2.1.3 Quantifying the influence of cultivar resistance on the requirement for disease control in wheat in the high rainfall zone of Australia.

Location or Trial: SFS Inverleigh Main Research site Project No. SFS00015

Funding Organisation: GRDC

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Summary:
There was no stripe rust development in this trial and as a result no statistically significant responses to fungicide application in terms of yield or quality. The greatest differences in yield were associated with the different variety maturities, since the earlier maturing variety Mitre (4.20 t/ha – mean of all treatments) was significantly higher yielding than Kellalac (3.69 t/ha – mean of all treatments), which was in turn higher yielding than the later maturing variety Amarok (3.01 t/ha – mean of two treatments).

Though there was a non significant trend for Mitre (rated MS-S for stripe rust) to give small (approx 5%) responses to fungicide application, these could not be correlated to superior green leaf retention or disease control.

From a commercial viewpoint, the trial result reinforces the need to scrutinise the expenditure associated with upfront disease control measures, since a more accurate view of the need for disease protection can be carried out at the start of stem elongation (GS30-31) than it can at seeding. The exception to this is where disease control at seeding is being put in place for root diseases or where early rainfall encourages favourable green bridge conditions for rust development and early sowing.

Background: In 2005, results from this trial indicated that if growers were to control disease only once in the growing season (wheat crop) it would be from the use of a foliar fungicide applied at GS39 rather than a seed treatment at establishment (either in furrow fungicide or seed treatment). It was also illustrated that the need for foliar disease control for rusts prior to flag leaf was strongly related to variety susceptibility. Where varieties were moderately susceptible to stripe rust as opposed to susceptible the cost effectiveness of disease control prior to flag leaf emergence became questionable.

Objectives:
To determine the influence of cultivar resistance on the cost effectiveness of upfront disease control, such as seed treatment/in furrow treatments as opposed to later season control based on foliar fungicides.

To determine the exact longevity of at sowing disease control measures in cultivars of differing disease resistance. In addition the trial examined the cost effectiveness of two alternative strategies for disease control in susceptible cultivars; a seed treatment with follow-up foliar fungicide versus two foliar fungicides.

Growing Season Rainfall (Apr – Nov): 235 mm
Soil Nutrition: Silty Loam, pH 5.8, Nitrate Nitrogen 30 mg/kg
Sowing Date: 30th May 2006
Sowing Rate: target 200 plants/m^2
Harvest Date: 5th January 2007
Seed Treatment: Hombre

Fertiliser Treatment: 150kg/ha MAP at seeding (30/5/06). Some plots sown with Impact treated fertiliser and Triad (see treatment list table 1). 40kg/ha N (46% urea) was applied at growth stage 31 (4/9/06).

Trial Design: The trial was sown into 2005 canola stubble and comprised of two cultivars Mitre (susceptible to stripe rust), Kellalac (moderately susceptible to stripe rust) with 11 fungicide treatments replicated four times. For observation Amarok (resistant to stripe rust) was also trialled with only two treatments, in effect to give a plus and minus comparison.
Fungicide Treatment: Mitre and Kellalac were treated with eleven different fungicide regimes based on three different timings of fungicides. Amarok received treatments 1 and 7 only (Table 1).

Table 1. Fungicide Treament List

Trt No.	**At Seeding**	**GS 32 – 2nd node (3 leaf)**	**GS 39 (flag leaf)**	**GS 59 (ear emergence)**
1	Untreated	---	---	---
2	Impact 400ml/ha	---	---	---
3	Impact 400ml/ha	---	Opus 250ml/ha	---
4	Triad 400ml/ha in furrow	---	---	---
5	Triad 400ml/ha in furrow	---	Opus 250ml/ha	---
6	---	Bayleton 500ml/ha	Opus 250ml/ha	---
7	---	---	Opus 250ml/ha	---
8	Triad 400ml/ha in furrow	Bayleton 500ml/ha	Opus 250ml/ha	---
9	---	Opus 125ml/ha	Opus 250ml/ha	---
10	---	Bayleton 500ml/ha	Opus 250ml/ha	Bayleton 500ml/ha
11	---	Opus 187 ml/ha	---	Opus 187ml/ha

Bayleton 125EC – 500ml/ha = 62.5 g/ha Triadimefon ai,

Opus 125SC – 250ml/ha = 31.25g/ha Epoxiconazole ai
Weed Control: Pre emergent (30/5/06) – Spray Seed @ 2L/ha and Trifluralin @ 1.2L/ha. Post Sowing Pre emergent spray (30/5/06) – Dual Gold @ 250mls/ha and Diuron @ 500 ms/ha. 30/7/06 – Axial 300ml/ha and Tigrex 750ml/ha.

Trial Results:

i) Disease assessment
Disease did not develop in the varieties in this trial. With no or little rainfall after mid September canopy duration was also curtailed during grain fill. With these conditions it is perhaps not surprising that fungicide application created no significant yield differences (see Table 1).

ii) Yield data
Comparing Mitre and Kellalac there was no statistical difference in yield between fungicide treated and untreated crops, though there was a trend for fungicide treated plots to be higher yielding than the control in Mitre and not in Kellalac (Figure 1. and Table 2). Mitre significantly out yielded Kellalac (mean yield 4.20 versus 3.69t/ha).

