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## DIVERSITY AND DISTRIBUTION OF MAJOR WINTER WEEDS IN UDHAM SINGH NAGAR, UTTARAKHAND, INDIA

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### ABSTRACT

Weeds are a global problem for agricultural crops, as they interfere with crop growth and productivity. Their proper identification plays a crucial role in effective weed management. The present study was conducted to study the diversity of winter weeds growing in different crops. A total of 83 weeds belonging to 64 genus and 28 families were collected from wheat, sugarcane, mustard, pulses, vegetables and roadsides during winter season. Maximum number of weeds (48) were collected from vegetable crops. Among the recorded species, there were 82 herbs and 01 climber. Asteraceae, Fabaceae, Amaranthaceae, Poaceae were recorded as dominant families followed by Brassicaceae, Scrophulariaceae, Acanthaceae.

**Keywords :** Winter weeds, Crops, Udham Singh Nagar.

### Introduction

Weeds are familiar but controversial plants that are neither all completely bad nor all good, depending on one's outlook. They are an integral part of an agriculturalist's life as they adversely affect the economic value and aesthetic aspect of the land and water that they infest. In general, weeds are unwanted plants in our environment that are found predominantly in crop fields and also infest lawns, roadsides, fencerows, waterways, gardens and forests, either consciously and unconsciously (Anderson, 2015). In natural conditions, weeds respond rapidly to soil disturbance and establish quickly, often utilizing nutrients and water more efficiently than the surrounding plants. They compete with other cultivated plants for light, water, nutrients, space, etc, reducing crop yields. Some weeds produce chemicals harmful to other plants and animals (Balkrishna *et al.*, 2019). Weeds are one of the main biological constraints that limit crop productivity. They compete with crops for natural and applied resources and are responsible for reducing quantity and quality of agricultural productivity (Rao *et al.*, 2015). The losses caused by weeds in agriculture far exceed losses from all other

categories taken together (Subramanian *et al.*, 1991). The total annual loss caused by weeds (33%) is more than the loss caused by either diseases (20%) or insect pests (26%) in India (Yaduraju *et al.*, 2015).

Uttarakhand is a hilly state of India with rich biological diversity, where approximately 16% of the total geographical area (about 0.8 million ha) is cultivated; thus, agriculture plays an important role in the state economy. Udham Singh Nagar district lying in the Tarai belt of the state has a highly fertile area where agriculture is primarily organized into two major cropping seasons: Kharif (Monsoon) and Rabi (Winter). Rice, wheat, sugarcane, maize, pulses are the main crops of this area. This region supports a rich diversity of weeds due to its fertile alluvial soils, high moisture availability, and intensive cropping systems. The floristic diversity and distribution of weeds in agricultural fields are influenced by several factors, including cropping pattern, crop type, cultural practices, moisture availability, soil characteristics, location, and season (Sit *et al.*, 2007). There are approximately 250,000 species of plants worldwide of those about 3% or 8000 species behave as weeds (Sah *et al.*, 2020). Holm *et al.* (1977) estimated that about

200 weeds are responsible for 95% of the agricultural weed problems worldwide.

Understanding the weed species that compete with cultivated crops is essential for their effective management. Accurate identification of weeds is considered a crucial step in weed control, as it provides the foundation for developing appropriate management strategies and helps in understanding the life cycle of the weed species (Naidu, 2012). A number of studies have been conducted on the diversity of weed flora in different regions of Uttarakhand (Melkania and Singh 1983a & b; Joshi *et al.*, 1988; Pangtey *et al.*, 1996; Dobhal *et al.*, 2006; Dangwal *et al.*, 2011; Tiwari *et al.*, 2016, 2020; Chamoli, 2020; Pandey *et al.*, 2020; Tiwari *et al.*, 2020). There seems a lack of information on weed diversity in various crops in Udham Singh Nagar (Agarwal *et al.*, 1997; Gupta *et al.*, 2008, Sharma *et al.*, 2024). Balkrishna *et al.* (2019) have reported medicinal weeds from Pantanjali, Haridwar. Knowledge of the biology and floristic composition of winter weeds is important for sustainable agriculture, as it helps in maintaining a healthy and productive agro-ecosystem. In this context, the present study was undertaken to assess the diversity of winter weed flora in Udham Singh Nagar, Uttarakhand.

