Kapinnie Yellow Leaf Spot

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Key messages

- **Significant variation in yellow leaf spot susceptibility exists between varieties of wheat commonly grown on the Lower Eyre Peninsula and this is correlated with significant yield differences**
- **If sowing into stubble with a history of yellow leaf spot, it is important to make good management decisions to avoid yield losses**
- **Choice of variety has more impact on yield than does fungicide management strategy, and is likely to lead to greater profit**

Why do these trials?

These trials are associated with the GRDC Stubble Retention Project aimed at developing management guidelines for stubble-retained farming systems on the Lower Eyre Peninsula (LEP). Retained stubble can act as a refuge for disease, including fungal diseases such as yellow leaf spot (YLS), throughout the summer fallow and this can result in considerable infection of subsequent crops. This issue is exacerbated where wheat is sown directly into wheat stubble, allowing direct transfer of YLS to the subsequent wheat crop. Identifying management strategies that maximise yield and reduce input costs is likely to be of value on the LEP where YLS is common, stubble is generally retained and short rotations are the norm.

How was it done?

Two separate trials ('YLS Susceptibility' and 'YLS Fungicide') were conducted in the same paddock at Kapinnie in 2014. The first trial sought to evaluate the reported YLS-susceptibility ratings of 20 common wheat varieties, within LEP conditions, as well as determine the yield penalty associated with YLS infection for each variety. The second trial compared two commonly-planted wheat varieties, Scout and Corack, tested under three different fungicide regimes. These two varieties represent opposite ends of the YLS-susceptibility spectrum with Scout rated susceptible-very susceptible (SVS) and Corack rated moderately resistant (MR). Both varieties have proven themselves above-average yielders in South Australia, including the LEP, with Corack generally only slightly (2%) ahead of Scout in most NVT trials.

Both trials plots were sown on the 23rd May using a six-row tined small-plot seeder at a rate of 180 plants/m^2, to a depth of 4 cm, at 22.5 cm row spacing. Each plot received the equivalent of 100 kg/ha of 18:20 P:N fertiliser. Fertiliser was treated with 400 mL/ha of fungicide (Impact), placed with the seed during sowing, except in the control plots for the 'YLS Fungicide' trial.

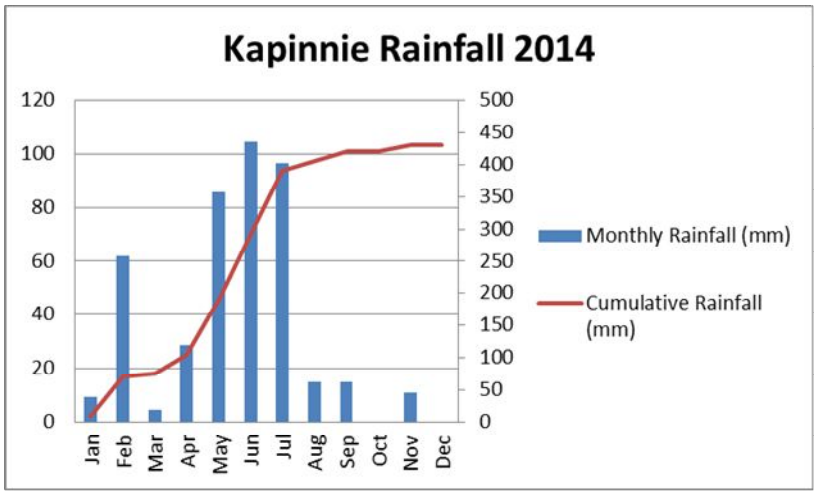
For the 'YLS Susceptibility' trial, each plot was visually evaluated on the 10th July 2014 and given a score from 1-9 (low-highly affected), based on the degree of YLS present in the plot. Plots were harvested on the 3rd December 2014 and the yield recorded.

For the 'YLS Fungicide' trial, plots of Corack and Scout wheat were subjected to the following treatments: nil fungicide (Nil), soil-applied fungicide only (Impact @ 400 mL/ha) (Soil) and soil and foliar-applied fungicides (Impact @ 400 mL/ha + Prosaro @450 mL/ha applied to foliage @ Zadock's GS25) (Foliar). Each treatment was replicated 4 times, with the 'Nil' treatment replicated 8 times.

