

## Inventory of Trees Inhabiting Central University of Jammu Campus Area of Samba District of Jammu and Kashmir

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**Abstract :** *The present work involves the Inventory of Trees Inhabiting Central University of Jammu Campus Area using Quadrat method of the size of  $10 \times 10 \text{ m}^2$ . The total number of tree species recorded from the campus were 24 belonging to 14 different families. Out of which 23 species were angiosperms and 1 species belongs to gymnosperms. The family Fabaceae have maximum number of 6 tree species. The genus Ficus and Acacia includes maximum number of tree species viz. *F. religiosa*, *F. benghalensis*, *F. palmata* and *A.koa*, *A.catechu* and *A.nilotica*. Migratory birds are attracted towards the fruits and flowers of *Bombax ceiba* and *Mallotus philippensis*. Out of 24 species 19 were medicinal, 14 economically important, 8 religious, 7 used as forage and fodder, 7 tree species were used as food and for ornamental purposes, respectively. *Leucanea leucocephala* have been found to be invasive specie in the study area. Among the plants documented, higher percentage of trees having medicinal significance (30.64%), followed by economic importance (22.58%), religious importance (12.90%), food (11.29%), forage and fodder (11.29%) and ornamental significance (11.29%). The present study reveals that study area of Campus region is endowed with a large number of medicinal trees. The inventory of tree wealth of the campus shall provide the ground work for further studies.*

**Keywords:** Inventory, Trees, Fabaceae

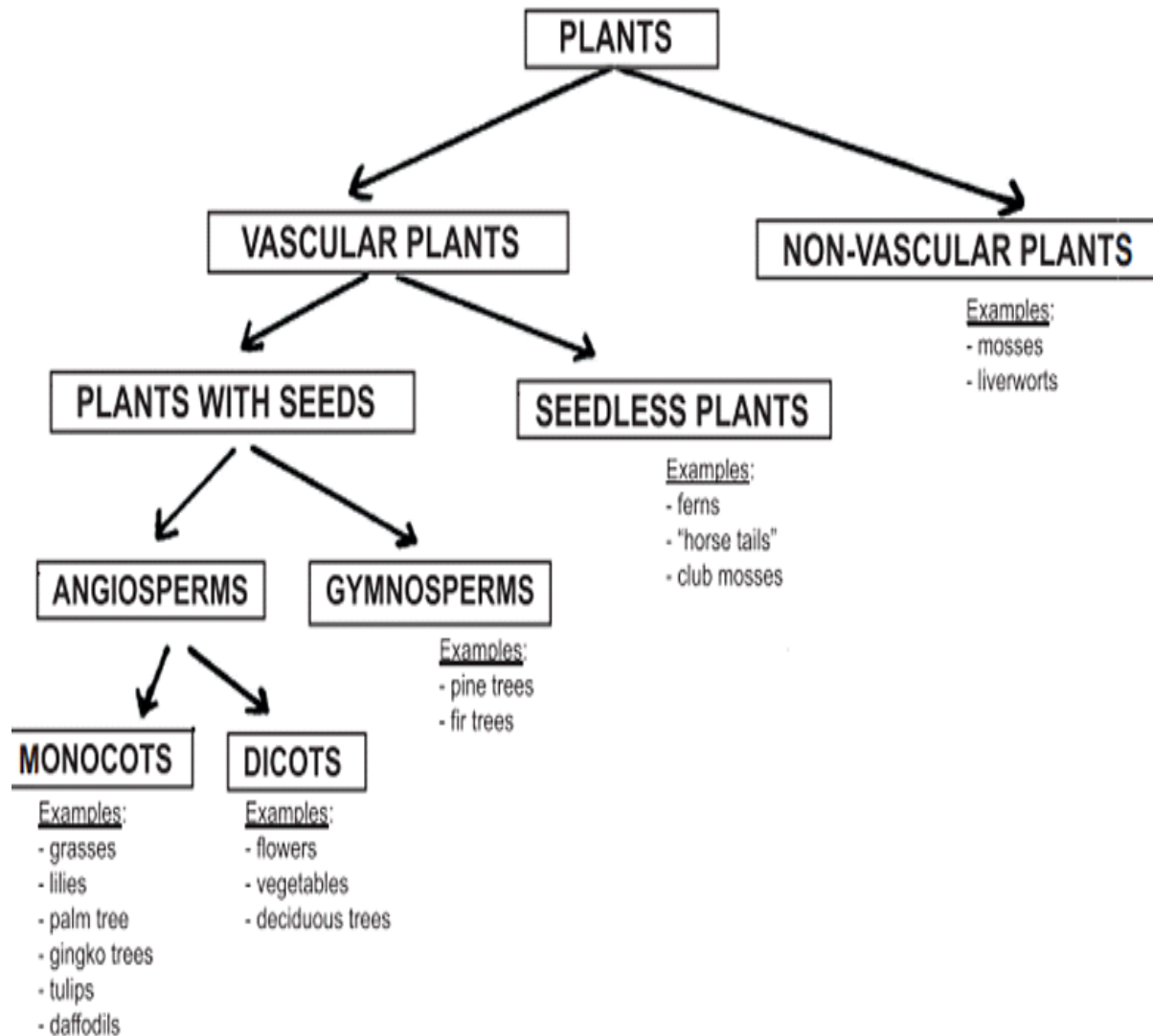
**Introduction:** Trees have been planted for thousands of year for food, wood, shelter and religious purposes. The first woody plants to be calculated were those yielding food such as olive. Land plants evolved from a group of green algae perhaps as early as 510 million years ago some molecular estimates place their origin even earlier, as much as 630 million years ago. This means that the land plants evolved from a branched, filamentous algae dwelling in shallow fresh water, perhaps at the edge of seasonally desiccating pools. Co-operative interactions with fungi may have helped early plants to adapt to the stresses of the terrestrial realm. After the invasion of land by plants a big adaptive radiation followed, in Devonian times. The first trees (big plants [30 meters] with woody stems) evolved about 360 million years ago and had roots and leaves (begin carboniferous). Amongst these first trees were lycopods, now species from this group are only known as small mosses (*Selaginella* or spike moss). Lycopod trees could only live in moist-environments because they reproduced by

spores, which need moisture to enable sperms to move to the egg. The seed enabled plants to colonize non-wet land, beginning a total change of much of the lands since plants play an important part in the formation of soil because they slow down erosion. The first seed plants evolved trees with seeds which thus colonized the lands and formed the first vast forests. One of the first kinds of large trees was Archaeopteris. Cordaites was the first of the group gymnosperms (naked-seeds) that colonized the land for quite a while. At the end of the permian time (280 million years ago) lycopod trees had declined and cordaites had disappeared. Gymnosperms, including conifers, took over land environment.

A woody perennial with a single main stem or in case of coppice with several stems having a more or less definite crown trunk growing to a considerable height bearing branches at some distance from ground.

