Department of Primary Industries
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NSW research results

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Faba bean sowing date – Lockhart 2016

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Key findings

- Across all varieties tested, there was no significant response to sowing time, which validates the current sowing window recommendation. Therefore, the optimum time to sow faba bean at Lockhart in 2016 was late April–mid May.
- PBA Nasma(Φ) and Fiesta VF were the two highest yielding commercial varieties.
- The advanced breeding lines AF10089 and AF09169, developed by Pulse Breeding Australia (PBA) were significantly higher yielding than all other varieties.
- PBA Samira(Φ) and Nura(Φ) yielded significantly higher when sown on 18 May compared to 28 April.
- Crop lodging was significantly less for the 18 May sowing date.
- PBA Nasma(Φ) flowered 17 and 14 days earlier than PBA Samira(Φ) and PBA Zahra(Φ) at 28 April, and eight and six days earlier at 18 May.

Aim

To compare growth, development and yield of current commercial faba bean varieties and advanced breeding lines sown on two dates on a brown clay loam at Lockhart southern NSW.

Site details

Location	'Orange Park' paddock 001, Lockhart NSW
Soil type	Brown clay loam, pH_{Ca} 5.6 (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	The previous crop was barley; paddock was burnt to remove stubble load
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
Plant population	Target: 30 plants/m^2
Sowing	Direct drilled using a six-row cone air seeder on 240 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 Fallow weed control: Roundup DST® (470 g/L glyphosate) 743 mL/ha, water 100 L/ha (8 January) Fallow weed control: Roundup DST® 1.2 L/ha, Amicide Advance 700® 476 mL/ha, Invader® 600 at 50 mL/ha, water 100 L/ha (5 February) Incorporated by sowing: Terbyne® 850 g/ha, Sencor® 700WG 250 g/ha, water 100 L/ha Post sowing: Select Xtra® 500 mL/ha, Factor® 180 g/ha, Supercharge® 100 mL/100 L, water 100 L/ha (8 August)

Disease management	Targeting chocolate spot (*Botrytis fabae* and *B. cinerea*) and ascochyta blight (*Ascochyta fabae*) Penncozeb® 750DF 2 kg/ha, water 100 L/ha (8 August) Penncozeb® 750DF 2 kg/ha, water 100 L/ha (16 September) Howzat® 500 mL/ha, water 100 L/ha (20 September) Bravo® 1.5 L/ha, water 100 L/ha (11 October)
Harvest date	15 December

Soil analysis

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

Characteristic	Depth (0–10 cm)
pH_{Ca}	5.6
Aluminium (KCL) (cmol+/kg)	0.1
Nitrate N (KCL) (mg/kg)	18
Ammonium N (KCL) (mg/kg)	1
Sulphur (mg/kg)	7.1
Phosphorus (Colwell) (mg/kg)	54
Organic carbon (OC) (%)	1.4

Season

The 2016 season at Lockhart was one the wettest experienced, with 568 mm of growing season rainfall (GSR) from April to October, well above the long-term average. While the experiment site experienced intermittent waterlogging across the growing season, drainage was sufficient to avoid crop damage.

Pre-season rainfall from January to May varied; a very dry February and March (Figure 1) after a wet January resulted in soil moisture being marginal at sowing. Timely April rain contributed to good early sowing conditions. Rainfall from May to November was significantly higher than the long-term average, which filled the soil moisture profile leading into spring (Figure 1). This abundant winter moisture provided ideal conditions for plant growth and reproductive crop phases.

