

FLORISTIC DIVERSITY OF BUNDELKHAND REGION OF UTTAR PRADESH

B.K. SINHA AND B.K. SHUKLA

Botanical Survey of India, Central Circle, Allahabad

A B S T R A C T

Floristic diversity of Bundelkhand region of Uttar Pradesh, comprising seven districts viz. Chitrakut, Banda, Hamirpur, Mahoba, Jalaun, Jhansi and Lalitpur, has been outlined in the present communication. The area is ideal for floristic survey because of its unique phytogeographical position as it lies in a transitional zone between the Upper Gangetic plains and Vindhyan ranges of Central India.

The vegetation mainly represents tropical dry deciduous forests, thorn forests and scrub forests with patches of *Boswellia*, *Butea*, *Anogeissus*, *Nyctanthes*, *Cochlospermum*, bamboos and grasslands. The floristic analysis reveals 1088 species belonging to 595 genera and 133 families of vascular plants. Poaceae (168 spp.) is the dominant family, followed by Fabaceae (138 spp.), Cyperaceae (60 spp.), Asteraceae (59 spp.) and Euphorbiaceae (44 spp.) A large number of species growing in this area are of medicinal and economic importance used by local peoples. A brief account of area, topography, climatic conditions, vegetation types, medicinal and economic plants, analysis of flora, systematic enumeration of the genera and species and conservation measures, etc. have been discussed.

INTRODUCTION

The Bundelkhand region is situated in south-western part of Uttar Pradesh. The entire Bundelkhand comprises seven districts viz., Chitrakut, Banda, Jalaun, Hamirpur, Lalitpur, Jhansi and Mahoba and six district of Madhya Pradesh viz., Datia, Tikamgarh, Chhatarpur, Panna, Damoh, Sagar and two sub-divisions Lahar and Bhader of Bhind and Gwalior districts respectively.

The Bundelkhand of Uttar Pradesh lies between 23°49' to 29°18' N latitude and 78°11' to 81°31' E longitude. having an area of ca 29416 sq. km. It is situated in a transitional zone between Upper Gangetic plain and Central India and has an interesting floral diversity. The southern part of Bundelkhand of Uttar Pradesh is bounded by Panna, Chhatarpur, Tikamgarh, Sagar and Satna and western part is bounded by Guna, Datia, Shivpuri and Bhind districts of Madhya Pradesh. The northern and north eastern part is bounded by Etawah, Kanpur, Fatehpur and Allahabad district of Uttar Pradesh. The area is ideal

for floristic survey because of its unique phytogeographical position and variable topography i.e. Vindhyan hills, plateau and deep ravines. (Map-I)

HISTORY

The name of Bundelkhand is taken from the "Bundela Thakurs", the most important clan inhabiting it. The word Bundela is popularly derived from bund "a drop" in allusion to the attempted sacrifice by the founder of the clan, a Gaharwar. His son was borne from the drop of blood which fell on the altar of Vindhyabasini Devi at Vindhyachal. Other derivation are from Vindhya or from "bandi" a slave girl.

TOPOGRAPHY

The northern range of eastern Vindhyas called Vindhyachal cuts across the south of Jhansi, Chitrakut and Banda with many outlying hills. The base of the hills rests on gneiss, while the hills themselves are of sandstone, overlaid south of these provinces by basalt, the Deccan trap, which has also spread north in dikes.

For the better understanding of topography of the region may be categorized under following heads, viz.,

