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Floristic Composition of Barino and Adjacent Region in Relation to Some Ecological Factors

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FLORISTIC COMPOSITION OF BARIND AND ADJACENT REGION IN RELATION TO SOME ECOLOGICAL FACTORS

A THESIS
SUBMITTED TO THE INSTITUTE OF BIOLOGICAL SCIENCES
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IN BOTANY

SUBMITTED
BY
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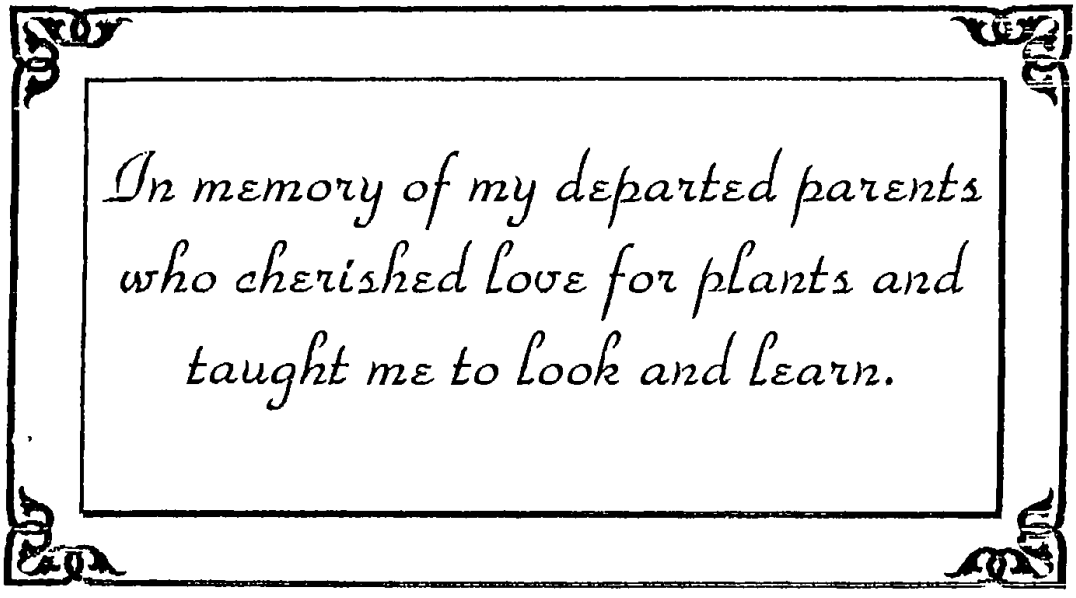
In memory of my departed parents
who cherished love for plants and
taught me to look and learn.

DECLARATION

I do hereby declare that the whole of the work submitted as a thesis for the degree of Master of Philosophy in Botany of the University of Rajshahi, is the result of my own investigation.

27/12/97

Professor Dr. Md. Mozahed Hossain
Supervisor

N. Nesa Khatun
27.12.97.

Nurun Nesa Khatun
Candidate

CERTIFICATE

I do hereby certify that the work embodied in this thesis has not already been submitted in substance for any degree and has not been concurrently submitted in candidature for any degree.

N. Nesa Khatun
27.12.97.

Nurun Nesa Khatun
Candidate

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ABSTRACT

The high Barind tract and some adjacent area were investigated with respect to the herbaceous flora and some physico-chemical conditions. The study area was divided into 3 study sites A, B and C. Monthly sampling trips were made for the collection of herbaceous plants and to study the phytosociological situation with the help of square quadrate. Some analytic characters which include Frequency, Relative frequency, Density, Relative density, Abundance, Relative abundance and Importance value index (IVI) and some synthetic characters which include Jaccard's community co-efficient (J,C,C) and co-efficient of similarities (C,S) of studied plants were determined and at the same time soil moisture (SM), Field capacity (F,C), soil pH and mobile phosphate content were determined from the collected soil samples from the study sites.

The analytic characters of the plants particularly Importance value index (IVI) and synthetic characters (J,C,C. and C.S.) were determined for the comparison between the two or more pairs of plant community, and soil moisture, field capacity, soil pH and mobile phosphate content were determined for the evaluation of the seasonal variations from site to site and their role on the existing flora.

During the present study period the soil moisture content was found to vary from site to site. The highest value 29.27% (Table -1b) of soil moisture was observed at site-B in the month of June 1993, while the rest of the study month it varied from 3.89% - 10.92% (Table - 1b). The highest value of soil moisture at

site A and C were observed 24.97% and 27.5% (Table-1a & Table-1c) respectively, in June 1993, while the rest of the study month it varied from (4.05% -11.08%) and (4.. 7 - 10.99) (Table 1a & Table 1c) respectively. The values indicate a very poor soil moisture content in all the sites and soil can be classed as a very dry soil. During the study period the Field capacity (FC) was found to vary from site to site. The highest FC in 3 sites (A,B,C) were observed 46.93%, 38.72% and 42.95% respectively. These value also indicate a very poor field capacity in the study area. Because the study zone is unlike other agro-ecological zones of the country, it is distinctly showing a sign of desertification as evidenced during the recent years.

The soil moisture content and field capacity values obtained during the present study clearly indicate that the soil of the study area is extremely dry.

The pH value was slightly to moderately alkaline. The highest pH value (8.2) was observed in site A. The lowest pH value (6.38) was observed in site B.

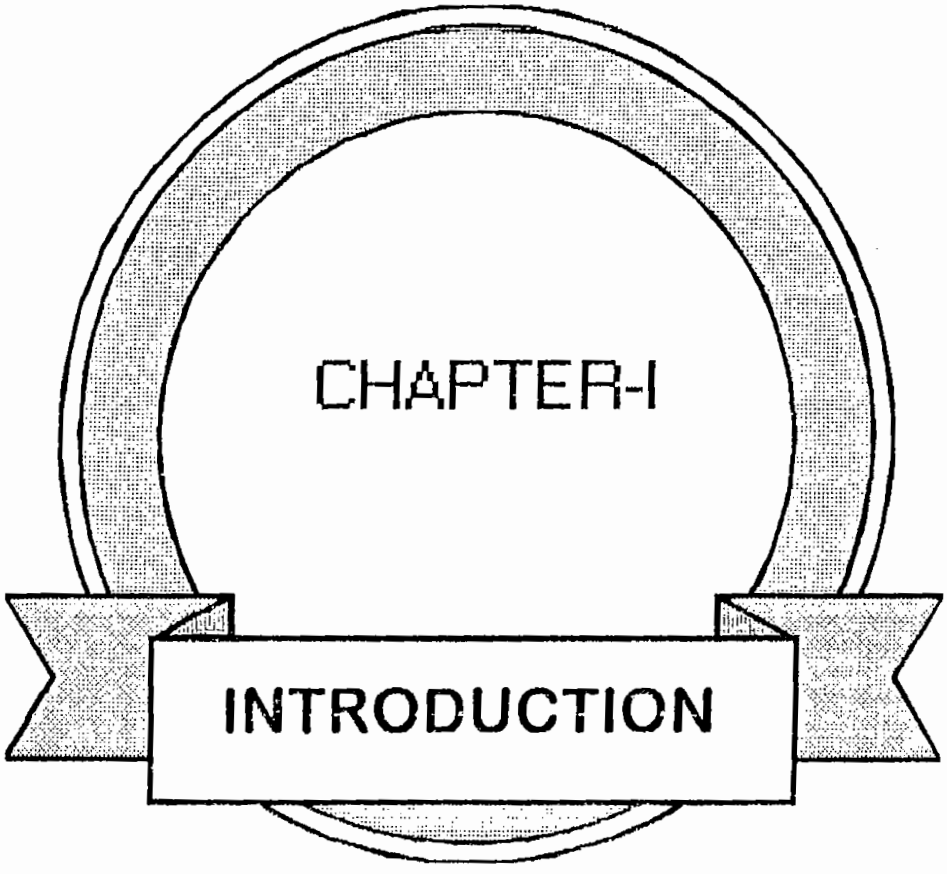
The mobile phosphate content was found to vary from site to site. The highest mobile phosphate content 0.05 mg/gm-I was observed in site A (Table-1a). The lowest mobile phosphate content (0.0025mg/gm-I) was observed in site C (Table-1c). The mobile phosphate content was found to be extremely low at site B and C compared to site A. The mobile phosphate content of the three study areas indicate that the soil of this area is poor in this nutrient substance.

Cyperus rotundus showed the highest frequency, density and abundance values in all sites. So, *Cyperus rotundus* is the dominant species in herb layers in all sites. *Cyperus rotundus* also showed the highest IVI values in all sites. So, in

this case *Cyperus rotundus* is the dominant species in all sites during the study period.

The C.S. values (67.32% and 31.82%) were observed respectively between A and B; B and C pair of communities, while the J.C.C value 51.35% was observed between A and B pair of communities, and the J.C.C. value 37.50% was observed between B and C pair of communities. While the C.S. value (31.70%)was observed between A and C pair of communities, then the J.C.C value was observed 36% in that communities.

From the present study a conclusion can be made that the study area supports a lower level of species diversity due to unfavourable edaphic, climatological and water stress factors.


CHAPTER-I
INTRODUCTION

INTRODUCTION

The Barind Tract is situated in the northern region of Bangladesh and includes greater Rajshahi, Dinajpur, Rangpur and parts of Bogra districts. This region lies between 24°-23 to 25°-15 North latitude and 88°-02 to 88°-57 East longitude, and is elevated 20-23M above the mean sea level. The area covered by the Barind tract is estimated to be 7728 KM^2. (NCS 1991). This region, especially the high Barind which includes Rajshahi district, is the driest place in the country, and is characterized by minimum rainfall, semi-arid climate with prolonged drought. This is a tract of comparatively high land with undulated topography and red clayey soil which bake hard during the early summer until the monsoon sets in. Thus, it affords only one crop a year, aman paddy being the dominant one. The arable land is generally unproductive and the agriculture suffers from drought during the rabi season of the year covering the period from October to March. The rabi season is a period of drought when, on the average, only about 75 mm rainfall occurs and most of the arable land remains fallow during this period. It is during this period that there occurs a substantial soil moisture dificit. The average annual water deficiency is about 80mm. in the vicinity of Rajshahi and more high in the undulated high barind. (Ahmed *et. al.* 1993). The upland of the Barind Tract in the western part is greatly denuded of plant cover at present and is showing signs of desertification. The ecosystem has undergone changes due to human interference and now it forms a distinct ecosystem different from other parts of the country with inevitable ecological changes amounting to environmental hazards. The situation has further deteriorated as the bulk of gangetic flow,

passing through the region, suffered a set back due to the authropogenic exploitations is the recent past.

During the recent few years, the Barind region has attracted the attantion of National and International bodies concerned with Agro-ecological and environmental assessment studies. The objective of the Non-Governmental Organization (NGO) and Governmental Organization (GO.) lies in the evaluation of climatological aspects, Geology, tropography, soil types assessment and land use patterns, drainage pattern and inundation during the rains, Agro-ecological zonation Agricultural development and the development constraints , ground water and surface water management strategies, drought and ecological hazzard assessment with a view to alleviation of constraints and stresses for sustainable development. Barendra multipurpose development project aimed at ground water development and deep tubewell (DTW), and low lift irrigation, surface water resources management and augmentation of river flow in the region has geared up changes in the croping pattern in the zone. Afforestation by this Governmental organization has resulted in the development of road side forest along the metalled roads consterted by the organization. Many NGO's are presently at work to develop agro-foresty including homestead and crop land forestry in this region. The object of these endeavour is aimed at the alleviation of the constraints in the food, fuel and fodder sector. Various plants including herbs, shrubs and trees make important contributions to the farming system better satisfy the wide range of house hold needs and are important source of fuel, fooder, food and building materials for the rural mass. But over use and destruction of forests and other plant resources have already resulted in a negetative impact on the fragile

Agroecological environment in this region. Due to increasing population pressure, more land is being brought under crop cultivaiton by destroying the fallow wood lands, forests, orchard lands, high land and deep gully vegetations. Plant twigs, leaves, and other biomass fuel also includes the felled and uprooted thickets of herbaceous and shrubby plants, generally meet the fuel requirement of the village masses in this regions. The savannah type of natural vegetation in the mid and high Barind region is gradually showing sign of disappearence and some of the characteristic plant species of the region are pottentially endangered. As the practice of agro-forestry, community homestead and cropland forestry with selected plant species are gradually gaining ground, the natural vegetation is giving in. This retreat and disappearence of the natural vegetation, is leaving the undulated topography almost denuded of its cover and the whole landscape is under rapid changes. The impact of water stress on the vegetation due to impared flow of the Padma from accors the boarder and depletion of the aquifer in barind due to DTW of Barendra Multipurpose development project are to be studid in a systematic way. The almost impoverished natural vegetation needs to be thoroughly studies Taxonomically and ecologically to know their community structure and role in the economy and physico-chemical and biological environment of this semi-arid land. The natural vegetation is considered as a renewable natural resource which plays biological role in supporting agriculture by protecting the soil water environment and maintain ecological balance.

Against this back drop, the present study was undertaken . The main object of this investigation is to study some of the physico-chemical properties of soil of the study area in the high barind and its fringe area, and also the

study the taxonomy, frequency, abundance and general diversity of the herbaceous plants in the area.

Review of literature

Our knowledge on the flora of the Indian subcontinent including the Bengal proper, Asam and Burma is cheifly based on the historic treaties of Hooker (1872-1897), Prain (1903), Kurz (1877) and Kanjilal (1934-1940). Cowan (1926), Cowan et al (1929) made valuable contribution on the trees of northern Bangal including shrubs and woody climbers. Heining (1925) worked on the floristic composition of Chittagong and other places of Bengal, while Sinclair (1955) worked out the flora of Cox's Bazar. Dutta and Mitra (1953) worked on the common plants of Dhaka while Bor (1960) worked on grasses of the subcontinent in which some texa were described from the then Eastern part of Pakistan.

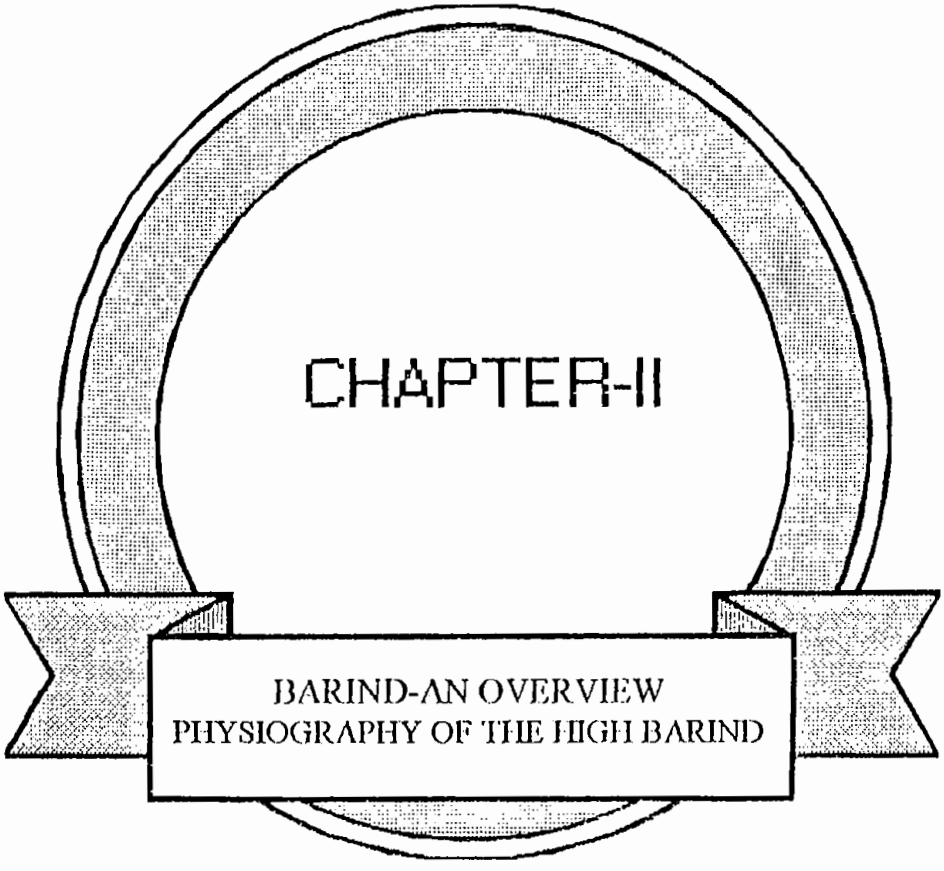
The available multitude of taxanomic literature in the country bean testimony that the Barind region has not been investigated extensively with respect to its floristic composition as yet. Only sporadic references on the occurence of different taxa have been made in some publication in the country. However, the enormous taxonomic and floristic studies made in the country, have started in early fiftees by M.S. Khan and his associates and students. The present knowledge on the floristic composition of the country is chiefly based on their contributions in the field. The valuable contributions made by M.S. Khan and his Co-workers include the study of Commelinaceae (Khan, 1977), Sphenocleaceae (Khan, 1977), Onagraceae (Khan, 1977), Rhizophoraceae (Khan, 1978), Haloragaceae (Khan, 1978), Nymphaeaceae (Khan, 1979), Ceratophylceae (Khan 1979), Zennichelliaceae (Khan, 1979), Sonneratiaceae ((Khan, 1980), Buddlejaceae (Khan, 1980), Cannabinaceae (Khan, 1980) ,

Oxalidaceae (Khan 1981), Zygophyllaceae (Khan, 1981), Molluginaceae (Khan, 1981), Dipterocarpaceae (Khan, 1984), Dipterocarpaceae (Khan, 1985) and Convolvulaceae (Khan, 1985). Many more importants contribution in the field are worthmentioning which include Khan & Hassan (1978), Khan, Hassan & Huq (1982), Khan & Huq (1981), Khan & Hossain (1971), Khan (1986), Khan, Rezia Khatun and Rahman (1996), Ghani & Khan (1967), Haq & Khan (1984), Khan & Huq (1979), Khan & Yusuf (1976), Khan & Miah (1984) Khan & Farida Banu (1969, 1972), Khan & Halim (1985), Khan & Aurangzeb (1959), Khan, Hassain, Huq and Rahman (1984) Khan and Yusuf (1979) and Khan & Mahbooba Halim (1987). Other important taxonomic works include Alam (1982), Alam & Yusuf (1992), Alam (1985), Chaffy & Sandom (1985), Enayet Hassan (1974), Huq & Begum (1984), Islam (1984), Begum & Huq (1982), Rahman & Mahbooba Halim (1982), Huq (1982), Mia & Huq (1986), Khatun (1987), Rahman & Mahbooba Halim (1987), Mazid F.Z. (1986), Mia & Huq (1984), Momtaz Begum & Huq (1983), Moula Baksh, Khan & Huq (1979, 1980), Begum Khatun and Haq (1988) and many other workers. Based on these studis a tentative estimate of the total number of species found in Bangladesh comes to around five thousand under 186 families including the exotic texa. A critical review of these voluminous literature clearly reveal that regional or area wise floristic studies are prerequisite for conservational strategies. Recently the Bangladesh Herbarium financed by the Ministry of Environment and Forest has launched an extensive floristic and ecological studies under the NCS IP-I Project which includes the Barind tract also (Personal communication from Professor- M. Zaman, Department of Botany, Rajshahi University).

Aims and Objectives of the study

The high Barind region has been chosen for the present study. The fringe of this zone near Rajshahi was taken for comparative studies.

The present investigation was undertaken to study some of the important physicochemical condition of soil in the study zone, collection and identification of the herbaceous plants occuring in the zone throughout the year. The study of floristic composition, frequency, seasonal abundance and importance value index, seasonal variation, diversity and interaction of the important ecological factors were taken into consideration.


CHAPTER-II
BARIND-AN OVERVIEW
PHYSIOGRAPHY OF THE HIGH BARIND

BARIND - AN OVERVIEW

As already stated, the Barind Tract is, situated between 24°-23 to 25°-15 North latitude and 88°-02 to 88°-57 East longitude with an elevation of 20-23 meters above the mean sea level. Locally known as Barendra Bhumi, the Barind tract is located in the centre and west of Rajshahi division and covers an area of 7, 728 KM^2. It occupies one fourth of the entire Rajshahi division. The Barind tract represents a series of uplifted blocks of Modhupun clay. It has a low content of weatherable sand and minerals. The major part of the tract is almost level and is crossed by a few minor rivers. The little Jamuna and Atrai flood plains occupy fault troughs which divide the tract into three main blocks. The western side of the western block has been titted up to the west and subsequently dissected by valleys. Most of the land is poorly drained and shallowly flooded during rainy season. A transitional area in the south is more deeply flooded. Better drained soils occur near the northern and eastern edges.

Except in the west, the difference in elevation between the Barind tract and adjoining flood plain is snall. Alluvium has shallowly buried fringes of the Barind tract within the Tista, little Jamuna, Atrai and Mahananda flood plain. Agro-ecologically the Barind tract is divided into three regions, namely the Level Barind Tract, Hight Barind Tract and the Northeastern Barind Tract.

The level Barind Tract:

This region occupies about 65 percent of the entire Barind Tract. This area includes the Dinajpur, Gaibandha, Jaipurhat, Bogra Naogaon, Natore and Sirajganj districts and covers an estimated area of 5049KM^2 . Two subregions

depending upon the innundation depth in the flood period have been recognised eg. Highland and Medium high land, and medium lowland and low land.

The landscape appears to be flat and there are slight differences in elevation between the higher parts on which the villages are located, and the slight dipressions lying between them. The relief is locally irregular near entranced river channels with shallow gulleys cutting back into the adjoining plain land. In the west, elevation gradually increases as this region merges with the high Barind Tract. The level Barind region is seasonally flooded, and the whole of the level landscape in poorly drained in the rainy season. The mean annual rainfall is highest in the northeast (2,000 m m) and lowest in the south west (1300-1500 mm). The grey terrace soils are characteristics of the Barind Tract. The predominant soils have a grey, silty, puddled top soil and ploughpan. All soils become very dry in the suface layer during the hot dry season. Very small amount of surface water are available from the rivers and tanks for irrigation in the dry season. The groundwater is available, but becomes less satisfactory in the west in areas adjoining the high Barind Tract. Transplanted Aman is major kharif crop. It is widely practiced by broadcast methods or transplanted Aus is grown in the East and North. Major part of the land remains fallow in absence of irrigation during the dry season, and some rabi crops are grown by irrigation.

Northeastern Barind Tract

This area occupies 15 percnet of the Barind Tract, and has several discontinuous areas on its northern and eastern margins. This region is located

in parts of Dinajpur, Rangpur, Gaibanda, Jaipurhat and Bogra districts and covers and area of about 1079 KM^2 (NCS, 1991). This part of the Barind has red soils similar to those of the Madhupur Tract. Three subregions have been recognised, separating areas with different proportions of well drained, moderately well drained and poorly drained soils. Most of this region is better drained than adjoining land on the level Barind Tract and in flood plain regions. The region is shallowly flooded in the rainy season. The mean annual rainfall is highest in the Northeast (2000 mm.) and decreases to around 1800m in western and southern areas. Surface water supplies are limited and available from tanks and few beels. Ground water is available in the major area in the northeast and is widely exploited by dugwells and tubewells. Main crops include sugarcane, Aus, mustard, black gram with irrigation and winter vegetables and wheat are grown in addition to rainfed Aus paddy in this region.

The High Barind Tract :

This area is also known as the dissected Barind Tract. It includes the western part of the Barind Tract where the underlying Madhupur clay has been uplifted and cut into deep valleys. This area occupies about 20 percent of the Barind Tract, and is located in Rajshahi, Nawabganj and Naogaon districts covering an area of about 1600 KM^2. The western and southern bounderis of the region are sharp, while the eastern boundary is transitional. Virtually all the land in this region stands above normal flooding level. Terracing of sloping land during the past two centuries to hold rainwater on the soil surface for paddy cultivation has much contributed to reduce the rate of surface run-off (NCS-1991). This is only partially true, as field bunds are too low to hold

enough rain water, and are often cut at intervals to allow rainwater discharge. As a result soil erosion takes place after every heavy shower. Despite the sloping relief, this region has predominently poorly drained grey soils with silty topsoil similar to those occuring on the level Barind Tract. The region is the driest area in the country and semi-arid in nature. The mean annual rainfull is about 1300 mm. Limited surface water is available in tanks, while ground water availability is generally poor in the hilly western part. The predominant land use is transplanted Aman grown as single crop during the summer. The rest of the year is arid and basically cropless.

Evidence of desertification is noticeable in the dry and bare soil conditions on the Barind Tract during the prolonged dry season. The Barind Tract is considered as an ecologically fragile zone with extremely low vegetation cover. There is practically no tree cover except in the homesteads. The soil have very few organic content. During the highly hot summer period , the moisture holding capacity of the silty topsoil especially when puddled for paddy cultivation is very low. Puddling of soils for paddy cultivation in the kharif season, leaves the topsoil dry and hard or powdery in the dry season and therefore, bare and almost denuded of weed growth. The powdery topsoil is blown away during the dry season. Low moisture holding capacity, low organic matter content and low natural fertility of the major soils in the high Barin Tract tend to limit the development potential for maximising crop production.

The abstraction of ground water for irrigation in already drowing down dry season water levels in some areas below the normal level of dug wells and hand tubewells to provide water for domestic use. The problem is likely to

more aggravate as tube well irrigation extends and become more intensive (NCS-1991). The basic problem of the Barind is an environmental crisis. The Barind has become an unstable ecosystem and farming is vulnerable to interruptions. Ecological deterioration has been a long and gradual process. A sustainable aggriculture can be created only when the ecosystem is restored to a sustainable state. The chronic nutritional deficits suffered by the soils, animals and the human population are interrelated phanomenon. An intergrated land use system, improved diversity and density of vegetational cover are of urgent need to save the situation in the region.

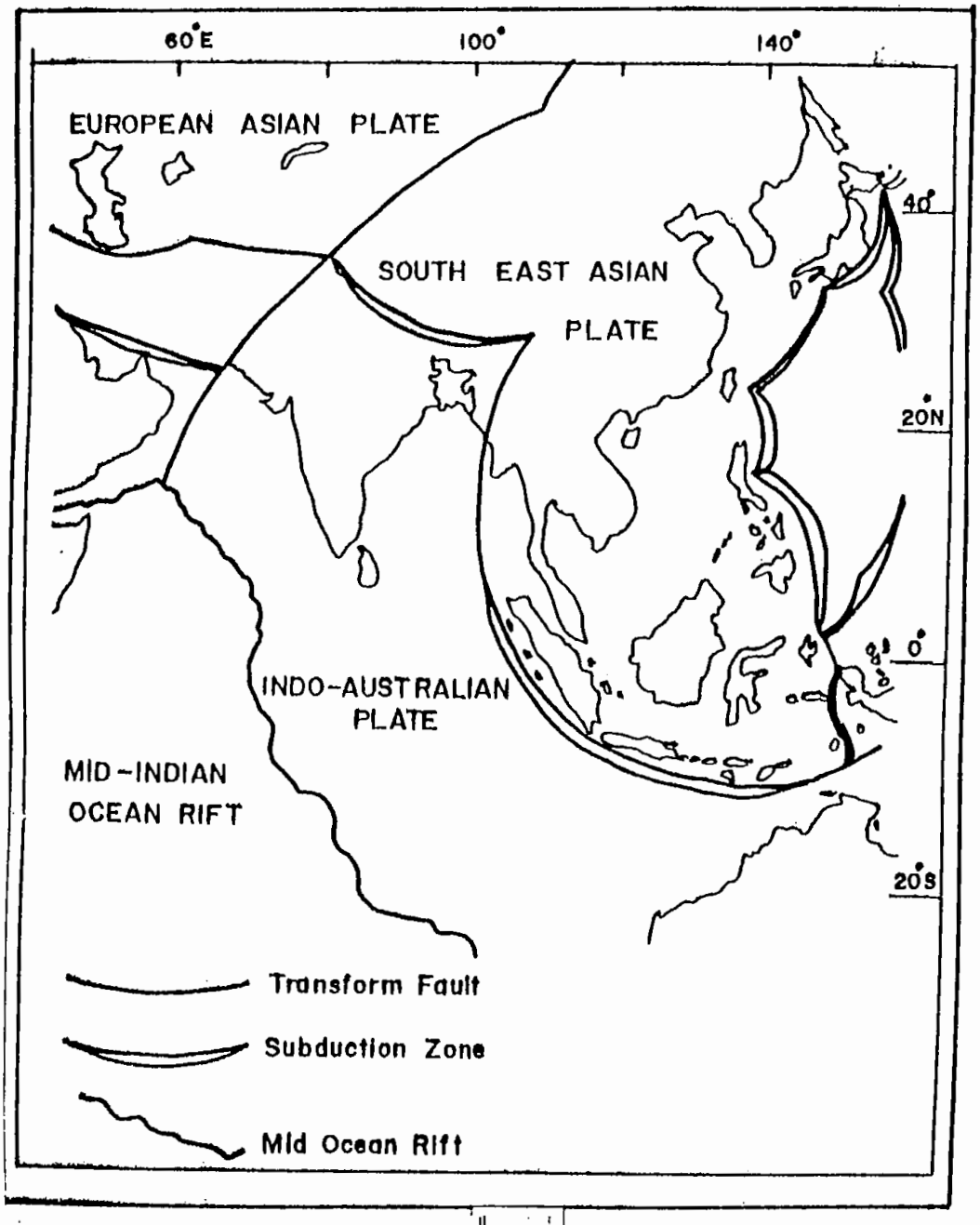
PHYSIOGRAPHY OF THE HIGH BARIND

The Barind Tract situated in the northern region of the country has a geographical location of 24°-23 to 25°-15 north latitude and 88°-02 to 88°-57 East longitude.

The Bengal basin in which the Bangladesh is situated, was formed on a mass of sediments underlain by the old rocks of the Gondwana continent (Clerk, 1971, Gordon, 1972, Morgan and McIntire, 1959). The Indian portion of the tectonic Gondwana plate collided with the East Asian and Eurasian plates in the Eocene period (38- Million years ago) resulting in the formation of the Himalayas and Arakan Yoma. The Indo-Asutralian plate was subducted under the East Asian plate along the line of Himalayas (Map -1), Clerk (1971) and Gordon (1972) proposed that due to this collision a portion of the North-Eastern part of the Indian plate fractured and sank below the sea level in the Oligocene period (38-26 Million years ago). This portion was filled up over the next 37 million years to form the Bengal Basin (Map -2). On two sides of the Bengal Basin the Meghalaya plateau is situated in the East and Chhotonagpur plateau in the West. Due to its position, with one of the worlds major subduction faults in the North and a major transform fault in the East, the Bengal Basin is one of the most active, tectonic region of the world. Large areas within Bangladesh have been filled up in the recent times.

