Distribution of weed flora of Indian mustard in Haryana

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ABSTRACT

A Survey of weed flora of Indian mustard (*Brassica juncea* L.) in south-western Haryana conducted during 2004-05 revealed that a total of 29 species were found to infest mustard fields, out of which 3 were grassy, 26 were broadleaf weeds. *Asphodelus tenuifolius Chenopodium album*, *Melilotus indica*, *Trigonella polycerata*, *C. murale*, *Cynodon dactylon*, *Orobanche aegyptiaca*, *Carthamus oxycantha*, *Avena ludoviciana* and *Convolvulus arvensis* were found highly associated with mustard crop in all districts. *Asphodelus tenuifolius* was the dominant weed in all districts except Hisar where relative density (R.D.) of *C. album* was more. *Malwa parviflora* a robust dicotyledonous weed which was considered to be weed of non cropped areas has also shown its presence in Jind, Jhajjar, Hisar, Rohtak and Mewat districts. Infestation of parasitic weed *Orobanche aegyptiaca* was more in Bhiwani, Rewari, Mahender Garh, Jhajjar and Gurgaon districts where crop is grown in light textured soils(loamy sand) and irrigated by sprinkler.

Key Words: Mustard, Grassy, Broadleaf, Ashodelus tenuifolius, C.album, Melilotus indica and C.murale

Indian mustard *(Brassica juncea* L. Czern and Coss) is the major cash crop of north-eastern Haryana grown in an area of 6.5 lakh ha in the state after pearlmillet, sorghum, fallow and clusterbean. Crop weed competition has been established as major deterrent for its low productivity. Although mustard is fast growing crop but due to its sowing at wider provide congenial atmosphere for weeds to grow resulting in 10-30% decrease in seed yield depending upon weed flora and intensity (Bhan 1992). Crop type and soil properties had greatest influence on the occurrence of weed species (Streibig *et al*. 1984 and Andreasen *et al.* 1991).The type of irrigation, cropping pattern, weed control measures and environmental factors had a significant influence on the intensity and infestation of weeds (Saavedra *et al.*1980). So, knowledge of weed species associated with crops in a region is therefore pivotal and necessary to plan and execute a sound and economical weed management schedule depending upon various factors affecting weed distribution in different areas. The present survey was the first attempt in totality to cover all mustard growing districts of Haryana state to study the composition of weed flora of mustard crop.

MATERIALS AND METHODS

To study the floristic composition of weeds in mustard in south-western Haryana, 257 fields were surveyed in Hisar, Bhiwani, Sirsa, Fatehbad, Mahendra Garh, Mewat, Gurgaon, Rohtak, Sonepat, Jhajjar and Jind districts of state during November - January as this period depicted most appropriate representation of majority of weed species as the weeds have cumulative effects of all agronomic practices, soil type, fertilizer and irrigation

application and weed control measures adopted during initial crop growing period. The road map of Haryana state was followed and routes were planned to establish sampling localities as equidistantly as possible (about10 Kms) avoiding inhabited areas. Four observations on density of individual weeds were recorded per field from four fields at one spot by using quadrate of (0.5 x 0.5 m), 100 meter deep inside the fields. Pooled average values of observations of weed density and percent occurrence of individual weeds were thus calculated as per method suggested by Misra (1968) and Raju (1977) given below:

$$\text{Relative density} = \frac{\text{No. of individuals in all quadrates}}{\text{No. of all species in all quadrates}} \times 100$$

$$\text{Per cent occurrence} = \frac{\text{No. of occurrences of a species in a district}}{\text{Total no. of observations recorded in a district}} \times 100$$

RESULTS AND DISCUSSION

Twenty nine weed species were found in the phyto-sociological survey of weeds in mustard crop throughout the state. Out of 29 weed species, 10 were found to be highly associated with mustard crop. The weeds *Asphodelus tenuifolius*, *C. album*, *Melilotus indica*, *Trigonella polycerata*, *C. murale*, *Cynodon dactylon*, *Orobanche aegyptiaca*, *Carthamus oxycantha*, *A. ludoviciana* and *Convolvulus arvensis* were found to be highly aggressive and dominating over other weed species present. *Asphodelus tenuifolius* was the most dominant weed in all the districts with a weed density of 17.4 - 67.9 plants/m² with a relative density of 13.5-37.1% except Mahendra Garh where *C. murale* with a relative density of 27% was most dominating weed followed by *C. album* (R.D. 24.8%) (Table 1 and 2). Broadleaf weeds *C. album*

