Department of Primary Industries
Department of Regional NSW

NSW research results

RESEARCH & DEVELOPMENT – INDEPENDENT RESEARCH FOR INDUSTRY

The following paper is from an edition of the Northern or Southern New South Wales research results book.

Published annually since 2012, these books contain a collection of papers that provide an insight into selected research and development activities undertaken by NSW DPI in northern and southern NSW.

Not all papers will be accessible to readers with limited vision.
For help, please contact: Carey Martin at carey.martin@dpi.nsw.gov.au

Published by NSW Department of Primary Industries,
a part of the Department of Regional New South Wales.

Department of Primary Industries
and Regional Development

NSW GOVERNMENT

SOUTHERN NSW RESEARCH RESULTS 2024

Pulse variety experiments – faba bean, lentil, lupin, field pea, and chickpea – Methul 2023

Mark Richards and Dr Neroli Graham

NSW DPIRD, Wagga Wagga Agricultural Institute, Private Mail Bag, Wagga Wagga NSW 2650

Key findings

- Average grain yield for all species was lower than the average over the last 5 years, due to severe moisture stress in the reproductive growth phase.
- The highest yielding faba bean varieties were FBA Ayla$^{\Phi}$, PBA Nanu$^{\Phi}$ and PBA Nasma$^{\Phi}$. Flowering started in early August and continued until end September. Earlier flowering in faba beans was correlated with higher grain yields.
- The highest yielding lentil varieties were PBA Kelpie XT$^{\Phi}$, PBA Ace$^{\Phi}$, GIA Thunder$^{\Phi}$, PBA Hallmark XT$^{\Phi}$ and GIA Lightning$^{\Phi}$. Most varieties started flowering in late August and finished in late September.
- PBA Bateman$^{\Phi}$ and Coyote$^{\Phi}$ were the highest yielding narrow-leaf lupin varieties. Coyote$^{\Phi}$ had a significantly lighter seed weight than all other varieties.
- The highest yielding field pea varieties were PBA Pearl$^{\Phi}$, PBA Taylor$^{\Phi}$, PBA Noosa$^{\Phi}$ and PBA Wharton$^{\Phi}$. PBA Percy was the first to flower in late August and all varieties finished flowering by early October. Seed weight varied significantly across all varieties.
- There was no significant difference in yield or seed weight between the 2 chickpea varieties, CBA Captain$^{\Phi}$ and PBA Slasher$^{\Phi}$.

- **Important note:** while all seasons are unique, it is important to consider long-term phenology and yield data to determine varietal responses and adaptation to growing environment.

Keywords Methul, 2023, pulses, variety, phenology, faba bean, field pea, lupin, chickpea, lentil, grain yield, seed weight

Introduction

Pulse variety experiments were conducted at Methul in 2023 to support southern NSW pulse growers with additional local variety information at our key research sites. Experiments were conducted on a range of varieties to investigate crop phenology and grain yield responses for a range of commercially available faba bean, lentil, lupin, field pea and chickpea varieties.

Site details

Location	Anglia, Methul
Soil type	Red chromosol

This research paper is an extract from the publication *Southern NSW research results 2024*, available at https://www.dpi.nsw.gov.au/agriculture/broadacre-crops/guides/publications/southern-nsw-research-results

Soil pH_{Ca}	5.6 (0–5 cm), 4.4 (5–10 cm), 4.5 (10–15 cm), 4.9 (15–20 cm), 5.4 (20–25 cm), 5.7 (25–30 cm)
Paddock history	Oats (2022), wheat (2021), barley (2020), wheat (2019), wheat (2018), canola (2017)
Fertiliser	100 kg/ha, SuPerfect® Grain Legume (N5:P15:S7:Ca11)
Rainfall	• Annual – 2023: 469 mm – Long-term average (LTA): 469 mm • In-crop (April–October) – 2023: 186 mm – LTA: 286 mm
Sowing and harvest	Table 1 shows the sowing and harvest dates for the experiments.

