sustainable agriculture

Best Inoculation Techniques for Pasture Legumes

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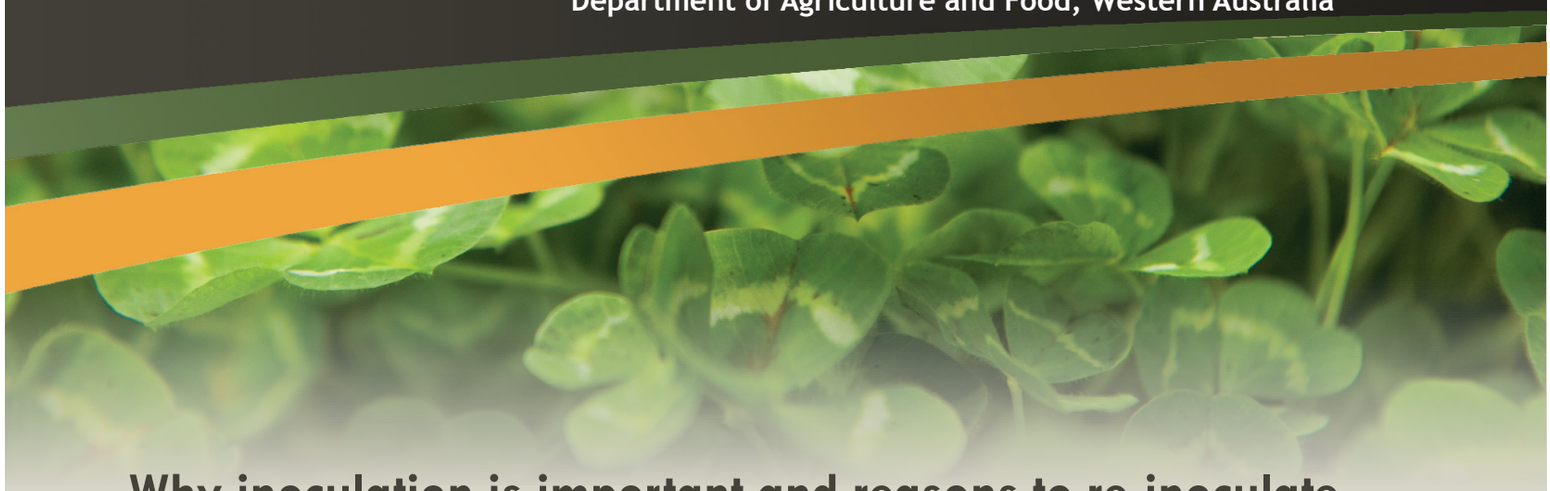

Why inoculation is important and reasons to re-inoculate

When sowing a legume pasture, it is vital to remember the importance of treating the seed with an effective rhizobial inoculant. The use of inoculants results in greater root biomass and an increase in nodulation, which increases plant vigour and yield. Compared to the relatively small cost of inoculation, nodule failure is very expensive, as without root nodulation with effective rhizobia, the plants will deplete soil nitrogen for their growth requirements.

The relationship between the rhizobia and host plant is very specific, and many rhizobial strains native to Australian soils are not effective in the pasture species cultivated. Therefore, to maximise nitrogen fixation and pasture production, seeds must be inoculated with a commercial strain of rhizobia prior to seeding. Before inoculation, make sure the rhizobial strain is effective for the legume species (Table 1), and be aware that if the pasture contains a mix of species, it may require inoculation with multiple rhizobial strains

Table 1: Inoculant groups for pasture legume species
Adapted from DAFWA Farmnote 431/2010 'Inoculating Pasture Legumes'

Inoculant Group	Pasture species	Scientific Name
C	Subterranean clover	Trifolium subterranean
	Rose clover	Trifolium hirtum
	Balansa clover	Trifolium michelanium
	Arrowleaf clover	Trifolium vesiculosum
	Crimson clover	Trifolium incarnatum
	Gland clover	Trifolium glanduliferum
O	Persian clover	Trifolium resupinatum
S	Yellow serradella	Ornithopus compressus
	French serradella	Ornithopus sativus
Biserrula	Biserrula	Biserrula pelecinus
AM	Burr medic	Medicago polymorpha
	Barrel medic	Medicago truncatula
	Sphere medic	Medicago sphaerocarpos
	Snail medic	Medicago scutellata
AL	Lucerne	Medicago sativa
	Strand medic	Medicago littoralis
	Disc medic	Medicago tornata

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Options available

Pasture seed can be custom-inoculated by seed retailers or prepared on farm just prior to sowing. There are four main inoculation techniques, described by the method in which the inoculant is carried. The methods vary in their cost ($5-25/ha) and labour requirements, which will determine the best technique for an individual situation. Also remember that the rhizobia contained within the inoculant are living cells and must be stored correctly. If seed is not sown within the specified shelf life of the inoculant, then it is highly recommended to re-inoculate the seed.

1. Peat-slurry

The peat-rhizobia inoculant is added to water to form a slurry. Before coating the seed with the slurry, an adhesive solution is added to help stick the inoculant to the seed. Common methods of mixing include the use of a cement mixer, shovelling on a cement floor or using a revolving drum. If preparing a seed mix, different seed species must be inoculated separately before blending for sowing.

With the exception of serradella, the seed should be lime-coated after inoculation using agricultural lime. Peat-slurry inoculated seed cannot be treated with pesticides or fungicides. Once inoculated with peat-slurry the seed should be sown into moist soil within 12 hours, or 24 hours if pelleted with lime.

2. Freeze-dried

Liquid is added to the inoculant powder to form a suspension which activates the rhizobia. A protecting agent is added to the suspension to increase rhizobial survival during seeding. Seed can be inoculated through spray application of the inoculant, and the dried seed does not need to be lime coated. Alternatively, the product can be directly injected into the furrow at seeding. Inoculated seed cannot be treated with pesticides or fungicides. Once inoculated, seeds should be sown into moist soil within five hours.

3. Granular

Peat or clay granules containing rhizobia can be purchased as stand-alone products to be seeded alongside the seed. The granules can either be mixed with the seed before sowing, or run through a third seeder box. Granular inoculants can be dry sown, however this decreases the effectiveness of inoculation. Due to the physical separation of the inoculant and seed, the seed can be treated with pesticides or fungicides without damaging the rhizobia.

4. Pre-coated seed

An inoculant coating is applied to the seed before purchase. This method is commonly used for lucerne and medics. Along with rhizobia, the coating may contain insecticides, fungicides and micro-fertilisers. Seed inoculated by this method has a shelf-life of several weeks, with the exception of clover, serradella and biserrula which must be freshly pre-coated, as their rhizobia species have a short lifespan.

Advantages/disadvantages of inoculation options

Inoculation method	Advantages	Disadvantages
Peat-slurry	Lowest cost method Inoculant can tolerate fertilisers	High labour and time requirement Requires lime coating Cannot tolerate pesticides and fungicides Non-flexible seeding
Freeze-dried	Lime coating not required Long shelf-life of inoculant	Cannot tolerate pesticides and fungicides Non-flexible seeding timeframe
Granular	Low labour and time requirement Can tolerate pesticides and fungicides Flexible seeding timeframe	Large bulk due to high application rate Higher cost Generally intolerant to fertilisers
Pre-coated seed	Can tolerate pesticides, fungicides and fertilisers Generally flexible seeding timeframe	Some species have a short lifespan Increases seed cost

For a detailed description of inoculation techniques, see the DAFWA Farmnote 431/2010 'Inoculating Pasture Legumes' at www.agric.wa.gov.au/pastures

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