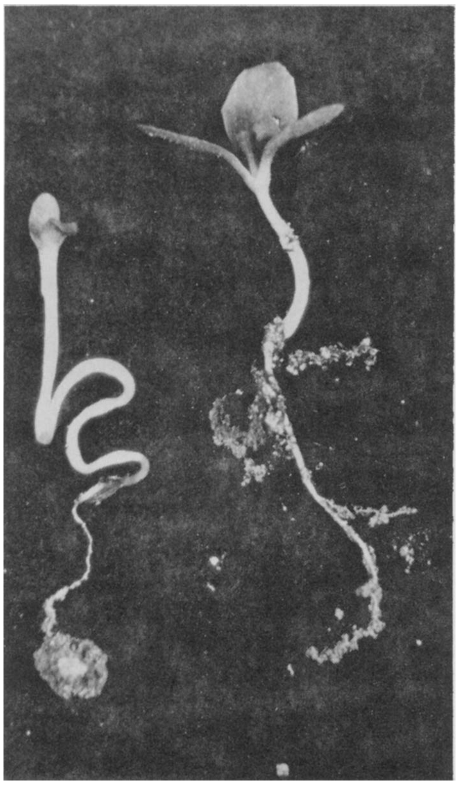

Seedling lettuce, to left, germinated from vermiculite tablet and shows distortion of hypocotyl and retarded development, as compared *with normal seedling from non-coated seed* on right.

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.

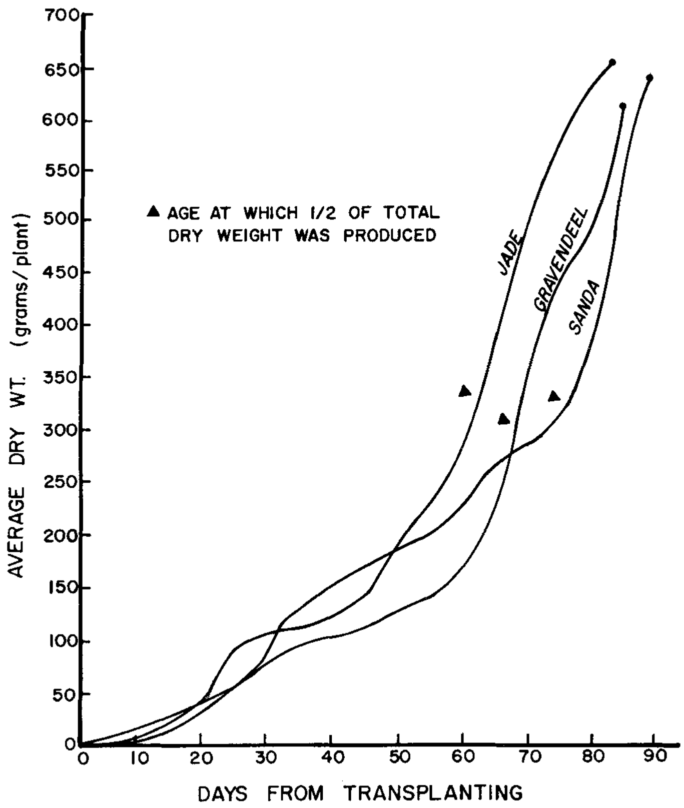
These studies were made in eight commercial Brussels sprouts fields in Santa Cruz County. Four fields were of the Jade Cross variety and two each of Sanda and Gravendeel. All eight fields yielded slightly higher than average for the Central Coast district and were free from common pathogens and nematodes.

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.

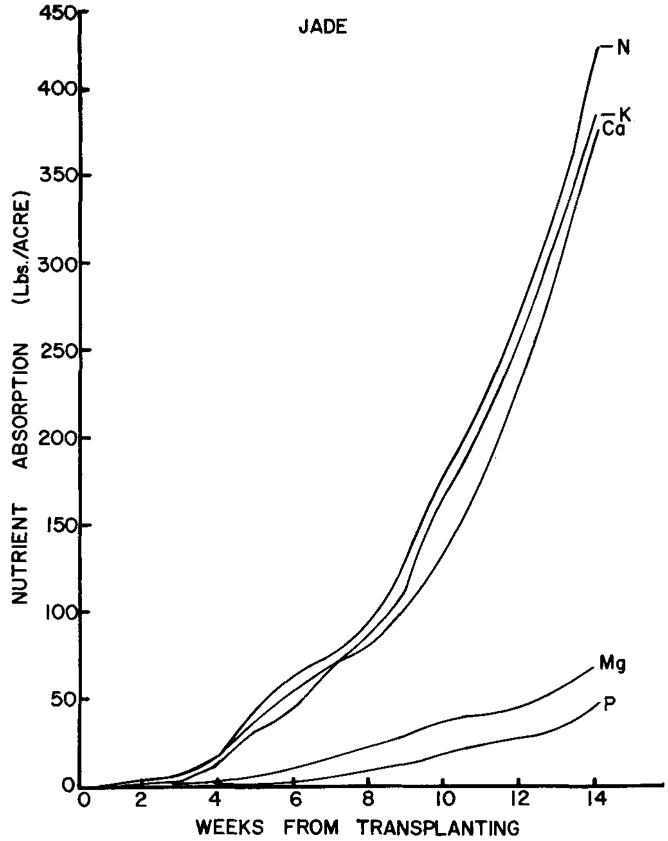
Growth pattern

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).



