

A sketch of the flora of Nameri National Park, Assam: II. Phytogeography

S.S. Begum¹, H. Roy², M. Nath and S.K. Borthakur

Department of Botany, Gauhati University, Guwahati-781014, Assam, India

¹Maryam Ajmal Women's College of Science & Technology, Maryam Nagar, Hojai, Nagaon, 782435, Assam, India

²Corresponding author: E-mail: mailme_royhimu@yahoo.com

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Abstract

The present paper deals with the phytogeography of Nameri National Park in Assam.

Key words: Phytogeography, Nameri National Park, Assam.

INTRODUCTION

The complex phytogeography is correlated with the wide range of altitude, the meridional orientation of the mountains and the geological past of the land (Rao 1974). Phytogeography deals with the distribution of plants in present and past (Good 1974). According to Good (1974) India, along with the continental South-East Asian region falls under the paleotropical kingdom and Indo-Malaysian sub-kingdom. On the basis of distribution of flora, the Indian Subcontinent has been subdivided into various botanical or floristic provinces by Clarke (1898); Hooker (1906); Chatterjee (1939); Meher-Homji & Mishra (1971) and Rao (1974). On the basis of climatic and geographical conditions the earth is generally divided into broad vegetational belts and accordingly India is under Tropical belt. Meher-Homji (1972) recognized 25 floristic provinces in India. The present study area, Nameri National Park (NNP) is under the province of Assam. 'Because of its distinctive flora', Assam has been treated as a distinct phytogeographical area (Chatterjee 1939; Clarke 1898; Hooker 1906; Sahni 1981), which forms an integral part of north-easterly extension of the Eastern Himalaya. Phytogeography can also be studied in the context of the historical geomorphology of a region. Ancient Gondwana land and the Great Ice Age both have influenced the formation of the present day flora of the region. Being a part of the Gondwana land, the flora shows relationship with that of Malaysia and Peninsular India and to some extent with that of African elements (Rao 1974). The influx of humid tropical Asiatic elements has taken place through the Assam gateway. The tropical Asiatic elements largely of Indo-Chinese and Malayan affinities represent perhaps the most dominant component member of our present day flora (Singh *et al* 2000)

NNP, happens to be the third national park of Assam after Kaziranga and Manas. Bordering the foothills of Arunachal Pradesh, it is located in the north bank of the river Brahmaputra in Sonitpur district of Assam and lies between 26°50' to 27° 03' N Latitude and 92°39' to 92°59' E Longitude. It covers an area of 200 sq km and is 181 km from Guwahati and 35 km from Tezpur of Assam.

NNP is surrounded by Pakke Tiger Reserve of Arunachal Pradesh in the north. The old course of Bordikorai River is its eastern boundary. The old course of Bordikorai River and Sikam Taungiya Villlage are in the southern boundary. The right bank of Jia Bhoreli River and Balipara Reserve Forest form its western boundary. It consists of plains and hills with varying altitude ranging from 100 – 275 m amsl. The park is criss-crossed by the river Jia Bhoreli and its tributaries *viz.*, Diji, Dinai, Doigurung, Nameri, Dikorai, Khari, etc. Each tributary forms bifurcation or trifurcation at many points into streams or channels. A few perennial water bodies are also dotted the area. There is certain natural water holes *viz.*, Borghuli Beel near Baithakata camp, Kuruwa Beel near Potashali camp, Magurmari Beel near Oubari camp along with Salt Licks at Balipung near Potashali camp.

The climate of the park is warm and humid with dry cold season. The vegetation (Plate I) and forest types of the park can be broadly classified into:

1. Tropical evergreen
2. Tropical semi-evergreen
3. Tropical moist deciduous
4. Riparian Forest
5. Grassland
6. Hydrophytic or Aquatic Vegetation

1. Tropical Evergreen forest: This type of forest occurs in the foothills along the northern boundary of NNP bordering Arunachal Pradesh. Tree species like *Altingia excelsa* Norenha., *Artocarpus chama* Buch.- Ham., *A. lacucha* Buchanon-Hamilton, *Canarium bengalensis* Roxburgh, *Dysoxylum binectariferum* Hooker f. et Beddome, *Mesua ferrea* Linnaeus, *Stereospermum chelonoides* (Linnaeus f). DC. and *Michelia doltsopa* DC., *Vatica lanceaefolia* Blume form the main canopy and these species primarily dominate this type of forest. Smaller trees and shrubby species viz., *Bauhinia purpurea* Linnaeus, *Cinnamomum bejolghota* (Buchanon-Hamilton) Sweet, *Ixora acuminata* Roxburgh, *Saurauia roxburghii* Wallich, *Pavetta indica* Linnaeus, etc. are also common. Various climbers and lianas like *Acacia oxyphylla* Graham ex Craib, *Combretum roxburghii* Sprengel, *Pothos scandens* Linnaeus (Plate II, Fig. 1), *Thunbergia grandiflora* Roxburgh are associated with the trees. Several species of palms like *Calamus spp.* and *Pinanga gracilis* Blume are common in damp hill slopes. Along the river banks *Cyathea gigantea* (Wallich ex Hooker) Holttum (Plate II, Fig. 2) and *Angiopteris evecta* (Froster) Haffmann (Plate II, Fig. 3) are quite common.

