Field Pea, Fungicide treatments to control ascochyta blight, HRZ Mid North (Hart), South Australia
Field Pea, Fungicide treatments to control ascochyta blight, LRZ Upper Eyre Peninsula (Minnipa), South Australia

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Aim
To compare the effectiveness of foliar fungicides and fungicidal seed dressings applied at 4 node stage to control ascochyta blight in field pea.

Background
Ascochyta blight (synonym: blackspot) is a common disease in Australian field pea where all varieties are susceptible. It is estimated to cause 15% loss in national annual yields. In Australia, the causal pathogens of Ascochyta blight are *Didymella pinodes*, *Phoma medicaginis* var. *pinodella* and *Phoma koolunga*. Ascospores of *D. pinodes* are blown several kilometres from infected stubble during autumn and early winter and conidia of all three pathogens are rain-splashed from the infected stubble, soil and diseased plants throughout the season. A second disease cycle is brought upon during spring when conditions are conducive for the spread of ascospores by wind, rain and increased humidity.
A foliar fungicide strategy is recommended for crops that have a potential yield of at least 1.5 t/ha. However, application of fungicides for crops with grain yields below 1.5 t/ha is not economical. Current strategy includes the application of P-Pickel T® fungicide as a seed dressing followed by foliar applications of fungicide at 7-9 node growth stage and at early flowering. The seed dressing and first foliar spray are designed to control the disease earlier in the season and the latter spray is to control the second wave of disease in the spring resulting from the ascospores.
However, practical problems in the application P-Pickel T® as a seed dressing has led to its poor preference by the industry. For instance, it is difficult to handle and has deleterious effects on rhizobium inoculant. Therefore, this trial will compare the efficacy of foliar fungicide sprays at early growth (at four node stage) against the P-Pickel T® seed dressing as an alternative strategy.

Treatments
Fungicide strategies

Treatment	Product & rate of application	Active Ingredients	Time of application
Nil	Fungicides not applied	Na	NA
P-Pickel T®	P-Pickel T® (200ml/100 kg seed)	Thiram (360 g/L) + Thiabendazole (200 g/L)	Seed dressing
P-Pickel T® and fortnightly chlorothalonil	P-Pickel T® (200ml/100 kg seed)	Thiram (360 g/L) + Thiabendazole (200 g/L)	Seed dressing
	Chlorothalonil (2 L/ha)	Chlorothalonil (720 g/L)	Fortnightly
P-Pickel T® and 2 sprays of chlorothalonil	P-Pickel T® (200ml/100 kg seed)	Thiram (360 g/L) + Thiabendazole (200 g/L)	Seed dressing
	Chlorothalonil (2 L/ha)	Chlorothalonil (720 g/L)	At 7-9 nodes and early flowering
P-Pickel T® and 2 sprays of Aviator XPro®	P-Pickel T® (200ml/100 kg seed)	Thiram (360 g/L) + Thiabendazole (200 g/L)	Seed dressing
	Aviator XPro® (600 mL /ha)	Bixafen (75 g/L) + Prothioconazole (150 g/L)	At 7-9 nodes and early flowering
P-Pickel T® and 2 sprays of Veritas®	P-Pickel T® (200ml/100 kg seed)	Thiram (360 g/L) + Thiabendazole (200 g/L)	Seed dressing
	Veritas® (1 L/ha)	Tebuconazole (200 g/L) + Azoxystrobin (120 g/L)	At 7-9 nodes and early flowering
2 sprays of chlorothalonil	Chlorothalonil (2 L/ha)	Chlorothalonil	At 4 nodes and early flowering
2 sprays of Aviator XPro®	Aviator XPro® (600 mL /ha)	Bixafen (75 g/L) + Prothioconazole (150 g/L)	At 4 nodes and early flowering
2 sprays of Veritas®	Veritas® (1 L/ha)	Tebuconazole (200 g/L) + Azoxystrobin (120 g/L)	At 4 nodes and early flowering

Table 1. Trial site details

	Hart	Minnipa
Sowing Date	16 May	15 May
Fertiliser (kg/ha) [1]	80	75
Disease inoculum	Infected stubble[2]	Infected stubble[2]
Variety	PBA Oura	PBA Oura
Seeding rate (plants/m²)	55	55
First fortnightly chlorothalonil	3 June	6 June
4 node spray	27 June	24 June
9 node spray	27 June	22 July
Early flowering spray	5 September	6 August
Replicates	3	3

[1]MAP (9.2, 20.2, 0, 2.7) + Zn (2.5)
[2] The disease was introduced into the trials with infected stubble collected after harvest in 2018 from Hart and Minnipa. The stubble was spread evenly over the trials immediately after sowing.

