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Extension FactSheet

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Blackleg, Aerial Stem Rot, and Tuber Soft Rot of Potato

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Blackleg, aerial stem rot, and tuber soft rot are all similar diseases caused by several types of soft-rot bacteria. Blackleg and tuber soft rot occur wherever potatoes are grown. Aerial stem rot is also widespread, but is most severe under sprinkler-irrigation.

Symptoms

Blackleg begins from a contaminated seed piece, but the symptoms can occur at several stages of plant development. In severe cases, entire seed pieces and developing sprouts may rot in the ground prior to emergence, resulting in a poor stand. Blackleg often develops after plants are well up or even in flower. In this case, stem bases of diseased plants typically show an inky-black to light-brown decay that originates from the seed piece and can extend up the stem from less than an inch to more than two feet. Leaves of infected plants tend to roll upward at the margins, become yellow, wilt, and often die. Aerial stem rot (also called bacterial stem rot or aerial blackleg) is initiated by soft-rot bacteria from sources external to the seed piece. Stem infection can occur through wounds or through natural openings such as leaf scars. Lesions on diseased stems first appear as irregular brownish to inky-black areas. These enlarge into a soft, mushy rot that causes entire stems to wilt and die. Potato tubers with soft rot have tissues that are very soft and watery, and have a slightly granular consistency. The diseased tissue is cream- to tan-colored, and often has a black border separating diseased from healthy areas. In the early stages, soft-rot decay is generally odorless, but later a foul odor and a stringy or slimy decay usually develops as secondary decay bacteria invade infected tissues. Most internal tuber tissues may be consumed by soft rot organisms, sometimes leaving only a shell of skin remaining in the soil.

Figure 1. Inky black to light-brown stem decay of blackleg originating from the potato seed piece and extending above ground up the stem. Note wilting leaves of infected plant.

Causal Organisms

Blackleg, aerial stem rot, and tuber soft rot are caused by two closely related bacteria, *Erwinia carotovora* subsp. *atroseptica* and *Erwinia carotovora* subsp. *carotovora*. *E. c. carotovora* is very common and has an extensive host range, including most fleshy vegetables. It survives readily in soil and surface waters such as rivers, lakes, and even oceans. These bacteria are capable of multiplying and persisting in the root zones of many host and nonhost crop and weed species. In contrast, *E. c. atroseptica* is associated mostly with potatoes. These bacteria do not survive well in soil for more than one year, unless they are contained within diseased tubers or other potato plant debris. Blackleg is usually caused by *E. c. atroseptica* carried on contaminated seed tubers. Most lots of seed tubers are contaminated to some degree, but the bacteria are usually dormant and do not cause disease unless environmental conditions are favorable. In contrast, aerial stem rot is usually caused by *E. c. carotovora* contained in infested soil or introduced to the crop by irrigation water, wind-blown rain, and insects. Tuber soft rot can be caused by either of these soft-rot bacteria.

Figure 2. Irregular, brownish black, soft, mushy stem lesions characteristic of aerial stem rot.

Moisture and temperature are the two critical factors in initiation and development of soft-rot diseases. High soil temperatures and bruising of seed tubers favor seed-piece decay and pre-emergence blackleg. Blackleg in growing plants is favored by cool, wet soils at planting followed by high temperatures after emergence. Dense plant canopies and long periods of leaf wetness favor infection of aerial plant parts. Although tuber soft rot can occur at any temperature above 50°F, disease develops best above 75°F. Oxygen depletion in tubers also favors soft rot. When seed pieces in soil or tubers in storage become covered with a film of water, the tissues rapidly become depleted of oxygen. This also may be induced by soil flooding or improper drying of washed tubers. Once it starts, tuber soft rot can proceed rapidly in storage. "Wet" areas may develop in the piled tubers that flow onto ones below, spreading the bacteria. Heat, coupled with condensation on tuber surfaces, can further adversely affect storage conditions, resulting in accelerated "melt" of the pile.

Management

1. Plant only certified, disease-free seed tubers. If possible, use whole (B-size) seed tubers that do not have to be cut.
2. When receiving seed tubers in bags, do not stack more than five bags high. With bulk or bagged seed, store at 40–45°F until 2–3 weeks before planting, then warm to 55–60° prior to cutting.
3. Clean all equipment used for cutting seed tubers thoroughly and then sanitize with an appropriate disinfectant. For current recommendations see the Ohio Vegetable Production Guide (OSU Extension Bulletin 672). Clean cutting equipment again periodically and definitely before cutting a new lot of seed tubers.
4. Treat cut seed pieces with recommended fungicide dressings immediately after cutting. See Bulletin 672 for details.
5. Plant treated cut seed pieces immediately if soil temperatures are 55–65°F at planting depth. Seed pieces can be held 1–2 weeks at 55–60°F and 95–99% relative humidity to hasten healing of cut surfaces. Condensation on surfaces of seed pieces must be avoided.
6. Do not irrigate fields until plants are well emerged. Avoid using surface water for irrigation.
7. During crop growth, monitor irrigation and nitrogen fertility to minimize excessive vine growth that will promote leaf wetness within the plant canopy.
8. Harvest tubers only after the vines are completely dead to ensure skin maturity. Low spots in the field should be left unharvested if significant waterlogging has occurred.
9. Take all precautions to minimize cuts and bruises when harvesting and handling tubers.
10. Hold newly harvested potatoes at 55–60°F with 90–95% relative humidity for the first 1–2 weeks to promote wound healing. After this curing period, lower the temperature of table stock to 38–40°F for long-term storage. Never wash tubers prior to storage.

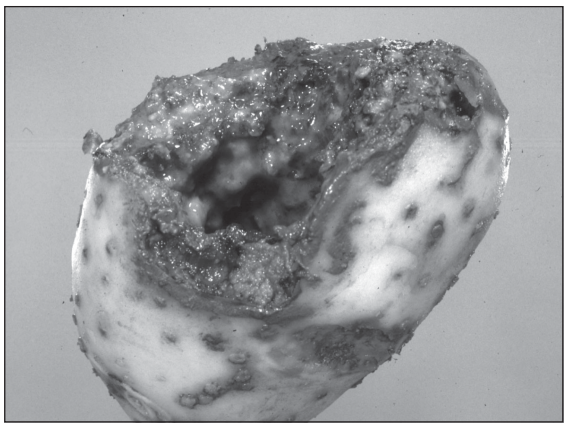

Figure 3. Potato tuber mostly consumed by soft rot bacteria resulting in a soft, watery, cream to tan-colored decay.

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