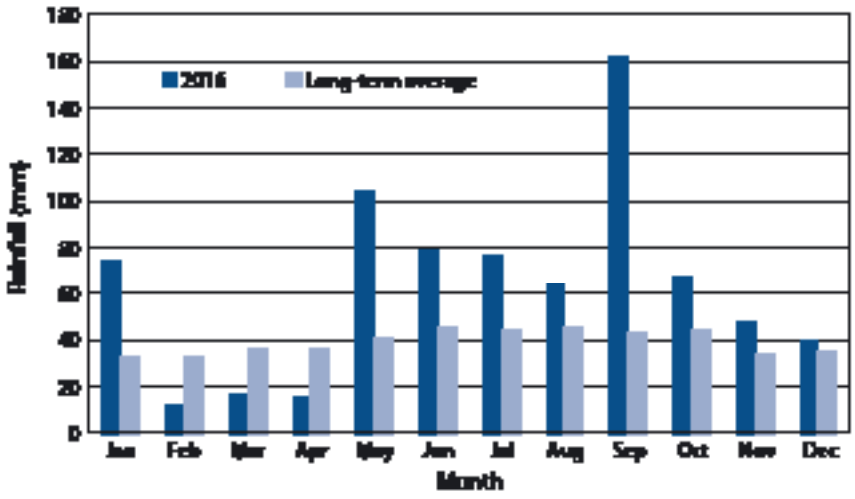

Figure 1. Monthly rainfall for Lockhart in 2016 and the long-term average.

Treatments

Varieties (8)

PBA Nasma$^{\Phi}$, PBA Samira$^{\Phi}$, PBA Zahra$^{\Phi}$, Nura$^{\Phi}$, Farah$^{\Phi}$, Fiesta VF, AF09169, AF10089

Sowing date (SD)

SD1: 28 April
SD2: 18 May

Results

Establishment

Establishment was similar for the two sowing dates with 37.8 plants/m^2 and 34.9 plants/m^2 respectively when averaged over the eight varieties. All varieties had similar plant establishment at both sowing dates.

Grain yield

The advanced breeding lines AF10089 (4.12 t/ha) and AF09169 (3.63 t/ha) had significantly higher yields than all other varieties. PBA Nasma$^{\Phi}$, PBA Samira$^{\Phi}$, PBA Zahra$^{\Phi}$, Farah$^{\Phi}$ and Fiesta VF had similar yields, which were lower than the two advanced breeding lines.

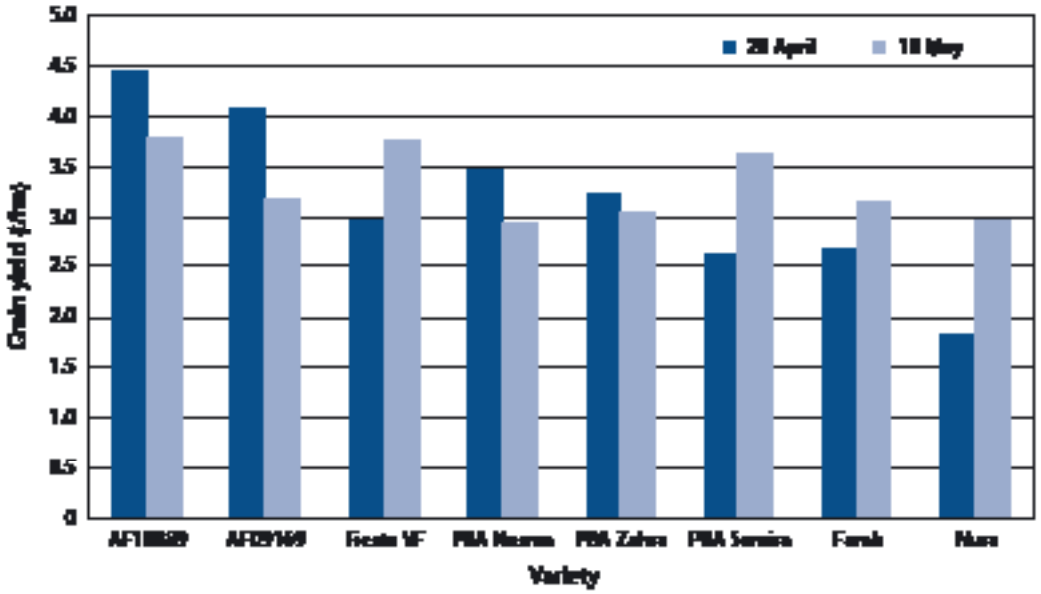

Figure 2. Grain yield for eight faba bean varieties sown on two sowing dates at Lockhart in 2016; l.s.d. (P = 0.05) = 0.85 t/ha.

The grain yield from AF09169 was significantly higher (22%) at SD1 than the later sowing on 18 May (Figure 2). PBA Nasma$^{\Phi}$, AF10089 and PBA Zahra$^{\Phi}$ had slightly higher grain yields at the 28 April sowing date compared with the 18 May sowing date. In contrast, PBA Samira$^{\Phi}$ and Nura$^{\Phi}$ had significantly higher grain yields when sown on 18 May – SD2 (Figure 2).