Table 1 Sowing and harvest dates for pulse variety experiments at Methul in 2023.

Species	Sowing date	Harvest date
Faba bean	12 May	13 November
Lentil	11 May	10 November
Narrow-leaf lupin	12 May	19 November
Field pea	15 May	6 November
Desi chickpea	15 May	19 November

Treatments

Variety

Table 2 lists the pulse species and varieties evaluated.

Table 2 Pulse species and varieties evaluated at Methul in 2023.

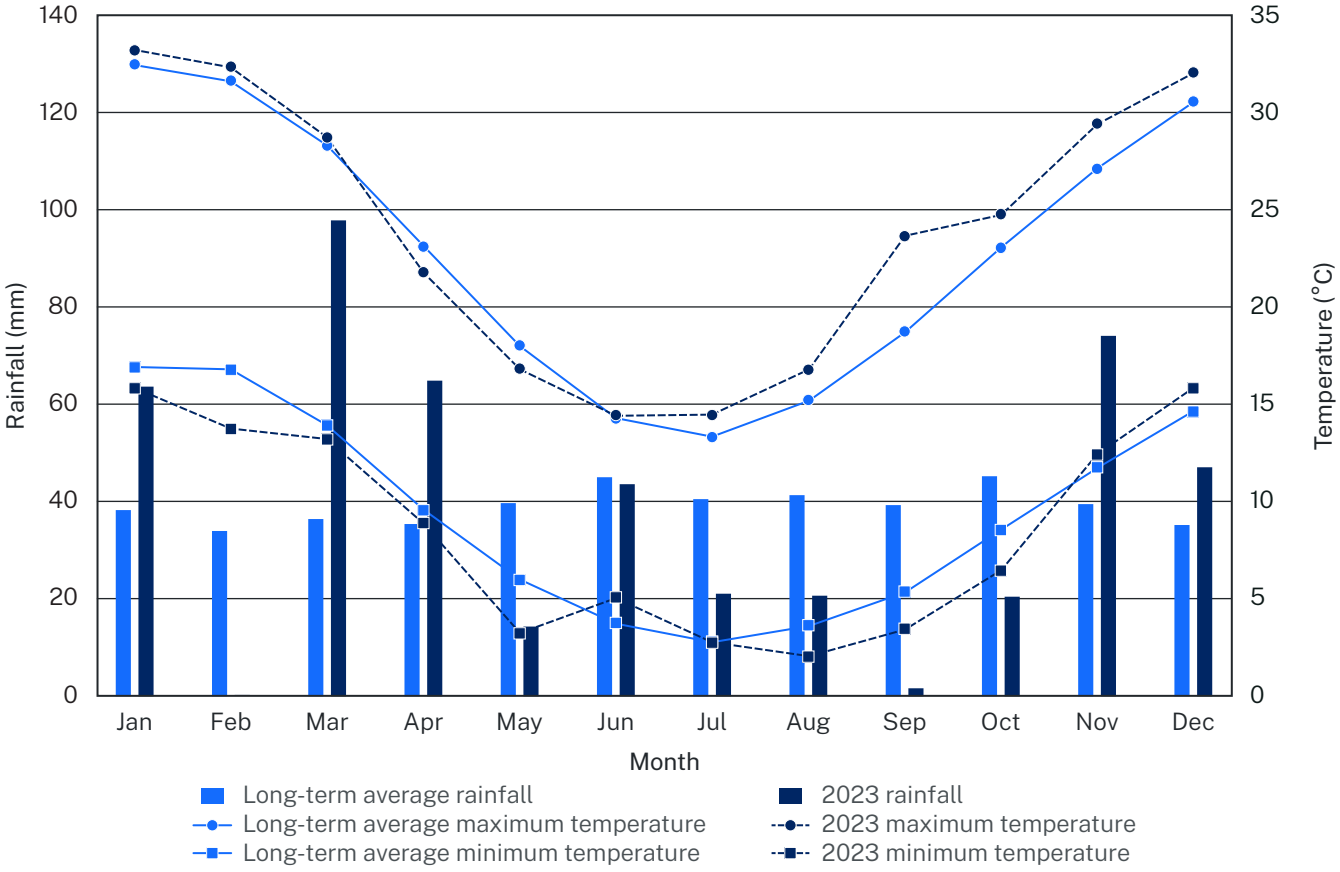
Species	Variety
Faba bean	FBA Ayla$^{\Phi}$, PBA Amberley$^{\Phi}$, PBA Marne$^{\Phi}$, PBA Nanu$^{\Phi}$, PBA Nasma$^{\Phi}$, PBA Samira$^{\Phi}$
Lentil	GIA Leader$^{\Phi}$, GIA Lightning$^{\Phi}$, GIA Thunder$^{\Phi}$, Nipper$^{\Phi}$, PBA Ace$^{\Phi}$, PBA Bolt$^{\Phi}$, PBA Hallmark XT$^{\Phi}$, PBA Highland XT$^{\Phi}$, PBA Jumbo2$^{\Phi}$, PBA Kelpie XT$^{\Phi}$
Narrow-leaf lupin	Coyote$^{\Phi}$, Lawler$^{\Phi}$, Mandelup$^{\Phi}$, PBA Bateman$^{\Phi}$, PBA Jurien$^{\Phi}$, Wonga
Field pea	APB Bondi$^{\Phi}$, PBA Butler$^{\Phi}$, PBA Noosa$^{\Phi}$, PBA Oura$^{\Phi}$, PBA Pearl, PBA Percy, PBA Taylor$^{\Phi}$, PBA Wharton$^{\Phi}$, Sturt
Desi chickpea	CBA Captain$^{\Phi}$, PBA Slasher$^{\Phi}$

