B20 Time of Sowing, HRZ Wagga Wagga, New South Wales

Aim

To compare growth, development and yield of current commercial faba bean varieties and promising advanced breeding lines at three sowing dates on a hard-setting, acidic, red-brown soil at Wagga Wagga in southern NSW. This information will be used to confirm and update current agronomic recommendations for faba bean in this region.

Key Findings

- The optimum time to sowing faba bean at Wagga Wagga 2015 was mid-late April.
- PBA Nasma, PBA Samira, PBA Zahra, Farah and Fiesta VF were the highest yielding commercial varieties.
- Choice of sowing time had far greater consequences on growth, development and grain yield of faba bean than choice of variety in this experiment.
- PBA Nasma produced a small grain size of 53 gm/100 seeds which may have negative marketing implications.

Treatments

Varieties (10)	AF05095-1, AF08207, AF10089, Determinant type, Farah, Fiesta VF, IX22OD/2-5, Nura, PBA Rana, PBA Samira.
Time of sowing (3)	14th April, 1st May, 18th May 2015

Site details

Site	Paddock 18, Wagga Wagga Agricultural Institute.
Soil type	Red-brown earth, pH ($CaCl_2$) (0–10 cm) 5.8
Trial Design	Randomised complete block design with sowing date the main blocks and varieties the sub-plots; three replications.
Sowing	Direct –drilled using a six row cone seeder with 300mm row spacings and GPS auto-steer
Inoculation	Group F peat inoculant was mixed directly into an on board 100L water tank then pumped though micro-tubes into each sowing furrow
Stubble management	Paddock had been burnt to remove wheat stubble (light burn only, still some stubble standing)
Fertiliser	80 kg/ha grain legume super (N:P:K:S 0:13.8:0:6.1) placed 50 mm below the seed
Plant population	Target 30 plants/m^2, 30 cm row spacing
Weed management	Commercial practices used with the aim of weed-free trials, eliminating both weed competition and weed seed set. Fallow weed control: 2 L/ha glyphosate (450 g/L) and 1 L/ha 2,4-D LV ester (680 g/L) Incorporated by sowing: 2 L/ha glyphosate (450 g/L), 2 L/ha Stomp® (440 g/L pendimethalin), 1.6 L/ha Avadex® (400 g/L tri-allate) and 900grams/ha Terbyne® (750 g/kg terbuthylazine) Post sowing: 300grams per ha of Terbyne (750 g/kg terbuthylazine) 500 ml/ha Select® (240 g/L clethodim), 100 ml/ha Verdict® (520 g/L haloxyfop) and 500 ml/100 L Uptake spraying oil
Insect / Disease management	Targeting *Helicoverpa* sp, Lucerne flea*, chocolate spot.* 100ml Lemat (12.6.15) Penncozeb 750 @ 1kg per ha (9.7.15) Penncozeb 750 @ 1kg per ha (7.8.15) Howzat 500g/l carbendazim @ 500ml per ha (2.9.15) Howzat 500g/l carbendazim @ 500ml per ha (21.9.15) Trojan 150g/l Gamma-Cyhalothrin @ 30ml per ha (24.10.15)

Soil analysis

Table 1. Site soil chemical characteristics for 0–10 cm and 10–30 cm depth at Wagga, 2015.

Depth	pH (1:5 $CaCl_2$)	Al Sat %	Total Nitrogen %	Sulfur mg/kg	P (Colwell) mg/kg	CEC cmol(+)kg
0–10 cm	5.8	<0.1	0.026	5.1	21	7.4
10–30 cm	5.0	<0.1	0.041	6.4	47	5.5

Rainfall

The 2015 growing season at Wagga Wagga was almost ideal for pulses except for a disastrous September/October. Growing season rainfall (April to October) was close to long-term average (333mm), with 56mm of this falling in early April ensuring timely sowing. Rainfall in June, July and August was 50% above long-term average and this contributed to valuable sub-soil moisture.

However, the flowering and grain filling period of September-October was extreme with eight continuous weeks of no effective rainfall and wide temperature fluctuations (5 September to 31 October). Three consecutive days in late September (23rd-25th) received below zero temperatures and damaging frosts, only to be followed by an exceptionally hot dry October. Average daily maximum temperature for the month exceeded the long-term average by 8.3°C, and the first week experienced unseasonal temperatures in the mid-30's.

