THE USE OF METRIBUZIN IN POTATOES AND TOMATOES

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Summary

Metribuzin applied before weed emergence was very effective at doses as low as 0.4 to 0.6 kg/ha especially in early season seed-beds. Higher rates also worked well after emergence. The herbicide applied either before or after emergence of the crop was tolerated by potatoes at these lower doses for the first four weeks after planting but yields were reduced by several later applications. Yields of tomatoes both direct-sown and transplanted were unaffected by similar metribuzin doses made at any time up to flowering.

INTRODUCTION

The use of metribuzin, a new substituted triazinone herbicide, was first reported by Eue *et al* (1969). Since this time, key reports on its development in Europe, mainly for weed control in potatoes, include recent papers by Mannall *et al* (1972) and Hack *et al* (1973).

Trials with metribuzin at Levin Horticultural Research Centre during 1971-74, one of which has already been reported by Cox (1971), have investigated weed susceptibilities and the tolerance of potatoes and both transplanted and direct-sown tomatoes. These trials are the subject of this paper.

METHODS AND MATERIALS

Potato experiments 1, 2 and 3 were planted by machine in two-row plots with rows 70 cm apart and 6.5 m long. Tubers were placed 30 cm apart in shallow, rounded ridges.

Tomato transplant experiments 4, 5 and 6 were laid out in plots 1.7 m wide and 6 m long containing one row of plants spaced 50 cm apart. Experiments 7 and 8 were direct-sown using a Stanhay precision drill in plots 1.7 m wide and 6 m long, containing three rows. At the late cotyledon stage the two outer rows were removed leaving a central row which was thinned to 30 cm between plants.

Further details of potato trials are included with results in Table 1 and Tables 2 and 3 show metribuzin rates and times of application to transplanted and direct-sown tomatoes, respectively. Appropriate fertilizer and insecticide/fungicide applications were made for each crop and herbicide treatments were applied with a propane pressurized sprayer.

Weed assessments were made where possible — usually counted in two random 30 x 30 cm quadrats per plot. In some instances, where there was a risk of weed competition affecting crop yield, the experiment was maintained weed-free through part or all of its life.

Potatoes were harvested with a two-row machine, tomatoes were handpicked weekly and both were graded and weighed.

TABLE 1: METRIBUZIN TREATMENTS AND THEIR EFFECT ON POTATO YIELDS

Rate, kg/ha and time of application		Total tubers, % of control		
Pre-em	Post-em	Expt 1 cv Rua	Expt 2 cv Rua	Expt 3 cv Ilam Hardy
0.5	—		90	101
0.8	—		105	110
—	0.3 4 weeks			104
—	0.5 after			107
—	0.8 planting			104
—	0.3 6-6½		90	75*
—	0.5 weeks	86*	105	88
0.5 +	0.5 after	90*		
—	0.8 planting	88*	102	70*
—	0.3 8 weeks		86*	
—	0.5 after		92	
—	0.8 planting		89	
Handweeded control		100 (64.2t/ha)	100 (40.6t/ha)	100 (16.5t/ha)
CV%		9.8	10.3	13.5

* Significantly lower than control at 5% level.

TABLE 2: DETAILS OF METRIBUZIN TREATMENTS APPLIED TO TRANSPLANTED TOMATOES, cv SCORESBY DWARF

kg/ha (post-em)		0.7	0.8	1.0
Applied, weeks	Expt 4	—	2½	—
after	Expt 5	2½, 4, 5½	—	2½, 4, 5½
transplanting	Expt 6	—	4	—

TABLE 3: DETAILS OF METRIBUZIN TREATMENTS APPLIED TO DIRECT-SOWN TOMATOES, Expt 7, cv SCORESBY DWARF and Expt 8, cv VF-145-21-4P

		kg/ha		
Applied 1 day after sowing:—		Applied 6, 7½ and 9 weeks after sowing:—		
0.4	0.6	0.2	0.4	0.6
pre-em	pre-em	post-em	post-em	post-em

RESULTS

Weed susceptibility

Experiments 3, 4, 6, 7 and 8 gave reliable information on the degree of susceptibility of various weed species to metribuzin. This is compiled in Table 4.

Crops — Herbicides

TABLE 4: SUSCEPTIBILITY OF WEEDS TO APPLICATIONS OF METRIBUZIN

metribuzin rate, kg/ha	Pre-emergence						Post-emergence	
	(a)		(b)		(c)		(d)	(e)
	Expt 3 0.5	0.8	Expts 0.4	7, 8 0.6	Expts 0.2	7, 8 0.4 0.6	Expt 4 0.8	Expt 6 0.8
<i>Capsella bursa-pastoris</i>			VS	VS	M			
<i>Chenopodium album</i> agg.			VS	VS			VS	VS
<i>Cotula australis</i>	VS	VS	VS	VS	R	R	S	
<i>Coronopus didymus</i>	VS	VS	VS	VS	M	S	S	VS
<i>Digitaria sanguinalis</i>	VS	VS			R	R	R	
<i>Fumaria muralis</i>								VS
<i>Juncus bufonius</i>			VS	VS				
<i>Oxalis corniculata</i>								VS
<i>Polygonum aviculare</i>					R	M	S	
<i>Polygonum persicaria</i>	VS	VS	VS	VS	S	S	S	VS
<i>Portulaca oleracea</i>			VS	VS	R	M	S	
<i>Rumex</i> spp								VS
<i>Senecio vulgaris</i>	VS	VS						
<i>Solanum nigrum</i> complex	R	R	R	M	R	R	R	M
<i>Spergula arvensis</i>	VS	VS						VS
<i>Trifolium</i> spp	VS	VS						VS

