

Chickpea Inoculation Trials 2008-2010

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GRDC code

NGA00003: Grower solutions for northern New South Wales and southern Queensland

Take home message- Inoculation of chickpea seed with Group N rhizobia is recommended regardless of chickpea history. The standard method of mixing slurry and applying direct to seed still appears adequate; however recent research has shown potential improvements by injecting the rhizobia into the seed furrow with water as a carrier. Peat granules have on average performed as well as the standard slurry method, while attapulgitic clay granules and bentonite clay granules have generally resulted in nodulation levels greater than the untreated control, but generally equal to or less than the standard slurry method.

Background

Australian soils do not contain rhizobia that are specific for nodulation of chickpeas. This essentially means that the rhizobia (Group N) need to be added to the root zone of the chickpea crop. In the past this has primarily been through the use of peat slurry applied to seed. Recently there have been developments in the use of granular clay and peat carriers and liquid slurry injection. Trials from 2008 to 2010 have compared the use of the available inoculant treatments. These have included:

- *Nodulaid*TM - standard peat slurry applied to seed (PS)
- *Nodulaid*TM *Water Inject* carrier (PS WI) - peat slurry injected into seed furrow with water as a carrier
- *Nodulator*TM - Attapulgitic clay granules mixed with seed in furrow (ACG)
- *EasyRhiz*[®] to seed (FD) - freeze dried rhizobia mixed into slurry and applied direct
- *EasyRhiz*[®] *Water Inject* water as a carrier (FD WI) - freeze dried rhizobia slurry injected into seed furrow with water as a carrier
- *Alosca*[®] granules - Bentonite clay granules mixed with seed in furrow (BCG)
- *N-Prove*[®] granules (available now only as *TagTeam*[®]) - peat granules mixed with seed in furrow (PG)

2008

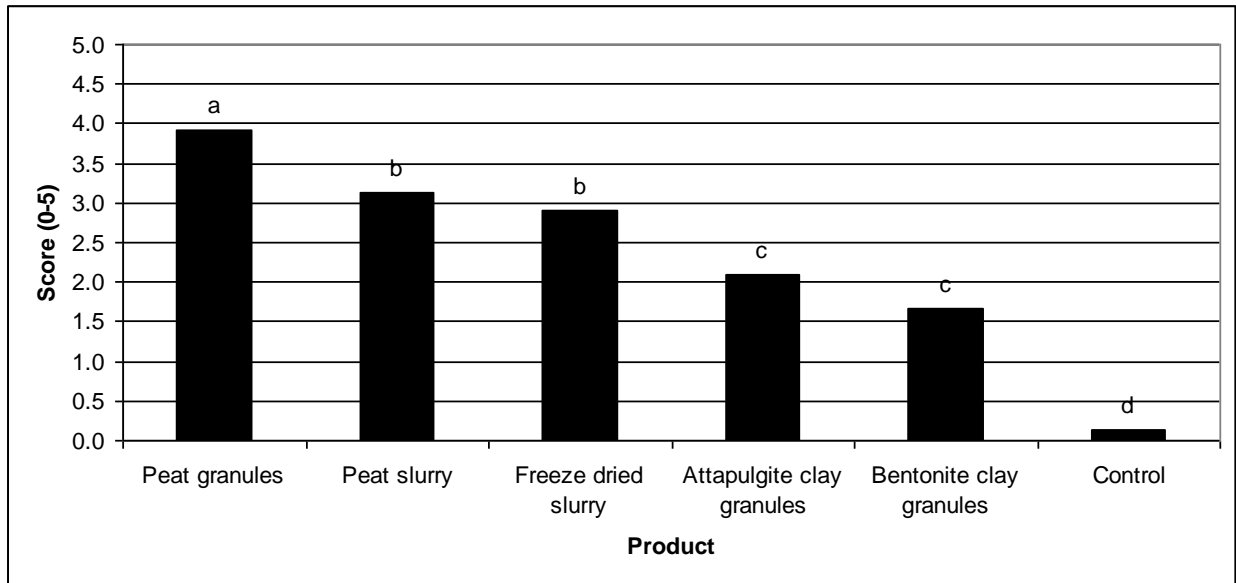


Figure 1: Effect of inoculant treatment on nodulation of chickpea roots- Narromine 2008

The scoring for this trial was based on a standard scoring system that allocates one score from zero to five based on nodulation around the crown and beyond the crown.

