## F5 Ascochyta Blight (synonym: Blackspot) Management, MRZ Mid North (Hart), South Australia
## F6 Ascochyta Blight (synonym: Blackspot) Management, LRZ Upper Eyre Peninsula (Minnipa), South Australia

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**Background**

Ascochyta blight (AB) is the major disease in field peas and associated with significant yield losses. In the absence of genetic resistance to AB in the current commercial field pea varieties, disease control is dependent on delayed sowing, maintaining adequate crop rotations and use of strategic fungicide application at an industry practice of P-Pickel T® seed dressing followed by two foliar applications of Mancozeb (2 kg/ha at 9 node and early flowering). However, this is generally only economical in crops yielding greater than 2 t/ha.

**Aim**

The current trials aimed to evaluate the efficacy of a range of unregistered foliar fungicides, including new actives, which have previously shown improved levels of disease control and yield benefit over the current industry practice.

**Treatments**

Trial sowing dates were 10 May at Hart (MRZ Mid North) and 6 May at Minnipa (LRZ Upper Eyre Peninsula), SA. The sowing dates at the two sites corresponded to a medium blackspot risk sowing window as forecasted by the Blackspot Manager, DAFWA Crop Disease Forecasts, May 2016. The dual purpose (grain/forage) field pea type PBA Coogee was sown at 55 plants/$m^2$ at all sites, selected for its increased biomass production, lodging and AB susceptibility over Kaspa. In order to accelerate AB infection in both trials field pea stubble infested with AB from the previous season was uniformly spread across the trials at the 1 to 2 node growth stage.

Fungicides were applied as seed dressings, fluid injection and/or foliar sprays at strategic growth stages (Table 1). The disease severity of AB within a plot was assessed as the percentage of plants covered by AB symptoms (purplish-black necrotic lesions on leaves) by the frequency of infected plants per plot at vegetative (7 node) and early bud development (13 node) growth stages. Further, a quantitative assessment on the vertical progression of AB on individual plants was conducted at mid to late flowering stage by randomly selecting five plants per plot and assessing the number of girdled nodes as a proportion of total nodes per plant per plot and thereafter using the scores to develop a disease index (DI).

***** Some of the fungicide treatments in this research contain unregistered fungicides, application rates and timings and were undertaken for experimental purposes only. The results within this document do not constitute a recommendation for that particular use by the author or author's organisation.***

**Table 1**: Summary of fungicide treatments, application rates and timings in a field pea AB management trials at Hart (Mid-North) and Minnipa (Upper Eyre Peninsula), SA 2016.

| Fungicide Treatment | Active ingredient and Application rate (gai) | Application timing |
|---|---|---|
| Nil | Nil | Nil |
| Sys | Fluxapyroxad 50 gai/100 kg seed | seed treatment |
| PPT | Thiram & Thiabendazole 72 & 40 gai/100 kg seed | seed treatment |
| Flu | Flutriafol 200 gai/ha | Fluid injection at seeding |
| Manc.Std | Mancozeb 1500 gai/ha | 6 WAS & early flower |
| Manc.Low | Mancozeb 375 gai/ha | 4 & 9 WAS & early, mid & late flower |
| Ami.Xtra | Azoxystrobin & Cyproconazole 120 + 48 gai/ha | 6 WAS & early flower |
| Avi.Xpro | Prothioconazole & Bixafen 90 + 45 gai/ha | 6 WAS & early flower |
| Uni + Ami.Xtra | Azoxystrobin & Metylaxyl-M 28 & 49 gai/100kg seed + Azoxystrobin & Cyproconazole 120 + 48 gai/ha | seed treatment + 6 WAS & early flower |
| Flu + Avi.Xpro | Flutriafol 200 gai/ha + Prothioconazole & Bixafen 90 + 45 gai/ha | Fluid injection at seeding + 6 WAS & early flower |
| Avi.Xpro early + Manc | Prothioconazole & Bixafen 90 + 45 gai/ha + Mancozeb 1500 gai/ha | 4 & 9 WAS + early flower |
| Chloro | Chlorothalonil 1440 gai/ha | Fortnightly from 4 WAS (10 sprays) |

