

SUGAR BEET

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Sugar beet, which is a tuber plant grown for the purpose of sugar extraction, is one of the cultivated plants with the highest boron requirement and the most sensitive to boron deficiency. Boron deficiency in the regions where sugar beet is grown can mostly be caused by both the washing of boron and the loss of its usefulness by adsorbing on clay minerals. While the washing problem comes to the fore in light textured soils in regions with heavy rainfall or boron-poor water resources and intensive irrigation, the binding problem in heavy textured soils is the main cause of boron deficiency. Of course, the inability to transport boron within the plant is another factor in the emergence of boron deficiency.

Tuber *Beta vulgaris* varieties, including sugar beet, and cruciferous (Brassicaceae) are the two most striking product groups in terms of sensitivity to boron deficiency. Sugar beet and fodder beet are among the products in which boron deficiency has been revealed for the first time in field conditions by receiving a positive response to boron fertilization in the world.

Due to the structural role of boron played in the cell wall, it is known that the cell walls deteriorate in boron deficiency and at the same time negatively affects the structure and function of the cell membranes. The necrotic spots seen in sugar beet tubers, darkening and heart rot in boron deficiency are explained by deterioration in the cell wall structure and the resulting accelerated deterioration process. As sugar beet is a plant grown not for its seed but for its tuber, and tuber yield and quality parameters are severely affected by boron deficiency, most of the boron deficiency studies in sugar beet have focused on these parameters.

Soil Application:

1.4-3 kg ha⁻¹ of B can be applied before or during sowing.

Foliar Application:

30 grams of B dissolved in 100 liters of water can be applied 10-15 days before blossoming.

It has been suggested that boron deficiency can disrupt the balance in the distribution of carbohydrates by both negatively affecting photosynthesis and reducing the sucrose carried in the phloem canal, and therefore causing less sugar transportation to organs such as roots and growing tubers. It is known that boron deficiency, which reduces the growth and yield of sugar beet, decreases the sucrose concentration in the phloem sap, and consequently both the sugar concentration and sugar yield of the tuber.

In boron deficiency, significant decreases occur in plant growth, especially in the growth of roots. In the experiments carried out under controlled conditions, striking increases in plant growth, especially in root growth, occur with the application of increasing amounts of boron to sugar beet. These observations show that root growth in sugar beet is much more sensitive than green parts in boron deficiency.

As the long-distance transport of boron in sugar beet is largely limited to the xylem vascular bundles, deficiency symptoms in the above-ground part appear primarily at the growing points and on the developing young leaves. Deformities occur in the youngest leaves of plants. As the leaf areas shrink and the petioles shorten, the leaf thicknesses increase significantly. In case of severe deficiency in both sugar beet and table beet, plant growth may come to a stopping point and deformation and blackening occur at the growth points.



Another important symptom associated with boron deficiency in beets is known as "heart rot" and begins and develops in the tuber as brown spots and rings. Heart rot causes serious yield and quality losses, resulting in significant economic damage. It is also known that cracking problem may occur in tubers affected by boron deficiency.

It is reported that the critical boron concentration, which is expected to start tuber and sugar yield decrease due to boron deficiency in sugar beet, is in the range of 30-40 mg kg⁻¹ for leaf blades. The critical value generally accepted for deficiency in leaf blades is 35 mg kg⁻¹. Boron in the range of 40-200 mg kg⁻¹ is considered sufficient in the leaves. Soil analysis must be done before boron fertilization to determine the boron needs of the soil.

