Indian J. Weed Sci. **38** (1 & 2) : 89-91 (2006)

Crop-Weed Competition and Determination of Critical Period in Onion (*Allium cepa*) under North-West Plain Zone

Nisha Chopra and Neelam Kumar Chopra
Indian Agricultural Research Institute Regional Station, Karnal-132 001 (Haryana), India

ABSTRACT

Significantly higher bulb yield was obtained when crop was kept weed-free for initial 60 days after transplanting (DAT) compared to 20 and 40 DAT where weeds remerged at later stages and accumulated higher weed dry matter and reduced the bulb yield. Bulb yield remained at par with weed-free check when weeds were allowed to grow with the onion crop upto 20 DAT; however, weedy period beyond 20 days was detrimental to bulb yield. There was 53.4% reduction in bulb yield under season long unweeded conditions. Critical period of crop-weed competition was found to be 20-60 DAT.

INTRODUCTION

Early infestation of weeds in onion is one of the major constraints limiting the establishment of the crop and thereafter its production. Weed pressure can be especially damaging to young onion plants because they are slow growing, have shallow roots and do not have enough foliage to adequately shade the ground. Bulb size and bulb yield are reduced under weedy conditions and yield reduction of 40-80% was reported in weed-infested field of onion (Mondal, 1997; Kolhe, 2001). The yield losses may be minimized effectively by keeping the fields weed-free during the critical period of weed-crop competition. Removing the weeds throughout the growing season may not be economical. Information on critical period of crop-weed competition is essential to optimize the herbicide use or integration of alternative weed control measures such as stage of mechanical weeding. Therefore, an experiment was conducted to determine the critical period of crop-weed competition in onion bulb to render weed management more effective and economical.

MATERIALS AND METHODS

The field experiment was conducted during winter seasons of 2004 and 2005 at Regional Station, Karnal of Indian Agricultural Research Institute, New Delhi. The soil of the experimental field was sandy clay loam in texture, with pH 7.8, organic carbon 0.50%, 22 kg P_2O_5 and 290 kg K_2O ha^{-1}. The experiment was laid out in randomized block design with four replications. There were 12 treatments consisting of initial weed-free periods when weeds were removed at 20, 40, 60, 80 and 100 days after transplanting (DAT) and crop was kept weedy thereafter and when weeds were allowed to grow with crop, weedy for initial 20, 40, 60, 80 and 100 DAT and weed-free thereafter alongwith weed-free and weedy till harvest. The transplanting of the seedlings (55 days) of Pusa Red variety was done on January 10 and 13 in 2004 and 2005 at 20 x 10 cm spacing. The crop was fertilized with 125 : 60 : 60 kg ha^{-1} N, P_2O_5 and K_2O. Full quantity of phosphorus, potash and half dose of nitrogen was applied at the time of transplanting. Remaining dose of nitrogen was applied by splitting into two equal parts. Weed density and weed dry matter were recorded at various stages with the help of a quadrate of 50 x 50 cm size.

RESULTS AND DISCUSSION

Effect on Weeds

The weed flora of the onion field comprised *Coronopus dydimus* (48%), *Anagalis arvensis* (6%), *Spergula arvensis* (6.0%), *Cyperus rotundus* (28%), *Melilotus indica* (3.0%), *Poa annua* (5.0%),

Convolvulus arvensis (2.0%) and *Vicia* spp. (2.0%). Weed density and weed dry weight were higher in 2005 compared to 2004. Weed density in the unweeded plot showed reduction at 80 DAT during both the years, which shows that majority of weeds, emerged upto 60 DAT (Table 1). The total dry matter of weeds in unweeded plots continuously increased upto 100 DAT (Table 2). The total weed dry matter producted at stages subsequent to the completion of initial weed-free period decreased significantly with increase in the duration of initial weed-free period. This was due to decreased weed density and further checked growth due to regular weedings. Significantly lower weed dry matter was observed in the plots kept weed-free for initial 60, 80 and 100 DAT and in the plots, which remained weed infested

