3.5 Pulse Agronomy Trials

3.5.1 How effective are new inoculant formulations in nodulating grain legumes? - Mininera, Vic

Location:
Mininera Research Site.

Funding:
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Background/Aim:
The delivery of inoculants or root nodule bacteria (rhizobia) by peat slurry application is sometimes considered to be a troublesome and time-consuming procedure for land holders. A number of new delivery formulations promise greater ease of application and eliminate the need for manual seed inoculation. These new inoculant formulations are likely to assist farmers in providing user-friendly methods for storage and delivery of root nodule bacteria to legumes. A range of granular carriers and freeze-dried products are available to meet these objectives. Granular formulations 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 nodulating grain legumes in a range of Australian soils. In this report we focus on a trial conducted at Mininera (Southwest Victoria).

Take home messages:
- Inoculation with effective formulations significantly improved nodulation, herbage and yield.
- Sterile peat slurry inoculant produced more nodules on faba beans than all other rhizobial products; freeze-dried rhizobia applied to seed and peat applied as liquid inoculant produced greater nodules than granular inoculants.
- Inoculation with peat slurry, peat applied as a liquid, and freeze-dried inoculants significantly improved herbage and yield compared with uninoculated treatments. Yield was also improved following application of bentonite granules.

Trial information:
Granular inoculants used in these trials were either purchased through Bay Classic Pty Ltd (Alosca), Becker Underwood Pty Ltd (Nodulator), or supplied from the manufacturer (Novozymes). All products were stored according to manufacturer's specifications. Products were applied according to the table below. Peat treatments used commercially available peat products.

Rainfall:

Avg. Annual:	589.7mm, Ararat Prison 1969-2008
Avg. G.S.R.:	449.4mm, Ararat Prison 1969-2008
2008 Total:	534.0mm, Mininera Research Site
2008 G.S.R.:	April – November = 330.5mm

Treatment	Treatment List
Alosca 10	Alosca bentonite clay granule sown @ 10kg/ha with seed
Becker 6	Becker Underwood attapulgite granules sown @ 6kg/ha with seed
NZ 5.6	Novozymes peat granules sown @ 5.6kg/ha with seed
New Edge in furrow	New Edge Microbials (freeze-dried rhizobia) was diluted at a rate of 1 vial per 500kg seed and injected by nozzles @ a rate of 50 l/ha into drill rows at sowing
New Edge on seed	New Edge Microbials (freeze-dried rhizobia) slurry applied to seed at a rate of 1 vial to 500 kg seed.
Peat inject	Peat slurry was applied at a rate based on 250 g of peat applied to 100 kg of seed, and injected into drill rows @ a rate 50 l/ha
Peat slurry	Peat slurry applied to seed
Nil	No rhizobia applied

Above (Figure1): Faba bean trial site testing new inoculant technologies

Table 2: Mininera: Faba bean (Farah)

Treatment	Nil	NZ 5.6	Alosca 10	Becker 6	New edge on seed	New Edge in furrow	Peat slurry	Peat inject	LSD
Nodule number per plant (crown)	0.4	1	2	8	23	6	43	18	8
Nodule number per plant (elsewhere)	0.3	1	2	5	10	4	21	13	6
Crown nodule mass (mg DM/ plant)	7	39	72	248	403	168	562	279	137
Elsewhere nodules (mg DM/plant)	4	18	48	63	86	85	118	123	52
Herbage (kg/ha)	3666	4135	4356	3995	4726	4166	4824	4815	955
Grain yield (t/ha)	.94	1.17	1.19	1.13	1.28	1.28	1.42	1.37	.238

Trial results :
Peat slurry inoculation and peat inoculation as a liquid improved the nodulation, shoot mass and grain yield of the faba beans, compared with the uninoculated treatment (Table 2). Freeze-dried inoculants provided less nodulation than treatments inoculated with sterile peat inoculants, applied either as a seed coating, or injected into the sowing furrow. Granules did not significantly improve nodulation compared with uninoculated treatments but bentonite granules significantly improved yield. The proportion of nodules on the crown and elsewhere on roots (e.g. on laterals) appeared to be influenced by different formulations.

Discussion:
The results in this experiment indicate the value of inoculating with effective rhizobia, which resulted in increased nodulation, herbage and grain yields compared with uninoculated treatments. Even greater benefits between well-nodulated treatments would be expected in a year with sufficient spring rainfall. Increased herbage will translate to greater nitrogen availability to the following cereal or oilseed crops and will provide a benefit in reducing the need for nitrogenous fertilizers. Growers now have a greater choice of rhizobial formulations which differ in their requirements for storage, application and performance. The results of field trials show that optimal root nodulation is required to provide the best herbage and grain yields.