As a separate component of the main trial, if the three varieties including the resistant variety were compared with and without a flag leaf fungicide, the only significant difference was in variety performance (Figure 2).

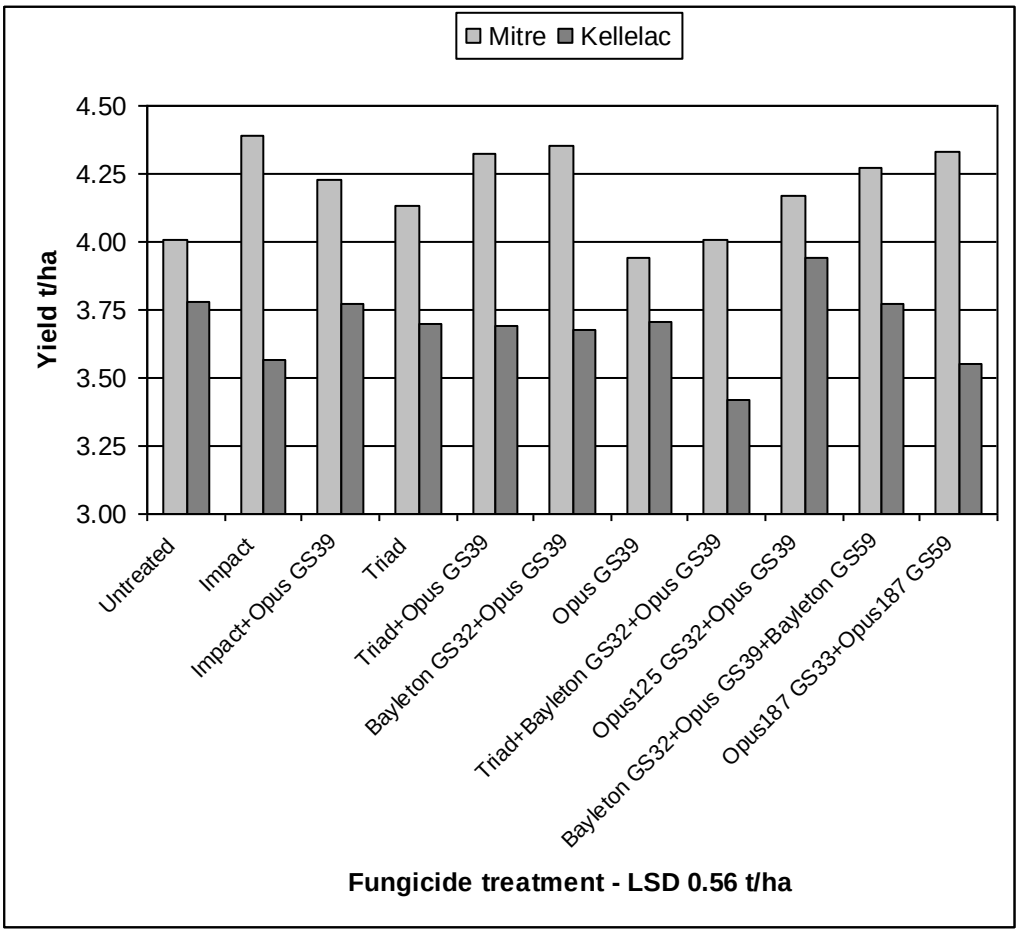

Figure 1. Influence of fungicide treatment on the yield (t/ha) of Mitre (stripe rust rating MS-S) and Kellalac (stripe rust rating MR-MS)

Table 1. Influence of disease management strategy on Yield t/ha, % Protein, Thousand seed weight (g), % Screenings 2.2mm, and Test weight kg/hl of Mitre and Kellalac.

Cv.	Fungicide	Yield t/ha	Protein %	TGW g	Screenings %	Test. wt kg/hl
Mitre						
	Untreated	4.01	10.9	33.2	5.2	78.2
	Impact in furrow	4.39	11.0	34.1	5.7	77.9
	Impact in furrow f.b. Opus GS39	4.23	11.4	32.8	5.3	77.7
	Triad in furrow	4.13	11.3	33.8	5.5	78.1
	Triad in furrow f.b. Opus GS39	4.32	11.4	32.0	5.1	77.6
	Bayleton GS32 f.b. Opus GS39	4.36	11.4	31.5	5.2	78.4
	Opus GS39	3.94	11.3	33.8	5.5	77.9
	Triad (i.f.) f.b. Bayleton GS32 f.b Opus GS39	4.01	11.1	35.1	5.5	78.3
	½ Opus GS32 f.b. Opus GS39	4.17	11.3	32.6	5.3	77.4
	Bayleton GS32 f.b. Opus GS39 f.b. Bayleton GS59	4.27	11.4	32.6	5.7	77.8
	¾ Opus GS33 f.b. ¾ Opus GS59	4.33	11.2	32.5	5.9	78.2
Kellalac						
	Untreated	3.78	12.4	34.4	6.7	78.5
	Impact in furrow	3.57	12.5	33.6	5.8	77.4
	Impact in furrow f.b. Opus GS39	3.77	12.3	33.4	5.7	78.1
	Triad in furrow	3.70	12.3	34.6	6.4	78.1
	Triad in furrow f.b. Opus GS39	3.69	12.1	34.2	5.3	78.5
	Bayleton GS32 f.b. Opus GS39	3.68	12.0	33.9	6.2	78.0
	Opus GS39	3.71	12.0	34.3	5.1	77.1
	Triad (i.f.) f.b. Bayleton GS32 f.b Opus GS39	3.42	11.9	34.0	5.5	77.8
	½ Opus GS32 f.b. Opus GS39	3.94	12.1	33.4	5.6	78.2
	Bayleton GS32 f.b. Opus GS39 f.b. Bayleton GS59	3.77	12.1	34.2	6.0	78.1
	¾ Opus GS33 f.b. ¾ Opus GS59	3.55	12.3	34.2	5.8	77.7
LSD						
Cultivar		0.14	0.3	1.5	0.5	1.2
Fungicide		0.27	0.4	1.4	0.7	0.8
Cultivar/Fungicide interaction		0.56	0.6	2.1	1.0	1.3