2. Tropical Semi evergreen forest: This is the most common type of forest found in NNP. The common tree species in this forest type are *Albizia lebbek* (Linnaeus) Bentham, *A. procera* (Roxburgh) Bentham, *Dillenia indica* Linnaeus, *Gmelina arborea* Roxburgh, *Magnolia hodgsonii* (Hooker f & Thomson) Keng, *Phoebe cooperiana* Kanjilal & Das, *P. goalparensis* Hutchinson, *Toona ciliata* Roemer, *Tetrameles nudiflora* R. Brown, *Sterculia villosa* Roxburgh, etc. Other small tree species include *Bauhinia purpurea* Linnaeus, *Callicarpa arborea* Roxburgh, *Mallotus philippensis* (Lamarck) Mueller-Argoviensis (Plate II, Fig. 4) are grown profusely in this forest. Epiphytic plants such as *Aeschynanthus acuminata* Wallich ex DC., *Asplenium nidus* Linnaeus (Plate II, Fig. 5), *Cymbidium aloifolium* Swartz, *Dendrobium aphyllum* C.E.C. Fischer, *D. moschatum* (Buchanon-Hamilton) Swartz, *D. nobile* Lindley, *Hoya parasitica* Wallich are commonly available on most of the tree species. The undergrowth of this forest is very rich and diverse. Species like *Alpinia nigra* (Gaertner) Burt, *Clerodendrum viscosum* Ventenat, *Psilanthus bengalensis* (Schultes) Leroy, *Costus speciosus* (Koenig) Smith, *Holmskioldia sanguinea* Retzius (Plate II, Fig. 6), *Leea crispa* Linnaeus, *Litsea* spp. *Morinda angustifolia* Roxburgh, *Phlogacanthus thyrsoiflorus* (Roxburgh) Nees are very common.

3. Tropical Moist deciduous forest: Tropical Moist deciduous forest is dominated by diverse species viz., *Bischofia javanica* Blume, *Bombax ceiba* Linnaeus, *Dalbergia sissoo* Roxburgh ex DC., *Duabanga grandiflora* (Roxburgh ex DC.) Walpers, *Lagerstroemia speciosa* (Linnaeus) Persoon, *Pterospermum acerifolium* (Linnaeus) Willdenow, *Pterygota alata* (Roxburgh) R. Brown, *Sterculia villosa* Roxburgh, *Trewia nudiflora* Linnaeus, *Zizyphus mauritiana* Lamarck, etc. Shrubby species like *Antidesma acidum* Retzius, *Boehmeria macrophylla* D. Don, *Buddleja asiatica* Loureiro, *Clerodendrum serratum* (Linnaeus) Moon, *C. viscosum* Ventanat, *Litsea salicifolia* (Roxburgh ex Nees) Hooker f., *Maesa indica* (Roxburgh) Wallich, *Mussaenda roxburghii* Hooker f. (Plate II, Fig. 7), etc are also growing in association with these tree species. Here *Mikania micrantha* Kunth, *Dioscorea pentaphylla* Linnaeus, *Smilax perfoliata* Loureiro,

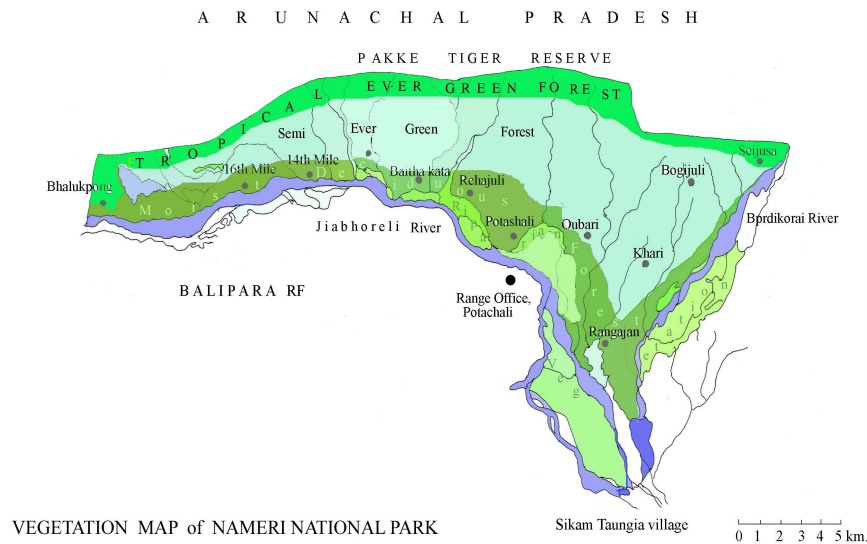


Plate I: Vegetation Map of Nameri National Park

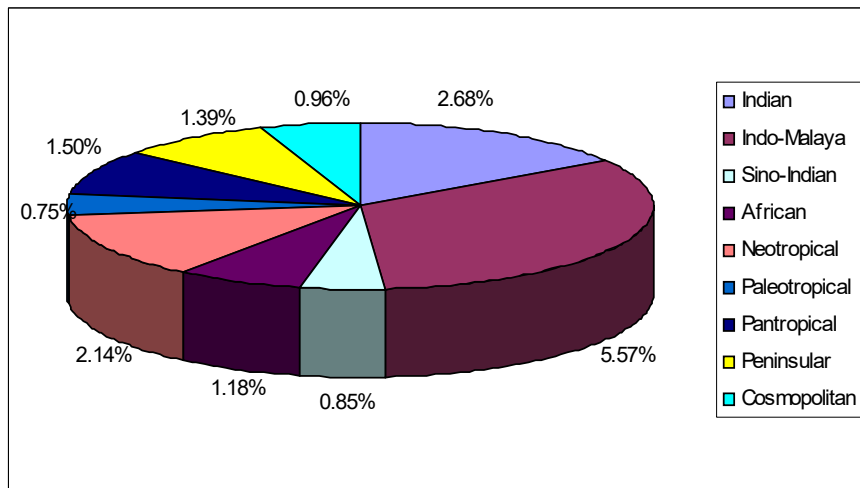


Fig 13. A pie diagram of diversified phytogeographical affinity of taxa in Nameri National Park.