In botany, a tree is a perennial plant with an elongated stem, or trunk supporting branches and leaves in most species. In some usages, the definition of a tree may be narrower, including only woody plants with secondary growth, plants that are usable as lumber or plants above a specified height. In looser senses, the taller palms, the tree ferns, bananas and bamboos are also trees. Trees tend to be long-lived, some reaching several thousand years old. The tallest known tree, a coast redwood named Hyperion stands 115.6 m (379 ft) high. Trees are not a taxonomic group but include a variety of plant species that have independently evolved a woody trunk and branches as a way to tower above other plants to compete for sunlight. A tree typically has many secondary branches supported clear of the ground by the trunk. This trunk typically contains woody tissue for strength, and vascular tissue to carry materials from one part of the tree to another. For most trees it is surrounded by a layer of bark which serves as a protective barrier. Below the ground, the roots branch and spread out widely; they serve to anchor the tree and extract moisture and nutrients from the soil. Above ground, the branches divide into smaller branches and shoots. The shoots typically bear leaves, which capture light energy and convert it into sugars by photosynthesis, providing the food for the tree's growth and development. Flowers and fruit may also be present, but some trees, such as conifers, instead have pollen cones and seed cones; others, such as tree ferns, produce spores.

Plants also called green plants, are multicellular eukaryotes of the kingdom Plantae. They form a clade that includes the flowering plants, conifers and other gymnosperms, ferns, clubmosses, hornworts, liverworts, mosses and the green algae. Green plants have cell walls with cellulose and characteristically obtain most of their energy from sunlight via photosynthesis by primary chloroplasts. Their chloroplasts contain chlorophylls a and b which gives them their green color. Some plants are parasitic and have lost the ability to produce normal amounts of chlorophyll or to photosynthesize. Plants are also characterized by sexual reproduction, modular and indeterminate growth, and an alternation of generations, although asexual reproduction is also common (Fig. 1).



**Fig. 1 the classification of plants**

Trees are considered to be lifelines for human existence as well as variety of conserved animal. It filters our air and keep it fresh by absorbing carbon dioxide and producing oxygen. Trees roots stabilize the soil and prevent erosion. It improves water quality by slowing and filtering rain water as well as protect aquifers and watersheds. Trees are carbon sinks, accumulating carbon as they grow and acting as stable carbon stores upon maturity. Three-quarters of the world's people rely on wood as their main source of energy. Thousand of things are made from them such as furniture, books, newspapers, houses, hockey sticks, guitars, pencils, fences and toothpaste. It lowers air temperature and induce rainfall by

evaporating water from their leaves. It provides food, shade and shelter to the humans and wildlife. They provides protection from the downward fall of rain, sleet and hail as well as reduce storm run-off and the possibility of flooding. They also act as sound barriers to reduce noise pollution and play a major role in helping to conserve the intensity of the Earth's magnetic field. Trees beautify the landscape.

A tree inventory is the gathering of accurate information on the health and diversity of a community forest. It is the systematic gathering of information about the urban forest and organizing it into usable information for tree management which also includes sound management plan.

There are several type of inventory that can be taken depending upon objective of city's urban forestry program. Some of common types are:

- **Specific problem inventory:** A specific problem inventory gathers data on one particular problem such as looking at the effects of Dutch elm disease.
- **Partial inventory :** A partial inventory uses sampling where only a subset of the trees in the community are observed to draw inferences on the whole forest
- **Complete inventory :** A complete inventory collects data from all trees in the population, and a cover type survey is a survey where some of the information gathered is usually done through aerial photography and GIS systems
- **Cover type survey:** This type of survey is being increasingly used in urban areas. These inventories are generally conducted by student groups and volunteers, or contracted to urban forestry consultants, or by municipal urban foresters using either handwritten methods, software, templates, add.

The inventory may be used to:

- Develop management and policy recommendations.
- Understand the species distribution of urban forest.
- Determine the overall health of public trees.
- Determine the quantity and location of vacant tree planting sites.
- Quantify the dollar value of our community's urban forest.

- Facilitate a comprehensive funding strategy involving public and private funds.
- Communicate the importance of a strong city forestry program.
- Determine the need for a community forestry program. For example, if the inventory reveals many dead and diseased trees or areas that are devoid of trees, this suggests that a program incorporating tree planting is badly needed.
- Prioritize maintenance schedules in order to reduce the potential liability that results from hazardous trees.
- It also streamlines the efficiency of street crews and facilitates long-term budgeting.
- Educate residents about the benefits of a healthy, well-managed community forest, and to inform them about species best suited to the community.
- Facilitate the planning that is essential to the community's quality of life.
- Provide the basis for the development of a comprehensive community forestry management plan.
- Enlisting the plant species to have an overview of diversity in an area.

Keeping in view the above significance of inventory, this study have been undertaken with the following objectives-

- To prepare an inventory of healthy plant species in area.
- To provide baseline data for forestry management plan.

### Review of Literature:

**Purohit and Dhar (1997)** studied Himalayan tree diversity. The Himalayan tree flora represents 28% of the total estimated Indian trees with nearly 40% of elements. The species richness along horizontal axis was greatest in east/ central Himalaya and declines sharply towards west.

**Kohli et. al., (1998)** conducted an inventory of multipurpose avenue trees of urban Chandigarh, India. Nearly 66 tree species were seen along the roadside. Also the city were decorated with 11 garden harbouring over 200 types of trees, 39 tree species served as ornamental, 34 yielding timber, 15 yielding food, 9 fodder, 6 fibres, 35 providing material for industrial use.

**Bimal et. al., (1991)** assessed the tree biodiversity of Bihar university campus Muzaffarpur. The total number of trees recorded in the university campus including L.S college were 921 belonging to 23 families, 47 genera and 51 species. The Leguminosae was represented by maximum number of 12 tree genera and genus *Ficus* has been represented by maximum number of 4 tree species viz *F. religiosa*, *F. benghalensis*, *F. glomerata* and *F. infectoria*. The commercially important tree *Swietenia mohogani* were 27 in number.

**Shankar (2001)** assessed the high tree diversity in Sal dominated lowland forest of eastern Himalaya. A total of 1015 individual inventoried in four transects of 0.5 ha each. Out of which 95.4% were live and 4.6% were laid. The Shannon's diversity index was 3.59 and evenness index was 0.80.

**Das and Das (2005)** conducted inventory of plant biodiversity in home garden of Barak valley, Assam. The total number of species in home garden was 122 with fruit as dominant including *A. catechi* (52.7%), *Musa sp* (22.2%), *A. heterophyllus* (9.4%) and *M. indica*

(9.3%). Many wild, rare tree species like *A. malaccensis* and *V. lanceaefolia* are also conserved in homegardens because of their high commercial value.

**Khumbongmayam et. al., (2005)** studied sacred groves of Manipur. A total of 173 plant species representing 145 genera under 70 families were recorded by laying forty quadrat of  $10 \times 10$  m randomly. Twenty quadrats of  $5 \times 5$  m<sup>2</sup> for shrubs and 20 quadrats of  $1 \times 1$  m<sup>2</sup> size for herbs 96% of the species were used as medicine for the treatment of various ailments.

**Mani and Parathasarthy (2006)** examined the tree diversity and stand structure in inland and coastal tropical dry evergreen forest of peninsular India. A total of 77 species in 61 genera of 30 families were identified by laying quadrat of  $100 \times 100$  m.

