Hand planting of lettuce seed for test comparisons was done by precise measurement, as shown above (and cover) on the flat non-bedded surface. Irrigation on all plots was done with a permanent sprinkler system.

Seedling emergence from encapsulated and coated LETTUCE SEED

FRANK E. ROBINSON

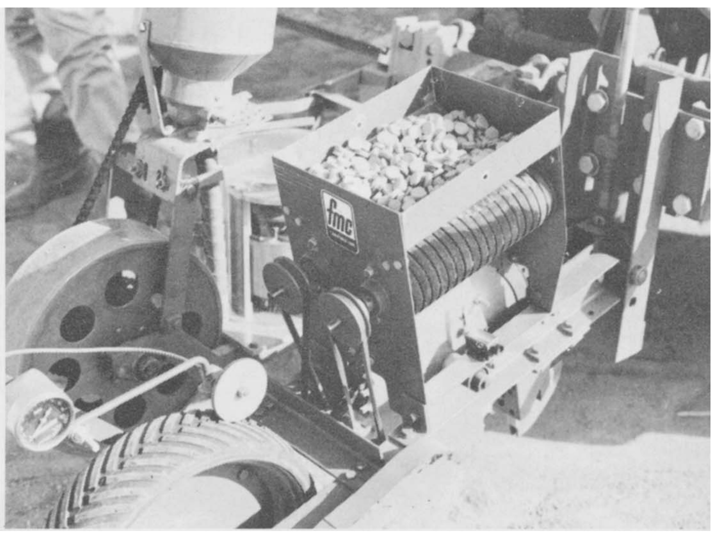
HUNTER JOHNSON, JR.

RATES OF EMERGENCE are greatly improved when sprinkler irrigation is used for lettuce germination in desert areas. Precision planting plus the possibilities for automatic thinners have offered growers hope for reducing labor requirements. To facilitate precision placement, various seed coatings and planting machines have been developed. This report compares emergence and growth rate of plants developing from seed encapsulated in pressed vermiculite tablets, clay-coated seed (10–1 mini-coated), and non-coated seed (see photos).

Machine plantings of vermiculite tablets were compared with machine plantings of non-coated lettuce seed in tests conducted at the Imperial Valley Field Station and at the Citrus Experiment Station, Riverside. A specially designed planter (see photo) was used to plant the tablets singly at a spacing of 10 inches. Non-coated seeds were spaced approximately 2¼ inches apart by the University of California vacuum-needle planter. Plots were 170 ft long, in four replications. Hand plantings were also made of tableted, mini-coated, and non-coated seed, at 6-inch intervals in 20-ft long plots replicated six times. The tablets were placed vertically with the upper surface even with the soil, which is the same orientation used by the machine. The mini-coated and non-coated seed were placed about ⅛ inch deep. All seed treatments were prepared from the same lot of the Vanguard variety.

Another hand-planted observation test

Photo below, left, and close-up to right, show the two machine planters mounted on a tractor draw-bar, as used in precision planting experiments with encapsulated, and coated lettuce seed. The U.C. vacuum-needle planter, mounted to left, was used to plant the non-coated seeds at 2¼-inch intervals and about ⅛ inch deep. The FMC planter, mounted to right, was used to place the vermiculite encapsulated seed at 10-inch spacing, vertically, with upper surface even with the soil.



Seed treatments used in experimental plantings of lettuce (Vanguard variety) at Riverside and Imperial Valley Field Station: left, non-coated seed; center, vermiculite encapsulated tablet (note seed single in central cavity); and clay-coated seed, to right.

was conducted to compare flat orientation of the tablets pressed even with the soil surface, tablets vertical with the upper edge even with the soil surface, and tablets planted vertically with the upper edge 1/2 inch deep. All plantings were on a flat, non-bedded soil surface. One hundred pounds of phosphorus were incorporated preplant, and 20 lbs of nitrogen (as ammonium nitrate) were injected into the sprinkler water. Rain Bird #14 sprinklers were used with 5/64-inch nozzles. Water pressure was at 70 psi. The initial irrigation on January 13, 1970, was for eight hours, followed by two and one-half hours daily.

