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Sunflower configuration × population × hybrid – Gurley 2015–16

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Key findings

- Sunflower yields were very low at this site in 2015–16, averaging 0.56 t/ha.
- Plant population affected plant measurements, with larger head diameters and 1000 grain weights resulting from lower populations.
- Hybrid selection also affected plant measurements. Ausistripe 14 had the longest arc length but the smallest head diameter. Ausigold 4 and Ausigold 62 had very similar plant characteristics.

Introduction

Optimising sunflower performance relies on being able to match a hybrid with the growing environment and ensuring that the most suitable agronomic management is provided. Suitable crop agronomy involves using the most appropriate row configuration and plant population as well as ensuring adequate nutrition, disease and insect management.

This experiment and others conducted in this series were designed to provide recommendations for growers and advisors to support decisions on optimal row configuration, plant population and hybrids for sunflower production in the north-western and Liverpool Plains regions of NSW. These two environments are the primary sunflower growing regions in northern NSW.

Site details

Location	'Kyntyre', Gurley
Co-operator	Doug Clark
Soil type and nutrition	The site was soil cored before sowing to determine starting nutrition (Table 1). Starting nitrogen (N) levels were 112 kg 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 103 mm of plant available water (PAW) to a depth of 1.2 m. A total of 284.5 mm of in-crop rainfall was recorded at the site (Table 2). This was largely received as one large fall of over 50 mm in mid-November and another large fall of 68.5 mm in early January. The intensity of these summer storm events meant the rainfall was not effective, as a large amount of rain was lost as runoff.
Sowing date	9 September 2015
Fertiliser	42 kg/ha Granulock Z applied at sowing
Harvest date	23 February 2016

Treatments

Hybrids (3)

Ausigold 4
Ausigold 62
Ausistripe 14

Row configuration (3)

Solid 100 cm
Single skip (100 cm)
Superwide (150 cm)

Plant population (3)

15,000 plants/ha
25,000 plants/ha
35,000 plants/ha

Table 1. Soil chemical characteristics.

Characteristic	Depth (cm)				
	0–10	10–30	30–60	60–90	90–120
pH (1:5 $CaCl_2$)	6.1	7.0	7.8	7.9	8.0
Nitrate nitrogen (mg/kg)	6.0	8.0	11.0	11.0	2.0
Sulfur (mg/kg)	2.7	3.1	18.8	131.7	195.7
Phosphorus (Colwell) (mg/kg)	16.0	4.0	2.0	<2.0	3.0
Organic carbon (OC) (%)	0.49	0.43	0.34	0.28	0.12

Table 2. In-crop rainfall at 'Kyntyre', Gurley in 2015–16.

Month	September	October	November	December	January	February
Rainfall (mm)	0	17	93.5	1.5	68.5	104

Results

Establishment

Plant establishment was slightly better than the targeted populations for all populations (Table 3). There was no difference in the establishment between hybrids.

Table 3. Target versus actual plant populations established, Gurley 2015–16.

Target plant population (plants/ha)	Actual established population (plants/ha)
15,000	20,680
25,000	28,120
35,000	44,260

Plant height

Five plants in each plot were measured for height, taken from ground level up to the point of attachment at the back of the head. There was no difference in plant height between the hybrids, plant populations or row configurations (data not shown). The average plant height in the experiment was 152 cm.

Head diameter and arc length

The head diameter and arc length of five plants in each plot was measured. Head diameter was measured across the back of the head and arc length across the front face of the head.

Plant population and hybrid selection both caused significant differences in both parameters.

Head diameters averaged 11.8 cm, indicating that yields were likely to be reasonably low. Head diameters decreased as the plant populations increased, with significant differences between each plant population (data not shown). There were also differences between the hybrids. Ausigold 62 and Ausigold 4 were not different from each other with head diameters of 13.0 cm and 12.3 cm respectively, but both were larger than Ausistripe 14 at 10.2 cm.

Head arc lengths decreased as plant populations increased. In contrast to the head diameters, Ausistripe 14 had the longest arc length at 19.7 cm, followed by Ausigold 4 at 18.3 cm and Ausigold 62 at 17.5 cm. As Ausistripe 14 is a confectionary hybrid, the seeds are typically longer, resulting in a more rounded head shape.

Grain yield

Sunflower yields were very low at this site in 2015–16 with an average of 0.56 t/ha. The coefficient of variation for grain yield was very high and, as such, no other grain yield results can be reported as the level of variability in the data was too high.

Grain quality

Sub samples from each plot were collected at harvest and analysed for 1000 grain weight and test weight. Plant population and hybrid selection caused significant differences in 1000 grain weight. The 1000 grain weight decreased as plant population increased (data not shown).

Ausistripe 14 had the highest 1000 grain weight and test weight, although its test weight was not significantly different from Ausigold 62 (Table 4).

Oil contents were not available at the time of writing.

Table 4. Hybrid performance at 'Kyntyre' – Gurley 2015–16.

Hybrid	1000 grain weight (g)	Test weight (kg/hL)
Ausigold 4	41.0	35.8
Ausigold 62	38.1	38.3
Ausistripe 14	44.4	39.7
l.s.d ($P = 0.05\%$)	1.26	3.09

Conclusions

Sunflower grain yields at this site in 2015–16 were very low as a result of the dry growing conditions, averaging only 0.56 t/ha and quite variable across the site. Varying row configuration did not affect either plant or grain parameters at this site under these low-yielding conditions. Varying plant populations and hybrids had the greatest effect on plant structures such as head diameter and head arc length. Larger head sizes and higher 1000 grain weights resulted from having lower plant populations under the dry conditions experienced at this site in 2015–16.

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