MALLEE CATCHMENT
TECHNICAL BULLETIN

Technical Bulletin #20

Improved cereal variety options for increased groundcover

Figure 1: The impact of sowing time and variety choice on the growth of wheat and barley was demonstrated at Ouyen and Werrimull in 2010. Photo: Mallee CMA.

This technical bulletin summarises the findings of field research conducted in 2010 to evaluate the performance of cereal varieties (wheat and barley) with differing maturity lengths for improved grain production, biomass accumulation and ground cover.

The identification and validation of land management strategies to minimise environmental and production risks in poor seasons is an ongoing priority for the low rainfall Mallee environment.

This project investigated whether cereal varieties with differing maturity lengths could be strategically used to reduce risk by assessing the impact of time of sowing and available soil water on performance across a range of seasons.

Background

Cereal cropping intensity has increased significantly in the Victorian Mallee over recent years. An increase from 30-50% of the landscape in cereal crop in the period 1985-2001 to greater than 70% of the landscape in cereal crop from 2007 onwards has been recorded (Drendel, 2010).

These rotations have however been dominated by varieties requiring a long growing period, early autumn breaks and wet springs.

The selection of cereal varieties available to farmers has also increased dramatically

At a glance

- The impact of time of sowing on eight cereal varieties with differing maturity lengths was evaluated at two locations (Ouyen and Werrimull) in 2010;
- The use of early maturing wheat varieties can be used as a management practice to improve early crop biomass accumulation;
- Late maturing varieties generally produced more groundcover by the end of spring;
- Grain yields varied according to variety maturity x time of sowing interactions.

mallee catchment management authority

and new varieties with short growing periods have been shown to out perform long season varieties in recent unfavourable growing seasons.

Farmers in continuous cereal rotations need to be able to exploit and manage the individual traits of cereal varieties to minimise their exposure to seasonal risk (both environmental and production) and prevent the build up of diseases and weeds.

In the Victorian Mallee the strategic use of cereal varieties with different maturities may assist with:

- More rapid establishment of groundcover;
- Increasing biomass production which contributes to long term maintenance of groundcover;
- Reducing the risk of crop failure;
- Providing farmers with greater flexibility to overcome threats to no-till – continuous cropping systems;
- Improving the productivity and profitability of No-Till – Continuous Cropping systems, thus making these practices more attractive to farmers.

Methodology

Two field trials were established in 2010 at Ouyen and Werrimull. Rainfall was well above average at both sites, with Ouyen recording 557mm and Werrimull receiving 486mm for the year. Each experiment had three replicates of eight cereal varieties sown on three dates. The varieties used and the classification assigned to them were:

- Axe and Katana Wheat (Early)
- Gladius and Correll Wheat (Mid)
- RAC1412 and Yitpi Wheat (Late)
- Hindmarsh Barley (Early)
- Commander Barley (Late)

The three sowing dates at the Ouyen site were the 2nd May, 4th June and the 23rd June. The Werrimull field experiments were established on the 7th May, 8th June and the 27th June, however the earliest sowing (7th of May) at this site was not successful due to seeding

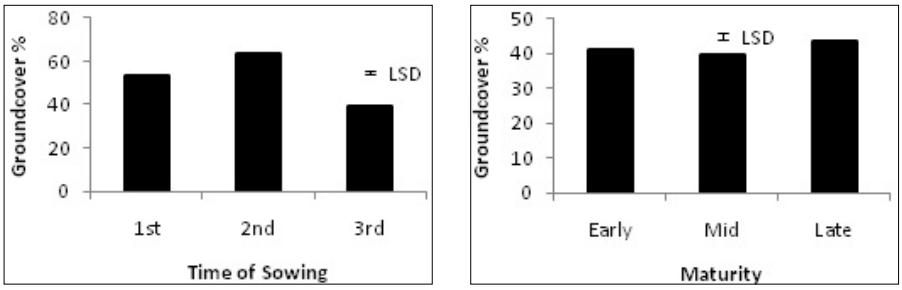

Figure 2: Wheat groundcover differences due to time of sowing (p=0.006, LSD=9.6%) and variety maturity (p=0.07, LSD=3.3%) at the Ouyen site.

