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Sorghum in the western zone – Row Configuration x Population x Hybrid – "Glendara", Rowena 2012

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Introduction

Sorghum is a reliable summer crop in eastern areas of northern NSW. However there is a need to improve the reliability of sorghum in western cropping areas and to assess strategies that will allow growers to adapt to increasingly variable seasonal conditions. The introduction of hybrids with increasing levels of Staygreen (SG), or using a combination of tillering, plant population and row configuration may help improve the reliability of sorghum yields.

In the eastern zone there has been a reasonable amount of work evaluating population and row spacing. Modelling work has suggested that sorghum can be a reliable component of western cropping systems but this work needs applied research to verify the modelling and give growers confidence to incorporate sorghum into their rotations.

In northern NSW crown rot, a stubble-borne fungal pathogen continues to be the most prevalent and damaging disease affecting winter cereals. Sorghum is recommended as a break crop but the success is dictated by the amount of breakdown of the winter cereal stubble. Although altering row configuration and population may improve the reliability of sorghum it may also reduce the rate of decomposition of cereal stubble and reduce water accumulation during the fallow period and the break crop benefits.

The trial outlined below aims to answer some of these questions and provide data for use in modelling the trial outcomes over long term climatic data sets. This was one of three sites planted across northern NSW in the 2011/12 season, the other two sites being Garah and Morialta. Results from the Morialta site are presented in another paper. The Garah site suffered inundation with water and could not be used.

Key findings

Hybrid tiller and head production can be strongly influenced by the row configuration and plant population.

Yield at this site was again above what is considered typical of this environment with the best treatments reaching close to 6 t/ha. In this above average yielding season higher yields were achieved from narrower row spacings and hybrids with higher tillering capacity.

Gross margins showed grain sorghum in these more favourable years to be a more attractive proposition for growers who used solid configurations, in this season. As would be expected the higher the grain yield the higher the resulting gross margin.

Trial details

Co-operator:	**Philip and John Harris**
Property:	**"Glendara", Rowena**
Sowing Date:	**29th and 30th September, 2011**
Planter:	**Monosem double disc**
Fertiliser:	**46 kg/ha Supreme Z at sowing**

Starting Soil Water

The site was cored at sowing to establish starting soil water. PAWC was estimated to be 167 mm.

Treatments

Hybrids

- 2436 (low tillering and high SG)
- MR43 (moderate SG and tillering)
- MR Bazley (PAC2437) (high tillering and low SG)

Row Configuration

- Solid on 1 m spacings
- Single skip
- Double Skip
- Superwide (1.5 m spacings)

Plant Populations

Populations were targeted using germination for each hybrid and an estimated establishment of 80%. Three populations were targeted in each of the row configurations.

- 30,000 plants/ha
- 50,000 plants/ha
- 70,000 plants/ha

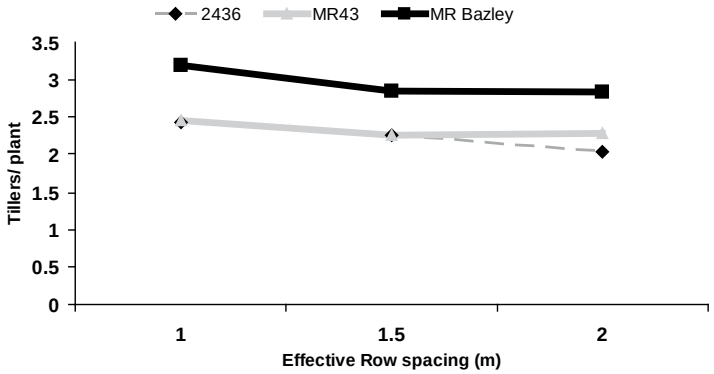

Figure 1: *Effect of row configuration on tillers per plant*

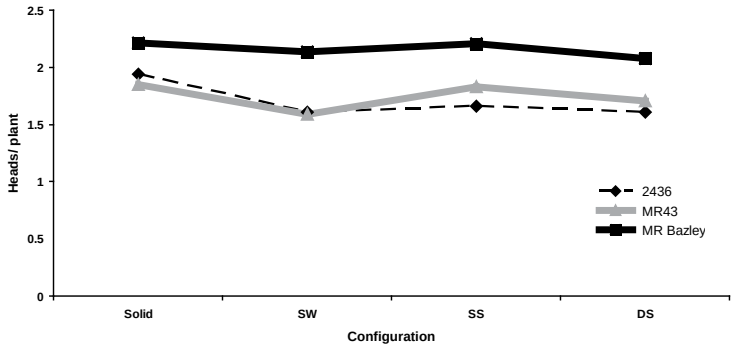

Figure 2: *Effect of row configuration on the number of heads per plant.*

Results

Establishment

Establishment counts were taken for each plot. This site had a good establishment for all hybrids. Target population was achieved for 30,000 plants/ha. However for the 50,000 plants/ha and 70,000 target populations, only 46,000 and 54,000 plants/ha respectively were established.