## Materials and Methods

### Study area

The present study was carried out in Udham Singh Nagar district which lies between 28°51'N to 29°23'N latitude and 78°45'E to 80°08'E longitude and is situated in the South- Eastern tarai belt of Uttarakhand. It is located between 28°51'N to 29°23'N latitude and 78°45'E to 80°08'E longitude. The district covering an area of 3055 Km<sup>2</sup> has seven tahsils viz. Kashipur, Kichha, Sitarganj, Bazpur, Jaspur, Gadarpur and Khatima. It is rightfully known as the food bowl of Uttarakhand. The fertile plain area supported by abundant water resources produces a rich harvest of rice, wheat, sugarcane, mustard, pulses and a wide variety of fruits and vegetables.

### Field survey and plant collection

The study is based on extensive and intensive field survey during peak period of weed growth in winter season during 2022-2024. Weeds were collected at premature and maturity harvesting stages of five winter crops i.e., wheat, sugarcane, mustard, pulses, vegetables. Several winter weeds were collected also from roadside near crop land (Fig. 1). Weeds were collected from 50 random crop fields, fencerows and crop edges of different villages of district Udham Singh Nagar namely Shyampuram, Dhakiya Gulabo, Kundeshwari, Kishanpur, Garhinegi, Nakuliya, Bhur

maholiya, Jhankat, Sainjana, Keval Ganj, Dineshpur, Patrampur, etc. The collected weeds were identified with the help of floras and other relevant literature (Duthie 1903-1929; Osmaston 1927; Babu 1977, Pant 1986; Uniyal *et al.*, 2007; Naidu, 2012; Puslakar and Srivastava, 2018). Botanical names and families were checked and updated by POWO (Plants of the World Online) database.



**Fig. 1:** Collection of weeds from various crop fields, A- Vegetable, B- Sugarcane, C- Mustard

## Results and Discussion

A total of 83 weed species belonging to 28 angiospermic families were recorded from crop fields, fencerows, field boundaries, and roadsides near agricultural fields during the winter season in different parts of Udham Singh Nagar, Uttarakhand. A list of weeds with their botanical name, family, habit, availability in different crop fields is presented in table 1. The collected weeds belonged to 25 families with 56 genera and 72 species of dicotyledons, while 3 families with 8 genera and 11 species were monocotyledons. Maximum number of weeds were collected from vegetable crops (48) followed by those in wheat (31), sugarcane (31), pulses (18), mustard (17) (Fig.2). A total of 44 weeds were found to be growing along roadsides and crop edges in the winter season. Asteraceae having 14 species constituted rich weed diversity followed by Fabaceae (10), Amaranthaceae (5), Poaceae (5) and Brassicaceae (4),

Scrophulariaceae (4). Among the collected weeds, herbs were dominant (82 spp.), whereas only one species was recorded as a climber. Certain genera such as *Acmella*, *Cyperus*, *Euphorbia*, *Lathyrus*, *Medicago*, *Melilotus*, *Sonchus*, *Stellaria* and *Vicia* include multiple species that were commonly found growing as weeds. Fig. 3 displays the occurrence of weeds in wheat and mustard fields. A total of 63 weed species were commonly observed, while 20 species were rarely recorded and occurred only in a few fields. Ten weed species have crop specific occurrence e.g. *Corchorus aestuans*, *Cyanotis axillaris* and *Vicia sativa* were observed in mustard crop fields; *Cyperus rotundus*, *Ludwigia hyssopifolia* and *Oldenlandia diffusa* in vegetable field; *Lathyrus aphaca* and *Oxalis corniculata* in wheat field and *Medicago lupulina* found only in pulses field.

