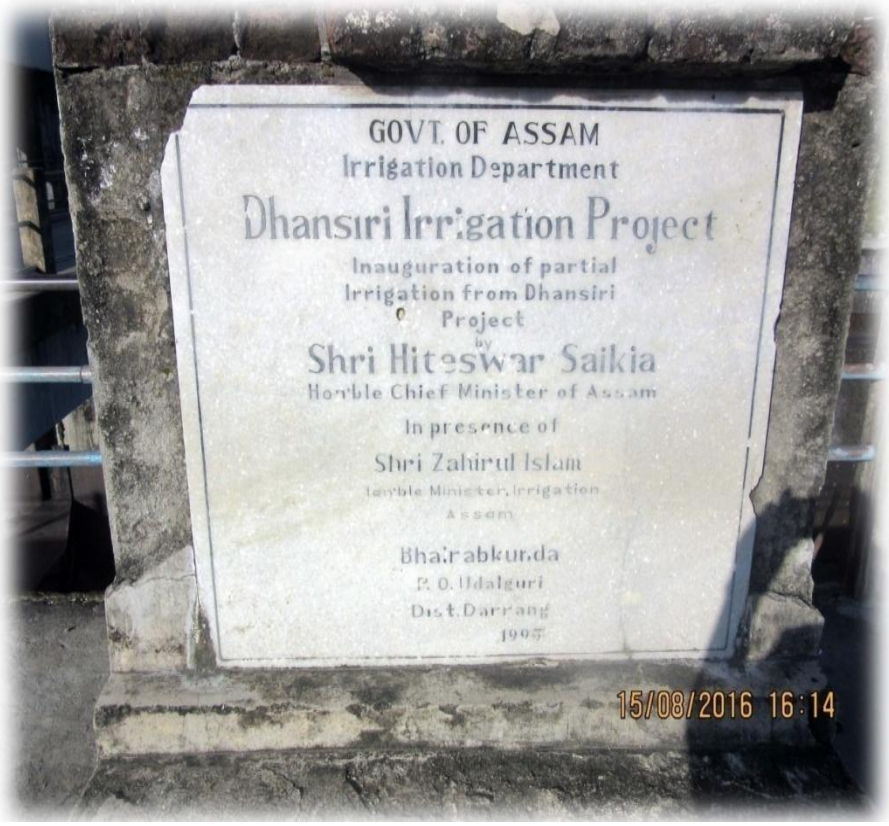
CHAPTER-III



METHODOLOGY

CHAPTER-III

METHODOLOGY

3.1 SURVEY AND COLLECTION

The present work is based on Monocot flora which have been collected the species from all the study sites and have been processed as per standard taxonomic procedure (Jain and Rao, 1977). Several collections and intensive field studies have been undertaken in and around the villages and adjoining forests and the specimen has been made in flowering as well as fruiting condition as far as possible from natural habitat with photograph. Specimens were collected with field number along with associated plants. The field notes included the habit and habitat, height of plants, colour of the flowers, etc. Repeated field trips were taken among the local people in a particular area and a close study of the uses and names of Monocot plants were made.

The data for the study have been collected both from primary and secondary sources during the field work. Field observation on plants and information on their uses were recorded in a field note book. Voucher specimens were collected for all the plants used by the Bodos and Rabhas of Udalguri district and preserved according to the conventional herbarium techniques (Jain and Rao, 1977). The field data were incorporated in the herbarium sheets. The specimens, on which this study is based have been deposited in the Herbarium of the Botany Department, University of Science and Technology, Meghalaya (USTM), Meghalaya-793101, India, for future reference.

Photographs depicting vegetation of an interesting, rare and scarce Monocot plants, endangered Monocot plants, medicinal Monocot plants have been provided.

3.2 HERBARIUM TECHNIQUES

For the pressing and preparation of the herbarium specimens of the collected sample the standard methodology of Jain and Rao (1977) have been followed. The delicate plant specimens were properly pressed in the field itself and dried. During

rainy season collections were pressed by spraying 10% Formaldehyde on drying paper orsprinkled with Para Dichlorobenzene (PDB). Utmost care has been taken for drying the specimens and then the dried specimen poisoned with standard solution of Mercuric Chloride ($HgCl_2$) in absolute alcohol (1gm in 100 cc) and mounted on 42× 28 cm sized herbarium sheets with the help of high quality glue fevicol. Small paper bags were used to contain detached seeds, fruits and other parts.

3.3 STUDY OF HERBARIUM SPECIMEN

Herbarium sheets and the accompanying field notes have also proved to be a good source of taxonomical data and ethnobotanical data. In several instances the observations on plant lore made by early botanical explorers were written on herbarium labels. Sometimes this information would not publish and even remained unnoticed. The importance and the advantage of such study has been explained by various workers (Schultes 1962; Jain 1964, 1967; Rao and Hajra 1986). In the present study, a specimen to specimen search and consultation was made in the Kanjilal Herbarium (Old Assam), Botanical Survey of India (BSI), Eastern Regional Centre (ERC), Woodlands, Laitumkhrah, Shillong-793003, Meghalaya, India. Regarding data, it was found that the ethnobotanical information noted by U.N. Kanjilal and his co-workers were all incorporated in his '*Flora of Assam'* (1934-40). In the materials added afterwards in the Kanjilal Herbarium, the author could not find any ethnobotanical information relevant to the present study.