Peat granules had a high level of nodulation around the crown as well as satisfactory nodulation beyond the crown, with nodules on all plants. Peat slurry and freeze dried slurry also had nodules on all plants, with a high level of nodulation around the crown, but little nodulation beyond the crown. Attapulgitic clay granules and bentonite clay granules had nodules present on 67% of plants. The untreated control had nodules present on 8% of plants. There was no significant difference in yield or dry matter production in this trial.

2009

The scoring system was updated for the 2009 trial, with a separate score from zero to ten given for nodulation around the crown and beyond the crown.

Figure 2 shows that all treatments resulted in nodulation levels around the crown and beyond the crown greater than the untreated control (Nil treatment). Nodulation around the crown from using peat slurry (PS) was greater than all other treatments. Application of the three granular treatments (attapulgitic clay granules, bentonite clay granules and peat granules) as well as the freeze dried slurry resulted in similar nodulation levels, being significantly less than the peat slurry (PS) but greater than the Nil treatment. There was no significant difference between products on nodulation beyond the crown area, with all being greater than the untreated control (Nil treatment).

The use of fungicide (thiram + thiabendazole) significantly reduced nodulation from both of the slurry treatments (PS & FD), with the freeze dried treatment (FD) having the greatest reduction in nodulation (data not presented).

There was no significant yield response from the treatments in this trial (data not presented).

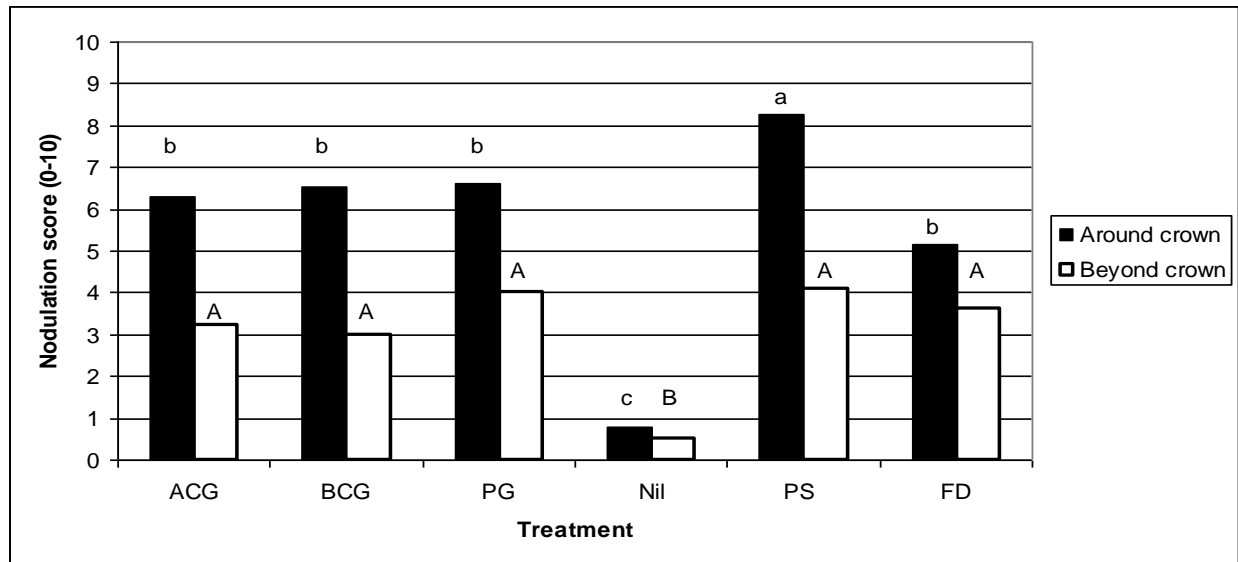


Figure 2: Effect of inoculant treatment on nodulation of chickpea roots- Trangie 2009

