CHAPTER 3

Study area

3.1. Assam

3.1.1 Introduction:

Assam is a biologically rich geographic region with the characteristics of diversified geographical conditions, topographical characteristics, climatic situations and the different types of vegetations. It is an ancient geographic homeland of different ethnic communities with their own socio-cultural heritages which help to construct the diversified culture of Assam as a whole.

3.1.2. Geography of Assam:

Assam is situated at the central part of North East India between $89^0 5' - 96^0 1'$ East Longitude and $24^0 3' - 27^0 58'$ North Latitude and is surrounded by the borders with Arunachal Pradesh, Nagaland, Manipur, Mizoram, Meghalaya, Tripura and West Bengal. The total geographical area is 78,438 sq km representing 2.39 per cent of the total area of India.

3.1.3. Physiography:

The whole region is divided into three geographic units, i.e. Brahmaputra Valley, Barak Valley and the Karbi plateau.

3.1.4. Climate:

The climate is tropical monsoon type, highly influenced by its geographic and physiographic conditions which are significantly different from the other part of India. The climate is mainly divided into three season i.e. summer, winter and monsoon.

3.1.5. Rainfall:

The average annual rainfall of the Assam is about 1500-3750mm. It varies from season to season. During winter, December to February, the average annual rainfall is 6 cm and in summer, from March to May it is about 64 cm. The highest rainfall of all the seasons in a
year amounting to 146 cm occurs during the monsoon period from June to September, while rainfall is 4 cm in October and November in the period of the retreating monsoon.

3.1.6. Temperature:

The temperature of Assam is neither high nor so low, i.e. Humid Meso-Thermal climatic type which is quite insignificant due to the less latitudinal extent and altitude variation. The temperature varies in summer between 28°C and 36°C, and in winter between 5°C and 28°C. December and January are the coldest months with temperature remaining between 5°C and 28°C, while June, July and August are the warmest months with temperature ranging between 28°C and 36°C. The highest parts of the hills and plateaus of the state record a relatively low temperature from 18°C and 28°C in summer and from 2°C and 25°C in winter.

3.1.7. Relative humidity:

Due to the hilly area and mountains, large number of rivers and water bodies, Assam is considerably covered with high moisture content throughout the year; the annual relative humidity is above 75%.

3.1.8. Soil:

The soil of Assam is of different types in different geographic locations due to the varying geological conditions, topological characteristics and agro-climatic situations. The soil of the Brahmaputra valley and the Barak valley are alluvial and fertile. The Karbi plateau and North Cachar Hills have less fertile lateritic and red soils. The soils of the western part of the Brahmaputra valley are comparatively less acidic, while the eastern part is more acidic. However, within the plains the soil of the flood-prone areas is comparatively less acidic.

3.1.9. Forest cover/ forest area:

According to the Indian Forest Report (2011), 26,832 sq. km of total area of Assam is covered by the forest area, i.e. 34.21%. The area constitutes of the Reserve Forests and the unclassified forests are 66.58% and 33,425 of the total area covered by forest.
The present study was mainly carried out in the Southern Assam (Barak Valley), because this region is the only habitat for the plants under study (i.e. *Smilax glabra* Roxb., *Homalomena aromatica* (Roxb.) Schott., *Bulbophyllum* (Hook.) Spreng., *Paphiopedilum spicerianum* (Rchb.f.) Pfitz.

3.2. SOUTHERN ASSAM:

3.2.1. Introduction:

Southern Assam is popularly known as Barak Valley as it is situated on the bank of the river Barak, one of the two major rivers of Assam. This region is characterized by the presence of scattered isolated low hillocks locally known as “Tillas” along with high rainfall, frequent floods and with hot and humid climatic condition.

3.2.2. Geography:

Southern Assam is situated between 92°15’ and 90°16’ East longitude and 24°0’8” and 25°0’8” North latitude and 26-27m above MSL. It is surrounded in North by Cachar Hills and Jaintia Hills, in the south by the State of Mizoram, in the East by Manipur and the West is the Sylhet District of Bangladesh and the state of Tripura. It covers an area of 6922 sq. km.

