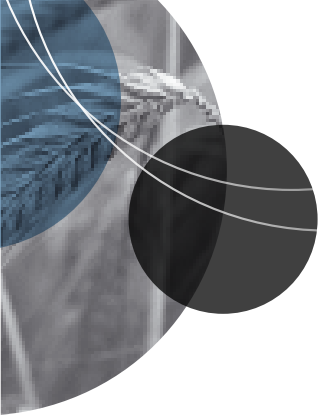

Agronomy – pulses

Lentil sowing date – Rankins Springs 2016

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Key findings

- Results from this experiment and previous research have proven that lentils can be successfully grown in southern NSW with sound agronomic planning and management.
- Across all varieties tested there was no significant difference between the 4 May and 20 May sowings, which validates the current sowing window recommendation from late April to mid May for the western region of southern NSW. Previous experiments have shown yield decline with a late May sowing.
- PBA Hurricane XT$^{(\phi)}$, PBA Jumbo2$^{(\phi)}$ and PBA Bolt$^{(\phi)}$ were the highest yielding commercial varieties, while PBA Ace$^{(\phi)}$ was significantly lower yielding in this experiment, which is not consistent with previous research.
- There was a significant reduction in seed weight when sowing was delayed for all varieties except PBA Ace$^{(\phi)}$, which showed no significant effect.

Aim

To compare growth, development and yield of current commercial lentil varieties and advanced breeding lines sown on two dates on a red, sandy loam soil at Rankins Springs in south-western NSW.

Site details

Location	'Hillview' Rankins Springs, RK & JG Eckermann, Paddock: Aloe
Soil type	Red, sandy loam, pH_{Ca} 5.4 (0–10 cm)
Experimental design	Randomised split plot design with sowing date in the main blocks and varieties in the sub-plots; three replications
Paddock history	Previous crop: wheat
Fertiliser	75 kg/ha grain legume starter (N 0: P 13.8: K 0: S 6.1) placed 50 mm below the seed 150 g/ha sodium molybdate, 16 June 2016
Plant population	Target: 120 plants/m^2
Sowing	Direct drilled using a six-row cone seeder on 300 mm row spacing using DBS tines and GPS auto-steer
Inoculation	Group F peat inoculant was mixed directly into an onboard water tank then pumped through micro tubes into each sowing furrow

Weed management	Commercial practices were used aiming for weed-free experiments, eliminating both weed competition and weed seed set Incorporated by sowing: Terbyne® (750 g/kg terbuthylazine) 850 g/ha, Triflur X® (480 g/L trifluralin) 1 L/ha, glyphosate (450 g/L) 2 L/ha, water 100 L/ha Post sowing: Select Xtra® (240 g/L clethodim) 500 mL/ha, Factor® (250 g/kg butoxydim) 180 g/ha, Supercharge® 100 mL/100 L, water 100 L/ha (5 August)
Insect management	Targeting Heliothis (*Helicoverpa* sp.), Lucerne flea (*Sminthurus virdis*) Fastac Duo® (100 g/L alpha-cypermethrin) 200 mL/ha, water 100 L/ha (6 September) Fastac Duo® (100 g/L alpha-cypermethrin) 200 mL/ha, water 100 L/ha (3 November)
Disease management	Targeting: Ascochyta blight (*Ascochyta lentis*), grey mould (*Botrytis fabae B. cinerea*) Penncozeb® 750DF (750 g/kg mancozeb) 2 kg/ha, water 100 L/ha (5 August) Howzat® (500 g/L carbendazim) 500 mL/ha, water 100 L/ha (6 September) Bravo® (720 g/L chlorothalonil) 1.5 L/ha, water 100 L/ha (26 September)
Harvest date	Desiccated 21 November – Reglone® (200 g/L diquat) 2.5 L/ha, water 100 L/ha Harvested 28 November

Soil analysis

Table 1. Site soil characteristics for 0–10 cm depth at Rankins Springs in 2016.

Characteristic	Depth (0–10 cm)
pH_{Ca}	5.4
Aluminium (KCL) (cmol+/kg)	1
Nitrate N (KCL) (mg/kg)	6
Ammonium N (KCL) (mg/kg)	1
Sulphur (mg/kg)	2.3
Phosphorus (Colwell) (mg/kg)	54
Organic carbon (OC) (%)	0.44

Season

The 2016 season at Rankins Springs was the wettest experienced in the past 36 years of records, with 517 mm of growing season rainfall (GSR), more than double the long-term average of 235 mm. While the experiment site had intermittent waterlogging across the growing season, drainage was sufficient to avoid crop damage. Pre-season rainfall (January to May) was variable, with an above-average January and a very dry February and March (Figure 1). Timely April rain contributed to favourable early sowing conditions. Rainfall during June, July and August was 63% above the long-term average, which filled the soil moisture profile leading into spring (Figure 1). This abundant winter moisture provided ideal conditions for growth and all early-sown pulses produced above average biomass for this environment. Despite the wet seasonal conditions, crop disease levels were generally low and the fungicide program contained the botrytis grey mould infection in susceptible lentil varieties.

