Arumpo

Arumpo (SW NSW Mallee) site attributes 2023

Background

The Mallee pulse site in 2023 was on Petro Station, approximately 60 km north east of Mildura. A rain of 20 mm fell on 15 April, the day after planting the mid April sowing (SD1), which resulted in excellent germination and establishment for all three sowing dates.

Growing season rainfall (April–October) in 2023 was around 200 mm, however over 200 mm of summer rainfall was received in the previous fallow period, providing high levels of soil moisture prior to sowing.

The soil is a sandy loam topsoil with clay content gradually increasing to a clay loam texture in the sub-soil. The soil is well suited to growing pulses as it is well drained and has a neutral to alkaline pH. Indicators of soil fertility were generally good while subsoil constraints were minimal in the 70–100 cm deep layer.

Pulse field day at Arumpo, 7 September 2023

Rainfall and temperature

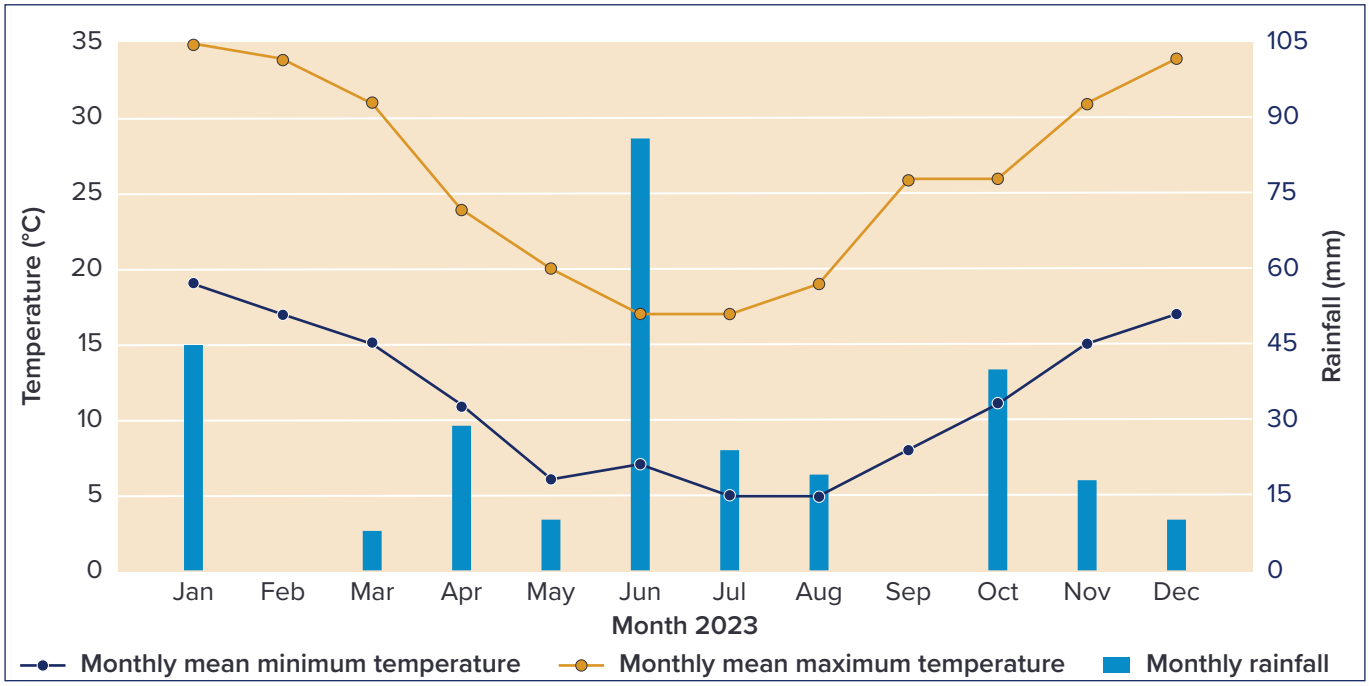

Figure 11: *Monthly rainfall and mean minimum and maximum temperature at Arumpo in 2023.*

