

Chapter 1

Diversity, Distribution, and Status of Weed Species of Northwest Himalaya



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1.1 Introduction

Weed is defined as ‘a herbaceous plant not valued for use or beauty, growing wild and rank, and regarded as cumbering the ground or hindering the growth of superior vegetation’ (Zimdahl 1999). Weeds are those plants which are harmful, interfere with the agricultural operations, increase labor, add input to the cultivation, and reduce the crop yield (Sen 2000). Weeds grow in a variety of ecosystems including pastures, rangelands, and forests. There are approximately 250,000 species of plants worldwide, of those about 3% or 8000 species act as weeds (Kumari 2016). Weeds have been recognized as a problem since the beginning of agriculture and the battle against weeds is a never ending one (Tiwari et al. 2016). Weeds are believed to have been existing on the earth ever since the man started cultivating plants around 10,000 BC (Macneish 1964). The factors that create weed problems can be classified as: hydrological, habitat modification, changes in succession, disturbances, grazing, competition, diseases, hybridization, reproductive constraints, introduction, etc. (Reid 1998). Weeds differ from other plants in being more adaptive and having peculiar characteristics that make them more competitive (Dangwal et al. 2010). Most of the weeds have characteristics of enormous seed production, variety of seed dormancies, ability to grow and multiply under variable environmental conditions (Sharma et al. 2010). Some plants are naturally weedy and become a nuisance when agriculture invades the areas in which they already grow, whilst others have developed into weeds since people have started to cultivate crops

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(Swarbrick and Mercado 1987). Weeds reduce crop yield by competing for water, soil moisture, soil nutrients, sunlight, and growing space needed by crop plants. Weeds have the ability to spread rapidly and reproduce in high numbers which enables them to effectively crowd out native and endemic plant populations and establish a plant kingdom of their own within a short period of time. Weeds also act as alternate hosts for insects, bacteria, viruses, and nematodes that affect the crops badly by causing diseases (Younkin 1942). Weeds also inhibit the growth parameters of crop plants by secreting allelopathic chemicals (Oudhia and Tripathi 1998). Most of the weeds are exotic and have been introduced for various purposes like food, fodder, medicinal, ornamental, plantation, horticulture, etc., and they support farming and forestry in a big way. Introduced species became invasive when they are introduced deliberately or unintentionally outside their natural habitats into new areas where they express the capability to establish, invade, and out-compete native species (Sekar et al. 2012). These invasive species are threatening biodiversity by exerting significant impact on the native and endemic plant species or directly by altering ecosystem properties and resulting in the displacement of native communities, hence creating an imbalance in natural and agricultural ecosystems (Vitousek 1986; Kohli et al. 2004). Several exotic disturbances dramatically affect succession and lead to exotic annual communities with low native species richness (Stylinski and Allen 1999).

Most often, the term ‘weed’ is used to denote the invasive species only, but native plants have also the weed potential and can also compete with our crops. Invasive species are defined as the exotic/non-native plants that express the capability to invade or compete with native species. But a weed may be a native or an exotic species that mostly grow and compete with our crops, most of which are non-native. Thus, weeds are both native and non-native, whereas ‘invasive’ is a term related to non-native competing species only. *Artemisia roxburghiana* is regarded as a weed in Indian Himalayan Region (IHR) (Bisht 2017), but it is native to the Himalayan Region (Samant et al. 1998), so cannot be regarded as invasive as it is a native plant species. The two terms ‘weeds’ and ‘invasive species’ are often used together and are considered one and the same thing. Invasive species can be regarded as weeds, but weeds cannot be regarded as invasive. The present study presents a comprehensive database of native as well as non-native weeds of Northwest Himalayan Region (Himachal Pradesh, Uttarakhand, and Jammu and Kashmir) along with common names, life forms, range of altitude, nativity, and flowering periods and will provide the baseline information about the weeds which will serve as a manual for future weed identification.

Present findings are based on the intensive review of available information on weed species for the Northwest and West Himalaya and also the survey conducted in different parts of Uttarakhand, Himachal Pradesh, and Jammu and Kashmir. Information on various aspects like altitude, life form, flowering period, and nativity was gathered. The samples of the specimens were collected and identified with the help of local/regional floras and research papers (Osmaston 1927; Choudhery and Wadhwa 1984; Naithani 1984; Samant 1987; Singh et al. 2002). Data were compiled and analyzed for diversity, distribution pattern, and nativity.

Nativity of the species was identified following Anonymous (1883–1970), Samant et al. (1998), Samant and Pal (2003), and Dhar et al. (2002).

1.2 Species Diversity and Distribution Pattern

A total of three hundred twenty-three weeds belong to 221 genera and 72 families (Table 1.1); they are of 279 species herbs, 27 shrubs, 15 climbers, and 2 species ferns (Fig. 1.1). Among the families, Asteraceae was the dominant family (57 species) followed by Poaceae (21 species), Lamiaceae (20 species), Ranunculaceae (19 species), Fabaceae (15 species), Brassicaceae (14 species) representing maximum weed species (Fig. 1.2). Out of documented weed species, 278 species represented dicot species within 186 genera and 58 families, while 43 species represented monocots within 33 genera and 12 families and 2 species as pteridophytes within 2 genera and 2 families.

Of the total species, maximum number of species (276) occur in the altitudinal zone, 1601–2400 m, followed by (206) in zone 801–1600 m, (146) in 2101–3200, (96) in up to 800 m, (54 species) in altitudinal zone 3201–4000 m, (18 species) in 4001–4800 (18), and (04 species) above 4800 m, respectively (Fig. 1.3).

Ranunculus was the dominant genera (09 species) followed by *Veronica*, *Ipomoea*, and *Artemisia* (05 species each), and *Polygonum*, *Chenopodium*, and *Viola* (04 species, each).

1.2.1 Richness of Native and Non-native Species

Out of 323 plant species, 56 were native to Himalayan Region and 267 plant species were non-native or exotic (Fig. 1.4). The native species grows within an altitude range of 1000–5600 m, whereas the non-native species grows within an altitudinal range of 200–4500. Only few non-native species grows above an altitude of 4000 m. Further, the peak flowering period of the recorded weeds is between May and September.

Weeds are the undesirable plants that reduce the crop yield by competing with the crops for moisture, light, space, nutrients, etc. Weeds affect everyone in the world by reducing crop yield and quality, delaying or interfering with harvesting, interfering with animal feeding, etc. (Kraehmer and Baur 2013). There is no reliable study of worldwide damage due to weeds. However, it is estimated that loss caused by weeds has exceeded the loss from any other category of agricultural pests such as insects, nematodes, diseases, and rodents (Abouzienna and Haggag 2016). Generally, weeds are invasive in nature but some weeds are native too. Invasive species cause loss of biodiversity including species extinction, changes in hydrology, and ecosystem function (Sekar 2012). Besides non-native weed species, native species also act as weeds and may cause damage to the crops or may reduce the

Table 1.1 Diversity, distribution pattern of Northwest and West Himalayan Region

S. no.	Taxa	Family	Common name	Life form	Range of altitude (m)	Nativity	Flowering period	References
1	<i>Barleria cristata</i> L.	Acanthaceae	Bluebell Barleria	S	200–2000	Asia	March–Sept	Bisht (2017)
2	<i>Dicliptera bupleuroides</i> Nees	Acanthaceae	Roxburgh's Foldwing	H	500–2000	Asia	March–Aug	Bisht (2017)
3	<i>Dicliptera roxburghiana</i> Nees	Acanthaceae	Chinese Foldwing	H	1500–2100	Asia	July–Oct	John and Dube (1995)
4	<i>Justicia parviflora</i> Nees	Acanthaceae	Small Flowered Rungia	H	300–2000	Asia	Oct–Dec	Bisht (2017)
5	<i>Peristrophe speciosa</i> (Roxb.) Nees	Acanthaceae	Showy Foldwing	H	Up to 1600	Asia	June–Oct	Bisht (2017)
6	<i>Adiantum capillus-veneris</i> L.	Adiantaceae	Maidenhair Fern	Pt	Up to 1800	Eurasia	–	Bandy et al. (2017)
7	<i>Sagittaria sagittifolia</i> L.	Alismataceae	Arrowhead	H	Up to 1800	North America Europe	July–Aug	Ganie et al. (2015)
8	<i>Achyranthes aspera</i> L.	Amaranthaceae	Chaf Flower	H	Up to 1700	North America	July–Sept	Tiwari et al. (2016)
9	<i>Achyranthes bidentata</i> Bl.	Amaranthaceae	Ox Knee	H	1500–2200	Asia	July–Sept	Bisht (2017)
10	<i>Aerva lanata</i> (L.) Juss. ex Schult	Amaranthaceae	Mountain Knotweed	H	Up to 1200	Asia and Africa	Aug–Oct	Rawat and Kharwal (2014)
11	<i>Alternanthera philoxeroides</i> (Mart.) Griseb	Amaranthaceae	Alligator Weed	H	Up to 1900	South America	July–Nov	Masoodi and Khan (2012)
12	<i>Alternanthera pungens</i> Kunth	Amaranthaceae	Khaki Weed	H	Up to 1800	South America	May–Aug	Singh and Dangwal (2014)
13	<i>Alternanthera sessilis</i> (L.) DC.	Amaranthaceae	Joy Wood	H	Up to 1500	South America	July–Sept	Dangwal et al. (2012)

