Angiospermic Biodiversity of Lucknow Areas of Uttar Pradesh, India

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Authors’ contributions

This work was carried out in collaboration among all authors. Author BPS designed the study, wrote the protocol and wrote the first draft of the manuscript. Authors AK and SCS managed the analysis of the study. Author SK managed the literature searches and performed the statistical analysis. All authors read, improved and approved the final manuscript.

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ABSTRACT

The total angiospermic floral biodiversity of Lucknow district including indigenous, naturalised and cultigens comprises over 1263 plant species covering 705 genera and 140 families of which 989 species are dicotyledons and 274 species are monocotyledons. The monocotyledons are poorly represented except Poaceae and Cyperaceae. Of the 274 species of monocotyledons, 176 species belong to these two families while 98 species represent 23 different families. Poaceae is the largest family followed by Leguminosae (s.l.), Asteraceae, etc. and Euphorbia is the largest genus followed by Cassia, Cyperus, etc.

Keywords: Biodiversity; angiosperm; monocotyledons; dicotyledons; Lucknow.
1. INTRODUCTION

A comprehensive species diversity study is a prerequisite for any region to sustainably utilize the plant resources. India is one of the top twelve mega-biodiversity centers in the world because it is the meeting place for three major global biogeographic realms: the Indo-Malayan, the Eurasian and Afro-tropical and has two of the eighteen recognized biodiversity “hot-spots” in the world – the Eastern Himalaya and the Western Ghats [1-10].

The organized floristic/biodiversity study in India was first started by W. Roxburgh who published his “Flora Indica” (1833) in two volumes. This was followed by the publication of “Flora of British India” by Sir J.D. Hooker (1872-1897) in seven volumes and this gave stimulus to taxonomic studies in India. Consequently, several regional floras appeared within a short span of time. However, there was a sudden fall in floristic activities during the middle of 20th century.

The district of Lucknow formed the central part of the province of Avadh and lies between the parallels of 26°30’ and 27°10’ N latitude and 80°31’ and 81°13’ E longitude. The rain fall is about 700-800 mm annually and the temperature rises up to 46°C in the month of May and June and falls 2°C in December and January. The district is an irregular quadrilateral with the city and cantonment of the Lucknow forming nearly the centre. It is bounded in the north by Sitapur, east by Barabanki south by Raibareli and in the north-west and the south-west, by Hardoi and Unnao districts respectively. The river Sai on the south and South-West forming the natural boundary for a short distance only. Some villages belonging to the district still lies across the river Sai to the north of the Lucknow-Kanpur road, while some villages of district Unnao lie on the Lucknow side of the river Sai.

The central upland marks the watershed and forms the most fertile part of the district. The course of the Sharda canal marks the highest level of watershed. The general slope of the district is from the north and North-West to the south and south-east with an almost imperceptible fall of one foot per mile with the exception of the immediate neighbourhood of the rivers which are entirely cut up by ravines, the slope of the land is very gradual and almost unnoticeable [11-17]. At its extreme north near Mahona the level is 450 feet above mean sea level, at Alambagh about the centre of the district near Lucknow, it is 394 feet and at Nagram on the south-east the level of 373 feet, showing a slope of not more than 43 feet in length of 45 miles, or less than 1 feet per mile.

Fig. 1. Map of Lucknow district
2. METHODOLOGY

The present work is the result of intensive survey and exploration of the biodiversity of Lucknow district for the last twenty five years. In different seasons, plant specimens in flowering and fruiting stage were collected. The data on habit, habitat, abundance, associations, flowering and fruiting period, photographs of important habitats, interesting species, etc. were collected, collated and compiled. The plant specimens were collected, numbered and preserved as voucher specimens. The specimens were identified with help of monographs and regional floras. The voucher specimens are lodged in the herbarium of Central Institute of Medicinal and Aromatic Plants (Acronym: CIMAP), Lucknow.

3. RESULTS AND DISCUSSION

The total angiospermic flora of Lucknow district including indigenous, naturalised and cultigens comprises over 1263 plant species under 705 genera and 140 families, of which 989 species are dicotyledons and 274 species are monocotyledons. The monocotyledons are rather poorly represented except Poaceae and Cyperaceae. Of the 274 species of monocotyledons, 176 species belong to these two families while 98 species represent 23 different families.

