Grower guide to assessing legume nodulation

Kangaroo Island
(Faba & broad bean, Field pea / Vetch, Lupin, Sub / White Clover, Lucerne)

- 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

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

Sampling pattern (sample at “x”)

| Buckets, spade, water |

OVERALL AVERAGE NODULATION SCORE:

<table>
<thead>
<tr>
<th>Overall success rating</th>
<th>Description</th>
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<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>
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<tr>
<td>None</td>
<td>No nodules present (= no nitrogen fixation)</td>
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NOTE: Plants scored as Adequate should have most nodules with a red/pink colour inside (actively fixing nitrogen).
FABA / BROAD BEAN

Adequate

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

Poor

less than 15 nodules

PEA / VETCH

Adequate

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

Poor

less than 20 nodules (red-brown earth)
LUPIN  
Adequate

![Lupin Adequate Roots](image1)

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

Few nodules (arrowed)  

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

SUB CLOVER  
Adequate

![Sub Clover Adequate Roots](image2)

50 to 100 nodules

Poor

![Sub Clover Poor Roots](image3)

Photo: Ross Ballard SARDI

Photo: Ross Ballard SARDI

Photo: Ross Ballard SARDI

Photo: Ross Ballard SARDI

less than 20 nodules
**LUCERNE / WHITE CLOVER**

*Adequate*

<table>
<thead>
<tr>
<th>Young plants: ideally 10 – 15 nodules per plant at 10 wk</th>
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<tr>
<td>Mature plants: look for nodules on the finer lateral roots</td>
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**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
- **Faba / broad bean** Group F or E
- **Pea / Vetch** Group E or F
- **Lupin** Group G only
- **Sub clover** Group C only
- **Lucerne** Group AL only
- **White Clover** Group B only

**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

*This guide is based on the work of Janine Sounness, formerly pulse agronomist with Agriculture Victoria, Horsham*

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