Pelleting Vegetable Seeds

effect on germination and rate of emergence on some seeds

J. C. Bishop

Small, round or irregularly shaped seeds can be covered with a coating of inert material and built up into pellets almost spherical in shape and containing a single seed each.

Pelleting permits the use of precision planting equipment which results in more even distribution of small seeds and in a reduction of the number of seeds required to plant a given area than is the case with usual planting methods.

This better distribution should facilitate thinning operations markedly, and reduce the check in growth to the remaining plants resulting from the thinning of a closely planted row of seedlings.

Tests for Injury to Seed

Preliminary tests were made to determine whether the pelleting process had harmed the seed with relation to its subsequent ability to germinate. The coating was removed in two ways:

1. By crushing the pellet and removing the seed from the powdered clay, and
2. By placing the pelleted seed on a small sieve and washing away the coating with a stream of water. As a check upon the effect of wetting in the latter treatment, uncoated seed was washed in the same manner.

In all the tests made with the seed removed from the pellets, results indicated that the pelleting process had not harmed the seed and that any differences noted between the germination behavior of pelleted and uncoated seed could be attributed to the presence of the coating itself.

Two pellet-drying methods were tested:

1. Oven-dried immediately at 90° F after coating, and
2. Air-dried for 48 hours after coating, before oven-drying at 90° F.

There appeared to be no significant differences in germination behavior between the pellets dried by these two methods.

Germination Tests

The pellets used in these studies were coated with a finely divided Bentonite clay with a moisture equivalent of about 88.7%.

The coating was applied with moisture by a process similar to that used to candy-coat nuts and other confections, followed by drying at 90° F.

Each pellet was assumed to contain a single seed, since, in all samples examined, one and only one seed was found per pellet. Onion, tomato and lettuce seeds were used.

Both pelleted and uncoated seed of the same seed lot were tested for germination and rate of emergence under several conditions:

1. Germination by the seed laboratory of the Division of Agricultural Engineering at the University of California, Davis. All seeds and pellets were germinated on moist filter paper in petri dishes—onion and tomato seeds at 25° C to 30° C, and lettuce seeds at 22° C. The results are reported as Standard Laboratory Germination Test in the tables.
2. Germination in field soil—Yolo Fine Sandy Loam—in uncovered cold frames. One replicate of 400 seeds was planted for each treatment in each of the first six lots of the onion seed. All other lots of seed were planted with four 100-seed replicates per treatment.
3. Germination on raised beds in the field—Yolo Fine Sandy Loam. In these tests five replicates of 100 seeds each were planted for each lot of seed and treatment.

All plantings were irrigated when it appeared necessary, and tests were conducted until several days had elapsed after the last seedling had appeared.

Results

The analysis of variance method was used in evaluating the data. Significant differences, where indicated, were determined when results from the preliminary tests mentioned in the introduction were included in the tables.

Average figures in the tomato tests were not statistically analyzed, since the few lots tested were not considered to be sufficient to base conclusions upon, and also the fall temperatures under which they were tested were dropping to a point where tomato seed germination would be extremely slow.

Effect of Pelleting on Tomato Seed Germination—1947

	Percentage Germination	
	Standard* laboratory germination test	Uncovered† cold frames
	per cent	per cent
Uncoated seed	88.9	68.1
Pelleted seed	86.5	71.1
Dates of tests	Oct.	Aug.-Oct.

* Average of three lots of seed.
† Average of two lots of seed.

In the case of onion and lettuce seed an appreciably higher germination was obtained with the uncoated seed than with the pelleted seed in the standard laboratory germination test. The same tendency is evident for tomato seed but to a lesser degree.

Effect of Pelleting on Onion Seed Germination—1947

	Percentage germination		
	Standard* laboratory germination test	Uncovered* cold frames	Field† planting
	per cent	per cent	per cent
Uncoated seed	87.4	58.4	75.6
Pelleted seed	73.5	60.6	74.8
Difference required for significance at the 5% level (odds 19 to 1)	6.8	not sig.	not sig.
Dates of tests	June-July November	June-Aug. Oct.-Nov.	Oct.-Dec.

* Average of seven lots of seed.
† Average of six lots of seed.

There was little or no difference between the percentage of germination of the uncoated onion and tomato seed as compared to the pelleted seed when they were planted in the soil of an uncovered cold frame.

Effect of Pelleting on Lettuce Seed Germination—1947–48

	Percentage germination	
	Standard* laboratory germination test	Field* planting
	per cent	per cent
Uncoated seed	97.9	92.1
Pelleted seed	58.5	86.5
Differences required for significance at the 5% level (odds 19–1)	....	not sig.
Dates of tests	Jan. 1948	Nov.-Dec., 1947

* Average of four lots of seed.

Under field conditions there was no significant difference in percentage of germination between the pelleted and uncoated lettuce and onion seed.

In the cold-frame beds there was no great difference in rate of emergence of the seedlings from pelleted and uncoated seed of onion and tomato.

Lettuce and onion were planted on furrow irrigated beds in the field. The results indicate that the seedlings from the pel-

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leted seed emerged above ground somewhat later than those from the uncoated seed.

