Weed flora of cotton and clusterbean in Haryana

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ABSTRACT

A survey of weed flora of cotton and clusterbean in south-western Haryana revealed that a total of 22 species were found to infest cotton crop, out of which 7 were grassy, one was sedge and 14 were broad leaf weeds. On the basis of IVI values, *Trianthema portulacastrum, Dactyloctenium aegypticum, Echinochloa colona, Digera arvensis* and *Cyperus rotundus* were found highly associated with cotton crop in all districts. *T. portulacastrum* alone constituted 48.7-56.8% of total weed flora with IVI values of 58.1-72.7 in all the districts, was the most dominant weed of cotton crop. Similarly cluster bean crop was found to infest with 25 major weeds of which 9 were grassy, 2 were sedges and 14 were broad leaf weeds *viz., Digera arvensis, Cleome viscosa T. portulacastrum, Cyperus rotundus, Physallis minima, D. aegypticum, Corchorus tridens, Mollugo verticillata and Cucumis callosus. Digera arvensis* constituting 43.2 to 69 % of total weed flora alone was the most dominant weed of cluster bean crop in all the districts except Bhiwani and Mahender Garh where *C. viscosa* was the most dominant weed with a relative density of 34.4 and 27.9 % and IVI values of 41.4 & 33.3, respectively. Among grassy weeds, *Dactyloctenium aegypticum* was the major grassy weed in all districts except in Mewat where *Echinochloa colona* was the most dominant weed with IVI value of 27.9. *Mollugo verticillata*, a weed of loamy sand soils showed its presence in Bhiwani, Mahender Garh, Jhajjar and Rewari only.

Key words: *Trianthema portulacastrum, Dactyloctenium aegypticum, Echinochloa colona, Digera arvensis, Cleome viscosa,* IVI value, Cotton, Clusterbean

Cotton and clusterbean are main important cash crops of south-western Haryana. Haryana state also has very strong canal based irrigation system. These crops are mainly planted after harvesting of wheat and mustard. Cotton crop, being planted widely spaced and slow initial growth faces severe competition due to weeds resulting in heavy yield losses.

Cluster bean is also a poor competitor with weeds and suffers heavily in early growth stage due to favorable environment for weeds to thrive. Critical period of crop weed competition in cluster bean has been identified as 20-30 DAS and presence of weeds beyond this result in yield reductions by 47 to 92% (Bhadoria *et al.* 2000 and Yadav 1998). Crop type and soil properties has 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 also have 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 cotton and cluster bean growing districts of Haryana state to study the composition of weed flora infesting these crops.

MATERIALS AND METHODS

Weed survey of cotton was conducted in six cotton producing districts namely Hisar, Fatehbad, Sirsa Jind, Bhiwani and Rohtak. In all 101 cotton fields were surveyed during August and September 2005, as this period depicted most appropriate representation of majority of weed species. To study weed composition of clusterbean crop, 129 fields were surveyed in Hisar, Sirsa, Fathebad, Bhiwani, Mahender garh, Jhajjar, Mewat, Gurgaon and Rewari districts of state during July-August 2007. The road map of Haryana state was followed and routes were planned to establish sampling localities as equi-distantly as possible (about 10 kms) avoiding inhabited areas. Four observations on density of individual weeds were recorded per field at one spot by using quadrate of (0.5 x 0.5 m), 100 meters deep inside the fields as suggested by Raju (1977). Pooled average values of relative weed density, relative frequency of individual weeds and importance value index (IVI) were calculated as per formula given below for each district separately :

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

Relative Density (%) = $\dfrac{a}{b}$

a = Number of individual of a species in all quadrates
b = No. of individual of all species in a quadrate

Relative Frequency (RF) % = $\dfrac{\text{Frequency of species A}}{\text{Sum Frequency of all species}}$ x 100

IVI (importance value index) = RD+RF

RESULTS AND DISCUSSION

Weed flora of cotton

Total twenty two weed species were found to infest cotton fields after 30-50 days of sowing. Among these 7 species were of grasses, one was sedge and 14 belonged to broadleaf weeds.

In all the districts, *Trianthema portulacastrum, Dactyloctenium aegypticum, Echinochloa colona, Digera arvensis* and *Cyperus rotundus* were the most dominant weeds. The respective relative density of these weeds varied from 48.7- 58.5, 7.5 21.4, 4.0 9.5, 3.6 8.6 and 2.3 - 8.5 % (Table 1). *T. portulacastrum* alone constituted 48.7 - 56.8 % of total weed flora in all the districts having IVI value of 58.1 in Jind to 72.7 in Hisar.

On the basis of IVI values, in all the districts except Rohtak, four weeds *T. portulacastrum, Dactyloctenium aegypticum, E. colona, D.* arvensis were the most dominant weeds in cotton which need to be controlled on priority basis in early stages. In Rohtak, *C. rotundus* was the fourth most dominant weed instead of *D. arvensis.* Other broad leaf weeds like *Phyllanthus niruri, Corchorus tridens, Physallis minima*, *Cucumis callosus, Tribulus terrestris* and *Amaranthus viridus* also provided competition to the crop in almost in all districts. *Cleome viscosa, T. terrestris, M. cerviana* and *C. ciliaris* weeds of light textured soils showed significant presence in Bhiwani district. *Cleome viscosa,* a typical weed of loamy sand soils was present in all districts except Rohtak where soils are some what heavy.

