Effects of

SEED COATING AND MULCHING MATERIALS ON LETTUCE EMERGENCE

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Three lettuce experiments were conducted in which raw seeds, seeds with 5-to-1 and 10-to-1 clay-to-seed coating ratios, and fully coated seeds were compared when planted under soil, and when planted under soil sprayed on the surface with petroleum mulch, and when planted under stabilized vermiculite, or petroleum coke. Stabilized vermiculite and petroleum coke increased the percentage of emergence and lowered the time required, regardless of seed coating. Petroleum mulch also improved emergence, but not as much as the other materials. Counts showed that both 10-to-1 and 5-to-1 coated seeds improved, to a considerable extent, on the slower and poorer emergence that had been observed with fully coated seeds. Both minimum seed coatings and replacement of the soil seed covering by vermiculite or coke offer real advantages for the precision planting of lettuce.

THE MECHANIZATION of lettuce planting has been limited by the inability of planters to place single seeds in a precise pattern. To overcome this, seed coatings of clay were developed which made it possible to plant single seeds more accurately. The ratio of clay coating to seed was usually about 55 to 1. In a 1955 report on studies with coated seed, a delayed and lowered emergence of coated seed was observed.[1] Although articles have been published describing precision planting techniques with coated seed, the use of such seed did not become a widespread practice for lettuce. To overcome the disadvantages of full-coated seed, minimum-coated seeds have been developed. Soil crusting, after rains or sprinkler irrigation, has also been a problem in the precision planting of lettuce. Previous work indicated that porous soil covering materials used over lettuce seeds were effective in crust prevention. The purpose of this study was to compare the emergence of various coated seeds when covered with crust-preventing materials.

TABLE 1. PLANTING DATES AND AVERAGE SOIL TEMPERATURE IN EXPERIMENTS WITH COVERING MATERIALS AND SEED COATINGS IN LETTUCE

Experiment	Planting date	Soil temperature
		deg F
1	January 28, 1966	43
2	April 26, 1966	61
3	June 9, 1966	62

In the spring of 1966, three trials were established on a Salinas silty clay soil in which a specific number of lettuce seeds were planted at a uniform depth and covered with soil or other materials. In the first experiment, the following seed types were included in main plot treatments: raw, 5-to-1 minimum-coated, and full-coated seeds. In the second and third experiments, 10-to-1 *minimum-coated* seed was also included as a main plot treatment. In the subplot treatments, four different covering materials were used. The seeds in all tests were from the same original seed lot, cultivar Calmar, with a guaranteed germination of 92 per cent. Coatings were also made by Germain's Inc. with their Filcoat process.

Lettuce beds were prepared as usual for irrigated soils in the Salinas valley. The seeds were planted in ½-inch square impressions made in the soil surface with a hand tool. After planting, the seeds were covered with the materials to be tested and then the area was irrigated by sprinkling. Initially, 1 inch of water was applied, and thereafter water was applied to maintain adequate moisture for germination. Seedling counts were made at intervals to determine the emergence patterns for each treatment and subtreatment. Temperature readings were made by inserting a soil probe thermometer to a

TABLE 2. EFFECT OF VARIOUS SEED COATINGS ON TOTAL EMERGENCE AND MEAN EMERGENCE PERIOD OF LETTUCE

Seed coating	Experiment 1		Experiment 2		Experiment 3	
	Emerged	M.E.P.*	Emerged	M.E.P.*	Emerged	M.E.P.*
	%	Days	%	Days	%	Days
Raw	66.4	12.2	63.2	7.4	62.4	7.5
5:1†	63.2	12.8	65.2	8.9	73.6	7.9
10:1†			67.2	8.7	70.4	7.9
Fully coated‡	54.2	14.3	47.2	10.5	51.2	9.7
L.S.D. at 5%	8.6	0.6	3.6	0.8	4.2	0.7

* M.E.P. = [daily emergence × days from planting]/total emergence.
† Ratio of clay to seed size in coating.
‡ Fully coated seed is 55:1.

