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Efficacy and Economics of Some New Herbicides for Weed Control in Onion

C. L. Patel, Z. G. Patel and R. B. Patel

Department of Agronomy, GAU, Navsari Campus-396 450

ABSTRACT

Studies on the comparative efficacy of oxyfluorfen, oxadiazon, alachlor and fluchloralin at two levels as well as lower levels of each herbicide with one hand weeding at 40 DAT, hand weeding only at 20, 40 as well as 20 + 40 DAT and unweeded control were carried out to develop technology for weed control in onion bulb crop at GAU, Navsari campus during *rabi* seasons of 1981, 1982 and 1983. The results revealed that both the levels of oxadiazon, alachlor and fluchloralin, lower levels of herbicides +one hand weeding at 40 DAT, and two hand weedings at 20 + 40 DAT were quite effective in checking weed growth, leading to significant increase in bulb yield as compared to unweeded control.

Considering the economics of onion bulb production, fluchloralin + one hand weeding at 40 DAT gave maximum additional income of Rs. 4398.0 per hectare. However, the highest net cost benefit ratio (Rs. 1: 18.14) was obtained under the treatment oxadizon @0.5 kg a.i./ha, followed by fluchloralin @0.9 kg a.i./ha (Rs. 1 : 15.35) and alachlor @ 2.0 kg a.i./ha (Rs. 1: 13.59).

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INTRODUCTION

Onion (*Allium cepa* L.) is an important vegetable crop which is widely cultivated in India on account of its high yield and storage suitability. It accounts for nearly 93 per cent of total export of vegetables of the country (Singh *et al.* 1976). Weeds compete severely with this crop and reduce the bulb yield upto the extent of 48 to 85 per cent depending upon the duration of crop-weed competition and intensity of weeds (Bhallia, 1978). Hand weeding is a costly affair and non-availability of labour at critical crop-weed competition stage results in much reduction of yield. Mechanical control is difficult due to narrow row spacing. Many workers (Bhallia, 1978; Upadhyay *et al.*, 1980 and Singh *et al.* 1982), therefore, suggested use of herbicides for controlling weeds in this crop in different onion growing regions. Keeping this in view the present experiment was conducted to find out suitable weed management practices in onion bulb crop under the agro-climatic conditions of South Gujarat.

MATERIALS AND METHODS

Field experiment was conducted for three years at the college farm, Gujarat Agricultural University, Navsari during

rabi seasons of 1981, 1982 and 1983. Sixteen treatments consisted of two levels each of nitrofen/oxyfluorfen, oxadiazon, alachlor and fluchlorlin (T_1 to T_8), lower level of herbicides + one hand weeding at 40 days after transplanting (T_9 to T_{12}), hand weeding at 20, 40 and 20 + 40 days after transplanting (T_{13} to T_{15}) and unweeded control (T_{16}) as mentioned in Table 1 were undertaken. They were arranged in a randomized block design with three replications. Sixty, fifty and fifty days old seedlings of the variety 'Nasik red' were transplanted at a distance of 15 x 10 cm on 3rd, 12th and 25th January and the crop was harvested on 1st May, 29th April and 15th May during the respective years. The crop was fertilized with 80 kg N, 40 kg P_2O_5 and 40 kg K_2O per hectare and was irrigated eight times.

All the herbicides were applied four days after transplanting as pre-emergence of weeds except fluchloralin, which was applied just before transplanting as pre-planting application @ 600 litre water per hectare, with high volume sprayer.

TABLE 1

Effect of weed control treatments on dry weight of weeds (g/m²) and W.C.E. at 80 DAT.

Treatment No.	*Treatments*	*Dose kg a.i./ha.*	*1981*		*1982*		*1983*	
			Dry wt. of Weeds	*W.C.E.*	*Dry wt. of Weeds*	*W.C.E.*	*Dry wt. of Weeds*	*W.C.E.*
T_1*	Nitrofen/oxyfluorfen	1.5/0.2	316.6	12.9	233.3	44.0	213.6	22.0
T_2*	Nitrofen/oxyfluorfen	2.0/0.3	303.3	16.5	198.3	52.4	148.6	45.8
T_3	Oxadiazon	0.5	53.3	85.3	120.0	71.2	96.6	64.7
T_4	Oxadiazon	1.0	33.3	90.8	86.6	79.2	87.3	68.1
T_5	Alachlor	1.5	50.0	86.2	173.3	58.4	123.0	55.1
T_6	Alachlor	2.0	36.6	89.9	146.6	64.8	124.6	54.5
T_7	Fluchloralin	0.9	41.6	88.5	95.0	77.2	60.6	77.8
T_8	Fluchloralin	1.35	26.6	92.7	73.3	82.4	58.3	78.7
T_9	T_1 + Weeding at 40 DAT		33.3	90.8	135.0	67.6	72.3	73.6
T_{10}	T_3 + Weeding at 40 DAT		13.3	96.3	95.0	77.2	56.0	79.5
T_{11}	T_5 + Weeding at 40 DAT		8.3	97.7	88.3	78.8	66.6	75.7
T_{12}	T_7 + Weeding at 40 DAT		16.6	95.4	33.0	92.1	31.3	88.5
T_{13}	Weeding at 20 DAT		126.6	65.2	296.6	28.8	211.6	22.8
T_{14}	Weeding at 40 DAT		70.0	80.7	155.0	62.8	117.6	57.1
T_{15}	Weeding at 20 + 40 DAT		50.0	86.2	110.0	73.6	107.6	60.7
T_{16}	Unweeded (Control)		363.3	–	416.6	–	274.0	–
	S.Em.±		29.1	–	35.8	–	14.3	–
	C.D.(5%)		83.9	–	103.3	–	41.2	–

DAT — Days after transplanting.