*WAS = Weeks after sowing. All fungicides were applied together with PPT except those applied as fluid injection at seeding. All treatments were treated with Apron® (350 g/L Matalaxyl-M) seed dressing to control downy mildew.*** *Some of the fungicide treatments in this research contain unregistered fungicides, application rates and timings and were undertaken for experimental purposes only. The results within this document do not constitute a recommendation for that particular use by the author or author's organisation.*

**Results**

**Seasonal growing conditions**

In 2016, the growing season rainfall (GSR) was above long term averages at both sites. A total of 356 and 268 mm was recorded for the months of April to October, at Hart and Minnipa respectively. The two trials were sown in late Autumn in relatively dry seed bed conditions, however, this was followed by wet conditions in winter and a relatively cool spring which resulted in prolonged maturation of the crop particularly at Hart. Black spot disease levels were very high at Minnipa and severe at Hart, however disease infection persisted longer into the plant reproductive phase at the latter site due to the extended and more favourable late seasonal conditions at this site.

**Effect of fungicide treatments on disease severity**

- A site x fungicide treatment interaction was found for disease severity at the late vegetative (7 node) and early bud development (13 node) growth stage suggesting that fungicide treatment response in controlling AB disease changed significantly with environmental (site) conditions. Assessment of AB disease responses at 7 node only evaluated the effect of fungicides that had been applied at seeding, 4 and 6 WAS (weeks after sowing) while that conducted at 13 node evaluated the effect of fungicides that had been applied at seeding, 4, 6, and 9 WAS.
- Disease severity at the 7 node assessment period was higher in the Nil treatment at Minnipa (42%) than at Hart (13%) (Table 2). This was a similar finding to that found in 2015 highlighting the importance of early season disease control at Minnipa. Treatments including Prothioconazole & Bixafen or Chlorothalonil applied at 4 WAS showed varying but improved disease control over all other treatments at both sites. This indicated that early application timings between 2 and 4 node improved early season disease control over later application at 6 WAS (5-6 node). The current industry practice, Mancozeb (2 kg/ha; Manc.Std) applied at 6 WAS reduced infection levels compared to Nil at Hart but not at Minnipa where disease severity was higher initially. This finding suggests that there may be differences in efficacy between fungicides depending upon the level of disease pressure.
- At the 13 node assessment period, the current industry practice, Mancozeb (2 kg/ha) treatment, reduced infection levels similar to the fortnightly Chlorothalonil and all the Prothioconazole & Bixafen treatments at Hart only (Table 2). This suggested that in some instances where AB infection is relatively low, these three fungicides may offer similar levels of disease control. At Minnipa, however, the fortnightly Chlorothalonil had the highest level of disease control over all other treatments. Differences between other foliar fungicides were less obvious and only the Flu + Avi.Xpro treatment applied at 6

WAS showed improved disease control over the Nil treatment. In most instances, Ami.Xtra treatments and the lower rate of Mancozeb (500 g/ha) treatment did not reduce infection levels over the Nil or the current industry standard of Mancozeb (2 kg/ha) treatments.

- The disease index scores at the mid flowering stage showed that the effect of fungicide treatments in controlling disease was similar across both sites. Notably, disease infection was high among all treatments including the fortnightly Chlorothalonil treatment which was shown to have up to 60 % infection level across both sites (Figure 1). However this treatment, as expected, still had an improved level of disease control over all other treatments at both sites. This was followed by the Flu + Avi.Xpro treatment which also had lower AB infection levels than the current industry practice of Mancozeb (2 kg/ha). Again this observation suggested that Avi.Xpro as a product had better efficacy in improving disease control (20 %) over the industry practice Mancozeb (2 kg/ha) treatment especially at this critical period of mid-late flowering and pod-filling.