Soil characteristics

Characteristic	Unit	Soil depth (cm)			
		0–10	10–40	40–70	70–100
Organic carbon	%	0.74			
Phosphorus (Colwell)	mg/kg	24			
PBI + Colwell P		39			
DGT-P	µg/L	66			
Iron	mg/kg	4.8			
Manganese	mg/kg	16			
Copper	mg/kg	0.52			
Zinc	mg/kg	1.4			
pH ($CaCl_2$)		7.53	7.98	8.14	8.16
Nitrate N	mg/kg	18	2.6	1.9	2.2
Ammonium N	mg/kg	2.2	<1.0	<1.0	<1.0
Sulphur	mg/kg	7.1	3.7	4.9	12.0
Effective cation exchange capacity (ECEC)	cmol/kg	12.4	28.4	31.7	31.1
Chlorine (Cl)	mg/kg	–	8	7	42
Electrical conductivity (EC) 1:5	dS/m	0.19	0.11	0.2	0.4
Ece	dS/m	2.6	1.6	1.7	3.4
Boron (B)	mg/kg	1.2	<0.1	2.7	9.8
Texture		Sandy loam	Sandy loam	Clay loam	Clay loam

Crop sequence and key management dates

Crop sequence		
Year	Crop	Variety
2022		
2021		
2020		

Site management 2023		
Activity	Date	Comments
Sowing	14 April	Time of sowing 1
	27 April	Time of sowing 2
	15 May	Time of sowing 3

Pulse field day at Arumpo, 7 September 2023

Pulse species and variety comparison at three sowing dates

Arumpo, southwest NSW Mallee 2023

Key findings

Lentil

- The highest lentil grain yield in the trial was from GIA Thunder$^{\Phi}$ sown mid April (1.9 t/ha). There was no difference in grain yield between lentils sown mid to late April (SD1 and SD2), however delaying sowing to mid May (SD3) reduced grain yield by 0.3–0.4 t/ha.
- Grain yield of GIA Thunder$^{\Phi}$ was 15% higher than PBA Hallmark XT$^{\Phi}$ and PBA Highland XT$^{\Phi}$.
- Peak biomass of lentils sown at the first two sowing times was almost 6 t/ha, double the dry matter produced by lentils sown in mid May.

Field Pea

- Field pea produced the highest grain yield of all pulse crops with up to 2.5 t/ha from a mid to late April sowing time.
- The grain yield of field pea was affected by sowing time but varieties were not significantly different. The yield of field peas sown mid–late April (SD1 and SD2) was 0.6–0.7 t/ha higher than when sown mid May.
- Peak biomass of field peas sown at SD1 and SD2 was 7.99 t/ha and 7.38 t/ha, respectively. This was more than 3 t/ha higher than the field pea biomass produced from the mid may (SD3) sowing.

Mid April (SD1) sowing of pulses at Arumpo, 14 April 2023

Field peas produced the highest yield of all pulses at Arumpo, 3 August 2023

Vetch

- Vetch grain yield was affected by both sowing time and variety with grain yield up to 1.5 t/ha. The grain yield of vetch sown mid–late April was 0.2 t/ha higher than vetch sown in mid May. Volga$^{\Phi}$ (1.2 t/ha) and Timok$^{\Phi}$ (1.3 t/ha) produced higher grain yield than Studenica$^{\Phi}$ (1.1 t/ha)
- Peak biomass was 7.5 t/ha when sown mid April, however there was a penalty for delayed sowing with 3.8 t/ha less biomass produced from vetch sown in mid May.
- Biomass was also measured at the start of podding to determine dry matter when vetch would be cut for hay. Biomass was assessed on 13 September for Timok$^{\Phi}$ sown mid and late April (SD1 and SD2), and 21 September for Timok$^{\Phi}$ sown mid May (SD3). Vetch sown mid April had 'hay cut' dry matter of 5.8 t/ha while mid May was 1.7 t/ha less at 4.1 t/ha.

