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BLOSSOM-END ROT OF TOMATO

Blossom-end rot of tomato, also called black rot and dry rot, occurs worldwide wherever tomatoes are grown. This disease can result in direct losses in quality and yield on field- and greenhouse-grown plants. In some years, crop losses as high as 50% have been reported. Most cultivars of tomato can be affected by this disease, although differences in susceptibility have been reported. While blossom-end rot is primarily a disease of tomato, it can also occur on eggplant and pepper, although it is not as common.

SYMPTOMS:

Blossom-end rot is characterized by large brown to black, dry, leathery areas on the blossom end of tomato fruit. Initial symptoms appear as small, water-soaked areas that resemble bruises on the blossom end of immature or green fruit (Figure 1). These spots can enlarge and coalesce until the affected areas involve up to half of the surface of the fruit. Symptoms are usually not visible on the stem end of the fruit (Figures 2 and 3). Development of blossom-end rot can also cause distortion of the fruit (Figure 4).

Affected tissues eventually dry, shrink, and become leathery. This is often manifest as a gradual progression of symptoms over time (Figure 5). During this time, the color of

affected areas gradually changes from a bleached yellow to a characteristic dark brown or black.



Figure 1. Initial symptoms of water-soaking on blossom end of tomato fruit.

Fruit affected by blossom-end rot often ripen more rapidly than normal, healthy fruit (Figure 6). Plum- or pear-shaped tomato cultivars have been found to be most susceptible (Figure 7).

Although symptoms can be found on fruit from any part of the plant, all of the fruit on an individual plant are usually not affected for the entire season. Symptoms often appear on fruit that are set at approximately

the same time. This is common on the first crop of fruit, which were formed when soil and air temperatures were cool early in the season.



Figure 2. Symptoms of blossom-end rot are not evident on stem end of the fruit.



Figure 3. Blossom end of fruit in Figure 2 with symptoms.

Blossom-end rot, as the name implies, usually occurs at the blossom end of the fruit (the end *away* from the stem) but it can

occasionally occur at the side of the fruit. Internal blossom-end rot appears as internal black lesions, which are not visible from the exterior of the fruit.



Figure 4. Affected fruit are often distorted.



Figure 5. Gradual progression of symptoms on affected fruit.



Figure 6. Fruit with blossom-end rot often ripen prematurely.

It is also not uncommon to find that the affected areas of these fruit are invaded by secondary fungi and bacteria that cause soft rot and fruit decay.



Figure 7. Plum- and pear-shaped tomatoes are highly susceptible to blossom-end rot.

CAUSE:

Blossom-end rot is a physiological disease associated with localized deficiencies of calcium in the fruit. This can occur even when there is an ample supply of calcium in the soil, stems, and leaves of the plant. Calcium is a nutrient that is required in relatively large quantities by rapidly growing fruit, especially by the rapidly dividing cells at the blossom ends of young fruit. When these cells are suddenly deprived of calcium, they begin to break down and symptoms develop. While many factors have been found to trigger this deficiency, water stress has frequently been implicated in playing a key role in initiating this problem. Since calcium is not a highly mobile element, periods of water stress as short as 30 minutes can result in blossom-end rot in highly susceptible plants.

Moisture problems that interfere with the balance of calcium in the plant can result from cultural practices that promote the

development of a shallow root system such as frequent, shallow watering. Moisture can also be a problem in plantings on light, sandy soil with fluctuating moisture levels and on plantings in heavy soils with high moisture-holding capabilities, which often become water-logged.

Other factors that have been found to favor this physiological disease include early planting in cold soil, poor fruit setting, high temperature, and water-logged soil. In addition, studies have shown that high levels of ammonium nitrogen in the soil can contribute to disease development by affecting calcium uptake by the plant. In particular, use of manures, especially poultry manure, favors this condition.

Staking, trellising, and pruning of tomato plants can increase stress and have been reported to increase blossom-end rot.

MANAGEMENT:

There are several strategies that can be used to minimize the development of blossom-end rot in the home garden. The most important thing is to maintain *even soil moisture* throughout the growing season. This can be accomplished by consistent irrigation and mulching, which help to maintain uniform moisture in the soil. In addition, selecting a proper site with a well drained soil with good aeration and enough organic matter or humus to retain moisture during dry periods will help to minimize disease development.

Since tomatoes planted early in cold soil are likely to develop blossom-end rot on the first crop of fruit, planting tomatoes in warmer soil helps to minimize the problem.

The soil pH should be maintained above 5.5, preferably 6.5. When calcium-deficient soils are indicated by a soil test, they can be amended with gypsum, superphosphate, or with applications of dolomitic or high-calcium limestone. It is also important to avoid excessive nitrogen fertilizer applications, especially in the ammonium form, just before or during fruiting.

Although foliar applications of calcium have been suggested by some, they have been found to have limited efficacy—calcium is poorly absorbed by the plant. Calcium sprays have been associated with phytotoxicity (marginal leaf burn).

When cultivating, care should be taken to avoid destroying or damaging the tender feeder roots that are responsible for uptake of water and nutrients.

Cultivar selection can help to minimize blossom-end rot since differences in susceptibility have been reported. Cultivars reported to have low incidences of blossom-end rot include Celebrity, Jet Star, Mountain Pride, and Winter. Cultivars with high incidences include Big Boy, Supersonic, Whopper, and Wonder Boy. However, differences can occur, depending on weather and planting conditions. Plum- or pear-shaped tomato cultivars have been found to be particularly prone to blossom-end rot.

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