Short communication

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Indian hemp : An emerging weed of wheat fields in Punjab

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Wheat (*Triticum aestivum* L.) is the predominant *Rabi* crop of North-Western Plain Zone and Central Zone of India. It occupied about 35.12 lac hectare area with a production of 165.91 lac tonnes during 2013-14 in Punjab (Anonymous 2014). A number of factors influence wheat production including weed infestation. Yield losses of wheat due to weeds are estimated around 25-50% and in very severe cases the losses may go upto 80% (Malik *et al.* 1995). The present study was conducted to identify emerging weeds in wheat crop in various districts of Punjab so as to devise effective weed control strategies in time.

Weed survey was conducted in wheat during the month of March in 2014 and 2015 in ten districts of Punjab belonging to three zones. Stoppage was made at 10 km for each survey and survey spot was selected more than 100 m deep in the field. The observations were recorded with quadrate of 50 x 50 cm placed randomly at four spots in one acre or a large field. Frequency and absolute density were worked out from the weed count data using following equations:

a. Frequency (%) = (Number of quadrates in which species occurs/ Total number of quadrates) x100

b. Absolute density (m^2) = (Total no of individuals of a species in all quadrates/ Total number of quadrates)

Interpretation of weed frequency was calculated as per McIntosh (1962), Ahmad *et al.* (2009)

The major weeds of wheat included four broad-leaf weeds (*Cannabis sativa, Chenopodium album, Malva neglecta* and *Rumex dentatus*) and four grasses (*Avena ludoviciana, Phalaris minor, Poa annua* and *Sorghum halepense*) (Table 1). During 2014, six weed species belonging to four families were recorded in wheat crop. However, infestation of *M. neglecta* and *S. halepense* in wheat fields widened the weed spectrum during 2015 with eight weed species belonging to five families.

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Table 1. Weeds flora of wheat in various districts of Punjab

Weed species	Common name	Local name	Family
A.ludoviciana	Wild oats	Jaundhar	Poaceae
C.sativa	Indian hemp	Bhang	Malvaceae
C.album	Lambs quarter	Bathu	Chenopodiaceae
M. neglecta	Button weed	-	Malvaceae
P. minor	Littleseed canary grass	Gulli danda	Poaceae
P. annua	Annual blue grass	Ghuien	Poaceae
R. dentatus	-	Jangli palak	Polygonaceae
S. halepense	Johnson grass	Baru	Poaceae

Submontane zone: In district Roopnagar, three and four weed species were recorded during 2014 and 2015, respectively (Tables 2 and 3). *P. minor* was the most densely populated weed during both the years. *C. sativa* was not recorded in 2014, and in 2015, it turned out to be the fourth major weed of wheat in this district after *P. minor, P. annua* and *R. dentatus* based on the frequency and absolute density data. In district Hoshiarpur, five weed species were observed during both the years. During 2014, *R. dentatus* and *P. minor* were the most frequent and most densely populated weeds, respectively. The most noteworthy change was that although *C.sativa* was an occasional weed during 2014 (54.6%), but it became a common weed of wheat fields of district Hoshiarpur by attaining very high frequency of 83.6% during 2015. Absolute density of this weed also increased in this district by more than three times from 1.2 to 3.7 plants m^2 within one year.

During 2014, five weed species, *viz. P. minor*, *R. dentatus*, *C. sativa*, *C. album* and *P.annua* were recorded in wheat fields of districts Jalandhar and Kapurthala of central zone. *C. album* was not recorded in district SBSN but other four weed species as observed in Jalandhar and Kapurthala were recorded in this district along with *A. ludoviciana* as the additional weed. During 2015, *M. neglecta* was also observed in wheat fields of Kapurthala and Jalandhar districts and *S. halepense* in SBSN district only. In Ludhiana and Moga districts, six weed spp. *viz., P. minor*, *R. dentatus*, *C. sativa*, *A. ludoviciana*, *P. annua* and *C. album* infested wheat fields. Weed flora of wheat fields of Ludhaiana and Moga districts was same during both the years.

Table 2. Frequency (%) and density (m^2) of weeds infesting wheat fields in three zones of Punjab during March in 2014

Agro-climatic zone	*P. minor*		*R.dentatus*		*C. sativa*		*A. ludoviciana*		*C.album*		*S. halepense*		*M. neglecta*		*P. annua*	
	F	D	F	D	F	D	F	D	F	D	F	D	F	D	F	D
Submontane																
Roop Nagar	50.7	1.2	17.8	0.5	0	0	0	0	0	0	0	0	0	0	15.8	0.9
Hoshiarpur	56.8	2.2	60.1	0.6	54.6	1.2	34.8	0.5	0	0	0	0	0	0	10.7	0.2
Central																
Kapurthala	72.8	8.7	60.8	0.6	40.8	0.9	0	0	15.9	0.5	0	0	0	0	25.8	0.5
Jalandhar	75.8	3.9	65.6	0.4	45.6	0.7	0	0	15.3	0.3	0	0	0	0	18.7	0.7
SBSN	78.7	2.1	20.7	0.2	5.8	0.1	10.8	0.2	0	0	0	0	0	0	13.7	0.4
Ludhiana	89.8	6.1	45.8	0.5	30.8	0.2	18.6	0.2	12.6	0.2	0	0	0	0	17.6	0.4
Moga	70.6	4.1	30.6	0.6	10.6	0.1	15.8	0.2	15.8	0.3	0	0	0	0	20.7	0.4
Arid Irrigated																
Bathinda	10.8	0.7	17.8	0.6	0	0	14.8	0.5	54.8	2.1	0	0	0	0	13.8	0.4
Muktsar	54.8	1.5	13.7	0.4	0	0	18.7	0.4	64.7	2.2	0	0	0	0	10.9	0.7
Faridkot	30.8	1.4	12.8	0.6	0	0	12.8	0.3	37.8	2.0	0	0	0	0	8.7	0.2

