

5.6 Evaluation of dual purpose cereal varieties - Bairnsdale, Vic

Location:

Bairnsdale Research Site.

Researchers:

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Background/Aim:

To determine:

- Which dual purpose varieties respond to Gippsland's climatic conditions?
- Which new varieties may have commercialization potential?
- Which varieties are best suited to forage and feed grain production?

Take home messages:

- Barley was the clear winner in terms of grain production for this year's trial whilst the Wheat varieties performed best in terms of the hay and grazing potential.
- Hay production was probably the best economic outcome in 2009 for most of the varieties covered in this trial. This reflected prevailing market prices at the time of harvest.
- The inclusion of Canola in this year's trial provided new information that will require further annual testing as the results were quite mixed. However, hay yields were in the range of 3-4 t/ha compared with the cereals of around 5 – 7 t/ha.
- The inclusion of an annual economic analysis would provide a clearer ranking of the three treatments across the two trials at a gross margin level.
- This year's grain yields were generally higher than last year's results whilst the hay yields were also on average higher than 2008.

Trial Design:

14 dual purpose cereal varieties were selected for the following two trials. An additional 6 Canola varieties were also included for trial one only. This was the first use of Canola within this trial which has run since 2007.

Both trial methodologies included:

Plots were 20 m x 2 m (raised beds) with 4 replicates per variety. Plots were harvested and yields recorded. Grain samples were obtained for analysis including Moisture%, Corrected Yield (according to moisture content), Screenings %, Protein % and Test Weight (measured in kg/hl)

Trial 1 (Forage and Grain) Sown 14 April 2009 (Early Sown)

Single 1m² plant quadrant cuts were taken from each variety on 11 August prior to GS32. The samples were weighed to determine production per hectare, with sub samples taken for DM analysis. The analysis was to provide an indication of the grazing value of the varieties at this stage. The plots were then grazed for 1 hour and 45 minutes by 300 ewes and lambs.

Again, 1m² plant quadrant cuts were taken from each variety on either 26th October or 11th November. The samples were weighed to determine production per hectare, with sub samples taken for DM analysis. The analysis was to provide an indication of the hay production value of the varieties at this stage.

Trial 2 (Grain only) Sown 4 June 2009 (Late Sown)

No Grazing and basic methodology as described above.

Rainfall:

Avg. Annual: 653.5mm, Bairnsdale 1942-2009
Avg. G.S.R. 479.8mm, Bairnsdale 1942-2009
2009 Total: 390.5mm, Bairnsdale Research Site
2009 G.S.R. April – October = 259.2mm
(Bairnsdale Research Site; 131.3mm below average)

Previous Crop: Peas for Green Manure

Sowing rate: Trials 1 & 2 80 kg/ha

Sowing dates: Trial 1 – 14 April, 2009
Trial 2 – 4 June, 2009

Fertiliser:

- Pre Sowing 1.5t/ha lime
- 80 kg/ha 75% Di Ammonium Phosphate (DAP) + 25% Sulphate of Potash (SOP) @ Sowing
- 50kg/ha Urea

Herbicides:

- Pre Sowing (Roundup @ 1 ltr/ha and Trflur at 0.8 ltr/ha)
- Trial 1 – (Nugrex @ 750mls/ha)
- Trial 1 & 2 – (Lontrel @150mls/ha, MCPA @ 1000mls/ha, Axial @300mls/ha and Hasten @ 500mls/ha)

Results and discussion

This year's results show that the winter wheat varieties generally produced the most DM/ha for the grazing component for the cereals with five of the top seven outcomes being achieved by wheat lines. This outcome is a better result for the wheat lines compared with the relative ranking for last season's results (Refer to table 1 final column).

The early grazing DM results returned totals around the 200kg/ha for most lines without a strong linkage to variety type. However, the two lowest yielding cuts for this early grazing were from wheat lines. For hay production the top three results were achieved by wheat lines, whilst three of the lowest four results were for barley varieties. This is quite a different result when compared with last season when the highest hay yield was achieved by 5092 Barley with other Barley varieties well represented in the top outcomes.