3.4 IDENTIFICATION AND NOMENCLATURE OF SPECIMENS

Critical morphological studies have been made of the collected Monocot plants for identification. For authentic identification, a number of Monocot flora and monographs have been consulted, especially *Flora of British India* vol.7, Hooker, 1872-1897; *Flora of India* Vol.1-3, 1993 along with neighbouring floras, viz. *Flora of Jowai*, Vol. 1 and 2, Balakrishnan, 1981-1983; *Flora of Tripura State*, vol.1-2, Deb, 1981-1983; *Flora of Kamrup district*, Baruah, 1992 etc. Identification of the voucher specimens have been done after analytical study and comparison with literal and

confirmed with authentic specimens in the Kanjilal Herbarium (Old Assam), Botanical Survey of India (BSI), Eastern Regional Centre (ERC), Woodlands, Laitumkhrah, Shillong-793003, Meghalaya, India, for proper identification. To eliminate any chance of error inidentification by mixing of species, that very particular specimen, which was the basis of discussion and information with the informant, was brought to the herbarium and identified.

Correct and up to date nomenclature of identified Monocot species were confirmed by consulting on line data bases of Plant list (http://www.theplantlist.org, Version1.1, Sep. 2018); Tropicos (https://www.tropicos.org); National D´ Historee Naturalee viz. (https://science.mnhn.fr/taxon); J-store (http://plants.jstor.org); The New York Botanical Garden (http://sweetgum.nybg.org/vh); Biodiversity Heritage Library (http://www.biodiversitylibrary.org) and (https://www.ipni.org).

3.5 DOCUMENTATION OF RET-MONOCOT PLANTS

The RET-Monocot plants were recorded by following relevant literature of Assam like *Assam's Flora* (Chowdhury, 2005), *Plant Diversity of Assam* (Barooah and Ahmed, 2014) and International Union for Conservation of Nature and Natural Resources (IUCN).

3.6 QUESTIONNAIRE METHOD

While collecting Monocot plants, the investigator has taken help of medicine man and local inhabitants from the Bodo and Rabha peoples of Udalguri district, as far as possible, all information has been recorded on the spot of collection and these have been tagged with field numbers. This information has been verified on repeated queries with elderly people in the age group between 45 to 90 years. For further verification medicine man and practitioner and the patients in different villages have been consulted. Vernacular names or local names (Bodo and Rabha) and uses have also been collected from the local community of Bodo and Rabha as per as possible. Details about the Monocot plant parts utilised in preparing the medicine and the preparation of dosage, and the administration were also noted.

Most of the medicinal Monocot plants must be obtained from the forest but a few plants are cultivated. Those plants which are not easily available are preserved and dried by the medicine man. Most of the medicines are prepared in the form of infusion or decoction. Perpending the plant orplant parts into paste or steeping the pounded material in water to get the extract or squeezing them for the juice are common practices. Generally pounded products are made into pills. For arthritis, swellings, bruises and boils, the roots, barks, leaves, shoots and flowers are boiled and applied as a poultice. Dry plant parts are usually made into powder and in certain cases barks or roots of medicinal plants are sucked and chewed. The folk medicine among the Bodos and Rabhas of Udalguri district is an art, practised mainly by the old men and women. Many women knew about household remedies and the ailments associated with women and child diseases. Specially, remedies for common ailments like wounds, swelling, pains, burns, fever, minor cuts and injuries, bleeding, tooth-ache, ear-ache, cold and cough, skin diseases, bone fractures, causing horror, tonsillitis, piles, blood dysentery, diarrhoea, chronic rheumatic, jaundice, asthma, hiccough, etc. are known to most of the common people. Contrary to the medicinal uses, plants associated with other material culture like food, house building, agricultural operations other domestic uses, etc. and plants associated with ceremonies, marry-making taboos, worships etc. are known almost equally both men and women of almost all the age groups among the Bodos and Rabhas of Udalguri district.

3.7 EVALUATION OF DATA

The data obtained from all the sources mentioned in the preceding paras are scrutinised with earlier important publications. For medicinal plants, Glossary of Indian Medicinal Plants and its supplements (Chopra *et al.* 1956, 1969; Asolkar *et al.* 1992), wealth of India; Raw materials (Anonymous 1948-1976, 2007, 2009, 2002), useful plants of India (Ambasta 1986), Dictionary of Indian folk medicine and ethnobotany (Jain 1991), Notable plants in Ethno medicine of India (Jain *et al.* 1995), Medicinal plant of India and Cross-cultural Ethnobotany of North East India (Saklani and Jain 1994) are taken as standard references. Because, these works have

synthesised all the earlier publications on Indian plants. On the basis of these works, interesting findings are evaluated.

3.8 ANALYSIS AND PRESENTATION OF DATA

This study is a work on Monocot flora from a taxonomic point of view and attention has been given to plants considered to be useful by the Bodo and Rabha community of Udalguri district. Both wild and cultivated Monocot plants are included.

Nomenclature of taxa has been brought up to date confirm to the requirements of the International Code of Botanical Nomenclature (ICBN) and in reference of portend recent monographic work. The binomial nomenclature is followed by reference to certain selected standard works like *Species Plantarum*, Linnaeus (1753); *Flora of British India*, Hooker (1872-1879); *Bengal Plants*, Prain (1903); *Flora of Assam*, Kanjilal *et al* (1934-1940) and others. Locally used vernacular names have also been quoted where these are known and mentioned specific of local inhabitants.

In the taxonomic treatment, families have been arranged according to the Bentham and Hooker's system of classification (1862-1883) with slight modification as accepted for central National Herbarium, Sibpur (CAL) and from publication of *Flora of India* Vols.1-3, Sharma *et al.* 1993; *Flora of Maharashtra State*: *Monocot*, Sharma, 1996.

Artificial dichotomous keys based on diagnostic characters have been provided for families and the keys for genera, species and infraspecific taxa are likewise given under their respective families. Each arm of the key has been designated by a number and a letter of alphabet like 1a.,1b., 2a., 2b., 3a., 3b., etc.

