5.2 Evaluation of dual purpose cereals for grazing and grain production - Longford, Tas

Location:
"Woollen Park", Longford, Tasmania

Author: Geoff Dean - SFS/TIAR
Funding Organisation: GRDC

Researchers: Geoff Dean - SFS/TIAR
Brett Davey - SFS/TIAR
Regan Parkinson - TIAR

Acknowledgments:
Thanks to Rob and Jo Bradley.

G.S.R. Rainfall (Mar-Nov): 606 mm including irrigation.

Take home messages:

- A replicated trial was conducted to compare dry matter production and subsequent grain yield of five cereal varieties: wheat (Mackellar), barley (Urambie, Franklin), triticale (Breakwell), and oats (Bass).
- With a longer vegetative period, four DM cuts were taken from Bass oats and consequently total DM production was significantly higher compared with the other varieties.
- Grain yield of Mackellar was significantly higher (8.0 t/ha) and lowest from Bass.
- A spring canola variety (45C75) provided 2.5 t/ha of dry matter from the first cut at the end of May but rapid plant development was a problem with budding occurring by mid-July. It is important that we are able to access and evaluate European winter canola germplasm.
- Differences in growth habit and early vigour between crop species and variety can be exploited to produce feed budgets across the whole farm.

Background/ Objectives:
With the release of winter wheat varieties from CSIRO, Plant Industry, Canberra and introduction of overseas varieties there is again the opportunity to grow wheat for both grazing and grain. This has particular potential where the crop can be watered up in a dry summer/ autumn.

The major potential limiting factor will be greater disease pressure due to the longer growing season. In particular the recent isolation of Wheat Streak Mosaic Virus (WSMV) on commercial seed of wheat grown in the state has serious implications as this disease may be potentially very damaging. Unfortunately the most practical strategy for management of this virus is to avoid over-summer volunteers and the "green bridge" between crops.

Other cereals are not as susceptible to WSMV and need to be further evaluated. A new grazing barley variety from NSW, Urambie, is being evaluated for the second year. There has also been considerable success in grazing winter canola varieties from Europe with reasonable dry matter (DM) production and good recovery with little or no reduction in grain yield. More recently spring type canola varieties have also been evaluated and shown surprisingly good recovery from grazing/cutting. In this trial a Clearfield variety was grown in preference to less vigorous triazine tolerant types. With the states stringent GM tolerance levels, bringing new winter canola varieties into Tasmania is very costly and will be done in conjunction with commercial quantities of seed.

A fast maturing line of barley from China and wheat from CSIRO were being assessed for ability to provide early DM.

The aims of this trial were to:

- Compare early sown dual purpose wheat, barley, triticale and oat varieties for DM production, feed quality, recovery from grazing and grain yield.
- Compare DM and feed quality of cereals with a tetraploid annual ryegrass used for over-winter grazing prior to seed production.
- Assess the potential of canola for grazing and grain production.

Trial information:
Varieties/lines include:

wheat:	Mackellar
barley:	Urambie, Franklin, MX (a Chinese line)
oats:	Bass
triticale:	Breakwell
ryegrass:	T-Rex
canola:	45C75

There were four replicates in a randomised complete block design with buffer plots to separate the taller crop species. It is difficult to control weeds with different crop types and so plots of 45C75 canola, T-Rex ryegrass and MX barley were not fully replicated (1-2 replicates only). Harvested plot sizes were 8m x 1.5m wide.

The trial was sown under a centre pivot on 11th March with 9:13:17:4 fertiliser at 250kg/ha and followed an onion crop. Dry matter cuts were taken on dates ranging from 25th May to 11th September depending on plant development and growth stage. The barley and triticale plots were earlier maturing and were only cut twice. A third cut was taken from Mackellar and Bass oats. The latter are much later maturing and in previous trials very prone to lodging, resulting in lower grain yields. Consequently Bass plots were cut on a fourth date. A fourth cut was also taken from the ryegrass. DM production data is presented on an oven dried basis.

Nitrogen was applied as a foliar spray (25kgN/ha) on 18th August with additional N topdressed on 29th August (70kgN/ha) and 10th October (70kgN/ha). To cover the large range of growth stages three fungicides were applied across the trial (7th August, 18th August and 16th October).
In past trials, after taking quadrat DM cuts, sheep and cattle have been used to remove the remaining growth. However with animals being introduced from paddocks of wheat it was found that the triticale and oats were preferentially grazed. Consequently trials are fenced and entire plots are now cut with a mower.

The season:
To assist in establishment the crop was watered up. Autumn irrigations are by necessity low input in case water-logging in a wet winter is exacerbated. With relatively mild conditions over autumn and early winter plants grew well with development advancing rapidly in varieties with less winter habit. There was a very dry winter but rains in September caused water-logging in several plots. With a dry October the site was irrigated. A frost occurred on October 23rd but this was not as severe as further south (-2.6°C).

