ABSTRACT

Asteraceae (nom. alt. Compositae) is one of the largest flowering plant families, with 30,000 species belonging to 1100 genera, constituting ca 10% of total flowering plants. It is distributed throughout the World from arctic waste to alpine meadows and from arid regions to rain forests. It is one of the dominant families of Indian flora not only by number, but also by its abundance. It is very well represented in India with 1052 taxa belonging to 177 genera. In Flora of India Volume 12 and 13 on family Asteraceae 892 species belonging to 167 genera have been described. It also included 41 species belonging to 10 genera, which are widely cultivated in different parts of country as ornamentals. The family Asteraceae is a natural assemblage of closely related taxa which are characterized by involucrate heads or capitula, a specialized racemose inflorescence usually with two distinct types of florets i.e. ray florets and disc florets (sometimes only of one type), the 5-lobed gamopetalous corolla, presence of pappus of simple hairs, scales or awns in place of usual calyx, syngenesious stamens, inferior, bicarpillate, unilocular ovary with a single basal ovule and cypsela (inferior achene) type of fruits. An analysis of the distribution of Asteraceous taxa from India revealed that the richest zone or the chief center of diversity of family Asteraceae in India is the Western Himalaya followed by Eastern Himalaya, Western Ghats, North-eastern India, Deccan, Desert biogeographic zone, Gangetic plains and the Andaman & Nicobar Islands.

Himachal Pradesh is bounded between 30°22" to 33°12" North latitudes and 75°47" to 79°04" East longitudes. To the east it forms India's border with Tibet. It is bounded by Jammu & Kashmir in the North, Uttarakhand in the Southeast, Haryana in the South and Punjab in the West. Himachal Pradesh is floristically very rich and shows a great amount of variation in its topography and climate. The unique nature of the flora of Himachal Pradesh has attracted numerous botanists since 1817 when William Spencer Webb visited Sabathu and William Moorcroft visited Kangra, Kullu and Lahaul & Spiti in 1819. Himachal Pradesh has 12 districts namely Bilaspur, Chamba, Hamirpur, Kangra, Kinnaur, Kullu, Lahaul & Spiti, Mandi, Shimla, Solan and Una.
A perusal of the literature shows that information on family Asteraceae from Himachal Pradesh is scanty and scattered. It is available either in the form of few research papers or in district floras such as Flora Simlensis, Flora of Bushar Himalayyas, Flora of Lahaul and Spiti, Flora of Kullu, Flora of Great Himalayan National Park, Flora of Sirmaur and Flora of Chamba. Besides these Chowdhery and Wadhwa (1984) have enumerated 301 species belonging to 93 genera of Asteraceae from Himachal Pradesh. Many of the above publications suffer from the following defects. Older publications, especially published before Independence, though excellent in the days when published are hopelessly out of date both for specific and generic names, as these are hardly used now. The Asteraceous plants have simply been listed by majority of workers. Either the plants have been described very briefly or if described are not supported by diagrams and/or coloured photographs. In distribution larger areas such as Himachal Pradesh and districts are mentioned, i.e. specific localities within districts where the plants actually occur within district have not been mentioned. Uses of only a few plants are included. In short till date not even a single publication dealing with all the aspects of family Asteraceae (nom. alt. Compositae) of Himachal Pradesh is available. Keeping this in view the present study is undertaken with the sole objective of preparing a pictorial guide on the Asteraceous flora of Himachal Pradesh with respect to their systematics, common and vernacular names, etymology, citations, morphological details, flowering and fruiting periods, present places of collection, habitat, distribution in the World, India and Himachal Pradesh, economic and ethnobotanical uses and coloured photographs.

For the present study an up-to-date literature on asteraceous flora of Himachal Pradesh had been collected. A large number of collections were made from different places from May 2004 to July 2009. The characteristic features of these plants were noted and their coloured photographs were taken in the field. The collected plants were brought to the laboratory for further identification. Five Herbarium mounts of these plants were also prepared for record and identification. Standard procedures were adopted for collecting, preserving and identifying the plants. All the collected and identified plants had been described and presented in the thesis by following the latest International Rules of Botanical Nomenclature.
Metric system had been adopted throughout the work and the abbreviations of periodicals and other abbreviations are in conformity with the World list of Scientific Periodicals and the common usage in botanical taxonomy and gardening. For each plant common and vernacular names available in the literature, etymology, citations, morphological details, flowering and fruiting periods, specimens examined, habitat, distribution in the World, India and Himachal Pradesh, economic and ethnobotanical uses, coloured photographs and notes (if any) are presented.