**Raupp et. al., (2006)** studied diversity of street tree of eastern north America . Thirty-two genera of trees encompassed the ten most common trees found in the 12 cities studied The most common genus of street tree were Acer. Maples were found in all cities where they comprised from 15% to 57% of the street trees. The next most common genera were Fraxinus and Quercus.

**Singh and Rawat (2006)** conducted Quantitative Analysis of Tree Species Diversity in Different Oak (*Quercus* spp.) systematically surveyed three oak forests along the altitudinal gradient. A total of 54 tree species belonging to 40 genera and 26 families were recorded in *Q. leucotrichophora* dominated forests, while only 32 species (59%) were recorded during the sampling . Lauraceae with 6 species were the dominant family followed by Betulaceae and Rosaceae (4 species each).

**Maco and Pherson (2007)** assessed the structure, function and value of street tree population in small communities Which included 2,393 public tree and an additional 696 private trees located within city's row.

**Nath and Das (2008)** studied bamboo resources in homegarden of Assam. 100 and 40 bamboo groove were selected through simple random sampling. Species inventory revealed

that bamboo growers maintain 7 species. Among these *Bambusa caharensis*, *B. vulgaris* and *B. balcooa* exhibited highest frequency.

**Rajkumar and Parthasarathy (2008)** investigated tree diversity in gaint evergreen forest of Andaman and Nicobar islands in which all tree > 30 cm girth at breast height were enumerated. 21 ha plots were established. Each 1 ha plot was divided into hundred 10 × 10 m quadrat. The Shannon (H') and Simpson indices were calculated for species diversity. Tree diversity inventory in Andaman gaint evergreen forest yielded a total of 105 species

**Rashid et. al., (2008)** investigated undergrowth species diversity of Sunderbans mangrove forest by random quadrat method. A total of 48 species were recorded belonging to families Fabaceae, Poaceae, Acanthaceae, Pteridaceae, Myrsinaceae, Rhizophoraceae. On the basis of frequency the 16 species were found to be dominant such as *Acarastichum aureum*, *Vitis trifoliata*, *Sacrolobus globosus* and *Phoenix palundora*.

**Konwar et. al., (2009)** studied the abundance of food plant species of Rhinoceros unicornis in pobitora wildlife sanctuary Assam. A total of 32 food plants species were identified of which 4 were shrubs, 5 were aquatic hydrophytes and 8 were tree species. Highest density of food plants species were *Hemarthria compressa*, *Vetiveria zizanioides*, and *Phargmites karka*.

**Tripathi & Singh (2009)** studied Species diversity and vegetation structure across various strata in natural and plantation forests in Katarniaghat Wildlife Sanctuary, North India . A total of 18 sites representing various categories of natural forests and plantations were selected for vegetation sampling. At each site 13 quadrats (15 m x 20 m) were laid. *Tiliacora acuminata*, one of the common under-storey species in the sal forests of Terai.

**Aslam et. al., (2010)** assessed the exotic ornamental flora of Kashmir valley. A total of 317 exotic ornamental plants species belonging to 209 genera, 85 families were recorded. Among them the dicotyledons were the largest group represents 252 species in 163 genera and 67 families. Gymnosperms were the smallest group with 13 species and Asteraceae was the largest family containing the 33 exotic ornamental species.

**Singh et. al., (2010)** conducted state level inventory of invasive alien plants in Uttar Pradesh. A total of 152 species distributed in 109 genera and 43 families were recorded. Only 17 species have been introduced deliberately. The genera with highest number of alien invasive taxa in U.P were *Ipomoea* and *Cassia*.

**Pant and Sharma (2010)** conducted inventory of some exotic cultivated tree species of Doon valley and their ethnobotanical uses. A total number of 18 exotic tree species distributed in 14 families were recorded as exotic cultivated tree species in Doon valley. *Bauhinia variegata*, *Bombax malabaricum*, *Butea monospermea*, *Melia azidarch* and *Prunus persica* were used as food, fodder and medicine also. Out of 18 tree species 5 tree species viz *Acacia farnesiana*, *Cinnamomum camphora*, *Eucalyptus tereticornis*, *Legerstromia speciosa*, *Shorea robusta* used for medicinal purposes to cure the various disease like cough and cold, rheumatism pain, urine trouble, fever, dysentery, antiseptics and wormicides.

**Singh et. al., (2010)** conducted state level inventory of invasive alien plants from Uttar Pradesh. Total 152 species distributed in 109 genera and 43 families were recorded as invasive aliens in the flora of UP. Herbs accounted for 128 species, shrubs 12 species, climbers 8 species, whereas trees and lianas 3 and 1 species respectively. People have found a large number of these alien species useful.

**Merrit et. al., (2011)** conducted a sample tree inventory of 190 randomly selected street segment in Pearland. Pearland tree occupied 40% of site. Oak tree was the dominant one. They concluded that more than 87% of street tree were in good condition and 79% of tree required only routine care.

**Sarkar et. al., (2011)** conducted natural resource inventory of Manbazar block in eastern plateau of India using Image processing and GIS software were used. The study area was Manbazar 1 and Manbazar 2 blocks of Purulia district in eastern plateau of India. The landuse pattern for Manbazar 1 was (38132) and Manbazar 2 (28581).

**Tambe et. al., (2011)** assessed the detailed forest type, density and change dynamics using satellite remote sensing data. The landscape was found to be dominated by Alpine and nival ecosystem. About 79% of geographical area of state has been classified as reserve forest out of which 41% occurred below the tree line and 47% above tree line

**Streetheran et. al., (2011)** assessed street tree inventory in kuala Lumpur, Malaysia. A 100% tree survey were conducted from april to October 2007. A comprehensive range of quantitative and qualitative information was collected in the field. A total of 2,291 tree, 35 species from 16 families were recorded. The survey showed that 68.6% of species were exotic species

**Ying et. al., (2011)** studied Key street tree species selection in urban area. The survey of 145 main streets was conducted in different administrative districts. The survey found 126,035 street trees which were distributed into 16 families and 22 species. The top five tree species were *Cinnamomum camphora*, *Magnolia grandiflora*, *Platanus acerifolia*, *Sophora japonica* and *Ligustrum lucidum*, accounting for 80% of the total population

**Jayakumar et. al., (2011)** documented floristic inventory and diversity assessments to understand the conservation of forest biodiversity. Sampling method used included plot sampling method, line transect method, fixed count sampling and ad-hoc method. Floristic diversity analysis of > 1 ha plot was very popular because it was widely used for monitoring forest dynamics and ethnobotanical research.

**Kumar et. al., (2012)** assessed an inventory of flora of Binog wildlife sanctuary, Mussorie. A total of 300 species of angiosperms, 31 species of pteridophytes and 4 species of gymnosperms were recorded from 1081.97 hectare area. During study 335 species of vascular plants were recorded. There were 186 herbs, 71 shrubs, 19 climbers and 58 tree species.

**Singh and Chand (2012)** conducted study above tree outside forest phytomass and carbon sequestration in semi arid region of southern himalaya. The study area was Mahendergarh district and dominated with species like *Acaia nilotica*, *Acacia Senegal*, *Capparis decidos*,

*Azadirachta indica* and *Prosopis cineraria*. The study result concluded that the classification of tree outside forest and estimation of phytomass and carbon content in tree outside forest was successfully achieved through combined approach of remote sensing and GIS. *Prosopis cineraria* was dominant which contributed more to phytomass content.

