INOCULATING LEGUMES
Rhizobia

- Rhizobia are living micro-organisms (also called root-nodule bacteria)
- Nodules on legume roots contain rhizobia, which fix nitrogen from the air
- Each type of legume is nodulated by a specific type of rhizobia, which are identified as belonging to different “Inoculant Groups”
- Rhizobia in inoculants do not survive well in extremes of temperature (over 30°C and at freezing temperatures) or drying conditions that lead to desiccation
- Different legume–rhizobia associations will tolerate different soil conditions. Generally rhizobia preferences are similar to those of the legume host
  - medic, pea, faba bean and chickpea rhizobia prefer neutral to alkaline soils (pH CaCl₂ 6.0 – 7.5)
  - lupin rhizobia tolerate acid soils (pH CaCl₂ less than 6.0)
Inoculation benefits

- Inoculated legumes will fix 25kg of nitrogen per tonne of legume shoot dry matter, on average.
- Low soil nitrate levels, good nodulation and agronomic practices that promote high legume production all increase N inputs from N fixation.
- Decomposing legume residues are a good source of slow-release nitrogen for a following crop.
- Economic benefits of legumes in crop production systems can be substantial, both from N fixation and the disease-break effect.
- For example: Inoculated faba beans in western Victoria yielded 2.7t/ha (1 t/ha more than the uninoculated crop) and added 180kg/ha of extra fixed nitrogen to the soil.
**Getting inoculation right**

- Use quality inoculants (the Green Tick logo is a trademark of AIRG* approval)
- Match the correct inoculant group to each legume
- Inoculants contain LIVE bacteria: make sure they are kept in moderate temperatures (less than 30°C, not frozen) away from sunlight and chemicals
- Sow freshly inoculated seed as soon as possible and definitely within 24 hours of inoculation
- Use clean potable water for dilution when using liquids or slurries, and make sure holding tanks are free from chemical and fertiliser residues
- Many pesticides, mineral and organic fertilisers are toxic to rhizobia and should never be mixed with rhizobia
- Rhizobia can be compatible with seed pickles or dressings for a limited time prior to sowing (see *Inoculating legumes: a practical guide* (2012) for manufacturer’s guidelines and Table 5.4 in Resource #1). Always apply the seed dressing first and allow it to fully dry before applying the rhizobia as a second process
- Always use inoculants before their expiry date
- Reseal opened bags of peat inoculant and use them within 2 weeks of first opening the bag

* Australian Inoculants Research Group
## Using Different Inoculant Formulations

<table>
<thead>
<tr>
<th></th>
<th>Peat</th>
<th>Freeze-Dried</th>
<th>Granular</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description</strong></td>
<td>Finely ground sterilised peat containing a high density of rhizobia</td>
<td>Powder containing a very high density of rhizobia</td>
<td>Granules of peat or clay or a mixture; contain a lower number of rhizobia per gram</td>
</tr>
<tr>
<td><strong>Storage</strong></td>
<td>Winter legume inoculants – refrigerate at 4°C; summer legume inoculants – store in cool, dry place</td>
<td>Refrigerate at 4°C DO NOT FREEZE</td>
<td>Store in a cool and dry place away from direct sunlight</td>
</tr>
<tr>
<td><strong>Common Application</strong></td>
<td>Mix with clean water to make a slurry, apply direct to seed (except for peanut). Can also be used in furrow</td>
<td>Reconstitute with clean water and add protective compound. The liquid suspension is applied direct to seed (except for peanut) or can be injected into the furrow</td>
<td>Granules are delivered in furrow at sowing. DO NOT allow granules to become moist during seeding as some products can cause blockages</td>
</tr>
<tr>
<td><strong>Using Additives</strong></td>
<td>If used, ensure adhesive solutions are cooled before rhizobia are added. Generally NOT COMPATIBLE with mineral and organic fertilisers and pesticides; check manufacturer’s guidelines</td>
<td>Generally NOT COMPATIBLE with mineral and organic fertilisers and pesticides; check manufacturer’s guidelines</td>
<td>Check inoculant manufacturer’s compatibility guidelines</td>
</tr>
<tr>
<td><strong>Sowing</strong></td>
<td>Best sown on day of coating into moist soil</td>
<td>Sow treated seed into moist soil within 5 hours of application</td>
<td>A third seeding box should be used to keep the granular formulation separate from fertilisers and pickled seed</td>
</tr>
</tbody>
</table>
Seed coating in practice