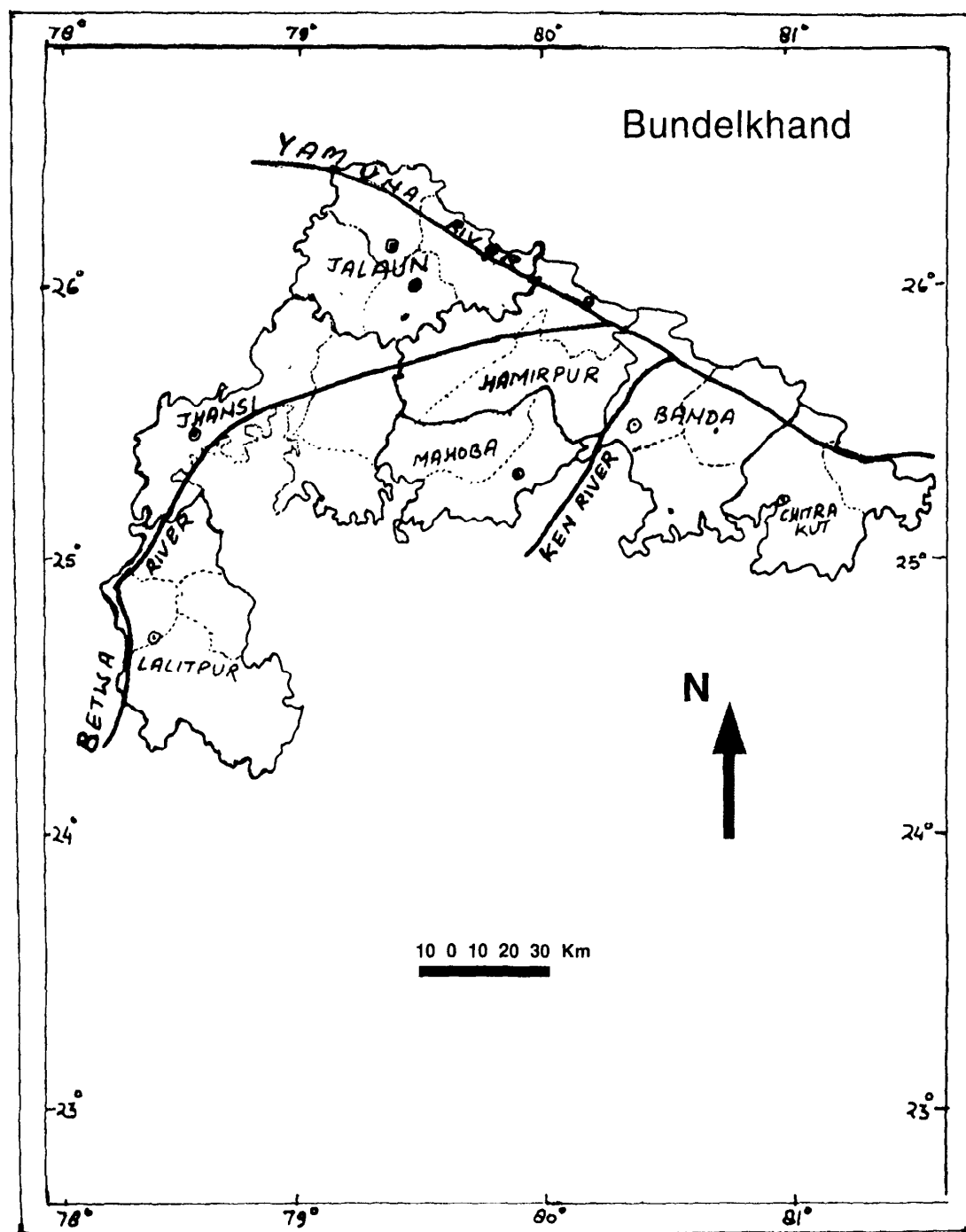
1. Northern plain land
2. Vindhyan Plateau
3. Vindhyan hilly region

The northern plain is also known as Yamuna Par Ka Maidan". It has alluvial plain in Jalaun, Hamirpur, Banda, Chitrakut, Jhansi, Mahoba and Lalitpur. This area is most suitable for agriculture purposes. The central portion of this area is known as Vindhyan Plateau having Bundelkhand gneiss with irregular rocky hills. The southern portion of this region is occupied by Vindhyan hills ranging between 150 to 600 m above sea level.

The soil of the region has been created by the degradation of the Vindhyan hilly tracts and the deposition of soil carried by the rivers viz., Yamuna, Ken, Betwa, Dhassan, Bairma, Baghain, Paisuni and southern Tons. In the hilly regions the soil is entirely sandy, overlying a substratum of rocks and is never deep red in colour. Fertility of the soil is very poor from Jhansi to Lalitpur, where the soil called "rakar" is found the prevailing colour of which is red or yellow due to the presence of iron in the disintegrated gneiss. In the low land, i.e. Yamuna plain and lying between the hills, the soil contains a large proportion of disintegrated trap, which gives it a dark colour that is black soil. The black soil is retentive of moisture, but requires irrigation in unfavourable seasons and in dry weather opens out in large cracks. The soil along the river banks is known as "Kachar" or "Tarai". This soil is most fertile and commonly used for wheat cultivation.

CLIMATE

The region falls under semi-arid climatic zone. The area enjoys three seasons, i.e. cool and dry winter, a long and hot summer and short rainy seasons except the transitional periods between the above seasons. From March to June is summer which is dry and hot. The summer



Map - 1 : Bundelkhand region of Uttar Pradesh.

days are characterised by hot winds (Loo) with maximum temperature rising upto 48°C. The July to September is the rainy season. The annual rain fall for the area concerned varies between 800 mm to 1300 mm. The winter season is from December to February, when temperature ranges between 9.5 to 21°C. Sometimes it may fall up to 1 or 2°C with occasional frost. The drought and less rain is the common feature of the area.

REVIEW OF LITERATURE

Edgeworth (1852, 1867) was the pioneer worker of this region. Later on Duthie (1903-1929); Kanjilal 1933, 1966); Raizada (1954, 1976); Raizada *et al.*, (1963) and Raizada and Jain (1964, 1966). Besides, few sporadic papers have been published viz., Dixit *et al.* (1984 a, b); Gupta *et al.*, (1980); Bhattacharya (1963, 1964); Bhattacharya and Malhotra (1964); Sinha (1987, 1990); Sinha and Verma (1985, 86a, b, 1988a, b); Verma and Sinha (1985, 86); Verma *et al.*, (1988, 1989, 1992); Verma and Shukla (1992); Nair and Nair (1977); Saxena and Vyas (1981, 86); Saxena and Tripathi (1989) and Ranjan (1997). While reviewing the previous botanical work done in Bundelkhand, it is concluded that there is no complete published botanical account for Bundelkhand region of Uttar Pradesh.

