds or were introduced unknowingly. The habit also are diversified, from small short living annuals to giant trees (Table 4). Many of these exotics are now restricted to cultivation only, whereas a good population have been naturalized.

Habit and mode of pollination of a plant is very important from the aerobiological point of view.

A. Habit : Recorded 709 specifies of angiospermic plants of Jalpaiguri town area has been analyzed for groups and were basically recognized for 16 habit groups (Table 2). Numerical distribution of the recorded plants has been shown in Table 4.

Table 4 : Numerical distribution of habit groups in the angiospermic flora of Jalpaiguri town area :

Habit groups	Dicots	Monocots	Total
Annual Herbs (AH)	232	53	285
Perennial Herbs (PH)	17	25	42
Hydrophytic Annuals (HA)	00	01	01
Hydrophytic Perennials (HP)	03	00	03
Geophytic Herbs (GH)	01	32	33
Suuffrutesecent Plants (Sf)	15	01	16
Undershrubs (US)	08	01	09
Shrubs (S)	85	02	87
Lianes (L)	09	01	10
Shrubby Climbers (SC)	32	00	32
Annual Climbers (AC)	24	00	24
Geophytic Climbers (GC)	10	01	11
Trees (T)	126	09	135
Epiphytes (E)	02	09	11
Root Parasites (RP)	04	00	04
Stem Parasites (SP)	06	00	06
Total :	**574**	**135**	**709**

It shows a clear dominance of annual herbs (285 spp.) in the flora. Climatically, the area supports a forested vegetation and in a forested vegetation the number of annual species reduce drastically. So, this is a clear indication of a disturbed habitat. On the other hand, the number of tree species is also quite high i.e. 135. Remnants of the forested vegetation, peoples' love for trees, plantation programs etc., are the reasons for the presence of such a good number of tree species in the area. Record of lesser number of PH, GH, Sf, E, etc. are due to the disturbances in the habitats.

B. Pollination : Two aspects of pollination are important : (1) aerobiologically compilation of a flowering calendar and (2) record the mode of pollination.

1. Flowering Calendar : A comprehensive flowering calendar of angiospermic plants of Jalpaiguri town has been prepared (Table 7) from direct observation for four years (1995 – 2001). The calendar has been presented in the Table 2 along with parameters like habit, abundance, flowering period and mode of pollination. The lowest number of flowering has been recorded in the month of June. There are two peaks in flowering. The October peak (348 spp.) which actually initiates in the month of September, coming down slowly and reached the lowest point in March and then rising again to reach a smaller peak (308 spp.) in May. From this peak it declines sharply and remains almost parallel upto August and then starts rising quite sharply to attain the October peak (Table 7).

The emerged picture finds a parallel with the local climatic condition. Monsoon starts here in mid June (Table 1) after a long dry and hot spell when seeds of Therophytic plants start germinating, and at the same time majority of other plants opts for a vegetative growth leading to the decline of the number of species. Monsoon continue upto the middle of September (Table 1), when the daily average temperature also start reducing. Then, the plants attaining vegetative growth moves into the flowering phase.

As a results a large proportion of plants remain in flowering phase in October. With the reduction of ambient temperature and the increase of dryness, most of the monsoonic therophytes slowly gets withered (releasing matured fruits). But, at the same time, during winter, numerous temperate vegetation gets emerged. These are short living and completes their life cycle by February – March. Again, during March – April with increase of the temperature, day length and generally with a few showers the plants gets stimulated to grow and flower, which include a large number of trees creating a May-peak in the flowering calendar of Jalpaiguri town (Table 2).

2. Mode of Pollination :

Seven types of pollination occur in the nature, out of which entomophilous plants occupy the highest position (477 species) which is followed by anemophilous plants (157 spp.). Lesser number of plants have been enumerated from amphiphilous (52 spp.), ornithophilous (12.spp.), hydrophilous (5 spp.), melachophilous (4 spp.) and cleistogamous (only 2 spp.) types (Table 6).

The trees are represented both by entomophilous and anemophilous species. However, a large number of anemophilous species along with some entomophilous species like *Bombax ceiba, Cassia fistula, C. siamea, Eucalyptus globulosus, Callistemon lanceolatus, Tamarindus indica, Carica papaya, Terminalia arjuna,*

Azadirachta indica, Zizyphus mauritiana etc. which have the potentiality to produce large amount of pollen, thereby, making them a part of the airspora.

Annual and perrenial herbs are the largest representatives in the flora with a varied ecological distribution (Table 4). Most of the herbaceous species by virtue of high pollen productivity have made them a major representative type in the aerobiological composition.

Grass family, i.e. Poaceae is numerically the third largest family and is represented by 30 species under 24 genera (Table 5). The species being anemophilous with an extended flowering period and abundant pollen production, their share in the atmospheric pollen content is relatively large and noteworthy.

Table 5 : Ten dominant angiospermic families in the flora of Jalpaiguri township area.

Sl. No.	Families	Genera	Species
01.	Fabaceae (Papilionaceae)	29	47
02.	Asteraceae	37	41
03.	Poaceae	24	30
04.	Euphorbiaceae	17	30
05.	Rubiaceae	17	25
06.	Caesalpiniaceae	6	18
07.	Scrophulariaceae	11	17
08.	Cyperaceae	11	17
09.	Solanaceae	9	17
10.	Verbenaceae	11	16

Table 6 : Mode of Pollination of the investigation plants

Types of Pollination	Taxa		Total
	Dicot	Monocot	
Anemophilous	89	68	157
Entomophilous	425	52	477
Amphiphilous	49	3	52
Ornithophilous	10	2	12
Melachophilous	0	4	4
Cleistogamous	0	2	2
Hydrophilous	1	4	5
Total	**574**	**135**	**709**

Table 7 : Numerical distribution of the flowering calendar of the investigated plants of Jalpaiguri Town.

Types of Pollination	Taxa	Jan.	Feb.	March	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Anemophilous	Dicot	40	42	41	46	49	40	39	36	39	43	38	43
	Monocot	8	9	9	15	26	31	46	52	51	48	27	18
Entomophilous	Dicot	198	198	186	194	182	143	139	154	181	208	185	186
	Monocot	12	12	10	11	21	23	25	19	21	19	15	13
Amphiphilous	Dicot	29	29	24	24	19	12	8	7	15	23	24	28
	Monocot	-	-	-	-	-	-	-	1	1	1	1	1
Ornithophilous	Dicot	1	2	4	7	6	1	1	1	1	-	-	-
	Monocot	-	-	-	-	1	1	1	-	-	-	-	-
Melachophilous	Dicot	-	-	-	-	-	-	-	-	-	-	-	-
	Monocot	-	-	-	-	1	5	4	1	-	-	-	-
Cleistogamous	Dicot	-	-	-	-	-	-	-	-	-	-	-	-
	Monocot	1	1	1	1	2	2	2	2	2	2	1	1
Hydrophilous	Dicot	-	-	-	-	-	-	-	-	1	1	1	1
	Monocot	-	-	-	-	1	-	-	-	3	3	1	-
Total :		**289**	**293**	**275**	**298**	**308**	**258**	**265**	**273**	**315**	**348**	**293**	**291**