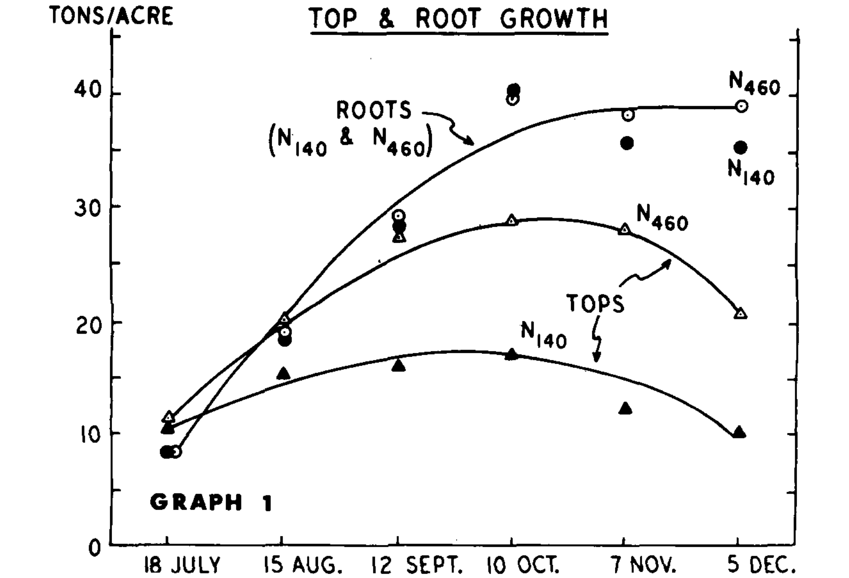

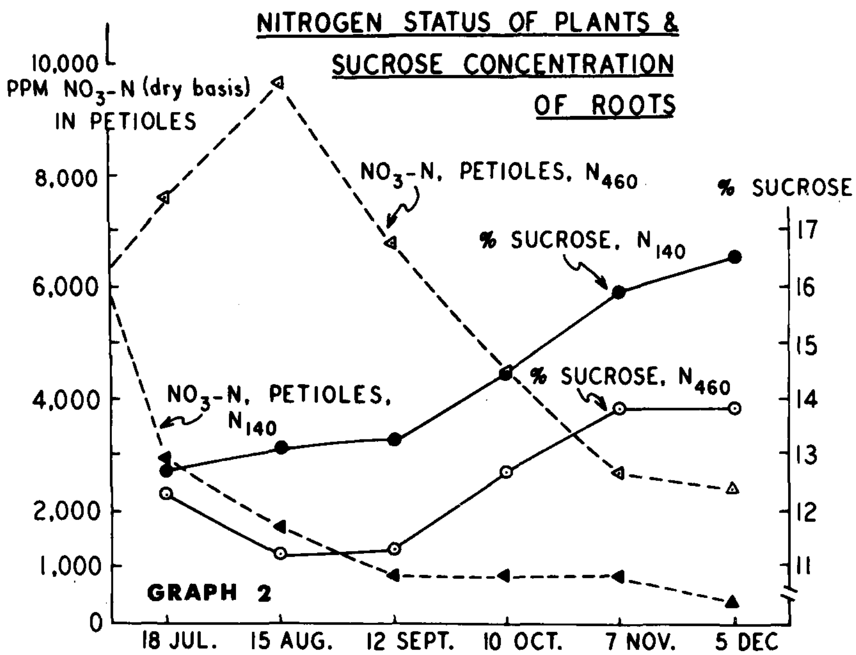

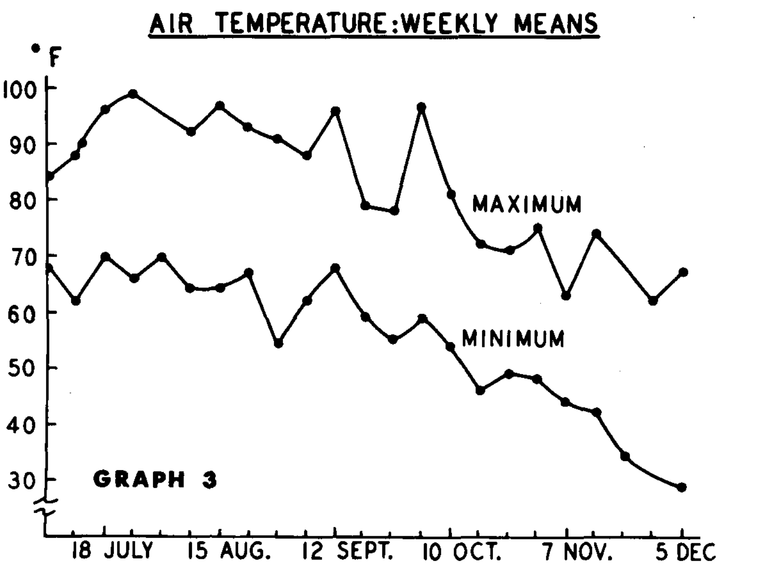

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PRODUCTION OF SUGAR BEETS in areas of low winter rainfall has the advantage that harvesting can be done in midwinter, at a time when soils in other areas have become too wet. Such an "off-season" supply of roots permits a longer, more efficient factory operation, and helps to meet the demand for more sugar. The climate and soils of the Antelope Valley, located in northern Los Angeles County at an elevation of about 2,400 feet, are well suited to winter harvesting. In 1961, sugar beets were grown in the valley for the first time since 1947.

