

Trial 2. HYC Genotype x Environment x Environment (G.E.M) Trial Series

Objectives: To assess the performance of winter and spring wheat germplasm managed under three different levels of management (22nd April sown).

Key Points:

- *Winter feed wheats RGT Accroc and Anapurna were significantly higher yielding than all other cultivars tested giving yields over 10t/ha and a 2t/ha advantage over Scepter.*
- *The ASW wheat DS Bennett was significantly higher yielding than all other white wheat milling varieties.*
- *Of the AH classified wheats Nighthawk and Beckom were the highest yielding (mean of the three managements).*
- *There was a significant reduction in yield as a result of defoliation (simulated grazing) at GS30 when the results from all cultivars were averaged.*
- *Although there was some evidence that the different varieties responded to management differentially the interaction was not statistically significant ($p=0.06$).*
- *Dry matter (DM) contents at harvest ranged from 17 – 20t/ha with significantly higher DM accumulation in the longer season winter wheats such as RGT Accroc, Anapurna and DS Bennett compared to Scepter.*
- *Greater dry matter accumulation with the winter wheat up to GS30 was the result of a longer vegetative period that correlated to higher tiller number per unit area and tillers/plant.*
- *At harvest however although there were more heads/m² with winter wheats they were not always significantly higher than spring wheats indicating greater tiller mortality in winter wheats compared to springs.*
- *In general, disease (principally Septoria and stripe rust) has been controlled by the two spray programme set out in standard management approach, however those varieties that tended to give higher yields at higher input (not significant) were in general the more susceptible.*
- *The increased nutrition (18kg N/ha and 25kg S/ha) and PGR applied with the high input approach did not generate any notable yield gains.*
- *In those cultivars that lodged (Gregory, Catapult, Beckom and Trojan) there was no indication that the PGR application reduced lodging, although there were significant positive effects from grazing on standing power.*
- *Protein levels averaged just 11% and indicated that yields were optimised at the level of N application.*
- *Harvest indices for winter wheats were in general closer to 37-40% compared to higher yielding spring wheats that were closer to 45%.*

Treatments: Three management levels (see Table 6) 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 (Yield t/ha)

Cultivar	Standard		Grazed* Standard		High Input		Mean	
Trojan (spring)	8.04	-	8.18	-	8.25	-	8.15	d
Scepter (spring)	7.92	-	8.29	-	8.34	-	8.18	d
Nighthawk (facultative)	8.52	-	8.25	-	8.59	-	8.45	c
Anapurna (winter)	10.37	-	9.62	-	10.35	-	10.11	a
RGT Accroc (winter)	9.94	-	9.90	-	10.34	-	10.06	a
Beckom (spring)	8.40	-	8.49	-	8.45	-	8.45	c
Catapult (spring)	7.80	-	8.03	-	8.26	-	8.03	de
Gregory (spring)	7.04	-	6.96	-	7.24	-	7.08	f
Kittyhawk (winter)	7.95	-	7.67	-	7.94	-	7.85	e
DS Bennett (Winter)	9.72	-	9.10	-	9.42	-	9.41	b
Mean	8.57	ab	8.45	b	8.72	a		
LSD Cultivar p = 0.05			0.18		P val		0.031	
LSD Management p=0.05			0.25		P val		<0.001	
LSD Cultivar x Man. P=0.05			0.43		P val		0.060	

