

Diversity and Distribution of Order Fabales in Nagpur City, Maharashtra

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Abstract Order Fabales is one of the largest orders of flowering plants. This order is distributed worldwide and exhibits the greatest diversity of morphological types in tropical and subtropical regions of the world. Order Fabales comprises the major families such as Caesalpiniaceae, Mimosaceae and Fabaceae. To explore the diversity of this order in Nagpur City, regular field visits were made. Present study enumerated the order Fabales with total 59 genera, 126 species, 4 sub-species and 4 varieties of which Family Mimosaceae with 11 genera, 24 species and 2 sub-species. Family Caesalpiniaceae observed with 8 genera, 27 species while the largest family Fabaceae covered most of the diversity in this order with 40 genera, 75 species, 2 sub-species and 4 varieties. The study was documented with flowering and fruiting seasons and distribution in the Nagpur localities.

Keywords Order Fabales, Caesalpiniaceae, Mimosaceae, Fabaceae, Nagpur

1. Introduction

Biodiversity is the entire diversity of life on the earth. It includes all genes, species and ecosystems. The studies of biodiversity have now assumed greater significance as ecologist and taxonomist try seriously to document the global biodiversity. For this, the exhaustive exploration

and taxonomic study i.e. floristic surveys of flora and forest areas have great importance. It is essential to prepare local floras of urban areas where there is severe threat to natural vegetation due to identification of species that are in different stages of vulnerability [1] as well as the various factors that influence the existing vegetation in any region [2].

Nagpur, one of the greenest cities of India, it is also called the 'Garden City of Maharashtra' and is appropriate to and worthy of being the 'Gateway to the Centre Indian Forest. It is also called 'Orange city of India'. One of the most basic tools needs to confront the loss of biodiversity on our planet is lack of floristic information. Floristic studies have acquired increasing importance in recent years in response to the need of developing countries to assess their plant wealth. In the recent years there has been growing interest in plant diversity studies in general and floristic studies in particular. In this connection, regional floristic studies are much importance. It can be achieved by intensive exploration of smaller areas [3].

The Nagpur city is quite rich and varied in its plants composition. In addition to the natural flora of the district, there are large numbers of plants found either in cultivation or introduced for various purposes at one time or other which have now been naturalized in the area [4].

Order Fabales are a climax order achieving the success, which very few other plants groups could reach. Both morphological and chemical features contributed to the success of this group. Of these three families, the

Mimosaceae evidently are primitive, the Fabaceae, the most advanced and the Caesalpinieae, the intermediate taxon. According to Hutchinson [5], order Leguminales is best split into three separate families: Caesalpinieae, Mimosaceae and Papilionaceae and treated the 3-subfamilies under the order Leguminales. Engler and Prantl [6], Bentham and Hooker [7] and some other taxonomists have considered Caesalpinioideae, Mimosoideae and Papilionoideae as sub-families of the family leguminosae under the order Rosales. These three sub-families are treated as distinct families by many botanists [8,9] except those who cling to tradition. Authors accepting them as separate families treat diversity of fruits and certain other characters. According to Takhtajan [8] and Cronquist [9] order Leguminales changed into order Fabales containing 3 families Mimosaceae, Caesalpinieae and Fabaceae.

The Mimosaceae, a tropical or subtropical family mostly of and regions are a comparatively small family of 50 genera containing 3000 or more species. Caesalpinieae is a tropical family of about 150 genera and 2200 species. The plants are mostly trees and shrubs and a few herbs. Fabaceae is a large family of 440 genera and about 12000 species. Plants are mostly herbs, undershrubs, shrubs though few trees are also there.