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Table 1.1 (continued)

S. no.	Taxa	Family	Common name	Life form	Range of altitude (m)	Nativity	Flowering period	References
14	<i>Amaranthus spinosus</i> L.	Amaranthaceae	Spiny Amaranth	H	1600–2800	South America	July–August	Banday et al. (2017)
15	<i>Amaranthus tricolor</i> L.	Amaranthaceae	Edible Amaranth	H	1200–1900	Asia and Africa	Aug–Nov	Dangwal et al. (2012)
16	<i>Amaranthus viridis</i> L.	Amaranthaceae	Slender Pigweed	H	Up to 2000	North America	July–Sept	Tiwari et al. (2016)
17	<i>Digera muricata</i> (L.) Mart.	Amaranthaceae	False Amaranth	H	500–1200	Asia and Africa	Aug–Sept	Dangwal et al. (2012)
18	<i>Narcissus pseudonarcissus</i> L.	Amaryllidaceae	Wild Daffodil	H	1600–2200	Europe	March–April	Banday et al. (2017)
19	<i>Bupleurum hamiltonii</i> Bal.	Apiaceae	Lanceleaf Thorough-Wax	H	2200–4500	Asia	July–Sept	Bisht (2017)
20	<i>Bupleurum lanceolatum</i> Wall. ex DC.	Apiaceae	Lanceleaf Thorough-Wax	H	1600–2600	Asia and Africa	July–Sept	Kumar et al. (2018)
21	<i>Centella asiatica</i> (L.) Urb.	Apiaceae	Pennywort	H	Up to 2100	Asia	April–Nov	Bisht (2017)
22	<i>Contium maculatum</i> L.	Apiaceae	Hemlock	H	1500–2400	Europe	June–Aug	Kumar et al. (2018)
23	<i>Heracleum candicans</i> Wall. ex DC.	Apiaceae	White Leaf Hogweed	H	2000–4500	Himalayan Region	June–Aug	Tiwari et al. (2016)
24	<i>Pimpinella diversifolia</i> DC.	Apiaceae		H	2000–3200	Himalayan Region	June–Sept	Bisht (2017)
25	<i>Scandix pectin-veneris</i> L.	Apiaceae	Venus Comb	H	1600–3100	Eurasia	May–Sept	Rawat and Kharwal (2014)
26	<i>Arisaema concinnum</i> Sch.	Araceae	Chinese Cobra	H	1500–2200	Himalayan Region	May–July	Kumar et al. (2018)
27	<i>Hedera helix</i> (L.) Pran.	Araliaceae	Common Ivy	C	1600–2600	Europe	Sept–Nov	Tiwari et al. (2016)

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Table 1.1 (continued)

S. no.	Taxa	Family	Common name	Life form	Range of altitude (m)	Nativity	Flowering period	References
28	<i>Hedera nepalensis</i> K. Koch	Araliaceae	Himalayan Ivy	C	1000–3000	Asia	Sept–Nov	Tiwari et al. (2016)
29	<i>Asparagus racemosus</i> Willd	Asparagaceae	Buttermilk Root	S	1000–2000	Asia and Africa	July–Aug	Banday et al. (2017)
30	<i>Asphodelus tenuifolius</i> Cav.	Asphodelaceae	Narrow Leaves Asphodel	H	Up to 1700	Asia	April–June	Banday et al. (2017)
31	<i>Achillea millefolium</i> L.	Asteraceae	Yarrow	H	1800–3100	Europe	June–July	Ganie et al. (2016)
32	<i>Ageratum conyzoides</i> L.	Asteraceae	Goat Weed	H	200–2000	South America	June–Aug	Kumar et al. (2018)
33	<i>Ageratum houstonianum</i> Miller	Asteraceae	Floss Flower	H	200–1500	North America	May–Oct	Tiwari et al. (2016)
34	<i>Anaphalis adnata</i> Wall. ex DC.	Asteraceae	Pearly Everlasting	H	1500–2600	Asia	May–Oct	Bisht (2017)
35	<i>Anaphalis contorta</i> (D. Don) Hook.	Asteraceae	Eared Leaf Pearly Everlasting	H	1500–4500	Himalayan Region	June–Oct	Bisht (2017)*
36	<i>Anaphalis triplinervis</i> (Sims) C.B. Clarke	Asteraceae	Triple-Veined Pearly	H	1500–3800	Himalayan Region	June–Sept	Tiwari et al. (2016)
37	<i>Anthemis cotula</i> L.	Asteraceae	Stinking Chamomile	H	1600–2500	Europe	May–Sept	Banday et al. (2017)
38	<i>Arctium lappa</i> L.	Asteraceae	Burdock	H	1600–3200	Europe	June–August	Banday et al. (2017)
39	<i>Artemisia annua</i> L.	Asteraceae	Annual Wormwood	H	1500–2400	Asia	July–Oct	Tiwari et al. (2016)

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Table 1.1 (continued)

S. no.	Taxa	Family	Common name	Life form	Range of altitude (m)	Nativity	Flowering period	References
40	<i>Artemisia capillaris</i> Thunb.	Asteraceae	–	H	1500–4300	Asia	June–Sept	Dobhal et al. (2006)
41	<i>Artemisia nilagirica</i> (Clarke) Pamp	Asteraceae	Indian Wormwood	S	Up to 2400	Asia	July–Nov	Tiwari et al. (2016)
42	<i>Artemisia roxburghiana</i> Wall. ex Besser	Asteraceae	Roxburgh's Wormwood	H	2200–5600	Himalayan Region	June–Sept	Bisht (2017)
43	<i>Artemisia tournefortiana</i> Reichb.	Asteraceae	–	H	1700–2100	Asia	June–July	Banday et al. (2017)
44	<i>Aster peduncularis</i> Wall. ex Nees.	Asteraceae	Himalayan Aster	H	1800–3200	Himalayan Region	June–Sept	Bisht (2017)
45	<i>Bellis perennis</i> L.	Asteraceae	Common Daisy	H	1600–2100	Europe	June–Sept	Tiwari et al. (2016)
46	<i>Bidens bipinnata</i> L.	Asteraceae	Spanish Needle	H	1500–2200	South America	June–Aug	Tiwari et al. (2016)
47	<i>Bidens pilosa</i> L.	Asteraceae	Beggar Tick	H	1900–2700	South America	March–Aug	Dangwal et al. (2012)
48	<i>Caesulia axillaris</i> Roxb.	Asteraceae	Pink Node Flower	H	200–1500	Asia	June–Aug	Kabdal et al. (2014)
49	<i>Carpesium abrotanoides</i> L.	Asteraceae	Pig's Head	H	1000–2200	Eurasia	Sept–Nov	Babaar and Bhat (2012)
50	<i>Centaurea iberica</i> Trev.ex Spreng.	Asteraceae	Iberian Star Thistle	H	2500–3500	Eurasia	July–August	Banday et al. (2017)
51	<i>Centipeda minima</i> (L.) Braon and Ascherson	Asteraceae	Sneeze Wort	H	1200–2200	Australia Asia	July–Sept	John and Dube (1995)
52	<i>Cichorium intybus</i> L.	Asteraceae	Chicory	H	1600–2500	Europe	March–Sept	Banday et al. (2017)

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Table 1.1 (continued)

S. no.	Taxa	Family	Common name	Life form	Range of altitude (m)	Nativity	Flowering period	References
53	<i>Chromolaena adenophorum</i> L.	Asteraceae	Crofton Weed	H	500–2000	North America	July–Sept	Angiras (2014)
54	<i>Cirsium vulgare</i> (Savi.) Tenore	Asteraceae	Bull Thistle	H	1500–2200	Eurasia	July–Aug	Tiwari et al. (2016)
55	<i>Cirsium arvense</i> (L.) Scop.	Asteraceae	Creeping Thistle	H	1600–2700	Eurasia	June–Oct	Singh and Dangwal (2014)
56	<i>Conyza bonariensis</i> (L.) Cronq.	Asteraceae	Asthma Weed	H	1500–2800	North America	April–Sept	Tiwari et al. (2016)
57	<i>Conyza canadensis</i> (L.) Cronq.	Asteraceae	Horseweed	H	1600–2500	South America	June–Sept	Banday et al. (2017)
58	<i>Cousinia microcarpa</i> Boiss.	Asteraceae	–	H	2500–4600	Asia	July–Sept	Kumar et al. (2018)
59	<i>Eclipta alba</i> (L.) Hassk.	Asteraceae	False Daisy	H	1200–2000	North America–Asia	Jan–Dec	Kumar et al. (2018)
60	<i>Elephantopus scaber</i> L.	Asteraceae	Elephant Foot	H	Up to 1800	Asia Africa	Sept–Nov	Bisht (2017)
61	<i>Emilia sonchifolia</i> (L.) DC.	Asteraceae	Lilac Tassel Flower	H	Up to 1500	Asia and Africa	July–Oct	Bisht (2017)
62	<i>Eupatorium adenophorum</i> Spreng.	Asteraceae	Croton Weed	H	Up 2000	North America	Feb–Aug	Negi (2016)
63	<i>Galinsoga ciliata</i> (Raf.) Blake	Asteraceae	Small Flowered Galinsoga	H	1500–2200	South America	July–Sept	Dangwal et al. (2012)
64	<i>Galinsoga parviflora</i> Cav.	Asteraceae	Quick Weed	H	1000–3000	South America	June–Sept	Dangwal et al. (2012)
65	<i>Gerbera gossypina</i> (Royle) Beauv.	Asteraceae	Hairy Gerbera Daisy	H	1500–2200	Himalayan Region	May–Aug	Bisht (2017)

