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Sorghum in the western zone – Row Configuration x Population x Hybrid – Bullarah 2013

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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 as both a break for winter crop diseases and weed management. Strategies also need to be assessed in this environment which may allow growers to adapt to increasingly variable seasonal conditions. The introduction of hybrids with increasing levels of Staygreen (SG), or using a combination of reduced 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 in sorghum. 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 extent of decomposition of winter cereal stubble which harbours the crown rot fungus. Although altering row configuration and population may improve the reliability of sorghum yield it may also reduce the rate of decomposition of cereal stubble and hence the break crop benefits while also potentially decreasing water accumulation during the subsequent fallow period.

The trial outlined below aimed to answer some of these questions and provide data for use in modelling the trial outcomes over longer term climatic data sets. This was one of three sites planted across northern NSW in the 2012/13 season, the other two sites being at Garah and Gurley.

Key findings

In moderately high yielding seasons (~5 t/ha) the narrowest solid plant row configuration achieved the highest sorghum yield. At this site, the super wide (1.5 m solid) configuration was the next highest yielding followed by single skip and then double skip configuration.

The mid and high tillering hybrids, MR 43 and MR Bazley yielded significantly better than the low tillering hybrid 2436.

In the 2013 season at this site there was very little impact of varying plant population on plant structures, yield or grain quality.

Site details

2012/13

Location: **"Kirribilli", Bullarah**

Co-operator: **Charles & Fiona Brett**

Sowing Date: **4th January, 2013**

Planter: **Monosem double disc precision planter**

Fertiliser: **42 kg/ha Supreme Z at sowing**

Paddock History: **Long fallow from wheat in 2011.**

Starting soil water: **199 mm (0–120 cm)**

Starting pathogens: **Root lesion nematodes and crown rot below detection limit based on PreDicta B. Based on plating 0% *Fusarium* crown and 16% 1st node.**

In crop rainfall

Table 1. *In-crop rainfall 2013 season*

January	February	March	April	May	Total (mm)
33	68	21.5	0	32	154.5

Starting soil nutrition

Table 2. *Soil Test results for "Kirribilli", Bullarah.*

Soil depth (cm)	Total N (mg/kg)	Sulphur (mg/kg)	Organic Carbon %	pH Level ($CaCl_2$)	Phosphorus (Colwell) mg/kg	Phosphorus (BSES) mg/kg	Zinc (DTPA) mg/kg
0–10	27	5.7	0.69	7.2	18	55.50	1.54
10–30	26	4.0	0.36	7.6	7	47.12	5.13
30–60	30	6.3	0.31	8.0	6	–	–
60–90	26	13.5	0.32	7.9	10	–	–
90–120	41	37.5	0.26	8.0	14	–	–

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 1m spacings
- Single skip
- Double Skip
- Superwide (1.5m 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.

- 15,000 plants/ha
- 30,000 plants/ha
- 50,000 plants/ha

Results

Plant Establishment

There was no impact of row configuration on plant establishment at this site (Table 3). Established plant populations were lower than targeted for the 30 and 50,000 plants/ha treatments, most likely due to the hot and dry conditions which followed planting, however there was good separation between the established populations (Table 4).

Table 3. *Plant structures data across configurations.*

Configuration	Plants/m^2	Tillers/m^2	Tillers/plant	Heads/m^2	Heads/plant
Solid	2.37	5.56 a	2.59 a	5.48 a	2.55 a
SS	2.37	4.80 b	2.36 ab	4.33 b	2.25 ab
SW (1.5m)	2.12	4.46 bc	2.31 b	4.25 b	2.29 ab
DS	2.09	4.22 c	2.18 b	3.91 b	2.05 b
l.s.d	n.s.d	0.57	0.26	0.88	0.41

Table 4. *Plant structures data across plant populations.*

Population (0'000/ha)	Plants/m²	Tillers/m²	Tillers/ plant	Heads/m²	Heads/plant
15	1.58 b	4.03	2.79	3.70	2.58
30	2.08 b	4.62	2.34	4.54	2.36
50	3.06 a	5.63	1.95	5.26	1.91
l.s.d	0.54	n.s.d	n.s.d	n.s.d	n.s.d

Tillers

Tiller production reduced as row spacing widened for both the number of tillers per metre square and the number of tillers per plant. Solid plant > Single skip = Super wide= Double skip (Table 3). There was no significant impact of plant population on tiller production (Table 4). In terms of hybrids, they performed as expected with 2436 being the low tillering hybrid, MR43 the mid and MR Bazley the higher tillering hybrid. There was very little difference in the tillering of MR 43 and MR Bazley overall. 2436 had quite a flat response to varying row configuration (Figure 1).