Stephania japonica (Thunberg) Miers, and other climbers are also found to associate with the tree and shrubby species. The ground cover is mainly composed of different angiospermic undershrubs and herbs along with different species of ferns. Characteristic floristic elements of the ground cover are *Ageratum conyzoides* Linnaeus, *Alternanthera sessilis* (Linnaeus) R. Brown ex DC., *Impatiens tripetala* Roxburgh, *Chenopodium album* Linnaeus, *Cassia sophera* Linnaeus, *Eranthemum strictum* Colebrook ex Roxburgh, *Solanum ferox* Linnaeus, *Solanum torvum* Swartz, *Spilanthes paniculata* DC., *Urena lobata* Linnaeus, etc. Pteridophytes commonly found in this forest are *Diplazium esculentum* (Retzius) Swartz, *Pteridium aquilinum* (Linnaeus) Kunh, *Equisetum* spp. etc.

4. Riparian Forest: As the park is criss-crossed by numerous rivers, rivulets, streams, streamlets, etc. the riparian forests are primarily confined to the banks of these water bodies and dominated by tree species like *Albizia lebbeck* (Linnaeus) Bentham, *Alstonia scholaris* (Linnaeus) R. Brown, *Bischofia javanica* Blume, *Bombax ceiba* Linnaeus, *Dalbergia sissoo* Roxburgh ex DC., *Dillenia indica* Linnaeus, *Duabanga grandiflora* (Roxburgh ex DC.) Walpers, *Lagerstroemia speciosa* (Linnaeus) Persoon, etc. along with shrubby species like *Leea asiatica* (Linnaeus) Ridsdale, *Homonoia riparia* Loureiro, *Alpinia nigra* (Gaertner) Burt, *Typha elephantina* Roxburgh and *Tamarix dioica* Roxburgh *Arundo donax* Linnaeus, *Echinochloa stagnina* (Retzius) P. Beauvois, *Hymenachne acutigluma* (Steudel) Gilliland and other species of grasses are also common in such forests.

5. Grassland: Grassland comprises of less than 10 % of the total area of the park and found in narrow stripes along the river banks. The common grass species those are growing abundantly in the area include *Arundo donax* Linnaeus, *Imperata cylindrica* (Linnaeus) P. Beauvois *Phragmites karka* Trinius, *Saccharum spontaneum* (Nees) Haines, *Axonopus compressus* (Swartz) P. Beauvois, *Cynodon dactylon* (Linnaeus) Persoon, *Paspalum conjugatum* Berg, *Eleusine indica* Gaertner, *Hemarthria compressa* (Linnaeus f.) R. Brown, *Thysanolaena latifolia* (Roxburgh ex Hornemann) Honda, *Neyraudia reynaudiana* (Kunth) Keng ex Hitchcock, along with sedges like *Fimbristylis dichotoma* Linnaeus f., *Lipocarpa chinensis* Osbeck, *Cyperus rotundus* Linnaeus, *Cyperus halpan* Linnaeus, *Cyperus diffusus* Vahl, *Pycreus flavidus* (Retzius) Koyama. A few tree species like *Bombax ceiba* Linnaeus, *Alstonia scholaris* (Linnaeus) R. Brown, *Lagerstroemia speciosa* (Linnaeus) Persoon, *Sterculia villosa* Roxburgh and *Zizyphus rugosa* Lamarck are sparsely distributed in this type of grassland.

6. Hydrophytic or Aquatic Vegetation: This type of vegetation occurs in perennial stagnant water bodies, ponds, beels, nalahs, abandoned river beds, etc which intersected the park in plain areas. During monsoon almost all of these water bodies remain water-filled but the water levels decreases slowly after monsoon is over and with the onset of winter. Aquatic angiospermic herbs viz. *Nymphaea nouchali* Burman f., *N. pubescens* Willdenow, *Nelumbo nucifera* Gaertner, *Trapa natans* Linnaeus (Plate II, Fig. 8), *Typha elephantina* Roxburgh, *Eichhornia crassipes* (Martius) Solms, *Pistia stratiotes* Linnaeus, *Lemna perpusilla* Torry, *Hydrilla verticillata* (Linnaeus f.) Royle, *Ottelia alismoides* (Linnaeus) Persoon, *Vallisneria spiralis* Linnaeus, *Potamogeton crispus* Linnaeus, *Monochoria hastata* (Linnaeus) Solms, *Ipomoea aquatica* Forsskål, etc occur in different water bodies of the park. Some other species viz., *Alpinia nigra* (Gaertner) Burt, *Aeschynomene indica* Linnaeus, *Alternanthera philoxeroides* (Martius) Grisebach, *Rotala aquatica* Loureiro, *Homonoia riparia* Loureiro, *Ludwigia adscendens* (Linnaeus) Hara, *Fimbristylis bisumbellata* (Forsskål) Bubani, *Polygonum* spp., *Arundo donax* Linnaeus, *Phragmites karka* (Retzius) Steudel, *Saccharum spontaneum* Linnaeus, etc are growing in the marshy or swampy areas of the park. Few small tree species viz. *Antidesma acidum* Retzius, *Barringtonia acutangula* (Linnaeus) Gaertner, etc are also common in the swampy areas.

