METALAXYL AS A MEANS OF CONTROLLING PHYTOPHTHORA IN ASPARAGUS

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SUMMARY

Metalaxyl was applied, at two rates of application, 650 g ai/ha and 1300 g ai/ha to a 6 year old asparagus (*Asparagus officinalis*) cultivar trial, in which phytophthora rot had previously been noted on spears. No yield increase was recorded after a pre-season application in 1982, although there was a significant reduction in the number of diseased spears. A significant increase in weight and numbers of spears was recorded after a second application of metalaxyl in 1983. Application at 1300 g ai/ha gave a better yield response than 650 g ai/ha. It is thought that metalaxyl is having a cumulative effect on *Phytophthora* levels in the soil and that phytophthora rot is probably causing serious losses in production beds.

INTRODUCTION

Phytophthora rot, caused by *Phytophthora megasperma* var. *sojae*, has been recorded on spears, crowns and roots of asparagus in New Zealand by Boesewinkel (1974). Establishment failures have been associated with *Phytophthora* in the Waikato and at Levin (Falloon 1982).

In a survey of the main asparagus production areas in New Zealand, Falloon (1982) found *Phytophthora megasperma* var. *sojae* rot in 11 of the 22 production beds examined. At Lincoln rotting and death of spears had been noted but not attributed to *Phytophthora* until 1979. Symptoms can be noted on spears 4 to 6 days after rain, typically as water soaked lesions, at or below ground level. The lesions spread rapidly, making infected spears unsaleable.

Falloon *et al* (1983) successfully controlled phytophthora rot in California, using metalaxyl. At one site plots treated with metalaxyl at 1100 g ai/ha gave a 43% higher yield, and at another site treatments of 550, 1100 and 2200 g ai/ha increased marketable spear numbers by between 22 to 43%.

In New Zealand, metalaxyl (Ridomil 5g, 5% ai, granulated formulation) at two rates of application, was applied to an established cultivar trial at Lincoln, and results are presented.

MATERIALS AND METHODS

Treatments were applied to a cultivar trial which had been planted in 1977. The trial had been harvested every season since 1978 (Falloon and Nikoloff 1983). *Phytophthora* infection of spears had been noted during the 1979, 1980 and 1981 harvests. Rows in the trial were 4.2 m long and 1.5 m apart. Plants were 0.2 m apart in staggered double rows that were 0.2 m apart.

There were eight cultivars in the trials: Viking, Viking 2k, Brooks Hybrid, UC66, UC72, Limburgia, Rutgers Beacon and MW500W. A split plot layout was used, with two replicates of two rates and untreated as the six blocks, and a staggered double row of each cultivar randomised in each block.

A shallow trench was dug around each block of eight rows before metalaxyl was applied, so any surface flooding would be drained away without affecting neighbouring plots.

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Metalaxyl was spread uniformly over blocks on September 17, 1982 and August 31, 1983, at rates of 650 g ai/ha and 1300 g ai/ha. Rainfall activated the metalaxyl after the 1982 application but sprinkler irrigation was applied for a short period after the 1983 application. Harvesting three times weekly began on 28 September in 1982 and on 1 October 1983 and continued for approximately 9 weeks. Weights and number of spears were recorded in five grades during the 1982 harvest. For the 1983 harvest, number and weight of saleable and reject spears were recorded.

In both seasons any spears showing phytophthora rot symptoms were recorded as diseased. Rows were also checked weekly for spears with phytophthora rot symptoms that had emerged but stopped growing. Pegs were used to mark the sites of diseased spears during the 1983 harvest, and on several occasions isolations from spears with phytophthora rot symptoms, confirmed the presence of the pathogen.

TABLE 1: Effect of application of metalaxyl on yield, expressed as a percentage of 1981 yields.

	untreated	Total yield metalaxyl 650g ai/ha	metalaxyl 1300g ai/ha	S.E.
1981 (no treatment)	6.44(t/ha)	5.67(t/ha)	6.09(t/ha)	0.38(t/ha)
1982	109%	114%	111%	0.48(t/ha)
1983	68%	90%	104%	0.33(t/ha)

RESULTS

Yield

Total mean yield obtained from each treatment block, expressed as a percentage of the 1981 yield is in Table 1. Results were analysed separately for each season. Yields between blocks in the 1981, and between treatments in the 1982 season were not significantly different. Metalaxyl treatments of 650 g ai/ha and 1300 g ai/ha increased total yield by 22% and 36% respectively in the 1983 season. This response was highly significant. Metalaxyl treatment at 1300 g ai/ha yielded as much as in 1981. The 650 g ai/ha treatment gave 90% of the 1981 yield, and the untreated only 68%.