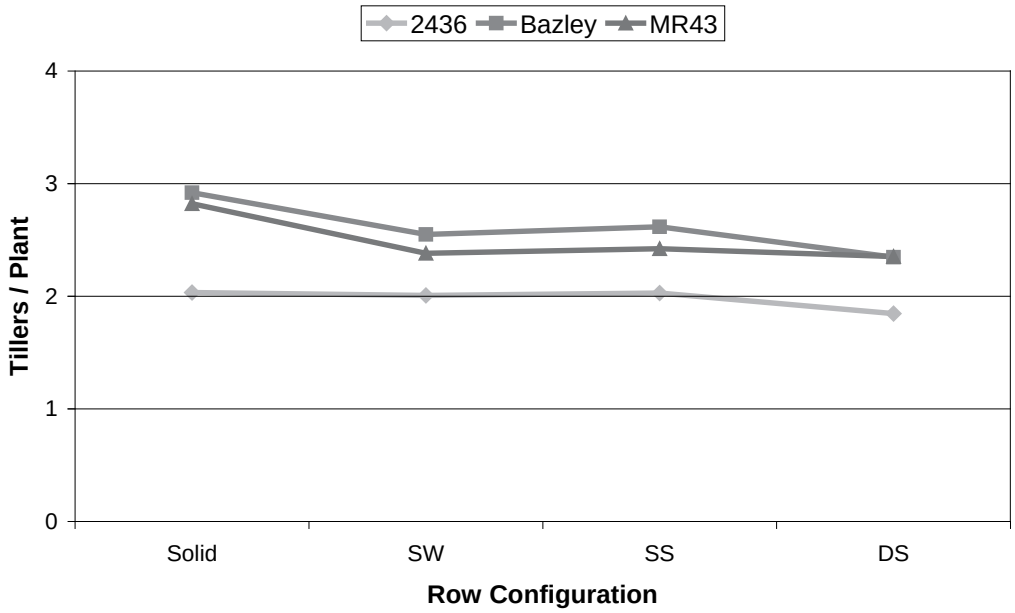

Figure 1. *Impact of varying row configuration on tiller production per plant.*

Head Numbers

The number of heads produced followed a similar trend to the tillers, with less heads produced as row spacing widened, however only the solid plant produced significantly more heads per metre squared (Table 3). In terms of hybrids, they performed as expected with 2436 producing less heads than MR43 and MR Bazley the higher tillering hybrid.

Dry Matter Production

Dry matter cuts were taken at anthesis and showed that there was a decline in the amount of dry matter produced as the row configuration increased. Solid plant produced slightly over 7 t/ha DM, which was significantly more than any of the other row configurations. There was no impact of varying hybrid or plant population on dry matter production.

Yield

There were significant differences in yield across row configurations; solid plant yielded the highest at 5.29 t/ha, followed by the superwide configuration at 4.42 t/ha, the single skip at 4.22 t/ha and double skip at 3.32 t/ha when averaged across the three hybrids (Figure 2). There was no significant difference in yield across the three plant populations. In terms of hybrid 2436 was the lowest yielding, while there was no significant difference in the yield of MR43 and MR Bazley.

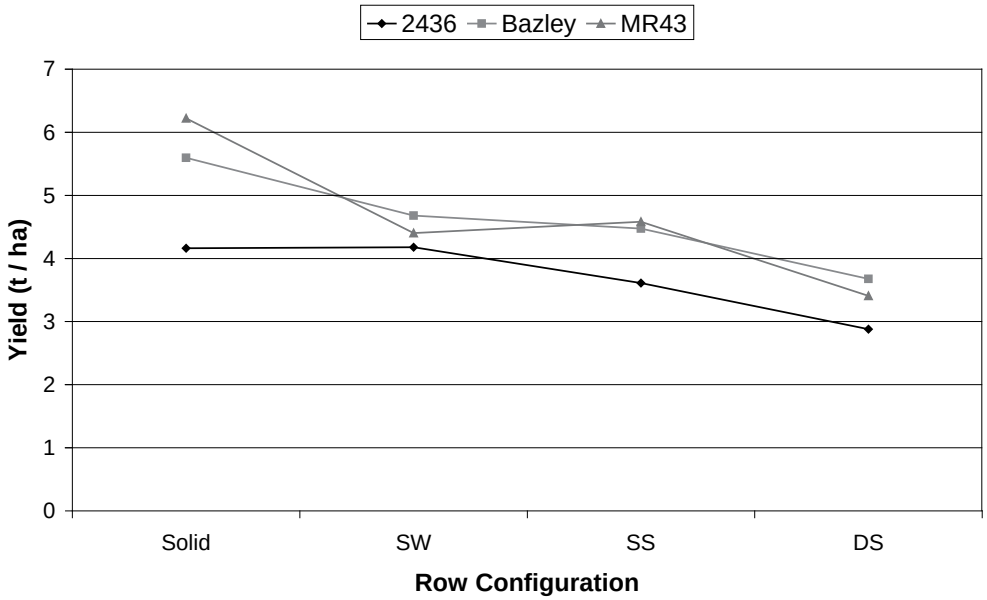

Figure 2. *Grain yield across row configuration.*

Grain protein

There was no significant impact of configuration (Table 5), hybrid variety or plant population on the protein results.

