

Trial 3. HYC Genotype x Environment x Management (G.E.M) Trial Series

Objectives: To assess the performance of winter and spring wheat varieties managed under three different levels of management sown in mid-April (17th April).

Key Points:

- *The awnless feed wheat SFR86-090 (RGT Cesario) was the top yielding variety under high input management at 9.88t/ha, however its yield was not significantly different to the winter varieties Anapurna and Tabasco.*
- *Unlike SFR86-090, Anapurna and Tabasco gave no significant reduction in yield when input level was reduced to standard input (120N, 2 Fungicide units, no PGR) from high (160N, 4 Fungicide units and 2 PGRs).*
- *Protein levels of 11 – 11.6% for most feed wheats indicated that yields were maximised at 120N with no need to go to 160N in the high N input.*
- *The sowing date was too early for the spring wheat germplasm (Trojan and Scepter) which developed too quickly (flowering 22-25 September) even when defoliated (simulated grazing).*
- *Defoliation at GS30 resulted in greater dry matter offtake with later developing cultivars, Tabasco giving over 2100kg/ha with defoliation on 25 August, compared to RGT Accroc which produced 1340kg/ha from 7 August defoliation.*
- *In contrast to previous seasons, there was little yield penalty for defoliation observed in the high yielding winter wheats compared to standard and high input, a possible indication that yield potential at standard and higher input was restricted.*
- *There were a number of factors that were the possible causes but warmer than average temperatures in November, leaf rust pressure, later army worm and low-level crown rot could have been factors.*
- *The dominant foliar diseases in the trial were Septoria tritici blotch (STB) with leaf rust also a significant disease. Late stripe rust was also observed in the trial, particularly in Trojan.*
- *In terms of yield potential, elevated temperatures in early November may have limited yield potential, but local commercial yields were higher and Tabasco with its late flowering (1st December) was still one of the highest yielding cultivars.*
- *With the exception of Tabasco the highest yielding cultivars flowered in the last 10 days of October, the period traditionally associated with the highest yields from this mid-April sowing date over the last three years at the SA CTC.*

Treatments: Three management levels (see Table 5) differing in defoliation, nitrogen, fungicide and PGR input were applied to 10 varieties of winter and spring wheat.

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

	Management Level					
	“Grazed” Input		Standard Input		High Input	
Cultivar	Yield t/ha		Yield t/ha		Yield t/ha	
Trojan (spring)	5.65	p	5.71	p	6.67	no
Scepter (spring)	5.47	p	5.59	p	6.46	o
Nighthawk (facultative)	7.23	mn	7.50	lm	7.87	kl
Anapurna (winter)	9.43	a-d	9.56	abc	9.82	ab
RGT Acrocc (winter)	8.35	h-k	7.95	jkl	8.62	e-i
Manning (winter)	8.22	h-k	7.17	mn	7.10	mno
SF Adagio (winter)	8.82	d-h	8.53	g-j	9.24	b-e
RGT Calabro (winter)	8.62	e-i	8.14	ijk	8.59	f-i
SFR86-090 (winter)	9.20	b-f	9.10	c-g	9.88	a
Tabasco (winter)	8.02	i-l	9.71	abc	9.68	abc
LSD Cultivar p = 0.05	0.37 t/ha		P val		<0.001	
LSD Management p=0.05	0.42 t/ha		P val		0.042	
LSD Cultivar x Man. P=0.05	0.64 t/ha		P val		<0.001	

Table 2. Influence of management strategy and variety on Protein (%).

