

BORON AND SUGARBEETS--WHAT ARE THE RISKS?

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Sugarbeets frequently receive preplant incorporated boron applications in the Treasure Valley even though few if any studies have documented the need for boron in this area. Sugarbeets are generally considered to have relatively high requirements for boron as compared to other commodities. The boron isn't expensive and growers may consider it as cheap insurance. Some of the boron may be applied in response to low to very low soil test readings which often can be found in Treasure Valley soils. Evenso, a sugarbeet field trial involving boron provided some rather disturbing results recently. It might be well to examine the available information on Boron and evaluate its importance in Treasure Valley sugarbeet production.

Boron is known to be an essential plant nutrient that is required in very small amounts. Boron serves several functions in the plant. It is involved with calcium in maintaining cell wall structure, helps regulate plant growth hormones, is important for the growth of new tissues and has been reported to assist with the transport of sugars and other plant products and nutrients.

Most soil boron is associated with the organic matter fraction. Consequently, the availability of boron increases as microbial activity increases and organic matter is decomposed. Sandy light textured soils generally provide less boron than silt loam or clay soils. Boron is generally less available at high soil pH. Given the low organic matter content and high pH of many Treasure Valley soils, producers might conclude that boron is potentially a limiting nutrient to their production.

In some areas of the country soil testing is used to help determine the boron needs of sugarbeets. Treasure Valley soil samples are frequently analyzed for boron and its not unusual to find soils that test low. Values less than .5 ppm in the Treasure Valley are common and would be considered deficient in some Midwest soils. Soils testing less than .25 ppm boron, while not commonly found, do occur in the Treasure Valley.

Despite the prevalence in the Treasure Valley of calcareous, low organic matter soils testing low in boron, deficiencies of boron have not been documented in this area. Several sugarbeet trials were conducted in the Treasure Valley from 1964 - 1969 to determine the need for boron but all failed to measure a positive growth response to boron applications (Painter, 1971). The soil test values for the seven trial locations ranged from .20 to .67 ppm. Beet tonnage was unaffected by boron applied and % sugar in most cases did not differ significantly.

An extensive survey of sugarbeet nutritional status was conducted in the West which included 15 Idaho fields (Haddock and Stuart, 1970). Leaf blade tissue test results for these fields indicated that boron was sufficient in all cases. A larger survey of 72 Idaho fields was conducted later (Leggett et al., 1975) again using tissue tests to indicate the micronutrient status of sugarbeets. The lowest value reported for leaf blade boron was 32 ppm. The critical level for sugarbeet leaf blade concentrations has been reported as 30 ppm.

From these results it does not appear that boron in Idaho sugarbeets is much of a limiting factor. Deficiencies of boron are rare if they occur at all. Furthermore, the soil test for boron apparently has little meaning for southern Idaho, and probably should not be used. Boron applications to sugarbeets appear to be a poor fertilizer investment. In fact, there appear to be some unknown risks involved that are simply not worth the taking.

At the urging of US Borax and with their support, we conducted a sugarbeet field trial in 1990 involving preplant applications of 0, 1 or 2 pounds boron per acre. The soil was a Greenleaf silt loam with a boron soil test value averaging .18 ppm over the trial area. Sugarbeet tonnage was not affected by the boron applied. However, % sugar was significantly reduced with applied boron and conductivity was increased. Sugar content dropped from 15.6 to 15.1 and 14.5 with 1 and 2 pounds of applied boron, respectively. Conductivity increased from .67 to .74 and .83 with 1 and 2 pounds of boron. Based on the 1990 contract, the % sugar reduction with 1 or 2 pounds of boron would have resulted in an income loss to the grower of \$33 or \$58 per acre, not counting the cost of the boron applied. The results were for only one trial, but are disturbing nonetheless.

Reduced % sugar content with applied boron is not commonly reported in the literature and we have no logical explanation for the results obtained. A trend for reduced % sugar with applied boron was reported for six locations in Michigan but the trend was not statistically significant and was more than compensated for with increased beet tonnage (Voth et al., 1979). Reduced % sugar with boron was indicated for only one of the seven Treasure Valley boron trials (Painter, 1968).

It is doubtful that reduced % sugar with boron occurs often in the Treasure Valley, based on the previous studies conducted in the area. Nevertheless, there apparently is some risk of reduced sugar content associated with indiscriminate boron applications.

In summary, several Treasure Valley field trials indicated that beet tonnage did not increase with boron applications and surveys of area fields have revealed adequate leaf blade tissue levels of boron. With all the above and given the risk of reducing sugar content, boron should not be applied, without compelling reasons, for Treasure Valley sugarbeets

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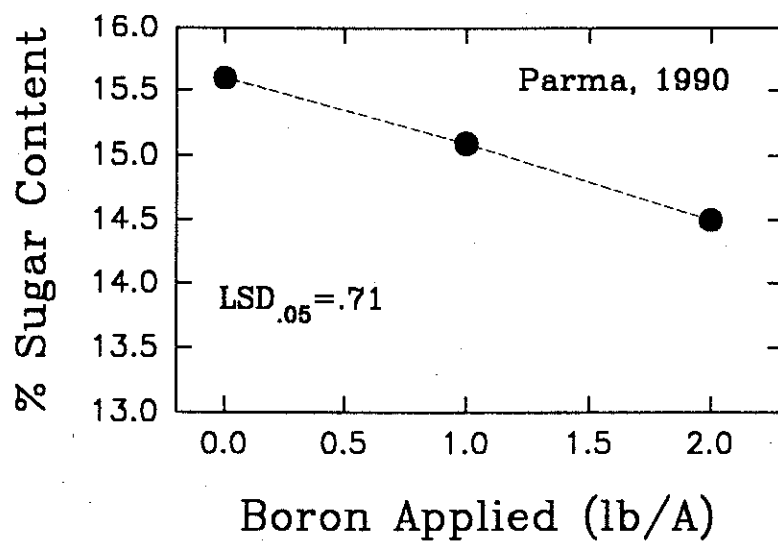


Figure 1. Sugar % as affected by preplant applied boron

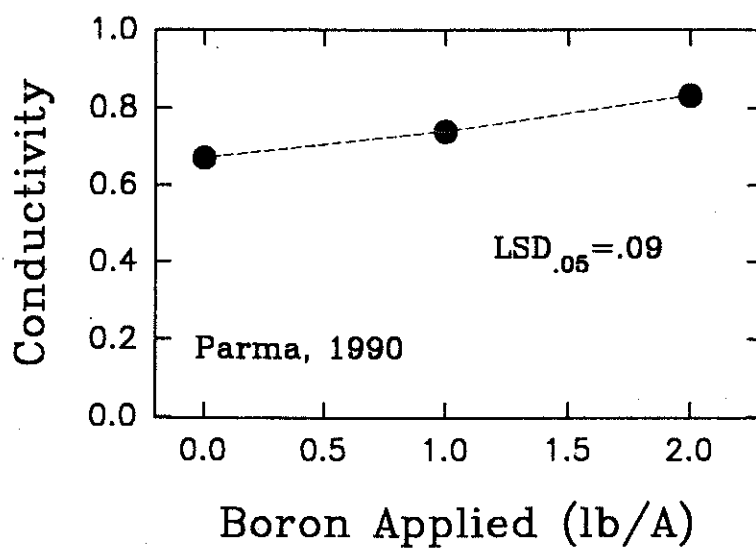


Figure 2. Conductivity as affected by preplant applied boron.