HERBICIDE TOLERANCE OF YOUNG NECTARINE TREES

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The importance of minimising weed competition in stone fruit plantings in their first year has been shown in previous trials in Otago (Mitchell 1987; Mitchell and Abernethy 1990) and Hawkes Bay (Hartley and Loader 1985). Many orchards in Central Otago are established on shallow coarse textured soils and there have been instances where residual herbicides have been associated with severe damage in stone fruit plantings.

This trial investigated the possible adverse effects on tree growth from planting to fruit production from the use of annually repeated residual herbicides at the recommended rate, and at 2 or 3 times the recommended rate. Rates of herbicides used in the trial were based either on label recommendations or on rates that had been used successfully in earlier tolerance trials.

Previously unplanted ground at the DSIR Research Orchard at Clyde was cultivated and prepared for planting in August 1986. Soil type was a Molyneux loamy sand with pH 6.3. Golden Queen root-stocks grafted with dormant buds of Fairlane nectarine were planted on ridges 3 m apart in early September 1986. Each 6 m long plot contained three grafted cuttings. First year treatments were applied to bare moist soil 8 days after planting. The 20 treatments (Table 1) and an untreated control were randomised within each of four replicates spread over seven rows. Plastic sleeves protected the cuttings from spray contact in the first year.

The annual spray treatments were applied in 320 litres water/ha at a pressure of 175 kPa to a 1.5 m wide strip either side of the trees using a modified Oxford precision sprayer with 8002 nozzles in late August/early September. Dichlobenil treatments were diluted with sand and applied by hand. The lower rate of each herbicide was increased by 100% and the higher by 50% in years 3 and 4 (1988 and 1989), except for norflurazon which was used only in the first year, being replaced by combinations of amitrole and simazine in later years (Table 1). Weeds which germinated between annual residual applications were spot sprayed approximately monthly with either paraquat, glyphosate, or glufosinate ammonium. The untreated control was hand-weeded monthly during each growing season. The area was irrigated by overhead sprinklers which were also used for frost protection. Tree pruning, fruit thinning, fungicide, insecticide and fertiliser applications were carried out according to normal orchard management. Buds which failed to grow in the first year (18%), were replaced by maiden trees in August 1987. The number of bud deaths was similar to those recorded in previous tolerance trials (Mitchell 1987; Mitchell and Abernethy 1990). Replacement trees were not included in any growth measurement or fruit yield data.

Tree growth was assessed by measuring height from the bud graft in June 1987 and 1988. Measurements were not taken in 1989 and 1990 due to pruning and tree shaping. Butt circumference, 10 cm above the graft was measured in June 1987 and 1988 and March 1990.

The crop was harvested in March 1989 and again in 1990 and the total number of fruit per tree counted and weighed. Tree height and the weight of marketable fruit, were subjected to analysis of variance.

No tree deaths were recorded following the planting of the replacement trees in 1987. Tree height in pendimethalin and diuron treatments was significantly less than the untreated control 9 months after planting (Table 1). In the second winter, after

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two annual applications of residual herbicide, only the higher rate of oryzalin was significantly affecting tree growth with height 15% less than in the hand weeded control. This effect was also apparent in butt growth with the circumference 20% less in June 1988 and 15% in March 1990. The rate of this herbicide had been increased to 13.5 kg/ha in year three (1989).

Short term symptoms of herbicide up-take (yellowing and inter-veinal discolouration of leaves) were noticed in the late spring of 1988 and 1989. The condition was more apparent where the higher rates of dichlobenil and terbacil had been applied. However, these effects were inconsistent within the treatments and appeared to have little or no effect on autumn leaf fall. In March 1990, trees in dichlobenil treated plots were visibly more 'open' in appearance than trees in other treatments.

Yield per tree is shown in Table 1. In 1990 oxyfluorfen at the high rate reduced both the number of marketable fruit and weight of fruit per tree, by 37% ($P < 0.05$) relative to hand-weeded plots. For oryzalin at the high rate, the number of marketable fruit in 1990 was 25% less ($P < 0.05$) than for hand-weeded plots but was not significantly different for fruit weight per tree. Fruit yield from the high rate of diuron was significantly less than that from hand-weeded. Oxyfluorfen was the only herbicide with a significant difference between the low and high rates.

The results indicate that in this Molyneux soil, nectarine trees are able to tolerate the herbicides used here even when applied at rates of up to three times those recommended.

TABLE 1: Tree height in 1987 and 1988 and fruit yield in 1989 and 1990

Treatment	Rate (kg/ha)		Tree Height (cm)		Weight of marketable fruit/tree (kg)	
	1986 & 1987	1988 & 1989	June 1987	June 1988	March 1989	March 1990
dichlobenil	6	12	88	207	12.2	16.2
	12	18	87	210	12.7	17.5
simazine	0.75	1.5	89	211	16.7	17.1
	1.5	2.25	76	203	13.6	18.4
terbacil	0.75	1.5	93	217	16.8	21.1
	1.5	2.25	77	207	13.8	19.3
pendimethalin	1.5	3.0	90	214	9.9	20.5
	3.0	4.5	74*	202	13.6	21.3
diuron	0.75	1.5	77	203	14.0	19.7
	1.5	2.25	74*	192	9.0	16.1*
linuron	1.0	2.0	79	202	16.0	20.0
	2.0	3.0	89	222	15.3	21.0
oryzalin	4.5	9.0	82	209	12.3	18.3
	9.0	13.5	77	184*	9.3	17.0
oxyfluorfen	0.5	1.0	88	204	17.0	18.8
	1.0	1.5	81	212	14.7	13.2*
oxadiazon	1.6	3.2	81	200	9.9	18.2
	3.2	4.8	80	205	14.1	20.0
amitrole i	0.4	0.8				
+ simazine	0.75	1.0	89	207	13.1	19.0
amitrole ii	0.8	1.2				
+ simazine	1.0	1.5	77	209	14.9	18.1
hand-weeded	-	-	91	216	13.0	20.8
LSD 5%			17	27	5.9	4.7

* Significantly different from hand-weeded at the 5% level.

i norflurazon 1.5 kg/ha } 1986 only
 ii norflurazon 3.0 kg/ha }

Herbicides used: norflurazon - Solicam; amitrole - Rural Activated Amitrole; simazine - Shell Simazine 50sc; dichlobenil - Casoron G; terbacil - Sinbar; pendimethalin - Stomp 330E; diuron - Karmex; linuron - Linuron 50WP; oryzalin - Surflan; oxyfluorfen - Goal; oxadiazon - Foresite; paraquat - Gramoxone; glyphosate - Roundup; glufosinate ammonium - Buster.

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