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Natural vascular floristic composition of Banaras Hindu University, India: An overview

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The naturally occurring vascular flora of the main campus of Banaras Hindu University spreading over an area of 1,300 acres was analyzed. A total of 329 vascular plant species were reported in the campus of which only 5 were Pteridophytes and the remaining 324 species were Angiosperms. No natural occurrence of gymnosperms was reported from the University Campus. Angiosperms were represented by 76 families of which the Asteraceae, Poaceae and Fabaceae are the dominant families of the flora of Banaras Hindu University.

Key words: Angiosperms, floristic composition, herbaceous species, pteridophytes, shrubs, tree species, undershrubs, vascular flora.

INTRODUCTION

Banaras Hindu University, the great seat of learning was founded by Pandit Madan Mohan Malaviya in 1916 as a National University during the freedom struggle with donation from both the rich and poor. The foundation stone of this largest teaching and residential university of Asia was laid by Lord Hardinge on February 4, 1916; the then Viceroy and Governor General of British ruled India. This vast central university presently has 3 institutes, 14 faculties (Sundaram, 2006) and 124 departments. However, on initiative of the present Vice-Chancellor, Prof. D. P. Singh, a new institute named Institute of Environment and Sustainable Development is developing under the guidance of renowned Ecologist Prof. J. S. Singh.

The university comprises of three constituent schools and the faculty of Education in the Kamachha campus, which is located 4 km far from the main campus in an area measuring 50 acres of land on which the university originally was established. The Banaras Hindu University was in fact the transformation of Central Hindu College founded by Irish born Indian social reformer Dr. (Mrs.) Annie Besant in 1898. The university campus spreading over 1,300 acres of land area has well maintained roads with extensive greenery all along and is encompassed by wall all around it. It is semi-circular in design and provides dense flora, giving it a rural setting with all amenities of a big city at its doorstep.

The other campus comprising an Agricultural Extension

Farm of the university is situated at Barkachha (Mirzapur district of Uttar Pradesh) about 120 km from Varanasi city, which covers an area of about 2,700 acres. However, Barkachha is fast developing as a second campus of Banaras Hindu University by the name Rajiv Gandhi South Campus.

More than nine decades old, the main university campus has a dense flora. However, large number of the woody flora, which includes trees, shrubs and climbers were planted either as avenue plantations or shade trees and ornamental plants along roads side, in the gardens of residential compounds and departments, while several of them have also regenerated by themselves. The main objective of the present study was to analyze the naturally occurring vascular flora of the main campus of Banaras Hindu University.

MATERIALS AND METHODS

Site description

Banaras Hindu University main campus is located about 5 km South of Varanasi city on the Western bank of river Ganga (25°18' N latitude and 83° 1' E longitude), on leveled topography at an elevation of 76 m (Singh et al., 1971). The Varanasi district belongs to Indo-Gangetic plains physiographic region of India. The soil is alluvial type formed by the deposition of sediments of river Ganga. Soil is fertile and sandy loam in texture.

The climate is Tropical monsoonal type with three distinct

season; the cold (November to February), the hot (March to mid-June), and the rainy (mid-June to September), while October is regarded as strictly transitional month. The diurnal range of temperature ranges on average between 13 and 14.5°C in the cold and hot months. The highest monthly temperature is recorded in May, varying between 32 and 42°C. The annual rainfall is around 100 cm of which about 90% occurs in the rainy season (Singh and Rana, 2006).

Field survey

An extensive field survey was conducted from July 2007 to collect the various natural vascular plant species growing in the campus. During the process of survey, visits were made to every nook and corner of the university to search the plant species. The survey was completed by June, 2008. The identification of plant species and collection of information regarding their medicinal and economic uses were done through various sources (Hooker, 1875-1897; Duthie, 1903-1922; Kirtikar and Basu, 1975; Bor, 1960; Pandey, 1988; Singh and Jain, 1989; Valiyathan, 1998; Tiwari, 2000).

RESULTS AND DISCUSSION

The natural vascular floristic composition of the Banaras Hindu University campus is summarized in the Table 1. A total of 329 vascular plant species were recorded of which only 5 species (belonging to 4 families) were represented by pteridophytes while the remaining 324 plant species (represented by 76 families) were that of angiosperms. None of the species of gymnosperms was reported growing naturally in the university campus. A total of 260 species of herbaceous plant species were reported representing 79.02% of the total vascular floristic composition of the campus. Natural tree species were only 42 in number constituting 12.76% of the total floristic composition of the campus whereas shrubs were 18 in number constituting only 5.47% of the total natural flora of Banaras Hindu University. The least representation was that by the undershrubs, that is 9 in number representing only 2.73% of the total natural vascular flora of the Banaras Hindu University campus. Thus the herbs are the dominant constituents of the floristic composition of Banaras Hindu University campus. Furthermore, of the 260 herbs reported from the campus, 201 were represented by the annual herbs.

The grasslands of the campus comprises the grasses like *Dichanthium annulatum*, *Eragrostis viscosca*, *Eragrostis tenella*, *Eragrostis elongata*, *Sporobolus diander*, *Dactyloctenium aegyptium*, *Digitaria marginata*, *Digitaria sanguinalis*, *Eleusine indica*, *Panicum psilopodium* and forbs like *Alysicarpus monilifer*, *Alysicarpus longifolius*, *Evolvulus alsinoides*, *Evolvulus nummularius*, *Convolvulus pluricaulis*, *Indigofera ennaephylla*, *Indigofera linifolia*, *Vernonia cinerea*, *Zornia diphylla*, *Lindernia crustacea* and *Lindernia ciliata*. The herbaceous species composition of the grasslands recorded for the present study conforms to the previous studies conducted on the grasslands of the Banaras Hindu University campus (Sant, 1962; Singh, 1967).