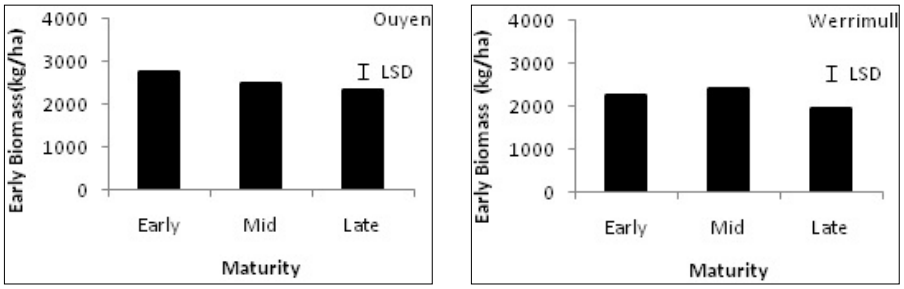

Figure 3: Differences of early biomass accumulation in wheat due to variety maturity at the Ouyen (p=0.047, LSD=348 kg/ha) and Werrimull (p=0.045, LSD=350 kg/ha) sites.

equipment malfunction and no data was collected at this site for this time of sowing.

Biomass was measured when the early sown Yipti treatment had reached growth stage Zodacks 31 and at anthesis. The percentage of ground cover produced by the end of winter was determined for each treatment by analysing digital photographs.

Modelling of wheat biomass production and grain yield was undertaken using the Australian Production Systems Simulator (APSIM) to assess the performance of treatments over a range of environmental conditions.

A best fit soil type was selected for each site from the APSIM soils database using estimated crop upper and lower limits. The model was run using the measured pre season plant available water (51mm and 22mm at Ouyen and Werrimull, respectively) and the measured nitrate and ammonium levels.

Figure 4: Cereal varieties trial, 2010. Photo: BCG.

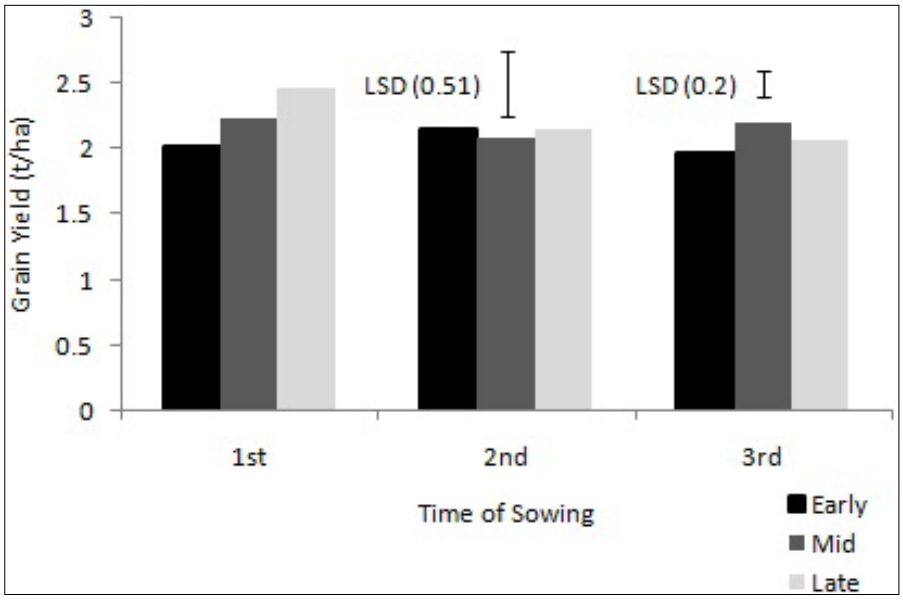

Figure 5: Wheat grain yield interaction (p= 0.015, LSD= 0.51 t/ha between time of sowing and LSD = 0.20 t/ha within time of sowing) between time of sowing and variety maturity of wheat at the Ouyen site.

Results

Groundcover

Across all three times of sowing at the Ouyen site, late maturing varieties had an average groundcover of 44%, which was significantly better than the groundcover produced by the mid maturity and early maturity varieties of 39 and 41% respectively (Figure 2). The late maturing barley variety had higher groundcover levels than the early maturing variety; however, groundcover was probably influenced by the varieties' growth habit. Growth stage may have also influenced groundcover in the wheat treatments.

Dry matter accumulation

Late maturity treatments produced the lowest early biomass; this was significantly less than the early maturing varieties at Ouyen and mid maturing varieties at Werrimull (Figure 3). However, variety maturity did not influence anthesis biomass production in 2010.

Grain yield

At the Ouyen site, there was a yield advantage of using the late maturity varieties at the first time of sowing. Therefore there was an 18 and 9.4% yield penalty in the early and mid maturity treatments respectively in comparison with the late maturity varieties at the earliest sowing date (Figure 5). There were no clear trends of variety maturity effects with delayed sowing, possibly because of the wet and mild spring experienced during the 2010 season. Therefore, APSIM was used to model potential yield outcomes for each treatment over 100 historic seasons at both the Ouyen and Werrimull sites.