For Total DM/ha (fodder and Hay combined) 5092 barley, Endeavour triticale and Amarok were the best for each of the respective cereal types. The triticale varieties all returned similar hay yields in the 6-7 tonnes/ha range placing them in the middle range of overall trial results. The big differences from last season were the lower barley hay yields with some varieties showing declines of over 40% compared with the 2008 results.

For the Hay only component of trial design one Endeavour Triticale recorded the largest result with 8.2 tonnes/ha. This was well in advance of other results and the overall trial average. This was also almost one tonne higher than the combined DM total from the grazing trial result for this variety. Another significant result was the hay yield for Gairdner which was almost 3 tonnes/ha greater than the equivalent result in the grazing trial. This large difference between variety hay yields for the grazed and ungrazed components was also evident with other varieties.

Results in Table 3 (Trial 1) indicate that the four Barley varieties recorded the four highest results in terms of grain yield for the grazed part of the trial. These yields were also generally higher than the results achieved last season but did vary between varieties. Unfortunately the test weights for all of the Barley results would relegate the grain to feed quality in 2009. Protein levels were also too high for malting grade.

Table 1. Trial 1 Fodder and Hay Dry Matter Production

Variety	Fodder* kgDM/ha	Fodder DM%	Hay# kgDM/ha	Hay DM%	Total kgDM/ha	Ranking 2008
Amarok	212	23.6	8650	40.9	8862	4
10.10.3	209	18.7	7251	41.2	7460	10
Frelon	161	23.0	7281	37.6	7442	7
Endeavour	212	13.5	7200	42.1	7412	13
GS1078	123	23.2	6869	41.2	6992	12
Monstress	206	10.8	6720	45.2	6926	5
CS95102.1	199	17.6	6399	44.3	6598	3
Tobruk	253	11.8	6325	44.5	6578	16
Crackerjack	210	13.2	6248	46.6	6458	11
5092	208	13.1	5861	33.7	6069	1
Capstan	171	11.9	5085	31.9	5256	9
CS170	199	16.4	4800	41.2	4999	8
Urambie	259	10.3	4671	35.0	4930	14
Gairdner	228	19.7	4227	31.2	4455	15

*Fodder samples taken prior to GS32

#Hay samples taken between GS65 and GS85
2008 ranking out of 24 varieties

Variety	kgDM/ha	DM%	Ranking 2008
Endeavour	8157	43.5	8
CS95102.1	7440	44.4	17
Amarok	7375	48.6	14
Gairdner	7120	36.1	5
10.10.3	6689	45.0	22
Monstress	6413	48.9	7
GS1078	5959	48.8	9
CS170	5908	42.3	16
Frelon	5872	46.9	18
Crackerjack	5742	52.0	6
Tobruk	5444	48.3	9
Urambie	4849	31.3	1
5092	4569	33.4	3
Capstan	4271	35.0	2

Table 2:
Trial 2, Hay
Dry Matter
Production

Note:
Hay samples taken
between GS65 and
GS85
2008 ranking out of
24 varieties

Table 3. Trial 1 Yield and Quality for grazed trial, early sown.

Variety	Yield (t/ha)	Significant Difference	Protein (%)	Moisture (%)	Test Weight (kg/hl)
Gairdner	4.03	a	13.38	12.65	59.40
5092	3.59	ab	13.30	12.40	55.70
Urambie	3.24	abc	13.55	12.60	56.05
Capstan	2.89	bcd	13.88	12.58	55.28
Monstress	2.66	b-e	10.25	12.00	66.25
Amarok	2.55	cde	10.98	12.23	68.40
CS95102.1	2.52	cde	11.25	12.10	68.95
CS170	2.42	cde	11.35	12.13	70.50
Crackerjack	2.33	cde	12.40	11.98	57.53
GS1078	2.31	cde	11.05	12.18	68.88
Frelon	2.14	de	11.75	12.15	65.80
10.10.3	2.03	de	10.75	12.08	67.88
Endeavour	1.97	de	10.88	11.88	64.33
Tobruk	1.88	e	12.70	11.75	61.70
LSD (P=.05)	0.9745		0.832	0.343	3.277
CV	26.32		4.87	1.97	3.62
Grand Mean	2.62		11.96	12.19	63.33
Treatment Prob(F)	0.0014		0.0001	0.0001	0.0001

The triticale yields showed the widest range across the respective cereal types including the two lowest yields which were both less than 2 tonnes/ha. These were generally lower than the equivalent outcomes achieved in 2008. The wheat yields also returned yields between 2.03 – 2.55 tonnes/ha which were in line with last year's yield results for this cereal type.

