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GRDC GRAINS RESEARCH & DEVELOPMENT CORPORATION

Transparent tube investigation into how basal sclerotinia causes yield loss in narrow leaf lupin

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Key message:

Myceliogenic germination of sclerotia commences by eruption of mycelia from sclerotia in soils under saturated soil conditions. After germination, mycelia grow between soil particles and infect roots of plants, this is known as basal infection. Remarkable mycelial infection was observed in lupin roots grown in soil inoculated with *Sclerotinia sclerotiorum* sclerotia in transparent perspex tubes. This mycelial infection had some visual negative impact on shoot and root growth of lupin. This is an initial experiment, and a further experiment will follow.

Background:

Sclerotinia is one of the most devastating fungal pathogens and can cause disease in over 200 crops species. It has can have significant impact on crop production in Australia as well as all over the world. In WA, canola and lupin are the main crops infected by sclerotinia, and the main sclerotinia species is *Sclerotinia sclerotiorum*. It is a highly weather sensitive disease, preferring wet and humid conditions. Sclerotinia infection by *Sclerotinia sclerotiorum* takes place in two different ways: 1) direct germination (myceliogenic germination) from sclerotia that mostly causes basal infection on plant stems at and below ground level (Figure 1); 2) Sclerotia can also produce apothecia and ascospores (carpogenic germination), this can cause canopy infection starting from infected flower petals (Figure 2). In recent years, incidence of basal infection in lupins has been increasing and growers are keen to know how this form of sclerotinia infection causes yield loss and can it be managed?

Figure 1a. Mycelogenic germinated Sclerotinia infected lupin seedlings infected with *Sclerotinia minor* (Jurien), Northam 2023

Figure 1b. Mycelogenic germinated *Sclerotinia minor* infected adult lupin plants (Jurien), Northam

Figure 2. Carpogenically germinated Sclerotia produce apothecia and ascosposes, ascosposes infect adult lupin plants in the crop canopy - *Sclerotinia sclerotiorum* infection symptoms shown in Bolgart in 2022.

Aim:

An observation trial was done at DPIRD Northam to understand how sclerotinia myceliogenic germination causes considerable damage in basal parts of lupin plants especially collar zone and root system of plants and is there any impact on plant architecture?

Methodology of trial:

This study used perspex transparent tubes to grow lupin plants. Two thirds of each perplex tube was filled with washed river sand and the top 1/3 filled with compost. Four lupin seeds and five sclerotia (per tube) of *Sclerotinia sclerotiorum* were placed in the middle of the compost in inoculated tubes. Uninoculated tubes on the other hand, contained only 4 lupin seeds per tube and no sclerotia. There were only two treatments and 4 replicates of each - T1 is uninoculated control and T2 is inoculated. Lupin variety was Jurien and tubes were thinned to three plants per tube. The experiment was set up on 15 April 2023 and the tubes kept in growth chamber which was maintained at around 20^0C temperature and 85% humidity, 12 hrs light/12 hrs dark period. Soil in the tubes was kept moist. The plants were observed weekly to see the disease progression.

Results and discussion:

The observation study showed that sclerotia germinated in the moist humid conditions leading to myceliogenic germination. Mycelial growth was seen in roots of inoculated tubes but roots in uninoculated tubes remained clean and healthy (Figure 3). In this study, myceliogenic germination in the inoculated treatment was observed to cause reduced root growth, root damage and reduced shoot growth compared to the healthy uninoculated

control treatment (Figure 4). Fresh and dry shoot and root weights of both infected plants and healthy plants were compared as part of the research but were not significantly different in a statistical analysis (Figure 5). This was an initial observation study to test the methodology and for more understanding another experiment will follow.