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Table 1.1 (continued)

S. no.	Taxa	Family	Common name	Life form	Range of altitude (m)	Nativity	Flowering period	References
66	<i>Gnaphalium affine</i> D. Don.	Asteraceae	Croton Weed	H	1700–2500	Africa Europe	Mar–June	Bahaar and Bhat (2012)
67	<i>Gnaphalium hypoleucum</i> DC.	Asteraceae	–	H	1500–2400	Asia	May–Aug	Bisht (2017)
68	<i>Gnaphalium luteo-album</i> L.	Asteraceae	Bal Raksha	H	1500–2000	Europe	Jan–Dec	Gupta et al. (2008)
69	<i>Inula cappa</i> DC.	Asteraceae	Fragrant Inula	H	1500–2200	Himalayan Region	June–Sept	Bisht (2017)
70	<i>Inula cuspidata</i> Wall. ex DC.	Asteraceae	Lanceleaf Inula	S	1600–2200	Himalayan Region	July–Sept	Bisht (2017)
71	<i>Lactuca serriola</i> L.	Asteraceae	Prickly Lettuce	H	1200–1800	Eurasia–Africa	July–Sept	Banday et al. (2017)
72	<i>Myriactis nepalensis</i> Less.	Asteraceae	Nepal Myriactis	H	1500–3300	Himalayan Region	April–Nov	Kumar et al. (2018)
73	<i>Parthenium hysterophorus</i> L.	Asteraceae	Santa Maria Feverfew	H	500–1800	South America	Jan–Dec	Dangwal et al. (2012)
74	<i>Saussurea heteromalla</i> D. Don	Asteraceae	–	H	2500–3800	Eurasia	April–August	Bisht (2017)
75	<i>Senecio vulgaris</i> L.	Asteraceae	Common Groundsel	H	1500–2000	Europe	April–May	Banday et al. (2017)
76	<i>Siegesbeckia orientalis</i> L.	Asteraceae	St. Paul's Wort	H	400–2400	Africa	August–Sept	Bisht (2017)
77	<i>Silybum marianum</i> (L.) Gaertn.	Asteraceae	Milk Thistle	H	1500–2000	Africa–Europe	June–Aug	Singh and Dangwal (2014)
78	<i>Solidago canadensis</i> L.	Asteraceae	Canada Golden Rod	H	1500–2200	North America	Oct–Dec	Dangwal et al. (2011)

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Table 1.1 (continued)

S. no.	Taxa	Family	Common name	Life form	Range of altitude (m)	Nativity	Flowering period	References
79	<i>Solidago virgaurea</i> L.	Asteraceae	European Golden Rod	H	1500–2200	Eurasia–Africa	Sept–Dec	Bisht (2017)
80	<i>Sonchus asper</i> (L.) Hill	Asteraceae	Prickly Sowthistle	H	800–2000	Eurasia	May–Sept	Banday et al. (2017)
81	<i>Sonchus oleraceus</i> L.	Asteraceae	Common Sowthistle	H	1500–2500	Cosmopolitan	March–Nov	Kumar et al. (2018)
82	<i>Tagetes minuta</i> L.	Asteraceae	Wild Marigold	H	1000–2600	South America	August–Oct	Tiwari et al. (2016)
83	<i>Taraxacum officinale</i> Wigg.	Asteraceae	Dandelion	H	1500–4000	Europe	April–Sept	Banday et al. (2017)
84	<i>Tragopogon graciles</i> D. Don	Asteraceae	Slender Salsify	H	1500–3200	Himalayan Region	March–Sept	Dangwal et al. (2012)
85	<i>Tridax procumbens</i> L.	Asteraceae	Tridax Daisy	H	Up to 1500	South America	June–Sept	Singh and Dangwal (2014)
86	<i>Xanthium spinosum</i> L.	Asteraceae	Spiny Cocklebur	H	1600–2200	South America	July–Oct	Banday et al. (2017)
87	<i>Xanthium strumarium</i> L.	Asteraceae	Rough Cocklebur	S	1200–2500	Africa–South America	Aug–Sept	Banday et al. (2017)
88	<i>Impatiens glandulifera</i> Royle	Balsaminaceae	Himalayan Balsam	H	2200–3800	Himalayan Region	June–Oct	Babaar and Bhat (2012)
89	<i>Begonia picta</i> Smith	Begoniaceae	Begonia	H	1000–2800	Himalayan Region	Aug–Oct	Bisht (2017)
90	<i>Berberis aristata</i> Roxb.	Berberidaceae	Indian Barberry	S	1500–3000	Himalayan Region	June–Nov	Tiwari et al. (2016)
91	<i>Berberis lycium</i> Royle	Berberidaceae	Barberry	S	1700–2600	Himalayan Region	March–June	Kumar et al. (2018)

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Table 1.1 (continued)

S. no.	Taxa	Family	Common name	Life form	Range of altitude (m)	Nativity	Flowering period	References
92	<i>Cynoglossum denticulatum</i> DC.	Boraginaceae	Barbed Forget Me Not	H	1500–2200	Asia and Africa	June–Sept	Kumar et al. (2018)
93	<i>Myosotis palustris</i> (L.) Nath.	Boraginaceae	True Forget Me Not	H	1500–2000	North America	May–June	Banday et al. (2017)
94	<i>Arabis amplexicaulis</i> Edgew.	Brassicaceae	Stem-Clasping Rock-Cress	H	1800–3200	Asia	May–July	Tiwari et al. (2016)
95	<i>Arabis glabra</i> (L.) Bern.	Brassicaceae	Tower Mustard	H	1600–2800	Eurasia–North America	May–July	Melkhanian and Singh (1983)
96	<i>Capsella bursa pastoris</i> L.	Brassicaceae	Shepherd's Purse	H	1500–3500	Asia and Africa	April–Sept	Banday et al. (2017)
97	<i>Cardamine impatiens</i> L.	Brassicaceae	Narrow Leaf Bitter Cress	H	2700–3500	Asia	May–June	Bisht (2017)
98	<i>Coronopus didymus</i> (L.) Smith	Brassicaceae	–	H	1500–3200	North America	March–Oct	Kumari and Saini (2018)
99	<i>Descurainia sophia</i> (L.) Webb. & Berth.	Brassicaceae	Fixweed	H	1700–2900	Africa	April–June	Banday et al. (2017)
100	<i>Eruca sativa</i> Mill.	Brassicaceae	Rocket	H	1700–2200	Europe	Jan–Dec	Banday et al. (2017)
101	<i>Goldbachia laevigata</i> (M. Bieb.) DC.	Brassicaceae	–	H	Up to 1400	Asia	June–Sept	Kumar et al. (2018)
102	<i>Lepidium capitatum</i> Hk. T.	Brassicaceae	Himalayan Peppergrass	H	3500–5300	Himalayan Region	July–Sept	Bahaar and Bhat (2012)
103	<i>Nasturtium officinale</i> Ait.	Brassicaceae	Water Cress	H	1600–2100	Europe	May–Aug	Dangwal et al. (2012)
104	<i>Rorippa indica</i> (L.) Hiern.	Brassicaceae	Indian Field Cress	H	Up to 1500	Asia	June–Aug	Bisht (2017)

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Table 1.1 (continued)