The experiment reported here is the first in a series to be conducted at the Antelope Valley Field Station to gather information on the efficiency of various production practices. In this experiment the growth of sugar beet plants and the sucrose content of their roots were assayed under conditions of high- and low-nitrogen nutrition.

Test plots

Sugar beets (variety US 22/3) were planted March 24 on double-row, 40-inch beds and thinned by hand to a uniform stand on May 28. Seventy pounds of N per acre were applied in the center of the beds before planting, and an additional 70 lbs of N/acre were sidedressed on all plots on June 14. On July 5 and again on July 26, 160 lbs of N/acre were sidedressed on one set of plots to establish four replications of two nitrogen rates: 140 lbs N/acre and 460 lbs N/acre. Ammonium nitrate was used as the source of nitrogen.

The sugar beets were sprinkler-irrigated throughout the season, and soil moisture levels were kept adequate for maximum growth. Leaf samples were collected at various times to determine the nutrient status of the plants. Six uniformly appearing subplots were selected within each of the nitrogen plots and randomly assigned to six different dates of harvest. On July 18, beets from 80 ft

AND QUALITY OF SUGAR BEETS
TELOPE VALLEY FIELD STATION

F. J. HILLS • D. M. MAY • W. D. BURGE • R. S. LOOMIS

Sugar beets responded to decreasing fall temperatures with an abrupt slowdown in both root and top growth but also with increases in the sucrose concentration of roots, according to this test in northern Los Angeles County. Plants that became deficient in nitrogen in mid-August produced roots as well as those kept supplied with nitrogen throughout the fall; and on December 5, roots of N-deficient plants contained 2.7 percentage points more sucrose than roots of high-nitrogen plants.

of row in each nitrogen plot were harvested. Subsequent harvests followed at four-week intervals, ending on December 5.

Growth of tops and roots is plotted in graph 1. Plants that received 140 lbs N/acre became deficient in nitrogen in early August (graph 2), and the rate of top production slowed compared with plants of the higher nitrogen rate. With the advent of freezing night temperatures in late November, top production decreased for plants of both nitrogen levels. The higher rate of nitrogen had no effect on the rate of root growth, as there were no statistically significant differences in root production due to fertilizer treatment at any of the harvest dates. Thus, in graph 1 the growth of roots for both rates of nitrogen is plotted as a single line. Regardless of nitrogen fertilization, however, the rate of root growth slowed abruptly after the harvest of October 10. As the plants were well supplied with nutrients and water, and were not diseased, the reduction in root growth was probably due to the sharp decline in temperature, especially at night, that occurred during this period (graph 3). The decrease in day length to the relatively short days of late fall and early winter probably also contributed to the lower rate of root growth.

Sucrose concentration

Sucrose concentration in sugar beet roots is closely associated with growth, which involves the major sucrose utilization processes in plants: the higher the rate of growth, the higher the rate of sugar utilization, and the less sugar remaining from its manufacture in leaves for storage in roots. It is known that nitrogen deficiency and low night temperatures decrease the rate of top and root growth of sugar beets and (when light intensity and leaf area are adequate) cause sucrose to accumulate in storage roots.

The changes of sucrose concentration in the roots of the plants of this experiment closely follow changes in growth rate. In August, when top growth slowed due to nitrogen deficiency in plants at the lower nitrogen level, the sucrose in roots remained at about 13%, but dropped to 11% for plants well supplied with nitrogen—increasing the top production rate. As root growth slowed in the late fall—probably because of lower temperatures—there was a sharp rise in sucrose concentration in roots of plants at both levels of nitrogen nutrition. Roots of plants at a high N level, however, were always lower in sucrose concentration. Plants that entered the fall period deficient in nitrogen produced root tonnages comparable to plants at a high nitrogen level, and, on December 5, contained 2.7 percentage points more sucrose.

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CALIFORNIA AGRICULTURE

Progress Reports of Agricultural Research, published monthly by the University of California Division of Agricultural Sciences.

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California Agriculture will be sent free upon request addressed to: Editor, *California Agriculture*, 207 University Hall, 2200 University Avenue, Berkeley, California 94720.