**Manikandan and Laskhminarasimhan (2012)** studied flowering plants of Rajiv Gandhi national park, Karnataka. A total of 1337 species belonging to 152 families, 754 genera. The dicotyledons were represented by 117 families, 597 genera and 1052 species, while monocotyledons by 35 families, 157 genera and 333 species

**Surendra (2013)** assessed the current status of invasive alien plant species in Andhra University Campus of Visakhapatnam district, India. Data were collected through Phytosociological method. The sampling technique was random sampling. Randomly total of 30 plots were taken, 15 from each North and South campus of Andhra University.

**Roby et. al., (2013)** investigated -a critically endangered and endemic tree from kerala, India- *Syzygium travancoricum*. Randomly selected 17 swamps were sampled. Ten quadrats of 10 x 10 m in each individual swamps was done. 153 trees in 60 swamp patches were counted.

**Archanal et. al., (2013)** demonstrated the slope and outcomes of forest resource mapping in Pinjore block, Haryana using cartosat -1 and LISS – 4 data. The total geographic area was 288 km<sup>2</sup>. The total forest cover occupied was 15.81 km<sup>2</sup>. For forest area 0.1 ha of sample plots has been selected. Further Panchkula district was having the dominancy of forest cover.

**Dar and Khuroo (2013)** studied floristic diversity in Kashmir Himalaya. A total of 2312 species belonged to land plants – bryophytes, pteridophytes. Gymnosperms and angiosperms have been recorded from region. These species were grouped under 842 genera and 189 families. A total plant species under different threat categories in Kashmir Himalayan were 355.

**Manzoor et. al., (2013)** assessed biodiversity of Pir Lasura national park. The survey carried out during June-July. A total of 159 species of vascular plants belonging to 83 families were recorded, appearing in different habit forms, viz. tree, shrubs, herbs and grasses and epiphytes. There were 2 species of gymnosperms, which were widely distributed on all mountain slopes and are most frequently exploited for timber.

**Miscicki and Sterenczak (2013)** investigated a two phase inventory method for calculating standing volume and tree density of forest stand in central Poland based on airborne laser scanning data. Data were collected from 34 sample plots of two sizes for the crown height model analysis. The strength of the relationship was highest in the “Centroid 500m<sup>2</sup>” plot and smallest in “border 1963,5 m<sup>2</sup>” plot. The highest value of correlation coefficient was  $R = 0,925$ .

**Pachaiyappan and Raj (2013)** studied the important environmental services of urban trees to disseminate the economic importance of trees. All trees > 5cm at breast height were inventoried from 1 ha area of Cooum river bank, Chennai. One hundred 10 × 10 m plots were randomly laid across northern and southern of the river. A total of 47 species were inventoried. *Muntingia calabura* and *Prosopis juliflora* were dominant.

**Jagtap and Mukherjee (2013)** assessed plant diversity of Gadchiroli district of Maharashtra. There were 237 species belonging to 184 genera and 73 families. Out of 73 families listed, 63 belong to dicotyledonae and 10 belong to monocotyledonae. Dominant families were Fabaceae (21 genera), Acanthaceae (12 genera) followed by Asteraceae (9 genera).

**Tamang et. al., (2013)** documented bamboo diversity, distribution pattern and its uses in Sikkim Himalaya. Field visits were undertaken in 4 districts of Sikkim that is East, West, North and South Sikkim. During the field survey conducted throughout the state, 30 species of bamboo under 80 genera were recorded. 21 bamboo species were found in tropical forest, 28 in sub tropical forest, 12 in temperate forest, 6 in subalpine forest and 3 species in alpine vegetation. *Dendrocalamus* genera has the maximum number of species followed by *Bambusa* and *Sinarundinaria*.

**Sharma and Kour (2014)** assessed tree diversity in rural area of block Vijaypur, J and K. Data were collected through sample plot survey. The samples of 20m x 20m were laid in three sacred groves present in both the villages. A total of 17 tree species belonging to 11 families were encountered during the study. The results for village Chak Slarian and Chak Bagla showed *Mangifera indica* to be dominant species.

**Singh et. al., (2014)** studied vegetational analysis and regeneration status of *Pinus roxburghii* and *Quercus leucotrichophora* in forest of Nainital. 10 plots of 10 × 10 m were randomly established in each forest for determination of species richness and other vegetation parameter. A total of 10 trees, 8 sapling and 6 seedling from study area. The dominant tree species were *Quercus leucotrichophora* and *Pinus roxburghii*.

**Gandhi and Sundrapandian (2014)** conducted tree inventory in tropical dry deciduous forest of Tiruvannamalai, Tamil naidu. 20 plots were laid randomly in sathanur reserve forest. A total of 60 tree species belong to 47 genera and 29 families and 12,548 stems were enumerated. *Albizia amara* was the dominant species in terms of density.

**Upadhyay and Mishra (2014)** studied the ecological analysis of mangroves ecosystem. A total of 29 mangrove species were recorded and only 8 species were common at 4 sites viz., Bhitarkanika, Dangmal, Thakurdia and Kakaranasi. The average value of DBH for different species were generally higher at Bhitarkanika and Dangmal.

**Kour et. al., (2014)** documented the aquatic invasive alien flora of Jammu region. A total of 55 invasive alien plant species belonging to 24 families were documented. Potamogetonaceae and Cyperaceae were the most abundant families. Among these 80% of aquatic alien plant species were introduced from neotropics.

**Nag and Gupta (2014)** studied population structure and regeneration of Sal by laying 34 quadrat in three different managed forest – Ballavpur wildlife sanctuary, Illamabazar and Garhjungle. Quadrat of 10 × 10 m<sup>2</sup> were laid randomly. Total 595 tree were recorded from three forest and only 17 exceeded 20 cm diameter at breast height. The forest was dominated

by small sized tree in all three sites and exhibited reverse J- shaped diameter density distribution.

**Kumar and Sharma (2014)** studied diversity of plant species in Mehari watershed of Doongi block, Rajouri, J and K. The study area was broadly divided into forest and agriculture area. The vegetational analysis was carried out by laying 25 sample plots each of 10 × 10 m and 5 × 5 m for tree and shrub respectively for forest area and 100 × 100 m in agriculture. A total of 7 tree species were encountered in sample plot laid in forest area and 34 tree species in agriculture.

**Khan et. al., (2014)** studied plant diversity of Himalayan region Poonch valley. A total of 430 vascular and 5 nonvascular plant species with 5 species of Bryophytes (5 families), 13 species of Pteridophytes (6 families), 4 species of Gymnosperms (1 family) and 413 species of angiosperms (95 families) were enumerated. Out of which 145 threatened, 30 endangered, 68 vulnerable and 7 rare species.

**Sarkar and Devi (2014)** assessed diversity, population structure and regeneration status of tree species in Hollongapar Gibbon wildlife sanctuary, Assam. Hundred quadrat of 10 × 10 m were laid randomly. A total of 75 tree species belonging to 60 genera and 40 families were recorded. The overall population structure of tree species shows a reverse J-shaped population curve.