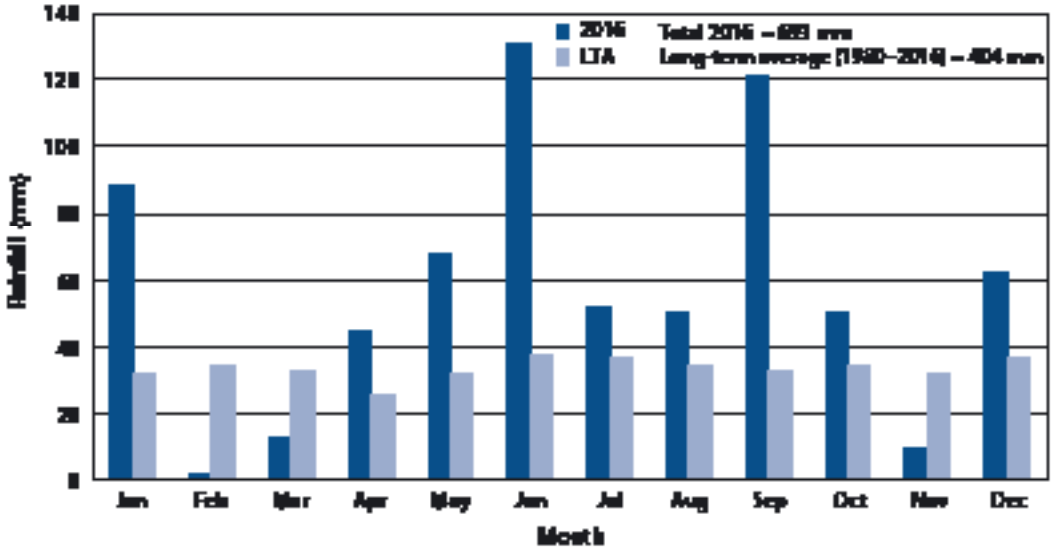

Figure 1. Monthly rainfall for 2016 and long-term average (LTA) rainfall for 'Hillview'.

Treatments

Varieties (8)

PBA Ace$^{\Phi}$, PBA Bolt$^{\Phi}$, PBA Hurricane XT$^{\Phi}$, PBA Jumbo2$^{\Phi}$, Nipper, CIPAL 1301, CIPAL 1422, CIPAL 1522

Sowing date (SD)

SD1: 4 May

SD2: 20 May

Results

Establishment

A lentil establishment of 120 plants/m^2 was targeted for each sowing date. Despite favourable environmental conditions at both sowing dates, the target population at the 4 May sowing date averaged 109.6 plants/m^2 across varieties and 123.8 plants/m^2 for the 20 May sowing date. PBA Jumbo2$^{\Phi}$ achieved the lowest plant establishment of 95.9 plants/m^2 when averaged over the two sowing dates (Table 2) but this did not affect grain yield with the favourable seasonal conditions.

Table 2. Plant establishment of eight lentil varieties averaged over two sowing dates at Rankins Springs in 2016; l.s.d. ($P = 0.05$) = 16.7 plants/m^2.

Variety	Establishment (plants/m^2)
PBA Jumbo2	95.9
PBA Hurricane XT	110.5
Nipper	115.5
CIPAL 1522	119.6
PBA Ace	121.0
PBA Bolt	121.5
CIPAL 1301	124.2
CIPAL 1422	125.4

Flowering

Varietal differences in days-to-flowering were observed between the eight lentil varieties, while no interaction between genotype and sowing date were evident. The advanced breeding line CIPAL 1522 was the earliest to flower at 107.5 days when averaged over the two sowing dates, while Nipper was significantly later to flower at 118 days after sowing, when compared with all other varieties (Figure 2).

