Agronomy Note

Boron applications for improved cotton yields

20 MULE TEAM BORAX™
RioTinto

- Boron is essential for all plant growth. It is important for cell wall structure, root growth, and pollination.
- Cotton requires an adequate supply of boron—especially during the boll development stage—or boll shed may occur, which reduces yields.
- Multiple foliar sprays of *Solubor*® applied alone or with insecticides will ensure an adequate supply of boron during flowering and boll development.
- Preplant soil application of *Granubor*® plus foliar sprays of *Solubor* during the growing season are recommended for soils testing low in available boron.

The nutrient requirements of cotton are well known, and methods of fertilizer application and other cultural practices resulting in optimum production have been developed over the past 50 years. Boron (B) has been universally recognized as the most important micronutrient for cotton production. While boron is essential for all stages of plant growth, an available supply is most important during flowering and boll development. This is especially true with today's fast-fruiting, high-yielding varieties.

Cell wall strength, cell division, fruit and seed development, and sugar transport are plant functions related to boron. Improved fiber quality (fineness, uniformity, and strength) has been reported with boron applications. While boron requirements for optimum plant nutrition are low as compared with those of nitrogen (N), phosphorus (P) and potassium (K), the need for boron is especially significant in flowering and boll development.

Deficiency symptoms

Because boron is vital to flower formation and seed production during the boll development stage, a decrease in boron supply during this critical stage can result in decreased yields. New flowers are distorted and there may be excessive shedding of squares. The sepals around the bolls also may fail to harden with low levels of available boron.

Severe deficiencies of boron which result in visual symptoms are rarely found in cotton producing regions where boron has been applied in previous years. Visual symptoms include bushy plants with young leaves which are thicker and darker green. Leaves may be misshapen and distorted with short and brittle petioles.

Soil tests and plant analyses

Boron deficiencies may be suspected on coarse-textured soils where organic matter content is low, on recently limed soils, and where delayed maturity has been reported in cotton with recommended N rates. Soil testing and plant analyses are both helpful in assessing the potential boron-supplying capacity of the soil and the current boron status of the growing plant.

The critical level of hot-water-soluble boron for cotton in most soils ranges from 0.2 to 1.0 ppm, depending on the soil pH, organic matter content and texture. Soils which are below the critical level generally will respond to applied boron. The critical level of boron in upper mature cotton leaves is about 15 ppm. Cotton plants with leaf boron contents below the critical level should be sprayed one or more times with *Solubor* after flower initiation and during boll development.

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Recommendations for cotton

Boron recommendations for cotton	
Marginal soil test boron and/or leaf analyses or dry weather during critical stages:	**Low soil test boron and a prior history of boron response:**
Multiple foliar sprays at rates of 0.5 lbs of *Solubor* / acre (0.1 lbs of B/acre) weekly for 3-5 times after flower initiation and during boll development. *Solubor* can be applied alone or with insecticides to plants, or with N solutions to the soil.	A soil application of 7 lbs of *Granubor* / acre (1 lb of B/acre) broadcast and incorporated prior to planting, plus one or more foliar sprays at 0.5 lbs of *Solubor* / acre per spray applied during flowering and boll development stages.

Boron applications should be made every year for cotton because soluble boron can be easily leached from the root zone, especially in sandy soils in high rainfall regions or with over-irrigation. The availability of boron in acid soils generally decreases when these soils are limed, so boron is recommended on freshly limed soils. Response to applied boron generally is greatest when there are adequate supplies of the other nutrients, especially N.

Data below show increased cotton yields with soil and foliar applications of boron in Tennessee. Foliar applications of *Solubor* (providing 0.1 lbs of B/acre per spray) resulted in a 9% increase over the check, and inclusion of K in the boron foliar spray resulted in a 13% increase. Doubling the boron foliar rate did not increase yields, but the boron petiole concentration was significantly increased. Cotton lint yields also were increased by a preplant soil application of boron.

Response of cotton to soil and foliar boron and potassium applications

B applied, lbs / acre		K applied, foliar	lint yield, lbs / acre	Petiole B, ppm
soil	foliar			
—	—	—	976 d	52 c
0.5	—	—	1,039 bc	54 c
—	0.4	—	1,050 ab	65 c
—	0.8	—	991 cd	93 a
—	0.4	14.6	1,105 a	74 b

Values in columns followed by the same letter are not significantly different at a probability level of0.05. Howard, DD, CO Gwathmey and CE Sams, *Agronomy Journal* 90:740-746, 1998.