VEGETATION TYPES

Out of *ca* 29416 sq. km. Bundelkhand region of U.P. *ca* 546 sq. km is under dense forest; 1042 sq. km. is open forest and 215 sq. km. is scrub jungle. District wise forest cover area of Bundelkhand is given in table 1. According to Champion and Seth (1968) the forests of Bundelkhand is typically "Northern Tropical dry deciduous type". Natural and reserve forest tracts are generally restricted to the hills of Vindhyan plateau. The vegetation of forests may be broadly divided into the following broad categories.

- a) Mixed deciduous forests.
- b) Dry scrub and thorn forests.
- c) Ravinous vegetation.
- d) Sawana forests i.e. Grass Lands and
- e) Aquatic vegetation.

MIXED DECIDUOUS FORESTS

These forests are natural vegetation of the region found on gentle slopes of hills, valleys and flat terrain due to better soil formation and good water holding capacity. Most of the animals and birds are confined to the mixed forest areas. The vegetation is demarcated into three layers viz., trees, shrubs and herbs intermingled with climbers. The dominant tree species are. *Anogeissus latifolia*, *A. pendula*, *Acacia catechu*, *A. leucophloea*, *A. nilotica* ssp. *indica*, *A. farnesiana*, *Boswellia serrata*, *Butea monosperma*, *Diospyros malabarica*, *D. montana*, *Emblica officinalis*, *Feronia limonia*, *Holarrhena pubescens*, *Lannea coromandelica*, *Lagerstroemia parviflora*, *Madhuca longifolia* ssp. *latifolia*, *Terminalia alata*, *T. chebula*, *Ziziphus oenopia*, *Z. xylopyra*, etc.

Less common tree species are *Aegle marmelos*, *Annona squamosa*, *Ailanthus excelsa*, *Albizia lebbeck*, *Alangium salvifolium*, *Azadirachta indica*, *Bombax ceiba*, *Balanites*

Table 1. District wise area and forest cover in Bundelkhand region of U.P.

District of Bundelkhand in U.P.	Total geographical area	Dense forest cover	Open forest	Scrub forest
Banda (Chitrakut)	7624 sq. km.	331 sq. km.	269 sq. km	36 sq. km
Hamirpur (Mahoba)	7165 sq.km.	---	180 sq. km	36 sq. km
Jalaun	4565 sq. km.	---	132 sq. km	30 sq. km
Jhansi	5024 sq. km.	---	138 sq. km	69 sq. km
Lalitpur	5039 sq. km.	215 sq. km.	323 sq. km	44 sq. km

Source : FSI Report, 2000

aegyptiaca, *Bridelia retusa*, *Buchanania lanzan*, *Bauhinia purpurea*, *Cassia fistula*, *Crateva religiosa*, *Cochlospermum religiosum*, *Cassine glauca*, *Careya arborea*, *Cordia dichotoma*, *Eriolaena candollei*, *Ehretia laevis*, *Ficus arnottiana*, *F. benghalensis*, *F. racemosa*, *F. religiosa*, *Flacourtia indica*, *Garuga pinnata*, *Grewia* spp., *Hymenodictyon orixense*, *Holoptelea integrifolia*, *Leucaena leucocephala*, *Mimusops elengi*, *Mitragyna parvifolia*, *Ougeinia oojeinensis*, *Pongamia pinnata*, *Pithecellobium dulce*, *Schleichera oleosa*, *Schrebera swietenoides*, *Sterculia urens*, *Syzygium heyneanum*, *Terminalia arjuna* and *T. bellirica*.

The shrubby layer is usually formed by the species like *Capparis decidua*, *Cassia auriculata*, *Carissa opaca*, *Lantana camara*, *Ixora pavetta*, *Flacourtia indica*, *Helicteres isora*, *Maerua arenaria*, *Olex scandens*, *Prosopis juliflora*, *Woodfordia fruticosa*, *Buddleja asiatica*, *Vitex negundo*, *Euphorbia nivulia*, *Mimosa himalayana* and *Nyctanthes arbor-tristis*, etc.

The common climber species are *Abrus precatorius*, *Ampelocissus latifolia*, *A. tomentosa*, *Aristolochia bracteolata*, *Atylosia scarabaeoides*, *Cocculus hirsutus*, *Cissampelos pareira* var. *hirsuta*, *Cuscuta reflexa*, *Canavalia gladiata*, *Cayratia trifolia*, *C. auriculata*, *Cryptolepis buchanani*, *Gymnema sylvestre*, *Hemidesmus indicus*, *Leptadenia reticulata*, *Mucuna pruriens*, *Rivea hypocrateriformis*, *Pergularia daenmia*, *Tinospora cordifolia* and *Wattakaka volubilis*.

The common herbs found in open forest pockets or its margins are *Hyptis suaveolens*, *Anisomeles indica*, *Leonotis nepetaefolia*, *Cassia tora*, *Tephrosia purpurea*, *Heteropogon contortus*, *Themeda quadrivalvis*, *Iseilema laxum*, *Aristida hystrix*, etc. and large varieties of grasses and sedges.

It may also be mentioned that sometimes *Anogeissus pendula*, *Butea monosperma*, *Aegle marmelos*, *Euphorbia nivulia*, *Acacia catechu*, *Disopyros tomentosa* and

Lagerstroemia parviflora individually dominate in small patches of dry deciduous forests and such forests are named after them.

