before and after gypsum addition shows considerable variation in the dissolving rate of gypsum. This was more of a problem at Kearney where the gypsum had not been so well crushed into smaller sizes.

All three water- or soil-amendment treatments gave temporary improvement in furrow water intake rates. At Fresno State College this improvement was noted in both the March and June measurements (see graph, test 1). However, by Sept. 18, the gypsum and sulfur treatments no longer showed benefits. Results from the sulfur treatment showed considerable improvement in the June measurement. The delay may be explained by a lag in microbial change of the sulfur to the soluble sulfate form.

Somewhat similar responses to gypsum and soil sulfur were shown in the Kearney measurements (graph, test 2). However, it is not known whether the gypsum-in-water treatment could have been of benefit during the last irrigation had more gypsum been dissolved. The temporary-only benefit of soil applications might be explained by the eventual leaching, or loss of much of the soil amendment, from the soil surface through a succession of irrigations.

1965 tests

Only the Kearney station vineyard was used in 1965. Several cultural practices commonly used to improve water infiltration were compared along with gypsum treatments in this test.

The five treatments included gypsum soil application, grass culture, grass culture plus gypsum, Merced rye winter covercrop, and a check. The grass-culture treatment consisted of annual rye grass planted in the furrow bottoms on March 2 and mowed as needed thereafter. The rye winter covercrop treatment was planted in November 1964 and disked-under March 18, 1965.

Results of this trial (see graph, test 3) also showed benefits from the gypsum applied earlier in the summer. The reverse was true of the grass, which gave benefit only later in the summer. The combination treatment was the best throughout the season.

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F. W. ZINK

Coated
aids

SIX TO SEVEN THOUSAND acres of direct-seeded celery are grown each year in the central coastal districts of California. Thinning celery requires approximately 50 man-hours per acre—roughly 40% of the labor necessary to produce a crop. Increasing labor costs and uncertainties concerning quality and supply of labor have prompted growers to look for methods to reduce the time required for thinning. Coated seed appears to possess many attributes which warrant evaluation in mechanized celery production.

The irregularly shaped and extremely small celery seeds (approximately 70,000 seeds per ounce) can be covered with a coating of finely divided Bentonite clay and built up into pellets containing a single seed each. Coating the seed permits the use of precision planting equipment, which results in a more even distribution of seeds and in a reduction of the number of seeds required to plant a given area than is the case with usual planting methods.

Two coatings

The two degrees of coating studied (as illustrated) included: minimum coating (B), seed coated to a somewhat irregular shape 4/64 to 5/64 inch in diameter, increasing the weight about 10 times; and spherical coating (C), seeds coated into a spherical shape 6/64 to 7/64 inch in diameter, increasing the weight nearly 40 times.

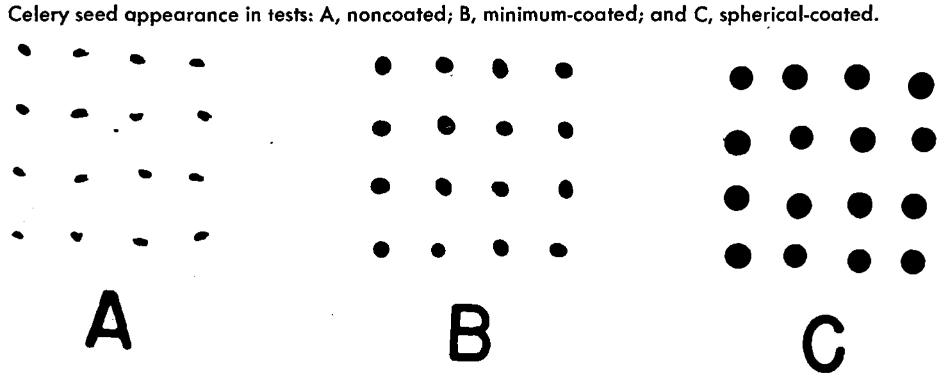
Tests were made to determine whether the coating process lowers the capacity of the seeds to germinate. In these tests, the coating was removed by placing the seeds on a sieve and washing away the coating with a stream of water. Both coated and noncoated seeds were germinated on moist filter paper in petri dishes at temperatures fluctuating between 60° and 70°F. The results indicated that the coating process had no harmful effect upon the seeds—and that the significant depression in germination of the spherical-coated seed (table 1) could be attributed to the presence of the clay coating itself.

Emergence

To determine the effect of seed coating on rate and percentage of emergence, a greenhouse planting was made in soil that had been pasteurized to eliminate soil insects and pathogenic fungi. The seeds were planted ½ inch deep and ½ inch apart in the row. Daily soil temperatures at the seeding depth fluctuated between 58° and 72°F. The percentage of emergence of spherical-coated seeds was significantly lower than that of either noncoated or minimum-coated seeds. No significant difference was found in percentage of emergence between noncoated and minimum-coated seeds. Rate of emergence (graph A), here given as the mean emergence period, was adversely affected by the two coating treatments. The mean emergence periods were 18.7 days for noncoated, 21.8 days for minimum-coated, and 22.3 days for spherical-coated seeds.

