Trial 1 HYC Barley G.E.M Trial Series- Time of Sowing 1 (FAR VIC B23-03-01)

Key Points:

- *The 2023 G.E.M trials looked to investigate the agronomic and economic influence of four management approaches- 'low' input (minimalist approach), 'high' input (no expenses spared), 'strategic' input (tailored approach based on pre-season forecasts/expectations) and 'tactical' (tailored approach based on strategic with in-season adjustment guided by climate and in-season triggers) on 6 varieties (details in table 10).*
- *There was no interaction between variety and management with all varieties responding similarly. Low input, which was characterised by cheaper fungicides, no PGR and less applied nitrogen, yielding significantly less than the other management approaches (Table 1).*
- *On average the quick developing but adaptable variety Rosalind yielded best (7.19 t/ha) with the slower developing spring barley Laureate also preforming strongly (6.98 t/ha) (Figure 1).*
- *RGT Planet and Neo suffered from high Net Form Net Blotch infection with untreated plots recording 98% and 55% of plot infected respectively. Robust fungicide in strategic and high input managements significantly reduced disease levels to less than 10% of plot infected in Neo. While still reducing infection in RGT Planet, NFNB infection was still between 88% and 94% plot severity (Figure 2).*
- *High grain protein results meant no treatment achieved malting grade (Table 3).*
- *Although there was no interaction between variety and management, economic differences have been observed when completing a partial net margin analysis. Varieties that showed very little yield differences between management, such as Pixel, meant reducing total operational costs under 'low input' was most economical (Table 7).*
- *There was a yield trend in Neo and RGT Planet to yield less where less fungicide input had been implemented and higher disease was found. Therefore, the economic analysis shows that the additional expenditure in the 'High' input was justified. An additional margin of $160/ha in Neo and $581/ha in RGT Planet was made by shifting from 'Low' to 'High' input.*

Treatments:

Six cultivars (RGT Planet, Rosalind, Laureate, Minotaur, Neo and Pixel) were tested under four different management programs;

1. Low Input- Two units of fungicide based on Tilt 500EC (propiconazole) applied at 500mL/ha (250g ai/ha) and Folicur 430SC (tebuconazole) applied at 290mL/ha (125g ai/ha) and 150kg N/ha.
2. High Input- Four units of fungicide (Systiva seed treatment plus foliar fungicides GS31, GS39, GS59), 225kg N/ha, PGR.
3. HYC Strategic Input – This management strategy was set out at the start of the season based on crop inputs that had been associated with higher yields in previous HYC research for that variety.
4. HYC Tactical Input – This was in essence the HYC strategic approach but modified to take account of particular variety agronomic traits such as disease resistance, grain quality or straw strength (Standing power).

The exact crop inputs applied to the different varieties and crop management regimes can be found in table 10.

Table 1. Influence of management strategy and cultivar on grain yield (t/ha).

