University of Kentucky
College of Agriculture,
Food and Environment
Cooperative Extension Service

Center for Crop Diversification Fact Sheet
CCD-FS-11

Blossom End Rot

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Introduction

Blossom end rot is a physiological disorder, or non-biotic disease, common to many fruiting vegetable crops, especially tomatoes and peppers. Squash and watermelon can also be affected. Blossom end rot is caused by a lack of calcium in the blossom (or distal) end of the fruit. Calcium is essential to plants because it acts as a binding agent between cell walls. It is also important for cell elongation in shoots and root tips.

Symptoms

The first fruit of the season are often the ones most affected by blossom end rot. The blossom end of immature fruit begins to appear soft and a bruise-like spot forms. The spot enlarges and becomes dark brown or black and sunken with a leathery texture. On pepper fruit, early blossom end rot can look similar to sunscald. Bacterial or fungal pathogens can invade this compromised tissue, which leads to secondary infections. It is important to distinguish between the primary issue and a secondary issue. In the case of blossom end rot, pesticide applications will not improve fruit quality because the pathogen only took advantage of fruit tissue that was already deteriorating. Fruit affected by blossom end rot are considered unmarketable.

Causes and management

Water stress

Calcium enters the plant with the flow of water. A lack of calcium in the fruit does not necessarily mean there is a lack of calcium in the soil. It may mean that the plant is unable to take up calcium and/or transport calcium to the fruit because there is simply not enough water to transport the calcium. Calcium transport can also be inhibited if there are not enough roots to take up the calcium. Root growth can be very slow in excessively wet or dry soils. Additionally, high humidity slows water movement in the plant and consequently movement of calcium into the fruit. Blossom end rot is often more severe early in the season when rapidly growing plants are exposed to water stress. On bare ground plantings, cultivation too close to the plants can cut roots, inducing drought stress and blossom end rot. Maintaining consistent soil moisture especially during high temperatures will help reduce and prevent blossom end rot. Drip irrigation is an efficient and effective way to maintain a uniform soil moisture level. Applying mulch can help regulate soil temperatures and moisture. If growing in a high tunnel or greenhouse, consider covering the structure with shade cloth to reduce heat stress.

Low soil pH

Calcium is less available to the plant when the soil pH is below 6.0. Most vegetable crops prefer a soil pH between 6.5-7.0. Before planting, collect a representative soil sample and have your soil tested. Lime can be applied to raise the soil pH, but is most effective when applied several months prior to planting. Consult the University of Kentucky publications Vegetable Production Guide for Commercial Growers (ID-36) or Home Vegetable Gardening in Kentucky (ID-128) for more specific soil pH recommendations based on the vegetable crops you intend to grow.

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High nitrogen fertility

Excessive additions of nitrogen (N) to the soil can cause an increase in vegetative (leaf) growth. Water will go to areas of new growth due to the increase in transpiration. Because calcium is moved by water through the plant, it will be taken to the new vegetative growth along with the water. It is not able to then be moved from the leaf tissue to the fruit. For peppers and tomatoes at bloom stage, the percent of N in leaf tissue should be between 4 and 6%, and no higher than 6%. A foliar tissue analysis will indicate whether or not nutrient concentrations are sufficient. Prior to planting tomatoes, it is recommended that 50 lbs./acre of N is applied and incorporated into the soil. After plants are established, an additional 75-100 lbs. of N/acre is recommended. This can be side-dressed or applied in weekly increments via drip irrigation. For more detailed recommendations for tomatoes or other vegetable crops, consult UK's ID-36.

High concentrations of cations

High concentrations of ammonium (NH4+), magnesium (Mg+2), potassium (K+) and sodium (Na+) in the soil will cause a reduced uptake of calcium by the plant. These cations compete with calcium for uptake. When one is present in greater than sufficient quantities compared to calcium, the result may be a calcium deficiency in the plant and fruit. Overfertilization with ammonium-N and/or potassium during bloom or fruiting stages will lead to excessive shoot growth, which can lead to blossom end rot. There are many fertilizers that contain or form ammonium-N. Common fertilizers containing or forming ammonium include urea, ammonium nitrate, diammonium phosphate, and ammonium sulfate. Fertilizers high in nitrate-N (NO3) are preferred and include calcium nitrate and potassium nitrate.

Low Calcium

As previously mentioned, soil should be tested prior to planting. Kentucky soils are rarely deficient in calcium, but if the soil analysis determines that your soil is deficient in calcium, applying lime pre-plant will supply the needed calcium. Calcium levels greater than 800 lbs. of calcium/acre should be sufficient for crop growth. Foliar tissue analysis will determine how much calcium is in the plant. Sufficient levels of calcium will change depending on the type of crop and the stage of growth. For tomatoes, the percent range for calcium at or just prior to

bloom is 1-3% calcium. For peppers at or prior to bloom, 1-2.5% calcium is sufficient. Calcium chloride foliar sprays have not been found to be effective in reducing blossom end rot because the fruit does not take calcium in through its epidermis and leaves do not transport calcium to the fruit.

Cultivars

Vegetable cultivars vary in their susceptibility to develop blossom end rot. Tomato cultivars that have been shown to have a high incidence of blossom end rot include 'Whopper,' 'Wonder Boy' and 'Big Boy.' 'Jet Star,' 'Early Girl' and 'Better Boy' have been shown to have lower incidence of blossom end rot. Plum or pear-shaped tomato cultivars are considered to be more susceptible. Cherry tomatoes are not known to develop the disorder. Peppers are considered to be less prone to develop blossom end rot than tomatoes. Once blossom end rot is observed on fruit, it is recommended to remove the fruit from the plant as it will not recover and this will limit the amount of energy the plant will further contribute to unmarketable fruit.

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