The relative importance of the families in a flora can be expressed by tabulating the first ten families in order of their number of species and comparing it with those of the adjacent regions or of the country as a whole. Smaller areas have more or less homogeneous flora as compared to larger areas.

The dominant genera in the Flora of Lucknow District is Euphorbia followed by Cassia, Cyperus, Ipomoea and so on shown in the following Table 3.

4. VEGETATIONAL DIVERSITY

The vegetational cover of Lucknow district is very poor. The percentage of the total forest area is negligible and out of it the natural forest is practically very less. Kukrail reserve forest, situated on both sides of Kukrail rivulet, Moosabagh and Rehmankherha on Hardoi road, near Chandrika Devi and near Dilkusha garden before Arjunganj crossing, etc. consist of some natural formations.

Table 1. Statistical analysis of diversity among families, genera and species

| Group            | Families | Genera | Species |
|------------------|----------|--------|---------|
| Dicotyledons     | 115      | 560    | 989     |
| Monocotyledons   | 25       | 145    | 274     |
| Total            | 140      | 705    | 1263    |

Table 2. Ten dominant families of Lucknow District and its Neighbouring regions and India

| Lucknow (Present study) | Delhi (Maheshwari 1963) | Gangetic (Hooker 1907) | India (Hooker 1907) |
|-------------------------|-------------------------|------------------------|---------------------|
| Gramineae (Poaceae)     | Gramineae               | Gramineae              | Orchidaceae         |
| Leguminosae(s.l.)       | Leguminosae             | Leguminosae            | Leguminosae         |
| (Fabaceae)              |                         |                        |                     |
| Compositae (Asteraceae) | Compositae              | Cyperaceae             | Gramineae           |
| Cyperaceae              | Cyperaceae              | Compositae             | Rubiaceae           |
| Euphorbiaceae           | Acanthaceae             | Scrophulariaceae       | Euphorbiaceae       |
| Acanthaceae             | Euphorbiaceae           | Malvaceae              | Acanthaceae         |
| Convolvulaceae          | Convolvulaceae          | Acanthaceae            | Compositae          |
| Scrophulariaceae        | Malvaceae               | Euphorbiaceae          | Cyperaceae          |
| Amaranthaceae           | Amaranthaceae           | Convolvulaceae         | Labiatae            |
| Verbenaceae             | Scrophulariaceae        | Lamiaceae              | Urticaceae          |
Table 3. Ten dominant genera of Lucknow District

| Genus               | Number of species |
|---------------------|-------------------|
| Euphorbia           | 17                |
| Cassia              | 15                |
| Cyperus             | 13                |
| Ipomoea             | 13                |
| Ficus               | 11                |
| Eragrostis          | 10                |
| Clerodendrum        | 8                 |
| Schoenoplectus      | 7                 |
| Digitaria           | 7                 |
| Fimbristylis        | 7                 |

The common tree species forming top layer are: *Acacia leucophloea* Willd., *A. nilotica* (L.) Del. ssp. indica (Benth.) Bren., *A. catechu* Willd., *Alangium salvifolium* (L. f.) Wang., *Albizia lebbeck* (L.) Benth., *Azadirachta indica* A. Juss., *Bombax ceiba* L., *Butea monosperma* (Lam.) Taub., *Catunaregam spinosa* Tievet., *Dalbergia sissoo* Roxb., *Diopysro montana* Roxb., *Ficus spp.*, *Flacourtia indica* Merr., *Gardenia turgida* Roxb., *Haplophragma adenophyllum* P. Dops., *Holoptelea integrifolia* (Roxb.) Planch., *Mitragyna parvifolia* Korth., *Morinda tomentosa* Heyne ex Roth, *Phoenix sylvestris* (L.) Roxb., *Pongamia pinnata* Pierre, *Prosopis juliflora* DC., *Stereospermum colais* Mabb., *Streblus asper* Lour., *Tamarindus indica* L., *Terminalia arjuna* W. et A., *T. bellirica* Roxb., *Trema orientalis* (L.) Bl., etc.