Seasonal conditions

The 2023 winter growing season started with above average rainfall in January, March and April (Figure 1). This provided sufficient soil moisture for sowing in the recommended sowing windows. However, for July, August, September and October rainfall was lower than the LTA, resulting in moisture stress during spring, the yield formation window.

Twenty-nine frosts were recorded during the winter growing season, 15 of these were during flowering from early August to late September. There were 4 days with a maximum temperature above 33 °C in mid September and early October.

Low soil moisture levels in spring, coupled with frequent frost and high temperatures during the grain filling phase, decreased potential grain yield. There were no significant disease issues at this site in 2023.



Monthly temperature and rainfall data for 2023 taken from on-site weather station.
Long-term data extracted from SILO.

Figure 1 Monthly minimum and maximum temperature, and total monthly rainfall in 2023, and long-term averages at Methul.

Results

Faba bean

Yields ranged from 1.44 t/ha (PBA Ayla$^{\Phi}$) to 1.18 t/ha (PBA Amberley$^{\Phi}$ and PBA Samira$^{\Phi}$) (Table 3). The average site yield was 1.32 t/ha. The highest yielding varieties, PBA Ayla$^{\Phi}$, PBA Nanu$^{\Phi}$ and PBA Nasma$^{\Phi}$ displayed no significant difference in yield.

Table 3 Growing region, crop phenology and grain yield responses for faba bean varieties at Methul in 2023.

Variety	Proposed NSW growing region	50% flowering (date)*	End of flowering (date)†	Yield (t/ha)‡	100 seed weight (g)
FBA Ayla	Northern	3 Aug	19 Sep	1.44 ^{a}	51.3
PBA Nanu		5 Aug	19 Sep	1.39 ^{ab}	55.2
PBA Nasma		2 Aug	20 Sep	1.36 ^{ab}	54.1
PBA Marne	Southern	8 Aug	20 Sep	1.30 ^{bcd}	58.6
PBA Amberley		17 Aug	21 Sep	1.18 ^{de}	61.7
PBA Samira		16 Aug	20 Sep	1.18 ^{de}	59.3
Mean		7 Aug	20 Sep	1.32	58.4
l.s.d. (*P*<0.05)		1.70	2.46	0.13	2.53

* 50% flowering is the date when 50% of plants had one open flower.

