Daysdale site attributes

2023

Rainfall

Table 1: *Monthly rainfall for 2023 and long-term average (LTA, 1925–2023), and total annual and growing season (GSR, April–October) rainfall at Oaklands General Store, approximately 20 km north west of the site.*

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	GSR
2023	81.2	3.2	14.6	54.2	18.0	61.6	25.9	40.0	3.2	55.0	93.8	79.2	**529.9**	**257.9**
LTA	37.8	33.2	35.2	34.6	40.5	41.8	40.7	42.4	39.4	47.6	39.5	42.2	**474.9**	**287.0**

Soil characteristics

Sampled July 2023

Characteristic	Unit	Soil depth (cm)	
		0–10 cm	10–100 cm
Texture		Clay loam	
Colour		Red/brown	
pH (1:5 $CaCl_2$)		4.9	
Organic carbon (W&B)	%	0.8	
Electrical conductivity (1:5 water)	dS/m	0.05	
Nitrate nitrogen	mg/kg	10.4	
Ammonium nitrogen	mg/kg	1.1	
Total nitrogen	kg/ha	17.3	67.4
Phosphorus (Colwell)	mg/kg	39.5	
PBI		49.0	
Sulphur (KCl40)	mg/kg	4.5	
Chloride	mg/kg	<10	
Cation Exch. Cap.	cmol(+)/kg	5.5	
Sodium % of cations (ESP)	%	0.6	
Aluminium saturation	%	2.5	
Calcium (Amm-acet.)	%	74.0	
Magnesium (Amm-acet.)	%	11.5	
Potassium (Amm-acet.)	%	12.0	

Pulse site species and variety comparison, 31 August at Daysdale

Crop sequence and key management dates

Crop sequence	
Year	Crop
2022	Wheat
2021	Canola
2020	Barley
2019	Wheat
2018	Canola

Site management 2023		
Activity	Date	Comments
Sowing	3–4 May	All trials
Harvest	9– 10 December	All trials

Pulse site field day at Daysdale, 12 October 2023

Pulse species and variety comparison

Daysdale 2023

Key findings

- **Lupin** grain yield averaged 2.15 t/ha with the albus lupin Murringo$^{\Phi}$ having the highest yield (2.51 t/ha). Peak biomass averaged 7.19 t/ha with no difference between varieties tested or +N treatment. As expected the albus lupins Murringo$^{\Phi}$ and Luxor$^{\Phi}$ produced the largest seeds (mean 44.7 g/100 seeds). Seed N concentration of albus lupin (Murringo$^{\Phi}$) was 6.2% and narrow-leaf lupin (PBA Bateman$^{\Phi}$) was 5.2%. The N concentration of PBA Bateman$^{\Phi}$ was unaffected by N application.
- **Field pea** grain yield averaged 2.44 t/ha with no difference between the four varieties tested. Peak biomass was 5.95 t/ha in PBA Butler$^{\Phi}$ with no effect of +N treatment. PBA Pearl$^{\Phi}$ produced the largest seed (22.0 g/100 seeds). Seed N concentration of PBA Butler$^{\Phi}$ was 4.1% and was unaffected by N application.
- **Faba bean** grain yield averaged 2 t/ha and peak biomass 5.47 t/ha with no difference between varieties tested or nitrogen (N) treatment (only applied to PBA Samira$^{\Phi}$). PBA Amberley$^{\Phi}$ produced the largest seed (84.7 grams/100 seeds) of all varieties, and as expected, FBA Ayla$^{\Phi}$ produced the smallest seed (59.5 g/100 seeds). Seed N concentration of faba beans averaged 4.3% and was unaffected by N application in PBA Samira$^{\Phi}$.
- **Lentil** grain yield averaged 1.21 t/ha with no difference between the four varieties tested. Peak biomass (measured in PBA Hallmark XT$^{\Phi}$) averaged 6.03 t/ha with no difference between N treatments. PBA Kelpie$^{\Phi}$ produced the largest seed (5.2 g/100 seeds) of all varieties, while PBA Hallmark XT$^{\Phi}$ produced the smallest (4.2 g/100 seeds). Application of N significantly increased PBA Hallmark$^{\Phi}$ seed size (4.4 g/100 seeds).
- **Vetch** grain yield averaged 1.16 t/ha with Morava the highest (1.49 t/ha). Peak biomass (measured in Timok$^{\Phi}$ and Benatas) averaged 6.04 t/ha with no difference between varieties or N treatments. Morava produced the largest seed (9.1 g/100 seeds) of all varieties, while Benetas produced the smallest (4.3 g/100 seeds). Seed N concentration of Timok$^{\Phi}$ (5.2%) was not affected by N application.
- **Chickpea** grain yield averaged 2.07 t/ha with CBA Captain$^{\Phi}$ the highest (2.22 t/ha). The application of N at 100 kg/ha increased the biomass of CBA Captain$^{\Phi}$ by 1.6 t/ha. As expected the kabuli type, Genesis™ 090, produced the largest seed (33.2 g/100 seeds). PBA HatTrick$^{\Phi}$ produced the smallest seed of the desi types (22.6 g/100 seeds). Seed N concentration of CBA Captain$^{\Phi}$ was 3.1% with nil N applied and 3.5% with 100 kg N/ha applied.

