2.1.6 Winter wheat variety trial - Dunkeld, Vic

Location:
Dunkeld Research Site.

Funding:
This was an SFS Dunkeld Branch funded trial.

Researchers:
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Background/Aim:
New winter wheat varieties need to be tested over several years before they will be considered in the domestic or export markets. This trial evaluates a number of varieties that are either commercially available or close to commercial release that may be suitable for the growing conditions of southern Victoria. This trial also incorporates a fungicide programme in order to identify the susceptibility and yield penalty (if any) for not using fungicides in these varieties. Management of trial inputs are based on the season and aim to gain the best margin per hectare.

Paddock History:
2007: Canola, 2008: Lupins

Soil Type: Sandy clay

Soil Nutrients:
N = 42.1mg/kg (0-10cm) + 13.6mg/kg (10-60cm)
P = 32mg/kg (Colwell, 0-60)
K = 0.28 Meq/100g (0-60cm)
S = 29.4mg/kg(0-60cm)
pH ($CaCl^2$) = 5.0 (0-60cm)

Take home messages:

- The average yield for the winter wheat trial at Dunkeld was 7.25t/ha. The highest yield was achieved by Preston (8.18 t/ha) followed by Beaufort (8.11 t/ha) and Mackellar (8.06 t/ha)
- Naparoo (3.98 t/ha) was a poor performer due to heavy grain fall prior to harvest
- Low protein was a feature of most varieties, this could potentially have been remediated via higher rates of nitrogen fertiliser.
- Preston graded as APW1 achieved the highest gross margin at $1261/ha, followed closely by six other FED1 graded varieties with no statistical difference between them, Beaufort, Mackellar, Einstein, Revenue, Frelon and CS150.2.
- Minor pressure of stripe rust was observed for the 2009 growing season at Dunkeld, with most varieties demonstrating good resistance levels. Three varieties, Naparoo, Amarok and Revenue showed some yield loss where fungicide was not used, although this was not statistically significant.
- Varieties in this trial also need to be considered in terms of grain yield in conjunction with dry matter production.

Trial information:
Trial design consisted of a replicated randomised block design using 3 repetitions treated with foliar fungicide and leaving 1 repetition untreated, to demonstrate local disease pressure and varietal susceptibility. Plot lengths were 14 metres long and 1.45m wide. The year started very dry but over the winter months we experienced average to above average rainfall and an average spring. A hot start to November brought an end to the growing season, as such and rainfall after 20th November was not considered as contributing to the yield results this season.

Rainfall:

Avg. Annual:	597.8mm, Hamilton Airport 1991-2009
Avg. G.S.R.	466.5mm, Hamilton Airport 1991-2009
2009 Total:	562.4mm, Hamilton Airport 2009
2009 G.S.R.	April – October = 447.2mm[1]
	(Hamilton Airport; 41.6mm below average)

For the purposes of this trial, any rainfall after 20th November has not been included in GSR due to the extremely hot weather preceding this effectively ending the growing season.

[1] Yield Potential: 1/3 of Dec 2008(109mm), Jan 2009 (4.6mm) & Feb (0.4mm) with monthly totals above 20mm + ½ March (29mm) rainfall when total above 20mm + ((April – November 20th rainfall) – 124mm*) x 20kg/mm/ha. In total December-March adjusted rainfall to stored soil water = 50.8mm, plus April-November 20th = 447.2mm, minus evaporation factor of 124mm* => 374mm. Therefore, for Dunkeld, the Wheat Variety Trial water limited yield should be 7.48t/ha, or 374mm x 20kg/mm/ha.
*Kirkagaard 2009, Evaporation intercept adjustment for a clay loam.

Tillage type:
This trial was seeded with the SFS cone seeder on 17.125 cm (6 ¾ inch) row spacing using 2.5cm knifepoints and Janke high V press wheels.

Pests & Diseases:
Stripe rust pressure was low to moderate for 2009, however susceptible varieties suffered some yield penalty where no fungicide was used. Aphids were seen in large numbers later in the growing season, however earlier undetected flights had also caused some BYDV in susceptible varieties.

Treatment list:
11 current wheat varieties. Measurements included yield and grain quality components, including protein, test weight, screenings and resulting classification.

Sowing rate:
Seeding rate based on seed size with a desire to establish 160 plants/m^2

Sowing date: 5th May 2009

Harvest Date: 6th January 2010

Fertiliser:
100kg/ha MAP at sowing, Urea at 90kg/ha at GS 31-32 (1/09/09)

Fungicides:
15/9 Prosaro @ 150ml/ha + Hasten @ 1%

Herbicides:
- 5/5/09 Sprayseed @ 1.2l/ha, Triflur @ 1.5l/ha
- 6/5/09 Dual Gold @ 250ml/ha + Diuron @ 500ml/ha
- 16/7/09 Axial @ 300ml/ha + Precept @ 1.0l/ha & Lontrel @ 250ml/ha & Adigor @500ml/ha

Results and discussion:
The Winter wheat trial at Dunkeld yielded an average of 7.25 t/ha for the 2009 season. Preston was the highest yielding variety with 8.18 t/ha however there was no significant difference in yield between the top 7 varieties. In descending order of yield they are Preston, Beaufort, Mackellar, Einstein, Revenue, Frelon and CS150.2. A noticeable poor performer was Naparoo, this was chiefly due to the fact that Naparoo dropped large amounts of grain on the ground prior to harvest.

Some Stripe Rust was evident as was some BYDV in susceptible varieties. Some varieties also displayed scarring from Adult Plant Resistance. The no fungicide treated plots showed some yield loss in Revenue, Amarok and Naparoo but as these are not replicated they are not significant results.