*Nitrogen @ 1.5 and 2.0 kg a.i./ha was used during the year 1981 and oxyfluorfen @ 0.2 and 0.3 kg a.i./ha was used during the years 1982 and 1983.

RESULTS AND DISCUSSION

The predominant weeds observed in the experimental area were *Panicum colonum* L., *Brachiaria eruciformis* L., *Echinochloa colonum* Link and *Cyperus rotundus* L., (among the monocots) *Trianthema portulacastrum* L., *Portulaca oleracea* L., *Eclipta alba* Hassk. *Physalia minima* L. and *Amaranthus spp* (among the dicots).

In general, monocot weeds were more as compared to dicot weeds in all the three seasons. The data in Table 1 indicated that application of oxadiazon, alachlor and fluchloralin (0.5, 1.5 and 0.9 kg a.i./ha) + hand weeding at 40 DAT (T_{10} to T_{12}) controlled the weeds very efficiently during all the three seasons as measured by the dry matter production of weeds and weed controlling efficiency (W.C.E.). Among the herbicides, both oxadiazon @ 1.0 kg a.i./ha (T_4) and fluchloralin @ 1.35 kg a.i./ha (T_8) were found to be equally effective in checking the weed growth. The results were in agree-

TABLE 2

Onion bulb yield and economics of different weed control treatments.

Treatments	*Bulb yield (q/ha)*				*Additional income over control*	*Cost of treatments (Rs./ha)*	*Net CBR*
	1981	*1982*	*1983*	*Mean*			
T_1	123.46	90.02	171.04	128.17	1723.20	—	—
T_2	128.60	96.19	174.12	132.97	2011.20	—	—
T_3	144.03	129.63	182.61	152.09	3158.40	165	18.14
T_4	144.03	137.34	194.18	158.52	3544.20	285	11.43
T_5	131.17	113.43	181.32	141.97	2551.20	177	13.41
T_6	146.60	134.26	178.75	153.20	3225.00	221	13.59
T_7	133.74	135.54	196.75	155.34	3353.40	205	15.35
T_8	151.75	137.60	208.33	165.89	3986.40	285	12.98
T_9	137.60	111.88	194.70	148.06	2916.60	—	—
T_{10}	145.32	130.65	200.61	158.86	3564.60	435	7.19
T_{11}	151.75	133.74	198.55	161.35	3714.00	447	7.30
T_{12}	147.89	140.17	230.19	172.75	4398.00	475	8.25
T_{13}	131.17	100.05	147.37	126.20	1605.20	270	4.94
T_{14}	142.75	108.28	155.60	135.54	2165.40	405	4.34
T_{15}	145.32	134.00	185.18	154.83	3322.80	540	5.15
T_{16}	104.16	59.44	124.74	99.45	—	—	—
S.Em. ±	5.55	13.14	14.00	7.00			
C.D.(5%)	16.02	37.87	40.42	19.70			

(i) Price of onion bulb Rs. 60/q.

(ii) Cost of treatments

(a) Labour wages Rs. 9.0/day.

(b) Price of Fluchloralin, Alachlor and oxadiazon were Rs. 160, 44 and 60 per litre, respectively.

(c) Price of oxyfluorfen was not available.

(d) Labour unit for weeding at 20, 40, 20 + 40 and herbicides + one hand weeding at 40 DAT were 30, 45, 60 and 30 respectively.

ment with the findings of Sandhu and Randhawa (1978). None of the herbicidal treatment caused any phytotoxic effect in onion seedlings.

The highest mean bulb yield (172.75 q/ha) was recorded under the treatment fluchloralin @ 0.9 kg a.i./ha + weeding at 40 DAT (T_{12}) however, it was at par with other treatments viz. T_8, T_{11}, T_{10}, T_4, T_{15} and T_6. Similar observations were reported by Upadhyaya *et al.* (1980). Increase in bulb yield in respective treatments may be due to reduction of crop-weed competition at critical period of crop. Significantly the lowest bulb yield (99.45 q/ha) was recorded under the unweeded control (T_{16}).

In general, a combination of lower dose of herbicides + hand weeding at 40 DAT (T_9 to T_{12}) gave as high yield as obtained with higher dose in each of the herbicides. This was in line with the finding of Singh *et al.*, (1982).

Considering the economics, treatment fluchloralin @ 0.9 kg a.i./ha + weeding at 40 DAT (T_{12}) gave the highest additional income of Rs. 4398.0 per hectare over control. This was in conformity with the finding of Upadhyay *et al.*, (1980). However, the application of oxadiazon @ 0.5 kg a.i./ha (T_3) gave the highest net cost benefit ratio (net CBR) of 1 : 18.14, followed by fluchloralin @ 0.9 kg a.i./ha 1 : 15.35 (T_7) and alachlor @ 2.0 kg a.i./ha 1 : 13.59 (T_6).

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