* "Grazed" – Mechanically defoliated at GS30

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

Management level (Protein %)							
Cultivar	Standard		Grazed standard		High input		Mean
Trojan (spring)	11.4	-	11.7	-	11.3	-	11.4
Scepter (spring)	10.6	-	10.7	-	10.7	-	10.7
Nighthawk (facultative)	11.6	-	11.6	-	11.4	-	11.5
Anapurna (winter)	11.5	-	10.4	-	11.5	-	11.1
RGT Accroc (winter)	11.6	-	10.5	-	11.6	-	11.2
Beckom (spring)	11.1	-	10.8	-	11.2	-	11.0
Catapult (spring)	11.3	-	11.2	-	11.3	-	11.3
Gregory (spring)	10.9	-	11.6	-	11.4	-	11.3
Kittyhawk (winter)	11.6	-	11.6	-	11.8	-	11.7
DS Bennett (Winter)	11.3	-	11.4	-	10.7	-	11.1
Mean	11.3		11.1		11.3		
LSD Cultivar p = 0.05			0.515		P value		0.021
LSD Management p=0.05			0.323		P value		0.526
LSD Cultivar x Man. P=0.05			0.892		P value		0.259

Table 3. Dry matter removed (t/ha) at GS30, GS75, and GS90. *Calendar dates vary due to differences in phenology.*

Variety	Grazing dry matter (GS30)		Grain development Dry Matter (GS75)		Harvest Dry Matter (GS90)	
	(t/ha)		(t/ha)		(t/ha)	
Trojan (spring)	0.17	b	11.45	d	18.54	bc
Scepter (spring)	0.07	b	11.59	d	17.36	cd
Nighthawk (facultative)	0.22	b	15.71	ab	18.63	bc
Anapurna (winter)	0.68	a	15.21	abc	20.07	a
RGT Accroc (winter)	0.62	a	16.94	a	19.64	ab
Beckom (spring)	0.06	b	13.18	bcd	17.16	d
Catapult (spring)	0.14	b	11.66	d	18.60	bc
Gregory (spring)	0.12	b	12.28	cd	18.12	cd
Kittyhawk (winter)	0.62	a	13.19	bcd	17.47	cd
DS Bennett (Winter)	0.69	a	15.55	ab	20.03	a
Mean	0.339		13.68		18.56	
P value	0.339		2.931		1.274	
LSD (p=0.05)	<0.001		0.0025		<0.001	

Table 4. Approximate date of the start of stem elongation (GS30) and beginning of flowering (GS60) under standard management and dry matter removed during simulated grazing (mechanical defoliation) at GS30 and associated grain yield loss associated.

	Date	Date	Dry Matter	Yield loss
Variety	GS30	GS60	kg/ha	t/ha
Trojan (spring)	17-Jun	23-Sep	0.17	+0.41
Scepter (spring)	17-Jun	23-Sep	0.07	+0.37
Nighthawk (facultative)	15-Jul	8-Oct	0.22	0.26
Anapurna (winter)	11-Aug	14-Oct	0.68	0.75
RGT Accroc (winter)	29-Jul	8-Oct	0.62	0.04
Beckom (spring)	17-Jun	23-Sep	0.06	+0.09
Catapult (spring)	17-Jun	23-Sep	0.14	+0.23
Gregory (spring)	17-Jun	23-Sep	0.12	0.08
Kittyhawk (winter)	15-Jul	8-Oct	0.62	0.28
DS Bennett (Winter)	29-Jul	14-Oct	0.69	0.62

+ = varieties where defoliation at GS30 increased grain yield. All other figures indicate grain loss