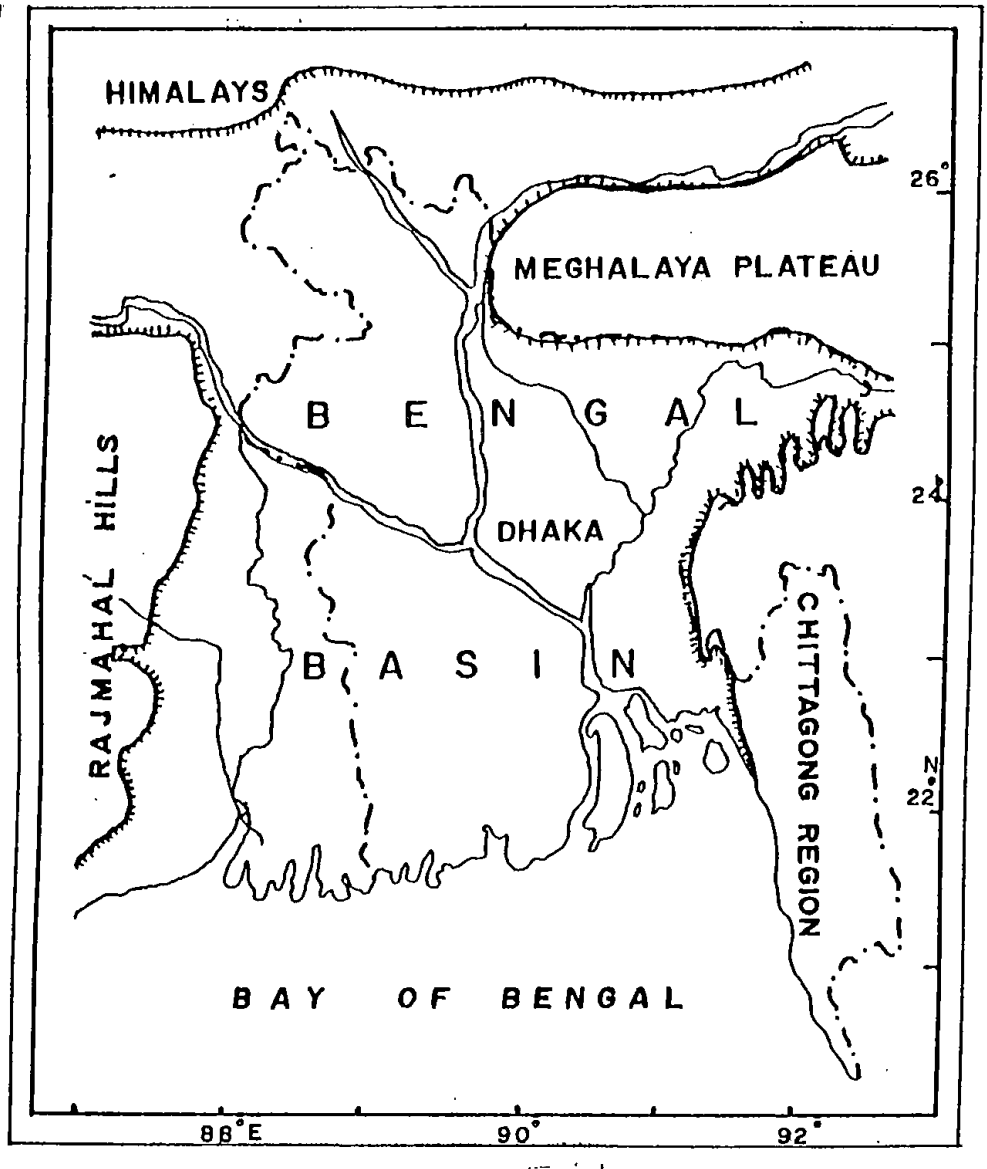
The Bengal Basin has been filled by sediments, washed down from the highlands on three sides of it and specially from the Himalayas. The greater part of this land building process was supposed to be due to the alluvial deposits by the Ganges and the Brahmaputra rivers (Morgan and McIntire,

TECTONIC PLATES



MAP - 1

BENGAL BASIN



MAP - 2

1959). Spate (1954), Johnson (1957), and Morgan & McIntire (1959) outlined the the physiographic subregions of the Bengal Basin. Accordingly, Bangladesh was devided into twenty four sub-regions with fifty four units on the basis of physical features and drainage pattern. One of these sub-region is the Barind Tract which includes the district of Rajshahi, Nawabganj, Nawgaon, Jaipurhat and Parts of Dinajpur, Bogra, Rangpur and Natore districts of Bangladesh, while eastern part of Malda district of west Bengal, India, is situated in the Barind.

The Barind area constitutes a portion of Indian platform of Bengal Geosyncline and is identified as the stable shelf of Bengal Basin. The surface geology consists entirely of sediments forming level to undulating landscape. The Barind track form the only outcropping feature. The Barind clay formation of the upland contains kaolinite, illite with trace montmorillinite that weathers to red brown soil. Silt and clay comprise the recent flood plain of the Atrai - Mohananda - Padma and their tributaries and distributaries. The surface deposits were laid down by the stream and interstream deposits of the rivers flowing through the area. The interstream deposits are called recent sidiments while the older deposits classified as pleistocene sediments (Ghani *et al*, 1990). Brammer *et al* (1988) divided the Barind Tract into three agroecological regions e.g. (i) level Barind Tract comprising of highland, medium high land, medium low land and low land; (ii) High Barind Tract and (iii) North Eastern Barind Tract with areas with well drained to poorly drained lands.

The High Barind Tract:

The present floristic studies were carried out in the high Barind region. This distinctive region was previously termed as dissected Barind Tract. It includes the western part of the Barind Tract where the underlyingMadhupur Caly has been uplifted and cut into by deep valleys: It occupies about 10 percent of the whole Barind Tract. The high Barind Tract differes from the level Barind Tract in being cut into by deep valleys. It differs from the North eastern Barind Tract in having higher rolling releief and shallower soils which are predominantly poorly drained. The High Barind Tract also differs from the Madhupur Tract in having poorly drained soils in having greater relief in the west than accuss anywhere on the Madhupur Tract and also in having a drier climate. It also differs from the adjoining flood plain regions in occupying high dissected relief and in having soils developed over the mineral poor Madhupur clay. The western and southern boundaries of the region are sharp, but the eastern boundary with the level Barind Taret is transitional. Compared to other region of the country, the Barind Tract specially the high Barind region has physiographic and climatological distinctiveness. The region has been titled upwards along the western edge. It has short deep valleys descending to the Gages, Mahananda and Punarvaba flood plains to the south and west, and long valleys eastwards which are deep in the west but gradually become shallower towards the boundary with level Barind Tract. Summits are are rounded in the highest areas, but flat, very gently slopping summits between valleys gradually increase in width towards, the east until they occupy the whole landscape near the boundary with the level Barind Tract. Except the highest and steeply sloping areas, the valley sides have been terraced for paddy cultivation.

Drainage pattern:

The region is excessively drained with rapid run-off of rain water, during monsoon months, from the sloping land are the impevious Madhupur Clay. But terracing the sloping land to hold rain water on the arable soil surface for paddy cultivation reduce the rate of run-off to a considerable extent. Excessive run-off occurs during heavy rainfall resulting in surface erosions. Most valleys have stream cannals which carry water during the monsoon. Many large and small ponds and impoundments hold water throughout the year depending upon the extent of rainfall. These water bodies provide limited irrigation for crop production. Almost all the land stands above normal flood level.

Climate:

The high Barind Tract lies in the driest part of the country and the climatic condition are almost uniform in the region. The climatic conditions are summerized in the UNDP/FAO AEZ report 2. Accordingly the mean annual rainfall in the region is about 1300 - 1400 mm. The mean length of the pre-monsoon transition period in 50-60 days, of which about two-third are dry days.

The mean length of the rainfed Kharif growing period is 185-190 days over most of the region, but it exceeds 190 days in the south west. The maen length of the rabi growing period is about 120 days. The mean start and end dates are arround 5-10 October and 10 February respectively. Almost whole of the region lies in the zones with the longest cool winter period (79-100days) and the highest number of days (5-10 days) with maximum atmospheric

temperature above 40°C, which some times reaches 46°C. The mean date when minimum temperature start to fall below 20°C ranges between about end-October in the north and early days of November in the south.

Soils:

Despite the sloping relief the high Barind region has predominantly poorly drained soil similar to those of the level Barind Tract. Because of terracing, the depth of the Madhupur Caly substratum varies within fields. There is a high proportion of soils containing hard lime nodules locally known as Kankor in the region. Although five gneral soil types (UNDP/FAO-1988) occur in this region, deep grey Terrace soil constitute about 72% of the total area. Other soils types are Acid Basin Clays (1% or less), shallow red-brown terrace soils, (3%) shallow grey terrace soil (3%) and grey valley soils (16%). Of the total area, 13% area has loamy soil feature while 87% is clayey (UNDP/FAO-1988).

Deep Grey Terrace soils, which covers 72% of the high Barind Tract, are said to be intermediate in properties between the shallow grey Terrace soils and the strongly weathered Deep Grey Terrace soils. The soils are similar in the upper layer to the shallow Grey Terrace soils, but the underlying clay substratum is more strongly mottled and are more permeable. The occur extensively on level summits and slops of the rolling topography but have been terraced to hold rain water within field bunds for paddy cultivation. The topsoil is grey silt loam to silty clay loam is strongly puddled and has a compact ploughpan at the base. It is white and powdery when dry. The subsoil is grey, brightly mottled yellow brown, silt loam to silty clay and porous. At

about 50cm this grades into grey, mottled red or strong brown rather plastic clay (UNDP/FAO-1988).

The soils are strongly or very strongly acidic (pH 4.5 - .5) in the top soils and slightly acidic to neutral below (pH 6 to 7), but some subsoils are more acidic. Organic matter content is very poor (1 - 1.5%), Permeability is slow and moisture holding capacity is low in the puddled soil and ploughpan. Permeabil;ity is more rapid and moisture holding capicity is slightly higher in the subsoil and substratum because of the irrigation thickness of the loamy material over the clay substratum due to the terrace formation, as well as local variation in the depth and degree of soil weathering, moisture properties can vary on a very local scale within fields and between fields (UNDP/FAO-1988).

Ecological Hazards:

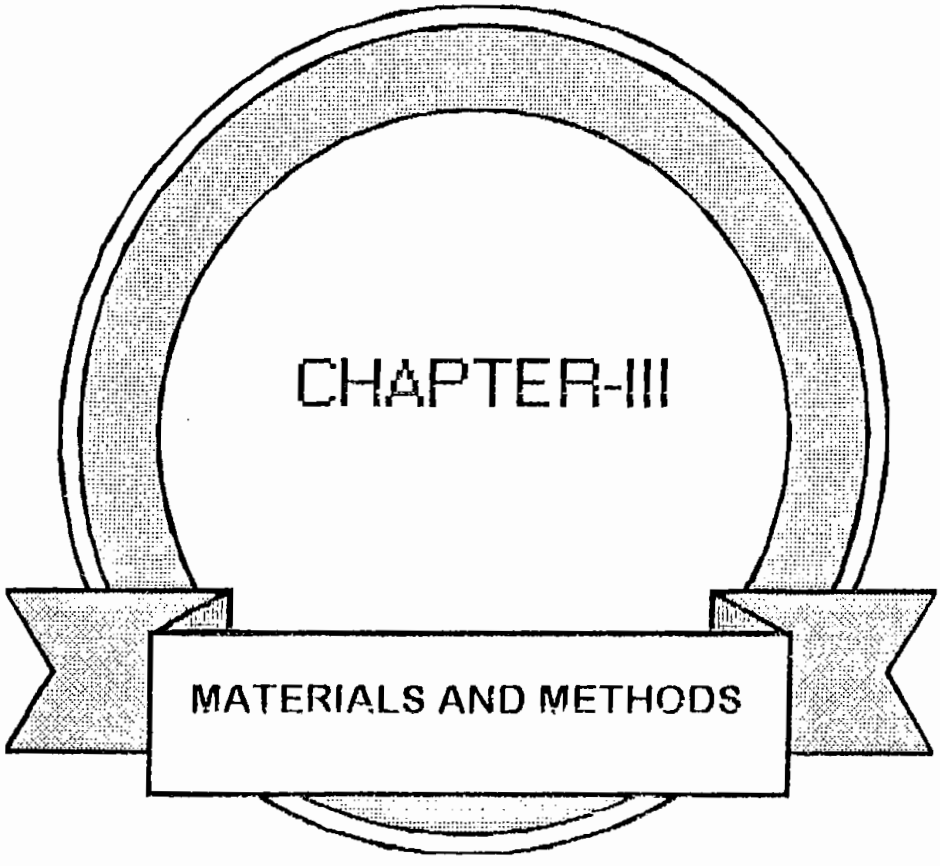
Some Ecologist claim that evidences of desertification are pronounced in the very dry soil condition in this region during the dry seasons. According to (UNDP/FAO-1988) reports, the white reflectants of the soil surface on airphotos and the satellite imagery representing dry season condition are considered to be mistaken by the ecologist. This report. says that the soils of the region are hydromorphic. Puddling of the soils for paddy cultivation in the Kharif season, leaves the topsoil dry and hard or as powdery in the dry season, and therefore bare even of weeds growth, and with a white, highly reflective, silty, residue on the surface. Under bounded paddy condition to day, the soils probably are less dessicated in the dry season, than they were in the past under natural vegitation which were known to be probably Savannah Woodland type or edaphic Savahhah types with imperfectly and poorly drained level upland

and valley soils, and thorn thicket type on sloping valley sides. Such vegetation would not only allow more run-off of rainfall over the impervious upland soils than occurs today, over bounded paddy fields, but it would also transpire more moisture from a greater soil depth than does Kharif paddy and rabi crops. According to(UNDP/FAO - 1988) reports, the present environment is neither degraded nor degrading in respect of fertility stability or productive potential, and the ecological hazards which actually exist in this region mainly due to misguided attempt of introduction of mechaniesd agriculture which distabiliges the soil; unplaned management of drainage system leaving deep gulley erosions; faulty construction of roads, dams regulators, spilways and other types of drainage systems leading to Ponding of the adjoining depression; indiscreminate use of fertilizers and their run-off leading to over fertilization of the depression damaging crops, eutrophication of water bodies, pollution of water affecting fish and other fauna; abstraction of groundwater for irrigation adversely affecting the aquifer; unplanned agroforestry development putting water stress on the crop plants. However, this report did not mention anything about the effect of Farakka on the ecological balance in the Barind and the gangetic plain in Bangladesh.

NGO activity in Agroforestry:

In the Barind Tract Swiss development corporation has been implementing village and farm forestry project since 1987. The project aimed at the increased supply of biomass fuel through growing trees in the homesteads and crop fields. The tree species planted in the private crop fields farmers included :

Acacia auriculiformis (Akasmoni), A. albida (Albida), Terminalia arjuna (arjun), Acacia nilotica (babla), Terminalia belerica (bahera), Crataeva religiosa (barun), Ficus bengalensis, (Bot), Calliandra callorthysus (Cacallianda), Gmelina arborca (gamar), Glivicida sapium(gliriciden), Melia azadirachta (ghora neem), Barringtonia acutangula (hijal), Leucaena leucocephala (ipil ipil), Engenia jambolana (jam) Lagerstoemia speciosa (jamrul), Casuarina equisetifolia (Jham), Trema orientalis (jhingi) Anthocephalus chinensis (kadam), Acacia catechu (khoir) A. mangium (mangium), Cassia siamea (Minjiri), Praserianthus falcataria (molucca koroi), Cocos nucifera (narikel), Azaderachta indica (neem), Paulonia sp., Trewia nudiflora (pitali), Samanea saman (raintree), Albizzia procera (sil koroi) Bombax ciba (shimul) Dalbergia sissoo (sisu), Albizzia chinencis (chaka koroi), Tamarindus indica (tetul) etc. in high and low lands (Swiss Development Corporation - 1994).


CHAPTER-III
MATERIALS AND METHODS

MATERIALS AND METHODS

The study area:

In the high Barind area three study spots were chosen for the scheduled study (Map -3). These spots were named as site A, site B and site C.

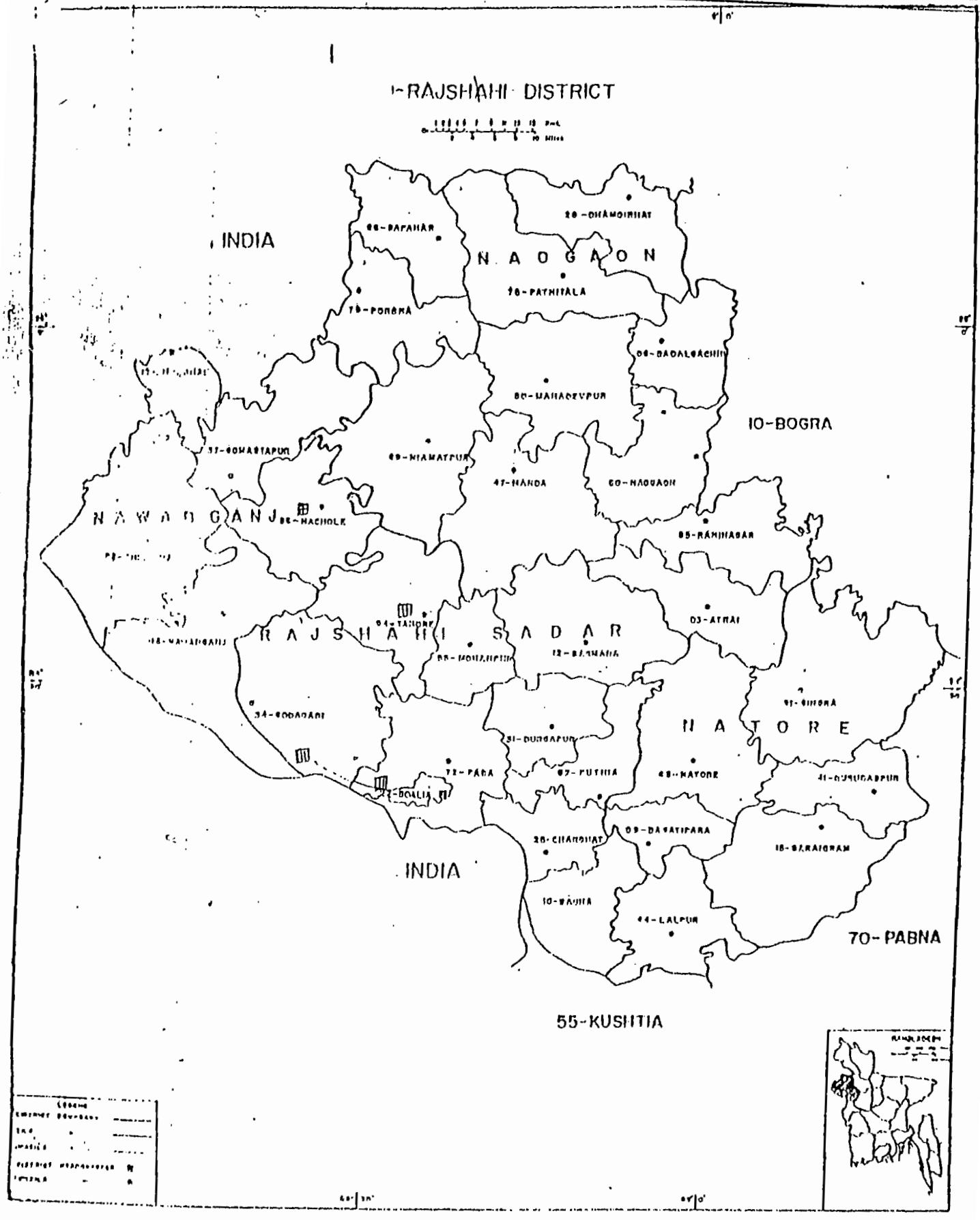
Site A: (Map -3)

This study area lies at the western outskirt of Rajshahi City which stretches from Horogram to Godagari (Zero point to 18 km from Rajshahi Court). The collection site was chosen along the Rajshahi - Nawabganj high way for the convenience of study.

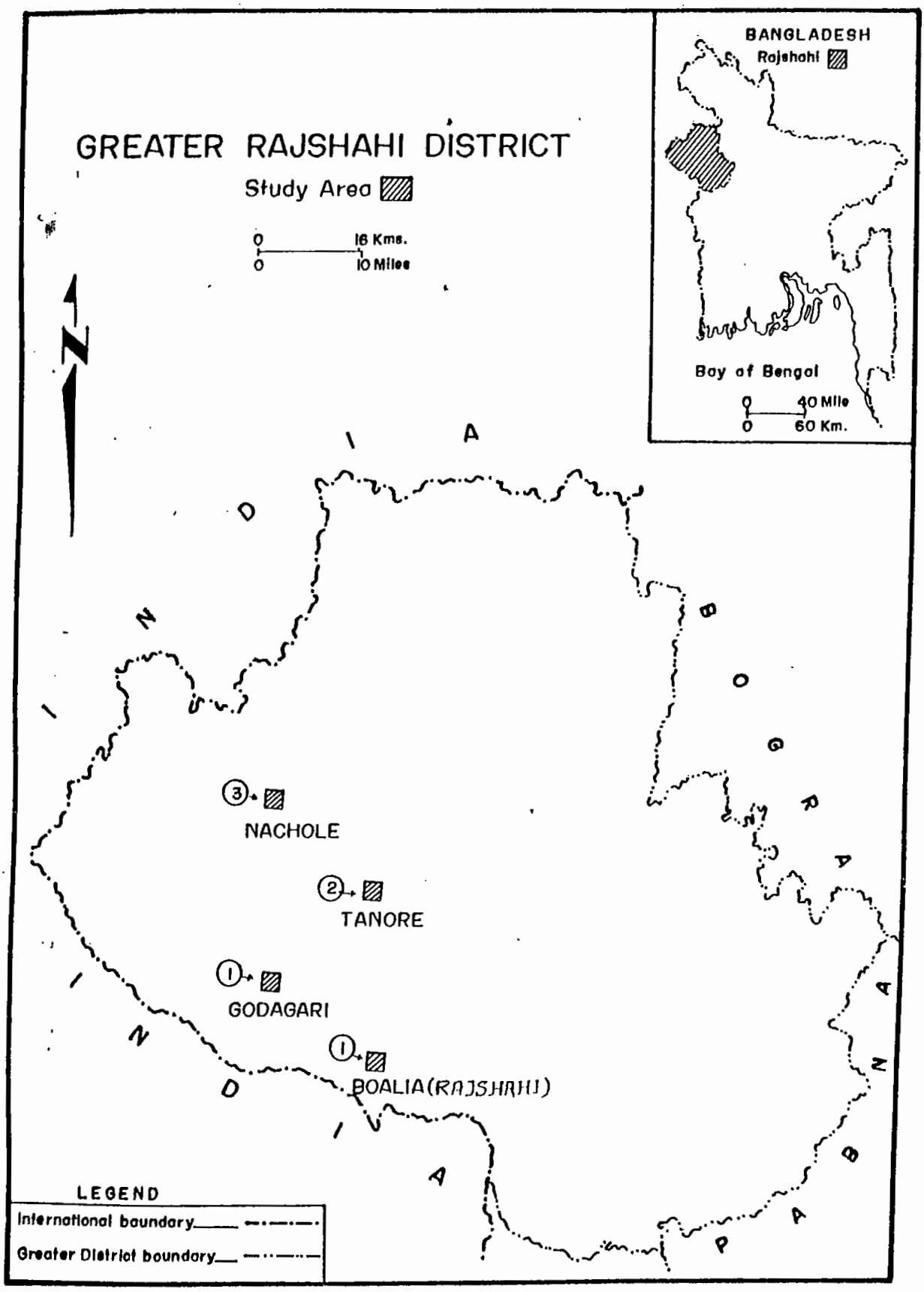
This site is situated on the fringe of the High Barind Tract, and consists of undulated land on the north side of the high way with a long and narrow strip of plain land in between. On the south side of the high way; is situated the sands of dry Padma.

Site B: (Map - 3)

Site B is situated at a place near Tanore thana. 40 km west of Rajshahi City. This place is situated at the middle of the high Barind Tract and consists of undulated land with deep depressions or valleys. The valleys provide vegetations in the gully which is subjected to heavy erosion during the rains. The rain water flows through these depressions which acts as temporary stream channel. These stream channel sides as well as cultivable and fallow lands were chosen for the purpose of studying the vegetation and estimation


1-RAJSHAHI DISTRICT
INDIA
NAOGAON
10-BOGRA
NAWABGANJ
RAJSHAHI SADAR
NATORE
INDIA
70-PABNA
55-KUSHTIA

MAP 3


GREATER RAJSHAHI DISTRICT
Study Area
0 16 Kms.
0 10 Miles
N
BANGLADESH
Rajshahi
Bay of Bengal
0 40 Mile
0 60 Km.
INDIA
BOGRA
PABNA
NACHOLE
TANORE
GODAGARI
BOALIA(RAJSHAHI)
LEGEND
International boundary
Greater District boundary

MAP 4

of the physico-chemical conditions of the soil. This study area is connected with Rajshahi by metalled road.

Site C: (Map - 3).

This site is situated at Nachole -a thana about 70 Km from Rajshahi City. The topography is similar to that of site - B,. This study spot is also situated at the central region of the High Barind Tract and is connected with Rajshahi City by metalled road. Cultivated fields (without standing crop), fallow lands and gully vegetation were studied for the purpose of the present research.

Field trips were made at one month interval for the study of vegetation and collection of the plant materials from the three study sites. As the study sites were many killo meters away from Rajshahi City, sampling on each site was conducted on consecutive days. Generally the three sites were visited on the 14th, 15th and 16th day of each month during the study period.

The physico - chemical condition:

The physico-chemical condition were also estimated following standard analytical methods. Some of the analysis were done on the spot while others were presented in the plant physiology Laboratory, Department of Botany, Rajshahi University. Herbarium sheets of collected plant materials were made properly and some of the specimen were preserved in FAA (Jahamsen - 1940) for microscopic and floral studies. Fresh materials were examined immediately after collection and identification was made following standard literature. (Prain, 1903 etc.). The phytosociological data were presented in a

number of tables and charts which included the number of plants, frequency, density, abundance and IVI values of plant population at different sites; the mean and standard deviation of quantitative characters and Jaccards community Co-efficient (J.C.C.) and the co-efficient of similarities (C.S.). A check list of the collected plants (herbs) with adequate citations of literature and place and time of occurrence have been presented.

Phytosociological investigation:

Determination of minimal area: As a pre-requisite for proper survey of any plant community, it is essential to determine the appropriate size of the quadrate to be used there. The purpose is to know the minimum size that may include the maximum number of species . Braun Blanquet (1932), Oosting (1956), Misra and Puri (1954) and many other prominent Ecologists had used species/area curve for determine the suitable area of the quadrate. In this study sampling was done by using a geometric system of nested plots (Vestal 1949). In this case plots of different sizes were plotted on vertical axis (0-Y) against the gradually increasing sample sizes on the horizontal axis (0-X axis). The desirable minimal quadrate size was determined by locating a point on the curve where the line took horizontal course and by joining it to the line axis of the sample size. The joining point indicated the minimal size of the quadrate. During this study, the determined minimal area of 10M x 10M and this size was used throughout the period of investigation.

Sampling of vegetation: In each site 3 quadrates each 1M x 1M. were taken at random with the help of measuring tape. In each of the quadrates individual number of herbs belonging to each of the species met with was

recorded. The herb species were recorded in the working sheets. Unidentified plant species were also collected for herbarium identification. The phytosociological data were collected and recorded from all the 3 sites at regular intervals.

Treatment of the phytosociolog' 'ata:

The phytosociological cha: an individual grouped in two categories eg. quantitative and qualitative. Quantitative characters obtained by quadrate : methods, indicate number of individuals, their sizes and the space they occupy. There are two sets of quadratitative characters, viz. analytic and synthetic. In this work both analytic and synthetic characters were considered (Oosting 1954)

a) The analytic phytosociological attributes viz. frequency relative frequency, density, relative density, abundance, relative abundance and Important value index (IVI) of the plant species involved were calculating by using the following formula:

$$\text{Frequency} = \frac{\text{No. of quadrates in which species occurred}}{\text{Total no of quadrates studied}} \times 100$$

This value is an expression of the percentage of sample plots in which the species occurs and shows how widely the species concerned is distributed in the plots studied.

$$\text{Relative frequency} = \frac{\text{Frequency of the species concerned}}{\text{Total no. of quadrates taken}} \times 100$$

This value indicates the depression of species in relation to that of all other species.

$$\text{Density} = \frac{\text{Total No. of plants of the species}}{\text{Total No. of quadrates taken}}$$

Density of a species is an average value indicating the number of individual of that species per quadrate. It is an absolute expression and when combined with frequency it becomes a useful value (Oosting, 1956).

$$\text{Relative density} = \frac{\text{Total No. of individuals of a species}}{\text{Total number of individuals of all species.}} \times 100$$

It is the number of individual plants of a species expressed in percentage on the basis of the total number of plants found in the plots studied. It is also called percentage abundance value (Rahman, 1984).

$$\text{Abundance} = \frac{\text{Total no. of individuals of the species in all quadrates}}{\text{No. of quadrates where the species occurred}}$$

Abundance refers actually to density of population in those quadrates in which a given species occured (Shukla and Chandal 1982).

$$\text{Relative abundance} = \frac{\text{Abundance value of a species}}{\text{Sum of the abundance values of all the species}} \times 100$$

Important value index (IVI) was determined by adding relative frequency, Relative density and relative abundance values. It is a parameter that expresses the relative status of different plant populations in the community involved. A species with higher IVI is considered as the characteristic species of the community.

b) The synthetic characters:

Jaccards Community co-efficient (J.C.C) and co-efficient of similarity (C.S) were determined by the following formula:

$$J.C.C. = \frac{c}{(a+b) - c} \times 100$$

where a = Total no. of species in a site

b= Total no. of species in another site

c= No. of common species in the pair of communities concerned

The Jaccard value (Jaccard, 1912) expressed in percentage indicates the percentage (%) number of common species between the pair of communities involved.

Community of the co-efficient: (C.S.) $\frac{2w}{(a+b)} \times 100$

Where w = Summation of the lesser values of the quantitative characters of the common species in the pair of communities involved.

a = Total of the quantitative characters of the species of one community

b = Total of the quantitative character of the species of another community (Oosting 1952)

The C.S. value (Kershaw, 1967) expressed in percentage gives the % of similarity of the considered quantitative character of the common species between the pair of communities. The total no. of possible pair for comparison in three as shown under J.C.C. The C.S. values were determined by using frequency.

Physico-chemical investigation:

Collection of Soil samples: The soil samples were collected from each of the threesites. These samples were obtained from a 0 - 12cm depth and they were put into separate polythene bags. These samples were then mixed together and taken to the laboratory and used for determining percentage of soil moisture content, field capacity PO_4 content and pH values.

Laboratory analysis

1. Determination of soil moisture content: During the study period soil moisture (SM) fluctuation in each of the sites were determined for calculating the percentage of SM on oven dry weight basis (Mac lean & Cook 1957) three samples were collected in each month at regular intervals and the average value was considered for the month.

