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# NSW research results

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# Maize nitrogen rate × hybrid responses – Gurley 2014–15

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## Key findings

- The trial site suffered from very dry conditions for the first three months after sowing.
- As a result, final grain yields were very low, averaging 0.3 t/ha.
- There was no impact from varying nitrogen rate on any aspect of plant growth or grain yield at this site except for cob number per plant.
- Hybrid selection affected crop yield.

## Introduction

Dryland maize remains a minor crop in north-western NSW. It is often considered a high risk dryland summer crop option in this environment, as favourable weather conditions (rainfall and mild temperatures) at flowering and grain fill are critical to achieving economically viable yields. Matching optimum nitrogen (N) nutrition to plant available water is essential to ensure that the maximum efficiency from inputs is achieved.

Nitrogen is the nutrient required in the largest quantities which, it has been suggested, accounts for around 20% of the variable costs associated with growing maize (Scott 2012).

This experiment compared plant characteristics and grain yield responses of three maize hybrids with varying rates of N applied at sowing or in-crop under dryland conditions at Gurley, south-east of Moree. An irrigated experiment was also conducted at Breeza on the Liverpool Plains in the 2014–15 season.

## Site details

| | |
|---|---|
| Location | 'Bulgate', Gurley |
| Co-operator | Peter Newton |
| Soil nutrition | Soil characteristics presented in Table 1 |
| Sowing date | 17 September 2014 |
| Fertiliser | 42 kg/ha Granulock Z applied at sowing |
| Plant population | Target three plants/m$^2$ (30,000 plants/ha) |
| Rainfall | A total of 233 mm of in-crop rainfall was recorded at the experiment site (Table 2). The majority of this was received in December and January. |
| Temperature | Temperatures were recorded at the site using a tiny tag. The data presented in Figure 1, shows two peak times when temperatures were above 40 °C in late October and late November. This period of extreme temperatures coincided with dry conditions, which had a major detrimental impact on crop yield as this was the critical period before silking. There was also a high occurrence of temperatures above 30 °C during the overall crop cycle. The optimum temperature for fertilisation (pollen viability) is 28 °C for maize, and above 35 °C is considered lethal. |
| Harvest date | 17 February 2015 |

Table 1. Soil chemical characteristics.

| Characteristic | Depth (cm) | | | | |
|---|---|---|---|---|---|
| | 0–10 | 10–30 | 30–60 | 60–90 | 90–120 |
| pH (1:5 $CaCl_2$) | 7.70 | 7.90 | 7.90 | 7.50 | 5.10 |
| Nitrate nitrogen (mg/kg) | 13.00 | 11.00 | 8.00 | 3.00 | 3.00 |
| Sulfur (mg/kg) | 4.20 | 6.60 | 117.50 | 2228.00 | 3600.00 |
| Phosphorus (Colwell) (mg/kg) | 26.00 | 4.00 | 3.00 | 5.00 | 10.00 |
| Organic carbon (OC) (%) | 1.22 | 0.80 | 0.58 | 0.15 | 0.08 |

Table 2. In-crop rainfall at 'Bulgate', Gurley in 2014–15.

| Month | September | October | November | December | January | February |
|---|---|---|---|---|---|---|
| Rainfall (mm) | 10 | 0 | 16 | 71 | 121 | 16 |

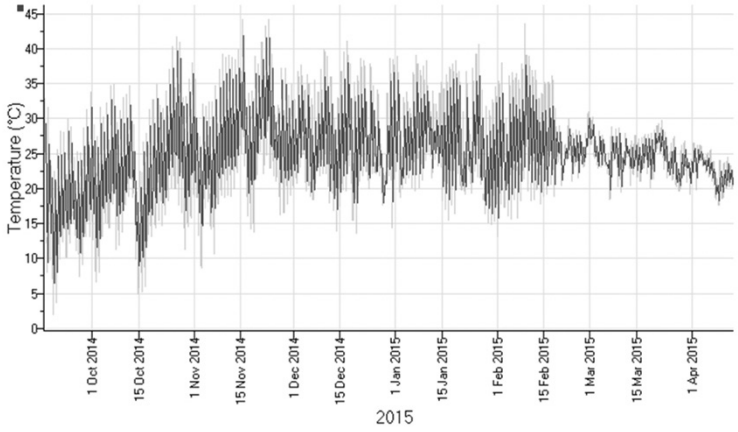


Figure 1. In-crop temperatures at "Bulgate", Gurley in 2014–15.

## Treatments

### Hybrids (3)

Pacific 624, Pioneer 1070, Pioneer 1467

### Nitrogen rates (6)

Nitrogen applied at sowing as urea: 0, 50, 75, 100, 75:75 split and 150 kg/ha. The 75:75 split treatment had 75 kg/ha applied at sowing and 75 kg/ha surface spread at the 6–8 leaf growth stage.

## Results

### Establishment

Plant establishment was better than the targeted three plants/$m^2$ for all hybrids, ranging from 3.4–3.9 plants/$m^2$. Two hybrids, Pacific 624 and Pioneer 1467, established slightly higher plant populations than the remaining hybrid, Pioneer 1070 (data not shown).

Nitrogen rate had no effect on establishment (data not shown).

### Tillering

The maize hybrids produced varying tiller numbers. The hybrid Pioneer 1467 produced more tillers per square metre and per plant than the other two hybrids (Table 3).

The N rate had no effect on tillers produced per square metre or tillers per plant.

### Cob production

Both N rate and hybrids affected the number of cobs produced per square metre and per plant, but there was no interaction between the two factors (Table 3). The hybrid Pioneer 1070 produced more cobs per square metre than Pacific 624 and cobs per plant than Pacific 624 and

Pioneer 1467 (Table 3). Pioneer 1467 was not significantly different from the other two hybrids for cobs per square metre.

Nitrogen rate affected cob production, with the 100 kg/ha and 150 kg/ha rates producing the highest number of cobs/m$^2$; the 0, 50 and 75:75 kg/ha kg/ha split produced significantly fewer cobs (data not shown).

### Grain yield

Grain yields were very low at this site in this season, on average 0.3 t/ha. There was no impact of N application on grain yield at this site. There was a significant impact of maize hybrid on grain yield (Table 3). The hybrid Pioneer 1070 was the highest yielding, followed by Pioneer 1467 which out yielded Pacific 624.

Table 3. Hybrid performance at 'Bulgate' Gurley in 2014–15.

| Hybrid | Plants/m$^2$ | Tillers/m$^2$ | Tillers/plant | Cobs/m$^2$ | Cobs/plant | Yield (t/ha) |
|---|---|---|---|---|---|---|
| Pacific 624 | 3.9 | 0.2 | 0.1 | 0.4 | 0.1 | 0.13 |
| Pioneer 1070 | 3.4 | 0.0 | 0.0 | 1.5 | 0.5 | 0.48 |
| Pioneer 1467 | 3.7 | 0.7 | 0.2 | 1.1 | 0.3 | 0.30 |
| l.s.d.($P$<0.05) | 0.33 | 0.21 | 0.05 | 0.43 | 0.13 | 0.08 |

## Conclusions

At this very low yielding dryland experiment site, hybrid choice had the largest effect on all plant and yield characteristics. The effect from varying N rates was non-existent on all plant components except for cob production. The highest number of cobs per square metre was produced from the 75, 100 and 150 kg/ha treatments.

## References

Scott JF (2012). Dryland maize (no till, feed). *North east budget series*. NSW DPI http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0003/175908/East-dryland-maize-12-13

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