† End of flowering is the date when only 5% of plants have an open flower.

‡ N.B. For grain yield interpretation, varieties with the same letter are statistically similar.

l.s.d. = least significant difference.

PBA Nasma$^{\Phi}$ reached 50% flowering (flowering) on 2 August, one day before FBA Ayla$^{\Phi}$ and 15 days before the last variety PBA Amberley$^{\Phi}$, on 17 August (Table 3). All varieties reached the end of flowering between 19 September and 21 September.

Hundred seed weight (HSW) ranged from 61.7 g for PBA Amberley$^{\Phi}$ to 51.3 g for FBA Ayla$^{\Phi}$ (Table 3). PBA Amberley$^{\Phi}$ was the only variety to record an HSW higher than 60 g.

Lentil

The average lentil yield was 0.81 t/ha (Table 4). There was no significant difference in yield between PBA Kelpie XT$^{\Phi}$, PBA Ace$^{\Phi}$, GIA Thunder$^{\Phi}$, PBA Hallmark XT$^{\Phi}$ and GIA Lightning$^{\Phi}$. GIA Leader$^{\Phi}$ was the lowest yielding variety at 0.57 t/ha, 44% lower than PBA Kelpie XT$^{\Phi}$.

Table 4 Crop phenology and grain yield responses for lentil varieties at Methul in 2023.

Variety	50% flowering (date)*	End of flowering (date)†	Yield (t/ha)‡	100 seed weight (g)	Classification (seed size)
PBA Kelpie XT	25 Aug	26 Sep	1.03 ^{a}	4.0	large
PBA Ace	31 Aug	30 Sep	1.02 ^{ab}	4.1	medium
GIA Thunder	29 Aug	27 Sep	0.92 ^{abcd}	3.2	small
PBA Hallmark XT	28 Aug	27 Sep	0.92 ^{abcd}	3.6	medium
GIA Lightning	3 Sep	26 Sep	0.89 ^{abcd}	3.0	small
PBA Jumbo2	27 Aug	27 Sep	0.79 ^{bcde}	4.3	large
Nipper	7 Sep	30 Sep	0.74 ^{def}	3.0	small
PBA Highland XT	25 Aug	27 Sep	0.60 ^{ef}	3.2	small
PBA Bolt	29 Aug	27 Sep	0.62 ^{ef}	3.9	medium
GIA Leader	30 Aug	28 Sep	0.57 ^{f}	4.1	medium
Mean	30 Aug	28 Sep	0.81	3.7	
l.s.d. (P<0.05)	0.85	1.31	0.23	0.14	

* 50% flowering is the date when 50% of plants had one open flower.

† End of flowering is the date when only 5% of plants have an open flower.

‡ N.B. For grain yield interpretation, varieties with the same letter are statistically similar.

l.s.d. = least significant difference.

Most varieties reached 50% flowering within a 4-day period, between 27 August and 31 August (Table 4). PBA Highland XT$^{\Phi}$ and PBA Kelpie XT$^{\Phi}$ were the quickest (25 August), Nipper$^{\Phi}$ was the slowest (7 September). All varieties finished flowering over a 5-day period between 26 September and 30 September.

HSW varied from 4.3 g for PBA Jumbo2$^{\Phi}$ to 3.0 g for GIA Lightning$^{\Phi}$ and Nipper$^{\Phi}$ (Table 4).

Narrow-leaf lupin

PBA Bateman$^{\Phi}$ and Coyote$^{\Phi}$ had statistically similar grain yields (Table 5). Their yields were significantly higher than all other varieties.

When sown on 12 May there was a 6-day difference in flowering date between the earliest flowering variety (Coyote$^{\Phi}$ on 19 August) and the latest (PBA Bateman$^{\Phi}$ and Lawler$^{\Phi}$ on 25 August) (Table 5). All varieties finished flowering over a 6-day period from 19 September to 24 September.

