IDAHO GREEN THUMB HOW-TO'S

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Blossom-End Rot in Tomatoes

at a glance

- Blossom-end rot is a physiological disorder and is not caused by a pathogen.
- Calcium deficiency is the basis of blossom-end rot.
- Inconsistent irrigation is the most common cause of blossom-end rot in Idaho.
- Management of blossom-end rot involves practices that enhance healthy root development.
- Blossom-end rot does not spread from one plant to another or from one fruit to another.

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The Condition

For a gardener, it is discouraging at harvest to see a dark, leathery patch develop on the bottom end of your vine-ripened tomatoes (Figure 1). The blemish is the classic symptom of blossom-end rot, a disorder caused by a calcium deficiency. The condition also occurs in peppers, eggplant, melons, and squash (Figure 2), albeit less often.

Figure 1. Blossom-end rot is caused by a calcium deficiency at the blossom end of the fruit. Courtesy of William M. Brown Jr., Bugwood.org.

Figure 2. Blossom-end rot in summer squash is also caused by calcium deficiency. Courtesy of Gerald Holmes, Strawberry Center, Cal Poly San Luis Obispo, Bugwood.org.

Calcium moves in a water solution from the roots, through the xylem, and to the rest of the plant. Since the water moves preferentially to the leaves to support photosynthesis and transpiration, the calcium moves with it. This, combined with the fact that calcium does not have the ability to move from the leaves to the fruit through the phloem, makes the roots' distribution of the mineral to other parts of the plant crucial. Essentially, it is the initial translocation from the roots that carries calcium to the fruit.

Thus, any disturbance in nominal water movement in a plant interferes with the calcium placement within that plant, increasing the likelihood of the disorder's development. For example, blossom-end rot often afflicts rapidly growing plants or those recovering from water stress, given that the flow of calcium in plants growing under these circumstances favors the leaves, leaving the fruit undersupplied.

Calcium-deficient fruit results in abnormal cell wall development, which appears as a water spot on its blossom end. As the condition progresses, the patch either dries and darkens or a secondary infectious organism enters to rot the fruit. Although this can occur any time the fruit is growing, it is more common in young fruit.

The Cause

Most Idaho soils are calcium-rich. Thus, those who understand the state's soil chemistry might wonder why blossom-end rot appears in our tomatoes. Several practices and conditions reduce mineral uptake, even in high-calcium soils. Basically, any situation that limits water flow through the plant or disrupts healthy root growth makes tomatoes susceptible to this condition:

- **Inconsistent watering.** When tomatoes get drought-stressed, even slightly, the calcium supply to the fruit can fluctuate, increasing their vulnerability.

- **Overwatering.** Waterlogged soils do not have the oxygen needed to support proper root development and functioning.
- **Daily, shallow watering.** Tomato roots can penetrate over two feet. However, frequent, shallow watering does not encourage the deep rooting that is essential for proper water uptake. This is especially important for young, developing plants.
- **Damaged roots.** Tillage too close to the roots of tomato plants can damage roots and decrease their ability to absorb needed calcium.
- **Overfertilization.** Too much nitrogen fertilizer, especially in the ammonia form, can encourage rapid vegetative growth while the plant is setting fruit. As a result, calcium moves to the rapidly growing leaves instead, making it unavailable to the fruit. High nitrogen levels promote leaf growth over fruit development, reducing the plant's ability to supply the calcium needed for proper fruit development.
- **Soil chemistry.** Soils with a pH lower than 6.5 are more likely to produce blossom-end rot.
- **Potting soil.** Raised beds or pots that have a nonmineral growing medium, such as potting soil, may just not have enough calcium for proper fruit development. Also, the limited dimensions of pots restrict root growth and development.

Management

Create conditions that favor the development of healthy root systems and that promote consistent water uptake:

- Keep soil as uniformly moist as possible without waterlogging it. Tomatoes need about two inches of water per week during the heat of the summer in southern Idaho. Windy conditions may increase this requirement. Consequently, irrigate once or twice per week, depending on your soil type. Sandy soils may need twice-a-week watering. Avoid daily and shallow irrigations.
- Promote deep-root growth early in the life of the plant. Till the soil so that compaction layers break up or never develop. Make sure the soil is evenly and deeply moist at the beginning of the season; then only water as often as the young plant needs to encourage healthy vegetative growth.
- Mulching helps to conserve soil moisture. Organic mulches, such as weed-free straw, grass clippings, or wood chips, left on top of the soil, help reduce evaporation from the soil surface.
- Tillage to control weeds should be kept shallow and not too close to the base of the plant.
- Use a fertilizer percentage mix that is low in nitrogen, such as a 5-20-5 or 8-16-8, especially as the plant begins to set fruit.
- If your soil pH is below 6.5, applying ground limestone (soil sweetener) may help.
- For low-calcium potting soils, try adding a handful of ground limestone before planting the tomato transplants. If growing them in pots, make sure the containers are big enough to hold the needed soil water and thus enable better root development.

Avoid using topical treatments. Because calcium does not move through the phloem from the leaves to the fruit, calcium sprays are ineffective.

Be aware of your soils. Application of lime to soils with a pH above 6.5 is unnecessary and ineffective.

If blossom-end rot does develop and the spot is very large, remove and discard the fruit. Fortunately, the condition does not spread from plant to plant or from fruit to fruit. Affected fruits are edible, but they ripen early and are tasteless.

If blossom-end rot is a consistent problem in your garden, experiment with planting different cultivars. Some tomato cultivars are more susceptible than others, like determinate tomatoes (bush-type tomatoes) that produce a lot of fruit at the same time. Generally, the larger the fruit, the more susceptible it is, but that is not always the case. Indeed, even cherry tomatoes can develop this condition. Try different cultivars to see which do best.

Know your tomato disorders. Do not confuse blossom-end rot with early season catfacing (Figure 3), abnormal cracking and dimpling that tends to develop early in the growing season when it is chillier. Some fruits exhibit both catfacing and blossom-end rot, which might make it easier to mistake one for the other.

Figure 3. Mild blossom-end rot and severe catfacing. Neither one makes the fruit inedible.

Further Reading

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