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# Faba beans on acidic soils in southern NSW: time of sowing effects on yield

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## Key findings

- Sow faba bean from 20 April (low rainfall zone) to 15 May (higher rainfall zone) on acidic soils in southern NSW.
- Sowing earlier than 20 April can result in excessive lodging and disease risk.
- Sowing later than mid-May lowers yield and produces shorter plants, affecting harvesting.
- Time of sowing has a greater impact on grain yield than choice of variety.

## Introduction

Variety evaluation and agronomic investigation of faba bean has been undertaken at Wagga Wagga Agricultural Institute as part of a national research program. Faba bean shows considerable promise as a profitable crop in its own right and as a pulse break crop in southern NSW cropping sequences. It is a competitive, erect, vigorous crop with high dry matter production and grain yield potential. Faba bean appears slightly more frost hardy and more tolerant of heavy soils than other pulses, fixes large amounts of nitrogen, has non-shattering pods and is well suited to mechanical harvest. It is important to adhere to tight disease protocols across the entire season. Avoid sowing the crop too early which can promote disease, excess growth and lodging, particularly in favourable extended springs. Equally, seeding too late may deprive the crop of height, bulk and yield, especially in drier seasons with quick early springs.

## Site details

The site was limed in 2011 lifting the $pH_{Ca}$ to 5.2 at 0–10 cm depth (*Table 1*), providing a more favourable environment for pulses and their associated rhizobia. The paddock had a failed pasture in 2013 which was chemically fallowed in the spring.

## Treatments

Eight varieties/breeding lines were included in this experiment but for simplicity and clarity, only four commercial varieties and one breeding line are reported here. Three sowing times were undertaken; 2 April, 24 April and 12 May. Stubble was absent and plots direct-drilled using a six-row coneseeder with 300 mm row spacing and GPS guidance. At seeding, 80 kg/ha SuPerfect® grain legume fertiliser (NPKS 0:13.8:0:6.1) was placed approximately 2 cm below the seed. Group F peat inoculant was mixed with water in an on-board tank and injected down each sowing tine at sowing. Normal recommended cultural practices were adopted for weed, insect and disease control throughout the season.

Table 1: Soil analysis of paddock 20A Wagga Wagga Agricultural Institute 2014.

| Depth | 0-10 cm | 10-20 cm |
|---|---|---|
| $pH_{Ca}$ | 5.2 | 5.0 |
| Al Sat % | 1.7 | 2.5 |
| Nitrate N | 8.5 | 15.0 |
| Ammonium N | 0.8 | 1.1 |
| P (Colwell) | 34.0 | 13.0 |
| CEC | 7.0 | 6.5 |

## Results

### Season effects

Chocolate spot (*Botrytis* sp.) fungal disease was present in the crops, especially the early times of sowing, but did not become severe. Fungal disease requires moist conditions, with 90% relative humidity optimal for disease spread, and was held in check by the dry weather in the spring. The high incidence of frosts through July and August caused stem splitting and bending that was most severe in the early sown crops. Overall, 2014 was a favourable pulse year at Wagga Wagga with minimal disease, above average yields and an early, dry harvest producing good quality unblemished seed.

### Grain yield, dry matter production and harvest index (HI%)

Grain yields were between 2.8 and 3.1 t/ha, well above the expected long-term average of 1.8–2.0 t/ha for faba beans at Wagga Wagga. This result was remarkable given the very dry, warm July, August, September and October and the 2–3 weeks premature finish to the growing season.

Despite these good yields, differences between varieties and sowing times were not statistically significant This suggest that the dry spring created a levelling effect across all treatments, with moisture and temperature imposing a ceiling to potential yield. All treatments effectively ran out of moisture. These results support a sowing time window from early April to mid-May for faba bean. In this region, growers still need to be mindful of the pitfalls of sowing too early (prior to 15 April resulting in excessive height, lodging and

disease) and sowing too late (short plants, loss of DM and grain yield).

Dry matter (DM) production was similar at the first two sowings (9.1–9.3 t/ha) but fell significantly (20%) when sowing was delayed to 12 May (average 7.5 t/ha). PBA Rana and PBA Samira produced significantly more DM at the first two sowings. The more vigorous growth of these two varieties was also reflected in higher NDVI readings at the early vegetative stage of both varieties, especially PBA Rana (data not shown).