2. Materials and Methods

Extensive visits to different parts of Nagpur City categorizing into East Zone, West Zone, North Zone, South Zone and Central Zone including prominent localities like University Campus, Ambazari, Ramnagar, Dharampeth, Laxminagar, NEERI colony, Ganesh tekdi, Pannase Lay-out, Railway station, LIT, Dabha, Ravinagar, Maharajbag, PDKV, Seminary hills, Satpuda Botanical Garden, Telangkheri, Futala, Ramdaspeth, Wardhaman Nagar, Wardha Road, Amravati road, Mahal, Anmol Nagar, Kamptee road, Civil lines etc. During every visit, the specimens were collected for laboratory analysis. All the specimens collected were serially numbered, field notes were recorded in field books with data like habit, habitat, height of the plant, colour of the flowers scent if any, number of individuals and other pertinent features for the purpose of precise identification of the specimens. Each specimen was observed in respect of vegetative, flowering and fruiting condition. Specimens were described; identified and authenticated with help of standard literatures, different floras, research papers and reports viz. Flora of Nagpur District [10], Flora of Maharashtra State [11], Flora of Marathwada [12]. The voucher specimens of the collections have been deposited at the Herbarium, PGTD Botany, RTM Nagpur University, Nagpur.



Figure 1. Nagpur City Map showing working zones

3. Results and Discussion

3.1. Analysis of the Diversity of Order Fabales in Nagpur City

Present investigation enumerated plants of order Fabales i.e. Family Mimosaceae, Caesalpiniaceae and Fabaceae of Nagpur city with total numbers of 59 genera with 126 species, 4 subspecies and 4 varieties. From which, Mimosaceae comprises 11 genera with 24 species and 2 subspecies (Table No. 2.1). Caesalpiniaceae have an account of 8 genera with 27 species (Table No. 2.2) while Family Fabaceae contributed with maximum numbers of 40 genera with 75 species, 2 subspecies and 4 varieties (Table No. 2.3). Of the three families of order Fabales, the

family Fabaceae is dominant and widely distributed in different localities of the city. The present work have compared with the earlier work of Ugemuge [10] and Graham [13]. The frequency percentage in the form of occurrence and distribution of all three families also calculated in co relation with present work's output i.e. genera 59 and species 126 (Table No. 1).

Graham [13] recorded 71 species of order Fabales from Nagpur and Telangkheri farm while Ugemuge [10] documented 105 species belonging to 53 genera from Nagpur city. Panda [14] have recorded the 35 native species of the order Fabales from the Bhadrak District of Odisha, India while our study documented with 126 species.

Table 1. A comparison between status of order Fabales of Nagpur city as per Graham [11] and Ugemuge [8] with present work

Comparative Analysis		Present Work		Ugemuge (1986)		Graham (1911)	
		No.	%	No.	%	No.	%
Mimosaceae	Genera	11	18.64	11	18.64	6	10.17
	species	24	19.05	19	15.08	10	7.94
Caesalpiniaceae	Genera	8	13.55	8	13.55	3	5.08
	species	27	21.43	27	21.43	8	6.35
Fabaceae	Genera	40	67.80	34	57.63	20	33.90
	species	75	59.52	59	46.83	53	42.06
Total Genera(as per present work)		59		Total Species (as per present work)		126	