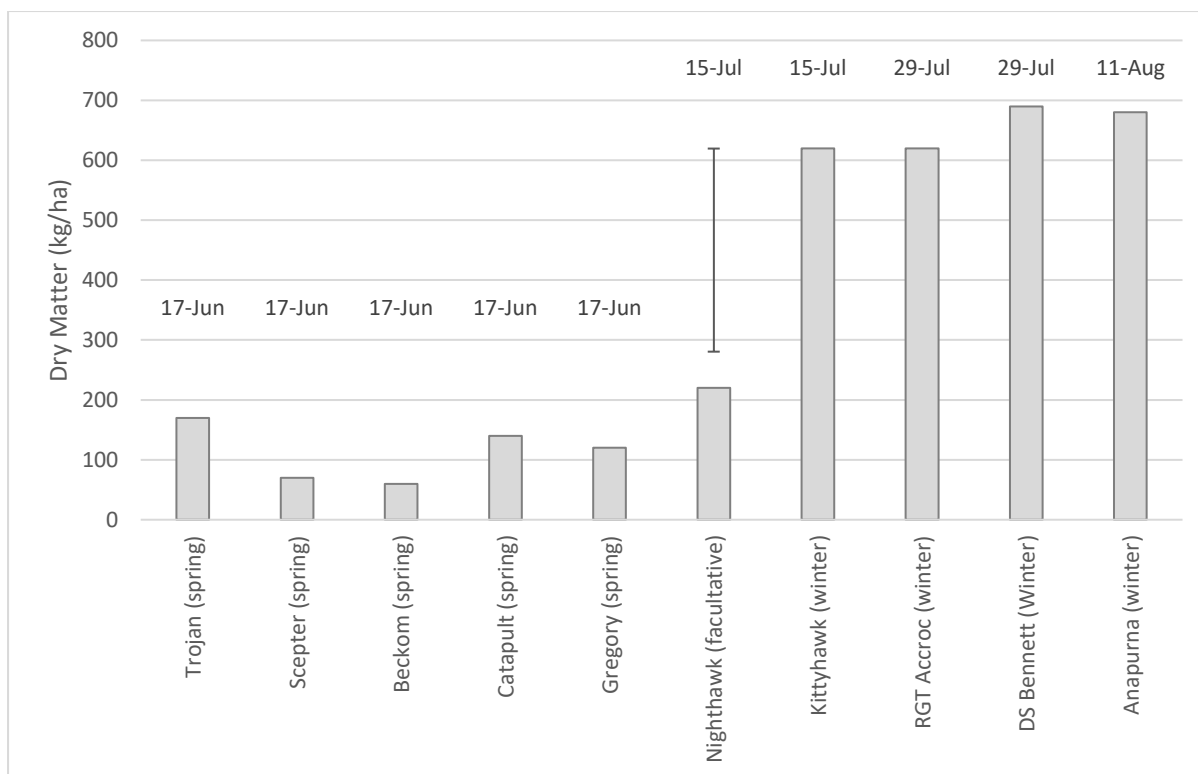


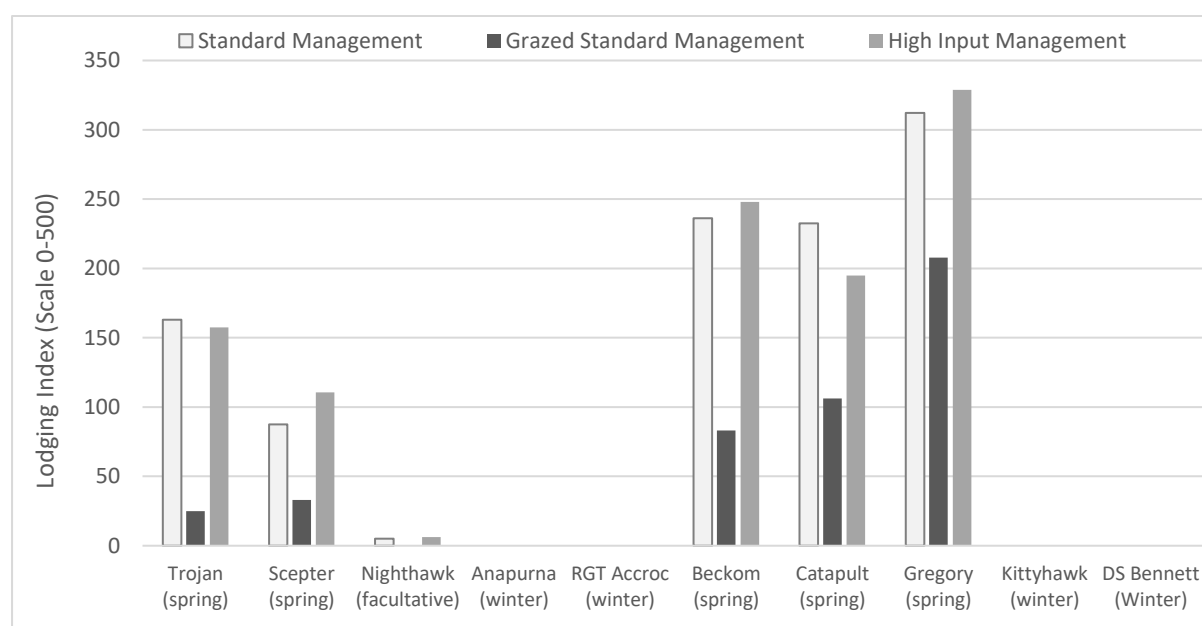
Figure 1. Dry Matter removed (kg/ha) and date of grazing at GS30, Error bar represents LSD of 340 kg/ha at p=0.05.