For both trials, the site contained an even coverage of wheat stubble known to carry YLS. Soil at this site comprises sand over dense sodic clay, a common soil type on the LEP. As with much of the district, this trial was heavily impacted by uneven rainfall distribution throughout the growing season

with 314.8 mm recorded at nearby Brimpton Lake from April to July (inclusive) and just 15 mm in each of August, September (no rainfall in October). Rainfall data are presented in Figure 1 (below).

Figure 1 – Rainfall data for Kapinnie through 2014



What happened?

YLS Susceptibility Trial

Table 1 (below) summarises the results of the trial, giving the mean yield and YLS score across four plots for each variety. The data are ranked by yield.

Table 1 – Summary of yield and YLS scores for all varieties in trial (ranked by yield)

Variety	Average Yield (t/h)	Average YLS (score/9)
Magenta	2.80	1.25
Corack	2.76	1.75
Kord	2.72	2.25
Mace	2.66	1.75
Wyalkatchem	2.65	2.00
Esparda	2.64	2.00
Cobra	2.53	2.75
Justica	2.29	3.25
Estoc	2.27	3.00
EmuRock	2.25	3.00
Trojan	2.05	2.50
Gladius	1.97	2.00
Grenade	1.89	3.75
RAC1843	1.80	4.50
Shield	1.78	2.75
Axe	1.71	3.00
Catalina	1.66	2.25
Yitpi	1.47	3.75
Phantom	1.46	3.25
Scout	1.16	3.50

The trial demonstrated significant differences in the resistance of varieties to YLS ($P < 0.0001$, CV 24.18). Table 2 (below) summarises the differences in mean YLS score for each of the varieties, giving an indication of the degree to which each variety may be susceptible to YLS; the rating, given in

brackets after each variety name, is the proposed YLS-resistance rating taken from the 2015 GRDC NVT sowing guide. This trial demonstrated that the YLS-susceptibility ratings reported in the NVT sowing guide are representative of varietal susceptibility under LEP conditions.

Table 2 – Ranked YLS scores for wheat varieties. NVT sowing guide susceptibility ratings in brackets.

Variety	YLS (score/9)
Magenta (MRMS)	1.25 (0.25)
Corack (MR)	1.75 (0.25)
Mace (MRMS)	1.75 (0.25)
Wyalkatchem (MR)	2 (0.41)
Espada (MS)	2 (0.41)
Gladius (MS)	2 (0.41)
Kord (MSS)	2.25 (0.25)
Catalina (MSS)	2.25 (0.48)
Trojan (MSS)	2.5 (0.29)
Cobra (MRMS)	2.75 (0.75)
Shield (MSS)	2.75 (0.48)
Estoc (MSS)	3 (0.00)
EmuRock (MRMS)	3 (0.41)
Axe (S)	3 (0.58)
Justica (S)	3.25 (0.25)
Phantom (SVS)	3.25 (0.63)
Scout (SVS)	3.5 (0.29)
Grenade (S)	3.75 (0.48)
Yitpi (SVS)	3.75 (0.25)
RAC1843 (N/A)	4.5 (0.29)
P < 0.05	**LSD 0.93**

Cobra, rated as being moderately resistant to moderately susceptible by the NVT sowing guide, stands out as a variety more affected in this trial than its rating would suggest. However, the high variability between plots for this one variety (SE = 0.75) suggests its results may be unbalanced due to a single bad outbreak or other factor.