The genera in families and species in genera have been arranged alphabetically. The plants have been arranged in alphabetical order according to their scientific names, so that there will be no difficulty to find out any Monocot plant on which information is required.

As for the nomenclature as far as possible, the latest validly and effectively published names of the plants have been given with their full citation, basionym and common synonym are also usually given. For literature a number of libraries havebeen consulted which include K.K. Handique, Gauhati University, Guwahati, Assam ; Botanical Survey of India (BSI) Eastern Regional Centre (ERC) Library, Shillong (Meghalaya) and Maulana Azad Central Library, University of Science and Technology, Meghalaya (USTM), Meghalaya-793101, India.

For each species in addition to the correctly accepted name, its reference in the *Flora of British India by* Hook; *Flora of Assam* by Kanjilal *et al* and Bor; *Flora of Tripura State* by Deb; *Flora of Jowai* by Balakrishnan, etc. also have been cited.

Description of species and infraspecific taxa has been given based on the study of live specimens. Their period of flowering and fruiting, notes on the places of occurrence of the plants and economic importance are appended. Some additional information has been recorded in a note in case of certain plants where it is thought to be necessary. In fact, this work has not only been planned to help botanists but also to meet the requirement of others not specialised in taxonomy or familiar with classification of plants.

Distribution of plants in the area of work are given after the description. This is followed by field number(s) of the herbarium specimen(s) collected by the author during the study. The information on distribution have been collected from herbarium sheets and literature.

Line drawings and photographs of certain plants which are significant or have significance in the present study are provided.

Information on uses for each species may not always involve all the aspects. The uses marked with an asterisk either do not seem to be known at all or at least not well known. Data based on partly identified or incomplete specimens or sometimes on only local names are classed as “Indeterminata” and appear at the end.

Within each species the information on uses are arranged according to their source *viz.* field and literature which can be arranged the data as following sources:

1.a] Medicinal uses recorded in field.

b] Medicinal uses recorded from literature.

2.a] Uses for food and drink recorded in field.

b] Uses for food and drink recorded from literature.

3.a] Material uses recorded in field.

b] Material uses recorded from literature.

4.a] Cultural uses recorded in field.

b] Cultural uses recorded from literature.

5.a] Uses associated with socio religious ceremonies and beliefs recorded in field.

b] Uses associated with socio-religious ceremonies and beliefs recorded from literature.

6.a] Information on commercial aspects recorded in field.

b] Information on commercial aspect recorded from literature.

7.a] Conservational aspect recorded in field.

b] Conservational aspect recorded from literature.

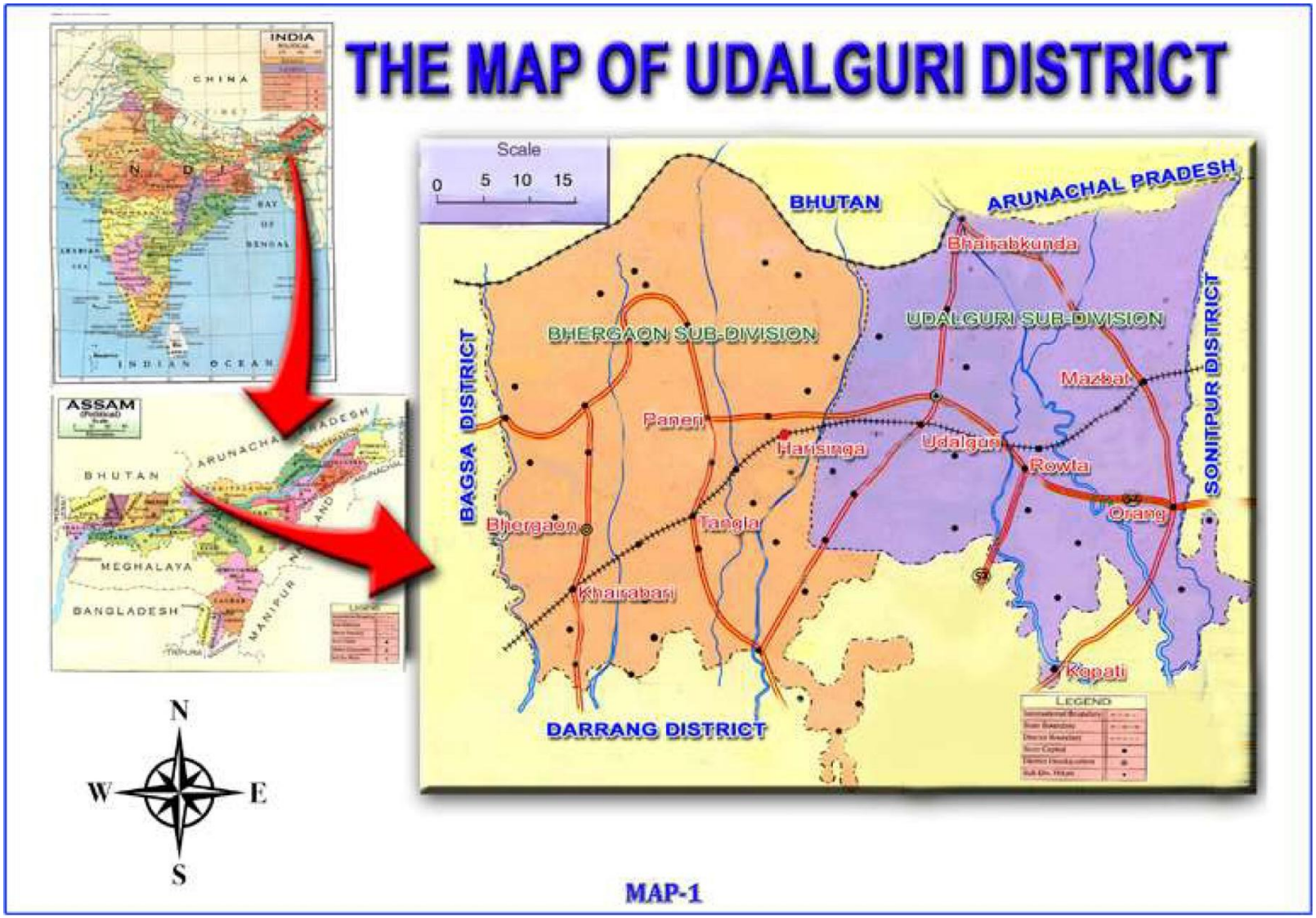
Though Chapter-V in this thesis is related to a large extent on the information collected during the field trips, yet it is presented separately because of the reason that the primary sources of information for Chapter-V is mainly the data gathered from the ethnobotanical usage on Monocot flora of Bodo and Rabha community of Udalguri district.

