



Irrigated winter cereal trials achieve 10 t/ha

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in a nutshell

- The 2007 irrigated winter cereal trials at Yanco achieved average yields of 10 t/ha
- Key traits of lodging and maturity did not have large effects on yield in 2007
- There was a high level of correlation of results between sites in the trial program

Having achieved average yields of 10 t/ha at the Yanco site, we can safely say we have successfully completed the first season of the “High yielding genotypes of winter cereals for irrigated regions of south east Australia” project. This achievement was accompanied by some disappointments, as you would expect in the season we have just had.

In my first article in the *Farmers’ Newsletter* (No. 176) introducing the project, I posed three questions underlying the project.

- Can varieties be selected that will produce yields consistently of 10 t/ha or greater under irrigation in south east Australia?
- What traits and genetic backgrounds are important to improve yields of irrigated winter cereals?
- With respect to variety performance, how variable are the irrigated areas of south eastern Australia?



Figure 1. Aerial photo of Yanco trials in October 2007. Photo: Peter Draper

As we examine the results of 2007 we can use these questions to assess the project results and each subsequent year of results.

Growing wheat under best practice

To satisfy our lofty goals for this project we need to be able grow the varieties and breeders lines under best management practices for irrigation. To do this we selected three trial locations believed to be representative of the irrigation environments of south east Australia:

- Yanco Agricultural Institute (NSWDPI)
- Mayrung (Harry Kooloos)
- Kerang (DPIVic).

The Yanco and Mayrung sites had trials of barley, durum, triticale and wheat. Unfortunately the Mayrung site was lost due to lack of available irrigation water in spring. The Kerang site had a single trial of bread wheat.



Figure 2. “This one looks alright” says Aaron Hutchison, NSW DPI Technical Officer for the Irrigated Winter Cereals project, showing off his ability to pick the highest yielding line, Super Seri 1, in the wheat trials.



Management of the trials was carried out to the formulae John Lacy developed to achieve 10 t/ha grain yield. The results achieved in 2007 show this crop management was 'spot on' with three of the six trials harvested having an average yield of 10 t/ha (Table 1).

The Yanco trials received a total of approximately 5.3 ML/ha

of irrigation water, which was delivered over a pre-water (1.7 ML/ha) and five spring irrigations (0.7 ML/ha each). The trial at Kerang received a total of approximately 6.25 ML/ha of irrigation water, which was delivered over a pre-water (2 ML/ha) and four spring irrigations (one at 1.25 ML/ha, and three at 1.0 ML/ha).

Table 1. The experiment means for yield and lodging for the 2007 Irrigated winter cereal trials.

Experiment	Crop	Location	No. of entries	Mean yield* (t/ha)	Mean lodging score**
B9A07YANA	Barley	Yanco	96	8.869	4.9
T9A07YANA	Triticale	Yanco	59	10.25	6.9
D9A07YANA	Durum	Yanco	100	10.26	6.2
W9A07YANA	Wheat	Yanco	1006	9.108	5.7
W9B07YANA	Wheat	Yanco	99	10.06	5.3
W9A07KERA	Wheat	Kerang	159	5.610	2.5

*Yield calculated using sowing width (no. tynes multiplied by distance between tynes) ie, for W9A07YANA, 7 x 18 cm = 1.26 m

** Lodging score 1-9 scale, where 1 equals no lodging present to 9 equalling completely flat on the ground.

Table 2. The top five performing varieties and breeders lines for yield in the 2007 irrigated winter cereal trials.

	Top 5 varieties			Top 5 breeders lines		
	Name	Yield (t/ha)	Rank in trial	Name	Yield (t/ha)	Rank in trial
Barley	Capstan	10.152	6	WB261	10.832	1
	Dash	9.814	15	VB0611	10.406	2
	Vlamingh	9.703	16	WABAR2452	10.361	3
	Hindmarsh	9.667	17	WABAR2288	10.288	4
	Mundah	9.448	25	WI4191	10.238	5
	LSD 0.05	1.119				
Triticale	Tobruk	11.103	15	TSA0222	12.982	1
	Jaywick	11.090	16	TSA0223	12.695	2
	Kosciuszko	10.524	26	TSA0105	12.598	3
	Everest	9.948	31	TSA0220	12.382	4
	Abacus	9.871	32	JRCT101	11.822	5
	LSD 0.05	1.662				
Durum	Arivato	10.8952	12	WID22221	11.5185	1
	Yallaroi	10.7926	20	27A15	11.4792	2
	Tamaroi	10.5315	38	HAZERA-13	11.3484	3
	Tamsr	10.4643	47	WID22350	11.3417	4
	Bellaroi	10.2824	57	WID22297	11.1915	5
	LSD 0.05	1.426				
Wheat#	Super_seri_1	9.961	1	HRZ03_0065	9.890	2
	Chara	8.929	87	VW1193	9.866	3
	Derrimut	8.912	95	VW1192	9.624	4
	Giles	8.784	154	VW0398	9.413	5
	Currawong	8.700	200	VW1966	9.410	6
	LSD 0.05	1.348				

*Yield calculated using sowing width (Number of tynes multiplied by distance between tynes) ie, for W9A07YANA, 7 x 18 = 1.26 m

Across sites analysis of three wheat experiments W9A07YANA, W9B07YANA, W9A07KERA.



The total nitrogen budget for the trials, including soil nitrogen, was 300 units (kg N/ha) with 220 units delivered over three applications, sowing (42 units), first node (68) and booting (110).

A fungicide regime was followed to prevent the development of any disease in the trials. The trials were sown early in May (barley sown 13 June 2007) and harvested in late December (the Kerang site was harvested 7 December 2007).

