Southern Irrigated Wheat Varieties Achieving Target Yields - Hillston 2016

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Introduction

For consistently producing high yielding irrigated wheat, varietal choice has been identified as one of the key factors, with lodging resistance one of the main varietal characteristic that growers look for on irrigation. Agronomic practices such as nitrogen management are also important in achieving high yields.

In its third year, this trial at Hillston is a satellite site of the 'Southern Irrigated Cereal and Canola Varieties Achieving Target Yields' project. It aims to test the suitability, in terms of lodging resistance, grain yield and quality, of current commercially available wheat varieties under high yielding irrigated conditions specific to Southern NSW.

Site Details

Location:	Hillston, NSW	
Soil type:	Red clay loam	
Sowing dates:	TOS 1: 17th May	TOS 2: 2nd June
Available N at sowing:	82 kg/ha (0-60 cm)	
0-10cm nutrients:	13 mg/kg Colwell P	
Previous crop:	Maize 2015/2016	
Rainfall:	95mm January–March + 532mm April–October	
In-crop irrigations:	1 x irrigation 4th November	
Fungicides:	30th July, 500ml Tilt	5th October, 300ml Prosaro (by air)
Starter fertiliser:	150 kg/ha MAP	
Harvest date:	13th December 2016	

Treatments

12 wheat varieties

1. 280913
2. EGA_Bellaroi
3. Chara
4. Cobra
5. Corak
6. Emu_Rock
7. Kiora
8. Lancer
9. Suntop
10. Trojan
11. Wallup
12. EGA_Wedgetail

2 times of sowing (TOS)

TOS 1: 17.05.2016 TOS 2: 2.06.2016

2 nitrogen treatments

	Sowing	First node	Booting	Total N
N1. Early N (EN)	130kg N/ha	100kg N/ha	-	230kg N/ha
N2. Late N (LN)	30kg N/ha	100kg N/ha	100kg N/ha	230kg N/ha

Results

Measurements taken from all plots included plant counts, Normalised Digital Vegetation Index (NDVI), lodging scores, grain yield and grain quality. Tiller and head counts were also taken on the varieties Chara, Corak, Lancer, Suntop and Wallup.

Plant Counts:

Plant counts were taken on all varieties on the 14th June for time of sowing 1 and on the 18th July for time of sowing 2. The average plant count for TOS 1 was 145 plants/m^2, which was statistically similar to TOS 2 with 143 plants/m^2. The variety Lancer had the lowest plant population across all nitrogen treatments and sowing times with 128 plants/m^2, although this was statistically similar to the varieties Chara and Kiora which had the highest plant populations of 156 plants/m^2. Applying all nitrogen early (143 plants/m^2), by the first node stage, was statistically similar to where the majority of nitrogen was applied from first node (145 plants/m^2).

There was a significant variety by time of sowing by nitrogen rate effect for plant establishment (table 1). For TOS1 the variety Wallup had the highest plant count, 168 plants/m^2, for the N1 treatment and Kiora had the highest plant counts, 191 plants/m^2, for the N2 treatment. For TOS 2 the variety Kiora had the highest plant count, 172 plants/m^2, for the N1 treatment and Bellaroi had the highest plant counts, 163 plants/m^2, for the N2 treatment.

Table 1: Plant Establishment counts (plants/m^2) of 12 wheat varieties by 2 Times of Sowing (TOS) and by 2 nitrogen treatments 2016

VARIETY	TOS 1		TOS 2	
	N1	N2	N1	N2
280913	150	146.8	135.2	133.4
Chara	165.4	152.6	150.5	137.7
Cobra	139.9	140.8	147.2	150.6
Corack	135.6	147.7	141.3	148.8
EGA Bellaroi	160.7	132.3	133.6	162.9
EGA Wedgetail	120.9	171	136.8	149.1
Emu Rock	110.3	139.5	124.5	150.4
Kiora	120.8	190.9	172.8	121.8
Lancer	126.9	114.8	147.1	121.8
Suntop	164	135.8	139	137.8
Trojan	143.7	166.2	146.7	147.9
Wallup	168.1	130.1	144.7	138.1
Average	***142.19***	***147.38***	***143.28***	***141.69***
LSD (p=0.05)	***38.41 plants/m^2***			

Tillers and Head Counts:

Tiller and head counts were taken on the varieties Chara, Corak, Lancer, Suntop and Wallup. There were significant effects for variety and N rate for tiller counts and variety for head counts.