Results and Interpretation

- Key Messages: Seed dressings were more effective at controlling the mild infections in Hart while seed dressings or foliar fungicides were not effective in controlling the severe infection levels in Minnipa. Seed dressing is more effective than foliar sprays for low to moderate disease severity, but for severe disease conditions both were less effective.

- Seasonal conditions on the disease: Minnipa had highly conducive conditions for diseases infection and spread during the period between plant emergence to the first foliar spray at 4 node stage compared to Hart. For example, Minnipa experienced three days with rainfall above 1 mm, while in Hart only one day above 1 mm. At Hart this rainfall even resulted in a very wet day, which dissipated humidity rapidly due to extreme winds (Table 2). Maximum temperatures were similar at both sites, but the overnight minimum temperatures were lower at Hart (Figure 1). These conditions explain the difference in disease establishment at the two sites; Hart was dry and colder hence there was little opportunity for disease infection to take place before fungicides were applied. At Minnipa, the conditions were ideal for spore release and infection, hence disease establishment was rapid and severe.

  The fortnightly fungicide strategies which initiated application of fungicides before the first rainfall event on 12th June at both sites were more effective at suppressing ascochyta blight.

Table 2. Rainfall events (mm per day) at Minnipa and Hart 2019 field trial sites from emergence until four node fungicide spray.

Date	Minnipa	Hart
12 June	18.0	41.0
16 June	8.4	0.0
18 June	3.6	1.0
Foliar fungicide sprayed	24 June	27 June
	3 effective days	1 effective day (but windy)

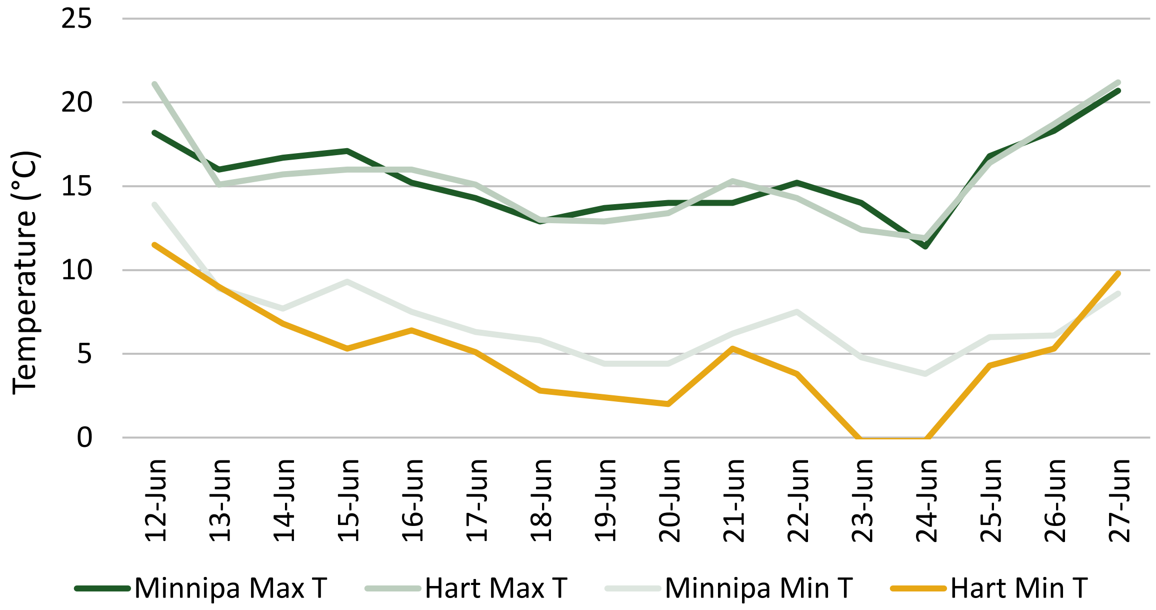

Figure 1. Daily maximum and minimum temperatures at Hart and Minnipa 2019 from 12 – 27 June during potential infection periods (rainfall events on 12, 16 and 18 June)

