Weed Flora Composition in Rice, Cotton and Cluster bean Crops in Haryana

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ABSTRACT

The present weed survey was carried out in south-western Haryana during kharif seasons of 2018 and 2019 in rice, cotton and Cluster bean revealed that 18, 20 and 27 weed species were infested the rice, cotton and Cluster bean, respectively. In rice, Echinochloa glabrescence and Leptochloa chinensis were the most dominant weed with IVI value of 67.6 and 37.6 per cent. Cyperus. difformis (19.7%) and Scirpus tuberosus (13.8%) were the dominant sedges infested the rice crop. E. colona was second most important weed in Sirsa with IVI value of 38.9 per cent, while in Fatehabad Leptochloa chinensis was second most important weed with IVI value of 34.4 per cent following E. glabrescence. Dactyloctenium aegyptium was the most dominant weeds of cotton and Cluster bean with highest IVI value of 48.3 per cent (in cotton) during 2019 and 55.0 per cent and 38.2 per cent in Cluster bean during 2018 and 2019, respectively. Digera arvensis, T. portulacastrum, Corchorus spp. were dominant broad-leaved weeds in cotton with relative density (14.8, 2.0 and 0.7%) and IVI (28.8, 3.8 and 5.9%) respectively. Mollugo verticillatsa, Corchorus tridens and Digera arvensis were major broadleaf weeds of Cluster bean. In Cluster bean, D. arvensis was present in all the surveyed districts whereas, Mollugo spp. was dominant in the Bhiwani and Charkhi Dadri districts of Haryana.

Key words*: Cotton; Cluster bean; Dactyloctenium aegyptium, IVI; Rice; Survey; Weeds;*

Rice is an important cereal crop while cotton and Cluster bean are important cash crops of *kharif* season of Haryana. Weed competition is one of the important biological constraints in *kharif* season crops. Weeds, unwanted and undesirable plants which interfere with utilization of land, water and other resources, are an important factor in the management of all land and water resources but losses caused by weeds exceed those by any other category of agricultural pests. Of the total annual loss in agricultural produce, weeds account for 45 percent, insect 30 percent, diseases 20 percent and other pests 5 percent (*Yaduraju, 2005*). Rice, cotton and Cluster bean crops are invaded with both grassy and broadleaf weeds. Rice, cotton and Cluster bean are mainly planted after harvesting of wheat and mustard crops. Major weeds that invades the cotton crop are *Dactyloctenium aegyptium* (L.), *Digitaria sanguinalis* (L.), *Cynodon dactylon* (L) Pers., *Trianthema portulacastrum* L., *Digera arvensis* L., and purple nut sedge (*Cyperus rotundus* L.) have been reported in north west Indian conditions causing yield losses from 10-70 per cent or more depending upon type and density of weeds (*Kaur et al., 2019; Punia et al., 2019*). Similarly, *Digera arvensis, Trianthema portulacastrum, Cleome viscosa, Dactyloctenium aegyptium, Amaranthus* sp., *Cyperus* sp., *Cynodon*

dactylon are the important weeds that infest the Cluster bean causing yield reduction from 47-92 per cent (*Punia et al., 2011*). The fields of transplanted rice are mainly infested with *Echinochloa colona*, *Echinochloa crusgalli*, *Cyperus rotundus*, *Eleusine indica* and *Eclipta alba (Jaswal and Singh, 2019)* and if not controlled in time than leads to more than 70 per cent reduction in grain yield of rice.

The intensity and infestation of weed flora in fields not only depends on the weed control measure but the result of the compound influence of ecological and crop management factors like type of irrigation, cropping pattern and environmental factors like temperature, rainfall and soil properties. 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. Thus, information on the up-to-date presence, composition, abundance, importance and ranking of weed species that infest in a particular area of interest is needed to reformulate appropriate weed management strategies to produces optimum yields of crops. Site specific knowledge on the nature and extent of infestation of weed flora through weed surveys is essential in planning of their effective management strategies. Therefore, the present investigation was under taken to assess the current status of important weeds including composition, distribution, severity and structure of weed communities prevailing in cotton, Cluster bean and rice crops of different districts of Haryana.