Days to 50% flowering

There was a reduction in the number of days to achieve 50% flowering when sowing was delayed from 28 April (100 days) until 18 May (95 days). There were significant genetic differences in days to 50% flowering with PBA Nasma$^{\Phi}$ 90.5 days, to Nura$^{\Phi}$ with 104.3 days when averaged across sowing dates.

Lodging

Sowing date significantly affected lodging score when averaged across all varieties. The average lodging score for SD1 on 28 April was 3.0, which was over twice the score for SD2 on 18 May with 8.4, where 1 = lodged and 9 = completely erect. There was variation between the varieties for lodging as Farah$^{\Phi}$ had the highest lodging score with 4.6, while the advanced breeding line AF09169 had the least when averaged over the two sowing dates at 6.6 (Figure 3).

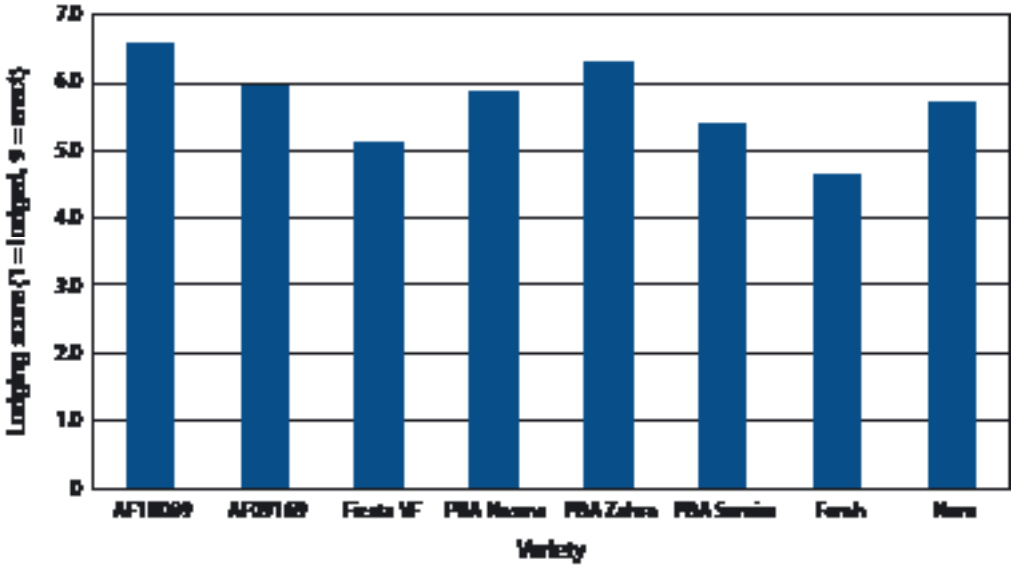

Figure 3. Lodging score (1 = lodged, 9 = erect) for eight faba bean varieties averaged over two sowing dates at Lockhart in 2016; l.s.d. ($P = 0.05$) = 0.9.

Seed size

Seed weight was heaviest at the earliest sowing date of 28 April with an average across all varieties of 70.4 g/100 seeds, which was 11% greater than that of the later sowing date of 62.3 g/100 seeds. There was a 25% variation in seed size with respect to variety, as PBA Nasma$^{\phi}$ had the heaviest seed weight with 77.3 g/100 seeds whilst Farah$^{\phi}$ had the lightest with 57.4 g/100 seeds when averaged across sowing dates. PBA Nasma$^{\phi}$ was significantly larger than all other varieties when averaged across sowing dates. This contrasted its seed size measurement in 2015 which was relatively small when compared to other varieties.