About 200gm of soil was put in the oven and kept for 48 hours at 105°C - 110°C. After this period the samples were taken out and re-weighed. Then the percentage of soil moisture was calculated out with the following formula:

$$\text{Soil moisture (SM)} \quad \frac{F-D}{D} \times 100$$

Where F = Fresh weight
D = Dry weight

2. Determination of field capacity (%) of soil:

Soil samples were collected from each of the sites (A, B and C) and put in some hollow iron cylinder with perforated lower caps and non-

perforated upper caps. Before putting soils the upper cap was removed and pores of the lower cap were blocked by filter paper. So that the soil can not be leaked through the pores. The cylinder with the soil was then kept in a water bath for 24 hours. After that it was removed from the water bath and drainage was allowed by covering the upper surface with the non-perforated upper cap. After the drainage was completed the upper cap was removed and the weight of the soil with the iron cylinder was taken quickly and then the sample was placed in an oven and maintained at 105°C for 48 hours. The weight of the oven dried soil together with the cyliner was then taken. Then the percentage of field capacity was calculated out with the following formula:

$$\text{Field capacity (\%)} = \frac{W_1 - W_2}{W_2 - W_3} \times 100$$

where W_1= The weight of the soil at field capacity with the iron cylinder

W_2 = Oven dry weight of the soil with the cylinder

W_3 = Weight of the cylinder

3. Determination of soil pII:

Approximately 20gm air dried soil was taken in a cleaned and dried 150 ml beaker and 50ml distilled water was added. The contents were thoroughly stirred with a glass rod for half an hour. Then pH of the suspension was determined with the help of a pH meter (Model-HANNA Instruments).

The pII meter was calibrated with a buffer solution (pII 7.0 at 26-28°C). The combined electrode was washed well with distilled water and dried by soft tissue paper. Then the electrode was inserted into buffer solution

(pH - 7.0) and the meter was adjusted at 7.0 . After the calibration the combined electrode was taken out and washed properly with distilled water. The electrode was inserted into the soil suspension upto a depth of 2cm.. So that the electrode could not touch the bottom of the beaker and kept for two minutes and the reading was recorded from the pH meter.

Determination of mobile phosphate in soil.

Method of Kursanov : Procedure: 5gm air dried soil sample was taken into a 100 ml conical flask, and added 25ml 0.2N solution of HCL by a pipette . The content of the conical flask is then shaken for one minute and is filtrated. 5 ml of the filtrate was taken into a test tube and 5ml of the reagent B is added.

Reagent A and B:

100 ml of distilled water is boiled and then is added 10 gms chemically pure ammonium molybdate and dissolved well. The warm solution is filtrated, cooled and then 200ml strong HCL (specific gravity 1.19) and100 ml distilled water. The reagent was preserved in a coloured bottle. Before use the reagent is diluted in distilled water to 5 times (1 part reagent 4 part distilled water). The diluted reagent thus obtained is the reagent B).

The content is shaken 20 to 30 seconds by a stirer made of "Tin" till blue colour appears until no further deepening of the colouration (in the end point of the reaction).

The colour is formed due to the formation of a complex compound of phosphoric acid and oxidation of molyhdenum (in the HCl acid medium).

$(MoO_2.\ 4MoO_3)_2.H_3PO_4.\ 4H_20.$

The tin stick is washed by distilled water and is dried by blotting paper, The experimental sample thus obtained is compared with the scale made of known conc. H_3PO_4. If the P_2O_5 content seems to be more than what the scale indicates then 10 ml. of the filtrate and 40 ml. of 0.2N HCl are taken into a 50

ml. volumetric flask. After mixing these two ingradiants, 5 ml is taken and mixed with 5 ml. of the reagent B and is then stired with the tin stick . It was then compared with scale.

Preparation of scale:

0.2423g. chemically pure $CaHP0_4.2H_20$ when dissolved in 1 litre of 0.2NHCl (Reagent 3) then 1 ml of the solution contains 0.1 mg P_20_5.

In 12 volumetric flasks (100 ml) the reagent B is poured one after another on the basis of scales shown on the table. Then the remaining empty portion of the flask is filled up by pouring 0.1N. IIcl (reagent 5) . From each flask 5 ml of the well mixed solution, is taken to the corres ponding test tube and in each of the test tubes 5 ml. of reagent B is added and stirred for 20-30 seconds by the tin stirer.

Reagent 5 : Preparation of 0.1NIICl.

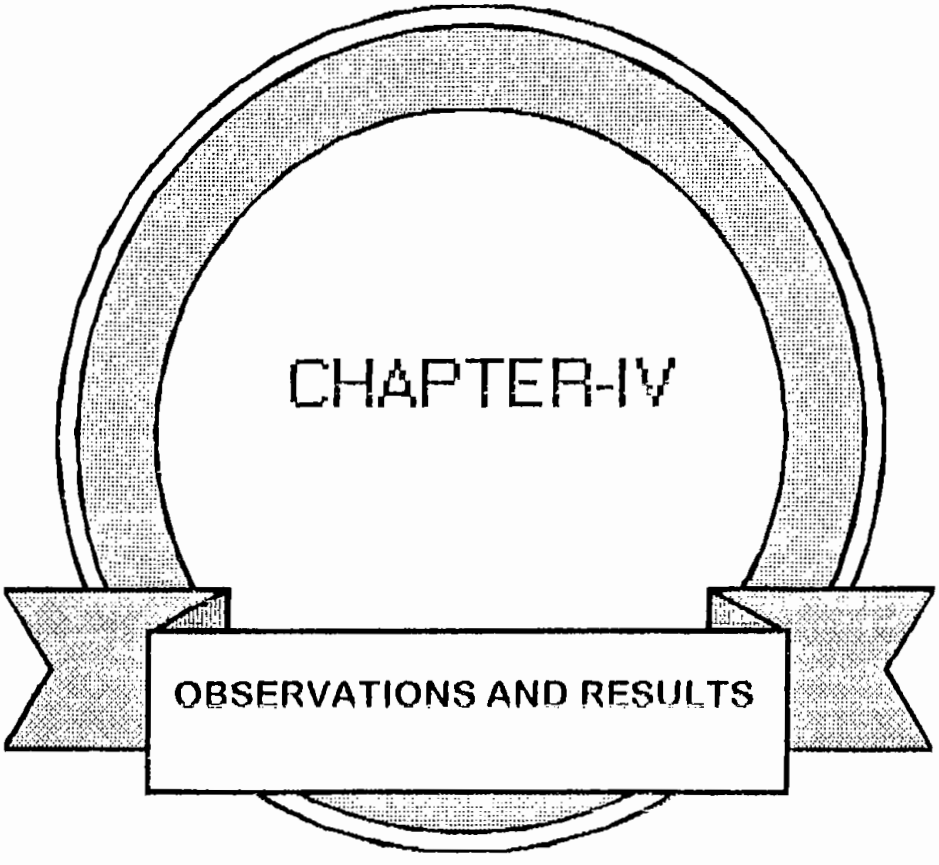
8.2 ml HCl(Specific gravity 1.19) + distilled water to make 1000 cc.

Reagent 3 : Preparation of 0.2NHCl

16.4 ml Hcl (Specific gravity 1.19) + distilled water to make 1000 cc.

Preparation scale of phosphate solution (According to Kursanov)

	No. of measuring flasks (100 ml capacity)											
Observations	1	2	3	4	5	6	7	8	9	10	11	12
Quantity of $CaHPO_4.2H_2O$ in the solution taken in ml	2.5	5	7.5	10.0	12.5	15.0	17.5	20.0	25.0	30.0	40.0	50.0
P_2O_5 content in mg in the 100 ml measuring flask containing the sample solution	0.25	0.5	0.75	1.0	1.25	1.5	1.75	2.0	2.5	3.0	4.0	5.0
P_2O_5 content (mg) in 5ml solution taken in the test tube corresponds to the 1g of soil sample solution.	0.0125	0.025	0.0375	0.05	0.0625	0.075	0.0875	0.10	0.125	0.15	0.20	0.25
P_2O_5 content (mg) in 100g of soil sample	1.25	2.5	3.75	5.0	6.25	7.50	8.75	10.0	12.5	15.0	20.0	25.0


CHAPTER-IV
OBSERVATIONS AND RESULTS

OBSERVATIONS AND RESULTS

1. Some physical properties of the soil:

Various physical properties of soil such as moisture content, field capacity, soil pH and mobile phosphate content values have been known to be essential for the growth and development of the plants. The above mentioned properties of soil usually get changed with the change of climatic factors and other agencies. In the present study all the above mentioned properties of soil were determined from the samples collected from the three sites during May 1992 to June 1993 the results are depicted in table -1a, 1b and 1c.

a) Moisture content: (Table 1a, 1b and 1c):

The moisture content of soil was directly related to the rainfall and varied from month to month. Maximum value (29.27%) was recorded during the month of June 1993 when the rainfall was maximum (477mm) and the minimum value (3.89%) was obtained in December, 1992, when there was no rainfall. Moisture content of the soil was found to vary from site to site. But the variation was not uniform. It is observed from the analysis that site B had maximum value 29.27% (Table - 1b) and the minimum value (3.89%) was also recorded from site B. In December 1992 when there was no rainfall, the moisture content in site A was more than that is all other sites. In site A the soil moisture content ranged between 4.05%

and 24.79% (Table - 1a) in site B it ranged between 3.89% and 29.27% (Table - 1b) and in site C it ranged from 4.07% to 27.50% (Table -1c).

(b) Field capacity (Table 1a, 1b, 1c).

The field capacity (F.C.) was found to vary from site to site. The maximum value 52.65% (Table - 1a) was recorded from site A and the minimum value 32.07% (Table - 1b) from site B. It is noteworthy that site A is with relatively fine textured blakish soil and other two sites are relatively fine textured reddish soil.

(c) pH values of the soil: (Table - 1a, 1b, 1c).

The pH of the soil of different sites as shown in (Table - 1a, 1b, 1c) indicate that the soils of all sites are moderately alkaline to slightly acidic. But the values vary from site to site and also from month to month. The minimum pH value of 6.26 (Table -1b) was recorded from the soil samples collected during the month of June, 1992 at site B. The maximum pH value of 8.42 was recorded during July, 1992 at Site A (Table -1a).

(d) Mobile phosphate content of the soil: (Table 1a, 1b, 1c):

The mobile phosphate content was found to vary from site to site. The maximum value (0.05mg/gm-1) was recorded from site A and site B, (Table 1a, 1b). The minimum value (0.002mg/gm^{-1}) was recorded from site B (Table - 1b). In some cases, mobile phosphate was found to be absent soil samples in this study areas.

Table - 1 : Atmospheric temperature, relative humidity, rainfall and soil temperature are collected from the nearest Meteorological office. Rajshahi. (January 1992 - June 1993.)

Month	Temperature °C		Rainfall mm.	Relative humidity		Soil temperature °C	
,	Max.	Min.		Max.	Mini.	Max.	Min.
						30 cm depth	
January '92	27.5	7.2	Nil	100%	66%	21.0	17.2
February '92	28.5	8.5	33	97%	42%	22.0	19.2
March '92	39.5	12.6	Nil	98%	24%	28.0	21.6
April '92	42.7	17.5	12	80%	20%	33.0	26.8
May '92	40.6	18.0	122	88%	29%	34.0	28.0
June '92	39.6	22.4	85	90%	39%	34.0	30.4
July '92	36.5	23.9	249	98%	71%	32.8	28.8
August '92	36.0	23.2	186	98%	66%	32.6	29.5
September '92	35.3	21.7	124	100%	66%	32.2	28.4
October '92	34.8	15.8	29	98%	60%	30.7	27.0
November '92	32.8	13.4	01	92%	62%	27.6	23.0
December '92	26.6	7.8	Nil	100%	54%	23.4	18.7
			ΣX = 841mm				
January '93	28.8	5.2	Nil	97%	49%	20.0	16.5
February '93	34.0	7.2	05	94%	30%	24.3	19.0
March '93	37.3	11.4	55	98%	20%	26.3	21.8
April '93	39.6	17.2	70	88%	23%	31.4	24.8
May '93	39.2	19.8	65	97%	56%	33.4	27.5
June '93	37.6	22.2	477	95%	63%	33.4	28.3

Table -1a: Average soil moisture, field capacity, soil pH and mobile phosphate content at site A during the study period.

Name of the month	Soil moisture %	Field capacity %	Soil pH	Mobile phosphate content mg/gm^{-1}
May '92	16.29±1.40	43.03±1.79	7.5±0.06	0.041±0.005
June '92	13.38±0.30	46.37±0.59	7.51±0.11	0.035±0.008
July '92	20.03±1.04	44.78±1.37	8.42±0.04	0.04±0.004
August '92	18.42±1.05	42.74±0.73	8.32±0.04	0.043±0.005
September '92	11.08±0.96	51.92±1.56	7.26±0.09	0.041±0.004
October '92	8.06±0.95	46.09±0.87	7.45±0.02	0.05±0.002
November '92	6.52±1.29	48.53±2.71	8.25±0.07	0.039±0.006
December '92	4.40±2.0	45.121±1.58	7.44±0.003	0.041±0.005
January '93	4.05±0.92	52.65±1.89	8.37±0.09	0.038±0.007
February '93	5.63±1.75	47.44±2.56	7.17±0.02	0.041±0.005
March '93	7.96±0.06	48.33±0.31	7.0±0.01	0.039±0.004
April '93	9.76±0.75	49.79±1.05	7.68±0.16	0.05±0.003
May '93	7.40±0.50	47.29±2.12	7.45±0.02	0.05±0.002
June '93	24.79±0.29	42.98±2.30	8.41±0.02	0.04±0.007

$\bar{X} = 46.93 \pm 0.84$

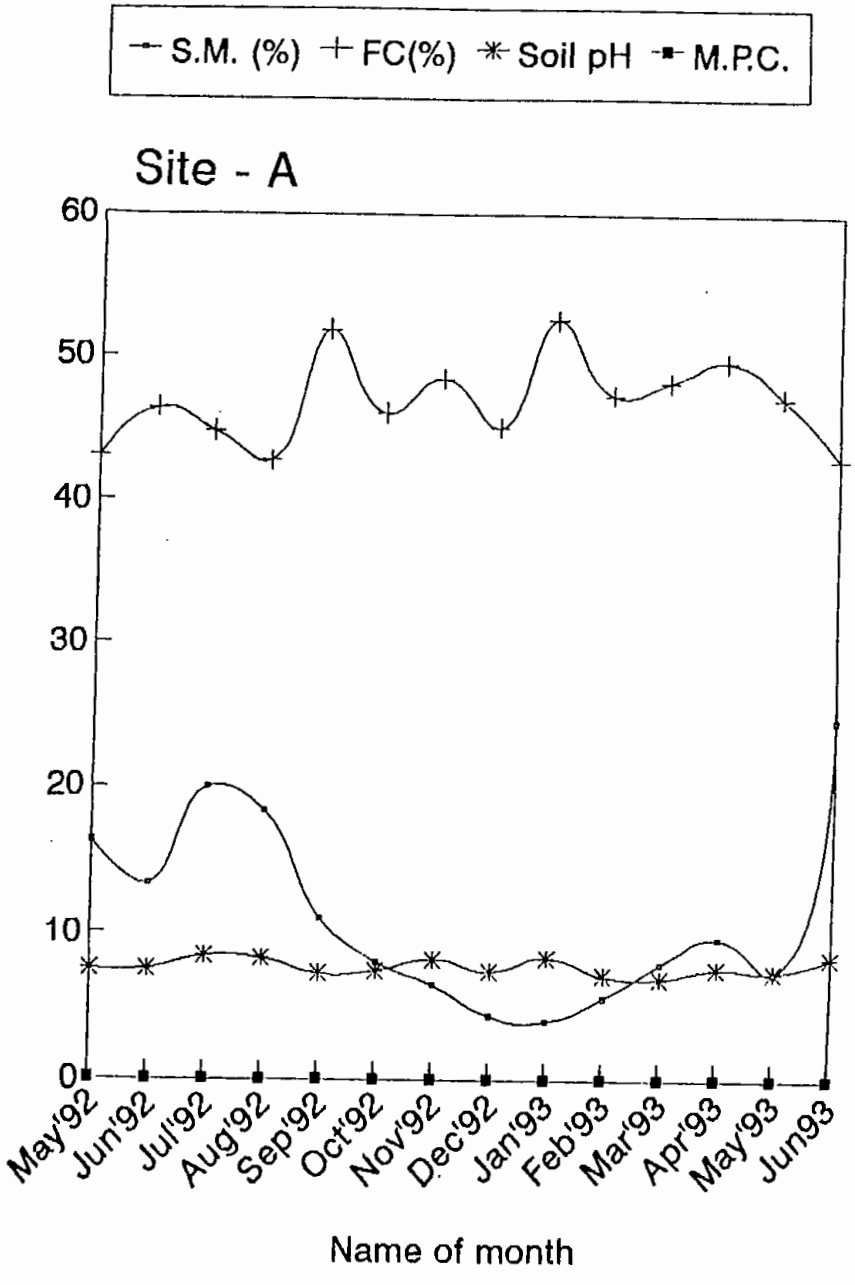

S.M. (%)
FC(%)
Soil pH
M.P.C.
Site - A
60
50
40
30
20
10
0
May'92
Jun'92
Jul'92
Aug'92
Sep'92
Oct'92
Nov'92
Dec'92
Jan'93
Feb'93
Mar'93
Apr'93
May'93
Jun93
Name of month

Table -1b: Average soil moisture, field capacity, soil pH and mobile phosphate content at site B during the study period.

Name of the month	Soil moisture %	Field capacity %	Soil pH	Mobile phosphate content mg/gm^{-1}
May '92	13.37±0.71	33.81±6.74	6.35±0.05	0.03±0.011
June '92	19.04±1.78	37.26±1.34	6.26±0.12	0.004±0.001
July '92	22.95±2.48	32.07±1.20	7.09±0.16	0.003±0.0008
August '92	16.69±2.18	35.31±1.13	6.57±0.14	0.002±0.0006
September '92	16.68±1.19	34.48±1.40	6.53±0.12	0.043±0.016
October '92	10.92±1.27	36.15±4.06	6.65±0.05	0.02±0.014
November '92	5.08±1.03	38.54±3.53	7.05±0.015	0.01±0.008
December '92	3.89±0.68	40.64±0.43	7.05±0.05	0.006±0.004
January '93	4.55±0.46	40.07±1.02	6.38±0.3	0.006±0.004
February '93	4.99±0.97	40.65±0.46	6.81±0.16	0.006±0.004
March '93	9.91±3.88	41.115±3.71	6.7±0.08	0.043±0.004
April '93	14.53±1.41	39.68±0.61	6.95±0.45	0.01±0.008
May '93	7.10±1.79	46.15±1.63	7.19±0.03	0.039±0.004
June '93	29.27±0.45	46.09±0.87	7.45±0.02	0.05±0.002

$\bar{X} = 38.72 \pm 1.13$

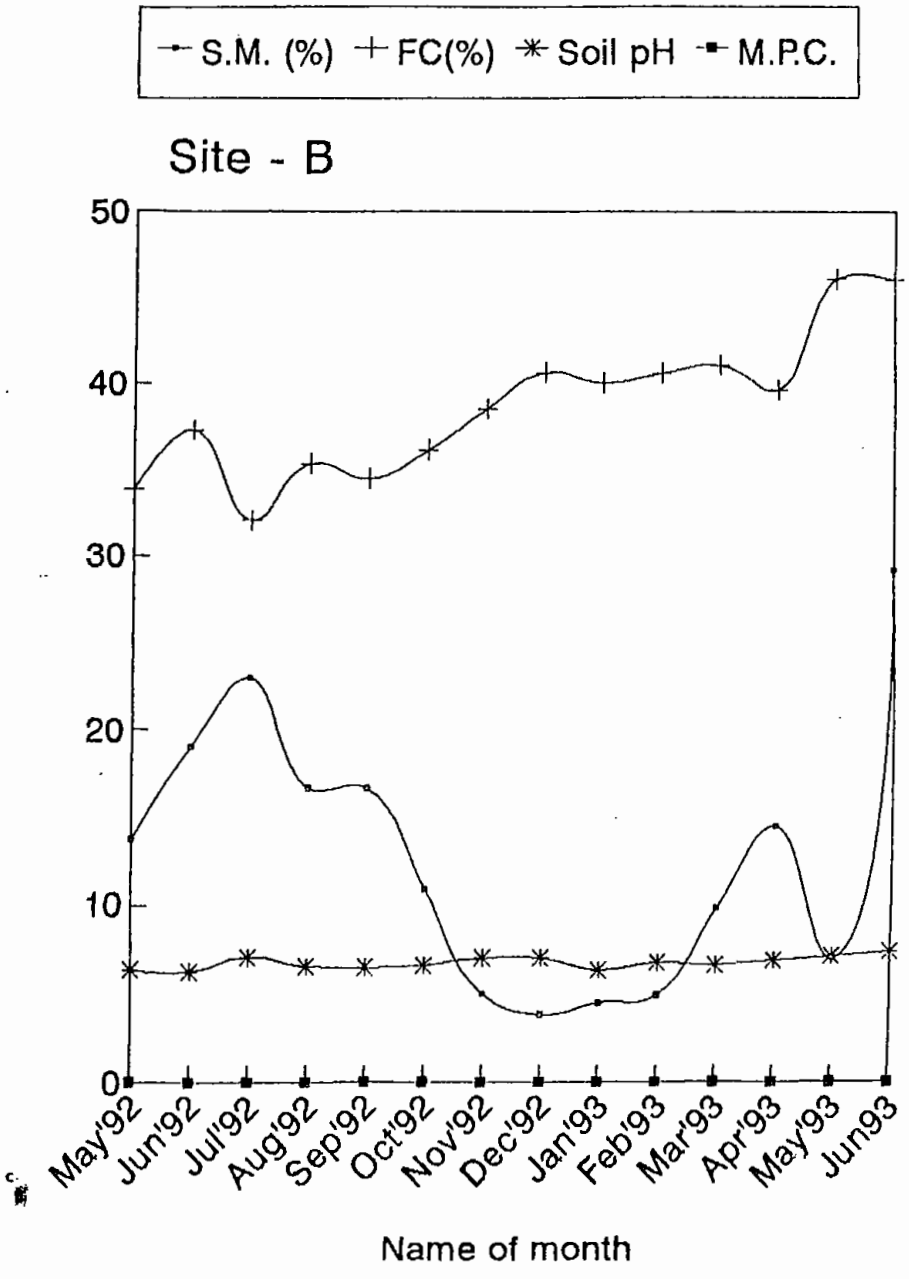
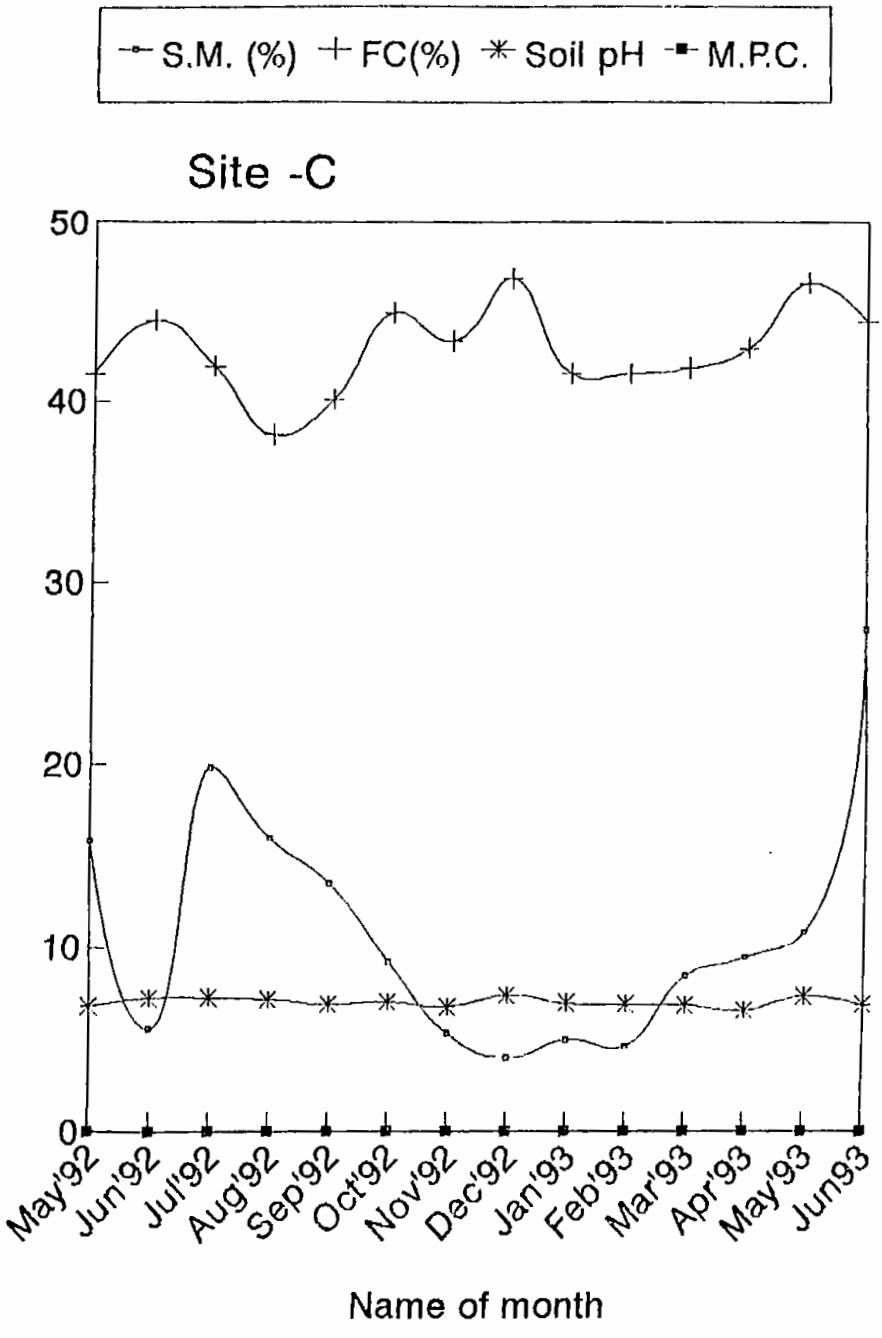

S.M. (%)
FC(%)
Soil pH
M.P.C.
Site - B
50
40
30
20
10
0
May'92
Jun'92
Jul'92
Aug'92
Sep'92
Oct'92
Nov'92
Dec'92
Jan'93
Feb'93
Mar'93
Apr'93
May'93
Jun93
Name of month

Table -1c: Average soil moisture, field capacity, soil pH and mobile phosphate content at site C during the study period.

Name of the month	Soil moisture %	Field capacity %	Soil pH	Mobile phosphate content mg/gm^{-1}
May '92	15.81±0.56	41.55±0.50	6.83±0.23	0.01±0.008
June '92	15.28±0.77	44.54±0.48	7.26±0.25	0.004±0.001
July '92	19.83±0.77	42.03±0.98	7.30±0.15	0.0025±0.00
August '92	15.99±0.93	38.19±1.67	7.21±0.19	0.01±0.008
September '92	13.51±2.5	40.18±2.11	6.96±0.06	0.006±0.004
October '92	9.29±0.65	44.99±0.66	7.10±0.09	0.006±0.003
November '92	5.41±1.55	43.45±5.40	6.83±0.15	0.006±0.003
December '92	4.07±1.19	46.89±7.04	7.47±0.07	0.0025±0.00
January '93	5.04±0.05	41.65±1.46	7.05±0.35	0.01±0.008
February '93	4.69±0.67	41.65±1.45	7.0±0.35	0.006±0.003
March '93	8.55±2.05	41.99±2.93	6.95±0.05	0.01±0.008
April '93	9.54±2.26	43.06±3.12	6.67±0.18	0.006±0.003
May '93	10.99±1.54	46.64±1.68	7.43±0.19	0.005±0.0025
June '93	27.50±2.40	44.53±0.48	7.0±0.10	0.01±0.008

$\bar{X} = 42.95 \pm 0.65$


S.M. (%)
FC(%)
Soil pH
M.P.C.
Site -C
50
40
30
20
10
0
May'92
Jun'92
Jul'92
Aug'92
Sep'92
Oct'92
Nov'92
Dec'92
Jan'93
Feb'93
Mar'93
Apr'93
May'93
Jun93
Name of month

Check List Of The Genera And Species Of The Studied Plants

During the present investigation a total of 127 genera and 140 species of herbaceous plants were collected from three study spots, of which 105 genera and 111 species belonged to Dicotyledons and 22 genera and 29 species to Monocotyledons and 1 genus , 1 species of Fern. The identification of all the taxa were made following standard literature. A check list of the studied plants is furnished with adequate citations and places of occurrence.

