Evaluating Yield Constraints in Faba Beans: Insights from the 2024 NAPA Trial in Perillup

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Key Messages

- National Pulse Agronomy (NAPA) trials aim to generate phenology, soil and yield data for a range of varieties, grown nationally across a wide range of dryland conditions.
- The three main season varieties; PBA Bendoc, PBA Amberly and PBA Samira, produced similar yields in time of sowing one (TOS 1).
- The dry start to the season significantly impacted plant establishment in TOS 1.
- The dry finish to the season impacted pod set and pod fill at the end of the season, especially in the main season varieties.
- The short season varieties PBA Nasma and FBA Ayla, which are widely grown in the northern Australian ag region, did not yield higher than the commonly grown longer season varieties.
- PBA Nasma and FBA Ayla flowered too early in the season (in cold conditions), despite the later time of sowing (TOS 2), and as a result flowers were aborted, and pod set was limited.

BACKGROUND

The GRDC investment, and GGA-led program 'Closing the Economic Yield Gap in Grain Legumes', is a comprehensive statewide project combining research trials and extension with technical and economic analysis to highlight and enhance the benefits of legumes within cropping rotations.

In 2024, as part of this project, SCF participated in a National Pulse Agronomy (NAPA) trial undertaken to generate locally relevant data used to validate APSIM modelling for faba beans. On another level, the trial also included a couple of varieties that have not been commonly grown in Western Australia, including two relatively short season varieties 'PBA Nasma' and 'FBA Ayla'. This provided a great opportunity for local farmers to compare growth stages in the paddock and have access to yield data.

METHODOLOGY/TREATMENTS

The 2024 SCF NAPA trial investigated four faba bean varieties, grown across two times of sowing (TOS); PBA Nasma, PBA Bendoc, PBA Amberly and FBA Samira, with the addition of FBA Ayla (along with PBA Nasma) in the second time of sowing. The primary NAPA trial was focused on TOS 1, with the TOS 2 looking at the viability of two short season varieties (Nasma, Ayla) that are usually grown in the northern ag regions of Australia. The trial NAPA methodology assessed; soil moisture 0-100cm, soil nitrogen 0-100cm, plant establishment, phenology, plant biomass and grain yield and quality.

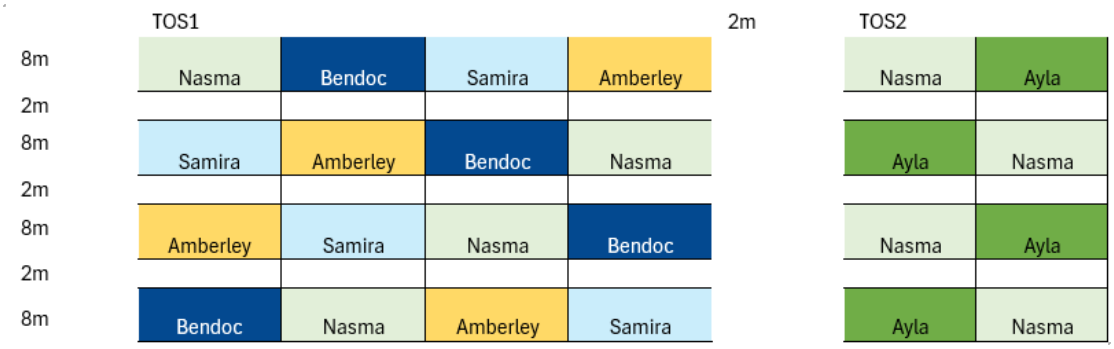

Figure 1: 2024 NAPA (SCF) trial design for TOS1 and TOS2.

RESULTS AND DISCUSSION

Plant Emergence & Establishment

The dry start to the 2024 growing season impacted plant establishment. Optimal faba bean plant numbers (plants per m2) for the high rainfall zone are between 30-35, however, research shows that yield is not severely impacted until plant numbers fall below 25 plants per m2. Table 1 shows emergence dates for each TOS and Table 2 shows average establishment counts. The first TOS was impacted by poor plant establishment with only PBA Amberley producing optimal plant numbers. There were higher plant counts recorded in TOS2, likely due to better soil moisture conditions at seeding. Time to emergence was also shorter in TOS2 for the same reasons.

