MEAT & LIVESTOCK AUSTRALIA

TIPS & TOOLS

SOUTHERN FEEDBASE

How do I improve legume nodulation if it is dry at sowing?

A recent industry survey found 40% of all pasture sowings take place under suboptimal soil moisture conditions and, often, are followed by a prolonged dry period until germinating rainfall is received.

This is likely to become an increasingly important issue for pasture establishment given the changes in autumn rainfall patterns in the past 20 years and forecast future climate scenarios.

A dry start can result in inadequate nodulation and, therefore, poor nitrogen fixation for legume pasture species. Wet inoculant delivery systems, such as peat and liquid injection, deliver high numbers of viable rhizobia to the soil, provided optimal preparation procedures are followed.

However, these systems rely on good soil moisture for survival of the rhizobia and its subsequent capacity to initiate nodulation in pasture legumes.

If a legume does not nodulate effectively it will utilise nitrogen from the soil's nitrogen pool, rather than contribute to building soil nitrogen. Additionally, the efficiency of utilisation of other management inputs, such as phosphorus and sulphur fertilisers, is also reduced. It is largely legumes which respond to application of these nutrients and they then provide nitrogen via biological nitrogen fixation to drive the production of other pasture components.

Therefore, when nodulation fails or is suboptimal, response to phosphorus and/or sulphur application is limited and feed quantity and quality for livestock is reduced, resulting in loss in potential production.

Options for improving nodulation

There are two main opportunities to boost nodulation if soil moisture conditions at sowing are suboptimal.

1. **Delay sowing until conditions improve.** This option will increase rhizobia survival when delivered via wet inoculant delivery systems, such as peat or liquid injection. However, if sufficient sowing rain is not received until autumn or even early winter, there will be a significant reduction in the growth of the newly established pasture due to low temperatures. Pasture legumes are capable of germinating at very low temperatures, but their emergence will be significantly delayed. This strategy may result in small plants which are more susceptible to spring moisture stress due to poorly developed root systems and weed competition.

   Additionally, as the amount of nitrogen fixed is related to how much the effectively nodulated legumes grow (20–30kg N/t shoot DM with adequate nodulation), late sowing could result in low fixed N production.

2. **Use robust inoculant delivery systems.** In recent years, a range of granular inoculants have been developed for use in pasture sowing. These products fall into two main groups:
   - Dry clay-based inoculants, which consist of bentonite clay infused with rhizobia. The clay, which is dried to a low moisture content during manufacturing, protects the rhizobia from dessication due to high temperature and low moisture conditions in the field.
   - Peat-based clay granules which consist of peat containing rhizobia mixed with clays to form granules.

   Granules contain less rhizobia cells per gram of product but their stable form means rhizobia have the capacity to survive for extended periods when sown with the seed.

Clay granules for re-inoculating pasture. Image courtesy ALOSCA Technologies Pty Ltd.

Other considerations when dry sowing pastures

Traditional pasture legumes such as sub-clover and annual medics are highly susceptible to moisture stress at sowing due to their slow-developing and shallow root systems and poor capacity to control moisture loss through their leaves. This makes them high-risk options when faced with dry sowing.

Annual legume species such as serradella, biserrula and arrowleaf or bladder clover have more rapidly developing and deeper root systems. This allows them to better withstand moisture stress at sowing. In addition, biserrula has the capacity to better regulate moisture loss through its leaves. Carefully choose the correct pasture legume, which is suited to your soils and, if you have to sow dry, it is essential they are successfully inoculated.

A two to three-year clean-up phase and achieving complete control of weeds will enhance establishment success for any pasture type. Similarly, be mindful of herbicides which have been applied in preceding years as there are many herbicide residues which can impact legume growth and nodulation. Keep accurate records and check herbicide labels for plant-back periods.

Need further help?

Talk to your local advisor or agronomist to develop a plan for optimising the response from pasture sowing.

Information: mla.com.au/extension-training-and-tools/feedbase-hub/

Table 1. Inoculant groups for common legume species

Inoculant group	Common name of legume
AL	Lucerne, strand medic, disc medic
AM	Burr medic, barrel medic, snail medic, sphere medic, murex medic
B	White clover, red clover, strawberry clover, berseem clover, talish clover
C	Sub-clover, balansa clover, bladder clover, crimson clover, purple clover, arrowleaf clover, rose clover, gland clover, helmet clover, Persian clover
D	Greater lotus
F	Vetch, lathyrus
G/S	French and yellow serradella
Biserrula	Biserrula
Lotus	Birdsfoot trefoil
Sulla	Sulla

Important notes

- Always read and follow product directions carefully.
- If using a wet inoculant delivery system ensure the product has been correctly stored and is used prior to expiry date. Seed treated with wet inoculant must be sown within 12 hours of treatment/preparation.
- If using granular inoculants, ensure products have been stored correctly and have not expired.
- If using pre-coated seed, observe the expiry date.

ABN 39 081 678 364. Published in June 2021. MLA acknowledges the matching funds provided by the Australian Government to support the research and development detailed in this publication.

Meat & Livestock Australia
Level 1, 40 Mount Street
North Sydney NSW 2060
Ph: 1800 023 100
mla.com.au

MEAT & LIVESTOCK AUSTRALIA