Several of the naturally growing woody species in the campus like *Madhuca indica*, *Phyllanthus emblica*, *Terminalia arjuna*, *Holarrhena pubescens*, *Nyctanthes arbor-tristis* and *Woodfordia fruticosa* are the chief constituents of the dry tropical deciduous forest (Jha and Singh, 1992).

Tree species like *Ficus religiosa*, *Ficus benghalensis*, *Ficus glomerata*, *Ficus rumphii*, *Ficus virens* and *Ficus hispida* are the examples of keystone species growing in the campus of Banaras Hindu University.

Five species of parasitic angiosperms were reported from the campus of Banaras Hindu University, which includes *Loranthus longiflorus*, *Dendrophthoe falcata*, *Cuscuta reflexa*, *Orobranche indica* and *Striga asiatica*. The shrubs *L. longiflorus* and *D. falcata* are the examples of partial stem parasites which can be seen frequently parasitizing on the trees of *Mangifera indica*, *Psidium guajava* and *Nyctanthes arbor-tristis* of the Banaras Hindu University campus. *Cuscuta reflexa* is a commonly occurring total stem parasite found parasitizing on shrubs and trees of the university campus.

As a total root parasite, the *O. indica* can be often spotted parasitizing on tomato, brinjal, cabbage and cauliflower like vegetable crops grown in kitchen gardens of residential compounds while another total root parasite *S. asiatica* can be spotted in grasslands parasitizing on grasses.

A large number of exotic flora were reported from the campus of Banaras Hindu University which includes *Acacia nilotica*, *Ageratum conyzoides*, *Anagallis arvensis*, *Annona squamosa*, *Argemone mexicana*, *Artocarpus lakoocha*, *Asparagus racemosus*, *Avena fatua*, *Bauhinia purpurea*, *Cassia occidentalis*, *Chenopodium album*, *Chloris incompleta*, *Clitoria ternatea*, *Crotalaria medicaginea*, *Croton sparsiflorus*, *Cynodon dactylon*, *Cyperus rotundus*, *Datura metel*, *Eichhornia crassipes*, *Euphorbia thymifolia*, *Gomphrena globosa*, *Heliotropium indicum*, *Holoptelea integrifolia*, *Lantana camara*, *Melia azedarach*, *Melilotus alba*, *Mimosa pudica*, *Nicotiana plumbaginifolia*, *Oxalis corniculata*, *Parthenium hysterophorus*, *Physalis minima*, *Pithecolobium dulce*, *Portulaca oleracea*, *P. guajava*, *Punica granatum*, *Sonchus oleraceus*, *Sphaeranthus indicus*, *S. diander*, *Tamarindus indicus*, *Tridax procumbens*, *Urena lobata* and *Ziziphus mauritiana*. Generally the Indo-Gangetic plains of India are rich in exotic flora (Ahmad, 1999).

The 94 years old vast campus of Banaras Hindu University comprises of several natural and artificial ponds and pools which supports the aquatic plants like *Nymphaea alba*, *N. stellata*, *Nelumbo nucifera*, *Limnophila heterophylla*, *L. sessilifera*, *Limnophyton obtusifolium*, *Pistia stratiotes*, *E. crassipes*, *Hydrilla verticillata*, *Vallisneria spiralis*, *Lagarosiphon roxburghii*, *Monochoria vaginalis*, *Naias minor*, *Wolffia arrhiza*, *Typha latifolia*, *Spirodela polyrrhiza*, *Utricularia flexuosa* and *U. stellaris*.

The herbaceous *Ammania beccifera*, *Echinochloa colona*, *E. crus-galli*, *Sphaeranthus indicus*, *Spilanthes acmella*, *Rumex nigricans*, *Veronica anagallis*, *Polygonum*

Table 1. Naturally occurring vascular flora of Banaras Hindu University campus, India.