HSW ranged between 13.2 g (Lawler$^{\Phi}$) and 11.8 g (Coyote$^{\Phi}$). All varieties were significantly heavier than Coyote$^{\Phi}$ (Table 5).

Table 5 Crop phenology and grain yield responses for narrow-leaf lupin varieties at Methul in 2023.

Variety	50% flowering (date)*	End of flowering (date)†	Yield (t/ha)‡	100 seed weight (g)
PBA Bateman	25 Aug	24 Sep	1.25 [a]	13.0
Coyote	19 Aug	19 Sep	1.22 [a]	11.8
PBA Jurien	20 Aug	20 Sep	1.12 [b]	12.7
Wonga	22 Aug	20 Sep	1.08 [b]	13.0
Mandelup	20 Aug	21 Sep	1.07 [b]	13.0
Lawler	25 Aug	24 Sep	1.04 [b]	13.2
Mean	22 Aug	21 Sep	1.13	12.8
l.s.d. (*P*<0.05)	1.84	3.25	0.12	0.63

* 50% flowering is the date when 50% of plants had one open flower.

† End of flowering is the date when only 5% of plants have an open flower.

‡ N.B. For grain yield interpretation, varieties with the same letter are statistically similar.

l.s.d. = least significant difference.

Field pea

PBA Pearl$^{\Phi}$, PBA Taylor$^{\Phi}$, PBA Noosa$^{\Phi}$ and PBA Wharton$^{\Phi}$ displayed no significant difference in yield (Table 6). The average site yield was 1.40 t/ha.

PBA Percy was the earliest variety to reach flowering on 22 August (Table 6). The latest flowering variety was PBA Butler$^{\Phi}$ on 5 September. All varieties finished flowering between 28 September and 1 October.

The average HSW was 17.1 g (Table 6). Seed weight varied between 20.4 g for PBA Percy and 15.1 g for Sturt$^{\Phi}$.

Table 6 Crop phenology and grain yield responses for field pea varieties at Methul in 2023.

Variety	Type	50% flowering (date)*	End of flowering (date)†	Yield (t/ha)‡	100 seed weight (g)
PBA Pearl	white	28 Aug	30 Sep	1.47 [a]	16.8
PBA Taylor	kaspa	3 Sep	29 Sep	1.42 [ab]	17.7
PBA Noosa	blue	1 Sep	28 Sep	1.38 [abc]	17.0
PBA Wharton	kaspa	2 Sep	29 Sep	1.38 [abc]	17.7
PBA Oura	dun	31 Aug	28 Sep	1.37 [bc]	19.5
Sturt	white	29 Aug	1 Oct	1.32 [cd]	15.1
APB Bondi	kaspa	3 Sep	29 Sep	1.29 [cde]	17.8
PBA Percy	dun	22 Aug	30 Sep	1.26 [de]	20.4
PBA Butler	kaspa	5 Sep	29 Sep	1.26 [de]	16.6
Mean		1 Sep	29 Sep	1.40	17.1
l.s.d. (*P*<0.05)		1.84	1.13	0.10	1.62

* 50% flowering is the date when 50% of plants had one open flower.

† End of flowering is the date when only 5% of plants have an open flower.

‡ N.B. For grain yield interpretation, varieties with the same letter are statistically similar.

l.s.d. = least significant difference.

Chickpea

There was no significant difference in yield or HSW between CBA Captain$^{\Phi}$ and PBA Slasher$^{\Phi}$ (Table 7). The average yield and HSW was 1.0 t/ha and 26.8 g respectively.

CBA Captain$^{\Phi}$ reached flowering on 3 September, significantly earlier than PBA Slasher$^{\Phi}$ (6 September) (Table 7).

Table 7 Grain yield, date to 50% flower and 100 seed weight for desi chickpea varieties at Methul in 2023.