1000 Grain weight

Varying row configuration had a significant impact on 1000 grain weight with all configurations having a higher 1000 grain weight than the solid configuration (Table 5). There was no impact of hybrid or plant population.

Screenings

Screening levels were very low, and not to a point where they would impact on receival standards. However, there were still statistical differences with screenings being lower from the skip row configurations when compared to the solid plant (Table 5).

Table 5. *Grain quality across row configurations.*

Configuration	Protein (%)	1000 Grain wgt (g)	Screenings (%)
Solid	10.2	35.12 b	1.89 a
SS	10.0	36.35 a	1.40 b
SW	10.0	36.72 a	1.60 ab
DS	10.0	36.43 a	1.39 b
l.s.d (5% level)	n.s.d	1.01	0.34

Finishing Soil Water

Finishing soil water cores from the Bullarah site were taken post harvest (Figure 3). Results at the site showed there were very minor differences in the amount of water remaining, both on the row and mid row.

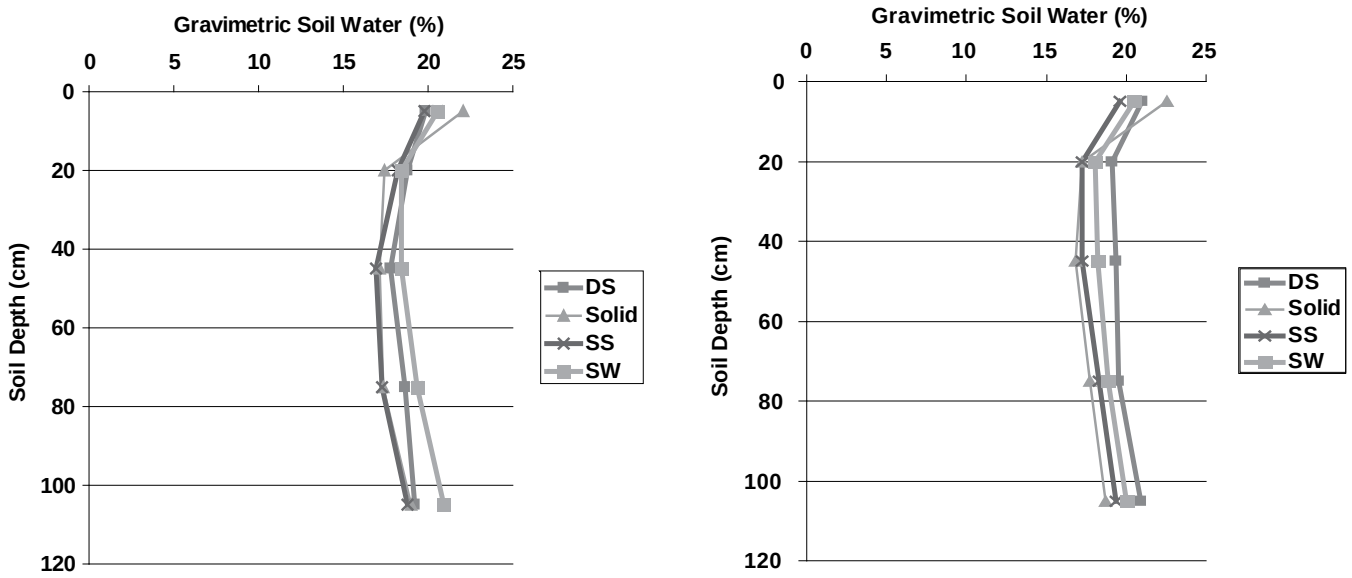

Figure 3. *Finishing soil water at Bullarah (LH – on row, RH – mid row).*

Summary

In a reasonably high yielding season, even on a late plant the narrower row spacing yielded the best. Varying row configuration had the biggest impact on all plant structures and yield components. While the impact of varying plant population and hybrid selection was less significant. The lower tillering hybrid 2436, produced the lowest yields, however there was very little difference between the mid and high tillering hybrids, MR43 and MR Bazley.

There was very little difference in the finishing soil water under the sorghum rows, however small differences started to appear in the mid row measurements at depth with the solid plant being the driest and the double skip the wettest.

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