Results

Establishment

Faba bean establishment was close to the targeted establishment, 30 plants/m^2. TOS 1 achieved an average plant establishment of 36.7 plants/m^2 and TOS 2 with 34.5 plants/m^2. TOS 3 was slightly but significantly lower with plant numbers at P<0.001 of 28 plants/m^2.

Grain yield, dry matter production and harvest index

Time of sowing was a critical factor for maximising faba bean yield in this experiment. Whilst there was no significant difference between TOS 1 and TOS 2 at P<0.001 , a delay in sowing until the 18th May resulted in a yield decline of 26% across all ten varieties (figure 1).

There was also a significant variety and time of sowing interaction at P>0.001 in this experiment. PBA Nasma yielded significantly higher than all other varieties in TOS 1. . PBA Nasma is a northern NSW variety and is susceptible to ascochyta blight. Also, its seed size in southern NSW is smaller than PBA Zahra and PBA Samira, which may have marketing implications. Across all sowing times PBA Nasma, PBA Samira, PBA Zahra, Farah and Fiesta VF were the highest yielding varieties. The large seeded PBA Rana was significantly lower yielding that the other commercially available varieties in all three sowing time treatments (Figure2). It must be noted that the last significant rainfall event was on the 4 September and the trial suffered severe heat and moisture stress in the first week of October. This event combined with moisture stress caused both TOS to abort flowers and finish prematurely. Due to the more advanced stage of development TOS1 and 2 were less severely affected. Irrespective, these results are consistent with maximum faba bean yield resulting from mid-April to early-May sowing in this region. Growers still need to be mindful of the consequences of:

- sowing too early (prior to 20 April) – excessive height, lodging and disease;
- sowing too late (after the middle of May) – short plants and restricted dry matter and grain yield.

Growers also need to aware that in cool, moist extended springs, even late April sowings can be subject to greater disease pressure and require careful monitoring and foliar fungicide sprays. Whilst this site experienced a wet winter and early spring, a preventative fungicide program combined with dry spring conditions reduced disease levels to an insignificant level.