The main NAPA (TOS1) trial featured two mid-season length varieties (PBA Bendoc and PBA Amberley) a longer season length variety (PBA Samira) and a short season variety (PBA Nasma). Interestingly, the phenological development of each variety was relatively similar throughout most of the growing season, with the shorter season varieties seemingly delayed by the cool and wet conditions.

Nodulation

Each treatment achieved optimal nodulation regardless of the TOS and variety (Table 2).

Grain quality

In terms of grain quality, most treatments were compliant with either FAB1 or FAB2 delivery grades. There were a few high moisture samples that were a result of harvest timing (logistical).

Harvest Yield

The harvest yield for TOS1 was marginally higher for PBA Amberley and PBA Bendoc, however, not statistically significant (Figure 2). Interestingly, TOS2 yielded lower than TOS1 even though establishment had been poorer in TOS1 (Figure 3), this included PBA Nasma which was sown at both timings.

Table 1: NAPA (SCF) trial sowing and emergence dates, 2024.

	Sowing Date	Emergence Date
TOS 1	14/05/2024	4/06/2024
TOS 2	7/06/2024	19/06/2024

Table 2: Average plant establishment per m2, for each variety, recorded on the 27/06/24.

Variety	Ave Plants per m2 (TOS1)	Ave Plants per m2 (TOS2)	Nodulation
Bendoc	22	N/A	6
PBA Amberley	26.5	N/A	6
Samira	21	N/A	6.5
PBA Nasma	23.625	28.5	6
FBA Ayla	N/A	27	6

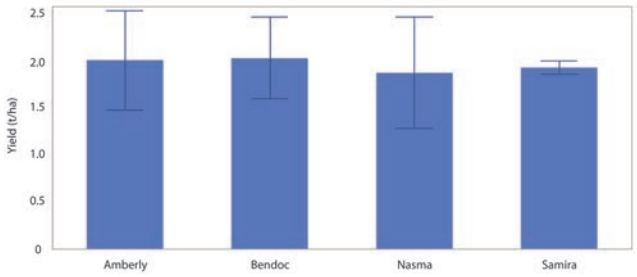

Figure 2: Average harvest yield (t/ha) for each treatment in TOS1, 2024.

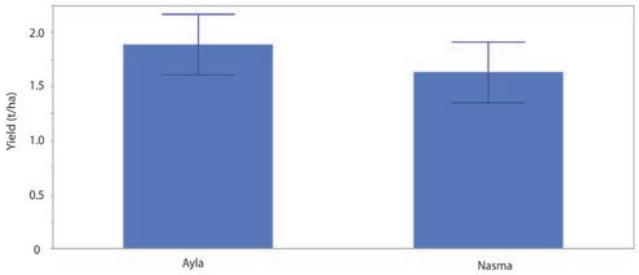

Figure 3: Average harvest yield (t/ha) for each treatment in TOS2, 2024.

CONCLUSIONS

The yield of the grain legumes in the trial (both TOS1 and 2) was quite low. This was largely due to seasonal issues. Adequate rainfall was not received until very late-May 2024 and in addition to this, there was a sharp dry cut-off to the growing season with less than half the median rainfall received in September 2024. The difficult seeding conditions resulted in low plant number establishment in TOS1, although a higher seeding rate may have helped to overcome this. The dry finish also impacted the yield of the three longer varieties, with the plants building less biomass later in the season and suffering from pod abortion, or only setting small pods. The PBA Nasma in TOS1 suffered from aborted flowers due to the crop flowering while it was still too cold for flower/podset. This reduced the number of viable flowers that were eventually converted to pods, and by extension impacted the yield of that variety.

The TOS2 component to the trial aimed to determine if it was possible to still produce good yields from later-sown shorter season varieties commonly grown in the north-eastern ag region. Although the yields in TOS2 were not significantly different from TOS1 the Ayla and Nasma in TOS2 suffered from significant flower abortion, which impacted pod-set. The later TOS likely delayed the flowering, however, the beans sown in TOS2 still flowered earlier then the longer varieties in TOS1, and as a result flowered in conditions that were too cool, and with day length that was too short for the varieties to maximise yield.

The yield difference (and more so, general lack of yield) in the main NAPA trial (TOS1) was largely a result of the dry finish to the season which negatively impacted the longer season varieties in PBA Samira and PBA Amberley that looked the best all season. The shorter season variety PBA Nasma failed to maximise yield due to flowering outside of the optimal window.

ACKNOWLEDGMENTS

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