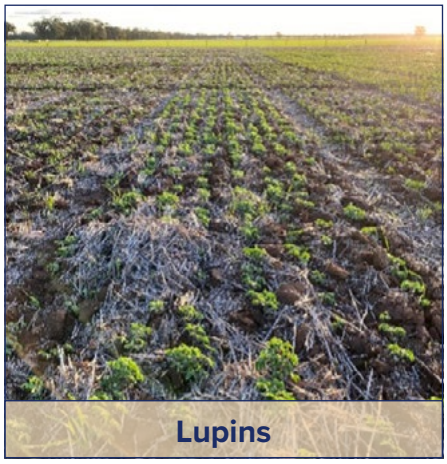
Trial details

Table 1: *Trial management details for pulse species and variety comparison trials.*

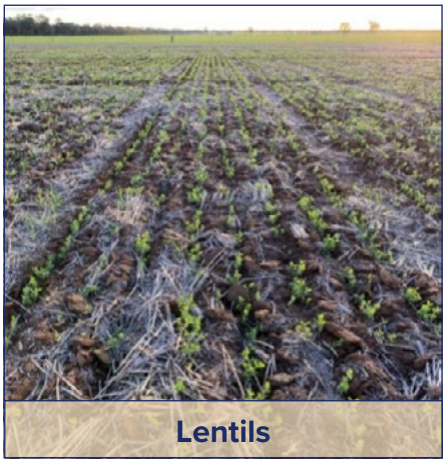
Management	2023
Pre-sow herbicide	3 May: trifluralin @ 2 L/ha
Sowing date	3–4 May
Starter fertiliser	MAP @ 80 kg/ha
Post sow pre-emergent herbicide	11 May: Reflex® @ 0.9 L/ha (except lupins and lentils)
Fungicide	2 August: chlorothalonil @ 2.3L/ha + carbendazim @ 0.5L/ha 29 August: Miravis® Star @ 0.75L/ha 2 October: Veritas® @ 0.75L/ha
Harvest	9–10 December

Table 2: *Pulse species, target plant population and varieties evaluated, including varieties tested under high nitrogen status (100 kg N/ha applied pre-sowing as urea) at Daysdale in 2023.*

Species	Target plant population (plant/m²)	Varieties				
Faba bean	25	PBA Samira(ф)	PBA Samira(ф) +N	PBA Amberley(ф)	PBA Nasma(ф)	FBA Ayla(ф)
Lupin	60	PBA Bateman(ф)	PBA Bateman(ф) +N	Murringo(ф)	Lawler	Luxor(ф)
Field pea	60	PBA Butler(ф)	PBA Butler(ф) +N	PBA Taylor(ф)	PBA Pearl(ф)	OZP1903
Vetch	80	Timok(ф)	Timok(ф) +N	Benetas	RM4(ф)	Morava
Chickpea	50	CBA Captain(ф)	CBA Captain(ф) +N	Genesis™ 090	PBA HatTrick(ф)	PBA Seamer(ф)
Lentil	120	PBA Hallmark XT(ф)	PBA Hallmark XT(ф) +N	PBA Kelpie XT(ф)	GIA Leader(ф)	CIPAL2122



Lupins



Lentils

Field peas

Faba beans

Chickpeas

Vetch

Pulse species comparison trials at establishment, Daysdale 16 June 2023

Results

Lupins

Table 3: *Lupin biomass, grain yield (corrected to 14% moisture), seed size, and seed nitrogen concentration at Daysdale in 2023.*

Variety	Peak biomass (t/ha)	Grain yield (t/ha)	Seed size (g/100 seeds)	Seed N concentration (%)
Murringo	6.90	2.51[a]	45.3[a]	6.2[a]
PBA Bateman	7.08	2.09[b]	17.5[b]	5.2[b]
Lawler	–	1.85[b]	17.4[b]	–
Luxor	–	2.15[b]	44.0[a]	–
PBA Bateman +N	7.60	2.14[b]	17.8[b]	5.2[b]
Mean	7.19	2.15	28.4	5.5
P Value	0.775	0.008	<0.001	<0.001
l.s.d. (*P* = 0.05)	n.s.	0.31	2.2	0.3