METHODOLOGY

To study the floristic composition of weeds in Cluster bean in Haryana, fields were surveyed in Fatehabad, Sirsa, Bhiwani and Charkhi Dadri districts of state during *Kharif* seasons of 2018 and 2019, while the weed survey of rice and cotton fields was conducted in Sirsa and Fatehabad districts of Haryana during 2019. To study the weed flora composition of cotton and rice, 35 cotton fields and 37 rice fields were surveyed in Sirsa and Fatehabad districts of Haryana 2019, while, for the Cluster bean crop 63 and 15 fields were surveyed in Sirsa, Fatehabad, Bhiwani and Charkhi Dadri during 2018 and Bhiwani and Charkhi Dadri districts 2019, respectively during August and September as this period depicted most appropriate representation of majority of weed species.

The road map of Haryana state was followed and routes were planned to establish sampling localities as equidistantly as possible (about 10 km) 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. Pooled average values of observations of relative density, relative frequency and IVI of individual weeds were thus calculated as per method suggested by *Misra (1968)* and *Raju (1977)* given below:

$$\text{Density } m^{-2} = \frac{\text{Total no. of individuals of sp. A in all the quadrates}}{\text{Total number of quadrates plotted}} \times 4$$

$$\text{Relative Density (RD) (\%)} = \frac{\text{Density of species A}}{\text{Total number of quadrates plotted}} \times 100$$

$$\text{Frequency (\%)} = \frac{\text{No. of quadrates where the species A occurred}}{\text{Total number of quadrates plotted}} \times 100$$

$$\text{Relative Frequency (RF) (\%)} = \frac{\text{Frequency of species A}}{\text{Sum frequency of all species}} \times 100$$

$$\text{Importance Value Index (IVI)} = \text{Relative Density} + \text{Relative Frequency}$$

RESULTS AND DISCUSSION

Weed flora of Cluster bean : The survey revealed that a total of twenty two species were found to infest the Cluster bean crop during *Kharif* 2018, out of which seven were grassy viz. *Brachiaria reptans, Cynodon dactylon, Dactyloctenium aegyptium, Digitaria sanguinalis, Eragrostis tenella, Echinochloa colona and Leptochloa chinensis;* two were sedges (*Bulbostylis barbata* and *Cyperus rotundus*) and thirteen were broadleaved weeds viz. *Cleome viscosa, Corchorus tridens, Crotalaria medicaginea, Cucumis callosus, Digera arvensis, Ipomea pestigridis, Mollugo disticha, Mollugo verticillata, Phyllanthus niruri, Physallis minima, Portulaca oleracea, Trianthema portulacastrum* and *Tribulus terrestris*. Among grassy weeds, *Dactyloctenium aegyptium* was most important weed with relative frequency (RF), relative density (RD) and IVI value of 16.7, 38.3 per cent and 55.0 per cent, respectively (Table 1). *Cynodon dactylon* and *Brachiaria reptans* were other important grassy weeds with relative frequency of 4.8 and 1.7 per cent and relative density of 2.9 and 1.0 per cent, respectively. The IVI value for *Cynodon dactylon* and *Brachiaria reptans* was 7.7 and 2.7 per cent respectively. *Mollugo verticillatsa, Corchorus tridens* and *Digera arvensis* were major broadleaf weeds with