The constituents of middle layer are shrubs. Among the shrubs the notable species are *Abutilon indicum* Sweet, *Carissa spinarum* L., *Capparis sepian* L., *Clerodendrum multiflorum* Ktze., *C. viscosum* Vent., *Calotropis procera* R. Br., *Datura inoxia* Mill., *D. metel* L., *Jatropha glandulifera* Roxb., *J. gossypifolia* L., *Justicia adhatoda* L., *Kigandelia reticulata* (Poir.) Bail., *Lantana camara* L. var. aculeata (L.) Mold., *Pogostemon benghalense* Ktze., *Ziziphus nummularia* (Burm. f.) W. et A., etc.

In the lower or ground layer, there are herbs like *Setaria* spp. *Achyranthes aspera* L., *Ageratum conyzoides* L., *Occimum americanum* L., *Indigofera linifolia* Retz., *I. linnaei* Ali, *Sida alba* L., *S. acuta* Burm. f., *S. cordata* Borr., *S. cordifolia* L., *Tephrosia purpurea* (L.) Pers., *Uaria picta* (Jacq.) Desv. ... and many other sedges and grasses like ... *Cyperus spp.*, *Fimbristylis spp.*, *Schoenoplectus spp.*, *Scirpus spp.*, *Cynodon dactylon* Pers., *Brachiaria spp.*, *Eragrostis spp.*, *Digitaria spp.*, *Panicum spp.*, *Setaria spp.* etc.

Among the twiners and climbers, some of the species are *Abrus precatorius* L., *Ampeleocissus latifolia* Planch., *Bryonopsis laciniosa* Naud., *Capparis zeylanica* L., *Cayratia trifolia* Domin, *Celastrus paniculatus* Willd., *Ceropogia longifolia* Wall., *Coccinia grandis* Voigt., *Cocculus hirsutus* (L.) Diels., *Cryptolepis buchanani* R.Br. ex R.&S., *Hemidesmus indicus* R.Br., *Ichnocarpus frutescens* Ait. et Ait., *Ipomoea spp.* *Leptadenia reticulata* W. et A., *Momordica dioica* Roxb. ex Willd., *Melothria maderaspatana* Cong., *Telosma palid* Spreng., *Tinospora cordifolia* (Willd.) Miers., *Ventilago denticulata* Willd. and *Ziziphus oenoplia* Mill.

The common parasites on the forest trees are *Cuscuta reflexa* Roxb. and *Dendrophthoe falcata* (L.f.) Ettings.

The noteworthy medicinal plants are *brus precatorius* L., *Acacia spp.*, *Achyranthes aspera* L., *Albizia lebbeck* Benth., *Andrographis paniculata* Nees ex Wall., *Bacopa monnieri* Wettst., *Baliospermum montanum* Muell.-Arg., *Butea monosperma* (Lam.) Taub., *Calotropis spp.*, *Cassia spp.*, *Catharanthus roseus* G. Don, *Celastrus paniculatus* Willd., *Centella asiatica* (L.) Urban, *Cissampelos pareira* L., *Datura innoxia* Mill., *Gloriosa superba* L., *Justicia adhatoda* L., *Hemidesmus indicus* R. Br., *Holanthrena pubescens* Wall. ex G. Don, *Leucas spp.*, *Phyllanthus spp.*, *Plumbago zeylanica* L., *Rauwolfia serpentina* Benth. ex Kurz, *R. tetraphylla* L., *Sida spp.*, *Solanium nigrum* L., *S. virginianum* L., *Streblus asper* Lour., *Terminalia spp.*, *Tinospora cordifolia* Miers. and *Withania somnifera* (L.) Dunal.

4.1 Seasonal Vegetation/Diversity

The seasonal variation of climatic factors is so great that the herbaceous species can, only with difficulty, remain dominant throughout the year.
The common species diversity during different seasons are mentioned below:

The species of rainy season are represented by Acalypha indica L., Alysicarpus spp., Amischophacelus axillaris (L.) Rao et Kam., Apluda mutica L., Boerhavia diffusa L., Brachiaria ramosa Stapf, B. reptans Gard., Cayratia trifolia Domin, Catharanthus pellissus G. Don, Cleome gynandra L., C. viscosa L., Coccinia grandis Voigt, Commelina benghalensis L., Cocculus hirsutus Diels, Corchorus aescuans L., C. capsularis L., C. olitorius L., Crotalaria medicaginea Lamk., Cyperus spp., Dactyloctenium aegyptium Beauv., Desmodium gangeticum DC., D. triflorum DC., Desmostachya bipinnata Stapf, Digera muricata Mart., Erargrostis tenella R. & S., E. tremula Hochst., E. poaeoides Beauv., Euphorbia hirta L., Hybanthus enneaspermus Muell., Hygrophiella auriculata Heyne, Indigofera linifolia Retz., I. linnaei Ali, Ipomoea pes-tigris L., Justicia quinqueangularis Koen. ex Roxb., J. simplex D. Don, Lasuca aspera Spreng., L. cephalotes Spreng., Lindernia ciliata Perrnall, Malvastrum coromandelianum Garcke, Martynia annua L., Melochia corchorifolia L., Momordica charantia L., M. dioica Roxb., Murdannia nudiflora Brenan, Oplismenus burmannii Beauv., Phyllanthus amarus Schum. et Thonn., P. fraternus Webst., Physalis minima L., Sida spp., Tephrosia purpurea Pers., Trianthema portulacastrum L., Triumfetta rhomboidea Jacq., Urena lobata L., Xanthium indicum L., and Zornia gibbosa Span.

The vegetation of rainy season disappears in October with the same rapidity as it came rainfalls. As the cold starts, temperature in October with the same rapidity as it came rainfalls. As the cold starts, temperature of European genera make their appearance species of rainfalls. As the cold starts, temperature

The species of rainy season are r

5.1 Aquatic and Marshland Diversity/Vegetation

The common habitat of aquatic and marshland vegetation are rivers, lakes, ponds, puddles, ditches and low lying areas which remain submerged during major part of the years. The hydrophytes of Lucknow can be classified into following six categories on the basis of their contact with air, water and soil:

i) Free-floating: In this category the species are only in contact with air and water like Eichhornia crassipes Solms., Hygrophila stipulacea Nees, Pistia stratiotes L., Spirodela polyrhiza Schleid, Trapa bispinosa Roxb., Wolffia arrhiza Wimm., etc.

ii) Suspended: In this group the species are only in contact with water and are rootless, e.g. Ceratophyllum demersum L., Utricularia stellaria var. infixa Cl., U. flexuosa Vahl, etc.

iii) Submerged attached: These are only in contact with soil and water but in some cases flowers are slightly raised above water, e.g. Hydrilla verticillata Royle, Ottelia alismoides Pers., Potamogeton crispus L., P. nodosus Poir., P. pectinatus L., Vallisneria spiralis L., etc.

iv) Attached with floating leaves: These are in contact with water, soil as well as air,
e.g. Aponogeton crispus Thunb., Ipomoea aquatica Forsk., Ludwigia adscendens Hara, Nelumbo nucifera Gaertn., Nymphaea nouchali Burn. f., N. stellata Wild., Nymphoides indicum Ktze., N. hydrophyllum Ktze., etc.

v) Amphibious: In this case the root, lower part of the stem and in some cases leaves are usually submerged in water, e.g. Aeschynomene aspera L., Amischophacelus axillaris R. Rao et Kam., Eleocharis dulcis Hen., Hemarthria compressa R. Br., Ischaemum rugosum Salisb., Polygonum ssp., Limnophyton obtusifolium (L.) Miq., Sagittaria guayanensis H.B.K., S. sagittifolia L., etc.

vi) Wetland: A large number of species represent this group e.g. Alternanthera paronychoides St' Hill., A. sessilis DC., A. pungens, Bacopa monnieri (L.) Pennell, Caesalia axillaris Roxb., Centella asiatica L., Cyperus ssp., Dentella repens Forsk., Eclipta prostrata L., Fimbristylis ssp., Hygrophila auriculata Heyne, Limnophila indica Druce, Polygonum plebeium R.Br., Scirpus ssp., Sphenoclea zeylanica Gaertn., Typha angustata Bory et Chaub., Veronica anagallis-aquatica L., etc.