VS very susceptible
S susceptible, well controlled
M moderately susceptible, some useful effect
R resistant

Applied to (a) Moist soil, temperature 13.2°C (in 0-10 cm layer).
(b) Dry surface, moist beneath, temperature 15.1°C.
(c) Dry soil, temperature 17.0°C.
(d) Cotyledon-stage weeds, just emerging from wet seedbed.
(e) Weeds at young plant stage.

Pre-emergence applications ranging from 0.4 to 0.8 kg/ha worked well on two occasions, (a) and (b), in October 1973. In December (c), when the soil was dryer and warmer, doses of 0.4 and 0.6 kg/ha were not quite as effective as they were earlier in the season. Black nightshade (*Solanum nigrum* complex) was not controlled on any occasion; summer grass (*Digitaria sanguinalis*) was well controlled in October but not in December. When applied just after emergence, under wet seedbed conditions (d), an application of 0.8 kg/ha of metribuzin was very effective. Later, when weeds were at the young plant stage (e), a few species were still well controlled by the same dose.

Although black nightshade was the most resistant species occurring in the experiments, substantial reductions in numbers were obtained at the higher application rates applied before and just after emergence (Table 5).

TABLE 5: EFFECT OF METRIBUZIN ON POPULATIONS OF SOLANUM NIGRUM AND TOTAL WEEDS UNDER DIFFERENT EXPERIMENTAL CONDITIONS

metribuzin kg/ha	No's/m ² 2 weeks after treatment Expts 7, 8		Expt 4	
	Cool, bare soil, dry surface, moist beneath <i>S. nigrum</i>	Total weeds	Cotyledon stage weeds, wet seedbed <i>S. nigrum</i>	Total weeds
untreated	73	550	44	608
0.4	78	95	—	—
0.6	37	50	—	—
0.8	—	—	18	33

Useful suppression of an irregular infestation of couch (*Agropyron repens*) was also obtained from metribuzin applied at 0.5 kg/ha before, followed by 0.8 kg/ha after, potato emergence.

Crop tolerance

Potatoes: Post-emergence metribuzin sprays at higher rates caused occasional chlorosis and necrotic spotting of the foliage. Yields were affected by some applications made from six weeks after planting (Table

1) while no effect was seen up to four weeks.

It should be noted that the Ilam Hardy crop of Expt. 3 was infected with fungus diseases (*Fusarium* and *Phytophthora* spp.) which might have affected its tolerance to the herbicide. Both crops of Rua (Expts 1 and 2) were healthy and produced good yields.

Tomatoes: Transplanted tomatoes were sprayed after two and a half weeks, when buds were developing on the first truss, after four weeks, when in full bud and after five and a half weeks, when the first truss was in full bloom (Table 2). They were not visibly affected by metribuzin treatments nor were any reductions in total yield obtained. However, the highest dose, 1 kg/ha, tended to delay mid-season fruiting by about a week when applied 2½ or 4 weeks after transplanting (see Fig. 1).

Fig. 1 Effect of Metribuzin Treatments on Tomato Maturity in Expt 5

Crops — Herbicides

In the direct-sown crops (Table 3) herbicide treatments were applied earlier, ranging from pre-emergence to the eight true leaf stage of the young plant. None of the treatments caused any visible differences in plant development and final yields varied little from treatment to treatment, averaging 69 t/ha for Scoresby Dwarf and 88 t/ha for VF-145-21-4P.

There was a slight suggestion of delayed maturity following the higher (0.6 kg/ha) pre-emergence treatment.

DISCUSSION

Results of the potato experiments indicate that metribuzin is best applied before the plants emerge or during the first few weeks of emergence. Work in potato crops at Pukekohe (Wilson, 1974) confirms the results in this paper. A metribuzin rate of 0.5 kg/ha can give very effective weed control and the trials reported here show that the herbicide works well as a soil treatment in cool, early season seedbeds. However, some applications from six weeks after planting, equivalent to approximately three weeks from emergence, led to yield reductions even at the lower rates.

In tomato crops, as with potatoes, doses higher than 0.5 kg/ha are not often likely to be necessary. At an advanced stage of foliar development, transplanted tomatoes tolerated metribuzin well at 0.7 kg/ha and the threshold of crop damage reached in one experiment should be avoidable in practice.

Neither of the direct-sown tomato cultivars were affected by 0.4 kg/ha at any time of application, and although there was a suggestion of a growth check following the pre-emergence 0.6 kg/ha application, yields were not reduced. Risks of crop damage in commercial use can be minimised if 0.5 kg/ha is not exceeded. Applications can be made before or after tomato emergence but from other experience it seems advisable to avoid spraying the emerging seedlings at least until the two true leaf stage is reached.

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