BORAX CORRECTS TIPBURN IN GREENHOUSE LETTUCE

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Boron deficiency has been unquestionably demonstrated in many soils of the United States and Europe. Certain soils along the eastern sandy coastal plains of the U. S. require borax for successful vegetable growing. The old soils of Virginia, Tennessee, and Kentucky will not now grow alfalfa successfully without borax application. Seed production, higher hay yields, and greater length of life of stands have resulted from borax applied to alfalfa. Boron deficiency is common in Michigan, especially for alfalfa, sugar beets, and some vegetable crops. In the extreme Northwest, some soils have been found deficient in boron.

In Illinois, boron deficiency has been shown to exist in several soil types throughout the state. Alfalfa is especially sensitive, the older soils of southern Illinois having shown the greatest response to borax. It is reported that a direct relationship exists between the age or intensity of weathering of a soil and its available boron content. Such a situation exists with potassium availability, suggesting that the same weathering agents place both potassium and boron among the dearer soil nutrients. However, there is no known relationship between the two elements and there is generally much more total potassium than boron in soils.

The rates of application of borax to correct boron deficiency suggest that only very small amounts of boron are required for normal plant development when compared with nitrogen, phosphorus, and potassium.

The requirements for boron among the different species of crop plants appear to vary considerably. Soils may be deficient for some crops and sufficient for others. Apparently the cereal grains and forage grasses have a low requirement, whereas legumes, tomatoes, root crops, cole crops, tobacco, sunflowers, and other plants have a high requirement.

The problem presented herein came to the attention of the Agricultural Extension office in 1944. Two Williamson County greenhouse operators reported peculiar symptoms in leaf lettuce appearing just at marketing time. Dr. R. H. Bray, University of Illinois, Department of Agronomy, suggested that the trouble might be boron deficiency.

DESCRIPTION OF SYMPTOMS

McHargue and Calfee (1) have shown that boron deficient head lettuce plants show necrotic tissue near the leaf margins and over the growing point. Moinat (2) grew head lettuce in nutrient solutions with and without boron. Plants without boron had thick, small, cupped, brittle leaves; furthermore, brown spots and waxy exudations appeared on the younger leaves, followed by the browning and death of the growing point. The leaf lettuce observed in the Herrin commercial greenhouses in 1944 exhibited some of the symptoms described above. Mr. Edward

Ridgeway reported that his lettuce was stunted and just at marketing time tipburn damage spread rapidly over the entire planting, causing serious financial loss. In addition, Mr. Ridgeway observed that the plants "bled" profusely with the whitish exudation. Furthermore the leaves seemed brittle and in handling they gave a metallic, rustling, paper-like noise.

Since leaf lettuce is harvested in a very immature stage as far as the life history of the plant is concerned, the growing point was not examined for evidence of nutritional disorders.

SOIL TREATMENT TO CORRECT TIPBURN DAMAGE

Mr. Ridgeway followed the suggestion of applying thirty pounds of borax per acre in the greenhouse unit in which tipburn had appeared the worst. Ordinarily three crops of lettuce are grown each year from September 1 to May 1. The borax was applied ahead of the second planting. The results of this simple and single treatment were phenomenal. At harvest time, the total yield was estimated to have increased from ten tons to twenty tons per acre for a single crop. The leaves held their normal green color throughout harvest without even a trace of tipburn. The plant sap did not flow as freely in cutting and there was an absence of the metallic sound in handling.

The soil in this greenhouse has been used continuously for more than thirty years. It is a highly weathered type common to southern Illinois and is one expected to be low in available boron for alfalfa and other legume crops. Previous to 1935 manure from the livestock yards in East St. Louis had been applied at the rate of one hundred tons per acre. For the last ten years manure produced on the home farm had been used. Since the farm soil is probably low in available boron, the feeds produced and fed to the livestock are likewise low. Intensive use of the greenhouse soil, including three crops of lettuce yielding fifty to sixty tons per acre and one of tomatoes yielding from twenty to thirty tons, had undoubtedly caused a heavy withdrawal of available boron so that a deficiency for lettuce was created. No apparent nutritional disorder has been observed with tomatoes that might be attributed to boron deficiency.

Mr. E. J. L. Larimer, a neighbor of Mr. Ridgeway, also reported correcting tipburn damage in leaf lettuce by using thirty pounds of borax per acre.

LITERATURE CITED

(1) McHargue, J. S. and Calfee, R. K. Effect of boron on the growth of lettuce. Plant Physiol. 7:154-161. 1932.

(2) Moinat, A. D. Nutritional relationships of boron and indileacetic acid in head lettuce. Plant Physiol. 18:517-523. 1943.