The relative ranking of the results from the grazed trial were also evident with the outcomes achieved by the ungrazed component. Again the four Barley varieties achieved the highest yields (see Table 4) and were in the same order as with the ungrazed trial. However, a similar outcome in terms of test weights and protein would have excluded all of these results to feed grade barley.

Table 4. Trial 2 Yield and Quality for non-grazed trial

Variety	Yield (t/ha)	Significant Difference	Protein (%)	Moisture (%)	Test Weight (kg/hl)
Gairdner	4.23	a	14.40	12.28	59.53
5092	4.15	a	13.15	12.70	52.80
Urambie	3.78	ab	13.95	12.65	53.40
Capstan	3.68	abc	14.68	12.70	54.90
GS1078	3.09	bcd	11.78	12.95	67.30
10.10.3	2.89	bcd	11.85	13.00	67.30
CS95102.1	2.87	bcd	11.83	13.00	66.58
Frelon	2.85	bcd	11.60	12.88	67.78
CS170	2.75	cd	10.63	13.20	69.43
Tobruk	2.62	d	11.10	12.70	65.55
Endevour	2.61	d	12.70	12.95	56.03
Amarok	2.59	d	11.85	13.08	65.48
Monstress	2.56	d	12.65	13.03	62.30
Crackerjack	2.14	d	11.13	12.68	66.60
LSD (P=.05)	1.0169		1.0290	0.370	2.666
CV	23.28		5.82	2.01	2.98
Grand Mean	3.06		12.38	12.84	62.50
Treatment Prob(F)	0.0021		0.0001	0.0016	0.0001

The triticale yields also improved when compared with the grazed trial and returned a tighter range of yields (2.14 – 2.62/t ha). However, they occupied four of the five lowest yields for this part of the trial. The wheat yields also generally showed improvements compared with the grazed results and occupied the mid range of outcomes for this trial. On average the wheat yields were around one tonne lower than the Barley yields. The overall trial mean of 3.06 t/ha was .44 t/ha higher than the grazed mean.

Table 5 contains the grazing and hay yields for the six Canola varieties that were part of this year's trial for the first time. Crop yields were not obtained for the Canola varieties and only the trial one protocols were undertaken. The early winter DM cuts showed a significant range of outcomes from 145 – 279 kg/ha. However, a larger range of outcomes was evident when considering the hay yields for these varieties for both the grazed and ungrazed components. Hay yields varied from 8.2 t/ha to 2.3 t/ha. There were also some large differences when comparing the outcomes for the same variety, eg. The two hybrid lines returned significant differences between the ungrazed and grazed results but also differed in relative results between the two varieties.

Table 5. Canola Fodder and Hay Dry Matter Production – Trial 1 and 2.

Variety	Fodder* kgDM/ha	Fodder DM%	Hay# kgDM/ha	Hay DM%	Total kgDM/ha
46Y78 Grazed	145	4.4	7337	35.7	7482
46Y78 Ungrazed	Na		3666	37.3	3666
Jardee Grazed	174	6.2	3409	31.1	3583
Jardee Ungrazed	Na		3260	40.8	3260
Garnet Grazed	169	7.0	3306	39.4	3475
Garnet Ungrazed	Na		4914	44.2	4914
Thunder Grazed	184	9.1	3853	35.9	4037
Thunder Ungrazed	Na		3263	42.3	3263
Hyola 50 Grazed	279	9.2	4603	40.6	4882
Hyola 50 Ungrazed	Na		6028	39.0	6028
46Y77 Grazed	228	5.7	4929	37.7	5157
46Y77 Ungrazed	Na		8203	53.6	8203

Discussion:

A composite set of results for both trials and all cereal varieties is detailed in table 6 below. These results only cover the DM and yield outcomes for each treatment across the varieties and need a full economic analysis using local grain and hay prices to consider the relative ranking of each treatment. However, a number of general conclusions can be drawn from these results.

