



## Plant diversity and distribution of weeds in winter season crops of agro-ecosystems in Bilaspur district, Chhattisgarh

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Article published on August 09, 2014

**Key words:** Diversity, Weeds, Agro ecosystem, Rabi crops.

### Abstract

A field survey was conducted at five different sites in Bilaspur district Chhattisgarh, during *winter* season of 2011-12 to identify the diversity and distribution of weed species growing in association with cultured crops and to determine their competitive ability against the infesting weeds. Present study deals with diversity and distribution of weeds in agriculture fields of Bilaspur district CG. The sixty nine species and 57 genera belonging to 22 families were identified. The total number of weeds in all five sites species varied from 24 to 32 and genera varied from 22 to 29. Out of 22 families of weeds identified Poaceae was dominant with 16 species, followed by Asteraceae (10 species), Fabaceae (7 species), Cyperaceae (6 species) and Amaranthaceae (5 species). On the basis of habit, 22.29% of the weeds were grass, 71.22% herbs and 8.69% sedge. The weeds were further classified into different categories based on their life span, habitat and nativity.

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## Introduction

Weed species are known to vary with season and type of cultivation. Weed infestation is one of the major constraints in crop production. The degree of damage caused by weeds is related to the type and density of weeds growing in a crop community. Persistence of weeds in a particular location is largely influenced by edaphic, biotic and abiotic factors, which affect their occurrence, abundance, range and distribution. Weeds are unwanted plants representing excellent examples of the successful struggle for existence. Weed infestation is a serious problem in agricultural and horticultural crop and lower the yield significantly through their competition with crop plants for sunlight, space, nutrients etc. (Dangwal *et al.*, 2010). However, some weeds are also allelopathic in nature (Oudhia and Tripathi, 1997, 1998). Weed flora of Agriculture field has large ecological amplitude, so they multiply and flourish well even in changed environmental conditions. Since weeds have unique potentialities for adaptation they survive almost in any environment and adjust themselves to the changed conditions (Sen, 1979; Kasera, 1988). Out of the 8000 known weed species growing in world, only 250 are of particular importance to very common, dominant and wide spread in the crop fields or agricultural crops (Holm *et al.*, 1977).

Weed survey are useful for determine the occurrence and relative important of weed species in crop production systems (Frick and Thomas, 1992; Thomas 1985). Phyto-sociological association of weeds in winter crops of Kashmir valley at varying altitudes from 1500 to 2000 m asl reported by (Singh *et al.*, 2007). A large majority of the weeds are not very harmful to cultivated plant with which they are associated (Sen 1979; Sen, 1990a, b; Holzner, 1978). In view of importance of the problem, the present study was conducted to find out the Rabi season weeds flora, especially in wheat crop, which will further help in future in formulating a good weed control program. Invasion of weeds becoming the great challenge to farmers to increase the production and crops yields. Association of weeds with crops

affects the density and yield of crop production. Present study will give information of effect of weeds on plant diversity and distribution in cultivated fields of rabi crops of Bilaspur.

## Materials and methods

### Study sites

The study area is situated between 17 to 23.7° north latitude and 80.40 to 83.38° east longitude in Bilaspur, Chhattisgarh. The climate is mainly tropical, humid and sub-humid. The average annual rainfall of the region is around 1400 mm and about 90 to 95 % of this amount is received during south-west monsoon season (June-October). The atmospheric humidity is 90% during monsoon months and starts decreasing from October onwards and reaches as low as 15-20 % during peak summer months. The soils of Chhattisgarh vary considerably in the three agro-climatic zones. Koni is one of the villages in Masturi in Bilaspur. Kota is the village comes under Bilaspur, Sakri in Takhatpur, Masturi is one of the towns in Masturi, and Mangla is a village in Belha Tehsil, Bilaspur C.G.