S/N	Family/Plant species	Habit
ANGIOSPERMS		
Acanthaceae		
1.	<i>Adhatoda zeylanica</i> Medic.	Shrub
2.	* <i>Andrographis paniculata</i> Nees	Herb
3.	* <i>Astercantha longifolia</i> Nees	Herb
4.	* <i>Blepharis boerhaviaefolia</i> Pers.	Herb
5.	<i>Ecbolium viride</i> (Flors.) Alston	Herb
6.	* <i>Justicia diffusa</i> Willd.	Herb
7.	* <i>Justicia simplex</i> D. Don	Herb
8.	* <i>Peristrophe bicalyculata</i> Nees	Herb
9.	* <i>Ruellia patula</i> Jacq.	Herb
10.	* <i>Ruellia prostrata</i> Lamk.	Herb
11.	* <i>Rungia parviflora</i> Nees	Herb
12.	* <i>Rungia repens</i> Nees	Herb
Aizoaceae		
1.	* <i>Mollugo hirta</i> Thumb.	Herb
2.	* <i>Trianthema monogyna</i> Linn.	Herb
Alismataceae		
1.	<i>Alisma oligococcum</i> F. Muell	Herb
2.	<i>Alisma plantago</i> Linn.	Herb
3.	<i>Limnophyton obtusifolium</i> Miq.	Herb
4.	<i>Sagittaria sagittifolia</i> Linn.	Herb
Amaranthaceae		
1.	<i>Achyranthes aspera</i> Linn.	Herb
2.	<i>Aerva lanata</i> (Linn.) Juss. ex Schult	Undershrub
3.	<i>Alternanthera sessilis</i> R. Br.	Herb
4.	* <i>Amaranthus polygamosus</i> Linn.	Herb
5.	* <i>Amaranthus spinosus</i> Linn.	Herb
6.	* <i>Amaranthus tenuifolius</i> Willd.	Herb
7.	* <i>Amaranthus viridis</i> Linn.	Herb
8.	* <i>Celosia argentea</i> Linn.	Herb
9.	* <i>Digera arvensis</i> Forsk.	Herb
10.	* <i>Gomphrena globosa</i> Linn.	Herb
Anacardiaceae		
1.	<i>Mangifera indica</i> Linn.	Tree
2.	<i>Spondias pinnata</i> (Koen.) Kurz	Tree
Annonaceae		
1.	<i>Annona squamosa</i> Linn.	Tree
Apiaceae		
1.	* <i>Centella asiatica</i> (Linn.) Urban	Herb
2.	* <i>Centella javanica</i> Linn.	Herb
3.	* <i>Centella rotundifolia</i> Linn.	Herb
Apocynaceae		
1.	<i>Alstonia scholaris</i> R. Br.	Tree
2.	<i>Holarrhena pubescens</i> Benth.	Tree
3.	<i>Rauvolfia serpentina</i> Benth.	Shrub

Table 1. Continues.

Araceae		
1.	<i>Pistia stratiotes</i> Linn.	Herb
Arecaceae		
1.	<i>Caryota urens</i> Linn.	Tree
Asclepiadaceae		
1.	<i>Calotropis gigantea</i> (Linn.) R. Br.	Shrub
2.	<i>Calotropis procera</i> (Ait) R. Br.	Herb
Asteraceae		
1.	* <i>Adenostemma viscosum</i> Forst.	Herb
2.	* <i>Ageratum conyzoides</i> Linn.	Herb
3.	* <i>Artemisia scoparia</i> Waldst. & Kit.	Herb
4.	<i>Blumea aromatica</i> DC.	Herb
5.	<i>Blumea eriantha</i> DC.	Herb
6.	* <i>Blumea indica</i> Linn.	Herb
7.	* <i>Blumea lacera</i> DC.	Herb
8.	<i>Blumea laciniata</i> DC.	Herb
9.	* <i>Blumea oxyodonta</i> DC.	Herb
10.	<i>Caesulia axillaris</i> Roxb.	Herb
11.	* <i>Carthamus oxyacantha</i> Linn.	Herb
12.	* <i>Centipeda orbicularis</i> Lour.	Herb
13.	* <i>Cnicus arvensis</i> Hoffm.	Herb
14.	* <i>Echinops echinatus</i> Roxb.	Herb
15.	* <i>Eclipta alba</i> Hask.	Herb
16.	* <i>Elephantopus scaber</i> Linn.	Herb
17.	* <i>Galinsoga parviflora</i> Cav.	Herb
18.	* <i>Gnaphalium indicum</i> Linn.	Herb
19.	* <i>Gnaphalium purpureum</i> Linn.	Herb
20.	<i>Launaea asplenifolia</i> Hook.	Herb
21.	<i>Launaea nudicaulis</i> Hook.	Herb
22.	* <i>Orthosiphon pallidus</i> Royle	Herb
23.	* <i>Parthenium hysterophorus</i> Linn.	Herb
24.	<i>Pluchea lanceolata</i> Cl.	Herb
25.	* <i>Pulicaria foliolosa</i> DC.	Herb
26.	<i>Sonchus arvensis</i> Linn.	Herb
27.	* <i>Sonchus oleraceus</i> Linn.	Herb
28.	* <i>Sphaeranthus indicus</i> Linn.	Herb
29.	* <i>Spilanthes acmella</i> Murr.	Herb
30.	* <i>Spilanthes paniculata</i> Linn.	Herb
31.	* <i>Taraxum officinale</i> Webber	Herb
32.	<i>Tridax procumbens</i> Linn.	Herb
33.	* <i>Vernonia anthelmintica</i> (Linn.) Willd.	Herb
34.	* <i>Vernonia cinerea</i> (Linn.) Less.	Herb
35.	* <i>Volutarella divaricata</i> Benth.	Herb
36.	* <i>Xanthium strumarium</i> Linn.	Herb
Bombaceae		
1.	<i>Bombax ceiba</i> Linn.	Tree

Table 1. Continues.