		Yield (t/ha)									
		Low Input		High Input		Strategic		Tactical		Mean	
1.	RGT Planet	5.19	-	7.68	-	5.85	-	7.07	-	**5.96**	c
2.	Rosalind	6.08	-	7.36	-	6.27	-	7.19	-	**7.19**	a
3.	Laureate	5.97	-	6.28	-	6.75	-	5.66	-	**6.98**	a
4.	Minotaur	6.61	-	7.05	-	6.14	-	6.46	-	**6.25**	bc
5.	Neo	6.31	-	7.48	-	6.65	-	6.92	-	**6.25**	bc
6.	Pixel	7.40	-	7.10	-	7.05	-	6.91	-	**6.49**	b
Mean		**5.99**	b	**6.72**	a	**6.98**	a	**6.88**	a	6.64	
LSD Cultivar P=0.05		0.31				P Value				<0.001	
LSD Management P=0.05		0.40				P Value				<0.001	
LSD Cultivar X Man. P=0.05		ns				P Value				0.283	
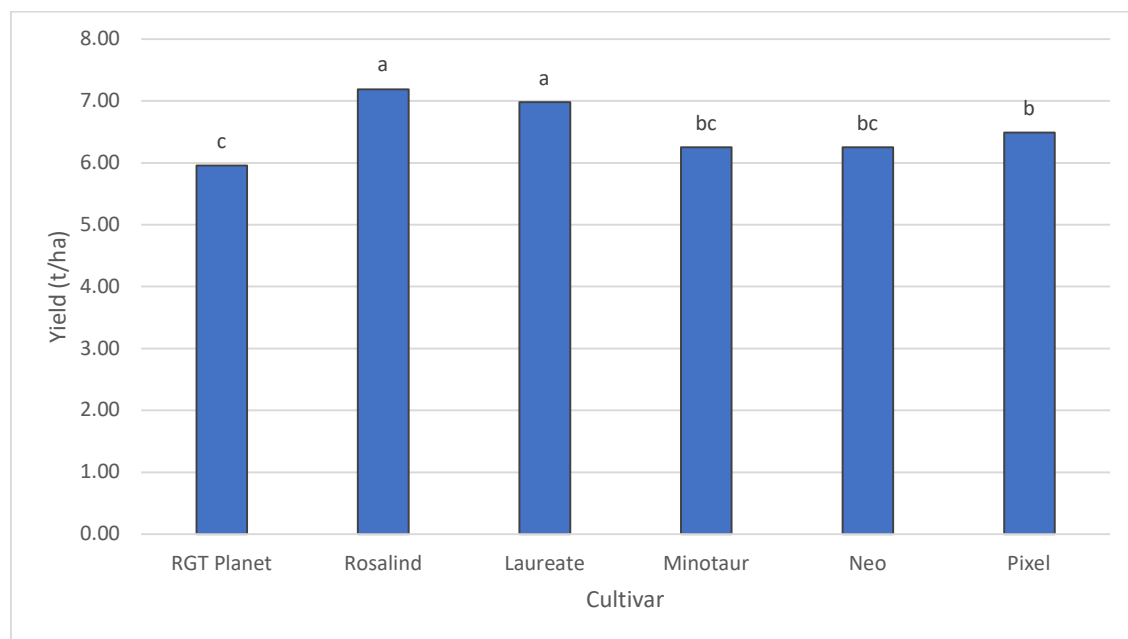
Figure 1. Influence of cultivar on grain yield (t/ha).

Table 2. Influence of management strategy and cultivar on harvest index (%).

		Harvest Index (%)									
		Low Input		High Input		Strategic		Tactical		Mean	
1.	RGT Planet	32.4	-	42.2	-	33.7	-	43.6	-	**37.6**	a
2.	Rosalind	35.6	-	37.4	-	33.6	-	40.1	-	**40.5**	a
3.	Laureate	42.0	-	32.5	-	30.2	-	30.4	-	**38.8**	a
4.	Minotaur	40.3	-	38.0	-	32.7	-	33.1	-	**32.6**	b
5.	Neo	43.0	-	43.4	-	38.7	-	35.6	-	**41.0**	a
6.	Pixel	39.2	-	41.1	-	41.4	-	32.5	-	**32.9**	b
Mean		**35.1**	-	**36.8**	-	**39.5**	-	**37.4**	-	37.2	
LSD Cultivar P=0.05		3.8				P Value				<0.001	
LSD Management P=0.05		ns				P Value				0.164	
LSD Cultivar X Man. P=0.05		ns				P Value				0.353	

Table 3. Influence of management strategy and cultivar on harvest protein (%).

		Protein (%)								
		Low Input		High Input		Strategic		Tactical		Mean
1.	RGT Planet	12.6	-	13.3	-	13.5	-	12.2	-	**12.9** d
2.	Rosalind	13.5	-	13.3	-	14.3	-	12.3	-	**13.4** b
3.	Laureate	12.6	-	12.8	-	13.3	-	13.3	-	**13.1** cd
4.	Minotaur	12.9	-	13.7	-	13.6	-	13.6	-	**13.7** a
5.	Neo	13.2	-	12.8	-	12.2	-	12.7	-	**12.4** e
6.	Pixel	13.9	-	13.0	-	12.7	-	13.2	-	**13.2** bc
Mean		**13.0**	**b**	**13.6**	**a**	**12.8**	**b**	**13.0**	**b**	13.1
LSD Cultivar P=0.05		0.2				**P Value**				<0.001
LSD Management P=0.05		0.3				**P Value**				<0.001
LSD Cultivar x Man. P=0.05		ns				**P Value**				0.898

Table 4. Influence of management strategy and cultivar on harvest test weights (kg/hL).

