Yellow leaf spot (*Pyrenophora tritici-repentis*) control with foliar fungicides in second wheat under full stubble retention

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Key points

- Fungicide applied at third node (GS33) gave significantly better yellow leaf spot (YLS) control and green leaf retention (GLR) than a tillering (GS23) application.
- The improvements in disease control with a single spray timing did not lead to a significant yield increase.
- There was a significant yield advantage (0.27t/ha) when both spray timings were sequenced in a two-spray programme despite the low yield of the trial (2t/ha).
- The value of the extra grain produced from two sprays was $69/ha, which covered the costs of the fungicides and their application.
- The net margin was greater with Tilt® (propiconazole) than Prosaro® (prothioconazole and tebuconazole) largely as result of Prosaro being a more expensive product.
- The best YLS control achieved with a foliar fungicide on the top three leaves was 65% control (recorded on flag-1).

Location: Yarrawonga, Victoria
Rainfall:
Annual: 377.8mm
GSR: 222mm (April – October)
Soil:
Type: Red loam over clay
Sowing information:
Variety: Young
Sowing date: 15 April 2013
Fertiliser: 75kg/ha MAP, 210kg urea throughout the season
Sowing equipment: 12m DBS with narrow tines, 15mm individual press wheels
Row spacing: 37.5cm
Paddock history:
2012 — wheat
2011 — canola
2010 — wheat
Plot size: 18m x 3m
Replicates: 4

Aim

The aim of the trial was to evaluate the value (disease control, yield effect and net margin) of foliar fungicide sprays for the control of yellow leaf spot (*Pyrenophora tritici-repentis*) in wheat established in the stubble of the previous wheat crop under no till. Net margin ($/ha) was calculated as the value of the grain yield increase over the untreated crop, minus fungicide and application cost.

Background

Considerable quantities of foliar fungicide are applied to control YLS in second wheat crops during tillering (GS23–26). There is little positive evidence to support the use of foliar fungicides for the control of the disease at this growth stage. This trial aimed to evaluate the best products available for disease control at both tillering (GS23–26) and third node (GS33) growth stages in terms of disease control, yield and margin.

Method

A replicated split plot experiment was established in a second wheat crop (cultivar Young) at Yarrawonga during 2013 to test the effect of two fungicide products (fungicide plots blocked as main plot) applied at a range of application timings (sub plots of each fungicide main plot).

Young, which is rated moderately resistant to moderately susceptible (MR-MS) to YLS followed a first wheat crop of EGA Wedgetail, which is rated moderately susceptible to susceptible (MS–S) for YLS.

The two fungicide products evaluated were Tilt at 500ml/ha (propiconazole 125g/ha ai) and Prosaro at 300ml/ha (prothioconazole 63g/ha ai and tebuconazole 63g/ha ai) applied at a single spray at GS23–26, GS33 and a two-spray programme applied at both timings.

Results

i) Disease assessments

At the first fungicide application made on 23 July (mid tillering), YLS was present in the crop on all plants assessed. There was a 90% incidence of infection on the second-newest emerging leaf, with 6% severity, while the third-newest emerging leaf had 100% incidence of infection with 24% of the leaf area affected.

Disease progressed up the crop canopy during early stem elongation infecting the top four leaves of the canopy. On 28 August, two days after the second fungicide application at GS33, the untreated crop had 14% disease infection on flag-3, 3% on flag-2 and 1% on flag-1.

Where the fungicide had been applied at mid tillering (GS23) there was 31% more green leaf retention (GLR) on flag-4 and a significant reduction in disease severity on flag-3 (see Table 1). There was no difference between the products with both fungicides giving approximately 42–47% control of the disease on flag-3.

When assessed at early grain fill (GS71–73) on 7 October, differences in disease control and GLR were evident on the top three leaves of the canopy, which correlated to final grain yield. Application timing produced significant differences in disease control when the performance of both fungicides was averaged.

Where a GS33 fungicide spray was made on 26 August (either alone or following an earlier tillering GS23 application) there was significantly better disease control on the flag-1 and significantly better GLR on the flag-2, than where a single application was made at tillering or the crop was left untreated (see Table 2).

The GS23 tillering fungicide spray still gave significantly better disease control results than the untreated on flag and flag-1.

When disease assessments were statistically analysed, excluding the untreated controls, there was no statistical difference evident between the two fungicide products applied. However, there was a trend on all top three leaves for Prosaro to be more effective than Tilt, which was almost significant on flag-1 (see Table 3).

ii) Grain yield

The two-spray fungicide programme (mean of both fungicide products) produced significantly higher yields than the GS23 or GS33 timings alone, which were not significantly different from the untreated crop (see Figure 1).

TABLE 2 Effect of fungicide timing on YLS severity on the flag and flag-1 and GLR on flag-2, measured at GS71–73 on 7 October*

Fungicide timing	% YLS severity		GLR
	Flag	Flag-1	Flag-2
Nil	3.4[a]	11.8[a]	33.9[c]
GS23	2.4[b]	8.6[b]	45.1[c]
GS33	1.8[b,c]	4.1[c]	60.3[b]
GS23 + 33	1.2[c]	3.1[c]	73.8[a]
LSD	0.7		11.3
P Value	<0.0001		<0.0001

* Mean of two fungicide products

[a,b,c] Values followed by the same letter are not statistically different.

