WEED CONTROL IN ASPARAGUS SEEDLINGS

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SUMMARY

Five field trials were conducted over a 2 year period to investigate several herbicides for weed control in seedling asparagus (*Asparagus officinalis*). Chemicals showing useful broad spectrum weed control with adequate crop tolerance as pre-emergence treatments were diuron 1.5-3.0 kg/ha, metribuzin 0.4-0.7 kg/ha and linuron 1.0-1.5 kg/ha. Both metribuzin and linuron could also be used as post-emergence treatments at the lower rates. Methabenzthiazuron at 1.5 kg/ha had some broad spectrum activity, but was more useful as an additive to metribuzin especially for controlling black nightshade (*Solanum nigrum*).

INTRODUCTION

Transplanting of 1 year old crowns is the recommended procedure for establishing asparagus beds in the Waikato/Bay of Plenty regions. The rapid expansion of asparagus cropping in the region will require considerable areas to be sown with seed to provide the transplant crowns required.

Asparagus seed is very slow to germinate and early growth of the plant is weak, so that seedlings are readily dominated by the wide range of spring and summer germinating weed species common to the area. In addition to general aggressive broadleaf weeds, annual warm-zone grasses are a particular problem. Since crown size is greatly reduced by weed competition during the plant's juvenile stage, a high standard of weed control is necessary from the time seed is sown in mid spring until asparagus plants enter the winter dormant phase approximately 6 months later.

Weed control is of the utmost importance in a nursery situation (Dawbin 1980, Franklin 1980) and limited local experience indicates that control recommendations developed for other areas need modifications to meet differences in soil type, climate and weed spectrum. This paper reports the results of five screening trials which evaluated both pre-emergence and post-emergence herbicides for weed control in asparagus seedlings.

MATERIALS AND METHODS

Three trials were conducted to evaluate herbicides applied pre-emergence (pre-E) and two trials post-emergence (post-E) for weed control between 1979 and 1981. Some details of the trial sites are given in Table 1. The plots were 4.5 — 11.0 m long and 1.5 — 2.0 m wide in which asparagus cv. Mary Washington 500W or UC72 (in Trial 3) was planted with a precision seeder in rows 35 cm apart. Treatments were arranged in a randomised block design with four replications. The herbicides were applied in 300-350 litres/ha of water at 200 kPa.

Ten chemicals, alone or as mixtures, were investigated for pre-E weed control. A desiccant treatment of paraquat/diquat 0.5 + 0.5 kg/ha was applied overall to trials 1, 2, 4 and 5 as a separate application just prior to asparagus seedling emergence. Trial 5 also had an overall pre-E treatment of metribuzin 0.5 kg/ha as a preparatory measure for the various post-E treatments. For comparison with the chemical treatments, the trials had handweeded and/or untreated control plots.

Most of the weed assessments were made by visual scoring. Asparagus seedling

Crops

TABLE 1: Details of trials.

Trial No.*	Location	Organic C (%)	pH	Rainfall** (mm)	Sowing date	Spraying date
1	Rukuhia	9.1	5.7	50.4	17.10.79	1.11.79
2	Rukuhia	9.6	5.8	61.3	20.10.80	30.10.80
3	Tamahere	8.7	5.9	94.3	1.12.80	12.12.80
4	Rukuhia	9.1	5.7	37.0	17.10.79	4.12.79
5	Rukuhia	9.6	5.8	43.8	20.10.80	12.1.81

* Trials 1-3 pre-emergence, 4 and 5 post-emergence; the soil type was Horotiu sandy loam.

** During 2 weeks after spraying date.

tolerance was determined by plant counts, visual scoring and in some trials by harvesting the tops of 25 plants from each plot and measuring the dry matter production.

RESULTS AND DISCUSSION

The main weeds encountered in these trials were redroot (*Amaranthus powellii*), black nightshade (*Solanum nigrum*), willow weed (*Polygonum persicaria*), and summer grass (*Digitaria sanguinalis*), with small numbers of prostrate amaranth (*Amaranthus deflexus*), wild portulaca (*Portulaca oleracea*), narrow-leaved plantain (*Plantago lanceolata*) and broad-leaved dock (*Rumex obtusifolius*).

The best weed control from chemicals applied pre-E on their own was provided by metribuzin and diuron, especially at the higher rates (Table 2). Linuron, in most cases gave significantly less weed control than metribuzin but was only slightly inferior to diuron and better than simazine or aziprotryne. Results from aziprotryne were similar to simazine in Trial 1, and are not tabulated. The three mixtures, all of which contained metribuzin, also provided good weed control. Combinations with linuron or diuron had slightly better activity than a mixture with methabenzthiazuron (Table 2).

