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

Location:
"Camperdown", Nile, Tasmania

Funding: GRDC

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Background/Aim:
With the release of winter wheat varieties from CSIRO, Plant Industry, Canberra and the introduction of overseas varieties there is again the opportunity to grow wheat for both grazing and grain. This use has particular potential where the crop can be watered up in a dry summer/ autumn. While the recent focus has been on winter wheats for dual purpose cropping, alternative cereal crops should also be considered particularly in light of the potential of Wheat Streak Mosaic Virus to severely impact on wheat grain yields. Triticale, barley, and oats are either resistant or less affected. Frosts at flowering are also less critical in barley and oats, an important consideration in more frost prone regions of Tasmania. A dual purpose barley variety from NSW, Urambie, was evaluated as well as two barley varieties from Europe. With a new stripe rust strain and the loss of resistance in Breakwell the alternative long season triticale, Endeavour, was evaluated.

Summary of findings:
- A replicated trial was conducted to compare dry matter production, recovery and subsequent grain yield of 6 cereal varieties: wheat (Revenue), barley (Urambie, Henley and a French variety), triticale (Endeavour), and oats (Bass).
- Grain yield was highest for Revenue and Endeavour (5.4 and 5.1 t/ha respectively) and lowest from Barley Z and Henley. Dry matter production was lowest from Revenue as with the water-logged conditions no third cut was taken.
- Winter barley germplasm is late flowering and may have considerable potential for early sowing in the more frost prone areas of Tasmania.
- There appears to be a strong interaction between grazing/cutting and water-logging with the additional stress of water-logging leading to poorer recovery after cutting.

Trial information:
Varieties/lines:
- wheat: Revenue
- barley: Urambie, Henley (England), Barley Z (France)
- oats: Bass
- triticale: Endeavour

The trial was sown on 23 March and followed a poppy crop. There were four replicates in a randomised complete block design. Prior to sowing 200kg/ha of single super was applied and at sowing a further 100 kg/ha of 24:4:13:4. Plot sizes were 10m x 1.5m wide. Two DM cuts were taken, on 21 May and 23 June. In previous trials additional DM cuts have been taken from wheat and oat varieties. However in 2009-10 the Bass oats in particular recovered poorly from just 2 cuts and so with comparable responses to the wet conditions in 2010-11, only 2 cuts were taken from all varieties. 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. This was probably not related to differences in palatability, simply due to a preference for a change in diet from the wheat the sheep had been grazing. Consequently plots cut are now cut with a mower. DM data is presented on an oven dried basis.

To reduce water-logging damage, nitrogen was initially applied as a foliar spray (12 kgN/ha) on 7 July. Two additional 50 kgN/ha topdressings were subsequently applied as urea. To cover the large range of growth stages, four fungicides were applied across the trial (22 September, 28 October, 15 November (aerial) and 9 December), generally accompanied with an insecticide. The barley and oat varieties were harvested on 4 January and the wheat and triticale on 28 January.

Growing season rainfall (Mar-Dec):
594 mm plus 50 mm irrigation at establishment

Results and discussion:

The season:

Irrigation and rainfall in March/April ensured good soil moisture and subsequent establishment of the crop. May was relatively dry but by then the crop was well established. Although July was below average rainfall and August and September average, the high rainfall earlier in the year and in June (Decile 8-9) ensured the soil profile remained water-logged over much of winter and spring. This made weed control difficult with most sprays being applied by hand. Continued high rainfall over late spring and into summer ensured the finish to the growing season was kind. Of course then the season did not know when to switch off but fortunately harvest of the wheat and triticale plots was only delayed by about a week.

Barley Yellow Dwarf Virus was not evident (3 insecticide applications) and there were no other diseases of significance apart from some scald and leaf rust on the barley which appeared before and between the early fungicide applications. Severe *Septoria tritici* on the wheat was evident in mid November and must have established in the 5 week window between the first and second fungicide applications. Infection may have been exacerbated by susceptible European varieties in an adjacent trial.