Modelling

At Ouyen, which had greater levels of plant available water at sowing than at Werrimull, the modelling showed that there was greater probability of achieving higher grain yields when late maturing varieties were planted early (Figure 6). However, at Werrimull, modelling suggested that using late maturing wheat varieties at the early sowing date would only benefit growers in 50% of seasons (Figure 7). At both sites, early and mid maturity varieties had the greatest yield potentials at the two later sowing dates, with little yield differences between the two maturity types expected. Furthermore, the modelling suggested that late maturity varieties had a greater probability of producing more biomass than mid or early maturity varieties, regardless of sowing time.

Implications of the findings

The aim of this project was to determine how differences in cereal variety maturity can be managed to reduce erosion risk and optimise production. It was also found that the use of early and mid maturing wheat varieties can be used to improve early crop biomass accumulation. In years when there is a risk of crop failure in the spring, early and mid season varieties may also help to reduce the threat of erosion by building more crop residues in comparison with later season varieties.

Variety maturity was shown to influence grain yield at the early sowing date, but its impact diminished as sowing became later. Modelling demonstrated that longer season varieties had potential yield benefits in the majority of seasons when sown early at Ouyen, but at Werrimull (where there was less subsoil moisture) the benefit of long season varieties were less pronounced. Moreover, there was more likely to be a yield advantage of using mid and short season varieties at both sites when crops were sown at the later sowing dates.

References

Drendel, H. (2010). *Mallee Soil Erosion and Land Management Survey - Post Sowing 2010,* Department of Primary Industries.

Acknowledgements

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Further Information

The information for this bulletin has been taken from '*Improved cereal variety options for increased groundcover*', a report for the Mallee CMA by Mallee Sustainable Farming.

A copy of the report can be downloaded from the Mallee CMA website:
www.malleecma.vic.gov.au

