Vegetable Crops

WEED CONTROL IN ONIONS UTILISING ETHOFUMESATE

J.R.F. McLean

Fisons Limited, Auckland

Summary

Pre- and post-emergent applications of ethofumesate at 1-2 kg/ha gave residual control of grass and many broadleaf weeds with good crop tolerance on 'Pukekohe Longkeeper' onions. Doses and times of application relative to crop and weed stages as well as choice of other chemical(s) in the weed control programme, influenced results.

INTRODUCTION

Despite the range of products available for weed control in onions, improvements in spectrum and length of weed control are necessary. Ethofumesate is currently being tested on this crop in several countries and has already shown considerable promise. This paper presents results from trials carried out at Pukekohe, New Zealand.

Commercial weed control programmes in Pukekohe onion crops are varied in content and results (Wilson 1971). To be commercially acceptable a wide latitude in application times and rates of herbicide is important (Crowder 1968). Continued protection from weeds is usually necessary for most of the season (Cox 1968) as the onion itself offers little competition to successive weed germinations. Many growers would prefer to make fewer treatments provided weed control and crop tolerance levels were not compromised. Additionally weed spectra change with successive cropping; the increase in summer germinating grasses, especially barnyard grass (*Echinochloa crus-galli*), being seen as a current threat to production (pers comm).

METHOD

During 1975-6 and 1976-7 six screening trials were conducted at five different sites in Pukekohe, representative of the commercial soil types and seedbeds. Three of the more detailed trials are presented. Applications were made through a modified Falcon hand sprayer fitted with a 2 m boom, pressurised by CO₂. TeeJet 730308 fan nozzles were calibrated to apply 312 litres/ha. Unless otherwise stated a 200 g/litre emulsifiable concentrate formulation of ethofumesate was used. The growers treated all sites pre-emergent to the crops with a proprietary mixture applying 0.25 kg of diquat plus 0.25 kg of paraquat/ha. Plot sizes ranged from 16-40 m², with one to four replications.

Trial 1. Three replications 1975

Treatment date	Crop stage	Weeds present
18 Aug	flag	wireweed (<i>Polygonum aviculare</i>) coltyledon twin cress (<i>Coronopus didymus</i>) up to 8 leaf

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Trial 1. Three replications 1975 (cont'd)

Treatment date	Crop stage	Weeds present
16 Sept	2-2½ leaf	wireweed 4 leaf willow weed (<i>Polygonum persicaria</i>) 4 leaf twin cress 8-12 leaf
4 Nov.	early bulb	wireweed up to 500 cm dia. willow weed 20-30 cm dia. twin cress up to 500 cm dia.

Trial 2. Four replications 1975

Treatment date	Crop stage	Weeds present
18 Aug	pre-em	None
3 Nov.	› 4 leaf	wireweed 5-15 cm willow weed 5-10 cm redroot (<i>Amaranthus powellii</i>) 5-10 cm barnyard grass 2-15 cm

Trial 3. Three replications 1976

Treatment date	Crop stage	Weeds present
22 Sept	3 leaf	barnyard grass, up to emergence of first true leaf twin cress up to 20 leaves white clover (<i>Trifolium repens</i>) 5 leaf hawkbit (<i>Leontodon taraxacoides</i>) 17 leaf sow thistle (<i>Sonchus oleraceus</i>) 9 leaf
12 Oct	› 3 leaf	As above plus: fathen (<i>Chenopodium album</i> agg) seedlings black nightshade (<i>Solanum nigrum</i>) seedlings chickweed (<i>Stellaria media</i>) seedlings wireweed seedlings poa annua (<i>Poa annua</i>) seedlings
28 Oct	› 4 leaf	As above and becoming young plants

The grower had applied the following chemical weed control treatments over the trial area prior to commencement of the trial; stale seed bed – proprietary mixture applying 0.25 kg diquat plus 0.25 kg paraquat/ha; flag stage of crop – proprietary mixture applying 1.2 kg chlorbufam plus 1.5 kg chloridazon/ha; 1 leaf stage of crop – 0.56 kg methabenzthiazuron/ha. Hawkbit was handweeded from the trial site on 12 October.

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The grower continued his weed control programme as follows:

Treatment date	Crop stage	Treatment kg/ha
22 Sept. 1976	3 leaf	methabenzthiazuron 0.56
26 Sept	3 leaf	propachlor 10.0
7 Oct.	> 3 leaf	methabenzthiazuron 0.56
31 Oct.	> 4 leaf	propachlor 10.0
5 Dec.	early bulb	methabenzthiazuron 1.7

RESULTS AND DISCUSSION

Treatment of onions at the flag (crook) stage with ethofumesate from 2.6-4.4 kg/ha appeared variably damaging (Table 1), whilst doses up to 3.0 kg/ha appeared selective at all other stages of the crop (Table 1, 2 and 3). Three further visually assessed screening trials, not reported in detail here, indicated good crop tolerance to ethofumesate at doses from 0.5-3.0 kg/ha applied pre-emergence, at the loop and at the 2 leaf stage of the crop. Residual weed control generally improved with increase in application rate (Table 1 and 2). Pre-emergence and early post-emergence (cotyledon to 1 true leaf) treatments of weeds resulted in better weed control than treatments made to more advanced weeds. Split applications up to 5 kg/ha applied as 3 kg/ha at the crop 3 leaf stage plus 2 kg/ha applied after the 4 leaf stage, or as 3 kg/ha pre-emergence plus 2.2 kg/ha at the crop 3 leaf stage appear selective (Table 2 and 3). Further investigation is required to ascertain whether this apparent selectivity is dependent on the interval between treatments, the crop stage at treatment, or is a function of both.