Boraginaceae		
1.	<i>*Borreria articularis</i> Linn.	Herb
2.	<i>*Heliotropium indicum</i> Linn.	Herb
3.	<i>*Heliotropium strigosum</i> Willd.	Herb
4.	<i>*Trichodesma indicum</i> R. Br.	Herb
Brassicaceae		
1.	<i>*Brassica sinensis</i> Linn.	Herb
2.	<i>*Capsella bursa-pastoris</i> Medic.	Herb
3.	<i>*Nasturtium officinale</i> R. Br.	Herb
4.	<i>*Sisymbrium irio</i> Linn.	Herb
Caesalpiniaceae		
1.	<i>Bauhinia purpurea</i> Linn.	Tree
2.	<i>Bauhinia racemosa</i> Lamk.	Tree
3.	<i>Cassia fistula</i> Linn.	Tree
4.	<i>*Cassia occidentalis</i> Linn.	Herb
5.	<i>*Cassia tora</i> Linn.	Herb
6.	<i>Pithecolobium dulce</i> Benth.	Tree
7.	<i>Tamarindus indicus</i> Linn.	Tree
Caryophyllaceae		
1.	<i>*Spergula arvensis</i> Linn.	Herb
Cappardaceae		
1.	<i>*Cleome viscosa</i> Linn.	Herb
2.	<i>*Gynandropsis pentaphylla</i> DC.	Herb
Ceratophyllaceae		
1.	<i>*Ceratophyllum demersum</i> Linn.	Herb
Chenopodiaceae		
1.	<i>*Chenopodium album</i> Linn.	Herb
Combretaceae		
1.	<i>Terminalia arjuna</i> Wt. & Arn.	Tree
2.	<i>Terminalia bellerica</i> (Gaertn.) Roxb.	Tree
Commelinaceae		
1.	<i>*Aneilema nudiflorum</i> R. Br.	Herb
2.	<i>*Commelina benghalensis</i> Linn.	Herb
3.	<i>*Commelina diffusa</i> Burm.	Herb
4.	<i>*Commelina longifolia</i> Lamk.	Herb
5.	<i>*Cyanotis axillaris</i> Schult.	Herb
Convolvulaceae		
1.	<i>Convolvulus pluricaulis</i> Chois.	Herb
2.	<i>Cuscuta reflexa</i> Roxb.	Herb
3.	<i>Evolvulus alsinoides</i> Linn.	Herb
4.	<i>Evolvulus nummularius</i> Linn.	Herb
5.	<i>*Ipomoea aquatica</i> Forsk.	Herb
6.	<i>Ipomoea fistulosa</i> Mart.	Shrub
7.	<i>Ipomoea pes-tigridis</i> Linn.	Herb
8.	<i>*Ipomoea pilosa</i> Sweet	Herb

Table 1. Continues.

Costaceae		
1.	* <i>Costus speciosus</i> (Koen.) Smith	Herb
Cucurbitaceae		
1.	* <i>Bryonia dioica</i> Jacq.	Herb
2.	* <i>Cephalandra indica</i> Naud.	Herb
3.	* <i>Coccinia grandis</i> (Linn.) Voigt	Herb
Cyperaceae		
1.	* <i>Bulbostylis barbata</i> Kunth	Herb
2.	<i>Carex cruciata</i> Wah.	Herb
3.	* <i>Cyperus aristatus</i> Rottbl.	Herb
4.	* <i>Cyperus compressus</i> Linn.	Herb
5.	* <i>Cyperus difformis</i> Linn.	Herb
6.	* <i>Cyperus digitatus</i> Roxb.	Herb
7.	* <i>Cyperus iria</i> Linn.	Herb
8.	<i>Cyperus rotundus</i> R. Br.	Herb
9.	* <i>Cyperus scariosus</i> Linn.	Herb
10.	* <i>Eriophorum comosum</i> Wall. ex Nees	Herb
11.	* <i>Fimbristylis diphylla</i> Vahl	Herb
12.	* <i>Kyllinga triceps</i> Rottb.	Herb
13.	* <i>Scirpus articulatus</i> Linn.	Herb
14.	* <i>Scirpus erectus</i> Poir	Herb
15.	<i>Scirpus mucronatus</i> Linn.	Herb
16.	* <i>Scirpus supinus</i> Linn.	Herb
Euphorbiaceae		
1.	* <i>Acalypha indica</i> Linn.	Herb
2.	* <i>Chrozophora prostrata</i> Dalz.	Herb
3.	* <i>Chrozophora rottleri</i> Juss.	Herb
4.	* <i>Croton sparsiflorus</i> Linn.	Herb
5.	* <i>Euphorbia granulate</i> Linn.	Herb
6.	* <i>Euphorbia hirta</i> Linn.	Herb
7.	* <i>Euphorbia nivulia</i> Linn.	Herb
8.	* <i>Euphorbia thymifolia</i> Linn.	Herb
9.	<i>Phyllanthus emblica</i> Linn.	Tree
10.	* <i>Phyllanthus niruri</i> Linn.	Herb
11.	<i>Phyllanthus simplex</i> Retz.	Herb
Fabaceae		
1.	* <i>Alysicarpus longifolius</i> Wt. & Arn.	Herb
2.	<i>Alysicarpus monilifer</i> DC.	Herb
3.	<i>Atylosia scarabaeoides</i> Benth.	Herb
4.	<i>Clitoria ternatea</i> Linn.	Undershrub
5.	<i>Crotalaria medicaginea</i> Lamk.	Herb
6.	<i>Dalbergia sissoo</i> Roxb.	Tree
7.	* <i>Desmodium gangeticum</i> (Linn.) DC.	Herb
8.	<i>Desmodium triflorum</i> DC.	Herb
9.	* <i>Heylandia latebrosa</i> DC.	Herb
10.	* <i>Indigofera enneaphylla</i> Linn.	Herb
11.	<i>Indigofera linifolia</i> Retz.	Herb

Table 1. Continues.