### Methods

Present work was done in the five selected field of Bilaspur (i.e. Masturi, Mangla, Koni, Sakri and Kota villages) to find out weed flora of Rabi crops. Extensive and intensive field surveys were conducted during different months of rabi (winter) season (2011-12) in 5 experimental sites. Three sites were selected in each area of cultivated fields. Weeds were collected from all the sites of the study area. Different types of weed were observed such as *Achyranthes*, *Parthenium*, *Ipomoea*, *Ageratum* etc. During this period interviews of farmers and agriculturists were conducted to collect information about the seasonal weed plants and their vernacular names. The collected weed plants were pressed, dried, preserved and properly identified with the help of available literature, monographs and confirmed from the authentic regional floras i.e. Flora of Madhya Pradesh with Vol. I-III, Flora of Bilaspur, Durg & Rajnandgaon and Flora of British India, Vol. 1-7 etc.

**Observation and result**

The during of present work diversity of weeds species in rabi crops were observed in the study sites i.e. Kota, Koni (agriculture college), Mangla, Sakri, Masturi of Bilaspur (C.G). In all sites of Bilaspur of Rabi crops representing 69 species, 57 genera and 22 families and total number of weeds in all five sites varied from 24 to 32. Observation was done on the distribution of weed species in five different study sites (Sakri, Koni, Mangla, Masturi, Kota) of Bilaspur

CG and also reported the presence of weed status in cultivated fields (Table 1)

Familywise distribution of genera of weeds in all experimental sites of Bilaspur district, Chhattisgarh (Fig. 1). Familywise distribution of number of species of weed in five experimental sites of Bilaspur district, Chhattisgarh (Fig. 2).

**Table 1.** Distribution of weed species in five different study sites of Bilaspur CG.

S.N.	Weed species	Koni	Kota	Masturi	Mangla	Sakri	Status*
1)	<i>Abutilon indicum</i> Linn	+	+	-	+	+	W
2)	<i>Achyranthes aspera</i> Linn.	+	+	-	+	+	W
3)	<i>Ageratum conyzoides</i> Linn.	+	+	-	+	-	W
4)	<i>Alternanthera ficoidea</i> Linn. <i>Alteranthera philoxeroides</i> (Mart.)	-	-	-	-	+	W
5)	Griseb	-	-	-	+	-	W
6)	<i>Alternanthera spinosa</i> Linn.	-	-	+	+	-	W,M
7)	<i>Alysicarpus monilifer</i> (L.) DC	-	+	+	+	-	O,V F
8)	<i>Alysicarpus vaginalis</i> (L.) DC	-	-	-	-	+	B,W B, M, O,
9)	<i>Amaranthus spinosus</i> Linn.	-	-	-	+	+	V,F
10)	<i>Anagallis arvensis</i> Linn.	-	+	+	-	+	B
11)	<i>Argemone mexicana</i> Linn.	+	+	-	+	+	W
12)	<i>Bidens pilosa</i> Linn.	-	+	-	-	+	W
13)	<i>Biophytum sensitivum</i> (L.)DC	-	-	+	+	-	M
14)	<i>Blumea lacera</i> Linn.	+	+	-	+	-	M
15)	<i>Boerhaavia diffusa</i> Linn	+	+	-	+	-	B,M,W
16)	<i>Carthmus oxycantha</i> M. Bieb	+	+	-	+	-	B,M, O,V,F
17)	<i>Centella asiatica</i> Linn.	-	-	+	-	-	F,M
18)	<i>Chenopodium album</i> Linn.	+	+	+	+	+	B,M, V
19)	<i>Chloris barbata</i> Sw.	-	-	-	+	+	W
20)	<i>Cleome viscosa</i> Linn.	-	-	+	-	-	B
21)	<i>Commelina benghalensis</i> Linn.	+	+	-	-	-	O
22)	<i>Convolvulus arvensis</i> Linn.	+	+	-	-	-	M, O, F
23)	<i>Cynodon dactylon</i> (L.)Pers	+	+	-	-	+	V
24)	<i>Cyperus difformis</i> Linn.	+	+	-	-	-	F
25)	<i>Cyperus compressus</i> Linn.	-	-	-	-	+	W,B
26)	<i>Cyperus esculents</i> Linn.	-	-	-	-	+	W,M, B
27)	<i>Cyperus iria</i> Linn.	-	-	+	-	-	W
28)	<i>Cyperus rotundus</i> Linn.	+	+	-	-	-	B
29)	<i>Dactyloctenium aegyptium</i> (L.)Willd.	+	+	-	-	-	W
30)	<i>Desmodium triflorum</i> Linn.	-	-	-	+	-	W,B