On dry ridges specially the species like *Nyctanthes arbor-tristis*, *Boswellia serrata*, *Sterculia urens*, *Cochlospermum religiosum* and *Euphorbia nivulia* etc. often form a characteristic open xerophytic forests.

Dendrocalamus strictus is the common bamboo and often occurs in patches of the forests regions. *Tectona grandis* occurs on quartzites and gneiss in Jhansi and Lalitpur districts in small patches.

Terminalia arjuna, *T.alata*, *Alangium salvifolium*, *Hymenodictyon orixensis*, *Syzygium heyneanum*, *Diospyros melanoxylon*, *Ficus racemosa*, *F. virens*, *F. religiosa*, and *Pongamia pinnata* are commonly found along the perennial streams and moist ravines.

The species, like *Tamarix ericoides* sometimes occur in the rocky river beds.

SCRUB AND THORN FORESTS

This type of forests occur in the dry parts of the area and are generally on level ground. The biotic interferences and excessive grazing pressure caused sparse tree layers and discontinuous vegetation, while shrubs become comparatively dense. These are known as scrub and thorn forests and are characterized by stunted growth and many stemmed trees and shrubs with small thorn bushes. The common plants recorded in this area are *Butea monosperma*, *Lagerstroemia parviflora*, *Acacia* spp., *Anogeissus pendula*, *Carissa opaca*, *Woodfordia fruticosa*, *Mimosa himalayana*, *Calotropis procera*, *Euphorbia neriifolia*, *Capparis decidua*, *Balanites aegyptiaca*, and *Dichrostachys cinerea*, etc. The north west part of the Jalaun district has scanty natural vegetation and in the driest localities only xerophyllous species, like *Dichrostachys cinerea*, *Capparis decidua*, *Acacia* spp., *Zizyphus* spp., *Maerua arenaria*, *Balanites aegyptiaca*, are commonly found.

RAVINOUS VEGETATION

The banks of Betwa and Yamuna are extremely undulated, created by innumerable ravines merging into the river bank and extending all along the course. The banks of these ravines and steeps, contain some characteristic species of arid zone which are viz., *Alhagi pseudalhagi*, *Crotalaria burhia*, *Pedaliium murex*, *Tribulus terrestris*, *Withania somnifera*, *Pulicaria angustifolia*, etc. The common species of the rugged barren river bank areas are *Capparis decidua*, *Butea monosperma*, etc. The flat river bank areas are used as cultivated land and the common tree species are *Acacia nilotica* ssp. *indica*, *Zizyphus mauritiana*, etc. The other less common tree species are *Aegle marmelos*, *Acacia* spp., *Feronia limonia*, *Mallotus philippensis*, *Carissa opaca*, *Flacourtia indica*, *Maerua arenaria*, *Zizyphus* spp., *Mimosa himalayana*, *Budleja asiatica*, *Vitex negundo*, *Prosopis juliflora*, *Bauhinia racemosa*, and *Euphorbia neriifolia*, etc. Climbers and twiners are *Antigonon leptopus*, *Capparis decidua*, *Celastrus paniculatus*, *Caesalpinia bonduc*, *Cayratia trifolia*, *Combretum nanum*, *Ichnocarpus frutescens*,

Gymnema sylvestre, *Hemidesmus indicus*, *Cissampelos pareira* var. *hirsuta* and many species of cucurbitaceae and convolvulaceae. The common herbaceous species in the area are *Crotalaria burhia*, *Acanthospermum hispidum*, *Alysicarpus* spp., *Pedaliium murex*, *Blainvillea acmella*, *Alhagi pseudalhagi*, *Withania somnifera*, *Tribulus terrestris*, *Dicoma tomentosa*, *Echinops echinatus*, *Cassia auriculata*, *Pulicaria angustifolia*, *Crotalaria* spp., *Desmodium* spp., *Indigofera* spp., *Rungia repens*, *Phyllanthus* spp., *Zornia gibbosa*, etc. The grass cover consists of *Aristida* spp., *Alloteropsis cimicina*, *Apluda mutica*, *Andropogon pumilus*, *Brachiaria* spp., *Capillipedium* spp., *Digitaria* spp., *Heteropogon contortus* and *Themeda quadrivalvis*, etc.

GRASSLANDS

Grasslands are found only in the clearing of the forests or in the plain areas. The common species are *Alloteropsis cimicina*, *Apluda mutica*, *Aristida* spp., *Bothriochloa pertusa*, *Brachiaria ramosa*, *Cenchrus ciliaris*, *Chloris dolichostachya*, *Chrysopogon fulvus*, *Cynodon dactylon*, *Dichanthium annulatum*, *Digitaria* spp., *Echinochloa* spp., *Eragrostis* spp., *Hackelochloa granularis*, *Iseilema laxum*, *Panicum* spp., *Rottboellia exaltata*, *Saccharum spontaneum*, *Setaria glauca*, *Sorghum halepense*, *Sporobolus diander*, *Themeda quadrivalvis*, *Vetiveria zizanioides*, etc.

AQUATIC VEGETATION

Bundelkhand region is rich in aquatic vegetation due to presence of many artificial and natural tanks and few perennial rivers, nallahs, ponds and lakes viz., Bela tal, Majhegawan tank, Vijayanagar tal and Barua Sagar dam, etc. They harbour many aquatic species which are as follows.