12.	<i>*Lathyrus aphaca</i> Linn.	Herb
13.	<i>*Lathyrus sphaericus</i> Retz.	Herb
14.	<i>*Melilotus alba</i> Desr.	Herb
15.	<i>*Melilotus indica</i> All.	Herb
16.	<i>*Mucuna pruriens</i> Baker	Herb
17.	<i>Pongamia pinnata</i> (Linn.) Pierre	Tree
18.	<i>*Rhynchosia capitata</i> DC.	Herb
19.	<i>*Rhynchosia minima</i> DC.	Herb
20.	<i>*Tephrosia pumila</i> Pers.	Herb
21.	<i>*Tephrosia purpurea</i> Linn.	Herb
22.	<i>*Zornia diphylla</i> Pers.	Herb
Fumariaceae		
1.	<i>*Fumaria parviflora</i> Lamk.	Herb
Gentianaceae		
1.	<i>*Exacum pendunculatum</i> Linn.	Herb
2.	<i>*Exacum tetragonum</i> Roxb.	Herb
Hydrocharitaceae		
1.	<i>*Hydrilla verticillata</i> Royle	Herb
2.	<i>*Lagarosiphon roxburghii</i> Benth.	Herb
3.	<i>*Ottelia alismoides</i> Pers.	Herb
4.	<i>*Vallisneria spiralis</i> Linn.	Herb
Lamiaceae		
1.	<i>*Coleus amboinicus</i> Lour.	Herb
2.	<i>*Hyptis suaveolens</i> (Linn.) Poir.	Herb
3.	<i>*Leonurus sibiricus</i> Linn.	Herb
4.	<i>*Leucas aspera</i> (Willd.) Link	Herb
5.	<i>*Nepeta ruderalis</i> Buch.-Ham.	Herb
6.	<i>*Ocimum canum</i> Sims.	Herb
7.	<i>*Salvia plebeia</i> R. Br.	Herb
Lemnaceae		
1.	<i>*Lemna minor</i> Linn.	Herb
2.	<i>*Spirodela polyrrhiza</i> Scheid.	Herb
3.	<i>*Wolffia arrhiza</i> Wimm.	Herb
Lentibulariaceae		
1.	<i>Utricularia flexuosa</i> Vahl	Herb
2.	<i>Utricularia stellaris</i> Linn.	Herb
Liliaceae		
1.	<i>Asparagus racemosus</i> Willd.	Undershrub
2.	<i>*Asphodelus tenuifolius</i> Cav.	Herb
3.	<i>*Zephyranthes candida</i> Herb.	Herb
Loranthaceae		
1.	<i>Dendrophthoe falcata</i> (Linn. f.) Etting	Shrub
2.	<i>Loranthus longiflorus</i> Desr.	Shrub

Table 1. Continues.

Lythraceae		
1.	<i>*Ammania baccifera</i> Linn.	Herb
2.	<i>Woodfordia fruticosa</i> (Linn.) Kurz.	Shrub
Malvaceae		
1.	<i>Abutilon asiaticum</i> Wt. & Arn.	Shrub
2.	<i>Abutilon indicum</i> (Linn.) Sweet	Shrub
3.	<i>Malvastrum tricuspidatum</i> Linn.	Undershrub
4.	<i>*Pavonia odorata</i> Willd.	Herb
5.	<i>Sida acuta</i> Burm. f.	Undershrub
6.	<i>Sida cordifolia</i> Linn.	Undershrub
7.	<i>Sida rhombifolia</i> Linn.	Undershrub
8.	<i>Sida veronicaefolia</i> Lamk.	Undershrub
9.	<i>Urena lobata</i> Linn.	Undershrub
10.	<i>Urena repanda</i> Roxb.	Herb
Meliaceae		
1.	<i>Azadirachta indica</i> A. Juss.	Tree
2.	<i>Melia azedarach</i> Linn.	Tree
Mimosaceae		
1.	<i>Acacia nilotica</i> (Linn.) Del.	Tree
2.	<i>Albizia lebbbeck</i> (Linn.) Benth.	Tree
3.	<i>Mimosa pudica</i> Linn.	Herb
4.	<i>Prosopis cineraria</i> Linn.	Tree
Moraceae		
1.	<i>Artocarpus heterophyllus</i> Lamk.	Tree
2.	<i>Artocarpus lakoocha</i> Roxb.	Tree
3.	<i>Ficus benghalensis</i> Linn.	Tree
4.	<i>Ficus glomerata</i> Roxb.	Tree
5.	<i>Ficus hispida</i> Linn. f.	Tree
6.	<i>Ficus religiosa</i> Linn.	Tree
7.	<i>Ficus rumphii</i> Blume	Tree
8.	<i>Ficus virens</i> Ait.	Tree
9.	<i>Streblus asper</i> Lour.	Tree
Moringaceae		
1.	<i>Moringa oleifera</i> Lamk.	Tree
Myrtaceae		
1.	<i>Psidium guajava</i> Linn.	Tree
2.	<i>Syzygium cuminii</i> (Linn.) Skeels	Tree
Naiadaceae		
1.	<i>*Naias minor</i> All.	Herb
2.	<i>Potamogeton indicus</i> Roxb.	Herb
Nelumbonaceae		
1.	<i>Nelumbo nucifera</i> Gaertn.	Herb
Nyctaginaceae		
1.	<i>Boerhaavia diffusa</i> Linn.	Herb
2.	<i>Boerhaavia repanda</i> Willd.	Herb

Table 1. Continues.