S.N.	Weed species	Koni	Kota	Masturi	Mangla	Sakri	Status*
31)	<i>Digitaria sanguinalis</i> (L) Scop	+	+	-	-	-	W,O
32)	<i>Echinochola colonum</i> (L.)Link	+	+	-	+	+	V
33)	<i>Echinocholia crusgalli</i> Linn.	+	+	-	-	-	F
34)	<i>Euphorbia hirta</i> Linn.	-	-	-	-	-	V
35)	<i>Euphorbia geniculata</i> Linn.	-	-	-	-	-	W
36)	<i>Euphorbia prostrata</i> Aiton.	+	-	-	-	+	W
37)	<i>Fimbriystylis dichotoma</i> (L) Vahl.	-	-	+	-	-	M
38)	<i>Heleotropium indicum</i> Linn.	-	-	+	-	-	M,O
39)	<i>Hygrophila spinosa</i> T. Anders	-	-	+	-	-	B,W
40)	<i>Hyptis suaveolans</i> Linn.	-	-	-	-	+	W
41)	<i>Indigofera hirsuta</i> Linn.	-	+	+	+	-	F
42)	<i>Justicia simplex</i> Linn.	-	-	+	+	-	V
43)	<i>Kyllinga triceps</i> Rottb	+	-	+	-	+	V
44)	<i>Leucas aspera</i> Linn.	+	+	-	-	+	F
45)	<i>Marsilea minuta</i> L	+	-	+	-	-	W
46)	<i>Medicago lupulina</i> Linn	-	-	+	+	-	V
47)	<i>Oldenandia corymbosa</i> Linn	-	-	+	+	-	O
48)	<i>Oxalis corniculata</i> Linn.	-	-	+	-	-	O
49)	<i>Panicum repens</i> Linn.	+	-	+	+	-	O
50)	<i>Parthenium hysterophorus</i> Linn.	+	+	-	-	+	W
51)	<i>Paspalum scorbiculatum</i> Linn.	-	-	+	-	-	M
52)	<i>Phalaris minor</i> Retz	+	+	-	-	-	M
53)	<i>Physalis minima</i> Linn.	-	-	+	-	-	B
54)	<i>Polygonum aviculare</i> Linn.	-	-	+	+	-	W
55)	<i>Saccharum spontaneum</i> Linn.	-	-	+	+	-	O
56)	<i>Setaria glauca</i> (L) P. Beauv	-	-	+	+	-	V
57)	<i>Setaria viridis</i> (L) P. Beauv	-	-	-	-	+	M,W
58)	<i>Sida cordata</i> Linn.	+	+	-	+	-	WW
59)	<i>Sida cordifolia</i> Linn.	-	-	-	+	-	W
60)	<i>Silybum marianum</i> (L) Gaertn	-	-	-	-	+	W, O
61)	<i>Solanum viriginum</i> Linn.	-	-	-	+	-	W
62)	<i>Sonchus oleraceus</i> Linn.	-	-	-	-	+	O
63)	<i>Spheranthus indicus</i> Linn.	-	-	+	+	-	M
64)	<i>Stellaria media</i> (Linn.)Vill	-	-	+	-	-	B,V
65)	<i>Tephrosia purpurea</i> (Linn) Pers.	+	+	-	-	-	F
66)	<i>Themeda quadrivalvis</i> (L) Kuntz	-	-	+	+	-	F
67)	<i>Tridax procumbens</i> Linn.	-	-	-	-	+	W,B,M,O
68)	<i>Trifolium rapens</i> Linn.	-	+	+	-	-	M
69)	<i>Xanthium strumarium</i> Linn.	+	+	-	-	+	W

\*W-Wheat, B-Barley, O-Onion, M-Mustard, F-Fodder, V-Vegetables.

In Sakri site, major weeds in cultivated crops representing 24 species, 22 genera and 09 families. In Mangla site, dominant weeds of rabi crops representing dominant sites with 32 species, 29 genera and 14 families. In Koni (Agriculture College) site, representing the 26 species, 24 genera and 13 families and in Kota site, representing 26 species, 24 genera and 13 families. In Masturi site, dominant weeds representing 29 species, 29 genera and 16 families (Fig. 3).

