TOLERANCE OF IMMATURE GRAPEVINES TO HERBICIDES

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Summary

Several herbicides were tested for weed control and crop tolerance of 16 months old grafted grape (*Vitis vinifera*) plants. Based on one season's results, simazine, napropamide and the terbutometon/terbuthylazine mixture provided good control of weeds and did not affect the fresh weight of the vines. Diuron, chlorthal-dimethyl and chlormethazole demonstrated adequate crop safety but did not give enough control of weeds to prevent a reduction in the growth of the vines.

INTRODUCTION

It is commonly believed that application of herbicides at rates normally used to control weeds among mature vines could be damaging if used in nurseries and on newly established vines. This is probably one of the main reasons why most of the vineyard managers in New Zealand are hesitant to use herbicides on young vines and resort to other methods of weed control which are expensive and sometimes not completely effective.

In mature vines the root system is a two-tiered structure with 30% of the roots in the top 30 cm of the soil and the remaining 70% diffused throughout the soil to a depth of 120 cm. Because of this, cultivation causes little root damage in mature vineyards, but it can be very damaging to the more lightly rooted young vines. Cultivation is also often more expensive, energy demanding and could result in the spread of perennial rhizomatous weeds when these are present.

Very little work on the tolerance of young vines to herbicides had been done in New Zealand but several chemicals including simazine, atrazine, monuron, diuron, napropamide and basal-applied glyphosate have given promising results overseas (Baird *et al* 1974; Curtis and Bennett 1979; Daniel and Lane 1978; Kiryukhin *et al* 1976; Mel'Kumova 1977). The objective of this study was to evaluate the effects of a number of likely herbicides on the growth and vigour of vines and to collect data on their weed control efficiency.

MATERIALS AND METHODS

Herbicide applications were made on 21 August 1979 to a vineyard containing 16 month old grafted plants (White Reisling grafted on to SO4 rootstock) at the Te Kauwhata Viticultural Research Station. The soil was a Te Kauwhata clay loam with 18% sand, 48% clay, 3.3% organic matter, 15.4 me./100 g cation exchange capacity and a pH of 7.3. Each plot consisted of six vines with a spacing of 1.5 m between the vines and 3 m between the rows. The plot width extended to 1.5 m on both sides of the vines so that the plants were in the middle of the plot and did not get any spray directly. Herbicides were applied with a 1.5 m wide boom on either side of the vines. The average height of vines at the time of the treatment was about 30 cm. The treatments were arranged in a randomised block design with four replications.

An overall application of paraquat at 0.5 kg/ha was made prior to applying the main herbicide treatments listed in Table 1 for a uniform desiccation of the existing vegetation. All herbicides were applied in a spray volume of 380 litres/ha water at a pressure of 210 kPa. The cultivation treatment was carried out by rotary hoeing between the rows and by using a Tassone undervine weeder as required.

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Fruit Crops

The effect of herbicides on weeds was evaluated 10, 16 and 22 weeks after application by harvesting four 0.1m² samples from each plot for dry matter weights. The vines were observed closely for phytotoxic symptoms such as chlorosis, necrosis, epinasty or stunting throughout their growth period. All the six vines in each plot were pruned leaving two buds of the current season's growth, on 14 April, 1980 and their fresh weights were recorded.

RESULTS AND DISCUSSION

Weed control

The weed spectrum of control plots during the trial period consisted mainly of broad-leaved dock (*Rumex obtusifolius*), twin cress (*Coronopus didymus*), narrow-leaved plantain (*Plantago lanceolata*), white clover (*Trifolium repens*), oxtongue (*Picris echioides*), sow thistle (*Sonchus oleraceus*) and Californian thistle (*Cirsium arvense*) with some sheep's sorrel (*Rumex acetosella*), shepherd's purse (*Capsella bursa-pastoris*), prairie grass (*Bromus unioloides*), lotus major (*Lotus pendunculatus*) and *Poa trivialis*. Although all the herbicide treatments included in this trial resulted in significant reductions in weed growth, the overall reductions by chlorthal-dimethyl and chlormethazole were not considered commercially acceptable (Table 1). Chlormethazole did provide significantly better control than chlorthal-dimethyl in the early stages but the residual effect was not sufficient in either case and the weed growth had recovered to more than 50% of that on the untreated plots by mid-December.