5.2 Diversity along Banks of Rivers, Lakes and Nallas

The species frequently met along the banks of rivers, ditches, ponds, lakes and nallas (Fig) are Alternanthera paronychoides St. Hill., Argemone mexicana L., A. ochroleuca Sweet, Arundo donax L., Chenopodium ambrosioides L., Chrozophora rotleri Juss., Coronopus didymus Sm., Croton bonplandianum Baill., Cyperus ssp., Fimbristylis bisemellata Bub., Lippia javanica Spreng., Nicotiana plumbaginifolia Viv., Phragmites karka Blatt., Phyla nodiflora Greene, Polygonum plebeium R.Br., Pulicaria crispa Sch.-Bip., Ranunculus sceleratus L., Rumex dentatus L., R. nepalensis Spreng., Sesbania sesban Merr., Tamarix dioica Roxb., Typha angustata Bory et Chaub., Verbascomum chinense (L.) Sant., Xanthium indicum L., etc.

5.3 Species Diversity of Old Buildings, Walls, and Rocky Crevices

The species growing in these peculiar habitats are presumably lime loving and therefore find the crevices in brick-walls, subsurface of plaster coverings and rocky crevices as a favourable habitat. The species in these habitats are Boerhavia diffusa L., Cassia tora L., Chenopodium album L., Cleome viscosa L., Commelina benghalensis L., Corchorus aetuans L., Cyperus ssp., Eleusine indica Gaertn., Ergrotrolis tenella (L.) Beauv., Ficus benghalensis L., F. religiosa L., Lindenberga macrostachya Benth., L. muraria P. Bruehl, Malvastrum coromandelianum (L.) Garcke, Peperomia pellucida H.B.K., Peristrophe paniculata Bream., Phyllanthus amarus Schum. et Thonn., P. fraternus Webst., Physalis minima L., Polygogon monspeliensis Desf., Portulaca pilosa L., Rungia pectinata Nees, Solanum nigrum L., Trianthema portulacastrum L., Tridax procumbens L., etc.

5.4 Diversity of Tree Species along Roadsides

Much of the greenery of the area is provided by a number of avenues, ornamental and economically important trees planted along roadsides. The common ones are Acacia auriculaeformis A. Cunn., Allantus excelsa Roxb., Albizia lebeck Benth., Azadirachta indica Juss., Cassia fistula L., C. siamea Lamk., C. surattensis Burm. f., Delonix regia Raf., Dalbergia sissoo Roxb., Drypetes roxburghii (Wall.) Hurusawa, Eucalyptus spp., Ficus benghalensis L., F. virens Ait., F. racemosa L., F. religiosa L., Grevillea robusta A. Cunn., Holoptelea integrifolia Planch., Kigelia pinnata DC., Lagerstroemia speciosa Pers., Madhuca indica Gmel., Peltophorum pterocarpum Bak., Polyalthia longifolia Thw., Pithecellobium dulce (Roth) Benth., Pongamia pinnata Pierre, Pterospermum aceri folium Willd., Prosopis juliflora DC., Syzygium cumini (L.) Skeels, S. jambos (L.) Alst., Tamarindus indica L., Terminalia arjuna W. et A., T. bellirica Roxb., etc.

5.5 Diversity of Species along Roadsides, Waste Places and Railway Tracks

These habitats are disturbed from time to time and are very much susceptible to invasion of a weed flora which quickly occupies such areas. Some of the worth mentioning weeds are: Ageratum conyzoides L., Argemone mexicana L., A. ochroleuca Sweet., Blumea spp., Boerhavia diffusa L., Cannabis sativa L., Carissa spinarum L., Capparis sepiaria L., Clerodendrum multiflorum Ktze., Cassia alata L., C. obtusifolia L., C. occidentalis L., C. tora L., Cleome gynandra L., C. viscosa L., Calotropis procera R.Br., Croton bonplandianum Baill., Crotalaria medicaginea Lamk., Datura metel L., D. innoxia
5.6 Species Diversity of Cultivated Fields

A number of weeds are associated with crop plants. The common ones associated with Kharif are: Aeschynomene indica L., Alysicarpus bupleurifolius (L.) DC., A. vaginalis (L.) DC., Borreria articularis F.N. Will., Bulbostylis barbata Cl., Cleome gynandra L., C. viscosa L., Cyperus spp., Corchorus aetans L. C. olitorius L. C. capsularis L., Digera muricata Mart., Eleusine indica Gaertn., Echinocloa colona Link., E. crusgalli Beauv., Eragrostis spp., Leucas aspera Spreng., L. cephalotes Spreng., Limnophila indica (L.) Druce, Phyllanthus amarus Schum. et Thonn., P. fraternus Beauv., P. virgatus Forst. f., Rotala indica Koehne etc. Rabi crop also consists of many common weeds like Ageratum conyzoides L., Anagallis arvensis L., Asphodelus tenuifolius Cav., Argemone mexicana L., A. ochroleuca Sweet, Chenopodium album L., C. murale L., Breae arvensis Less., Euphorbia dracunculoides Lam., Fumaria indica Pugsley, Gnaphalium purpureum L., Medicago lupulina L., M. polymorpha Pers., Melilotus alba Desr., M. indica All., Phalaris minor Retz., Vicia hisruta Gray, V. sativa L., etc.