		Test Weights (kg/hL)								
		Low Input		High Input		Strategic		Tactical		Mean
1.	RGT Planet	65.5	-	66.9	-	67.3	-	67.4	-	**66.0** c
2.	Rosalind	65.7	-	66.5	-	67.6	-	66.5	-	**66.5** b
3.	Laureate	66.6	-	65.6	-	68.4	-	61.7	-	**65.2** d
4.	Minotaur	66.3	-	65.0	-	67.6	-	61.7	-	**67.7** a
5.	Neo	66.3	-	65.3	-	66.6	-	62.9	-	**66.8** b
6.	Pixel	66.5	-	64.9	-	66.7	-	63.0	-	**62.3** e
Mean		**65.5**	**c**	**65.5**	**bc**	**66.3**	**a**	**65.8**	**b**	65.8
LSD Cultivar P=0.05		0.5				**P Value**				<0.001
LSD Management P=0.05		0.3				**P Value**				<0.001
LSD Cultivar X Man. P=0.05		ns				**P Value**				0.403

Table 5. Influence of management strategy and cultivar on harvest retention (%).

		Retention (%)								
		Low Input		High Input		Strategic		Tactical		Mean
1.	RGT Planet	90.2	-	93.8	-	95.0	-	95.9	-	92.6 b
2.	Rosalind	93.5	-	93.6	-	95.2	-	95.2	-	93.9 ab
3.	Laureate	93.8	-	95.0	-	95.2	-	73.3	-	94.8 ab
4.	Minotaur	93.1	-	94.4	-	95.3	-	69.5	-	95.2 ab
5.	Neo	94.7	-	94.7	-	95.6	-	76.7	-	95.7 a
6.	Pixel	93.6	-	95.1	-	96.0	-	74.2	-	73.4 c
Mean		**90.6**	**-**	**90.4**	**-**	**91.7**	**-**	**91.1**	**-**	90.9
LSD Cultivar P=0.05		2.7				**P Value**				<0.001
LSD Management P=0.05		ns				**P Value**				0.484
LSD Cultivar x Man. P=0.05		ns				**P Value**				0.892

Table 6. Influence of management strategy and cultivar on harvest screenings (%).