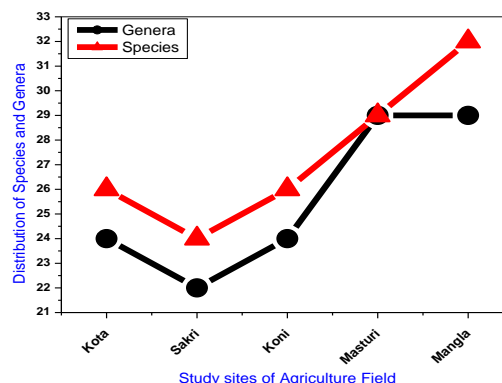


Fig. 3. showing comparative distribution of genera and species in study sites.

Family wise trend in diversity of species and genera with following dominant families Poaceae, Asteraceae, Cyperaceae Lamiaceae and Amaranthaceae in different sites i.e Kota, Sakri, Koni, Masturi and Magla sites of Bilaspur CG were compared and illustrated by (Graph 1-5).

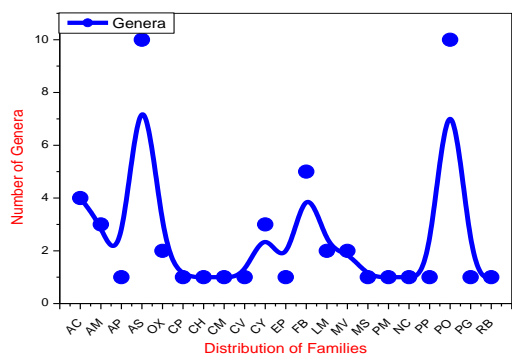


Fig. 1. family wise diversity of genera in different study sites.

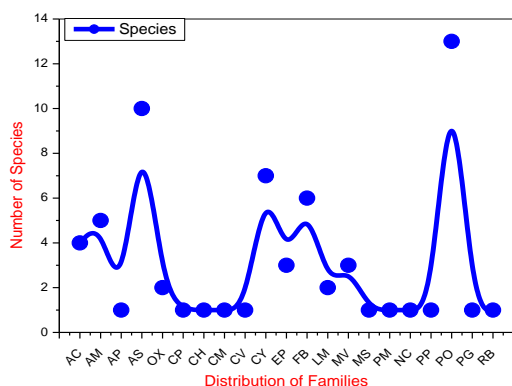


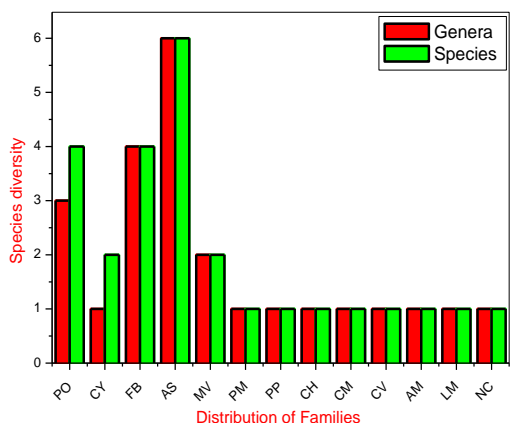
Fig. 2. family wise diversity of number of species in study sites.

Abbreviations

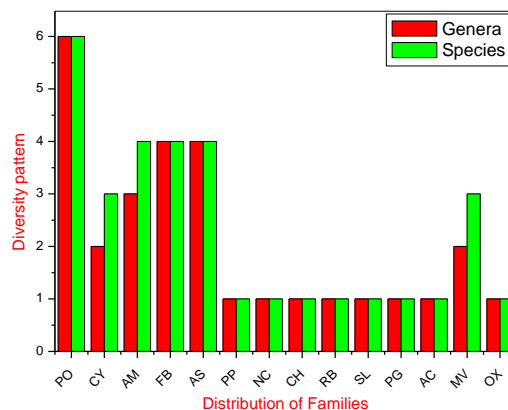
AC-Acanthaceae, AM-Amaranthaceae, AP-Apiaceae, AS-Asteraceae, CP-Capparaceae, CH-Chenopodiaceae, CM-Commelinaceae, CV-Convolvulaceae, CY-Cyperaceae, EP-Euphorbiaceae, FB-Fabaceae, LM-Lamiaceae, MV-Malvaceae, MS-Marsileaceae, NC-Nyctaginaceae, OX-Oxalidaceae, PP-Papaveraceae, PM- Primulaceae, PO-Poaceae, PG-Polygonaceae, RB-Rubiaceae and SL-Solanaceae