Table 2. Elements observed in Order Fabales

Table 2.1. Family: Mimosaceae

Sr.No	Scientific Names	Vernacular name	Flowering & Fruiting	Location
1	<i>Acacia auriculiformis</i> A. Cunn.	Australian babul	June-Jan	Nandanvan, Buildi
2	<i>Acacia campbelli</i> Arn.		June-March	University Campus
3	<i>Acacia catechu</i> (L.F.) Willd.	Khair	July-Dec	Ambazari, Seminary hills
4	<i>Acacia farnesiana</i> (L.) Willd.	Devbabul	Aug-July	Ambazari, Seminary hills
5	<i>Acacia ferruginea</i> DC.	Pandharakhair	May-Oct	Campus, Seminary hills
6	<i>Acacia leucophloea</i> (Roxb.) Willd	Hivar	Aug-Feb	Campus, Seminary hills
7	<i>Acacia modesta</i> Wall.	--	Feb.- May	Opposite Veterinary College
8	<i>Acacia nilotica</i> (L.) Willd. ssp. <i>astringens</i> (Schum. & Thonn) Roberty.	Vedibabhul	Aug-Dec	Umrer road, Campus
9	<i>Acacia nilotica</i> (L.) Willd. ssp. <i>indica</i> (Bth.) Brenan.	Babhul	June-April	Campus, Telangkheri, Ambazari
10	<i>Acacia pennata</i> (L.) Willd.	Jari, Chilar	Aug-Jan	Ambazari, Seminari hills
11	<i>Acacia tomentosa</i> Willd.	Anjar	Dec-Mar	Campus, Seminary hills
12	<i>Adenanthera pavonina</i> L.	Thorla Gunj	Mar-May	Maharajbag
13	<i>Albizia lebbbeck</i> (L.) Willd. var. <i>lebbbeck</i>	Shirish	Feb-Dec	Campus, Ambazari, Seminari hills
14	<i>Albizia procera</i> (Roxb.) Bth.	Pandhara Shirish	May-Dec	Campus, Wardha road
15	<i>Dichrostachys cinera</i> (L.) var. <i>indica</i> Brenan & Brumit.	Sagunkati	Sept-Jan	Kalmeshwar road, Vayusena Nagar
16	<i>Leucaena latissiliqua</i> (L.) Gills.	Subabhul	Throughout the year	Campus, Telangkheri, Umrer road
17	<i>Mimosa hamata</i> Willd.	Chilati	June-Oct	Campus, Seminary hills
18	<i>Mimosa pudica</i> L.	Lajalu	June-Jan	PG Boys hostel RTMNU, Maharajbag
19	<i>Mimosa rubicaulis</i> Lam.	Arai	June-Dec	Kalmeshwarroad, Campus
20	<i>Neptunia triquetra</i> (Vahl.) Btm.	Lajalu	June-Nov	Campus
21	<i>Parkia biglandulosa</i> Wight & Arn.	Chenduphal	Dec-Apr	Boys hostel RTMNU, Campus
22	<i>Pithecellobium dulce</i> (Roxb.) Btm.	Vilayti Chinch	Jan-June	Campus, Vayusena Nagar
23	<i>Prosopis cineraria</i> (L.) Druce.	Shami	Dec-June	Mahal, Bharat Nagar
24	<i>Prosopis juliflora</i> (Swartz.) DC.	--	Feb-Oct	Amravati road, Kamptee road
25	<i>Samanea saman</i> (Jacq.) Merr.	Rain tree	Mar-Sept	Bharat Nagar, Wathoda, Campus

Table 2.2. Family: Caesalpiniaceae

26	<i>Bauhinia malabarica</i> Roxb.	-	Sept-Feb	VC Bungalow RTMNU
27	<i>Bauhinia purpurea</i> L.	RaktaKanchan	Sept-Feb	Telangkheri, Cultivated in gardens
28	<i>Bauhinia racemosa</i> Lam.	Apta	Apr-Oct	Seminary hills, Ambazari
29	<i>Bauhinia vahlii</i> Wight & Arn.	-	Apr-Mar	Campus
30	<i>Bauhinia variegata</i> L.	Kachnar	Dec-May	Telangkheri
31	<i>Caesalpinia bonduc</i> (L.) Roxb.	Sagargota	July-Jan	Futala, Umrer road
32	<i>Caesalpinia corearia</i> (Jacq.) Willd.	Libi-dibi	Sept-Dec	Ambazari
33	<i>Caesalpinia pulcherrima</i> (L.) Swartz.	Shankasur	Throughout the year	Ambazari, Wardhaman Nagar
34	<i>Cassia absus</i> L.	Kankuti	Aug-Nov	Amravati road, Campus
35	<i>C. alata</i> L.	-	Sept-Jan	Amravati road, Itwari Rail. Station, Ambazari
36	<i>Cassia bicapsularis</i> L.	-	Sept-Dec	Futala, Telangkheri
37	<i>Cassia fistula</i> L.	Amaltas	Mar-Oct	Telangkheri, campus, Shankar Nagar
38	<i>Cassia javanica</i> L.	-	July-Sept	Maharajbag, Sakkardara
39	<i>Cassia occidentalis</i> L.	Rantarota	Aug-Mar	Seminary hills
40	<i>Cassia pumila</i> Lam.	-	Aug-Dec	Campus
41	<i>Cassia renigera</i> Wall.	-	Apr-June	Sakkardara
42	<i>Cassia senna</i> L.	Sonamukhi	Throughout the year	Planted in gardens, Maharajbag
43	<i>Cassia siamea</i> Lam.	-	Aug-Feb	Campus, Bharat Nagar
44	<i>Cassia sophera</i> L.	-	Aug-Jan	Telangkheri, Shri. Ayurvedic College
45	<i>Cassia tora</i> L.	Tarota	July-Nov	Ambazari, Campus
46	<i>Cassia uniflora</i> Mill.	-	Aug-Dec	Campus, LIT
47	<i>Delonix elata</i> (L.) Gamble.	Gulmohar	June-Dec	Amravati Road
48	<i>Delonix regia</i> (Boj. ex Hook) Raf.	Gulmohar	Apr-Oct	Bharat Nagar, Buildi
49	<i>Hardwickia binata</i> Roxb.	Anjan	July-Mar	Seminary hills, Amravati road
50	<i>Peltophorum pterocarpum</i> (D.C.) Baker	-	Aug-Feb	Campus, Amravati road
51	<i>Saraca asoca</i> (Roxb.) de Wilde.	Seeta Ashok	Jan-Apr	Maharajbag
52	<i>Tamarindus indica</i> L.	Chinch, Imli	Feb-Nov	Telangkheri, Campus, VNIT

