HERBICIDES FOR TAMARILLOS

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SUMMARY

A large number of herbicides was tested on tamarillos (*Cyphomandra betacea*) both as soil drench and foliar spray treatments. Those which warrant further investigation are soil applications of alachlor, chloroxuron, chlorthal, diphenamid, diuron, lenacil, linuron, methabenzthiazuron, oryzalin, oxadiazon, oxyfluorfen, pendimethalin, prometryn, propachlor, propyzamide and simazine and foliage treatments of atrazine, bentazone, cyanazine, desmedipham/phenmedipham, diclofop-methyl, fenoxaprop-ethyl, fenthiaaprop-ethyl, fluazifop-butyl, prometryn and sethoxydim. Programmes based on prometryn followed by a specialised foliage herbicide treatment are promising.

INTRODUCTION

The tamarillo, a native of Peru, has been grown commercially in New Zealand since the 1920's. It is also grown in India and South East Asia. It is a shrub, about 3-4m tall when mature, which prefers a warm climate, a light, well-drained soil and a sheltered situation. Fruiting begins within 18 months of planting.

Production in New Zealand has increased steadily in the past 5 years and in 1981 the annual yield was 2176t from 439 ha and about the same number of growers (Anon 1983). The fresh export value in the year ending 30 June 1982 was \$203,770 (Bollard and Weston 1983). Surprisingly, the volume of the New Zealand domestic market is twice that of kiwifruit.

The current MAF growers' handbook (Fletcher 1975) makes no recommendations for herbicide use apart from directed sprays of paraquat and diquat. A literature search has revealed no information from any other source on the tolerance of tamarillos to herbicides.

This paper reports the results of glasshouse screening tests carried out in April and May 1983 with soil-and foliage-applied herbicides. Procedures were similar to those previously used in kiwifruit (Cox 1980).

METHODS AND MATERIALS

Seeds extracted from fresh fruit were germinated in seed boxes and 'pricked out' into plastic propagating trays containing a soil, sand and pumice mixture. When seedlings had attained 2-3 true leaves they were transferred singly to 7 cm diameter plastic pots containing the same medium to which had been added a fertiliser mix of dried blood, superphosphate, sulphate of potash and lime. During the next 3 weeks protective sprays of triforine fungicide and permethrin plus pirimiphos-methyl insecticide were applied and the plants were then size-graded in eight replicates in each of two experiments. Plants ranged from 4-7 cm in height with 4-6 true leaves.

In Experiment 1 herbicides, as detailed in Table 1, were applied in 10 ml of solution per pot. The solution was applied evenly to the soil surface by pipette, carefully avoiding contact with the plant foliage.

The treatments of Experiment 2, listed in Table 2, were applied to the plant foliage in a laboratory spray booth. Herbicide solutions were sprayed in 410 litres/ha equivalent at 200 kPa through a fan nozzle travelling at a constant speed and height above the plants.

After treatment, plants were returned to the glasshouse bench and the development of effects was observed and recorded. Fresh weights were taken after 3 weeks and mean values for each herbicide are presented as individual rates were not significantly different.

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TABLE 1: Soil treatments applied to tamarillo seedlings at 4-6 true leaf stage and their effect after 3 weeks, Experiment 1.

Herbicide	Rates kg ai/ha	Mean fresh weight g	Herbicide	Rates kg ai/ha	Mean fresh weight g
acifluorfen	1.2, 1.8	2.4*	amitrole T	1.2, 1.8	2.2*
alachlor	1.2, 1.8	4.2	asulam	1.6, 2.4	5.1
atrazine	0.8, 1.2	3.5*	atrazine	0.8, 1.2	4.8
bromacil	0.8, 1.2	0.8*	aziprotrotryne	1.2, 1.8	2.7*
chloramben	4.0, 6.0	3.5*	bentazone	0.8, 1.2	4.4
chloroxuron	3.0, 4.5	4.4	bromofenoxim	1.0, 1.5	0.5*
chlorthal	5.0, 7.5	4.4	bromoxynil	0.4, 0.6	0.3*
chlorthiamid	5.0, 7.5	2.8*	carbaryl/ propanil	3.0, 4.5	0.4*
diphenamid	3.0, 4.5	5.0	carbetamide	2.4, 3.6	4.4
diuron	0.8, 1.2	4.4	chlormethazole	0.8, 1.2	3.7*
hexazinone	0.8, 1.2	0.9*	cyanazine	0.8, 1.2	4.3
karbutilate	3.0, 4.5	0.6*	dalapon	2.7, 4.0	3.4*
lenacil	0.8, 1.2	4.6	desmedipham/ phenmedipham	0.8, 1.2	4.7
linuron	0.8, 1.2	4.5	desmetryn	0.2, 0.3	2.7*
metamitron	3.0, 4.5	1.9*	diclofop-methyl	1.2, 1.8	4.9
methabenz- thiazuron	0.8, 1.2	4.7	dinoseb acetate	0.8, 1.2	3.9*
metribuzin	0.4, 0.6	1.3*	ethofumesate	1.2, 1.8	3.8*
oryzalin	2.4, 3.6	4.5	fenoxaprop-ethyl	0.4, 0.6	5.0
oxadiazon	1.2, 1.8	4.6	fenthiaaprop-ethyl	0.6, 0.9	4.9
oxyfluorfen	1.2, 1.8	4.6	fluazifop-butyl	0.6, 0.9	4.6
pendimethalin	1.2, 1.8	4.5	glufosinate	0.8, 1.2	0.5*
prometryn	0.8, 1.2	4.8	hexazinone	0.8, 1.2	0.7*
propachlor	3.0, 4.5	4.1	ioxynil	0.4, 0.6	0.6*
propyzamide	1.0, 1.5	4.4	linuron	0.6, 0.9	0.7*
simazine	0.8, 1.2	4.5	metamitron	3.0, .45	3.6*
terbacil	0.8, 1.2	0.7*	methabenz- thiazuron	0.8, 1.2	2.1*
terbumeton/ terbuthylazine	1.6, 2.4	3.7*	metribuzin	0.3, 4.5	3.6*
untreated		4.7	prometryn	0.6, 0.9	4.1
			sethoxydim	1.2, 1.8	4.4
			terbacil	0.8, 1.2	1.7*
			terbumeton/ terbuthylazine	1.2, 1.8	3.9*
			untreated		5.0
MSD 1%		0.8	MSD 1%		1.0
CV		24.2%	CV		33.8%