Common ferns like *Salvinia natans* (Linnaeus) Allioni, *Azolla pinnata* Roxburgh, *Ceratopteris thalictroides* (Linnaeus) Brongniart, *Marsilea minuta* Linnaeus, etc and fern-allies like *Equisetum ramosissimum* Desfontaines are also found in stagnant water-bodies of the park.

MATERIALS AND METHODS

The area was visited periodically covering all the seasons during 2003 – 2007. The whole process of collection, pressing and preparation of mounted herbarium sheets was in accordance to the conventional herbarium techniques (Jain & Rao 1977). Identification of the specimens were made by comparing field descriptions and observations with the descriptions available in authentic litera-

tures, counter checked and confirmed by consulting authenticated herbarium sheets preserved in ASSAM herbarium, Shillong, Herbarium of Arunachal Field Station (ARUN), Herbarium of State Forest Research Institute, Itanagar, Arunachal Pradesh. All the earlier collections deposited at ASSAM Herbarium have also been consulted during the study. Voucher specimens have been deposited at ASSAM herbarium.

RESULTS AND DISCUSSION

The present study deals with 882 species under 580 genera and 159 families of Angiosperm, 2 species under 2 genera and 2 families of Gymnosperm and 48 species under 37 genera and 26 families of Pteridophytes. Of the total species, dicotyledons comprise of 129 families, 438 genera

Table - 1. Quantitative analysis of the different taxonomic, habit and habitat groups, in Nameri National Park

| Taxonomic Group | Total Number | Percentage |
|----------------------|--------------|------------|
| ANGIOSPERMS | | |
| Dicots | | |
| Families | 129 | 68.61 |
| Genera | 438 | 70.75 |
| Species | 663 | 71.13 |
| Monocots | | |
| Families | 30 | 16.04 |
| Genera | 142 | 22.94 |
| Species | 219 | 23.49 |
| GYMNOSPERMS | | |
| Families | 2 | 1.06 |
| Genera | 2 | 0.32 |
| Species | 2 | 0.21 |
| PTERIDOPHYTES | | |
| Families | 26 | 13.82 |
| Genera | 37 | 5.97 |
| Species | 48 | 5.15 |
| Habit | | |
| Herb | 396 | 42.48 |
| Shrub | 215 | 23.06 |
| Climber | 100 | 10.72 |
| Tree | 221 | 23.71 |
| Habitat | | |
| Aquatic | 101 | 10.83 |
| Terrestrial | 776 | 83.26 |
| Epiphytic | 49 | 5.25 |
| Parasitic | 4 | 0.42 |
| Saprophytic | 1 | 0.10 |
| Lithophytic | 1 | 0.10 |

and 663 species and monocotyledons comprise of 30 families, 142 genera and 219 species. Out of the total 187 families, dicotyledons represent 129, monocotyledons by 30, gymnosperms by 2 and pteridophytes by 26 families respectively. Out of the total 619 genera, dicotyledons represent 438, monocotyledons by 142, gymnosperms by 2 and Pteridophytes by 37 respectively. Of the total 932 species, dicotyledons represent 71.13%, monocotyledons by 23.5%, gymnosperms by 0.21% and pteridophytes by 5.15% of the flora. Out of the total recorded species herbs comprise of 396 (42.48%), shrubs 215 (23.06%), climbers 100 (10.72%) and trees 221 (23.71%). Of the total 932 species, aquatic 101 (10.83%), terrestrial 776 (83.26%), epiphytic 49 (5.25%), parasitic 4 (0.42%), saprophytic 1 (0.10%) and lithophytic 1 (0.10%) (Table - 1). A comparison of monocot and dicot ratio with that of Assam (Baishya 1999) and India (Karthikeyan 2000) is shown in Table - 2. A conspectus of angiospermic families showing diversity of genera and species is shown in Table - 3. Data pertaining to the diversity of genera and species in the study area are shown in Table - 4 & 5 respectively. Similarly, species diversity within genera has been shown in Table - 6. A comparative account of ten largest families of NNP, Assam, India and North-East India are arranged in order of abundance of genera and species and shown in Table - 7. Comparison of ten largest genera of NNP with the dominant genera in Assam is given in Table - 8. In order to get a clue into the richness of angiospermic plant diversity of NNP, a cross-comparison has been made with the works of Hajra & Jain (1996) on Kaziranga & Manas and on Orang National Park (Nath & Choudhury 1994) in Table - 9.

Indian elements which are indigenous to India and represented in the study area include *Acacia catechu* (Linnaeus f.) Willdenow, *Aegle marmelos* (Linnaeus) Correa, *Andrographis paniculata* (Burman f.)