S. no.	Taxa	Family	Common name	Life form	Range of altitude (m)	Nativity	Flowering period	References
105	<i>Rorippa islandica</i> (Oeder) Borbas	Brassicaceae	Marsh Cress	H	1200–1800	Eurasia	June–Aug	Banday et al. (2017)
106	<i>Sisymbrium loeselli</i> L.	Brassicaceae	False London Rocket	H	1600–2500	Europe–Africa	June–Sept	Banday et al. (2017)
107	<i>Thlaspi arvense</i> L.	Brassicaceae	Penny Cress	H	2000–4500	Europe	July–Sept	Bisht (2017)
108	<i>Campanula colorata</i> (Wall.) Roxb.	Campanulaceae	Bellflower	H	1500–2000	Asia	May–June	Melkhanian and Singh (1983)
109	<i>Cannabis sativa</i> L.	Cannbinaceae	Hemp	H	800–3000	Asia	July–Sept	Banday et al. (2017)
110	<i>Cerastium viscosum</i> L.	Caryophyllaceae	Clammy Chickweed	H	2000–4000	Eurasia	May–Aug	Banday et al. (2017)
111	<i>Drymaria cordata</i> (L.) Willd	Caryophyllaceae	Tropical Chickweed	H	200–2400	Africa	May–Sept	Bisht (2017)
112	<i>Gypsophila cerastioides</i> D. Don	Caryophyllaceae	Himalayan Baby's Breath	H	3000–4600	Himalayan Region	May–July	Bisht (2017)
113	<i>Silene conoidea</i> L.	Caryophyllaceae	Cone Champion	H	1800–3100	Asia	Mar–May	Rawat and Kharwal (2014)
114	<i>Stellaria media</i> (L.) Vill	Caryophyllaceae	Common Chickweed	H	1600–2900	Europe	June–August	Banday et al. (2017)
115	<i>Chenopodium album</i> L.	Chenopodiaceae	Common Lambs Quarter	H	1600–2900	Europe	June–Aug	Tiwari et al. (2016)
116	<i>Chenopodium ambrosioides</i> L.	Chenopodiaceae	Mexican Chai	H	1700–2200	South America	June–Aug	Dangwal et al. (2012)
117	<i>Chenopodium botrys</i> L.	Chenopodiaceae	Sticky Goosefoot	H	1600–3700	Africa–Europe	July–Sept	John and Dube (1995)

(continued)

Table 1.1 (continued)

S. no.	Taxa	Family	Common name	Life form	Range of altitude (m)	Nativity	Flowering period	References
118	<i>Chenopodium murale</i> (L.)	Chenopodiaceae	Nettle-Leaved Goosefoot	H	1500–2000	Africa–Europe	June–Aug	Dangwal et al. (2012)
119	<i>Cleome viscosa</i> L.	Cleomaceae	Asian Spider Flower	H	1200–1800	Asia	July–Oct	Dangwal et al. (2012)
120	<i>Colchicum luteum</i> Baker	Colchicaceae	Yellow Saffron	H	1900–2700	Himalayan Region	March–May	Banday et al. (2017)
121	<i>Commelina benghalensis</i> L.	Commelinaceae	Wandering Jaw	H	Up to 1600	Asia and Africa	April–Aug	Tiwari et al. (2016)
122	<i>Commelina diffusa</i> Burm.	Commelinaceae	Climbing Dayflower	H	Up to 1700	Asia	May–Nov	Tiwari et al. (2016)
123	<i>Commelina forskaoalii</i> Vahl	Commelinaceae	Rat's Ear	H	1600–2800	Asia, RICA	May–Sept	Kumar et al. (2018)
124	<i>Cyanotis vaga</i> (Lour.) Sch.	Commelinaceae	Wandering Dew Grass	H	800–2500	Asia	July–Sept	Dangwal et al. (2012)
125	<i>Cynotis cristata</i> (L.) D. Don	Commelinaceae	–	H	Up to 1700	Asia and Africa	Aug–Oct	John and Dube (1995)
126	<i>Murdannia spirata</i> (L.) Bruckn.	Commelinaceae	Asiatic Dewflower	H	500–1800	Asia	Sept–Nov	John and Dube (1995)
127	<i>Convolvulus arvensis</i> L.	Convolvulaceae	Field Bindweed	C	2000–4000	Europe	April–Sept	Kumar et al. (2018)
128	<i>Ipomoea cairica</i> (L.) Sweet	Convolvulaceae	Mile-a-Minute Vine	C	700–2000	Africa–South America	Aug–Nov	Tiwari et al. (2016)
129	<i>Ipomoea eriocarpa</i> R. Br.	Convolvulaceae	Tiny Morning Glory	C	1000–1900	Asia–Australia	Sept–Nov	Dangwal et al. (2012)
130	<i>Ipomoea nil</i> (L.) Roth.	Convolvulaceae	–	C	Up to 1700	North America	March–Dec	Dangwal et al. (2012)

(continued)

Table 1.1 (continued)

S. no.	Taxa	Family	Common name	Life form	Range of altitude (m)	Nativity	Flowering period	References
131	<i>Ipomoea pes-tigridis</i> L.	Convolvulaceae	Morning Glory	C	Up to 1600	Africa	Aug–Nov	Dangwal and Singh (2012)
132	<i>Ipomoea purpurea</i> (L.) Roth.	Convolvulaceae	Common Morning Glory	C	1500–2100	South America	July–August	Dangwal et al. (2012)
133	<i>Diplocyclos palmatus</i> (L.) Jeff.	Cucurbitaceae	Striped Cucumber	C	1000–2200	Africa	June–July	Tiwari et al. (2016)
134	<i>Trichosanthes cucumerina</i> L.	Cucurbitaceae	Wild Snake Gourd	C	500–1600	Asia–Australia	June–Aug	Dangwal et al. (2011)
135	<i>Cyperus difformis</i> L.	Cyperaceae	Small Flower Umbrella Sedge	H	1600–3100	Africa–Europe	June–Sept	Tiwari et al. (2016)
136	<i>Cyperus iria</i> L.	Cyperaceae	Umbrella Sedge	H	1600–2100	Asia and Africa	July–Sept	Dangwal et al. (2012)
137	<i>Cyperus panicus</i> (Rott.) Boeck	Cyperaceae	–	H	1500–2200	Australia	June–Sept	Dangwal et al. (2012)
138	<i>Cyperus sanguinolentus</i> Vahl	Cyperaceae	Purple Glume Flat Sedge	H	1200–1900	South America	July–Sept	Dangwal et al. (2012)
139	<i>Eriophorum comosum</i> (Wall.) Nees	Cyperaceae	Hairy Cotton Grass	H	500–2800	Asia	May–Nov	Singh and Dangwal (2014)
140	<i>Isolepis setacea</i> (L.) R.Br.	Cyperaceae	Bristle Club Rush	H	1600–2500	Eurasia–Africa	July–Aug	Dangwal et al. (2012)
141	<i>Euphorbia heliscopia</i> L.	Euphorbiaceae	Umbrella Milkweed	H	1600–2500	Eurasia	July–Sept	Banday et al. (2017)
142	<i>Euphorbia hirta</i> L.	Euphorbiaceae	–	H	Up to 2000	North America	Sept–Oct	Kumar et al. (2018)
143	<i>Alysicarpus vaginalis</i> (L.) DC.	Fabaceae	Buffalo Clover	H	500–1500	Asia and Africa	July–Sept	John and Dube (1995)

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Table 1.1 (continued)

S. no.	Taxa	Family	Common name	Life form	Range of altitude (m)	Nativity	Flowering period	References
144	<i>Astragalus leucocephalus</i> Grah. ex Benth.	Fabaceae	White Head Milkvetch	S	1500–4700	Asia	May–Aug	Bisht (2017)
145	<i>Crotolaria albida</i> Heyne ex Roth.	Fabaceae	Narrow Leaf Rattlepod	H	500–2800	Asia	July–Nov	Bisht (2017)
146	<i>Crotolaria medicaginea</i> Lamk.	Fabaceae	Medick Rattlepod	H	200–1400	Asia	March–Aug	Dangwal et al. (2011)
147	<i>Lathyrus aphaca</i> L.	Fabaceae	Yellow Pea	H	Up to 1600	Europe	Apr–May	Rawat and Kharwal (2014)
148	<i>Lathyrus sativus</i> L.	Fabaceae	Chicken Pea	H	Up to 2500	Europe	May–Aug	Rawat and Kharwal (2014)
149	<i>Lathyrus sphaericus</i> Retz.	Fabaceae	Red Grass Pea	H	Up to 1800	Europe–Australia	May–Aug	Gupta et al. (2008)
150	<i>Lotus corniculatus</i> L.	Fabaceae	Bird's Foot Trefoil	H	1600–2500	Eurasia	May–Aug	Banday et al. (2017)
151	<i>Medicago sativa</i> L.	Fabaceae	Alfalfa	H	1600–1900	Africa–Europe	June–August	Banday et al. (2017)
152	<i>Melilotus indica</i> (L.) Allioni	Fabaceae	Yellow Sweet Clover	H	1500–2200	Eurasia–Africa	August–Sept	Tiwari et al. (2016)
153	<i>Trifolium pratense</i> L.	Fabaceae	Red Clover	H	1600–3300	Eurasia	May–August	Tiwari et al. (2016)
154	<i>Trifolium repens</i> L.	Fabaceae	White Clover	H	1600–3300	Europe	May–August	Banday et al. (2017)
155	<i>Vicia hirsuta</i> (L.) Gray	Fabaceae	Gray Vetch	C	800–1800	Eurasia	Mar–Apr	Rawat and Kharwal (2014)
156	<i>Vicia sativa</i> L.	Fabaceae	Common Vetch	H	Up to 1800	Eurasia	May–July	Rawat and Kharwal (2014)

