

CHAPTER 1: GENERAL INTRODUCTION

1.1 Introduction

Biodiversity is the integral part of the human being and its survival. It provides direct and indirect use values for human existence and sustainability of ecosystem. Plant species are used for various economic food and medicinal purposes since time immemorial. Our forefather's knowledge on plant species and its utilization are reflected in their traditional socio-cultural and religious ceremonies which are still found to be practices in some communities. A systematic knowledge of plant species is important to understand the floristic diversity, values of species and its associated ethnobotanical importance. Floristic composition of a region determines the diversity and significance of species which are resulted from interactions of biological and climatic characteristics of that region. Therefore, a systematic study of plant diversity through floristic explorations is very essential to quantify the floristic data and its relevant information's associated with socio cultural and religious values, and maintaining ecological balance.

A floristic exploration is highly significant as it helps us to know the regional plant species diversity, their proper identifications that accomplished by botanical keys, local names, illustrations with descriptions, uses and other related informations. Flowering group of plants contributes the major component of any flora and play an imperative role in the entire ecosystem being the greatest contributor of food, fuel, shelter, medicine, fodder, etc. for all kinds of sustainable life forms [1].

On the earth, the total number of species is not yet determined however, it is estimated that the total number of animal and plant species could be between 13 and 14 million [2]. Further it has been reported that it could be ranges from 3 to 100 million species but most of the species are still not described, even not known [3]. However, recent studies suggested that the total number is closer to 5-10 million species [4, 5]. On the other hand, conservation biologists warn that many species could become extinct during the next twenty to thirty years [6].

The systematic record of plant species of a particular geographical region is termed as “Flora” [7] and the entire systematic study of Flora is known as floristic study. The flora of India is more varied than that of other countries of an equal area in the Eastern hemisphere [8] and ranks 10th in the global biodiversity of flowering plants. This is because of varied rainfall, temperature, geology and topography, which influence the floristic and vegetation differently at regional scale. In India, the number of estimated flowering plant species is about 17,000 [9-12]. A comprehensive study on plant diversity of any area gives an up-to-date data on flora and acts as an essential tool for assessing their utility and conservation measures. After Rio Earth Summit held in 1992, biological resources have received a priority in all global discussions about biodiversity conservation.

The North-Eastern region of India comprising Assam and other seven states viz. Arunachal Pradesh, Manipur, Nagaland, Meghalaya, Mizoram, Tripura and Sikkim is regarded as biogeographical “Gate Way” for mass of India’s biological

resources. Among the known species, about 8000 flowering plant species are exists in this region. This region harbours about 54 species of Gymnosperms, 500-1020 species of Pteridophytes, more than 800 species of orchids, about 56 species of Canes [13]. The entire North East India is bounded by the Himalayas and Bay of Bengal and constitutes a characteristic narrow passage way that connects the Indian subcontinent to East Asia and Southeast Asia. The region exhibits diverse hilly terrain with wide ranging altitudinal range and physiographically, the entire region is categorized into the Eastern Himalayas, Northeast hills (Patkai-Naga Hills and Lushai Hills) and the Brahmaputra and Barak Valley plains. North East India characterizes the transition zone between the Indian, Indo-Malayan and Indo-Chinese biogeographic regions and a meeting place of the Himalayan Mountains and Peninsular India and it was part of the "Deccan Peninsula" [14].

The state is located between 26° 14' 38.9616" N latitude and 92° 32' 16.2312" E longitude and contributes the major part of the Eastern Himalaya with a geographic area of 78,438 km². The altitude ranges between 42m and 1736m. The total forest cover is about 27,673 km² measuring 24.58% of total geographical area of the state and it contributes about 3.2 % of India's total forest cover [15]. The annual average rain fall is between 800-3200 mm. The maximum temperature rises up to 36°C in the peak summer (June-July) and the minimum temperature falls down to 6°C during winter (December-January). Takhtajan [16] considered this area as "Cradle of Flowering Plant" considering the concentration of number of primitive species particularly Angiosperms. The state

has heterogenic physiography and phytogeography which significantly harbour diverse plant diversity. It shows a rich floristic diversity representing 3,895 species of flowering plants [17]. The major forests type of Assam comprises Tropical Wet Evergreen, Tropical Semi-Evergreen, Tropical Moist Deciduous, Sub Tropical Broad Leaved Hill, Sub Tropical Pine and Littoral and Swamp Forests.