Wallich *ex* Nees, *Azadirachta indica* A. Jussieu, *Bridelia squamosa* Gehrman, *Butea monosperma* (Lamarck) O. Kuntze, *Callicarpa macrophylla* Vahl, *Careya arborea* Roxburgh, *Clerodendrum serratum* (Linnaeus) Moon (Plate II, Fig. 9), *Cryptolepis buchani* Roemer & Schultes, *Dalbergia sissoo* Roxburgh *ex* DC., *Ficus benghalensis* Linnaeus, *Glochidion assamicum* Hooker f., *Grewia hirsuta* Vahl, *Holarrhena pubescens* (Buchanon-Hamilton) Wallich *ex*. G. Don, *Kydia calycina* Roxburgh, *Lagerstroemia parviflora* Roxburgh, *Lansea coromandelica* (Holtum) Merrill, *Murraya koenigii* (Linnaeus) Sprengel, *Piper longum* Linnaeus (Plate II, Fig. 10), *Sterculia villosa* Roxburgh, *Tamarix dioica* Roxburgh *ex* Roth, *Terminalia arjuna* Beddome (Plate II, Fig. 11), *Tinospora cordifolia* (Willdenow) Miers *ex* Hooker f & Thomson and *Vallaris solanacea* (Roth) O. Kuntze.

Table - 2. Comparison of the ratio of Monocotyledons to Dicotyledons of NNP with Assam and India

| Ratio | Present study on NNP | Assam (Baishya 1999) | India (Karthikeyan 2000) |
|-------------------|----------------------|----------------------|--------------------------|
| Monocot : : Dicot | 1 : 3.02 | 1 : 2.96 | 1 : 2.97 |

Table - 3. A conspectus of families showing number of genera and species in NNP

| Family | Genera | Species | Family | Genera | Species |
|------------------|--------|---------|------------------|--------|---------|
| Acanthaceae | 12 | 18 | Caprifoliaceae | 2 | 2 |
| Agavaceae | 1 | 1 | Caricaceae | 1 | 1 |
| Alangiaceae | 1 | 2 | Caryophyllaceae | 2 | 4 |
| Alismataceae | 1 | 2 | Celastraceae | 3 | 4 |
| Amaranthaceae | 7 | 9 | Chenopodiaceae | 1 | 2 |
| Amaryllidaceae | 1 | 1 | Chloranthaceae | 1 | 1 |
| Anacardiaceae | 5 | 6 | Clusiaceae | 2 | 7 |
| Annonaceae | 6 | 7 | Combretaceae | 2 | 7 |
| Apiaceae | 5 | 5 | Commelinaceae | 6 | 9 |
| Apocynaceae | 10 | 10 | Convolvulaceae | 4 | 10 |
| Aquifoliaceae | 1 | 1 | Costaceae | 1 | 1 |
| Araceae | 11 | 13 | Crassulaceae | 1 | 1 |
| Araliaceae | 2 | 2 | Cucurbitaceae | 13 | 16 |
| Arecaceae | 8 | 10 | Cuscutaceae | 1 | 1 |
| Aristolochiaceae | 1 | 1 | Cyperaceae | 13 | 39 |
| Asclepiadaceae | 7 | 7 | Dilleniaceae | 2 | 3 |
| Asteraceae | 25 | 33 | Dioscoreaceae | 1 | 4 |
| Averrhoaceae | 1 | 1 | Dipterocarpaceae | 2 | 2 |
| Balsaminaceae | 2 | 3 | Ebenaceae | 1 | 1 |
| Basellaceae | 1 | 1 | Ehretiaceae | 2 | 2 |
| Begoniaceae | 1 | 4 | Elaeagnaceae | 1 | 1 |
| Bignoniaceae | 2 | 2 | Elaeocarpaceae | 2 | 5 |
| Bixaceae | 1 | 1 | Eriocaulaceae | 1 | 1 |
| Bombacaceae | 1 | 1 | Euphorbiaceae | 20 | 35 |
| Boraginaceae | 4 | 4 | Fabaceae | 23 | 32 |
| Brassicaceae | 3 | 3 | Fagaceae | 1 | 1 |
| Buddlejaceae | 1 | 1 | Flacourtiaceae | 3 | 4 |
| Burseraceae | 2 | 4 | Fumariaceae | 1 | 1 |
| Cactaceae | 1 | 1 | Gesneriaceae | 1 | 1 |
| Caesalpiniaceae | 6 | 16 | Haemodoraceae | 1 | 1 |
| Cannaceae | 1 | 1 | Hamamelidaceae | 1 | 1 |
| Capparaceae | 4 | 5 | | | |