2010

Two trials were conducted in 2010 (Argyle and The Clump Rd), both in the Edgeroi/Bellata districts. Treatments used included:

- Standard peat slurry applied to seed (PS)
- Peat slurry injected into seed furrow with water as a carrier (PS WI)
- Attapulgitic clay granules mixed with seed in furrow (ACG)
- Freeze dried rhizobia mixed into slurry and applied direct to seed (FD)
- Freeze dried rhizobia slurry injected into seed furrow with water as a carrier (FD WI)

Both trials also looked at the effect of the fungicides thiram and thiram + thiabendazole (P Pickle-T).

Argyle

Peat slurry (PS), Peat slurry water inject (PS WI) and freeze dried water inject (FD WI) resulted in significantly greater nodulation around the crown than nil treatment and the attapulgitic clay granules (Figure 3). The two water inject treatments resulted in significantly greater nodulation beyond the crown than all other treatments. Yield of the water inject treatments and attapulgitic clay granules were significantly greater than the untreated. There was no significant effect of fungicide on yield or nodulation.

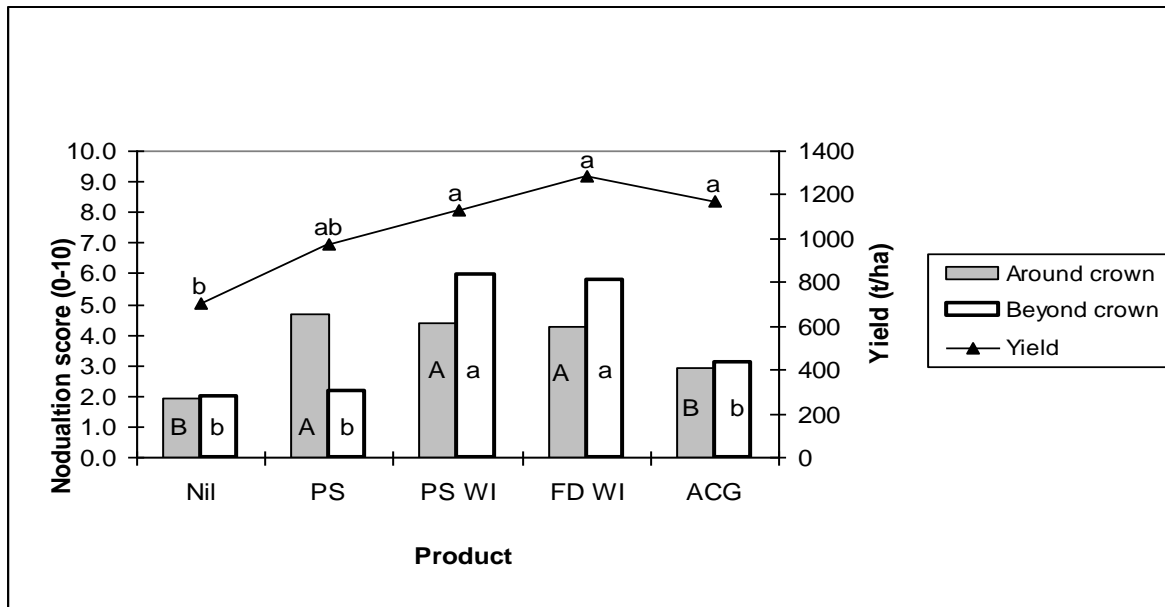


Figure 2: Effect of inoculant treatment on nodulation of chickpeas and chickpea yield- Argyle, Edgeroi 2010