Table 2.3. Family: Fabaceae

53	<i>Abrus precatorius</i> L.	Gunj	Sep-Dec	Futala, Campus
54	<i>Aeschynomene aspera</i> L.	-	Sep-Dec	Campus
55	<i>Alysicarpus bupleurifolius</i> (L.) DC.	-	Aug-Sep	Campus
56	<i>Alysicarpus hamosus</i> Edgew.	-	Aug-Oct	Campus, Ambazari.
57	<i>Alysicarpus heyneanus</i> Wight & Arn. var. <i>heyneanus</i>	-	July-Oct	Campus
58	<i>Alysicarpus longifolius</i> (Rottl. ex Spreng.) Wight & Arn.	-	Oct-Feb	Campus, Seminary hills.
59	<i>Alysicarpus monilifer</i> (L.) DC.	-	July-Oct	Campus
60	<i>Alysicarpus ovalifolius</i> (Schum.) J.Leon.	-	Aug-Oct	Campus, LIT
61	<i>Alysicarpus scariosus</i> (Rottl. ex Spreng.) Grah.	-	Aug-Dec	Campus
62	<i>Alysicarpus tetragonolobus</i> Edgew. var. <i>tetragonolobus</i>	-	Aug-Dec	Campus, LIT, NRCC.
63	<i>Alysicarpus vaginalis</i> (L.) DC. var. <i>nummularifolius</i> Miq.	-	Aug-Oct	Campus
64	<i>Arachis hypogaea</i> L.	Bhuimung	Aug-Nov	Campus
65	<i>Butea monosperma</i> (Lam.) Taub. var. <i>monosperma</i> .	Palas	Feb-Apr	Campus, Ambazari
66	<i>Butea superba</i> Roxb.	Palasvel	Feb-Apr	Campus, Ramnagar
67	<i>Cajanus cajan</i> (L.) Millsp.	Tur	Oct-Feb	Campus, Ambazari.
68	<i>Cajanus platycarpus</i> (Bth.) Van der Maesen.	Gophanvel	Sep-Dec	Campus
69	<i>Cajanus scarabaeoides</i> (L.) du-Petit-Thours.	Rantur	Jun-Dec	Campus
70	<i>Canavalia gladiata</i> (Jacq.) DC.	-	Oct-Mar	NEERI, Seminary hills.
71	<i>Cicer arietinum</i> L.	Chana	Oct-Mar	Ambazari road, Umrer road
72	<i>Clitoria ternatea</i> L. var. <i>pilosula</i> Wall	-	July-Oct	Satpuda Botanical Garden, Campus

