

CHAPTER V

5. MATERIAL AND METHODS

5.1 Planning of Survey

Understanding the vastness and frequent variation in the floristic composition, especially between the north facing and south facing slopes, and, as per altitude with sharp physiographic changes, the important and thrust areas of the district were listed with the help of existing literatures, forest maps of Darjeeling, state Government information centres and previous personal experiences. In the process, the places visited by previous workers and hitherto unexplored ones were identified. A plan of action for survey, collection of specimens and recording was prepared. This was more useful and almost a prerequisite particularly for higher altitudes above 2200m and deep forests which welcome no random visits (Map 5).

5.2 Collection and Preservation

The collection of Dicotyledonous Angiosperms of Darjeeling district was initiated in the year 1984 and carried on to January 1993. The plant specimens were collected from all parts of the district randomly in the first three years and selectively afterwards.

The headquarter selected initially was Darjeeling Govt. College, while processing subcentres were chosen at Kalimpong and Siliguri (NBU Herbarium). The headquarter was shifted to Kalimpong College, Kalimpong in 1988. The camps were set in selective manner in places far and near, with a view to covering all habitats including forests, deforested areas, cultivated lands, Tea gardens, River beds, walls, lakes, landslide areas and wastelands. Specimen collection were made in all seasons, covering a spot at least twice a season and more, whenever the situation demanded for. In the higher altitudes camping and collection were done as per specified programme in three different seasons visiting a spot every season, between 1986-1992.

As far as possible, the specimens were collected in flowering and fruiting conditions or both together whenever available. They were tagged with field numbers, recorded in the field note book and temporarily preserved in polythene containers keeping the mouth tightened to prevent desiccation. Specimens in this condition were brought to the field camp and then segregated, cleared and directly treated with formalin for killing organs. The cleared specimens were displayed in blotting papers, taking care of the size, flower and leaf exposure. Portable field press was used in pressing these specimens in this condition for drying. The blotting papers were changed everyday and specimens were checked, adjusted and reinserted to the press. After returning to the headquarter, the larger, non-portable plant presses were used and specimens transferred to them. In rainy seasons formaldehyde treatment was given in between these stages to protect the plants from fungal attack. The changing of blotting papers continued till the specimens were dried up. On the completion of drying, the specimens were poisoned by spraying over or soaking in 4% solution of $HgCl_2$ in 90-95% rectified spirit. They were blotted dry, again. At this, stage, the specimens were ready for mounting.

The mounting was done on standard herbarium sheets (41.5x28cm) using glue and threads. The herbarium label (15.5x10cm) was pasted at the bottom right hand corner of the sheet. The label contained important information such as, (1) collection number, (2) date of collection, (3) name of the plant, (4) family, (5) local names (if available), (6) habit, (7) habitat, (8) exact locality, (9) altitude, (10) flower colour, (11) distribution, (12) ecological status, (13) Information on medicinal and ethnobotanical uses and (14) name of the collector and determinator.

Larger fruits, tubers and rhizomes were collected, and if need be, splitted to smaller parts and made into sections and preserved and dried separately, often using cotton pads inside blotting paper to maintain level and shape. For quicker drying hot air oven was used as and when needed.

Smaller fruits and/or seeds, loose flowers and floral parts, that could not be settled to herbarium sheets were placed in paper packets or envelopes which, were again affixed at the lefthand top corner of the herbarium sheet.

5.3 Field Note

The field record was prepared for noting the names of the areas visited, habit, habitat, abundance, flower colour, odour and associations of plants, covering such characters which cannot be recorded later from the herbarium specimen. The altimeter reading was taken at all places of visit to record altitudes. the medicinal, ethnobotanical and other local uses of plants were recorded in the field itself by interviewing local herbalists, Vaidhyas (medicine prescriber) and experienced village people.

5.4 Flowering and Fruiting Periods

The flowering and fruiting periods of all species in such stages were noted by recording them in 'monthwise plotted' field note book. The recording was done every time a place was visited and the range of flowering and fruiting period was prepared.

5.5 Identification

In the first stage the identification of plants were done in the Taxonomy laboratory at Darjeeling Government College (1984-87) and Kalimpong College (1988-1992). In the second stage, this was done in the herbaria of Lloyd Botanical Garden, Darjeeling, Botanical Survey of India, Gangtok and University of North Bengal. The final checking/verification and authentication was done in the Central National Herbarium, Howrah.

5.6 Nomenclature and Description

Consulting the different flora, monographs and revisions, latest nomenclature has been used. Protologues have been consulted in most of the cases to decipher (1) Nomenclature problems and (11) identity of doubtful specimens. Nomenclature of different families and genera have been made in accordance to the Appendix II and III of the *International Code of Botanical Nomenclature* (1988).

Nomenclature is followed by the references to protologues along with author citation. This reference is followed by reference to reports in major floristics and taxonomic works, giving preference to the relevant local flora. In these references, that follow protologue, the citation of authors' name has not been given in the case of floristic works, which are already popular among researchers and scholars and this in a way, helped in saving time and space, in this voluminous work. *Basionym*, common *synonyms* and *local names* (wherever available) are given. *Flora of British India* (J.D. Hooker 1872-1896) has been refered in all names and synonyms of dicotyledons.

The description, flowering and fruiting periods; Taxonomical, Ecological and Ethnobotanical notes, Ecological status and local and general (world) distribution, have been provided. Artificial dichotomous key to the species, varieties and forma have been prepared for identification. The discription in general, have been made briefly, highlighting the important and relevant characters of identification. However, detailed descriptions are provided in case of threatened (in the category of endangered) and newly reported species and varities. Repeation of characters specified in the keys have been avoided in description whenever possible. Line drawings and/or photographs have been given in

cases of new species, new varieties and new forma and a number of botanically interesting, newly recorded, threatened and wild plants of ethrobotanical and economic potentialities.

5.7 Status

The status means the ecological status of the species in question referring to its abundance of occurrence. The estimated number of individuals of a species per unit area is referred to as *abundance*. To determine abundance the sampling was done at random at many places and the number of individuals of a species were added together for all sampling studies to take out the mean.

Following Raunkiaer's (1934) ecological statistics of frequency the following modified expressions have been made under the 'status' of a species, in the present work:

| Class | No. of individuals/unit area |
|----------------------|------------------------------|
| Rare/Threatened | 1-4 |
| Sparse/occasional | 15-14 |
| Frequent | 15-29 |
| Common | 30-90. |
| Abundant/very common | 100+ |

5.8 Storing

One set of voucher specimens have been deposited to the Central National Herbarium, Howrah (CAL). The second set has been preserved in the Herbarium, Department of Botany, Kalimpong College, Kalimpong (KALIM) and University of North Bengal (NBU).

5.9 Systematic Enumeration

The dicotyledonous families of the flora of Darjeeling district in this work have been arranged following Bentham and Hooker's system of classification (1862-1883). Inside this, a number of families have been broken to smaller families following the delimitation treatment accorded by J. Hutchinson (1973), upto the limit of the considerations made in the *Fascicles Flora of India* (1980 onwards-). The genera and species have been arranged as per the key relation and affinity of characters, while keeping in view that such treatment would not deviate far away from the Bentham and Hooker's system of classification. In case of the varieties the type variety has been treated first, followed by the others.