Table 1. Weed flora of cotton in different districts of Haryana

Name of weed	Hisar			Fatehbad			Sirsa			Bhiwani			Jind			Rohtak		
	R.D. (%)	R.F. (%)	IVI	R.D. (%)	R.F. (%)	IVI	R.D (%)	R.F. (%)	IVI	R.D. (%)	R.F. (%)	IVI	R.D. (%)	R.F. (%)	IVI	R.D (%)	R.F. (%)	IVI
Amaranthus viridis	4.1	4.9	9	1.3	5	6.3	1.4	3.3	4.7	2.0	2.2	4.2	0.8	6.4	7.2	0.9	4.4	5.3
Brachiaria reptans	0	0	0	0.1	2.1	2.2	0.3	4.9	5.2	2.9	3.5	6.4	5.3	6.6	11.9	2.8	6.4	9.2
Celosia argentea	0	0	0	2.6	7.6	10.2	2.2	5.7	7.9	0	0	0	1.2	4	5.2	1.7	5.6	7.3
Cenchrus ciliaris	0	0	0	0	0	0	0	0	0	1.7	7.8	9.5	0	0	0	0.3	2.5	2.8
Cleome viscosa	0.5	5.8	6.3	1.5	4	5.5	0.3	7.8	8.1	2.2	4.3	6.5	0	1.7	1.7	0	0	0
Convolvulus arvensis	0	0	0	0	0	0	0	0	0	0.9	5.7	6.6	2.2	3.4	5.6	1.8	1.8	3.6
Corchorus tridens	1.2	6.6	7.8	2.3	5.8	8.1	0.8	7.6	8.4	2.3	4.3	6.6	1.1	3.2	4.3	0	0	0
Cucumis callosus	0.2	6	6.2	1.3	8.5	9.8	0	0	0	1.7	2.8	4.5	0.6	5.2	5.8	1	5	6
Cynodon dactylon	0	0	0	0	0	0	0.9	7	7.9	0	0	0	0	0	0	0.9	6.4	7.3
Cyperus rotundus	3.4	7.4	10.8	2.3	10.1	12.4	3.4	9.2	12.6	2.6	9.9	12.5	8.5	8.2	16.7	6.5	11.5	18
Dactyloctenium aegypticum	20.4	9.5	29.9	17.9	8.3	26.2	21.4	9.9	31.3	9.5	8.6	18.1	7.5	8.6	16.1	7.8	9.6	17.4
Digera arvensis	3.9	10.8	14.7	7.9	10.1	18	5.2	11.1	16.3	8.6	9.9	18.5	4.0	7.5	11.5	3.6	8.4	12.0
Digitaria sanguanalis	1.1	4.1	5.2	0	0	0	0.3	2.9	3.2	0.8	1.7	2.5	2.3	5.6	7.9	0	0	0
Echinochloa colona	5.8	9.2	15	8.3	9.3	17.6	8.7	7.8	16.5	4.0	7.1	11.1	6.8	9.4	16.2	5.5	12.2	17.7
Eragrostis tenella	0	0	0	0	0	0	0	0	0	1.5	6.4	7.9	1.4	5.8	7.2	1.5	3.8	5.3
Molluga cerviana	0	0	0	0	0	0	0	0	0	1.4	2.2	3.6	0	0	0	0	0	0
Phyllanthus niruri	2.1	6.5	8.6	1.5	2.6	4.1	1.6	6.2	7.8	1.6	2.8	4.4	1.6	4	5.6	1.6	3.2	4.8
Physallis minima	0.3	6.9	7.2	2.3	6	8.3	0.8	4.8	5.6	2.7	3.5	6.2	2.5	4	6.5	6.2	3.8	10
Saccharum spontanium	0	0	0	0.1	2.1	2.2	0.1	0.2	0.3	0	0	0	0	0	0	0	0	0
Solanum nigrum	0	0	0	0	0	0	0	0	0	0.13	1.4	1.53	2.4	2.1	4.5	1.9	3.2	5.1
Trianthema portulacastrum	56.8	15.9	72.7	49.4	10.3	59.7	52.2	11.6	63.8	51.8	9.9	61.7	48.7	9.4	58.1	56	12.2	68.2
Tribulus terrestris	0.1	6.4	6.5	1.1	8.2	9.3	0	0	0	2.2	5.7	7.9	2.0	5	7	0	0	0