	Nymphaeaceae	
1.	<i>Nymphaea alba</i> Linn.	Herb
2.	<i>Nymphaea stellata</i> Willd.	Herb
	Oleaceae	
1.	<i>Nyctanthes arbor-tristis</i> Linn.	Shrub
	Orobanchaceae	
1.	* <i>Orobranche indica</i> Wall.	Herb
	Oxalidaceae	
1.	* <i>Biophytum sensitivum</i> DC.	Herb
2.	<i>Oxalis corniculata</i> Linn.	Herb
	Papavaraceae	
1.	* <i>Argemone mexicana</i> Linn.	Herb
	Pedaliaceae	
1.	* <i>Martynia diandra</i> Glox.	Herb
	Periplocaceae	
1.	<i>Hemidesmus indicus</i> (Linn.) R. Br.	Shrub
	Piperaceae	
1.	* <i>Peperomia pellucida</i> (Linn.) Kunth.	Herb
	Poaceae	
1.	* <i>Agropyron repens</i> Linn.	Herb
2.	* <i>Avena fatua</i> Linn.	Herb
3.	<i>Bothriochloa pertusa</i> (Willd.) A. Camus	Herb
4.	* <i>Brachiaria ramosa</i> (Linn.) Stapf.	Herb
5.	* <i>Chloris incompleta</i> Roth.	Herb
6.	<i>Cynodon dactylon</i> (Linn.) Pers.	Herb
7.	* <i>Dactyloctenium aegyptium</i> Willd.	Herb
8.	<i>Desmostachya bipinnata</i> (Linn.) Stapf.	Herb
9.	<i>Dichanthium annualatum</i> (Linn.) Stapf.	Herb
10.	* <i>Digitaria marginata</i> Beauv.	Herb
11.	* <i>Digitaria sanguinalis</i> (Linn.) Scop.	Herb
12.	* <i>Echinochloa colonum</i> (Linn.) Link	Herb
13.	* <i>Echinochloa crus-galli</i> (Linn.) P. Beauv.	Herb
14.	* <i>Eleusine indica</i> Gaertn.	Herb
15.	* <i>Eragrostis tenella</i> (Linn.) P. Beauv	Herb
16.	* <i>Eragrostis unioides</i> Nees	Herb
17.	* <i>Eragrostis viscosa</i> (Retz.) Trin.	Herb
18.	* <i>Eragrotis elongata</i> Nees	Herb
19.	* <i>Eulaliopsis binata</i> (Retz.) C.E. Hubbard	Herb
20.	<i>Imperata cylindrica</i> Beauv.	Herb
21.	* <i>Oplismenus burmanii</i> Beauv.	Herb
22.	* <i>Panicum psilopodium</i> Trin.	Herb
23.	* <i>Paspalidium flavidum</i> A. Camus	Herb
24.	* <i>Paspalum scorbiculatum</i> Linn.	Herb
25.	* <i>Phalaris minor</i> Linn.	Herb
26.	* <i>Poa annua</i> Linn.	Herb
27.	<i>Rottboellia exaltata</i> Linn. f.	Herb
28.	<i>Saccharum spontaneum</i> Linn.	Herb

Table 1. Continues.

29.	<i>*Setaria glauca</i> (Linn.) Beauv.	Herb
30.	<i>Sporobolus diander</i> Beauv.	Herb
31.	<i>Sporobolus tetragonus</i> R. Br.	Herb
Polygalaceae		
1.	<i>*Polygala chinesis</i> Linn.	Herb
Polygonaceae		
1.	<i>*Polygonum amphibium</i> Linn.	Herb
2.	<i>Polygonum capitatum</i> Buch.-Ham.	Herb
3.	<i>*Polygonum flaccidum</i> Meissn.	Herb
4.	<i>*Polygonum glabrum</i> Willd.	Herb
5.	<i>*Polygonum hydropiper</i> Linn.	Herb
6.	<i>*Polygonum orientale</i> Linn.	Herb
7.	<i>*Polygonum serrulatum</i> Lagasc.	Herb
8.	<i>*Rumex nigricans</i> Hook.	Herb
Pontederiaceae		
1.	<i>Eichhornia crassipes</i> Solms.	Herb
2.	<i>*Monochoria vaginalis</i> Presl.	Herb
Portulacaceae		
1.	<i>*Portulaca oleracea</i> Linn.	Herb
2.	<i>*Portulaca quadrifida</i> Linn.	Herb
Primulaceae		
1.	<i>*Anagallis arvensis</i> Linn.	Herb
Punicaceae		
1.	<i>Punica granatum</i> Linn.	Tree
Ranunculaceae		
1.	<i>*Ranunculus aculeatus</i> Linn.	Herb
Rhamnaceae		
1.	<i>Ziziphus mauritiana</i> Lamk.	Tree
2.	<i>Ziziphus nummularia</i> (Burm.f.) Wt. & Arn.	Shrub
3.	<i>Ziziphus oenoplia</i> Mill	Shrub
4.	<i>Ziziphus xylopyrus</i> Willd.	Shrub
Rubiaceae		
1.	<i>Anthocephalus cadamba</i> Miq.	Tree
2.	<i>Oldenlandia corymbosa</i> Linn.	Herb
3.	<i>*Oldenlandia dichotoma</i> Hook.	Herb
4.	<i>*Oldenlandia diffusa</i> Roxb.	Herb
5.	<i>*Spermacoce stricta</i> Linn.	Herb
Rutaceae		
1.	<i>Aegle marmelos</i> (Linn.) Correa	Tree
2.	<i>Murraya koenigii</i> (Linn.) Spring	Tree

Table 1. Continues.