Table 1: Dry matter production (t/ha) from alternative dual purpose cereal trial, Nile, Tasmania, 2010-11.

Crop	1st cut 21 May DM (t/ha)		2nd cut 23 June DM (t/ha)	
Henley	1.30	a	0.12	d
Bass	1.25	a	0.11	d
Barley Z	1.05	b	0.25	c
Endeavour	1.05	b	0.31	b
Urambie	0.95	b	0.49	a
Revenue	0.70	c	0.28	bc
F prob	**< 0.001**		**< 0.001**	
l.s.d. (0.05)	**0.154**		**0.047**	

Dry matter production:
The DM removed by mowing is presented in Table 1. DM production was relatively low due to some early grazing by deer and the water-logged conditions. DM yield results are partly a reflection of growth habit with the more erect types tending to cut greater DM. Henley barley and Bass oats being more erect and faster growing produced significantly higher dry matter from the first cut. In contrast the other varieties were more prostrate and produced lower DM yields.

In contrast to the first cut the highest DM from the second mowing was produced from Urambie, Endeavour and to a lesser extent Revenue and Barley Z. This may be due to better recovery after the first mowing or this material commencing its phase of rapid growth after meeting its vernalisation (cold period) requirement. In 2009-10 Barley Z handled the water-logging better than the other barley material (Henley and Urambie - general yellowing) and even the Bass oats (pale green colour). However this was not repeated in 2010-11.

The relatively poor recovery of Bass oats in the water-logged conditions of this trial was surprising but supports similar results in 2009-10. Under wet conditions it was expected that the barley varieties would struggle and oats and triticale perform relatively better. Even canola in an adjacent trial appeared less affected by water-logging than Bass. In previous trials, with the late maturity of Bass, an additional DM cut has been possible and without this, lodging at harvest has been a problem. However in 2009-10 the recovery of Bass after cutting was relatively poor, no additional cut was taken and height at harvest was relatively short. Similarly with a March sowing a third cut has been achieved with wheat under non-water-logged conditions where no additional cut has been possible with the barley and triticale (see Evaluation of short term fodder trial report). While the data in Table 1 shows DM that was removed by mowing, actual DM was much higher and ranged from 1.28 t/ha (Henley) to 3.30 t/ha (Barley Z; data not presented).

Fodder tissue samples are still being processed and analysed for crude protein, energy, fibre and digestibility. Of note the Revenue was a higher DM % i.e. less water content compared with the other varieties.

