

Effect of nitrogen and weed management on onion (*Allium cepa*)

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ABSTRACT

A field investigation was carried out during the winter seasons of 1987-88 and 1988-89 to study the effect of 3 levels of nitrogen (50, 100 and 150 kg/ha) and 9 weed-control treatments. Weed biomass and the bulb yield of onion increasing with increasing levels of N. Pre-emergence application of oxadiazon (1.0 kg/ha) followed by manual weeding 45 days after transplanting showed the maximum weed-control efficiency of 77.0% compared with 60.5% with oxadiazon alone, and also increased the bulb yield by 81.4-254.9% over weedy check. Higher bulb yield was realized even at lower dose of 50 kg N/ha with weed-control treatments. However, weedy check gave the lowest bulb yield even with heavy fertilization (150 kg N/ha).

Onion (*Allium cepa* L.) faces severe competition with the weeds at its initial stage of crop growth on account of high doses of fertilizers and frequent irrigations. Uncontrolled growth of weeds in onion causes 40.2-74.9% reduction in bulb yield depending upon weed flora, their intensity and the duration of crop-weed competition (Singh *et al.*, 1985; Mishra *et al.*, 1986). Manual weeding, though very effective in controlling weeds but very often, is not accomplished during the critical period of crop-weed competition due to labour-intensive operation. Singh *et al.* (1985) and Patel *et al.* (1986) reported herbicidal control of weed and increased yield in onion. The effectiveness of herbicides used at various places differs with varied climate, soil texture and diversified weed flora. Therefore a study was initiated to elicit information on the role of weed control for improving the nitrogen utilization by

onion crop.

MATERIALS AND METHODS

A field experiment was conducted during the winter seasons of 1987-88 and 1988-89 at the Fruit Research Farm of the Agricultural Research Station, Banswara (Rajasthan). The soil was clay loam having low amount nitrogen and medium available phosphorus and potash, with pH 8.15. The treatments comprised 3 levels of N (50, 100 and 150 kg/ha) and 9 weed-control treatments (Table 1). The experiment was laid out in a factorial randomized block design with 3 replications. Seedlings of onion culture 'UD 102' were transplanted in November and December, each year. Recommended management practices were adopted to raise the experimental crop. Weed biomass at crop maturity, bulb yield and yield-attributing characters were recorded for treatment evaluation.

RESULTS AND DISCUSSION

The major weeds observed in the experimental field on onion were: *Chenopodium album* L., *C. murale* L., *Spergula arvensis* L., *Anagallis arvensis* L., *Convolvulus arvensis* L., *Cyperus rotundus* L. and *Cynodon dactylon* (L.) Pers.

Effect on weeds

The dry matter of weeds increased significantly with each incremental dose of N, but during 1987–88 differences were

significant only at 150 kg N/ha (Table 1). In undisturbed plots of weedy check, the dry-matter accumulation in weeds was 2,176 and 2,243 kg/ha at 50 kg N/ha during first and year respectively, which increased significantly to 2,769–2,942 kg/ha at 150 kg N/ha. The dry matter of weeds increased with N application and this might be due to the fact that weeds used greater quantity of soil-applied N, resulting in enhanced growth of weeds and more dry-matter production. Hill and Carlson (1986) also opined that

Table 1. Dry-matter accumulation in weeds (kg/ha) at crop maturity and weed-control efficiency as influenced by interaction of nitrogen levels and weed-control treatments