The variety Wallup had a significantly higher tiller count with 498 tillers/m^2, although statistically similar to Chara and Corak. Lancer had a significantly lower tiller count with 371 tillers/m^2, which was statistically similar to Suntop and Corak, (figure 1).

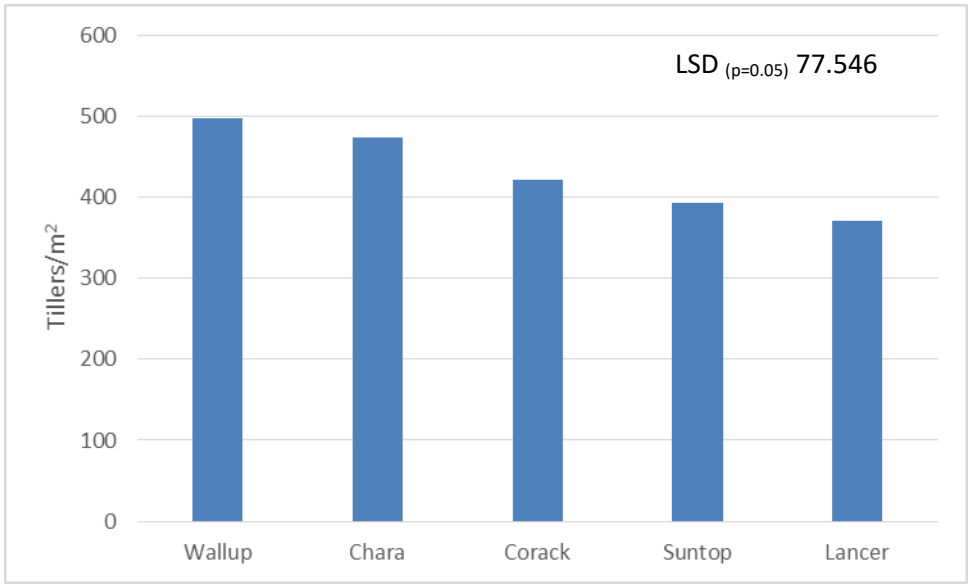

Figure 1: Average tiller counts (tillers/m^2) for each variety.

Applying all nitrogen early, up to the first node stage, had statistically higher tiller counts than where nitrogen was applied later, from the first node stage. Tiller counts for nitrogen treatment 1 (486 tillers/m^2) were significantly higher than the tiller counts for nitrogen treatment 2 (378 tillers/m^2).

The variety Wallup had a significantly higher head count with 471 heads/m^2, although statistically similar to Lancer. Corak had a significantly lower head count with 386 heads/m^2, which was statistically similar to Suntop, (figure 2).