Discussion

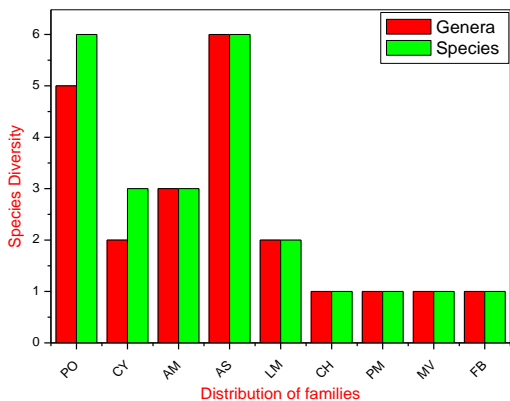
In weed flora of Kashmir valley there are 401 weed species belonging to 251 genera and 56 families was reported (Kaul 1986). In Koni (Agriculture College) total number of weeds of rabi crops varied from *Convolvulus arvensis* to *Xanthium strumarium*. In this site most of the weeds belong to five dominant families were Poaceae (with maximum genera & species), Asteraceae, Cyperaceae, Malvaceae and Euphorbiaceae. In Sakri, total number of weeds of rabi crops varied from *Alysicarpus monilifer* to *Xanthium strumarium*. Most of the weeds belong to five dominant families were Asteraceae (with maximum genera & species), Poaceae, Cyperaceae, Lamiaceae and Amaranthaceae.



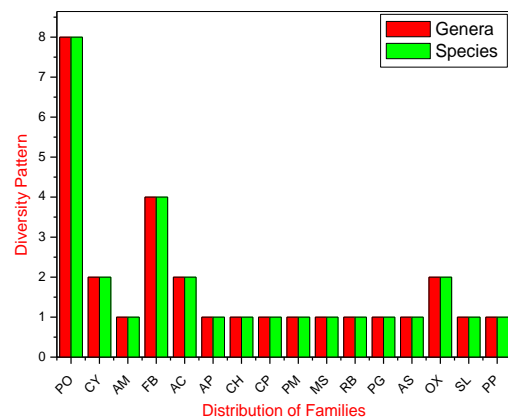
**Graph 1.** Family wise diversity of genera and species in Kota.



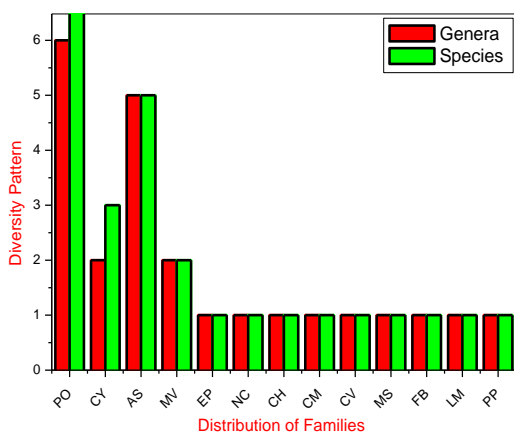
**Graph 4.** Family wise diversity of genera and species in Mangla.



**Graph 2.** Family wise diversity of genera and species in Sakri.



**Graph 5.** Family wise diversity of genera and species in Masturi.



**Graph 3.** Family wise diversity of genera and species in Koni.

In Kota, weeds of rabi crops varied from *Convolvulus arvensis* to *Bidens pilosa*. In this site most of the weeds belong to five dominant families were Asteraceae (with maximum genera & species), Fabaceae, Cyperaceae, Poaceae and Malvaceae. In Mangla site total number of weeds of rabi crops varied from *Sphaeranthus indicus* to *Chloris barbata*. In this site most of the weeds belong to five dominant families were Poaceae (with maximum genera & species), Asteraceae, Amaranthaceae, Fabaceae and Malvaceae.

