WEED CONTROL IN POTATOES AT PUKEKOHE

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Summary

Four weed control trials on spring-planted potatoes at Pukekohe are reported. Excellent control of summer-germinating weeds was obtained in October plantings with alachlor at 2 kg/ha pre-emergence and with metribuzin at 0.5 kg/ha post-emergence. High rates of pre-emergence applied metribuzin caused slight veinal chlorosis in trial planted in early August but did not affect crop yield.

INTRODUCTION

Pre-emergence residual herbicides are now used on over 95% of the potato crops grown in the Pukekohe district. The most favoured chemicals are methabenzthiazuron, linuron and prometryn or a mixture of the latter two. Diquat/paraquat is often added to improve control of emerged weeds.

Weed control is generally very good on major plantings made over the May to July period. However, for August-November plantings, problems in the control of summer germinating weeds have been reported. The four trials described here were designed to evaluate rates and timing of various chemicals in order to improve control of weeds in spring planted potato crops.

EXPERIMENTAL METHODS

Details of the four trials are shown in Tables 1 to 4. Chemical rates chosen were those considered to be normal for the season and soil type (Patumahoe clay loam). In most cases twice normal rates were also included to observe possible harmful effects of overdose. Two row plots separated by guard areas were used, with a 4.5 m plot length initially, and 6.6 m in the third and fourth trials. Chemicals were applied over a 2 m wide strip in all trials using a modified Oxford sprayer (Cox 1968). The cultivar Ilam Hardy was used throughout and dates of planting, chemical application, weed recording and harvesting are shown below:

Trial	Planted	Treatment application		Weeds assessed	Tuber harvest
		pre-em.	post-em.		
1.	15/10/71*	21/10/71	—	17/11/71	17/2/72
2.	28/10/71	3/11/71	24/11/71	14/12/71	20/3/72
3.	3/8/73	24/8/73	—	25/10/73	18/12/73
4.	14/9/73	20/9/73	23/10/73	18/11/73	15/1/74

* EPTC treatments soil incorporated before planting on 29/9/71

Pre-emergence residual treatments were applied within six days of planting trials except the third where an overall paraquat/diquat was applied 21 days after planting and the residual herbicides the following day. Detailed weed counts were taken in the first two trials using six 230 cm² random quadrats per plot. In trials 3 and 4 weed counts were carried out only on the control plots and treatments were assessed on a 0 to 10 scale where 10 is equal to the unweeded control. After assessment all plots were maintained weed free.

Major weed species occurring in the trial sites were as follows: speedwell (*Veronica persica*), twincreed (*Coronopus didymus*), black nightshade (*Solanum nigrum* complex), wireweed (*Polygonum aviculare*), fumitory (*Fumaria muralis*), white clover (*Trifolium repens*), scarlet pimpernel (*Anagallis arvensis*), willow weed (*Polygonum persicaria*), seedling dock (*Rumex obtusifolius*) and shepherd's purse (*Capsella bursa-pastoris*).

RESULTS

Trial 1

Table 1 shows that alachlor at 2 kg/ha gave extremely effective weed control. Next best was metobromuron which reduced the overall stand except for some speedwell and black nightshade. Normal rates of monolinuron or linuron failed to give adequate control of speedwell or black nightshade and were no better than the diquat/paraquat treatment just before emergence. EPTC incorporated pre-planting produced disappointing results and timing of this chemical application to obtain ideal conditions was found to be difficult.

There were no significant differences in crop yields between individual treatments. When analysis was performed on chemicals (both rates) the first grade yield from EPTC was significantly lower than that of the alachlor treatments (Table 1).

TABLE 1: TRIAL 1 WEED COUNTS AND YIELD MEANS

Treatments	Timing	Rate kg/ha	Total Weeds /m ²	1st Grade Total Yield t/ha/t/ha
EPTC	pre-plant	3.0	124)	
EPTC	" "	6.0	57)	42.4 b 52.0 a
paraquat/diquat	pre-em*	0.25/0.25	63)	47.5 56.0
alachlor	" "	2.0	1)	
alachlor	" "	4.0	1)	46.7 a 55.4 a
monolinuron	" "	1.0	62)	
monolinuron	" "	2.0	29)	44.2 ab 53.7 a
metobromuron	" "	2.0	12)	
metobromuron	" "	4.0	35)	45.2 ab 54.0 a
linuron	" "	1.0	51)	
linuron	" "	2.0	49)	44.8 ab 53.7 a
untreated			172	43.4 53.0
CV%				10.0 7.9

* applied at first emergence of crop, 11 days after the other pre-emergence residual chemicals.

Trial 2

Results are shown on Table 2. Metribuzin as an early post-emergence spray when the potato foliage was 20 to 25 cm high gave outstanding weed control. Even at 0.5 kg/ha no weeds were recorded in the metribuzin plots four weeks after treatment application. By comparison unsprayed controls had 437 weeds/m². Excellent weed control was also achieved in this trial with cyanazine and prometryn. EPTC (raked in at first sign of crop emergence) or carbetamide (pre-emergence) failed to give adequate weed control. Crop yields were reduced by the carbetamide treatments.