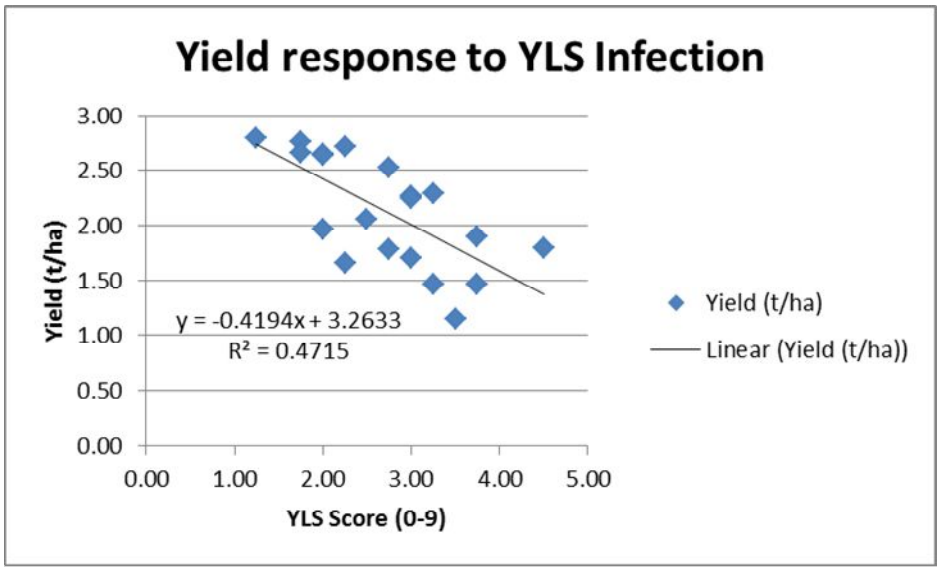
The trial also highlighted a significant linear relationship between YLS score and yield (P = 0.0313, R2 = 0.4715), indicating that YLS susceptibility does translate to yield losses. Table 3 (below) highlights the effect that increased YLS had on yield across varieties.

Table 3 – Yields of wheat varieties, ranked by YLS score. Numbers in brackets are standard error of mean.

Variety	Yield (t/ha)	YLS (Score/9)
Magenta	2.80 (0.23)	1.25 (0.25)
Corack	2.76 (0.22)	1.75 (0.25)
Mace	2.66 (0.24)	1.75 (0.25)
Wyalkatchem	2.65 (0.28)	2 (0.41)
Esparda	2.64 (0.35)	2 (0.41)
Gladius	1.97 (0.20)	2 (0.41)
Kord	2.72 (0.21)	2.25 (0.25)
Catalina	1.66 (0.08)	2.25 (0.48)
Trojan	2.05 (0.26)	2.5 (0.29)
Cobra	2.53 (0.41)	2.75 (0.75)
Shield	1.78 (0.27)	2.75 (0.48)
Estoc	2.27 (0.34)	3 (0.00)
EmuRock	2.25 (0.28)	3 (0.41)
Axe	1.71 (0.10)	3 (0.58)
Justica	2.29 (0.20)	3.25 (0.25)
Phantom	1.46 (0.29)	3.25 (0.63)
Scout	1.16 (0.31)	3.5 (0.29)
Grenade	1.89 (0.26)	3.75 (0.48)
Yitpi	1.47 (0.36)	3.75 (0.25)
RAC1843	1.80 (0.39)	4.5 (0.29)
P < 0.05	**R^2 = 0.4715**	

Whilst the effect of YLS on yield is significant between groups of varieties, the yield response to YLS infection varies between varieties, reducing the linearity of the relationship i.e. the relationship exists but does not explain all variation in yield. Figure 2 (below) demonstrates this relationship.

Figure 2 – linear regression demonstrating impact of YLS on yield.