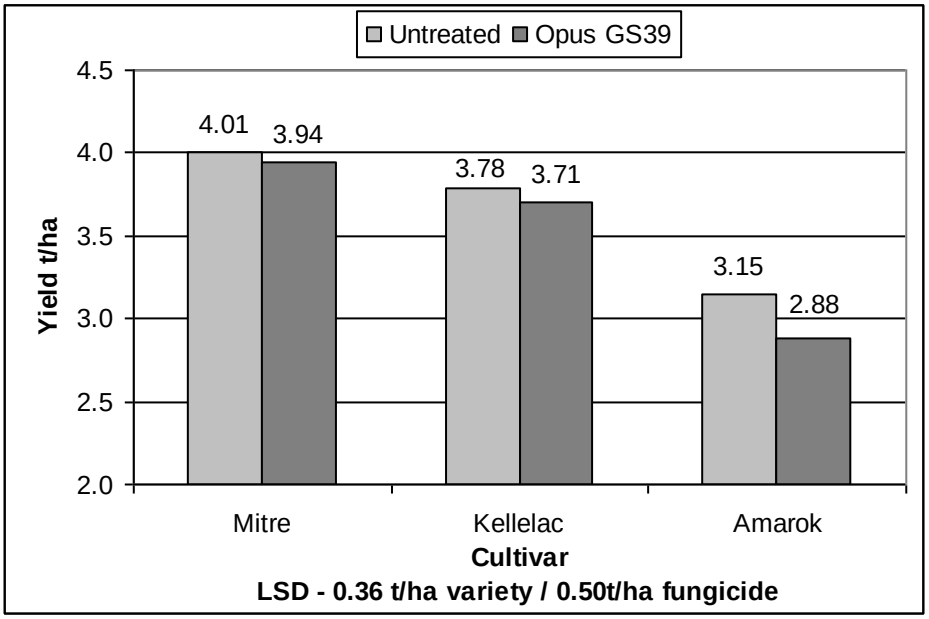

Figure 2. Influence of a flag leaf fungicide treatment (Opus 250 ml/ha) on the yield (t/ha) of Mitre (stripe rust rating MS-S), Kellalac (stripe rust rating MR-MS) and Amarok (stripe rust resistant)

Table 2. Influence of a flag leaf fungicide spray (Opus 250ml/ha) on Yield t/ha, % Protein, Thousand seed weight (g), % Screenings 2.2mm, and Test weight kg/hl of Mitre (MS-S), Kellalac (MR-MS) and Amarok (R).

		Yield	Protein	TGW	Screenings	Test weight
Cultivar	Fungicide	t/ha	%	g	%	kg/ha
Mitre	Untreated	4.01	10.9	33.2	5.2	78.2
	Opus GS39	3.94	11.3	33.8	5.5	77.9
Kellalac	Untreated	3.78	12.4	34.4	6.7	78.5
	Opus GS39	3.71	12.0	34.3	5.1	77.2
Amarok	Untreated	3.15	11.8	33.4	8.0	75.9
	Opus GS39	2.88	9.7	32.7	8.4	75.6
LSD						
Cultivar		0.38	2.4	1.3	1.2	0.7
Fungicide		0.32	2.0	1.6	1.0	0.7
Cultivar/Fungicide interaction		0.50	3.1	2.2	1.6	1.0

Conclusions

Fungicide application in all three varieties lost money relative to an untreated crop, with no significant improvement in yield or quality as a result of application. This result was the same, irrespective of cultivar susceptibility to stripe rust. There was no disease development in the trial due to the extremely dry spring conditions and as a consequence no value to these products in this trial.

From a commercial viewpoint, the trial result reinforces the need to scrutinise the expenditure associated with upfront disease control measures since a more accurate view of the need for disease protection can be carried out at the start of stem elongation GS30-31 rather than at seeding. The exception to this is where disease control at seeding is being put in place for root diseases or where early rainfall encourages favourable green bridge conditions and early sowing.