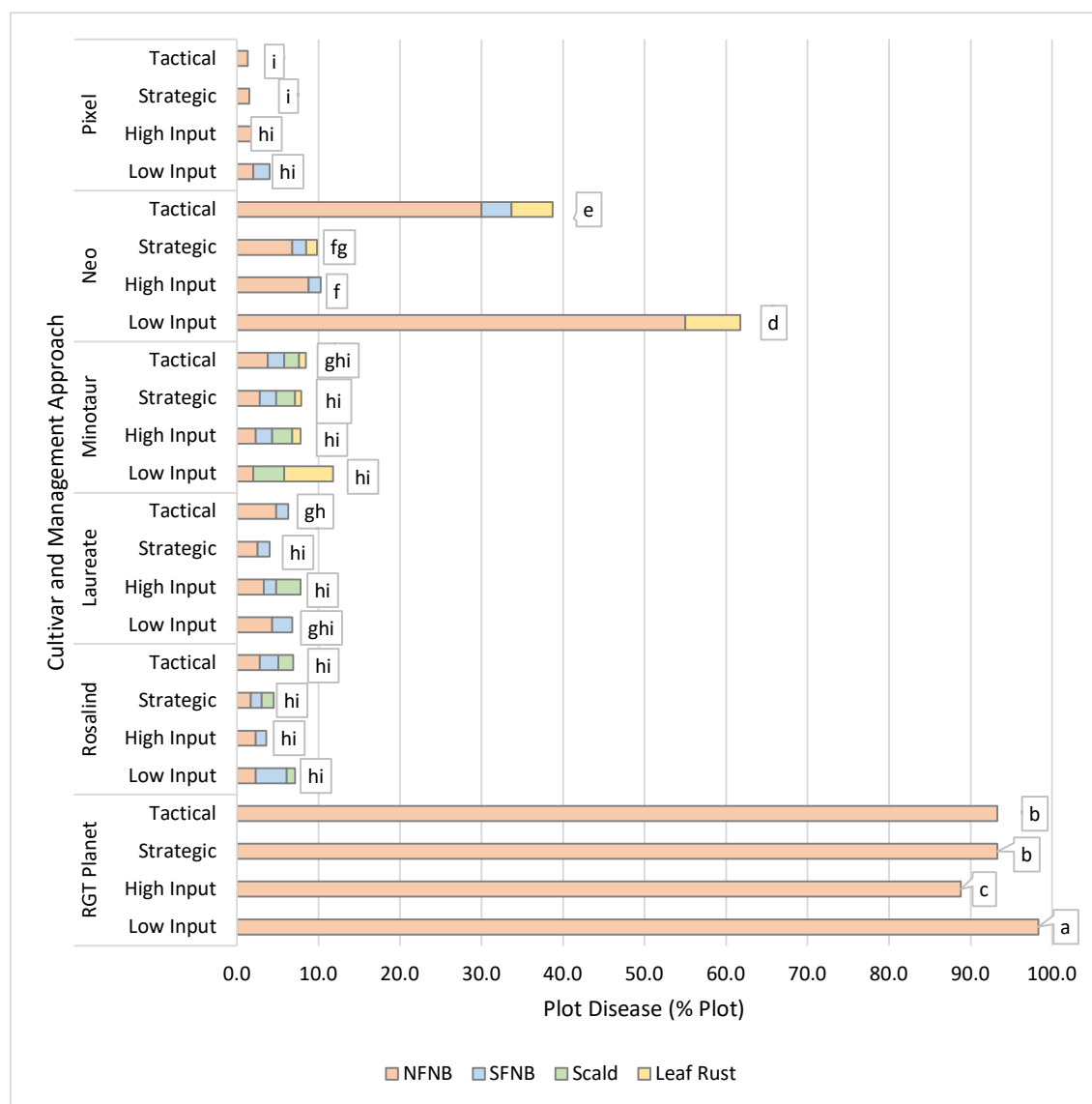|		Screenings (%)									
		Low Input		High Input		Strategic		Tactical		Mean	
1.	RGT Planet	3.2	-	1.9	-	1.7	-	2.0	-	**2.8**	**b**
2.	Rosalind	2.6	-	2.3	-	1.8	-	2.0	-	**2.2**	**bc**
3.	Laureate	2.3	-	2.6	-	2.1	-	5.3	-	**2.3**	**bc**
4.	Minotaur	3.0	-	2.5	-	1.8	-	5.4	-	**1.9**	**c**
5.	Neo	2.2	-	2.4	-	2.1	-	4.6	-	**2.0**	**c**
6.	Pixel	2.4	-	1.9	-	1.8	-	5.5	-	**5.2**	**a**
Mean		2.9	-	2.8	-	2.5	-	2.7	-	2.7	
LSD Cultivar P=0.05				0.6			**P Value**			<0.001	
LSD Management P=0.05				ns			**P Value**			0.739	
LSD Cultivar x Man. P=0.05				ns			**P Value**			0.915	

Figure 2. Influence of management strategy and cultivar on Net Form Net Blotch (NFNB), Spot Form Net Blotch (SFNB), Scald and Leaf Rust. Assessed 10 October 2023, GS75-80. Letters outside the end of bars refers to statistical difference for NFNB.

Table 7. Influence of management strategy (variable inputs only) and cultivar on system profitability Margin $/ha (after N, F & PGR costs).

