

**Chapter 3**  
**MATERIALS**  
**AND**  
**METHODS**

### 3. Materials and Methods

#### 3.1 Materials

The collection of specimens within the Zemu and Lhonak valley were done during 2012 to 2015, for the last four years (Pl.4). Total 12 collection trips, with average time of 12 days, during pre-monsoon (March-April), monsoon (June-August) and post-monsoon (October-November) seasons were done and these collections are in mostly 3 specimens for each gathering.

All these collections are pressed properly, dried, fumigated, poisoned and finally mounted to prepared herbarium specimens.

These herbarium specimens are duly kept in the herbarium of Calcutta University Herbarium (CUH), Department of Botany, University of Calcutta and one set of specimens are deposited at the herbarium of Sikkim State Forest Department.

#### 3.2 Methods

All these collections are identified with the consultation of relevant literatures and also the earlier collections deposited both at Central National Herbarium, Botanical Survey of India, P.O. : Botanical Garden, Sibpur, Howrah – 711103, West Bengal, India (CAL), herbarium of Sikkim Himalayan Circle, Botanical Survey of India, Gangtok, Sikkim, India (BSHC) and Calcutta University Herbarium (CUH), Department of Botany, University of Calcutta, 35, Ballygunge Circular Road, Kolkata – 700 019.

In almost all the cases the specimens are matched with the observed characters under simple dissecting microscope or whenever necessary under zoom microscope. In most of the cases flowers are dissected for the identification of collected specimens. Many collections are here by represented in this thesis with their line drawings as figures (illustration).

All these collected specimens are cited in the presentation of present observation (Floristic aspects of flowering plants) of Zemu and Lhonak Valley, as “*exsiccata*”. Besides the citation of these collected specimens, other collections are also cited, which were collected from this area by the earlier workers deposited at CAL and BSHC. In the presentation of the present observation as floristic aspects of flowering plants of Zemu and Lhonak valley, Sikkim the following aspects are considered.

1. The family concept of Angiosperms is followed after Takhtajan (1997) with some of the consideration of the concept of other classifications Hutchinson (1973), Cronquist (1981), Thorne (2000).
2. Key to the genera of each family is presented when there are more than one genera; a key to the species is presented for each genus when more than one species are present under each genus. In this regard key to the families is not presented to avoid the repetition of many of the characters as given in many classical literatures of Indian flora and also to avoid the voluminous content of this thesis. Key to the infraspecific taxa is presented where it is required.



**Plate 4:** Collection of specimens: A- Field camp near Lhonak La, B-C- Lhonak Valley, D-F- Zemu valley.

- 3.(i) Presentation of correct nomenclature with citation is done. Citations are here considered which are relevant to this study or of this area, or often of the latest works done on the family or on the genera.
- (ii) The nomenclatural citation is followed by a short description of the species. For newly described taxa, newly recorded (for Indian flora) or rediscovered taxa an elaborated description is provided. The description is sometimes chosen for a few diagnostic characters by which the species can be identified or differentiated from the related one; thus the uniformity of description may not be present in the species under different genera as well as under different families. Reiteration of characters as presented in the key and also in description is sometimes present as the essential features for the identity of species both in the field and in the dried herbarium specimens.
- (iii) The distributional ranges mentioning altitude of each species is noted.
- (iv) A note, specially the taxonomic note, is sometimes presented when there is some critical point of observation of characters of specimens or of taxonomic treatment of species or discretion expressed by earlier workers.

However, limitation is there regarding the citation of all collections which are collected from the different areas of Zemu and Lhonak valley in different times. The specimens are mainly cited which were collected by Smith and Cave (1911) during 1909 (July to August) after due examination of the identity of the collected specimens at CAL. Similarly, other recorded specimens are cited which had been collected by the staff members of the Botanical Survey of India, Sikkim Himalaya Circle, Gangtok, Sikkim from the establishment of this Circle Office in December, 1979.

During the collection trips the topographical characters of the area, dominant floristic patterns, habitat condition etc. has been noted and finally these observations are incorporated in the thesis. These findings are further supplemented based on the additional information of different authors (Hajra and Mudgal, 1997; Mukhopadhyay, 1998; Chowdhery, 1998; Bandopadhyay and Singh, 1998; Roy and Thapa, 1998; Sudhakar *et al.* 1998; Singh and Chauhan, 1998; Lachungpa, 1998; Shukla *et al.* 2000, Maity and Chauhan, 2002).

During the assessment and floristic study of Zemu and Lhonak valley the following aspects have been considered and a status report has been made under present observation :

1. Physical characteristics of Zemu and Lhonak valley.
2. Aspects of Flowering Plant Diversity of Zemu and Lhonak valley including the present status.

3. List of Rare and Threatened Plants of Zemu and Lhonak valley.
4. Species/taxa new to science.
5. Additions to the Flora of India.
6. Rediscovery of species in India.
7. List of Endemic species.
8. List of the Rare, Endangered and Threatened species and
9. Major Medicinal plants of Zemu and Lhonak valley.