Harvest index (HI%) was similar at the first two sowings (31–32%) but rose significantly at the final sowing (38%). Dry matter is converted more efficiently into grain yield with later sowings, but the down side to later sowing is less residual fixed N since a greater proportion of N is exported in the grain.

### Plant height and podding

Varieties such as PBA Rana that flower and pod later tend to set pods on later nodes, higher up the stem than early varieties such as IX220D/2-5.

Plant height and height of bottom pods declined significantly with delayed sowing from 2 April to 12 May (*Figure 1*). Past experience shows this trend continues with further sowing delays. This has a significant effect on the harvester's ability to get below bottom pods and for this reason growers should not delay sowing.

In contrast, plants can grow too tall and lodge when sown too early, as occurred in this experiment at the first sowing (2 April; *Figure 2*). PBA Rana and Farah were most vulnerable to lodging under ideal early growing conditions.

All varieties were shorter at the second and third sowings and remained erect, simplifying management and harvest.

### Growth and development phases

Delays in sowing constricts the flowering and grain fill phases of all faba bean varieties (*Figure 3*). For example, a 40 day difference at sowing (from 2 April to 12 May) was reduced on average to only a 12 day difference between varieties at the end flowering (range 17 September to 29 September), and further to only 4 days difference at maturity (range 27 October to 31 October).

This significant reduction of the growing period with later sowings was reflected in much shorter plants, more erect growth, less disease, reduced DM, a halving of the length of the flowering period (from 73 days to 37 days) and a significant reduction in the number of flowering nodes. Interestingly, yield remained unaffected, thus the late sown crop had a significantly higher harvest index than the early sown crops. This reflects the significant frost damage to the April sown crops which were unable to fulfil their yield potential.

Nura was the latest variety to flower at all sowing dates, preceded by PBA Rana and PBA Samira.

IX220D/2-5 is a very early northern NSW breeding line and was included in this experiment to compare phenology to southern lines. It started flowering 60, 37 and 18 days earlier than PBA Rana at the 1st, 2nd and 3rd sowing time respectively, but finished flowering

