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Maize row configuration × population × hybrid – Spring Ridge 2014–15

Loretta Serafin, Mark Hellyer and Peter Perfrement

NSW DPI, Tamworth

Introduction

Dryland maize production has declined dramatically in northern NSW since the 1900s. Grain sorghum has largely replaced maize due to greater reliability in yields and higher economic returns. Dryland maize still remains a small component of rotations on the Liverpool Plains and also east of Moree. Research data to support current and future dryland maize production is limited, hence a series of experiments were designed to provide baseline agronomic data.

The trial outlined below was designed to compare grain yield and quality responses to variations in row configurations, plant population and hybrid selection. Two other sites were planted in the 2014–15 season with one east of Moree and the other north-west of Moree. However, due to dry conditions, the data was not useable.

Key findings

The solid 75 cm or single skip row configurations produced the highest yields at this site in this season.

Plant population also affected yield and grain quality, with the 15,000 plants/ha or 30,000 plants/ha treatments providing the best outcomes.

The maize hybrid P1070 performed best at this site in this season. The larger plant biomass hybrid PAC624 struggled under the tough dryland conditions at this site.

Site details

Location: **"Niluan" Spring Ridge**

Co-operator: **Jim Russell**

Sowing date: **28 October 2014**

Harvest date: **9 March 2015**

Planter: **Monosem precision planter**

Starting soil water

The site was cored pre-sowing to establish starting soil water. There was limited moisture at the start of the season with 133 mm plant available water (PAW) for maize.

Starting nutrition

The site was cored just before sowing to determine starting soil nutrition (Table 1).

Table 1. *Starting soil nutrition at "Niluan" Spring Ridge*

Depth (cm)	Nitrate (mg/kg)	Colwell P (mg/kg)	Colwell K (mg/kg)	Sulfur (mg/kg)	Organic carbon (%)	Conductivity (dS/m)	pH ($CaCl_2$)
0–10	177	45	699	3.6	1.34	0.435	7.6
10–30	54	19	330	3.2	1.00	0.333	7.9

Treatments

Row configuration
1. Solid 75 cm
2. Solid 100 cm
3. Single skip 100 cm

Plant populations
1. 15,000 plants/ha
2. 30,000 plants/ha
3. 50,000 plants/ha

Hybrids
1. P1467
2. PAC 624
3. P1070

The trial was blocked by row configuration, then plant population; hybrids were randomised within blocks.

Results

With all tables, values followed by the same letter are not significantly different at the 95% confidence levels (P=0.05).

Plant structures

Plant establishment was better than anticipated, with established populations higher than the target populations (Table 2). There was no difference in plant establishment between the three hybrids or row configurations.

Varying plant population also resulted in differences in the number of cobs produced per hectare and per plant, with the highest number of cobs produced in the 30,000 target plant population treatment (Table 2).

Table 2. *Plant population effect on plant structures*

Target population (plants/ha)	Established population (plants/ha)	Cobs (number/ha)	Cobs (number/plant)
15,000	20,490 c	25,190 c	1.26 b
30,000	35,190 b	57,410 a	1.64 a
50,000	57,470 a	47,040 b	0.82 c

There were differences in the tillering ability of the three hybrids, with P1070 producing a lower number of tillers/m^2 than P1467, but produced an equivalent number of cobs per plant (Table 3).

Table 3. *Hybrid effect on plant structures*

Hybrid	Tillers (number/m^2)	Tillers (number/plant)	Cobs (number/plant)
P1070	0.15 b	0.04 b	1.33 a
PAC 624	0.26 b	0.07 ab	1.10 b
P1467	0.42 a	0.13 a	1.30 a

Grain yield

The average grain yield at the site was 1.83 t/ha. There were significant differences in response to plant population, hybrid and row configuration. The solid 75 cm and single skip treatments yielded the best (Table 4). At this site in this season, the higher the plant population the lower the grain yield; however statistically there was no difference in the yield of the 15,000 and 30,000 plant/ha populations (Table 5).

Table 4. *Row configuration effect on grain yield and quality*

Row configuration	Yield (t/ha)
Solid 75 cm	1.91 a
Solid 100 cm	1.74 b
Single skip (100 cm)	1.84 ab

Table 5. *Plant population effect on grain yield and quality*

Target population (plants/ha)	Yield (t/ha)	1000 grain weight (grams)
15,000	2.04 a	276.6 a
30,000	1.88 a	228.6 b
50,000	1.58 b	212.8 c

Hybrid performance differed, with P1070 out yielding P1467 and the larger biomass plant type PAC624 (Table 6). There was no apparent correlation between the number of tillers per plant and final yield.

Table 6. *Hybrid effect on grain yield and quality*

Hybrid	Yield (t/ha)	1000 grain weight (grams)
P1070	2.22 a	229.3 b
P1467	1.80 b	230.6 b
PAC624	1.48 c	258.1 a

There was also a significant interaction between plant population and hybrid. Typically, each hybrid obtained their highest or equal highest yield at the lowest target plant population (Table 7).

Table 7. *Grain yield across the interaction of hybrid × plant population at Spring Ridge 2014–15*

Target population (plants/ha)	Hybrid		
	P1070	P1467	PAC624
15,000	2.30 a	1.93 b	1.88 b
30,000	2.31 a	1.99 ab	1.34 c
50,000	2.05 ab	1.46 c	1.23 c

Grain quality

There were differences in the grain quality produced with some of the treatments. The 1000 grain weight declined as the target plant population increased (Table 5). Generally, 1000 grain weight increased as grain yield declined; the hybrid PAC624 therefore had a higher 1000 grain weight than the other two hybrids evaluated (Table 6).

Summary

The solid 75 cm or single skip row configurations produced the highest maize yields at this site in this season. Differences were also evident with varying plant population and hybrid. At this site in this season the best yields were obtained from either the 15,000 plants/ha or 30,000 plants/ha target plant population treatment using the maize hybrid P1070.

Overall, site yields were not very high, on average 1.83 t/ha as a result of the limited starting soil water and the hot, dry finish to the season.

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