Fungicide strategy	Chemical costs + Application costs	Fertiliser costs + Application costs	Total (N, F, PGR) costs & application	Yield	Income	Margin
	$/ha	$/ha	$/ha	t/ha	$/ha	$/ha
Laureate						
Low Input	$25.90	$215.65	$241.56	5.97	$1,893.44	$1,651.88
High Input	$127.62	$323.48	$451.10	6.28	$1,991.71	$1,540.61
Strategic	$127.62	$215.65	$343.27	6.75	$2,138.17	$1,794.89
Tactical	$100.09	$248.26	$348.35	5.66	$1,794.22	$1,445.87
Minotaur						
Low Input	$25.90	$215.65	$241.56	6.61	$2,095.37	$1,853.81
High Input	$127.62	$323.48	$451.10	7.05	$2,234.22	$1,783.12
Strategic	$127.62	$215.65	$343.27	6.14	$1,944.80	$1,601.52
Tactical	$50.82	$248.26	$299.08	6.46	$2,046.24	$1,747.16
Neo						
Low Input	$25.90	$215.65	$241.56	6.31	$1,999.64	$1,758.08
High Input	$127.62	$323.48	$451.10	7.48	$2,369.58	$1,918.48
Strategic	$127.62	$215.65	$343.27	6.65	$2,109.00	$1,765.73
Tactical	$59.88	$248.26	$308.15	6.92	$2,194.59	$1,886.45
Pixel						
Low Input	$25.90	$215.65	$241.56	7.40	$2,344.22	$2,102.66
High Input	$127.62	$323.48	$451.10	7.10	$2,249.12	$1,798.02
Strategic	$127.62	$215.65	$343.27	7.05	$2,233.27	$1,889.99
Tactical	$84.80	$248.26	$333.06	6.91	$2,191.42	$1,858.36
RGT Planet						
Low Input	$25.90	$215.65	$241.56	5.19	$1,645.23	$1,403.67
High Input	$127.62	$323.48	$451.10	7.68	$2,435.51	$1,984.41
Strategic	$127.62	$215.65	$343.27	5.85	$1,854.45	$1,511.18
Tactical	$100.09	$248.26	$348.35	7.07	$2,241.19	$1,892.84
Rosalind						
Low Input	$25.90	$215.65	$241.56	6.08	$1,926.73	$1,685.17
High Input	$127.62	$323.48	$451.10	7.36	$2,332.49	$1,881.39
Strategic	$127.62	$215.65	$343.27	6.27	$1,986.96	$1,643.69
Tactical	$100.09	$248.26	$348.35	7.19	$2,278.60	$1,930.25

Figures in green=most profitable approach, figure in red=least profitable approach. Refer to table 8 for pricing information.

Table 8. Input costs in economic analysis.

Product	Product type	Price
Opus	Fungicide	$35.06/L
Prosaro	Fungicide	$56.25/L
Aviator Xpro	Fungicide	$58.46/L
Tilt 500	Fungicide	$3.17/L
Folicur	Fungicide	$14.90/L
Moddus Evo	PGR	$84.95/L
Urea	Fertiliser	$0.60/Kg