YLS Fungicide Trial

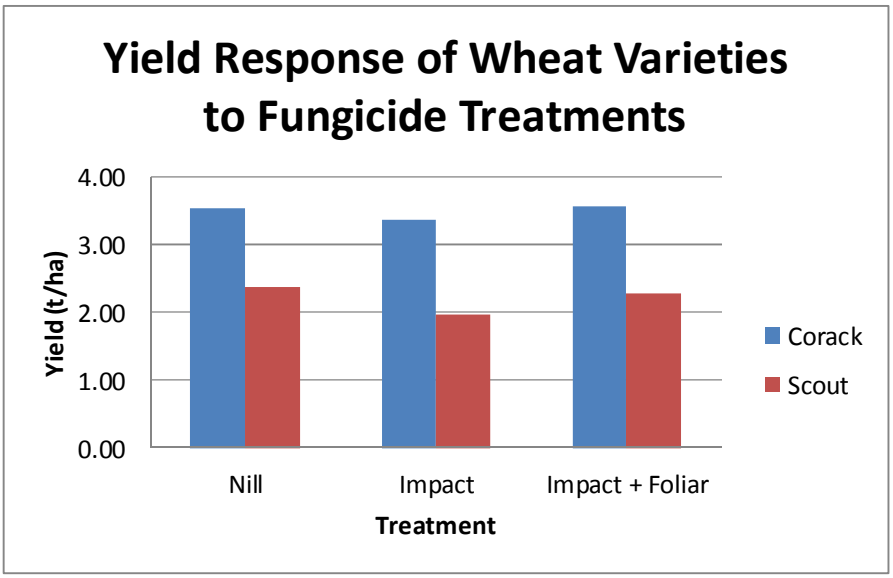
Across all treatments in the 'YLS Fungicide trial', Corack yielded significantly better than Scout (P < 0.0001, CV 20.66). Whilst Corack has generally performed better than Scout in NVT trials – 110 % compared with 108 % of site average across the LEP – the difference in yield noted in this trial is substantially greater than this expected approximate 2 % difference. Table 4 (below) provides a summary of thee mean yield of each variety for each treatment.

Table 4 – yield data for each variety by each treatment

	Variety Yield (t/ha)	
Treatment	Corack	Scout
Nill	3.55	2.37
Impact	3.37	1.98
Impact + Foliar	3.57	2.29

Figure 3 (below) demonstrates the lack of response of either variety to treatments.

Figure 3 – Yield responses of wheat varieties Corack and Scout to fungicide treatments



Notably, untreated Scout out-yielded either fungicide treatment. This is a surprise, given Scout was clearly affected by YLS. It demonstrates that the treatments were ineffective during this trial. Furthermore, the relative difference between Corack and Scout actually gets bigger (though not significantly) with treatment. Unexplained is the appearance that both varieties yielded lowest when treated with Impact at sowing. This difference is not statistically significant and may be due to random error alone.

What does this mean?

These two trials have important implications for LEP growers. The 'YLS Susceptibility' trial generally confirms the resistance ratings associated with NVT trials. However, critically, this trial establishes YLS resistance in an environment known to contain significant infection with YLS. For growers on the LEP, where YLS is common, this provides good information on the reliability of the NVT YLS-resistance ratings to their specific circumstance. Furthermore, the 'YLS Susceptibility' trial clearly shows the yield penalty associated with planting a susceptible variety into a paddock with a history of YLS.

The 'YLS Fungicide' trial demonstrates the importance of selecting a wheat variety based on more than just potential yield. In a YLS-free environment, the difference between a susceptible variety and a resistant variety may be very little (i.e. 2 % difference across LEP for Corack and Scout). However, where YLS exists, the difference is likely to be highly significant. What the NVT ratings do not make clear is the yield penalty associated with sowing a susceptible variety into an infected paddock. Of greatest interest however is that multiple treatments of fungicide had no benefit, even for the susceptible Scout, where a response could be expected. This trial demonstrates the value in selecting resistant varieties, rather than making selection based on other factors and hoping that management with fungicides will make the difference.

Where to from here?

The research undertaken here generally confirms the susceptibility ratings reported in the NVT sowing guides. Furthermore, this research demonstrates that infection with YLS does impact final yield and must therefore by avoided. It was anticipated that a yield response to fungicide treatment would be measurable in a YLS-susceptible variety such as Scout, however this was not the case. Research undertaken by AGT (2014), including trials on the EP, demonstrated that the best response to fungicides generally came where foliar sprays were applied after GS 31, something this trial did not address. It may be that further research would demonstrate yield responses to later fungicide application. However the work by AGT also indicated, as did this trial, that it is not possible to fully protect wheat from the effects of YLS through management with fungicide and, consequently, selecting resistant varieties is the most important strategy for reducing the effects of YLS, particularly when sowing into wheat stubble containing YLS spores.

Acknowledgements
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