Three of the four Barley lines returned higher grain yields for the ungrazed late sown trial compared against either the grazed or ungrazed trial one results. This was quite different to the Wheat varieties where only GS1078 returned higher yields in trial two, ie. Five of the Wheat varieties returned mixed outcomes when comparing yields across treatments. A similar result was evident for the Triticale lines with the late sown yields usually lower than either of the treatment one results.

In terms of hay production nearly all lines (either grazed or ungrazed) would have produced a higher gross margin growing and selling the produce as hay compared with grain yield (based on \$140 tonne for hay and \$180 for grain). The value of the August grazing has also not been calculated and included in these estimates. This outcome predominately reflects the prevailing market prices at harvest with feed grain prices possibly lower than hay prices depending on quality and location.

These results also need to be considered by comparing with the outcomes from the previous two years of the identical trial at the Gippsland site. The key outcome from this comparison shows that significant variability has occurred from year to year with no strong trend emerging in many cases. The relative importance of the cereal types has varied between years for both the hay and grain yields.

The first year of the Canola variety results will add to the value of this trial going forward. A large range of outcomes were evident with these Canola results and further annual trials will hopefully provide a clearer picture with respect to the impact of grazing on Canola in this region. This would also need to consider the addition of Canola grain yields to the trial protocol in line with the cereals to generate comparable annual outcomes.

Trial Observations:

- Fodder cuts were intended for observation, so were not taken to provide statistically significant results.

Table 6. Comparative values across trials 1 and 2 by variety.

Variety by treatment		Yield (t/ha)	Fodder* kgDM/ha	Hay# kgDM/ha	Total kgDM/ha
Gairdner	ES Grazed	4.03	228	4227	4455
	ES Ungrazed	3.8	na	na	na
	LS Ungrazed	4.23	na	7120	7120
5092	ES Grazed	3.59	208	5861	6069
	ES Ungrazed	4.10	Na	5058	5058
	LS Ungrazed	4.15	Na	4569	4569
Capstan	ES Grazed	2.90	171	5085	5256
	ES Ungrazed	3.78	Na	6991	6991
	LS Ungrazed	3.68	Na	4271	4271
Urambie	ES Grazed	3.24	259	4671	4930
	ES Ungrazed	3.36	Na	6197	6197
	LS Ungrazed	3.78	Na	4849	4849
Frelon	ES Grazed	2.14	161	7281	7442
	ES Ungrazed	3.16	Na	6099	6099
	LS Ungrazed	2.85	Na	5872	5872
CS95102.1	ES Grazed	2.52	199	6399	6598
	ES Ungrazed	3.11	Na	7329	7329
	LS Ungrazed	2.87	Na	7440	7440
Amarok	ES Grazed	2.55	212	8650	8862
	ES Ungrazed	3.15	Na	6880	6880
	LS Ungrazed	2.59	Na	7375	7375
GS1078	ES Grazed	2.31	123	6869	6992
	ES Ungrazed	2.93	Na	3957	3957
	LS Ungrazed	3.09	Na	5959	5959
CS170	ES Grazed	2.42	199	4800	4999
	ES Ungrazed	3.23	Na	6790	6790
	LS Ungrazed	2.75	Na	5908	5908
10.10.3	ES Grazed	2.03	209	7251	7460
	ES Ungrazed	3.23	Na	7642	7642
	LS Ungrazed	2.89	Na	6689	6689
Tobruk	ES Grazed	1.88	253	6325	6578
	ES Ungrazed	3.06	Na	6236	6236
	LS Ungrazed	2.62	Na	5444	5444
Endavour	ES Grazed	1.97	212	7200	7412
	ES Ungrazed	2.87	Na	5711	5711
	LS Ungrazed	2.61	Na	8157	8157
Monstress	ES Grazed	2.66	206	6720	6926
	ES Ungrazed	2.61	Na	6455	6455
	LS Ungrazed	2.56	Na	6413	6413
Crackerjack	ES Grazed	2.33	210	6248	6458
	ES Ungrazed	2.81	Na	6067	6067
	LS Ungrazed	2.14	Na	5742	5742