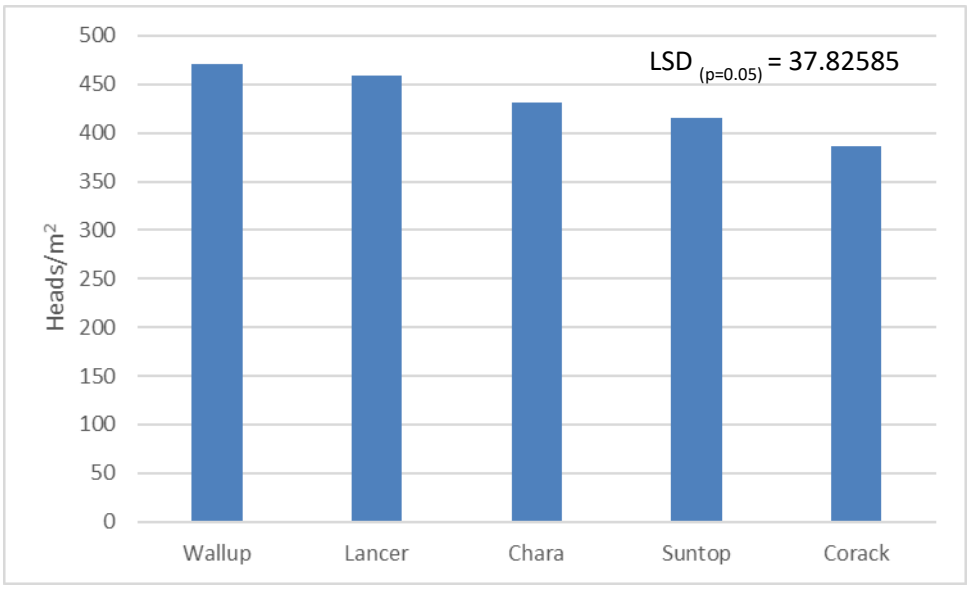

Figure 2: Average head counts (heads/m^2) for each variety.

Normalised Digital Vegetation Index (NDVI):

Crop vigour was measured at heading/flowering using a hand held NDVI. There was a significant TOS, variety and Nitrogen rate effect for NDVI.

NDVI for TOS 1 was 0.85, which was significantly higher than for TOS 2, 0.84. The variety Chara had the highest NDVI value of 0.86, which was statistically similar to Wedgetail and Lancer. The variety Corak had the lowest NDVI value of 0.831, which was statistically similar to the durum variety 280913, Bellaroi and Wallup. Applying nitrogen early gave a significantly higher NDVI value (0.852) as opposed to where nitrogen was applied later (0.8393).

Grain Yield:

Grain yield for the trial averaged 8.71 t/ha, with the average grain yield for TOS 1 8.56/ha, which was statistically similar to the average grain yield for TOS 2 8.87t/ha. The highest yielding variety was Cobra, yielding 10.27 t/ha, which was significantly higher than all other varieties in the trial, (figure 3). The lowest yielding variety was the durum variety 280913, yielding 6.81 t/ha, which was significantly lower yielding than all other varieties in the trial.

