
PELLETED INOCULATED LEGUME SEED

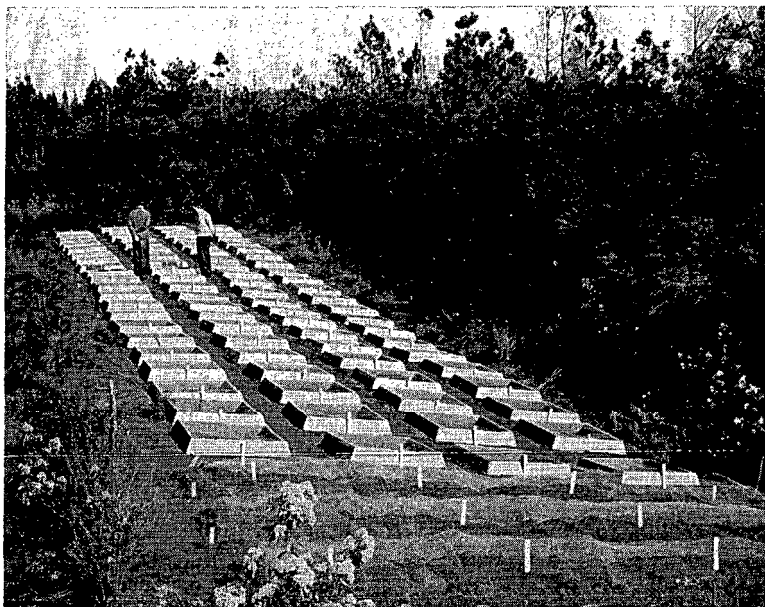
A. HASTINGS

*Technical Officer, Plant Diseases Division,
D.S.I.R., Auckland*

IN NEW ZEALAND extensive areas of new land are being sown to pasture each year. In many of these areas the soil does not contain the 'beneficial rhizobial bacteria which nodulate the roots of common pasture legumes. In some cases, if rhizobia are present in the soils they are only in **low** numbers ; also many strains present in the soils are not effective on all clovers being sown. This deficiency can be corrected by the cheap, simple procedure of seed inoculation. However, if full value is to be obtained from inoculation, the seed must be sown under conditions which favour the survival of the applied bacteria. Provided inoculated seed is sown promptly into a well-prepared seedbed and adequately covered, excellent results will be obtained. However, several practical problems at times make this difficult. With land development now largely confined to more difficult soils and situations, inoculated seed may have to be held after inoculation, is sometimes sown into dry soil under dry conditions, and is frequently broadcast without adequate covering. In such circumstances, there is a gradual desiccation and death of the bacteria. Sometimes when sowing inoculated seed it is an advantage to be able to sow the seed with acid superphosphate, but this practice is injurious to the legume bacteria.

In 1960, a method of pelleting inoculated seed was developed which it was hoped would overcome many of the problems and increase the chances of successful inoculation under adverse conditions. The pelleting method is a method of protecting the nodule bacteria on seed by applying them in a special glue and then covering them with a layer of finely powdered non-acid material. This procedure has been developed in New Zealand from a method of lime pelleting seed reported from Western Australia (Cass-Smith and Goss, 1958).

This method of seed inoculation and pelleting is simple and inexpensive and farmers wishing to inoculate and pellet their seed can readily do so on the farm. However, with the supply of commercially prepared pelleted seed becoming more readily available it is most likely that the bulk of treated seed will be processed by seed firms.