Faba Beans

- Faba bean grain yield was maximized by early sowing with 1.8 t/ha for PBA Marne$^{\Phi}$ sown mid April (SD1). There was 0.25 t/ha penalty for delaying sowing to 27 April (SD2), and a further 0.2 t/ha penalty delaying to mid May (SD3). Mean grain yield was 0.45 t/ha higher from sowing in mid April compared to mid May.
- The average grain yield of PBA Marne$^{\Phi}$ across all sowing dates was 1.5 t/ha, higher than PBA Samira$^{\Phi}$ and PBA Bendoc$^{\Phi}$ which both averaged 1.3 t/ha.
- Faba bean biomass production was also improved by early sowing, with almost 6 t/ha of dry matter grown with a mid April (SD1) sowing. Peak biomass was reduced by 1.5 t/ha when sowing was delayed to 27 April (SD2), with a further reduction of 0.8 t/ha when sowing was delayed to mid May (SD3).

Chickpea

- Chickpea grain yield was not responsive to sowing time and varieties were not significantly different. The average grain yield across all sowing times and varieties was 1.2 t/ha. Later sown chickpeas possibly benefited more than early sowing times from 40 mm of rain on 4 October.
- Sowing time influenced biomass produced. Chickpeas sown on 17 April (SD1) produced 4.3 t/ha of dry matter, which decreased by 0.7 t/ha for

27 April (SD2) sowing, and a further 0.5 t/ha for 15 May (SD3) sowing.

Trial details

Table 61: *Trial management details for lentil, vetch, field pea, faba beans and chickpeas sown on three dates at Arumpo in 2023.*

Management	2023
Sowing date	SD1: 14th April 2023 SD2: 27th April 2023 SD3: 15th May 2023
Starter fertiliser	SuPerfect® (8.8% phosphorus, 11% sulfur, 19% calcium) @ 70 kg/ha
Pre-emergent herbicides (all IBS)	Lentil, field pea, vetch: simazine @ 200 g/ha + diuron @ 200 g/ha Faba bean: simazine @ 550 g/ha Chickpea: simazine @ 550 g/ha + isoxaflutole @ 70 g/ha
Varieties	Lentil: GIA Thunder$^{\Phi}$, PBA Hallmark XT$^{\Phi}$, PBA Highland XT$^{\Phi}$ Field pea: PBA Butler$^{\Phi}$, PBA Taylor$^{\Phi}$, PBA Twilight$^{\Phi}$ Vetch: Studenica$^{\Phi}$, Timok$^{\Phi}$, Volga$^{\Phi}$ Faba bean: PBA Bendoc$^{\Phi}$, PBA Marne$^{\Phi}$, PBA Samira$^{\Phi}$ Chickpea: CBA Captain$^{\Phi}$, Genosis™ 090, PBA Striker$^{\Phi}$
Target plant population	Lentil: 120 plants/m^2 Field pea: 40 plants/m^2 Vetch: 50 plants/m^2 Faba bean: 20 plants/m^2 Chickpea: 35 plants/m^2

Results

Table 62: *Grain yield and peak biomass of lentils sown on three dates (mid April, late April, mid May) at Arumpo, southwest NSW in 2023.*

	Grain yield (t/ha)			Peak biomass (t/ha)		
Lentil variety	SD1: 14 Apr	SD2: 27 Apr	SD3: 15May	SD1: 14 Apr	SD2: 27 Apr	SD3: 15May
GIA Thunder	1.85	1.64	1.21	6.94	6.29	2.81
PBA Hallmark	1.36	1.31	1.01	6.19	5.61	3.29
PBA Highland	1.37	1.40	1.20	4.81	5.75	3.11
l.s.d. (sowing date)	0.15			0.88		
l.s.d. (variety)	0.15			n.s.		
l.s.d. (variety × sowing date)	n.s			n.s.		

l.s.d. (*P*<0.05); n.s. = not significantly different

Table 63: *Grain yield and peak biomass of field peas sown on three dates (mid April, late April, mid May) at Arumpo, southwest NSW in 2023.*