- Rates of application, i.e. volumes and weights of formulation, water and seed, are given on inoculant packets
- Peat formulation is made into a slurry using clean potable water in a clean drum and mixing well
- For pasture seed, an adhesive is often added to the slurry
- NOTE: Avoid fertiliser and pesticide residues and saline water
- Always grade seed first to remove pod debris and fine grain dust, which can block seeders
- Freshly prepared slurry is pumped from the drum (or poured) into the path of grain legume seed going up a slow-moving flighted auger into a grain bin
- Pasture seed, being small, can be coated in a concrete mixer or by mixing with a shovel on a concrete floor
- Most temperate pasture seed is best coated with fine lime (builders’ and slaked lime should be avoided)
- Freeze-dried inoculant can be applied in the same way as peat slurry, as per manufacturer’s instructions
- Allow slurry-treated seed to dry before filling air-seeders to prevent ‘bridging’ in the tank
Assessment of nodulation

- A well-nodulated plant has nodules on the crown (where the root meets the shoot) and on the tap root and lateral roots
- Take a few plants from each of several locations in the paddock, to cover paddock variability
- Carefully dig up plants with root systems intact and gently wash roots (e.g. in a bucket of water) to remove soil
- Cut nodules open: pink-coloured tissue indicates active N fixation
- Desired numbers of nodules per plant at 8-10 weeks old are given in the sections of the guide for individual legume species
- Assessment of nodulation for chickpea: 0-1 = inadequate
  2-3 = adequate
  4-5 = good

PHOTOS: A. GIBSON
Troubleshooting nodulation failure

- Indications of poor nodulation are yellowing young leaves, yellow and/or stunted patches of plants, and lack of nodules on root systems.
- Nodulation failure is difficult to remedy, except by adding inorganic nitrogen, which can be costly.
- Possible other remedies (if done immediately):
  - In flood or sprinkler-irrigated fields, add slurry or liquid inoculant to the irrigation water.
  - Over-sow a granular inoculant close to the original sowing furrow.
Chickpea *Cicer arietinum*

**INOCULANT GROUP N (STRAIN CC1192)**

**CHICKPEA CROPS AND RHIZOBIA**
- Chickpea has a very specific rhizobia requirement
- Rhizobia generally absent outside main growing areas

**CHICKPEA INOCULATION**
- Peat formulation: as slurry to seed (most common) or in furrow
- Freeze-dried formulation: as slurry to seed or liquid in furrow
- Granular formulation: in furrow at sowing

**ASSESSMENT OF NODULATION**
- After 8 weeks, 10 – 30 pink nodules per plant are satisfactory

**LIKELIHOOD OF CROP RESPONSE TO INOCULATION**

- **HIGH** Chickpea not previously grown
- **MODERATE** Previous inoculated chickpea crop more than 4 years ago, or recent crop performed below expectation
- **LOW** Well-nodulated chickpea crop in past 2 years

Well-nodulated roots of chickpea
Field Pea, Vetch
*Pisum sativum, Vicia species*

**INOCULANT GROUP E** (STRAIN SU303)
(GROUP F IS ALSO SUITABLE FOR PEA)

**PEA AND VETCH CROPS AND RHIZOBIA**
- Where not previously grown, inoculate with rhizobia for effective nodulation and nitrogen fixation
- Group E rhizobia are moderately sensitive to soil acidity

**PEA AND VETCH INOCULATION**
- Peat formulation: as slurry to seed (most common) or in furrow
- Freeze-dried formulation: as slurry to seed or liquid in furrow
- Granular formulation: in furrow at sowing

**ASSESSMENT OF NODULATION**
- After 8 weeks, 100 pink nodules per plant (heavier textured soils) and 20 nodules per plant (lighter soils) are satisfactory

**LIKELYHOOD OF CROP RESPONSE TO INOCULATION**

**HIGH**
Crop not previously grown, or soils with pH (CaCl₂) below 6.0 and high summer temperatures (over 35°C for 40 days)

**MODERATE**
Previous inoculated pea, vetch (or bean) crop more than 4 years ago, or recent pea/vetch crop nodulated poorly and performed below expectation

**LOW**
Soils loam or clay, neutral to alkaline pH, and recent well-nodulated host crop

Well-nodulated roots of field pea

PHOTO: E. DREW
Faba Bean, Broad Bean, Lentil
Vicia faba, Lens culinaris

INOCULANT GROUP F (STRAIN WSM1455)