FAMILY : GRAMINEAE

1. *Cynodon dactylon* Pers ;
   F.B.I. vii 288; E.D.C. 2558
   Prain, 1903; 925 V-II
   Locality : Horograme, Nachole, Tanore; Kazipara, Baganpara - Godagari .
   Occurrence : Whole year

2. *Oryza stiva* Linn;
   F.I. ii. 200; F.B.I. vii. 92 ; E.D.O. 258
   Prain, 1903; 891 Vol-II
   Locality : Horograme, Nachole, Tanore; Kaziara, Baganpara - Godagari .
   Occurrence : November

3. *Imperata* arundinacea Cyril ;
   F.B.I. vii 106; E.D.I. 51
   Prain, 1403. 894. Vol II
   Locality : Nachole, Tanore, Horograme, Kazipara, Baganpara. - Godagari .
   Occurrence : Whole year

4. *Oryza sativa* var *fatua* Linn
   Prain, 1903. 891. Vol-II.
   Locality : Kazipara - Godagari .
   Occurrence - October to December

5. *Panicum indicum* Linn ;
F.I. · i. 281; F.B.I. vii. 41; Prain. 1903; 887; Vol-II.
Locality : Tanore.
Occurrence : October

6. Panicum stagninum Trim;
F.I. i. 295
Prain. 1903, 886; Vol-II
Locality : Tanore
Occurrence : October

7. *Panicum repens* . Linn
F.B.I vii- 49. P rain, 1903; 888; Vol-II
Locality : Kazipara- Godagari .
Occurrence : Octover

8. Panicum atrosasijuineum. Linn
Prain, 1903; 833. Vol-II.
Locality : Kazipara - Godagari .

9. *Eleusine aegyptiaca.* Desf.;
F.I.i. 344; F.B.I vii 295; E.D.E. 166;
Parin, 1903, 927; Vol-II
Locality : Tanore .
Occurrence : October

10. *Eleusine verticillata*, Roxb;
F.I. i. 346; F.B.I. vii. 295; E.D.E. 190
Prain, 1903. Page-927; V. II
Locality : Tanore.
Occurrence : October

11. *Paspalum Orbiculare*. Linn
Prain, 1903,890 Vol-II
Locality : Tanore; Kazipara- Godagari
Occurrence : Octobcr

12. *Eragrostis sp.* Beauv
Locality : Tanore
Occurrence : October

13. *Eragrostis ferruginea* Beauv.
Prain, 1903; 919. V. II
Locality : Tanore.
Occurrence : October

14. *Setaria verticillata.* Beauv.
F.B.I. vii. 80; E.D.S. 1223
Prain, 1903, 881; V-II
Locality - Tanore.
Occurrence : October

15. *Andropogon aciculatus.* Retz
F.I.i 262; F.B.I. vii. 188; E.D.A. 1073
Prain, 1903, 907; Vol-II
Locality : Tanore.
Occurrence : October

16. *Leersia hexandra.* SW;
F.B.I. vii. 94; E.D.L. 247
Prain, 1903, 892, Vol-II
Locality : Tanore; Kazipara- Godagari.
Occurrence : October

17. *Hygrorhiza aristata.* Nees;
F.B.I. vii. 95; E.D.H. 513
Prain, 1903. 892. Vol-II
Locality : Tanore.
Occurrence : October

18. Phragmites karka. Trin.; F.B.I. vii. 304
Prain. 1903; 919; Vol-II
Locality : Tanore.
Occurrence : October

19. *Eragrostis gangetica.* Steud
Prain, 1903; 921; Vol-II
Locality : Tanore.
Occurrence : October

20. *Andropogon squarrosus.* Linnf;
F.B.I. vii. 186
Prain. 1903, 907; Vol-II
Locality : Kazipara - Godagari .
Occurrence : October

21. *Oplismenus burmanni.* Beauv; F.B.I. vii. 68
Prain, 1903; 883; Vol-II
Locality : Kazipara - Godagari .
Occurrence : October

22. *Vossia cuspidata.* Griff.
Prain, 1903; 899; Vol-II
Locality : Tanore.
Occurrence : October

23. Poa sp.
Locality : Horograme, Tanore, Nachole, Kazipara - Godagari .
Occurrence : Whole year

FAMILY : COMPOSITAE

1. *Eclipta alba* Hassk;
F.B.I. iii. 304; E.D.E. 7.
Prain. 1903. 448. Vol-I
Locality : Horograme; Tanore; Nachole; Baganpara; Kazipara - Godagari
Occurrence : Whole year

2. *Eclipta Prostrata.* Hassk;
F.I. iii. 438
Prain, 1903; 448; Vol-I
Locality :, Tanore, Nachole Horograme; Baganpara, Kazipara - Godagari
Occurrence : Whole year

3. *Launea asplenifolia* Hook.f;
F.B.I. iii. 415; E.D.L. 110
Prain. 1903; 464; Vol-I
Locality : Horograme, Tanore, Nachol; Baganpara, Kazipara - Godagari
Occurrence : Whole year

4. *Gnaphalium indicum.* Linn
F.B.I. iii. 289
Prain. 1903. 442. Vol-II
Locality : Horograme,Tanore, Nachol; Baganpara, Kazipara - Godagari
Occurrence : December

5. *Sphaeranthus indicus.* Linn;
F.B.I. iii. 275; E.D.S. 2518.
Prain, 1903. 441; Vol-I
Locality : Kazipara - Godagari .
Occurrence : Whole year

6. *Xanthium indicum.* Linn
Prain, 1903. 446; Vol-I
Locality : Kazipara, Baganpara - Godagari .
Occurrence : April

7. *Cotula hemisphaerica.* Wall;
F.B.I. iii. 316
Prain, 1903; 456; Vol-I
Locality : Kazipara -Godagari.
Occurrence : December

8. *Blumea lacera* . DC;
F.B.I. iii. 263; E.D.B. 546
Prain, 1903; 438; Vol-I
Locality : Tanore, Nachole, Horograme; Kazipara, Baganpara - Godagari .
Occurrence - October to January

9. *Vernonia cinerea*. Less
F.B.I. iii. 233; E.D.V. 79
Prain, 1903, 432; Vol-I
Locality : Tanore, Nachole, Horograme; Kazipara, Baganpara - Godagari .
Occurrence : October to January

10. *Eupatorium odoratum*. linn;
F.B.I. iii. 244
Prain, 1903, 434; Vol-I
Locality : Baganpara, Kazipara - Godagari .
Occurrence : March

11. *Grangea mederaspatana*. Poir.
F.B.I. iii. 247; E.D.G. 660
Prain. 1903, 435; Vol-I
Locality : Baganpara - Godagari .
Occurrence : Whole year

12. *Cnicus arvensis*. Hoffm;
F.B.I. iii. 362; E.D.C. 1412
Prain, 1903; 458, Vol-I
Locality : Baganpara - Godagari .
Occurrence : March

13. *Tridax procumbens*. Linn
F.B.I. iii. 311
Prain, 1903, 455, Vol-I
Locality : Tanore; Kazipara, Baganpara - Godagari .
Occurrence : April

14. *Sonchus asper.* Vill;
F.B.I. iii. 414
Prain. 1903, 463; Vol-I
Locality : Horograme,Tanore, Nachole .
Occurrence : January to June

15. *Mikania scandens.* Willd.;
F.B.I. iii. 244
Prain, 1903, 434, Vol-I
Locality : Horograme, Tanore, Nachole.
Occurrence : Whole year

FAMILY : EUPHORBIACEAE

1. *Euphorbia zornioides* Boiss;
F.B.I. v. 246
Prain, 1903, 691; Vol-II
Locality : Kazipara, Baganpara - Godagari .
Occurrence : Whole year

2. *Euphorbia thymifolia.* Burm;
F.I. ii. 473; F.B.I. v. 252; E.D.E. 549
Prain. 1903, 692; Vol-II
Locality : Tanore, Nachole,Horograme, Baganpara, Kazipara - Godagari
Occurrence : Whole Year

3. *Euphorbia hirta.* Linn.
Prain, 1903. 689; Vol-II.
Locality : Tanore, Nachole,Horograme, Baganpara, Kazipara - Godagari
Occurrence : Whole year

4. *Acalypha indica.* Linn;
F.I. iii. 675; F.B.I. v. 416; E.D.A. 306
Prain. 1903, 710; Vol-II
Locality : Horograme; Tanore, Nachole, Baganpara, Kazipara - Godagari .
Occurrence : Whole year

5. *Chrozophora plicata.* A. Juss;
F.B.I. v. 409; E.D.C. 2211
Prain, 1903, 708; Vol-II
Locality : Horograme, Tanore, Nachole, Baganpara, Kazipara - Godagari .
Occurrence : Whole Year

6. *Croton sp.*
Locality : Horograme; Tanore, Nachole, Baganpara, Kazipara - Godagari .
Occurrence : Whole year

7. *Phyllanthus reticulatus* (Seedling). Poir;
F.B.I. v. 288; E.D.P. 663.
Prain. 1903, 700; Vol-II.
Locality : Horograme; Tanore, Nachole, Baganpara, Kazipara - Godagari .
Occurrence : Whole year

8. *Phyllanthus urinaria.* Linn.
F.I. iii. 660; F.B.I. v. 293; E.D.P. 673
Prain. 1903, 701; Vol-II
Locality : Kazipara, Baganpara - Godagari .
Occurrence : Whole Year

FAMILY : AMARANTACEAE

1. *Amaranthus gangeticus.* Linn;
F.I. iii 616; F.B.I. iv. 719; E.D.A. 927
Prain, 1903, 650; Vol-II
Locality : Horograme; Tanore, Nachole.
Occurrence : Whole year.

2. *Amaranthus spinosus.* Linn;
F.I. iii. 611; F.B.I. iv. 718; E.D.A. 943.
Prain. 1903, 650; Vol-II
Locality : Horogrami; Tanore, Nachol; Kazipara, Baganpara - Godagari
Occurrence : Whole year

3. *Amaranthus viridis.* Linn;
F.I. iii. 605, F.B.I. iv. 720; E.D.A. 953
Prain. 1903, 651; Vol-II
Locality : Horogrami, Tanore, Nachol; Kazipara, Baganpara - Godagari
Occurrence : Whole year

4. *Alternenthera sessilis.* R.Br.
F.B.I. iv. 731; E.D.A. 877.
Prain. 1903, 655; Vol-II
Locality : Horogrami. Tanore, Nachol; Kazipara, Baganpara - Godagari
Occurrence : Whole year

5. *Achyranthes aspera.* Linn.;
F.I. i. 672; F.B.I. iv. 730; E.D.A. 382
Prain. 1903, 654; Vol-II
Locality : Horogrami Tanore, Nachol; Kazipara, Baganpara - Godagari
Occurrence : Whole year

6. *Psilotrichum ferrugineum.* Moq;
F.B.I. iv. 725, 652; Vol-II
Prain. 1903, 653, V-II.
Locality: Horogram, Tanore, Nachole; Kazipara, Bagarpara - Godagari
Occurrence : Whole year

FAMILY : ACANTHACEAE

1. *Rungia pectinata.* Nees.;
F.B.I. iv. 550; E.D.R. 656
Prain. 1903, 613; Vol-II
Locality : Kazipara - Godagari .
Occurrence : Whole year

2. *Gusticia simplex.* Don.;
F.B.I. iv. 539
Prain. 1903, 610, Vol-II
Locality : Kazipara
Occurrence : April, May, June

3. *Nelsonia campestris.* R.Br.;
F.B.I. iv. 394
Prain, 1903, 594; Vol-II
Locality : Kazipara - Godagari
Occurrence : December

4. *Hemigraphis hirta.* T. And;
F.B.I. iv. 422
Prain, 1903, 600; Vol-II
Locality : Kazipara - Godagari
Occurrence : May

FAMILY : ANONACEAE

1. *Anona reticulata* Linn;
F.I. ii. 657; F.B.I. i. 78; E.D.A. 1158
Prain. 1903, 134; Vol-I
Locality : Horograme, Tanore, Nachol, Kazipara, Baganpara - Godagari
Occurrence : Whole year

2. *Anona squamosa* (Seedling). Linn;
F.I. ii. 657; F.B.I. i. 78; E.D.A. 1166.
Prain. 1903. 134; Vol-I
Locality : Horograme, Tanore, Nachole.
Occurrence : Whole year

FAMILY : ANACARDIACEAE.

1. *Mangifera indica* (Seedling). Linn;
F.I. i. 641; F.B.I. ii. 13, E.D.M. 147
Prain. 1903, 248; Vol-I
Locality : Horograme, Tanore, Nachole.
Occurrence : Whole year

FAMILY : AROIDEAE

1. *Colocasia esculenta* Linn.
Prain 1903, 837 V.II
Locality : Horograme, Tanore, Nachole.
Occurrence : Whole year

FAMILY : CUCURBITACEAE

1. *Mukia medaraspatana* Arn.
Prain. 1903., 383; Vol-I
Locality : Horograme, Tanore, Nachole Kazipara, Baganpara - Godagari.
Occurrence : Whole year

2. *Mukia scabrella.* Arn
F.B.I. ii. 623; E.D.M. 791
Prain, 1903. 383; Vol-I
Locality : Kazipara, Baganpara - Godagari.
Occurrence : Whole year

3. *Cucurbita sp.*
Locality : Horograme, Tanore, Nachole.
Occurrence : July to December

4. *Lagenaria vulgris.* Ser;
F.B.I. ii. 613; E.D.L. 30.
Prain. 1903, 378; Vol-I
Locality : Horograme, Tanore, Nachole.
Occurence : July to December

5. *Cephalandra indica.* Naud;
F.B.I. ii. 621; E.D.C. 919
Prain. 1903, 381; Vol-I
Locality : Horograme, Tanore, Nachok, Baganpara, Kazipara - Godagari
Occurrence : Whole year

FAMILY : LEGUMINOSAE

1. *Melilotus alba* Lamk.
F.B.I. ii. 89
Prain. 1903, 295; Vol-I
Locality : Horograme, Tanore, Nachole.
Occurrence : January to March

2. *Melilotus indica* All.
Prain. 1903, 295; Vol-I
Locality : Horograme, Tanore, Nachole.

3. *Ervum sp.*
Locality : Horogram, Tanore, Nachole.
Occurrence : Whole year

4. *Lens esculenta.* Moench;
E.D.L. 252
Prain. 1903, 260; Vol-I
Locality : Horograme, Tanore, Nachok, Kazipara, Baganpara - Godagari.
Occurrence : December

5. *Cajanus indicus* (Seedling). Spreng.
F.B.I. ii. 217; E.D.C. 49
Prain. 1903, 272; Vol-I
Locality : Horograme, Tanore, Nachok, Kazipara, Baganpara - Godagari
Occurrence : December

6. *Acacia catechu* (Seedling) Willd.;
F.B.I. ii. 295; E.D.A. 135
Prain. 1903, 330; Vol-I
Locality : Horograme, Tanore, Nachok, Kazipara, Baganpara - Godagari.
Occurrence : Whole year

7. *Dolichos lablab* (Climber) Linn;
F.B.I. ii. 209; Party
Prain, 1903, 278; Vol-I
Locality : Horograme, Tanore, Nachok, Kazipara, Baganpara - Godagari.
Occurrence : December

8. *Vicia hirsuta*. Koch;
F.B.I. ii. 177; E.D.V. 112
Prain, 1903, 260; Vol-I
Locality : Horograme, Tanore, Nachok, Kazipara, Baganpara - Godagari.
Occurrence : December

9. *Desmodium sp.*
Locality : Horograme, Tanore, Nachok, Kazipara, Baganpara - Godagari.
Occurrence : April

10. *Tamarindus indica* (Seedling). Linn;
F.I. ii. 215; F.B.I. ii 273; E.D.T. 28
Prain 1903, 320; Vol-I
Locality : Horograme, Tanore, Nachok, Kazipara, Baganpara - Godagari.
Occurrence : Whole year

11. *Alysicarpus vaginalis* DC.
F.B.I. ii. 158
Prain. 1903, 306; Vol-I
Locality : Kazipara - Godagari.
Occurrence : November

12. *Desmodium triflorum*. DC;
F.B.I. ii. 173
Prain. 1903, 303; Vol-I
Locality : Kazipara - Godagari.
Occurrence : April

13. *Vicia angustifolia* Linn;
E.D.V. 114
Prain, 1903, 259; Vol-I
Locality : Kazipara, Baganpara - Godagari .
Occurrence : January

14. *Cassia sophera* (Seedling) Linn;
F.B.I. ii. 262; E.D.C. 787
Prain, 1903, 314; Vol-I
Locality : Tanore, Horograme, Kazipara, Baganpara - Godagari .
Occurrence : Whole year

FAMILY : LYTHRACEAE

1. *Ammannia baecifera.* Linn;
F.B.I. ii. 569; E.D.A. 958
Prain. 1903.363; Vol-1
Locality: Kazipara - Godagari .
Occurrence : December

2. *Ludwigia parviflora.* Roxb.;
F.I. i. 419; F.B.I. ii. 588
Prain. 1903, 369; Vol-I
Locality : Kazipara - Godagari .
Occurrence : November

FAMILY: LABIATAE.

1. *Ocimum basilicum.* Linn;
F.I.iii.17; F.B.I. iv.608.E.D.O.18.
Prain. 1903.629.Voll-II
Locality : Kazipara, Baganpara - Godagari .
Occurrence : November

2. *Leucas aspera.* Spreng.
F.B.I. iv. 690; E.D.L. 309.
Pain. 1903, 639; Vol-II
Locality :Tanore, Nachole Horograme; Baganpara, Kazipara - Godagari .
Occurrence : Whole year

FAMILY : LILIACEAE

1. *Allium cepa.* Linn;
F.I. ii. 142; F.B.I. vi. 337; E.D.H. 769
Prain, 1903, 809; Vol-II
Locality : Horograme; Tanore, Nachole.
Occurrence : December

2. *Allium sativum* . Linn;
F.I. ii. 142; F.B.I. vi. 337; E.D.A. 779
Prain. 1903, 809; Vol-II
Locality : Tanore, Nachole Horograme .
Occurrence : December

FAMILY : LATHYRACEAE

1. *Lathyrus sativus.* Linn;
F.I. iii. 322; F.B.I. ii. 179; E.D.L. 100
Prain. 1903, 261; Vol-I
Locality : Tanore, Nachole Horograme, Kazipara, Baganpara - Godagari .
Occurrence : December

FAMILY : CONVOLVULACEAE.

1. *Evolvulus nummularius.* Linn;
Prain. 1903, 539; Vol-II
Locality : Horograme, Tanore, Nachole Kazipara, Baganpara - Godagari .
Occurrence : Whole year

2. *Ipomoea reptans*. Poir.
Prain. 1903, 547; Vol-II
Locality : Horograme, Tanore, Nachole, Kazipara, Baganpara - Godagari .
Occurrence : October

3. *Merremia tridentata* . Hallier f.
Prain. 1903, 543; Vol-II
Locality : Kazipara - Godagari .
Occurrence : November

4. *Merremia umbellata*. Hallier f.
Prain. 1903, 542; Vol-II
Locality : Kazipara - Godagari .
Occurrence : November

FAMILY : CHENOPODIACEAE

1. *Basella alba*. (climber) Linn;
Prain, 1903, 659; Vol-II
Locality : Kazipara - Godagari .
Occurrence : January

2. *Spinacia oleracea*. Linn
F.B.I. V. 6
Prain. 1903, 658; Vol-II
Locality : Horograme; Tanore, Nachole.
Occurrence : January

3. *Chenopodium album*. Linn;
F.I. ii. 58; F.B.I. V. 3; E.D.C. 1003
Prain. 1903, 657; Vol-II
Locality : Horograme; Tanore, Nachole.
Occurrence : December

FAMILY : CRUCIFERAE.

1. *Rephanus sativus*. Linn;
   F.I. iii. 126; F.B.I. i. 166
   Prain. 1903, 148; Vol-I
   Locality : Horograme; Tanore, Nachole
   Occurrence : December

2. *Brassica nigra*. Linn;
   Prain, 1903, 145; Vol-I
   Localtiy : Horograme;Tanore, Nachole
   Occurrence : December

FAMILY : COMMELINACEAE

1. *Commelina bengalenis*. Linn;
   F.I. i. 171; F.B.I. vi. 370; F.D.C. 1748
   Prain. 1903, 814; Vol-II
   Locality : Horograme; Tanore, Nachole, Kazipara, Baganpara - Godagari
   Occurrence : Whole year

2. *Commelina appendiculata*. Clarke;
   F.B.I. vi. 374
   Prain. 1903, 815; Vol-II
   Locality : Horograme; Tanore, Nachole.
   Occurrence : Whole year

3. *Aneilema vaginatum*. R.Br;
   F.B.I. vi. 381
   Prain. 1903, 816; Vol-II
   Locality : Kazipara - Godagari.
   Occurrence : November

FAMILY : CAPPARIDEAE

1. *Cleome viscosa*. Linn;
   F.I. iii. 128; F.B.I. i. 170; E.D.C. 1367
   Prain. 1903, 149; Vol-I
   Locality : Horograme; Tanore, Nachole, Kazipara - Godagari.
   Occurrence : December

2. *Capparis sp.*(Seedling).
Locality : Baganpara - Godagari .
Occurrence : March

FAMILY : CYPERACEAE

1. *Cyperus rotundus.* Linn;
F.I. i. 197; F.B.I. vi. 614. E.D.C. 2612.
Prain. 1903, 862; Vol-II
Locality : Horograme; Tanore, Nachol, Kazipara, Baganpara - Godagari
Occurrence : Whole year

FAMILY : RUBIACEAE

1. *Adina cordifolia* (Seedling). Hook. f.;
F.B.I. iii. 24; E.D.A. 514
Prain. 1903, 403; Vol-I
Locality : Kazipara - Godagari .
Occurrence : Whole year

2. *Oldenlandia corymbosa* Linn;
F.B.I. iii. 64; E.D.O. 132.
Prain. 1903, 409, Vol-I
Locality : Horograme; Tanore, Nachol, Kazipara, Baganpara - Godagari .
Occurrence : December

3. *Randia sp* (Seedling)
Locality : Kazipara - Godagari .
Occurrence : Whole year

4. *Hedyotis glabra.* Br.;
F.B.I. iii. 59
Prain, 1903, 407; Vol-I
Locality : Kazipara - Godagari .
Occurrence : March

FAMILY : HYDROPHYLLACEAE.

1. *Hydrolea zelanica.* Vahl;
F.B.I. iv. 133; E.D.H. 504
Prain. 1903, 528. Vol-II
Locality : Kazipara, Baganpara - Godagari .
Occurrence : November

FAMILY : TILIACEAE.

1. *Triumfetta annua* Linn;
F.B.I. i. 369; E.D.T. 835
Prain. 1903, 196; Vol-I
Locality : Kazipara - Godagari
Occurrence : November

FAMILY : SCROPHULARINEAE

1. *Herpestis chamaedroides.* Linn;
Prain. 1903, 570; Vol-II
Locality : Horograme; Tanore, Nachole Kazipara, Baganpara - Godagari .
Occurrence : Whole year

2. *Bonnaya sp.*
Locality : Kazipara - Godagari .
Occurrence : April

3. *Lindenbergia urticifolia.* Lehm;
F.B.I. iv. 262; E.D.L. 371
Prain. 1903, 566, Vol-II
Locality : Horograme; Tanore, Nachole Kazipara, Baganpara - Godagari .
Occurrence : Whole year

4. *Scoparia dulcis.* Linn;
F.B.I. iv. 289
Prain. 1903. 575; Vol-II
Locality : Horograme; Tanore, Nachole Kazipara, Baganpara - Godagari .
Occurrence : Whole year

FAMILY : PAPAVERACEAE.

1. *Argemone mexicana* . Linn;
F.I. ii. 571; F.B.I.i. 117. E.D.M. 1351
Prain. 1903, 142; Vol-I
Locality : Horograme; Tanore, Nachok Kazipara, Baganpara - Godagari
Occurrence : Whole year

FAMILY : POLYGONACEAE.

1. *Polygonum glabrum.* Willd;
F.I. ii. 287; F.B.I. v. 34; E.D.P. 1091
Prain. 1903, 663; Vol-II
Locality : Kazipara, Baganpara - Godagari
Occurrence : November

2. *Polygonum plebejum.* R.Br.;
F.B.I.v. 27; E.D.P. 1114.
Prain, 1903, 662; Vol-II
Locality : Horograme; Tanore, Nachok Kazipara - Godagari
Occurrence : Whole year

FAMILY : PRIMULACEAE

1. *Anagallis arvensis.* Linn;
F.B.I. iii. 506; E.D.A. 1034.
Prain. 1903, 472; Vol-I
Locality : Horograme; Tanore, Nachok Kazipara, Baganpara - Godagari
Occurrence : December

FAMILY : PALMEAE

1. *Phoenix dactylifera* (Seedling). L.
Locality : Horograme; Tanore, Nachok Kazipara, Baganpara - Godagari
Occurrence : Whole year

FAMILY : BORAGINACEAE

1. *Heliotropium indicum.* Linn;
F.I. i. 454; F.B.IU. iv. 152; E.D.H. 102
Prain. 1903, 532; Vol-II
Locality : Horograme, Tanore, Nachoḳ Kazipara, Baganpara - Godagari
Occurrence : Whole year

FAMILY : GENTIANACEAE.

1. *Canscora diffusa.* R.Br.;
F.B.I. iv. 103; E.D.C. 384.
Prain. 103, 525; Vol-II
Locality : Baganpara - Godagari .
Occurrence : January

FAMILY : FICOIDEAE

1. *Mullugo hirta.* Thumb;
F.B.I. ii. 662; E.D.M. 615
Prain. 1903, 389: Vol-I
Locality : Horograme; Tanore, Nachoḳ Kazipara, Baganpara - Godagari .
Occurrence : Whole year

FAMILY : LINEAE

Lippia nodiflora. Rich;
F.B.I. iv. 563; E.D.L. 451.
Prain, 1903, 616; Vol-II
Locality : Horograme; Tanore Nachoḳ Kazipara Baganpara - Godagari.
Occurrence : Whole year

FAMILY : MALVACEAE

1. *Sida cordifolia.* Linn;
   F.I. iii. 177; F.B.I. i. 324; E.D.S. 1694
   Prain. 1903, 175; Vol-I
   Locality : Horograme; Tanore, Nachok, Kazipara , Baganpara - Godagari .
   Occurrence : August

2. *Abutilon sp.*
   Locality : Kazipara - Godagari .
   Occurrence : January

3. *Abutilon indicum.* G.Don;
   F.B.I. i. 326; E.D.A. 89
   Prain. 1903, 176, Vol-I
   Locality : Kazipara - Godagari .
   Occurrence : January

4. *Bombax malabaricum* (Seedling). DC.;
   F.B.I. i. 349
   Prain. 1903, 185; Vol-I
   Locality : Horograme; Tanore, Kazipara, Baganpara - Godagari
   Occurrence : Whole year

FAMILY : MELIACEAE

1. *Melia azadirachta* (Seedling), Linn;
   F.I. ii. 394; F.B.I. i. 544; E.D.M. 363
   Prain. 1903, 218; Vol-I
   Locality : Horograme; Tanore, Kazipara, Baganpara - Godagari .
   Occurrence : Whole year

FAMILY : MENISPERMACEAE

1. *Stephania hernandifolia.* Walp;
F.B.I. i. 103; E.D.S. 2794
Prain. 1903, 136; Vol-I
Locality : Horograme; Tanore, Nachole.
Occurrence : Whole year

FAMILY : MYRTACEAE

1. *Psidium sp* (Seedling)
Locality: Horograme; Tanore, Nachol; Kazipara,Baganpara - Godagari .
Occurrence : Whole year

2. *Euginea sp.* (Seedling).
Locality: Horograme; Tanore, Nachole Kazipara, Baganpara - Godagari .
Occurrence : Whole year

FAMILY: NYCTAGINEAE

1. *Boerhaavia repens*, Linn.;
F. B. I. iv. 709.
Prain , 1903. 645, Vol. -II.
Locality : Horograme;Tanore, Nachole.
Occurrence : October

FAMILY : UMBELLIFFRAE

1. *Coriandum sativum* , Linn.,
F. I. ii. 94; F.B.I. ii. 717;E.D.C.1954.
Prain , 1903. 395, Vol. -I.
Locality: Horogram ; Natore, Nachole
Occurrence : January

Hydrocotyle asiatica, L.

2. = *Centella asiatica*, Urban
Locality : Horogram, Tanore, Nachole.
Occurrence : Whole year

3. *Daucus sp.*
Locality : Kazipara, Baganpara - Godagari .
Occurrence : November

4. *Seseli indicum* W. & A.;
F.B.I. ii. 693; E.D.S. 1201
Prain. 1903, 393; Vol-I
Locality : Kazipara - Godagari .
Occurrence : April

FAMILY: SOLANACEAE

1. *Capsicum frutescens* . Linn;
Prain. 1903, 557; Vol-I
Locality : Horogram ; Tanore, Nachole.
Occurrence : Whole year

2. *Solanum nigrum.* Linn;
F.B.I. iv. 229; E.D.S. 2299
Prain. 1903, 554; Vol-II
Locality : Horogram ; Tanore Nachol, Baganpara, Kazipara - Godagari .
Occurrence : Whole year

3. *Lycopersicum esculentum* Mill;
F.B.I. iv. 237; E.D.L. 596
Prain. 1903, 553; Vol-II
Locality : Horograme, Tanore, Nachole.
Occurrence : January

4. *Solanum melongena.* Linn;
F.I. i. 566; F.B.I. iv. 235; E.D.S. 2284
Prain. 1903; 555; Vol-II
Locality : Tanore, Nachol; Horograme
Occurrence : November

5. *Solanum xanthocarpun.* Schrad & Wendl
F.B.I. iv. 236; E.D.S. 2345.
Prain. 1903, 555; Vol_II
Locality : Kazipara - Godagari
Occurrence : November

FAMILY : ONAGRACEAE.

1. *Jussiae repens.* Linn;
F.I. ii. 401; F.B.I. ii. 587
Parain. 1903, 368; Vol-I
Locality : Kazipara - Godagari
Occurrence : November

2. *Trapa bispinosa* Roxb;
F.I. i. 428; F.B.I. ii. 590; E.D.T. 516
Prain, 1903; 369, Vol. - I
Locality : Kazipara - Godagari
Occurrence : May

FAMILY : NYMPHAEACEAE

1. *Nymphaea esculenta* Linn;
F.I. ii. 578
Prain. 1903, 140; Vol-I.
Locality : Tanore, Nachol, Horograme; Kazipara, Baganpara - Godagari
Occurrence : Whole year

2. *Nelumbium speciosum* Willd.;
F.I. ii. 647; F.B.I. i. 116 ; E.D.N. 39
Prain. 1903, 141; Vol-I
Locality : Tanore, Nachol, Horograme, Kazipara, Baganpara - Godagari .
Occurrence : Whole year

FAMILY : MARSILEACEAE

1. *Marsilea quadrifoliata.* Linn;
E.D.M. 306
Prain. 1903, 957; Vol-II
Locality: Horograme; Nachol; Kazipara, Baganpara - Godagari .
Occurrence : Whole year

FAMILY : URTICACEAE

1. *Streblus asper* (Seedling). Lour.;
F.B.I. v. 489; E.D.S. 2912
Prain. 1903, 727; Vol-II
Locality : Horograme; Bagan Para, Kazipara - Godagari .
Occurrence : Whole year

2. *Ficus sp.* (Seedling)
Locality : Horograme; Tanore, Nachole .
Occurrence : Whole year

FAMILY : VERBINACEAE

1 *Clerodendron viscosum* (Seedling) Vent;
Locality : Horograme; Tanore, Nachol; Kazipara - Godagari .
Occurrence : Whole year

FAMILY : RHAMNACEAE

1. *Zizyphus mauritiana* (Seedling). Lamk.
   Locality : Horograme; Tanore, Nachole.
   Occurrence : Whole year

FAMILY : RUTACEAE

1. *Glycosmis pentaphylla* (Seedling). Corr;
   F.B.I. i. 499; E.D.G. 271.
   Prain. 1903, 208; Vol-I
   Locality : Horograme; Tanore, Nachole.
   Occurrence : Whole year

FAMILY : ZINGIBERACEAE.

1. *Curcuma longa*. Linn;
   F.I. i. 32; F.B.I. vi. 214; E.D.c. 2433
   Prain. 1903, 783; Vol-II
   Locality : Horograme, Tanore, Nachole.
   Occurrence : October

FAMILY : POLYPODIACEAE

1. *Ceratopteris thallictroides*(Fern) Brogn. F.I.C. 123.
   Prain. 1903, 940; Vol-II
   Localtiy : Horograme; Tanore, Nachole.
   Occurrence : July

FAMILY : OROBANCHACEAE

1. *Orobanche indica*. Ham;
   F.I. iii. 27; F.B.I. iv. 326; E.D.O. 230.
   Prain. 1903, 580; Vol-II
   Locality : Horograme; Tanore, Nachole.
   Occurrence : January

Family : Oxalidaceae

1. *Oxalis corniculata*. Linn.
F.I. ii. 457; F.B.I. i. 436; E.D.o. 547.
Prain 1903; 203; Vol. - I
Locality: Horograme, Tanore, Nachole.
Occurrence : December.

Phytosociological Studies

SITE - A

Site A : In this site 52 plant species were recorded. All species were herbs.

i) January '92 to June' 92 :

The highest and lowest frequency, density and abundance values are as follows.

Name of the species	Frequency	Density	Abundance
1. *Cyperus rotundus*	97.222	20.271	20.271
2. *Oldenlandia corymbosa*	0.839	0.167	0.273
3. *Blumea lacera*	0.926	0.0093	0.0278

Here, *Cyperus rotundus* showed the highest frequency, density and abundance values. *Oldenlandia corymbosa* showed the lowest frequency value. *Blumea lacera* showed the lowest density as well as lowest abundance value.

Frequency values ranging from 0.926% to 82.407% were shown by *Argemone mexicana, Leucas aspera, Cynodon dactylon, Euphorbia thymifolia, Blumea lacera* etc. (Table - 2a).

