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INOCULATION AND LIME PELLETING OF LEGUMINOUS SEEDS

By OLGA M. GOSS and W. A. SHIPTON, Plant Pathology Branch

MOST of the extensive areas of new land being brought into cultivation in Western Australia are very sparsely populated with the rhizobial root nodule bacteria which are essential for successful legume pasture establishment. These bacteria, therefore, must be introduced into the soil where, under favourable conditions, they will develop nodules on the roots (Fig. 1).

The introduction of the bacteria is accomplished most readily by inoculation of the seed with a pure culture of the specific strain of bacteria, and the subsequent protection of these living organisms by a lime pellet. Lime pelleting is the process of cementing a coating of lime around the inoculated seed (Fig. 2).

Experiments carried out by the Department of Agriculture over a number of years have shown that lime pelleting is of particular value in—

- Promoting survival of the inoculated bacteria, permitting earlier seed preparation and dry sowing if necessary.
- Protecting the bacteria from the toxicity of the fertilisers used at planting.
- Overcoming nodulation problems due to slight soil acidity.

It is therefore recommended that the method be adopted as standard practice, whenever seeds of pasture or forage legumes such as clovers, medics, vetch, field peas, lupins and serradella are being inoculated before planting. Seed should not be treated with a systemic insecticide when the seed is to be inoculated and lime pelleted, due to the risk of injury to the bacteria.

MATERIALS USED

- Peat inoculant.
- Ground limestone.
- Methyl cellulose solution.
- Fresh or powdered skim milk.

PEAT INOCULANT

Peat cultures (inoculants) containing tested strains of rhizobial bacteria are produced commercially. Pure cultures of these strains are issued to manufacturers by U.D.A.L.S.*, who also check the cultures during production to ensure that only those of high quality are issued to farmers. The peat cultures should be kept under cool conditions, preferably under refrigeration, both during transport and when stored either by the distributors or the farmers.

When ordering the inoculant, the type and amount of seed to be inoculated should be specified. On receipt it is wise to check that the correct bacterial culture has been forwarded, and that the culture is fresh (which is indicated by the expiry date on the packet).

GROUND LIMESTONE

Only very finely ground calcium carbonate (limestone) is suitable; builders lime and hydrolime are injurious. At present two grades of limestone, namely

* U.D.A.L.S.—University of Sydney and New South Wales Department of Agriculture Laboratory Service

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M.A.F. and L/SC, are registered by the Department of Agriculture as suitable for pelleting by the method reported here. For registration certain minimum standards regarding purity, fineness of grinding and pH are required.

**Methyl Cellulose Solution**

The adhesive agent used to cement the limestone around the inoculated seed is methyl cellulose, a material which absorbs and retains moisture. Methofas 125 and Methocel are both recommended as suitable forms of methyl cellulose for pelleting purposes.

The recommended method for preparing a methyl cellulose solution is given below.

The quantities given will allow two pints of the solution to be prepared:

(a) Sprinkle 2 oz. methyl cellulose onto \( \frac{1}{2} \) pint of near-boiling water, stirring vigorously until the powder is dispersed.

(b) Slowly add 1 pints of cold water, still stirring vigorously until an even gel is produced.

The solution is immediately ready for use.

**DETAILS OF METHOD**

(1) Calculate the quantities of materials needed for pelleting various legume seeds from the table below.

<table>
<thead>
<tr>
<th>Type of Seed</th>
<th>Amount of Seed</th>
<th>Methyl cellulose Solution</th>
<th>Milk</th>
<th>Lime</th>
<th>Inoculant *</th>
</tr>
</thead>
<tbody>
<tr>
<td>SMALL SEED:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(e.g. white or strawberry clover, serradella.)</td>
<td>15</td>
<td>2</td>
<td>( \frac{1}{2} )</td>
<td>15</td>
<td>As recommended by the manufacturers on the packet.</td>
</tr>
<tr>
<td>MEDIUM SEED:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(e.g. Subterranean clover, barrel medic, lucerne.)</td>
<td>30</td>
<td>2</td>
<td>( \frac{1}{2} )</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td></td>
<td>140 (1 bag)</td>
<td>9</td>
<td>2</td>
<td>70</td>
<td></td>
</tr>
<tr>
<td>LARGE SEED:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(e.g. Vetch, pea lupins.)</td>
<td>60</td>
<td>2</td>
<td>( \frac{1}{2} )</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td></td>
<td>180 (1 bag)</td>
<td>6</td>
<td>( \frac{1}{2} )</td>
<td>45</td>
<td></td>
</tr>
</tbody>
</table>
(2) Prepare methyl cellulose solution (see above).

(3) Mix the peat culture with the milk and mix in the methyl cellulose solution.

(4) Pour the mixture over the seed and stir until all seeds are wetted.

(5) Add immediately the required amount of finely ground lime and mix until the seeds are evenly coated and well separated.

(6) Bag the pelleted seed.

Hints on Processing Pellets

(1) Small amounts of seed can be readily pelleted by hand, using kitchen utensils.

(2) Large amounts can be processed in a cement mixer, by shovelling over on a cement floor, or by use of a revolving drum or similar device. If a cement mixer is used, it should be stopped before the lime is added. The tendency to clumping can be minimised by rubbing the clumps against the side of the revolving drum with the hand.

(3) All the lime should be added at once or inferior pellets will result.

Time of Seed Preparation and Sowing

Inoculation and lime pelleting of legume seeds should not be started earlier than necessary to fit in with other farm commitments. Preparation some time in advance of sowing has been demonstrated to be satisfactory for subterranean clover and barrel medic (Goss and Shipton, 1965). For a number of reasons however, it is not recommended to treat the seed before April.

Sowing too early is not wise because of the chance of light rain which may allow germination but give insufficient moisture to support growth.

Sowing Methods

Lime pelleted seed may be sown by either of two methods:

(1) Through the ordinary seed box of a “combine” drill so that it drops into the soil with the fertiliser at a precise depth. Special reducing cogs may be obtained for most drills to reduce the sowing rate.

(2) Thoroughly mixed with the fertiliser and sown through the fertiliser box.

Satisfactory pasture establishment may be obtained by the use of either method (Goss and Shipton, 1965b).

When adjusting the sowing rate remember that:

- 3 lb. of small seed per acre is equivalent to 6 lb of pelleted seed.
- 6 lb. of medium seed per acre is equivalent to 9 lb. of pelleted seed.
- 40 lb. of large seed per acre is equivalent to 50 lb. of pelleted seed.
Seed Treatment with Systemic Insecticides

Experiments have shown that the systemic insecticide “Rogor”* is toxic to rhizobia inoculated onto the seed, even when the insecticide was used one month before inoculation (Goss and Shipton, 1965c).

Therefore, the use of systemic insecticides is not recommended where inoculation is a necessity.

REFERENCES


* Registered Trade name. Rogor is composed of dimethyl phosphorothiolothionate.
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