| Family | Genera | Species | Family | Genera | Species |
|------------------|--------|---------|------------------|--------|---------|
| Hippocastanaceae | 1 | 1 | Piperaceae | 2 | 7 |
| Hydrocharitaceae | 3 | 3 | Plantaginaceae | 1 | 1 |
| Hypericaceae | 1 | 1 | Plumbaginaceae | 1 | 1 |
| Hypoxidaceae | 1 | 1 | Poaceae | 44 | 62 |
| Icacinaceae | 2 | 2 | Polygalaceae | 2 | 3 |
| Juglandaceae | 1 | 1 | Polygonaceae | 2 | 10 |
| Juncaceae | 1 | 1 | Pontederiaceae | 2 | 2 |
| Lamiaceae | 10 | 10 | Portulacaceae | 1 | 1 |
| Lardizabalaceae | 1 | 1 | Potamogetonaceae | 1 | 1 |
| Lauraceae | 9 | 22 | Proteaceae | 1 | 1 |
| Lecythidaceae | 2 | 2 | Punicaceae | 1 | 1 |
| Leeaceae | 1 | 4 | Ranunculaceae | 3 | 3 |
| Lemnaceae | 2 | 2 | Rhamnaceae | 3 | 5 |
| Lentibulariaceae | 1 | 1 | Rosaceae | 2 | 3 |
| Liliaceae | 2 | 2 | Rubiaceae | 22 | 31 |
| Lobeliaceae | 1 | 1 | Rutaceae | 9 | 12 |
| Loranthaceae | 4 | 4 | Sabiaceae | 2 | 3 |
| Lythraceae | 5 | 6 | Sapindaceae | 4 | 4 |
| Magnoliaceae | 2 | 6 | Sapotaceae | 1 | 1 |
| Malpighiaceae | 1 | 1 | Saurauiaceae | 1 | 4 |
| Malvaceae | 7 | 11 | Saururaceae | 1 | 1 |
| Marantaceae | 2 | 2 | Saxifragaceae | 1 | 1 |
| Melastomataceae | 4 | 5 | Schisandraceae | 1 | 1 |
| Meliaceae | 8 | 12 | Scrophulariaceae | 10 | 11 |
| Menispermaceae | 4 | 5 | Smilacaceae | 1 | 2 |
| Menyanthaceae | 1 | 1 | Solanaceae | 4 | 10 |
| Mimosaceae | 5 | 11 | Sonneratiaceae | 1 | 1 |
| Molluginaceae | 2 | 2 | Staphyleaceae | 1 | 1 |
| Moraceae | 6 | 20 | Stemonaceae | 1 | 1 |
| Moringaceae | 1 | 1 | Sterculiaceae | 8 | 12 |
| Musaceae | 1 | 1 | Styracaceae | 1 | 1 |
| Myristicaceae | 2 | 2 | Symplocaceae | 1 | 2 |
| Myrsinaceae | 3 | 6 | Taccaceae | 1 | 1 |
| Myrtaceae | 4 | 7 | Tamaricaceae | 1 | 1 |
| Najadaceae | 1 | 1 | Tetrameleaceae | 1 | 1 |
| Nelumbonaceae | 1 | 1 | Theaceae | 2 | 2 |
| Nyctaginaceae | 2 | 2 | Thunbergiaceae | 1 | 2 |
| Nymphaeaceae | 1 | 2 | Thymelaeaceae | 2 | 2 |
| Oiacaceae | 2 | 2 | Tiliaceae | 3 | 6 |
| Oleaceae | 4 | 5 | Trapaceae | 1 | 1 |
| Onagraceae | 1 | 5 | Typhaceae | 1 | 1 |
| Opiliaceae | 1 | 1 | Ulmaceae | 2 | 2 |
| Orchidaceae | 23 | 39 | Urticaceae | 10 | 14 |
| Oxalidaceae | 2 | 3 | Verbenaceae | 12 | 23 |
| Pandanaceae | 1 | 1 | Violaceae | 1 | 3 |
| Papaveraceae | 1 | 1 | Vitaceae | 4 | 9 |
| Passifloraceae | 1 | 1 | Zingiberaceae | 8 | 14 |

Along with the Indian elements the flora of NNP has exhibit the phytogeographical affinity with other floristic regions of the world (Table - 10 & Fig 13). The representative species of Indo-Malayan elements from the study area include *Adhatoda zeylanica* Medikus, *Aerva sanguinolenta* (Linnaeus) Blume, *Albizia procera* (Roxburgh) Bentham, *Anisomeles indica* (Linnaeus) O. Kuntze, *Antidesma acidum* Retzius, *Apluda mutica* Linnaeus, *Ardisia solanacea* (Poiret)

Table - 4. Generic diversity under families

| No. of genus in a Family | No. of Family |
|--------------------------|---------------|
| 1 | 74 |
| 2 | 30 |
| 3 | 07 |
| 4 | 11 |
| 5 | 03 |
| 6-10 | 16 |
| 11-15 | 05 |
| 16-20 | 01 |
| 21-30 | 04 |
| >30 | 01 |

Table - 5. Species diversity under families

| No. of Species in a Family | No. of Species |
|----------------------------|----------------|
| 1 | 63 |
| 2 | 24 |
| 3 | 09 |
| 4 | 11 |
| 5 | 08 |
| 6-10 | 16 |
| 11-20 | 13 |
| 21-30 | 02 |
| 30-40 | 06 |
| >40 | 01 |

Table - 6. Species diversity within genera

| No. of Species in a Genus | No. of Genus |
|---------------------------|--------------|
| 01 | 420 |
| 02 | 91 |
| 03 | 29 |
| 04 | 20 |
| 05 | 04 |
| 6-10 | 10 |
| 11-15 | 02 |