3.9 GEOGRAPHICAL PROFILE

Assam is situated in the North Eastern part of India which extends from 24°8´ N to 27°56´N latitude and 89°42´E to 96°0´E longitude. The state is surrounded by

Bhutan and Arunachal Pradesh in the North; Arunachal Pradesh and Nagaland in the East and South East; Nagaland, Manipur, Mizoram and Meghalaya in the South and Bangladesh and West Bengal in the West. Generally, the state of Assam is characterized by climatic condition of relatively coolness, extreme humidity, heavy summer rainfall and winter almost drought. The survey and collection of plants were carried out in the field of Udalguri district, BTAD, Assam. India which is situated on North Bank of Brahmaputra.

The Udalguri district, BTAD of Assam, India is bounded by Bhutan and West Kameng district of Arunachal Pradesh State in the Northern side, Sonitpur district in the Eastern side, Darrang district in the Southern side and Baksa district in the Western side. Total geographical area is 1,852.16 km² (715.12 sqm.) and its latitude and longitude are 26°30´-26°40´N and 92°15´-92°23´E respectively. The average altitude of the districtis 590 feet.



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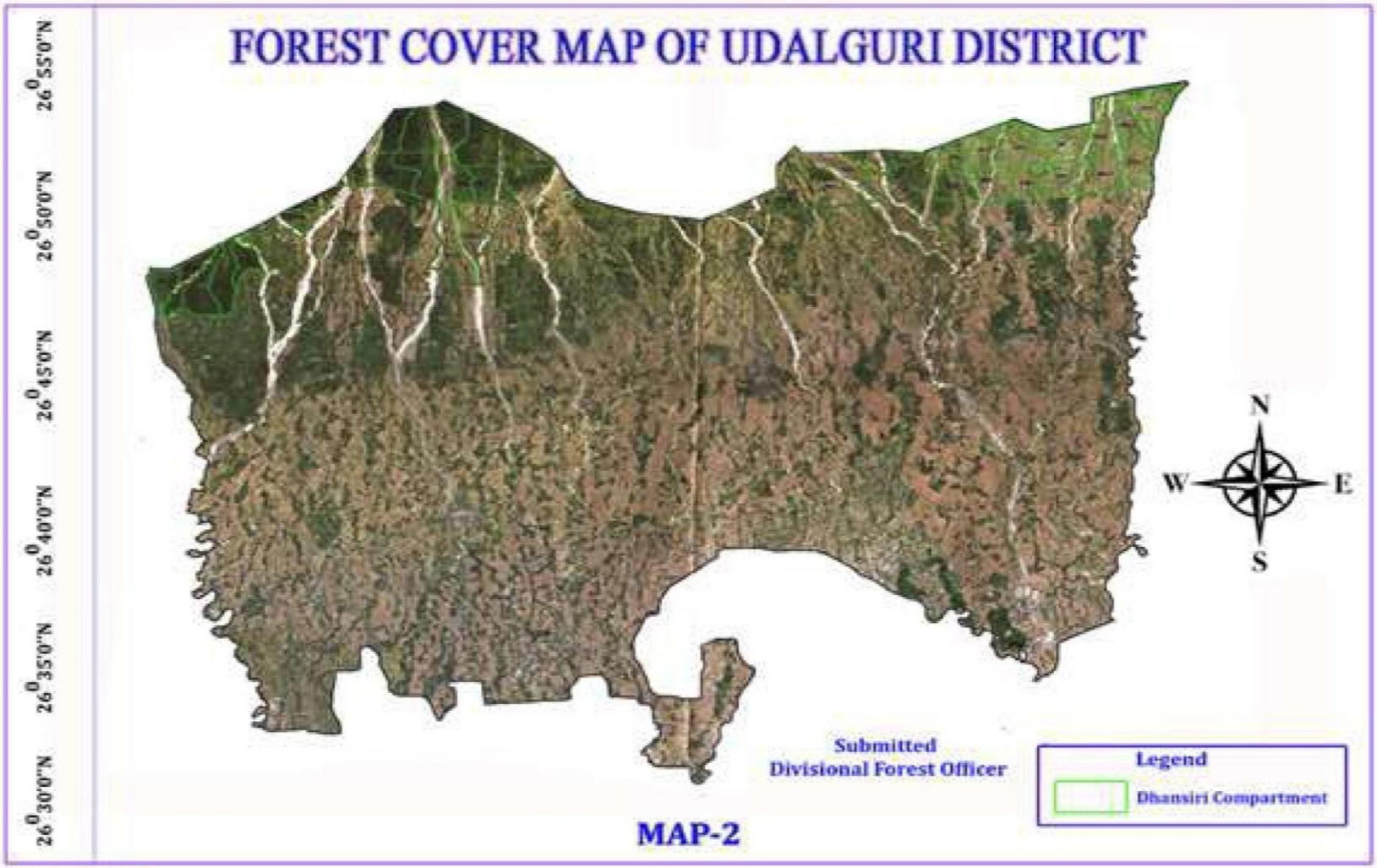
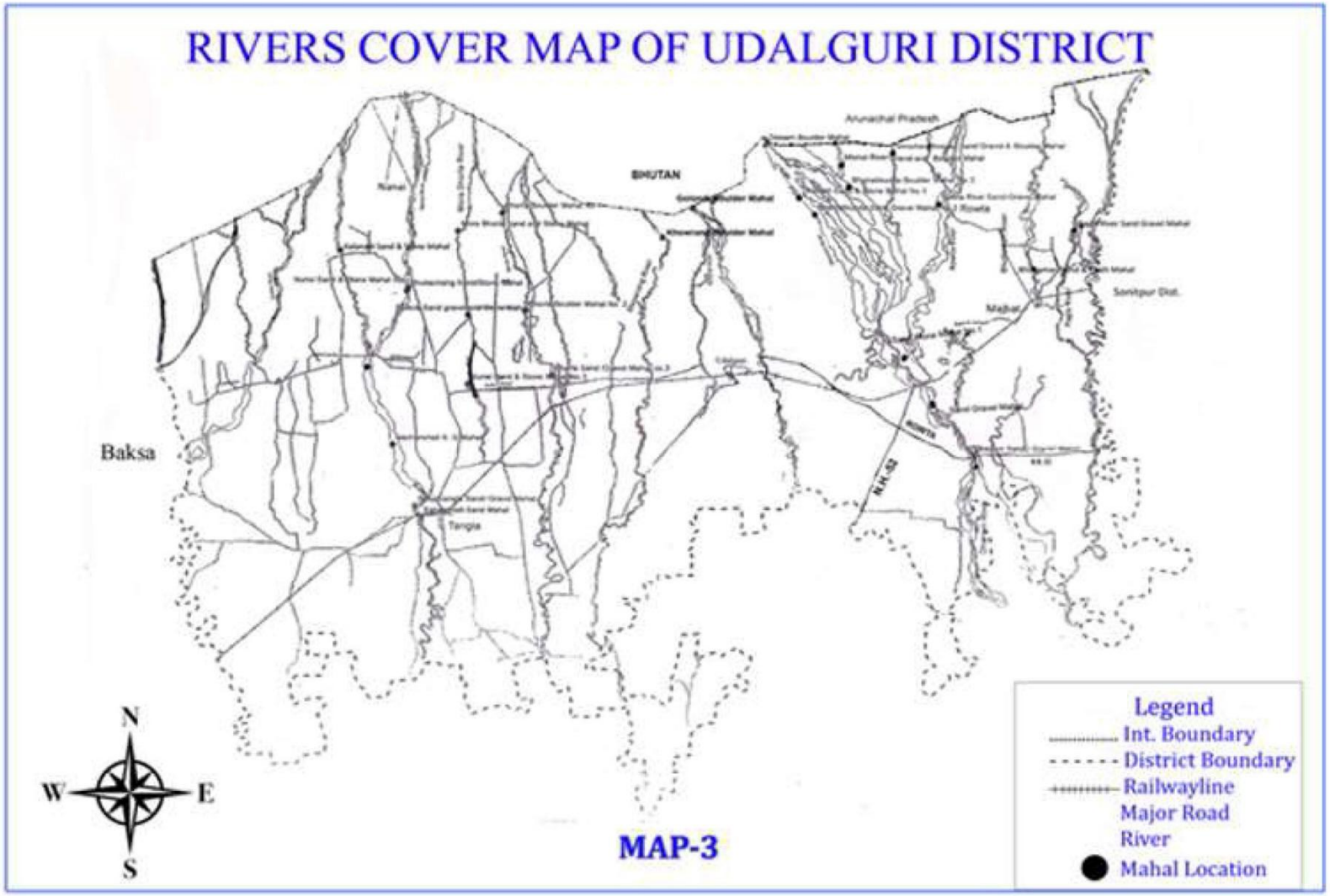
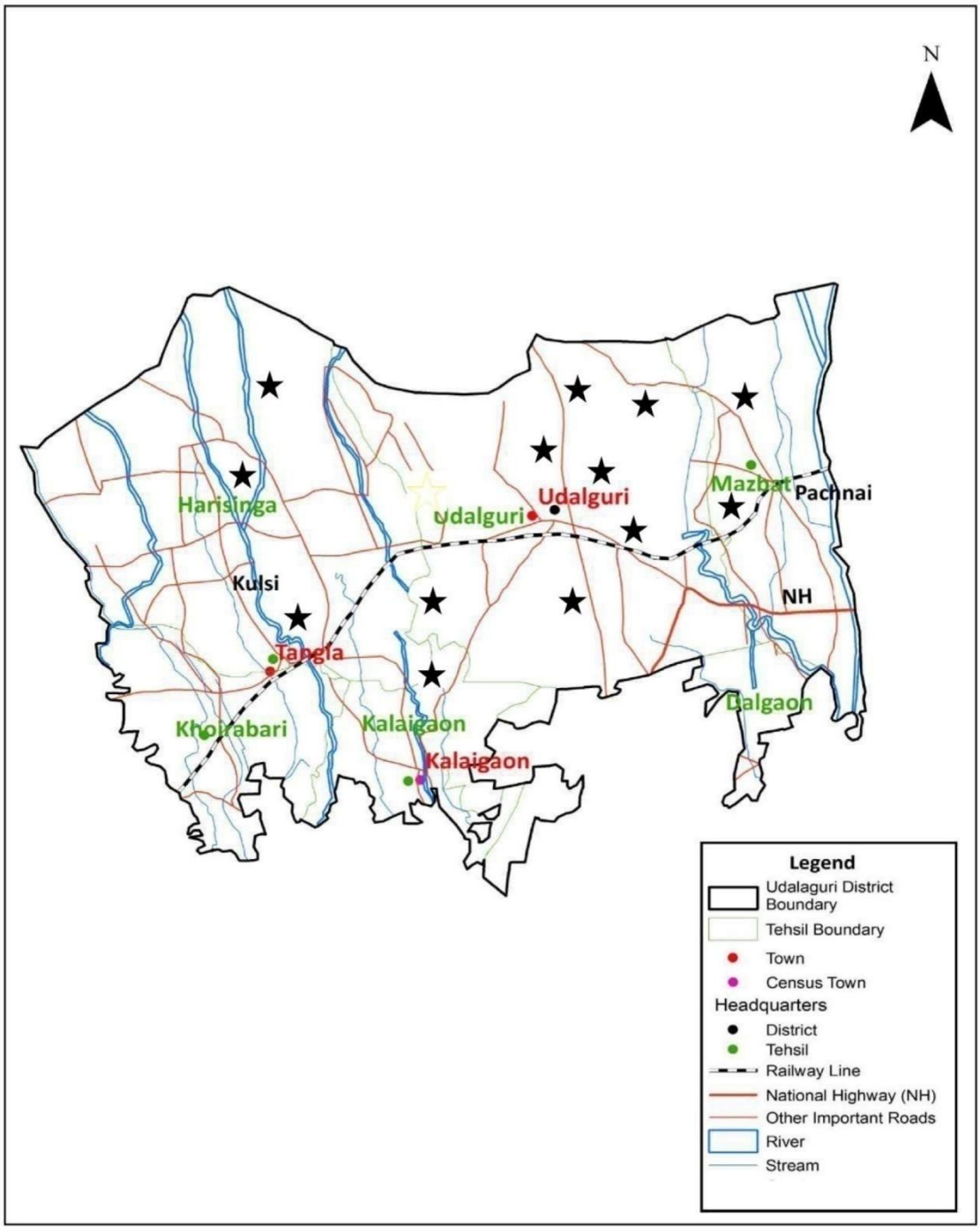


