SULFUR AND NITROGEN DEFICIENCY RELATIONSHIPS IN SUGAR BEETS GROWN FOR SEED IN OREGON

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Growing of sugar beet seed by the overwintering method (2) has come into widespread use in the United States during the past 12 years. The development of sugar beet seed production by this method in Oregon, leading to the studies reported in this paper, has taken place in the past 5 years (10).

From results with the sugar beet seed crop in various areas it appears that soils of good tilth and more than average fertility are desirable for growing the crop. In addition to the use of manure, nitrogenous fertilizers applied as side-dressings to the growing crop are commonly used (3, 5). It has been shown that the nitrogen supply available to the plant during the fruiting period governs, to a large extent, the utilization by the plant of stored carbohydrate reserves in the sugar beet root. If nitrogen becomes a limiting factor during this period, utilization of carbohydrate root reserves stops and the maturing of the seed crop may be seriously interfered with (5).

In 1914, Reimer (6), in a preliminary report, called attention to serious sulfur deficiencies in soils in southern Oregon and, in 1919, with Tarter (7), gave a full account of the results from sulfur application. Since that date extensive work carried on by the Oregon Experiment Station has demonstrated the value of sulfur as a fertilizer on many crops in western Oregon (1, 4, 9).

The preliminary studies reported in this paper deal with both nitrogen and sulfur deficiencies in relation to sugar beet seed production, and the further relationship of sulfur deficiency to nitrogen utilization.

PLAN OF EXPERIMENT

The experimental plot was located near Jefferson, Oregon, on soil of the Newberg series. The plot included treatments of lime, boron, potash, phosphorus, sulfur, and nitrogen. Only the nitrogen and sulfur treatments are considered in this paper. The boron deficiency relationships have been reported (10), and no significant response to lime (CaCO3), potash, or phosphorus was observed in this experiment. Further critical work is necessary, however to determine definitely the effect of these elements in sugar beet seed production in the Willamette Valley. The experimental design consisted of a split-plot arrangement (11). There were eight replicated plots of each treatment. Appropriate errors were obtainable for measuring the direct effect of both sulfur and nitrogen and also the interaction effects of these two elements.

The sulfur treatments constituted the main blocks and each sulfur block was of sufficient size to accommodate three nitrogen treatments. Ninety-four pounds

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3Figures in parenthesis refer to "Literature Cited", p. 1078.