Density values ranging from 0.019 to 6.397 were shown by *Gnaphalium indicum, Allium sativum, Argemone mexicana, Mullugo hirta, Boerhaavia repens* etc. (Table - 2a)

Abundance values ranging from 0.028 to 4.472 were shown by *Gnaphalium indicum, Argemone mexicana, Leucas aspera, Oxalis eorniculata, Heliotropium indicum* etc. (Table - 2a).

ii) July '92 to December '92

The highest and lowest frequency, density and abundance values are as follows.

Name of the species	Frequency	Density	Abundance
1. *Cyperus rotundus*	93.518	31.675	31.80
2. *Eclipta prostrata*	0.926	0.0093	0.028
3. *Mukia medaraspatana*	0.926	0.019	0.056
4. *Gnaphalium indicum*	1.852	0.019	0.028

Here, *Cyperus rotundus* showed the highest frequency, density and abundance values. On the other hand *Eclipta prostrata* and *Mukia medaraspatana* showed the lowest frequency value.*Eclipta prostrata* also showed the lowest density and abundance values. The lowest abundance value was also shown by *Gnaphalium indicum.*

Frequency values ranging from 5.556% to 70.369% were shown by *Leucas aspera, Argemone mexicana, Cynodon dactylon. Euphorbia hirta, Anagallis arvensis* etc. (Table - 2b)

Density values ranging from 0.019 to 10.741 were shown by *Gnaphalium indicum, Blumea lacera, Amaranthus spinosus, Euphorbia thymifolia, Coriandrum sativum* etc. (Table - 2b).

Abundance values ranging between 0.042 and 10.741 were shown by *Boerhaavia repens, Melilotus indica, Amaranthus spinosus, Coriandrum sativum* etc. (Table - 2b).

iii) January '93 to June '93 :

The highest and lowest frequency, density and abundance values are as follows.

Name of the species	Frequency	Density	Abundance
1. *Cyperus rotundus*	96.296	14.851	14.911
2. *Heliotropium indicum*	0.926	0.0093	0.028
3. *Eclipta prostrata*	0.926	0.019	0.056
4. *Raphanus sativus*	0.926	0.0093	0.028
5. *Boerhaavia repens*	0.926	0.0093	0.028
6. *Chenopodium album.*	0.926	0.019	0.056
7. *Blumea lacera*	1.852	0.019	0.028
8. *Croton sp.*	1.852	0.019	0.028

Here, *Cyperus rotundus* showed the highest frequency, density and abundance values. On the contrary, *Heliotropium indicum, Eclipta prostrata, Raphanus sativus, Boerhaavia repens, Chenopodium album* showed the lowest frequency value. *Heliotropium indicum, Raphanus sativus, Boerhaavia* repens also showed the lowest density and abundance values. The lowest aboundance value was also shown by *Blumea lacera* and *Croton sp.*

Frequency values ranging between 1.85% and 88.889% were shown by *Luecas aspera, Argemone mexicana, Euphorbia hirta, Amaranthus spinosus, Melilotus alba, Anona reticulata, Croton sp.* etc. (Table - 2c).

Density values ranging from 0.019 to 7.916 were shown by *Argemone mexicana, Leucas aspera, Blumea lacera, Anagallis arvensis, Eclipta prostrata, Vernonia cinerea* etc.(Table -2c).

Abundance values ranging between 0.056 and 8.138 were shown by *Argemone mexicana, Leucas aspera, Oxalis corniculata, Boerhaavia repens. Amaranthus viridis* etc. (Table - 2c).

SITE - B

Site B i) January '92 to June '92.

In site B the total number of plant species was 60, of which 56 species were herbs, 3 species were climbers and 1 species was root parasite.

The highest and lowest frequency, density and abundance values are to follows :

Name of the species	Frequency	Density	Abundance
1. *Cyperus rotundus*	90.740	6.388	6.731
2. *Acacia catechu* (Seedling)	1.852	0.019	0.056
3. *Phoenix dactylifera* (Seedling)	1.852	0.037	0.111
4. *Heliotropium indicum*	1.852	0.019	0.056
5. *Croton sp.*	3.704	0.037	0.056
6. *Coriandrum sativum*	3.704	0.037	0.056
7. *Lathyrus sativus*	3.704	0.037	0.056
8. *Chrozophora plicata*	3.704	0.037	0.056

Here, *Cyperus rotundus* showed the highest frequency, density and abundance values. On the other hand the lowest frequency was shown by *Acacia catechu* and *Phoenix dactylifera. Acacia catechu* and *Heliotropium indicum* showed the lowest density value. The lowest abundance value was

shown by *Croton sp. Coriandrum sativum, Heliotropium indicum, Lathyrus sativus, Acacia catechu* and *Chrozophora plicata.*

Frequency values ranging from 3.704% to 66.667% were shown by *Leucas aspera, Argemone mexicana, Herpestis chamaedroides, Ervum sp. Cynodon dactylon, Lippia nodiflora, Orobanche indica,* etc. (Table -3a).

Density values ranging from 0.037 to 2.369 were shown by *Leucas aspera, Argemone mexicana, Amaranthus viridis, Chlrodendron viscosum* etc. (Table - 3a).

Abundance values ranging from 0.083 to 28.252 were shown by *Leucas aspera, Lindenbergia urticifolia, Scoparia dulcis, Orobanche indica* etc. (Table - 3a).

ii) July '92 to December '92

The highest and lowest frequency, density and abundance values are as follows :

Name of the species	Frequency	Density	Abundance
1. *Cyperus rotundus*	90.741	17.517	18.758
2. *Brassica nigra*	1.852	0.019	0.056
3. *Anagallis arvensis*	1.852	0.019	0.056
4. *Boerhaavia repens*	1.852	0.019	0.056
5. *Stephania hernandifolia*	1.852	0.019	0.056
6. *Croton sp.*	1.852	0.111	0.315
7. *Melia azadirachta* (Seedling)	1.852	0.037	0.111
8. *Dolichos lablab*	3.704	0.037	0.056
9. *Anona reticulata*	3.704	0.037	0.056

Here, *Cyperus rotundus* showed the highest frequency, density and abundance values. On the other hand, the lowest frequency, density and

abundance values were shwon by *Brassica nigra, Anagallis arvensis, Boerhaavia repens, stephania hernandifolia,* The lowest frequency value was also shown by *Croton sp.* and *Melia azadirachta* (Seedling). The lowest abundance value was also shown by *Dolichos lablab* and *Anona reticulata.*

Frequency values ranging between 3.704% and 66.666% were shown by *Leucas aspera, Acalypha indica, Euphorbia hirta, Orobanche indica, Amaranthus viridis* etc. (Table -3b).

Density values ranging between 0.037 and 3.944 were shown by *Chenopodium album, Lindenbergia urticifolia, Lippia nodiflora* etc. (Table-3b)

Abundance values ranging between 0.111 and 4.157 were shown by *Amaranthus gangeticus, Chenopodium album,Scoparia dulcis, Amaranthus viridis* etc. (Table - 3b).

iii) January '93 to June '93

The highest and lowest frequency, Density and abundance values are as follows.

Name of the species	Frequency	Density	Abundance
1. *Leucas aspera*	74.074	3.481	3.537
2. *Solanum nigrum*	1.852	0.019	0.056
3. *Brassica nigra*	1.852	0.019	0.056
4. *Cucurbita sp.*	1.852	0.019	0.056
5. *Cyperus rotundus*	68.519	4.593	4.99

Here, *Leucas aspera* showed the highest frequency value. *Cyperus rotundus* showed the highest density and abundance values. On the other hand, *Solanum nigrum, Brassica nigra* and *Cucurbita sp.* showed the lowest frequency, density and abundance values.

Frequency values ranging between 3.704% and 70.370% were shown by *Cyperus rotundus, Euphorbia hirta, Argemone mexicana, Euphorbia thymifolia, Orobanche indica, Lindenbergia urticifolia* etc. (Table -3c).

Density values ranging between 0.056 and 3.833 were shown by *Allium cepa, Ervum sp, Lippia nodiflora, Orobanche indica* etc. (Table - 3c).

Abundance values ranging between 0.074 and 7.851 were shown by *Euphorbia thymifolia, Chrozophora plicata, Acalypha indica* etc. (Table - 3c).

SITE - C

Site - C: In this site 50 plant species were recorded. Among them 9 species were trees, 39 (Seedling) species were herbs, 1 species was climber and 1 species was fern .

i) January '92 to June '92:

The highest and lowest frequency, density and abundance values are as follows :

Name of the species	Frequency	Density	Abundance
1. *Cyperus rotundus*	69.444	13.999	13.889
2. *Lindenbergia urticifolia*	2.778	0.028	0.083
3. *Gnaphalium indicum*	2.778	0.028	0.083
4. *Cephalandra indica*	2.778	0.028	0.083
5. *Anona squamosa* (Seedling)	2.778	0.028	0.083
6. *Sida cordifolia*	2.778	0.028	0.083
7. *Commelina bengalensis*	44.444	11.166	23.722
8. *Bombax malabaricum* (Seedling)	5.556	0.055	0.055

Here, *Cyperus rotundus* showed the highest frequency and density values. The highest abundance value was shown by *Commelina bengalensis*. On the other hand, the lowest frequency and density values were shown by *Lindenbergia urticifolia, Cephalandra indica, Anona squamosa* (Seedling) *Gnaphalium indicum* and *Sida cordifolia* etc (Table - 4a). The lowest abundance value was shown by *Bombax malabaricum*.

Frequency values ranging between 5.556% and 55.556% were shown by *Achyranthes aspera, Centella asiatica, Alternenthera sessilis, Vernonia cinerea, Imperata arundinacea, Clerodendron viscosum* etc. (Table -4a).

Density values ranging between 0.056 and 11166 were shown by *Scoparia dulcis*, *Mikania scandens*, *Herpestis chamaedroides*, *Alternenthera sessilis* etc. (Table -4a).

Abundance values ranging between 0.083 and 13889 were shown by *Cephalandra indica*, *Eclipta prostrata*, *Mikania scandens*, *Herpestis chamaedroides* etc. (Table - 4a)

ii) July '92 to December '92 :

The highest and lowest frequency, density and abundance values are as follows :

Name of the species	Frequency	Density	Abundance
1. *Cyperus rotundus*	75.0	5.498	6.208
2. *Sida cordifolia*	2.778	0.028	0.083
3. *Anona squamosa* (Seedling)	2.778	0.028	0.083
4. *Phyllanthus reticulatus*	2.778	0.028	0.083
5. *Euphorbia thymifolia*	2.778	0.306	0.917
6. *Polygonum plebejum*	2.778	0.833	2.5
7. *Oldenlandia corymbosa*	2.778	0.083	0.25
8. *Commelina bengalensis*	66.666	19.472	20.347
9. *Psidium sp.* (Seedling)	5.556	0.056	0.056

Here, *Cyperus rotundus* showed the highest frequency value. On the other hand, the lowest frequency value was shwon by *Sida cordifolia*, *Anona squamosa* (Seedling), *Phyllanthus reticulatus*, *Euphorbia thymifolia*, *Polygonum plebejum* and *Oldenlandia corymbosa*. *Commelina bengalensis* showed the highest density and abundance values. The lowest density value was shown by *Phyllanthus reticulatus*, *Anona*

squamosa(Seedling) and *Sida cordifolia.* The lowest abundance value was shown by *Psidium sp.*

Frequency values ranging between 5.556% and 66.666% were shown by *Commelina bengalensis, Achyranthes aspera, Evolvulus nummularius. Curcuma longa, Melia azadirachta* (Seedling), *Eclipta prostrata, Herpestis chamaedroides, Lindenbergia urticifolia* etc. (Table - 4b).

Density values ranging from 0.083 to 5.498 were shown by *Cyperus rotundus, Oldenlandia corymbosa, Scoparia dulcis, Clerodendron viscosum, Psilotrichum ferrugineum* etc. (Table - 4b).

Abundance values ranging from 0.083 to 6.208 were shown *Cyperus rotundus Scoparia dulcis Euphorbia thymifolia, Oldenlandia corymbosa* etc. (Table - 4b).

(iii) January '93 to June '93

The highest and lowest frequency, density and abundance values are as follows :

Name of the species	Frequency	Density	Abundance
1. *Cyperus rotundus*	77.778	6.638	6.749
2. *Cynodon dactylon*	55.556	9.028	10.639
3. *Cephalandra indica*	2.778	0.028	0.083
4. *Amaranthus gangeticus*	2.778	0.028	0.083
5. *Sida cordifolia*	2.778	0.028	0.083
6. *Solanum nigrum*	5.556	0.056	0.083
7. *Vernoria cinerea*	2.778	0.028	0.083

Here, *Cyperus rotundus* showed the highest frequency value. The highest density and abundance values were shown by *Cynodon dactylon.* On the other hand, the lowest frequency, density and abundance values were shown by *Cephalandra indica, Amaranthus gangeticus* and *Sida cordifolia.* The lowest abundance value was also shown by *Solanum nigrum* and *Vernonia cinerea.*

Frequency values ranging from 5.556% to 55.556 % were shown by *Commelina bengalensis, Achyranthes aspera, Evolvulus nummularius, Eclipta prostrata, Clerodendron viscosum, Amaranthus gangeticus.* etc. (Table - 4c).

Density values ranging from 0.083 to 6.638 were shown by *Cyperus rotundus, Evolvulus nummularius, Lindenbergia urticifolia, Ervum sp.* etc. (Table - 4c).

Abundance values ranging from 0.125 to 6.749 were shwon by *Cyperus rotundus, Lindenbergia urticifolia, Mikania scandens, Phyllanthus reticulatus* etc. (Table - 4c).

Table - 2a: No of plants, Frequency, Density, Abundance and IVI values of the plant population at site-A in January to June 1992.

No	Name of the sps.	No of the plants	Frequency	Density	Abundance	IVI
1.	*Cynodon dactylon*	3.917	34.258	1.305	1.708	8.524
2.	*Blumea lacera*	0.0278	0.926	0.009	0.0278	0.0943
3.	*Lindenbergia urticifolia*	5.694	20.370	0.4164	0.625	5.3001
4.	*Euphorbia thymifolia*	1.199	21.296	0.453	0.625	6.326
5.	*Cyperus rotundus*	65.916	97.222	20.271	20.271	57.928
6.	*Argemone mexicana*	16.444	82.407	5.609	5.670	33.582
7.	*Leucas aspera*	7.139	82.407	2.379	2.546	25.785
8.	*Euphorbia hirta*	2.972	41.667	0.990	1.255	11.355
9.	*Soalanum nigrum*	0.944	21.296	0.315	0.468	4.829
10.	*Mullugo hirta*	1.917	12.963	0.639	0.667	4.106
11.	*Lippia nodiflora*	0.611	12.963	0.204	0.292	4.093
12.	*Lycopersicum esculentum*	2.333	20.369	0.722	0.912	4.687
13.	*Anagallis arvensis*	0.472	10.185	0.157	0.417	2.239
14.	*Heliotropium indicum*	0.028	0.926	0.0092	0.028	0.179
15.	*Oryza sativa*	1.306	11.111	0.435	0.805	2.704
16.	*Vernonia cinerea*	0.944	9.259	0.315	0.727	3.723
17.	*Spinacia oleracea*	0.25	1.852	0.083	0.125	0.476
18.	*Eclipta prostata*	0.111	3.704	0.037	0.083	0.542
19.	*Amaranthus gangeticus*	0.6667	11.110	0.222	0.403	2.077
20.	*Melilotus alba*	0.50	10.185	0.167	0.222	2.419
21.	*Amaranthus spinosus*	1.361	24.073	0.454	1.065	6.422
22.	*Altern enthera sessilis*	1.249	25.925	0.416	1.306	5.094
23.	*Amaranthus viridis*	0.139	3.704	0.046	0.139	0.932
24.	*Raphanus sativus*	3.389	8.333	1.129	1.218	5.266
25.	*Allium sativum*	17.195	11.111	5.731	5.731	6.415
26.	*Commelina bengalensis*	1.083	11.110	0.333	0.412	1.842

27.	*Evolvulus nummularius*	0.111	2.778	0.037	0.037	0.614
28.	*Boerhaavia repens*	0.056	0.926	0.019	0.056	0.343
29.	*Oxalis corniculata*	2.028	29.628	0.730	1.264	6.292
30.	*Allium cepa*	7.444	5.556	2.481	2.481	3.230
31.	*Mililotus indica*	1.583	16.667	0.528	0.681	3.882
32.	*Coriandrum sativum*	10.889	5.556	3.629	3.629	4.958
33.	*Gnaphalium indicum*	19.194	36.111	6.397	6.472	16.967
34.	*Poa sp.*	0.444	3.704	0.120	0.213	0.889
35.	*Herpestis chamaedroides*	1.499	16.667	0.499	0.796	4.860
36.	*Polygonum plebejum*	3.945	8.333	1.314	1.384	2.989
37.	*Centella asiatica*	0.056	1.852	0.019	0.056	0.417
38.	*Acalypha indica*	0.139	7.407	0.129	0.167	2.340
39.	*Scoparia dulcis*	0.167	4.629	0.056	0.097	0.902
40.	*Launea asplinifolia*	0.556	7.407	0.185	0.458	2.212
41.	*Psilotrichum ferrugineum*	0.778	12.037	0.259	0.373	2.504
42.	*Oldenlandia corymbosa*	7.407	0.839	0.167	0.273	1.858
43.	*Sonchus asper*	0.083	1.852	0.028	0.042	0.276
44.	*Chrozophora plicata*	0.722	16.667	0.241	0.352	4.589
45.	*Imperata arundinacea*	-	-	-	-	-
46.	*Chenopodium album*	-	-	-	-	-
47.	*Solanum melongena*	0.25	3.704	0.083	0.120	1.369
48.	*Brassica nigra*	-	-	-	-	-
49.	*Croton sp.*	-	-	-	-	-
50.	*Ervum sp.*	0.278	2.778	0.093	0.093	1.129
51.	*Mukia medaraspatana*	-	-	-	-	-
52.	*Anona reticulata*	-	-	-	-	-

Table -2b: No of plants, Frequency, Density, Abundance and IVI values of the plant population at site-A in July to December 1992.

No	Name of the sps.	No of the plants	Frequency	Density	Abundance	IVI
1.	*Cynodon dactylon*	7.528	60.184	2.508	3.3003	19.471
2.	*Blumea lacera*	0.306	7.407	0.102	0.116	1.194
3.	*Lindenbergia urticifolia*	1.50	24.074	0.499	0.792	5.526
4.	*Euphorbia thymifolia*	1.028	21.296	0.342	0.606	6.351
5.	*Cyperus rotundus*	96.389	93.518	31.675	31.80	103.589
6.	*Argemone mexicana*	15.944	54.629	5.407	5.611	25.764
7.	*Leucas aspera*	14.194	70.369	4.731	5.166	23.629
8.	*Euphorbia hirta*	2.111	37.963	0.757	1.245	9.233
9.	*Soalanum nigrum*	0.722	20.370	0.240	0.495	4.369
10.	*Mullugo hirta*	1.056	9.259	0.352	0.454	3.067
11.	*Lippia nodiflora*	1.139	25.926	0.379	0.560	5.519
12.	*Lycopersicum esculentum*	2.222	25.926	0.740	0.866	6.976
13.	*Anagallis arvensis*	0.306	5.556	0.101	0.181	0.760
14.	*Heliotropium indicum*	-	-	-	-	-
15.	*Oryza sativa*	0.056	1.852	0.019	0.056	0.518
16.	*Vernonia cinerea*	0.389	9.259	0.129	0.194	2.507
17.	*Spinacia oleracea*	1.445	9.259	0.315	0.468	2.509
18.	*Eclipta prostata*	0.028	0.926	0.0093	0.028	0.246
19.	*Amaranthus gangeticus*	1.499	26.851	0.499	0.727	5.956
20.	*Melilotus alba*	0.194	3.704	0.065	0.097	0.843
21.	*Amaranthus spinosus*	0.778	16.667	0.259	0.556	4.218
22.	*Altern enthera sessilis*	0.389	8.333	0.129	0.292	1.412
23.	*Amaranthus viridis*	0.639	11.111	0.213	0.255	2.789
24.	*Raphanus sativus*	0.222	6.481	0.065	0.125	1.592
25.	*Allium sativum*	-	-	-	-	-
26.	*Commelina bengalensis*	1.028	22.222	0.342	0.503	5.478
27.	*Evolvulus nummularius*	-	-	-	-	-
28.	*Boerhaavia repens*	0.083	1.852	0.028	0.042	0.231

29.	*Oxalis corniculata*	1.055	6.481	0.268	0.514	1.243
30.	*Allium cepa*	-	-	-	-	-
31.	*Mililotus indica*	1.361	9.259	0.454	0.509	1.822
32.	*Coriandrum sativum*	32.222	8.334	10.741	10.741	11.621
33.	*Gnaphalium indicum*	0.056	1.852	0.019	0.028	0.204
34.	*Poa sp.*	6.861	53.704	2.286	2.80	17.291
35.	*Herpestis chamaedroides*	0.611	8.333	0.204	0.278	2.442
36.	*Polygonum plebejum*	-	-	-	-	-
37.	*Centella asiatica*	-	-	-	-	-
38.	*Acalypha indica*	2.556	23.148	0.852	1.079	5.906
39.	*Scoparia dulcis*	0.444	10.185	0.148	0.185	2.284
40.	*Launia asplinifolia*	0.417	2.778	0.139	0.222	0.681
41.	*Psilotrichum ferrugineum*	0.278	4.629	0.093	0.106	1.447
42.	*Oldenlandia corymbosa*	0.611	12.037	0.249	0.542	2.045
43.	*Sonchus asper*	-	-	-	-	-
44.	*Chrozophora plicata*	0.139	3.704	0.046	0.097	0.545
45.	*Imperata arundinacea*	0.167	5.556	0.056	0.125	0.984
46.	*Chenopodium album*	0.056	1.852	0.019	0.056	0.293
47.	*Solanum melongena*	0.556	9.259	0.185	0.207	1.906
48.	*Brassica nigra*	0.0556	1.852	0.019	0.0556	0.208
49.	*Croton sp.*	0.194	3.704	0.065	0.167	0.642
50.	*Ervum sp.*	0.389	4.629	0.037	0.056	0.451
51.	*Mukia medaraspatana*	0.056	0.926	0.019	0.056	0.109
52.	*Anona reticulata*	0.056	1.852	0.019	0.056	0.451

Table - 2c: No of plants, Frequency, Density, Abundance and IVI values of the plant population at site A in January to June 1993.

No	Name of the sps.	No of the plants	Frequency	Density	Abundance	IVI
1.	*Cynodon dactylon*	3.667	46.296	1.231	1.421	14.13
2.	*Blumea lacera*	0.056	1.852	0.019	0.028	0.196
3.	*Lindenbergia urticifolia*	1.722	24.074	0.588	0.731	5.686
4.	*Euphorbia thymifolia*	0.972	21.296	0.324	0.495	5.328
5.	*Cyperus rotundus*	44.556	96.296	14.851	14.91	21.910
6.	*Argemone mexicana*	23.749	81.481	7.916	8.138	43.223
7.	*Leucas aspera*	13.222	88.889	4.406	4.555	34.363
8.	*Euphorbia hirta*	2.167	41.667	0.722	1.019	11.129
9.	*Soalanum nigrum*	0.444	12.037	0.157	0.264	2.295
10.	*Mullugo hirta*	1.583	13.889	0.528	0.528	4.739
11.	*Lippia nodiflora*	0.500	11.111	0.167	0.245	3.232
12.	*Lycopersicum esculentum*	0.972	23.148	0.324	0.402	3.441
13.	*Anagallis arvensis*	0.056	1.852	0.019	0.056	0.421
14.	*Heliotropium indicum*	0.028	0.926	0.0093	0.028	0.494
15.	*Oryza sativa*	-	-	-	-	-
16.	*Vernonia cinerea*	0.306	7.407	0.083	0.106	1.675
17.	*Spinacia oleracea*	0.749	10.185	0.897	0.435	2.277
18.	*Eclipta prostata*	0.056	0.926	0.019	0.056	0.206
19.	*Amaranthus gangeticus*	0.749	1.852	0.176	0.264	1.907
20.	*Melilotus alba*	1.028	16.666	0.342	0.393	3.724
21.	*Amaranthus spinosus*	1.167	21.296	0.389	0.551	5.944
22.	*Alternenthera sessilis*	0.389	6.481	0.129	0.157	1.615
23.	*Amaranthus viridis*	0.167	4.629	0.056	0.097	1.053
24.	*Raphanus sativus*	0.028	0.926	0.0093	0.028	0.109
25.	*Allium sativum*	-	-	-	-	-
26	*Commelina bengalensis*	0.278	7.407	0.093	0.125	1.019

27.	*Evolvulus nummularius*	-	-	-	-	-
28.	*Boerhaavia repens*	0.028	0.926	0.0093	0.028	0.144
29.	*Oxalis corniculata*	2.611	25.926	0.893	1.306	6.143
30.	*Allium cepa*	-	-	-	-	-
31.	*Mililotus indica*	3.806	24.999	1.268	1.495	6.494
32.	*Coriandrum sativum*	5.694	5.556	1.750	1.750	4.354
33.	*Gnaphalium indicum*	3.278	19.443	1.092	1.273	6.727
34.	*Poa sp.*	2.972	24.99	0.99	1.157	7.492
35.	*Herpestis chamaedroides*	1.472	21.296	0.491	0.644	5.586
36.	*Polygonum plebejum*	0.167	5.556	0.056	0.139	1.14
37.	*Centella asiatica*	-	-	-	-	-
38.	*Acalypha indica*	1.417	12.963	0.469	0.662	4.456
39.	*Scoparia dulcis*	0.278	7.407	0.093	0.139	1.889
40.	*Launea asplinifolia*	2.056	10.185	0.685	0.713	3.835
41.	*Psilotrichum ferrugineum*	1.249	15.741	0.417	0.722	5.085
42.	*Oldenlandia corymbosa*	0.89	13.889	0.296	0.491	3.437
43.	*Sonchus asper*	-	-	-	-	-
44.	*Chrozophora plicata*	0.78	23.148	0.268	0.412	4.769
45.	*Imperata arundinacea*	-	-	-	-	-
46.	*Chenopodium album*	0.056	0.926	0.019	0.056	0.141
47.	*Solanum melongena*	0.278	5.556	0.092	0.092	0.765
48.	*Brassica nigra*	-	-	-	-	-
49.	*Croton sp.*	-	-	-	-	-
50.	*Ervum sp.*	0.056	1.852	0.019	0.028	0.599
51.	*Mukia medaraspatana*	0.25	2.778	0.083	0.830	0.826
52.	*Anona reticulata*	0.056	1.852	0.019	0.056	0.451

Table - 3a: No of plants, Frequency, Density, Abundance and IVI values of the plant population at site B in January to June 1992.

No	Name of the sps.	No of the plants	Frequency	Density	Abundance	IVI
1.	*Herpestis chamaedroides*	4.778	55.55	1.592	1.731	17.872
2.	*Cyperus rotundus*	19.167	90.740	6.388	6.731	59.069
3.	*Leucas aspera*	10.111	66.667	2.369	4.713	28.252
4.	*Argemone mexicana*	7.111	62.963	2.37	2.676	25.295
5.	*Cynodon dactylon*	2.278	29.63	0.758	0.981	8.793
6.	*Gnaphalium indicum*	0.611	7.407	0.204	0.306	2.146
7.	*Solanum nigrum*	0.278	5.556	0.093	0.093	1.576
8.	*Amaranthus gangeticus*	-	-	-	-	-
9.	*Anona reticulata*	0.278	7.407	0.111	0.139	1.864
10.	*Croton sp.*	0.111	3.704	0.037	0.056	0.488
11.	*Coriandrum sativum*	0.111	3.704	0.037	0.056	0.679
12.	*Phyllanthus reticulatus*	0.167	5.556	0.056	0.111	1.047
13.	*Heliotropium indicum*	0.056	1.852	0.019	0.056	0.368
14.	*Ervum sp.*	0.333	5.556	0.111	0.111	1.37
15.	*Imperata arundinacea*	-	-	-	-	-
16.	*Sonchus asper*	0.222	7.407	0.074	0.111	1.547
17.	*Brassica nigra*	-	-	-	-	-
18.	*Oldenlandia corymbosa*	-	-	-	-	-
19.	*Zizyphus mauritiana* (Seedling)	-	-	-	-	-
20.	*Melia azadirachta* (Seedling)	-	-	-	-	-
21.	*Chenopodium album*	-	-	-	-	-
22.	*Cucurbita sp.*	-	-	-	-	-
23.	*Clerodendron viscosum* (Seedling)	0.222	5.556	0.0741	0.167	1.782
24.	*Lindenbergia urticifolia*	2.167	16.667	0.722	0.796	6.784
25.	*Lens esculenta*	0.167	3.704	0.056	0.083	0.501
26.	*Lippia nodiflora*	3.444	40.741	1.148	1.296	12.888
27.	*Orobanche indica*	0.833	11.111	0.278	0.278	4.653
28.	*Cajanus indicus*	0.833	16.667	0.278	0.370	2.944

29.	*Scoparia dulcis*	3.555	24.074	1.185	1.259	7.456
30.	*Laginaria vulgaris*	0.389	3.704	0.129	0.195	0.706
31.	*Amaranthus viridis*	0.50	14.815	0.167	0.241	3.461
32.	*Lycopercicum esculentum*	2.111	12.963	0.703	1.249	4.547
33.	*Solanum melongena*	1.611	22.222	0.537	0.57	6.775
34.	*Capcicum frutescens*	4.389	19.444	1.463	1.463	12.747
35.	*Oxalis corniculata*	2.333	24.074	0.778	0.833	6.895
36.	*Anagallis arvensis*	0.278	7.407	0.093	0.222	1.858
37.	*Achyranthes aspera*	0.278	5.556	0.093	0.093	1.765
38.	*Boerhaavia repens*	-	-	-	-	-
39.	*Commelina bengalensis*	2.611	12.963	0.87	0.935	4.811
40.	*Mangifera indica* (Seedling)	0.111	3.704	0.019	0.111	0.699
41.	*Oryza sativa*	0.167	5.556	0.056	0.111	1.047
42.	*Lathyrus sativus*	0.111	3.704	0.037	0.056	0.449
43.	*Acacia catechu* (Seedling)	0.056	1.852	0.019	0.056	0.275
44.	*Cleome viscosa*	0.333	5.556	0.111	0.111	1.37
45.	*Sida cordifolia*	-	-	-	-	-
46.	*Chrozophora plicata*	0.111	3.704	0.037	0.056	1.292
47.	*Allium cepa*	-	-	-	-	-
48.	*Basella alba*	-	-	-	-	-
49.	*Dolichos lablab*	-	-	-	-	-
50.	*Colocasia esculenta*	-	-	-	-	-
51.	*Stephania hernandifolia*	-	-	-	-	-
52.	*Poa sp.*	2.389	27.778	0.796	0.796	11.108
53.	*Acalypha indica*	1.111	25.926	0.370	0.537	7.136
54.	*Amaranthus spinosus*	1.555	25.926	0.518	0.768	6.471
55.	*Euphorbia hirta*	3.389	61.111	1.129	1.324	16.588
56.	*Euphorbia thymifolia*	2.389	38.889	0.796	0.954	13.228
57.	*Vernonia cinerea*	1.611	25.926	0.537	0.842	6.344
58.	*Eclipta prostrata*	0.167	5.556	0.056	0.111	0.725
59.	*Phoenix dactylifera* (Seedling)	0.111	1.852	0.037	0.111	0.328
60.	*Vicia hirsuta*	0.499	9.259	0.204	0.278	3.255

Table - 3b: No of plants, Frequency, Density, Abundance and IVI values of the plant population at site B in July to December 1992.

