13. BORON

As most fieldmen are aware, boron is needed by plants in only very minute amounts and the range between boron deficiency and boron excess is not great. Boron deficiency and boron toxicity are discussed separately below.

Boron Deficiency

As more and more irrigation project water is used (as opposed to well water) we will be seeing more and more boron deficiency. This is because most project water comes from sources that are low in boron (e.g., snowmelt from the Sierras). Continued use of this water will gradually deplete boron in the soil - this depletion will be more rapid on sandy soils. Boron deficiency could well be involved in some of the "mystery" maladies listed in the chapter on calcium.

When attempting to diagnose a suspected boron deficiency, the first thing the fieldman should do is look at the boron content of the water source. If the B content of the water is 0.3 ppm or greater, you can pretty well eliminate the possibility of boron deficiency (with an exception to be given later).

Boron deficiency affects mainly the growing points of plants or the fruiting parts of plants. If terminal dieback is seen, if there is irregular spotting, discolorations or lesions on fruit, suspect boron deficiency.

An excellent example of the limitations of plant and soil analysis in diagnosing boron deficiency comes from the Pacific northwest. Prune and pear growers in this area have found that fall sprays of boron significantly increase the set of fruit the following spring. This, in spite of the fact that leaves show adequate levels of boron and that in some cases soil levels of boron are "dangerously high". Without the fall boron sprays, the trees do not exhibit classic boron deficiency symptoms - there was simply a higher than normal flower drop in the spring that could easily have pass- ed unnoticed or have been attributed to other causes - a good ex- ample of "hidden hunger".

Correction of boron deficiency

An idea of the very small amount of boron needed to correct boron deficiency can be appreciated when it is realized that 1 ppm boron in irrigation water is a toxic level for many crops. 1 ppm boron in irrigation water supplies 8 to 10 Ibs of boron annually, thus only 8 to 10 Ibs of actual boron per acre (for 1 year only) should be ample to correct a deficiency. 10 Ibs of boron per acre is 1 ounce per 272 square feet.

Boron materials are available for both soil and foliar application. The actual boron content of any material should be checked close- ly to make sure that an excessive amount is not applied.

Boron Toxicity

Boron toxicity is far easier to diagnose than boron deficiency. Areas of potential boron toxicity have usually been fairly well defined; if not, soil analysis can define them. Soil and water analysis can provide excellent supportive information (plant analysis is also useful, but not always definitive) when diagnosing boron toxicity.

There is no antidote for boron toxicity. The only recommendation is plenty of water and

leaching. Sulfuric acid has been found to greatly increase the rate of boron leaching from high boron soils.

Soils differ in their capacity to adsorb boron from or release boron to the soil solution. Soils will therefore differ in the amount of time and leaching that will be necessary to reduce boron to safe levels.

Calcium Effects On Boron

A 1944 study showed the following effect of calcium and potassium on boron deficiency and toxicity:

Nutrient	**Effect on boron deficiency**	**Effect on Boron toxicity**
Calcium	Increases severity	Decreases severity
Potassium	Increases severity	Increases severity

Thus, in a situation where both calcium stress and boron deficiency co-exist (a not unlikely set of circumstances) the addition of calcium alone could well increase the severity of crop symptoms caused by boron deficiency.

General Reference

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