BEAN AND LENTIL CROPS AND RHIZOBIA

- Where not previously grown, inoculate with rhizobia for effective nodulation and nitrogen fixation
- Group F rhizobia are moderately sensitive to soil acidity

BEAN AND LENTIL INOCULATION

- Peat formulation: as slurry to seed (most common) or in furrow
- Freeze-dried formulation: as slurry to seed or liquid in furrow
- Granular formulation: in furrow at sowing

ASSESSMENT OF NODULATION

- After 8 weeks, 100 pink nodules per plant (heavier textured soils) and 20 nodules per plant (lighter soils) are satisfactory

LIKELIHOOD OF CROP RESPONSE TO INOCULATION

HIGH: Crop not previously grown, or soils with pH (CaCl₂) below 6.0 and high summer temperatures (over 35°C for 40 days)

MODERATE: Previous inoculated bean or lentil crop more than 4 years ago, or recent bean/lentil crop nodulated poorly and performed below expectation

LOW: Soils loam or clay, neutral to alkaline pH, and recent well-nodulated host crop
Lupin and Serradella
*Lupinus* and *Ornithopus* species

**INOCULANT GROUPS G** *(LUPIN STRAIN WU425)*  
**S** *(SERRADELLA STRAIN WSM471)*

**LUPIN AND SERRADELLA CROPS AND RHIZOBIA**
- Groups G and S both nodulate lupin and serradella
- Inoculation is essential where lupin or serradella have not been grown, because sandy soils are often acutely N-deficient

**LUPIN AND SERRADELLA INOCULATION**
- Peat formulation as slurry to seed (most common) or in furrow
- Lime pelleting of serradella recommended in all states except WA
- Inoculating podded serradella: adjust liquid volumes to ensure even distribution; follow manufacturer’s instructions carefully

**ASSESSMENT OF NODULATION AFTER 8 WEEKS**
- Lupin: crown region (top of root system) covered with nodules
- Serradella: more than 20 pink nodules per plant are satisfactory

**LIKELIHOOD OF CROP RESPONSE TO INOCULATION**
- **HIGH**  No previous lupin or serradella grown in paddock
- **MODERATE**  More than 4 years since growing inoculated legume host, or recent crop performed below expectation
- **LOW**  In the north and central regions of the WA wheat/sheep belt OR vigorous lupin/serradella growth and good nodulation in past 4 years
Peanut or groundnut

*Arachis hypogaea*

INOCULANT GROUP P (STRAIN NC92)

PEANUT CROPS AND RHIZOBIA

- Main growing area: Queensland, with some growers in northern NSW and northern WA

PEANUT INOCULATION

- Recommend water injection of peat or freeze-dried inoculum to prevent damage to seed from slurry coating
- Granular inoculum dispensed with seed at planting

ASSESSMENT OF NODULATION

- Peanut can form many nodules, i.e. more than 100/plant
- Satisfactory number of nodules per plant 8-10 weeks after sowing: not possible to stipulate

LIKELIHOOD OF CROP RESPONSE TO INOCULATION

HIGH  Peanut not previously grown

MODERATE  Where there is a history of poor nodulation

LOW  Recent and/or intensive peanut cultivation
Mungbean and Cowpea

*Vigna radiata* (green gram), *V. mungo* (black gram) and *V. unguiculata*

**INOCULANT GROUP I** *(STRAIN CB1015)*

**MUNGBEAN, COWPEA CROPS AND RHIZOBIA**

- Where not previously grown, inoculate with rhizobia for effective nodulation and nitrogen fixation

**MUNGBEAN AND COWPEA INOCULATION**

- Peat formulation: as slurry to seed (most common) or in furrow
- Freeze-dried formulation: as slurry to seed or liquid in furrow
- Granular formulation: in furrow at sowing

**ASSESSMENT OF NODULATION**

- After 8 weeks, more than 20 pink nodules per plant are satisfactory

**LIKELIHOOD OF CROP RESPONSE TO INOCULATION**

**HIGH**
- No previous mungbean, cowpea or other related *Vigna* species grown

**MODERATE**
- Previous inoculated crop more than 4 years ago, or recent crop performed below expectation

**LOW**
- Recent and/or intensive mungbean or cowpea cultivation

**PHOTO:** G. CUMMING
**Soybean** *Glycine max*

**INOCULANT GROUP H (STRAIN CB1809)**

**SOYBEAN CROPS AND RHIZOBIA**
- Soybean specifically requires Group H rhizobia and will not nodulate with the same rhizobia as mungbean or cowpea
- Good agronomy and inoculation practice are needed for good yield and nitrogen fixation