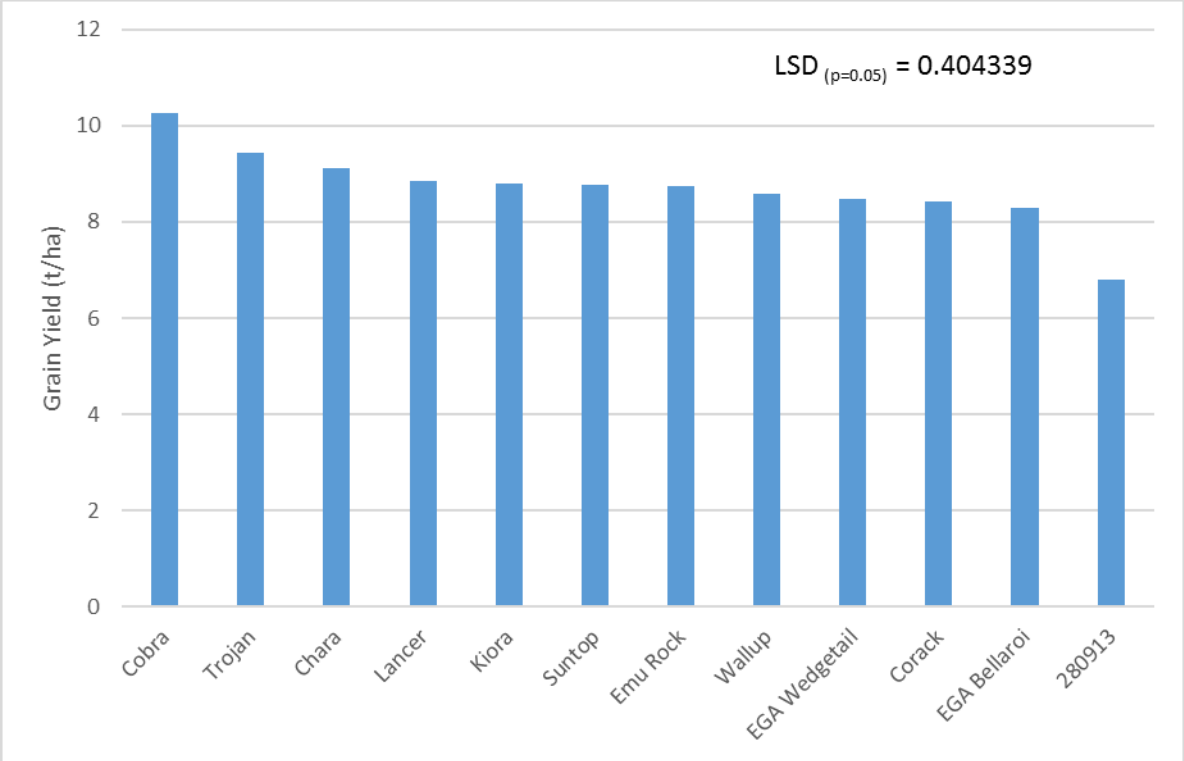

Figure 3: Average Grain yield for each variety.

Sowing date impacted on the performance of some varieties in this trial. The durum variety 280913 was significantly lower yielding than all other varieties at TOS 1 and TOS 2, (figure 4). The highest yielding variety across sowing times was Cobra, which was significantly higher yielding than all other varieties except Trojan at TOS1, which was statistically similar.

The varieties Corak and Wallup, which are quicker maturing varieties, were the only two varieties to show a significant difference between sowing times, with TOS 1 significantly lower yielding than TOS 2. All other varieties were statistically similar yielding for both sowing times.

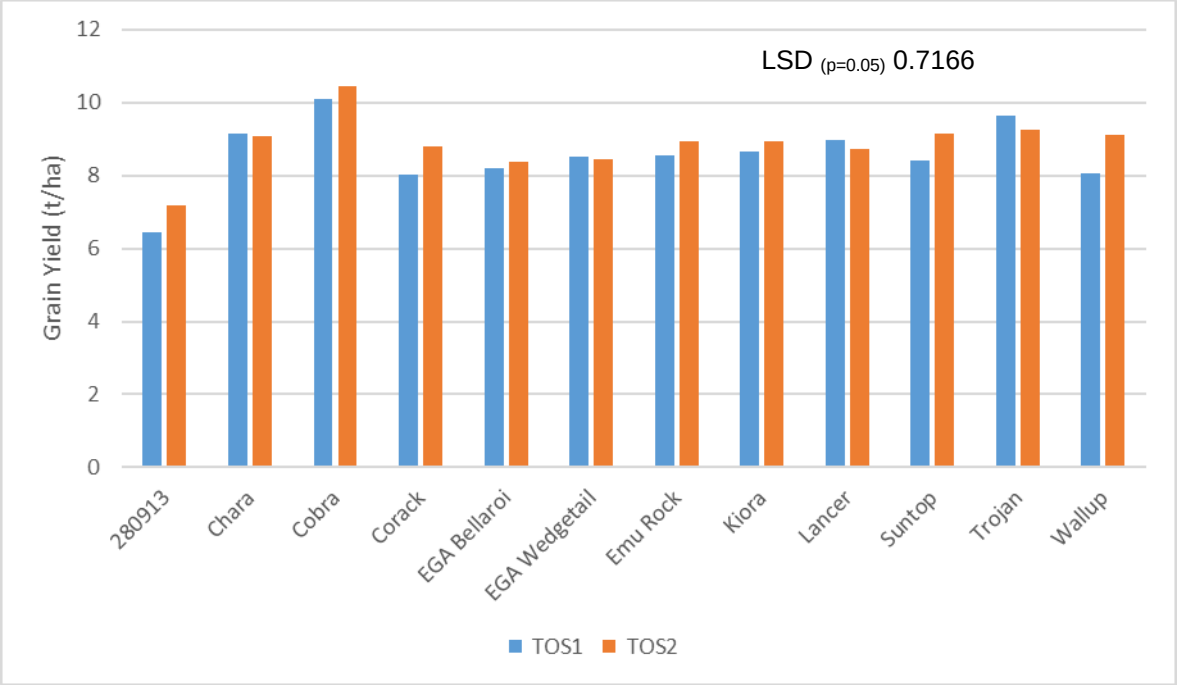

Figure 4: Average grain yield for each variety and TOS

Grain Quality:

Overall across sowing time and nitrogen treatment, grain protein ranged from 12% for the variety Trojan to 13.86% for the durum variety 280913, (figure 5).

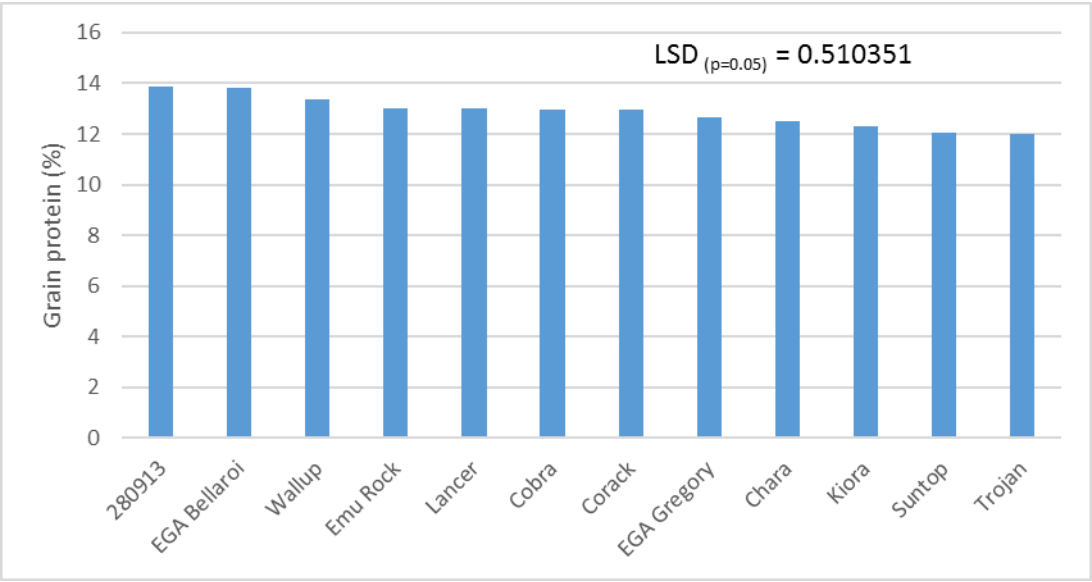

Figure 5: Average grain yield for each variety

Grain Protein was significantly higher where nitrogen was applied later (N2 treatment), 13.04% as opposed to where the nitrogen was applied early (N1 treatment), 12.71%. There was a significant interaction between TOS and N rate, with TOS 2 having a significantly higher protein (13.18%) when nitrogen was applied later as opposed to where it was applied early, 12.63%.

There were significant interactions for TOS, variety and TOS x variety for screenings. Screenings were low in the trial with the average screening across varieties, sowing time and nitrogen treatment of 0.73%. TOS had a significant effect on screenings, with TOS 2 (0.816%) having a significantly higher level of screenings than TOS 1 (0.645%). There was also a significant effect of variety on screenings. The variety Corak had the lowest screenings (0.304%) overall, with Chara having the highest screenings (1.356%) overall.

For TOS 1 Corak had the lowest screenings with 0.25%, which was statistically similar to Wallup, 280913, Cobra, EGA_Gregory and EGA_Bellaroi. Emu-Rock had the highest screenings with 1.17%, which was statistically similar to Chara and Kiora. For TOS 2 the durum variety 280913 had the lowest screenings with 0.26%, statistically similar to Wallup, Corak, EGA_Bellaroi and Cobra. Chara had the highest screenings with 1.56%, which was statistically similar to Kiora and EGA_Gregory (figure 6).