Table 3. Frequency (%) and density (m^2) of weeds infesting wheat fields in three zones of Punjab during March in 2015

Agro-climatic zone	*P.minor*		*R.dentatus*		*C.sativa*		*A.ludoviciana*		*C.album*		*S. halepense*		*M. neglecta*		*P. annua*	
	F	D	F	D	F	D	F	D	F	D	F	D	F	D	F	D
Submontane																
Roop Nagar	75.8	1.8	25.8	0.7	11.9	0.2	0	0	0	0	0	0	0	0	22.7	1.2
Hoshiarpur	72.6	2.7	75.6	0.8	83.6	3.7	55.6	0.7	0	0	0	0	0	0	15.7	0.3
Central																
Kapurthala	74.5	7.7	72.5	0.7	65.7	1.2	0	0	23.5	0.6	0	0	8.5	0.2	32.5	0.7
Jalandhar	78.5	4.9	74.5	0.5	64.7	0.9	0	0	18.6	0.4	0	0	6.7	0.3	21.5	0.9
SBSN	82.5	2.7	22.7	0.4	12.7	0.1	20.6	0.3	0	0	32.5	0.8	0	0	16.7	0.5
Ludhiana	87.5	5.8	58.6	0.7	45.6	0.3	24.5	0.2	15.6	0.3	0	0	0	0	20.8	0.5
Moga	72.8	3.6	39.8	0.8	19.8	0.3	16.8	0.4	20.8	0.6	0	0	0	0	25.7	0.6
Arid Irrigated																
Bathinda	14.5	0.9	23.5	0.7	0	0	12.5	0.3	65.7	1.3	0	0	0	0	10.7	0.2
Muktsar	68.9	1.9	11.6	0.3	7.6	0.1	14.6	0.2	75.6	2.7	0	0	0	0	8.9	0.4
Faridkot	34.6	1.6	10.8	0.4	0	0	9.8	0.2	39.8	1.9	0	0	0	0	7.9	0.3

P. minor was the most frequent and densely populated weed of Jalandhar, Kapurthala, SBSN, Ludhiana and Moga districts of Punjab. *C. sativa* was an occasional weed (40.8-45.6%) of districts Kapurthala and Jalandhar during 2014, but it became a frequent weed (64.7-65.7%) in wheat fields of these districts during 2015 (Tables 2 and 3)..

In Bathinda, Muktsar and Faridkot districts (arid irrigated zone), five weed species *viz.*, *P. minor*, *R. dentatus*, *A. ludoviciana*, *C. album* and *P. annua* were observed during 2014. During 2015, six weed species were observed in Muktsar district with the addition of *C. sativa* in the weed spectrum. As compared to other zones, *P. minor* infestation was comparatively less in this zone of Punjab. *C. album* was the most frequent and most densely populated weed of arid irrigated zone. There was no infestation of *C. sativa* in wheat fields of arid irrigated zone in 2014. Although at a very low frequency, it has started to emerge even in Muktsar district of this zone in 2015 (Table 2 and 3).

This survey clearly shows that *P. minor* is still the dominant weed of wheat fields but *C. sativa*, which was earlier a weed of non-cropped areas has also started infesting wheat fields. The survey indicated alarming increase in frequencies and densities of *C. sativa* in different areas of Punjab particularly in districts Hoshiarpur, Kapurthala, Jalandhar and Ludhiana in Submontane and central zones. In these districts, the frequency of *C. sativa* increased from 30.8-54.6% to 45.6-83.6% in one year. This level of increase in infestation indicated that this weed is likely to become a major weed of wheat in near future in these districts. Khan *et al.* (2014) ranked *C. sativa* as second most dense and frequent weed after *Parthenium hysterophorus* in Peshawar valley of Pakistan.

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SUMMARY

Wheat fields of three agro-climatic zones, *viz.* submontane zone (districts Roopnagar and Hoshiarpur), central zone (Jalandhar, Kapurthala, Shaheed Bhagat Singh Nagar, Ludhiana and Moga) and arid irrigated zone (districts Bathinda, Muktsar and Faridkot) were surveyed for recording weed flora during the month of March in 2014 and 2015. The major weed flora included four broad-leaf weeds *Cannabis sativa*, The most noteworthy change was increase in the frequency of *C. sativa* over two years. *C. sativa* which was earlier a weed of non-cropped areas has started infesting wheat fields also. The frequency of C. *sativa* in districts Ludhiana, Kapurthala, Jalandhar and Hoshiarpur increased from 30.8-54.6% in 2014 to 45.6-83.6% in 2015. In districts Roopnagar, Shaheed Bhagat Singh Nagar and Moga, the frequency of this weed increased from 0-10.6% in 2014 to 11.9-19.8% in 2015. The survey indicated that *C. sativa* is likely to become a major weed of wheat in near future in four districts *viz.*, Ludhiana, Kapurthala, Jalandhar and Hoshiarpur.

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