Dunedoo

Dunedoo site attributes

2023

Rainfall

Table 1: *Monthly rainfall in 2023 and long-term average (LTA, 1878–2023), total annual and growing season (GSR, April–October) rainfall at Dunedoo (Silo PPD).*

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	GSR
2023	100	34	37	37	5	34	30	23	13	42	84	38	477	184
LTA	71	63	55	42	42	47	48	42	47	56	58	65	636	324

Soil characteristics

Sampled June 2023		Soil depth (cm)		
Characteristic	Unit	0–10	10–30	30–60
pH ($CaCl_2$)		5.2	6.7	7.5
pH (water)		6.1	7.2	8.1
Organic Carbon	%	1.9	1.2	0.6
Electrical conductivity (1:5 water)	dS/m	0.10	0.19	0.23
Phosphorus (Colwell)	mg/kg	18	8	<5
Sulphur (KCl4O)	mg/kg	4	4	3
Chloride	mg/kg	<10	<10	13
Nitrate N	mg/kg	32.0	12.0	5.5
Ammonium N	mg/kg	1.5	0.9	0.9
Cation exchange capacity (CEC)	meq/100 g	13.1	15.7	30.2
Exc. calcium	%	8.3	12.0	20.0
Exc. magnesium	%	3.0	3.0	8.7
Exc. potassium	%	1.80	1.20	0.89
Exc. sodium	%	0.06	0.04	0.28
Soil colour		brown	brown	orange/yellow
Soil texture		clay	clay	clay

Crop sequence and key management dates

Crop sequence		
Year	Crop	Cultivar
2022		
2021		
2020		

Site management 2023		
Activity	Date	Comments
Sowing	10 May	Main sowing: faba beans, lupins, vetch, canola
	10 June	Main sowing: chickpeas, field peas, lentils, wheat
		Late sowing: faba beans, lupins, vetch
Harvest	2 November	Field peas, vetch
	15 November	Chickpeas, faba beans, lentils, lupins, canola, wheat

Pulse species comparison

Dunedoo 2023

Key findings

- Field peas were the highest yielding pulse species evaluated, averaging 1.2 t/ha. APB Bondi$^{\Phi}$ and PBA Taylor$^{\Phi}$ out-yielded PBA Butler$^{\Phi}$ by 0.4 t/ha.
- Albus lupin varieties Luxor$^{\Phi}$ and Murringo$^{\Phi}$ yielded double the narrowleaf variety PBA Bateman$^{\Phi}$, 1.0 t/ha compared to 0.5 t/ha.
- Chickpea grain yield averaged 0.7 t/ha, faba beans 1.2 t/ha and vetch 1.1 t/ha from the main sowing time. Delayed sowing resulted in a significant increase in Samira$^{\Phi}$ faba bean yield (from 1.2 to 1.7 t/ha) and a significant reduction in vetch yield (from 1.1 to 0.3 t/ha).
- Faba beans, field peas and vetch had the highest peak biomass from the main sowing time (~4.7 t/ha).
- Delayed sowing of faba bean, albus lupin and vetch resulted in a reduction in peak biomass.
- A nitrogen application treatment (+N) was included to enable a comparison of N-fixation in a high N environment between species. Nitrogen was applied to selected varieties of each species and had no effect on yield or seed nitrogen concentration. Biomass of the +N treatments compared to Nil N was lower in Samira$^{\Phi}$ faba bean and Studenica$^{\Phi}$ vetch, while it was higher in Luxor$^{\Phi}$ albus lupins.
- As a comparison with the pulse species, canola yielded 0.4 t/ha and wheat yielded 3.0 t/ha.
- Seed nitrogen concentration was highest in albus lupins and lowest in chickpeas and field peas. Seed N concentration is important when calculating the nitrogen balance (N-fixation – N removed) of a pulse crop.