Grain price (BAR1: $317.00) as of 16 February 2024 based off Geelong GrainCorp. Contractor rates factored in for application costs. Other costs such as seed sourcing and sowing, insurance, herbicides, insecticides, harvesting, insurance and MAP were not taken into consideration in this analysis as they were constant regardless of the management strategy used.
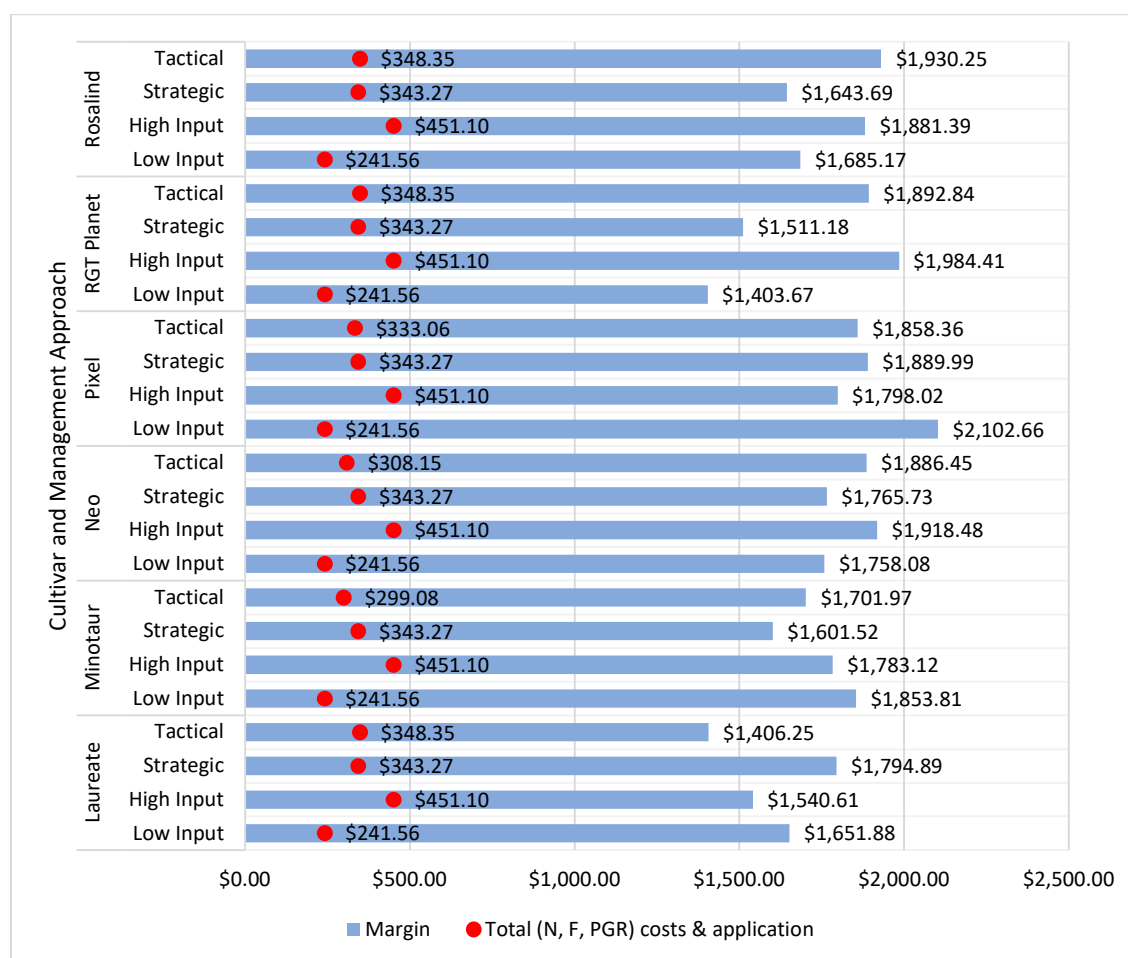

