

4.5 Pulse Agronomy Trials

4.5.1 How Effective Are New Inoculant Technologies For The Nodulation Of Grain Legumes? - Inverleigh And Mininera, Vic

Location: Inverleigh and Mininera

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Researchers:

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Rainfall (mm) April – November:

Inverleigh : 393 mm
Mininera : 430 mm

Summary of Findings:

- Inoculation with freeze-dried rhizobial formulations produced nodulation of grain legumes equivalent to that of the traditional peat slurries, with significantly less preparation required when inoculated in furrows. Becker Underwood granules produced less nodules than peat slurries treatment, but improved inoculation over nil treatments.
- Granular products varied in their ability to provide nodulation of grain legumes.

Background:

The delivery of inoculants of root nodule bacteria (rhizobia) by peat slurry application is considered to be a difficult and time-consuming procedure for land holders. There have been a number of new delivery technologies coming onto the market, promising greater ease of application, eliminating the need for manual seed inoculation. These new inoculant products are therefore likely to assist farmers in the effective delivery of root nodule bacteria to legumes. Four inoculant manufacturers have, or are currently developing, a range of granular carriers and freeze-dried products to meet these objectives.

The granular products containing the rhizobia are usually applied at sowing in a similar way to grain or fertilizer. Freeze-dried rhizobia can be used as a coating on the seed, or directly injected as a liquid in the drill rows during sowing.

Since these inoculants have not had widespread use, the aim in this study was to test these new delivery systems and their effect on nodulation grain legumes in a range of Australian soils. Experiments were conducted across a range of environments in Victoria and southern New South Wales. In this report we focus on trials conducted at Inverleigh and Mininera (Victorian South West).

Trial Inputs:

Granular inoculants used in these trials were either purchased through Bay Classic Pty Ltd (Alosca) or supplied by the manufacturer Becker Underwood Pty Ltd (Nodulator). Nodulator was stored at 4 °C and the Alosca product stored in a cool room away from direct sunlight according to manufacturers specifications. Granule products were applied with seed or at 2.5 or 5cm depth. A Freeze-dried root nodule bacteria product supplied by New-Edge Microbials was stored at 4°C prior to sowing according to manufactures recommendations. It was directly applied onto the seed or injected into the drill rows at sowing using a rate of one small vial per 500kg of seed.

Trial Design:

All trials were set up using a randomized block design with 4 replications. Chickpea, Faba or Lupins were sown using plot lengths of 10m by 1.42m wide. All trials were sown using a cone seeder, with granules sown through the cone with the seed or placed at depth. Superphosphate was applied from a small calibrated fertilizer box at a rate of 120 kg/ha. After each treatment the cone seeder was sterilized to eliminate any possibility of contamination between rhizobial treatments. Each plot was sampled by randomly taking ten plants from each plot for measurements.

▼ Table 4.32: Treatment list

Treatment	Treatment list
A 10	Alosca bentonite clay granule sown @ 10kg/ha with seed
B 6	Becker Underwood granules sown @ 6kg/ha with seed
B 6 U 2.5	Becker Underwood granules sown @ 6kg/ha 2.5cm below the seed
B 6 U 5	Becker Underwood granules sown @ 6kg/ha 5cm below the seed
E-Rhiz inject	EasyRhiz (freeze-dried rhizobia) injected by nozzles @ a rate of 50 l/ha into drill rows at sowing
E-Rhiz on seed	EasyRhiz (freeze-dried rhizobia) applied to seed
Peat	Peat slurry coated on seed
Nil	No rhizobia applied

Results:

Peat inoculation improved the nodulation of lupin, chickpea and faba beans, compared with the uninoculated treatment (Tables 4.23, 4.33 and 4.34). The shoot mass and grain yields showed no differences between treatments likely due to the dry conditions during the growing season for 2007.

The Freeze-dried inoculants provided a similar nodulation to that of the peat inoculants applied either as a seed coating, or injected into the sowing furrow. The newly-released Nodulator granules from Becker Underwood produced significantly less nodules than the peat slurries, but produced more nodules than the un-inoculated treatments.

Alosca granules did not improve nodulation compared with uninoculated treatments.

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▼ **Table 4.33: Inverleigh : Chickpeas (Genesis 090)**

Treatment	Nil	Alosca 10	B 6	B 6 U 2.5	B 6 U 5	E- Rhiz on seed	E- Rhiz inject	Peat	LSD
Nodule number (per plant)	0.1	0.4	9.2	6.8	3.5	17.3	17.3	20.1	5.1
Nodule score (per plant)	0.0	0.3	2.3	1.0	1.3	2.7	1.7	2.3	0.8
Nodule dry matter (mg per plant)	0.0	7.0	126.0	89.0	50.0	151.0	110.0	142.0	40.0

▼ **Table 4.34: Inverleigh: Lupins (Belara)**

Treatment	Nil	Alosca 10	B 6	B 6 U 2.5	E –Rhiz on seed	E- Rhiz inject	Peat	LSD
Nodule number (per plant)	3.4	1.5	5.9	3.0	16.8	13.3	10.5	7.0
Nodule score (per plant)	1.8	1.3	2.1	1.7	3.2	3.0	2.8	0.8
Nodule dry matter (mg per plant)	39.0	17.0	62.0	30.0	154.0	97.0	124.0	61.0

▼ **Table 4.35: Mininera: Faba bean (Farah)**

Treatment	Nil	Alosca 10	B 6	B 6 U 2.5	E –Rhiz on seed	E- Rhiz inject	Peat	LSD
Nodule number (per plant)	0.1	1.5	8.6	1.5	26.6	20.0	31.1	7.6
Nodule score (per plant)	0.1	0.5	1.7	0.5	3.1	2.9	4.4	1.1
Nodule dry matter (mg per plant)	5.0	51.0	189.0	51.0	461.0	351.0	404.0	107.0

Discussion:

Australia now has four inoculant manufacturers developing or producing inoculants aimed at simplifying the delivery of rhizobium products into farming systems. This gives landholders a greater choice of product that best suits their individual requirements. The results of field trials show that careful selection of inoculant products is crucial to obtain maximum root nodulation and in providing the best results.

▲ **Photo 4.6 Inoculation responses achieved in chickpeas at Inverleigh 2007**▲ **Photo 4.7: A well-nodulated chickpea root system at Inverleigh 2007**

Note the difference in the colour of the plots indicating nitrogen deficiency in the uninoculated plot.