Source : Dhansiri Forest Division, Udalguri, BTAD.



Source : Dhansir Forest Division, Udalguri, BTAD.

Map of Udalguri district, BTC showing surveyed area-



MAP - 4 **Secondary Source**

3.10 SEASONAL CHARACTERS

The maximum rainfall was awarded in the month of June and July of the 2014, 2015, 2016 and 2017, respectively whereas a small quantity of rainfall was recorded during December, January and February. Depending upon the temperature and rainfall of the year 2014, 2015, 2016 and 2017, it may be divided into four seasons (Barthakur, 1986) viz., i) Pre-monsoon, ii) Monsoon, iii) Retreating monsoon, and iv) Cool and dry winter. The vegetation or flora of the area depend on this cycle of climatic seasons. By early March, the pre-monsoon starts along with gradual rise in the mercury level coupled with occasional thunder showers. Up to mid of April, the early part of this season is affected by very strong winds causing excessive transpiration and evaporation which turns into dusty storms, a peculiar climatic phenomenon experienced in the lower Brahmaputra valley. The dusty storm subsides towards late April with the frequency of the thunder shower increases.

The South-West Monsoon starts from the middle of June and continues up to September during this period, it breaks in the area characterizing mainly by cloudy weather, higher humidity, heavy rainfall with thunder, higher temperature and weak variable surface wind. The monsoon season is the most important period for growing, flowering and fruiting of Monocot flora in the region. The South-West Monsoon starts to retreat by the middle of September and is followed by fogs towards the end of November. The number of rainy days as well as the intensity of rainfall decreases during this season. Some Monocot crops and grass species are benefited by the moderate Autumn rainfall. The winter season starts at the end of November and continues up to the end of February. The absence of rainfall, cool weather with low temperature around 9°C to 11°C and of frequent morning fogs.

The meteorological data for the year 2014, 2015, 2016 and 2017were recorded during the investigation period annually with the maximum and minimum temperature in (°C), relative humidity in (%) and total rainfall in (mm) and are represented in the Table 1:, Table 2:, Table 3:, Table 4:, and Figure 1:, Figure 2:, Figure 3:, Figure 4:, respectively.

The average highest and lowest temperature was recorded 38.0°C in June, 2016 and 10.0°C in January 2016 and 2017; the average relative humidity was 96.4% in June, 2014 and lowest 60.4% in January, 2015; and the average highest rainfall was 880.2 mm in May, 2015, and the lowest a trace or a nil in January, in December, 2014 and also in 2017, respectively.