Pulse species and variety comparison, plus wheat and canola at Dunedoo in 2023

Trial details

Table 2: *Trial management details for pulse species and variety comparison at Dunedoo in 2023.*

Management	2023
Sowing date	10 May: main sowing – faba beans, lupins, vetch, canola 10 June: main sowing – chickpeas, field peas, lentils, wheat 10 June: late sowing – faba beans, lupins, vetch
Starter fertiliser	MAP @ 75 kg/ha, in furrow
Harvest date	2 November: field peas, vetch 15 November: chickpeas, faba beans, lentils, lupins, canola, wheat
Target plant population	Chickpeas: 35 plants/m^2 Faba beans: 20 plants/m^2 Field peas: 40 plants/m^2 Lentils: 110 plants/m^2 Lupins: 35 plants/m^2 Vetch: 35 plants/m^2 Canola: 30 plants/m^2 Wheat: 120 plants/m^2

Table 3: *Treatments included in pulse species and variety comparison at Dunedoo in 2023.*

Species Variety	Sowing time*	Additional management	Nitrogen rate** (kg N/ha)
Canola			
HyTTec® Trophy	Main	Decile 2 N	0
	Main	Decile 6 N	43
	Main	Decile 8 N	71
Faba beans			
PBA Samira$^{\phi}$	Main		0
	Main	+N	100
	Late		0
PBA Nasma$^{\phi}$	Main		0
FBA Ayla$^{\phi}$	Main		0
Lupins			
PBA Bateman$^{\phi}$ (narrowleaf)	Main		0
	Late		0
Murringo$^{\phi}$ (albus)	Main		0
Luxor$^{\phi}$ (albus)	Main		0
	Main	+N	100
	Late		0
Vetch			
Studenica$^{\phi}$	Main	Hay	0
	Main	Brown manure	0
	Main		0
	Main	+N	100
	Late		0

Species variety	Sowing time*	Additional management	Nitrogen rate** (kg N/ha)
Field peas			
PBA Butler$^{\phi}$	Main		0
	Main	+N	100
PBA Taylor$^{\phi}$	Main		0
APB Bondi$^{\phi}$	Main		0
Chickpeas			
CBA Captain$^{\phi}$	Main		0
	Main	+N	100
PBA HatTrick$^{\phi}$	Main		0
PBA Seamer$^{\phi}$	Main		0
Lentils			
PBA Hallmark XT$^{\phi}$	Main		0
CIPAL 2122	Main		0
PBA Kelpie XT$^{\phi}$	Main		0
	Main	+N	100
Wheat			
LongReach Mustang$^{\phi}$	Main	Decile 2 N	0
	Main	Decile 6 N	23
	Main	Decile 8 N	83

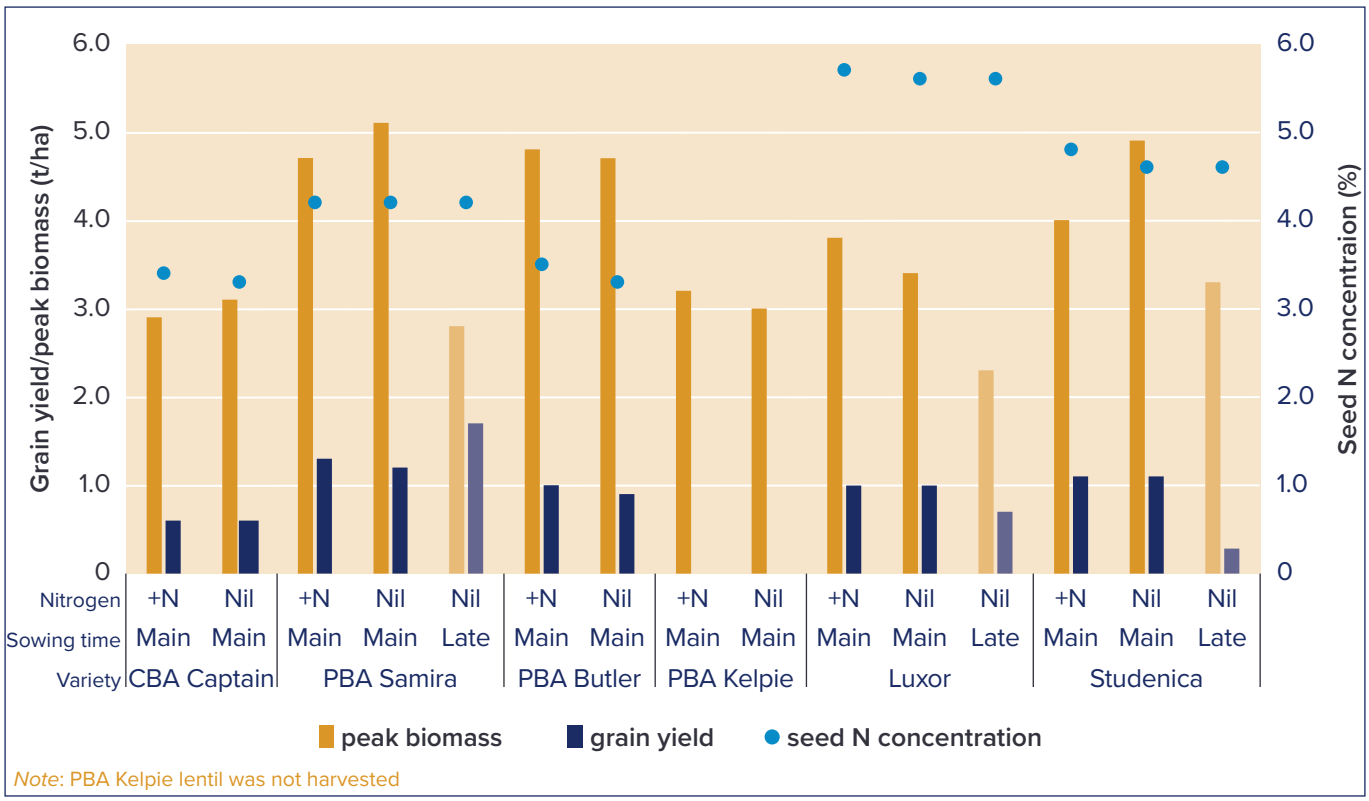
* Main sowing time: 9 May
Late sowing time: 7 June

