

## Trial 4: HYC Disease Management Germplasm Interaction

**Objectives:** To develop profitable and sustainable approaches to disease management in HRZ wheat.

Individual objectives specific to the trial were:

- Monitor the effectiveness of flutriafol in furrow for early disease control in wheat.
- To evaluate whether newer germplasm or new fungicide chemistry allows a reduction in the number of fungicide applications whilst increasing profitability (note: reducing the number of fungicides is seen as a key measure for slowing down resistance development in cropping systems).
- Examine whether there is germplasm (varieties tested) that has sufficient early season disease resistance to replace the need for the Timing 1 (T1) spray applied at GS31-32.
- To determine the cost benefit ratio of fungicide application in HRZ regions of different season lengths.

### Key Messages:

- Yields of 14t/ha and above were achieved with three varieties of wheat - Big Red, RGT Cesario and RGT Accroc with untreated plots of RGT Cesario and Big Red yielding 13.52 and 13.68t/ha.
- Although the untreated crops of RGT Cesario and Big Red were lower yielding than treated plots there was no statistically significant yield response to fungicides in these varieties with a maximum 0.5t/ha response in Cesario and 0.7t/ha response in Big Red.
- These responses to fungicides compared to the more susceptible RGT Accroc giving a maximum of 3t/ha to fungicide, intermediate susceptibility of Anapurna giving a maximum of 2.57t/ha.
- These larger responses to fungicides were the result of higher infection levels of Septoria tritici blotch (STB) and late leaf rust infection which were far less significant in Cesario and Big Red.
- The response to four units of fungicide in Revenue, the most susceptible cultivar for both STB and leaf rust was almost 4t/ha and the yield penalty for dropping to 2 units of fungicide was a minimum of 0.7t/ha.
- With RGT Cesario the yield increase associated with moving from a single flag spray to 4 units of fungicide was only 0.22t/ha (not significant) valued at \$66/ha at \$300/t, which was approximately the cost of the extra fungicide units (seed treatment and two foliar) and their application.
- With Big Red two units of fungicides (IDM 2-unit approach – GS31 and GS39) gave a 0.28t/ha advantage (not significant) over one spray at flag leaf (GS39).
- Where leaf rust was more severe than early STB the 2-spray straddle approach of a later first and second spray (GS33 & GS55-59) were more successful than the 2 spray IDM approach which had earlier spray timings GS31 and GS39.

### i) Standard plots

**Treatments:** Five levels of fungicide management applied across 8 varieties

Five levels of fungicide input were applied to eight cultivars based on five timings: at sowing (seed treatment SDHI Systiva based on fluxapyroxad, GS31, GS33, GS39, GS59).

1 unit of fungicide was applied at GS39 – flag leaf fully emerged on the main stem.

2 units IDM (Integrated Disease Management) was applied at GS31 and GS39 – 1<sup>st</sup> node and flag leaf.

4 units were applied at sowing (Systiva s.t.) and GS31, GS39 and GS59 – head emergence.

2 units Straddle applied at GS33 (third node) and GS55-59 (head 50-100% emerged).

Products applied are presented in Table 3. Disease levels were primarily Septoria tritici blotch (STB), leaf rust, stripe rust was also present in Trojan and Tabasco. Stripe rust in Tabasco has never been observed in Tasmania since it was first tested in 2016 at the Hyper Yielding Crops research centre. **Table 1.** Influence of management strategy and variety on grain yield (t/ha) – SAGI Predicted yield analysis with Standard Error (SE).

	Management Level					Mean
	Untreated	1 Fungicide Unit	4 Fungicide Units	2 units IDM approach	2 units Straddle approach	
Cultivar	Yield t/ha	Yield t/ha	Yield t/ha	Yield t/ha	Yield t/ha	Yield t/ha
Trojan (s)	3.86	4.94	6.20	4.90	6.51	5.28
Scepter (s)	6.14	5.78	6.10	5.77	5.85	5.93
Big Red (w)	13.68	14.10	13.96	14.38	14.30	14.08
RGT Cesario (w)	13.52	13.80	14.02	13.76	13.52	13.72
Anapurna (w)	11.02	12.24	13.59	12.79	12.86	12.50
RGT Accroc (w)	11.41	13.07	14.41	12.94	13.81	13.13
Revenue (w)	8.52	10.18	12.44	11.20	11.71	10.81
Tabasco (w)	11.13	13.41	12.96	12.98	13.03	12.70
Mean	9.91	10.94	11.71	11.09	11.45	
LSD Cultivar x Fung. P=0.05	0.98t/ha (all wheats)				P val 0.	

