RIDGE FUMIGATION FOR CONTROL OF VERTICILLIUM WILT IN STRAWBERRIES

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SUMMARY

Ridge fumigation was evaluated on soil infested with *Verticillium albo-atrum* as a cost-saving alternative to overall soil fumigation. Ridge fumigation with dazomet at three rates (228, 190, 152 kg ai/ha) gave better yields than 66% methyl bromide + 33% chloropicrin (MBCP) (138 kg total ai/ha) and chloropicrin (147 kg ai/ha) ridge treatments, and a similar yield to MBCP overall (450 kg/ha) in the first season (1981/82). In the second season (1982/83), all ridge-only fumigation treatments were inferior to MBCP overall fumigation. Dazomet was again more effective than MBCP or chloropicrin at a comparable rate.

INTRODUCTION

Verticillium wilt, caused by *Verticillium albo-atrum* is a common soil borne disease of a wide range of crops. The usual method of control is to fumigate the whole area of land to be planted with a mixture of 66% methyl bromide and 33% chloropicrin (Soil Fume MBC33) by mechanised rig or to incorporate dazomet granules (Basamid granular) into the soil. However, these 'overall' fumigation treatments are expensive. A cheaper alternative is to fumigate only the soil in the ridge, leaving the alleys untreated. This reduces the cost of polyethylene sheeting associated with 'overall' soil fumigation and significantly reduces the dosage of fumigant required. It also greatly reduces both time and cost of preparing strawberry beds for planting, and removes the risk of recontamination of the treated soil.

Soil fumigants can be manually injected into ridges covered with polyethylene film, but this method is physically demanding. The technique (application by hand) was shown to give good control of black root rot of strawberries (caused by *Cylindrocarpon* and *Pyrenochaeta* spp) (Tate 1982) and *Verticillium dahliae* (Tate *et al* 1982) on tomatoes. This paper reports a further trial with strawberries in soil infested with *V. albo-atrum*.

METHODS

At the Levin Horticultural Research Centre a liquid fumigant injector was developed for use on a TML strawberry moulder. This machine is able to ridge-up and cover the ridge with polyethylene film in a single operation. The liquid fumigant is carried in a stainless steel pressure tank, metered through a peristaltic pump driven by a land wheel and injected into the soil through a single tine outlet located centrally, just above the base of the ridge former.

A trial to evaluate ridge fumigation was established in a commercial garden on Levin silt loam with a history of verticillium wilt. Ridge fumigation treatments (Table 1) were applied in autumn, 1981, at bed formation, using different rates of both liquid and granular fumigants under black polyethylene film (50 μ m). Dazomet treatments were spread by hand just prior to ridging and incorporated into the ridged soil during ridge formation.

The standard treatment for comparison was overall MBCP soil fumigation with a mechanised rig, which was done about 3 weeks before bed formation and covering with black film by the TML moulder.

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Planting holes were cut in the film mulch a week after fumigation to allow gas to disperse. Strawberry plants cv. 'Tioga' were planted through the film 5 weeks later. The experimental design was a partially randomised block with six replications. Each plot consisted of double staggered rows of 40 plants at 15 cm spacings with 30 for recording. Crop management followed routine commercial practice. In the first season fruit yields were recorded three times a week from 27 October 1981 to 13 January 1982, and in the second season, twice a week from 12 November 1982 to 26 January 1983. From time to time diseased plants were checked for the presence of *Verticillium albo-atrum*.

TABLE 1: Effect of mechanised ridge-only soil fumigation treatments on 'Tioga' strawberry yield for 1981/82 and 1982/83 seasons

Soil fumigation treatment (ridge-only)	Application rate (kg ai/ha)	Total yield (t/ha)	
		1981/82	1982/83
chloropicrin	147	41.5	21.0
dazomet	228	48.2	29.1
dazomet	190	47.3	26.6
dazomet	152	48.9	28.3
MBCP (overall)	450	47.6	36.8
MBCP (ridge only)	138	38.3	16.1
untreated	—	24.1	7.1
LSD 5%		4.3	4.7

Fig. 1: Effect of mechanised ridge-only soil fumigation treatments on 'Tioga' strawberry cumulative yields, at fortnightly intervals, 1981/82 season.

RESULTS AND DISCUSSION

The lowest dazomet rate used was adequate for maximum response, whereas similar rates of MBCP and chloropicrin were too low (Table 1). The difference is partly attributed to dazomet being well incorporated throughout the ridge by rotary hoe whereas the liquid fumigants were ejected as a thin stream into the centre of the 45 cm wide ridge.

The benefits of ridge fumigation were not as great in the second season as they were in the first season. This can be attributed partly to the abnormally dry and windy weather during the growing period of the second season. The differences in yields between the first and second seasons and the effects of treatments are shown in Figs. 1 and 2.

Fig. 2: Effect of mechanised ridge-only soil fumigation treatments on 'Tioga' strawberry cumulative yields, at fortnightly intervals, 1982/83 season.

The trial area was heavily infested with *Verticillium* wilt inoculum, confirmed by the high level of disease that developed in untreated plots and the presence of *V. albo-atrum* in these plants. The high disease pressure tested the treatments much more severely, and under these conditions, dazomet was shown to be as effective as overall fumigation in the first production year.

Since the machine used in this trial is capable of forming a ridge, injecting the fumigant and covering it with polyethylene film in a single operation, it makes significant cost savings possible compared to overall fumigation. Ridge fumigation is an accepted practice in the USA and has already been adopted by fumigation contractors in New Zealand. It is concluded that the technique can be used to control *verticillium* wilt in strawberries grown as an annual crop, but caution is required for plantings destined for two seasons' production.

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