73	<i>Clitoria ternatea</i> L. var. <i>ternatea</i>	Gokarni	July-Dec	Campus, LIT.
74	<i>Crotalaria calycina</i> Schrank.	-	Aug-Nov	Campus
75	<i>Crotalaria juncea</i> L.	Boru	Aug-Jan	Campus
76	<i>Crotalaria linifolia</i> L.	-	Sep-Feb	Campus
77	<i>Cullen corylifolia</i> (L.) Medik.	Bawachi	Aug-Jan	Campus, Umrer road
78	<i>Cyamopsis tetragonolobus</i> (L.) Taub.	Gawar	July-Dec	Kamptee road garden
79	<i>Dalbergia latifolia</i> Roxb.	PahariSheesham	Sep-Feb	Campus, Seminary hills
80	<i>Dalbergia sissoo</i> Roxb.	Sheesham	Mar-Feb	Campus, Seminary hills
81	<i>Derris scandens</i> (Roxb.) Btm.	Tupbel	Aug-Oct	Sitabuldi
82	<i>Desmodium dichotomum</i> (Willd.) DC.	Chikta	Oct-Dec	Telangkheri garden, Campus
83	<i>Desmodium gangeticum</i> (L.) DC.	Salwan	Aug-Nov	Seminary hills, Campus
84	<i>Desmodium scorpiurus</i> (Sw.) Desv.	-	Oct-Mar	Telangkherigarden, Campus
85	<i>Desmodium triflorum</i> (L.) DC.	Ranmethi	Aug-Jan	Telangkherigarden, Campus
86	<i>Erythrina suberosa</i> Roxb.	Pangara	Mar-Sep	Campus, Seminary hills
87	<i>Erythrina variegata</i> L.	Pangara	Feb-Apr	Laxminagar square, Pandharabodi.
88	<i>Gliricidia sepium</i> (Jacq.) Kunth.	-	Feb-Apr	Ambazari, Pandharabodi, Ganeshpeth
89	<i>Glycine max</i> (L.)	Soyabean	Sep-Nov	Umrer road, PDKV.
90	<i>Goniogyna hirta</i> (Willd.) Ali	-	Sep- Aug-Jan Nov	Ambazari, Pardi
91	<i>Indigofera astragalina</i> DC.	-	Aug-Oct	Ambazari, Pardi
92	<i>Indigofera cordifolia</i> Heyne.	-	Aug-Jan	Campus, LIT
93	<i>Indigofera linifolia</i> (L.) Retz.	-	Aug-Jan	Campus, LIT
94	<i>Indigofera linnaei</i> Ali.	Bhuiguli	Aug-Jan	Campus, LIT, Wardha road
95	<i>Indigofera trifoliata</i> L. var. <i>duthiei</i> (Drumm. Ex Naik.) Sanj.	Sarpot	Aug-Dec	Campus, Amravati Road
96	<i>Indigofera trita</i> L. var. <i>trita</i> .	-	Aug-Jan	Campus
97	<i>Lablab purpureus</i> (L.) Sweet.	Popat	Oct-Feb	Cultivated in garden, Ravinagar, Telangkheri.
98	<i>Lablab purpureus</i> (L.) Sweet. var. <i>lignosus</i> (L.) King.	Waal	Oct-Feb	Cultivated in garden, Home
99	<i>Lathyrus aphaca</i> L.	Ranwatana	Jan-Mar	Seminary hills, Marajbagh
100	<i>Lathyrus sativus</i> L.	Lakh	Jan-Mar	Umrer road
101	<i>Lens culinaris</i> Medik.	Masur	Dec-Feb	Mahal, Ambazari
102	<i>Melilotus alba</i> Medik.	Ranmethi	Feb-Mar	Campus, Sakkardara
103	<i>Melilotus indica</i> (L.) All.	Ranmethi	Jan-Mar	Campus
104	<i>Milletia peguensis</i> Ali.	Ranmethi	Feb-Oct	Rare, Campus, Maharajbagh
105	<i>Mucuna pruriens</i> (L.)DC.	Khajkui	Sep-Feb	Campus, Seminary hills
106	<i>Ougeinia oojeinensis</i> (Roxb.) Hochr.	Kalapals, Tiwas	Feb-Apr	Seminary hills
107	<i>Phaseolus vulgaris</i> L.	Vilaytiseem	Dec-Mar	Seminary hills, Campus
108	<i>Pisum sativum</i> L.	Watana	Dec-Mar	Campus, Seminary hills.
109	<i>Pongamia pinnata</i> (L.) Pierre.	Karanj	Feb-May	Campus, Seminary hills
110	<i>Pseudarthria viscida</i> (L.) Wt. & Arn.	Chikta	Aug-Nov	Satpuda Botanical Garden, Seminary hills
111	<i>Pterocarpus marsupium</i> Roxb. var. <i>marsupium</i> .	Bijja	Dec-Mar	Seminary hills.
112	<i>Rhynchosia bracteata</i> Bth.	-	Oct-Nov	Seminary hills
113	<i>Rhynchosia minima</i> (L.) DC.	Turel	July-Dec	Campus, Saoner road
114	<i>Sesbania bispinosa</i> (Jacq.) W. F. Wight.	Ran-Shevra	Sep-Jan	Campus
115	<i>Sesbania grandiflora</i> (L.) Poir.	Heti	Nov-Mar	LIT, Mahal.
116	<i>Tephrosia pumila</i> (Lamk.) Pers	-	Aug-Jan	Campus, LIT
117	<i>Tephrosia purpurea</i> (L.) Pers.	Unhali, Diwali	July-Jan	Campus, Kamptee road
118	<i>Tephrosia strigosa</i> (Dalz.) Sant	-	Aug-Oct	Ambazari
119	<i>Tephrosia villosa</i> (L.) Pers.	-	Aug-Oct	Campus, Ambazari
120	<i>Teramnus labialis</i> (L. f.) Spreng.	Tipani	Aug-Dec	Campus, LIT.
121	<i>Trigonella foenum-graecum</i> L.	Methi	Feb-Mar	Ambazari, Telangkheri