In present study representing 69 weeds species of rabi crops of different sites of Bilaspur and most of the

weeds belong to families Asteraceae, Fabaceae, Euphorbiaceae, Poaceae and Cyperaceae. Gupta *et al.*, (2008) studied the dynamics of cereal crop weeds of Doon valley with special reference to rice, maize and wheat fields. They reported 151 weed species belonging to 118 genera and 31 families; 57 weeds were reported from rice, 77 from maize and 71 from wheat fields.

In wheat crop of Bannu districts forty three weeds species (Shinwari and Wazir 1988). *Echinochloa crusgali*, *Echinochloa colona*, *Fimbristylis miliacea*, *Xanthium strumarium*, *Celosia argentea*, and *Ageratum conyzoides* weeds species were observed during surveyed in 6 villages of Ambikapur in Chhattisagarh (Oudhia and Dixit, 1994). Hussain *et al.*, (2004) studied the flora of Mastuj Tehsil, Chitral District, Pakistan and ten top most weeds in decreasing order of importance were *Mentha royleana* Benth., *Convolvulus arvensis* L., *Hordeum spontaneum* C. Koch and *Trifolium repens* L., etc. Hussain *et al.*, (2009) reported on species diversity and ecological characteristics of weeds of wheat fields of Botanical Garden at AzaKhel, District Nowshera, Pakistan. Chopra *et al.*, (2002) reported that decrease in seed yield of wheat approximately 28.66% and 28% respectively due to weed competition. Hald (1999) observed the impact of changing the season on the diversity of the weed flora in rotational fields and found that change in land use spring to winter cereals involved more than 25% immediate reduction in the density of plants and species and altered and made less predictable the composition of the weed flora.

Rajput *et al.*, (2003) observed that *Cyperus rotundus* L., *Argemone mexicana* L., *Celosia argentea* L., *Digera arvensis* L., *Euphorbia hirta*, *Launea splanifolia*, *Cynodon dactylon*. Paradker (1995) surveyed the weed flora of winter crop in Balaghat (MP) and Paradker *et al.*, (1993) reported that winter vegetables of Satpuda MP. Weed flora of agricultural field not only minimize the nutritionally value which ultimately effect the growth and quality of the cultivated crops but minimize the aesthetic value.

These weeds found suitable place in the cultivated field/agricultural field as they get sufficient water and proper nutrition. They are found growing in association with cultivated crops in different habitat of the fields and effect the growth of cultivated species/ crops. The weed control problems present a major challenges to the cultivated and managing authorities of the agricultural field because of increasing labour and other production costs that reduce the net income of the by selling of the cultivated crops.

#### Acknowledgement

Authors are thankful to Dr R. K.S. Tiwari Senior Scientist, Agriculture College, Bilaspur CG for help and support during field work. One of Author (PKS) is thankful to Prof. S.K. Chaturvedi, Head, Department of Botany, Guru Ghasidas University, Bilaspur CG for encouragement.

#### References

- Abusteit EO.** 1993. Weed competition in soybeans. Journal of Agronomy and Crop Science, **171(2)**, 96-101.
- Ahmad S.** 1992. Preliminary studies on the weeds of wheat fields of Babri Banda, Kohat District, NWFP. Pakistan Journal Weed Science Research, **5**, 36-40
- Chopra NK, Sinha JP, Chopra KB.** 2002. Effect of seedling age on seed yield and its quality in paddy CV, Pusa 44. Seed Research, **30(1)**, 79-81
- Dangwal LR, Singh A, Singh T, Sharma A, Sharma C.** 2010. Effect of weeds on the yield of wheat crop in Tehsil Nowshera. Journal of American Science, **6**, 405-407.
- Frick B, Thomas AG.** 1992. Weed surveys in different tillage systems in southwestern Ontario field crops. Canadian Journal of Plant Science, **72**, 1337-1347.