5.7 Endangered and Threatened Species

Due to various biotic as well as abiotic factors many of the species of the district are depleting day by day. Some of the important ones are: Abrus precatorius L., Althagi mauroorum Medik., Andrographis paniculata Nees ex Wall., Baliospermum montanum Muell.-Arg., Biophyrum sensitivum DC., Cassia absus L., Cassia pumila Lam., Catunaregam spinosa Terv., Celastrus paniculatus Willd., Costus speciosus Smith, Cryptolepis buchanani R.S., Curculigo orchioides Gaertn., Curcuma angustifolia Roxb., Dentella serpyllifolia Wall. ex Craib, Gloriosa superba L., Hibiscus lobatus Ktze., Holarrhena pubescens Wall. ex G.Don, Ipomoea nil Roth, Ipomoea turbinata Lag., Helicteres isora L., Hemidesmus indicus R.Br., Holarrhena pubescens Wall. ex G. Don, Leptadenia reticulata W. & A., Malva parviflora L., Marsdenia tenacissima Moon, Mililusa velutina Hk. f. et Thom., Mucuna pruriens DC., Oenanthe javanica DC., Orthosiphon pallidus Royle ex Benth., Oxytropis esculentum R. Br., Phyllanthus maderaspatensis L., Plumbago zeylanica L., Rauvolfia serpentina Benth. ex Kurz, Salvadoria persica L., Schleichera oleosa Oken, Schoenoplectus grossus Palla, Utraria picta Desv. ex DC., Ventilago denticulata Willd., Verbascum thapsus L., Verbena officinalis L., Zeuxine strateumatica Schlr.

5.8 Ornamental Species

A large number of trees, shrubs, annuals, pot herbs, climbers, twiners, are frequently grown as ornamentals in gardens, parks, public places, house yards and in hedges. The common among them are: Acacia auriculiformis Cunn., Aglaonema spp., Alcea rosea L., Allamanda cathartica L., Alocasia spp., Anthocephalus chinensis A. Rich. ex Walp., Anthurium spp., Artabotrys hexapetalus Bhandari, Agathis spp., Bauhinia spp., Beloperone sp., Bignonia alliacea Lam., B. unguis-cati L., Bougainvillea spp., Buddleja spp., Caesalpinia pulcherrima Swartz., Caladium spp., Calliandra spp., Callistemon spp., Campsis grandiflora Schum., C. radicans (L.) Seem. ex Bureau, Caryota urens L., Cassia alata L., C. auriculata L., C. roxburghii DC., C. siamea Lam., C. surattensis Burm. f., Centaurea spp., Cereus spp., Christia vespertilionis(L.) Bakh. f., Clerodendrum splendens G. Don, Clitoria ternatea L., Coleus blumei Bentham., Crossandra sp., Cycas spp., Delonix regia Raf., Dieffenbachya spp., Duranta repens L., Erythrina cristagalli, E. variegata L., Euphorbia milli Ch. des Moul., E. nerifolia L., E. nivulia Buch. Ham., E. tirucalli L., Ficus benjamina King., Galphimia gracilis Bartl., Gardenia jasminoides Ellis, G. latifolia Soland., Gmelina philippensis Cham., Gomphrena globosa L., Grevillea robusta Cunn. ex R.Br., Hamelia patens Jacq., Heliconia sp., Hibiscus rosa-sinensis L., H. schizopetalus Hk. f., Iberis amara L., Ipomoea quamoclit L., Ixora spp., Jacaranda mimosifolia D. Don, Jasminum spp., Jatropha integerrima Jacq., Justicia gendarussa Burm. f., Koeleuteria api culata Rehd. & Wilson, Lagerstroemia indica L., L. reginae Roxb., L. tomentosa Presl, Lobularia spp., Lupinus spp., Malpigia glabra L., Malvaviscus arboreus Cav., Millingtonia hortensis L. f., Monastera sp., Mussaenda frondosa L., Nerium indicum Mill., Nyctanthes arbor-tristis L., Parkinsonia aculeata L., Pedilanthus tithymaloides Poir., Petrea volubilis L., Petunia spp., Pinus roxburghii Sarg., Plumeria spp., Punica granatum L., Pyrostegia venusta