Free floating hydrophytes: *Azolla pinnata*, *Eichhornia crassipes*, *Lemna perpusilla*, *Pistia stratiotes*, *Spirodela polyrhiza*, *Wolffia arrhiza*, etc.

Suspended submerged hydrophytes: *Ceratophyllum aurea*, *Ceratophyllum demersum*, etc.

Anchored submerged hydrophytes: *Blyxa aubertii*, *Hydrilla verticillata*, *Najas minor*, *Lagarosiphon alternifolia*, *Potamogeton crispus*, *P. pectinatus*, *Vallisneria spiralis*, etc.

Anchored hydrophytes with floating shoots: *Alternanthera philoxeroides*, *Cyperus alopecuroides*, *Hygrophiza aristata*, *Ipomoea aquatica*, *Ludwigia adscendens*, *Neptunia oleracea*, etc.

Anchored hydrophytes with Floating leaves: *Aponogeton natans*, *Limnophyton obtusifolium*, *Marsilea minuta*, *Monochoria vaginalis*, *Nelumbo nucifera*, *Nymphaea nouchali*, *N. pubescens*, *Nymphoides hydrophylla*, *N. indica*, *Ottelia alismoides*, *Potamogeton nodosus*, *Sagittaria guayanensis* ssp. *lappula*, *Tenagocharis latifolia*, etc.

Emergent amphibious hydrophytes: *Aeschynomene indica*, *Alternanthera sessilis*, *Ammania baccifera*, *A. multiflora*, *Bacopa monnieri*, *Amischophacelus axillaris*, *Coix*

gigantea, *C. lacryma-jobi*, *Cyperus distans*, *C. nutans*, *C. pangorei*, *Echinochloa colona*, *E. stagnina*, *Eleocharis atropurpurea*, *E. dulcis*, *E. geniculata*, *E. palustris*, *Eriocaulon cinereum*, *Fimbristylis schoenoides*, *F. tetragona*, *Fuirena ciliaris*, *Hoppea dichotoma*, *Hydrolea zeylanica*, *Hygrophila auriculata*, *Ischaemum rugosum*, *Limnophila indica*, *Ludwigia octovalvis*, *L. perennis*, *Ophiuros exaltatus*, *Phragmites karka*, *Phyla nodiflora*, *Polygonum barbatum*, *P. glabrum*, *Ranunculus sceleratus*, *Panicum paludosum*, *Paspalidium punctatum*, *Rotala indica*, *R. rotundifolia*, *Scirpus articulatus*, *S. lateriflorus*, *S. maritimus*, *Typha angustata*, etc.

USEFUL PLANTS

In the rural areas, the majority of people still depend on wild plants for their various requirements. Efforts were made during field trips for the collection of information regarding the local uses of plants. The results obtained from the survey and economic assessment of the vegetation are summarized under the following categories based on the parts used:

1) Edible Plants

Fruits : A number of plants provide fruits eaten raw, cooked or pickled viz., *Aegle marmelos*, *Alangium salvifolium*, *Ampelocissus latifolia*, *Annona squamosa*, *Buchanania lanzan*, *Carissa carandas*, *C. opaca*, *Coccinia grandis*, *Cordia dichotoma*, *Ficus palmata*, *F. racemosa*, *F. virens*, *Flacourtia indica*, *Grewia hirsuta*, *Feronia limonia*, *Mangifera indica*, *Manilkara hexandra*, *Momordica dioica*, *Moringa oleifera*, *Phoenix acaulis*, *P. sylvestris*, *Phyllanthus emblica*, *Physalis minima*, *Pithecellobium dulce*, *Solanum nigrum*, *Syzygium cumini*, *Tamarindus indica*, *Trapa natans* var. *bispinosa* *Catunaregam spinosa*, *Zizyphus mauritiana*, *Z. nummularia* and *Z. oenoplia*.

Seeds: Seeds of many species, viz., *Cassia occidentalis*, *Eleusine coracana*, *Oryza rufipogon*, *Panicum sumatrense*, *Paspalum scrobiculatum*, *Sterculia urens*, *Terminalia bellirica*, *Vigna aconitifolia*, etc. are eaten raw, cooked or roasted.

Rhizomes/ tubers: The rhizomes or tubers of *Asparagus racemosus*, *Dioscorea bulbifera*, *D. pentaphylla*, *Nelumbo nucifera*, *Nymphaea pubescens*, etc. species are eaten.

Leave and tender shoots: *Amaranthus spinosus*, *A. tricolor*, *A. viridis*, *Chenopodium album*, *Ipomeoea aquatica*, *Oxalis corniculata*, *Basella alba*, *Portulaca oleracea*, etc.

Flowers: The flowers of several species viz., *Bauhinia purpurea*, *B. racemosa*, *Hibiscus sabdariffa*, *Indigofera cassioides*, *Madhuca longifolia* var. *latifolia*, *Moringa oleifera*, *Nelumbo nucifera*, *Sesbania grandiflora*, *Woodfordia fruticosa*, etc. are used as vegetable

2. Plants of Miscellaneous uses

Beverages & drinks : *Cassia occidentalis*, *Madhuca longifolia* var. *latifolia*, and *Tamarindus indica*.