Dry matter production:
Franklin barley and Breakwell triticale produced significantly more DM from the first cut than either Urambie barley or Mackellar wheat with Bass oats being intermediate (Table 1). However, with the second cut Urambie was significantly higher yielding than all other varieties except Bass. Mackellar produced the least DM from the first 2 cuts but a third cut was able to be taken before stem elongation, Growth Stage 30. Bass is even later maturing and a fourth cut was possible. Apart from the significantly higher production from Bass, total DM production was relatively uniform across varieties in the replicated trial.

Table 1: Dry matter (DM) production (t/ha) from multiple cuts and grain yields (t/ha) from dual purpose cereal trial, Longford, Tasmania, 2008-09.

Crop	1st cut 25 May DM (t/ha)	2nd cut 4-Jul DM (t/ha)	3rd cut 30-Jul DM (t/ha)	4th cut 11-Sep DM (t/ha)	Total DM (t/ha)		Grain yield (t/ha)	
Mackellar	1.45	1.12	0.51	-	3.08	b	8.02	a
Breakwell	2.02	1.13	-	-	3.16	b	7.20	b
Franklin	2.10	1.00	-	-	3.11	b	5.59	c
Urambie	1.36	1.49	-	-	2.85	b	5.55	c
Bass	1.71	1.23	0.36	0.65	3.95	a	3.74	d
F prob	**0.007**	**0.047**	**0.006**		**0.002**		**<0.001**	
LSD P=0.05	**0.410**	**0.309**	**0.068**		**0.44**		**0.578**	
cv%	**15.2**	**16.6**	**6.9**		**8.8**		**6.2**	

In comparison, a plot of T-rex ryegrass produced a similar total amount of DM to Bass (4.0 t/ha) across the same 4 cutting dates. However initial growth was much slower up to the first cut and much greater for the fourth cut.

The highest initial growth was from an early maturing Chinese barley line which produced 2.8t/ha in the first cut but only 0.5t/ha in the second cut. Similarly the canola 45C75 yielded well in the first cut (2.5 t/ha) and while initial recovery from cutting was reasonable, by the second cut there was little additional DM (0.1-0.3 t/ha) and most plants were at the budding stage by mid July. With subsequent removal of the main stem, plants recovered with fresh shoots formed at the base of the plant.

Grain yield:

Mackellar wheat produced a significantly higher grain yield than Breakwell triticale which in turn was higher yielding than Urambie and Franklin barley (Table 1). The lowest grain yield was from Bass oats.

With strong winds there were some losses from grain shaking in Bass (average 0.25 t/ha) and Urambie through neck break (0.5 t/ha) but these values do not change the level of significance. Lodging was also severe in Bass despite the later DM cut. Stripe rust was present in some of the Breakwell plots and scald in Franklin but this was largely controlled with the three fungicides. The short stature of Urambie after cutting in this trial could be an issue in rocky paddocks.

It would have been interesting to determine the effects of cutting on grain yield of canola but most of the pods were shattered by a hail storm just prior to harvest. Several quadrats were cut from less damaged sections of the plot but at the time of writing these are yet to be processed. Grain yields of the fast maturing Chinese barley line were very low.

Frost damage in the cut plots was minimal. However there were substantial losses in uncut treatments in another trial due to the earlier flowering.

Summary:

Mackellar wheat showed the most potential as a dual purpose crop with the highest grain yield and DM production comparable to all other varieties except Bass. The latter produced the most fodder but the lowest grain yield. There was no significant difference in DM production between Mackellar, Breakwell, Urambie and Franklin however there was a large difference in when this was produced. Franklin barley (and a Chinese line) were far more vigorous early whereas the later developing varieties, in particular Bass, tended to produce less DM but extra cuts ensured a higher total DM.

Franklin has no significant fodder or grain production advantage over Urambie and is also more susceptible to scald. However it and the Chinese line in particular may have a place in providing early feed prior to grazing wheat or oats. In this way differences in crop growth rates can be utilised in developing feed budgets for the farm as a whole system.

With the early warm conditions development in the barley and triticale was rapid. Franklin barley reached the start of stem elongation by the end of May but with the onset of colder winter temperatures and the effects of cutting, the rate of development decreased. Without cutting both the barley varieties and Breakwell triticale reached 2nd-3rd node stage (GS32-33) by mid July. With an earlier sowing (before mid March) varieties with a strong vernalisation or winter habit are required. The high initial DM production from canola is of note but a March sowing is again too early with the advanced crop development that occurs in spring types. It is important that we are able to access and evaluate the European winter canola germplasm.

In the last 3 seasons there has not been a continuously wet winter. Under these conditions it is expected that the barley varieties would struggle and oats and triticale perform relatively better. With a wet winter reduced animal growth rates can be expected and soil pugging and compaction will be of concern in dual purpose systems.