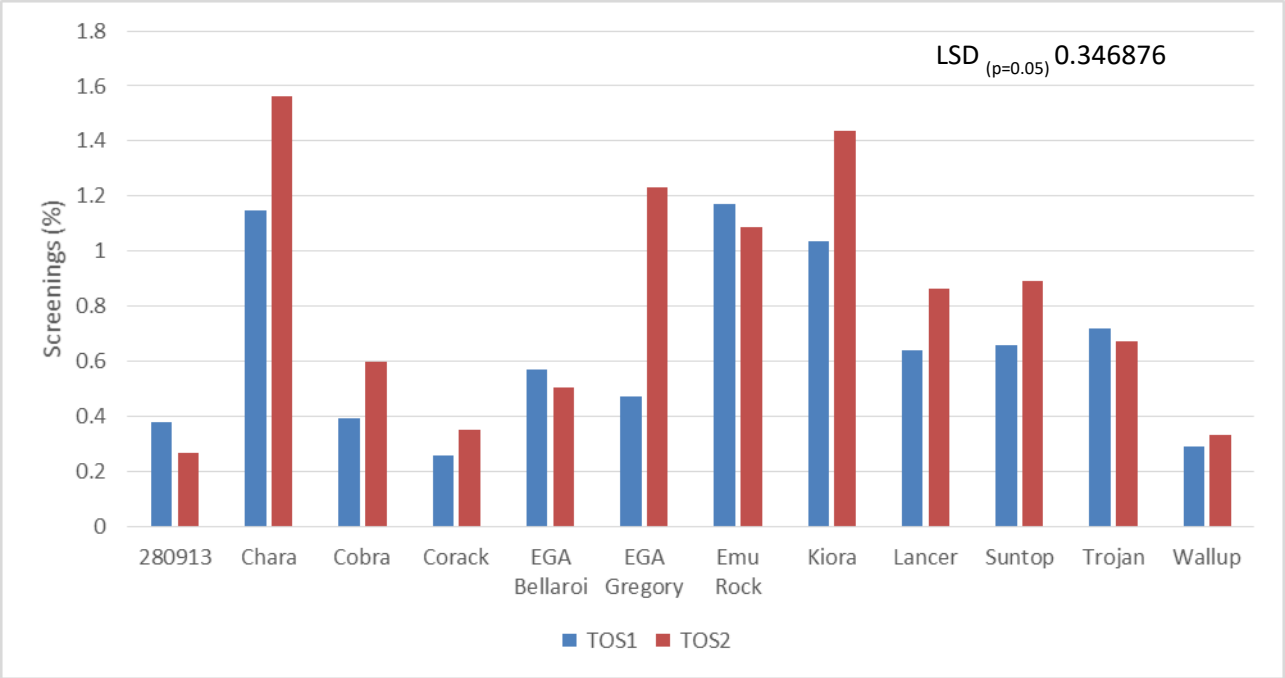

Figure 6: Average screenings for each variety at each TOS

Summary

Growing conditions in 2016 were very wet and mild, with rainfall from May to September one of the wettest on record. Growing season rainfall for Hillston was 532mm.

Variety choice was still a key factor in producing high yields, given the season. Cobra was the highest yielding variety in the trial, with Chara and Trojan the only other two varieties to yield over 9 t/ha. Durum wheat varieties did not perform as well in 2016, with 280913 the lowest yielding variety in the trial. The other durum variety in the trial EGA _Bellaroi also did not perform.

The varieties Corak and Wallup, which are quicker maturing varieties, were the only two varieties to show a significant difference between sowing times, with TOS 1 significantly lower yielding than TOS 2. All other varieties were statistically similar yielding for both sowing times.

Nitrogen application timing was another key factor in 2016. Applying all nitrogen early had higher tiller counts and crop biomass as opposed to applying nitrogen later. Later nitrogen applications produced significantly higher grain protein.

Acknowledgements

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