**Table 2**: Ascochyta blight disease severity assessed at 7 and 13 node (percentage plot severity) in field pea (PBA Coogee) under different fungicide treatments at Hart (Mid-North) and Minnipa (Upper Eyre Peninsula), SA, 2016.

| | Disease severity at 7 node (% plant disease) | | | | Disease severity at 13 node (% plant disease) | |
|---|---|---|---|---|---|---|
| **Fungicide Treatment*** | **Hart Log (base 10)** | **Hart Raw data** | **Minnipa Log (base 10)** | **Minnipa Raw data** | **Hart** | **Minnipa** |
| Nil | 1.12 | 13.1 | 1.62 | 41.6 | 32 | 51 |
| Sys | 1.03 | 10.6 | 1.58 | 38.3 | 35 | 45 |
| PPT | 0.84 | 6.8 | 1.62 | 41.6 | 36 | 46 |
| Flu | 0.77 | 5.8 | 1.6 | 40 | 24 | 51 |
| Manc.Std | 0.77 | 5.8 | 1.6 | 40 | 24 | 47 |
| Manc. Low | 0.82 | 6.5 | 1.6 | 40 | 32 | 47 |
| Ami.Xtra | 0.84 | 6.8 | 1.62 | 41.6 | 33 | 49 |
| Avi.Xpro | 0.77 | 5.8 | 1.6 | 40 | 24 | 46 |
| Uni+Ami.Xtra | 1.05 | 11.3 | 1.58 | 38.3 | 32 | 47 |
| Flu + Avi.Xpro | 0.5 | 3.2 | 1.54 | 35 | 19 | 41 |
| Avi.Xpro early + Manc | 0 | 1 | 0.9 | 7.9 | 17 | 42 |
| Chloro | 0.1 | 1.3 | 0.5 | 3.1 | 14 | 25 |
| **LSD (P<0.05)** | **0.19** | | **0.19** | | **7.8** | |

*Refer to treatment legend in Table 1 for treatment identification

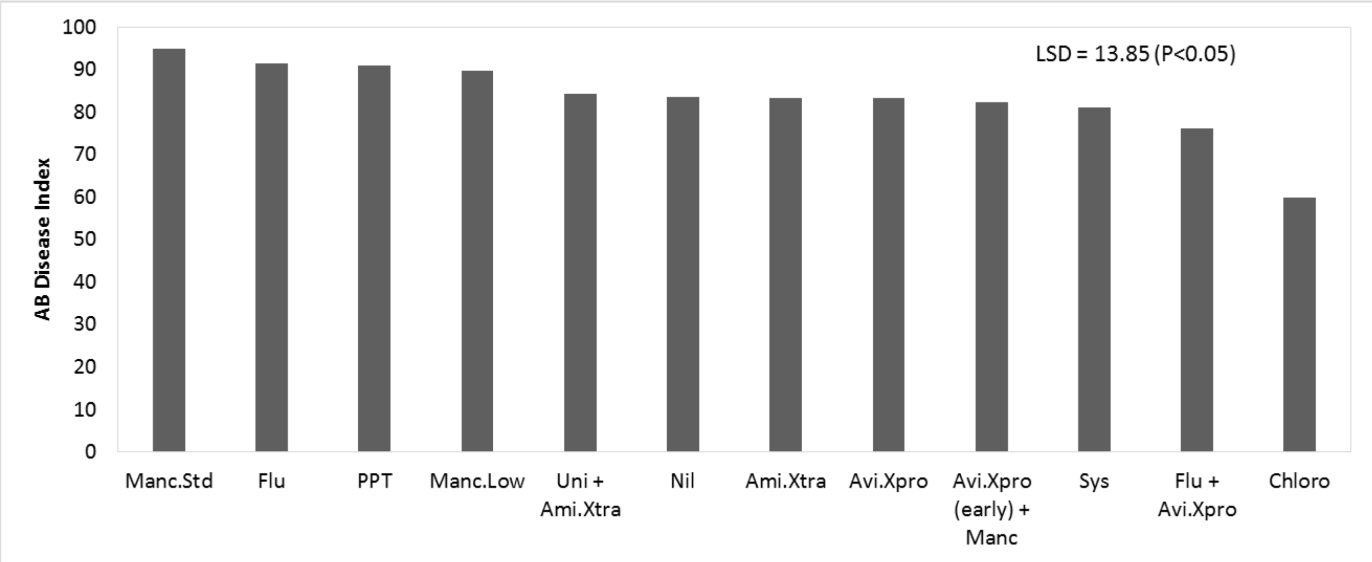


**Figure 1**: Ascochyta blight disease index developed from a quantitative assessment of the number of girdled nodes on individual field pea plants at mid-late flowering under different fungicide treatments at Hart (Mid-North) and Minnipa (Upper Eyre Peninsula), SA, 2016. (*Refer to treatment legend in Table 1 for treatment identification)