Bidi : rolling leaves of *Diospyros melanoxylon*

Brooms : Inflorescence of *Arundo donax* and *Thysanolaena maxima*.

Dyes : *Acacia catechu*, *Ampelocissus latifolia*, *Butea monosperma*, *Curcuma aromatica*, *Lawsonia inermis*, *Mallotus philippensis*, *Nyctanthes arbor-tristis*, *Phyllanthus emblica* and *Woodfordia fruticosa*.

Fibres : *Abutilon indicum*, *Bauhinia purpurea*, *B. vahlii*, *Butea monosperma*, *Cannabis sativa*, *Corchorus capsularis*, *Crotalaria juncea*, *Calotropis procera* and *Hibiscus* spp.

Gums : *Acacia ferruginea*, *A. catechu*, *A. leucophloea*, *A. nilotica* ssp. *indica*, *Azadirachta indica*, *Buchanania lanzan*, *Butea monosperma*, *Anogeissus pendula*, *Boswellia serrata*, *Cochlospermum religiosum*, *Lannea coromandelica*, *Sterculia urens*, *Woodfordia fruticosa*.

Kattha is obtained from the woods of *Acacia catechu*.

Timber wood: The wood of following trees are used for house construction, agricultural implements, leats and, cots, etc. *Acacia catechu*, *A. nilotica* ssp. *indica*, *Albizia lebbeck*, *Azadirachta indica*, *Bauhinia racemosa*, *Boswellia serrata*, *Butea monosperma*, *Cordia dichotoma*, *Dalbergia sissoo*, *Haldina cordifolia*, *Lagerstroemia parviflora*, *Lannea coromandelica*, *Mallotus philippensis*, *Mangifera indica*, *Ougeinia oojeinensis*, *Mitragyna parvifolia*, *Syzygium cumini* and *Pterocarpus marsupium*.

The wood from the *Ailanthus excelsa*, *Boswellia serrata*, *Holarrhena pubescens* and *Mallotus philippensis* are used for making toys, matchsticks, packing cases, etc.

Fodder & forage: *Albizia lebbeck*, *Apluda mutica*, *Cenchrus pennisetiformis*, *Chrysopogon fulvus*, *Crotalaria juncea*, *Cynodon dactylon*, *Desmodium triflorum*, *Dichanthium annulatum*, *Themeda quadrivalvis* and many other grass species are used as fodder and forage.

Oil Yielding Plants: The important oil yielding species are: *Argemone mexicana*, *Azadirachta indica*, *Brassica rapa* ssp. *campestris*, *Buchanania lanzan*, *Linum usitatissimum*, *Madhuca longifolia* var. *latifolia*, *Ricinus communis*, *Schleichera oleosa*, *Sesamum indicum*, *Cymbopogon martinii* and *Vetiveria zizanioides*, etc.

3. Medicinal Plants

The local people living in villages particularly in forest areas are using a number of wild plants for curing various diseases. These are described under following heads.

Bone fracture/ sprain: The paste of *Peristrophe bicalyculata*, *Tinospora cordifolia*, and *Viscum articulatum* are used.

Lactation: The boiled tuberous roots of *Asparagus racemosus* are used for milk secretion.

Filaria: *Eclipta prostrata* and *Elephantopus scaber* are used to cure filaria

Constipation and stomach pain: *Aegle marmelos*, *Cassia fistula*, *Cissampelos pareira* var. *hirsuta*, *Helicteres isora*, *Phyllanthus emblica* with *Terminalia bellirica* and *T. chebula*.

Diarrhoea and Dysentery: *Acacia nilotica* ssp. *indica*, *Anisomeles indica*, *Bauhinia racemosa*, *Celosia argentea*, *Centella asiatica*, *Cyperus rotundus* and *Catunaregam spinosa*.

Pains, swellings and body-aches: *Achyranthes aspera*, *Argemone mexicana*, *Calotropis gigantea*, *Capparis zeylanica*, *Cuscuta reflexa*, *Eclipta prostrata* and *Sphaeranthus indicus*.

Cuts, Wounds and boils: *Agave angustifolia*, *Azadirachta indica*, *Blumea lacera*, *Buchanania lanzan*, *Cleome viscosa*, *Capparis zeylanica*, *Martynia annua*, *Phyllanthus amarus*, *Euphorbia thymifolia*, *Terminalia arjuna* and *Tridax procumbens*.

Antidote to Snake bite and Scorpion bite : *Achyranthes aspera*, *Calotropis procera*, *Curculigo orchoides*, *Euphorbia hirta*, *Ficus benghalensis* and *Hoppea dichotoma*.

Fever: *Aloe vera*, *Andrographis echioides*, *A. paniculata*, *Ocimum basilicum*, *Oxalis corniculata*, *Ricinus communis* and *Catunaregam spinosa*.

Jaundice and Liver disorder: *Aegle marmelos*, *Cassia fistula*, *Cochlospermum religiosum*, *Boerhavia diffusa* and *Phyllanthus amarus*

Skin diseases : *Abrus precatorius*, *Alangium salvifolium* *Azadirachta indica*, *Cassia occidentalis*, *C. tora*, *Dendrophthoe falcata*, *Hemidesmus indicus* and *Mallotus philippensis*.