## ii) Integrated Disease Management (IDM)/inoculated plots

Part of the same trial series described above was expanded to look at four cultivars and four fungicide management treatments and three starting “Disease Pressures”. The starting point “Disease Pressures” for the treatments were as follows:

1. Flutriafol applied to the MAP fertiliser – 100g/ha ai 400ml/ha
2. Standard – untreated (cultivated poppy stubble)
3. Inoculated with infected wheat stubble – 1.5 kg/plot

**Treatments:** On top of these three starting points were four levels of fungicide management applied across four varieties with varying resistance to STB. These cultivars were:

1. RGT Cesario – winter wheat (STB R-MR rating)
2. Anapurna – winter wheat (MR-MS)
3. RGT Accroc – winter wheat (MS)
4. Revenue – winter wheat (S)

Four levels of fungicide input were applied to these four cultivars based on four timings: at sowing (seed treatment SDHI Systiva based on fluxapyroxad, GS31, GS39 and GS59 as described.

1 unit of fungicide was applied at GS39 – flag leaf fully emerged on the main stem.

2 units IDM (Integrated Disease Management) were applied at GS31 and GS39 – 1<sup>st</sup> node and flag leaf.

4 units were applied at sowing (Systiva s.t.) and GS31, GS39 and GS59 – head emergence.

## Key Messages:

- Increasing disease pressure (principally STB) using infected wheat straw reduced the yield of the most susceptible cultivars and invariably increased the yield response to full fungicide protection, although this increase was not statistically significant.
- Applying flutriafol in furrow before other treatments were applied significantly reduced disease pressure in more susceptible cultivars and had the greatest impact on yield with Revenue and RGT Cesario.
- However, with Anapurna and RGT Accroc, provided that at least one foliar fungicide was applied, there was little value in flutriafol in furrow upfront.
- The value of genetic resistance to STB and leaf rust was evident in the maximum responses to fungicide which when infected stubble was present was 4.11t/ha with Revenue (S), 3.42t/ha RGT Accroc (MS), 2.89t/ha Anapurna (MR/MS) and 0.57t/ha with RGT Cesario (R-MR) which was the most resistant of the cultivars.
- Flutriafol application in furrow reduces the overall response to subsequent fungicide programmes, but not sufficiently to affect the overall level of foliar fungicide input required.

