

Boron Toxicity

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Boron is an essential micronutrient to plants and is involved in functions such as meristematic growth and cellular differentiation, maturation, division and elongation. Many species vary in their requirements for boron and, usually, there is a narrow range between adequate and toxic levels of boron.

Symptoms of toxicity include marginal leaf chlorosis and necrosis, followed by scorching, burning and premature drop of interior foliage (Figure 1). This leaves plants with tufts of foliage at the ends of branches often of only current-season's growth. This perennial defoliation leads to plant stress and decline. Symptoms are most pronounced in broadleaf evergreens but can occur in other species (Figure 2).

As rocks weather in soils, boron is released into the soil solution as boric acid and can be readily leached from soil. However, the chemical status of boron and its availability may change with pH. Boron toxicity is most commonly associated with irrigation water sourced from wells, often in saline soils. The subsequent availability of boron for uptake hinges on many factors within the soil, such as texture and adsorption capacity of boron by the soil.

Figure 1: Boron toxicity symptom development on Southern magnolia



Figure 2: Boron toxicity of Mahonia



Treatment success is often erratic. If irrigation water is the source of boron, the simplest and often most successful solution is to reduce the amount of irrigation applied to the plant without allowing excessive drought stress to develop. Use other sources of irrigation water with lower levels of boron if they are available. Applications of quality irrigation water and/or rainfall will leach excess boron from the soil. Soil amendments of gypsum, sulfur or lime and organic matter have also been shown to help. All remediation strategies are most successful when coupled with a reduction in application of boron-laden water and discontinued use of products containing boron.

Boron toxicity is complex and may involve soil and tissue diagnostic sampling. Comprehensive soil and irrigation management programs are often required. If it is not possible to address these conditions, consider replacement of the plants with those known to be less sensitive to boron.