Values with the same letter are not significantly different; n.s. = not significant

Lupin varieties, 31 August 2023

Field pea varieties, 31 August 2023

Field peas

Table 4: *Field pea biomass, grain yield (corrected to 14% moisture), seed size, and seed nitrogen concentration at Daysdale in 2023.*

Variety	Peak biomass (t/ha)	Grain yield (t/ha)	Seed size (g/100 seeds)	Seed N concentration (%)
PBA Taylor	–	2.38	19.7[b]	–
PBA Butler	5.75	2.56	20.0[b]	4.0
OZP1903	–	2.54	19.7[b]	–
PBA Pearl	–	2.28	22.0[a]	–
PBA Butler +N	6.15	2.42	19.4[b]	4.1
Mean	5.95	2.44	20.2	4.05
P Value	0.106	0.122	0.003	0.182
l.s.d. (*P* = 0.05)	n.s.	n.s.	1.2	n.s.

Values with the same letter are not significantly different; n.s. = not significant

Faba beans

Table 5: *Faba bean biomass, grain yield (corrected to 14% moisture), seed size, and seed nitrogen concentration at Daysdale in 2023.*

Variety	Peak biomass (t/ha)	Grain yield (t/ha)	Seed size (g/100 seeds)	Seed N concentration (%)
PBA Samira	5.52	2.04	74.3[b]	4.3
PBA Amberley	–	2.05	84.7[a]	–
PBA Nasma	5.28	2.08	68.3[b]	4.3
PBA Ayla	–	1.73	59.5[c]	–
PBA Samira +N	5.61	2.09	82.4[a]	4.4
Mean	5.47	2.00	73.8	4.3
P Value	0.762	0.065	<0.001	0.462
l.s.d. (*P* = 0.05)	n.s.	n.s.	6.3	n.s.

Values with the same letter are not significantly different; n.s. = not significant

Faba bean variety comparison trial at Daysdale, 31 August 2023

Lentils

Table 6: *Lentil biomass, grain yield (corrected to 14% moisture), seed size, and seed nitrogen concentration at Daysdale in 2023.*

Variety	Peak biomass (t/ha)	Grain yield (t/ha)	Seed size (g/100 seeds)	Seed N concentration (%)
PBA Hallmark XT	5.56	1.22	4.2[d]	4.0
PBA Kelpie XT	–	1.16	5.2[a]	–
CIPAL 2122	–	1.24	4.5[c]	–
GIA Leader	–	1.17	4.7[b]	–
PBA Hallmark XT +N	6.49	1.26	4.4[c]	4.1
Mean	6.03	1.21	4.6	4.0
P Value	0.263	0.505	<0.001	0.215
l.s.d. (*P* = 0.05)	n.s.	n.s.	0.1	n.s.

Values with the same letter are not significantly different; n.s. = not significant

Lentil variety comparison trial at Daysdale, 31 August 2023

Vetch

Table 7: *Vetch biomass, grain yield (corrected to 14% moisture), seed size, and seed nitrogen concentration at Daysdale in 2023.*

Variety	Peak biomass (t/ha)	Grain yield (t/ha)	Seed size (g/100 seeds)	Seed N concentration (%)
Timok	5.81	1.16^{b}	7.1^{b}	5.2^{ab}
Benetas	5.88	0.51^{c}	4.3^{d}	5.5^{a}
RM4	–	1.29^{ab}	5.2^{c}	–
Morava	–	1.49^{a}	9.1^{a}	–
Timok +N	6.42	1.34^{ab}	7.2^{b}	4.9^{b}
Mean	6.04	1.16	6.6	5.2
P Value	0.367	<0.001	<0.001	0.020
l.s.d. (*P* = 0.05)	n.s.	0.20	0.3	0.4

Values with the same letter are not significantly different; n.s. = not significant

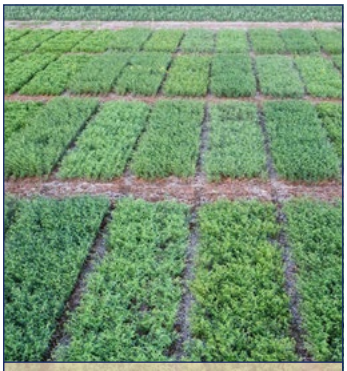
Vetch varieties, 31 August 2023

Chickpeas

Table 8: *Chickpea biomass, grain yield (corrected to 14% moisture), seed size, and seed nitrogen concentration at Daysdale in 2023.*