- Disease assessment: Severity of ascochyta blight was assessed in both trials at seven weeks after sowing, 12-17 days after the four-node foliar fungicide spray, 13th August at Hart and 28th August at Minnipa. Dry conditions stopped any further spread of disease in spring and no further assessments were conducted.

  At Hart the initial disease severity was low, less than 2% leaf area diseased (Table 3). At initial growth stages, P-Pickel T® treatment had significantly less disease than plots without the seed dressing. However, as the plant matured seed dressings without foliar fungicides were not effective for disease control compared to the nil treatment. This indicates that foliar sprays are needed for decreasing the spread of disease. The three fungicide products performed similarly in this trial, although the fortnightly applications demonstrated that further disease control is possible (Table 3).

Table 3. Effects of fungicide strategies on Ascochyta blight of field pea as a percentage area diseased on four bottom leaves on 9th July and as percentage of plant area diseased on 13th August at Hart in 2019.

Treatment	**Percentage of area diseased**	
	On lowest four leaves (July 9)[1]	**On whole plant (August 13)**
Nil	2.1 cd	29.5 c
2 sprays chlorothalonil	2.1 cd	27.8 c
2 sprays Veritas®	1.9 bc	28.2 c
2 sprays Aviator XPro®	1.5 b	24.2 c
PPT[2] + 2 sprays Veritas®	0.3 a	16.6 b
PPT	0.3 a	29.1 c
PPT + 2 sprays chlorothalonil	0.2 a	16.4 b
PPT + 2 sprays Aviator XPro®	0.2 a	14.4 b
PPT + fortnightly chlorothalonil	0.1 a	6.0 a
LSD ($p < 0.001$)	0.5	6.4

[1] only one foliar fungicide application by July 9
[2] P-Pickel T®
Different letters represent significant difference between treatments.

In contrast, at Minnipa the disease severity was much higher than Hart. Seed dressing did not reduce disease levels below the untreated nil plants (Table 4). Combination of fortnightly sprays and seed dressing decrease disease severity below the untreated. At 15 weeks after sowing only the fortnightly sprays of fungicide and the two sprays of Aviator XPro® had disease levels significantly lower than the untreated. Fortnightly sprays were initiated before the epidemic began therefore the diseases symptoms were lower compared to those without fortnightly sprays (Table 4). This demonstrates the importance of preventing the establishment of the disease early in the crop growth, through fortnightly applications of chlorothalonil. However, multiple applications of sprays required to control the disease is not particularly economic in field pea. Dry conditions in the spring stopped the spread of the disease further.

Table 4. Effects of fungicide strategies on Ascochyta blight of field pea as a percentage area diseased on four bottom leaves on 11th July and as percentage of plant area diseased on 28th August at Minnipa in 2019.

Treatment	**Percentage of area diseased**	
	On lowest four leaves (July 11) [1]	**On whole plant (August 28)**
Nil	35.3 c	62.7 c
2 sprays chlorothalonil	36.7 c	57.5 bc
2 sprays Veritas®	28.2 bc	51.3 bc
2 sprays Aviator XPro®	19.5 bc	46.0 b
PPT** + 2 sprays Veritas®	14.1 b	56.5 bc
PPT	30.2 bc	60.8 c
PPT + 2 sprays chlorothalonil	22.8 bc	50.9 bc
PPT + 2 sprays Aviator XPro®	35.3 c	55.9 bc
PPT + fortnightly chlorothalonil	0.2 a	18.9 a
LSD ($p < 0.001$)	17.6	14.4

[1] only one foliar fungicide application by July 9

[2] P-Pickel T®

Different letters represent significant difference between treatments.

Grain Yield

- Dry conditions in spring stopped the spread of disease and reduced plant growth and pod fill, hence no grain yield effects were measurable.

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