Three emergence tests, one each in April, May, and June, were conducted in

Celery seed appearance in tests: A, noncoated; B, minimum-coated; and C, spherical-coated.



celery seed mechanization efforts

TABLE 1. EFFECT OF SEED COATING ON CELERY GERMINATION

Seed treatment	Germination
	%
Noncoated	83 a*
Noncoated washed	84 a
Minimum-coated	81 ab
Minimum-coated washed	85 a
Spherical-coated	78 b
Spherical-coated washed	83 a

* Germination percentage figures followed by different letters are significantly different at the 5% level.

commercial celery fields. Noncoated, minimum-coated, and spherical-coated seeds were planted by hand at a depth of ½ inch with 1-inch spacing in the row. Soil type in all tests was Salinas silty clay loam. The emergence curves of the April planting (graph B) are representative of those for the May and June plantings. The rate of emergence was depressed by both coating treatments. In the April planting the mean emergence periods were 20.6 days for noncoated, 25.7 days for minimum-coated, and 27.2 days for spherical-coated seeds. No significant differences in percentage of emergence were found between noncoated and minimum-coated seeds, but the percentage of emergence for spherical-coated seeds was significantly lower than those of noncoated or minimum-coated seeds in all tests.

Field trials

A series of trials was run in growers' fields to determine the effects of seed coating on stand counts, thinning time, and yield. Noncoated seeds were planted at the rate of 1 lb per acre (approximately 40 seeds per foot of row) with a Planter Jr. planter. A Stanhay Precision Seeder, set to drop a seed at 1-inch intervals, was used to plant the minimum-coated seeds. Spherical-coated seeds were planted with a Gramor Planter, also set to drop seeds at 1-inch intervals. Seeds were planted at a depth of approximately ½ inch.

Pre-thinning stand density was relatively high in the noncoated-seed treatment. Stand counts before thinning in both coated-seed treatments were low, although seedlings were relatively evenly distributed within the row (table 2). The plants were thinned to leave approximately 7 inches between plants. The noncoated seed treatment produced the largest post-thinning population, followed by minimum-coated and spherical-coated treatments in that order. In the coated-seed treatments, there were fewer than 0.2% double plants after thinning. Doubles in the noncoated treatments ranged from 3.8% to 6.7%.

Thinning time

Fewer plants in the row (where coated seeds were used) simplified thinning. Hoeing was easier, and finger-thinning was nearly eliminated. This study indicates that approximately 25 man-hours of thinning labor per acre can be saved by using coated seeds and precision planters. Further savings may be expected with the development of mechanical thinners.

There was a small reduction in yield from spherical-coated seed plots compared with yields from noncoated seed plots (table 3). This was due, in part, to a significantly lower post-thinning population in plots planted with spherical coated seeds. Yields from minimum-coated seed plots were slightly greater in the 2-dozen- and 2½-dozen-size pack than from the noncoated-seed plots. This was attributed to a combination of less "set back" in growth at thinning, and of fewer doubles from the minimum-coated seeds.

Since the number of coated seeds planted per acre is about 70% less than that of noncoated seeds currently planted, more exacting management of seedbed preparation and irrigation is necessary—and more consideration must be given to losses of seedling plants from disease, insects, rodents, and birds.

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Graph A, emergence curves for celery seed greenhouse planting; Graph B, emergence curves for April field planting.

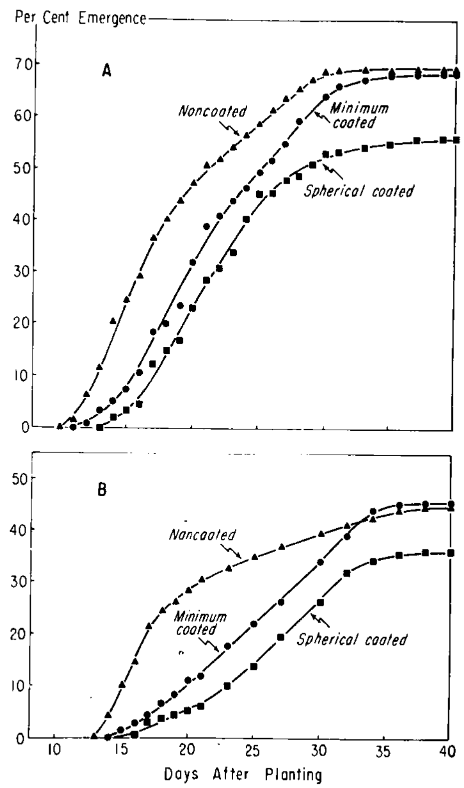

TABLE 2. EFFECT OF NONCOATED AND COATED SEED ON PRE- AND POST-THINNED STANDS, PERCENTAGE OF DOUBLES AFTER THINNING, AND TIME REQUIRED TO HAND THIN

Trial no.	Seed treatment	Plant population		Doubles post-thinning	Thinning time
		Pre-thinning	Post-thinning		
		Plants/ft of row	Plants/acre	%	Man-hours per acre
1	Noncoated	17.2**	44,100**	6.1**	51.4**
	Spherical-coated	3.8	42,600	0.0	23.6
2	Noncoated	16.2**	44,600**	3.8**	50.5**
	Spherical-coated	3.1	41,800	0.0	22.1
3	Noncoated	18.4**	44,400	6.7**	52.2**
	Minimum-coated	5.2	43,900	0.2	26.5
4	Noncoated	16.1**	44,200*	4.4**	49.4**
	Minimum-coated	4.9	43,500	0.1	25.7

* Difference significant at the 5% level.
** Difference significant at the 1% level.

TABLE 3. EFFECT OF COATED SEED ON CALCULATED YIELD PER ACRE EXPRESSED IN SIZE OF PACK

Trial no.	Seed treatment	Yield in crates per acre*		
		2-doz size	2½-doz size	3-doz size
1	Noncoated	612	504	120
	Spherical-coated	604	491	98
2	Noncoated	668	426	126
	Spherical-coated	659	401	90
3	Noncoated	561	432	93
	Minimum-coated	584	461	78
4	Noncoated	621	408	106
	Minimum-coated	653	430	84

* Sturdy crate (9¾ × 16 × 20¼ inches); differences in yield not significant.