The tropical and temperate forests represent a high diversity of tree species including the gigantic species like *Albizia lucidior*, *Artocarpus chama*, *Artocarpus lakoocha*, *Dalbergia sissoo*, *Duabanga grandiflora*, *Ficus benghalensis*, *Mesua ferrea*, *Michelia champaca*, *Phoebe goalparensis*, *Tectona grandis*, etc. having high timber value. Apart from the timber yielding species, other species which are important for providing wild edible fruits like *Aegle marmelos*, *Artocarpus lacucha*, *Dillenia indica*, *Solanum anguivi*, *Spondias pinnata*, etc; wild vegetables like *Amaranthus spinosus*, *Amaranthus viridis*, *Oenanthe javanica*, *Ipomoea aquatica*, *Moringa oleifera*, *Sphenoclea zeylanica*, *Phlogacanthus curviflorus*, etc; fibre yielding species like *Bombax ceiba*, *Gossypium herbaceum*, *Abroma augusta* etc; medicinal plant like *Bacopa monnieri*, *Clerodendrum serratum*, *Garcinia pedunculata*, *Oroxylum indicum*, *Phyllanthus emblica*, *Terminalia bellirica*, *Terminalia arjuna*, etc. and aromatic plants and spices like *Cinnamomum tamala*, *Houttuynia cordata*, *Piper longum*, *Piper nigrum*, etc. are commonly distributed in the state. The primitive species like *Magnolia* sp., *Pachylarnax* sp., *Fissistigma* sp., *Alseodaphne* sp., *Cinnamomum* sp., *Litsea* sp., *Michelia* sp. exists in the state is a concern of high interest among the plant taxonomists.

Since time immemorial man are utilizing different plant species for medicinal purposes. The peoples of India are using medicinal plants since prehistoric period. In India, about 70% of population dwells in rural areas and many of them reside in the neighbourhood of forest and use various plant parts as food, medicines, and in many other purposes for their daily livelihood [18]. Medicinal plants have a long-standing history among indigenous communities, and are an integral part for treating various diseases, particularly to cure daily ailments and this practice of traditional medicine is based on hundreds of years of belief and observations. With enormously diversified ethnic groups and rich biological resources, India represents one of the great emporia of ethnobotanical wealth [19]. The use of herbal treatment is immensely increasing globally and many modern researchers are involved to explore the potential, scope, utility of ethnobotanical information for treating various diseases as well as usefulness of wild plants [20- 38]. Reports estimated that traditional medicine accounts for about 40% of all health care [39]. It has been projected that about 85% of traditional medicines used globally are derived from plants [40]. Therefore, ethnobotanical research has immense scope to understand the importance, value and usefulness of wild and semi-wild plants and the ancient and primitive methods of land management and biodiversity conservation. The documentation of ethnobotanical data help in further research of drug discovery with the help of indigenous knowledge and also the wisdom of the tribal communities will also be recorded before losing it. It is the call of the time to study and understand this high valued traditional knowledge present among the tribal communities.

Another important aspect of biodiversity is Non-Timber Forest Products (NTFPs). These are objects of biological origin belonging to both plant and animal, derived from the forest and allied land uses for subsistence and cash income by forest dwellers. NTFPs have long been harvested for subsistence and trade [41]. The World Health Organization report indicates that more than 80% of the population of South Asia uses plant-based medicines for maintaining and improving its health [42] and people have benefited from these plants for many generations.

It has been estimated that 25 percent of 6.2 billion world population, are dependent on forest resources including plant and animal products [43]. It is also estimated that about 60 million aboriginal people all over the world depend on the forest ecosystem for their livelihood [44]. Tropical forests are considered to be important repositories of forest resources, especially NTFPs. Non-timber forest products (NTFPs) have played a significant role in progressive growth in benefiting people and industries of a nation. An estimated 50 million economically marginalized forest dwellers in India harvest large quantities of NTFPs for their subsistence as well as for trade [45, 46]. In a report it has been estimated that women forest dwellers alone collect products worth about 700 million US dollars annually [47]. The study on NTFPs has able to draw considerable attention throughout the country. At the same time the study of NTFPs in Assam shows negligible in comparison to other part of the India. Dattagupta *et al.* [48, 49] reported a study of NTFPs from Cachar district of Assam. However, to date, no systematic study has been

carried out on potential utilization of NTFPs in Sonitpur district of Assam.