Scope for improving cereals for irrigation

The timing of lodging in the 2007 trials was five to six weeks after flowering and this is likely to be why it has had little impact on yield for the triticale, durum and smaller bread wheat trial at Yanco. However in the main bread wheat trial at Yanco the lodging that occurred at the end of October did have a significant negative effect on yield. At the Kerang site higher levels of lodging were actually positively correlated with yield. The reason for this is due to the overall lower yield potential of the trial due to poor establishment.

The apparent low impact of the timing of flowering and

physiological maturity on yield points to our belief that the trials at Yanco did not suffer significant moisture stress during the growing season. The trend of the timing of flowering correlations with yield suggests that for barley, bread wheat and durum lines which flowered later were slightly higher yielding. This correlation became significant only in the main bread wheat trial at Yanco. However for triticale the trend was the reverse situation with lines which flowered earlier having a yield advantage. This was also the case for the Kerang bread wheat trial where early flowering lines showed a weak but significant correlation with higher yields.

The individual results of varieties and breeding lines should be viewed in the context that these are a single years results. Care should be taken interpreting too much significance from them when we know that the "year" can have a large effect on how varieties perform. Over the duration of the project we will determine a more accurate estimate of how the varieties behave under intensive irrigation management.

One encouraging feature of the trials in 2007 was the high level of correlation between the Yanco and Kerang wheat

Table 3. The top 5 performing varieties and breeders lines for resistance to lodging in the 2007 irrigated winter cereal trials.

	Top 5 varieties			Top 5 breeders lines		
	Name	Lodging score (1-9)	Rank in trial	Name	Lodging score (1-9)	Rank in trial
Barley	Capstan	0.94	5	VB0608	0.45	1
	Baudin	1.05	6	WABAR2518	0.81	2
	Hindmarsh	3.95	33	WABAR2420	0.83	3
	Dash	4.22	39	WB261	0.85	4
	Buloke	6.14	56	WABAR2523	1.1	7
	LSD 0.05	2.16				
Triticale	Jaywick	5.7	11	AT616	2.0	1
	Tobruk	6.4	12	TSA0219	2.3	2
	Speedee	6.8	19	TSA0218	3.2	3
	Kosciuszko	6.9	20	TSA0217	3.9	4
	Breakwell	6.9	22	AT573	4.2	5
	LSD 0.05	1.76				
Durum	Arivato	1.53	2	27A19	0.99	1
	Bellaroi	5.60	30	27P09	1.95	3
	Kalka	6.86	50	27P13	2.04	4
	Tamaroi	7.03	55	27A03	2.19	5
	Wollaroi	7.12	56	LRD04-0012	2.33	6
	LSD 0.05	2.23				
Wheat	Yenda	1.19	34	VW4076	0.42	1
	EGA_Wedgetail	1.67	63	HRZ06_0284	0.50	2
	Wyuna	1.78	81	RAC1429	0.51	3
	Chara	2.34	134	HRZ03_0033	0.55	4
	Bolac	3.06	213	HRZ04_0049	0.64	5
	LSD 0.05	2.01				

** Lodging score 1-9 scale, where 1 equals no lodging present to 9 completely flat on the ground.



trials. This means that despite the Kerang trial suffering early set backs and yielding almost half that of the Yanco trials the ranking of varieties was quite similar at both sites. Tables 2 and 3 give the performance of the five top varieties and breeders lines for yield (Table 2) and lodging (Table 3). The encouraging aspect of these results is the dominance of breeding lines at the top of the trials, showing scope for improved varieties in the future.

These results show that yields of 10 t/ha can be achieved using best practice management in trials. These preliminary results support our belief that within existing breeders lines in Australian breeding programs are potential varieties with superior traits for intensive management under irrigation. This project will provide the framework for those varieties to be selected and ultimately released to farmers. 🌞

Acknowledgments

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Full trial results will be available through the GRDC website (www.grdc.com.au) or the below contacts.

Further information

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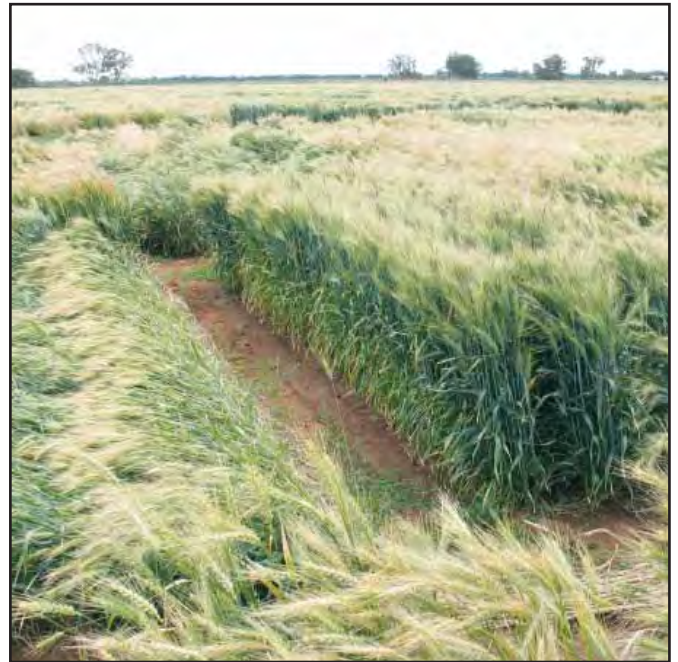


Figure 3. Lodging in the plots at Yanco in early November.