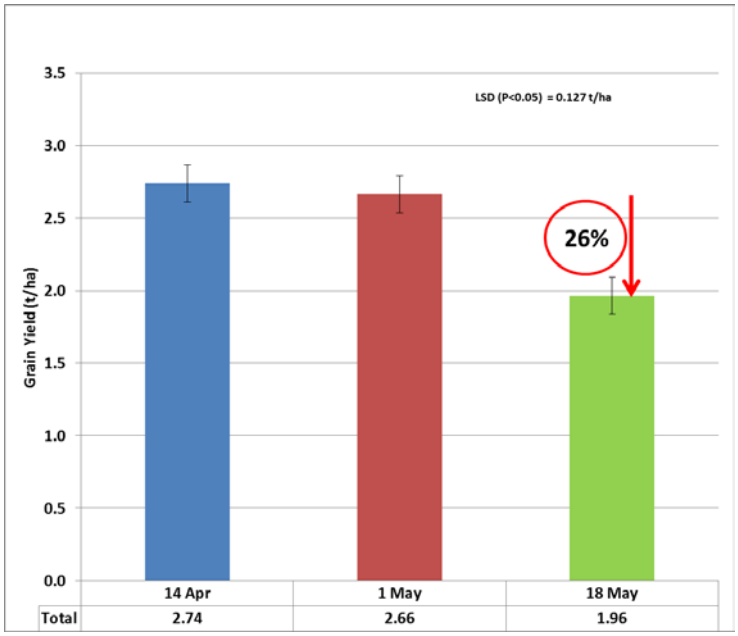
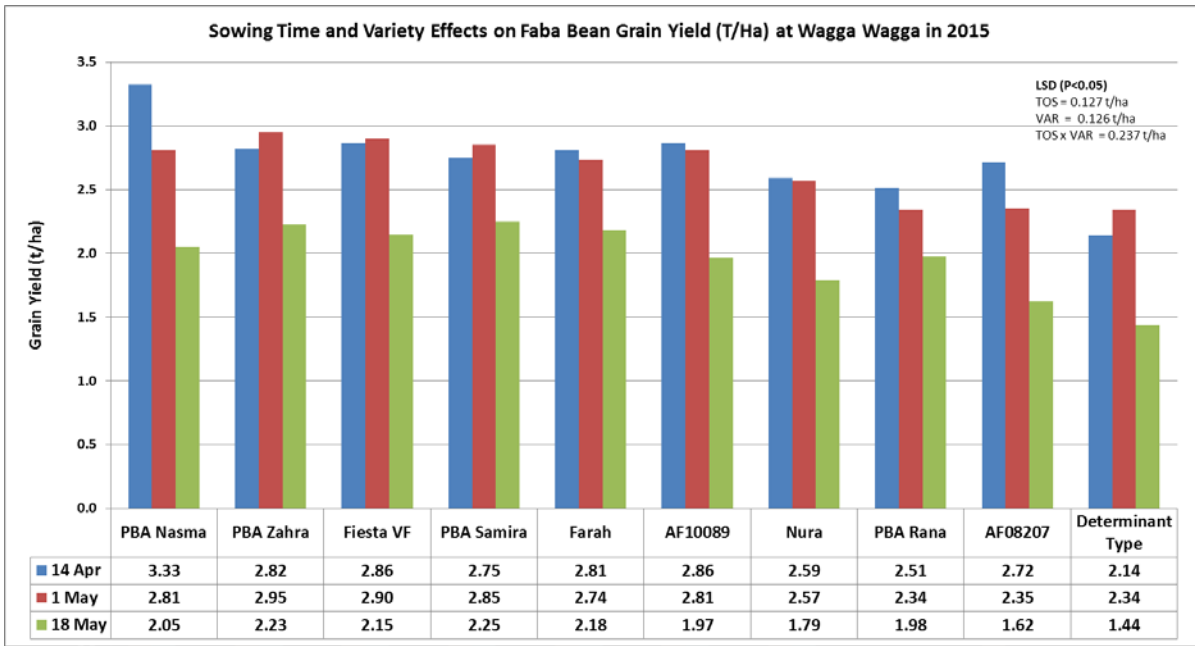
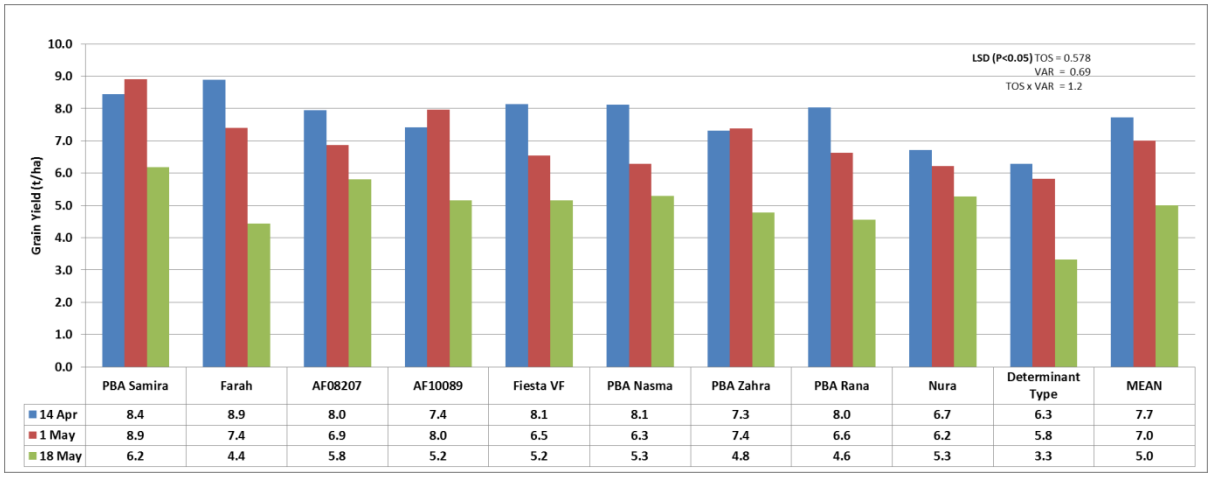


Figure 1. Mean grain yield of ten faba bean varieties sown at three dates at Wagga Wagga in 2015.



	PBA Nasma	PBA Zahra	Fiesta VF	PBA Samira	Farah	AF10089	Nura	PBA Rana	AF08207	Determinant Type
14 Apr	3.33	2.82	2.86	2.75	2.81	2.86	2.59	2.51	2.72	2.14
1 May	2.81	2.95	2.90	2.85	2.74	2.81	2.57	2.34	2.35	2.34
18 May	2.05	2.23	2.15	2.25	2.18	1.97	1.79	1.98	1.62	1.44

Figure 2. Grain yield of ten faba bean varieties sown at three dates at Wagga Wagga in 2015.