No	Name of the sps.	No of the plants	Frequency	Density	Abundance	IVI
1.	*Herpestis chamaedroides*	3.333	33.333	1.111	1.111	9.31
2.	*Cyperus rotundus*	58.055	90.741	17.517	18.758	82.014
3.	*Leucas aspera*	10.944	66.666	3.644	4.036	21.076
4.	*Argemone mexicana*	10.111	27.778	3.370	3.703	14.408
5.	*Cynodon dactylon*	0.722	16.667	0.241	0.398	4.738
6.	*Gnaphalium indicum*	-	-	-	-	-
7.	*Solanum nigrum*	0.945	20.370	0.314	0.454	3.945
8.	*Amaranthus gangeticus*	11.833	33.333	3.944	4.157	14.226
9.	*Anona reticulata*	0.111	3.704	0.037	0.056	0.915
10.	*Croton sp.*	0.333	1.852	0.111	0.315	1.10
11.	*Coriandrum sativum*	-	-	-	-	-
12.	*Phyllanthus reticulatus* (Seedling)	-	-	-	-	-
13.	*Heliotropium indicum*	-	-	-	-	-
14.	*Ervum sp.*	0.167	5.556	0.056	0.111	0.869
15.	*Imperata arundinacea*	1.333	24.074	0.444	0.629	4.028
16.	*Sonchus asper*	-	-	-	-	-
17.	*Brassica nigra*	0.056	1.852	0.019	0.056	0.334
18.	*Oldenlandia corymbosa*	0.389	7.407	0.129	0.195	1.712
19.	*Zizyphus mauritiana* (Seedling)	0.167	3.704	0.056	0.083	0.589
20.	*Melia azadirachta* (Seedling)	0.111	1.852	0.037	0.111	0.436
21.	*Chenopodium album*	0.222	3.704	0.037	0.111	0.580
22.	*Cucurbita sp.*					
23.	*Clerodendron viscosum* (Seedling)	0.222	7.407	0.074	0.111	2.097
24.	*Lindenbergia urticifolia*	2.889	16.667	0.963	1.657	6.986
25.	*Lens esculenta*	-	-	-	-	-
26.	*Lippia nodiflora*	1.778	25.926	0.592	0954	6.401
27.	*Orobanche indica*	0.5	5.556	0.167	0.167	1.779
28.	*Cajanus indicus*	-	-	-	-	-

29.	*Scoparia dulcis*	1.389	22.222	0.463	0.463	6.875
30.	*Laginaria vulgaris*	-	-	-	-	-
31.	*Amaranthus viridis*	2.667	29.629	0.888	0.583	4.456
32.	*Lycopersicum esculentum*	2.278	12.963	0.759	1.176	3.628
33.	*Solanum melongena*	0.778	14.815	0.240	0.259	2.853
34.	*Capcicum frutescens*	6.611	29.629	2.203	2.519	11.858
35.	*Oxalis corniculata*	1.722	11.111	0.574	0.944	3.809
36.	*Anagallis arvensis*	0.056	1.852	0.019	0.056	0.389
37.	*Achyranthes aspera*	0.278	7.407	0.093	0.195	1.365
38.	*Boerhaavia repens*	0.056	1.852	0.019	0.056	0.297
39.	*Commelina bengalensis*	0.50	5.556	0.166	0.389	1.199
40.	*Mangifera indica* (Seedling)	-	-	-	-	-
41.	*Oryza sativa*	0.111	3.704	0.037	0.111	0.552
42.	*Lathyrus sativus*	-	-	-	-	-
43.	*Acacia catechu*(Seedling)	-	-	-	-	-
44.	*Cleome viscosa*	1.278	16.667	0.426	0.426	3.263
45.	*Sida cordifolia*	0.111	3.704	0.037	0.111	0.706
46.	*Chrozophora plicata*	-	-	-	-	-
47.	*Allium cepa*	8.278	5.556	2.759	2.759	6.449
48.	*Basella alba*	0.222	3.704	0.074	0.111	0.644
49.	*Dolichos lablab*	0.111	3.704	0.037	0.056	0.536
50.	*Colocasia esculenta*	0.111	3.704	0.037	0.111	0.552
51.	*Stephania hernandifolia*	0.056	1.852	0.019	0.056	0.227
52.	*Poa sp.*	3.50	27.78	1.167	1.528	11.108
53.	*Acalypha indica*	3.222	55.555	1.073	1.351	12.082
54.	*Amaranthus spinosus*	1.167	29.629	0.389	0.555	6.595
55.	*Euphorbia hirta*	1.944	42.593	0.648	1.046	10.885
56.	*Euphorbia thymifolia*	2.833	35.185	0.944	1.944	9.866
57.	*Vernonia cinerea*	0.444	11.111	0.148	0.222	2.602
58.	*Eclipta prostrata*	-	-	-	-	-
59.	*Phoenix dactylifera* (Seedling)	-	-	-	-	-
60.	*Vicia hirsuta*	0.167	3.704	0.056	0.167	0.602

Table - 3c: No of plants, Frequency, Density, Abundance and IVI values of the plant population at site B in January to June 1993.

No	Name of the sps.	No of the plants	Frequency	Density	Abundance	IVI
1.	*Herpestis chamaedroides*	1.611	31.481	0.537	0.722	9.472
2.	*Cyperus rotundus*	13.78	68.519	4.593	4.990	44.299
3.	*Leucas aspera*	10.44	74.074	3.481	3.537	31.560
4.	*Argemone mexicana*	4.667	57.407	1.555	1.740	18.976
5.	*Cynodon dactylon*	1.778	24.074	0.592	0.639	8.203
6.	*Gnaphalium indicum*	-	-	-	-	-
7.	*Solanum nigrum*	0.056	1.852	0.019	0.056	0.656
8.	*Amaranthus gangeticus*	0.50	1.111	0.167	0.333	2.103
9.	*Anona reticulata*	0.333	12.963	0.111	0.249	3.208
10.	*Croton sp.*	-	-	-	-	-
11.	*Coriandrum sativum*	-	-	-	-	-
12.	*Phyllanthus reticulatus* (Seedling)	0.222	5.556	0.074	0.139	2.149
13.	*Heliotropium indicum*	-	-	-	-	-
14.	*Ervum sp.*	0.167	3.704	0.056	0.083	0.759
15.	*Imperata arundinacea*	-	-	-	-	-
16.	*Sonchus asper*	-	-	-	-	-
17.	*Brassica nigra*	0.056	1.852	0.019	0.056	1.919
18.	*Oldenlandia corymbosa*	-	-	-	-	-
19.	*Zizyphus mauritiana* (Seedling)	-	-	-	-	-
20.	*Melia azadirachta* (Seedling)	-	-	-	-	-
21.	*Chenophodium album*	-	-	-	-	-
22.	*Cucurbita sp.*	0.056	1.852	0.019	0.056	0.351
23.	*Clerodendron viscosum*	0.167	5.556	0.056	0.111	1.875
24.	*Lindenbergia urticifolia*	1.556	18.518	0.518	0.741	5.494
25.	*Lens esculenta*	-	-	-	-	-
26.	*Lippia nodiflora*	1.667	16.667	0.556	0.667	8.072
27.	*Orobanche indica*	0.50	12.963	0.167	0.204	2.805
28.	*Cajanus indicus*	-	-	-	-	-

29.	*Scoparia dulcis*	-	-	-	-	-
30.	*Laginaria vulgaris*	-	-	-	-	-
31.	*Amaranthus viridis*	0.389	9.259	0.129	0.305	2.044
32.	*Lycopersicum esculentum*	0.50	5.556	0.167	0.306	1.535
33.	*Solanum melongena*	1.222	27.78	0.407	0.537	7.828
34.	*Capcicum frutescens*	2.111	11.111	0.704	0.704	4.752
35.	*Oxalis corniculata*	1.056	11.111	0.352	0.50	3.572
36.	*Anagallis arvensis*	-	-	-	-	-
37.	*Achyranthes aspera*	0.222	5.556	0.074	0.139	1.738
38.	*Boerhaavia repens*	0.667	5.556	0.222	0.222	1.645
39.	*Commelina bengalensis*	0.167	3.704	0.056	0.083	0.704
40.	*Mangifera indica* (Seedling)	-	-	-	-	-
41.	*Oryza sativa*	-	-	-	-	-
42.	*Lathyrus sativus*	-	-	-	-	-
43.	*Acacia catechu* (Seedling)	-	-	-	-	-
44.	*Cleome viscosa*	0.50	5.556	0.167	0.167	1.507
45.	*Sida cordifolia*	-	-	-	-	-
46.	*Chrozophora plicata*	0.167	5.556	0.056	0.111	1.558
47.	*Allium cepa*	11.50	5.556	3.833	3.833	7.868
48.	*Basella alba*	-	-	-	-	-
49.	*Dolichos lablab*	-	-	-	-	-
50.	*Colocasia esculenta*	-	-	-	-	-
51.	*Stephania hernandifolia*	-	-	-	-	-
52.	*Poa sp.*	3.833	27.778	1.277	1.629	11.628
53.	*Acalypha indica*	2.333	44.444	0.777	1.093	13.180
54.	*Amaranthus spinosus*	0.722	18.518	0.241	0.444	4.519
55.	*Euphorbia hirta*	4.722	70.370	1.574	1.851	22.957
56.	*Euphorbia thymifolia*	3.333	55.556	1.111	1.435	16.152
57.	*Vernonia cinerea*	0.333	9.259	0.111	0.129	2.526
58.	*Eclipta prostrata*	-	-	-	-	-
59.	*Phoenix dactylifera* (Seedling)	-	-	-	-	-
60.	*Vicia hirsuta*	0.389	5.556	0.129	0.333	1.362

Table - 4a: No of plants, Frequency, Density, Abundance and IVI values of the plant population at site-C in January to June 1992.

No	Name of the sps.	No of the plants	Frequency	Density	Abundance	IVI
1.	*Cyperus rotundus*	30.85	69.444	13.99	13.889	49.868
2.	*Commelina bengalensis*	33.50	44.444	11.166	23.722	30.786
3.	*Evolvulus nummularius*	3.58	30.556	1.167	1.264	9.007
4.	*Imperata arundinacea*	2.25	25.00	0.75	1.042	6.834
5.	*Oxalis corniculata*	3.667	16.667	1.222	1.833	4.40
6.	*Ficus sp.* (Seedling)	0.917	24.999	0.306	0.50	4.399
7.	*Vernonia cinerea*	1.833	38.889	0.610	0.903	11.628
8.	*Achyranthes aspera*	6.167	55.556	2.056	2.334	23.072
9.	*Stephania hernandifolia*	2.00	25.00	0.666	1.292	5.769
10.	*Melia azadirachta* (Seedling)	2.00	33.333	0.667	1.00	7.361
11.	*Colocasia esculenta*	26.00	24.999	8.667	8.861	10.732
12.	*Commelina appendiculata*	11.00	22.222	3.666	5.194	10.981
13.	*Streblus asper*	0.50	13.889	0.167	0.375	4.579
14.	*Ervum sp.*	1.917	33.333	0.639	0.639	12.071
15.	*Mikania scandens*	1.50	24.999	0.444	0.569	9.575
16.	*Phoenix dactylifera* (Seedling)	0.50	13.889	0.167	0.375	2.203
17.	*Eclipta prostrata*	1.667	22.222	0.555	0.750	5.436
18.	*Clerodendron viscosum*	0.833	19.445	0.278	0.542	5.569
19.	*Alternenthera sessilis*	2.833	30.556	0.945	2.181	8.595
20.	*Lindenbergia urticifolia*	0.083	2.778	0.028	0.083	0.342
21.	*Psilotrichum ferrugineum*	0.667	5.556	0.222	0.333	2.576

22.	*Scoparia dulcis*	0.167	5.556	0.056	0.083	1.728
23.	*Phyllanthus reticulatus* (Seedling)	0.167	5.556	0.083	0.125	0.681
24.	*Herpestis chemaedroides*	0.583	5.556	0.194	0.292	1.651
25.	*Poa sp.*	0.333	5.556	0.111	0.167	0.896
26.	*Gnaphalium indicum*	0.083	2.778	0.028	0.083	0.719
27.	*Bombax malabaricum* (Seedling)	0.167	5.556	0.055	0.055	0.646
28.	*Cephalendra indica*	0.083	2.778	0.028	0.083	0.719
29.	*Euphorbia thymifolia*	-	-	-	-	-
30.	*Polygonum plebejum*	-	-	-	-	-
31.	*Oldenlandia corymbosa*	-	-	-	-	-
32.	*Amaranthus gangeticus*	-	-	-	-	-
33.	*Heliotropium indicum*	-	-	-	-	-
34.	*Desmodium sp.*	-	-	-	-	-
35.	*Zizyphus mauritiana* (Seedling)	-	-	-	-	-
36.	*Psidium sp.* (Seedling)	-	-	-	-	-
37.	*Acalypha indica*	-	-	-	-	-
38.	*Argemone mexicana*	0.583	5.556	0.194	0.194	1.614
39.	*Curcuma longa*	1.50	13.889	0.499	0.694	4.193
40.	*Solanum nigrum*	0.250	8.333	0.083	0.167	1.642
41.	*Lippia nodiflora*	4.167	52.778	1.472	1.542	14.894
42.	*Anona squamosa* (Seedling)	0.083	2.778	0.028	0.083	0.574
43.	*Eugenia sp.* (Seedling)	0.417	11.111	0.139	0.208	2.591
44.	*Blumea lacera*	1.583	24.999	0.528	0.611	7.789
45.	*Cenlelta asiatica*	21.5	52.778	7.167	7.489	21.065
46.	*Cynodon dactylon*	1.50	5.556	0.472	1.417	1.973
47.	*Tamarindus indica* (Seedling)	0.167	5.556	0.056	0.083	0.923

48.	*Ceratopteris thallictroides*	1.833	8.333	0.611	0.611	1.736
49.	*Sida cordifolia*	0.083	2.778	0.028	0.083	0.492
50.	*Glycosmis pentaphylla* (Seedling)	0.50	13.889	0.167	0.292	4.386

Table - 4b: No of plants, Frequency, Density, Abundance and IVI values of the plant population at site C in July to December 1992.

No	Name of the sps.	No of the plants	Frequency	Density	Abundance	IVI
1.	*Cyperus rotundus*	16.50	75.00	5.498	6.208	26.329
2.	*Commelina bengalensis*	58.41	66.666	19.472	20.347	49.713
3.	*Evolvulus nummularius*	6.833	52.78	2.278	2.444	10.962
4.	*Imperata arundinacea*	5.583	38.889	1.861	2.903	9.879
5.	*Oxalis corniculata*	3.333	24.99	1.11	2.153	4.987
6.	*Ficus sp.* (Seedling)	0.75	16.665	0.249	0.542	2.605
7.	*Vernonia cinerea*	1.167	30.555	0.389	0.514	5.065
8.	*Achyranthes aspera*	5.50	55.555	1.832	2.486	18.269
9.	*Stephania hernandifolia*	2.167	22.222	0.721	2.00	6.013
10.	*Melia azadirachta* (Seedling)	4.917	52.778	1.637	1.707	10.137
11.	*Colocasia esculenta*	1.083	8.333	0.361	1.083	2.184
12.	*Commelina appendiculata*	8.75	13.889	2.916	3.028	7.957
13.	*Streblus asper*	1.083	17.592	0.361	0.833	4.929
14.	*Ervum sp.*	2.50	30.555	0.833	1.764	11.447
15.	*Mikania scandens*	0.50	8.333	0.167	0.375	2.952
16.	*Phoenix dactylifera* (Seedling)	0.417	11.111	0.138	0.389	1.511
17.	*Eclipta prostrata*	0.333	11.111	0.111	0.167	1.701
18.	*Clerodendron viscosum*	1.25	24.999	0.417	0.667	5.683
19.	*Alternenthera sessilis*	2.75	27.777	0.917	1.180	6.175
20.	*Lindenbergia urticifolia*	0.25	5.556	0.083	0.125	0.888
21.	*Psilotrichum ferrugineum*	1.25	22.222	0.417	0.486	7.129

22.	*Scoparia dulcis*	0.5	13.889	0.167	0.333	2.591
23.	*Phyllanthus reticulatus* (Seedling)	0.083	2.778	0.028	0.083	0.343
24.	*Herpestis chemaedroides*	0.75	16.667	0.250	0.25	2.809
25.	*Poa sp.*	-	-	-	-	-
26.	*Gnaphalium indicum*	-	-	-	-	-
27.	*Bombax malabaricum* (Seedling)	-	-	-	-	-
28.	*Cephalandra indica*	--	--	-	-	-
29.	*Euphorbia thymifolia*	0.917	2.778	0.306	0.917	1.179
30.	*Polygonum plebejum*	2.50	2.778	0.833	2.500	2.778
31.	*Oldenlandia corymbosa*	0.25	2.778	0.083	0.250	0.505
32.	*Amaranthus gangeticus*	0.917	16.667	0.306	0.306	2.461
33.	*Heliotropium indicum*	0.250	8.333	0.083	0.167	0.967
34.	*Desmodium sp.*	0.333	5.556	0.111	0.333	2.056
35.	*Zizyphus mauritiana* (Seedling)	0.167	5.556	0.055	0.167	0.635
36.	*Psidium sp.* (Seedling)	0.167	5.556	0.056	0.056	0.539
37.	*Acalypha indica*	0.167	5.556	0.056	0.083	1.440
38.	*Argemone mexicana*	-	-	-	-	-
39.	*Curcuma longa*	12.583	50	4.194	4.194	36.549
40.	*Solanum nigrum*	0.083	2.778	0.028	0.083	0.928
41.	*Lippia nodiflora*	3.25	33.333	1.083	1.569	6.882
42.	*Anona squamosa* (Seedling)	0.083	2.778	0.028	0.083	0.343
43.	*Eugenia sp.* (Seedling)	1.75	22.222	0.583	0.958	3.073
44.	*Blumea lacera*	-	-	-	-	-
45.	*Centella asiatica*	14.833	66.667	4.944	5.277	22.563
46.	*Cynodon dactylon*	4.833	24.999	1.611	2.722	11.857
47.	*Tamarindus indica* (Seedling)	-	-	-	-	-

48.	*Ceratopteris thallictroides*	-	-	-	-	-
49.	*Sida cordifolia*	0.083	2.778	0.028	0.083	0.487
50.	*Glycosmis pentaphylla* (Seedling)	0.167	5.556	0.056	0.083	0.889

Table No. 4c: No. of plants, Frequency, Density, Abundance and IVI values of the plant population at site C in January to June 1993.

No	Name of the sps.	No of the plants	Frequency	Density	Abundance	IVI
1.	*Cyperus rotundus*	21.083	77.778	6.638	6.749	38.592
2.	*Commelina bengalensis*	15.50	55.555	5.165	5.999	33.539
3.	*Evolvulus nummularius*	5.50	44.445	1.832	2.221	10.784
4.	*Imperata arundinacea*	2.667	13.889	0.889	1.250	4.062
5.	*Oxalis corniculata*	1.167	16.666	0.388	0.750	2.893
6.	*Ficus sp.* (Seedling)	0.417	13.889	0.1386	0.250	1.790
7.	*Vernonia cinerea*	0.083	2.778	0.028	0.083	0.921
8.	*Achyranthes aspera*	6.083	47.222	1.833	2.139	27.258
9.	*Stephania hernandifolia*	1.50	19.444	0.499	0.917	4.029
10.	*Melia azadirachta* (Seedling)	8.00	44.444	2.666	2.722	12.757
11.	*Colocasia esculenta*	0.75	11.111	0.249	0.375	4.391
12.	*Commelina appendiculata*	-	-	-	-	-
13.	*Streblus asper*	0.75	24.999	0.249	0.583	6.499
14.	*Ervum sp.*	3.917	47.222	1.305	1.361	18.507
15.	*Mikania scandens*	1.25	16.667	0.416	0.625	7.592
16.	*Phoenix dactylifera* (Seedling)	0.333	8.333	0.111	0.333	1.509
17.	*Eclipta prostrata*	3.583	30.556	1.194	1.236	6.674
18.	*Clerodendron viscosum*	1.417	24.999	0.472	0.833	7.235
19.	*Altermenthera sessilis*	0.250	5.556	0.083	0.125	0.786
20.	*Lindenbergia urticifolia*	0.50	13.888	0.166	0.278	3.275
21.	*Psilotrichum ferrugeneum*	-	-	-	-	-

22.	*Scoparia dulcis*	-	-	-	-	-
23.	*Phyllanthus reticulatus* (Seedling)	0·417	13·889	0·139	0·167	1·675
24.	*Herpestis chamaedroides*	0.750	13.889	0.25	0.292	3.222
25.	*Poa sp.*	0.50	5.556	0.167	0.250	1.121
26.	*Gnaphalium indicum*	-	-	-	-	-
27.	*Bombax malbaricum* (Seedling)	-	-	-	-	-
28.	*Cephalendra indica*	0.083	2.778	0.028	0.083	0.921
29.	*Euphorbia thymifolia*	-	-	-	-	-
30.	*Polygonum plebejum*	-	-	-	-	-
31.	*Oldenlandia corymbosa*	-	-	-	-	-
32.	*Amaranthus gangeticus*	0.083	2.778	0.028	0.083	0.407
33.	*Heliotropium indicum*	-	-	-	-	-
34.	*Desmodium sp.*	-	-	-	-	-
35.	*Zizyphus mauritiana* (Seedling)	-	-	-	-	-
36.	*Psidium sp.* (Seedling)	-	-	-	-	-
37.	*Acalypha indica*	4.75	11.111	1.583	1.639	9.064
38.	*Argemone mexicana*	-	-	-	-	-
39.	*Curcuma longa*	0.583	11.111	0.194	0.292	3.934
40.	*Solanum nigrum*	0.167	5.556	0.056	0.083	0.674
41.	*Lippia nodiflora*	6.25	55.555	2.083	2.249	13.632
42.	*Anona squamosa* (Seedling)	0.333	11.111	0.111	0.250	1.482
43.	*Eugenia sp.* (Seedling)	0.50	13.889	0.167	0.292	2.499
44.	*Blumea lacera*	0.583	16.667	0.194	0.292	5.342
45.	*Centella asiatica*	7.750	44.444	2.583	3.069	13.097
46.	*Cynodon dactylon*	27.083	55.556	9.028	10.639	37.989
47.	*Tamarindus indica* (Seedling)	-	-	-	-	-

48.	*Ceratopteris thallictrodes*	-	-	-	-	-
49.	*Sida cordifolia*	0.083	2.778	0.028	0.083	0.487
50.	*Glycosmis pentaphylla* (Seedling)	0·667	19·444	0·222	0·542	6·232

Table - 5a : Average of the four quantitative characters at site A during the study period (Means of three replicates ± S.E.)

No	Name of the sps.	Name of the plants	Frequency	Density	Abundance
1.	*Cynodon dactylon*	5.04±1.25	46.91±7.49	1.68±0.41	2.14±1.24
2.	*Blumea lacera*	0.13±0.09	3.39±2.02	0.04±0.03	0.06±0.03
3.	*Lindenbergia urlicifolia*	2.97±1.37	22.84±1.23	0.50±0.05	0.72±0.05
4.	*Euphorbia thymifolia*	1.07±0.07	21.29±0.00	0.37±0.04	0.58±0.04
5.	*Cyperus rotundus*	68.95±15.04	95.68±1.11	22.27±4.96	22.33±4.98
6.	*Argemone mexicana*	18.71±2.52	72.84±9.11	6.31±0.80	6.47±0.83
7.	*Leucas aspera*	11.518±2.21	80.56±5.43	3.84±0.74	4.09±0.79
8.	*Euphorbia hirta*	2.42±.028	40.43±1.23	0.82±0.08	1.17±0.08
9.	*Soalanum nigrum*	0.70±0.15	17.90±2.94	0.24±0.05	0.41±0.07
10.	*Mullugo hirta*	1.52±0.25	12.04±1.41	0.51±0.08	0.55±0.06
11.	*Lippia nodiflora*	0.75±0.19	16.67±4.66	0.25±0.07	0.37±0.09
12.	*Lycopersicum esculentum*	1.84±0.44	2.31±1.60	0.59±0.14	0.73±0.16
13.	*Anagallis arvensis*	0.28±0.12	5.86±2.41	0.09±0.04	0.22±0.11
14.	*Heliotropium indicum*	0.02±0.01	0.62±0.31	0.006±0.003	0.02±0.01
15.	*Oryza sativa*	0.45±0.43	4.32±3.46	0.15±0.14	0.29±0.26
16.	*Vernonia cinerea*	0.55±0.20	4.64±0.62	0.18±0.07	0.34±0.19
17.	*Spinacia oleracea*	0.82±0.35	7.09±2.64	0.43±0.24	0.34±0.11
18.	*Eclipta prostata*	0.07±0.02	1.85±0.93	0.022±0.008	0.06±0.02
19.	*Amaranthus gangeticus*	0.97±0.026	13.27±7.29	0.29±0.10	0.46±0.14
20.	*Melilotus alba*	0.57±0.24	10.19±3.74	0.19±0.08	0.24±0.09
21.	*Amaranthus spinosus*	1.10±0.17	20.68±2.16	0.37±0.06	0.72±0.17
22.	*Alternenthera sessilis*	0.68±0.29	13.58±6.19	0.22±0.09	0.59±0.36
23.	*Amaranthus viridis*	0.32±0.16	6.48±2.33	0.11±0.05	0.16±0.05
24.	*Raphanus sativus*	1.21±1.09	5.25±2.23	0.40±0.36	0.46±0.38
25.	*Allium sativum*	5.73±5.73	3.70±3.70	1.91±1.91	1.91±1.91
26.	*Commelina bengalensis*	0.7±0.26	13.58±4.45	0.26±0.08	0.35±0.11
27.	*Evolvulus nummularius*	0.04±0.04	0.93±0.93	0.01±0.01	0.01±0.01
28.	*Boerhaavia repens*	0.06±0.02	1.23±0.31	0.02±0.01	0.04±0.01
29.	*Oxalis corniculata*	1.89±0.45	20.68±7.18	0.63±0.19	1.03±0.26
30.	*Allium cepa*	2.48±2.48	1.85±1.85	0.83±0.83	0.83±0.83
31.	*Mililotus indica*	2.25±0.78	16.98±4.55	0.75±0.26	0.89±0.30
32.	*Coriandrum sativum*	16.27±8.12	6.48±0.93	5.37±2.74	5.37±2.74
33.	*Gnaphalium indicum*	7.51±5.92	19.14±9.89	2.50±1.97	2.59±1.97
34.	*Poa sp.*	3.43±1.87	27.47±14.49	1.13±0.63	1.39±0.76
35.	*Herpestis chamaedroides*	1.19±0.29	15.43±3.79	0.39±0.09	0.57±0.15
36.	*Polygonum plebejum*	1.37±1.29	4.63±2.45	0.46±0.43	0.51±0.44
37.	*Centella asiatica*	0.02±0.02	0.62±0.62	0.01±0.01	0.02±0.02

38.	*Acalypha indica*	1.37±0.69	14.51±4.61	0.48±0.21	0.64±0.26
39.	*Scoparia dulcis*	0.29±0.08	7.41±1.60	0.09±0.03	0.14±0.03
40.	*Launea asplinifolia*	1.01±0.52	6.79±2.16	0.34±0.17	0.46±0.14
41.	*Psilotrichum ferrugineum*	0.77±0.28	10.80±3.27	0.26±0.09	0.40±0.18
42.	*Oldenlandia corymbosa*	2.97±2.22	8.92±4.08	0.24±0.04	0.44±0.08
43.	*Sonchus asper*	0.03±0.03	0.62±0.62	0.01±0.01	0.01±0.01
44.	*Crozophora plicata*	0.55±0.032	14.51±5.72	0.19±0.07	0.29±0.09
45.	*Imperata arundinacea*	0.06±0.06	1.85±1.85	0.02±0.02	0.04±0.04
46.	*Chenopodium album*	0.04±0.02	0.93±0.53	0.01±0.01	0.04±0.02
47.	*Solanum melongena*	0.36±0.09	6.17±1.63	0.12±0.03	0.14±0.03
48.	*Brassica nigra*	0.02±0.02	0.62±0.62	0.01±0.01	0.02±0.02
49.	*Croton sp.*	0.08±0.06	1.85±1.07	0.03±0.02	0.07±0.05
50.	*Ervum sp.*	0.31±0.04	3.39±0.62	0.07±0.02	0.08±0.01
51.	*Mukia medaraspatana*	0.02±0.02	0.31±0.31	0.01±0.01	0.02±0.02
52.	*Anona reticulata*	0.04±0.02	1.23±0.62	0.01±0.01	0.04±0.02

Table - 5b : Average of the four quantitative characters at site B during the study period (Means of three replicates ± S.E.)