122	<i>Uraria picta</i> (Jacq.) Desv.	Pitwan	Sep-Oct	Rare, Gorewada
123	<i>Vigna angularis</i> (Willd.) Ohwi & Ohashi.	Udid	Sep-Nov	Telangkheri
124	<i>Vigna mungo</i> (L.) Hepper.	Moong	Aug-Nov	Campus, Telangkheri.
125	<i>Vigna radiata</i> (L.) R.	Jangli Moong	Aug-Oct	Telangkheri
126	<i>Vigna trilobata</i> (L.) Verdc. var. <i>trilobata</i> .	Jangli Math	Aug-Oct	Campus, Telangkheri.
127	<i>Vigna unguiculata</i> (L.) Walp. ssp. <i>cylindrica</i> (L.) van- Eseltin.	Chavli	Feb-Oct	Seminary hills, Umrer road
128	<i>Vigna unguiculata</i> (L.) Walp. ssp. <i>unguiculata</i> .	Barbati	June-Oct	Telangkheri, Umrer road
129	<i>Zornia diphylla</i> (L.) Pers.	-	Aug-Oct	Campus, Dabha road
130	<i>Zornia gibbosa</i> Span.	Thipri	Aug-Oct	Campus, LIT.

*Dichrostachys cinera* (L.) var. *indica*.*Parkia biglandulosa* Wight. & Arn.*Peltophorum pterocarpum* (D.C.) Baker.*Cassia alata* L.*Cassia fistula* L.*Delonix regia* (Boj. ex Hook.) Raf.



Clitoria ternatea L. var. *ternatea*.



Uraria picta (Jacq.) Desv.



Butea monosperma (Lam.) Taub.



Gliricidia sepium (Jacq.) Kunth.

4. Conclusions

Present investigation enumerated plants of order Fabales in Nagpur city with potentialities of 59 genera with 125 species, 4 subspecies, 4 varieties belonging to 3 families. From the present study it is concluded that the number of taxa of order Fabales has increased sufficiently to earlier record of Graham [13], Ugemuge [10], Kamble [15,16] and Thakre [17]. It is also pointed out that earlier reported taxa such as *Acacia modesta*, *Uraria picta* are found with a single individual in the area, and needs further thorough investigations. So that it can be conserved in the area. Revision of floristic diversity is very important because these studies are considered as the backbone of the assessment of phytodiversity, conservation management and sustainable utilization of natural resources, habit loss and extinction rates of threatened taxa.

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