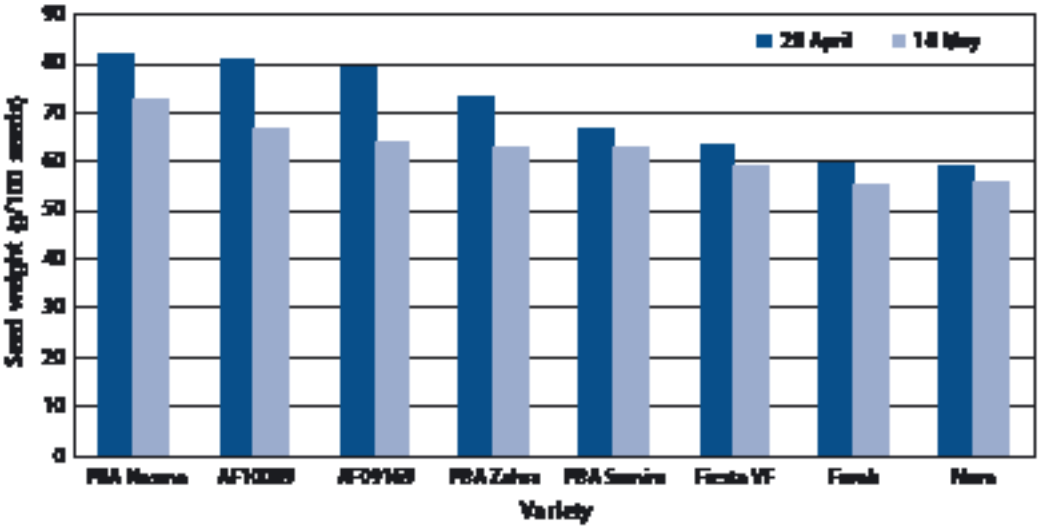

Figure 4. Seed weight for eight faba bean varieties sown on two sowing dates at Lockhart in 2016; l.s.d. ($P = 0.05$) = 3.9 g/100 seeds.

All varieties except PBA Samira$^{\phi}$ and Nura$^{\phi}$ had significant difference in seed weight between the first and second time of sowing (Figure 4). The difference between sowing dates for seed weight was greatest for advanced breeding lines AF10089 and AF09169 with 13.9 g/100 seeds and 14.9 g/100 seeds, respectively. Contrasting the non-significant difference between sowing was Nura$^{\phi}$ and PBA Samira$^{\phi}$ with 3.3 g/100 seeds and 3.5 g/100 seeds, respectively (Figure 4).

Interestingly, PBA Samira$^{\phi}$ and Nura$^{\phi}$ were the only varieties which yielded significantly higher when sown on 18 May compared to 28 April and were also the only varieties where seed weight was not significantly reduced by delayed sowing (figure 2 and 4).

Summary

Given the above average growing season rainfall (568 mm) with plenty of moisture throughout the growing season and grain fill period at Lockhart, the high yield results from this experiment must be considered in context. The similarity in grain yield, 3.16 t/ha and 3.31 t/ha at the two sowing dates of 28 April and 18 May, respectively was in part due to the high moisture levels throughout the growing season coupled with the mild winter and spring temperatures. There were differing responses to sowing date for grain yield with varieties, such as AF09169, AF10089 and PBA Nasma$^{\Phi}$ having higher yields when sown earlier on 28 April whilst PBA Samira$^{\Phi}$, Fiesta VF and Nura$^{\Phi}$ had higher yields when sown later on the 18 May.

The recommended sowing window for faba bean in Wagga Wagga, southern NSW is from late April until the middle of May. Sowing before late April might possibly cause crops to become excessively tall with high biomass that can lead to lodging and increased disease risks. Sowing after the middle of May decreases plant biomass and grain potential.

Lodging scores were highest for the first sowing date when compared with the second, due to ideal growing conditions and very few frosts. Fiesta VF had the highest lodging score (1.8) for the first sowing time.

PBA Nasma$^{\Phi}$ and the two advanced breeding lines AF10089 and AF09169 had high seed weight over 63 g/100 seeds at both sowing dates, and more than 78 g/100 seeds when sown at the first sowing date.

PBA Nasma$^{\Phi}$, AF10089 and AF09169 have exhibited high grain yield in combination with low lodging and large seed size under these environmental conditions. Sowing within the recommended window for each particular variety helps maximise yield potential. Further research into agronomic management is required to maximise yields from PBA Nasma$^{\Phi}$ in southern NSW as this variety exhibits contrasting phenotypic characters to the currently recommended southern varieties PBA Samira$^{\Phi}$ and PBA Zahra$^{\Phi}$.

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