No	Name of the sps.	Name of the plants	Frequency	Density	Abundance
1.	*Herpestis chamaedroides*	3.24±0.92	40.12±7.73	1.08±0.30	1.19±0.29
2.	*Cyperus rotundus*	30.33±13.95	83.33±7.41	9.49±4.04	10.16±4.33
3.	*Leucas aspera*	10.49±0.24	69.14±2.47	3.16±0.40	4.09±0.34
4.	*Argemone mexicana*	7.29±1.57	49.38±10.92	2.43±0.52	2.04±0.89
5.	*Cynodon dactylon*	1.59±0.46	23.46±3.75	0.53±0.15	0.67±0.17
6.	*Gnaphalium indicum*	0.21±0.21	2.47±2.47	0.07±0.07	0.10±0.10
7.	*Solanum nigrum*	0.43±0.27	9.26±5.66	0.14±0.09	0.20±0.13
8.	*Amaranthus gangeticus*	4.11±3.86	14.81±9.79	1.37±1.29	1.49±1.33
9.	*Anona reticulata*	0.24±0.07	8.02±2.69	0.09±0.02	0.15±0.06
10.	*Croton sp.*	0.15±0.09	1.85±1.07	0.05±0.03	0.12±0.09
11.	*Coriandrum sativum*	0.04±0.04	1.23±1.23	0.01±0.01	0.02±0.02
12.	*Phyllanthus reticulatus* (Seedling)	0.13±0.07	3.70±1.85	0.04±0.02	0.08±0.04
13.	*Heliotropium indicum*	0.02±0.02	0.62±0.62	0.01±0.01	0.02±0.02
14.	*Ervum sp.*	0.22±0.06	4.94±0.62	0.07±0.02	0.10±0.01
15.	*Imperata arundinacea*	0.44±0.44	8.02±8.02	0.15±0.15	0.21±0.21
16.	*Sonchus asper*	0.07±0.07	2.47±2.47	0.02±0.02	0.04±0.04
17.	*Brassica nigra*	0.04±0.02	1.23±0.62	0.013±0.006	0.04±0.02
18.	*Oldenlandia corymbosa*	0.13±0.13	2.47±2.47	0.04±0.04	0.07±0.07
19.	*Zizyphus mauritiana.* (Seedling)	0.06±0.06	1.23±1.23	0.02±0.02	0.03±0.03
20.	*Melia azadirachta* (Seedling)	0.04±0.04	0.62±0.62	0.01±0.01	0.04±0.04
21.	*Chenopodium album*	0.07±0.07	1.23±1.23	0.01±0.01	0.04±0.04
22.	*Cucurbita sp.*	0.02±0.02	0.62±0.62	0.01±0.01	0.02±0.02
23.	*Clerodendrom viscosum* (Seedling)	0.20±0.20	6.17±0.62	0.07±0.01	0.13±0.02
24.	*Lindenbergia urticifolia*	2.20±0.39	17.28±0.62	0.73±0.13	1.06±0.29
25.	*Lens esculenta*	0.06±0.06	1.23±1.23	0.02±0.02	0.03±0.03
26.	*Lippia nodiflora*	2.29±0.57	27.78±7.01	0.77±0.19	0.97±0.18
27.	*Orobanche indica*	0.611±0.11	9.88±2.23	0.20±0.04	0.22±0.03
28.	*Cajanus indicus*	0.28±0.28	5.56±5.56	0.09±0.09	0.12±0.12
29.	*Scoparia dulcis*	1.65±1.03	15.43±7.43	0.55±0.34	0.57±0.37
30.	*Laginaria vulgaris*	0.13±0.13	1.23±1.23	0.04±0.04	0.07±0.07
31.	*Amaranthus viridis*	1.19±0.74	17.90±6.08	0.39±0.25	0.38±0.10
32.	*Lycopersicum esculentum*	1.63±0.57	10.49±2.47	0.54±0.19	0.91±0.30

33.	*Solanum melongena*	1.20±0.24	21.61±3.75	0.39±0.09	0.46±0.09
34.	*Capcicum frutescens*	4.37±1.29	20.06±5.35	1.46±0.43	1.56±0.53
35.	*Oxalis corniculata*	1.70±0.37	15.43±4.32	0.57±0.12	0.76±0.13
36.	*Anagallis arvensis*	0.11±0.08	3.09±2.23	0.04±0.03	0.09±0.07
37.	*Achyranthes aspera*	0.26±0.02	6.17±0.62	0.09±0.01	0.14±0.03
38.	*Boerhaavia repens*	0.24±0.21	2.47±1.63	0.08±0.07	0.09±0.07
39.	*Commelina bengalensis*	1.09±0.77	7.41±2.83	0.36±0.25	0.47±0.25
40.	*Mangifera indica*	0.04±0.04	1.23±1.23	0.01±0.01	0.04±0.04
41.	*Oryza sativa*	0.09±0.05	3.09±1.63	0.03±0.02	0.07±0.04
42.	*Lathyrus sativus*	0.04±0.04	1.23±1.23	0.01±0.01	0.02±0.02
43.	*Acacia catechu* (Seedling)	0.02±0.02	0.62±0.62	0.01±0.01	0.02±0.02
44.	*Cleome viscosa*	0.70±0.29	9.26±3.70	0.23±0.09	0.23±0.09
45.	*Sida cordifolia*	0.04±0.04	1.23±1.23	0.01±0.01	0.04±0.04
46.	*Chrozophora plicata*	0.09±0.05	3.09±1.63	0.03±0.02	0.06±0.03
47.	*Allium cepa*	0.59±1.98	3.70±1.85	2.19±1.14	2.19±1.14
48.	*Basella alba*	0.07±0.07	1.23±1.23	0.02±0.02	0.04±0.04
49.	*Dolichos lablab*	0.04±0.04	1.23±1.23	0.01±0.01	0.02±0.02
50.	*Colocasia esculenta*	0.04±0.04	1.23±1.23	0.01±0.01	0.04±0.04
51.	*Stephania hernandifolia*	0.02±0.02	0.62±0.62	0.01±0.01	0.02±0.02
52.	*Poa sp.*	3.24±0.44	27.778±0.00	1.08±0.15	1.32±0.26
53.	*Acalypha indica*	2.22±1.061	41.98±8.64	0.74±0.20	0.99±0.24
54.	*Amaranthus spinosus*	1.15±0.24	23.36±2.42	0.38±0.08	0.59±0.09
55.	*Euphorbia hirta*	3.35±0.80	58.02±8.17	1.12±0.27	1.41±0.24
56.	*Euphorbia thymifolia*	2.85±0.27	43.21±6.26	0.95±0.09	1.44±0.29
57.	*Vernonia cinerea*	0.79±0.41	15.43±5.27	0.27±0.14	0.39±0.22
58.	*Eclipta prostrata*	0.06±0.06	1.85±1.85	0.02±0.02	0.04±0.04
59.	*Phoenix dactylifera* (Seedling)	0.04±0.04	0.62±0.62	0.01±0.01	0.04±0.04
60.	*Vicia hirsuta*	0.35±0.09	6.17±0.04	0.13±0.04	0.26±0.05

Table - 5c: Average of the four quantitative characters at site C during the study period (Means of three replicates ±S.E.)

No	Name of the sps.	Name of the plants	Frequency	Density	Abundance
1.	*Cyperus rotundus*	22.81±4.23	70.07±2.45	8.71±2.66	8.95±2.48
2.	*Commelina bengalensis*	35.80±12.44	55.56±6.41	11.93±4.15	16.69±5.43
3.	*Evolvulus nummularius*	5.30±0.94	42.59±6.48	1.76±0.32	1.98±0.36
4.	*Imperata arundinacea*	3.50±1.05	25.93±7.23	1.17±0.35	1.73±0.59
5.	*Oxalis corniculata*	2.72±0.78	19.44±2.78	0.91±0.26	1.58±0.42
6.	*Ficus sp.* (Seedling)	0.69±0.15	18.52±3.34	0.23±0.05	0.43±0.09
7.	*Vernonia cinerea*	1.03±0.51	24.07±10.92	0.34±0.17	0.5±0.24
8.	*Achyranthus aspera*	5.92±0.21	52.78±2.78	1.91±0.07	2.32±0.10
9.	*Stephania hernandifolia*	1.89±0.20	22.22±1.60	0.63±0.07	1.40±0.32
10.	*Melia azadirachta* (Seedling)	4.97±1.73	43.52±5.63	1.66±0.58	1.81±0.49
11.	*Colocasia esculenta*	9.28±8.36	14.81±5.16	3.09±2.79	3.44±2.72
12.	*Commelina appendiculata*	6.58±3.36	12.04±6.48	2.19±1.12	2.74±1.51
13.	*Streblus asper*	0.78±0.17	18.83±3.27	0.26±0.06	0.59±0.13
14.	*Ervum sp.*	2.78±0.59	37.04±5.16	0.93±0.19	1.26±0.33
15.	*Mikania scandens*	1.08±0.30	16.67±4.81	0.34±0.09	0.52±0.08
16.	*Phoenix dactylifera* (Seedling)	0.42±0.05	11.11±1.60	0.14±0.02	0.37±0.02
17.	*Eclipta prostrata*	1.86±0.94	21.29±5.63	0.62±0.31	0.72±0.31
18.	*Clerodendron viscosum* (Seedling)	1.17±0.17	23.15±1.85	0.39±0.06	0.68±0.08
19.	*Alternenthera sessilis*	1.94±0.85	21.29±7.91	0.65±0.28	1.16±0.59
20.	*Glycosmis pentaphylla* (Seedling)	0.44±0.15	12.96±4.04	0.15±0.05	0.31±0.13
21.	*Lindenbergia urticifolia*	0.28±0.12	7.41±3.34	0.09±0.04	0.16±0.06
22.	*Psilotrichum ferrugineum*	0.64±0.36	9.26±6.68	0.21±0.12	0.27±0.14
23.	*Scoparia dulcis*	0.22±0.15	6.48±4.04	0.07±0.05	0.14±0.10
24.	*Phyllanthus reticulatus* (Seedling)	0.22±0.10	7.41±3.34	0.08±0.03	0.13±0.02
25.	*Herpestis chamaedroides*	0.69±0.06	12.04±3.34	0.23±0.02	0.28±0.01
26.	*Poa sp.*	0.28±0.15	3.70±1.85	0.09±0.05	0.14±0.07
27.	*Gnaphalium indicum*	0.03±0.03	0.93±0.93	0.01±0.01	0.03±0.03
28.	*Bombax malbaricum*	0.06±0.06	1.85±1.85	0.02±0.02	0.02±0.02
29.	*Cephalendra indica*	0.06±0.03	1.85±0.93	0.02±0.01	0.06±0.03
30.	*Euphorbia thymifolia*	0.31±0.31	0.93±0.93	0.10±0.10	0.31±0.31
31.	*Polygonum plebejum*	0.83±0.83	0.93±0.93	0.28±0.28	0.83±0.83

32.	*Oldenlandia corymbosa*	0.08±0.08	0.93±0.93	0.03±0.03	0.08±0.08
33.	*Amaranthus gangeticus*	0.33±0.29	6.48±5.16	0.11±0.09	0.13±0.09
34.	*Heliotropium indicum*	0.08±0.08	2.78±2.78	0.03±0.03	0.06±0.06
35.	*Desmodium sp.*	0.11±0.11	1.85±1.85	0.04±0.04	0.11±0.11
36.	*Zizyphus mauritiana* (Seedling)	0.06±0.06	1.85±1.85	0.02±0.02	0.06±0.06
37.	*Psidium sp.* (Seedling)	0.06±0.06	1.85±1.85	0.02±0.02	0.02±0.02
38.	*Acalypha indica*	1.64±1.56	5.56±3.21	0.55±0.52	0.57±0.53
39.	*Argemone mexicana*	0.19±0.19	0.19±0.19	0.06±0.06	0.06±0.06
40.	*Curcuma longa*	4.89±3.86	20.87±14.83	1.63±1.29	1.73±1.24
41.	*Solanum nigrum*	0.17±0.05	2.86±1.53	0.06±0.02	0.11±0.03
42.	*Lippia nodiflora*	4.56±0.89	31.02±14.88	1.55±0.29	1.79±0.23
43.	*Anona squamosa* (Seedling)	0.07±0.02	4.66±3.32	0.06±0.03	0.14±0.06
44.	*Eugenia sp.* (Seedling)	0.89±0.43	12.18±6.35	0.29±0.14	0.49±0.24
45.	*Blumea lacera*	0.72±0.46	6.08±5.31	0.24±0.15	0.30±0.18
46.	*Centella asiatica*	14.69±3.97	44.20±13.04	4.89±1.32	2.79±1.77
47.	*Cynodon dactylon*	11.14±8.03	27.35±15.65	3.70±2.68	4.93±2.88
48.	*Tamarindus indica*	0.06±0.06	0.06±0.06	0.02±0.02	0.03±0.03
49.	*Ceratopteris thallictroides*	0.61±0.61	0.61±0.61	0.20±0.20	0.20±0.20
50.	*Sida cordifolia*	0.083±0.00	1.88±0.89	0.028±0.00	0.083±0.00

Importance value indices (IVI) of diffrerent species in diffrent sites

Flora of study area as surveyed in 3 selected sites consisted of 152 species as mentioned before. The IVI of different species of different sites during the three periods are described below.

Tables 6a - 6c indicate that most of the herbs of different sites were found to occur throughout the year except a few species only.

Site - A:

At this site 52 plant species were recorded. The occurrence of these species and their importance value indices (IVI) were found to vary from period to period as shown in Table -6a. Among the plant species *Cyperus rotundus* had the maximum IVI of 61.14, whereas *Brassica nigra* showed the minimum IVI of 0.07. Most of the herbs acquired very low 0.09 - 14.04 (Table - 6a). The IVI of 34.19 and 27.93 were shown by *Argemone mexicana.* and *Leucas aspera*

IVI of the herbs together with their periodic variations.

During the three periods of survey, it was observed that most species of herbs perennate all over the year. Only a few species occured occasionally and they included eg. *Heliotropicem indicum, Polygonum plebejum* found in January to June 1992 and January to June 1993 (But not in July to December 1992). Among them *Ploygonum plebejum* showed the maximum IVI (1.37).

Some other herbs found only in January to June in 1992 were *Allium sativum; cultivated Evolvulus nummalarius, Allium cepa, (Cultivated), Centella asiatica, Sonchus asper.* Among them *Allium sativum* (Cultivated) showed the maximum IVI (2.14). Some other species occured only in July to December 1992; such as *Imperata arundinacea, Brassica nigra; Croton sp.* Among these species *Imperata arundinacea* showed the maximum IVI 0.33. *Mukia madaraspatna* and *Anona reticulata* were found in July to December 1992 and January to June 1993, but not in January to June 1992. Among them *Mukia medaraspatna* showed the maximum IVI 0.31. Only one species *Oryza sativa* was found in January to December 1992 (but not in January to June 1993).

From the result it is clear that *Cyperus rotundus* was the dominant species in herb layers.

Site - B.

In this site 60 plant species were recorded. The occurrence of these species and their important value indices (IVI) were found to vary from period to period as shown in Table - 6b. Among the herbs *Cyperus rotundus* had the maximum IVI 61.79 whereas *Stephania hernandifolia* showed the minimum IVI (0.08). The IVI 26.96 and 19.56, 16.81 were shown by *Leucas aspera* and *Argemone mexicana and Euphorbia hirta.* All other species had very low IVI 0.09 - 13.08 (6b).

IVI of the herbs together with their periodic variations.

Among the herbs *Cyperus rotundus* had the highest IVI of 61.79 and *Stephania hernandifolia* had the lowest IVI of 0.08. Most of the herbs prevailed all over the year, except a few species that were found in particular season. e.g, *Gnaphalium indicum, Heliotropiun indicum, Lagenaria vulgaris. Eclipta prostrata, Phoenix dactylon* (Seedling) *and Lens esculenta (*Cultivated) were found in January to June 1992. Among them *Gnaphalium indicum* showed the maximum IVI (0.72). A few species were found only in July to December 1992 such as *Imperata arundinacea, Sida cordifolia, Oldenlandia corymbosa and Chenopodium album.*. Among them *Imperata arundinacea* showed the maximum IVI (1.34). Some other species were found in July to December 1992 and January to June 1993 (but not in January to June in 1992) eg. *Amaranthus gangeticus.; Brassica nigra, Boerhaavia repens; Allium cepa (Cultivates)*. Among them *Amaranthus gangeticus* showed the maximum IVI (5.44*)*. A few species were found in January to June 1992 and July to December 1992 (but not in January to June 1993) such as *Croton sp.*; *Scoparia dulcis and Oryza sativa.* Among them *Scoparia dulcis* showed the maximum IVI (4.78). *Phyllanthus reticulatus* and *Chrozophora plicata* were found in January to June 1992 and January to June 1993 (but not in July to December 1992). Among them *Phyllanthus reticulatus* showed the maximum IVI 1.07 (Table 6b).

On the basis of this result, it is clear that *Cyperus rotundus* was the dominant species in herb layers.

Site - C.

The flora of site C consisted in 50 plant species. Among these plant species *Cyperus rotundus* had the maximum IVI of 38.26 and the IVI of *Commelina bengalensis* is near to the former. On the other hand, *Oldenlandia corymbosa* had the minimum IVI of 0.17 (Table - 6c). The IVI 22.87; 18.91 and 17.27 were shown by *Achyranthes aspera; Centella asiatica* and *Cynodon dactylon*. All other species had very low IVI 0.18-14.89 (Table - 6c).

IVI of the herbs together with their periodic variations.

Among the herbs *Cyperus rotundus* showed the highest IVI 38.26 and *Oldenlandia corymbosa* showed the lowest IVI (0.17). Most of the herbs prevailed all over the year except a few species that were found in a particular season eg. *Commelina appendiculata, Psilotrichum ferrugineum and Scoparia dulcis* were found in July to December 1992 and January to June 1993 (but not in January to June 1992). Among them *Commelina appendiculata* showed the maximum IVI 6.31. Some other species were found only in July to December such as *Euphorbia thymifolia; Polygonum plebejum. Oldenlandia corymbosa, Heliotropium indicum; Desmodium sp., Psidium sp*(Seedling). and *Zizyphus mauritiana* (Seedling). Among them *Polygonum plebejum* showed the maximum IVI 0.93. A few species were found in January to June 1993, such as *Gnaphalium indicum, Bombax malabaricum, Ceratopteris thallictroides, Argemone mexicana*. Among them *Ceratopteris thallictroides* showed the maximum IVI 0.58, *Blumea lacera* was found in January to June 1992 and

1993 (But not in July to December 1992). The IVI of 4.38 was shown by *Blumea lacera*. A few species were found in January to June 1992 and July to December 1992 such as *Amaranthus gengeticus* and *Acalypha indica*. Among them *Acalypha indica* showed the maximum IVI 3.50 (Table - 6c).

This result indicates that *Cyperus rotundus* was the dominant species in herbs layers.

Table - 6a: Importance value index (IVI) at site A during the study period

No	Name of the sps.	Jnauary'92 - June '92	July'92 - Dec. 92	Janu. '93 - June '93	Average
1.	*Cynodon dactylon*	8.524	19.471	14.133	14.04±3.16
2.	*Blumea lacera*	0.094	1.194	0.196	0.49±0.35
3.	*Lindenbergia urticifolia*	5.30	5.526	5.686	5.50±0.11
4.	*Euphorbia thymifolia*	6.326	6.351	5.328	6.0±0.34
5.	*Cyperus rotundus*	57.928	103.589	21.910	61.14±23.63
6.	*Argemone mexicana*	33.582	25.764	43.223	34.19±5.05
7.	*Leucas aspera*	25.785	23.629	34.363	27.93±3.28
8.	*Euphorbia hirta*	11.355	9.233	11.129	10.57±0.67
9.	*Solanum nigrum*	4.829	4.369	2.295	3.83±0.78
10.	*Mullugo hirta*	4.106	3.067	4.739	3.97±0.49
11.	*Lippia nodiflora*	4.093	5.519	3.232	4.28±0.67
12.	*Lycopercicum esculentum*	4.687	6.976	3.441	5.03±1.04
13.	*Anagallis arvensis*	2.239	0.760	0.421	1.14±0.56
14.	*Heliotropium indicum*	0.179	-	0.494	0.22±0.14
15.	*Oryza sativa*	2.704	0.518	-	1.07±0.83
16.	*Vernonia cinerea*	3.723	2.507	1.675	2.64±0.59
17.	*Spinacia oleracea*	0.476	2.509	2.277	1.75±0.64
18.	*Eclipta prostata*	0.542	0.246	0.206	0.33±0.11
19.	*Amaranthus gangeticus*	2.077	5.956	1.907	3.31±1.32
20.	*Melilotus alba*	2.419	0.843	3.724	2.33±0.83
21.	*Amaranthus spinosus*	6.422	4.218	5.944	5.53±0.67
22.	*Alternenthera sessilis*	5.094	1.412	1.615	2.71±1.19
23.	*Amaranthus viridis*	0.932	2.789	1.053	1.59±0.59
24.	*Raphanus sativus*	5.266	1.592	0.109	2.32±1.53
25.	*Allium sativum*	6.415	-	-	2.14±2.14
26.	*Commelina bengalensis*	1.842	5.478	1.014	2.78±1.37

27.	*Evolvulus nummularius*	0.614	-	-	0.20±0.20
28.	*Boerhaavia repens*	0.343	0.231	0.144	0.24±0.06
29.	*Oxalis corniculata*	6.292	1.243	6.143	4.56±1.66
30.	*Allium cepa*	3.230	-	-	1.08±1.08
31.	*Mililotus indica*	3.882	1.822	6.494	4.07±1.35
32.	*Coriandrum sativum*	4.958	11.621	4.354	6.98±2.33
33.	*Gnaphalium indicum*	16.967	0.204	6.727	7.97±4.88
34.	*Poa sp.*	0.889	17.291	7.492	8.56±4.76
35.	*Herpestis chamaedroides*	4.860	2.442	5.586	4.29±0.95
36.	*Polygonum plebejum*	2.989	-	1.114	1.37±0.87
37.	*Centella asiatica*	0.417	-	-	0.14±0.14
38.	*Acalypha indica*	2.340	5.906	4.456	4.23±1.04
39.	*Scoparia dulcis*	0.902	2.284	1.889	1.69±0.41
40.	*Launea asplinifolia*	2.212	0.681	3.835	2.24±0.91
41.	*Psilotrichum ferrugineum*	2.504	1.447	5.085	3.01±1.08
42.	*Oldenlandia corymbosa*	1.858	2.045	3.437	2.45±0.49
43.	*Sonchus asper*	0.276	-	-	0.09±0.09
44.	*Chrozophora plicata*	4.589	0.545	4.769	3.30±1.38
45.	*Imperata arundinacea*	-	0.984	-	0.33±0.33
46.	*Chenopodium album*	-	0.293	0.141	0.14±0.08
47.	*Solanum melongena*	1.369	1.906	0.765	1.35±0.33
48.	*Brassica nigra*	-	0.208	-	0.07±0.07
49.	*Croton sp.*	-	0.642	-	0.21±0.21
50.	*Ervum sp.*	1.129	0.451	0.599	0.73±0.21
51.	*Mukia medaraspatana*	-	0.109	0.826	0.31±0.26
52.	*Anona reticulata*	-	0.451	0.451	0.30±0.15

Table - 6b: Importance value index (IVI) at site B during the study period

No	Name of the sps.	Jnauary'92 - June '92	July'92 - Dec. 92	Janu. '93 - June '93	Average
1.	*Herpestis chamaedroides*	17.872	9.31	9.472	12.22±2.83
2.	*Cyperus rotundus*	59.069	82.014	44.299	61.79±10.97
3.	*Leucas aspera*	28.252	21.076	31.560	26.96±3.09
4.	*Argemone mexicana*	25.295	14.408	18.976	19.56±3.16
5.	*Cynodon dactylon*	8.793	4.738	8.203	7.24±1.26
6.	*Gnaphalium indicum*	2.146			0.72±0.72
7.	*Solanum nigrum*	1.576	3.945	0.656	2.06±0.98
8.	*Amaranthus gangeticus*		14.226	2.103	5.44±4.43
9.	*Anona reticulata*	1.864	0.915	3.208	1.99±0.67
10.	*Croton sp.*	0.488	1.10	-	0.53±0.32
11.	*Coriandrum sativum*	0.679	-	-	0.23±0.23
12.	*Phyllanthus reticulatus (ISeedling)*	1.047	-	2.149	1.07±0.62
13.	*Heliotropium indicum*	0.368	-	-	0.12±0.12
14.	*Ervum sp.*	1.37	0.869	0.759	0.99±0.19
15.	*Imperata arundinacea*		4.028		1.34±1.34
16.	*Sonchus asper*	1.547	-	-	0.52±0.52
17.	*Brassica nigra*	-	0.334	1.919	0.75±0.59
18.	*Oldenlandia corymbosa*	-	1.712	-	0.57±0.57
19.	*Zizyphus mauritiana* (Seedling)	-	0.589	-	0.19±0.19
20.	*Melia azadirachta* (Seedling)	-	0.436	-	0.15±0.15
21.	*Chenopodium album*	-	0.580	-	0.19±0.19
22.	*Cucurbita sp.*	-	-	0.351	0.12±0.12
23.	*Clerodendron viscosum*	1.782	2.097	1.875	1.92±0.09
24.	*Lindenbergia urticifolia*	6.784	6.986	5.494	6.42±0.47

25.	*Lens esculenta*	0.501	-	-	1.17±1.17
26.	*Lippia nodiflora*	12.888	6.401	8.072	9.12±1.94
27.	*Orobanche indica*	4.653	1.779	2.805	3.08±0.84
28.	*Cajanus indicus*	2.944	-	-	0.98±0.98
29.	*Scoparia dulcis*	7.456	6.875	-	4.78±2.39
30.	*Laginaria vulgaris*	0.706	-	-	0.24±0.24
31.	*Amaranthus viridis*	3.461	4.456	2.044	3.32±0.69
32.	*Lycopercicum esculentum*	4.547	3.628	1.535	3.24±0.89
33.	*Solanum melongena*	6.775	2.853	7.828	5.82±1.51
34.	*Capcicum frutescens*	12.747	11.858	4.752	9.79±2.53
35.	*Oxalis corniculata*	6.895	3.809	3.572	4.76±1.07
36.	*Anagallis arvensis*	1.858	0.389	-	0.75±0.57
37.	*Achyranthes aspera*	1.765	1.365	1.738	1.62±0.13
38.	*Boerhaavia repens*		0.297	1.645	0.65±0.51
39.	*Commelina bengalensis*	4.811	1.199	0.704	2.24±1.29
40.	*Mangifera indica* (Seedling)	0.699	-	-	0.23±0.23
41.	*Oryza sativa*	1.047	0.552	-	0.53±0.30
42.	*Lathyrus sativus*	0.449	-	-	0.15±0.15
43.	*Acacia catechu* (Seedling)	0.275	-	-	0.09±0.09
44.	*Cleome viscosa*	1.37	3.263	1.507	2.05±0.61
45.	*Sida cordifolia*	-	0.706	-	0.24±0.24
46.	*Chrozophora plicata*	1.292	-	1.558	0.95±0.48
47.	*Allium cepa*	-	6.449	7.868	4.77±2.42
48.	*Basella alba*	-	0.644	-	0.21±0.21
49.	*Dolichos lablab*	-	0.536	-	0.18±0.18
50.	*Colocasia esculenta*	-	0.552	-	0.18±0.18
51.	*Stephania hernandifolia*	-	0.227	-	0.08±0.08
52.	*Poa sp.*	11.108	11.108	11.628	11.28±0.17
53.	*Acalypha indica*	7.136	12.082	13.180	10.79±1.86
54.	*Amaranthus spinosus*	6.471	6.595	4.519	5.86±0.67
55.	*Euphorbia hirta*	16.588	10.885	22.957	16.81±3.49
56.	*Euphorbia thymifolia*	13.228	9.866	16.152	13.08±1.82
57.	*Vernonia cinerea*	6.344	2.602	2.526	3.82±1.26
58.	*Eclipta prostrata*	0.725			0.24±0.24
59.	*Phoenix dactylifera* (Seedling)	0.328			0.11±0.11
60.	*Vicia hirsuta*	3.255	0.602	1.362	1.74±0.79

Table - 6c: Importance value index (IVI) at site C during the study period

No	Name of the sps.	Jnauary'92 - June '92	July'92 - Dec. 92	Janu. '93 - June '93	Average
1.	*Cyperus rotundus*	38.592	26.329	49.868	38.26±6.79
2.	*Commelina bengalensis*	33.539	49.713	30.786	38.01±5.90
3.	*Evolvulus nummularius*	10.784	10.962	9.007	10.25±0.62
4.	*Imperata arundinacea*	4.062	9.879	6.834	6.93±1.68
5.	*Oxalis corniculata*	2.893	4.987	4.40	4.09±0.62
6.	*Ficus sp.* (Seedling)	1.79	2.605	4.399	2.93±0.77
7.	*Vernonia cinerea*	0.921	5.065	11.628	5.87±3.12
8.	*Achylanthes aspera*	27.258	18.269	23.072	22.87±2.59
9.	*Stephania hernandifolia*	4.029	6.013	5.769	5.27±0.62
10.	*Melia azadirachta* (Seedling)	12.757	10.137	7.361	10.09±1.56
11.	*Colocasia esculenta*	4.391	2.184	10.732	5.77±2.56
12.	*Commelina appendiculata*		7.957	10.981	6.31±3.27
13.	*Streblus asper*	6.499	4.929	4.579	5.34±0.59
14.	*Ervum sp.*	18.507	11.447	12.071	14.01±2.26
15.	*Mikania scandens*	7.592	2.952	9.575	6.71±1.96
16.	*Phoenix dactylifera* (Seedling)	1.509	1.511	2.203	1.74±0.23
17.	*Eclipta prostrata*	6.674	1.701	5.436	4.60±1.49
18.	*Clerodendron viscosum*	7.235	5.683	5.569	6.16±0.54
19.	*Alternenthera sessilis*	0.786	6.175	8.595	5.19±2.31
20.	*Lindenbergia urticifolia*	3.275	0.888	0.342	1.50±0.90
21.	*Psilotrichum ferrugineum*	–	7.129	2.576	3.24±2.08
22.	*Scoparia dulcis*	–	2.591	1.728	1.44±0.76
23.	*Phyllanthus reticulatus* (Seedling)	1.675	0.343	0.681	0.89±0.39
24.	*Herpestis chamaedroides*	3.222	2.809	1.651	2.56±0.47

25.	*Poa sp.*	1.121	-	0.896	0.67±0.34
26.	*Gnaphalium indicum*	-	-	0.719	0.24±0.24
27.	*Bombax malbaricum* (Seedling)	-	-	0.646	0.22±0.22
28.	*Cephalandra indica*	0.921	-	0.719	0.55±0.28
29.	*Euphorbia thymifolia*	-	1.179	-	0.39±0.39
30.	*Polygonum plebejum*	-	2.778	-	0.93±0.93
31.	*Oldenlandia corymbosa*	-	0.505	-	0.17±0.17
32.	*Amaranthus gangeticus*	0.407	2.461	-	0.96±0.76
33.	*Heliotropium indicum*	-	0.967	-	0.32±0.32
34.	*Desmodium sp.*	-	2.056	-	0.69±0.69
35.	*Zizyphus mauritiana* (Seedling)	-	0.635	-	0.21±0.21
36.	*Psidium sp.* (Seedling)	-	0.539	-	0.18±0.18
37.	*Acalypha indica*	9.064	1.44	-	3.50±2.81
38.	*Argemone mexicana*	-	-	1.614	0.54±0.54
39.	*Curcuma longa*	3.934	36.549	4.193	14.89±10.83
40.	*Solanum nigrum*	0.674	0.928	1.642	1.08±0.29
41.	*Lippia nodiflora*	13.632	6.882	14.894	11.80±2.49
42.	*Anona squamosa* (Seedling)	1.482	0.343	0.574	0.79±0.35
43.	*Eugenia sp.* (Seedling)	2.499	3.073	2.591	2.72±0.18
44.	*Blumea lacera*	5.342	-	7.789	4.38±2.29
45.	*Centella asiatica*	13.097	22.563	21.065	18.91±2.94
46.	*Cynodon dactylon*	37.989	11.859	1.973	17.27±10.74
47.	*Tamarindus indica* (Seedling)	-	-	0.923	0.31±0.31
48.	*Ceratopteris thallictroides*	-	-	1.736	0.58±0.58
49.	*Sida cordifolia*	0.487	0.487	0.492	0.49±0.002
50.	*Glycosmis pentaphylla* (Seedling)	6.232	0.889	4.386	3.84±1.57

Table - 7: Average Importance Value Indices (IVI) of different plants in different sites (Means of 3 replicates±S.E.)