Sapotaceae		
1.	<i>Madhuca indica</i> Gmel.	Tree
Scrophulariaceae		
1.	* <i>Celsia coromandeliana</i> Vahl	Herb
2.	* <i>Limnophila heterophylla</i> (Roxb.) Benth.	Herb
3.	* <i>Limnophila sessiliflora</i> Bl.	Herb
4.	* <i>Lindenbergia polyantha</i> Royle	Herb
5.	* <i>Lindenbergia urticaefolia</i> Link	Herb
6.	* <i>Lindernia ciliata</i> (Colsm.) Pennell	Herb
7.	* <i>Lindernia crustacea</i> (Linn.) F. Muell	Herb
8.	<i>Scoparia dulcis</i> Linn.	Herb
9.	* <i>Striga asiatica</i> Benth.	Herb
10.	* <i>Veronica anagallis</i> Linn.	Herb
Smilacaceae		
1.	<i>Smilax zeylanica</i> Linn.	Shrub
Solanaceae		
1.	* <i>Datura alba</i> Nees	Herb
2.	* <i>Datura fastuosa</i> Linn.	Herb
3.	* <i>Datura metel</i> Linn.	Herb
4.	* <i>Nicotiana plumbaginifolia</i> Linn.	Herb
5.	* <i>Physalis minima</i> Linn.	Herb
6.	* <i>Solanum elaeagnifolium</i> Linn.	Herb
7.	* <i>Solanum nigrum</i> Linn.	Herb
8.	<i>Solanum torvum</i> Sweet	Shrub
9.	* <i>Solanum xanthocarpum</i> Schrad. & Wendl.	Herb
Sterculiaceae		
1.	<i>Sterculia urens</i> Roxb.	Tree
Tiliaceae		
1.	* <i>Corchorus acutangulus</i> Lamk.	Herb
Typhaceae		
1.	<i>Typha latifolia</i> Edgew.	Herb
Ulmaceae		
1.	<i>Holoptelea integrifolia</i> (Roxb.) Planch	Tree
Urticaceae		
1.	* <i>Urtica dioica</i> Roxb.	Herb
Verbenaceae		
1.	<i>Clerodendrum viscosum</i> Vent.	Shrub
2.	<i>Lantana camara</i> Linn.	Shrub
3.	<i>Lippia nodiflora</i> Rich.	Herb
4.	<i>Verbena officinalis</i> Linn.	Herb
Zygophyllaceae		
1.	* <i>Tribulus terrestris</i> Linn.	Herb

Table 1. Continues.

Pteridophytes		
Azollaceae		
1.	* <i>Azolla pinnata</i> R. Br.	Herb
Dryopteridaceae		
1.	* <i>Dryopteris filix-mas</i> (Linn.) Schott	Herb
Marsiliaceae		
1.	* <i>Marsilea minuta</i> Linn.	Herb
Salviniaceae		
1.	* <i>Salvinia cucullata</i> Linn.	Herb
2.	* <i>Salvinia natans</i> Linn.	Herb

*Annual Herbs

amphibium, *P. capitatum*, *P. flaccidum*, *P. glabrum*, *P. hydropiper*, *P. orientale*, *P. serrulatum*, *Scirpus articulatus*, *S. erectus*, *S. mucronatus*, *S. supinus*, *Cyperus aristatus*, *C. compressus*, *C. difformis*, *C. digitatus*, *C. iria*, *C. rotundus* and *C. scariosus* can be observed growing on moist and damp ground of the university campus.

Shrubs like *Ziziphus nummularia*, *Z. oenoplia* and *Z. xylopyrus* often appear as stray plants in the grasslands of the Banaras Hindu University campus. The herbaceous species like *Boerhaavia diffusa*, *Lippia nodiflora*, *T. procumbens*, *Lindenbergia polyantha* and *Euphorbia thymifolia* are more frequent on the rocky or stony substratum of the campus.

Commelina benghalensis, *C. diffusa*, *C. longifolia*, *O. corniculata*, *Oplismenus burmanii*, *Biophytum sensitivum*, *Centella asiatica*, *C. rotundifolia* and *C. javanica* are more common on moist soil under shade of the trees than in open habitat of the campus of Banaras Hindu University.

Of the total species reported, the maximum number of species that is, 36 belongs to Asteraceae family, 31 belongs to Poaceae family while 22 species were represented by the Fabaceae family of angiosperms. Thus the Asteraceae, Poaceae and Fabaceae are the dominant families of the floristic composition of Banaras Hindu University campus.

Of the five species of pteridophytes reported from the university campus, four are aquatic plants. *Salvinia cucullata*, *Salvinia natans* and *Azolla pinnata* are found growing in the ponds and pools of the campus, while the *Marsilea minuta* is found in the water channels along roadside in rainy season. The fern *Dryopteris filix-mas* is a terrestrial species found growing in the moist and shady places of the university campus.

The study suggests that the protected campus of Banaras Hindu University is rich in natural vascular flora, though the floristic composition is dominated by the angiospermic flora.

Endemic and threatened species

No endemic species was reported from the campus of Banaras Hindu University. Indo-Gangetic Plains of India is poor in endemism (Ahmed, 1999). The *Martynia diandra*, *O. indica*, *S. asiatica*, *Rauvolfia serpentina* and *Smilax zeylanica* represents the threatened species of the campus flora.