-Photo A. Underhill

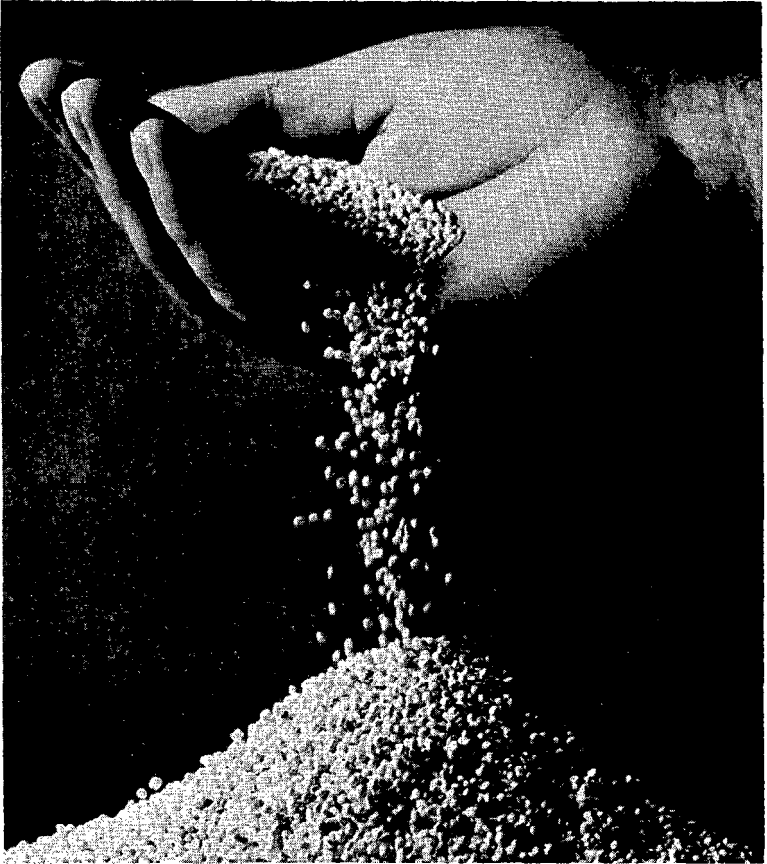
FIG. 1 : *Experimental field plots, clover and lucerne inoculation trials.*

Details of Pelleting Method

To pellet 30 lb of seed:

- (1) Mix 2 oz of methyl cellulose in 1 pint of water; mix the inoculant in 1 pint of water (as per instructions on packet) then mix the dissolved inoculant and glue together and leave to thicken overnight in a cool room or refrigerator.
- (2) Pour the methyl cellulose, which is now black, from the peat inoculant into a suitable container, add the seed, and stir until all seeds are thoroughly wetted.
- (3) Add immediately about 20 lb of finely sieved pelleting material all at once and stir briskly until the seeds are evenly coated and well separated.
- (4) Spread out the pellets to dry for several hours (not in direct sunlight).

The inoculant should be one certified in New Zealand and can be obtained from seed and produce firms throughout the country in sizes to treat 30 lb, 60 lb, or 120 lb of seed; the 30 lb size costs 8s. 9d.



—Photo S. A. Rumsey

FIG. 2: *Lime pelleted red clover seed.*

A suitable container for pelleting seed is a clean cement mixer, or, for small quantities of seed, a bucket or a kitchen mixing bowl. The first batch of seed pelleted in a cement mixer may be somewhat inferior to subsequent batches owing to the amount of methyl cellulose glue and pelleting powder that sticks to the walls.

Materials for Pelleting

It is necessary to use a high-count inoculant of the correct strain of bacteria; tests have shown that low-count inoculants do not make a satisfactory product. It is also impor-

tant to use suitable coating materials, which must be fine enough to pass through a 100 mesh sieve and the glue must be non-toxic to bacteria. Many commercial glues contain preservatives and other harmful materials and may damage the seed or kill the nodule bacteria. Several glues have been used for pelleting, but only two can be recommended. They are methyl cellulose and gum arabic (gum acacia). Of the two glues, methyl cellulose is preferred and is more satisfactory for pelleting seed. Methyl cellulose is used in a 5% solution (2 oz in 2 pints of water). The solid material is available from all chemists' shops. In bulk it is sold commercially as methyl cellulose for pelleting. Gum arabic was used as a 45% solution (18 oz in 2 pt water) and is available from printers and stationers.