Table 1. Effect of time of weed removal on total weed-density (m^{-2}) in onion

Treatment	40 DAT		60 DAT		80 DAT		100 DAT	
	2004	2005	2004	2005	2004	2005	2004	2005
Weed-free for initial (DAT)								
20	112	179	181	401	111	340	133	233
40	45	110	55	377	49	383	250	239
60	164	0	66	274	38	182	164	239
80	89	0	40	254	40	166	76	160
100	138	0	43	303	39	276	66	180
Upto harvest	125	0	0	404	0	302	0	258
Weedy for initial (DAT)								
20	78	0	41	392	30	335	70	232
40	413	617	103	285	49	144	71	194
60	358	518	333	429	83	246	81	204
80	325	690	299	538	156	410	102	244
100	285	693	291	614	165	412	122	420
Upto harvest	456	703	353	568	209	372	138	410

DAT–Days after transplanting.

Table 2. Effect of time of weed removal on total weed dry weight (g m^{-2}) and bulb yield

Treatment	40 DAT		60 DAT		80 DAT		100 DAT		Bulb yield (t ha^{-1})	
	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005
Weed-free for initial (DAT)										
20	7.52	6.08	29.76	43.88	130.2	164.4	162.5	251.8	9.06	8.31
40	1.28	1.68	3.76	26.28	4.80	150.28	50.32	204.8	10.6	9.97
60	3.56	0.00	3.16	18.18	2.96	16.08	22.16	84.48	13.1	13.63
80	12.48	0.00	2.28	19.28	3.00	21.60	10.52	32.0	13.5	14.17
100	6.36	0.00	4.28	20.00	3.08	23.60	8.08	34.28	13.5	14.41
Up to harvest	4.36	0.00	0.00	16.00	0.00	22.80	0.00	22.40	15.9	14.69
Weedy for initial (DAT)										
20	1.68	0.00	2.88	19.80	2.32	14.00	10.72	23.60	13.6	14.3
40	12.68	18.04	4.20	24.28	3.32	15.88	8.76	36.20	13.0	11.7
60	8.76	19.92	57.12	137.08	4.56	18.28	16.70	25.00	11.4	9.99
80	13.84	28.32	72.76	141.08	225.6	291.7	14.84	31.08	10.7	8.36
100	5.08	19.48	37.04	145.80	139.0	290.2	186.64	355.6	10.3	7.59
Upto harvest	35.40	28.36	111.84	151.80	212.5	305.8	229.40	367.48	9.1	5.11
LSD (P=0.05)									2.96	2.51

DAT–Days after transplanting.

for initial 20 DAT (Table 2). Initial weed-free period of 20 and 40 days could not reduce the weed density and weed dry weight compared to initial weed-free period of 60 and 80 days due to re-emergence of weeds in these plots, which accumulated higher dry matter than initial weed-free periods of 60 and 80 days.

Effect on Crop

Uncontrolled weeds during entire crop season resulted in reduction of 53.5% in bulb yield. Unweeded conditions of initial 20 days did not reduce the bulb yield compared to season long weed-free. However, allowing the weeds to grow with crop beyond 20 DAT significantly reduced the bulb yield (Table 2). Significant increase in onion bulb yield was recorded under initial weed-free conditions upto 60 DAT over 20 and 40 days initial weed-free period; however, increase in weed-free period of 80 or 100 days did not cause further significant increase in the bulb yield. The bulb yield was significantly reduced even if the weeds were removed upto 40 DAT (Table 2), which could be because of re-emergence of large number of weeds. The results are in close conformity with those of Gafar and Islam (1993) and Rameshwar *et al.* (2001).

REFERENCES

Gafar, M. A. and M. A. Islam, 1993. Critical period of weed competition in onion (*Allium cepa*). *Bangladesh J. Sci. and Indust. Res.* **28** : 68-75.

Kolhe, S. S. 2001. Integrated weed management in onion (*Allium cepa*). *Indian J. Weed Sci.* **33** : 26-29.

Mondal, R. C. 1997. *Weed, Weedicide and Weed Control–Principles and Practices*. Agrobotanica, New Delhi. pp. 2-3 and 185-186.

Rameshwar, G. D., Vishal Sharma Dogra and Gurdev Singh, 2001. Crop-weed competition in onion (*Allium cepa*) under dry temperate high hill conditions of Himachal Pradesh. *Indian J. Weed Sci.* **33** : 168-170.