Table - 7. Comparison of Ten Largest families of Nameri National Park with Assam, India and North East India

| Study Area, NNP. Genus/Species | Assam (Baishya 1999) Genus/Species | India (Karthikeyan 2000) Genus/Species | North East India (Rao 1974) Species |
|-----------------------------------|--|--|---|
| Poaceae 44/62 | Poaceae 83/212 | Poaceae 263/1291 | Orchidaceae 550 |
| Orchidaceae 23/39 | Orchidaceae 81/191 | Orchidaceae 184/1229 | Poaceae 435 |
| Cyperaceae 13/39 | Leguminosae 68/171 | Leguminosae 173/1192 | Fabaceae 317 |
| Euphorbiaceae 20/35 | Asteraceae 66/127 | Asteraceae 166/800 | Asteraceae 218 |
| Asteraceae 23/33 | Rubiaceae 55/127 | Rubiaceae 113/616 | Cyperaceae 182 |
| Fabaceae 23/32 | Euphorbiaceae 45/102 | Cyperaceae 38/545 | Euphorbiaceae 165 |
| Rubiaceae 22/31 | Cyperaceae 15/81 | Euphorbiaceae 84/523 | Rubiaceae 156 |
| Verbenaceae 12/23 | Araceae 18/47 | Acanthaceae 92/500 | Lamiaceae 101 |
| Lauraceae 9/22 | Cucurbitaceae 23/46 | Lamiaceae 72/435 | Acanthaceae 90 |
| Moraceae 6/20 | Lauraceae 10/45 | Rosaceae 40/432 | Zingiberaceae 75 |

Roxburgh, *Arundinella bengalensis* (Sprengel) Druce, *Barringtonia acutangula* (Linnaeus) Gaertner, *Bischofia javanica* Blume, *Bombax ceiba* Linnaeus, *Buddleja asiatica* Loureiro, *Cassia fistula* Linnaeus, *Celastrus paniculatus* Willdenow, *Clematis gouriana* Roxburgh ex DC., *Clerodendrum indicum* (Linnaeus) Kuntze, *C. viscosum* Ventenat, *Costus speciosus* (Koenig) Smith, *Cuscuta reflexa* Roxburgh, *Cynoglossum glochidiatum* Wallich ex Bentham, *Cyanotis cristata* (Linnaeus) Schultes, *Deeringia amaranthoides* (Lamarck) Merrill, *Desmodium heterocapon* (Linnaeus) DC., *D. laxiflorum* DC., *Dillenia pentagyna* Roxburgh, *Eragrostis unioides* (Retzius) Nees ex Steudel, *Ficus hispida* Linnaeus f., *Flemingia strobilifera* (Linnaeus) R. Brown ex Aiton, *Garuga pinnata* Roxburgh, *Gmelina arborea* Roxburgh, *Gouania leptostachya* DC., *Hemarthria compressa* (Linnaeus f.) Roxburgh, *Leea asiatica* (Linnaeus) Ridsdale, *Litsea monopetala* (Roxburgh) Persoon, *Momordica dioica* Roxburgh ex Willdenow, *Murdannia nudiflora* (Linnaeus) Brenan, *Nymphoides indica* (Linnaeus) O. Kuntze, *Phragmites karka* (Retzius) Trinius ex Steudel, *Polygala arvensis* Willdenow, *Rorippa indica* (Linnaeus) Hiern, *Smilax ovalifolia* Roxburgh, *Streblus asper* Loureiro, *Syzygium cumini* (Linnaeus) Skeels, *Tectona grandis* Linnaeus f., *Tephrosia candida* DC., *Terminalia bellirica* (Gaertner) Roxburgh, *Terminalia chebula* Retzius, *Trewia nudiflora* Linnaeus, *Trichosanthes cordata* Roxburgh, *Toona ciliata* M. Roemer, *Wrightia arborea* (Dennst.) Mabblerley and *Zizyphus oenoplia* (Linnaeus) Miller.

Table - 8. Comparison of ten largest genera of Nameri National Park with Assam flora

| Present study, NNP | | Assam (Baishya 1999) | |
|-------------------------|-------------------|-------------------------|-------------------|
| Genus | No. of Species | Genus | No. of Species |
| <i>Cyperus</i> | 13 | <i>Cyperus</i> | 35 |
| <i>Ficus</i> | 12 | <i>Ficus</i> | 32 |
| <i>Polygonum</i> (s.l.) | 9 | <i>Polygonum</i> (s.l.) | 26 |
| <i>Clerodendrum</i> | 7 | <i>Eugenia</i> | 25 |
| <i>Cassia</i> | 7 | <i>Dendrobium</i> | 22 |
| <i>Litsea</i> | 7 | <i>Eleocarpus</i> | 20 |
| <i>Dendrobium</i> | 6 | <i>Piper</i> | 19 |
| <i>Desmodium</i> | 6 | <i>Strobilanthes</i> | 19 |
| <i>Fimbristylis</i> | 6 | <i>Panicum</i> | 18 |
| <i>Ipomoea</i> | 6 | <i>Blumea</i> | 18 |

Sino-Indian genera of common occurrence in NNP include *Maesa*, *Schima*, *Osbeckia*, *Litsea*, *Rubus*, etc. The common Indo-African elements in the area are *Alstonia scholaris* (Linnaeus) R. Brown, *Biophytum sensitivum* (Linnaeus) DC., *Brachiaria mutica* (Forssk.) Stapf, *Crassocephalum crepidioides* (Bentham) S. Moore, *Dioscorea pentaphylla* Linnaeus, *Ehretia acuminata* R. Brown, *Enydra fluctuans* Loureiro, *Euphorbia thymifolia* Linnaeus, *Ludwigia hyssopifolia* (G. Don) Exell, *Nymphaea nouchali* Burman f. and *Vetiveria zizanioides* (Linnaeus) Nash et Small.