(continued)

Table 1.1 (continued)

S. no.	Taxa	Family	Common name	Life form	Range of altitude (m)	Nativity	Flowering period	References
157	<i>Vicia sepium</i> L.	Fabaceae	Bush Vetch	H	Up to 1800	Eurasia	May–August	Banday et al. (2017)
158	<i>Corydalis cornuta</i> Royle	Fumariaceae	Horned Corydalis	H	2300–3600	Himalayan Region	July–Sept	Bisht (2017)
159	<i>Erodium cicutarium</i> (L.) Aiton	Gentianaceae	Common Stork's Bill	H	1700–2200	Africa and Europe	May–July	Banday et al. (2017)
160	<i>Gentiana cashemirica</i> Decne.	Gentianaceae	Kashmir Gentiana	H	2500–4000	Himalayan Region	May–July	Kumar et al. (2018)
161	<i>Geranium nepalense</i> Sweet	Gentianaceae	Nepal Geranium	H	1500–4000	Asia	May–Aug	Bisht (2017)
162	<i>Geranium wallichianum</i> D. Don ex Sweet	Gentianaceae	Cranesbill Geranium	H	2400–3600	Himalayan Region	May–Aug	Kumar et al. (2018)
163	<i>Swertia cordata</i> (Wall. ex D. Don) Clarke	Gentianaceae	Heart-Leaf Swertia	H	1700–4000	Himalayan Region	Sept–Oct	Bisht (2017)
164	<i>Hydrilla verticillata</i> (L.) Royle	Hydrocharitaceae	Water Thyme	H	Up to 1800	Asia and Africa	June–July	Kumar et al. (2018)
165	<i>Hypericum cernuum</i> Roxb.	Hypericaceae	Pendant St. John's Wort	H	1500–2600	Himalayan Region	May–Aug	Kumar et al. (2018)
166	<i>Hypericum perforatum</i> Buch-Ham. ex D. Don	Hypericaceae	Perforate St. John's Wort	H	1600–2900	Himalayan Region	May–July	Singh and Dangwal (2014)
167	<i>Hypericum uratum</i> L.	Hypericaceae	Nepal St. Johns Wort	H	1700–2600	Asia	April–Sept	Bisht (2017)
168	<i>Iris ensata</i> Thunb.	Iridaceae	Japanese Iris	H	1600–2200	Asia	April–May	Banday et al. (2017)
169	<i>Iris kumaonensis</i> Wall. ex D. Don	Iridaceae	Kumaon Iris	H	2400–4300	Himalayan Region	April–July	Kumar et al. (2018)

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Table 1.1 (continued)

S. no.	Taxa	Family	Common name	Life form	Range of altitude (m)	Nativity	Flowering period	References
170	<i>Ajuga bracteosa</i> Wall. ex Benth.	Lamiaceae	Common Bugleweed	H	1200-3000	Africa and Asia	May-July	Bisht (2017)
171	<i>Ajuga parviflora</i> (Benth) Wall.	Lamiaceae	Small Flowered Bugleweed	H	1600-2800	Himalayan Region	May-June	John and Dube (1995)
172	<i>Colebrookia oppositifolia</i> Sm.	Lamiaceae	Indian Squirrel Tail	S	300-1700	Asia	Apr-Nov	Rawat and Kharwal (2014)
173	<i>Leucas cephalotes</i> (Roth.) Spreng.	Lamiaceae	Head Leucas	H	150-2000	Asia	May-Sept	Dangwal et al. (2011)
174	<i>Leucas lanata</i> Benth.	Lamiaceae	Woolly Leucas	H	700-1800	Asia	Jan-Dec	Dangwal et al. (2011)
175	<i>Marrubium vulgare</i> L.	Lamiaceae	Common Horehound	H	1700-2500	Eurasia-Africa	June-Nov	Kumar et al. (2018)
176	<i>Mentha arvensis</i> L.	Lamiaceae	Corn Mint	H	1200-2600	Eurasia-Africa	May-August	Banday et al. (2017)
177	<i>Micromeria biflora</i> (Buch-Ham.) Benth.	Lamiaceae	Lemon Savory	H	1000-4000	Asia and Africa	May-August	Bisht (2017)
178	<i>Nepata cataria</i> L.	Lamiaceae	Catmint	H	2200-3300	Eurasia	May- July	Banday et al. (2017)
179	<i>Nepata ciliaris</i> Benth.	Lamiaceae	White-Leaved Catmint	H	2300-3600	Himalayan Region	May-July	Bisht (2017)
180	<i>Nepata gracilliflora</i> Benth.	Lamiaceae	-	H	2000-3300	Himalayan Region	May-June	Bisht (2017)
181	<i>Perilla frutescens</i> (L.) Britt.	Lamiaceae	Beefsteak Plant	H	600-2400	Asia	May-August	Rawat and Kharwal (2014)
182	<i>Pogostemon benghalensis</i> (Burm.f.) Kuntze	Lamiaceae	Bengal Pogostemon	H	200-1500	Asia	Nov-Dec	Bisht (2017)

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Table 1.1 (continued)

S. no.	Taxa	Family	Common name	Life form	Range of altitude (m)	Nativity	Flowering period	References
183	<i>Prunella vulgaris</i> L.	Lamiaceae	Self-Heal	H	1600–3000	Africa and Europe	May–Aug	Ganie et al. (2016)
184	<i>Salvia lanata</i> Roxb.	Lamiaceae	Bush Sage	H	1000–1600	Eurasia	Mar–July	Bisht (2017)
185	<i>Salvia moorcroftiana</i> Wall. ex Benth	Lamiaceae	Moorecroft's Salvia	H	1800–2700	Himalayan Region	May–June	Banday et al. (2017)
186	<i>Scutellaria gaelericulata</i> L.	Lamiaceae	Scull-Cap	H	1600–2500	Eurasia	July–Aug	Banday et al. (2017)
187	<i>Teucrium quadrifarium</i> Buch.-Ham. ex D. Don	Lamiaceae	–	S	500–2400	Asia	July–Sept	Bisht (2017)
188	<i>Thymus serpyllum</i> L.	Lamiaceae	Wild Thyme	H	2400–4500	Europe	June–August	Banday et al. (2017)
189	<i>Lemna gibba</i> L.	Lemnaceae	Large Duckweed	H	Up to 1600	Europe	July–August	Varshney et al. (2007)
190	<i>Spirodela polyrrhiza</i> (L.) Sch.	Lemnaceae	Least Duckweed	H	1700–2200	Africa and Europe	July–August	Ganie et al. (2015)
191	<i>Utricularia aurea</i> Lour.	Lentibulariaceae	Golden Bladderwort	H	1500–2700	Asia–Australia	June–Aug	Ganie et al. (2015)
192	<i>Ophiopogon intermedius</i> D. Don	Liliaceae	Lily of the Valley	H	800–1600	Asia	June–Sept	Kumar et al. (2018)
193	<i>Tulipa stellata</i> Hook.	Liliaceae	Indian Tulip	H	1800–2500	Asia	April–May	Banday et al. (2017)
194	<i>Reinwardtia indica</i> Dumor.	Linaceae	Yellow Flax	S	300–2300	Asia	Feb–May	Bisht (2017)
195	<i>Viscum album</i> L.	Loranthaceae	Mistletoe	H	600–2600	Eurasia	April–May	Kumar et al. (2018)
196	<i>Ammania baccifera</i> L.	Lythraceae	Monarch Redstem	H	200–1000	Asia and Africa	May–June	Kabdal et al. (2014)

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Table 1.1 (continued)

S. no.	Taxa	Family	Common name	Life form	Range of altitude (m)	Nativity	Flowering period	References
197	<i>Woodfordia fruticosa</i> (L.) Kurz.	Lythraceae	Fire Flame Bush	S	200–1800	Asia and Africa	March–June	Rawat and Kharwal (2014)
198	<i>Abutilon indicum</i> (L.) Sweet	Malvaceae	Indian Mallow	H	200–1200	Australia	August–Nov	Singh and Dangwal (2014)
199	<i>Hibiscus trionum</i> L.	Malvaceae	–	S	1600–2200	Africa	June–Sept	Kumar et al. 2018
200	<i>Malva neglecta</i> Wall.	Malvaceae	Dwarf Mallow	H	1600–2400	Asia and Africa	May–July	Banday et al. 2017
201	<i>Malva parviflora</i> L.	Malvaceae	Cheeseweed Mallow	H	1600–2400	Eurasia–Africa	May–Aug	Dangwal et al. (2011)
202	<i>Malva sylvestris</i> L.	Malvaceae	Common Mallow	H	1600–2200	Eurasia	May–Aug	Banday et al. (2017)
203	<i>Sida acuta</i> Burm. f.	Malvaceae	Common Wireweed	S	250–2700	South America	Sept–March	Singh and Dangwal (2014)
204	<i>Sida rhombifolia</i> L.	Malvaceae	Jelly Leaf	S	Up to 1500	South America	June–Nov	Singh and Dangwal (2014)
205	<i>Urena lobata</i> L.	Malvaceae	Congo Jute	S	200–1400	Asia Africa	June–Aug	Singh and Dangwal (2014)
206	<i>Marsilia quadrifolia</i> L.	Marsileaceae	Four-leaved Clover	F	Up to 1500	Tropical Region		Dangwal et al. (2012)
207	<i>Tinospora cordifolia</i> (Thunb.) Miers.	Menispermaceae	Heart-Leaved Moonseed	S	200–1200	Asia	July–Aug	Dangwal and Singh (2012)
208	<i>Nelumbo nucifera</i> Gaertn.	Nelumbonaceae	Sacred Water Lotus	H	Up to 1700	Asia and Africa	June–Aug	Bisht (2017)
209	<i>Boerhavia diffusa</i> L.	Nyctaginaceae	Spreading Hogweed	H	300–1200	Asia and Africa	June–Aug	Rawat and Kharwal (2014)