MR Bazley populations were established around 12% lower than 2436 and MR43, which established at similar populations.

Tillers

As population increased tiller production per square metre increased, whilst tiller production per plant decreased across all hybrids.

There was no significant difference in tillering between 2436 and MR43. MR Bazley produced significantly more tillers than the other two hybrids both per square metre and per plant.

Head numbers

As plant population increased the number of heads per square metre also increased. The trends between hybrids were the same for head numbers as they were for tillers, there was no significant difference between 2436 and MR43 while MR Bazley produced significantly more tillers.

Heads per plant decreased as plant population increased.

Across configurations, the solid plant produced significantly more heads per square metre than all other configurations. The trend was for decreasing head number as row spacing increased.

Yield

Rowena was the highest yielding of three sites in the 2011/12 season, with an average site yield of 4.5 t/ha. There was quite a large range in yields across the different treatments though, with the best (solid plant) yielding 5.2 t/ha and the worst (double skip) 3.5 t/ha.

Yield decreased as row spacing increased in the 2011/12 season (Figure 3).

Solid plant yielded the best at all 3 sites in the 2010/11 season and also in the 2011/12 season, however both seasons have been wetter than average.

Superwide and single skip configurations were not statistically different in their final yield. Single skip and superwide yielded 88 and 91% respectively of the solid plant.

The double skip configuration resulted in 1.7 t/ha less or 67% of the yield of the solid plant.

Yields across the three hybrids were significantly different. 2436 was the lowest yielding hybrid by far, 0.5 t/ha less than MR43, while the yield difference between MR43 and the highest yielding MR Bazley was less at only 0.2 t/ha.

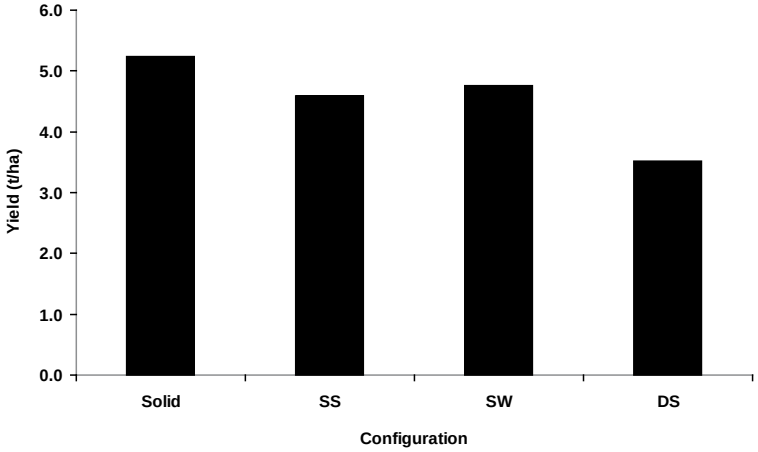

Figure 3: *Grain yield across sowing configurations*

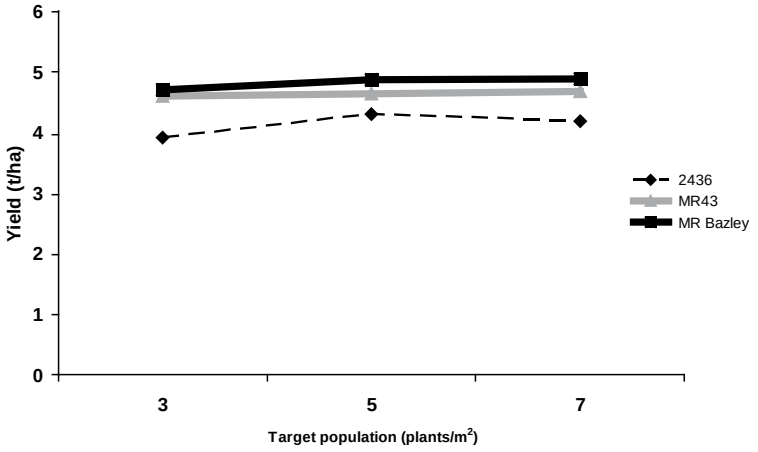

Figure 4: *Grain yield across hybrids and plant populations*

Grain Quality

There was no significant difference in 1000 grain weight or hectolitre weight across configurations, populations or hybrids.

