

Faba bean agronomy and varieties

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KEY MESSAGES

- Prices for faba beans have remained very high compared with long term averages, enhancing the profitability of faba beans. Growers always need to be aware of possible price swings as the international market is limited. The potential return for the crop should be based on longer term pricing between \$300 and \$400/t
- New varieties, PBA Zahra and PBA Samira, offer significantly improved grain yield (>10%) and disease resistance compared with older varieties
- Sowing early is essential to maximise benefits to the farming system from improved biomass and grain yield to maximise profitability
- Good disease management is critical to maximise grain yield and quality. Growers are encouraged to carefully plan their strategies, regularly monitor crops and have fungicide purchased in advance, to ensure appropriate timing of application

LONGER TERM LESSONS 2012-15

Faba beans have continued to produce excellent and profitable yields in the higher rainfall zone of South Western Victoria. From 2012 to 2015 in Southern Pulse Agronomy (SPA) trials, gross profits between approximately \$700/ha and \$2000/ha were achieved (based on average management costs of \$250/ha and grain price at \$400/t for the best varieties; table 1). This has led to a large expansion in area sown and increasing interest in agronomic management of the crop. Growers are also benefiting from the system benefits related to improved weed control options, breaking the cereal disease cycle and reducing fertiliser nitrogen costs. Trials over this period have addressed a range of issues to maximise yields, from new varieties to sowing dates and rates, row spacing and stubble, inoculation treatments, disease, nutritional and canopy management.

New varieties: Growers should consider upgrading to the latest varieties as yield benefits of more than 10% can be expected in addition to improved agronomic traits. In SPA trials from 2012 to 2015, PBA Zahra and PBA Samira had grain yields 122% and 112% of Farah (table 3). In the higher yielding seasons of 2012 and 2013 PBA Zahra had yields 137% of Farah, which could be worth between \$400-\$600/ha in those seasons.

Table 1. Mean grain yield and estimated net returns of faba beans grown at Southern Pulse Agronomy trial sites in the high rainfall zone from 2012 to 2015.

Variety	2015		2014		2013		2012		Average	
	Grain yield (t/ha)	Net return (\$/ha)								
PBA Zahra	2.35	690	3.09	988	3.94	1326	5.53	1962	3.73	1241
PBA Samira	2.44	726	3.05	971	2.97	939	5.14	1806	3.40	1110
PBA Rana	2.22	638			3.38	1102	4.49	1546	3.36	1095
Nura	2.18	622	2.71	834	2.85	889	4.14	1406	2.97	938
Farah	2.32	678	2.95	928	2.88	903	4.04	1366	3.05	969
LSD (p<0.05)	0.20		0.20		0.30		0.37			

Sowing time: To maximise yield potential in beans, growers are encouraged to sow early (mid-April to first week May). Trials sown by Southern Farming Systems at Westmere in 2015 again highlighted the importance of this, with yields more than 30% greater when sown in April (2.6 t/ha) compared with May (1.9 t/ha). Historically sowing has been delayed to minimise the risks of disease and improve weed management. Better adapted varieties combined with improved disease and weed management tools can now overcome these risks of earlier sowing.

Row spacing, stubble and sowing rate: Due to their indeterminate growth pattern, faba beans are relatively adaptable to a range of row spacing and sowing rates. Trials have generally shown minimal differences in yields from 20 cm (8') to 38 cm (15') row space. It is important to consider the disease management and stubble management benefits from wider rows in your system, particular if sowing early with new higher biomass and better adapted varieties. Where possible, maintaining stubble will maximise yield potential and harvestability in beans (pod height is increased in standing stubble). Data in 2015 from sowing rate trials on the modern varieties such as PBA Zahra and PBA Samira support the traditional recommendation of 20 plants/m² on narrow rows, but on wider rows reduction in density to 15 plants/m² did not reduce yields. Growers are advised to avoid dropping below 15 plants/m² as grain yields dropped by about 20% when reduced to 10 plants/m² (data not shown).

Disease management: To minimise the risks of yield and grain quality loss, growers are encouraged to use a strategic fungicide strategy and regularly monitor crops for symptoms. Specific management guides are available from the Pulse Australia website (<http://www.pulseaus.com.au/growing-pulses/bmp/faba-and-broad-bean/idm-strategies>). Trials in the last few years have shown yield improvements from disease management strategies ranging from 50% (>1 t/ha) in 2011 to 0% in 2013. That yield loss in 2011, could be have cost more than \$400/ha.