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Table 1.1 (continued)

S. no.	Taxa	Family	Common name	Life form	Range of altitude (m)	Nativity	Flowering period	References
210	<i>Mirabilis jalapa</i> L.	Nyctaginaceae	Four O' Clock	H	Up to 2000	Africa	June–Sept	Rawat and Kharwal (2014)
211	<i>Epibolium hirsutum</i> L.	Onagraceae	Hairy Willow Herb	H	1000–3000	Eurasia	July–Aug	Banday et al. (2017)
212	<i>Epibolium laxum</i> Royle	Onagraceae	Lax Willow Herb	H	2200–3300	Himalayan Region	July–Aug	Bahaar and Bhat (2012)
213	<i>Oenothera rosea</i> Aiton	Onagraceae	Evening Primrose	H	1200–2000	South America	May–Sept	Melkhania and Singh (1983)
214	<i>Oxalis corniculata</i> L.	Oxalidaceae	Woodsorrel	H	300–2900	Europe	Feb–Nov	Banday et al. (2017)
215	<i>Oxalis latifolia</i> Kunth	Oxalidaceae	Simple Perennial Woodsorrel	H	300–2200	North America	Feb–Oct	Tiwari et al. (2016)
216	<i>Argemone mexicana</i> L.	Papaveraceae	Mexican Poppy	H	200–1500	North America	Feb–May	Tiwari et al. (2016)
217	<i>Papaver dubium</i> L.	Papaveraceae	Long Headed Poppy	H	1800–2700	Europe	April–May	Kumar et al. (2018)
218	<i>Eurya acuminata</i> DC.	Pentaphylacaceae	Tapering Leaf Eurya	S	1500–2400	Asia Himalayan Region	May–June	Bisht (2017)
219	<i>Plantago lanceolata</i> L.	Plantaginaceae	Ribwort Plantain	H	1200–2200	Africa and Europe	May–Aug	Banday et al. (2017)
220	<i>Plantago major</i> L.	Plantaginaceae	Broadleaf Plantain	H	1200–2600	Eurasia	May–Aug	Banday et al. (2017)
221	<i>Aegilops tauschii</i> Coss.	Poaceae	Tausch's Goat Grass	H	1000–2000	Asia	April–June	Banday et al. (2017)
222	<i>Agrostis tenuis</i> Sibth.	Poaceae	Common Bentgrass	H	1900–2500	Europe	May–June	Banday et al. (2017)

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Table 1.1 (continued)

S. no.	Taxa	Family	Common name	Life form	Range of altitude (m)	Nativity	Flowering period	References
223	<i>Alopecurus pratensis</i> L.	Poaceae	Meadow Foxtail	H	2000–2800	Eurasia	May–July	Ganie et al. (2015)
224	<i>Avena fatua</i> L.	Poaceae	Wild Oat	H	Up to 2000	Asia	April–June	Banday et al. (2017)
225	<i>Avena sativa</i> L.	Poaceae	Spring Wild Oat	H	1500–2000	South America	April–May	Tiwari et al. (2016)
226	<i>Brachiaria ramosa</i> (L.) Stapf	Poaceae	Browntop Millet	H	Up to 1800	Asia and Africa	July–Sept	Kumari and Saini (2018)
227	<i>Bromus catharticus</i> Vahl.	Poaceae	Prairie Grass	H	Up to 1700	North America	Aug–Oct	Tiwari et al. (2016)
228	<i>Bromus mollis</i> L.	Poaceae	Soft Brome	H	1600–1800	North America	May–Sept	Banday et al. (2017)
229	<i>Carex cernua</i> Boott.	Poaceae	–	H	200–1300	Asia	April–June	Bahaar and Bhat (2012)
230	<i>Cynodon dactylon</i> (L.) Pers.	Poaceae	Dhoob Grass	H	Up to 3000	Africa	April–July	Banday et al. (2017)
231	<i>Drepanostachyum falcatum</i> Nees	Poaceae	Dwarf Bamboo	H	1500–3600	Himalayan Region	–	Tiwari et al. (2016)
232	<i>Echinochloa colona</i> (L.) Link	Poaceae	Jungle Rice	H	Up to 1900	South America	June–Aug	Chopra et al. (2013)
233	<i>Echinochloa crusgalli</i> (L.) Beauv.	Poaceae	Barnyard Millet	H	Up to 1900	South America–Europe	July–Sept	Banday et al. (2017)
234	<i>Heteropogon contortus</i> (L.) Beauv.	Poaceae	Black Spear Grass	H	400–2600	Africa and Asia	Jan–March	Dangwal et al. (2011)

(continued)

Table 1.1 (continued)

S. no.	Taxa	Family	Common name	Life form	Range of altitude (m)	Nativity	Flowering period	References
235	<i>Imperata cylindrica</i> (L.) Beauv.	Poaceae	Cogon Grass	H	700–2400	Asia	July–Oct	Tiwari et al. (2016)
236	<i>Lolium temulentum</i> L.	Poaceae	Poison Darnel	H	800–1100	Europe	April–June	Singh and Dangwal (2014)
237	<i>Pennisetum flaccidum</i> Griseb.	Poaceae	Himalayan Fountain Grass	H	Up to 2400	Himalayan Region	May–Oct	Bahaar and Bhat. (2012)
238	<i>Saccharum spontaneum</i> L.	Poaceae	Wild Sugarcane	H	200–1800	Asia	July–Sept	Tiwari et al. (2016)
239	<i>Setaria glauca</i> (L.) Beauv.	Poaceae	Yellow Foxtail	H	1500–2200	Eurasia	Aug–Oct	Tiwari et al. (2016)
240	<i>Sorghum halepense</i> (L.) Pers.	Poaceae	Johnson Grass	H	Up to 1500	Eurasia–Africa	July–Aug	Banday et al. (2017)
241	<i>Sporobolus diander</i> (Retz.) Beauv.	Poaceae	Tussock Dropseed	H	1500–2000	Asia–Australia	May–July	Bisht (2017)
242	<i>Fagopyrum debotrys</i> (D. Don) Hara	Polygonaceae	–	H	1500–3400	Himalayan Region	Aug–Oct	Bisht (2017)
243	<i>Polygonum amphibium</i> (L.) Gray.	Polygonaceae	Amphibious Knotweed	H	2500–3800	Himalayan Region	May–July	Varshney et al. (2007)
244	<i>Polygonum hydropiper</i> (L.) Delab.	Polygonaceae	Water Pepper	H	900–2400	Asia and Africa	July–Sept	Dangwal et al. (2012)
245	<i>Polygonum persicaria</i> L.	Polygonaceae	Lady's Thumb	H	2200–3500	Eurasia–Africa	Feb–Nov	Tiwari et al. (2016)
246	<i>Polygonum plebejum</i> R. Brown	Polygonaceae	Indian Knotweed	H	300–1800	Asia and Africa	Jan–Dec	Gupta et al. (2008)

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Table 1.1 (continued)

S. no.	Taxa	Family	Common name	Life form	Range of altitude (m)	Nativity	Flowering period	References
247	<i>Rumex dentatus</i> L.	Polygonaceae	Sour Dock	H	Up to 1400	Eurasia–Africa	June–August	Tiwari et al. (2016)
248	<i>Rumex hastatus</i> D. Don	Polygonaceae	Sheep's Sorrel	H	1200–2600	Asia	May–Sept	Kumar et al. (2018)
249	<i>Rumex nepalensis</i> Spreng.	Polygonaceae	Nepal Dock	H	1200–4200	Eurasia	June–July	Banday et al. (2017)
250	<i>Portulaca oleracea</i> L.	Portulacaceae	Common Purslane	H	300–1600	South America	April–May	Banday et al. (2017)
251	<i>Potamogeton nodosus</i> Poir.	Potamogetonaceae	Long Leaf Pondweed	H	1600–2600	Eurasia	May–July	Ganie et al. (2015)
252	<i>Anagalis arvensis</i> L.	Primulaceae	Blue Pimpernel	H	300–2500	Eurasia	June–August	Banday et al. (2017)
253	<i>Primula denticulate</i> Smith	Primulaceae	Wild Primula	H	1600–2200	Himalayan Region	April–June	Kumar et al. (2018)
254	<i>Anemone obtusiloba</i> D. Don	Ranunculaceae	Himalayan Anemone	H	2000–3400	Himalayan Region	June–Sept	Tiwari et al. (2016)
255	<i>Anemone rivularis</i> Buch-Ham. ex DC.	Ranunculaceae	River Anemone	H	1600–400	Himalayan Region	June–Oct	Bisht (2017)
256	<i>Anemone vitifolia</i> Buch-Ham.	Ranunculaceae	Wild Flower	S	2000–3000	Asia	July–Sept	Kumar et al. (2018)
257	<i>Aquilegia pubiflora</i> Wall. ex Royle	Ranunculaceae	Fragrant Columbine	H	2500–3300	Himalayan Region	July–August	Kumar et al. (2018)
258	<i>Clematis barbellata</i> Edgew.	Ranunculaceae	Brown Clematis	S	3000–3400	Himalayan Region	June–Aug	Bisht (2017)