1.2 Choice of the present work

Erstwhile Sonitpur is one of the most important districts of the state Assam, as it lies in the foot hill of Eastern Himalaya bounded by Darrang and Udalguri districts in west, the Brahmaputra River in south, West Kameng district of Arunachal Pradesh in north and Lakhimpur district in east. Despite of it immense floristic and ethnobotanic potential the district is still almost unexplored. A few works on floristics and ethnobotanical studies are available which are very limited. Devi [50] worked on herbaceous angiosperms of Tezpur Sub division of Sonitpur while, Begam [51] worked on the floristics of Nameri National Park. Likewise, ethnobotanical study from the erstwhile Sonitpur district is very meagre. Works on Bodo community are reported by Saikia [52, 53] and Bora [54], Begum and Hynniewta worked on medicinal plants resources of Nameri National Park [55]. No report on NTFPs from the district is available. Therefore, to bridge the research gap in term of floristic and ethnobotanical work an attempt has been made to document a detailed updated Flora (dicot) of erstwhile Sonitpur district and ethnobotanical utilities, along with the assessment of NTFPs. The study will help to reconstruct the data on dicot floral record of erstwhile Sonitpur and will also serve as the additional data for the Flora of Assam and its importance.

1.3 Aims and Objectives of the study

1. Exploration, documentation and systematic analysis of dicot angiosperms.

2. Study on uses of medicinal dicot angiosperms among a few selected tribes.
3. Evaluation and assessment of Non Timber Forest Products (NTFPs) with special reference to Mishing community.

1.4 Bibliography

- [1] Chandrasekharan, C. Terminology, definition and classification of forest products other than wood, 1995.
- [2] Heywood, V.H. *Global Biodiversity Assessment*, Cambridge University Press, Cambridge, UK, 1995.
- [3] May, R. M. Tropical Arthropod Species, More or Less? *Science* 329: 41-42, 2010.
- [4] Hamilton, A. J., Y., Basset, K.-K., Benke, P.-S., Grimbacher, S.-E. Miller, V., Novotn, G. A., Samuelson, N.-E., Stork, G.-D. Weiblen, and Yen. J.-D. Quantifying Uncertainty in Estimation of Tropical Arthropod Species Richness. *The American Naturalist* 176:90-95, 2010.
- [5] Mora, C., Tittensor, D. P., Adl, S., Simpson, A. G. B., and Worm, B. How Many Species Are There on Earth and in the Ocean? *PLoS Biol* 9:10, 2011.
- [6] Khera, A.N., Kumar, A., Ram, J., and Tewari, A. Plant biodiversity assessment in relation to disturbances in midelevational forest of Central Himalaya, India, *Tropical Ecology* 42: 83-95 ,2001.
- [7] Palmer, M.W., Wade, G.L., and Neal, P. Standards for writing of floras. *Bioscience*, 339-345, 1995.

- [8] Ahmedullah, M., and Nayar, M. P. *Endemic Plants of the Indian Region*, Botanical Survey India, Calcutta, 1987.
- [9] Bibby, C.J. *Putting Biodiversity in the map- priority area for global conservation*, Cambridge, 1992.
- [10] Groombridge, B. *Global biodiversity: status of earth's dwindling resources*, report compiled by the world conservation monitoring centre, London, 1992.
- [11] Groombridge, B., and Jenkins, M.D. *Global Biodiversity: Earth's Living Resources in the 21st Century*, The World Conservation Press, Cambridge, 2000.
- [12] Venu, P. A review of floristic diversity inventory and monitoring methodology in India. *PINSA*, 5: 281-292, 1998.
- [13] WWF, *Review of Biodiversity in NE India*, Report. New Delhi, 2003.
- [14] Rao, R.R., and Murti, S.K. North-East India: A major centre for plant diversity in India. *Indian Journal of Forestry* 13(3): 214- 222. 1990.
- [15] Krishi Vigyan Kendra report, AAU, Sonitpur Napam, Tezpur, 2015-16.
- [16] Takhtajan, A. *Flowering Plants. Origin and Dispersal*. Tr. Jeffery, 1969.
- [17] Chowdhury, S. *Assam's Flora: Present status of Vascular Plants*. Assam Science Technology and Environment Council, 2005.
- [18] Datta, T., Patra, A.K., and Dastidar, S.G., 2014. Medicinal plants used by tribal population of Coochbehar district, West Bengal, India-an ethnobotanical survey. *Asian Pac J Trop Biomed* 4(1), 478-482.