**Bhat et. al., (2014)** studied plant diversity in Homegarden of karwar, Karnataka. A total of 210 species of flowering plants were recorded from the 50 gardens during different seasons of the study period belonging to 69 plant families. Families represented by 10 or more number of species were Euphorbiaceae (13 species), Apocynaceae (11 spp.), Cucurbitaceae (10 spp.) and Fabaceae (10 spp.). The minimum number of plants recorded in a garden is 44 and the maximum recorded number in a garden is 138.

**Vandanam (2015)** studied ecological features of cultivated stands of *Aquilaria malaccensis*, a vulnerable tropical tree species in Assam homegarden. A total of 135 homegarden were selected randomly. Random quadrat of 10 × 10 m were used for trees. A total of 323 plant

species belonging to 241 genera under 95 families consisting of 106 herbs, 61 shrub and 156 tree were recorded.

**Bhavannarayana et. al., (2015)** conducted an inventory of degraded forest of Burna, Baliagam reserve forest of srikakulam and Mallavaram reserve forest of east Godavari districts of Andra Pradesh, India. One of the method followed in laying sample plots was the stratified random sampling. Number of species found in burna were 16, Baliagam 11, Prothavaram 16, Mallavasram 17. *Terminalia tomentosa* species were present everywhere except Baliagam..

## Material and Methodolgy

**Study Area:** The study have been carried out in the permanent campus of Central University of Jammu, Bagla Rahya Suchani ,District Samba, Jammu.

The Jammu city is geographically located at an altitude of 327m above mean sea level in the northern part of India. Location Coordinates of Jammu is 32.73°N 74.87°E. Jammu city is hilly and is surrounded by snowcapped mountains. It is surrounded by Shivalik range to the northeast and southeast while the Trikuta range surrounds it in the north -west.

The climate of Jammu city is variable. In southern part, the climate is subtropical and in northern part comprising hill top, climate tends to be temperate. The area experiences hot summers and severe winters. Temperature is lowest between November & February when the minimum night temperature touches zero degree in the hill area and 3° – 4° C in the outer plain areas. Average Maximum temperature in Jammu is 47° C .The Temperature starts rising from third week of March and reaches maximum during the month of May.

Central University of Jammu is located in the district Samba. Samba is located at  $32.57^{\circ}\text{N}$   $75.12^{\circ}\text{E}$ . It has an average elevation of 384 meters (1259 feet). Samba town is situated on range of Shivalik hills alongside the National Highway 1-A / on the bank of river Basantar at a distance of 40 km from Jammu city. District Samba is bounded by District Udhampur in the North, District Kathua in the East, Tehsil Jammu and Bishnah of District Jammu in the west. The climate of the district being sub-tropical zone. The area is hot and dry in summer and cold in winter. Being in the foot hills of the mountains nights are bit cooler than that of neighboring areas of Punjab. The temperature ranges between 6 to 47 degree Celsius.

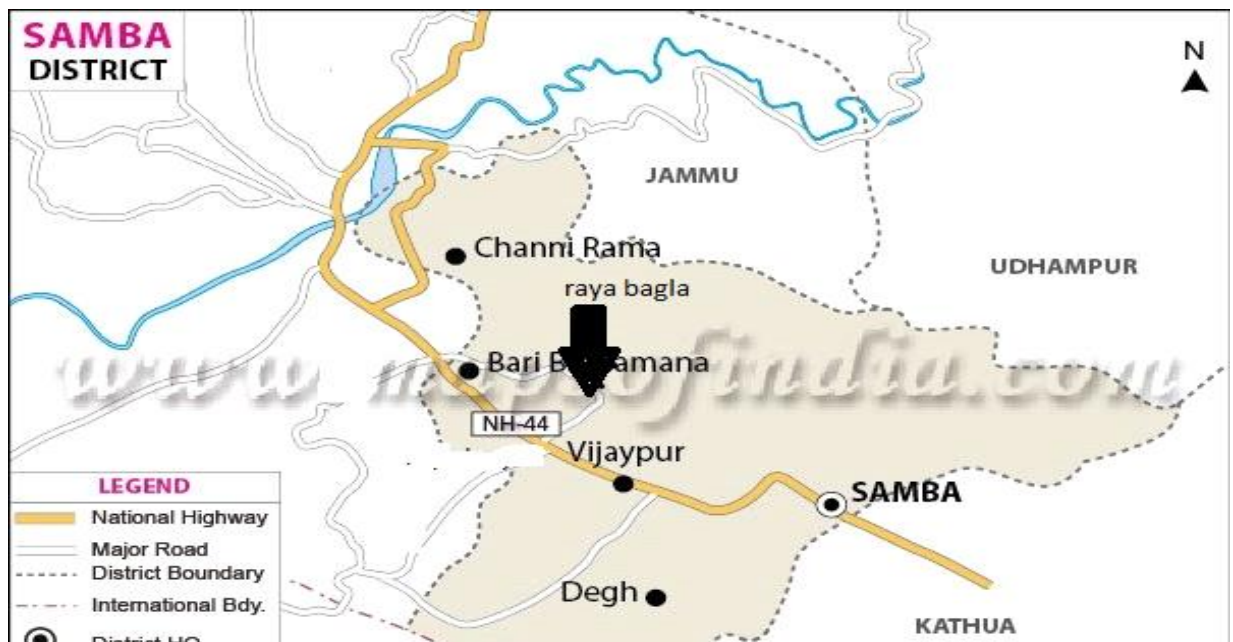


Fig 2. Map showing the University Campus Area:

Source : [www.mapsofindia.com](http://www.mapsofindia.com)

The sampling have been done in the Central University of Jammu Bagla, Rahya. Bagla. RahyaSuchani is a Village in Vijaypur Tehsil in Samba District of Jammu & Kashmir State, India. It is located 10 KM towards west from District headquarters Samba, 198 KM from State capital Srinagar, Jammu. Its geographical coordinates are  $32^{\circ} 37' 10''$  North,  $74^{\circ} 59'$

50" East. Bagla Raya is surrounded by Samba Tehsil towards East, Purmandal Tehsil towards west, Bishnah Tehsil towards west, Ghagwal Tehsil towards East.

The area have been thoroughly surveyed and then quadrats of 10 × 10 m<sup>2</sup> have been prepared to enlist the various tree species in each quadrat. A rapid vegetation assessment have been conducted from feb to may 2015. An inventory of trees have been prepared with family of each species mentioned in the area. Photographs of trees have been taken and plants were identified using relevant scientific literature.

## Results and Discussion

On the basis of our systematic enumeration of trees of the Central University of Jammu, the preliminary data recorded such as botanical name of tree identified and their utilities have been given in Table 1.

Table 1. List of tree species along with their botanical name and utilities.

S.No	COMMON NAME	BOTANICAL NAME	FAMILY	UTILITIES
1	Amaltas	<i>Cassia fistula</i>	Caesalpiaceae	Medicinal uses (intestinal parasites , hemorrhage) Ornamental values. Economical importance (used for making temple drums, agricultural implements, bridges etc.) Religious significance in the Kerala state of India.
2	Jamun	<i>Syzygium cumini</i>	Myrtaceae	Medicinal importance ( control diabetes) . Bark of tree is astringent, sweet, diuretic and digestive. Wood is used for furniture, charcoal production and fire work.