In all 174 taxa belonging to 165 species and 82 genera have been identified and described (Table 1). Most of the asteraceous plants (172 taxa) were with simple heads, i.e. with large number of florets crowded on a common receptacle surrounded by involucre. Only two species, namely *Echinops corinigerus* and *Echinops niveus*, were with compound heads (i.e. consisting of numerous heads). In as many as 68 species heads were radiate, i.e. ray or outer florets ligulate and disc or inner florets tubular. In 60 species heads were discoid, i.e. all florets tubular. 27 species had only ligulate heads, i.e. with only ligulate florets. In 10 species the heads were disciform, i.e. in which outer florets were female, and fertile, filiform; and inner florets were bisexual, fertile, and tubular. Ligules are usually inconspicuous or absent in such heads. Pappus was present in majority of the asteraceous plants, but was found to be absent in 22 species.

The number of annual, biennial and perennial speceies was 49, 1 and 82 respectively. Others showed a combination of life span, such as 23 species were Annual-Perennial, 6 species were Annual-Biennial; and 4 species were Biennial-Perennial. The number of asteraceous herbs and shrubs recorded from Himachal Pradesh were respectively 156 and one. As many as 8 species were intermediate between herbs and shrubs. The most common colour of asteraceous flowers of Himachal Pradesh was found to be yellow/yellowish (78 species), followed by white, purplish, blue or violet, pinkish, greenish/greenish-yellow, pale red, and pale brown. As many as 51 species of the family Compositae were found growing as weeds in Himachal Pradesh. 10 species belonging to *Bidens*, *Calendula*, *Cosmos*, *Dahlia*, *Solidago*, *Tagetes*, *Tithonia* and *Zinnia* were found growing in wild as escape plants. Latex was found in 21 species. Out of these 18 species were with
milky latex, and 3 species were with yellow latex (*Launaea asplenifolia, Launaea procumbens, and Launaea secunda*).

The number of asteraceous plant species recorded from different districts of Himachal Pradesh is: Kinnaur (116), Chamba (111), Shimla (113), Kullu (95), Lahaul & Spiti (84), Kangra (78), Sirmaur (62), Mandi (31), Solan (20), Una (11), Bilaspur (15) and Hamirpur (13). Out of 165 species, 4 species namely *Cotula aurea, Senecio vulgaris, Soliva anthemifolia* and *Synedrella vialis*, not enumerated earlier, have been reported for the first time from Himachal Pradesh. The number of species recorded for the first time from different districts of Himachal Pradesh are 10 species from Bilaspur, 10 species from Hamirpur, one species from Kangra, 4 species from Kinnaur, one species from Kullu, 2 species from Lahaul & Spiti, 2 species from Mandi, 6 species from Shimla and 5 species from Solan. A large number of asteraceous plants are economically and ethnobotanically important. The number of such plants are: medicinal (69 species), aromatic (34 species), essential oil yielding (22 species), edible (20 species), fodder yielding (14 species), pesticide/insecticide/fungicide (11 species), plants having ornamental value (10 species), sacred (7 species), poisonous and toxic plants (6 species), incense yielding (6 species), dye yielding (5 species), fatty oil yielding plants (4 species), etc.

Himachal Pradesh is rich in asteraceous flora and many of them are facing extinction due to overexploitation, habitat destruction, urbanization, etc. Some of the important vulnerable and endangered species are *Cicerbita lessertiana, Crepis multicaulis, Jurinea dolomiae*, *Saussurea costus, Saussurea obvallata, Saussurea gossypiphora, Senecio vulgaris* and *Taraxacum watii*. It is hoped that the results of the present study will be utilized for further studies on asteraceous plants.