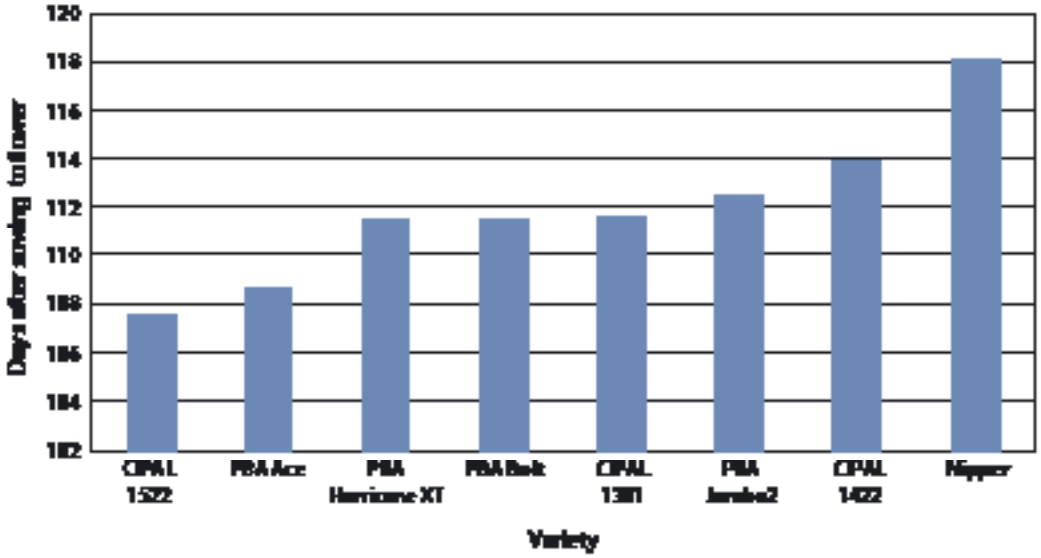

Figure 2. Days after sowing to flowering for eight lentil varieties averaged over the two sowing dates at Rankins Springs in 2016; l.s.d. ($P = 0.05$) = 3.2 days.

Grain yield

Growing season rainfall (April–October) of 517 mm in 2016 helped the site achieve a mean grain yield of 2.96 t/ha. Averaged across all varieties, there were no significant differences in yield between the two sowing dates of 4 May and 20 May, which might have been influenced by ample water throughout the growing season coupled with a mild spring to aid pod formation and seed fill.

PBA Hurricane XT$^{\Phi}$, PBA Jumbo2$^{\Phi}$ and PBA Bolt$^{\Phi}$ were the three highest yielding commercial varieties when averaged across the two sowing dates (Figure 3). PBA Ace$^{\Phi}$ was significantly lower than the highest yielding varieties in this experiment, which is not consistent with previous research conducted in this region.

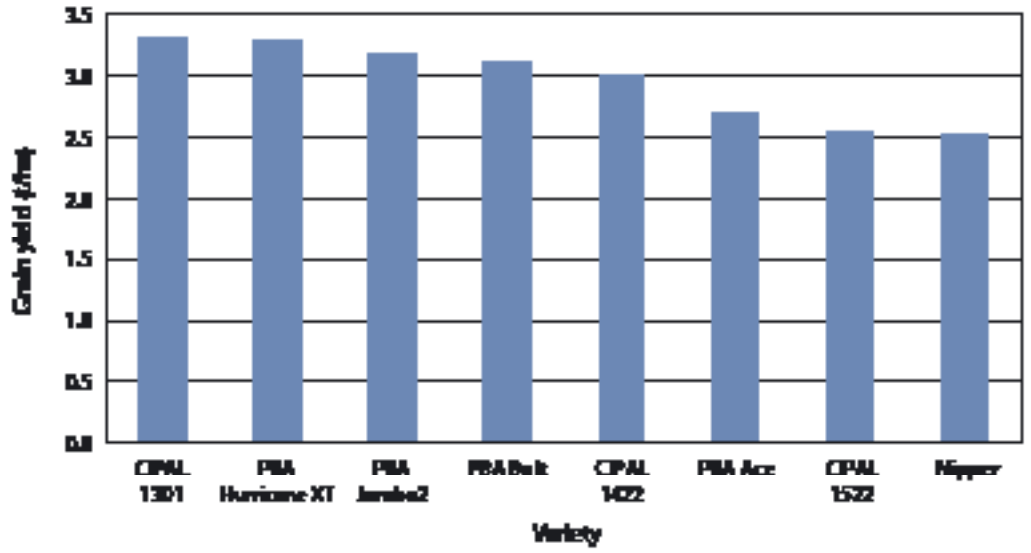

Figure 3. Grain yield of eight lentil varieties averaged over the two sowing dates at Rankins Springs in 2016; l.s.d. ($P = 0.05$) = 0.31 t/ha.