Table 2. Weed flora of cluster bean in south-western districts of Haryana

Name of weed	Hisar			Fatehbad			Sirsa			Bhiwani			Mahender Garh		
	R.D. (%)	R.F. (%)	IVI	R.D. (%)	R.F. (%)	IVI	R.D. (%)	R.F. (%)	IVI	R.D. (%)	R.F. (%)	IVI	R.D. (%)	R.F. (%)	IVI
Aerva javanica	0	0	0	0	0	0	0	0	0	0.85	1.9	2.75	1.6	3.15	4.65
Brachiaria reptans	0	0	0	0	0	0	0.5	3.15	3.65	3.7	4.51	8.21	2.6	6.75	9.35
Cenchorus echinatus	0	0	0	0	0	0	0	0	0	2.0	5.0	7	2.9	6.3	9.2
Citrullus lanatus	0	0	0	0	0	0	0	0	0	1.4	1.55	2.95	0.39	2.25	2.64
Cleome viscosa	1.1	3.82	3.92	3.1	6.75	9.85	1.4	4.85	6.25	34.4	7.0	41.4	27.9	5.4	33.3
Corchorus tridens	0.5	8.91	9.41	0.35	7.6	7.95	1.2	9.01	10.21	4.1	7.0	11.1	6.3	9.0	15.3
Cucumis callosus	0.2	8.91	9.11	0.9	8.74	8.82	0.7	12.6	13.3	0.28	7.0	7.28	0.9	4.5	5.4
Cynodon dactylon	0.02	3.18	3.20	0	0	0	0	0	0	1.7	6.22	7.92	2.9	2.25	5.15
Cyperus rotundus	21.7	8.27	29.8	9.3	5.9	15.22	4.4	7.19	11.59	1.7	6.22	7.92	2.9	2.25	5.15
Dactyloctenium aegyptium	1.6	7.64	9.24	2.2	5.07	7.27	3.5	6	9.5	3.0	6.22	9.22	2.4	8.1	10.5
Digera arvensis	69.0	10.1	79.1	64	10.1	76.13	62.7	12.6	75.3	3.2	1.9	5.1	2.5	6.75	9.20
Digitaria sanguinalis	0.3	7.0	7.0	0.3	6.96	6.99	0	0	0	0.42	6.4	6.82	0.96	9.0	9.46
Echinochloa colona	0.38	3.18	3.56	0.9	5.27	6.17	1.8	3.42	5.22	0	0	0	0	0	0
Euphorbia hirta	0.76	3.82	4.58	2.2	7.9	10.1	0.8	3.59	4.39	0	0	0	0	0	0
Phyllanthus niruri	0.87	5.72	6.59	1.02	6.9	6.92	0.8	8.08	8.88	3.2	5.6	8.8	5.6	2.7	8.3
Physallis minima	1.3	9.55	10.85	1.9	9.28	11.18	3.0	8.99	11.99	3.5	5.44	8.94	7.1	6.75	13.05
Trianthema portulacastrum	8.6	4.45	13.05	11.8	6.9	18.7	19.5	4.28	23.78	6.2	0.93	7.13	3.6	1.8	5.4
Tribulus terrestris	0.49	7.64	8.13	1.2	8.75	9.95	0.26	9.89	10.15	1.7	6.8	8.5	4.1	4.95	9.05
Zizyphus rotundifolia	0	0	0	0	0	0	0	0	0	8.22	5.75	13.97	0.9	5.4	6.3

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Table 3. Weed flora of clusterbean in southern Haryana