Plate II: Figs. 1 - 12: 1. *Pothos scandens*; 2. *Cyathea gigantea*; 3. *Angiopteris evecta*; 4. *Mallothus philippensis*; 5. *Asplenium nidus*; 6. *Holmskioldia sanguinea*; 7. *Mussaenda roxburghii*; 8. *Trapa natans*; 9. *Clerodendrum serratum*; 10. *Piper* sp.; 11. *Terminalia arjuna*; 12. *Urena lobata*

Neotropical elements or plants of tropical American region occurring in NNP represented by *Acacia farnesiana* (Linnaeus) Willdenow, *Argemone mexicana* Linnaeus, *Bidens pilosa* Linnaeus, *Cassia alata* Linnaeus, *C. occidentalis* Linnaeus, *Chenopodium ambrosioides* Linnaeus, *Cissampelos pareria* Linnaeus, *Digitaria ciliaris* (Retzius) Koeler, *Eichhornia crassipes* (Martius) Solms, *Eupatorium odoratum* Linnaeus, *Ipomoea carnea* Jacquin, *Jatropha curcas* Linnaeus, *J. gossypifolia* Linnaeus, *Lantana camara* Linnaeus, *Hyptis suaveolens* (Linnaeus) Poit., *Mimosa pudica* Linnaeus, *Peperomia pellucida* (Linnaeus) H.B.K., *Physalis minima* Linnaeus, *Scoparia dulcis* Linnaeus and *Tridax procumbens* Linnaeus.

Table - 9. Comparative account of the Angiospermic plants of Nameri National Park with Kaziranga & Manas National Park and Orang National Park

| Nameri NP Present Study | | | Kaziranga & Manas NP (Hajra & Jain 1996) | | | Orang NP (Nath & Choudhury 1994) | | |
|----------------------------|-------|---------|---|-------|---------|-------------------------------------|-------|---------|
| Family | Genus | Species | Family | Genus | Species | Family | Genus | Species |
| 159 | 580 | 882 | 115 | 377 | 560 | 95 | 322 | 450 |

Table - 10. Phytogeographical analysis of the flora of NNP shows the following percentage of affinity with elements of other region

| Name of the Region | Percentage of affinity |
|-------------------------------------|------------------------|
| Indian | 2.68% |
| Indo-Malayan | 5.57% |
| Sino-Indian | 0.85% |
| Indo-African | 1.18% |
| Tropical American or Neotropical | 2.14% |
| Paliotropical | 0.75% |
| Pantropical | 1.5% |
| Peninsular | 1.39% |
| Cosmopolitan elements | 0.96% |

The paleotropical elements occurring in the park area include *Achyranthes aspera* Linnaeus, *Cleome viscosa* Linnaeus, *Cyperus difformis* Linnaeus, *Cyperus iria* Linnaeus, *Ipomoea aquatica* Forssk., *Physalis minima* Linnaeus, *Saccharum spontaneum* Linnaeus, etc. On the other hand representative pantropical elements of the study area are *Ageratum conyzoides* Linnaeus, *Alternanthera sessilis* (Linnaeus) R. Brown ex DC., *Amaranthus spinosus* Linnaeus, *Boerhavia diffusa* Linnaeus, *Cardiospermum halicacabum* Linnaeus, *Cassia tora* Linnaeus, *Cyperus compressus* Linnaeus, *Dactyloctenium aegyptium* (Linnaeus) Willdenow, *Eclipta*

prostrata (Linnaeus) Linnaeus, *Elephantopus scaber* Linnaeus, *Euphorbia hirta* Linnaeus, *Hedyotis corymbosa* (Linnaeus) Lamarck, *Sida acuta* Burman f., *Vernonia cinerea* (Linnaeus) Lessing, *Bauhinia vahlii* Wight & Arnott, *Murraya koenigii* (Linnaeus) Sprengel and *Plumbago zeylanica* Linnaeus. Some of these elements also occur in South India and thereby shows the phytogeographical affinity of the NNP with South India.

The cosmopolitan elements widely distributed throughout the world occurring in the study area include *Chenopodium album* Linnaeus, *Cynodon dactylon* (Linnaeus) Persoon, *Cyperus rotundus* Linnaeus, *Pseudognaphalium affine* (D. Don) Anderberg, *Mariscus sumatrensis* Retzius, *Oxalis corniculata* Linnaeus, *Portulaca oleracea* Linnaeus, *Triumfetta rhomboidea* Jacquin (Plate II, Fig. 12), *Vallisneria spiralis* Linnaeus, etc.

CONCLUSIONS

A total of 932 species under 619 genera and 187 families has been recorded from the study area. The flora of study area is found to be more interesting and rich as compared to those of the Kaziranga and Orang National Park. The area was also found to show similarity in its species composition with those of Indo-Malayan elements, Sino-Indian elements, Indo-African elements, Tropical American or Neotropical elements, Paleotropical elements, Pantropical elements, Peninsular elements along with the presence of certain cosmopolitan elements and elements occurring widely in rest of India. In the study area Poaceae is the largest among the Monocot the families and Euphorbiaceae is the largest among the Dicots. Arora (1964) reported 115 families of woody dicotyledons from the Western Ghats and Assam. Of these, 98 families are common to both the regions and 12 families viz., Aceraceae, Aquilariaceae, Betulaceae, Fagaceae, Hamamelidaceae, Ixonanthaceae, Juglandaceae, Myricaceae, Sarcospermaceae, Saxifragaceae, Scrophulariaceae and Styracaceae are restricted to Assam only. Six of these 12 families viz., Fagaceae, Hamamelidaceae, Juglandaceae, Saxifragaceae, Scrophulariaceae and Styracaceae are also found to occur in the present study area.

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