3	Khair	<i>Acacia catechu</i>	Fabaceae	Used as fuel, fodder. Medicinal importance (Anaemia, Leprosy, Bronchitis, Pruritus, Diarrhoea). Katha is also obtained from khair tree. Wood is used as the raw material in the industry, in ship building.
4	Sinduria	<i>Mallotus philippensis</i>	Eurphorbiaceae	Medicinal uses ( constipation, anorexia, cancers, dermatosis etc). To produce red dye. Wood pulp used for making writing and printing paper.
5	Shisham	<i>Dalbergia sisso</i>	Papilionaceae	Wood is economically important ( quality furniture, plywoods, bridge piles, sport goods, railway sleepers). In cosmetics (minimize lines and wrinkles) It can also reduce the productivity of grazing areas and deny access to waterways and coastal areas.
6	Amla	<i>Emblica officinalis</i>	Euphorbiaceae	Medicinal values ( anemia, diabetes, jaundice, asthma and bronchitis) Amla wood is commonly used in firework. Cultural Importance Religious importance.
7	Mango	<i>Mangifera indica</i>	Anacardiaceae	Medicinal significance ( tender leaves used to cure diabetes, purifies the blood and expels worms from the body) Religious importance. Wood is used in packing and timber.
8	Chir	<i>Pinus</i>	Pinaceae	Wood is used for furniture Bark of tree is used as edible food. Ornamental value.
9	Sfeda	<i>Eucalyptus</i>	Myrtaceae	Medicinal values. used to make dyes. They have been planted in some places to lower the water table and reduce soil salination
10	Babool	<i>Acacia nilotica</i>	Mimosaceae	In medicines( small pox, diarrhea, skin disorder). Wood is used in furniture and charcoal production.

				It is introduced and cultivated for erosion and fuel wood. Flowers are used for ornamental purposes, Leaves serves as fodder for goats.
11	Simbal	<i>Bombax ceiba</i>	Malvaceae	Economic uses( manufacture of plywood, match boxes and sticks) Used as ornamental tree. Birds and insects also attracted to flowers to collect pollen and nector. Medicinal utilities (dysentery and diarrhea).
12	Ber	<i>Ziziphus mauritiana</i>	Rhamnaceae	Fruit is used as edible food, forage. Religious importane. Wood is used as fuel and charcoal production. Medicinal uses (dysentery and diarrhea).
13	Gndila	<i>Premna latifolia</i>	Lamiaceae	Used in medicines( inflammation, cardiac disorder)
14	Pkodia	<i>Ficus palmata</i>	Moraceae	Medicines importance (constipation, lungs disorder) Fuits are used as edible food. Wood is used for making hoops, garlands, ornaments etc.
15	Siris	<i>Albizia lebbeck</i>	Fabaceae	Medicinal importance (anti flammatoy activities) Forage and fodder. Ornamentally used. Wood is used for firework and charcoal production.
16	Furlai	<i>Senegalia modesta</i>	Fabaceae	Medicinal uses (Pods are used for conjunctivitis). Ornamental uses. Used in perfume industry due to its strong fragrance.
17	Nrsini	<i>Leucaena leucocephala</i>	Fabaceae	Used as forage , firewood, timber, green manure, shade and erosion control. It is invasive species.
18	Koa	<i>Acacia koa</i>	Fabaceae	Used in wood carving, furniture and musical instruments.
19	Rajain	<i>Diospyros cordifolia</i>	Ebenaceae	It has medicinal properties

20	Peepal	<i>Ficus religiosa</i>	Moraceae	Medicinal importance( bark has ben used to heal wounds) Cultural importance . Religious importance. Reddish dye is extracted from bark.
21	Barh	<i>Ficus benghalensis</i>	Moraceae	Medicinal importance (dysentery, diarrhea) Ornamental , cultural and spiritual importance. Figs are keystone species in many rainforests.
22	Plash	<i>Butea monosperma</i>	Fabaceae	Used as forrage . Medicinal values(intestinal worms, diarrhea, skin disorder), Religious importance, Usage in leather, Culinary use, Patravali plate
23	Bael	<i>Aegle marmelos</i>	Rutaceae	Medicinal values (improves digestion, cure diabetes) Used as food, Religious significance
24	Dhaman	<i>Grewia tilifolia</i>	Malvaceae	Forage, fodder medicinal properties (treatment of rheumatism,diabetes).



Fig 3. *Cassia fistula*

Kingdom Plantae  
Class Eudicot  
Order Fabales  
Family Fabaceae



Fig 4. *Syzygium cumini*

Kingdom Plantae  
Class Magnoliopsida  
Order Myrtales  
Family Myrtaceae

Genus *Cassia*

Species *fistula*



Fig 5. *Acacia catechu*

Kingdom Plantae

Class Magnoliopsida

Order Fabales

Family Fabaceae

Genus *Acacia*

Species *catechu*

Genus *Syzygium*

Species *cumini*



Fig 6. *Mallotus philippensis*

Kingdom Plantae

Class Magnoliopsida

Order Euphorbiales

Family Euphorbiaceae

Genus *Mallotus*

Species *philippensis*



Fig.7 *Dalbergia sissoo*

Kingdom Plantae

Class Magnoliopsida



Fig.8 *Emblica officinalis*

Kingdom Plantae

Class Magnoliopsida

Order Fabales  
Family Fabaceae  
Genus *Dalbergia*  
Species *Sisso*

Order Malpighales  
Family Euphorbiaceae  
Genus *Emblica*  
Species *officinalis*



Fig.9 *Mangifera indica*

Kingdom Plantae  
Class Magnoliopsida  
Order Sapindales  
Family Anacardiaceae  
genus *Mangifera*  
Species *indica*



Fig.10 *Pinus*

Kingdom Plantae  
Class Pinopsida  
Order Pinales  
Family Pinaceae  
Genus *Pinus*



Fig.11 *Eucalyptus*

Kingdom Plantae



Fig.12 *Acacia nilotica*

Kingdom Plantae

Class Magnoliopsida  
Order Myrtales  
Family Myrtaceae  
Genus *Eucalyptus*



Fig.13 *Bombax ceiba*

Kingdom Plantae  
Class Magnoliopsida  
Order Malvales  
Family Malvaceae  
Genus *Bombax*  
Species *ceiba*



Fig.15 *Premna latifolia*

Class Magnoliopsida  
Order Fabales  
Family Fabaceae  
Genus *Acacia*  
Species *nilotica*



Fig.14 *Ziziphus mauritiana*

Kingdom Plantae  
Class Magnoliopsida  
Order Rhamnales  
Family Rhamnaceae  
Genus *Ziziphus*  
Species *mauritiana*



Fig. 16 *Ficus palmata*

Kingdom Plantae  
Class Magnoliopsida  
Order Lamiales  
Family Lamiaceae  
Genus *Premna*  
Species *latifolia*