Variety	Peak biomass (t/ha)	Grain yield (t/ha)	Seed size (g/100 seeds)	Seed N concentration (%)
Genesis 090	–	1.94^{b}	33.2^{a}	–
CBA Captain	6.2^{b}	2.22^{a}	25.0^{b}	3.1^{b}
PBA HatTrick	–	1.98^{b}	22.6^{c}	–
PBA Seamer	–	1.99^{b}	24.9^{b}	–
CBA Captain +N	7.81^{a}	2.23^{a}	25.5^{b}	3.5^{a}
Mean	7.01	2.07	26.2	3.3
P Value	0.025	0.001	<0.001	0.001
l.s.d. (*P* = 0.05)	1.22	0.14	0.8	0.1

Values with the same letter are not significantly different



Chickpea varieties, 31 August 2023

Acknowledgements

We gratefully acknowledge the investment support of the GRDC for BRA2105-001RTX, '*Development and extension to close the economic yield gap and maximise farming systems benefits from grain legume production in New South Wales*'.

Also thank you to the Hanrahan family for kindly hosting the trial at Daysdale.

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Faba bean disease management

Daysdale 2023

Key findings

- **Disease pressure** was low in 2023 with <10% leaf area infection at the beginning of flowering. Both cercospora leaf spot and chocolate spot were present, but chocolate spot was the dominant disease later in the season.
- **Chocolate spot:** The susceptible (S) variety PBA Bendoc$^{\Phi}$ had the highest level of infection and the moderately resistant-moderately susceptible (MR-MS) variety PBA Amberley$^{\Phi}$ had the lowest level of infection of all varieties in the trial.
- **Grain yield** of the MR–MS chocolate spot resistant variety PBA Amberley$^{\Phi}$ did not respond to fungicide, while the more susceptible variety PBA Bendoc$^{\Phi}$ responded to the *Complete* treatment with 0.3 t/ha increase in grain yield, compared to *Nil* fungicide.
- The *Delayed* treatment (first fungicide applied at mid-flowering in late August) yielded the same as the *Complete* treatment, showing that there was no yield benefit from applying fungicides before the beginning of flowering in 2023.
- **Peak biomass:** Disease infection levels had no significant effect on biomass production, but PBA Samira$^{\Phi}$ had more biomass than PBA Bendoc$^{\Phi}$ and PBA Amberley$^{\Phi}$.

Trial details

Table 1: *Trial management, faba bean varieties assessed at Daysdale in 2023.*

Management	2023
Sowing date	4 May
Starter fertiliser	MAP @ 80kg/ha

Variety	Chocolate spot rating
PBA Amberley$^{\Phi}$	MR–MS
PBA Bendoc$^{\Phi}$	S
PBA Samira$^{\Phi}$	MS

Table 2: *Fungicide treatments applied to the faba beans at Daysdale in 2023.*

Fungicide treatment	Date applied	Fungicide applied
Nil	Nil	
Budget	29 August	Chlorothalonil 720 @ 2.3 L/ha + carbendazim 500 @ 0.5 L/ha
	2 October	Chlorothalonil 720 @ 2.3 L/ha + carbendazim 500 @ 0.5 L/ha
Delayed	29 August	Miravis® Star @ 0.75 L/ha
	2 October	Veritas® @ 0.75 L/ha
Complete	24 July	Tebuconazole 430 @ 0.145 L/ha
	3 August	Chlorothalonil 720 @ 2.3 L/ha + carbendazim 500 @ 0.5 L/ha
	29 August	Miravis® Star @ 0.75 L/ha
	2 October	Veritas® @ 0.75 L/ha