	Management Level					
	High Input		Standard Input		“Grazed” Input	
Cultivar	Protein %		Protein %		Protein %	
Trojan (spring)	14.0	-	13.4	-	12.6	-
Scepter (spring)	13.6	-	13.5	-	12.2	-
Nighthawk (facultative)	12.5	-	12.2	-	12.1	-
Anapurna (winter)	12.2	-	11.6	-	11.3	-
RGT Acrocc (winter)	12.2	-	11.6	-	8.4	-
Manning (winter)	12.5	-	11.6	-	10.4	-
SF Adagio (winter)	12.1	-	11.6	-	11.1	-
RGT Calabro (winter)	11.9	-	11.2	-	10.9	-
SFR86-090 (winter)	11.8	-	11.3	-	10.7	-
Tabasco (winter)	11.2	-	10.5	-	9.7	-
Mean	12.4	a	11.8	a	10.9	b
LSD Cultivar p = 0.05	0.87 %		P val		<0.001	
LSD Management p=0.05	0.68 %		P val		0.005	
LSD Cultivar x Man. p = 0.05	ns		P val		0.453	

There were significant interactions between variety and management in the effect on grain size and screenings. Spring varieties that were defoliated later than planned (GS31-32) showed a significant decrease in grain size and increase in screenings compared to winter wheat such as Anapurna (largest grained variety) that showed stable grain size across the three managements (Tables 3 & 4).

Table 3. Influence of management strategy and variety thousand Seed Weight (grams).

	Management Level						
	High Input		Standard Input		“Grazed” Input		Mean
Cultivar	TSW (gram)		TSW (gram)		TSW (gram)		
Trojan (spring)	46.6	a-d	44.4	efg	39.1	lmn	43.3
Scepter (spring)	44.6	d-g	44.4	efg	39.7	klm	42.9
Nighthawk (facultative)	42.2	hij	41.1	i-l	40.7	jkl	41.3
Anapurna (winter)	46.1	b-e	46.4	a-e	45.3	b-f	45.9
RGT Acrocc (winter)	41.8	h-k	41.0	i-l	39.2	lmn	40.6
Manning (winter)	34.6	p	35.2	p	38.3	mn	36.0
SF Adagio (winter)	45.6	b-e	44.7	c-g	46.4	a-e	45.6
RGT Calabro (winter)	46.7	abc	47.2	ab	48.4	a	47.4
SFR86-090 (winter)	43.4	fgh	42.9	ghi	41.9	hij	42.7
Tabasco (winter)	38.4	mn	37.5	no	35.9	op	37.3
Mean	43.0	-	42.5	-	41.5	-	
LSD Cultivar p = 0.05		1.2 g		P val		<0.001	
LSD Management p=0.05		1.3 g		P val		0.073	
LSD Cultivar x Man. p = 0.05		2.1 g		P val		<0.001	

Table 4. Influence of management strategy and variety on screenings (%).

	Management Level							
	High Input		Standard Input		“Grazed” Input		Mean	
Cultivar	Screenings (%)		Screenings (%)		Screenings (%)			
Trojan (spring)	0.5	g-j	0.7	e-j	1.8	a	1.0	b
Scepter (spring)	0.5	g-j	0.6	f-j	1.4	abc	0.9	bc
Nighthawk (facultative)	1.1	cde	1.4	bc	1.5	ab	1.3	a
Anapurna (winter)	0.5	g-j	0.8	e-i	0.7	e-j	0.7	cd
RGT Acrocc (winter)	1.0	def	1.3	bcd	0.9	efg	1.0	b
Manning (winter)	1.4	abc	1.7	ab	1.3	bcd	1.5	a
SF Adagio (winter)	0.4	ij	0.3	j	0.5	hij	0.4	e
RGT Calabro (winter)	0.8	e-i	0.7	e-j	0.6	f-j	0.7	cd
SFR86-090 (winter)	0.6	f-j	0.7	e-j	0.4	ij	0.6	de
Tabasco (winter)	0.7	e-j	0.7	e-j	0.8	e-h	0.7	cd
Mean	0.7	b	0.9	ab	1.0	a		
LSD Cultivar p = 0.05		0.23 %		P val		<0.001		

LSD Management p=0.05	0.15 %	P val	0.015
LSD Cultivar x Man. p = 0.05	0.40 %	P val	<0.001

Table 4. Approximate date of pseudo stem erect (GS30), mid flowering (GS65) under grazed management, dry matter (DM) removed in simulated grazing (mechanical defoliation) management at GS30 and grain yield reduction associated with grazing.