(continued)

Table 1.1 (continued)

S. no.	Taxa	Family	Common name	Life form	Range of altitude (m)	Nativity	Flowering period	References
259	<i>Clematis montana</i> Buch-Ham. ex DC.	Ranunculaceae	Mountain Clematis	S	1600–4000	Asia	June–Aug	Dangwal and Singh (2012)
260	<i>Delphinium denudatum</i> Wall. ex HK. & T.	Ranunculaceae	Wild Delphinium	H	1500–2700	Himalayan Region	June–August	Kumar et al. (2018)
261	<i>Ranunculus acris</i> L.	Ranunculaceae	Meadow Buttercup	H	1200–2500	Himalayan Region	May–July	Banday et al. (2017)
262	<i>Ranunculus arvensis</i> L.	Ranunculaceae	Corn Buttercup	H	1600–3200	Europe	April–June	Rawat and Kharwal (2014)
263	<i>Ranunculus diffusus</i> DC.	Ranunculaceae	Spreading Buttercup	H	1500–2200	Asia	April–Aug	John and Dube (1995)
264	<i>Ranunculus hirtellus</i> Royle	Ranunculaceae	Softly Hairy Buttercup	H	2500–3800	Asia	May–Sept	Bisht (2017)
265	<i>Ranunculus laetus</i> Wall. ex HK. T.	Ranunculaceae	Cheerful Buttercup	H	1600–2800	Europe	Mar–April	Rawat and Kharwal (2014)
266	<i>Ranunculus muricatus</i> L.	Ranunculaceae	Spiny Fruit Buttercup	H	1600–2700	Africa–Europe	Mar–June	Rawat and Kharwal, (2014)
267	<i>Ranunculus repens</i> L.	Ranunculaceae	Creeping Buttercup	H	1500–2500	Eurasia–Africa	April–June	Kumar et al. (2018)
268	<i>Ranunculus sceleratus</i> L.	Ranunculaceae	Celery-Leaved Buttercup	H	1200–2200	Europe	May–July	Dangwal et al. (2011)
269	<i>Ranunculus trichophyllus</i> Chaix ex Vill.	Ranunculaceae	Threat Leaf Crowfoot	H	2000–3000	Eurasia	May–July	Game et al. (2015)
270	<i>Thalictrum foliolosum</i> DC.	Ranunculaceae	Meadow Rue	H	1300–2800	Himalayan Region	June–Oct	Tiwari et al. (2016)
271	<i>Thalictrum secundum</i> Edgew.	Ranunculaceae	–	H	1600–2800	Himalayan Region	June–Sept	Bisht (2017)

(continued)

Table 1.1 (continued)

S. no.	Taxa	Family	Common name	Life form	Range of altitude (m)	Nativity	Flowering period	References
272	<i>Agrimonia pilosa</i> Ledeb.	Rosaceae	Hairy Agrimony	H	1000–3000	Eurasia	June–Aug	Bisht (2017)
273	<i>Cotoneaster microphyllus</i> Wall. ex Lind.	Rosaceae	Rockspray Cotoneaster	S	1500–3300	Himalayan Region	May–June	Bisht (2017)
274	<i>Duchesnea indica</i> (Andr.) Focke	Rosaceae	Indian Strawberry	H	Up to 2000	Asia	March–Sept	Tiwari et al. (2016)
275	<i>Fragaria nubicola</i> (Hook) L. ex Lacalla	Rosaceae	Wild Strawberry	H	1800–3800	Europe–Himalayan Region	June–Oct	Bisht (2017)
276	<i>Potentilla gerardiana</i> Lindl. ex Lehm.	Rosaceae	–	H	1500–2600		June–Sept	Bisht (2017)
277	<i>Potentilla nepalensis</i> Hook.	Rosaceae	Crimson Cinquefoil	H	2000–2800		June–Sept	Kumar et al. (2018)
278	<i>Potentilla reptans</i> L.	Rosaceae	Creeping Cinquefoil	H	1700–2600	Eurasia	June–Sept	Banday et al. (2017)
279	<i>Prinsepia utilis</i> Royle	Rosaceae	Himalayan Cherry Prinsepia	S	1600–2500	Himalayan Region	May–Aug	John and Dube (1995)
280	<i>Rosa brunonii</i> Lind.	Rosaceae	Himalayan Rusk	S	1200–2400	Africa–Europe	April–June	Bisht (2017)
281	<i>Rosa moschata</i> Herrm.	Rosaceae	Musk Rose	S	1500–2200	Asia	July–Aug	John and Dube (1995)
282	<i>Rubus ellipticus</i> Smith	Rosaceae	Yellow Himalayan Raspberry	S	1500–2400	Asia	May–July	Tiwari et al. (2016)
283	<i>Galium aparine</i> L.	Rubiaceae	Catch Weed	H	3000–4000	Africa–Europe	July–Aug	Bisht (2017)
284	<i>Galium asperifolium</i> Wall.	Rubiaceae	–	H	2700–3200	North America	June–Aug	Bisht (2017)
285	<i>Galium elegans</i> (Wall.) Roxb.	Rubiaceae	–	H	1600–2700	Africa–Europe	May–July	Bisht (2017)

(continued)

Table 1.1 (continued)

S. no.	Taxa	Family	Common name	Life form	Range of altitude (m)	Nativity	Flowering period	References
286	<i>Rubia cordifolia</i> L.	Rubiaceae	Indian Madder	C	1500–2500	Asia and Africa	July–Sept	Kumar et al. (2018)
287	<i>Azolla cristata</i> Kaulf.	Salviniaceae	Mosquito Fern	Pt	Up to 1700	North America		Ganie et al. (2015)
288	<i>Parnassia nubicola</i> Wall. ex Royle	Saxifragaceae	Himalayan Bog Star	H	2500–4000	Himalayan Region	July–Aug	Bisht (2017)
289	<i>Saxifraga diversifolia</i> Wall. ex Seringe	Saxifragaceae	Diverse-Leaved Saxifrage	H	2200–4800	Himalayan Region	July–Oct	Bisht (2017)
290	<i>Mazus japonicus</i> (Thunb.) Kuntze	Scrophulariaceae	Mazus	H	Up to 1500	Asia	July–Oct	Kumar et al. (2018)
291	<i>Scrophularia himalensis</i> Royle ex Benth.	Scrophulariaceae	Himalayan Figwort	H	2000–3500	Himalayan Region	June–August	Bisht (2017)
292	<i>Verbascum thapsus</i> L.	Scrophulariaceae	Great Mullein	H	1800–3600	Eurasia	July–Aug	Tiwari et al. (2016)
293	<i>Veronica anagallis</i> L.	Scrophulariaceae	Brook Pimpernel	H	1800–3000	Eurasia	May–June	Banday et al. (2017)
294	<i>Veronica arvensis</i> L.	Scrophulariaceae	Corn Speedwell	H	2200–3200	Europe	April–Oct	Banday et al. (2017)
295	<i>Veronica beccabunga</i> L.	Scrophulariaceae	Brooklime	H	1200–2500	Europe–Africa	April–Aug	Babaar and Bhat (2012)
296	<i>Veronica biloba</i> L.	Scrophulariaceae	Two-Lobed Speedwell	H	2300–4200	Asia	April–Aug	Gupta et al. (2008)
297	<i>Veronica persica</i> Poir.	Scrophulariaceae	Common Speedwell	H	1500–3000	Eurasia	April–Aug	Gupta et al. (2008)
298	<i>Smilax aspera</i> L.	Smilacaceae	Rough Bindweed	C	Up to 1600	Africa Europe	July–Sept	Tiwari et al. (2016)

(continued)

Table 1.1 (continued)