** Nitrogen applied as urea incorporated by sowing

Table 4: *Peak biomass, grain yield and seed N concentration of six pulse species plus wheat and canola at Dunedoo in 2023.*

Species	Variety	Sowing time	N applied (kg/ha)	Peak biomass (t/ha)	Grain yield (t/ha)	Seed N concentration (%)
Canola	HyTTec Trophy	Main	0	4.5	0.3	–
	HyTTec Trophy	Main	43	–	0.6	–
	HyTTec Trophy	Main	71	–	0.3	–
Chickpeas	CBA Captain	Main	100	2.9	0.6	3.4
	CBA Captain	Main	0	3.1	0.6	3.3
	PBA Drummond	Main	0	–	0.9	–
	PBA Seamer	Main	0	–	0.8	–
Faba beans	FBA Ayla	Main	0	–	1.0	–
	PBA Nasma	Main	0	–	1.1	–
	PBA Samira	Main	100	4.7	1.3	4.2
	PBA Samira	Main	0	5.1	1.2	4.2
	PBA Samira	Late	0	2.8	1.7	4.2
Field peas	APB Bondi	Main	0	–	1.4	3.5
	PBA Butler	Main	100	4.8	1.0	3.5
	PBA Butler	Main	0	4.7	0.9	3.3
	PBA Taylor	Main	0	–	1.3	3.5
Lentils	Cipal 2122	Main	0	–	–	–
	PBA Hallmark XT	Main	0	–	–	–
	PBA Kelpie XT	Main	100	3.2	–	–
	PBA Kelpie XT	Main	0	3.0	–	–
Lupins	Luxor	Main	100	3.8	1.0	5.7
	Luxor	Main	0	3.4	1.0	5.6
	Murringo	Main	0	–	1.0	–
	Luxor	Late	0	2.3	0.7	5.6
	PBA Bateman	Main	0	2.9	0.5	5.4
Vetch (grain)	Studenica	Main	100	4.0	1.1	4.8
	Studenica	Main	0	4.9	1.1	4.6
	Studenica	Late	0	3.3	0.3	4.6
Wheat	LRPB Mustang	Main	0	–	2.9	–
	LRPB Mustang	Main	23	–	2.9	–
	LRPB Mustang	Main	83	–	3.2	–
			l.s.d. (P = 0.05)	1.0	0.4	0.3

Note: Lentils were not harvested in this trial



Note: PBA Kelpie lentil was not harvested

Figure 2: *Peak biomass, grain yield and seed nitrogen concentration of one variety of each pulse species evaluated at main and late sowing time (faba beans, albus lupin and vetch) and +N treatment at Dunedoo in 2023.*