Weeds have been a challenge for farmers since the very beginning of agriculture. The information on weed biology and floristic composition is crucial for agricultural sustainability and for developing effective management strategy for agro-ecosystems (Tiwari *et al.*, 2020). Accurate identification of weed is the first step of weed management. It is said that proper identification is the half way to control weed (Naidu, 2012). During the present study, Asteraceae, Fabaceae, Amaranthaceae, Poaceae, Brassicaceae were recorded as dominant families. Similarly, Pandey *et al.* (2020) have also reported these families as the dominant ones during the study on diversity of weed flora. Diversity is strongly correlated with soil moisture and elevation (Gupta *et al.*, 2008). The present study reports 31 weed species from wheat crop, while Gupta *et al.* (2008) have reported 71 weed species from wheat fields in Doon valley. Total 102 weed species belonging to 27

families have been reported by Melkania and Singh (1983) from monsoon crops in western Himalayas and tarai region. This variation may be due to selected area, study duration, soil fertility, climate factors, cropping pattern and many other factors.

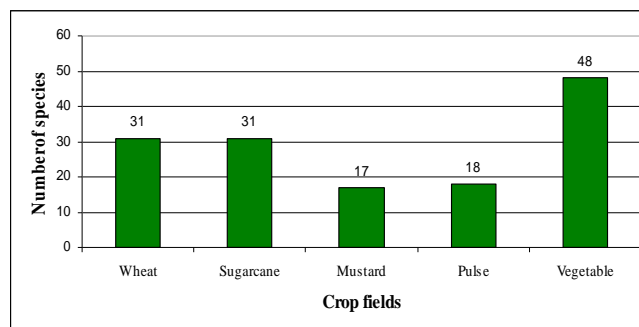


Fig. 2 : Status of weeds in different crop fields.



Fig. 3: Occurrence of different weeds in crop fields. A- Wheat, B- Mustard

Table 1: Weeds collected from different localities.

SN	Weed Species	Family	Habit	Collection sites					
				W	S	M	P	V	RS
1	<i>Achyranthes aspera</i> L.	Amaranthaceae	Herb	-	-	-	-	+	+
2	<i>Acmella ciliata</i> (Kunth) Cass.	Asteraceae	Herb	-	-	-	-	+	+
3	<i>Acmella radicans</i> (Jacq.) R.K.Jansen	Asteraceae	Herb	-	+	-	-	+	-
4	<i>Acmella uliginosa</i> (Sw.) Cass	Asteraceae	Herb	-	+	-	-	+	-
5	<i>Ageratum haustonianum</i> Mill.	Asteraceae	Herb	-	-	+	-	-	+
6	<i>Alternanthera philoxeroides</i> (Mart.) Griseb.	Amaranthaceae	Herb	+	+	-	-	-	-
7	<i>Alternanthera sessilis</i> (L.)DC.	Amaranthaceae	Herb	-	+	-	-	+	-
8	<i>Amaranthus viridis</i> L.	Amaranthaceae	Herb	+	-	-	-	-	+
9	<i>Anagallis arvensis</i> L.	Primulaceae	Herb	-	-	+	-	+	+
10	<i>Androsace umbellata</i> (Lour.) Merr.	Primulaceae	Herb	-	-	-	-	+	-
11	<i>Avena sativa</i> L.	Poaceae	Herb	+	-	-	-	+	-
12	<i>Campanula dimorphantha</i> Schweinf.	Campanulaceae	Herb	-	-	+	-	-	+
13	<i>Cardamine flexuosa</i> With.	Brassicaceae	Herb	-	+	-	-	+	-
14	<i>Chenopodium album</i> L.	Chenopodiaceae	Herb	+	+	-	-	+	-
15	<i>Commelina benghalensis</i> L.	Commelinaceae	Herb	-	-	-	+	+	+