* Shows values significantly less than untreated at MSD 1%. (Tables 1 and 2).

RESULTS**Soil-applied treatments, Experiment 1**

Symptoms of acifluorfen were first to appear, 5 days after treatment. Necrosis of the leaf veins spread from the petiole end outwards and the plant growing point died. Seven days after application leaf scorch was noted on some plants treated with bromacil; on some plants treated with hexazinone the petioles were abnormally extended and the leaves slightly scorched.

After 14 days a number of other treatments had developed symptoms:—
 chlorthiamid: leaf tissue collapse (heart-shaped 'stain') surrounded by yellowing changing to green at leaf margin.
 karbutilate: leaf scorch and drop.
 metamitron: leaves drooping, margins scorched, new leaves cupped.
 metribuzin: severe scorch and drop of some leaves, other leaves cupped and chlorotic.
 terbacil: leaf scorch and drop.

After 18 days, propyzamide-treated plants were dark green with curling leaves. The terbumeton/terbuthylazine-treated plants were drooping, with leaves slightly cupped and occasionally scorched.

At the 3 week assessment fresh weights of all the above treatments except propyzamide were reduced (Table 1). Atrazine and chloramben treatments were also reduced. Root damage was noted on both chloramben and oxyfluorfen treatments.

Treatments which did not affect fresh weights at this assessment were: alachlor, chloroxuron, chlorthal, diphenamid, diuron, lenacil, linuron, methabenzthiazuron, oryzalin, oxadiazon, oxyfluorfen, pendimethalin, prometryn, propachlor, propyzamide and simazine.

Foliage-applied treatments, Experiment 2

Seven days after treatment the following symptoms were observed:

amitrole T: leaves scorched, new leaves 'bleached'.
 bromofenoxim: leaves severely scorched, some dropped.
 bromoxynil: leaves severely scorched.
 carbaryl/propanil: leaves with scorched patches, drooping, some dropped.
 dinoseb acetate: severe scorch and leaf drop, new leaves distorted.
 glufosinate: strong yellow colouration, some leaves scorched.
 ioxynil: leaf edges scorched, or chlorotic.

After several more days, further treatments developed symptoms:—

dalapon: leaves cupped downwards and distorted.
 ethofumesate: young leaves distorted, growing point necrotic.
 hexazinone: sprayed leaves scorched and dropped off.
 linuron: slight leaf scorch, elongated petioles, stunted.
 metribuzin: necrotic patches on leaves, some upward cupping, some leaves dropping.

Sixteen days after treatment the following symptoms were apparent:—

asulam: slightly distorted leaves with chlorotic areas.
 carbetamide: young leaves distorted (puckered), older leaves dark green colour.
 desmetryn: leaves drooping, some scorched and dropped off.
 methabenzthiazuron: leaves drooping, some scorched.
 terbacil: some leaves necrotic, some dropped, some with marginal scorch.
 terbumeton/terbuthylazine: leaves drooping, petioles extended.

Twenty days after treatment with aziprotryne, leaves showed chlorotic margins with some drooped and cupped.

In addition to these treatments, chlormethazole and metamitron treatments also reduced growth (Table 2). The visual effects of asulam and carbetamide were not accompanied by significantly lower fresh weights.

Atrazine, bentazone, cyanazine, desmedipham/phenmedipham, diclofop-methyl, fenoxaprop-ethyl, fenthiaaprop-ethyl, fluazifop-butyl, prometryn, and sethoxydim did not affect growth.

DISCUSSION

Many of the tested herbicides caused damage to tamarillo seedlings. The method of application sometimes produced interesting differences. Atrazine was tolerated as a foliage treatment, not as a soil drench, whereas the reverse was true for linuron and methabenzthiazuron.

Tolerance was not often associated with particular chemical groups although ureas and uracils were generally poorly tolerated. Within the triazine group, aziprotryne and desmetryn were not tolerated whereas prometryn was. Soil-applied simazine was tolerated but atrazine and terbumeton/terbuthylazine were not.

Herbicide treatments marked by an asterisk in Tables 1 and 2 produced definite and drastic early effects. Of the remainder, many are already in common use in other crops where their weed control potential is well-known and their value can be judged accordingly. The most appropriate programme for the crop would involve a residual herbicide applied just after planting-out in spring followed by an application directed at specific weeds later in the season.

Further field testing of all the tolerated herbicides is warranted. Programmes based on prometryn followed by a specialised foliage herbicide should be effective and safe.

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