	PBA Samira	Farah	AF08207	AF10089	Fiesta VF	PBA Nasma	PBA Zahra	PBA Rana	Nura	Determinant Type	MEAN
14 Apr	8.4	8.9	8.0	7.4	8.1	8.1	7.3	8.0	6.7	6.3	7.7
1 May	8.9	7.4	6.9	8.0	6.5	6.3	7.4	6.6	6.2	5.8	7.0
18 May	6.2	4.4	5.8	5.2	5.2	5.3	4.8	4.6	5.3	3.3	5.0

Figure 4. Dry matter production (DM) of ten varieties of faba bean sown at three dates at Wagga Wagga in 2015.

Dry matter production was similar at the first two sowings (7.7–7.0 t/ha) but decreased significantly (by 29%) when sowing was delayed to 18 May (average 5.0 t/ha). The more vigorous growth of PBA Samira, Farah, PBA Zahra, PBA Nasma and PBA Rana, and was reflected in higher DM at the first two sowings.
There was a small but significant time of sowing and variety interaction for harvest index (HI%). Harvest index increased significantly from TOS 1 (35.6%) to 40.1% and 40.5% for TOS 2 and TOS 3 respectively. Whilst TOS 2 and TOS 3 had significantly different grain yield and DM totals they were similar in their efficiency of converting DM to grain. The implication here for a higher HI% is, more N is exported in the grain and less residual N remains.

Seed size
There was no significant variety and time of sowing interaction in this trial. Not surprisingly variety was significant for seed size at P<0.001 given normal seed size variation between faba bean varieties. Whilst PBA Rana was significantly lower yielding than the other commercial varieties it did however have a significantly larger seed size at P<0.001 (Figure 3). Interestingly, in this experiment PBA Nasma was significantly smaller seeded than all other varieties tested at 53.3 gm/100 seeds (Figure 3).

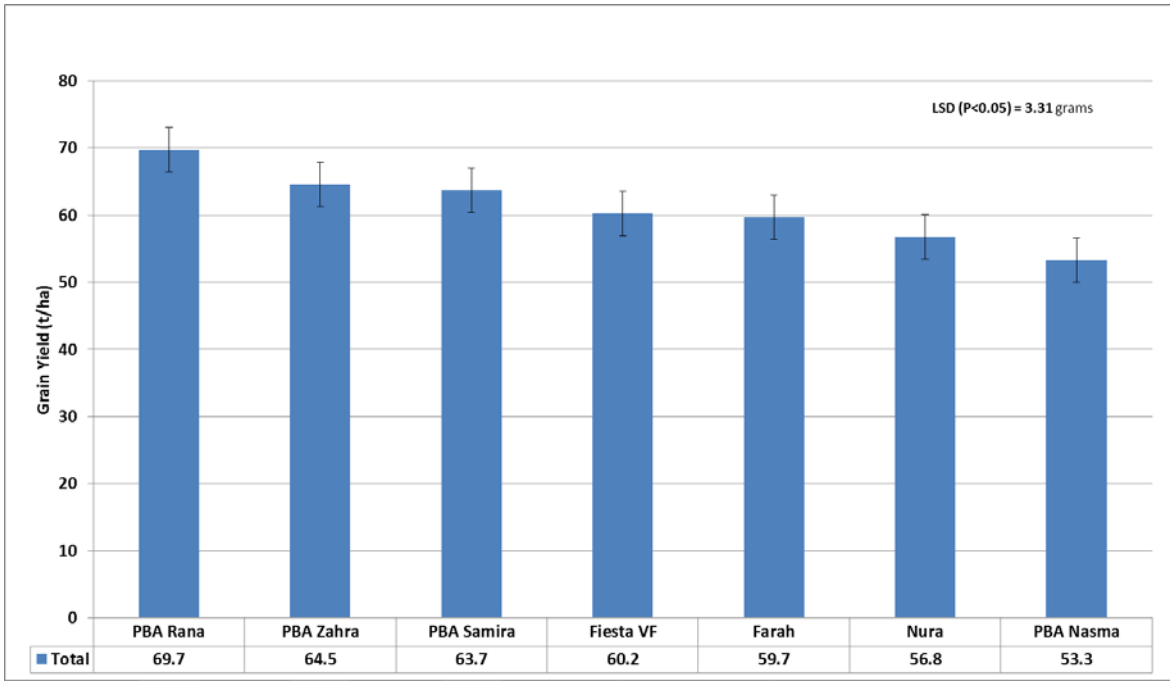


Figure 3. Effect of ten faba bean variety on grain weight at Wagga Wagga in 2015.