TABLE 3. EFFECT OF COVERING MATERIALS ON TOTAL EMERGENCE AND MEAN EMERGENCE PERIOD OF LETTUCE SEEDLINGS

Seed covering	Experiment 1		Experiment 2		Experiment 3	
	Emerged	M.E.P.*	Emerged	M.E.P.*	Emerged	M.E.P.*
	%	Days	%	Days	%	Days
Soil	32.2	14.8	29.6	11.5	45.2	9.9
Vermiculite + P.V.A.	85.6	11.2	81.2	6.9	77.6	6.5
Petroleum coke	84.4	11.9	81.2	7.0	83.6	7.4
Petroleum mulch	43.2	14.7	49.6	10.1	51.6	9.2
L.S.D. at 5%	8.0	1.2	5.4	1.3	4.8	0.7

* M.E.P. = [daily emergence × days from planting]/total emergence.

depth of 4 inches into the seed row at the same time each day. Vermiculite was sprayed with polyvinylacetate to keep it from being blown away by the wind or washed away by rain or sprinkling. The table shows planting dates and the average soil temperature at 8:30 a.m. during the germination period.

Emergence

Besides the obviously better handling characteristics of coated seed, the emergence percentage and mean emergence period of coated seeds are important. More uniform seedlings came from seed lots with the lowest mean emergence period. When plants emerged fast, they were not as subject to stand problems as slower emerging plants. Faster emerging seedlings appeared to be larger and more uniform, whether because of covering material or seed type.

In these tests, total emergence of minimum-coated seeds was equal to or better than raw seeds in all experiments. Fully coated seeds emerged in significantly lower numbers in all three experiments. Minimum-coated seeds always required more time to emerge than raw seed, but less time than fully coated seeds. There was no significant difference between 5-to-1 and 10-to-1 coatings. The grower objection to the poorer emergence of fully coated seed was overcome by the use of minimum-coated seed. The inventor of a synchronous thinner that is now being marketed pointed out that definite space is needed between single plants for such a machine to operate efficiently. This could be more easily accomplished with minimum-coated seed. Another researcher reported 10 per cent fewer doubles when minimum-coated seeds were used in precision planters in comparison with raw seed. Minimum-coated seed should, therefore, permit more accurate single placement of lettuce seeds without lowering emergence percentages. The delayed emergence occurring with minimum-coated seed was not as great as with coated seed.

Mulching

These data show that, regardless of seed type used, coverings of stabilized vermiculite and coke greatly enhanced the total emergence and lessened the mean emergence period. Lettuce emerged three days earlier when covered with the porous materials than when covered with soil alone. Petroleum mulch over the soil improved the emergence percentage, but not nearly as much as vermiculite or coke. Since crusts did not form where petroleum mulch or the porous materials were used, it seems that seedlings emerge more rapidly through vermiculite or coke because of lessened resistance, or perhaps other improved environmental conditions. Crusting was definitely a factor in the soil covering treatment, and this restricted the emergence more than with the other materials. The improved stands resulting from the use of vermiculite and coke should prove of significant practical value in mechanization. No significant interactions between covering materials and type of seed coating were measured.

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Reinfection Possibilities for Angular Leaf Spot Pathogen in California Cotton

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ANGULAR LEAF SPOT of cotton (*Gossypium hirsutum*), caused by the bacterium *Xanthomonas malvacearum*, became established in California in about 1951. By 1962, however, sanitation had eradicated it from cotton fields, and attempts in 1966–67 to demonstrate cotton-gin-contamination failed even though contamination had been readily demonstrated in 1958–60, when the disease was widespread.

It was then suggested that the disease could be re-established in California only by contaminated seed introduced from other cotton-growing areas. However, *X. malvacearum* was imported in 1967 on cotton seed from South Carolina even though the seed had been acid-delinted and fumigated before arrival here, as required by state permit.

Acid-delinting has been used for many years for the control of *X. malvacearum* and other seed-borne cotton pathogens in the United States, but a low percentage of the seed can be infected internally. Although acid-delinting removes external bacteria, it apparently has little effect on the pathogen within the seed, and is not completely effective in controlling the disease or preventing its introduction into disease-free areas like the San Joaquin Valley. This report presents details of the 1967 occurrence in California, and suggests methods for preventing re-establishment of the disease.

Field occurrence

Many cotton varieties from other states have been grown recently in California for comparison with the variety (SJ-1) now grown in the San Joaquin Valley. The seed was brought in under restrictions and with the approval of the California Department of Agriculture. Plants suspected of having angular leaf spot were found in early September, 1967, in a sprinkler-irrigated variety trial at Arvin, California. The infection was later found in three varieties from South Carolina—all exhibiting angular leaf lesions, systemic spread in leaf veins, black arm on stems, and boll lesions. Counts of infected plants indicated 1 to 2 per cent infection in all of these varieties. There was no apparent spread to adjacent varieties, or to commercial cotton.

The same varieties were also observed at locations near Tulare and Madera, California, where furrow irrigation was used. Since expression of the disease in these instances was expected to consist of only the black arm phase, observations