Variety	50% flowering (date)*	Yield (t/ha)	100 seed weight (g)
CBA Captain	3 Sep	1.06	26.2
PBA Slasher	6 Sep	0.94	27.4
Mean	4 Sep	1.00	26.8
l.s.d. (*P*<0.05)	0.75	n.s.	n.s.

* 50% flowering is the date when 50% of plants had one open flower.

l.s.d. = least significant difference.

n.s. = not significant.

Conclusion

The results of these experiments need to be considered in the context of unfavourable spring conditions, with severe moisture stress experienced by all experiments throughout the reproductive window. The site only received 121 mm of rain from May to October inclusive, less than 50% of the long-term average of 248 mm for the same period. Moisture stress, combined with some severe frosts in mid August and mid September, restricted yield potential for all species. Immediately following the 4 days of consecutive frosts in mid September was a week of hot weather averaging 30°C with the hottest day reaching 34 °C.

FBA Ayla$^{\Phi}$ was the highest yielding faba bean variety, while PBA Nanu$^{\Phi}$ and PBA Nasma$^{\Phi}$ were statistically equivalent. These 3 varieties, developed for the northern growing region of NSW, performed better in this environment than the southern region bred lines due to their earlier flowering and faster maturity. They started to flower approximately 2 weeks earlier than the southern varieties. As a result, they were able to convert limited soil water more efficiently into grain yield before the slower maturing varieties, such as PBA Amberley$^{\Phi}$ and PBA Samira$^{\Phi}$.

Average yields for lentil varied significantly, ranging from 0.57 t/ha to 1.03 t/ha. Given the below optimum seasonal conditions, lentil did not reach its average plant height, which affected harvest efficiency for the shorter varieties. Flowering started in late August and continued through until late September. HSW ranged from 3.0 g to 4.3 g reflecting the normal seed classification of the respective varieties.

PBA Bateman$^{\Phi}$ and Coyote$^{\Phi}$ were the highest yielding narrow-leaf lupin varieties. HSW for Coyote$^{\Phi}$ was significantly lower than all other varieties tested. Further information on the Coyote$^{\Phi}$ variation in seed size across a range of seasons and environments is warranted, compared with other current varieties.

The average field pea yield across all varieties was higher than all the other pulse species at 1.4 t/ha. This is not surprising given the faster reproductive and maturity phases of field pea and hence it's capacity to take advantage of less favourable seasons where rainfall is particularly limiting.

Acknowledgements

Thank you to Digby, Denzel and Greg Graham and families, Anglia, Methul for their ongoing collaboration and support of pulse research.

Thank you to Daniel Johnston, Karl Moore, Jess Simpson, Lily Tenhave and Gerard Ryan for their technical assistance.

We acknowledge the ongoing support of pulse research in southern NSW by NSW DPIRD.

More information

Mark Richards
Wagga Wagga Agricultural Institute, Wagga Wagga
mark.richards@dpi.nsw.gov.au
0428 630 429

Find results from other pulse agronomy experiments in previous editions of Southern NSW research results (https://www.dpi.nsw.gov.au/agriculture/broadacre-crops/guides/publications/southern-nsw-research-results).

Disclaimer

The information contained in this publication is based on knowledge and understanding at the time of writing (October 2024) and may not be accurate, current or complete. The State of New South Wales (including the Department of Primary Industries and Regional Development), the author and the publisher take no responsibility, and will accept no liability, for the accuracy, currency, reliability or correctness of any information included in the document (including material provided by third parties). Readers should make their own inquiries and rely on their own advice when making decisions related to material contained in this publication.

The product trade names in this publication are supplied on the understanding that no preference between equivalent products is intended and that the inclusion of a product name does not imply endorsement by the department over any equivalent product from another manufacturer.

www.dpird.nsw.gov.au

Always read the label

Users of agricultural chemical products must always read the label and any permit before using the product and strictly comply with the directions on the label and the conditions of any permit. Users are not absolved from any compliance with the directions on the label or the conditions of the permit by any reason of any statement made or omitted to be made in this publication.