Fig.17 *Senegalia modesta*

Kingdom Plantae  
Class Magnoliopsida  
Order Fabales  
Family Fabaceae  
genus *Senegalia*  
Species *modesta*



Kingdom Plantae  
Class Magnoliopsida  
Order Rosales  
Family Moraceae  
Genus *Ficus*  
Species *palmata*



Fig.18 *Albizzia lebeck*

Kingdom Plantae  
Class Magnoliopsida  
Order Fabales  
Family Fabaceae  
Genus *Albizzia*  
Species *lebeck*



Fig.19 *Leucaena leucocephala*

Kingdom Plantae  
Class Magnoliopsida  
Order Fabales  
Family Leucaena  
Genus *Leucaena*  
Species *leucocephala*



Fig.21 *Diospyros cordifolia*

Kingdom Plantae  
Class Magnoliopsida  
Order Ericales  
Family Ebenaceae  
Genus *Diospyros*  
Species *cordifolia*

Fig.20 *Acacia koa*

Kingdom Plantae  
Class Magnoliopsida  
Order Fabales  
Family Fabaceae  
Genus *Acacia*  
Species *koa*



Fig.22 *Ficus religiosa*

Kingdom Plantae  
Class Magnoliopsida  
Order Rosales  
Family Moraceae  
Genus *Ficus*  
Species *religiosa*



Fig.23 *Ficus benghalensis*

Kingdom Plantae  
Class Moraceae  
Order Uritales  
Family Moraceae  
Genus *Ficus*  
Species *religiosa*



Fig.24 *Butea monosperma*

Kingdom Plantae  
Class Magnoliopsida  
Order Fabales  
Family Fabacea  
Genus *Butea*  
Species *monosperma*



Fig.25 *Aegle marmelos*

Kingdom Plantae  
Class Magnoliopsida  
Order Sapindales  
Family Rutaceae  
Genus *Aegle*  
Species *marmelos*



Fig.26 *Gerwia tilifolia*

Kingdom Plantae  
Class Magnoliopsida  
Order Malvales  
Family Maltaceae  
Genus *Grewia*  
Species *tilifolia*

## Conclusion

A total of 24 species belonging to 14 families have been identified in the study area. Out of 24 species 23 were angiosperms and 1 gymnosperm. *Leucaena leucocephala* have been as an invasive specie. The highest number of plants have been reported from the family *Fabaceae*. The family *Fabaceae* is cosmopolitan in distribution and well represented throughout temperate and tropical regions of the world. Legumes are particularly diverse in tropical forests with a seasonally dry aspect and temperate shrublands. The preference of legumes for semi-arid to arid habitats is related to a nitrogen-demanding metabolism.

Out of 24 tree species 19 tree species viz. *Cassia fistula*, *Syzygium cumini*, *Eucalyptus*, *Mangifera indica*, *Acacia catechu*, *Malotus phillipensis*, *Emblica officinalis*, *Bombax ceiba*, *Ziziphus jujuba*, *Premna latifolia*, *Ficus palmata*, *Albizia lebbeck*, *Acacia odonata*, *Diospyros cardifolia*, *Ficus religiosa*, *Ficus benghalensis*, *Butea monosperma*, *Grewia tilifolia* and *Aegle marmelos* used for medicinal purposes to cure the various disease like cough and cold, rheumatism pain, urine trouble, fever, dysentery, antiseptics and wormicides.

7 tree species *Bombax ceiba*, *Pinus*, *Cassia fistula*, *Ficus religiosa*, *Ficus benghalensis*, *Albizia lebbeck* and *Mangifera indica* have been cultivated as ornamental tree species on road sides and gardens for the aesthetic beauty. 7 tree species viz. *Acacia catechu*, *Acacia nilotica*, *Grewia tilifolia*, *Ziziphus mauritiana*, *Butea monoaperma*, *Albizia lebbeck* and *Leucaena leucocephala* have been used as forage and fodder. 7 tree species viz. *Syzygium cumini*, *Emblica officinalis*, *Mangifera indica*, *Pinus*, *Ziziphus mauritiana*, *Ficus palmata* and *Aegle marmelos* have been used as food. 8 tree species *Butea monosperma*, *Cassia fistula*, *Emblica officinalis*, *Mangifera indica*, *Ziziphus mauritiana*, *Ficus benghalensis*, *Ficus religiosa* and *Aegle marmelos* have religious importance. Migratory birds are attracted towards the fruits and flowers of *Bombax ceiba* and *Mallotus philippensis*.

14 tree species have been economically used (timber, paper, box, match sticks, musical instruments, packaging material, railways, making hoops, sport goods and) viz. *Cassia*

*fistula, Syzygium cumini, Acacia catechu, Mallotus phillipenis, Dalbergia sisso, Emblica officinalis, Mangifera indica, Eucalyptus Pinus, Acacia nilotica, Bombax ceiba, Ziziphus mauritiana, Ficus palmata and Butea monosperma.*

*A. catechu* have been banned by the Supreme Court in 1997 because of its various uses, its wood, bark and roots are in great demand. It is mostly used in katha production and medicines and that’s why its wood is very costly. This all has lead to over exploitation of this particular tree. This reduced diversity in the area can also be devoted to diversion of agriculture land to into urban areas. The old growth trees are being removed for various reasons.

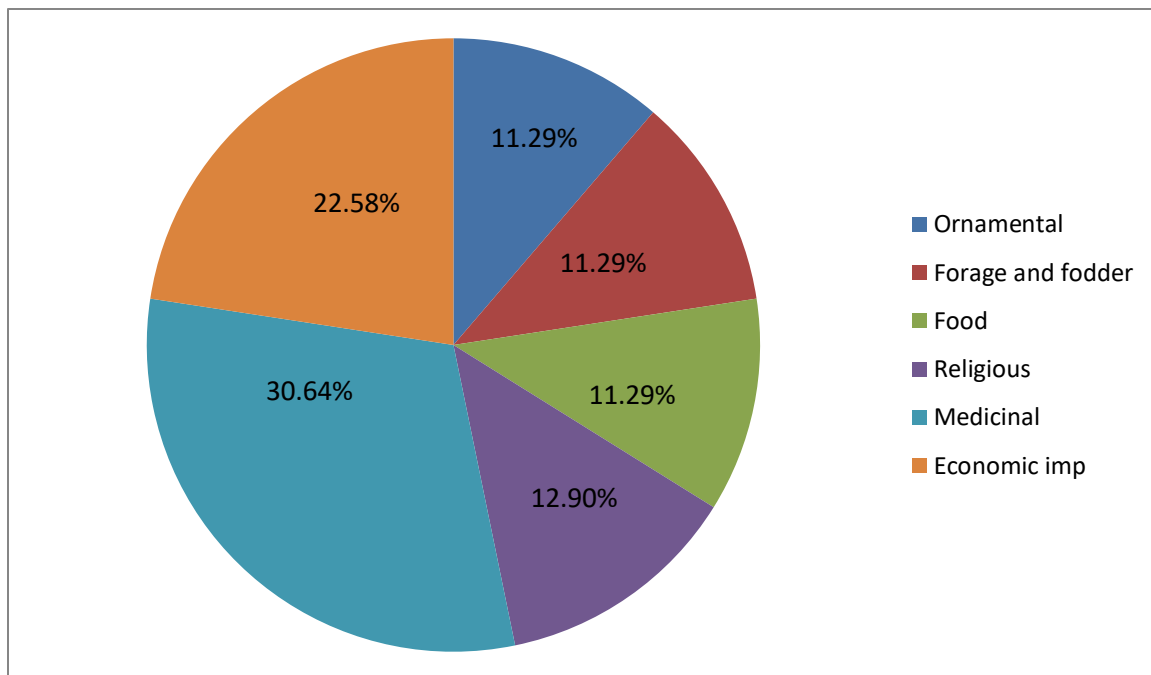


Fig. 27 showing the Different Uses of Tree species

Among the plants documented, higher percentage of trees having Medicinal significance (30.64%), followed by Economic importance (22.58%), Religious importance (12.90%), food (11.29%), Forage and fodder (11.29%) and Ornamental significance (11.29%) Fig.27. The present study reveals that study area of Campus region is endowed with a large number

