# Sorghum row direction x configuration x hybrid – Terry Hie Hie 2015–16

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## Key findings

- Varying row direction from north–south or east–west did not affect grain yield or quality.
- Row configuration did not affect grain yield, however, there were some effects on grain quality. The solid row configuration produced higher grain protein and screenings levels, but lower test weight than the superwide and single skip treatments.
- There were differences between the hybrids for grain yield and quality. MR Apollo and MR 43 produced higher yields than 84G22. Differences in grain quality were also found, with MR Apollo producing a higher grain protein level and 1000-grain weight than the other two hybrids.

## Introduction

Sorghum is an important summer crop in north-eastern NSW, where dryland sorghum yields ranging from 3 t/ha to 5 t/ha are common. In these farming systems, where grower and advisor confidence in growing sorghum is high and a reasonable amount of other research has been conducted on general crop agronomy, the research emphasis is focused more on lifting yields. This is in contrast to research in the drier, western zone where improving confidence and reliability in crop production are the paramount research focus.

The experiment outlined below was designed to compare grain yield and quality responses with variations in row direction (north–south versus east–west) across a range of row configurations (to simulate various light interception orientations) and sorghum hybrids. A second site was planted in the 2015–16 season, located further south at Spring Ridge on the Liverpool Plains.

## Site details

| | |
|---|---|
| Location | 'Grattai East', Terry Hie Hie |
| Co-operator | Michael Ledingham |
| Soil nutrition | The site was soil cored before sowing to determine starting nutrition (Table 1). Starting nitrogen (N) levels were 49 N/ha to a depth of 1.2 m. |
| Starting soil water and rainfall | The site was soil cored before sowing and found to have 34 mm of plant available water (PAW) to a depth of 1.2 m. Rainfall was recorded at the experiment site (Table 2). |
| Sowing date | 17 September 2015 |
| Fertiliser | 80 kg/ha Starter Z |
| Harvest date | 22 January 2016 |

Table 1. Soil chemical characteristics.

| Characteristic | Depth (cm) | | | | |
|---|---|---|---|---|---|
| | 0–10 | 10–30 | 30–60 | 60–90 | 90–120 |
| pH (1:5 $CaCl_2$) | 5.9 | 6.6 | 7.2 | 7.1 | 7.4 |
| Nitrate nitrogen (mg/kg) | 7 | 3 | 4 | 2 | 3 |
| Sulfur (mg/kg) | 7.5 | 3.2 | 5 | 4.2 | 9.5 |
| Phosphorus (Colwell) (mg/kg) | 28 | 9 | 6 | 4 | 3 |
| Organic carbon (OC) (%) | 1.28 | 0.54 | 0.24 | 0.13 | 0.09 |

Table 2. In-crop rainfall at 'Grattai East', Terry Hie Hie in 2015–16.

| Month | September | October | November | December | January |
|---|---|---|---|---|---|
| Rainfall (mm) | 10 | 81 | 0 | 76 | 0 |

## Treatments

### Row direction

1. North–south
2. East–west

### Hybrids

1. MR Apollo
2. MR 43
3. 84G22

### Row configuration

1. Solid (1 m spacing)
2. Single skip
3. Superwide (1.5 m spacing)

The experiment was a split-split design with main blocks of row direction and sub blocks of row configuration with hybrids randomised within blocks. Three replicates were used.

## Results

### Plant structures

Plant establishment was targeted at a population of 50,000 plants/ha. The average plant population recorded was 50,190 plants/ha. Neither row configuration nor hybrid affected the established plant population. There was a significant effect from row direction, with higher plant establishment in the north–south direction at 52,530 plants/ha versus 47,840 plants/ha in the east–west direction.

Tillering was quite low at this site in this season, with only 15,000 tillers/ha produced on average. There was no significant difference between hybrids, row configurations or row direction for tillering.

Similarly, the number of heads produced was not high. There was no significant difference for hybrid or row direction; however there were differences across the row configurations. On average, 61,420 heads/ha were produced across treatments. There were more heads produced in the solid configuration compared with the single skip configuration (67,780 heads/ha vs 56,300 heads/ha). The superwide treatment was not different from either the solid or single skip treatments (60,190 plants/ha).

There were slightly more tillers per plant and heads per plant produced by the east–west row direction than the north–south treatment (data not shown).

### Days to flowering

Neither row direction nor row configuration affected the days to 50% flowering. However, there were significant differences between the hybrids. MR 43 was the quickest at 74 days, followed by 84G22 at 75 days. MR Apollo was 4–5 days slower reaching 50% flowering at 79 days.

### Grain yield

The site mean grain yield was 3.54 t/ha. Neither row direction nor row configuration affected grain yield at this site in this season. However, there were significant differences in the hybrid performance. MR Apollo and MR 43 performed similarly, producing 3.83 t/ha and 3.58 t/ha respectively, while 84G22 produced less at 3.20 t/ha. There were no significant interactions between the three factors.

### Grain quality

The grain protein levels averaged 9.2%. There was a significant interaction between row direction, row configuration and hybrid for protein content, however, no clear pattern was evident, making explaining the results difficult. When examining the significant single factors, the solid row configuration produced higher grain protein than the superwide or single skip treatments. Similarly, MR Apollo produced higher grain protein than the other two hybrids (data not shown). Unfortunately, growers are not remunerated based on protein content, making the differences more important from an academic and nutrient removal point of view.

Test weights showed significant differences based on the treatments for hybrid and row configuration only. The solid row configuration produced a significantly lower test weight than the other two configurations, but well above the receival standards level. MR Apollo also had a lower test weight than the other two hybrids.

Screening levels were low, with a site average of 2.1%. Significant interactions occurred for hybrid and row configuration. The solid plant produced more screenings than the other two configurations. 84G22 produced significantly higher levels of screening than the other two hybrids, but levels were still low.

The only differences in 1000-grain weight were found between hybrids, with MR Apollo having a higher 1000-grain weight than MR 43, which was higher than 84G22.

## Conclusions

The effect from row direction on plant structures was minor, with only an increase in plant establishment detected from the north–south direction compared with the east–west direction. This difference did not translate into higher tiller or head production per hectare. There were slightly more tillers per plant and heads per plant from the east–west direction, but again this did not correlate with higher yields.

Row configuration did not affect plant establishment or tillering, however, there were more heads produced per hectare from the solid configuration compared with the single skip. This did not translate into a difference in grain yield; however, there were some impacts on grain quality. The solid row configuration produced higher grain protein and screenings levels, but lower test weights than the superwide and single skip treatments.

There were differences between the hybrids for grain yield, with MR Apollo and MR 43 producing higher yields than 84G22. There were also differences in grain quality, with MR Apollo producing a higher grain protein level and 1000-grain weight than the other two hybrids

The results from this experiment suggest that there is no economic value in altering the sowing direction of rows to either north–south or east–west, or any yield benefit from altering row configuration between solid, single skip or superwide.

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