Table 1. Weed flora of Cluster bean in 2018 and 2019

Name of weed	2018			2019		
	R.F. %	R.D. %	IVI `%	R.F. %	R.D. %	IVI %
Amranthus sp.	-	-	-	1.2	0.3	1.5
Brachiaria reptans	1.7	1.0	2.7	-	-	-
Bulbostylis barbata	1.4	3.4	4.8	3.6	4.6	8.3
Catharanthus pusilus	-	—	-	2.4	3.2	5.6
Cenchrus cilliaris	-	-	-	6.0	2.3	8.3
Cleome viscosa	2.0	0.4	2.4			
Corchorus tridens	9.2	5.6	14.8	9.6	2.1	11.7
Crotalaria medicaginea	1.0	0.4	1.4	2.4	2.5	4.9
Cucumis callosus	6.1	1.0	7.1	4.9	0.9	5.7
Cynodon dactylon	4.8	2.9	7.7	2.4	1.5	4.0
Cyperus rotundus	10.6	9.6	20.2	3.6	1.3	4.9
Dactyloctenium aegyptium	16.7	38.3	55.0	13.3	25.0	38.2
Digera arvensis	13.0	22.0	35.0	6.0	2.3	8.3
Digitaria sanguinalis	1.0	0.2	1.2	8.4	4.9	13.3
Echinochloa colona	1.0	0.9	1.9	-	-	-
Eleusine indica	-	-	-	2.4	1.4	3.8
Eragrotis tenella	1.0	0.3	1.3	8.4	29.0	37.4
Ipomea pestigridis	1.0	0.1	1.1	1.2	0.1	1.3
Leptochloa chinensis	0.7	0.5	1.2	-	-	-
Mollugo disticha	2.7	2.4	5.1	-	-	-
Mollugo verticillatsa	4.1	10.4	14.5	10.8	8.8	19.6
Phyllanthus niruri	3.4	1.5	5.0	1.2	0.1	1.3
Physallis minima	1.0	0.1	1.1	-	-	-
Portulaca oleracea	3.1	0.5	3.6	-	-	-
Rhynchosia capitata	-	-	-	1.2	4.5	6.9
Trianthema portulacastrum	7.5	3.9	11.4	3.6	4.0	7.6
Tribulus terrestris	4.4	0.8	5.2	6.0	1.3	7.3

relative density of 10.4, 5.6 and 22.0 per cent, relative frequency of 4.1, 9.2 and 13.0 per cent and IVI value of 14.5, 14.8 and 35.0 per cent, respectively. *Mollugo verticillata* and *Cleome viscose*, the weed of loamy sand soils showed their presence in Bhiwani district only. Among sedges, *Cyperus rotundus* is a major weed with relative frequency and relative density of 10.6 and 9.6 per cent, respectively. During *kharif* 2019, a total of 20 species were infested the crop. *Dactyloctenium aegyptium*, *Eragrostis*, *Digitaria sanguinalis* were also the dominant grassy weeds with IVI value of 38.2, 37.4 and 13.3 per cent. *Mollugo spp.*, *Corchorus tridens, Digera arvensis and T. portulacastrum were* dominant broad-leaved weeds with IVI value of 19.6, 11.7, 8.3 and 7.6 per cent. Keeping the weeds in view, weed management practices can be followed for better growth and yield of crop. *D. aegyptium* was the most important weed in the Fatehabad, Sirsa, Bhiwani and Charkhi Dadri districts of Haryana during 2018 as the IVI (%) value of this weed is higher in all the districts *D. aegyptium, D arvensis, C. rotundus* were present in all the four districts while *Mollugo spp.* was more pre dominant in the Bhiwani and Charkhi Dadri districts where the soils are sandy in texture. Similarly, in 2019, the weed survey of Bhiwani and Charkhi Dadri revealed that the *D aegyptium* was of pre-dominant weed of Cluster bean with higher IVI value as compared to other weeds (Fig. 1). *Mollugo spp.* was also present in both the districts during 2019. Similar infestation in Cluster bean crop of Haryana was also reported by *Punia et al. (2010)* and *(Anonymous 2019)*.

