HERBICIDE TOLERANCE AND WEED CONTROL IN YOUNG NECTARINES

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SUMMARY

Trials conducted at three sites in Hawkes Bay showed dormant bud nectarines were tolerant to a wide range of herbicides. Alachlor, atrazine, dichlobenil, diuron, linuron, methabenzthiazuron, metribuzin, oryzalin, oxyflorfen simazine, terbacil, terbuteton, terbutylazine and terbutryn were applied directly over the exposed dormant buds without damage. Treatments giving best weed control resulted in the best tree growth. Terbutylazine generally gave the best weed control and tree growth but tended to produce yellow edging on old leaves.

INTRODUCTION

The export market for peaches and nectarines is promising for high quality fruit. An expansion of the export market, extension of the season by growing new cultivars and changes in favoured cultivars would mean continued new plantings.

There is little published work on herbicide tolerance of young stonefruit trees or of the effects of weed competition during early establishment. Five trials conducted in Hawkes Bay in 1985 and 1986 are reported here.

METHOD

In 1985 a two-replicate screening trial was conducted at HBARC on nectarine cultivars Fantasia, Redgold and Firebrite, peach cultivars Springcrest and Flamecrest and apricot cultivars Trevatt and Sundrop. A range of herbicides were applied over covered and exposed buds. No trees were damaged by any herbicide tested and no cultivar or species differences in sensitivity were noted. As a result of this trial all subsequent work in 1986 was done on one cultivar of nectarine, Fantasia, and all herbicides were applied directly over the exposed buds.

All trials were conducted on dormant bud trees grown on Golden Queen rootstocks using three or four trees, 50 cm apart, in single row plots. Trees were planted in July and cut back to the dormant bud. Herbicides were applied to bare soil by precision boom sprayer in 200 litres/ha at 230 kPa over a 1.1 m band with four replicates of each treatment. All trees received standard fungicide treatments for leaf curl control.

The soil type at Hawkes Bay Agricultural Research Centre (HBARC) is Mangateretere silt loam (pH 5.9; sand 26% silt 42%; clay 32%; organic C 3.7%; CEC 21.4% me). At Davis Road the soil is Twyford silt loam (pH 5.5; sand 38%; silt 43%; clay 19%; organic C 2.6%; CEC 16% me) and at Napier Road it is Twyford sandy loam (pH 5.4; sand 70%; silt 16%; clay 14%; organic C 2.2%; CEC 15% me).

The effects of treatments on tree height (scion growth above bud union) and trunk diameter, (15 cm about bud union) were measured in March. Weeds were counted or assessed visually.

Herbicide tolerance and weed control

A wide range of herbicides and herbicide combinations (Table 1) was tested at HBARC. One trial received no further weed control treatment to record treatment effect *per se*. The other was kept weed free, by spot treatment with paraquat, to measure tree tolerance to herbicides. Rainfall was 35 mm in the week after treatment and 79 mm in the first month.

Herbicide tolerance on light soils

Terbutylazine was compared with other herbicides (Table 2) for safety on light soils at Davis Road and Napier Road. Some additional hand weeding and spot

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TABLE 1: Effect of treatments on weed control and tree growth (nectarines cv Fantasia) with and without weeds.