It is possible that the moisture supply to these seeds was not as uniform as that

Effect of Pelleting on Rate of Emergence of Onion Seed—1947

Average number of days from seeding to appearance of seedlings

	Uncovered* cold frames	Field† planting
Uncoated seed	11.9	18.4
Pelleted seed	13.0	19.5
Difference required for significance at the 5% level (odds 19–1)	not sig.	1.1
Dates of tests	June-Aug. Oct.-Nov.	Oct.-Dec.

* Average of seven lots of seed.
† Average of six lots of seed.

Effect of Pelleting on Rate of Emergence of Tomato Seed—1947

Average number of days from seeding to appearance of seedlings

	Uncovered cold frames*
Uncoated seed	11.7
Pelleted seed	12.3
Dates of tests	Aug.-Oct.

* Average of two lots of seed.

Effect of Pelleting on the Rate of Emergence of Lettuce Seed—1947

Average number of days from seeding to appearance of seedlings

	Field planting*
Uncoated seed	8.9
Pelleted seed	11.7
Difference required for significance at the 5% level (odds 19–1)	0.5
Dates of tests	Nov.-Dec.

* Average of four lots of seed.

prevailing in the cold-frame beds, which could account for the slower emergence.

The differences in the field tests were less than those shown in the data for the seeds planted in the flats.

Conclusions

1. In both cold-frame and field tests pelleted seed germinated as well, but at a slightly slower rate than uncoated seed. However, it does not seem that the slight delay would be very apparent or of any consequence in commercial field plantings.

2. Standard laboratory germination tests show some depression in germination due to pelleting.

3. Under the conditions of these experiments, it appears that the process of pelleting has had no harmful effect upon the seed and that any differences noted between pelleted and uncoated seed—in percentage germination or rate of emergence—can be attributed to the presence of the clay coating itself.

4. No significant difference in percentage germination or rate of emergence were noted between pellets oven-dried immediately after coating at 90° F and pellets air-dried for 48 hours before oven-drying at 90° F.

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Twig Dieback

on orange and grapefruit trees

L. J. Klotz

Severe twig dieback sometimes develops during the spring on navel, Valencia, and grapefruit trees, being particulary extensive on navel trees.

The trouble was general throughout the citrus growing areas this spring and in the spring of 1946, being particularly severe in Tulare County navel orchards.

Twigs and small branches are killed back in length from a few inches to two feet or more. A small side shoot of the current spring's growth may wilt and die. From such a shoot the infection may enter the larger main twig, which is girdled, killing everything beyond to the end of the twig.

During investigations, several bacterial species and many fungus species including the genera *Alternaria, Colletotrichum, Fusarium, Hormodendrum* and *Stemphyllium* were isolated from injured twigs. The blast bacterium was not found. These organisms can likely extend the damage in the injured twigs, but they have not been regarded as primary parasites.

The south side and southwest quadrant of the tree suffer the most injury. Groves in poor condition from lack of care, from waterlogging, and from cold showed more of the dieback than well-kept groves.

The stimulation to growth and release of moisture into the air by the leaves caused by unusually early warm spring weather probably plays a part in causing the injury. The foliage suddenly starting to give off moisture rapidly cannot be supplied with sufficient soil moisture by the still relatively inactive roots in the cold soil.

The stress may also induce the formation of gums which plug the water-conducting vessels. As a result, the new and some older growth are injured or killed by water depletion.

This may occur even where the tree has an adequate supply of good feeder roots and in the presence of abundant soil moisture. The fungi and bacteria present complete the destruction of the injured leafy twigs.

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DONATIONS FOR AGRICULTURAL RESEARCH

Gifts to the University of California for research by the College of Agriculture accepted in June, 1948

BERKELEY

Allied Chemical & Dye Corporation $600.00
For testing miticides

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American Cyanamid Company
100 pounds 1% Parathion dust, 50 pounds ½% Parathion dust, 15 pounds 25% wettable powder, 15 pounds 25% concentrate to make 350 pounds 1% dust plus 5% DDT.
Experimental use for insects on cotton

Dow Chemical Company .... 5 gallons of Dowax 222
25 pounds Neotran wettable, 24 pounds DN dry mix
Experimental use on deciduous fruit tree insects

E. I. DuPont de Nemours Company .... 50 pounds Copper A Compound, DuPont
4 pounds DL Lysine monohydrochloride, 4 pounds DL Methionine

Hercules Powder Company
200 pounds 20% Toxaphene dust and 5 gallons 50% Toxaphene concentrate
Experimental use on cotton insects

Lederle Laboratories Div., American Cyanamid Co. .... 10 grams Folvite powder
To study effects of folic acid on growth and hatchability of chickens

Niagara Chemical Div. of Food Machinery Corp. .... 100 pounds Hexcide dust
Experimental use on cotton insects

Stauffer Chemical Company .... 50 pounds 2% Gamma benzene hexachloride
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Tobacco By-Products & Chemical Corporation .... 27 pounds 14% dry nicotine
For experimental insect control

DAVIS

California Committee on the Relation of Electricity to Agriculture $3,625.00

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RIVERSIDE

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