Weed flora of cotton : The weed species infested the
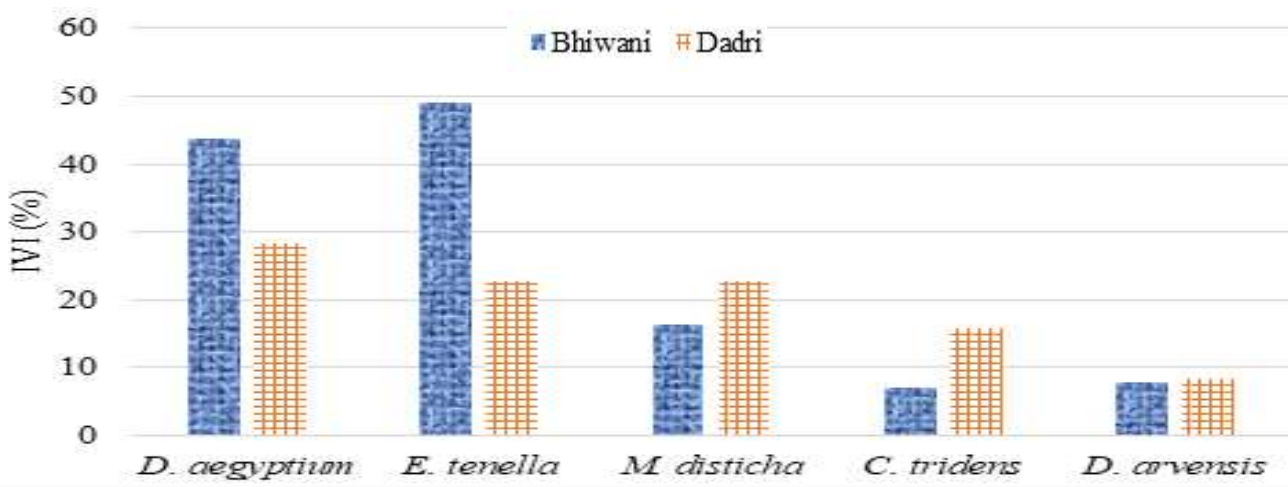
Fig 1. IVI (%) of important weeds during 2019 under Cluster bean in different districts of Haryana

Table 2. Weed flora of cotton during *kharif* 2019

Name of weed	R.F. %	R.D. %	IVI `%
Cleome viscosa	0.6	0.1	0.7
Commelina benghalensis	3.5	1.4	4.9
Corchorus tridens	5.2	0.7	5.9
Crotalaria medicaginea	0.6	0.1	0.7
Cucumis callosus	1.7	0.3	2.0
Cynodon dactylon	2.3	1.6	3.9
Cyperus rotundus	9.9	5.0	14.9
Dactyloctenium aegyptium	19.8	28.5	48.3
Digera arvensis	14.0	14.8	28.8
Digitaria sanguinalis	4.7	2.2	6.9
Echinochloa colona	6.4	6.2	12.6
Eragrotis tenella	12.2	22.4	34.6
Ipomea sp.	3.5	0.7	4.2
Leptochloa chinensis	4.7	10.7	15.3
Mollugo sp.	0.6	0.1	0.7
Phyllanthus niruri	0.6	1.3	1.9
Physalis minima	4.1	1.2	5.3
Trianthema portulacastrum	1.7	2.0	3.8
Tribulus terrestris	2.3	0.3	2.7
Vernonia sp.	0.6	0.4	1.0

fields of cotton are *C. benghalensis, C. callosus, C. dactylon, C. rotundus, C. tridens, C. viscosa, D. aegyptium, D. arvensis, D. sanguinalis, E. colona, E. tenella, Ipomea sp., L. chinensis, Mollugo spp., P. minima, P. niruri, T. portulacastrum, T. terrestris, Vernonia sp.* In cotton, *D. aegyptium* and *E. tenella* were dominant grassy weeds with higher relative frequency (19.8% and 12.2%), relative density (28.5% and 22.4%) and IVI (48.3 and 34.6%) respectively, while

D. arvensis, T. portulacastrum, Corchorus spp. were dominant broad-leaved weeds with relative frequency (14.0,1.7 and 5.2%), relative density (14.8, 2.0 and 0.7%) and IVI (28.8, 3.8 and 5.9%) respectively. *D. aegyptium* was the predominant weed in both Sirsa and Fatehabad Districts of Haryana during 2019 **(Table 2) a**s the IVI (%) was higher as compared to other weeds followed by *D. arvensis* in Sirsa and *E tenella* in Fatehabad District (Fig. 2). *C. rotundus* and *L. chinensis* were the other dominant weeds in both the districts of Haryana during 2019 for which control measures should be adopted at early stages of growth to avoid the yield losses. *Punia et al. (2010)* also reported that the *D. aegyptium* among the grassy weeds while *T. portulacastrum* among the broad leaf weeds were dominant weeds infested the cotton fields in different districts of Haryana.