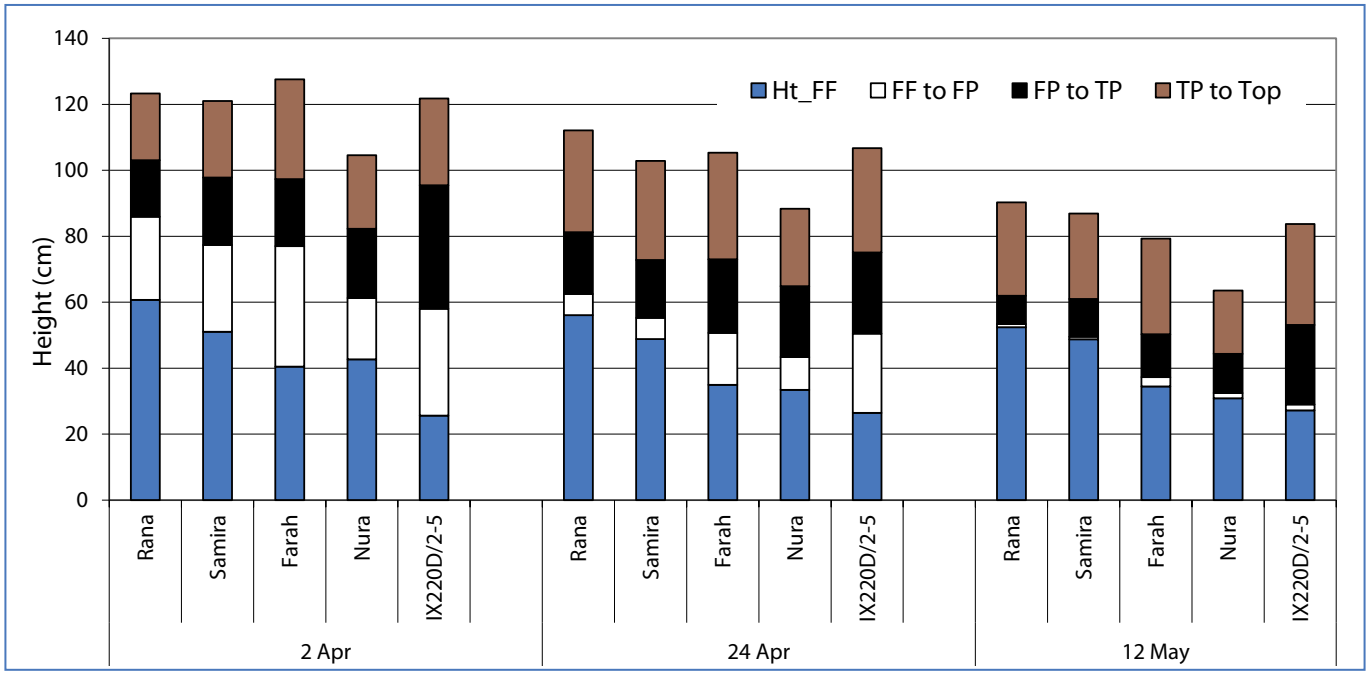


Figure 1: Effect of sowing date and variety of faba bean on height of the stem to first flower (FF), first pod (FP), top pod (TP) and to the top of the plant (Top).

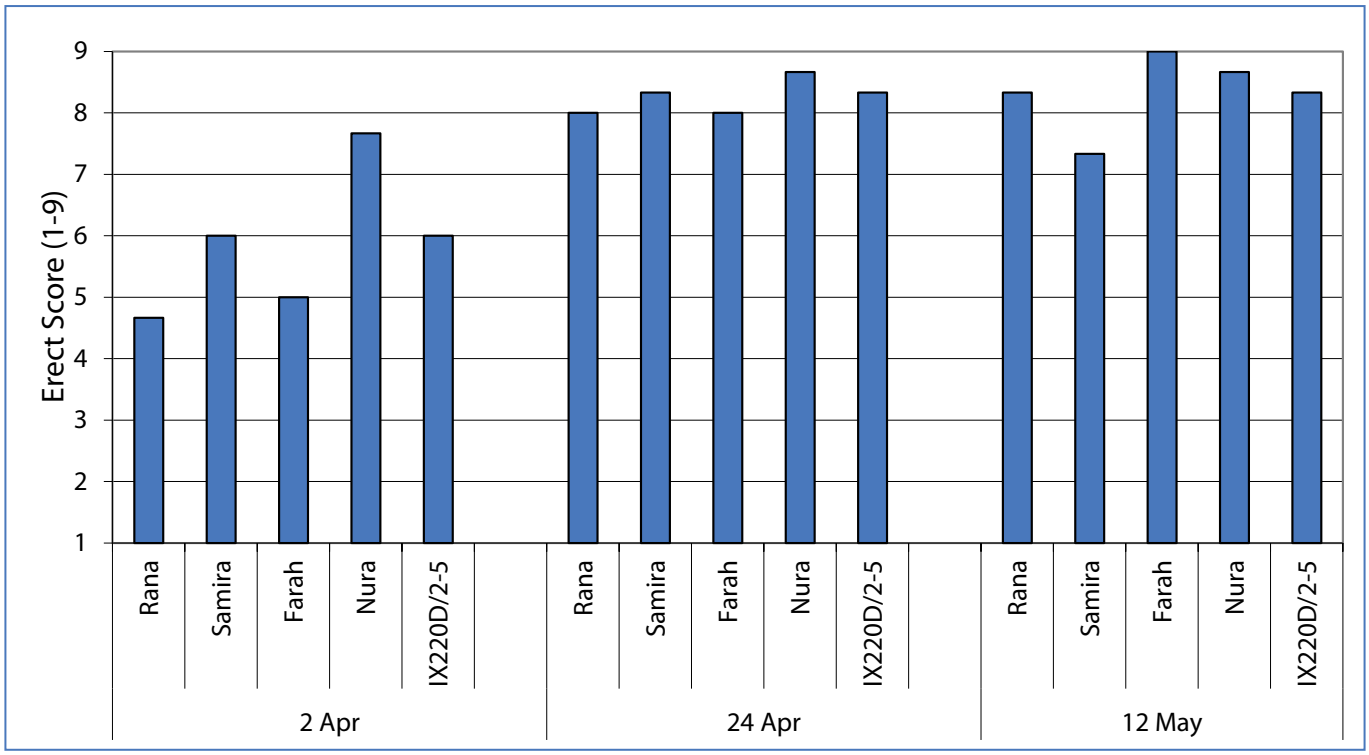


Figure 2: Effect of sowing date and variety on faba bean lodging. The scale for erectness uses a 1–9 score, where 9 is completely vertical and 1 completely flat.