Cough, Cold and bronchitis : *Abrus precatorius*, *Adhatoda zeylanica*, *Barleria prionitis*, *Cassia occidentalis*, *Cordia dichotoma*, *Ocimum canum*, *Solanum virginianum* and *Verbascum chinense*.

Toothache : *Hemidesmus indicus*, *Ichno-carpus frutescens*, *Madhuca longifolia* var. *latifolia* and *Rivea hypocrateriformis*.

Urinary trouble : *Hemidesmus indicus* (root) and *Hibiscus rosa-sinensis* (Flower).

Impotency and Sexual disorder: *Chlorophytum, tuberosum* (tubers), *Euphorbia thymifolia*, *Hemidesmus indicus* (root), *Hygrophila auriculata* (seeds) and *Sida rhombifolia* (leaf).

ANALYSIS OF THE FLORA

The flora of Bundelkhand region of Uttar Pradesh comprises 1088 species belonging to 595 genera and 133 families of angiosperms. Out of these, 302 species in 142 genera and 29 families are of monocots and 786 species under 453 genera and 104 families are of dicots (Table-2 & 3).

Table 2: The number of families, genera and species included in different groups.

Group	Families	Genera	Species
Dicots	104	453	786
Monocots	29	142	302
Total	133	595	1088

Table 3: List of Families, showing numbers of Genera and Species:

Sl. No.	Families	Genera	Species	Sl. No.	Families	Genera	Species
DICOTS							
1.	Ranunculaceae	1	1	29.	Simaroubaceae	1	1
2.	Magnoliaceae	1	1	30.	Balanitaceae	1	1
3.	Annonaceae	3	3	31.	Burseraceae	2	2
4.	Menispermaceae	4	6	32.	Meliaceae	3	3
5.	Nymphaeaceae	2	3	33.	Olaceae	1	1
6.	Papaveraceae	1	2	34.	Celastraceae	3	4
7.	Fumariaceae	1	1	35.	Rhamnaceae	2	6
8.	Brassicaceae	6	6	36.	Vitaceae	3	6
9.	Capparaceae	5	9	37.	Leeaceae	1	1
10.	Violaceae	1	1	38.	Sapindaceae	4	4
11.	Cochlospermaceae	1	1	39.	Anacardiaceae	5	5
12.	Flacourtiaceae	2	3	40.	Moringaceae	1	1
13.	Polygalaceae	1	4	41.	Fabaceae	41	96
14.	Caryophyllaceae	4	4	42.	Caesalpinaceae	7	21
15.	Portulacaceae	1	2	43.	Mimosaceae	8	21
16.	Tamaricaceae	1	2	44.	Rosaceae	1	1
17.	Elatinaceae	1	2	45.	Vahliaceae	1	1
18.	Dipterocarpaceae	1	1	46.	Combretaceae	4	10
19.	Malvaceae	12	37	47.	Myrtaceae	4	5
20.	Bombacaceae	2	2	48.	Lecythidaceae	2	2
21.	Sterculiaceae	7	9	49.	Lythraceae	5	10
22.	Tiliaceae	3	17	50.	Punicaceae	1	1
23.	Linaceae	1	1	51.	Onagraceae	1	3
24.	Malpighiaceae	2	2	52.	Trapaceae	1	1
25.	Zygophyllaceae	2	2	53.	Caricaceae	1	1
26.	Oxalidaceae	2	3	54.	Cucurbitaceae	12	15
27.	Averrhoaceae	1	1	55.	Cactaceae	1	2
28.	Rutaceae	6	6	56.	Aizoaceae	3	3

Sl. No.	Families	Genera	Species	Sl. No.	Families	Genera	Species
57.	Molluginaceae	2	4	97.	Loranthaceae	2	3
58.	Apiaceae	7	7	98.	Santalaceae	1	1
59.	Cornaceae	1	1	99.	Euphorbiaceae	19	44
60.	Rubiaceae	13	18	100.	Urticaceae	1	1
61.	Asteraceae	39	59	101.	Ulmaceae	2	2
62.	Campanulaceae	2	2	102.	Cannabaceae	1	1
63.	Sphenocleaceae	1	1	103.	Moraceae	3	15
64.	Plumbaginaceae	1	1	104.	Salicaceae	1	1
65.	Primulaceae	3	3	105.	Ceratophyllaceae	1	1
66.	Myrsinaceae	1	1	MONOCOTS			
67.	Sapotaceae	3	3				1.
68.	Ebenaceae	1	3		Hydrocharitaceae	5	5
69.	Loganiaceae	2	2	2.	Orchidaceae	3	3
70.	Oleaceae	3	7	3.	Zingiberaceae	2	2
71.	Salvadoraceae	1	2	4.	Costaceae	1	1
72.	Apocynaceae	12	15	5.	Amaryllidaceae	3	5
73.	Asclepiadaceae	12	14	6.	Hypoxidaceae	1	1
74.	Gentianaceae	6	8	7.	Cannaceae	1	1
75.	Hydrophyllaceae	1	1	8.	Dioscoreaceae	1	6
76.	Boraginaceae	7	16	9.	Liliaceae	7	7
77.	Convolvulaceae	11	28	10.	Pontederiaceae	2	2
78.	Solanaceae	7	14	11.	Commelinaceae	4	9
79.	Scrophulariaceae	15	21	12.	Juncaceae	1	1
80.	Orobanchaceae	1	2	13.	Taccaceae	1	1
81.	Lentibulariaceae	1	1	14.	Smilacaceae	1	1
82.	Bignoniaceae	6	6	15.	Musaceae	1	1
83.	Pedaliaceae	3	3	16.	Arecaceae	4	5
84.	Acanthaceae	20	35	17.	Pandanaceae	1	1
85.	Verbenaceae	9	13	18.	Typhaceae	1	1
86.	Lamiaceae	12	23	19.	Araceae	2	2
87.	Plantaginaceae	1	1	20.	Lemnaceae	3	4
88.	Nyctaginaceae	3	4	21.	Alismataceae	2	3
89.	Amaranthaceae	9	21	22.	Butomaceae	1	1
90.	Chenopodiaceae	1	2	23.	Najadaceae	1	2
91.	Basellaceae	1	1	24.	Aponogetonaceae	1	1
92.	Phytolacaceae	1	1	25.	Potamogetonaceae	1	4
93.	Polygonaceae	3	7	26.	Zannichelliaceae	1	1
94.	Aristolochiaceae	1	2	27.	Eriocaulaceae	1	1
95.	Piperaceae	2	2	28.	Cyperaceae	7	60
96.	Lauraceae	2	2	29.	Poaceae	82	168