**Effect of fungicide treatments on grain yield**

- There was a site by fungicide interaction for grain yield.
- Higher yields were recorded at Hart (1.74 t/ha) than at Minnipa (1.30 t/ha) which is likely to be due to higher rainfall and a longer and more favourable season finish (Table 3). The disease index scores showed that disease was strongly correlated ($R^2$=0.72, P≤ 0.05, data not presented) with grain yields across the two sites hence disease was a major driver in yield loss in 2016.
- At Hart, the highest grain yields were recorded from the fortnightly Chlorothalonil (2.67 t/ha) treatment over all other treatments. This treatment received its last fungicide spray in early spring, 8 November, which was almost three and half months after the early flowering stage compared when most other treatments had ceased having foliar sprays (15 August).
- Comparatively at Minnipa the last Chlorothalonil spray was applied on the 19 October, two months after the early flowering stage sprays (17 August) highlighting the longer and more favourable finishing conditions experienced at Hart. Yields at Hart were improved by 20 % from the use of Prothioconazole & Bixafen or Azoxystrobin & Cyproconazole over the current industry practice, Mancozeb (2 kg/ha) and the Nil treatment which both yielded similarly.
- At Minnipa, the fortnightly Chlorothalonil treatment yielded similar to a number of treatments including all Prothioconazole & Bixafen treatments, one of the Azoxystrobin & Cyproconazole and the lower rate of Mancozeb (500 g/ha) which was applied at five separate occasions. The performance of these fungicides in grain yield response was quite remarkable given that the fortnightly Chlorothalonil treatment had received up to 10 sprays whereas the other treatments had only received sprays ranging from 2 to 5 in number. Notably, there was no yield improvement from the application of the current industry practice, Mancozeb (2 kg/ha) over the Nil treatment. These results suggested that both application timing and type of product were important for disease control under high disease pressure conditions at both sites in 2016.

**Table 3**: Mean yield (t/ha) of field pea (PBA Coogee) under different fungicide treatments at Hart (Mid-North) and Minnipa (Upper Eyre Peninsula) SA, 2016.

| | Grain yield (t/ha) | |
|---|---|---|
| **Fungicide treatment*** | **Hart** | **Minnipa** |
| Nil | 1.49 | 0.95 |
| Sys | 1.55 | 1.19 |
| PPT | 1.33 | 1.05 |
| Flu | 1.49 | 1.1 |
| Manc. Std | 1.54 | 1.19 |
| Manc. Low | 1.6 | 1.37 |
| Ami.Xtra | 1.84 | 1.32 |
| Avi.Xpro | 1.93 | 1.4 |
| Uni. + Ami.Xtra | 1.91 | 1.21 |
| Flu. + Avi.Xpro | 1.89 | 1.57 |
| Avi.Xpro (early) + Manc. | 1.65 | 1.58 |
| Chloro | 2.67 | 1.67 |
| **LSD (P<0.05)** | **0.336** | |

*Refer to treatment legend in Table 1 for treatment identification

**Conclusion**

- The recommended field pea industry practice of P-Pickel T® (PPT) seed treatment and 2 foliar fungicides of Mancozeb (Manc.Std) failed to significantly reduce disease infection levels or increase grain yield over untreated control treatments under high blackspot disease pressure in 2016.
- Early disease control applications (four weeks after sowing) were important for reducing initial blackspot infection levels at Minnipa, conversely later spring applications were important at the higher rainfall site of Hart.
- Over two consecutive years, a yield benefit of at least 15% has been obtained from application of new experimental fungicide actives over the current industry practice treatment of two foliar sprays of Mancozeb.
- Further research is required to understand the interaction in efficacy between fungicides and timing of disease infection, together with the drivers of ascochyta blight onset and progression in different field pea growing environments.