Weed-control treatment	N (kg/ha)					
	1987–88			1988–89		
	50	100	150	50	100	150
Weedy check	2,176	2,298	2,942	2,243	2,404	2,769
Manual weeding, 1	1,704 (21.7)	1,833 (20.2)	1,894 (35.4)	1,749 (22.0)	2,001 (16.8)	2,080 (24.9)
Manual weeding, 2	1,568 (27.9)	1,366 (40.6)	1,551 (47.3)	1,560 (30.5)	1,659 (31.0)	1,928 (30.4)
Fluchloralin	1,027 (52.8)	1,121 (51.2)	1,649 (43.9)	1,071 (52.3)	1,157 (51.9)	1,383 (50.1)
Fluchloralin + weeding 45 DAT	870 (60.0)	1,041 (54.7)	1,106 (62.4)	915 (59.2)	1,058 (56.0)	1,151 (58.4)
Oxadiazon	859 (60.5)	774 (66.3)	897 (69.5)	872 (61.1)	798 (66.8)	876 (68.4)
Oxadiazon + weeding 45 DAT	572 (73.7)	576 (74.9)	876 (70.2)	543 (75.8)	554 (77.4)	849 (69.3)
Alachlor	979 (55.0)	1,154 (49.8)	1,012 (65.6)	1,001 (55.4)	1,105 (54.0)	1,187 (57.1)
Alachlor + weeding 45 DAT	672 (59.1)	869 (62.2)	959 (67.4)	724 (67.7)	878 (63.5)	1,022 (63.1)
Mean	1,159	1,126	1,432	1,186	1,290	1,472
CD (P = 0.05)						
Nitrogen		85.7		61.9		
Weed control		148.4		107.2		
Nitrogen × weed control		NS		NS		

Fluchloralin, preplant incorporated, oxadiazon and alachlor, pre-emergence applied

Figures in parentheses indicate weed-control efficiency

DAT, Days after transplanting

fertilizer treatment benefits the weeds more than crop. Dry-matter accumulation in weeds was decreased significantly with weed-control treatments.

Herbicidal control of weed was found statistically superior to manual weeding. Pre-emergence application of oxadiazon (1.0 kg/ha) reduced the weed biomass significantly during both years compared with 1 and 2 manual weedings (Table 1). The results confirm the findings of Phogat *et al.* (1989) in rainy-season onion. Pre-emergent oxadiazon supplemented with 1 manual weeding 45 days after transplanting further reduced the dry-matter accumulation, with weed-control efficiency 70.2–74.9 and 69.3–77.0 during the first and second year (Table 1). Patel *et al.* (1986) reported also superiority of oxadiazon (1.0 kg/ha) coupled

with 1 manual weeding. However, Malik *et al.* (1982) and Singh (1986) reported superiority of manual weedings to herbicidal control. Pre-emergence application of alachlor (2.0 kg/ha) with and without 1 manual weeding 45 days after transplanting was also found effective in reducing dry-matter accumulation in weeds.

Effect on crop

Increasing levels of N increased the bulb yield of onion significantly, as also reported by Singh and Sharma (1991). Irrespective of N levels, all weed-control treatments increased the bulb yield (10.2–23.4 tonnes/ha) significantly over the weedy check (Table 2). In spite of heavy fertilization (150 kg N/ha) weedy check produced lowest. Pre-emergent oxadiazon (1.0 kg/ha) followed by

Table 2. Effect of weed-control treatments on the bulb yield of onion (tonnes/ha)

Weed-control treatment	N (kg/ha)							
	1987–88				1988–89			
	50	100	150	Mean	50	100	150	Mean
Weedy check	12.3	12.7	13.7	12.9	4.7	5.3	5.4	5.1
Manual weeding, 1	16.9	16.7	18.3	17.3	7.8	10.6	12.2	10.2
Manual weedings, 2	19.3	20.0	21.3	20.2	10.8	12.5	13.6	12.3
Fluchloralin	18.0	18.7	19.0	18.6	13.6	15.2	16.4	15.1
Fluchloralin + weeding 45 DAT	20.3	20.7	22.6	21.2	16.4	17.8	19.2	17.8
Oxadiazon	20.7	21.3	21.3	21.1	16.1	16.8	19.6	17.5
Oxadiazon + Weeding 45 DAT	22.6	23.3	24.3	23.4	17.2	16.8	20.2	18.1
Alachlor	20.0	21.3	22.6	21.3	11.6	11.7	13.8	12.7
Alachlor + weeding 45 DAT	21.7	22.6	25.0	23.1	13.5	13.1	16.2	14.3
Mean	19.1	19.7	20.9		12.4	13.3	15.2	
CD (P = 0.05)								
Nitrogen			1.79			0.72		
Weed control			3.28			1.24		
Nitrogen × weed control			NS			NS		

