

Cabbage boron deficiency (290)

Common Name

Cabbage hollow stem

Scientific Name

Boron deficiency

Distribution

Probably in all the areas of the world where brassicas are grown. Symptoms are common on brassicas in the highlands of Papua New Guinea, and on papaya in New Caledonia.

Hosts

Many of the brassica family, including broccoli, Brussels sprout, cabbage, cauliflower, Chinese cabbage and turnip. Beetroot (Amaranthaceae) is also susceptible, as is carrot and celery (Apiaceae) (**see Fact Sheet no. 191**). Boron deficiency is reported on all vegetables related to cabbage in the hill soils of the Suva Peninsula, Fiji by Graham¹. Symptoms are also reported from the highlands of Papua New Guinea on beetroot, cabbage, cauliflower, celery and turnip. Boron deficiency can also occur in ornamentals.



Photo 1. Broccoli showing "hollow stem" symptom, typical of boron deficiency. Similar symptoms occur in cabbage and other members of the brassica family.

Symptoms & Life Cycle

Boron is essential for plant growth, but in very small amounts; it is needed for cell wall formation, and is also involved in flowering and fruit set. Boron deficiency occurs in sandy soils, leached by rain or irrigation, with a pH greater than 7. Deficiency symptoms are also more likely in soils low in organic matter, during long droughts, and in soils with high levels of calcium.

Boron is not moved around the plant; it does not travel from the old leaves as they die to the young ones. Therefore, a continuous supply is required if there is not enough in the soil. If boron is limiting, symptoms often occur in the growing point, and this may die. The death of the shoot stimulates buds to develop which form distorted, thick and brittle leaves. Typical symptoms on commonly grown vegetables are as follows:

In cabbage, the stems are hollow or with a soft, discoloured pith (Photo 1). Heads are small and petioles brittle. Bacterial soft rots may occur on the heads causing a foul-smelling decay. Cauliflower show curled leaves, hollow stems and small, brown heads.

Beetroot is particularly susceptible to boron deficiency, showing dark patches, distortions of the root, and collapse of the young leaves. Similarly, turnip has misshapen roots and dark patches (brown heart), and watery areas may occur.

Impact

Boron is the most common micronutrient deficiency, and causes large losses in crop production and crop quality worldwide.

Detection & inspection

Look for plants with deformed young leaves and growing points. For brassicas look for hollow stems, stunting, brittle leaves, and brown heads (or curds) in cauliflower and broccoli.

Management

CULTURAL CONTROL

Boron is only needed in small amounts, and the difference between deficiency and toxicity is small. The best way to treat boron deficiency is to add plenty of compost, as boron is present in organic matter. If that does not solve the problem, then use borax, or a specially made boron fertilizer.

Note, boron deficiency may not simply be caused by a lack of boron, but by a lack of balance between levels of boron and potassium, nitrogen and calcium. So, if symptoms persist, it would be best to have a soil analysis to arrive at the correct solution. Boron deficiency is also influenced by pH.

CHEMICAL CONTROL

Once a soil test has confirmed boron deficiency, or you are certain boron deficiency is the cause of the symptoms on your plants, use one of the products suggested below. Apply as a drench to the soil rather than spraying the leaves; this is to make sure that the boron gets to the roots, and from there to the shoot tips where it is needed.

- Use borax (11% boron) at 10 kg/ha (1 g/m²) on light soils, and repeat after 2 weeks ONLY if the symptoms persist in the new growth. Borax is sold in laundry and cleaning sections of supermarkets. Dissolve the borax in water at a rate of 1g/litre and apply as a spray per m² soil.
- Use a commercial product (e.g., Solubor 20% boron), formulated in such a way as to keep boron dispersed and soluble in water. Follow the manufacturer's instructions. For brassicas, Solubor is recommended at the rate of 6 kg/ha (foliar application), and 6-12 kg/ha (soil application); that is 0.6-1.2 g/m². Use the lower rates initially, and apply pre-plant for soil application.

If using either product as a foliar application, it is best to spray a few plants first, as leaves can be damaged by boron. Repeat applications may be required in sandy soils where rainfall or irrigation is high.

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¹Graham KM (1971) Plant diseases of Fiji. Ministry of Overseas Development. Her Majesty's Stationery Office, London; and Higgins G, Scheufele S (2016) Boron deficiency. The Centre for Agriculture, Food and the Environment, UMassAmherst Vegetable Program. (<https://ag.umass.edu/vegetable/fact-sheets/boron-deficiency#:~:text=In%20brassicas%2C%20boron%20deficiency%20can,hollow%20stems%20with%20discolored%20tissue.&text=Boron%20applications%20are%20not%20recommended%20to%20prevent%20hollow%20stem%20in%20the%20field.>); and Kelling KA (undated) Understanding plant nutrients: Soil and applied boron. University of Wisconsin-Extension. (<http://corn.agronomy.wisc.edu/Management/pdfs/a2522.pdf>); and from Dear BS, Weir RG (2004) Boron deficiency in pastures and field crops. AGFACTS NSW Agriculture. (https://www.dpi.nsw.gov.au/_data/assets/pdf_file/0005/158864/boron-deficiency-pastures-field-crops.pdf). Photo 1 Gerald Holmes, California Polytechnic State University at San Luis Obispo, Bugwood.org.

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