The Clump Rd

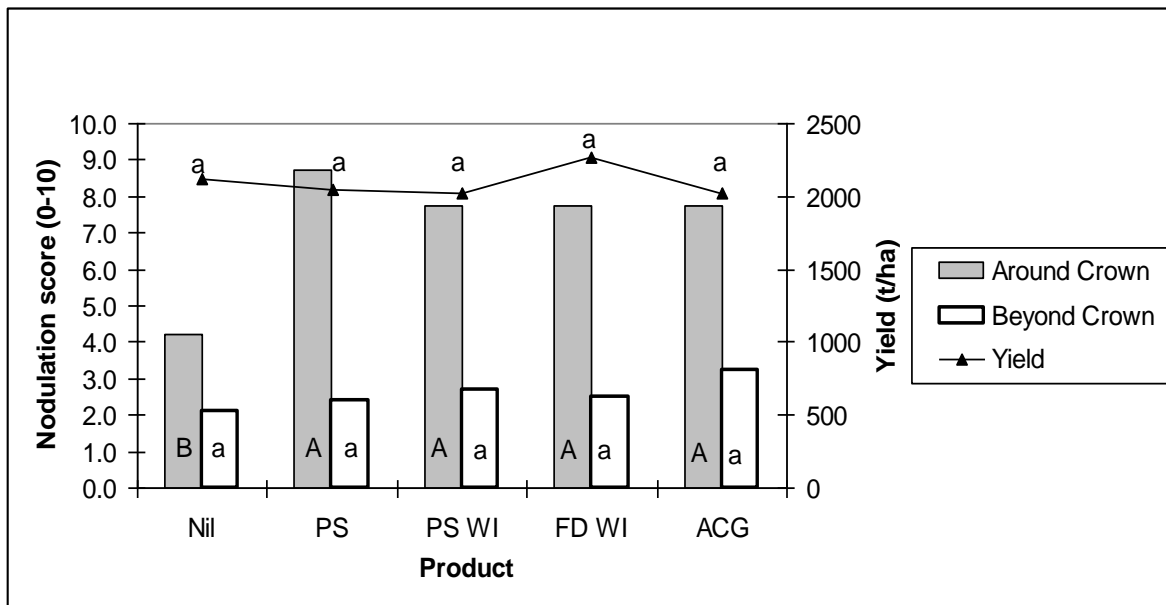


Figure 4: Effect of inoculant treatment on nodulation of chickpea roots and chickpea yield- The Clump Rd, Bellata 2010

All treatments resulted in significantly greater nodulation around the crown than the nil treatment. There was no significant effect of treatment on nodulation beyond the crown or on yield. There was also no significant effect of fungicide on yield or nodulation.

Discussion

Limited trial data has shown that the most effective of the new technologies appears to be the application of rhizobia 'in-furrow' with water (water inject). This will reduce the need to mix and

apply slurry to the seed, but will require the need for large volumes of water being available at sowing, as well as a liquid tank and plumbing to be incorporated into the seeder.

Clay granules (attapulgite and bentonite) have often resulted in less nodulation than the standard slurry treatments. This has also been found in southern NSW, in work carried out by Denton *et al.* (2009). However, where chickpeas are a regular crop in the rotation, the reduced efficacy provided by the clay granules compared to the standard slurry treatment is likely to be less pronounced. Granules can reduce labour and downtime at sowing, so would only be recommended where real efficiency gains can be made. Peat granules resulted in nodulation levels greater than the clay granules in one of two trials.

The use of standard slurry treatment (peat slurry) still appears to be a reliable method of application. In some cases nodulation may be less than with the 'water inject', but this needs to be balanced with the extra machinery cost of liquid injection.

In one trial (2009), nodulation from the slurry applied to seed method was significantly affected by fungicide (thiram + thiabendazole), where the fungicide and slurry were applied within an hour of each other. In the trials where the fungicide did not affect nodulation, the seed had been treated with fungicide at least several days before inoculation. In the fungicide affected trial, the freeze dried slurry (FD) treatment showed a greater reduction in nodulation from fungicide than what was seen from the peat slurry (PS) treatment.

Each of these trials was conducted in paddocks with no known history of chickpea production. Where chickpea cultivation has been regular, it is likely that the response to inoculation will be less pronounced than these trials have shown.

Reference and further reading

Denton, M.D., *et al.*, A multi-site field evaluation of granular inoculants for legume nodulation, *Soil Biology and Biochemistry* (2009).

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