Economic plants

The important medicinal plants growing in the campus of Banaras Hindu University includes *Abutilon indicum*, *Achyranthes aspera*, *Adhatoda zeylanica*, *Aegle marmelos*, *Albizia lebbeck*, *Ammania baccifera*, *Andrographis paniculata*, *A. mexicana*, *A. racemosus*, *Azadirachta indica*, *B. purpurea*, *B. racemosa*, *Blumea lacera*, *B. aromatica*, *Boerhaavia diffusa*, *Bryonia dioica*, *Calotropis procera*, *C. gigantea*, *Cassia fistula*, *C. occidentalis*, *C. tora*, *C. asiatica*, *C. album*, *Clerodendrum viscosum*, *Coccinia grandis*, *C. benghalensis*, *C. pluricaulis*, *Costus speciosus*, *C. dactylon*, *Dalbergia sissoo*, *Datura alba*, *D. falcata*, *Desmodium gangeticum*, *Eclipta alba*, *Evolvulus alsinoides*, *Ficus glomerata*, *F. religiosa*, *H. indicum*, *Hyptis suaveolens*, *Elephantopus scaber*, *Hemidesmus indicus*, *H. pubescens*, *Leucas aspera*, *M. azedarach*, *Moringa oleifera*, *Mucuna pruriens*, *N. nucifera*, *Ocimum canum*, *Oldenlandia corymbosa*, *O. corniculata*, *Phyllanthus niruri*, *P. minima*, *Pongamia pinnata*, *R. serpentina*, *Scoparia dulcis*, *Sida veronicaefolia*, *Solanum nigrum*, *Solanum xanthocarpum*, *S. indicus*, *S. acmella*, *Streblus asper*, *Syzygium cuminii*, *Tephrosia purpurea*, *Terminalia arjuna*, *T. bellerica*, *Trianthema monogyna*, *Tribulus terrestris*, *U. lobata*, *Urtica dioica*, *Vernonia anthelmintica* and *W. fruticosa*.

D. sissoo, *A. lebbeck*, *A. indica*, *T. indica*, *H. integrifolia*, *Bombax ceiba*, *Anthocephalus cadamba*, *A.*

nilotica and *S. cuminii* are the important timber yielding tree species of the flora of Banaras Hindu University campus.

The edible fruit trees of the campus include *Mangifera indica*, *S. cuminii*, *Z. mauritiana*, *A. squamosa*, *P. guajava*, *P. granatum*, *A. lakoocha* and *A. heterophyllus*. Besides these, *P. emblica*, *T. bellerica*, *T. arjuna* and *T. indicus* are the other tree species which produce fruits of commercial importance. *A. nilotica*, *A. marmelos*, *M. indica*, *B. ceiba*, *Sterculia urens* and *A. indica* are the gums and resins yielding tree species of the university campus.

The fibre yielding plants of the campus flora are *B. ceiba*, *F. hispida*, *F. rumphii*, *A. indicum*, *Sida cordifolia*, *U. lobata*, *T. latifolia*, *B. purpurea* and *Bauhinia racemosa*.

The tannin yielding trees includes *A. nilotica*, *B. purpurea*, *C. fistula*, *P. emblica*, *Nyctanthes arbor-tristis*, *T. arjuna*, *T. bellerica*, *Ficus virens*, *F. benghalensis* and *Z. mauritiana*.

W. fruticosa, *Nyctanthes arbor-tristis* and *Indigofera linifolia* are the important dye yielding plant species of the campus flora.

The important fodder yielding tree species of the campus includes *A. lebeck*, *D. sissoo*, *P. pinnata*, *Ficus religiosa*, *F. racemosa*, *F. hispida*, *F. virens* and *M. oleifera*.

Madhuca indica, *P. pinnata*, *A. indica* and *H. integrifolia* are the oil yielding tree species of the Banaras Hindu University campus. The oil is obtained from the seeds of these tree species.

The insecticides yielding plant species of the campus flora are *O. canum* and *A. indica*.

S. cucullata, *S. natans* and *E. crassipes* are the green manure plant species whereas *A. pinnta* is biofertilizer plant species growing in the campus of Banaras Hindu University.

Ethnomedicinal plants

The *Banwasi* (*Mushar*) and *Dharkar* tribal races and other rural communities inhabiting in rural areas nearby the university often visit the protected campus of Banaras Hindu University to collect the plants or their parts for the fulfillment of their medicinal requirements. Plants used by them for the treatment of various ailments includes *B. diffusa* (Jaundice), *A. indica* (Chicken pox and skin diseases), *T. procumbens* (Wound healing), *S. cuminii* (Diabetes and digestive disorders), *A. aspera* (Pyrrohoea and Piles), *A. paniculata* (Fever and Malaria), *A. marmelos* (Dysentery), *A. mexicana* (Skin diseases) *Peristrophe bicalyculata* (Gout), *L. aspera* (Headache), *D. alba* (Asthma), *F. glomerata* (Diarrhoea and Dysentery), *E. thymifolia* (Constipation), *Blumea aromatica* (Skin diseases), *E. alsinoides* (Nerve tonic), *C. procera*

(Asthma and skin diseases) etc. *B. diffusa* is the over-exploited plant species of the campus flora due to its medicinal value (Singh, 2007).

Conclusion

The study reveals that the natural vascular floristic composition of the Banaras Hindu University is dominated by the angiospermic flora. The herbaceous species are the major constituents of the naturally occurring campus flora. The Asteraceae, Poaceae and Fabaceae constitute the dominant families of the campus flora.

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