Results

Disease infection

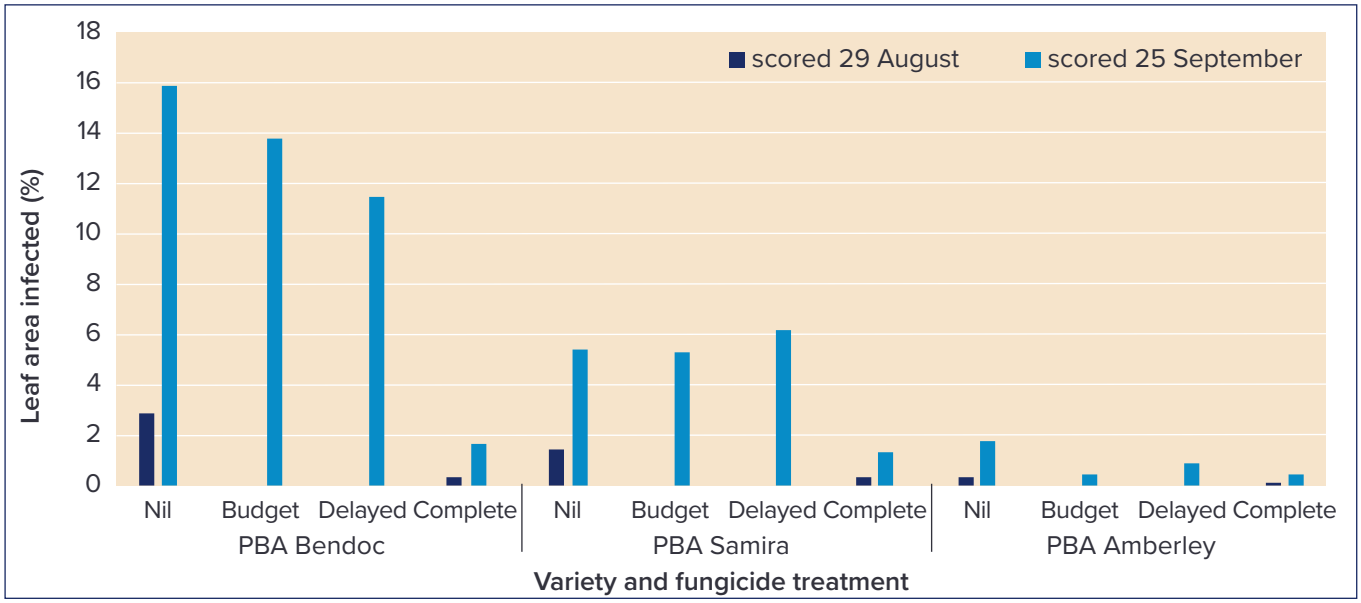

Figure 1: *Effect of fungicide management and faba bean variety on chocolate spot infection, assessed 29 August (Nil and Complete treatments) and 25 September (all treatments) at Daysdale in 2023.*

Early fungal disease infection in faba beans at Daysdale, 20 July 2023.

Biomass, yield and seed size

Table 3: *Effect of faba bean cultivar and fungicide strategy on crop peak biomass at Daysdale in 2023.*

Treatment	Peak biomass (t/ha)			
	PBA Bendoc	PBA Samira	PBA Amberley	Mean
Nil	5.16	5.39	5.22	5.26
Complete	4.63	6.07	4.26	4.99
Mean	4.90[b]	5.73[a]	4.74[b]	
Cultivar	*P* value = 0.002	l.s.d. = 0.28		
Fungicide	*P* value = 0.569	l.s.d. = n.s.		
Cultivar x Fungicide	*P* value = 0.361	l.s.d. = n.s.		

Table 4: *Effect of fungicide management and faba bean variety on grain yield at Daysdale in 2023.*

Treatment	Grain yield (t/ha)			
	PBA Bendoc	PBA Samira	PBA Amberley	Mean
Nil	1.90^{c}	1.88^{c}	2.10^{ab}	1.96^{c}
Budget	2.15^{ab}	1.88^{c}	1.99^{bc}	2.01^{bc}
Delayed	2.15^{ab}	2.15^{ab}	2.09^{ab}	2.13^{a}
Complete	2.20^{a}	2.04^{abc}	2.04^{abc}	2.09^{ab}
Mean	2.10	1.99	2.05	
Cultivar	*P* value = 0.170	l.s.d. = n.s.		
Fungicide	*P* value = 0.013	l.s.d. = 0.11		
Cultivar x Fungicide	*P* value = 0.049	l.s.d. = 0.19		

Table 5: *Effect of faba bean cultivar and fungicide strategy on seed size at Daysdale in 2023.*

Treatment	Seed size (g/100 seeds)			
	PBA Bendoc	PBA Samira	PBA Amberley	Mean
Nil	64.3	76.8	79.7	73.6^{c}
Budget	66.6	77.3	80.3	74.7^{bc}
Delayed	65.4	80.3	82.8	76.1^{a}
Complete	66.0	79.5	81.8	75.8^{ab}
Mean	65.5^{c}	78.5^{b}	81.1^{a}	
Cultivar	*P* value = 0.0001	l.s.d. = 2.02		
Fungicide	*P* value = 0.001	l.s.d. = 1.25		
Cultivar x Fungicide	*P* value = 0.168	l.s.d. = n.s.		

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