- Gupta A, Joshi SP, Manahas RK.** 2008. Multivariate analysis of diversity and composition of weeds communities of wheat fields in Doon valley India, *Tropical Ecology*, **49**, 103-112
- Hald AB.** 1999. The impact of changing the season in which cereals are shown on the diversity of the weed flora in rotational fields in Denmark. *Journal of Applied Ecology*, **36**, 24-32.
- Holm L, Plucknett D, Pancho J, Herberger J.** 1977. *The World's Worst Weeds: Distribution and Biology*. University of Hawaii Press, Honolulu, 609 pp.
- Holzner W.** 1978. Weed species and weed communities. *Vegetatio*, **38**, 13-20.
- Hussain F, Murad A. Durrani MJ.** 2004. Weed communities in the wheat fields of Mastuj District Chitral, Pakistan. *Pakistan Journal of Weed Science and Research*, **10(3-4)**, 101-108.
- Hussain F, SM. Shah, Fazal-e-Hadi, Asadullah.** 2009. Diversity and ecological characteristics of weeds of wheat fields of University of Peshawar Botanical Garden at AzaKhel, District Nowshera, Pakistan. *Pakistan Journal of Weed Science and Research*, **15(4)**, 283-294.
- Kasera PK.** 1988. *Arid Agro-ecosystem: Weed Biology and Weed Management*, Ph.D. Thesis, University of Jodhpur, Jodhpur, India
- Kaul MK.** 1986. *Weed flora of Kashmir Valley*. Scientific Publishers, Jodhpur, India, 422 pp
- Oudhia P, Kolhe SS, Tripathi RS.** 1997. Allelopathic effects of white top (*Parthenium hysterophorus* L.) on chickpea. *Legume Research*, **20(2)**, 117-120.
- Oudhia P, Tripathi RS.** 1997. Allelopathic potential of *Calotropis gigantea* R.Br. *World Weeds* **4**, 109-119.
- Oudhia P, Tripathi RS.** 1998. Allelo-pathic effects of *Parthenium hysterophorus* L. on kodo, mustard and problematic weeds. In: *Proceeding First International Conference on Parthenium Management (Vol. II)*, UAS, Dharwad, India. 6-9 October, 136-139.
- Oudhia Pankaj, Dixit Anil** 1994. Weeds in Ambikapur region (Madhya Pradesh) and their traditional use. *Weed News*, **1(2)**, 19-21.
- Paradkar NR.** 1995. Weed flora of winter crops in Balaghat district (Madhya Pradesh). *Advances in Plant Sciences*, **8**, 367-370
- Paradkar VK, Saraf RK, Tiwari JP.** 1993. Weed flora of winter vegetable of Satpura Plateau, region of Madhya Pradesh. *Proceeding Indian Society. Weed Science International Symposium*, Vol. 2 Hisa.
- Rajput HD, Singh K, Kushwh SH.** 2003. Integrated weed management in chilli (*capsicum annum*). *Indian Journal of Agronomy* **48(2)**, 136-138.
- Sen DN.** 1979. *Ecophysiological studies on weeds of cultivated fields with special reference to Bajra (Pennisetum typhoideum Rich.) and Til (Seasamum indicum Linn.) crops*. Final Report US PL-4 Project, University of Jodhpur, Jodhpur, India
- Sen DN.** 1988. *Environment and Plant Life in Indian Desert*. Geobios International, Jodhpur, India.
- Sen DN.** 1990a. *Ecology and Vegetation of Indian Desert*. Agro-Botanical Publishers, Bikaner, India.
- Sen DN.** 1990b. Key factors affecting weed-crop balance in Agro-ecosystems. In: *Weed Management in Agro-ecosystem: Ecological approaches*, Eds.



Altieri M A. and Liebman M., CRC Press Inc, Boca Raton, Florida USA, 157-182.

**Shinwari ZK, Wazir I K.** 1988. A key and checklist to the weeds of wheat fields of Bannu District, Pakistan. *Journal of Agronomy Research*, **9(4)**, 561-573.

**Singh KK, Prakash A.** 1996. Observations on ethno-botany of Kol tribes of Varanasi District of Uttar Pradesh. *Indian Journal of Economic Taxonomic Botany* **120**(Addl. Ser), 133-135.

**Singh KN, Ara S, Wani GA, Hasan B, Khanday BA.** 2007. A phyto-sociological association of weeds in winter crops of Kashmir valley. *Indian Journal of Weed Science*, **39**(1-2), 74-77.

**Thomas AG.** 1985. Weed survey system used in Saskatchewan for cereal and oilseed crops. *Weed Science*, **33**, 34-43.