Sl. No.	Name of the species	Site - A	Site - B	Site - C
1.	*Cynodon dactylon*	14.0±3.16	7.24±1.26	17.27±10.74
2.	*Blumea lacera*	0.49±0.35	-	4.38±2.29
3.	*Lindenbergia urticifolia*	5.50±0.11	6.42±0.47	1.50±0.90
4.	*Euphorbia thymifolia*	6.0±0.34	13.08±1.82	0.39±0.39
5.	*Cyperus rotundus*	61.14±23.63	61.79±10.97	38.26±6.79
6.	*Argemone mexicana*	34.19±5.05	19.56±3.16	0.54±0.54
7.	*Leucas aspera*	27.93±3.28	26.96±3.09	-
8.	*Euphorbia hirta*	10.57±0.67	16.81±3.49	-
9.	*Solanum nigrum*	3.83±0.78	26.96±3.09	1.08±0.29
10.	*Mullugo hirta*	3.97±0.49	-	-
11.	*Lippia nodiflora*	4.28±0.67	9.12±1.94	11.80±2.49
12.	*Lycopergicum esculentum*	5.03±1.04	3.24±0.89	-
13.	*Anagallis arvensis*	1.14±0.56	0.75±0.57	-
14.	*Heliotropium indicum*	0.22±0.14	0.12±0.12	0.32±0.32
15.	*Oryza sativa*	1.07±0.83	0.53±0.30	-
16.	*Vernonia cinerea*	2.64±0.59	3.82±1.26	5.87±3.12
17.	*Spinacia oleracea*	1.75±0.64	-	-
18.	*Eclipta prostrata*	0.33±0.11	0.24±0.24	4.60±1.49
19.	*Amoranthus gangeticus*	3.31±1.32	5.44±4.43	0.96±076
20.	*Mililotus alba*	2.33±0.83	-	-
21.	*Amaranthus spinosus*	5.53±0.67	5.86±0.67	-
22.	*Altern enthera sessilis*	2.71±1.19	-	5.19±2.31
23.	*Amaranthus viridis*	1.59±0.59	3.32±0.69	-
24.	*Raphanus sativus*	2.32±1.53	-	-
25.	*Allium sativum*	2.14±2.14	-	-
26.	*Commelina bengalensis*	2.78±1.37	2.24±1.29	38..01±5.90
27.	*Evolvulus nummularius*	0.20±0.20	-	10.25±062
28.	*Boerhaavia repens*	0.24±0.06	0.65±0.51	-

29.	*Oxalis corniculata*	4.56±1.66	4.76±1.07	4.09±062
30	*Allium cepa*	1.08±1.08	4.77±2.42	-
31.	*Mililotus indica*	4.07±1.35	-	-
32.	*Coriandrum sativum*	6.98±2.33	0.23±0.23	-
33.	*Gnaphalium indicum*	7.97±4.88	0.72±0.72	0.24±0.024
34.	*Poa sp.*	8.56±4.76	11.28±0.17	0.67±0.34
35.	*Herpestis chamaedroides*	4.29±0.95	12.22±2.83	2.56±0.47
36.	*Polygonum plebejum*	1.37±0.87	-	0.93±0.93
37.	*Centella asiatica*	0.14±0.14		18.91±2.94
38.	*Acalypha indica*	4.23±1.04	10.79±1.86	3.50±2.81
39.	*Scoparia dulcis*	1.69±0.41	4.78±2.39	1.44±076
40.	*Launea asplinifolia*	2.24+0.91	-	-
41.	*Psilotrichum ferrugineum*	3.01±1.08	-	3.24±2.08
42.	*Oldenlandia corymbosa*	2.45±0.49	0.57±0.57	0.17±0.17
43.	*Sonchus asper*	0.09±0.09	0.52±0.52	--
44.	*Chrozophora plicata*	3.30±1.38	0.45±0.48	-
45.	*Imperata arundinacea*	0.33±0.33	1.34±1.34	6.93±1.68
46.	*Chenopodium album*	0.14±0.08	0.19±0.19	-
47.	*Soalanum melongena*	1.35±0.33	5.82±1.51	-
48.	*Brassica nigra*	0.07±0.07	0.75±0.59	-
49.	*Croton sp.*	0.21±0.21	0.53±0.32	
50.	*Ervum sp.*	0.73±0.21	0.99±0.19	14.01±2.26
51.	*Mukia mederaspatana*	0.31±0.26	-	-
52.	*Anona reticulata*	0.30±0.15	1.99±0.67	-
53.	*Phyllanthus reticulatus* (Seedling)	-	1.07±0.62	0.89±0.39
54.	*Melia azadirachta* (Seedling)	-	0.15±0.15	10.09±1.56
55.	*Cucurbita sp.*	-	0.12±0.12	-
56.	*Clerodendron viscosum* (Seedling)	-	1.92±0.09	6.16±0.54
57.	*Zizyphus mauritiana* (Seedling)	-	0.19±0.19	0.21±0.21
58.	*Lens esculenta*	-	0.17±0.17	-

59.	*Orobanche indica*	-	3.08±0.84	-
60.	*Cajanus indicus*	-	0.98±0.98	-
61.	*Lagenaria vulgaris*	-	0.24±0.24	-
62.	*Capcicum frutescens*	-	9.79±2.53	-
63.	*Achyranthes aspera*	-	1.62±0.13	22.87±2.59
64.	*Mangifera indica* (Seedling)	-	0.23±0.23	-
65.	*Lathyrus sativus*	-	0.15±0.15	-
66.	*Acacia catechu* (Seedling)	-	0.09±0.09	-
67.	*Cleome viscosa*	-	2.05±0.61	-
68.	*Sida cordifolia*	-	0.24±0.24	0.49±0.002
69.	*Basella alba*	-	0.21±0.21	-
70.	*Dolichos lablab*	-	0.18±0.18	-
71.	*Colocasia esculenta*	-	0.18±0.18	5.77±2.56
72.	*Stephania hernandifolia*	-	0.08±0.08	5.27±0.62
73.	*Phoenix dactylifera* (Seedling)	-	0.11±1.11	1.74±0.23
74.	*Vicia hirsuta*	-	1.74±1.79	-
75.	*Ficus sp.* (Seedling)	-	-	2.93±0.77
76.	*Commelina appendiculata*	-	-	6.31±3.27
77.	*Streblus asper*	-	-	5.34±0.59
78.	*Mikania scandens*	-	-	6.71±1.96
79.	*Glycosmis pentaphylla* (Seedling)	-	-	3.84±1.57
80.	*Bombax malabaricum* (Seedling)	-	-	0.22±0.22
81.	*Desmodium sp.*	-	-	0.69±0.69
82.	*Psidium sp.* (Seedling)	-	-	0.18±0.18
83.	*Curcuma longa*	-	-	14.89±10.83
84.	*Anona squamosa* (Seedling)	-	-	0.79±0.35
85.	*Eugenia sp.* (Seedling)	-	-	2.72±0.18
86.	*Tamarindus indica* (Seedling)	-	-	0.31±0.31
87.	*Ceratopteris thallictroides*	-	-	0.58±0.58
88.	*Cephalandra indica*	-	-	0.55±0.28

Jaccard's Community Co-efficient (J.C.C) and Co-efficient of Similarities (C.S)

The JCC and C.S values between the three possible pair of three plant communities as calculated are shown in Table - 9. The percentage number of common species between the pair of communities as expressed by J.C.C values was 51.35% between communities A and B, and that between B and C was 37.5% only. The JCC value was 36% between communities A and C. So the similarity in the percentage number of species between the three pair of communities was less than 60% but more than 30%.

The percentage similarity of the quantitative characters of common species involved are indicated by the C.S values (as shown in table - 9). Considering the frequency value of the common species, the C.S value between A and B was 67.32%. It was 31.70% between A and C. The C.S value was 31.82% between B and C. So the percentage number of common species between A and B showed the highest C.S with respect to frequency of plant species. In this survey work the similarity in the frequency values of the common species between the pair of communities were less than 70% and more than 30%.

Table - 8: Average frequency at site-A, Site B, and Site-C in January 1992 to June 1993.

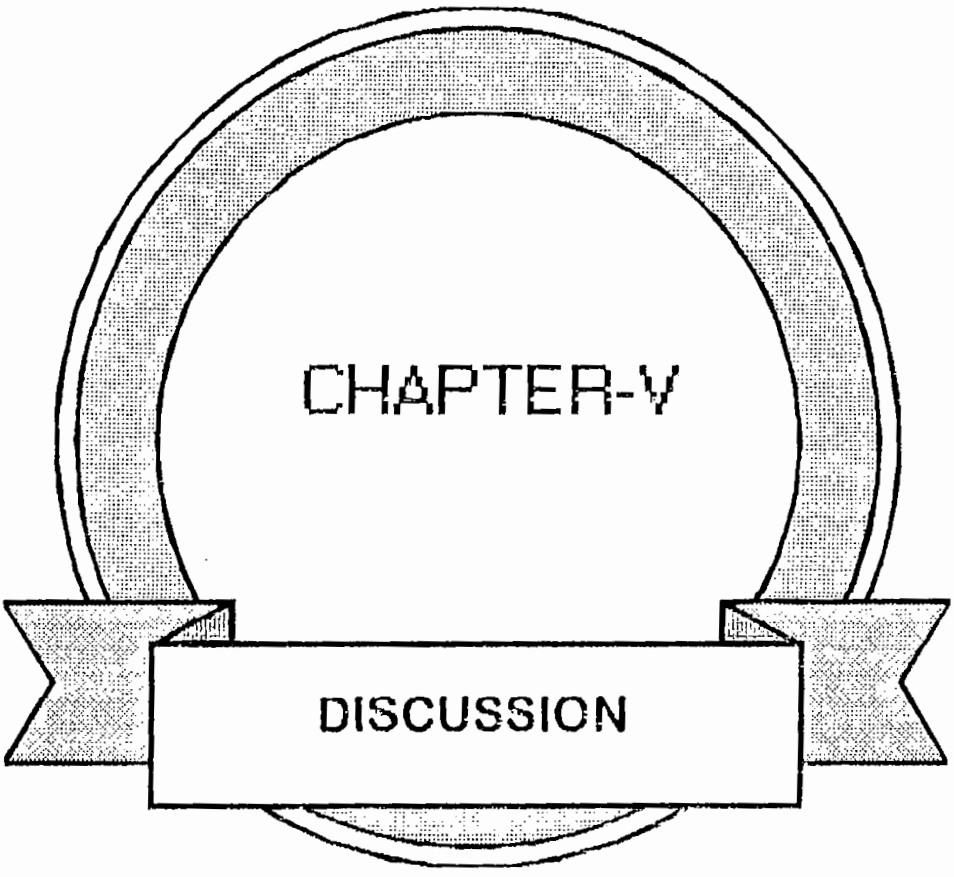
Sl. No.	Name of the species	Site - A	Site - B	Site - C
1.	*Cynodon dactylon*	46.91	23.46	27.35
2.	*Blumea lacera*	3.39	–	6.08
3.	*Lindenbergia urticifolia*	22.84	17.28	7.41
4.	*Euphorbia thymifolia*	21.29	43.21	0.93
5.	*Cyperus rotundus*	95.68	83.33	74.07
6.	*Argemone mexicana*	72.84	49.38	0.19
7.	*Leucas aspera*	80.56	69.14	–
8.	*Euphorbia hirta*	40.43	58.02	–
9.	*Solanum nigrum*	17.90	9.26	2.86
10.	*Mullugo hirta*	12.04	–	–
11.	*Lippia nodiflora*	16.67	27.78	31.02
12.	*Lycopergicum esculentum*	2.31	10.49	–
13.	*Anagallis arvensis*	5.86	3.09	–
14.	*Heliotropium indicum*	0.62	0.62	2.78
15.	*Oryza sativa*	4.32	3.09	–
16.	*Vernonia cinerea*	8.64	15.43	24.07
17.	*Spinacia oleracea*	7.09	–	–
18.	*Eclipta prostrata*	1.85	1.85	21.29
19.	*Amaranthus gangeticus*	13.27	14.81	6.48
20.	*Mililotus alba*	10.19	–	–
21.	*Amaranthus spinosus*	20.68	23.36	–
22.	*Alternenthera sessilis*	13.58	–	21.29
23.	*Amaranthus viridis*	6.48	17.90	–
24.	*Raphanus sativus*	5.25	–	–
25.	*Allium sativum*	3.70	–	–
26.	*Commelina bengalensis*	13.58	7.41	55.56
27.	*Evolvulus nummularius*	0.93	–	42.59
28.	*Boerhaavia repens*	1.23	2.47	–

29.	*Oxalis corniculata*	20.68	15.43	19.44
30.	*Allium cepa*	1.85	3.70	-
31.	*Mililotus indica*	16.98	-	-
32.	*Coriandrum sativum*	6.48	1.23	-
33.	*Gnaphilium indicum*	19.14	2.47	0.93
34.	*Poa sp.*	27.47	27.78	3.70
35.	*Herpestis chamaedroides*	15.43	40.12	12.04
36.	*Polygonum plebejum*	4.63	-	0.93
37.	*Centella asiatica*	0.62	-	44.20
38.	*Acalypha indica*	14.51	41.98	5.56
39.	*Scoparia dulcis*	7.41	15.43	6.48
40.	*Launea asplinifolia*	6.79	-	-
41.	*Psilotrichum ferrugineum*	10.80	-	9.26
42.	*Oldenlandia corymbosa*	8.92	2.47	0.93
43.	*Sonchus asper*	0.62	2.47	-
44.	*Chrozophora plicata*	14.51	3.09	-
45.	*Imperata arundinacea*	1.85	8.02	25.93
46.	*Chenopodium album*	0.93	1.23	-
47.	*Soalanum melongena*	6.17	21.61	-
48.	*Brassica nigra*	0.62	1.23	-
49.	*Croton sp.*	1.85	1.85	-
50.	*Ervumsp.*	3.39	4.94	37.04
51.	*Mukia maderaspatana*	0.31	-	-
52.	*Anona reticulata*	1.23	8.02	-
53.	*Phyllanthus reticulatus* (Seedling)	-	3.70	7.41
54.	*Melia azadirachta* (Seedling)	-	0.62	43.52
55.	*Cucurbita sp.*	-	0.62	-
56.	*Clerodendron viscosum* (Seedling)	-	6.17	23.15
57.	*Ziziphus mauritiana* (Seedling)	333	1.23	1.85
58.	*Lens esculenta*	-	1.23	-

59.	*Orobanche indica*	–	9.88	–
60.	*Cajanus indicus*	–	5.56	–
61.	*Lagenaria vulgaris*	–	1.23	–
62.	*Capcicum frutescens*	–	20.06	–
63.	*Achyranthes aspera*	–	6.17	52.78
64.	*Mangifera indica* (Seedling)	–	1.23	–
65.	*Lathyrus sativus*	–	1.23	–
66.	*Acacia catechu* (Seedling)	–	0.62	–
67.	*Cleome viscosa*	–	9.26	–
68.	*Sida cordifolia*	–	1.23	1.88
69.	*Basella alba*	–	1.23	–
70.	*Dolichos lablab*	–	1.23	–
71.	*Colocasia esculenta*	–	1.23	14.81
72.	*Stephania hernandifolia*	–	0.62	22.22
73.	*Phoenix dactylifera* (Seedling)	–	0.62	11.11
74.	*Vicia hirsuta*	–	6.17	–
75.	*Ficus sp.* (Seedling)	–	–	18.52
76.	*Commelina appendiculata*	–	–	12.04
77.	*Streblus asper*	–	–	18.83
78.	*Mikania scandens*	–	–	16.67
79.	*Glycosmis pentaphylla*	–	–	12.96
80.	*Bombaz malabaricum* (Seedling)	–	–	1.85
81.	*Desmodium sp.*	–	–	1.85
82.	*Psidium sp.*	–	–	1.85
83.	*Curcuma longa*	–	–	20.87
84.	*Anona squamosa*	–	–	4.66
85.	*Eugenia sp.* (Seedling)	–	–	12.18
86.	*Tamarindus indica* (Seedling)	–	–	0.06
87.	*Ceratopterts thallictroides*	–	–	0.61
88.	*Cephalendra indica*	–	–	1.85

Table - 9: Jaccard's Community Co-efficient and Co-efficient of Similarity values between the pair of communities in three sites.

Pair of communities	Jaccard's Community Co-efficient (J.C.C.)	Co-efficient of Similarity (Using frequency values)
AB	51.35%	67.32%
BC	37.5%	31.82%
AC	36%	31.70%


CHAPTER-V
DISCUSSION

DISCUSSION

The three study zones lying 25KM apart in the high Barind Tract have been investigated for two years with respect to their floristic composition along with some important Physico-chemical condition of the soil. The herbaceous plants occurring naturally have been considered in the present study with a view to presenting the present status of the flora. In few occasions some cultivated fallow land also fell with the transact. An annoted check list of the herbaceous plants collected from the study zone have been presented with adequate citations. The abundance frequency, density and importance value index of the studied plants have also been treated. The physico - chemical conditions comprised of the atmospheric and soil temperature during the study period, soil moisture content field capacity (%) of soil, soil pH and mobile phosphate content of the soil of the study spots. The climatological data have been adopted from the weather Record Center of Rajshahi and also from the Geography department of Rajshahi University, Rajshahi. Atmospheric temperature of this study zone is characterized by high hot summer and extreme cold in the winter. During the hot summer months the maximum temperature was recorded in the month of April (max 42.7°C and min. 17°C) while lowest temperature (max. 26.6°C and min. 7.8°C) in the month of December, 1992. In 1993 the highest temperature was recorded in April and May (39.6°C) and lowest temperature was recorded in January with minimum temperature going below 5°C at the same time. Ten years mean of monthly maximum and minimum temperature of some selected area (FAO/UNDP/BAG/85/085, 1990,) are in agreement with the present records. The soil temperature was also found to vary correspondingly (Table - 1). As regards the relative humidity, the maximum highest value was

recorded in the months of January, September and December in 1992-93 with minimum in the months of April and March in 1992-93. These data are also in agreement of the FAO/UNDP Reports.

As regards the rainfall, the study zone including the Rajshahi main locus, very low rainfall was experienced during the study period.During the study period rainfall was totally absent in the months of December, January and March. Maximum rainfall was recorded in July (249 mm) with moderately high rains in the months May, August and September in 1992-93. November, February and April had scanty rains. These values are also in agreement with the FAO/UNDP (1990) values of rainfall of 35 years average where the total annual rainfall was shown to be 1438 mm. But during the study period the total annual rainfall was found to be 841mm. only, which indicates the stress of water in the study zone. Dr. Milos Holy Director of the Institute of Irrigation and Drainage of Technical University of Praque, Switzerland, said in his paper "Water and the Environment" Irrigation and Drainage Paper -8, that a desert climate has a rainfall less than 118 mm, an Arid climate has a rainfall ranging from 118-246 mm, a Semi-arid climate has a rainfall ranging from 246-496 mm. while in a moderately humid climate rainfall varies from 297-985 mm. A humid climate is characterized by an annual rainfall ranging from 986-1970, while a very humid climate has a rainfall above 1970 mm. Based an this characterization of climate on rainfall gradients, the 35 year average of rainfall data by the FAO / UNDO (1990) and the data of rainfall during the present study period, it can be said that the study area passes through the Humid to desert climate chatracteristics. Moderately humid to Arid climate characteristics are apparent from the climatological and rainfall data (Table-I). The study

zone is unlike other agro-ecological zones of the country, is distinctly showing a sign of desertification as evidenced during the recent years. Apart from the Farakka effect, the indiscriminate withdrawal of the underground water by hundreds of Deep Tube Wells (DTW) of the Brendra Multipurpose Development project, has added to the stressing situation. The aquifer has gone much lower and hand lift pumps have become inoperative. The situation aggrevates in the summer month when drinking water becomes scares. More than 3000 DTW are in operation in the Barind zone for irrigation in the agricultural land. UNDP in itsTechnical report in 1982 on Ground water survey-the hydrologic conditions of Bangladesh, included the Barind in zone -"O". It said in its report that zone "O" lies in western Rajshahi district and consists of older alluvial deposits known as Barind Tract. Thick clay deposits have been proven by test drilling which indicates that the main aquifer does not occur in the upper 300 M (980 ft). Therefore, ground water potential is limited to development from relatively. Thin, fine grained sand zones that occur within the clay sequence. The aquifer is capable of supporting only small domestic water needs.(FAO/UNDP, 1990). The Barendra Multipurpose development authority has duely contradicted the views of FAO/UNDP, and the consequence is almost apparent now (Barendra Prokalpa - Preskhit Sanglap). With only mean 120 h umid days when rainfall provides water for crops, rest of the year with 51 Pre Kharif, 89 Kharif and 123 rabi crop days left to minimum rains, become dependent on the irrigation water which is hardly available to cover each and every agricultural lands in the zone (FAO/UNDP,'90).

Ali *et. al* (1981) studied the soil properties of the Barind region specially of the High Barind Tract which included the Present study area. According to

them the Barind soil has a has a pH value indicating slightly alkaline (7.7±0.2); the soil contains 48±9% sands, 28±9% silt, 24±7% Clay, 0.33±0.14% organic carbon: 0.05±0.01%, total Nitrogen, 5.9±4.7ppm available phosphorus 0.569±0.233 ppm, Potassium; 12.9±4.5 me% cation exchange capacity (CEC) 07.7±5.2 me% exchangable calsium, and 0.21±0.12 me% of exchangable sodium. These values indicate clearly that the Barind soil is poor in nutrients (Ali et. al. 1981). This finding was found to be in agreement with these of Kar et. al 1985. Khalil et. al. 1986 and Habib et. al. 1984.

During the present study period the soil moisture at site A (Table - 1a) was found to vary from 24.79±0.29 to 4.05±0.92. The highest value was observed in the month of June '93 followed by May and July 1992. The values indicate a very poor soil moisture content at site - A. Soil moisture values at site -B (Table -1b) also varied from 29.27±0.45 in June 1993 to 3.89±0.68 in December, 92. The next higher values were observed in the month of June and July in 1992. This study site is also poor in soil moisture content. The values of soil moisture content at site - C (Table -1c) indicates a highest value in the month of June 27.5±2.4 in 1993 followed by next higher values in May, June and July in 1993;. The values did never exceed the highest value (27.5±2.4). This study spot is extremely poor in its soil moisture content. It is obvious from this study that the soil moisture content was higher in 1993 than in 1992 as the months of 1993 had more rainfall that those in 1992. However, the study zone was found to be extremely poor in its soil moisture content and the soil is said to be extremely dry (Ahmed et. al. 1986).

The field capacity of the soils of the study zone was found to be variable. At site - A (Table -1a) the FC varied from 52.65±1.89 to 42.74±0.73. The

highest value was obtained in the month of January, '93 while the lowest value was observed in August 1992.

At site B (Table - 1b) the field capacity values varied from 46.09 ±0.87 to 32.07±1.20. The highest value was obtained in June 1993 while the lowest value was in July '92.

At site C (Table - 1c) the FC values varied from 46.89±7.04 to 38.19±1.67. The highest value was observed in the month of December, 92 while the lowest value was obtained in the month of August' 92. It appears from the above discussion that the soil of the study zone has on the whole a low field capacity and can be termed as less to moderately moisrure. The site B shows a little higher values of FC than those of site -B and site -C. The late two study spots are similar in nature with respect to their FC. The three study sites showed an average FC values of 46.93±0.84, 38.71±1.13 and 42.95±0.65 for site -A, B and C respectively, which indicate that the soil of study sites have more or less similar FC levels.

The soil moisture content and FC values obtained during the present study clearly indicate the soil of the study area is dry. In few occassions the soil moisture was found to be moderately high which was probably due to rainfall during the sampling time. The low moisture content of soil at site -B and site -C indicate a highly dry nature of the soil which is not suitable for herbs or grass cover to grow. In fact the undulated land of the study zone was found to be almost bare or with few grasses and thickets of some herbaceous plant which can thrive in condition of extreme water stress, situation to which can be

attributed the poor floristic diversity of the Barind as a whole. The findings has made it apparent.

As regards the present study, the pH value was found in conformity with the findings of Ali et. al (1987). The pH value at study site A varied from 7.0±0.01 to 8.41±0.02 with high values in the months of July, August, November, January and June and lower values in the rest of the study period. At this study site the pH was slightly to moderately alkaline. At site B, the pH value ranged from 6.2±0.12 to 7.45±0.02 throughout the study time. Alkaline values were observed in the months of of July, Novem,ber, December, May and June with rest of the months, the soil indicating an acidic condition. This finding is in conformity with the FAO/UNDP reports of 1990. The site C showed almost slightly alkaline value ranging from 7.43±0.07 to a slightly acidic value of 6.67±0.18. Acidic values were found in the months of May, September, November, March and April in 1992-93. pH values of site B and site C are almost similar.

The mobile phosphate content of the three study areas indicate that the soil of this area is poor in this nuttrient substance. The FAO/UNDP findings and the findings of Ali et. al (1981). are in conformity with the present findings. The FAO/UNDP investigations report a poor nutrient status of the Barind soil in respect to the total nitrogen and Phosphate content. The soil is depleted of organic matter as well. The values of mobile phosphate content varies from 0.05±0.003 mg/gm^{-1} to 0.035±0.008 mg/gm^{-1} at site -A (Table-1a), 0.05±0.002 to 0.002±0.0006 mg/gm^{-1} at site B (Table - 1b) and 0.01±0.0008 to 0.0025±0 at site -C (Table - 1c).

The mobile phosphate content was found to be extremely low at site C and D compared to site A. On the whole the soils of all the three sites show an extremely poor mobile phosphate content. Considering the high soil temperature, low soil moisture, low field capacity and extremely low phosphate content, the soil of the study zone can be termed unsuitable for a richer flora to grow with only selective few with a lower species diversity in the areas as evidenced from the floristic studies.

A review of the taxonomic literature of floristic studies has been made in the introductory chapter. The citation of different works made in the review, clearly indicate that the Barind Tract has not been investigated throughly in respect to its floristic composition, although agro-ecological studies have been made in comprehensive details. With the encroachment of the agricultural land , more fallow and forest cover have fallen to agriculture and the flora subsequently disappeared. Due to incessant anthropogenic high handedness, the original landscape has changed to the present state. Works on the floristic composition on area on a regionaal basis have not been undertaken as yet. As a result of which a clear picture of floristic composition of the Barind Tract is out of question, although some remote reference can be made from the legendary works of Hooker (1865).

Prain (1903) who stated from their taxonomic and phytogeographical investigations that in the eighteenth century, the Rajshahi district including the Barind Tract was mostly covered with mixed "Sal" (*Shorea robusta*) forest or semiever green forest and savana. It is therefore evident that due to increased population and advent of modern agricultural practices together with construction of roads and highways, buildings and infrastructure, have together

brought about great changes in the previously existing flora. Presently there is no recognised forest in the district although some Sal forests are being regenerated to in the Northeast Barind Tract by the Ministry of Environment and Forest, Government of Bangladesh. Recently a one year survey of flora in the Northern region of the country including the Barind Tract has been conducted by the Bangladesh Herba ium under NCSIP - I project. The finding are yet to be made public (Personal Communication by Dr. M. Zaman, Professor of Botany, Rajshahi University - a member of the study team).

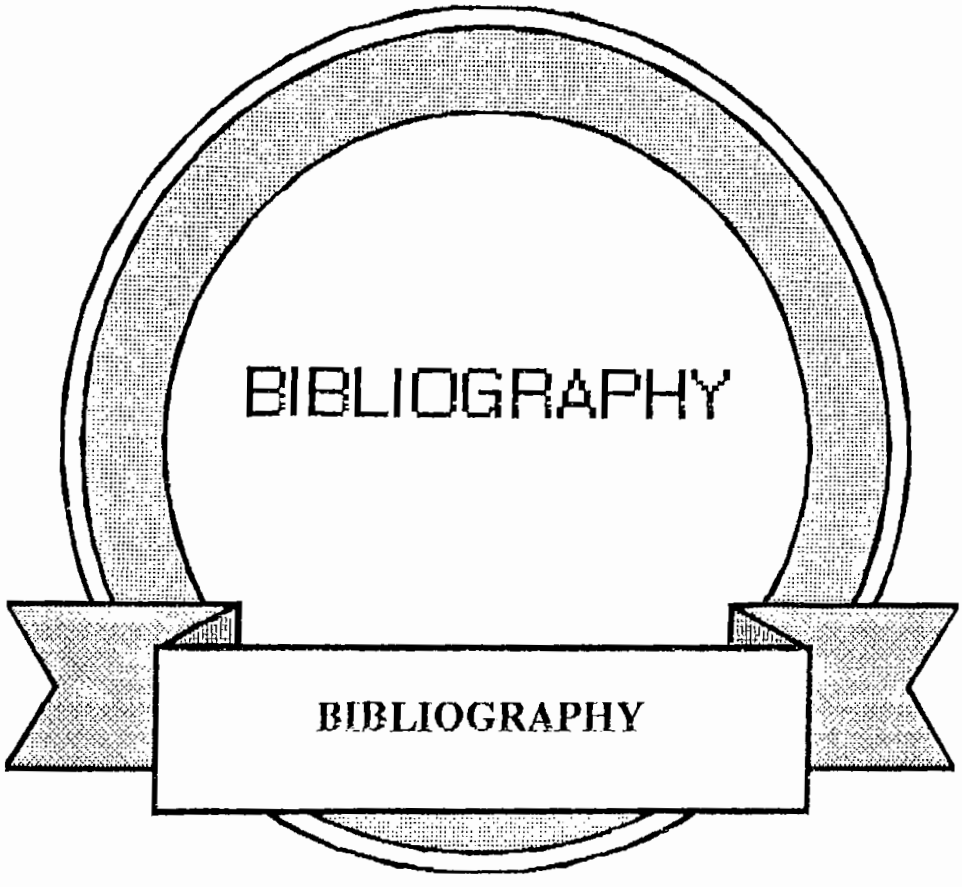
In the present study 127 genera and 140 species of herbaceous angiosperms were identified and their Density, Frequency and Abundance have been calculated. The IVI, JCC and CS values have been worked out with comprehensive details. It appears from the present study that the study area supports a herbaceous flora with a very low species diversity. The reason for such poor diversity can be attributed to the extreme dry soil, unfavourable climatological condition and prolonged water stress. (FAO/UNDP, 1990).

The frequency of occurrence of different plants at site A, B and C have been depicted in Table -8. The three sites have many common plants with more or less similar frequency of occurrence. At site A *Cyperus rotundus* was found to be highly dominant followed by *Lencus aspera, Argemone mexicana, Euphorbia hirta, Lindenbergia urticifolia, Euphorbia thymifolia, Amaranthus spinosus, Oxalis corniculata, Gnaphlicum indicum, Solanum nigrum, Lippia nodiflora, Melilotus indica, Acalypha indica, Chrozophora plicata, Commelina benghalensis, Alternanthera sessilies* and the rest of the genera and species at this locus.

At site B. *Cyperus rotundus* was found to have highest frequency of occurrence followed by *Leucus aspera, Euphorbia hirta, Argemone mexicana, Euphorbia thymifolia, Acalypha indica, Herpestis chamaedroides, Lippia nudiflora, Cynodon dactylon, Amaranthus spinosus, A. viridis, Scoparia dulcis, Oxalis corniculata* and the rest of the species.

Similarly at site C, *Cyperus rotundus* was found to have highest frequency of occurence which was followed by *Commelina benghalensis, Achyranthes aspera, Centella asiatica, Evolvulus nummularius, Lippia nudiflora, Cynodon dactylon, Vernonia cinerea, Eclipta prostrata* and others.

The JCC and CS between three possible pairs of plants of three sites showed a percentage number of common species between the pair of communities A & B and that between B & C were 51.35% and 37.5% only, while the J.C.C. value between A and C was 36% which indicate the similarity in percentage of species between the three pairs of the communities was less than 60%. From the present study a conclusion can be made that the study area supports a lower level of species diversity due to unfavourable edaphic, climatological and water stress factor coupled with low nutrient status of the soil, as evidenced from earlier reports.



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