of medicinal trees as well as trees with other utilities. The inventory of tree wealth of the campus shall provide the ground work for further studies.

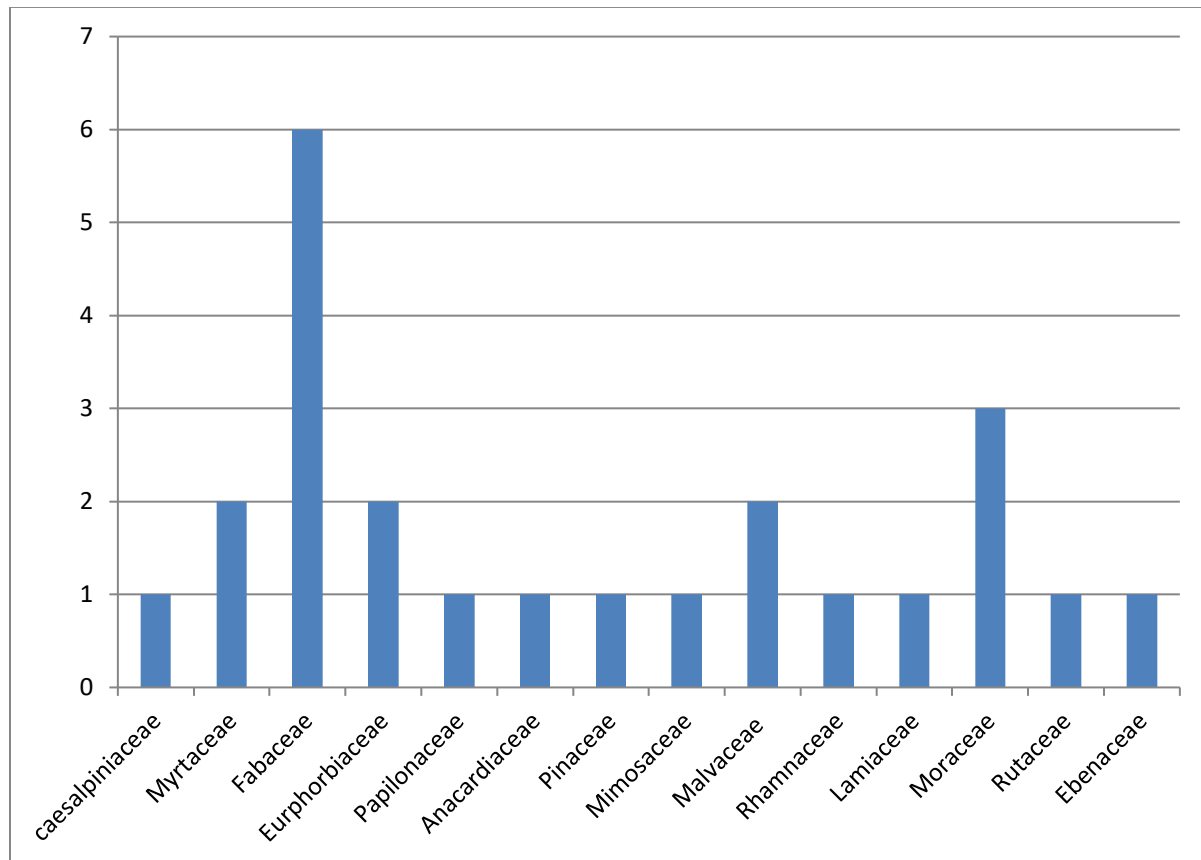


Fig. 28 showing the Dominant families of Bagla Village .

Family Fabaceae is represented with 6 number of tree species followed by Moraceae (3), Myrtaceae (2), Euphorbiaceae (2), Malvaceae(2). Families Caesalpiniaceae, Papilionaceae, Anacardiaceae, Pinaceae, Mimosaceae, Rhamnaceae, Lamiaceae, Rutaceae and Ebenaceae contain single species each.

The present study involves identification of tree species and their inventorizaion at the Central University of Jammu , Campus Area Rhaya Bagla. The Baseline information on the tree species is essential to understand the population status of species growing in the study area in order to identify their economic and conservation value and thus develop strategies for conservation and management of economically important species that are under high anthropogenic pressure. A total of 24 species belonging to 14 families were identified in the study area. Out of 24 species 23 were angiosperms and 1 gymnosperms. *Leucanea leucocephala* was found to be the invasive species. The highest number of plants have been reported from the family *Fabaceae*. Out of 24 species 19 are medicinal, 14 economically important (timber, paper, box, match sticks, musical instruments, packaging material, railways, making hoops, sport goods and.) 8 religious, 7 used as forage and fodder, 7 ornamental and 7 used as food. Regular use of tree species by humans having multiple utilities has lead to their rapid depletion. The natural flora of the campus is under the influence of biotic pressure. The forest ecosystems of Bagla region are experiencing disturbances of various magnitudes. Practices of over grazing, construction, surface burning, forage and fodder, fuel, timber, fuelwood and litter removal at a given time is a continuous disturbance affecting the stability of the forest and retarding the successional processes in the area. Human disturbances and cattle grazing in natural forest ecosystems have alter the structure and species composition and natural functions of the ecosystems . Local people from study area have shown major dependence on various plants to fulfil their requirements hence; they should be trained for appropriate methods of proper collection of useful plant parts and conservation strategy for the flora of area.

Therefore, there is an urgent need to develop a proper mechanism for the utilization of such important species, so that their population can be maintained for posterity. Introduction of agro forestry system in the area is required in order to reduce the dependence of people on

forests for fuel, fodder and timber. On the basis of the study various measures can be adopted to improve the status of trees in the study area i.e. by strengthening the agro forestry system, agri-silviculture practices and planting indigenous trees in the wasteland such as along the road, canals and community lands. The protection of sacred groves of the area is need of the hour as these are the sites of high phyto-diversity. The Biodiversity parks and Botanical garden should also be undertaken.

However, considering the increasing anthropogenic pressure, there may be spatial and temporal threat to the seedling establishment and growth of tree species in the study site. The growth, survival and reproductive potential of the tree species will be at risk in near future if the present trend of anthropogenic continues. Thus, a systematic management plan is required for the conservation of vegetation and sustainable use of available resource.

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