3.2.3. Physiography:

Southern Assam comprises of 3 districts of Assam, i.e. Cachar, Karimgang and Hailakandi. Topographically this geographic region is covered by hills, hillocks, wide plains, wetlands and the two important rivers, viz the Barak and the Khushiaria along with their tributaries. The whole valley can be divided into eight classes ranging from high hills with elevation exceeding 300 m to perennially water logged beels (Das et al. 2013).

a) High Hilly Region: The region occurs mostly in the Northern and Eastern part of the zone bordering Meghalaya, N. C. Hills and Manipur with an elevation of above 300m.
b) Dissected Foot Hill Region: This region lies on the North and North-East area bordering the high hills and interspersed by thin strips of Detraited valleys.

c) Low Hilly Region: This region covers a large area mixed with the broad and undulating plains with an elevation of less than 300m.

d) Undulating Plains: The areas cover scattered undulating plains with mixed low hills and meander plains.

e) Detraited Valley: This region occurs in the dissected foot hills region as small strips and also scattered mainly in undulating plain areas.

f) Broad Meander Plains: These regions occur mainly on the North of the Barak River in large pitches mixed with low hills and piedmonts.

g) Flood Plains: These plains cover the banks of the Barak River, which divide the zone into Northern and Southern region.

h) Law lying Areas: The areas include the region of natural depressions and water logged areas. These areas are mainly located in the South of the River Barak.

3.2.3. Climate:

The climate of southern Assam is characterized by sub tropical, warm and humid environmental conditions.

3.2.4. Rainfall:

The rain fall pattern of this geographical area can be divided into different geographic units. Among the three districts, Karimgang has the highest rainfall followed by Cachar and Hailakandi. The average rainfall of this area is 3180 mm with 146 days rainfall per year. On the other hand the highest rainfall occurs between the month of May to September and the lowest from the month of December to February. Depending upon the rainfall the whole geographic region is divided into three rainfall zones (Das et al., 2013)-

1) High rainfall zone: It extends to the North Western part of Southern Assam bordering Meghalaya, including the high hilly areas. The average rainfall is above 4000mm.
2) Moderate Rainfall zones: it spreads from high hilly area in the North and North East to Bangladesh border in the West. The average rainfall of this zone is between 3000-4000 mm.

3) Low Rainfall Zone: This zone lies in the South of the moderate rainfall zone and covers the entire Southern part from Manipur border in the East to Tripura in the West which is the Southern part of Hailakandi district bordering Mizoram. The average rainfall is recorded below 3000mm.

3.2.4. Temperature:

The maximum temperature of the Southern Assam is 33.6°C in the Month of August and the minimum temperature is 12.13°C in the month of January.

3.2.5. Relative humidity:

The relative humidity of Southern Assam in the morning is higher than the evening. In the morning it is about 90% or above and 81 % in the evening. The higher relative humidity is recorded in Cachar District followed by the Karimgang and Hailakandi districts.

3.2.6. Soil:

Soil is one of the important abiotic factors of the environment. The origin of the soil of Southern Assam in alluvial composed of peddles, sand, slit, clay and mixture of sand and clay particle. Geomorphologically Southern Assam is divided into six units, viz-Alluvial flood free, alluvial flood plain, Surma group, Tipan group, Duaitila groups and beels (Nath, 2012). Depending upon the level of degradation and type of vegetation the color of the soil of this region is dark brown to yellowish brown. The pH of the soil ranges from 4.5 to 6.

The soil of the Southern Assam is divided into five major soil classes (Das et al., 2013).

a) Old riverine alluvium soil: This type of class is found in the bank of Barak and Kushiaria rivers. The texture varies from sandy to fine loam.
b) Old mountain alluvium soil: It is found in the broad meander and undulating bordering area of the old riverine alluvium. The texture ranges from sandy to clay.

c) Non laterised soil: This is the largest soil type classes, which covers the whole alluvial region.

d) Laterised red soil: This type of soil is found in the Northern side of the region, bordering Meghalaya. The texture is sandy loam with rich Fe and Al and highly acidic.

e) Peat soil: Peat soil is found in the low lying areas, i.e. beels and haors with scattered patches. This soil contains dark grey coloured soil with organic matter.

3.2.7. Forest cover:

Southern Assam is surrounded by many hills and has dense forests. The characteristic of the vegetation of this region is tropical evergreen and tropical semi evergreen (Borah and Garkoti, 2011) and deciduous. The total forest cover is 2338 sq.km, i.e. 33.78% of the total geographically area. The total forest area of the three districts (i.e. Cachar, Karimgang and Hailakandi) is 1116.08 sq. km. There is one wild life sanctuary (Barail Wild life Sanctuary) and 12 reserve forests in Southern Assam. Cachar district has the highest number of Reserve forest.

The vegetation of Southern Assam is broadly divided into seven types based on the floristic composition (Hussain, 2013)

1. Tropical wet Evergreen Forests
2. Tropical Semi-Evergreen Forests
3. Tropical moist deciduous Forests
4. Swamp forests
5. Riparian Forests
6. Bamboo and cane-brakes
7. Grass lands
3.2.7.1. Tropical wet Evergreen Forests:

This type of vegetation is found in the Northern and Eastern slopes of Southern Assam. The annual rainfall of this area ranges from 2500-3500 mm and altitude variation is from 100-1500 mm. The characteristic feature of this forest is presence of three distinct canopies.