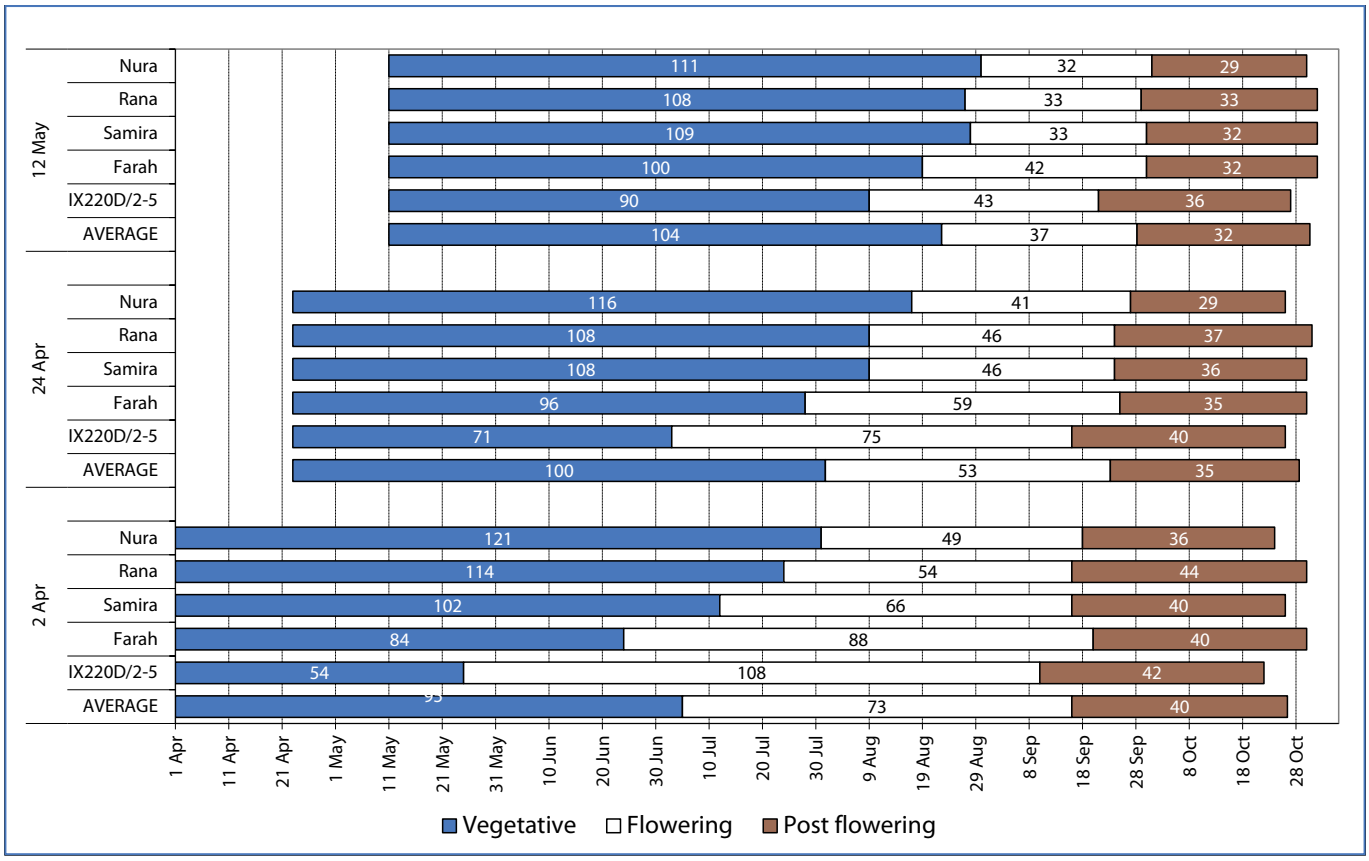


Figure 3: Development phases of five faba bean varieties at three sowing dates at Wagga Wagga in 2014.

only 6-8 days earlier. This wide flowering window results in a significantly larger number of podding nodes to potentially contribute to yield, and some insurance against environmental extremes during this period. It demonstrated a very high yield potential in 2013, but this advantage did not carry through to 2014.

## Summary

Faba beans had above average yield (2.8–3.1 t/ha) in a dry spring at Wagga Wagga.

Early April sown treatments escaped a yield penalty from potential disease due to the dry spring, despite their high biomass. If an average spring occurs, the disease in the early sown treatments would be difficult to control with fungicides.

The early April sown crops suffered extensive damage from frosts which had a significant impact on grain yield potential.

The dry spring largely negated differences between varieties and time of sowing as yield potential was not reached.

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