Genera and Species Ratio : Monocots are comparatively poorly represented in the area. Out of 302 species, 228 species belong to Cyperaceae and Poaceae alone. The remaining 74 species are distributed under 27 different families. The ratio of families of Monocots and Dicots is 1:3:8, of genera 1:3.1 and of species are 1:2.6.

The ratio of genera and species is approximately 1:13 for world, 1:7 for India, 1:2.2 for Gangetic plain, but 1:1.9 for Bundelkhand region of Uttar Pradesh. The genus: species ratio is small in the area which confirms the general law that the flora of small area is relatively richer in order and genera than species.

Dominance of the families : The relative importance of 10 dominant families in order of their species content is presented in Table-2 for the flora of Bundelkhand region of Uttar Pradesh which indicate that Poaceae (168 species) occupy the first position followed by Leguminosae *s.l.* (138 species) as shown in Table 4.

Table 4: Dominant families of Bundhelkhand region of U.P.

Sl. No.	Families	No. of Genera	No. of Species
1.	Poaceae	82	168
2.	Leguminosae <i>s.l.</i>	56	138
3.	Cyperaceae	7	60
4.	Asteraceae	39	59
5.	Euphorbiaceae	19	44
6.	Malvaceae	12	37
7.	Acanthaceae	20	35
8.	Convolvulaceae	11	28
9.	Lamiaceae	12	23
10.	Amaranthaceae	9	21

A comparison of the 10 dominant families of Bundelkhand region of Uttar Pradesh *vis-a-vis* India and the adjoining areas in presented in table-5.

Conservation Measures: The Bundelkhand region of Uttar Pradesh is in unique Phytogeographical position, as it lies in a transitional zone between the Upper gangetic plains and Vindhyan ranges of Central India. The flora of the area shows maximum similarity with central India and partly with the flora of Gangetic Plains. There is rich plant diversity in respect of fodder plants as well as medicinal/economic plants. Due to population pressure, developmental activities and unmanaged grazing serious threat for depletion of flora and habitat exist. Therefore, the future planners and foresters should take proper care before the construction of big projects and cattle grazing should be managed in a proper way.

The forests of the foot hills of Vindhyan rages are mainly affected due to unmanaged quarries of minerals and stones. It should be properly managed.

Table 5: Status of 10 dominant families of Bundelkhand compared with that of India and adjoining areas.

Status of Plant Diversity in India (Sharma and Singh 2000)	Flora of Madhya Pradesh (Verma and Mudgal 1999)	Upper Gangetic Plain (Duthie 1903-1929) and (Raizada 1976)	Flora of Bundelkhand region of U.P.
Poaceae (1200)	Fabaceae (264)	Poaceae (301)	Poaceae (168)
Fabaceae (1152)	Poaceae (257)	Fabaceae (217)	Fabaceae (138)
Orchidaceae (1141)	Asteraceae (153)	Asteraceae (215)	Cyperaceae (60)
Asteraceae (950)	Cyperaceae (131)	Cyperaceae (132)	Asteraceae (59)
Rubiaceae (659)	Acanthaceae (103)	Euphorbiaceae (100)	Euphorbiaceae (44)
Cyperaceae (545)	Euphorbiaceae (96)	Acanthaceae (88)	Malvaceae (37)
Euphorbiaceae (528)	Orchidaceae (88)	Lamiaceae (79)	Acanthaceae (35)
Acanthaceae (510)	Rubiaceae (74)	Scrophulariaceae (74)	Convolvulaceae (28)
Rosaceae (492)	Scrophulariaceae (69)	Convolvulaceae (73)	Lamiaceae (23)
Lamiaceae (454)	Lamiaceae (62)	Malvaceae (67)	Amaranthaceae (21)

Figures in the bracket indicate the number of species.

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