

Nutri-Facts

Agronomic information on nutrients for crops

Nutri-Facts #7

It's a Fact — Boron Is Required by Plants

IT'S A FACT that boron (B) is required by crops for their growth and reproduction. Boron deficiencies are widespread across North America. Responses to B fertilization have been documented in 43 states in the U.S. and throughout Canada. Alfalfa frequently responds to B, but responses also occur in a large number of fruit, vegetable, and field crops.

Get the Facts — Boron in Soils

There are several factors that influence B availability in the soil:

- **Organic matter**

Organic matter is the most important soil source of B. In hot, dry weather, decomposition slows down in the soil surface where most of the organic matter is found. This can lead to a B deficiency. In cold weather, organic matter decomposition also slows, and low B release affects many cold crops (Brussels sprouts, radishes) and other early planted species.

- **Weather conditions**

Dry weather restricts root activity in the surface soil and can cause temporary B deficiency.

Symptoms may tend to disappear as soon as the surface soil receives

Under one acre of growing corn, there are approximately 25,000 miles of corn roots - **It's a fact.**

Surprisingly, this tremendous quantity of roots is in contact with less than 1 percent of the soil. Such a small percentage of roots making soil contact is one of the reasons why it is so important to maintain soil fertility in the medium to high range for profitable crop production.

rainfall. Root growth continues, but yield potential is often cut.

- **Soil pH**

Plant availability of B is good between pH 5.0 and 7.0 (**Figure 1**). At higher pH values, B uptake is reduced.

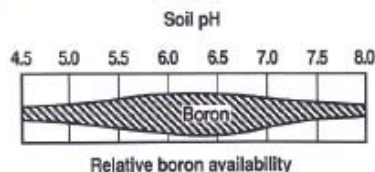


Figure 1. Effect of pH on boron availability.

Liming acid soils can lower B availability and enhance response to B fertilizers. **Figure 2** shows the interaction of two different grades of limestone on rose clover response to B. Note that the finer grind limestone (more reactive) requires more B for optimum rose clover yield.

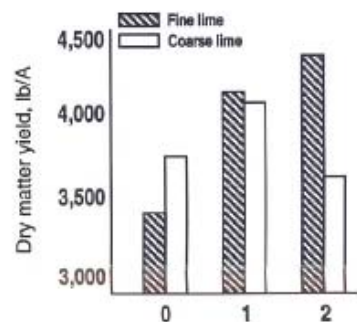


Figure 2. Rose clover response to lime and boron.

- **Soil texture**

Coarse-textured sandy soils, which are composed largely of quartz, are typically low in minerals that contain B. Plants growing on such soils commonly show B deficiencies.

- **Leaching**

Boron is mobile in the soil and is subject to leaching. Leaching is of greater concern on sandy soils and/or in areas of high rainfall.

Get the Facts — Boron for Crops

Crops vary significantly in their responsiveness to B (**Table 1**). Most legumes, as well as several fruits and vegetables, are highly responsive to B. Other vegetables show somewhat less response. Grains are generally less responsive to B.

Table 1. Responsiveness of crops to B.

Most response	Medium response	Least response
Alfalfa	Broccoli	Beans
Cauliflower	Cabbage	Blueberries
Celery	Carrots	Cucumbers
Sugarbeets	Lettuce	Corn
Table beets	Spinach	Onions
Turnips	Sweet corn	Potatoes
Peanuts	Tomatoes	Small grains
Cotton	Asparagus	Sorghum
Apples	Canola	Sudangrass
Clover	Radish	Soybeans

Functions and Deficiency Symptoms of Boron in Plants

Boron is essential in plants for the growth and development of new cells in the new growth areas. Seed development, cell wall formation, flower-

ing, nodule formation, and developing fruit all depend on adequate B.

Another role of B is its formation of complexes within the plant that are associated with sugar translocation. It is important in the formation of proteins. Although B is mobile in the soil, it is immobile in the plant, and nutrient deficiencies appear on the youngest leaves or growing points.

The following are specific B deficiency symptoms of various crops:

- Celery: crooked stem
- Peanuts: hollow heart
- Apples: corky core
- Alfalfa: rosetting, yellow top, death of terminal bud
- Sugarbeets and table beets: black heart (heart rot)
- Cotton: ringed or banded leaf petioles with dieback of terminal buds, causing rosetting effect at the top of the plant. Ruptured squares and thick, green leaves that stay green until frost and are difficult to defoliate.

Solving Boron Deficiency Problems

It is important that B fertilizers are applied uniformly because of the narrow range between adequacy and toxicity. Rates of B fertilization depend on several factors including: soil tests, plant analyses, plant species, crop rotation, weather conditions, cultural practices and soil organic matter.

Boron can be applied to the soil as a broadcast or band application, or applied foliar as a spray or dust. Soil application rates for responsive crops may be as high as 3 lb B/A, and for low and medium responsive crops, 0.5 to 1.0 lb/A (**Table 2**).

Table 2. Boron reduces barren stalks and increases corn yield.

Boron rate ¹ lb/A	Barren stalks,%	Yield bu/A
0	23	148
1	27	161
2	19	170
4	18	164

¹ Soil applied.

Florida

Adequate boron means higher yields...and higher profits. ■

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