Table 1: Meteorological data for the year, 2014

Months	Temperature (°C)		Relative humidity (%)		Rainfall (mm)
	Max.	Min.	Max.	Min.	Total
January	23.5	10.0	81.9	70.0	Nil
February	26.3	13.5	85.9	61.5	19.2
March	30.4	15.6	60.0	42.3	15.4
April	30.3	20.3	71.4	50.2	177.1
May	31.6	25.3	79.1	72.1	295.6
June	32.3	25.3	96.4	80.0	351.1
July	34.1	28.1	84.1	81.5	180.3
August	35.4	26.7	83.5	79.8	210.4
September	33.0	25.9	82.4	80.3	190.6
October	31.1	21.9	88.5	81.4	2.1
November	32.0	18.6	85.6	81.1	2.1
December	25.1	12.7	88.3	73.4	Nil

Secondary Source

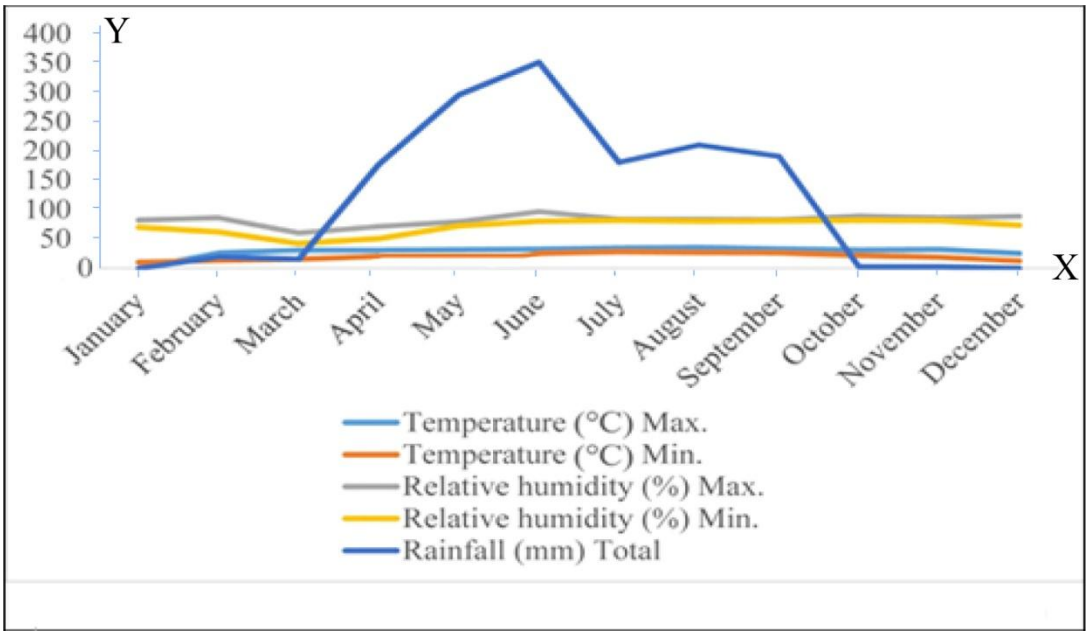


Figure 1: Graphical representation of meteorological data for the year, 2014

Table 2: Meteorological data for the year, 2015

Months	Temperature (°C)		Relative humidity (%)		Rainfall (mm)
	Max.	Min.	Max.	Min.	Total
January	23.1	13.1	91.0	71.0	5.2
February	28.0	15.9	80.1	72.3	15.3
March	30.7	21.1	82.3	71.6	39.1
April	29.0	22.3	82.5	73.8	120.3
May	30.9	24.0	88.6	79.0	880.2
June	36.0	25.0	86.1	77.1	340.1
July	36.9	26.1	80.3	73.0	251.8
August	36.1	25.3	84.0	76.5	339.0
September	36.0	24.0	85.1	78.1	230.6
October	36.0	22.0	84.6	71.3	215.0
November	33.0	18.4	86.3	78.1	21.4
December	32.0	12.3	85.3	74.5	12.8

Secondary Source

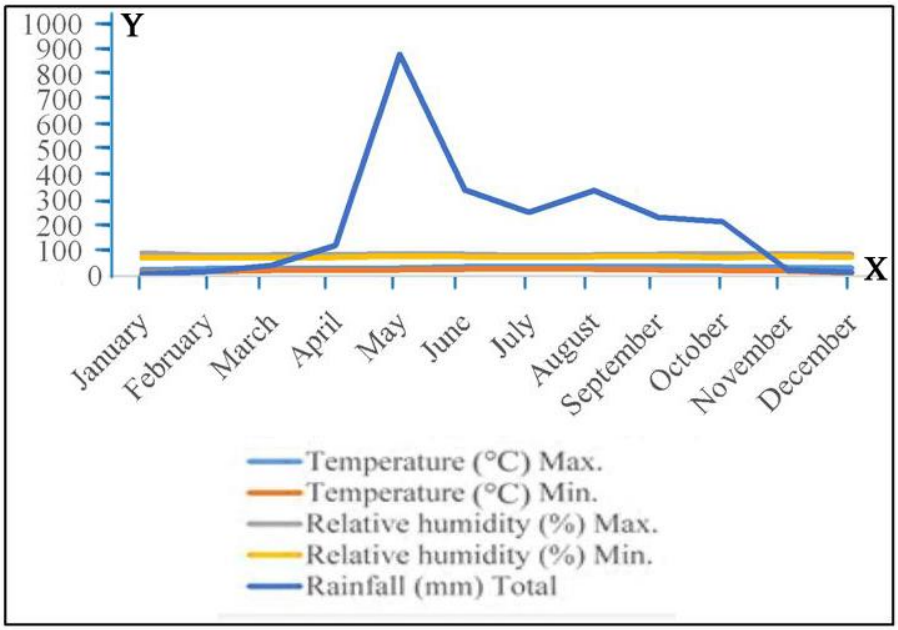


Figure 2: Graphical representation of meteorological data for the year, 2015

Table 3: Meteorological data for the year, 2016

Months	Temperature (°C)		Relative humidity (%)		Rainfall (mm)
	Max.	Min.	Max.	Min.	Total
January	27.0	10.0	81.0	70.2	13.1
February	30.0	12.1	84.1	72.0	10.2
March	32.3	21.2	71.2	54.3	91.6
April	33.2	21.0	78.8	75.2	310.5
May	36.0	23.3	80.6	76.1	321.0
June	38.0	26.5	85.4	79.8	365.1
July	36.1	23.9	87.9	80.2	409.1
August	36.0	25.6	82.0	70.6	230.2
September	37.1	25.5	86.0	79.8	395.0
October	36.3	21.0	81.3	71.0	123.5
November	32.4	16.3	84.3	72.1	39.9
December	28.0	13.8	86.6	76.0	24.3

