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.

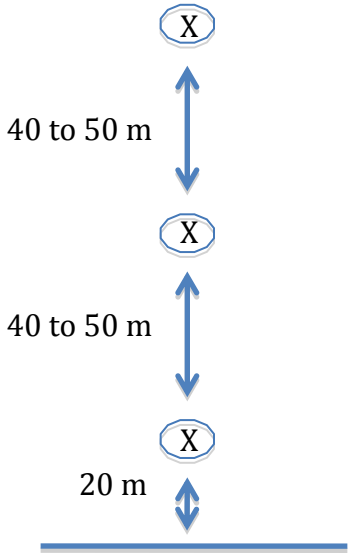
2. Carefully wash off the soil in a bucket of water and rinse roots once or twice to remove remaining soil. (Soak for up to 30 min for heavy soils).

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

Buckets, spade, water

Sampling pattern (sample at "x")



Edge of paddock

OVERALL AVERAGE NODULATION SCORE:

Overall success rating	
Adequate	70% or more of plants rated adequate
Borderline	50 – 70% of plants rated adequate
Poor	Less than 50% of plants rated adequate
None	No nodules present (= no nitrogen fixation)

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

Photo: Liz Farquharson SARDI

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

Poor

less than 20 nodules (red-brown earth)

LUPIN *Adequate* *Poor*

Photo: Ross Ballard SARDI

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* *Poor*

Photo: Ross Ballard SARDI

50 to 100 nodules

Photo: Ross Ballard SARDI

less than 20 nodules

LUCERNE / WHITE CLOVER

Adequate

Photo: Ross Ballard SARDI

Young plants: ideally 10 – 15 nodules per plant at 10 wk

Mature plants: look for nodules on the finer lateral roots

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

(*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 (eg 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 $CaCl_2$; 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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