Figure 3. Influence of management strategy and cultivar on system profitability. Value outside the bar denotes margin ($/ha) after N, F & PGR costs.
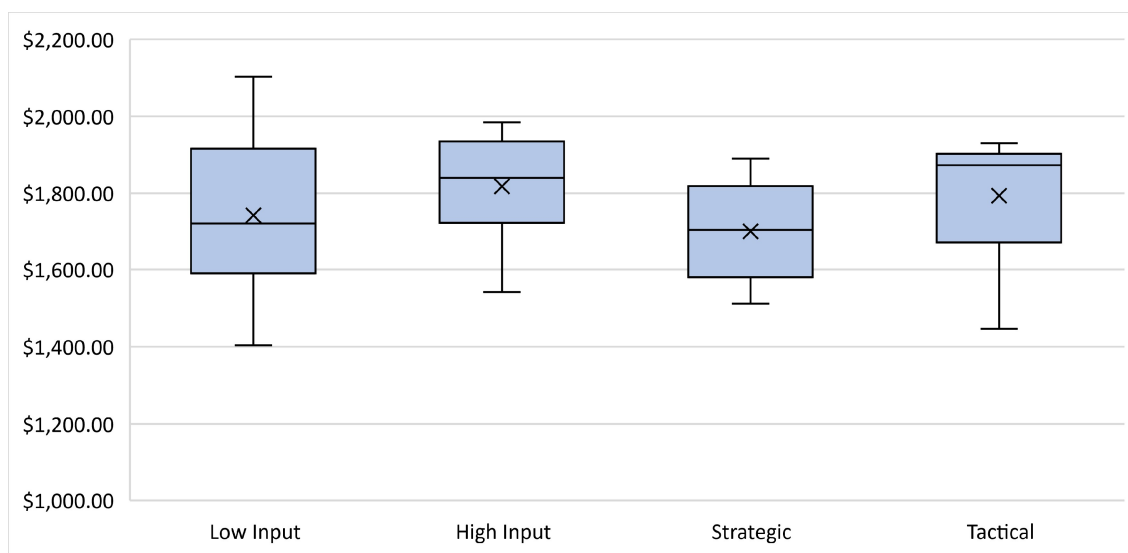
Figure 4. Graph representing the distribution of margin after N, F & PGR costs across the six varieties ($/ha) under low, high, strategic and tactical management strategies.

Table 9. Active ingredients and chemical loading (g/L) for products used.

Name	Active 1		Active 2		Type
Fungicide					
Aviator Xpro	Prothioconazole	150 g/L	Bixafen	75 g/L	EC
Opus	Epoxiconazole	125 g/L	---	---	SC
Prosaro	Prothioconazole	210 g/L	Tebuconazole	210 g/L	SC
Systiva	Fluxapyroxad	333 g/L	---	---	FS
Tilt	Propiconazole	500 g/L	---	---	EC
Folicur	Tebuconazole	430 g/L	---	---	SC
PGR					
Moddus Evo	Trinexapac-ethyl	250 g/L	---	---	DC

Table 10. Trial input and management details.

Sowing date:		29 April 2023	
Harvest date:		22 December 2023	
Seed rate:		200 seeds/m^2	
Basal fertiliser:	29 Apr	100 kg/ha MAP	

Nitrogen:		Low Input	Strategic
		150kg N/ha	150kg N/ha
		High Input	**Tactical**
		225kg N/ha	175kg N/ha

PGR:		Low Input	Strategic
	GS30	----	Moddus Evo 0.20 L/ha
	GS33	----	Moddus Evo 0.20 L/ha
		High Input	**Tactical (except Minotaur)**
	GS30	Moddus Evo 0.20 L/ha	Moddus Evo 0.20 L/ha
	GS33	Moddus Evo 0.20 L/ha	Moddus Evo 0.20 L/ha

Fungicide:		Low Input	High Input
	GS00	----	Systiva
	GS31	Tilt (0.5L/ha)	Prosaro (0.3L/ha)
	GS39	Folicur (0.29L/ha)	Aviator Xpro (0.5 L/ha)
	GS59-61	----	Opus (0.5L/ha)

		Strategic	Tactical
	GS00	----	----
	GS31	Prosaro (0.3L/ha)	See below
	GS39	Aviator Xpro (0.5 L/ha)	See below
	GS59-61	Opus (0.5L/ha)	----

Tactical fungicide						
	RGT Planet	**Rosalind**	**Laureate**	**Minotaur**	**Neo**	**Pixel**
GS31	Prosaro (0.3L/ha)	Prosaro (0.3L/ha)	Prosaro (0.3L/ha)	Tilt (0.5L/ha)	Tilt (0.5L/ha)	Tilt (0.5L/ha)
GS39	Aviator Xpro (0.5 L/ha)	Aviator Xpro (0.5 L/ha)	Aviator Xpro (0.5 L/ha)	Aviator Xpro (0.5 L/ha)	Folicur (0.29L/ha)	Aviator Xpro (0.5 L/ha)
GS59-61	----	----	----	----	----	----