**SOYBEAN INOCULATION**
- Peat formulation: as slurry to seed (most common) or in furrow
- Freeze-dried formulation: as slurry to seed or liquid in furrow
- Granular formulation: in furrow at sowing

**ASSESSMENT OF NODULATION**
- After 8 weeks, more than 20 pink nodules per plant are satisfactory

**LIKELIHOOD OF CROP RESPONSE TO INOCULATION**

**HIGH**
Soybean not previously grown, or very alkaline or very acid soils

**MODERATE**
Previous inoculated soybean crop more than 4 years ago

**LOW**
Recent and/or intensive cultivation of soybean
Annual clovers *Trifolium* species

(SUBTERRANEAN, BALANSA, PERSIAN, BLADDER, ARROWLEAF, ROSE, GLAND, CRIMSON, PURPLE, CUPPED AND HELMET)

**INOCULANT GROUP C** (STRAIN WSM1325)

**ANNUAL CLOVERS AND RHIZOBIA**
- Inoculation is essential for gland, bladder and arrow-leaf clovers and recommended for all other annual clovers

**ANNUAL CLOVER INOCULATION**
- Most commonly applied as a slurry of peat followed by pelleting with fine lime or other suitable product
- All inoculant formulation types can be used
- Seed often purchased already inoculated. Check time from inoculation not more than six weeks. Freshly inoculated seed is best

**ASSESSMENT OF NODULATION**
- Good: 50 – 100 pink nodules per plant after 8 weeks of growth

**LIKELIHOOD OF CROP RESPONSE TO INOCULATION**

| HIGH | Gland, bladder and arrowleaf clovers; no previous annual clover grown in paddock; soils with pH (CaCl₂) below 5.0; where soil is tilled at pasture renovation |
| MODERATE | No annual clover host in past 4 years and soil pH (CaCl₂) below 5.5; annual clover present, but growth or nodulation below expectation |
| LOW | Soils with neutral or alkaline pH and recent history of good clover growth and nodulation |
Annual medics

*Medicago* species (except strand and disc)

**INOCULANT GROUP AM** *(strain WSM1115)*

**ANNUAL MEDICS AND RHIZOBIA**

- Inoculation always recommended for burr, murex and sphere medic, sown into slightly acidic soils (pH CaCl₂ below 6.0)
- DO NOT use Group AL inoculant because it is less effective at fixing nitrogen with some medic species in this group

**ANNUAL MEDIC INOCULATION**

- Most commonly applied as a slurry of peat followed by pelleting with fine lime or other suitable product
- Granular and freeze-dried inoculant formulations are available
- Seed often purchased already inoculated. Check time from inoculation. Freshly inoculated seed is best

**ASSESSMENT OF NODULATION**

- Good: 10 – 20 pink nodules per plant after 8 weeks of growth

**LIKELIHOOD OF CROP RESPONSE TO INOCULATION**

**HIGH** Burr, sphere and murex medic on soils with pH (CaCl₂) below 6.0 OR no history of sown or naturalised medic

**MODERATE** Medic present, but growth or nodulation below expectation

**LOW** Neutral to alkaline loam or clay soils with recent vigorous medic growth and good nodulation
Biserrula *Biserrula pelecinus*

**INOCULANT GROUP BISERRULA SPECIAL** *(STRAIN WSM1497)*

**BISERRULA AND RHIZOBLIA**

- An annual pasture legume, grown since 2001, mostly in WA
- *Biserrula* has a very specific rhizobia requirement
- It does not nodulate with rhizobia associated with other indigenous or cultivated legumes
- It is essential to inoculate if *Biserrula* has not been recently grown

**BISERRULA INOCULATION**

- Peat-slurry lime pelleted seed or seed sown with granular inoculant
- Higher inoculation rates (above recommended rates), e.g. one 250g packet of inoculant for 10kg seed is recommended

**ASSESSMENT OF NODULATION**

- Good: at least 5 large (>5mm) and 10 small nodules per plant after 8 weeks of growth

**LIKELIHOOD OF CROP RESPONSE TO INOCULATION**

**HIGH**

*Biserrula* host not previously grown

**MODERATE**

No *Biserrula* in past 4 years OR last *Biserrula* pasture not inoculated or lacked ‘good’ nodulation near top of root system