Weed flora of rice : The rice fields were infested with *Ammania baccifera, C. difformis, Commelina benghalensis, Chloris barbata, D. aegyptium, Echinochloa colona, E. crusgalli, E. glabrescence, Eclipta alba, Fimbristylis miliacea, Ipomea aquatic, L. chinensis, Lemna minor, Marsilea quadrifolia, Paspalum distichum, Panicum reptans, Polygonum* and *Scirpus tuberosus. E. glabrescence* (34.2, 33.4 and 67.6), *L. chinensis* (15.2, 22.4 and 37.6) *and E. colona* (12.7, 8.5 and 21.1) *were dominant grassy weeds, C. difformis* (8.9, 10.8 and 19.7) and *S. tuberosus* (5.1, 8.37 and 13.8) were dominant sedges while *A. baccifera* (2.5, 0.8 and 3.3) and *L. minor* (2.5, 3.9 and 6.4) were dominant broad-leaved weeds having
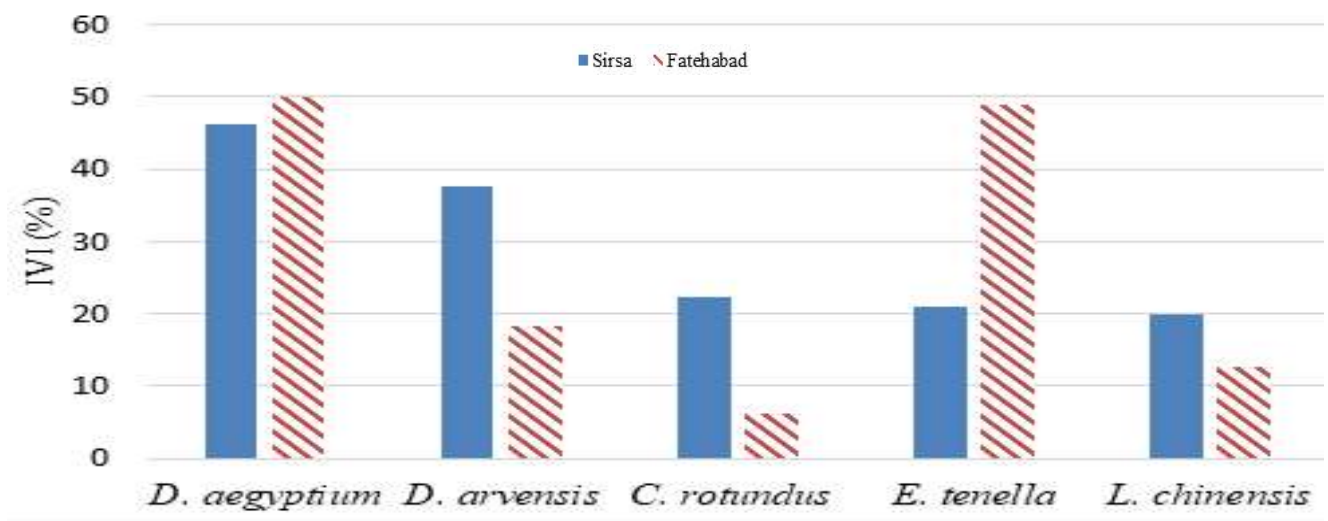
Fig 2. IVI (%) of important weeds during 2019 under cotton in different districts of Haryana

Table 3. Weed flora of rice during 2019

Name of weed	RF (%)	RD (%)	IVI (%)
Ammania baccifera	2.5	0.8	3.3
Chloris barbata	1.3	1.3	2.6
Commelina benghalensis	1.3	0.8	2
Cyperus difformis	8.9	10.8	19.7
Dactyloctenium aegyptium	2.5	1.3	3.8
Echinochloa colona	12.7	8.5	21.1
Echinochloa crusgalli	1.3	0.5	1.8
Echinochloa glabrescence	34.2	33.4	67.6
Eclipta alba	1.3	0.7	2
Fimbristylis miliacea	1.3	0.5	1.8
Ipomoea aquatica	1.3	0.3	1.5
Lemna minor	2.5	3.9	6.4
Leptochloa chinensis	15.2	22.4	37.6
Marsilea quadrifolia	1.3	2.1	3.3
Panicum repens	2.5	1.0	3.6
Paspalum distichum	3.8	1.8	5.6
Polygonum sp.	1.3	1.3	2.6
Scirpus tuberosus	5.1	8.7	13.8