Table 5. Plants/m² assessed at GS12, tillers/m² assessed GS31, heads/m² assessed at GS90, and the number of tillers per plant.

Variety	Plants/m ²		Tillers/m ²		Heads/m ²		Tillers/Plant
Trojan (spring)	137	ab	324	c	494.4	cd	2.4
Scepter (spring)	125	bcd	343	c	463.3	de	2.7
Nighthawk (facultative)	143	a	484	ab	576	a	3.4
Anapurna (winter)	137	ab	517	a	520.4	bc	3.8
RGT Accroc (winter)	121	cd	518	a	554.1	ab	4.3
Beckom (spring)	122	bcd	354	c	521.5	bc	2.9
Catapult (spring)	142	a	362	c	598.9	a	2.5
Gregory (spring)	147	a	319	c	445.9	de	2.2
Kittyhawk (winter)	116	d	434	b	440.9	e	3.7
DS Bennett (Winter)	135	abc	507	a	555.6	ab	3.8
Mean	132.5		416.3		517.1		3.1
LSD	14.9		54.6		50.3		
P value	<0.001		<0.001		<0.001		

Table 6. Crop lodging index (0-500) at crop maturity (GS90) on 7 December.

Variety	Management level (Lodging GS90 (0-500 scale))			
	Standard	"Grazed"	High input	Mean
Trojan (spring)	163 cd	25 gh	158 cd	115 c
Scepter (spring)	88 ef	33 fgh	111 de	77 d
Nighthawk (facultative)	5 h	0 h	6 h	4 e
Anapurna (winter)	0 h	0 h	0 h	0 e
RGT Accroc (winter)	0 h	0 h	0 h	0 e
Beckom (spring)	236 b	83 efg	248 b	189 b
Catapult (spring)	233 b	106 de	195 bc	178 b
Gregory (spring)	312 a	208 bc	329 a	283 a
Kittyhawk (winter)	0 h	0 h	0 h	0 e
DS Bennett (Winter)	0 h	0 h	0 h	0 e
Mean	104 a	46 b	104.6 a	
LSD Cultivar p = 0.05		34.1 P val		<0.001
LSD Management p=0.05		21.2 P val		<0.001
LSD Cultivar x Man. P=0.05		59.0 P val		<0.001