There has been considerable research into materials for coating seed after inoculation. The most suitable materials at present are as follows: Gafsa phosphate and dolomite ; Gafsa phosphate and lime ; Nauru phosphate and dolomite ; Nauru phosphate and lime ; or lime alone. Of these the best appears to be a mixture of Gafsa phosphate and dolomite, followed by Nauru phosphate and dolomite. Suitably ground Gafsa or Nauru phosphate is available from most fertilizer companies. Lime and dolomite are readily available. Lime for pelleting, must be finely ground. Coarse ground limestone, slaked lime and builders' lime are not suitable for pelleting.

Increase in Seed Weight through Pelleting

With pelleting of legume seed there is an increase in seed weight which varies with the pelleting material used. In general, the approximate increase for small seeds such as white clover is about 2 lb for every 3 lb of seed -i.e., 3 lb of plain seed is equivalent to about 5 lb of pelleted seed. With larger seed, such as subterranean clover or lucerne, the increase is about 1 lb for every 2 lb of seed — i.e., 3 lb of plain seed is equivalent to about 4½ lb of pelleted seed.

Advantages of Pelleting

Preparation of pelleted inoculated seed takes more time and uses extra materials, so pelleting is more expensive than simple inoculation. However, the protection given to the nodule bacteria by the coating offers several advantages. Seed pelleted by this technique can be sown in contact with superphosphate and other fertilizer without damaging the nodule bacteria. The nodule bacteria on inoculated pelleted



-Photo S. A. Rumsey

FIG. 3: Materials required in pelleting 30 lb of seed. (a) 30 lb seed. (b) Inoculant for 30 lb seed. (c) Pelleting material. (d) Methyl cellulose.

seed survive for a longer period and enough seed may be inoculated and pelleted at one time to last for several days. The bacteria are protected by pelleting when sowing of inoculated seed into dry ground is unavoidable. In soils where the acidity is marginal for effective nodulation,

pelleting could make the difference between success and failure. Pelleted seed allows legume establishment on soils where conventional inoculation fails.

Field Trial Results

Tables 1 and 2 present typical results obtained in trial work.

TABLE 1: RESULTS WITH DIFFERENT ADHESIVES

Field plots of white clover pellets prepared with methyl cellulose and a proprietary glue sown 60 days after seed had been treated

Treatment	Assessment of Growth and Establishment Replicated Field Plots Sown April 27		
	Dates of assessment		
	June 16	July 12	August 1
Lime pellet with methyl cellulose as sticker	2.5	22	24
Lime pellet with proprietary glue as sticker	12	9	10
Clay pellet with methyl cellulose as sticker	22	27	29
Clay pellet with proprietary glue as sticker	9	9	11
Commercial lime pellet inoculated on outside	8	9	8

*Assessment was on a growth and establishment basis and the possible top points for 3 replications was 30(10x3).

TABLE 2: RESULTS FROM TESTS WITH PELLETTED INOCULATED SEED IN TWO SOIL TYPES*

Glasshouse test of inoculated white clover pellets in two soil types (Seed sown 3 months after treatment)

Treatment or Pellet	Weight of Foliage from 4 Replications in grams	
	Parau Clay	Wairakei brown loam
No treatment	0.3	1.7
Normal inoculation	0.3	1.8
Lime pellet	6.6	3.3
Dolomite pellet	5.1	3.0
Gafsa phosphate pellet	6.6	3.6
Lime/soil pellet	6.0	7.2
Dolomite/soil pellet	7.8	7.2
Gafsa/soil pellet	5.7	5.7
Gafsa/dolomite/soil pellet	7.8	5.4
Gafsa/dolomite pellet	8.1	5.4

* Extracted from Table 2, Hastings and Drake, 1962.

In conclusion, there is no doubt that some commercial firms have adapted this method and are making good pellets ; there is evidence of this in recent Lands and Survey sowings in the Westport district. Other firms appear to be still having difficulty in adapting the procedure to produce a 100% effectively inoculated pellet. Research on this point is under way.

REFERENCES

- Cass-Smith, W. P. ; Goss, Olga M., 1958 : A method of inoculating and lime-pelleting leguminous seeds. *Dept. Agric., Western Austr. Bull.* 2,518.
- Hastings, A.; Drake, A. D., 1962: Further tests with materials for pelleting clover seed. *N.Z. J. Agric.*, 104: 330.
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