The machine planting of FMC tablets, conducted at Riverside, was similar to tests in Imperial Valley. The hand plantings were conducted on conventional beds in 2-row plots 20 ft long. Non-coated seed, tablets, and mini-coated seed were placed at 6-inch intervals. In addition, observation tests were conducted with tablets planted flat; vertical, half exposed; and vertical with upper edge even with the soil surface, as compared with mini-coated and non-coated seed at 1/8-inch depth. Rain Bird #14 sprinklers were used with 5/64-inch nozzles at 55 psi. The initial irrigation on January 30, 1970, was six hours with daily two-hour applications following for seven days. No fertilizer was applied in this experiment.

Percentage of stand resulting from machine planting lettuce seed was 83 per cent for the vermiculite tablets in the Imperial Valley, and 91 per cent at Riverside (number of seeds planted was unknown so percentage of stand was not calculated for the non-coated seed at both locations). Green weight (obtained from samples 42 days after first irrigation) in Imperial Valley was 3.68 grams for vermiculite tablets as compared with 6.36 grams for the non-coated seed, and at Riverside (48 days after first irrigation) was 1.36 grams for vermiculite tablets compared with 1.34 grams for non-coated seed.

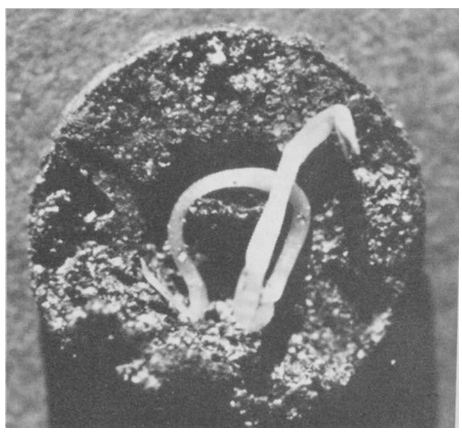
Emergence

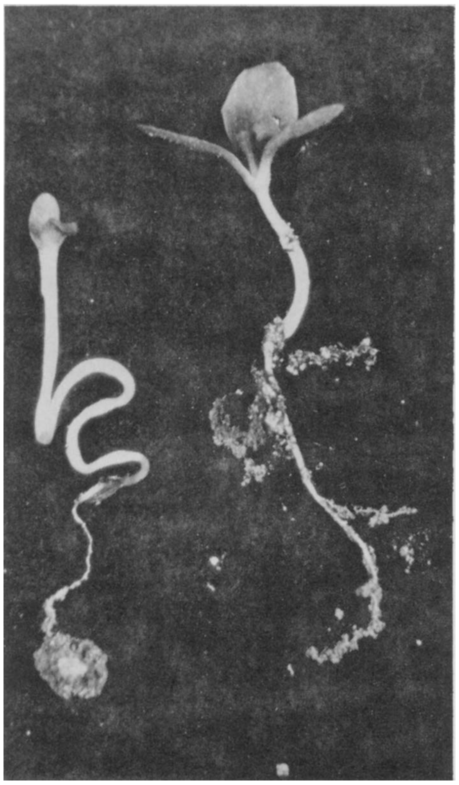
In the Imperial Valley test, the non-coated seed emerged in four days, the tablets in six days, and the mini-coated seed in seven days. In the Riverside test the non-coated seed emerged first, with the mini-coated seed next, and the tablets last. Although there was some difference in time of emergence among the seed treatments, the percentages in final stands were all high enough to be commercially acceptable and were not significantly different. The plants emerging from the vermiculite tablets were visibly smaller, particularly at the early stages. than those from the other two treatments. This difference in size persisted at Imperial Valley Field Station, and is reflected in the green weights shown in the tables. At Riverside the size difference no longer existed after the plants had grown to the 5 or 6 leaf stage at 55 days.

In the Imperial Valley test it was observed that many of the tablets maintained their original conformation after 30 days of sprinkler irrigation. This was due to the very fine droplets created by the high sprinkler pressure (70 psi) which prevented erosion of the tablets. At Riverside, the lower pressure plus some wind distortion of the sprinkler streams resulted in larger droplets, allowing some tablet erosion to take place. These variations in water application could account for differences in plant weight among the treatments, between the locations, assuming that the greater tablet erosion at Riverside resulted in more softening of the tablet. Limited observations in the field, as well as in the greenhouse, indicated that when the tablet is insufficiently softened or eroded, emergence of the seedling root system is inhibited. In these cases, the seedling emerges above ground before the root begins to emerge, resulting in retarded growth. These observations seem to indicate that it may be important to provide a precipitation rate which will lightly erode the tablet for best results with this planting system.