- [19] Kala, C.P. Current status of medicinal plants used by traditional vaidyas in Uttaranchal State of India. *Ethnoboany Res. Appl.* 3: 267-278, 2005.
- [20] Schultes, R.E. The role of ethnobotanist in the search for new medicinal plants. *Lloydia* 25:257-266, 1962.
- [21] Schultes R.E. The widening panorama in medical botany. *Rhodora* 65:97-120, 1962.
- [22] Ford. R.I *The Nature and Status of Ethnobotany* Anthropol. Papers no. 67, Museum of Anthropol Uni. Michigan. Ann Arbor. 428, 1978.
- [23] Jain S.K Ethnobotany : Its scope and study . *Indian Museum bulletin* 2(1): 39-43, 1967(a).
- [24] Jain S.K *Glimpes of Indian Ethnobotany*. Oxford and IBH publishing Co. New Delhi, 1981.
- [25] Jain S.K *Ethnobotany : interdisciplinary Sci. rev. II*: 285 - 292, 1986.
- [26] Jain S.K (ED 1989): "*Contribution to Indian Ethnobotany*" scientific publishers, Jodhpur
- [27] Jain S.K *Dictionary of Indian Folk medicine and Ethnobotany*, Deep publication, New Delhi, 1991.
- [28] Jain S.K. Ethnobotany and research on medicinal plant in India. CIBA Foundation symposium, 185. In: Derek J. Chadwick and Joan March (Eds) *Ethnobotany and the search of new Drugs*. John wiley & sons. Chickester U.K,153-168, 1994.
- [29] Dutta, B.K., Dutta. P.K., Potential of ethnobotanical studies in North East India: an overview. *Indian Journal of Traditional Knowledge* 4: 7-14, 2005.
- [30] Ali Shtayeh M.S., Jamous R.M., and Al-Shafie J.H.

- Traditional knowledge of wild edible plants used in Palestine (Northern West Bank): a comparative study. *Journal of Ethnobiology and Ethnomedicine* 4: 1-13, 2008.
- [31] D.L., Baheti, A.M., Jain, S.R., and Khandelwal, K.R. Use of medicinal plants among tribes in Satpuda region of Dhule and Jalgaon districts of Maharashtra-an ethnobotanical survey. *Indian Journal of Traditional Knowledge* 9: 152-157, 2010.
- [32] Ong, H.C., Lina, E., and Milow, P. Traditional knowledge and usage of edible plants among the Semai community of Kampung Batu 16, Tapah, Perak, Malaysia. *Scientific Research and Essays* 7 (4): 441-445, 2012.
- [33] Paul, A.K., Chakma, P., and Nahar, N. A Survey of non-conventional plant items consumed during times of food scarcity by the chakma people of Hatimara village of Rangamati District, Bangladesh. *American Eurasian Journal of Sustainable Agriculture*. 5 (1): 87- 91, 2011.
- [34] Menendez-Baceta, G., Aceituno-Mata, L., and Tardfo, J. Wild edible plants traditionally gathered in Gorbeialdea (Biscay, Basque Country). *Genetic Resources and Crop Evolution*. 59: 1329—1347, 2012.
- [35] Tiwari, J.K., Ballabha, R., and Tiwari, P. Some promising wild edible plants of srinagar and its adjacent area in alaknanda valley of Garhwal Himalaya, India. *Journal of American Science* 6 (4): 167-174, 2010.
- [36] Bajpai, O., Pandey, J., and Chaudhary, L.B. Ethnomedicinal Uses of Tree Species by Tharu Tribes in the Himalayan Terai Region of India. *Research Journal of Medicinal Plant*

