5.5 Investigation of Emerging Grain Legume Inoculant Technologies

Location:
SFS Inverleigh Research site

Funding:
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Rainfall (mm) April – November : 233mm

Summary of Findings:
The 2006 field trials have again shown that there is a place for new carrier products of root nodule bacteria in our systems, which could be of great benefit to the farmer. These new products in most cases performed as well as the traditional peat slurry carrier. The introduction of these new products offers producers an opportunity to choose the type of delivery system which best suits their business and budget.

Background to the trial:
Landholders today are trying to streamline their operations to save time and money. The development of new carrier materials assist in the protection and efficient delivery of root nodule bacteria to legumes. Four inoculant manufacturers have, or are currently developing, granular and freeze-dried products to meet these objectives. The granular products are applied at sowing in a similar way to grain or fertiliser. Freeze dried material can be used as a coating on the seed or directly injected in the drill rows on the sowing pass.

Trial Inputs:
Granular inoculants were purchased (Bay Classic Pty Ltd (Alosca)) or supplied by the manufacturer (Becker Underwood Pty Ltd) and stored according to manufactures instructions with Becker Underwood Pty Ltd granules being stored at 4 ^{0}C on arrival and the Alosca product stored at room temperature. Granules were applied at two sowing depths (with seed and 2 cm below seed) and at two rates (5 and 10kg/ha).

Freeze dried root nodule bacteria supplied by New-Edge Microbials was also stored as to manufactures instructions and applied onto the seed and injected into the drills at sowing, a rate of one small vial per 500kg of seed.

Trial Design:
The three field trials located at Inverleigh were a randomised block design with plot sizes of 21.3 m^2 with three or four replicates of each species x treatment combination.

All trials were sown with a cone seeder, with the granules sown through the cone together with the seed and superphosphate (120 kg/ha single super). The cone seeder was sterilised after each treatment to eliminate potential contamination of rhizobial treatments. Best practice weed and pest management was undertaken.

Plant sampling was undertaken twice during the growing season with a total of twenty plants taken per treatment.

Table 1 Treatment List

Treatment	Treatment list
A 10	Alosca granules sown @ 10kg/ha with seed
A 10 U	Alosca granules sown @ 10kg/ha 2cm below the seed
A 5	Alosca granules sown @ 5kg/ha with seed
B 10	Becker Underwood granules sown @ 10kg/ha with seed
B 10 U	Becker Underwood granules sown @ 10kg/ha 2cm below the seed
B 5	Becker Underwood granules sown @ 5kg/ha with seed
E-Rhiz inject	EasyRhiz injected by nozzles into drill rows at sowing
E-Rhiz on seed	EasyRhiz applied to seed

Trial Results:
In the Lupin field trial peat inoculation improved the nodulation of plants and increased the shoot N due to effective nodulation compared with the Nil treatment (Table 2, Figure 1). There were no differences in shoot mass or grain yield, which is most likely due to the drought conditions in the 2006 growing season, although grain N is likely to be improved from inoculation (data not obtained yet).

Experimental granules from the manufacturers Becker Underwood and freeze dried product from New-Edge Microbials improved nodulation of plants indicating that this technology may be an effective alternative to peat inoculants in a similar comparison.

Alosca granules that are designed for acid sandy soils and were not refrigerated performed poorly at this trial site and others around the state, and further evaluation is being conducted in Victorian environments.

Lupin (Jindalee) SFS Inverleigh

Table 2. Nodulation characteristics following inoculation with a range of granular or freeze-dried products.

Treatment	**Nodule number**	**Nodule Score**	**Nodule Dry Mass (grams)**
Alosca 10	1.17	1.00	0.33
Alosca 10 U	0.37	0.67	0.07
Alosca 5	0.3	0.67	0.07
Nil	0.10	0.00	0.03
Peat	10.23	2.83	1.34
LSD	**3.06**	**0.65**	**0.41**

Treatment	Nodule number	Nodule Score	Nodule Dry Mass (grams)
Becker 10	12	1.83	1.17
Becker 10 U	3.57	2.17	0.71
Becker 5	6.70	1.00	0.93
E-Rhiz inject	4.07	0.83	0.55
E-Rhiz on seed	8.53	3.17	1.38
Nil	0.10	0.00	0.03
Peat	10.23	2.83	1.34
LSD	**6.24**	**0.85**	**0.67**