Inoculated vs uninoculated | Inoculated all four tubes | Uninoculated all four tubes

Figure 3. The treatments in translucent tubes monitored during the study showing the impact of sclerotinia myceliogenic germination on lupin plants

A) Whole plant Uninoculated (left) vs Inoculated (right) B) Roots Uninoculated (left) vs Inoculated

Figure 4. Sclerotinia mycelogenic germination and its impact on A) whole lupin plants and B) roots

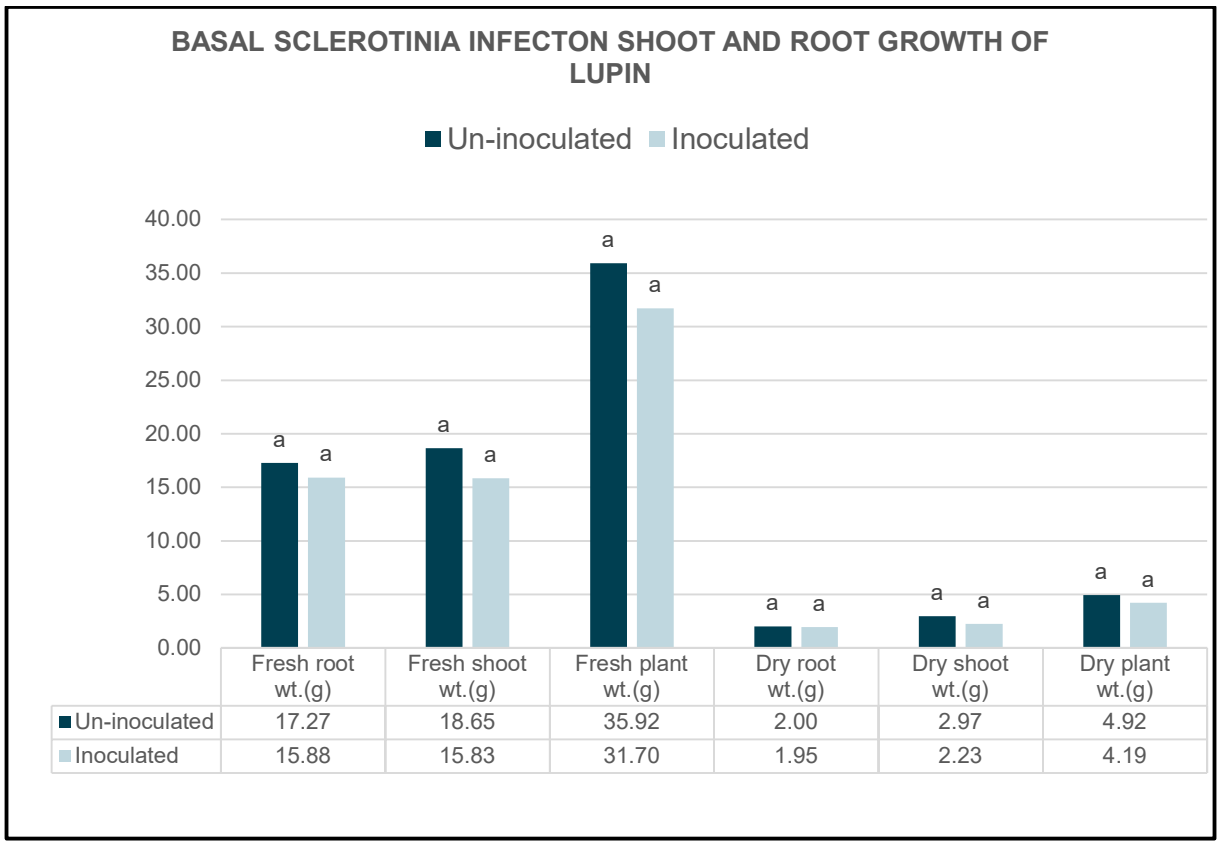

Figure 5. Effect of Sclerotinia mycelogenic germination on lupin shoots and roots weight shown in grams (G) for uninoculated (no sclerotia added to tube) and inoculated treatments.

The research was undertaken as part of the GRDC project DAW2104-002RTX - Sclerotinia management for narrow leaf lupin crops in Western Australian farming systems. Research is continuing.

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