Of the materials tested, simazine provided the best overall weed control, especially at the high rate. The only rate of terbumeton/terbuthylazine mixture included in this trial provided equally good weed control. Low rates of diuron and napropamide were not effective enough but at high rates both these gave good results and, although generally less effective than simazine, the differences were mostly not significant (Table 1).

TABLE 1: Effect of treatments on weeds (DM yield as % of control) and the growth of vines (fresh weight of canes and leaves)

Treatment	Rate (kg/ha)	Weeks after initial application			Vine yield (% of control)
		10	16	22	
chlormethazole	2.0	37	49	51	180
chlormethazole	4.0	16	41	48	196
chlorthal-dimethyl	5.0	72	73	76	154
chlorthal-dimethyl	10.0	46	54	54	164
diuron	3.0	38	40	44	156
diuron	6.0	17	28	31	210
napropamide	3.0	42	47	47	206
napropamide	6.0	34	29	31	278
simazine	2.5	13	24	32	203
simazine	5.0	0	7	19	292
terbumeton + terbuthylazine	3.5	6	13	24	261
cultivation	-	0	0	0	296
control	-	100	100	100	100
LSD (5%)		22	18	16	44
control (g/m ²)		224	344	202	0.268*

* Fresh weight of vines (kg/vine)

Some of the weeds which proved difficult to control were broad-leaved dock, oxtongue and Californian thistle. Chemicals other than chlormethazole and chlorthal-dimethyl controlled weeds for the duration of the trial, especially at the high rates.

Fruit Crops

Crop tolerance

Pruning weights of the grapevines (Table 1) showed that all treatments improved the growth and yield of vines significantly over the untreated control. There were no significant differences between various chemicals at the low rate of application and pruning weights with the high rates were significantly greater than with the low rates except in the case of chlorthal-dimethyl and chlormethazole. At the high rate simazine and napropamide were the most promising chemical treatments and did not differ significantly from cultivation or the terbumeton/terbuthylazine mixture. The yields from the high rate of diuron and chlormethazole were significantly lower than the above three herbicides.

Visual observations of the grapevines at regular intervals showed no phytotoxic symptoms from any herbicide treatment and it could be assumed that the increases in vegetative growth were the result of reduced competition from weeds. This is supported by the fact that the better weed control given by the high rate of herbicides resulted in higher yields of vines. An exception to this was napropamide which gave similar weed control to diuron but significantly higher vine yields and in fact was one of the best treatments (Table 1). The long term effects of these chemical treatments remain to be determined.

Simazine is probably the most widely tested herbicide in both young and established vineyards and it has given varied results in trials elsewhere. Kokan and Fernandez (1974) reported damage in vine nurseries from simazine at 2 kg/ha or more. Severe damage to rooted cuttings in sand culture was also observed with a concentration of simazine equivalent to 2.5 kg/ha (Leonard *et al* 1964), although this medium would lack the adsorptive capacity of most soils. In reports by Curtis and Bennett (1979), Gast and Grob (1960), Kiryukhin *et al* (1976) and Mel'Kumova (1977), however, simazine gave good weed control without damaging vines.

CONCLUSIONS

The results of this study suggest that cultivation for weed control in young grapevines could be replaced by herbicides such as simazine, napropamide and the terbumeton/terbuthylazine mixture, all of which provided good weed control without causing any crop damage. Diuron, chlorthal-dimethyl and chlormethazole were less effective but caused no apparent damage. The weed spectrum of a particular vine nursery or a young vineyard may, therefore, be a major factor in selecting the herbicide and the rate to use for weed control.

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