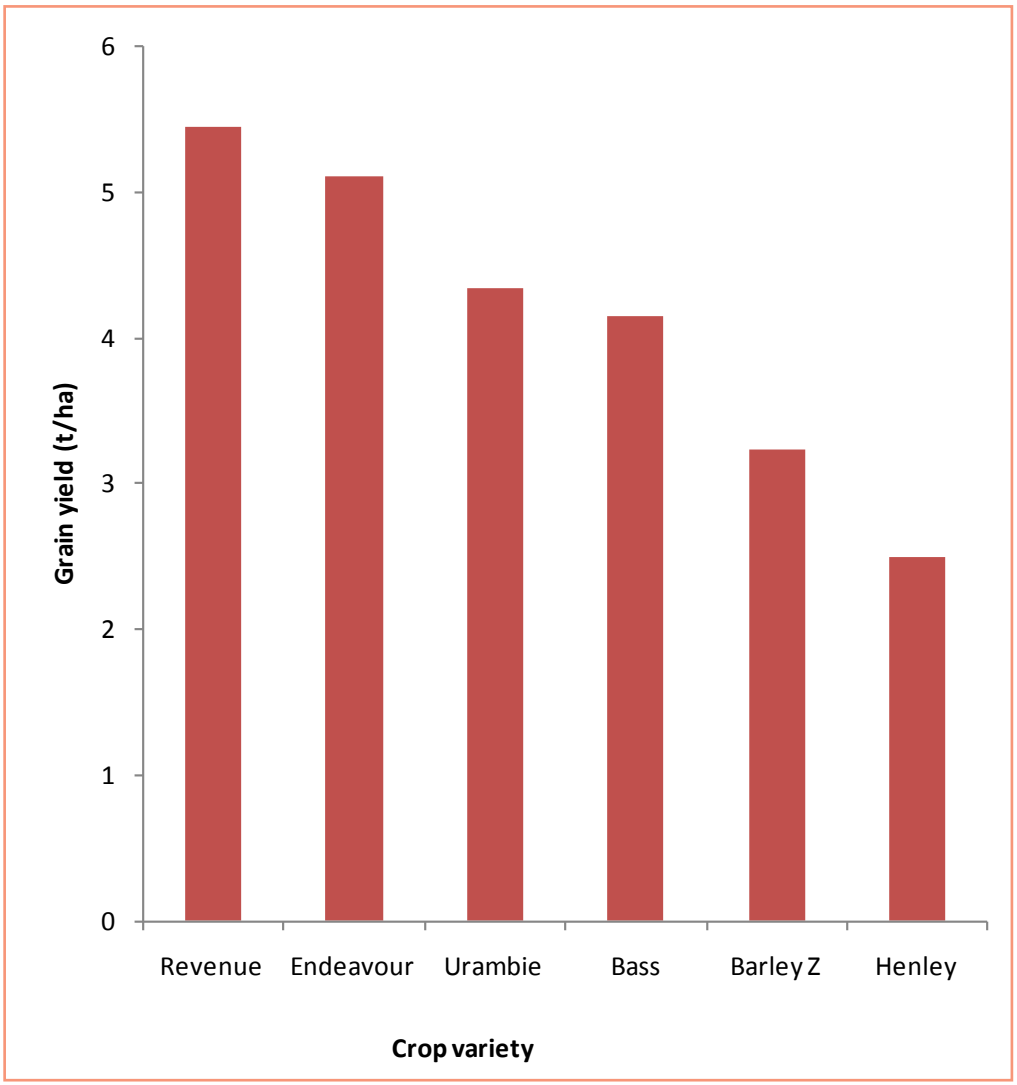

Figure 1: Grain yields (t/ha) from alternative dual purpose cereal trial, Nile, Tasmania, 2010-11. (l.s.d. = 0.76 t/ha).

Grain yield:
Overall grain yields were not high due to the water-logged conditions (Figure 1). As discussed in the paper in this volume "The effect of grazing on grain yield of early sown wheat" there appears to be a strong interaction between cutting and water-logging. Cutting (and grazing in another trial) appeared to place additional stress on plants and as in 2009-10, recovery was considerably poorer than in previous seasons without water-logging.

Revenue wheat and Endeavour triticale produced a significantly higher grain yield than Urambie and Bass which in turn were higher yielding than the other barley lines (Barley Z and Henley). In 2009-10 the yield of Revenue was significantly higher than Endeavour however the loss of leaf area due to Septoria in the current trial is likely to have reduced the grain yield of Revenue. All barley varieties were of short stature at harvest and this could be an issue in rocky paddocks. More careful management of grazing intensity with barley crops will thus be required.

Summary:
With regard to potential grain yield the old line of being able to eat dual purpose crops into the ground appears not to be not true when an additional stress such as water-logging is imposed. Endeavour triticale showed the greatest potential as a dual purpose crop with grain yields comparable with Revenue and higher DM production. However without water-logged conditions a third DM cut would have been taken from the Revenue.

Further evaluation of European barley germplasm in dual purpose trials is warranted and additional lines will be screened for suitable flowering date with early sowing, in particular for more frost prone areas where wheat production is avoided.

The relatively poor performance of Bass oats in the water-logged conditions of this trial was surprising. While lower grain yields than wheat and triticale have been recorded in all previous trials the dry matter production was also relatively low. The relative intolerance of Bass to waterlogging will be studied further.