

## **Boron Fertilization of Potatoes and Alfalfa**

**Even on sandy soils with low B levels, no yield or quality responses were found.**

Jessica Davis, Extension Soil Specialist

Susie Thompson, Research Scientist, San Luis Valley Research Center

Abdel Berrada, Research Scientist, Southwestern Colorado Research Center

Ron Meyer, Extension Agronomist, Golden Plains Area

John Mortvedt, Faculty Affiliate

Boron is an essential plant nutrient for all crops. It plays important roles in cell wall synthesis, sugar transport, and seed production. Alfalfa is considered to be a crop with a high B requirement, while potatoes require lower B levels.

Boron deficiencies are found most often in sandy soils, with low organic matter contents and high soil pH levels. Deficiency symptoms in alfalfa are described as “yellow-top.” The younger leaves turn yellow or red between the veins, rosetting develops due to shortened stems, and, ultimately, the terminal bud dies. In potatoes, symptoms include discoloration and death of the terminal buds, stubby roots, short internodes, and bud and flower drop.

We initiated several studies from 1997-1999 to evaluate the impact of B application on irrigated alfalfa yield and on yield and quality of two potato cultivars. We sought out soils with low B levels, low organic matter levels and coarse textures, and settled on three locations: one in southwestern Colorado near Yellow Jacket (alfalfa); one in northeastern Colorado in the sandhills near Holyoke (alfalfa); and one gravelly soil in the San Luis Valley near Center (potatoes). Each study site was evaluated for two years. Soil properties are given below.

<b>Location</b>	<b>Soil Boron (ppm)</b>	<b>Soil Organic Matter (%)</b>	<b>Soil Texture</b>
Yellow Jacket	0.4	1.1	silty clay loam
Holyoke	0.2	1.2	sandy loam
Center	0.1	1.0	gravelly sandy loam

The alfalfa varieties were Pioneer 5454 at Holyoke and Archer at Yellow Jacket. Two potato cultivars were evaluated: Russet Norkotah and Russet Nugget. Solubor<sup>TM</sup> was applied pre-plant

to potatoes at 0, 1, and 2 lbs B/acre. Foliar application of Solubor<sup>TM</sup> was made to alfalfa in April at rates of 0, 0.5, 1, 2, and 4 lbs B/acre.

There was no significant impact of B fertilizer application on alfalfa yield for any of the cuttings in any of the four site-years. There was also no significant impact on potato yield (total or components), specific gravity, agronomic characteristics, quality traits or disease ratings in either of the two site-years.

Why were there no yield responses to B fertilization on low B soils in this study? Are there other B sources to consider? Let's take a look at the potential for irrigation water and subsoil to supply B to crops.

Perhaps the irrigation water is supplying the necessary B to crops. A survey of 92 wells in northeastern Colorado revealed an average of 0.52 ppm B in the irrigation water, with a range from 0.03 to 2.30 ppm B. Based on 30 inches (2.5 ft) of consumptive water use by alfalfa, 0.3 ppm B in irrigation water would provide alfalfa's required 2 lbs B/A (2.5 acre-feet of water x 2.7 million lbs water/acre-foot x 0.3 ppm B = 2.0 lbs B/acre). Therefore, irrigation water may be providing the necessary B, thus preventing a response to B fertilizer, even on soils testing low in available B.

However, the B level in the irrigation water at both Yellow Jacket and Center was only 0.02 ppm (equivalent to 0.1 lbs B/acre-foot of water), a level low enough to suspect that a B fertilizer response could occur. Could subsoil B be supplying the B need for the crops grown in these locations? This is a possibility in the soil at Yellow Jacket; however, the shallow gravelly soils of the San Luis Valley or the deep sands of northeastern Colorado don't have much potential for subsoil storage of B.

At this point, no confirmed B deficiencies have ever been documented in Colorado. Therefore, CSU does not recommend B fertilization even on soils testing low in available B.

###