2015 RESEARCH TRIALS

Ten trials were located in the HRZ in 2015 across sites at Rokewood, Westmere and Hamilton investigating sowing dates, plant densities, inoculation, nutrition and grow regulants, and fungicide regimes.

Sowing date

At Westmere, a trial investigated the impact of sowing dates (April 22 and May 22) on the growth and yield of PBA Zahra and PBA Samira, which are two newer varieties that are more resistant to disease.

The soil was moist on both sowing dates, so there were no delays in establishment. Sowing early resulted in improved early vigour and biomass, leading to a much more developed canopy due to warmer establishment temperatures (figure 1). Also, plants in this treatment developed more racemes to flower and pod. There were no major differences in disease incidence noted between the sowing dates. At maturity, consistent with observations throughout the season, earlier sown treatments were visually taller and appeared to have increased biomass.

PBA Zahra and PBA Samira displayed a similar response to sowing date with the April 22 sowing displaying grain yields 30% greater than May 22 (Table 2). In addition to improved grain yields, the higher biomass that results from sowing earlier is likely to result in greater input of N to the farming system.

Table 2. Grain yields of faba beans at Westmere in the sowing date trial.

Sowing date	Yield (t/ha)
April 22	2.6 a
May 22	1.9 b

Means followed by same letter do not significantly differ (LSD ($p=0.05$)=0.2 t/ha).



Figure 1. Establishment and early growth of beans in the sowing date trial at Westmere (mid-July).

Sowing rate

Three sowing rate trials were sown in 2015 to determine the optimum plant density for the new variety PBA Zahra. At Rokewood, PBA Zahra was sown (April 23) in comparison to Nura, at target densities of 5, 10, 15, 20 and 30 plants/m² in a no till system with standing stubble and 36 cm row space. At Westmere and Hamilton, PBA Zahra was sown in comparison to PBA Rana at target densities of 10, 20, 30 and 40 plants/m² in a conventional system (20 cm row space) on April 22 and April 30, respectively.

At Westmere and Hamilton, establishment was slightly higher than target (table 3) and PBA Zahra generally had slightly better establishment than PBA Rana (not shown). Establishment was not recorded at Rokewood. Growth throughout the season was good at Rokewood and Westmere, but stunted at Hamilton, where poor nodulation was observed. The reason for poor nodulation was unclear, but could be related to herbicide residues. There were no differences in disease intensity across treatments within any of the trials. All sites were impacted by dry conditions throughout spring and the heat wave in late October.

In terms of grain yield, at all sites varieties generally responded similarly to plant densities. At Westmere and Hamilton highest yields were achieved at the target densities of 30 and 40 pl/m², while at Rokewood the only density to show reduced yields was 5 pl/m² (tables 3 and 4). Despite the differences in grain yield between the 20 and 30 pl/m² treatment at Westmere and Hamilton, the relative profitability was likely to be similar due to the increased sowing costs of the higher plant density.

Responses observed in these trials are reflective of previous observations which indicate that sowing rates can be reduced when using wider row spacings, particularly in a stubble retained system. At Rokewood, where the optimum density was 10-15 pl/m², row spacing was 36 cm (in standing stubble), while at Westmere and Hamilton row spacing was 20 cm (conventional system) and the optimum density was 20-30 pl/m². At Hamilton, where growth was poor due to the poor nodulation, higher densities were needed to maximise yield.

At Westmere, the average yield of PBA Zahra was 3.0 t/ha compared with PBA Rana 2.5 t/ha, while at Hamilton and Rokewood the yields were similar to PBA Rana and Nura, respectively.

Table 3. Establishment and grain yields of beans sown at Westmere and Hamilton in sowing rate trial.

Target plant density (pl/m ²)	Sowing rate (kg/ha)*	Westmere		Hamilton	
		Establishment (pl/m ²)	Grain yield (t/ha)	Establishment (pl/m ²)	Grain yield (t/ha)
10	70	16	2.3 c	16	0.7 c
20	140	26	2.8 b	27	1.2 b
30	210	35	3.0 a	39	1.6 a
40	280	47	3.0 a	42	1.8 a

Means followed by same letter do not significantly differ (Westmere – LSD ($p=0.05$)=0.2 t/ha; Hamilton – LSD ($p=0.05$)=0.3 t/ha).