Phenology (GS30 and GS65), Dry matter removal (GS30) and yield decrease with grazing				
	Date	Date	DM	Yield reduction
Cultivar	GS30	GS65	Kg/ha GS30	(t/ha)
Trojan (spring)	8-Jul	25-Sep	680	0.06
Scepter (spring)	8-Jul	22-Sep	690	0.13
Nighthawk (facultative)	8-Jul	15-Oct	450	0.27
Anapurna (winter)	7-Aug	21-Oct	1490	0.13
RGT Acrocc (winter)	7-Aug	15-Oct	1340	+0.40
Manning (winter)	7-Aug	3-Nov	1840	+1.06
SF Adagio (winter)	7-Aug	21-Oct	1480	+0.28
RGT Calabro (winter)	7-Aug	27-Oct	1440	+0.48
SFR86-090 (winter)	13-Aug	21-Oct	1510	+0.10
Tabasco (winter)	25-Aug	1-Dec	2210	1.68

Compared to 2019 dry matter at harvest was significantly lower with none of the wheat varieties under any management giving 20t/ha dry matter at harvest. As would be expected with later than planned defoliation the spring wheats had reduced harvest dry matter compared to the standard (Figure 1). Although not statistically part of the same trial the second sowing date of GEM (11 May sown) tended to produce higher dry matter at maturity (Figure 2). This resulted in a trend for higher yields from the May sowing date (Figure 3).

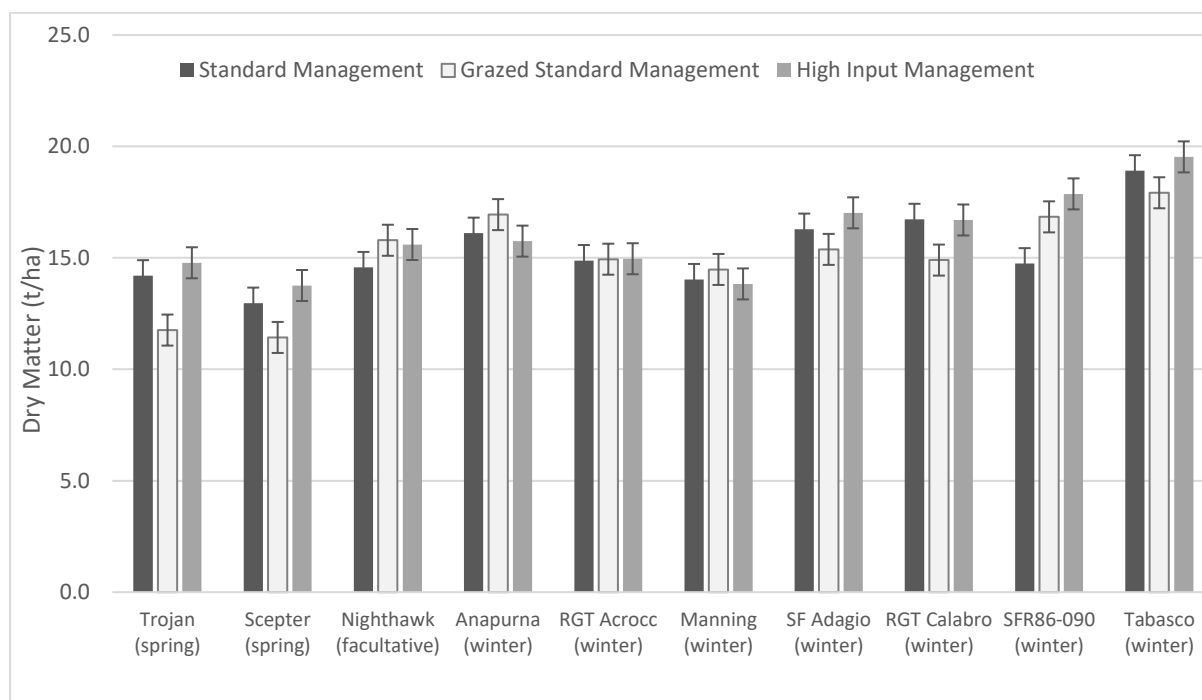


Figure 1. Dry matter at physiological maturity GS89 (except Tabasco), 8 December.

