ABSTRACT

The nature has endowed Himachal Pradesh with a wide range of agro-climatic conditions due to which almost all kinds of fruits grown in the country can be produced in the State. At present about 34 types of fruit species are grown in Himachal Pradesh on a bigger or smaller scale, but Apple has dominated the fruit industry of the State during the last five decades. Area under apple crop constitutes about 46.5% of the total area under horticultural crops in HP; and its production has increased manifolds since 1950-1951. It is now grown in 9 out of 12 districts of Himachal Pradesh in sub-temperate and dry temperate zones at an altitude of 1500-3700 m. In Himachal Pradesh, during 2005-06 out of total fruit production of 695517 MT, the production of apple alone was 540356 MT. Himachal Pradesh has thus rightly earned the name 'Apple State of India'. However, one of the major problems faced in apple orchards is the presence of weeds (unwanted plants other than apple). Weed infestation in nurseries is a very serious problem, causing slow growth and development of young seedlings. Up to 90% of the tree roots are in the top 60 cm (2 ft.) of the soil and weeds growing in the root areas of the trees are in direct competition with the apple tree for water and nutrients. They also harbour insects, diseases and rodents. They may lower both the quality and the quantity of apple fruit and may increase the cost of production by causing difficulties during harvest. Since apple trees are poor competitors, the weed control becomes necessary. Apple crops are served fertilizer heavily. The weeds rob up the fertilizers at a faster rate than the apple plants resulting in fewer yields. It is very essential that before evaluating the damage and control measures that are to be undertaken to eradicate them, the weeds growing in any one particular region must properly be identified. Moreover, the weeds which actually occur within the apple orchards have not been identified till date. It is with this objective that the present study was undertaken.
The unique nature of the flora of Himachal Pradesh, which lies between $32^0 22' 10'' - 33^0 12' 40''$ N latitude and $75^0 47' 55'' - 79^0 04' 20''$ E longitude, has attracted numerous botanists since 1817 when William Spencer Webb visited Sabathu and William Moorcroft visited Kangra, Kullu and Lahaul & Spiti in 1819. A perusal of the scattered and scanty literature on weed identification with particular reference to apple orchards of Himachal Pradesh revealed that older publications, especially published before Independence, though excellent in those days when published, are now hopelessly out of date both for specific and generic names. These are hardly used now. Most of the publications deal with only listing of the plants, i.e. they are not represented by any detailed description and diagrams/photographs of the plants for identification. In many publications, the exact localities where the plants actually occur within Himachal Pradesh/District(s) of Himachal Pradesh have not been mentioned therein. Lastly the number of weed species mentioned therein is extremely less. Since an improvement can be made by updating the above information by including detailed descriptions and coloured photographs, the present study “identification of weed flora in apple orchards of Himachal Pradesh” is undertaken with the sole objective of preparing a pictorial guide on weeds of apple orchards with respect to the their systematics, etymology, morphological details, distribution, ecological notes, economic and ethnobotanical or local uses.

Large numbers of weed collections were made from different apple orchards of Himachal Pradesh during the period from 2002 to 2007. The characteristic features of the weeds were noted and their coloured photographs were taken in the field. Five Herbarium mounts of these plants were also prepared for record and identification. Standard procedures were adopted for collecting, preserving and identifying the plants. For each plant common and vernacular names, etymology, citations, morphological details, flowering and fruiting periods, places of collection, habitat, distribution,
economic and ethnobotanical uses, coloured photographs and notes, if any, are presented. Classification given by Pichi Sermolli (1977) and followed by Khullar (1994, 2000) for pteridophytes; and Bentham & Hooker (1862-1883) and Hooker (1872-1897) for seed plants with modifications according to the latest rules and knowledge have been adopted.

In all 367 weeds belonging to 252 genera and 92 families have been collected, identified, described and photographed. 36 species belonging to 19 genera and 14 families are pteridophytes and only a single species Ephedra gerardiana belonging to family Ephedraceae is a gymnosperm. 331 species belonging to 233 genera and 78 families are angiosperms. Out of these 310 species belonging to 212 genera and 63 families are dicots and 20 species belonging to 20 genera and 14 families are monocots. The top 10 families of weed flora of Himachal Pradesh (with number of species in brackets) are Asteraceae (57 species), Rosaceae (19 species), Lamiaceae (18 species), Papilionaceae (13 species), Polygonaceae (12 species), Ranunculaceae (12 species), Scrophulariaceae (10 species), Solanaceae (10 species), Boraginaceae (8 species) and Urticaceae (8 species). Four genera namely Anaphalis, Geranium, Ipomoea and Rubus have 5 species each. Five genera namely Adiantum, Berberis, Chenopodium, Malva and Solanum have 4 species each. 18 genera namely Androsace, Asplenium, Aster, Clematis, Dryopteris, Epilobium, Euphorbia, Galium, Gentiana, Hypericum, Jasminum, Plantago, Polystichum, Potentilla, Pteris, Rumex, Sonchus and Viola have 3 species each. The rest of the genera have either two species or are represented by a single species each.

Out of 367 weeds, 279 are herbs and 55 are shrubs. The rest of the weeds are either herbs-undershrubs/shrubs (18) or undershrubs/shrubs-trees (15). The number of annual, biennial and perennial weeds is 87, 11 and 234 respectively. 35 weeds are annual to perennial. Three parasitic weeds have also been found. These are Cuscuta reflexa, Orobanche alba and Orobanche cernua.
Weeds can be beneficial too. 236 species of weeds are reported to be medicinal; 89 weeds have edible value; 50 weeds can be utilized as fodder; 38 species are aromatic and have essential oils; 29 species have ornamental value; 26 weeds can be used as fuel; 25 species are good soil binders; 22 are dye yielding plants; 21 species have sacred value; 13 species yield wood; 12 are fibrous plants; 11 can yield fatty oils; 10 species are poisonous and have narcotic value; 8 are tannin yielding; and 7 can be utilized as insecticides.

13 species, namely Astragalus oplites, Calendula officinalis, Cosmos bipinnatus, Dahlia rosea, Delphinium denudatum, Dichrocephala chrysanthemifolia, Digitalis purpurea, Eupatorium adenophorum, Galinsoga quadriradiata, Ipomoea quamoclit, Jasminum mesnyi, Nepeta podostachys and Orobanche cernua, not enumerated in the Flora of Himachal Pradesh by Chowdery and Wadhwa (1984), have been reported for the first time from Himachal Pradesh. Three fern allies (pteridophytes other than ferns), namely Equisetum diffussum, Equisetum ramosissimum and Selaginella adunca, not included by Khullar (1994, 2000) in his monumental work on Fern flora of West Himalayas in 2 Volumes, have also been reported from Himachal Pradesh.

It is hoped that the results of the present study can be utilized for further research and incorporation in studies like weed identification, weed control, orchard soil management, plant biodiversity and utilization of plant resources.