Treatment (kg ai/ha) applied 5-6.8.86	%Weed cover ¹		Tree growth (March)			
			with weeds		without weeds	
	2.12.86		ht(m)	dia(mm)	ht(m)	dia (mm)
hand weeded (weed free)	—	—	1.37	18	1.41	17
untreated	100	100	0.70**	6**		
atrazine 2 + alachlor 3	3	0	1.27	15	1.53	18
dichlobenil 6	5	5	1.19	15	1.48	17
diuron 2 + methabenzthiazuron 3	11	7	1.39	17	1.54	18
linuron 2 + metribuzin 0.5	2	0.3	1.28	17	1.44	17
metolachlor 3.2 + terbuthylazine 1.8	3	0.3	1.32	16	1.49	19
oryzalin 4	54	54	0.87**	8**	1.50	17
oryzalin 4 + metribuzin 0.5	36	34	1.08**	12**	1.48	18
oxadiazon 2	16	15	1.22	14*	1.55	19
oxyfluorfen 1	4	2	1.29	17	1.51	19
oxyfluorfen 1 + metribuzin 0.5	4	2	1.39	18	1.42	18
simazine 3 + dichlobenil 6	1	0	1.23	16	1.46	17
simazine 3 + metribuzin 0.5	6	1	1.27	15	1.46	18
terbacil 1	15	0	1.12*	14*	1.54	18
terbuthylazine 4	5	0	1.30	16	1.39	16
terbuthylazine 6	4	0	1.38	16	1.57*	19
terbuthylazine 2 + terbumeton 2	4	0	1.25	16	1.50	18
terbutryn 2.8 + terbuthylazine 1.2	4	1	1.24	15	1.41	17
terbutryn 5.6 + terbuthylazine 2.4	4	0	1.31	17	1.43	17
LSD 5%			0.21	3.5	0.15	3.2
LSD 1%			0.28	4.6	0.20	4.2

¹ Figures in 2nd column = weed cover excluding prostrate amaranth.

* ** Significantly different from hand weeded at 5% and 1% respectively.

TABLE 2: Nectarine tree growth following the use of residual herbicides on two light soils.

Treatment (kg ai/ha) applied 4.8.86	Davis Road			Napier Road		
	% weed cover Oct ¹	tree growth		% weed cover Oct ¹	tree growth	
		ht(m)	dia(mm)		ht(m)	dia(mm)
untreated/hand weeded	80	0.76	10	25	0.98	10
oryzalin 4	22	1.04	13	60	0.71 ²	8 ²
oxadiazon 2	26	0.84	12	30	1.00	12
oxyfluorfen 1	3	0.96	13	25	1.16	15
terbuthylazine 3	2	0.81	11	15	1.11	16
terbuthylazine 6	3	0.66	10	8	1.22	16
terbuthylazine 12				0	1.11 ²	18 ²
terbuthylazine 1.5 + terbumeton 1.5	3	0.89	12	10	1.02	14
bark mulch	0	1.11	15			
mulch + oryzalin 2	0	1.11	16			
weed mat	0	1.02	14			
LSD 5%		0.42	5.2		0.25	4.2

¹ weeds on all plots removed October, December and February² only 2 replicates

treatment with paraquat and clopyralid (Versatill) was used to control resistant weeds. The mulch treatments were 15 cm of bark laid on bare ground or over herbicide. Rainfall was similar to that at HBARC but the Davis Road site also received about 25 mm sprinkler irrigation after treatment.

Time of herbicide application trial

Five herbicides (Table 3) were applied over dormant bud Fantasia in July, August or early September at HBARC. Plots were kept weed free after treatment. Bud movement was scored visually before and after the September treatment. After the July treatment there was no rain for 6 days and only 2.6 mm in 10 days. After August treatment 37 mm fell in 6 days while after September treatment there was no rain for 4 days and only 3 mm in the first 12 days.

TABLE 3: Effect of time of herbicide application on nectarine tree development from dormant buds.

Treatment (kg ai/ha)	Application date	Bud score		No. bud failures (from 16)	Tree growth	
		2/9	19/8		height (m)	trunk dia (mm)
hand weeded		1.9	4.3	0	1.14	14
linuron 2	15 July	1.7	5.0	1	1.24	15
oryzalin 4	15 July	2.0	4.7	2	1.19	14
oxadiazon 2	15 July	2.4	5.1	1	1.24	15
oxyfluorfen 1	15 July	1.7	4.7	3	1.21	15
terbuthylazine 4	15 July	2.1	4.8	3	1.29	16
linuron 2	21 August	1.6	4.5	1	1.18	14
oryzalin 4	21 August	2.3	5.0	1	1.17	14
oxadiazon 2	21 August	1.8	4.5	0	1.17	15
oxyfluorfen 1	21 August	1.9	4.1	1	1.22	13
terbuthylazine 4	21 August	2.0	4.9	0	1.19	15
linuron 2	3 September	1.7	4.6	2	1.26	14
oryzalin 4	3 September	1.8	4.9	0	1.14	13
oxadiazon 2	3 September	1.6	4.5	0	1.21	15
oxyfluorfen 1	3 September	1.6	4.1	2	1.16	14
terbuthylazine 4	3 September	1.7	4.7	0	1.24	15
LSD 5%					0.16	2.5