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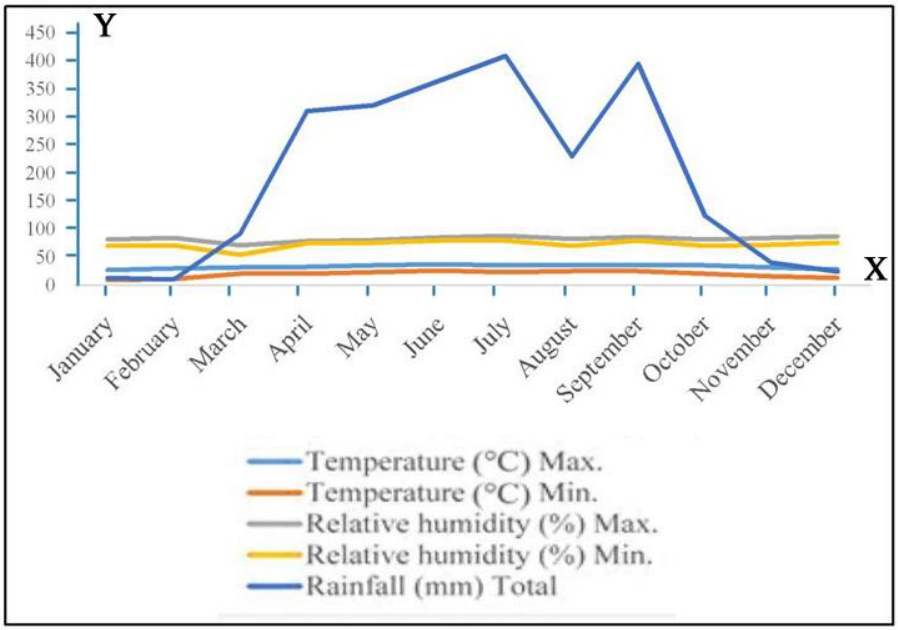

Figure 3: Graphical representation of meteorological data for the year, 2016

Table 4: Meteorological data for the year, 2017

Months	Temperature (°C)		Relative humidity (%)		Rainfall (mm)
	Max.	Min.	Max.	Min.	Total
January	27.1	10.0	80.1	70.1	Nil
February	30.2	12.3	76.1	50.3	4.5
March	30.3	16.0	71.2	48.1	13.5
April	33.0	19.4	78.5	70.5	182.3
May	35.1	22.6	89.1	78.1	398.1
June	37.1	25.0	88.3	78.3	215.7
July	37.4	26.9	82.0	80.0	291.8
August	37.0	26.8	81.5	78.4	190.6
September	37.4	26.8	85.0	76.0	113.3
October	35.5	22.3	82.3	77.0	110.0
November	30.1	15.0	84.1	71.3	31.7
December	28.2	13.1	81.1	70.1	Nil

Secondary Source

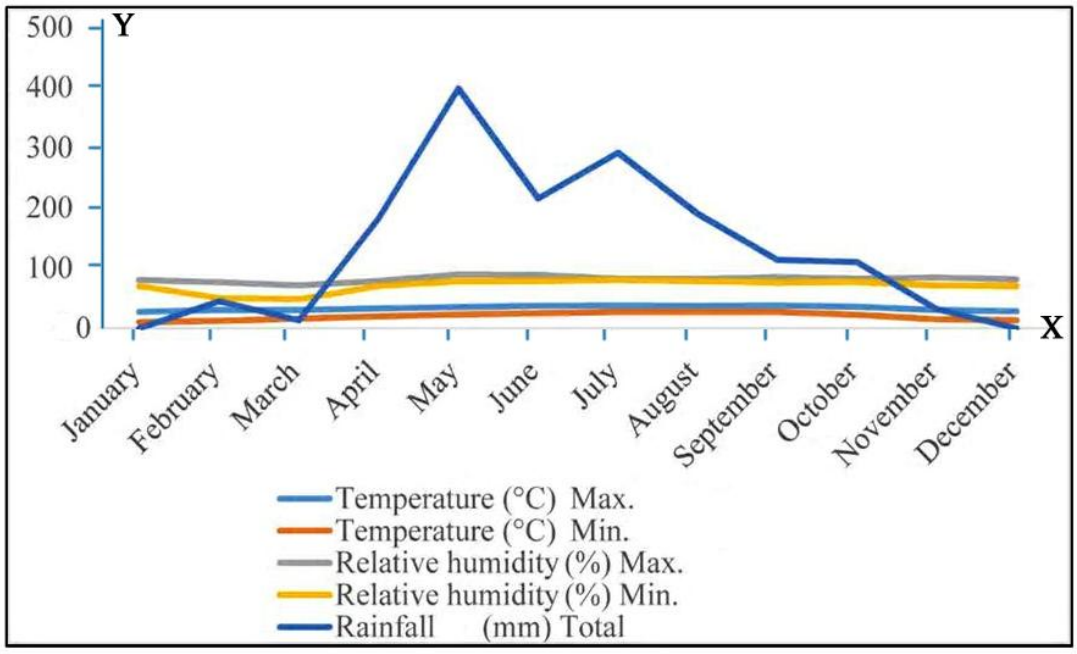

Fig 4. Graphical representation of meteorological data for the year, 2017