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Miers, Quisqualis indica L., Ravanella madagascariensis J.F. Gmel., Ravenia spectabilis Griseb., Rheo spathacea Stern., Roystonia regia Cook., Saraca asoca De Wilde, Setcreasea pallida Rosc., Scindapsus spp., Spathodea campanulata Beauv., Tabebuia spp., Tecoma stans H.B.K., Thunbergia spp., Verbena spp., Wedelia urticaefolia, Zebrina pendula Sch., etc.

6. ECONOMICALLY IMPORTANT SPECIES

The information on the vegetation and flora of a region is incomplete without a list of economically important plants. Hence, the following list is given:

**Cereals:** The notable cereals cultivated throughout the district are: Avena sterilis L. var. culta Raizada, Hordeum vulgare L., Oryza sativa L., Pennisetum spp., Setaria italica (L.) P. Beauv., Sorghum vulgare (L.) Pers., Zea mays L., etc.

**Pulses:** The commonly cultivated pulses are: Cajanus cajan (L.) Millsp., Cicer arietinum L., Lens culinaris Medik., Pisum sativum L., Vigna mungo Hepper, V. radiata (L.) Wilczek, etc.

**Vegetables:** The common vegetables grown in the district are: Abelmoschus esculentus (L.) Moench., Allium cepa L., Amorphophalus campanulatus Bl., Beta vulgaris L., Coccinia grandis (L.) Voigt, Colocasia esculenta (L.) Schott., Cucurbita maxima Duch., Cucumis sativus L., Cyamopsis tetragonoloba (L.) Taub., Daucus carota L., Lablab purpureus Sw., Lagenaria siceraria Standley, Luffa acutangula Roxb., L. cylindrica (L.) Roem., Lycopersicon esculentum Mill., Momordica charantia L., Rapanus sativus L., Solanum melongena L., S. tuberosum L., Spinacia oleracea L., Trichosanthes dioica Roxb., etc.

**Fruits:** The notable edible fruits of the district are: Annona squamosa L., Averrhoa carambola L., Carica papaya L., Cucumis melo L., Grewia subinaequalis DC., Mangifera indica L., Manilkara hexandra (Roxb.) Dub., Morus spp., Musa paradisiaca L., Physalis peruviana L., Psidium guajava L., Vitis vinifera L., Ziziphus mauritiana Lam., etc.

**Timbers:** The common timber trees of the district are: Acacia nilotica (L.) Del. ssp. indica Brenan, Bambusa spp., Dalbergia sissoo Roxb., Dendrocalamus strictus Nees, Eucalyptus spp., Haplophragma adenophyllum P. Dop., Madhuca indica Gmel., Tectona grandis L.f., etc.

**Oil yielding plants:** The common oil yielding plants are: Arachis hypogaea L., Brassica spp., Linum usitatissimum L., Sesamum indicum L., etc.

**Fodder plants:** Crotalaria juncea L., Pennisetum spp., Sorghum vulgare (L.) Pers., Trifolium alexandrianaum L., etc. are cultivated to meet the requirement of fodder.

**Fibre yielding plants:** Crotalaria juncea L., Gossypium spp., Hibiscus cannabinus L. are chiefly grown.

**Spices and condiments:** The common spices and condiments cultivated are: Allium sativum L., Capsicum annuum L., Coriandrum sativum L., Cuminum cyminum L., Cuminum cymimum L., Foeniculum vulgare Mill., Nigella sativa L., Trachyspermum ammi (L.) Sprague, Trigonella foenum-graecum L., etc.

7. CONCLUSION

The total angiospermic floral biodiversity of Lucknow district including indigenous, naturalised and cultivants comprises over 1263 plant species covering 705 genera and 140 families, of which 989 species are dicotyledons and 274 species are monocotyledons.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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