16	<i>Commelina diffusa</i> Burm.f.	Commelinaceae	Herb	-	-	-	-	+	+
17	<i>Conyza bonariensis</i> L.	Asteraceae	Herb	+	+	-	-	+	+
18	<i>Corchorus aestuans</i> L.	Tiliaceae	Herb	-	-	+	-	-	-
19	<i>Cyanotis axillaris</i> (L.) D.Don ex Sweet	Commelinaceae	Herb	-	-	+	-	-	-
20	<i>Cyperus rotundus</i> L.	Cyperaceae	Herb	-	-	-	-	+	+
21	<i>Cyperus difformis</i> L.	Cyperaceae	Herb	-	-	-	-	+	-
22	<i>Cyperus mindorensis</i> (Steud.) Huygh	Cyperaceae	Herb	-	+	-	-	-	-
23	<i>Dicliptera chinensis</i> (L.) Juss	Acanthaceae	Herb	-	-	-	+	+	+
24	<i>Dicliptera paniculata</i> (Forssk.) I.Darbysh.	Acanthaceae	Herb	-	-	-	+	+	+
25	<i>Digera muricata</i> (L.) Mart.	Amaranthaceae	Herb	-	-	-	-	+	+
26	<i>Dysphania ambrosioides</i> (L.) Mosy & Clem.	Chenopodiaceae	Herb	-	-	-	-	+	+
27	<i>Eclipta prostrata</i> (L.) L.	Asteraceae	Herb	+	+	-	-	-	+
28	<i>Eleusine indica</i> (L.) Gaertn.	Poaceae	Herb	-	-	-	-	+	+
29	<i>Euphorbia helioscopia</i> L.	Euphorbiaceae	Herb	+	-	+	-	+	+
30	<i>Euphorbia heterophylla</i> var. <i>cyathophora</i> (Murray) Griseb.	Euphorbiaceae	Herb	-	+	-	-	-	+
31	<i>Euphorbia prostrata</i> Aiton.	Euphorbiaceae	Herb	+	-	-	-	+	+
32	<i>Fumaria indica</i> (Hausskn.) Pugsley	Fumariaceae	Herb	+	-	+	-	+	-
33	<i>Galium aparine</i> L.	Rubiaceae	Herb	-	+	-	-	-	+
34	<i>Gamochaeta pensylvanica</i> (Willd.) Cabrera	Asteraceae	Herb	+	-	-	-	-	+
35	<i>Ipomoea quamoclit</i> L.	Convolvulaceae	Climber	-	+	-	-	-	+
36	<i>Ixeris polycephala</i> Cass.	Asteraceae	Herb	+	-	-	+	-	-
37	<i>Lathyrus aphaca</i> L.	Fabaceae	Herb	+	-	-	-	-	-
38	<i>Lathyrus odoratus</i> L.	Fabaceae	Herb	-	-	-	+	-	-
39	<i>Launaea asplenifolia</i> (Willd.) Hook.f.	Asteraceae	Herb	-	-	+	-	-	+
40	<i>Lepidium didymum</i> L.	Brassicaceae	Herb	-	+	-	-	+	+
41	<i>Ludwigia hyssopifolia</i> (G. Don) Excell	Onagraceae	Herb	-	-	-	-	+	-
42	<i>Lysimachia arvensis</i> (L.) U.Manns and Anderb	Primulaceae	Herb	+	-	-	-	+	-
43	<i>Mazus pumilus</i> (Burm.f.) Steenis	Scrophulariaceae	Herb	+	+	-	-	+	-
44	<i>Malvastrum coromendelianum</i> (L.) Garcke	Malvaceae	Herb	+	+	-	-	-	-
45	<i>Mecardonia procumbens</i> (Mill.) Small	Plantaginaceae	Herb	+	+	-	-	-	-
46	<i>Medicago lupulina</i> L.	Fabaceae	Herb	-	-	-	+	-	-
47	<i>Medicago polymorpha</i> L.	Fabaceae	Herb	+	+	-	-	-	-
48	<i>Melilotus albus</i> Medik.	Fabaceae	Herb	+	+	-	-	-	+
49	<i>Melilotus indicus</i> (L.) All.	Fabaceae	Herb	+	-	-	-	-	-
50	<i>Mesosphaerum suaveolens</i> (L.) Kuntge	Lamiaceae	Herb	-	+	-	-	-	+
51	<i>Misopates orontium</i> (L.) Raf.	Plantaginaceae	Herb	-	-	-	+	+	-
52	<i>Oldenlandia diffusa</i> (Willd.) Roxb.	Rubiaceae	Herb	-	-	-	-	+	-
53	<i>Oplismenus compositus</i> (L.) P.Beauv.	Poaceae	Herb	-	-	-	-	+	+
54	<i>Oxalis corniculata</i> L.	Oxalidaceae	Herb	+	-	-	-	-	-
55	<i>Oxalis debilis</i> Kunth	Oxalidaceae	Herb	-	+	-	-	+	-
56	<i>Parthenium hysterophorus</i> L.	Asteraceae	Herb	+	+	+	+	+	+
57	<i>Phalaris minor</i> Retz.	Poaceae	Herb	+	-	-	+	-	-
58	<i>Physalis angulata</i> L.	Solanaceae	Herb	+	+	+	+	+	+
59	<i>Poa annua</i> L.	Poaceae	Herb	+	+	+	+	+	+
60	<i>Polygonum plebeium</i> R.Br.	Polygonaceae	Herb	+	-	-	+	+	+
61	<i>Portulaca oleracea</i> L.	Portulacaceae	Herb	-	+	-	-	+	+
62	<i>Pouzolzia zeylanica</i> (L.) Benn.	Urticaceae	Herb	-	+	-	-	-	+
63	<i>Rorippa dubia</i> (Pers.) H.Hara	Brassicaceae	Herb	-	-	+	-	-	+
64	<i>Rorippa indica</i> (L.) Hiern	Brassicaceae	Herb	-	-	+	-	+	+
65	<i>Rumex dentatus</i> L.	Polygonaceae	Herb	-	-	-	-	+	+
66	<i>Rungia pectinata</i> (L.) Nees	Acanthaceae	Herb	-	+	-	+	-	-
67	<i>Salvia plebeia</i> R.Br.	Lamiaceae	Herb	+	+	-	-	-	-
68	<i>Scoparia dulcis</i> L.	Scrophulariaceae	Herb	-	-	-	+	-	+
69	<i>Sida rhombifolia</i> L.	Malvaceae	Herb	+	+	-	-	-	-
70	<i>Solanum nigrum</i> L.	Solanaceae	Herb	+	+	+	+	+	+
71	<i>Soliva anthemifolia</i> (Juss.) Sweet	Asteraceae	Herb	+	+	-	-	-	-
72	<i>Sonchus asper</i> (L.) Hill	Asteraceae	Herb	-	-	-	-	+	+