GRAPH 1. GROWTH OF 3 VARIETIES OF BRUSSELS SPROUTS AS MEASURED BY DRY-MATTER PRODUCTION IN ABOVE-GROUND PARTS



GRAPH 2. NUTRIENT ABSORPTION OF JADE CROSS VARIETY OF BRUSSELS SPROUTS

Sprouts of the Jade Cross at harvest had 15 per cent dry matter content.

The nutrient uptake curves for the three varieties were similar, so only Jade Cross is presented in graph 2. Nutrient absorption was slow during the first three weeks after transplanting. As the transplants became established, the uptake increased and after eight weeks the rates were high and nearly linear. Absorption of half of the quantity of nutrients required nearly 70 days or about two-thirds of the growing season.

Levels of five nutrients in above-ground parts of Brussels sprouts are presented in table 3. Except for calcium and magnesium, nutrient levels based on dry weight of tops tended to decrease as plants approached maturity. As shown in table 2, sprouts were higher in N, P, and K, but lower in Ca and Mg than total plant tops at harvest. Roots were lower in all five nutrients than the above-ground parts (compare tables 2 and 3).

At harvest time the amounts of nutrients in the plant tops on an acre basis were approximately 370 lbs N, 350 lbs K, 35 lbs P, 330 lbs Ca and 62 lbs Mg. However, sprouts taken from the field in a machine harvest of the Jade Cross variety removed 150 lbs N, 123 lbs K, 20 lbs P, 22 lbs Ca and 11 lbs Mg per acre. In a hand harvest of these varieties, a lesser amount of each nutrient would be removed from the field.

Sprouts production on new, relatively infertile land, according to these findings, must include heavy fertilization to achieve profitable yields of acceptable quality. The fact that about half of the amount of nutrients taken up by the crop are removed during the first two-thirds of the growing season indicates that timing of fertilizer application is important. A portion of the nitrogen, perhaps one-half, and all of the phosphorus and potassium (since the latter two leach, but very slowly), could be applied at or before transplanting the crop. The remaining nitrogen could be applied four to six weeks after transplanting to ensure a continuous and sufficient supply for the phase of fastest growth and greatest nutrient uptake.

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TABLE 2. CONCENTRATION OF SELECTED MINERAL NUTRIENTS, DRY MATTER CONTENT AND FRESH WEIGHT AT HARVEST OF SPROUTS AND ROOTS OF JADE CROSS BRUSSELS SPROUTS

	Sprouts harvested	Roots recovered
	(Per cent of dry weight)	
Nitrogen	4.02	1.01
Phosphorus	.52	.27
Potassium	3.18	1.52
Calcium	.57	.63
Magnesium	.30	.32
	(Per cent of fresh weight)	
Dry Matter	15.0	23.1
	(Pounds per acre)	
Fresh weight	25,874	6,485

TABLE 1. DRY MATTER CONTENT AND FRESH WEIGHT OF ABOVE-GROUND PARTS OF BRUSSELS SPROUTS PLANTS AT VARIOUS SAMPLING TIMES DURING GROWTH

	Per cent of fresh weight (average of Jade, Sanda, Gravendeel)					
Dry Matter	10.4	10.6	10.8	11.5	12.2	12.5
	Pounds per acre—fresh weight					
Jade	386	5,463	20,454	41,264	85,756	106,000
Sanda	1,655	7,882	35,544	52,269	76,439	101,000
Gravendeel	1,665	5,304	17,454	33,856	63,805	85,139

TABLE 3. NUTRIENT COMPOSITION OF ABOVE-GROUND PARTS OF BRUSSELS SPROUTS PLANTS AT VARIOUS SAMPLING TIMES DURING GROWTH DAYS FROM TRANSPLANTING

	15	30	45	60	75	90
	Per cent of dry weight (average of Jade, Sanda, Gravendeel)					
Nitrogen	4.05	4.52	3.94	3.39	3.07	2.84
Phosphorus	.42	.42	.38	.35	.33	.29
Potassium	3.78	3.50	3.08	2.89	2.87	2.65
Calcium	2.05	3.05	2.68	2.57	2.66	2.69
Magnesium	.61	.78	.65	.69	.62	.51