**LOW**

Neutral to alkaline loam or clay soils and recent (past 2 years) host crop with good nodulation
Lotus *Lotus pedunculatus* (syn. *uliginosus*)

**INOCULANT GROUP D** (STRAIN CC829)

*Lotus corniculatus* (Birdsfoot trefoil)

**INOCULANT GROUP LOTUS SPECIAL** (STRAIN SU343)

**LOTUS AND RHIZOBIA**

- NOTE: A different strain of rhizobia is needed for each species of *Lotus*
- Perennial *Lotus* pastures are mostly in medium to high rainfall areas of eastern Australia; their rhizobia have a similar distribution
- *Lotus* rhizobia are moderately tolerant of soil acidity

**LOTUS INOCULATION**

- Most commonly applied as a slurry of peat followed by pelleting with fine lime or other suitable product
- One packet of peat inoculant (250g) will inoculate 10kg seed
- Freeze dried formulations are available

**ASSESSMENT OF NODULATION**

- Good: more than 30 pink nodules per plant after 8 weeks of growth

**LIKERIHOOD OF CROP RESPONSE TO INOCULATION**

**HIGH**  
*Lotus* host not previously grown

**MODERATE**  
No *Lotus* in past 4 years OR last *Lotus* pasture not inoculated or lacked ‘good’ nodulation near top of root system

**LOW**  
Loam soils with neutral pH and a recent history (past 2 years) of *Lotus* with good nodulation
Lucerne, strand and disc medics, Melilotus albus
Medicago sativa, M. littoralis, M. tornata

INOCULANT GROUP AL (STRAIN RRI128)

LUCERNE, MEDIC AND MELILLOTUS ALBUS PASTURES AND RHIZOBIA

- Inoculation is always recommended for good lucerne establishment
- DO NOT USE Group AM inoculant because it is less effective at fixing nitrogen with lucerne, strand and disc medic

RHIZOBIA INOCULATION

- Most lucerne seed is sold preinoculated; if it is more than six months since inoculation, the seed should be reinoculated
- Due to nodulation sensitivity to low pH, coat inoculated seed with lime
- One packet of peat inoculant (250g) will inoculate 25kg seed

ASSESSMENT OF NODULATION

- Lucerne: at least 5 pink nodules (ideally 10-15) per plant at 8 weeks
- Strand medics often form few nodules: 5 nodules at 8 weeks are satisfactory

LIKELIHOOD OF CROP RESPONSE TO INOCULATION

HIGH
Always inoculate lucerne at sowing; soils with pH (CaCl₂) less than 6.0; no sown or naturalised medic

MODERATE
Medic present, but growth or nodulation below expectation

LOW
Neutral to alkaline loam or clay soils with recent vigorous medic growth and good nodulation
**Perennial clovers** *Trifolium* species

(White, strawberry, red, talish, alsike and caucasian)

**INOCULANT GROUP B (STRAIN TA1)**

**EXCEPT FOR CAUCASIAN CLOVER SPECIAL (STRAIN CC283B)**

**PERENNIAL CLOVERS AND RHIZOBIA**

- Inoculation assists vigorous early growth of small-seeded perennial legumes
- For good nodulation, soil pH (CaCl₂) should ideally be greater than 5.5
- DO NOT USE Group C inoculant (WSm1325); nitrogen fixation by perennial clovers is significantly better with the Group B inoculant strain TA1

**PERENNIAL CLOVER INOCULATION**

- Most perennial clover seed is sold preinoculated; if it is more than two weeks since inoculation, the seed should be reinoculated
- For white clover, use 250g packet of peat inoculant to inoculate 25kg of seed; adjust the inoculation rate for small-seeded species

**ASSESSMENT OF NODULATION**

- Good: at least 10 pink nodules per plant after 8 weeks of growth

**LIKELIHOOD OF CROP RESPONSE TO INOCULATION**

**HIGH** Always inoculate Caucasian clover; no previous perennial clover grown in paddock; soils with pH (CaCl₂) below 5.0; where soil is tilled at pasture renovation

**MODERATE** No perennial clover host in past 4 years and soil pH below 5.5; perennial clover present, but growth or nodulation below expectation

**LOW** Soils with neutral or alkaline pH and recent history of good clover growth and nodulation
Sulla Sulla coronaria

INOCULANT GROUP SULLA SPECIAL (STRAIN WSM 1592)

