

Pulse species and variety comparison

Parkes and Canowindra 2021

Key findings

- Faba beans had the highest grain yield (average 5.7 t/ha Canowindra and 5.8 t/ha Parkes) and produced very high biomass (average 14.9 t/ha Canowindra and 13.6 t/ha Parkes) at both sites. The high biomass indicates a high amount of nitrogen fixed (N-fix samples currently being processed), but the beans also had very high removal in the grain with an average removal of 229 kg N/ha at Canowindra and 262 kg N/ha at Parkes.
- Faba beans out-yielded both canola and wheat at Canowindra and Parkes, even with high N input.
- Murringio^{db} (albus) and PBA Bateman^{db} (narrow-leaf) lupins produced very high biomass at Canowindra (17.6 and 15.6 t/ha respectively), but grain yield was lower than faba beans. Biomass of lupins was lower at the Parkes site (3.0 and 7.9 t/ha for Murringio^{db} and PBA Bateman^{db} respectively) which had intermittent waterlogging. Grain yield followed a similar trend with high yield for Murringio^{db} (4.3 t/ha) and PBA Bateman^{db} (3.4 t/ha) at Canowindra but low yield for Murringio^{db} (0.8 t/ha) and moderate yield for PBA Bateman^{db} (2.6 t/ha) at Parkes.
- The dry matter production from vetch was relatively low at both sites but vetch was cut at an earlier growth stage (before podding) to simulate hay cut timing.
- CBA Captain^{db} chickpeas had relatively low biomass compared to faba beans at both sites, with moderate grain yield (2.2 and 2.6 t/ha at Canowindra and Parkes respectively). CBA Captain^{db} chickpeas yielded more than lentils at both sites. Lentils (like Murringio^{db} albus lupins) suffered from waterlogging at Parkes and had low biomass and yield.
- Lupins had the highest seed N content, removing 90% more N than chickpeas (lowest seed N content) per tonne of grain produced.
- An assessment of total nitrogen derived from fixation is being completed on the biomass samples to determine a nitrogen balance of each species at these sites and other sites in the project.

Trial Details

Table 1: Trial management and fungicide treatments applied at Parkes and Canowindra in 2021.

Management	Details	Parkes	Canowindra
Sowing Date	Canola, faba beans, lupins, vetch	31 May	3 May
	Wheat, chickpeas, lentils		20 May
Harvest Date	Faba beans, canola	14 December	23/11/2021
	Wheat, chickpeas, lupins, lentils	23 December	
	Wheat, narrow-leaf lupins, lentils		12 December
	Chickpeas, broadleaf lupins		17 January 2022
Starter Fertiliser	MAP	75 kg/ha	30 kg/ha

Results

Biomass and grain yield

Table 2: Peak biomass* and grain yield of two varieties of five legume species plus one variety of canola and wheat (both with a high and low N rate)† at Canowindra and Parkes in 2021.

Species	Variety	Canowindra		Parkes	
		Peak biomass (t/ha)	Grain yield (t/ha)	Peak biomass (t/ha)	Grain yield (t/ha)
Canola (High N)	HyTTec Trophy	14.8	4.0	9.3	2.4
Canola (Low N)	HyTTec Trophy	12.5	3.8	8.2	2.1
Chickpea	CBA Captain	7.0	2.2	9.0	2.6
	PBA Hattrick	4.0	0.8	8.2	2.3
Faba bean	PBA Nasma	14.8	5.5	12.1	5.3
	PBA Samira	15.0	5.8	15.1	6.3
Lentil	PBA Hallmark XT	6.7	1.4	3.9	0.7
	PBA Kelpie/ GIA Leader	6.8	1.6	2.4	0.2
Lupin	PBA Bateman	15.6	3.4	7.9	2.6
	Murringo	17.6	4.3	3.0	0.8
Vetch (hay)	Studenica	5.5	–	4.7	–
Wheat (High N)	LRPB Mustang/ LRPB Flanker	13.7	4.3	9.1	3.8
Wheat (Low N)	LRPB Mustang/ LRPB Flanker	12.1	3.9	7.8	3.8
I.s.d. ($P = 0.05$)		2.8	0.6	3.4	1.0

* Peak biomass sampling targeted at early–mid pod fill for each species. Vetch was cut before podding in line with commercial practice for hay production.

† High N rate = 120 kg N/ha (50 kg/ha urea 20 July + 211 kg/ha urea 3 September). Low N rate = 40 kg N/ha (50 kg/ha urea 20 July + 36 kg/ha urea 3 September).



Figure 4: Species screen trial, generally growing well with no soil type restrictions at Canowindra in 2021.

Seed nitrogen concentration and N removal

Table 3: Grain nitrogen (N) concentration, grain yield and calculated Total N removal of two varieties of four pulse species at Canowindra and Parkes in 2021.

Location		Canowindra			Parkes		
Species	Variety	Grain N (%)	Grain yield (t/ha)	Total N removal (kg/ha)	Grain N (%)	Grain yield (t/ha)	Total N removal (kg/ha)
Chickpea	CBA Captain	3.4	2.2	74.2	3.4	2.6	88.9
	PBA Hattrick	3.5	0.8	28.1	3.4	2.3	79.3
Faba bean	PBA Nasma	4.1	5.5	228.9	4.5	5.3	242.4
	PBA Samira	4.0	5.8	230.3	4.5	6.3	282.7
Lentil	PBA Hallmark XT	4.2	1.4	58.7	4.0	0.7	29.2
	GIA Leader/ PBA Kelpie XT	4.3	1.6	69.1	4.1	0.2	10.5
Lupin	PBA Bateman	5.3	3.4	179.5	5.1	2.6	132.4
	Murringo	6.1	4.3	262.6	5.9	0.8	49.0
l.s.d. ($P < 0.05$)		0.19	0.6	21.3	0.2	1.0	41.3



Figure 5: Species screen trial. Murringo[®] lupins (front left), PBA Bateman[®] lupins (front right). Faba beans rear centre with chickpeas to the left and wheat to the right.