CROP & FOOD RESEARCH
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Control of sclerotinia leaf drop of lettuce

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Introduction

Sclerotinia leaf drop (SLD), caused by the soil-borne fungus *Sclerotinia minor*, is an economically important disease of lettuce in New Zealand (Figure 1). Reports of unsatisfactory control of SLD with the sole currently available chemical, carbendazim, and reports of resistance and enhanced degradation problems with fungicides used against the disease overseas highlighted the need to identify alternative fungicides as well as other methods to control the disease. Several fungicides and biological control agents have been reported to reduce the incidence of *Sclerotinia* diseases. The aim of this study was to investigate the efficacy of four fungicides, calcium cyanamide, hydrated lime, and *Trichoderma* on SLD of lettuce.

Figure 1 Lettuce plant showing symptoms of Sclerotinia leaf drop.

◀ **Figure 2** Sclerotia of *S. minor* on inoculated potato tuber pieces.

Materials and methods

Two experiments were conducted at the Pukekohe Research Centre in 2006 on a Patumahoe mottled clay loam (pH 6.5). The two experiments (A and B) had identical treatments, shown in **Table 1**. The experiments were laid out in randomised blocks with five treatment replications along five rows. Each plot contained 24 lettuce plants (6 plants spaced 0.4 m apart along each of four rows per bed). Fertilisers, pesticides and fungicides during the growing season were managed as for local commercial practice. An Oxford precision sprayer, calibrated to 1000 L/ha, was used to apply the fungicides.

Lettuce plants cv. Winguard, established as cell plants, were transplanted by hand on 18 July and 6 November in eleven four-row beds. Sclerotia of *S. minor*, produced in the laboratory on inoculated potato tuber pieces (**Figure 2**) were distributed evenly on the surface of experimental plots (0.5 g/m^2) and raked into the soil 1 day before planting. A nylon mesh bag, containing 20 *S. minor* sclerotia, was buried 20–30 mm deep in the centre of each plot at planting. The bags were dug up 4 weeks after planting and the sclerotia recovered from the bags, washed, surface-sterilised, rinsed, and plated out on antibiotic-amended PDA at 20°C to determine the number of viable sclerotia. Disease assessments were carried out 2-weekly until plant harvest on 19 October and 27 December 2006.

The mean percentage viable sclerotia 4 weeks after planting, and mean incidence of plants infected with or killed by Sclerotinia at harvest were compared using analysis of variance (ANOVA).

Table 1 Experimental treatments.

1	Hydrated lime $Ca(OH)_2$ at 2.5 t/ha applied immediately after planting banded (10 cm wide) along rows
2	*Trichoderma hamatum*: Lettucemate™ Flake (2 kg/m3) in potting mix plus LettuceMate™ WP (100 g/100 L water) applied to cells at 200 ml/m2 3 days before planting, and 3 and 6 weeks after planting at 1000 L/ha
3	Prolific® (500 g/L carbendazim) at 2 kg/ha applied at planting and 1 and 3 weeks later
4	Suimisclex® 500 (500 g/L procymidone) at 1.7 L/ha applied at planting and 1 and 3 weeks later
5	Boscalid (500 g ai/kg boscalid) at 1.0 kg/ha applied at planting and 1 and 3 weeks later
6	Pristine (128 g ai/kg pyraclostrobin + 252 g ai/kg boscalid) at 1.5 kg/ha applied at planting and 1 and 3 weeks later
7	Perlka™ (calcium cyanamide) at 500 kg product per ha incorporated 10–15 cm into the soil, then left for 9 days before planting
8	Banded hydrated lime + *Trichoderma* + Suimisclex® 500 (HL + T + S)
9	Banded hydrated lime + *Trichoderma* (HL + T)
10	Banded hydrated lime + Sumisclex (HL + S)
11	*Trichoderma* + Suimisclex® 500 (T + S)
12	Control

Table 2 Mean percentage viable sclerotia 4 weeks after planting (for Expts A and B), and mean incidence of plants infected with or killed by Sclerotinia at harvest (Expts A and B combined).

Treatment	Expt A Mean % viable sclerotia	Expt B Mean % viable sclerotia	Expts A and B Mean % infected plants
Hydrated lime	78	73	12.1
Trichoderma	49	51	14.2
Prolific®	70	79	4.2
Suimisclex® 500	75	84	5
Boscalid	69	73	6.3
Pristine	71	74	6.3
Perlka™	73	94	5.4
Hydrated lime + *Trichoderma* + Suimisclex® 500	80	74	14.7
Hydrated lime + *Trichoderma*	73	50	14.2
Hydrated lime + Suimisclex® 500	76	93	11.3
Trichoderma + Suimisclex® 500	78	83	13.8
Control	81	83	17.5
LSD ($P < 0.05$)	11.8	11.8	5.1

Results

There was a very significant difference between treatments ($P < 0.001$) in the mean percentage viability of sclerotia after being buried for 4 weeks in the soil. There was also a significant experiment x treatment interaction ($P < 0.001$). Perlka™ and hydrated lime + Suimisclex® 500 were more effective in Expt A than in Expt B at reducing viable sclerotia, whereas hydrated lime + *Trichoderma* was more effective in Expt B than in Expt A (**Table 2**). *Trichoderma* on its own had significantly ($P < 0.05$) fewer viable sclerotia than to all other treatments for both experiments. Where *Trichoderma* was used with other treatments, it was not as effective against sclerotia.

The incidence of infected plants was significantly different between treatments ($P < 0.001$), and there were no treatment differences between the two experiments. Therefore, data from the two experiments were combined. Perlka™ and the four fungicides applied on their own gave best control of lettuce drop (**Table 2**). While Suimisclex® 500 on its own gave good control of drop, this fungicide was not as effective when combined with either lime or *Trichoderma*.

Conclusion

The three fungicides and Perlka™ gave similarly good control of lettuce drop. *Trichoderma* was more effective on its own rather than with Suimisclex® 500 and hydrated lime at reducing sclerotia in the soil ,probably because the hydrated lime and Suimisclex® 500 acted against the fungus. Further research is required to explain the efficacy of Suimisclex® 500 on its own but the lack of efficacy when combined with either lime or *Trichoderma*.

For comparisons of products for the control of Sclerotinia leaf drop of lettuce to be valid, it is important that the results of several field experiments from different geographic locations are compared. Future research is aimed at developing an integrated disease control program for Sclerotinia leaf drop using combinations of various controls and management practices in different regions.

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References

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