Managing N fixation in pulses

Barellan 2022

Key findings

- The soil was a brown sandy loam with pH_{Ca} 5.2, Colwell phosphorus 44 ppm and total nitrogen (0–60 cm) 52.9 kg N/ha. The pulse crop grown was lupins in 2016.
- The addition of 40 kg/ha of nitrogen at sowing (broadcast and incorporated by sowing, IBS) increased the early vigour of lentils (as measured through NDVI on 2 and 31 August) but had no effect on the vigour of field peas.
- Acid tolerant rhizobia resulted in improved nodulation compared to both standard peat and nil inoculant treatments in lentils. In the field peas, both the acid tolerant rhizobia and standard peat had better nodulation than the nil inoculant treatment.
- There was no effect of inoculant treatment or N application on grain yield of lentils. Field pea grain yield was higher in both the standard peat and acid tolerant rhizobia treatments than in the uninoculated treatment. The addition of nitrogen at sowing also increased field pea yield.

Trial Details

Table 1: *Trial management and treatments applied at Barellan in 2022.*

Management	
Pre-sow herbicides	3 May: glyphosate 450 @ 1.5 L/ha + Reflex® (240 g/L fomesafen) @ 1 L/ha
Sowing date	6 May
Starter fertiliser	MAP @ 80 kg/ha (phosphorus 21.9%, nitrogen 10%, sulphur 1.5%, calcium 1.6%)
Sowing rate	Calculated for each species and variety based on seed size. Lentil target 100 plants/m^2, field pea target 40 plants/m^2
Fungicide	Due to multiple trial species on one site, fungicide application was off-label. Contact trial manager for more information
Insecticide	11 October: Transform (500 g/kg sulfoxaflor)@ 50g/ha + Trojan® (150 g/L gamma-cyhalothrin) @ 30 mL/ha + wetter 1000 @ 0.2%
Harvest date	20 December
Treatments	
Species, variety	Lentil, PBA Hallmark XT$^{\phi}$
	Field pea, Sturt$^{\phi}$
Rhizobia inoculant	Nil
	Standard peat
	Acid tolerant peat
N rate (applied as urea IBS)	0 kg N/ha
	40 kg N/ha

Results

Lentils

Table 2: *Effect of nitrogen and inoculation on vigour (NDVI), nodulation score* (1 September), grain yield and seed weight of lentils at Barellan in 2022.*

Treatment	NDVI – 2 August	NDVI – 31 August	Nodule score*	Grain yield (t/ha)
Nitrogen				
0N	0.39	0.55	2.5	2.6
40N	0.43	0.62	2.6	2.7
Mean	0.41	0.59	2.5	2.7
l.s.d. (*P*=0.05)	0.016	0.054	ns	ns
Inoculation				
Nil	0.41	0.57	1.8	2.5
Standard Peat	0.40	0.57	2.3	2.7
Acid Tolerant	0.43	0.62	3.5	2.7
Mean	0.41	0.59	2.5	2.7
l.s.d. (*P*=0.05)	ns	ns	0.55	ns

* Nodulation scores 0 to 8, where 0 = no nodules and 8 = extremely abundant. A score of 4 is considered adequate.
Source: Dr Ron Yates, Department of Agriculture and Food WA.

Field peas

Table 3: *Effect of nitrogen and inoculation on vigour (NDVI), nodulation score* (1 September), grain yield and seed weight of field peas at Barellan in 2022.*

Treatment	NDVI – 2 August	NDVI – 31 August	Nodule score*	Grain yield (t/ha)
Nitrogen				
0N	0.64	0.69	3.5	2.8
40N	0.66	0.70	3.8	3.1
Mean	0.65	0.69	3.6	2.95
l.s.d. (*P*=0.05)	ns	ns	ns	0.05
Inoculation				
Nil	0.65	0.69	3.1	2.7
Standard Peat	0.63	0.69	3.7	3.1
Acid Tolerant	0.66	0.70	4.1	3.0
Mean	0.65	0.69	3.6	2.95
l.s.d. (*P*=0.05)	ns	ns	0.42	0.284

* Nodulation scores 0 to 8, where 0 = no nodules and 8 = extremely abundant. A score of 4 is considered adequate.
Source: Dr Ron Yates, Department of Agriculture and Food WA.

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