

Chapter - 4

LITERATURE SURVEY

4.1 PREVIOUS FLORISTIC WORKS

The floristic richness of the Eastern Himalayas including Darjeeling–Sikkim has attracted a large number of explorers, researchers, botanists and plant collectors from different parts of the world, especially the Britishes. As the area of Darjeeling were once an integral part of Sikkim at least up to 1835, and for this reason, in almost all the previous works, Darjeeling has been considered as a part of Sikkim even up to the early 1900s (Das 1986, 1995, 2004; Bhujel 1996).

The publication of a small floristic account on Nepal by D. Don in 1821 may be considered as the pioneer for the floristic exploration for the Eastern Himalayas. However, this publication is based on the specimens deposited earlier in Lambert's Herbarium. Again, in 1825, D. Don published *Prodromus Florae Nepalensis*. Virtually, the famous naturalist Griffith also explored the area after two decades, in 1847. But the comprehensive exploration by the famous botanist Sir J. D. Hooker during 1848–1849 (Hooker 1849–1850, 1849–1851) is considered to be the first scientific and systematic exploration of the flora of India, so, he became the first botanical explorer of the Eastern Himalaya. After arriving at Darjeeling on 16th April 1848, he collected plant specimens employing 18 specimen collectors. He first visited around Darjeeling, and then through the ridges of Singalila he entered to eastern Nepal. Forwarding ahead to the higher Himalaya he visited Sikkim and finally returned to Darjeeling. He is one of such botanist who explored the entire region and made a historic collection of approximately 3500 plant-specimen, only from the Darjeeling–Sikkim Himalaya. Hooker then consequently published the details of his expeditions in the form of *Rhododendrons of Sikkim Himalayas* (1849–1851), *The Himalayan Journals* (1854), *Flora of India* (1855) with T. Thomas, *The Flora of British India* (1854, 1872–97, 1904) and *Sketch of the Flora of British India* (1907). The results of Hooker's exploration, in reality, become the foundation of Indian Systematic Botany (Bhujel 1996). The *Flora of British India* is still one of the most comprehensive descriptions of botanical splendors of the region.

Some other eminent botanical explorers who simultaneously worked during the period of Hooker's explorations on different aspects of the flora of the district are A. Cambbell (1849, 1852), Thomas Anderson (1864, 1868, 1871), J. Scott (1874), C. B. Clarke (1876, 1877, 1885, 1886), H. J. Elwes (1877), J. S. Gamble (1875, 1878, 1896, 1912, 1917), G. A. Gammie (1893, 1894), Sir George King and Robert Pantling (1885, 1895, 1898 a,b); George H. Cave and W.W. Smith (1911), Smith (1911, 1913), C. C. Lacaita (1913) and so on.

Following Sir J.D. Hooker's footsteps of Several other successive botanical explorer including P. Bruhl (1926), A. M Cowan & J. M. Cowan (1929), H. Hara (1961, 1965, 1966, 1971), M. Mizushima (1963), I. H. Burkill (1907, 1916), H. Kanai (1963), H. Ohashi (1975), Guha, K.K. (1983), A. J. C. Grierson & D. J. Long (1983–1994), J. H. Noltie (1994, 2000), and N. R. Pearce & P. J. Cribb (2002) have enormous contribution towards the flora and floristic conservation of the region.

Significantly, many national botanists from various parts of our country have worked upon the flora of Darjeeling and numerous floristic and/or taxonomic accounts have been published during the recent past and the activities are still in progress. The prominent botanists of such category includes K. P Biswas (1940, 1956, 1966), S. K. Mukherjee (1940), A. Banerji (1948), B.N. Ghosh (1951–1957), H. L.

Chakrabarty (1959), Mehra et al (1964), G.C. Sen (1964), K. M. Matthew (1969, 1970, 1981), G. S. Yonzone (1976) and Yonzone *et al* (1981, 1984, 1985, 1987), Kundu *et al* (1981), A.P. Das (1984, 1986, 1991, 1994, 1995, 1996, 1997, 1998, 2001, 2002, 2002, 2004, 2011 etc.), A. P. Das *et al* (1986, 1987, 1990, 1995, 1997, 1998, 2002, 2003, 2004, 2009 – 2014), U. C. Pradhan *et al* (1983, 1984, 1985 & 1981), U.C. Pradhan 1976, 1979 & 1990), R. B. Bhujel (1984), R. B. Bhujel *et al* (1994, 1996 a, 1998, 2002), Majumdar *et al* (1984), A. Mukherjee (1988), P. C. Lama (1989), P. Basu (1990), A. K. Samanta (1998), A.P. Das & A. K. Lahiri (1997), P. C. Rai (2001), P. C. Rai *et al* (1996, 1998, 2001, 2001, 2002, 2004, 2013), S.K. Rai (2002), S.K. Rai *et al* (1999, 2002, 2007), D. Lama (2004), U. Rai (2006), U. Rai *et al* (2001, 2007, 2010, 2013, 2014), C. Ghosh (2006), Kumar *et al* (2009, 2010), Paul *et al* (2012), S. Nirola *et al* (2011, 2014), S. Moktan *et al* (2012, 2013), R. Yonjan *et al* (2012, 2013, 2014), N. Thapa *et al* (2013), D. Choudhury *et al* (2013) and so on.