**Figure 2.** Influence of variety and management on crop lodging index (0-500) at crop maturity (GS90) on 7 December.

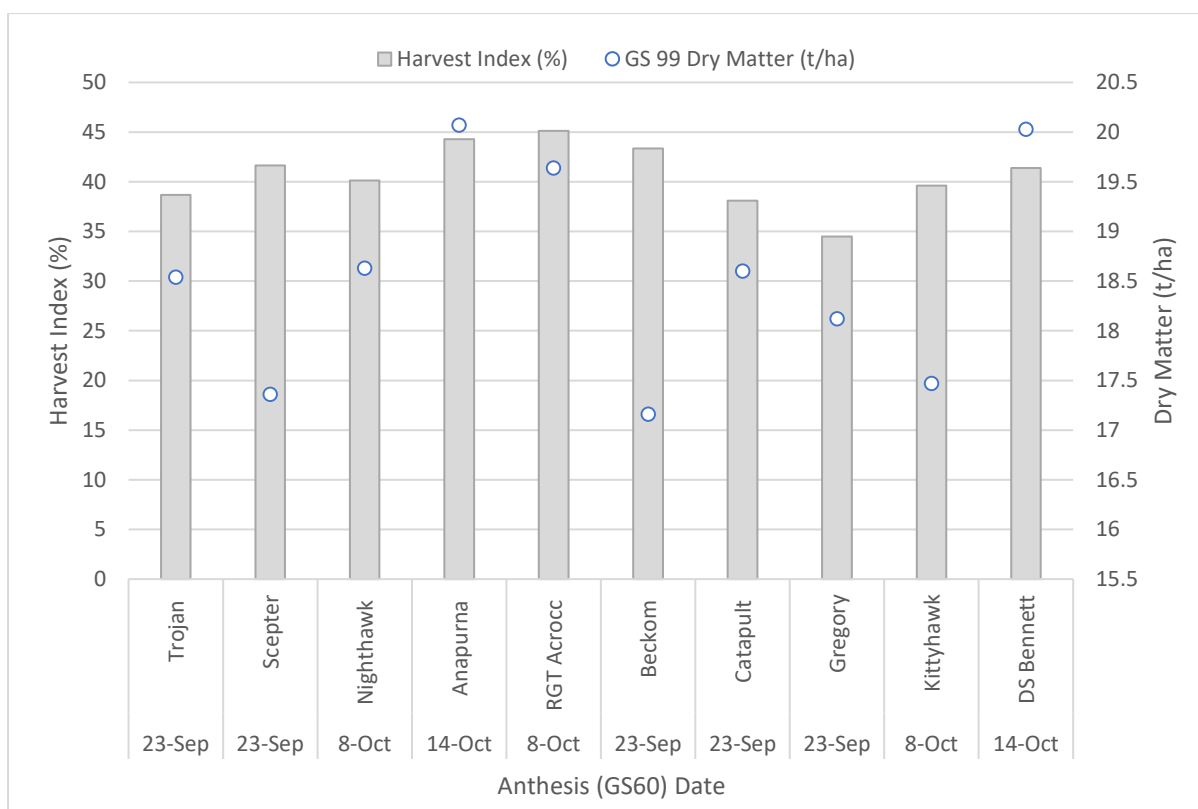


Figure 3. Influence of cultivar on dry matter at harvest (t/ha) and harvest index (%) – mean of management levels. Anthesis date shown.

Table 7. Details of the management levels.

Plant pop'n: 180 seeds/m² (150 plants/m² target) - all three managements

	Timing	Standard	Grazed Standard	High Input
Seed treatment:		Vibrance/Gaucho	Vibrance/Gaucho	As 1 F unit + Systiva
Basal Fertiliser:	21 April	120kg MAP (12 Kg N)	120kg MAP (12 Kg N/ha)	120kg MAP (12 Kg N/ha)
Nutrition:	18 June	40kg N/ha	40kg N/ha	40kg N +25kg S + 25kg K/ha
	23 July	70kg N/ha	70kg N/ha	88kg N/ha
Total N Applied:		122kg N/ha	122kg N/ha	140kg N/ha
PGR:	11 August	---	---	Moddus Evo 100ml/ha
				Errex 0.65L/ha
Fungicide*:	GS 31	Opus 500ml/ha	Opus 500ml/ha	Prosaro 300ml/ha
	GS39	Amistar Xtra 800ml/ha	Amistar Xtra 800ml/ha	Amistar Xtra 800ml/ha
	GS61			Opus 500ml/ha

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

**Timings of fertiliser and fungicides were adjusted to take account of the differences in spring) and winter wheat phenology (development).*