TABLE 2: Total spear numbers after application of metalaxyl, expressed as a percentage of 1981 spear numbers.

	untreated	Total number of spears metalaxyl 650g ai/ha	metalaxyl 1300g ai/ha	S.E.
1981 (No treatment)	382,000/ha	321,000/ha	331,000/ha	27,900
1982	126%	129%	134%	30,900
1983	86%	107%	118%	17,300

Total numbers of spears for each treatment block, expressed as a percentage of 1981 spear numbers are in Table 2. Spear numbers between blocks in 1981, and between treatments in the 1982 season were not significantly different. Response to metalaxyl in the 1983 season was significant for total spear numbers.

Number of diseased spears

The mean number of diseased spears recorded from each treatment for the 1982 and 1983 season are in Table 3.

Results were transformed using $\sqrt{1+x}$ (where x = No. diseased spears) before analysis. There was a highly significant difference between the untreated and both

metalaxyl treatments in each year. There was no significant difference between metalaxyl application rates in either year.

Noting the site of every diseased spear, during the 1983 harvest, indicated that the disease was present along the length of every row in the untreated blocks and was not restricted to a particular site or plant.

TABLE 3: Mean number of diseased spears recorded per treatment after application of metalaxyl.

	Number of diseased spears (untransformed data)			S.E.
	untreated	metalaxyl	metalaxyl	
1982	28.4	5.9	9.5	3.4
1983	65.0	16.2	10.0	6.6

area of treatment blocks = 50.4 m²

Discussion

In this trial overall yields increased between 1981 and 1982 but decreased between 1982 and 1983. Other asparagus trials, at Lincoln, showed a similar pattern, with a decrease in yield between 1982 and 1983. This yield fluctuation can be attributed to seasonal effects as management over the three harvest seasons was similar.

No increase in yield occurred, after application of metalaxyl, during the 1982 harvest season; yields from the six treatment blocks followed a similar pattern to the 1981 harvest season. However there was a reduction in the number of diseased spears recorded in the treated blocks.

After application of metalaxyl in 1983 a significant increase in weight and number of spears was recorded. There was also an increase in the number of diseased spears in the untreated plots. Of the two rates of application, the better response to metalaxyl was obtained at 1300 g ai/ha. Yield increases were similar to those recorded by Falloon *et al* in California.

In previous seasons diseased spears had been noted 4 or 5 days after rainfall. The 1982 and 1983 seasons followed a similar pattern. Rainfall for both harvest seasons, 1 September to 30 November, was similar, (1982, 171.6 mm; 1983, 163.1 mm) but the pattern of rainfall was different. There were 28 rain days in that period in 1982, and 39 rain days in 1983. Thus although the average rainfall per day in 1983 was lower than 1982 it rained for longer periods. It should also be noted that overall, 1982 was a dry year, and had a below average rainfall of 495.5 (30 year average 689 mm). This could restrict the activity of *Phytophthora* in the soil. It is economic, at the rates used, to apply metalaxyl even if two applications, one year apart, are needed to achieve a similar yield increase to that obtained in this trial.

The yield results indicate that metalaxyl may have a cumulative effect on *Phytophthora* infection levels in the soil. It is almost certain that phytophthora rot lowers yield by reducing storage reserves in the roots, possibly affecting buds as well. A reduction in disease in the storage roots, should lead to better summer fern growth and increased yield during the next harvest season. Certainly the results recorded here indicate a large proportion of the damage caused by phytophthora rot remains unseen, below the soil surface. Falloon (pers comm) has suggested that one, late winter or early spring application of metalaxyl could be the most effective treatment.

CONCLUSIONS

Phytophthora can invade spears and buds of asparagus and is almost certainly attacking the storage roots. The results reported indicate that a significant increase in yield can be obtained by application of metalaxyl, the rate of 1300g ai/ha giving the greater yield increase. While metalaxyl can control phytophthora rot and give a subsequent increase in yield a more important conclusion to be drawn is that

phytophthora rot is probably causing more serious losses in production beds than previously thought. Further work is needed on that aspect as well as determining the long term effects of metalaxyl application and the most appropriate time of application.

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