Seed size

Delaying the sowing date from 4 May until 20 May resulted in reduced seed weight from 3.9 g/100 seeds to 3.7 g/100 (data not shown). There was a significant reduction in seed weight when sowing was delayed for all varieties except PBA Ace$^{\Phi}$, which showed no significant effect (Figure 4). This is an important factor to consider when growing lentil, as seed size is an important marketing trait.

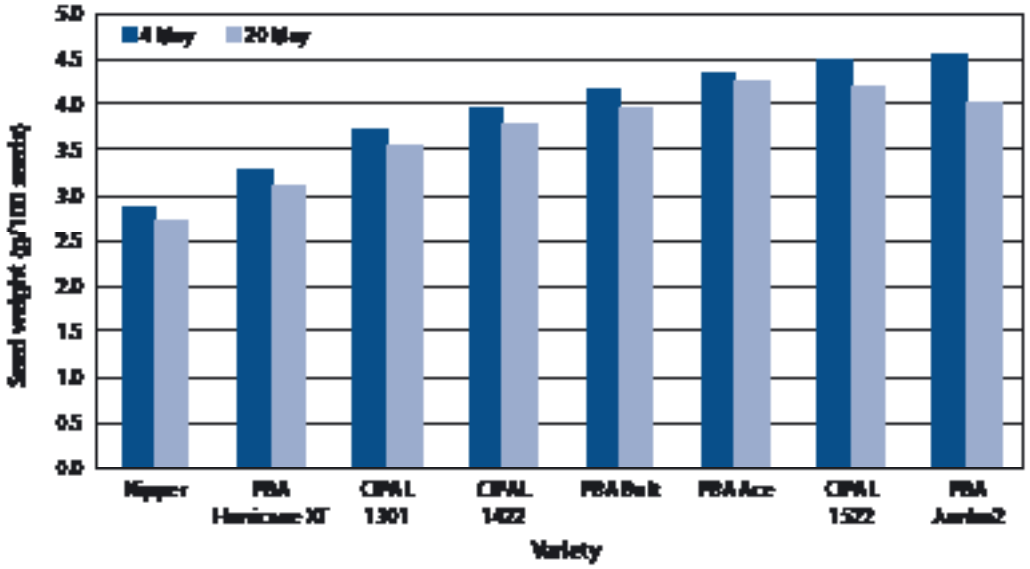

Figure 4. Seed weight of eight lentil varieties sown on two sowing dates at Rankins Springs in 2016; l.s.d. ($P = 0.05$) = 0.14 g/100 seeds.

Summary

Given the growing season rainfall of 517 mm at Rankins Springs in 2016 was 282 mm or 162% higher than the long-term average of 235 mm, the high grain yield from this experiment must be considered in context. Soil type and drainage over this experimental site was sufficient to minimise the impact of high rainfall and intermittent waterlogging. High growing season rainfall, in conjunction with favourable spring conditions and minimal disease pressure, resulted in equivalence between the 4 May and 20 May sowing dates for grain yields.
The highest yielding lentil variety was CIPAL 1301, with statistically similar yields to the commercial varieties PBA Hurricane XT$^{\Phi}$, PBA Jumbo2$^{\Phi}$, PBA Bolt$^{\Phi}$ and PBA Ace$^{\Phi}$.

Appropriate sowing date is one of the most critical management factors for lentil production systems in southern NSW; it determines plant growth, disease pressures and grain yield. Research from 2013 until 2016 has indicated the optimum time to sow lentil in southern NSW is between late April and mid May in the south-western cropping region (later than lupin and faba bean, but earlier than field pea). In the eastern cropping region, early to late May (7–10 days later than the south-western region) is the optimum time.

Sowing outside these dates severely compromises growth and grain yield potential. Sowing lentil earlier than recommended encourages biomass accumulation, which can lead to increased disease pressures as well as increased lodging and reduced seed quality.

Reduction in seed weight occurred when sowing was delayed from 4 May (3.9 g/100seeds) to 20 May (3.7 g/100 seeds) irrespective of variety, which is important to meet premium market requirements. Varietal differences in seed weight were recorded with CIPAL 1522, PBA Ace$^{\Phi}$ and PBA Jumbo2$^{\Phi}$ all achieving over 4 g/100 seeds, while Nipper was 2.8 g/100 seeds.

Results from this experiment support previous research showing that lentil can be successfully grown in southern NSW with sound agronomic planning and management. Careful consideration must be given to variety selection, paddock selection (i.e. soil pH and drainage), sowing date, herbicide residues, weed control, harvest timing and market opportunities.

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