DEPARTMENT OF PRIMARY INDUSTRIES

Primary Industries Research Victoria
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Evaluation of diallyl disulphide (DADS) for integrated control of onion white rot on bunching onions

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Introduction

Onion white rot, caused by *Sclerotium cepivorum*, is a significant threat to production of bunching onions in vegetable farms in Tasmania, Victoria, NSW and Queensland. In fields infested with high levels of sclerotia of *S. cepivorum*, crop losses to white rot range from 5 to 50% if fungicide protection is inadequate during periods when soil conditions are favourable for disease development. Field trials evaluated the effectiveness of the germination stimulant of sclerotia DADS, used alone and in combination with fungicide and biocontrol treatments, for management of white on spring onion crops in sandy soils.

Onion white rot on spring onions

Injecting DADS into sandy soil

Methods

- DADS treatments (90% diallyl disulphide, Alli-up™) were injected into soil with modified MS rigs using 500-800L of water/ha when soil temperatures were between 13°C and 18°C (Spring and Autumn).
- DADS treatments were applied as single & dual applications using 5 and 10 L/ha of DADS.
- Fungicide sprays were applied with a knapsack (1000L of water/ha) the first after sowing (soil surface sprays) and repeated four weeks later (stem-base/foliar spray).
- Prills with spores of the biocontrol agent *Trichoderma atroviride* C52 (10^6 cfu/g prills, 50kg/ha) were applied below the seed with a modified seeder. *Trichoderma* levels in soil were determined using diluting plating and selective medium.

Table 1. Mean number of viable sclerotia of *S. cepivorum* per kg dry soil from plots treated with DADS in Spring 2002 and Autumn 2003

Treatment	Trial 1	Trial 2
untreated control	131.3a	51.7a
DADS (5 L/ha) 1 application	-	11.4b
DADS (10 L/ha) 1 application	-	21.6b
DADS (5 L/ha) 2 applications	45.5b	0.0c
DADS (10 L/ha) 2 applications	30.5b	1.4c

Means with different letters are significantly different (P=0.05).

Testing viability of sclerotia

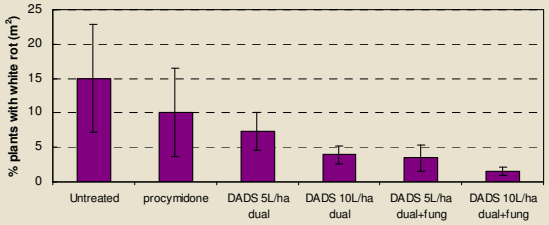

Fig. 1. Trial 1 - The effect of DADS alone and integrated with fungicide on disease incidence in spring onions.

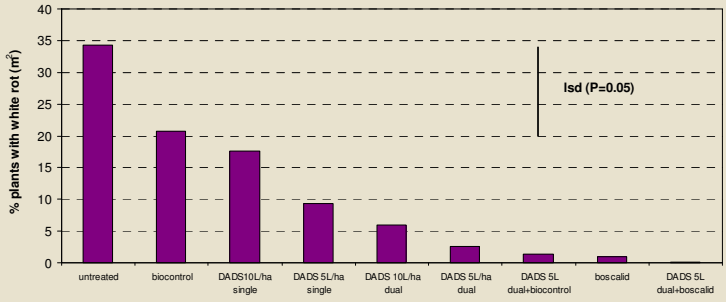

Fig. 2. Trial 2 - The effect of DADS alone and integrated with fungicide and biocontrol treatments on disease incidence in spring onions.

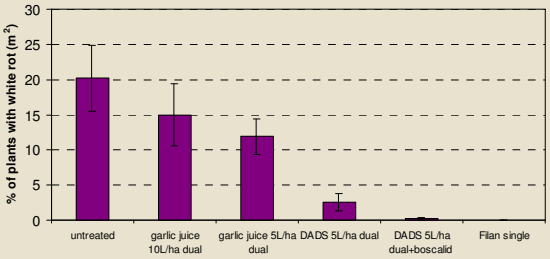

Fig. 3 Trial 3 - The effect of DADS alone and integrated with fungicide treatments on disease incidence in spring onions.

Results

Trial 1: Two applications of DADS reduced the number of sclerotia from 131.3 (nil) to 30.5 (10L/ha) and to 45.5/kg soil (5L/ha) (Table 1). These treatments reduced the percentage of plants infected with white rot from 15% to 7% (5L/ha) and to 4% (10L/ha) when compared to plants in untreated soil (Fig. 1).

Trial 2: Two applications with either 5 or 10L/ha of DADS were more effective than single applications of both rates in reducing the number of sclerotia in soil and disease incidence (Table 1 and Fig. 2). These dual treatments reduced the percentage of plants infected with white rot from 34% to 6% (10L/ha) and to 2% (5L/ha) when compared to plants in plots without DADS (Fig. 2). Integrating DADS with two sprays of the new fungicide Filan™ resulted in almost completed disease control. The biocontrol agent alone was not able to effectively protect the roots/bulbs of growing plants against infection throughout the season. However, when combined with single and dual applications of both rates of DADS it contributed to good levels of disease control.

Trial 3: Two applications of DADS using 5L/ha reduced the percentage of infected plants from 20% to 3% compared to plants in untreated plots (Fig. 3). Two rates (5 and 10L/ha) of garlic juice tested were not effective in reducing disease. One appropriately timed spray of Filan™ gave almost complete disease control.

Conclusions

- The germination stimulant of sclerotia DADS was effective reducing sclerotial numbers in soil and white rot incidence on spring onion crops.
- When combined with appropriately timed and applied fungicide treatments, effective control of white rot on bunching onions was achieved.
- Efficacy and application data collected by this research will support registration of DADS in Australia.
- Future work will focus on developing organic DADS and other cost effective soil treatments for white rot control in Australia.

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Acknowledgments:

Spring onion growers in Victoria