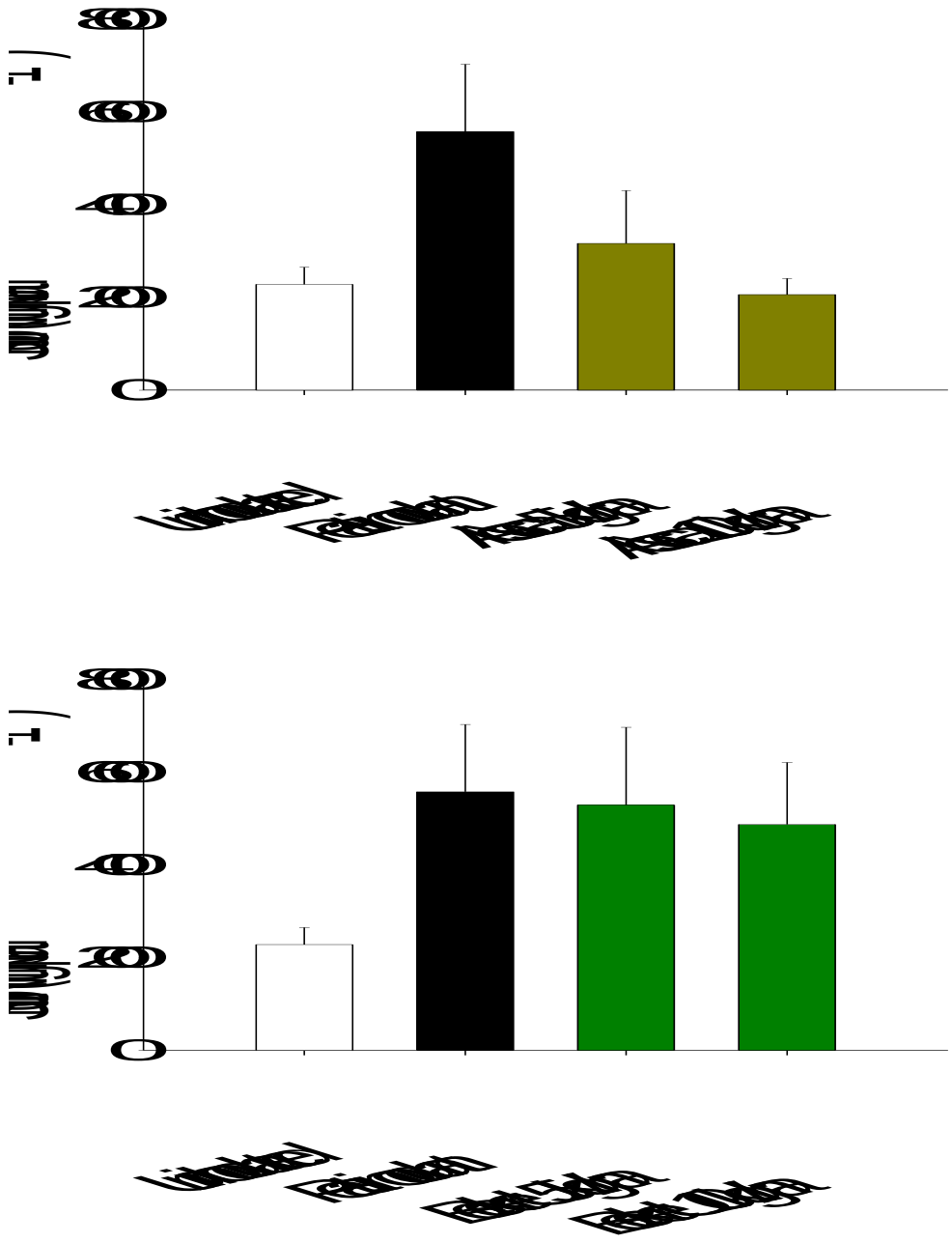

Figure 1. Shoot nitrogen of lupin (Jindalee) inoculated with either Alosca or Becker Underwood granules compared with uninoculated or standard peat slurry inoculation treatments.

Trial Observations:
Field trials for the 2006 season have been poor in the growth of the plants and grain yields, as the growing rainfall was inadequate. Nodulation and shoot N concentrations responded strongly to treatments, even under these harsh conditions.