73	<i>Sonchus oleraceus</i> L.	Asteraceae	Herb	-	-	-	-	+	-
74	<i>Stellaria aquatica</i> (L.) Scop.	Caryophyllaceae	Herb	-	-	-	-	+	-
75	<i>Stellaria media</i> (L.) Vill.	Caryophyllaceae	Herb	-	+	-	-	+	+
76	<i>Trianthema portulacastrum</i> L.	Aizoaceae	Herb	-	-	+	-	-	+
77	<i>Trifolium resupinatum</i> L.	Fabaceae	Herb	-	-	+	+	+	-
78	<i>Vernonia cinerea</i> (L.) Less	Asteraceae	Herb	-	-	-	-	+	+
79	<i>Veronica anagallis-aquatica</i> L.	Scrophulariaceae	Herb	-	-	-	-	+	+
80	<i>Veronica polita</i> Fr.	Scrophulariaceae	Herb	-	-	-	-	+	+
81	<i>Vicia hirsuta</i> (L.) Gray	Fabaceae	Herb	+	-	-	+	-	-
82	<i>Vicia sativa</i> L.	Fabaceae	Herb	-	-	+	-	-	-
83	<i>Vicia tetrasperma</i> (L.) Schreb	Fabaceae	Herb	+	-	-	+	+	-

(Collection Sites: 1. W- Wheat, 2. S- Sugarcane, 3.M- Mustard, 4. P- Pulses, 5. V- Vegetables, 6. R-Roadside.)

## Conclusion

Documentation of weed species helps in the accurate identification of dominant and problematic weeds, which is essential for planning effective weed management practices. The present study provides valuable information on the diversity of weed flora in agricultural fields of Udham Singh Nagar, Uttarakhand. The study also contributes to a better understanding on the distribution of winter weeds in various crop fields, which can assist farmers and researchers in selecting suitable control measures and crop management strategies. In addition, such information can serve as a baseline data for future ecological, taxonomic, and agricultural studies, and may help in promoting sustainable agricultural practices in the region.

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