Grower guide to assessing legume nodulation

Lower Eyre Peninsula, SA
(Lupin, Field pea / Vetch / Lentil, Faba bean, Chickpea)

- Was your legume inoculation successful? If you didn’t inoculate, should you do so in future?
- You can check to see if this year’s legume nodulation is adequate.
- See short, instructional videos at: [www.ua.edu.au/legume-inoculation](http://www.ua.edu.au/legume-inoculation)

METHOD

1. In late winter or early spring (or about 10 – 12 weeks after sowing), collect about 30 plants, 10 at each of 3 sample spots (see sample pattern diagram), putting each sample of 10 in a separate bucket.

2. Carefully wash off the soil in a bucket of water and rinse roots once or twice to remove remaining soil. (Soak for up to 30 min for heavy soils).

3. Score each plant for adequate / poor nodulation (refer to photos of adequate and poor nodulation and desirable numbers of nodules per plant, see over). Sort plants into two groups: adequately and poorly nodulated, work out the % plants adequately nodulated and then the average score for the three sampling locations. For easier assessment, float the roots in water on a white background.

**Equipment needed**

- Buckets, spade, water

**Sampling pattern (sample at “x”)**

**OVERALL AVERAGE NODULATION SCORE:**

<table>
<thead>
<tr>
<th>Overall success rating</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adequate</td>
<td>70% or more of plants rated adequate</td>
</tr>
<tr>
<td>Borderline</td>
<td>50 – 70% of plants rated adequate</td>
</tr>
<tr>
<td>Poor</td>
<td>Less than 50% of plants rated adequate</td>
</tr>
<tr>
<td>None</td>
<td>No nodules present (= no nitrogen fixation)</td>
</tr>
</tbody>
</table>

NOTE: Plants scored as Adequate should have most nodules with a red/pink colour inside (actively fixing nitrogen).
**LUPIN**

**Adequate**

Nodules right around the crown & on laterals;
*Plant on R*: nodules have been sliced open to reveal pink interior (arrowed)

Note: Normal lupin roots can have a pink interior that is unrelated to nodulation

**Poor**

Few nodules (arrowed)

Photo: Ross Ballard SARDI

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**PEA / VETCH / LENTIL**

**Adequate**

50 to 100 nodules per plant
(20 nodules per plant on lighter soils)

Photo: Liz Farquharson SARDI

**Poor**

Less than 20 nodules (red-brown earth)
**FABA BEAN**

**Adequate**

50 to 100 nodules per plant
(20 nodules per plant on lighter soils)

**Poor**

Less than 15 nodules

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**CHICKPEA**

**Adequate**

Adequate: 10 to 30 nodules;
note multi-lobed nodules around crown

**Poor**

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Photo: Andrew Heath
What if the nodulation score is poor?

1. Sample elsewhere in the paddock to see if it is a localised problem or not.
2. Answer the questions in the next column.
3. Look for further information on troubleshooting:
   e.g. the “Nodulation Assessment Guide” or “Inoculating Legumes: A practical Guide”, via
   [www.ua.edu.au/legume-inoculation](http://www.ua.edu.au/legume-inoculation)
   *(Internet search: legume growers resources)*.

Inoculant groups:
Use correct inoculant type

<table>
<thead>
<tr>
<th>Legume</th>
<th>Group</th>
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</thead>
<tbody>
<tr>
<td>Lupin</td>
<td>Group G only</td>
</tr>
<tr>
<td>Pea / Vetch</td>
<td>Group E or F</td>
</tr>
<tr>
<td>Faba bean / Lentil</td>
<td>Group F or E</td>
</tr>
<tr>
<td>Chickpea</td>
<td>Group N only</td>
</tr>
</tbody>
</table>

Selected troubleshooting questions for poor nodulation of freshly inoculated legumes:

- Incorrect inoculant group used?
- Inoculant mixed with poor quality water (e.g. saline or chlorinated)?
- Inoculant combined with potentially toxic pesticides, trace elements or organic amendments?
- Inoculant combined with fertilizer?
- Dry sowing into paddock with no background of correct rhizobia?
- Sowing into extremely acidic soil (pH less than 5 in CaCl₂; except for lupin inoculant)?
- Was soil waterlogged for an extended period during the growing season?
- Herbicide damage from previous or current crop? (NOTE: SU herbicides in alkaline soils can dramatically inhibit nodulation of legumes in following years).

**NOTE:** If it is the first time to grow this legume crop in the paddock, the rate of inoculant application can be doubled.