Post-emergence treatments of ethofumesate plus or followed by linuron gave superior control of larger weeds than did repeat treatment of ethofumesate alone. Ethofumesate applied in tank-mix with linuron, at the rates used, resulted in temporary leaf scorch and necrosis, but did not greatly reduce yields compared with split applications of ethofumesate followed by linuron 20 days later where leaf scorch was not apparent (Table 3). Pre-emergence control of barnyard grass with ethofumesate was greatly superior to post-emergence control, or that obtained with propachlor applied at the same time (Table 2 and 3).

The addition of 2-2.5% by volume of emulsifiable All Season Crop Oil to the ethofumesate spray mixture resulted in increased weed control, especially with the lower rates tested (Table 3). Crop yields may be depressed by the addition of oil when the treatment is followed closely by an application of linuron. Ethofumesate plus oil followed 20 days later by linuron resulted in the greatest number of "picklers", although total yields exceeded those of the grower (Table 3).

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TABLE 1: Weed control and crop yield trial 1

Treatment 18 Aug kg/ha	Treatment 16 Sept kg/ha	Treatment 4 Nov kg/ha	Weed % ground cover late Dec	% Crop tolerance visual	Yield as % of grower's yield
ethofumesate	2.6	ioxynil 0.7	1.5	100	84
ethofumesate	4.4	ioxynil 0.7	0.5	70	71
chlorbufam + chloridazon	1.6 2.0	ioxynil 0.7		100	99
	ethofumesate SC, 0.75	ioxynil 0.7	41*	100	81
	ethofumesate SCO, 1.1	ioxynil 0.7	Tr	100	107
	chlorbufam 1.2 + chloridazon 1.5	ioxynil 0.7		100	95
	ethofumesate 1.1	ioxynil 0.7	20	100	96
	ethofumesate 2.0	ioxynil 0.7		100	104
GROWER TREATMENTS:					
	18 Aug and 17 Sept	chlorbufam + chloridazon 0.9 + 1.13 kg/ha		100	100
	21 Oct	ioxynil 0.7 kg/ha			
	29 Oct	alachlor 2.9 kg/ha			

SC = 500 g/litre suspension concentrate;

SCO = SC plus crop oil at 2.5% of spray volume

* plus 3.5% other weeds

CONCLUSION

Providing weeds tolerant to ethofumesate are controlled by some other control method/chemical, ethofumesate treatments at 1-2 kg/ha appear to offer a reduction in the number of other herbicide treatments required in an onion weed control programme, whilst maintaining crop quality and yields.

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TABLE 2: Weed control and crop tolerance trial 2.

Treatment 18 Aug	Treatment 3 Nov	Weed % ground cover late Dec		% Crop Tolerance Visual
Nil	Nil	BG	WW	W
ethofumesate 3.0	ethofumesate + ioxynil 2.2 + 0.8	20	3	75
propachlor 6.9	ethofumesate SCO 2.2	Tr	Tr	5
chlorbufam + chloridazon 1.3 + 1.6	propachlor 7.0	20	10	30
propachlor 6.9	ethofumesate + alachlor 2.3 + 4.0	15	10	5
Nil	ethofumesate 2.2 + ioxynil 0.8	2	Tr	50
ethofumesate 2.2	ethofumesate SC 1.8	5		60
				Tr
BG = barnyard grass		WW = willow weed		SM = stinking mayweed (<i>Anthemis cotula</i>)
* 5-10% black nightshade, twin cross, redroot and fathen				

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- Cox, T.I., 1968. The development of weed control programmes in drilled onions. *Proc. 21st N.Z. Weed and Pest Control Conf.*: 17-23.
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- Wilson, G.J., 1971. Herbicides for weed control in onions. *N.Z. Jl. Agric.* 122: 75-77.

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TABLE 3: Weed control and crop yield, trial 3

Treatment 22 Sept kg/ha	Treatment 12 Oct kg/ha	Treatment 28 Oct kg/ha	Number of weeds/48m ²							Weed Score† 18 Jan	Onion size		Onion yield kg/16m ²
			6 Jan '77								% diameters		
			BG	H	BG	R	F	H	H		> 7cm	< 4cm	
ethofumesate 1.0	linuron 0.5		2	12					3.7	48	51	1	62
ethofumesate 1.5	linuron 0.5		1	2					3.0	48	48	4	60
ethofumesate 2.0		ethofumesate 2.0	28	18	41	19	7	28**	9.0	52	44	4	59
ethofumesate 3.0		ethofumesate 2.0	10	10	13	12		47	7.3	56	43	1	59
ethofumesate 1.0													
+ oil*	linuron 0.5				3		1		2.0	42	53	5	58
ethofumesate 1.5													
+ oil*	linuron 0.5				2				1.3	46	48	6	61
propachlor 6.5		ethofumesate 2.0			18	31	25	1	5.7	46	51	3	64
ethofumesate 1.0													
+ linuron 0.5			5	8	1		5		3.0	48	48	4	56
Grower treatments . . . see text									4.7	49	49	2	56

* crop oil at 2% of spray volume

BG = barnyard grass, H = hawkbit, R = redroot, F = fathen

** plus 7% black nightshade and twin cress

† weed score at harvest, 0 = No weed, 10 = high number