The typical cotton weeds such as *Ipomoea pestigridis, Cynodon dactylon and Cenchrus cilliaris* have almost diminished from fields due to improved irrigation facilities and adoption of mechanized farming. Similar weed infestation in cotton fields of Bathinda, Faridkot and Sangrur districts of Punjab having similar agro climatic conditions to that of area surveyed was also observed (Anonymous 2001).

Weed flora of clusterbean

In all, 129 sites were surveyed and crop was found to infest with 25 major weeds of which 9 were grassy, two were sedges and 14 were broad leaf weeds. *D. aegyptium*

E. colona, D. sanguinalis among grassy weeds*, D. arvensis, C. viscosa T. portulacastrum, P. minima, C. tridens, M. verticillata* and *C. callosus and C. rotundus* among sedges were the major weds observed in all districts. *Digera arvensis* was the most dominant weed in all the districts except Bhiwani and Mahender Garh constituting 43.2 to 69 % of total weed flora alone. In Bhiwani and Mahender Garh, *Cleome viscosa* was the most dominant weed with a relative density of 34.4 and 27.9% and IVI values of 41.4 and 33.3, respectively (Table 2-3).

In District Hisar, based on IVI values, *Digera arvensis* with IVI value of 79.1 was the most dominant weed followed by *C. rotundus* (29.8), *T. portulacastrum* (13.05), *Corchorus tridens* (9.41) and trailing wine *Cucumis callosus* (9.11). Almost similar weed flora was recorded in clusterbean at Jodhpur by Saxena and Singh (2003) and Bhadoria *et.al*. (2000).

Among grassy weeds, *Dactyloctenium aegyptium* was the major grassy weed in all districts*.* In Jhajjar and Gurgaon districts of state, this weed was the second most important weed with IVI values of 22.3 and 35.7, respectively, where as in Rewari *C. rotundus* was the second most important weed with 12.9 % relative frequency and IVI value of 24.9 (Table 3). In Fatehbad, *Euphorbia hirta* with a relative density of 2.2% and IVI value of 10.1 showed its significant presence as one of major five weeds found in the district. New high moisture depleting weed *M. verticillata* locally known as *"Chiri bajria"* a weed of light textured loamy sand soils was found only in Jhajjar, Bhiwani, Rewari and Mahendergarh.

In Bhiwani this weed was rated as one of major five weeds of clusterbean with a R.D. of 6.2% and IVI value of 13.2. In Fatehbad and Sirsa, *T. portulacastrum* was the second most important weed with a relative density of 11.8 and 19.5% respectively (Table 2).

In district Hisar, Sirsa and Fatehbad, due to application of tube well water having more saline content, density of this weed is more as compared to Bhiwani and Jhajjar. *E. colona* was the second most important weed of clusterbean in Mewat district with a relative density of 21.7 plants/m² and IVI value of 27.9 although this weed showed its presence in Hisar, Sirsa, Fatehbad and Gurgaon but with low density and frequency.

REFERENCES

Andreasen JC, Streibig and Hass H.1991.Soil properties affecting the distribution of 37 weed species in Danish fields. *Weed Research* **31**:181-187

Anonymous. 2001. Weed flora of cotton in Punjab. In: *Annual report*. 24th All India Coordinated Project on Weed Control. PAU Ludhiana centre

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	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

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	0.0
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

Bhadoria RBS, Jain PC and Tomar SS. 2000. Crop-wed competition in clusterbean (*Cyamopsis tetragonaloba*) under rainfed conditions. *Indian Journal of Agronomy* **45**: 737- 739

Misra R. 1968. *Ecology Workbook*. Oxford and IBF Publishing Co. Ltd., New Delhi.

Raju RA. 1977. *Field manual for weed ecology and herbicide research*. Agrotech Publishing Academy, Udaipur, 288 p

Saavedra K, Torres LG, Bermejo EH and Hildago B. 1990. Influence of environmental factors on the weed flora in crop in the Guadalquivir Valley. *Weed Research* **30**.363-374

Saxena, Anurag and Singh YV. 2003. Weed management in clusterbean in arid regions. In : *Proceedings of Biennial Conference of Indian Society of Weed Science*, March, 12-14, 2003 Pant Nagar : 25

Streibig JC, Gottshau A, Dennis B, Hass H and Molgaar P. 1984. Soil properties affecting weed distribution. In: 7th *International Symposium on Weed Biology*, *Ecology and Systematics,* Paris from 10-12 Oct :147-54

Yadav RS. 1998. Effects of weed removal in clusterbean (*Cyamopsis tetragonaloba*) under different rainfall situations in an arid region. *Journal of Agronomy and Crop Science* **181**: 209-214