- 10(1): 19–41, 2016.
- [37] Mehra, A., Bajpai, O., and Joshi, H. Diversity, utilization and sacred values of Ethno-medicinal plants of Kumaun Himalaya. *Tropical Plant Research* 1(3): 80–86, 2014.
- [38] Ngbolua, K.N., Mihigo, S.O., and Liyongo, C.I. Ethno-botanical survey of plant species used in traditional medicine in Kinshasa city (Democratic Republic of the Congo). *Tropical Plant Research* 3(2): 413–427, 2016.
- [39] World Health Organization (WHO). 2013. WHO traditional medicine strategy 2002-2005. Geneva: World Health Organization. [Online] Available from [tp://www.who.int/medicines/publications/traditionalpolicy/en/index.htm](http://www.who.int/medicines/publications/traditionalpolicy/en/index.htm). [Accessed on 27 October,].
- [40] Fransworth, N.R. *Screening plants for new medicines*. Washington DC. National Academy Press, 1988.
- [41] Ticktin, T. The ecological consequences of harvesting non-timber forest products. *Journal of Applied Ecology* 41(4): 11–21, 2004.
- [42] Debbie, S. *Risks or remedies? Safety aspects of herbal remedies* in the UK. *J. R. Soc. Med.* 91: 294–296, 1998.
- [43] Iqbal, M. *International Trade in Non-Wood Forest Products: An Overview*. Food and Agriculture Organization, Rome, Italy, 1993.
- [44] World Bank, *A Revised Forest Strategy for the World Bank Group*. (Draft). Washington D.C, 2001.
- [45] Uma shaanker, R.; Ganeshiah, K.N.; Krishnan, S.; Ramya, R.; Meera, C.; Aravind, N.A.; Kumar, A.; Rao, D.; Vanaraj, G.; Ramachandra, J.; Gauthier, R.; Ghazoul, J.; Poole, N. and

- Chinnappa Reddy, B.V. *Livelihood gain and ecological cost of non-timber forest product dependence: assessing the roles of dependence, ecological knowledge and market structure in three contrasting human and ecological settings* in South India. *Environmental Conservation* 31(3): 242–253, 2004.
- [46] Hegde, R.; Suryaprakash, S.; Achoth, L. and Bawa, K.S. Extraction of non-timber forest products in the forests of Biligiri Rangan Hills, India, 1: contribution to rural income. *Economic Botany* 50(3): 243–250, 1996.
- [47] Pandey, R.K. and Saini, S.K. Edible plants of tropical forests among tribal communities of Madhya Pradesh. *Indian Journal of Traditional Knowledge* 6 (1): 185-190, 2007.
- [48] Dattagupta, S., Gupta, A. and Ghose, M. Non-Timber Forest Products of the Inner Line Reserve Forest, Cachar, Assam, India: dependency and usage pattern of forest-dwellers. *Assam University Journal of Science & Technology: Biological and Environmental Sciences* 6 (1): 21-27, 2010.
- [49] Dattagupta, S., Gupta, A. & Ghose, M. Diversity of non-timber forest products in Cachar District, Assam, India. *Journal of Forestry Research* 25(2): 463–470, 2014.
- [50] Devi, M. *Herbaceous Angiosperms of Tezpur sub-division of Sonitpur district, Assam with reference to their taxonomy and scope utilization*. Ph.D. Thesis, Gauhati University, Guwahati, Assam, 1998.
- [51] Begum, S.S. *Floristic diversity of Nameri National Park, Assam with special reference to rare, endangered and endemic plants*. Ph. D. Thesis, Gauhati University, Guwahati, Assam, 2008.

- [52] Saikia, B. Ethnomedicinal plants from Gahpur of Sonitpur district, *Indian Journal of Traditional Knowledge* 5(4): 529-530, 2006.
- [53] Saikia, B. Medico-ethnobotany in Bodo tribes in Gahpur of Sonitpur district, Assam, *Indian Journal of Traditional Knowledge* 9(1): 52-54, 2010.
- [54] Bora, P.J. A study on ethnomedicinal uses of plants among the Bodo tribe of Sonitpur district, Assam. *Journal of Economic and Taxonomic Botany* 23(2):609-614, 1999.
- [55] Begum, S.S. and Hynniewta, T.M. Medicinal plants resources of Nameri National Park, Assam, India. *Annals of Forestry* 15(1): 62-72, 2006.