higher relative frequency, relative density and IVI value, respectively (Table 3). In Sirsa district, *E. glabrescence* was the most dominant weed followed by *E. colona* with IVI of 49.6 and 38.9 per cent, respectively. In Fatehabad district, *E. glabrescence* was also the most dominant weed while *L. chinensis* was the second most important weed showing its presence with IVI of 34.4 per cent. *Kumar et al. (2020)* reported that *E. crusgalli* and *E. colona* were the most common weed in different surveyed states including Punjab and Haryana showing the close association of these weeds with rice owing to similarity to rice in terms of growth habits, phenology, and adaptation to ecologies where rice is grown and to rice agronomic/cultural practices.

CONCLUSION

The *kharif* crops *i.e.* rice, cotton and Cluster bean were infested by both the grassy as well as broadleaved weeds. *E. glabrescence* and *L. chinensis* were most abundant weeds in rice. *D. aegyptium* and *E. tenella* were dominant grassy weeds while *Digera arvensis*, *T. portulacastrum*, *C. tridens* were dominant weeds in cotton with high IVI value. In Cluster bean crop also *D. aegyptium* was the dominant grassy weed while *D. arvensis* and *M. disticha* and *C. tridens* were important broadleaved weeds with higher IVI value which needs to be controlled using different weed management practices to avoid crops yield loses.

REFERENCES

Anonymous (2019). Weed flora of Cluster bean in Haryana. In: Annual report. 31st Annual Report on All India Coordinated Project on Weed Control. CCS HAU Hisar centre. Pp 80.

Jaswal, A. and Singh, A. (2019). Effect of post-emergence herbicide application on weed flora in transplanted basmati rice. *Plant Arch.,* **19** (1) : 449-454.

Kaur, T.; Bhullar, M.; S. and Kaur, S. (2019). Weed control in *Bt* (*Bacillus thuringiensis*) cotton with pre mix of pyrithiobac sodium plus quizalofop ethyl in north-west India. *Crop Prot.,* **119** : 69–75.

Kumar, V.; Craufurd, P.; Singh, S.; Samaddar, A.; Singh, B.; Panneerselvam, P.; Singh, M.; Dubey, S. K.; Kumar, A.; Singh, R.; Singh, R.; Veettil, P.C.; Sharma, S.; Ignatius, Wasim, M. I., Ajay, A. and Malik, R.K. (2020). Weed flora and weed management practices of smallholder rice farmers in key rice growing states of India. In: New frontiers in agricultural extension -Volume II. International Maize and Wheat Improvement Center (CIMMYT). pp. 550.

Misra, R. (1968). Ecology workbook. Oxford and IBF Publishing Co. Ltd., New Delhi, 44 PP.

Punia, S. S.; Manjeet; Yadav, D. B. and Choudhry, A. (2019). Integrated weed management in cotton under irrigated conditions of Haryana. *Indian J. Weed Sci.,* **51**(2):158–162.

Punia, S.S.; Singh, S. and Yadav, D. B. (2011). Bio-efficacy of imazethapyr and chlorimuron-ethyl in cluster bean and their residual effect on succeeding rabi crops. *Indian J. Weed Sci.,* **43**(1 & 2):48-53.

Punia, S. S.; Yadav, D. B.; Brar, A. P.; Malik, Y. P. and Yadav, R. (2010). Weed flora of cotton and cluster bean in Haryana. *Indian J. Weed Sci.,* **42**(1&2): 37-41.

Raju, R.A. (1977). Field manual for weed ecology and herbicide research. Agrotech Publishing Academy, Udaipur, pp 288.

Yaduraju, N.T. (2005). Consultancy, training and contractual research services. NRCWS Bulletin 31, National Research Centre for Weed Science, Jabalpur, Madhya Pradesh, pp. 30-45.

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