**Table 2.** Influence of management strategy and variety on grain yield (t/ha).

Table 2: Influence of management strategy and variety on grain yield (t/ha).										
Management Level										
		Untreated		1 Fungicide Unit		4 Fungicide Units		IDM approach		Mean
Disease pressure	Cultivar	Yield t/ha		Yield	t/ha	Yield t/ha		Yield t/ha		Yield
Flutriafol	RGT Cesario	<b>13.93</b>	0.36	<b>14.25</b>	0.36	<b>14.50</b>	0.36	<b>14.41</b>	0.36	<b>14.27</b>
	Anapurna	<b>11.20</b>	0.36	<b>12.12</b>	0.36	<b>13.31</b>	0.36	<b>12.58</b>	0.36	<b>12.27</b>
	RGT Accroc	<b>11.44</b>	0.36	<b>12.76</b>	0.36	<b>14.30</b>	0.37	<b>12.85</b>	0.36	<b>12.82</b>
	Revenue	<b>9.37</b>	0.36	<b>10.64</b>	0.36	<b>12.76</b>	0.36	<b>11.55</b>	0.36	<b>10.99</b>
	Mean	<b>11.49</b>		<b>12.44</b>		<b>13.72</b>		<b>12.85</b>		
Standard	RGT Cesario	<b>13.52</b>	0.38	<b>13.80</b>	0.37	<b>14.02</b>	0.37	<b>13.76</b>	0.37	<b>13.78</b>
	Anapurna	<b>11.02</b>	0.37	<b>12.24</b>	0.37	<b>13.59</b>	0.37	<b>12.79</b>	0.38	<b>12.41</b>
	RGT Accroc	<b>11.41</b>	0.37	<b>13.07</b>	0.38	<b>14.41</b>	0.39	<b>12.94</b>	0.37	<b>12.96</b>
	Revenue	<b>8.52</b>	0.37	<b>10.18</b>	0.37	<b>12.44</b>	0.37	<b>11.20</b>	0.37	<b>10.59</b>
	Mean	<b>11.12</b>		<b>12.32</b>		<b>13.62</b>		<b>12.67</b>		
Stubble	RGT Cesario	<b>13.17</b>	0.37	<b>13.35</b>	0.38	<b>13.74</b>	0.37	<b>13.82</b>	0.37	<b>13.52</b>
	Anapurna	<b>9.96</b>	0.38	<b>11.36</b>	0.38	<b>12.85</b>	0.37	<b>12.42</b>	0.37	<b>11.65</b>
	RGT Accroc	<b>10.46</b>	0.36	<b>12.54</b>	0.37	<b>13.88</b>	0.37	<b>12.71</b>	0.37	<b>12.40</b>
	Revenue	<b>7.67</b>	0.37	<b>9.59</b>	0.36	<b>11.78</b>	0.37	<b>10.46</b>	0.37	<b>9.88</b>
	Mean	<b>10.32</b>		<b>11.71</b>		<b>13.06</b>		<b>12.35</b>		
LSD Disease pressure p=0.05				0.5t/ha		P val		<0.001		
LSD Dis. press. x cultivar p=0.05				0.88t/ha		P val		<0.001		
LSD Dis. press.x fung. p=0.05				0.52t/ha		P val		<0.001		
LSD Cultivar x fung. P=0.05				0.60t/ha		P val		<0.001		

LSD Dis. press.x cultivar x fung. p=0.05	ns	P val	0.995
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**Table 3.** Details of the management levels (kg, g, ml/ha).

<b>Sowing date:</b>		<b>29 April</b>				
<b>Seed Rate:</b>		180 Seeds/m <sup>2</sup>				
<b>Sowing Fertiliser:</b>		100kg MAP				
<b>Seed Treatment:</b>		Vibrance & Goucho				
<b>Grazing:</b>		Nil				
<b>Nitrogen:</b>	10 Aug	46kg N/ha				
	1 Oct	160kg N/ha				
<b>PGR:</b>	GS30	Moddus Evo 100ml/ha + Errex 650ml/ha				
	GS32	Moddus Evo 100ml/ha + Errex 650ml/ha				
		<b>Untreated</b>	<b>1 Fungicide Unit</b>	<b>4 Fungicide Units</b>	<b>IDM approach</b>	<b>Straddle approach</b>
<b>Fungicide:</b>	GS00	---	---	Systiva	---	---
	GS31	---	---	Prosaro 300ml/ha	Prosaro 300ml/ha	---
	GS33	---	---	---	---	FAR F1-19 750ml/ha
	GS39	---	FAR F1-19 750ml/ha	FAR F1-19 750ml/ha	FAR F1-19 750ml/ha	---
	GS55	---	---	---	---	Opus 500ml/ha
	GS59-61	---	---	Opus 500ml/ha	---	---

## Trial 5: Nutrition for Hyper Yielding Wheat

**Objectives:** To assess the value of higher nutrition input (N, P, K & S) for wheat in the growing season and as an “N bank” for the following season.

Individual objectives specific to the trials were:

- To assess the value of additional nutrients in the growing crop (set up as small plots at the HYC Research sites) and for the following crop (mirror image trial set up in the host farmer’s surrounding paddock).
- To assess the value of adding increased P, K, and S when targeting higher yield potential rather than N alone.

### Key Messages:

- There was a significant response to N application in the trial with a 2.41t/ha yield increase associated with a 200kg N/ha application applied in three splits.
- 200kg N/ha produced a crop canopy of 23t/ha dry matter
- There was no significant increase in yield over and above 200N or from the application of additional P and S, although grain protein continued to increase up to 291N the highest rate of nitrogen fertiliser applied.