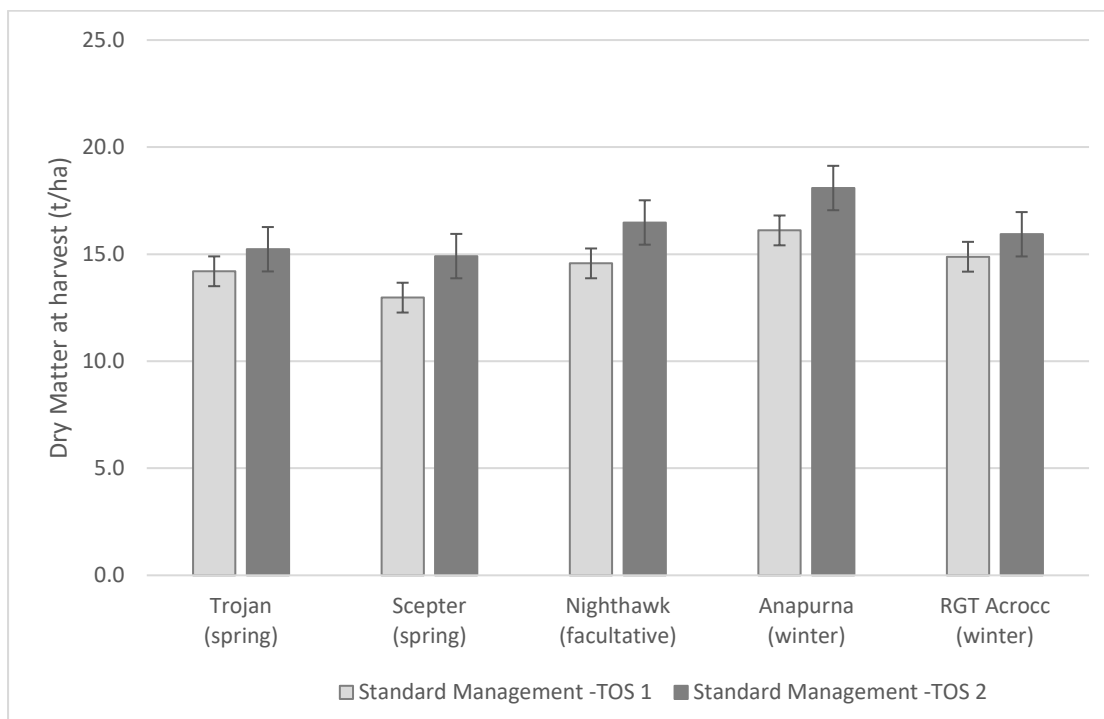


Figure 2. Dry matter accumulation at physiological maturity (t/ha) from five cultivars under the standard management sown on 17 April and 11 May.