Weed Species	Jhajjar			Rewari			Gurgaon			Mewat		
	R.D. (%)	R.F. (%)	IVI	R.D. (%)	R.F (%)	IVI	R.D. (%)	R.F. (%)	IVI	R.D. (%)	R.F. (%)	IVI
Amaranthus viridis	0.5	1.7	2.2	5	6.4	11.4	0	0.0	0.0	2.2	13.8	
Bulbostylis barbata	2.9	5.2	8.1	10.1	9.7	19.8	0	0.0	0.0	0	0.0	0.0
Cleome viscosa	7.8	8.6	16.4	2.5	5.8	8.3	0	0.0	0.0	0	0.0	0.0
Corchorus tridens	1.4	3.4	4.8	8.7	9.7	18.4	0	0.0	0.0	0	0.0	0.0
Cucumis callosus	1.4	6.9	8.3	1	4.2	5.2	1.4	18.5	19.9	4.3	15.4	19.7
Cyperus rotundus	11.2	8.6	19.8	12	12.9	24.9	5.5	11.5	17.0	6.5	12.3	18.8
Dactyloctenium aegyptium	11.8	10.5	22.3	7.5	9.7	17.2	24.2	11.5	35.7	8.7	12.3	21.0
Digera arvensis	43.2	15.6	58.8	37.1	12.9	50.0	48.4	25.0	73.4	54.3	30.8	85.1
Digitaria sanguinalis	4.2	6.9	11.1	1.7	4.2	5.9	8.3	17.3	25.6	0	0.0	0.0
Echinochloa colona	0.9	1.7	2.6	0	0.0	0.0	4.2	5.8	10.0	21.7	6.2	27.9
Elusine indica	5.5	5.2	10.7	1.2	3.2	4.4	0	0.0	0.0	0	0.0	0.0
Eragrostis tremula	0.9	1.7	2.6	3.3	3.2	6.5	2.8	4.6	7.4	0	0.0	0.0
Molluga verticillata	0.5	1.7	2.2	3.5	3.2	6.7	0	0.0	0.0	0	0.0	0.0
Physallis minima	1.9	3.4	5.3	0	0.0	0.0	5.2	5.8	11.0	0	0.0	0.0
Phyllanthus niruri	3.2	6.9	10.1	2.3	6.4	8.7	0	0.0	0.0	2.2	9.2	11.4
Trianthema portulacastrum	0.5	1.7	2.2	3.3	4.2	7.5	0	0.0	0.0	0	0.0	0.0
Tribulus terrestris	2.2	10.3	12.5	0.8	4.2	5.0	0	0.0	0.0	0	0.0	0.0

and *M. indica* occurred at 100% of sites surveyed. In all the districts, *C. album* was the second most important weed except Rewari and Jhajjar where *C. murale* infestation was more as compared to *C. album*. Brackish underground waters used for irrigation in Rewari and Jhajjar districts may be reason for prevalence of *C. murale* in these areas as this weed flourishes only under saline-sodic waters. Parasitic weed *Orobanche aegyptiaca* had more infestation and relative frequency in Bhiwani, Mahendra Garh, Rewari, Jhajjar, and Gurgaon where soils are loamy sand in texture and crop is irrigated with sprinkler than Hisar, Sirsa, Fatehbad and Mewat. This weed was absent in Rohtak, Sonepat and Jind districts. *Trigonella polycerata* and *Sisymbrium irio* other weeds of light textured soils were also found in Bhiwani, Mahender Garh, Jhajjar, Gurgaon, Sirsa, Fatehbad districts of state (Table 1 and 2). Where as Silene conidea showed its presence in Bhiwani and Mahendra Garh districts at 12 and 20 % sites, respectively. Typical dry land weeds such as *Aerva javanica*, *Zizyphus rotundifolia*, *Pluchea lanceolata* and *Carthamus oxycantha* were present in Bhiwani, Jhajjar, Mahendra Garh, Gurgaon, Fatehbad, Sirsa and Mewat districts. Grassy weeds like *P. minor* and *A.ludoviciana* showed significant presence in all districts except Bhiwani and Mahendra Garh. In Jind, Sonepat, Sirsa, Hisar and Fatehbad, *P. minor* was among the first five dominating weeds because in these districts mustard is grown in cotton-wheat-pearlmillet and mustard crop sequence so ecological conditions are favourable for the *P. minor* establishment while in Mewat, Gurgaon, Sonepat, Rohtak and Rewari, *A. ludoviciana* was among the list of five dominating weeds with higher weed density. *Malwa parviflora* a robust dicotyledonous weed which was considered to be weed of non cropped areas has also shown its presence in Jind, Jhajjar, Hisar, Rohtak and Mewat districts although with low density. New weed *Veronica persica* with a relative density of 1.5 plants/m^2 was also found to infest the crop at 20% locations in Mahender Garh district. Similarly, *Anagallis arvensis* was prevalent in Sirsa, Jind, Hisar, Mewat, Rohtak, Sonepat while it was absent in Rewari, Mahendra Garh and Bhiwani. Greater soil moisture, heavy soils with high fertility and the absence of any suitable control measure seemed to contribute the dominance of these two weeds.

The data clearly show that the occurrence of weed species could directly be correlated to the soil type, fertility status, under ground quality water, cropping patterns and agronomic practices followed in that area. Careful monitoring of the changing weed flora could be of much practical value in implementing an effective control measure depending upon the threshold value to keep the weeds at bay at an economical viable cost.

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