S. no.	Taxa	Family	Common name	Life form	Range of altitude (m)	Nativity	Flowering period	References
299	<i>Smilax glaucophylla</i> Klotz.	Smilacaceae	Elegant Smilax	C	1000–2200	Asia	April–May	Tiwari et al. (2016)
300	<i>Datura metel</i> L.	Solanaceae	Datura	S	1500–2200	South America	July–Sept	Kumar et al. (2018)
301	<i>Datura stramonium</i> L.	Solanaceae	Jimson Weed	H	1600–2700	North America	June–Sept	Banday et al. (2017)
302	<i>Nicandra physalodes</i> (L.) Gaertn.	Solanaceae	Apple of Peru	S	800–2300	South America	May–Nov	Kumar et al. (2018)
303	<i>Solanum nigrum</i> L.	Solanaceae	Black Nightshade	H	1200–2500	South America	June–Oct	Banday et al. (2017)
304	<i>Solanum xanthocarpum</i> Schrad & Wendl.	Solanaceae	Yellow Fruit Nightshade	H	1500–2000	Asia	August–Oct	Dangwal et al. (2011)
305	<i>Corchorus aestuans</i> L.	Tiliaceae	East Indian Mallow	H	Up to 2000	Asia	Aug–Oct	Singh and Dangwal (2014)
306	<i>Triumfetta amua</i> L.	Tiliaceae	–	H	Up to 2200	Africa and Asia	June–Aug	Bisht (2017)
307	<i>Triumfetta pilosa</i> Roth.	Tiliaceae	Diamond Burbark	H	1000–2600	Asia and Africa	June–Aug	Bisht (2017)
308	<i>Trapa natans</i> L.	Trapaceae	Water Chestnut	H	1600–2200	Eurasia	July–Nov	Varshney et al. (2007)
309	<i>Girardinia diversifolia</i> (L.) Frits	Urticaceae	Himalayan Nettle	H	500–1600	Himalayan Region	Sept–Oct	Singh and Dangwal (2014)
310	<i>Pouzolzia indica</i> (L.) Gaudich	Urticaceae	Graceful Pouzolz's Bush	H	300–1500	Asia	July–Oct	John and Dube (1995)
311	<i>Pouzolzia pentandra</i> (Roxb.) Benn.	Urticaceae	Melastome Pouzolz's Bush	H	Up to 1200	Asia	July–Oct	Dangwal et al. (2012)
312	<i>Urtica dioica</i> L.	Urticaceae	Common Nettle	H	1600–3000	Africa–Europe	June–Sept	Bisht (2017)

(continued)

Table 1.1 (continued)

S. no.	Taxa	Family	Common name	Life form	Range of altitude (m)	Nativity	Flowering period	References
313	<i>Urtica parviflora</i> Roxb.	Urticaceae	–	H	1500–2800	Himalayan Region	May–June	John and Dube (1995)
314	<i>Valeriana hardwickii</i> (Wall.) Roxb.	Valerianaceae	–	H	1900–3100	Asia	May–July	Bisht (2017)
315	<i>Valeriana jatamansi</i> Jones	Valerianaceae	Indian Valerian	H	1500–3600	Himalayan Region	May–July	Tiwari et al. (2016)
316	<i>Lantana camara</i> L.	Verbenaceae	Wild Sage	S	Up to 2000	South America	April–Sept	Angiras, 2014
317	<i>Viola biflora</i> Smith	Violaceae	Arctic Yellow Violet	H	2300–4300	Eurasia–North America	May–June	Bisht (2017)
318	<i>Viola canescens</i> Wall. ex Roxb.	Violaceae	Dog Violet	H	2500–4300	Asia	April–May	Kumar et al. (2018)
319	<i>Viola pilosa</i> Blume	Violaceae	Smooth Leaf White Violet	H	2200–4300	Asia	March–April	Bisht (2017)
320	<i>Viola tricolor</i> L.	Violaceae	Wild Pansy	H	1500–1800	Europe	March–May	Bisht (2017)
321	<i>Vitis lanata</i> Roxb.	Vitaceae	Wild Grape	C	900–2100	Eurasia	June–July	Tiwari et al. (2016)
322	<i>Hedychium spicatum</i> Smith	Zingiberaceae	Spiked Ginger Lily	H	1800–2800	Himalayan Region	July–August	Kumar et al. (2018)
323	<i>Tribulus terrestris</i> L.	Zygophyllaceae	Bullhead	H	1900–3000	Africa–South America	July–August	Dangwal et al. (2011)

H Herb, *S* shrub, *C* climber, and *Pt* pteridophytes/Fern

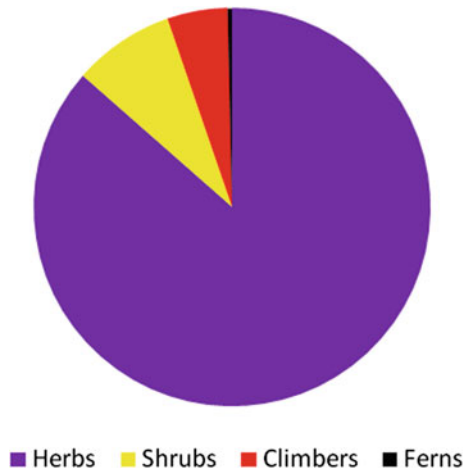


Fig. 1.1 Diversity of life forms of weed species

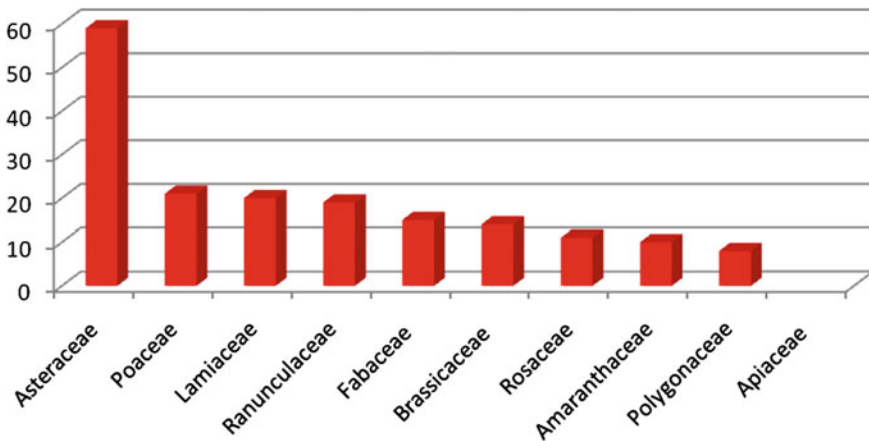


Fig. 1.2 Dominant families of weed species

yield. Further, the flowering period of weeds coincides with the flowering period of crops. Weeds mature ahead of crops so that their seeds get mixed with crop seeds, thus resulting in adulteration, and these weeds compete again with the crops in the next season, so the battle against weeds is a never ending one (Tiwari et al. 2016). Weeds cause many billion of crop losses annually, and identification and proper management of weeds will reduce the loss by increasing crop yield and quality.

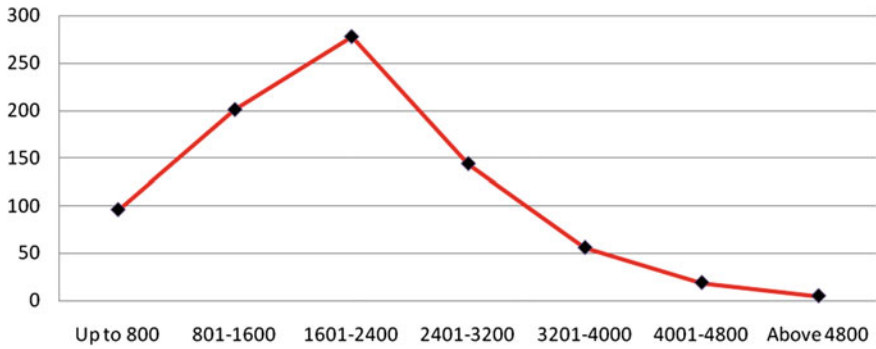


Fig. 1.3 Altitude-wise distribution pattern of weed species

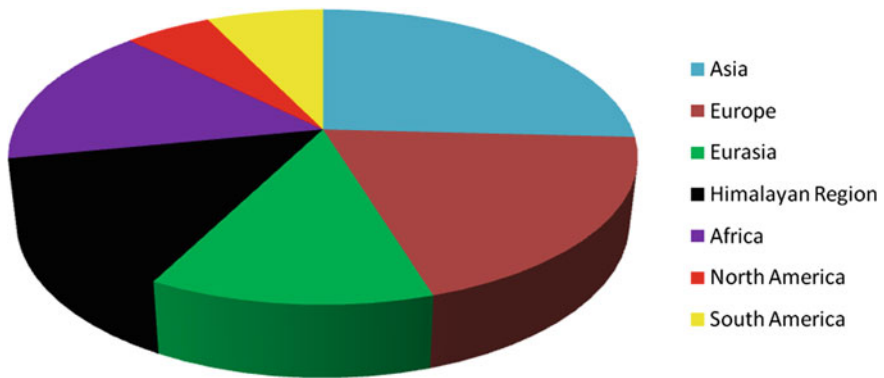


Fig. 1.4 Distribution of native and non-native weed species

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