Some of the common species of middle canopy are *Callicarpa arborea* Roxb., *Holarrhena antidysenterica* Wall., *Macaranga denticulate* (Blume.) Müll.Arg., *Bauhinia purpurea* L., *Ficus auriculata* Lour., etc.

The lower canopy is covered by *Balakata baccata* (Roxb.) Esser., *Ficus roxburghii* Wall. ex. Miq. etc. On the other hand the forest floor is covered with the species of Zingiberaceae, Costaceae, and Taccaceae etc.

3.2.7.2. Tropical Semi-Evergreen Forests:


The common shrub species are *Eurya acuminata* D.C., *Hibiscus macrophyllus* Roxb., *Sida acuta* L., *Urena lobata* L. etc. Some common climbers growing in this vegetation are *Uncaria macrophylla* Wall., *Hoya parasitica* Wall., *Ipomoea obscura* (L.) Ker Gawl. etc.
3.2.7.3. Tropical moist deciduous Forests:

The average rainfall of this vegetation is 1000 to 2000 mm. and it comprises the Sal forest and major parts of scrub forest. Some important tree species of this vegetation are Shorea robusta Gaertn., Lagerstromia parviflora Roxb., Bombax ceiba L., Gmelina arborea Roxb., Ficus roxburghii Wall. ex Miq. etc.

3.2.7.4. Swamp forests:

This type of vegetation is found in the Beels (undrained depressions). Aquatic plants belonging to Araceae, Cyperaceae, Eriocaulonaceae, Lemnaceae, Najadaceae, and Nymphaeaceae are common. Some extensive growing aquatic plants are Monochoria hastate (L.) Solms., Eichhornia crassipes (Mart.) Solms., Scleria terrestris (L.) Fassett., Cyperus iria L., Ipomoea aquatica Forssk. etc. Some of the bordering trees and shrubs of the Beels are Lagerstroemia speciosa (L.) Pers., Ficus pyriformis, F. heterophylla L.f. Supl., Hyptianthera stricta (Roxb. ex. Schult.) etc as well as some grass species, i.e. Arundinella, Thysanolaena etc.

3.2.7.5. Riparian Forests:

This is one type of vegetation which occurs all over the evergreen and semi evergreen zones of Southern Assam along the river banks and extend in several areas. Some common species are Dellinia indica L., Anthocephalus cadamba Miq., Samania saman (Jacq.) Merr., Bischofia javanica Bl., Lagerstromia speciosa (L.) Pers., Cassia tora L., C. alata L., Clerodendron viscosum Vent. , C. infortunatum, Lantana camera L. etc.

3.2.7.6. Bamboo and cane-brakes:

Presence of bamboo is the salient feature of the secondary growth of both evergreen and semi evergreen types of vegetation. The common species of bamboo in this vegetation are Bambusa balcooa Roxb., B. Bambos Voss., B. multiplex (Lour.) Raeusch, B. nutans Wall. ex. Munro., B. pallid Munro, B. polymorpha Munro., B. tulda Roxb., B. vulgaris f. waminii (Brandis) Wen., B. reptans, Dendrocalamus giganteus Munro., Gigantochloa albociliata, Melocanna baccifera Parkinson. etc.
3.2.7.7. Grass lands:

The grasslands occur in alluvial plains and riparian flats throughout the valley. The most common grass species growing in the grasslands are: *Arudinella benghalensis* (Spreng.) Druce, *Axonopus compressus* (Sw.) P. Beauv., *Brachiaria reptans* (L.) Gardner & Hubbard, *Cenotheca lappacea* (L.) Desv., *Cynodon dactylon* (L.) Pers., *Imperata cylindrical* (L.) P. Beauv., *Leersia hexandra* Sw., *Saccharum spontaneum* L. etc.
Fig 3.1: Map of the Study area: A) Map of India (Forest cover map), B) Map of Assam (Forest cover map), c) Map of Cachar.
Fig 3.2: Average temperature, relative humidity and rainfall of Southern Assam in the different months of 2010

Fig 3.3: Average temperature, relative humidity and rainfall of Southern Assam in the different months of 2011
Fig 3.4: Average temperature, relative humidity and rainfall of Southern Assam in the different months of 2012

Fig 3.5: Average temperature, relative humidity and rainfall of Southern Assam in the different months of 2013
Fig 3.6: Average temperature, relative humidity and rainfall of Southern Assam in the different months of 2014