DAT, Days after transplanting

manual weeding 45 days after transplanting under all levels of N gave the maximum bulb yield and was significantly superior to manual weeding and preplant incorporated fluchloralin at 1.0 kg/ha (Table 2). This might be on account of more competition at 45 days stage in latter 2 treatments. The findings are in accordance with those reported by Patel *et al.* (1986). However, Mishra *et al.* (1986) reported that oxadiazon and fluchloralin were at par with 2 manual weedings at 20 and 40 days after transplanting. Further, Sharma and Mehta (1989) reported safe use of fluchloralin (1.0 kg/ha), as its residue in soil and onion plant was below the tolerance limit of 1 ppm. Pre-emergent alachlor did not show any consistent results in 2 years, because during 1987-88 it showed promising trend but not in second year. The increase in the bulb yield of onion was attributed mainly to higher circumference of bulb and its weight which was favoured under high supply of N due to ability of pre-emergent oxadiazon or alachlor supplemented with 1 manual weeding 45 days after transplanting in securing weed-free condition to the crop at its most critical weed-crop competition stage. Nandal *et al.* (1992) also reported maximum bulb yield from oxadiazon (1.5 kg/ha) which was associated with plant stand and higher bulb diameter. Therefore, there is a considerable saving in N application by effective control of weeds, as drain of N through weeds could be arrested.

REFERENCES

- Hill, J. E. and Carlson, H. L. 1986. Competition for nutrients by crop and weed plants. (In) *Proceedings of 37th Annual California Weed Conference*, held at California, USA (*vide Field Crops Abstract* 39 : 358).
- Malik, Y. S., Singh K. P. and Pandita, M. L. 1982. Chemical weed control in onion (*Allium cepa* L.). *Indian Journal of Weed Science* 14 : 24-21.
- Mishra, H. P., Singh, S. J. and Mishra, S. S. 1986. Effect of herbicides on weed control efficiency and production potential in onion (*Allium cepa* L.). *Indian Journal of Weed Science* 18 : 187-191.
- Nandal, T. R., Singh, A. K. and Arya, P. S. 1992. Chemical weed control in onion. (In) *Proceedings of Annual Conference of Indian Society of Weed Science*, held at Haryana Agricultural University, Hisar, 3-4 March 1992 pp. 110.
- Patel, C. L., Patel Z. G., Patel, R. B. and Nail, A. G. 1986. Chemical weed control in onion bulb crop. *Indian Journal of Agronomy* 31 : 414-415.
- Phogat, B. S., Bhan, V. M. and Singh, J. 1989. Efficacy of herbicides on weeds in Kharif onion. *Indian Journal of Weed Science* 21 : 78-79.
- Sharma, R. and Mehta, H. M. 1989. Studies on pendimethalin and fluchloralin residues in soil and onion. *Indian Journal of Agronomy* 34 : 245-247.
- Singh, D. and Sharma, R. P. 1991. Effect of soil-moisture regimes and nitrogen fertilization on onion. *Indian Journal of Agronomy* 36 : 125-126.
- Singh, G., Bhan, V. M. and Tripathi, S. S. 1985. Weed control in onion. *Indian Journal of Weed Science* 17 : 9-13.
- Singh, S. P. 1986. Weed control in onion in UP Hills. *Indian Journal of Weed Science* 18 : 63-64.
- Singh, D. and Sharma, R. P. 1991. Effect of soil-moisture regimes and nitrogen fertilization on onion. *Indian Journal of Agronomy* 36 : 125-126.