There were significant differences in screenings across row configurations and hybrids. Screenings reached up to 13.5% in the solid plant configuration but declined to around 8% for double skip. There were also significant differences in hybrids, with MR Bazley showing lower screenings than MR43 and 2436.

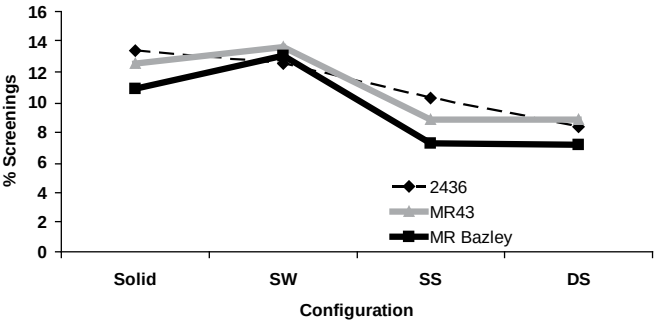

Figure 5: *Effect of Row configuration and Hybrid on Screenings*

Finishing Soil Water

Finishing soil moisture across configurations for the hybrid MR43 was measured at harvest. These measurements were taken both on row and mid row for all configurations except double skip where an extra core was taken in the middle of the skip area.

Differences in the finishing soil water were detected at the surface, whilst moisture was similar at depth for all configurations with the exception of the middle of the skip area in the double skip plots.

The middle of the skip area for the double skip configuration shows more moisture remaining at all depths below 50 cm.

No significant difference was observed between on row and mid row soil moisture in any configuration.

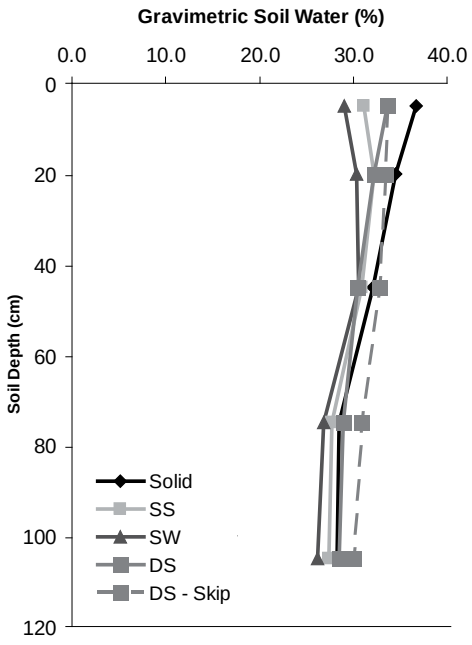

Figure 6: *Gravimetric soil water in between plant rows across all sowing configurations*

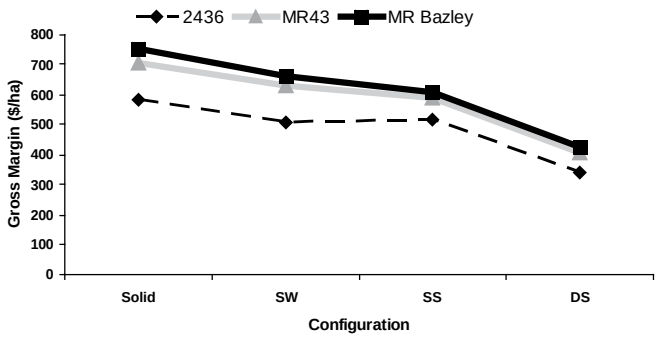

Figure 7: *The effect of sowing configuration and variety on gross margin*

Gross Margins

Gross margins follow the same trend as grain yield. Gross margin decreased as row spacing increased.

There was no significant difference between the gross margin for single skip and super wide configurations.

There was a difference in gross margin between hybrids, with 2436 having a lower gross margin as a result of its lower yield.

Conclusions

Hybrid tiller and head production can be strongly influenced by row configuration and plant population. High tillering hybrids can be made to perform like a low tillering hybrid if plant population and effective row spacing are increased.

In this trial, a similar trend to our previous research was evident, where as row spacing widened and plant population increased the number of tillers and heads reduced. Under above average seasonal rainfall this resulted in lower yields.

Yield at this site was again above what is considered typical of this environment with the best treatments reaching close to 6 t/ha. In this above average yielding season higher yields were achieved from narrower row spacings and hybrids with more tiller production. However, this is also a more risky row configuration in years of stress.

Gross margins showed grain sorghum in these more favourable seasons to be a more attractive proposition for growers who used solid configurations. As would be expected the higher the grain yield the higher the resulting gross margin.

Acknowledgements

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