4.2 NECESSITY OF THE PRESENT WORK

Sharing only less than 0.1 % (3149 km² out of 3,287,240 km²) of the geographical area of the country, Darjeeling district harbors around one-seventh of the flowering plants of India (Yonzone 1993). Different governmental and non-governmental agencies realised the importance of the flora of this region and that has been reflected through its incorporation in the Himalaya Hotspot, the 22nd Biodiversity Hotspot [formerly within 'Indo-Burma Hotspot'] in the entire world by IUCN along with the establishment of a number of Protected Areas including three wildlife sanctuaries, two national parks and wide areas of reserved forests.

Darjeeling being a world renowned hill station of tourist interests it attracts varieties of people almost from all the corners of the world. The beauty of these hills is being created by virtue of its natural or the geographical beauty and sceneries which is ultimately being created by the flora or the vegetation of the region. Therefore, the government agencies have imparted significant emphasis on the extension of ecotourism activities in the district which will create opportunities for the local people by generating alternative income sources by participating in one or more areas of ecotourism business.

Floristic analysis and enumeratory survey of the district is essential for proper estimation of naturally occurring plant resources in the area. This type of work will help the government and other agencies to estimate and plan different developmental and conservational measures and programs. It was appeared as a huge task to work out with about 2700 angiosperms (Das 1995, 2004) of the district for a single floristic survey. In this regard, survey and studies on the dicotyledonous flora of the entire district has been conducted by Bhujel (1996) from the same laboratory. However, no such floristic works on monocotyledonous flora have been undertaken, so far, for the district to highlight the complete angiospermic resources of the district. Whatever little information on the monocotyledonous flora are there comes from the work of Das (1986, 1995, 2004) where he has recorded 237 species covering 126 genera and 34 families. However, the Taxonomy and Environmental Biology Laboratory of the Department of Botany, University of North Bengal has conducted intensives surveys of some protected areas and Tea Gardens in Darjeeling and also recorded many monocotyledonous plants but these enumerations only provided the distribution of recorded species only in a given region and not represent the district in entirety. The present work will help to understand the number of monocotyledonous taxa of the district, their distribution status, and conservational measures taken so far and need to be taken in future.

The present study is associated with the floristic work, through field visits, survey by making extensive explorations and recording of the floristic components of the Darjeeling district. Latest updated nomenclature of plant species, taxonomic descriptions, vernacular and local names, flowering and fruiting seasons, distributions, ecological status, and their ethnobotanical importance for the local people have significantly dealt in the study, which will systematically be helpful for the sustainable development of the vegetational resources of the region. Further, this type of work shall remained as an indispensable source of information for students, researchers, scientists and policy makers in near future for the meaningful utilization and management of biodiversity. This may be an essential tools for naturalists, plant taxonomist, ecologist, foresters for conservation activities, sustainable exploitation, environmental strategies and over all planning of numerous basic developmental activities for the district.

The flora of a place always contributes a significant value for the local residents. The ethnic local

people of Darjeeling have been closely associated with the locally available plants for their food, shelter, alternative medicine and for other essential items for the survival for many centuries. Documentation of ethnobotanical information from the tribal people of the district shall be important resources while conducting assessment of natural resources in near future. These ultimately enable identification thereby conserving the economically potential plants species of NTFPs having herbal medicinal, aromatic, ornamental, wild edible values, etc.

However, if the past and present floristic assessments are compared then that might be an eye opener for governmental agencies that the biological resources are depleting in different periods due to mismanagement and misuses of biodiversity, and should take necessary actions to control that. Removal of natural vegetation, plantation with very few selected commercially important species, rampant uncontrolled collection of NTFPs including medicinal, ornamental and RET plants causing unrecoverable loss in rich heritage basic resource. These studies will also ultimately enable us to realize the status of our endemic and endangered floral elements growing in different eco-climatic niches within the boundary of the district. Establishment of some protected areas in different corners of the world is certainly being done based on such kind of works.

The present work has thus emphasized upon the enumeratory studies of the monocotyledonous flora for Darjeeling, - the northernmost and the only Himalayan District of the Indian state of West Bengal. And, with the completion of this work, there is now a complete Angiospermic flora of Darjeeling district in hands of appropriate persons for its multifarious use.