



Damping off in spinach

Best bet fungicide and biologicals - trial 2016-2017

Short report by Len Tesoriero and Donna Lucas

Main finding

A preliminary field trial was conducted to evaluate the efficacy of chemical and biological control treatments for damping off pathogens in spinach. We demonstrated that three fungicide treatments significantly reduced the area of diseased plants within beds, however, they did not significantly increase overall spinach yield compared to untreated controls. This is most likely due to other variables affecting plant growth in the trial area.

The trial

The trial was established at Harvest Farms at Richmond, Tasmania.

Trial design was a Latin square with six treatments and six replicates. Each plot was a 10m length of bed.

Trial treatments were:

1. Control (6 L water/treatment unit)
2. Previcur® (Propamocarb) @ 2.6 L/ha + Aliette® (Fosetyl-Aluminium) @ 1.2 kg/ha
3. Serenade Prime® (Bacillus subtilis QST 713 strain) @ 7 L/ha
4. Uniform® (Metalaxyl-M 124 g/L + azoxystrobin 322 g/L) @ 400 mL/ha
5. Uniform® + Serenade Prime® @ 7 L/ha
6. Previcur® @ 2.6 L/ha + Aliette® @ 1.2 kg/ha + Serenade Prime® @ 7 L/ha

The spinach was sown on 19th December 2016. The seed variety was 2157. Seed was dressed with Thiram and the effective sowing rate was 1,795 seeds / linear metre (1,600 seed / linear metre x 0.9 field factor¹). The width of the sowing bed was approximately 1.5m.

Trial treatments were applied as a soil drench using watering cans after sowing on the same day.

¹ 'Field Factor' is a correction based on expected losses in the field for the species.

Results

Diseased plants became evident in the crop

We observed diseased plants that showed typical symptoms of damping off. At early stages of plant development, individual plants were found to be wilting, dying or dead (Figure 1, 17 days after sowing). Then, as the crop developed, bare patches became evident, which is typical of damping off caused by *Rhizoctonia* spp. (Figure 2, 24 days after sowing). *R. solani* and *P. ultimum* were isolated when affected plants were sampled and plated.

R. solani was confirmed by DNA analysis of soil samples taken at sowing and harvest. Two sub-species relevant to vegetable crops were determined from these soil molecular assays: *R. solani* AG2-1 and AG2-2 which can both affect a wide range of crops. AG2-2 is known to cause damping off of spinach.



Figure 1. Plants wilting and roots rotting (typical damping off symptoms) (17 days after sowing)



Figure 2. Bare patches where plants have died (24 days after sowing)

Some plants were observed with symptoms that looked slightly different to typical damping off disease. Plants were stunted and yellowing but roots did not exhibit typical damping off rotting (Figure 3). *Colletotrichum* was isolated from leaves of these plants. Therefore, it was most likely Anthracnose disease that caused the symptoms. These were observed in two or three small patches, but *Colletotrichum* may have also occurred in other areas within the trial that were not examined or tested in detail.

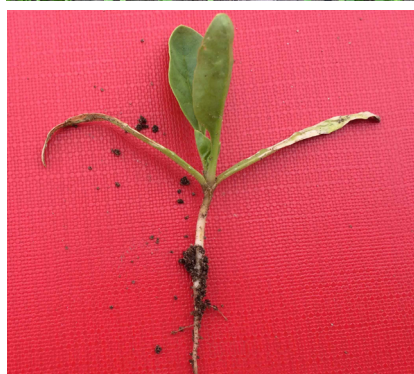


Figure 3. Plants wilting, yellowing and dying (17 days after sowing)

There was a treatment effect on number of disease patches (harvest date)

There was a significant treatment effect on the number of diseased (bare) patches. There were fewer bare patches in treatments 4, 5 and 6 compared to the control (Figure 4).

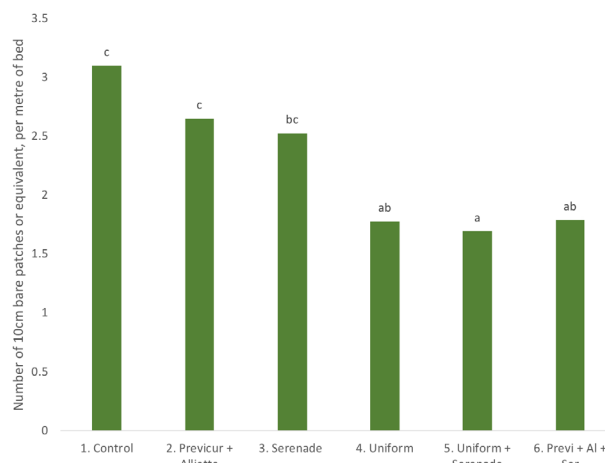


Figure 4. Number of 10 cm disease diameter patches per metre of bed

There was no significant treatment effect on yield

There were no significant treatment effects on spinach yields. The average yield across all treatments was 2.5 kg per metre of bed. Data for each plot ranged from 1.6 to 3.9 kg per metre of bed. Yield and disease occurrence were very variable across the site.

Discussion and implications

The wet conditions before sowing and just after sowing most likely worsened the occurrence of disease. These wet conditions made tillage and other operations difficult and as a result the soil in some areas within the trial was more cloddy than typical at sowing. Soil condition may also have influenced the occurrence and distribution of disease.

The variability in yields per plot was most likely affected by site variability including: irrigation and water application (irrigation affected by wind), soil structure, depth of top soil and natural spatial variability in abundance of soil pathogens. Compaction was evident at a depth of about 20 cm but was not consistent across the site or across beds. This may relate to variation in depth of top soil or due to beds being relocated on top of previous wheel tracks. Compaction can cause drainage issues which can make soil-borne diseases worse.

The treatment effect on disease bare patches is promising. However, further work is required to confirm this effect under different conditions. In both of the treatments that included Uniform[®], there were fewer disease patches than in the control. The Previcur[®] + Alliette[®] + Serenade[®] treatment also had fewer disease patches than the control, suggesting there may have been a positive interaction between these products given that treatments of Previcur[®] + Alliette[®] alone or Serenade[®] alone did not have significantly fewer diseased patches than the control.

Conclusions and recommendations

It is promising that some of the products / product combinations examined in this trial reduced the bare patches in the crop.

This trial was conducted as a preliminary trial. Fungicide trials take considerable time and effort and require assessment under a range of conditions of not only efficacy but also different application rates, split applications and placement as well as other health and environmental aspects for registration purposes.

Future research should consider additional fungicide active ingredients and also consider results from current pot trials using seed treatments for spinach.

Next steps are to compile research from this and other trials to prioritise future research needs.

Seed treatment is preferable to soil drenches to reduce the number of operations in the field.



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