In the observation tests on tablet orientation, the flat placement resulted in better total emergence than when tablets were oriented vertically with the upper edge even with the soil surface. Deep placement of tablets delayed emergence and produced smaller plants. At Riverside, half-exposed tablets provided good

Curling of hypocotyl on lettuce seedling germinated in vermiculite tablet.





Seedling lettuce, to left, germinated from vermiculite tablet and shows distortion of hypocotyl and retarded development, as compared with normal seedling from non-coated seed on right.

emergence; but the resulting seedlings were weak and lacked vigor. This was probably caused by unusual exposure of the hypocotyl when the sprinklers eroded the upper half of the tablet. Investigations with these and other methods of preparing lettuce seed for precision stand establishment will be continued.

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COMPARISON OF HAND-PLANTED LETTUCE SEED—VERMICULITE TABLETS, CLAY-COATED, NON-COATED

	Imperial Valley		
	Vermiculite tablets	Clay-coated	Non-coated seed
Per cent stand NS	83.4	87.1	92.7
Green wgt.** (grams)	2.56	4.65	5.09
	Riverside		
Per cent stand NS	82.7	75.3	87.1
Green wgt.** (grams)	3.01	2.96	3.14

NS—No significant differences.
** Statistically significant at the 1% level.

BRUSSELS SPROUTS
growth and nutrient absorption

N. C. WELCH · K. B. TYLER
JAMES QUICK

Heavy fertilization is necessary for profitable Brussels sprouts production on new, relatively infertile land. About half of the nutrients taken up by the crop are removed during the first two-thirds of the growing season. Perhaps half of the nitrogen, and all of the phosphorus and potassium could be applied before transplanting the crop. The other half of the nitrogen could be applied 4 to 6 weeks after transplanting.

THE FIVE TO SIX THOUSAND ACRES of Brussels sprouts grown annually in the Central Coast Counties of Monterey, San Luis Obispo, San Mateo and Santa Cruz—with production valued at from five to seven million dollars per year—represents approximately 90 per cent of the total U. S. production. Brussels sprouts require a cool, moist climate, particularly during the harvest period. For this reason most Brussels sprouts fields are situated within a few miles of the ocean shore. The shallow marine-bench soils used for Brussels sprouts production in the Central Coast district are usually infertile in their native state because of leaching by winter rains.

Because of great variation in pH, depth, salinity and inherent fertility of these coastal soils, growers need all the information obtainable on diagnostic methods, critical nutrient levels, growth rates, and nutrient removal to formulate effective fertilizer programs. This report provides research findings on growth and nutrient absorption of three varieties of Brussels sprouts.

These studies were made in eight commercial Brussels sprouts fields in Santa Cruz County. Four fields were of the Jade Cross variety and two each of Sanda and Gravendeel. All eight fields yielded slightly higher than average for the Central Coast district and were free from common pathogens and nematodes.

Fields were sampled at weekly intervals after transplanting until harvest to follow growth and nutrient uptake. Each sample consisted of eight to 20 plants, depending on size and stage of growth. These were selected at random and cut level with the soil surface. Plant samples were weighed to determine fresh weight, then washed, dried, re-weighed, ground and analyzed. Roots and sprouts were also taken from Jade Cross fields at harvest time and treated in a manner similar to the plant samples.

Growth pattern

The patterns of growth for the three varieties of Brussels sprouts are best portrayed by the growth curves of graph 1. Growth was slow and fairly even during the first eight weeks, then rate of growth (or dry weight increase) accelerated and remained high until harvest for all three varieties. Approximately 60 days were required to produce the first half of the plants' total dry weight. As shown in table 1, dry matter percentage remained fairly constant in the Brussels sprouts tops through the growing season, starting at 10.4 per cent and attaining 12.5 per cent average for the three varieties at market maturity. Fresh plant material produced in the above ground portions of Jade Cross, Sanda and Gravendeel were 53, 50, and 43 tons per acre, respectively.

Jade Cross root samples at harvest contained 23.1 per cent dry matter or nearly twice that of the plant tops (see table 2).