Table 1: Grain yield, corrected to 12.5% moisture, sprayed with fungicide and compared to unsprayed check. A WUE calculation is included.

Variety	[1]Yield t/ha	[2]Sig. Diff.	% of site mean	[3]WUE % of 7.48 t/ha	[4]Quality Classification Potential	[5]Untreated Check (t/ha)
Preston	8.18	a	112.9	109.4	APW	8.05
Beaufort	8.11	a	111.9	108.4	FED1	8.41
Mackellar	8.06	a	111.2	107.8	FED1	7.93
Einstein	7.85	a	108.3	104.9	FED1	7.95
Revenue	7.63	ab	105.3	102.0	FED1	6.79
Frelon	7.63	ab	105.2	102.0	FED1	7.46
CS150.2	7.55	ab	104.1	100.9	FED1	7.03
CS170	7.12	bc	98.2	95.2	FED1	7.03
Amarok	6.83	c	94.2	91.3	FED1	6.12
10.10.3	6.82	c	94.1	91.2	FED1	6.44
Naparoo	3.98	d	54.9	53.2	FED1	3.24
Mean	**7.25**					**6.95**
LSD P=0.05	**0.672**					
CV	**6.41**					
Trt Prob (F)	**0.0001**					

[1] Consideration needs to be taken for yields, as plots represent 72.5% of arable area and thus should be calculated using this percentage for comparison to local and commercial results.
[2]Means followed by the same letter do not significantly differ (P=0.05, LSD).
[3]Water Use Efficiency percentages are calculated based on the water limited potential yield of wheat at Dunkeld for the 2009 growing season; being 374mm x 20kg/mm/ha, or 7.48t/ha.
[4]Quality Classification Potential taken from 2009-2010 NACMA Wheat Standards and should be used as a guide only.
[5] Untreated check not statistically significant due to one treatment only.

All varieties apart from Preston are feed wheats, as such the gross margin analyses are in line with yield results. Preston wheat topped the gross margins with $1261/ha followed by Beaufort with $1034/ha and Mackellar with $1034/ha. If Preston had been sold at the FED1 price it would have still been first in GM with $1057/ha. As stated earlier there was no significant difference in yield between the top 7 varieties, as such there is no significant difference in their gross margins when sold as feed wheats. The long season varieties such as Einstein and Revenue, although still yielding well, suffered somewhat from lower test weights and higher screenings, although this made no difference in the overall outcome. Overall protein was quite low in most varieties indicating that nitrogen levels were a limiting factor and future trials may require higher application rates.

Table 2: Grain quality analysis, including protein, test weight & screenings that contributes to final economic analysis of variety performance on a GM/ha basis (using standard inputs across all treatments of $450/ha).

Variety	Yield t/ ha	Protein %	Test Weight kg/hl	Screenings below 2.0mm	[1]Resultant Quality Classification	[1]Max Quality Classification	[2]GM $/ ha	GM Rank	Yield Rank
Preston	8.19	12.33	74.28	1.5	APW	APW	1261	1	1
Beaufort	8.11	11.60	71.03	3.8	FED1	FED1	1042	2	2
Mackellar	8.07	11.80	71.90	8.0	FED1	FED1	1034	3	3
Einstein	7.85	11.73	69.63	5.5	FED1	FED1	994	4	4
Revenue	7.63	11.30	69.70	5.5	FED1	FED1	954	5	5
Frelon	7.63	11.63	73.05	7.8	FED1	FED1	954	6	6
CS150.2	7.55	11.43	73.18	4.5	FED1	FED1	939	7	7
CS170	7.12	12.28	67.58	6.5	FED1	FED1	860	8	8
Amarok	6.83	11.68	71.53	3.5	FED1	FED1	806	9	9
10.10.3	6.82	12.38	70.90	5.0	FED1	FED1	805	10	10
Naparoo	3.98	13.10	73.90	5.8	FED1	FED1	282	11	11
Mean	**7.25**	**11.93**	**71.51**	**5.2**					
LSD (P=0.05)	**0.67**	**1.256**	**1.954**	**3.37**					
CV	**6.41**	**7.29**	**1.89**	**44.85**					
Trt Pr (F)	**0.0001**	**0.1911**	**0.0001**	**0.02**					

[1]Quality parameterisation is based on 2009-2010 NACMA Wheat Standards and should be used as a guide only. Testing undertaken at Riordan Grains, Inverleigh Office.
[2]Prices for grain were taken as a spot price on the day of harvest and supplied by Riordan Grains; APH2/H1 = $228/t, H2 = $218/t, APW1 = $209/t, ASW1, $193/t , AUH2 = $205/t, AGP1= $194/t, FED1 =$184

Summary:
This trial produced results that are relatively difficult to decipher in that the top seven of the eleven varieties had no statistical difference between them in terms of yield. As all of the varieties are being sold as feed wheat, apart from Preston, they all lie within the FED1 quality parameters. Some longer season varieties, such as Einstein and Revenue, suffered lower test weights and higher screenings, perhaps due to the sudden finish to the season. However this had little effect on their overall yield and gross margins. Significantly lower yielding varieties were CS170, Amarok, 10.10.3 and the lowest, Naparoo, which suffered from grain fall. What is important to note is that many of the varieties included in this trial are regarded as dual purpose wheats and as such their grain yield needs to be considered in conjunction with their production of dry matter for grazing and their fit in an individual farm system.

Figure 1. Aerial photo of Dunkeld field day, 2009