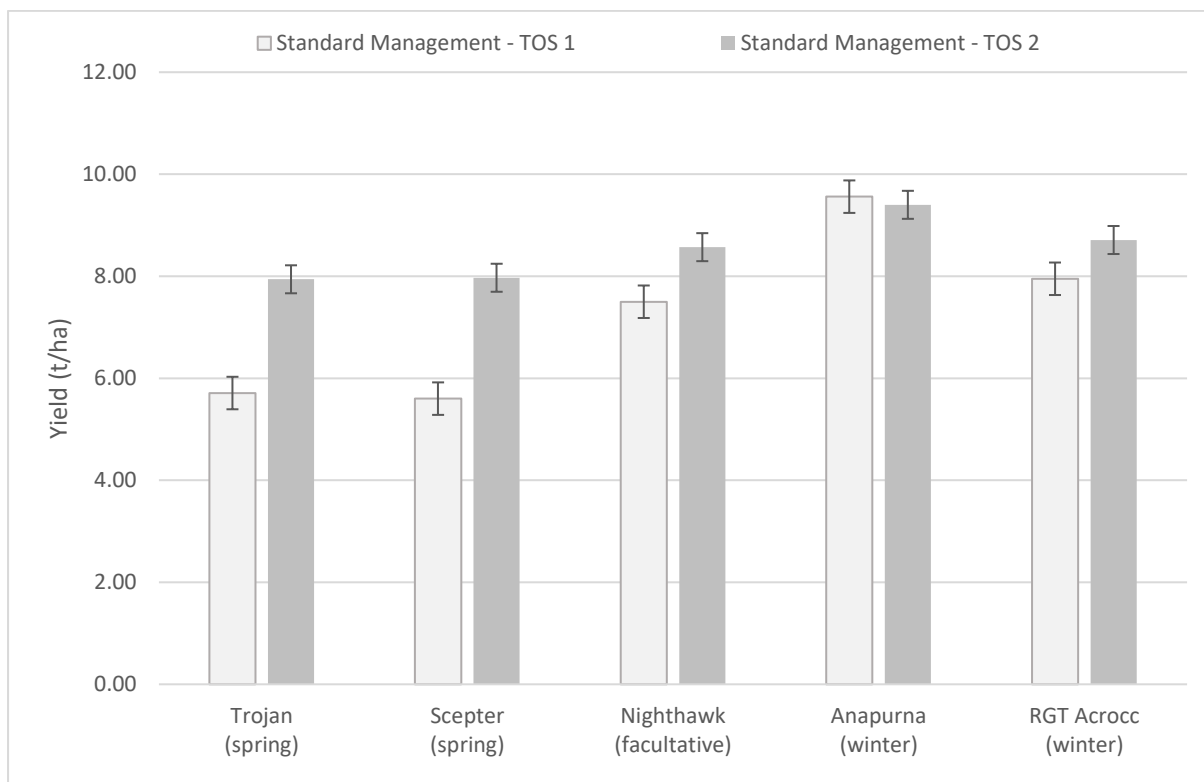


Figure 3. Grain yield (t/ha) observations from five cultivars grown under the standard management sown at TOS 1 (17 April) and TOS 2 (12 May).

Table 5. Details of the management levels (kg, g, ml/ha).

Plant pop'n:		180 seeds/m ² (150 plants/m ² target) - all three managements		
		Standard Input (grazed*)	Standard Input	High Input
Grazing:		✓	----	----
Seed treatment:		Vibrance/Gaucha	Vibrance/Gaucha	As standard + Systiva
Basal Fertiliser:	17 April	100kg MAP	100kg MAP	100kg MAP
Nitrogen**:	29 July	87 kg Urea (40 N)	87 kg Urea (40 N)	87 kg Urea (40 N)
	11 August	87 kg Urea (40 N)	87 kg Urea (40 N)	87 kg Urea (80 N)
	2 September	87 kg Urea (40 N)	87 kg Urea (40 N)	87 kg Urea (80 N)
Total N Applied:		120 N	120 N	160 N
PGR**:	GS30	---	---	Mod. 100ml + Errex 650ml
	GS32	---	---	Mod. 100ml + Errex 650ml
Fungicide**:	GS31-32	Opus 500ml	Opus 500ml	Prosaro 300ml
	GS39	Radial 840ml	Radial 840ml	Radial 840ml
	GS59-61	---	---	Opus 500ml

All other inputs of insecticides and herbicides were standard across the trial. Mod. - Moddus

** Mechanically defoliated, **Timings of PGRs, fertiliser and fungicides were adjusted to take account of the differences in spring (s) and winter wheat (w) phenology (development). High management spring plots received 40N extra at 29 July, winters received 40N extra 2 September as listed in table.*