Bud score 1 = bud swelling, slight green showing; 2 = green < 3 mm;

3 = green tip 3-5 mm; 4 = small leaf 5-8 mm; 5 = small leaf 8-12 mm.

RESULTS

Herbicide tolerance and weed control

In the absence of weeds none of the wide range of herbicides tested had any adverse effect on tree growth even though all were applied over the exposed dormant buds (Table 1). Oryzalin, oryzalin + metribuzin, oxadiazon and terbacil did not give good early weed control and tree growth was depressed in these treatments. By January most plots had a cover of prostrate amaranth (*Amaranthus deflexus*) which was worst on plots free of other weeds. Simazine + dichlobenil gave the best control of this weed. Tree growth was greater on the trial which had been kept completely weed-free by spot treatment.

Herbicide tolerance on light soils

On the Davis Road site terbuthylazine (6 kg ai/ha) was not as good as mulch treatments (Table 2) but the results were variable due to sheep damaging a number of trees. Although no treatment gave adequate weed control terbuthylazine and oxyfluorfen showed the most activity. The Napier Road site had a serious problem with some difficult-to-kill weeds such as Indian doab (*Cynodon dactylon*), docks (*Rumex*

spp), yarrow (*Achillea millefolium*), narrow-leaved plantain (*Plantago lanceolata*) and creeping mallow (*Modiola caroliniana*), all of which required additional spot treatment with paraquat and clopyralid to control. Tree growth was good on all terbuthylazine plots (including an accidental application at 12 kg ai/ha). The higher rates gave good weed control including control of a late season infestation of creeping mallow. On both sites terbuthylazine-treated trees showed yellow edges to the older leaves in February.

Time of herbicide application

Buds were at the green tip stage at final treatment and earlier treatments had not affected bud movement (Table 3). The September treatments also had no effect on bud movement or on the number of bud failures. Tree measurements taken in February were similar for all treatment times (Table 3).

DISCUSSION

Young nectarine trees showed good tolerance to a wide range of herbicides. The choice of herbicide can therefore be based on effectiveness and cost. Terbuthylazine was the most effective treatment overall and also the cheapest.

The tolerance shown by nectarine dormant buds to direct application of herbicides should greatly simplify treatment, as it avoids the need to cover buds or direct spray away from buds. Though it is probably inadvisable to spray as late as 'green tip', there does appear to be a good safety margin for timing of application to dormant buds. Safety does not appear to be affected by subsequent rainfall.

Yellowing of older leaves in late summer following terbuthylazine treatment was noted on heavy soil in the screening trials in 1985/86 but only on light soil in 1986/87. This was probably due to a difference in rainfall. In 1985 nearly 200 mm of rain fell during the week of treatment whereas in 1986 there was only 79 mm in the month after treatment. Some of the trees affected in 1985/86 were left to fruit in 1986/87. Yield of all varieties cropped, Springcrest, Flamecrest, Firebrite and Fantasia, was higher on terbuthylazine plots than on oxyfluorfen/oryzalin plots, suggesting no adverse carry over effect.

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Herbicides used:— atrazine (Gesaprim), alachlor (Shell Alachlor), dichlobenil (Casoron G), diuron (Karmex), linuron (Linuron 50), metolachlor + terbuthylazine (Primextra II), oryzalin (Surflan), oxadiazon (Foresite), oxyfluorfen (Goal), methabenzthiazuron (Tribunil), metribuzin (Sencor), simazine (Gesatop), terbacil (Sinbar), terbuthylazine (Gardoprim), terbuthylazine + terbutmeton (Caragard), terbutryn + terbuthylazine (Topogard).