TABLE 1 Influence of fungicide application on YLS severity and GLR, assessed at GS33, 28 August, 36 days after the GS23 application

Fungicide treatment		% YLS severity			GLR
Product	Timing	Flag-1	Flag-2	Flag-3	Flag-4
	Nil	0.8[a]	5.5[a]	15.1[a]	40.6[b]
Prosaro	GS23	0.6[a]	3.1[b]	8.0[b]	67.4[a]
	Nil	0.7[a]	4.1[a,b]	13.3[a]	38.5[b]
Tilt	GS23	0.6[a]	3.3[b]	7.7[b]	74.5[a]
LSD		0.4	1.5	2.6	20.0
P value		0.64[(n.s.)]	0.02	<0.01	<0.01

[a,b] Values followed by the same letter are not statistically different.

N.B. There were two untreated treatments (one blocked with Prosaro treatments and one blocked with Tilt treatments) note that results have been presented separately from both untreated treatments

TABLE 3 Effect of fungicide product on YLS on the flag and flag-1 and the GLR on flag-2, at GS71–73 on 7 October*

Fungicide product	% YLS severity		GLR
	Flag	Flag-1	Flag-2
Tilt	2.1[a]	6.4[a]	53.3[a]
Prosaro	1.5[a]	4.2[a]	66.1[a]
LSD	1.2	2.3	22.5
P Value	0.21	0.054	0.17

* Mean of three application timings — excluding the untreated controls

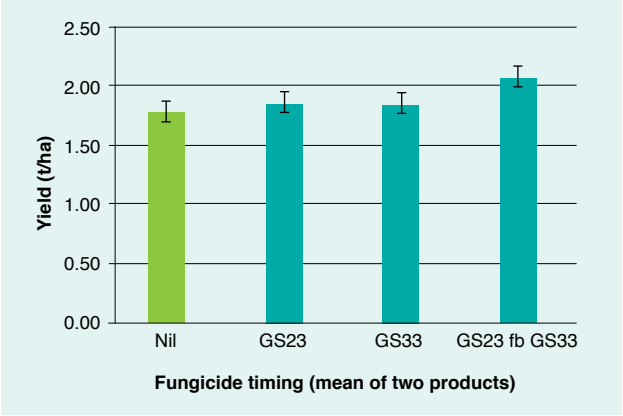

FIGURE 1 Influence of fungicide timing on yield*

* Mean of two fungicide products (Tilt and Prosaro)
fb — followed by
Error bars presented as LSD value

There was no significant difference in yield between the two fungicide products applied at either GS23 or GS33 when the untreated plots were excluded from the analysis, (Prosaro 1.97t/ha and Tilt 1.92t/ha) (see Figure 2). The two-spray approach using either fungicide maximised yield (2.05–2.07t/ha).

Grain quality components (protein, screenings and test weight) were not significantly different as a result of fungicide application compared with the untreated crop.

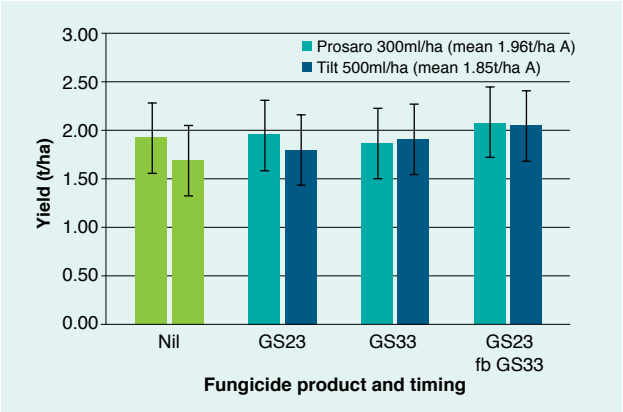

FIGURE 2 Influence of fungicide product and timing on grain yield*

* Error bars presented as LSD value

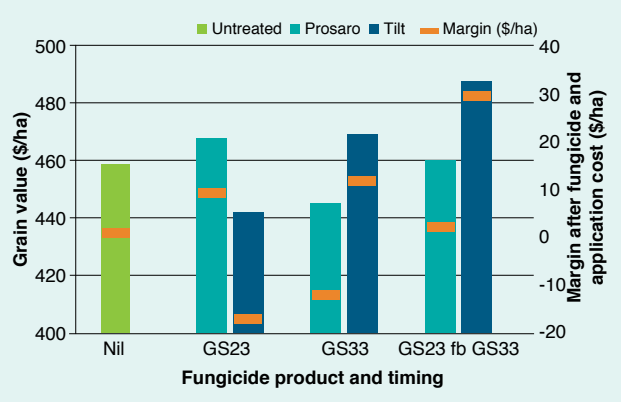

FIGURE 3 Influence of fungicide product and timing on net margin after fungicide cost and application

Please note margin details taken from the average of all eight untreated plots. Prosaro costed at $77/L ($23.10/ha for a single spray and $46.20/ha for two sprays), Tilt costed at $12/L ($6/ha for a single spray and $12/ha for two sprays). Application cost $12/ha for a single spray and $24/ha for two sprays. Yield increases over untreated valued at $256/t.

Frost damage in the trial is likely to have increased the percentage of screenings (trial mean 8.8% screenings). The mean protein content was 13.7% with no significant differences due to treatment.

In terms of economic return from applying fungicide for the control of YLS, the 0.27t/ha obtained with the two-spray programme added $69/ha in terms of gross return (based on $256/t for AGP1 downgraded due to the high screenings). The net margin ($/ha) after application and fungicide costs was greatest at $29/ha with the two-spray Tilt programme. As Prosaro was more expensive, the two-spray programme net margin was lower at just $2/ha.

Note: A second trial was established at Coreen, NSW, in wheat cv. Gregory following canola. Although YLS was present at trial establishment (tillering), the disease did not progress.

Acknowledgments

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