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TABLE 2: TRIAL 2 WEED COUNTS AND YIELDS

Treatment	Timing	Rate kg/ha	Total Weeds /m ²	1st Grade yield t/ha	Total Yield t/ha
carbetamide	pre-em	2	339	28.8 bcAB	32.4 bcAB
carbetamide	" "	3	130	23.6 cB	26.2 cB
cyanazine	" "	1	8	35.8 abA	40.1 abA
cyanazine	" "	2	8	37.0 abA	40.8 abA
prometryn	" "	2	1	35.5 abA	38.5 abAB
EPTC	first em.	3	186	36.9 abA	40.3 abA
metribuzin	post-em.	0.5	0	38.6 aA	42.6 aA
metribuzin	" "	1.0	0	39.7 aA	44.4 aA
untreated		—	437	35.4 abA	39.3 abA
CV%				16.2	15.7
Chemical Mean Yields (2 rates)					
carbetamide				26.2 bB	29.3 bB
cyanazine				36.4 aA	40.4 aA
metribuzin				36.2 aA	39.4 aA

Trial 3

Results are shown in Table 3. Excellent weed control was obtained with all rates of metribuzin and at the very high rate of 1.2 kg/ha no weeds were recorded. At the low metribuzin rate (0.4 kg/ha) only a few black nightshade seedlings germinated with the occasional milkweed (*Euphorbia peplus*) plants. Prometryn gave good control and was better than linuron or methabenzthiazuron especially on speedwell and fumitory. In spite of an overall paraquat/diquat spray the day before application of the residual chemicals a dense weed stand followed.

Four weeks after the pre-emergence treatment, symptoms of veinal chlorosis were noted on odd plants where the high rates of metribuzin were applied (0.8 and 1.2 kg/ha). Otherwise these plots grew normally and yields were not affected. All herbicide treatments produced significantly higher yields than the hand weeded controls. Reduction in the controls may have been the result of weed competition in the early period of growth and/or some disturbance of plants in the process of hand weeding.

TABLE 3: TRIAL 3 WEED RATING AND YIELDS

Treatment	Timing	Rate kg/ha	Weed Rating* 0-10	1st Grade Yield t/ha	Total Yield t/ha
linuron	" "	1.2	4.0	57.2 aA	63.0 aA
linuron	" "	2.4	1.7	56.7 aA	62.1 aA
methabenzthiazuron	" "	2.0	4.0	57.2 aA	62.2 aA
methabenzthiazuron	" "	4.0	1.7	57.9 aA	63.9 aA
metribuzin	" "	0.4	1.0	53.7 aA	59.9 aA
metribuzin	" "	0.8	1.0	55.0 aA	60.7 aA
metribuzin	" "	1.2	0.0	54.5 aA	60.4 aA
prometryn	" "	1.2	3.0	55.1 aA	61.5 aA
prometryn	" "	2.4	0.7	54.6 aA	59.8 aA
untreated		—	10.0	47.7 bB	53.4 bB
CV%				7.0	6.3

* Weed rating 0 to 10 scale where 10 is equal to the untreated controls.

Trial 4

Results are shown in Table 4. Again best weed control was achieved with metribuzin, and the post-emergence treatment was slightly superior to the same rate applied pre-emergence. A few black nightshade seedlings appeared in the pre-emergence metribuzin plots but the post-emergence treatment was almost weed free. The combination of terbuthylazine and terbutryn gave very good weed control except for fumitory. Alachlor also gave good control but was improved by the addition of linuron which reduced wireweed density. As in the previous trial methabenzthiazuron did not rate highly and failed to give adequate control of fumitory, speedwell, black nightshade, wireweed and willow weed.

No significant yield differences were recorded between treatments.

TABLE 4: TRIAL 4 TREATMENTS AND WEED RATING

<i>Treatment</i>	<i>Timing</i>	<i>Rate kg/ha</i>	<i>Weed Rating* 0-10</i>
alachlor	pre-em.	2.0	2.1
alachlor + linuron	" "	1.5+0.6	1.0
alachlor + terbutryn	" "	1.5+0.6	2.1
linuron + terbutryn	" "	0.6+0.6	5.5
terbuthylazine + terbutryn	" "	0.6+0.6	1.3
linuron + trietazine	" "	0.6+0.6	5.5
methabenzthiazuron	" "	2.0	7.0
metribuzin	" "	0.6	0.8
metribuzin	post-em.	0.6	0.3
untreated	—	—	8.7

* Weed rating 0 to 10 scale where 10 is equal to the untreated controls.

DISCUSSION

Metribuzin gave outstanding weed control in three trials. There was no harmful effect on yield from rates up to 1.2 kg/ha pre-emergence or 1.0 kg/ha post-emergence. Post-emergence sprays resulted in yellowing of the potato foliage and since this has also been seen under commercial conditions application should be restricted to pre-emergence or early post-emergence stages of the crop. In addition any toxic effect is likely to be greater on soft foliage, particularly that of early planted crops (April to June).

Unfortunately, in all these trials insufficient summer grasses were present for reliable chemical comparisons. However observations on commercial crops indicated that metribuzin at 0.8 kg/ha gives control of summer grasses. For early season crops with the weed spectrum commonly occurring at Pukekohe the 0.4 kg/ha rate just before emergence is recommended. The effect of metribuzin was long lasting and in one trial a 0.5 kg/ha treated area remained clean for 10 weeks except for a few groundsel (*Senecio vulgaris*) plants. The first new weed to establish in this area was speedwell.

Alachlor gave very good weed control in the October planted trial although summer grasses did not occur in the site for evaluation as planned. No information is available from this trial series on whether alachlor would be suitable for early crops under high rainfall conditions.

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REFERENCE

- Cox, T. I., 1968. Further modification of the Oxford sprayer. *Pest Articles and News Summaries* (C) 14: 245-49.