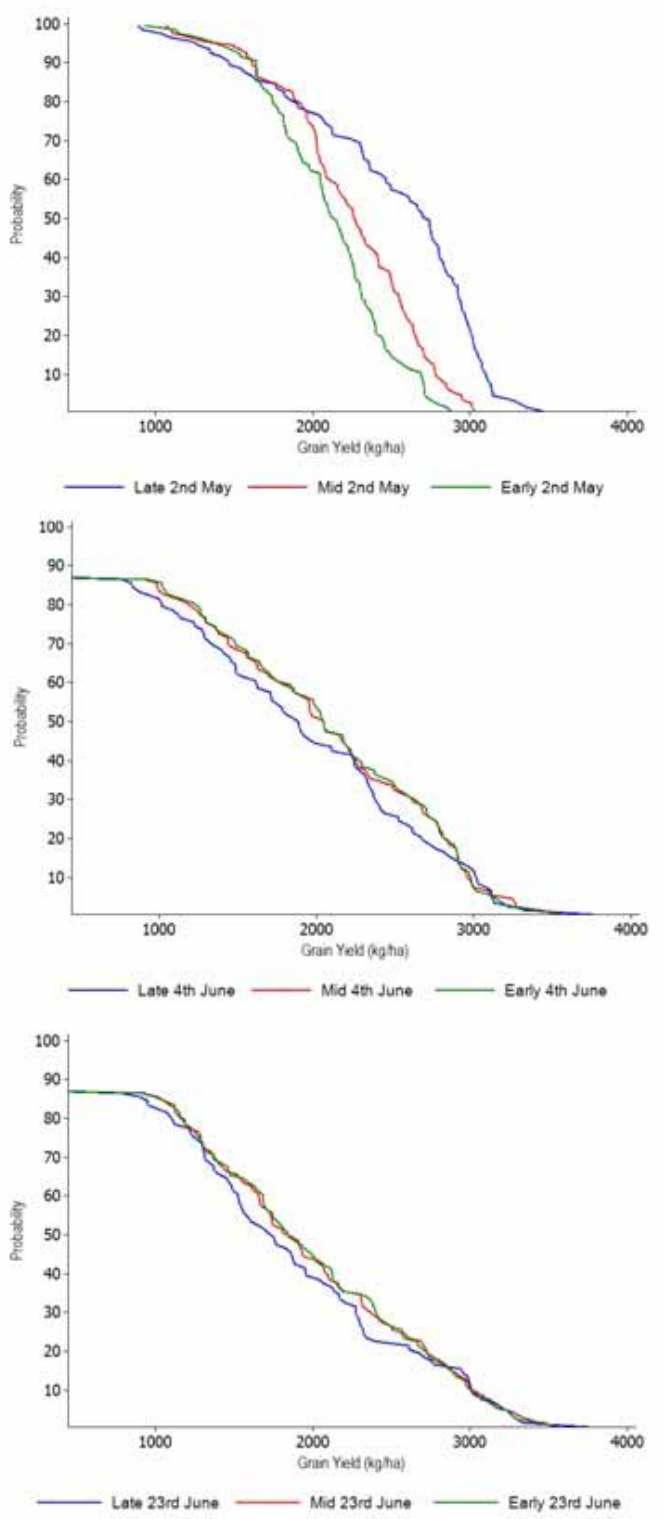

Figure 6: APSIM predicted wheat grain yield for late maturity, mid maturity and early maturity varieties sown on the 2nd of May, 4th of June and 23rd of June at the Ouyen site.

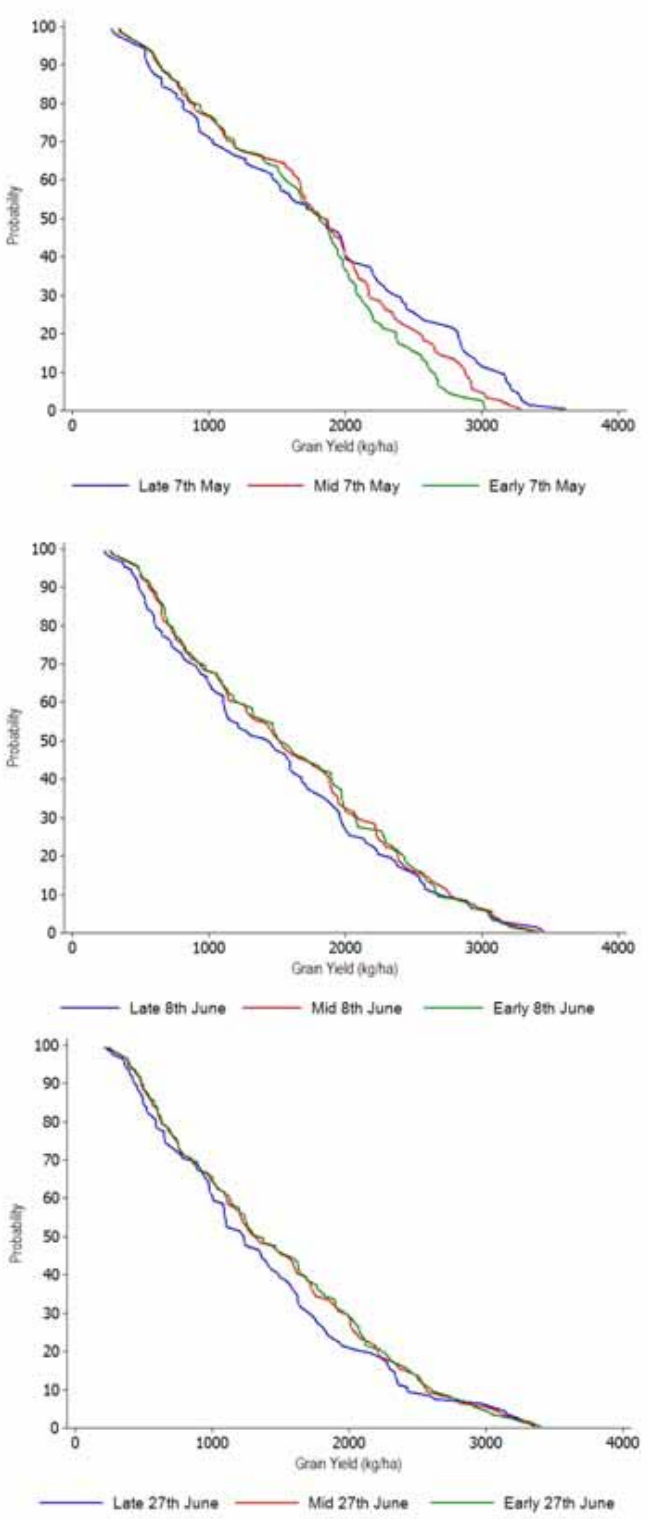

Figure 7: APSIM predicted wheat grain yield for late maturity, mid maturity and early maturity varieties sown on the 7th of May, 8th of June and 27th of June at the Werrimull site.

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