	Grain yield (t/ha)			Peak biomass (t/ha)		
Field pea variety	SD1: 14 Apr	SD2: 27 Apr	SD3: 15May	SD1: 14 Apr	SD2: 27 Apr	SD3: 15May
PBA Butler	2.48	2.49	1.74	8.87	7.96	4.14
PBA Taylor	2.22	2.46	1.78	8.04	7.47	4.34
PBA Twilight	2.19	2.41	1.62	7.05	6.70	4.55
l.s.d. (sowing date)	0.188			1.07		
l.s.d. (variety)	n.s.			n.s.		
l.s.d. (variety × sowing date)	n.s			n.s.		

l.s.d. (*P*<0.05); n.s. = not significantly different

Table 64: *Grain yield and peak biomass of vetch sown on three dates (mid April, late April, mid May) at Arumpo, southwest NSW in 2023.*

Vetch variety	Grain yield (t/ha)			Peak biomass (t/ha)		
	SD1: 14 Apr	SD2: 27 Apr	SD3: 15May	SD1: 14 Apr	SD2: 27 Apr	SD3: 15May
Studenica	1.08	1.12	1.05	7.00	6.03	3.62
Timok	1.23	1.34	1.07	7.70	6.46	3.84
Volga	1.42	1.49	1.10	7.99	6.19	3.78
l.s.d. (sowing date)	0.12			0.84		
l.s.d. (variety)	0.12			n.s.		
l.s.d. (variety × sowing date)	n.s			n.s.		

l.s.d. (*P*<0.05); n.s. = not significantly different

Vetch (foreground), field peas and lentils (back) at Arumpo, 3 August 2023

Table 65: *Total biomass at start of podding (hay-cut timing) of vetch sown on three dates (mid April, late April, mid May) at Arumpo, southwest NSW in 2023. Actual hay yield may be 50–70% of this.*

Vetch variety	Hay biomass/yield (t/ha)		
	SD1: 14 Apr	SD2: 27 Apr	SD3: 15May
Studenica	6.08	4.10	3.66
Timok	5.76	6.68	4.19
Volga	5.66	5.36	4.62
l.s.d. (sowing date)	0.89		
l.s.d. (variety)	n.s.		
l.s.d. (variety × sowing date)	n.s		

l.s.d. (*P*<0.05); n.s. = not significantly different

Table 66: *Grain yield and peak biomass of faba beans sown on three dates (mid April, late April, mid May) at Arumpo, southwest NSW in 2023.*

	Grain yield (t/ha)			Peak biomass (t/ha)		
Faba bean variety	SD1: 14 Apr	SD2: 27 Apr	SD3: 15May	SD1: 14 Apr	SD2: 27 Apr	SD3: 15May
PBA Bendoc	1.58	1.21	1.05	6.17	4.02	3.59
PBA Marne	1.83	1.59	1.21	5.82	4.56	3.43
PBA Samira	1.40	1.27	1.21	5.59	4.39	3.49
l.s.d. (sowing date)	0.10			0.52		
l.s.d. (variety)	0.10			n.s.		
l.s.d. (variety × sowing date)	0.18			n.s.		

l.s.d. (*P*<0.05); n.s. = not significantly different

Table 67: *Grain yield and peak biomass of chickpeas sown on three dates (mid April, late April, mid May) at Arumpo, southwest NSW in 2023.*

	Grain yield (t/ha)			Peak biomass (t/ha)		
Chickpea variety	SD1: 14 Apr	SD2: 27 Apr	SD3: 15May	SD1: 14 Apr	SD2: 27 Apr	SD3: 15May
CBA Captain	1.25	1.21	1.19	4.11	3.87	3.10
Genesis 090	1.23	1.26	1.22	4.72	3.39	3.21
PBA Striker	1.21	1.18	1.17	4.05	3.56	3.09
l.s.d. (sowing date)	n.s.			0.50		
l.s.d. (variety)	n.s.			n.s.		
l.s.d. (variety × sowing date)	n.s.			n.s.		

l.s.d. (*P*<0.05); n.s. = not significantly different