* Estimated based on a seed size of 70 g/100 seeds.

Table 4. Grain yields of beans sown at Rokewood in sowing rate trial.

Target plant density (pl/m ²)	Grain yield (t/ha)
5	1.5 b
10	1.9 ab
15	2.1 a
20	2.1 a
30	2.0 a

Means followed by same letter do not significantly differ LSD ($p<0.10$)=0.39 t/ha

Disease management and new fungicides

Three disease management trials were sown to determine the optimum strategy for chocolate spot control in faba beans. At Westmere (sown April 30) and Hamilton (sown May 4) PBA Zahra and Nura were compared under three management regimes: nil, standard (carbendazim at early flower and again two to three weeks later), and fortnightly (carbendazim applications every two weeks until end of flowering). At Rokewood (sown April 23), eight varieties were compared under four regimes: nil, 2xCS (carbendazim applied early and late flower), 3xCS (carbendazim applied early, mid and late flower) and fortnightly (mix of carbendazim, chlorothalonil and mancozeb applied fortnightly from eight weeks after sowing). In addition, another fungicide trial at Westmere focussed on finding potential replacements for carbendazim as an active ingredient for the control of chocolate spot.

Disease pressure across all sites was relatively low in 2015, resulting in no significant grain yield increase from fungicide application at Rokewood and Hamilton. However, at Westmere in the disease management trials there were significant differences observed in both disease incursion and grain yield. All varieties showed similar response to fungicide regimes. In the fortnightly, standard and nil treatments there was 3%, 6% and 10% of leaf area affected by disease, respectively. This resulted in grain yields of 2.0, 1.9 and 1.6 t/ha, respectively.

Comparing varieties, PBA Zahra had grain yields higher than Nura at Westmere (2.1 cf. 1.7 t/ha) and Rokewood (table 1) and lower than Nura at Hamilton (1.4 cf. 1.7 t/ha).

In the 'new fungicide' trial disease pressure was relatively low and consistent across all varieties and fungicide treatments (Table 5). Relative to the standard treatment used to control chocolate spot, 'carbendazim', there was no effect on grain yield or disease score from any of the fungicides. Similar to the disease management trial, PBA Zahra had significantly higher grain yield (2.3 t/ha) than PBA Rana (1.7 t/ha) and Nura (1.8t/ha) (LSD ($p=0.05$)=0.1 t/ha). Further testing needs to occur in seasons of high disease pressure to fully assess the applicability of utilising these fungicides to control disease in beans.

Table 5. Yield and chocolate spot score by variety and fungicide treatment for the chocolate spot trial. Average yield 1.9 t/ha. Chocolate spot score not significant.

Fungicide	Chocolate spot score (% leaf area)			Grain yield (t/ha)		
	PBA Zahra	PBA Rana	Nura	PBA Zahra	PBA Rana	Nura
Azoxystrobin + cyproconazole	15	18	13	2.5 a	1.5 c	1.7 bc
Bixafen + prothioconazole	11	20	21	2.4 a	1.5 c	1.7 bc
Carbendazim	13	18	13	2.4 a	1.7 bc	1.8 b
Chorothalonil	16	16	11	2.2 a	1.7 bc	1.8 b
Tebuconazole + azoxystrobin	16	23	18	2.2 a	1.9 b	1.8 b
Chorothalonil	16	16	11	2.2 a	1.7 bc	1.8 b
Tebuconazole + azoxystrobin	16	23	18	2.2 a	1.9 b	1.8 b

Means followed by same letter do not significantly differ (LSD ($p=0.05$)=0.3 t/ha)

Inoculation and nutrition

A trial was sown to determine the effect of nutrition, growth regulants and nodulation treatments on PBA Zahra faba bean growth and yield at Rokewood (sown April 23). The nodulation and growth regulants included a number of novel experimental treatments, while nutrition treatments were foliar applied boron, zinc and copper. In addition, two nitrogen treatments of 100 and 200 kg/ha were applied through split applications at sowing and throughout the season. All treatments were compared with a control treatment with granular inoculant and standard fertilizer applied at sowing (100 kg/ha MAP 9.1, 20.2, 0, 2.7 + 2.5% Zn).