SULLA AND RHIZOBIA

- It is essential to inoculate Sulla as it has very specific rhizobia requirements; Sulla rarely nodulates with background soil rhizobia
- Seedlings quickly develop nitrogen deficiency symptoms where nodulation is inadequate

SULLA INOCULATION

- Most commonly applied as a slurry of peat followed by pelleting with fine lime or other suitable product
- Higher inoculation rates (above recommended rates) of one 250g packet of inoculant for 10kg seed are recommended
- Seed sold through retail outlets may be preinoculated; due to its very short shelf life, sow as soon as possible after inoculation

ASSESSMENT OF NODULATION

- Good: 4 large (>5 mm) nodules per plant after 8 weeks of growth

LIKELIHOOD OF CROP RESPONSE TO INOCULATION

HIGH

Sulla not previously grown OR soils with pH (CaCl₂) below 6.0

MODERATE

No Sulla in past 4 years OR growth or nodulation of previous Sulla pasture below expectation

LOW

Neutral or alkaline loam or clay soils and recent (past 2 years) Sulla host with good nodulation
## Inoculant Groups for Common Legume Species and the Maximum Amount of Seed That Should Be Treated by a 250-Gram Bag of Peat Inoculant

<table>
<thead>
<tr>
<th>Inoculant Group</th>
<th>Common Name of Legume</th>
<th>Seed Size</th>
<th>Maximum Weight of Seed Treated by 250-Gram Peat Inoculant</th>
</tr>
</thead>
<tbody>
<tr>
<td>AL</td>
<td>Lucerne, strand and disc medics, Melilotus albus</td>
<td>Small</td>
<td>25kg</td>
</tr>
<tr>
<td>AM</td>
<td>Burr medic, barrel medic, snail medic, sphere medic, murex medic</td>
<td>Medium</td>
<td>50kg</td>
</tr>
<tr>
<td>B</td>
<td>White clover, red clover, strawberry clover, alsike clover, talish clover</td>
<td>Small</td>
<td>25kg</td>
</tr>
<tr>
<td>C</td>
<td>Subterranean clover, balansa clover, crimson clover, purple clover, arrowleaf clover, rose clover, gland clover, helmet clover, Persian clover</td>
<td>Small–medium</td>
<td>25–50kg</td>
</tr>
<tr>
<td>D</td>
<td>Greater lotus</td>
<td>Small</td>
<td>10kg</td>
</tr>
<tr>
<td>E</td>
<td>Field pea, vetch, narbon bean, lathyrus</td>
<td>Large</td>
<td>100kg</td>
</tr>
<tr>
<td>F</td>
<td>Lentil, faba bean, broad bean</td>
<td>Medium–large</td>
<td>50–100kg</td>
</tr>
<tr>
<td>G</td>
<td>Lupin</td>
<td>Large</td>
<td>100kg</td>
</tr>
<tr>
<td>H</td>
<td>Soybean</td>
<td>Large</td>
<td>100kg</td>
</tr>
<tr>
<td>I</td>
<td>Cowpea, mungbean (green and black)</td>
<td>Large</td>
<td>100kg</td>
</tr>
<tr>
<td>N</td>
<td>Chickpea</td>
<td>Large</td>
<td>100kg</td>
</tr>
<tr>
<td>P</td>
<td>Peanut or groundnut</td>
<td>Large</td>
<td>100kg</td>
</tr>
<tr>
<td>S</td>
<td>French and yellow serradella</td>
<td>Medium</td>
<td>50kg</td>
</tr>
<tr>
<td>Biserrula</td>
<td>Biserrula</td>
<td>Small</td>
<td>10kg</td>
</tr>
<tr>
<td>Lotus</td>
<td>Birdsfoot Trefoil</td>
<td>Small</td>
<td>10kg</td>
</tr>
<tr>
<td>Sulla</td>
<td>Sulla</td>
<td>Medium</td>
<td>10kg</td>
</tr>
</tbody>
</table>
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USEFUL RESOURCES:
1. Inoculating Legumes: a practical guide (2012) Free, online

2. Fact Sheet: Rhizobial inoculants 2013 Free, online
   ▶ www.agwine.adelaide.edu.au/farming/legumes-nitrogen/legume_inoculation
   ▶ www.alosca.com.au
   ▶ www.agro.basf.com.au
   ▶ www.microbials.com.au

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