Treatments which did not provide adequate weed control on their own were aziprotryne 1.0, 1.5; simazine 0.5, 1.0; linuron 1.0, 1.5; diuron 1.0; alachlor 3.0 and methabenzthiazuron 1.5 (kg/ha). Some of the pre-E herbicides reduced asparagus seedling numbers by 20-100% and were considered unsafe. These included (not listed in Table 2): simazine 1.0; alachlor 3.0, 4.5; hexazinone 0.25, 0.5; bromacil 1.0, and the commercial mixture of atrazine 1.8 plus metolachlor 3.2 (kg/ha).

Numbers of asparagus seedlings in plots treated with various herbicides or combinations listed in Table 2 were all similar to those of the control treatments in Trials 1 and 2. In Trial 3 there was an indication that high rates of metribuzin and its mixtures, particularly with linuron, caused a reduction in the seedling population. Dry matter yields of asparagus 5 months after the spraying date confirmed that the 1.0 kg/ha rate of metribuzin resulted in a significant reduction in plant growth.

In Trials 4 and 5, the best weed control was achieved by metribuzin and linuron with similar crop tolerance (Table 3). Mixtures of metribuzin with methabenzthiazuron or linuron increased crop damage with some improvement in both initial and residual weed control.

Post-emergence applications of the high rates of metribuzin and linuron always resulted in some crop damage, although the seedlings recovered eventually in many cases. In a subsequent trial, not reported here, it was also noted that crop injury was intensified where the two herbicides were applied post-E, either alone or in combination to plants showing some damage from pre-E treatments.

Results from these trials show some useful treatments and combinations for both pre-E and post-E weed control in seedling asparagus. It is imperative that rates of herbicides be determined and used accurately. The seeds of the new hybrid cultivars are so expensive that no appreciable mortality would be acceptable. The activity of most

TABLE 2: Effects of pre-emergence treatments on weeds and asparagus seedlings.

Treatment	Rates (kg/ha)			Weed cover (%)			Asparagus seedling No. (%)*
Trial No.	1	2	3	1	2	3	3
handweeded control				4 gh	—	—	—
untreated control				78 a	100 a	100 a	100 abc
metribuzin	0.4	0.5	0.5	9 fg	23 cd	18 de	100 abc
metribuzin	0.8	1.0	0.7	2 h	10 de	13 e	85 bc
diuron	1.0	2.0	2.0	16 de	23 cd	23 de	105 ab
diuron	1.5	3.0	—	8 fgh	13 cde	—	—
linuron	1.0	1.5	1.5	18 de	48 b	30 cd	107 a
linuron	1.5	2.0	—	13 ef	28 cd	—	—
simazine	0.5	—	0.4	28 b	—	90 a	99 abc
methabenzthiazuron	1.5	2.0	1.5	26 bc	65 b	73 b	102 abc
methabenzthiazuron	2.3	3.0	2.0	21 cd	63 b	43 c	105 abc
metribuzin + diuron	0.4 + 1.0	0.5 + 1.5	0.5 + 1.5	4 gh	20 cde	10 e	97 abc
metribuzin + linuron	—	0.5 + 1.0	0.5 + 1.0	—	18 cde	13 e	81 c
metribuzin + methabenzthiazuron	0.4 + 1.5	0.5 + 1.5	0.5 + 1.5	8 fgh	23 cd	15 e	85 bc
CV%				11.8	20.1	8.9	7.2
days post sowing	15	10	12	56	77	45	46

* Seedling numbers in trials 1 and 2 were not significantly different between treatments; seedling No. as % of untreated.

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TABLE 3: Effects of post-emergence treatments on weeds and asparagus seedlings.

Treatment	Rate (kg/ha)	Weed Cover (%)		Asparagus Seedlings			
		Trial 4	Trial 5	Number (%)		DM (%)	Damage (%)
				Trial 4*	Trial 5*	Trial 4†	Trial 5
handweeded control		5	—	100	—	100 a	—
untreated control		—	80	—	88	—	0
metribuzin	0.4	25	17	95	93	83 ab	10
metribuzin	0.6	—	20	—	91	—	10
linuron	0.5	29	—	100	—	84 ab	—
linuron	1.0	21	33	101	92	76 b	25
methabenzthiazuron	1.5	42	—	100	—	81 ab	—
methabenzthiazuron	2.0	35	63	98	77	66 b	10
metribuzin + linuron	0.4 + 0.5	—	15	—	85	—	40
CV%		3.8	24	3.3	5.5	9.5	25
days post treatment		35	16	35	38	35	16

* No. as % of untreated trial 4; as % of pre-treatment count Trial 5.

† DM as % of untreated.

herbicides appears to last only 6 to 8 weeks, hence the crop requires a number of weed control measures. Some form of cultural weed control may be necessary to remove the weeds not controlled by the selective herbicides. Some perennial weeds such as Californian thistle (*Cirsium arvense*) and broad-leaved dock would have to be spot treated or handweeded.

A number of selective herbicides for control of grass weeds in asparagus are presently being investigated. In addition, work will be continued to define accurately the most suitable rates of herbicides and also to develop a weed control programme for the entire growing season.

REFERENCES

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