In terms of growth regulants, one treatment significantly reduced growth and grain yield, while another improved grain yield (data not shown). None of the nutrient treatments with boron, zinc or copper applied foliar caused a significant response. In the nodulation treatments, all inoculants had nodule numbers not significantly different from the granular rhizobia (I_Gran) treatment (figure 2). However, the 'Nil' treatment (with inoculant applied) and the nitrogen fertilizer treatments had a reduction in the number of nodules per plant. Grain yields were similar across all treatments, except the inoculation treatment 'I_SB', which showed a significant reduction. Further work is ongoing to investigate the amount of nitrogen fixed in these treatments and potential contribution of nitrogen to the farming system.

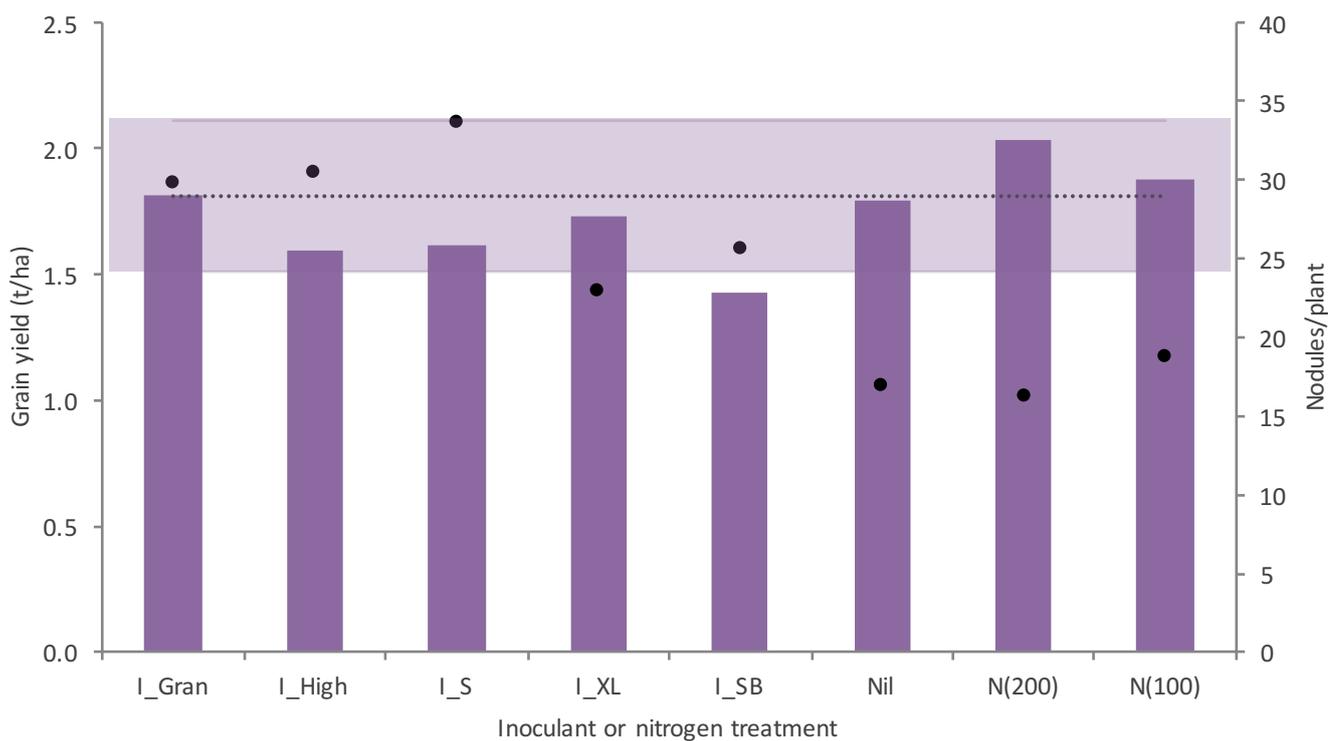


Figure 2. The effect of nodulation treatment or nitrogen application on the number of nodules/plant (dots) and grain yield (bars) of PBA Zahra faba beans grown at Rokewood in 2015. Bars that fall outside the shaded zone have grain yields significantly different from the control 'I_Gran' treatment. Nodules/plant LSD($p < 0.05$)=8; Grain yield LSD($p < 0.05$)=0.3 t/ha.

ACKNOWLEDGEMENTS

Trials at Rokewood were funded by GRDC and DEDJTR under the project "Expanding the use of pulses in the southern region" as part of Southern Pulse Agronomy (DAV00113). Trials at Westmere and Hamilton were part-funded by this project in collaboration with Southern Farming Systems.

