CROP FOCUS

# Boron Fertility in Crop Production

## Function in Plants

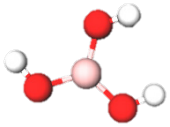
- The primary role of boron in plants is forming the structure of cell walls. Boron is also important in the transport of sugars, cell division, amino acid production, flower initiation, and pollen development.

| 5 |
|---|
| **B** |
| Boron |
| 10.81 |

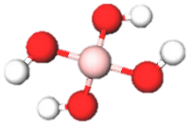
- Boron plays a role in ensuring colonization of roots with mycorrhizal fungi. Mycorrhizal fungi assist plants in taking up important nutrients like phosphorus and zinc.
- A 200 bu/acre corn crop takes up 0.21 lbs/acre of boron. A 75 bu/acre soybean crop takes up 0.12 lbs/acre of boron.

## Availability in Soil

- The plant available forms of boron, $B(OH)_3$ and $B(OH)_4^-$, are mobile in the soil solution.
- Availability of boron is greatest in moderately acidic soils that have a pH ranging from 5-7 (Figure 1).



$B(OH)_3$



$B(OH)_4^-$

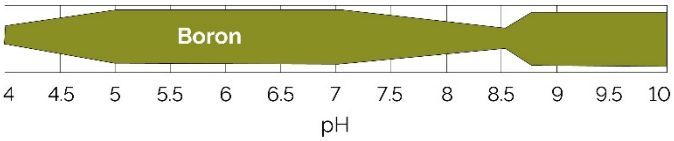



**Figure 1.** Relative availability of boron by soil pH.

- Soil organic matter is the primary source of boron for plant uptake. Weather conditions that favor organic matter decomposition (warm, ample moisture) will tend to increase boron availability
- Boron does not bond tightly with soil particles and is subject to leaching. Boron can become deficient in areas where the nutrient is readily leached and is not replenished through organic matter decomposition.

## Boron Deficiency in Crops

- Boron is not mobile within plants, meaning that deficiencies will appear in the newest growth. It is possible to have excess boron in older leaves and a deficiency in newer leaves on the same plant.
- Plants with deficiencies can show symptoms of light general chlorosis and deformed leaves with areas of discoloration.
- Growing points of plants may be stunted or stop growing, and the plant will have fewer flowers and seeds.
- Boron deficiencies are most common in alfalfa and clover.
- In alfalfa, internodes shorten resulting in nodes and leaves that are very close together, giving the plant a "rosette" effect.

**Figure 2.** Alfalfa is one of the crops most likely to benefit from boron applications.

- Boron deficiency in corn can manifest as narrow white streaks on leaves, shortened upper internodes, small abnormal ears, and small abnormal tassels with anthers that fail to produce pollen.
- Soil sampling can be used to identify boron deficiencies.
- Drought conditions tend to favor boron deficiencies by reducing release from organic matter and plant uptake

## Boron Fertilizers

### Forms of Boron

- In the major crop production areas of North America, the micronutrients most often supplied by fertilization include boron, zinc, manganese, and iron.
- Common forms of boron fertilizer are borax and boric acid.

### Boron Application

- Granular forms of boron can be top dressed or broadcast. Boron can be easily mixed with other granular fertilizers to ensure even distribution.
- Boron should **not** be banded, as high concentrations near the seed can be toxic.
- Foliar applications of boron are possible, but boron is not mobile in the plant, meaning that the application will only be effective on the leaves it is applied to.
- Application rates typically range from 0.5 to 1.0 lbs/acre of boron for crops such as corn, soybean, and cotton, but can be as high as 3 lbs/acre for highly responsive crops such as alfalfa or sunflower.
- Boron toxicity can result when applications exceed recommended rates.

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