

Trial 3. Influence of Rhizobium Inoculation on the Break Crop Effect of Faba Bean Yield and Profitability

Protocol Objective: To evaluate the yield influence of granular inoculants and nitrogen fertiliser applied to faba beans grown under surface irrigation.

Location: Finley IRC

FAR Code: FAR F21-02-1

Sown: 29 April 2021

Cultivar: PBA Bendoc

Harvested: 22nd December 2021

Rotation position: Wheat (2020), Wheat (2019), Faba beans (2018)

Soil Management: Cultivation with speed disc to incorporate stubble in Autumn

Irrigation: Surface irrigation, 3 applications totalling 289mm

GSR: April-November 300mm. Total water available 589mm

Key Messages:

- Applying Nodulator granular inoculant at recommended rates led to a significant increase in nodulation, compared to the untreated plots, but did not increase yield.
- Increasing the rate of Nodulator to double or triple the recommended rate had no additional effect on nodulation, compared to the standard rate.
- Applying nitrogen fertiliser (40kg N/ha) at sowing had no negative effect on subsequent nodulation and increased grain yield by 0.96 - 1.39 t/ha compared to treatments where no nitrogen was applied, however the more variable nature of the trial meant that the advantage not statistically significant.
- Applying nitrogen at pod set increased grain yield by 0.22 – 0.65 t/ha compared to treatments where no nitrogen was applied, however again this yield advantage was not statistically significant.
- Although there were no significant differences between dry matter and nitrogen offtake at flowering, there was a trend for more dry matter and nitrogen in the dry matter at flowering where nitrogen had been applied at sowing.

Table 1. Influence of rhizobium inoculation and N fertiliser input on yield values (t/ha).

Treatment Rate & Timing		Grain Yield t/ha
1.	Untreated	5.92 -
2.	Nodulator 4.2kg/ha	5.91 -
3.	Nodulator 8.4kg/ha	5.49 -
4.	Nodulator 12.6kg/ha	5.66 -
5.	Nodulator 4.2kg/ha + 40 kg N/ha pod set	6.14 -
6.	Nodulator 4.2kg/ha + 40 kg N/ha IBS	6.88 -
Mean		6.00
LSD		ns
P val		0.169

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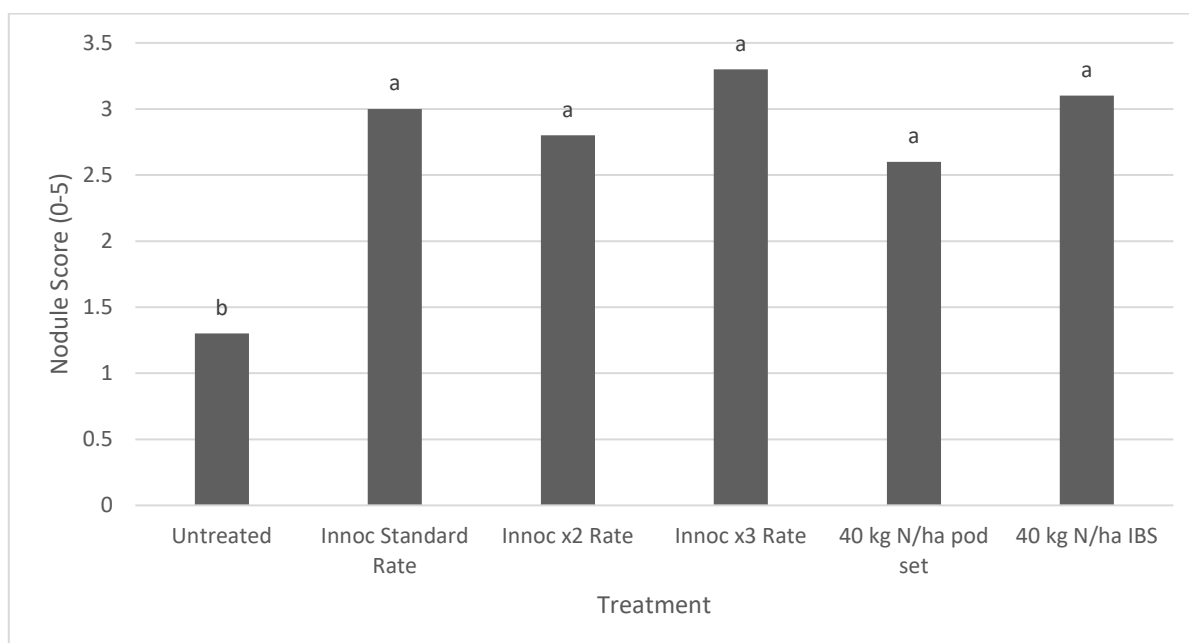
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Table 2. Influence of rhizobium inoculation on faba bean dry matter production and nitrogen uptake at mid flowering – assessed GS64 (9 September).

		Mid flowering (GS64)	
		Dry matter	Nitrogen (N)
Treatment Rate & Timing		t/ha	Kg/ha
1.	Untreated	3.22 -	93 -
2.	Nodulator 4.2kg/ha	3.03 -	106 -
3.	Nodulator 8.4kg/ha	3.01 -	110 -
4.	Nodulator 12.6kg/ha	3.41 -	112 -
5.	Nodulator 4.2kg/ha + 40 kg N/ha pod set	3.63 -	112 -
6.	Nodulator 4.2kg/ha + 40 kg N/ha IBS	3.87 -	158 -
Mean		3.36	115
LSD		ns	ns
P val		0.675	0.058

40kg N/ha at pod set not applied when assessment of crop N content was assessed.

**Figure 1.** Influence of treatments tested on root nodule scores (0-5 scale) Assessed at 8 node 28-July – cv PBA Bendoc.

Treatments with the same letters are not significantly different.

6 plants were randomly dug out from each plot, roots were gently washed to remove soil. The nodules were counted as effective (pink outside and healthy pink inside) and non-effective (black, white and green). A score based on the number and distribution of effective nodules was calculated from the table below.

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Table 3. Nodule scoring system used in Figure 3.

Nodule Score	Distribution and Number of Effective Nodules	
	Crown (Top 5cm)	Elsewhere
0	0	0
0.5	0	1 to 4
1.0	0	5 to 9
1.5	0	>10
2.0	<10	0
2.5	<10	<10
2.75	<10	>10
3.0	>10	0
4.0	>10	<10
5.0	>10	>10

SAGI statistical analysis (Predicted values for Yield and Harvest dry matter) The following statistical analysis of key harvest assessments has been carried out by SAGI. This analysis uses spatial statistical analysis to refine predicted values for key assessment values.

Table 1: Harvest Traits for the Treatments

Treatment	Yield (t/ha)	Harvest DM
Control	5.64 ± 0.43 -	9.65 ± 1.44 -
Rate1	5.99 ± 0.43 -	9.9 ± 1.44 -
Rate2	5.66 ± 0.42 -	11 ± 1.44 -
Rate3	5.92 ± 0.43 -	12.71 ± 1.45 -
UreaPodSet	6.14 ± 0.43 -	10.78 ± 1.44 -
UreaSeeding	6.54 ± 0.42 -	12.07 ± 1.44 -

Note: values expressed as mean ± standard error of prediction
- no subscripts relevant for this response

A summary of the experiment statistics is below:

Table 2: Key statistics for each response analysed

Statistic	Yield (t/ha)	Harvest DM
LSD	0.793	4.216
Mean	6.000	11.000
Treatment_p-value	0.246	0.658
CV	28.185	29.882

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