

Ring Rot of Potato

Clavibacter michiganensis subsp. *sepedonicus*

Host: Potato (*Solanum tuberosum*).

Disease common name: Ring rot.

Pathogen: *Clavibacter michiganensis* subsp. *sepedonicus*; syn.: *Corynebacterium michiganense* pv. *sepedonicum* and *Corynebacterium sepedonicum*.

Disease Cycle

Inoculum: Inoculum comes from infected potato tubers, potato debris, volunteer plants, and contaminated farm equipment, storage bins, and transport trucks.

Transmission: The pathogen is disseminated when seed potatoes contact the above sources of inoculum and during cutting and planting operations. Tubers with latent infections used for seed are a particularly important means for transmitting the disease. When infected or contaminated tubers are planted, the bacterium becomes systemic on developing plant parts and the pathogen then is spread by rain or irrigation water to healthy roots and foliage of adjacent plants.

Infection: Bacteria enter plants through wounds, invade the xylem vessels, multiply profusely, and cause plugging. Bacteria also move from vessels into the surrounding parenchyma tissues that break down, forming cavities. The bacteria may invade the vascular tissue of the entire plant, including the roots, causing them to deteriorate. The bacteria invade stolons and infect progeny tubers, which may or may not show symptoms.

Symptoms and signs: Infected plants usually do not show aboveground symptoms until mid- to late season. Lower leaves first wilt during hot weather and recover at night. As the disease progresses, one or more of the stems in a hill may appear stunted (Fig. 1), the interveinal tissues of leaflets turn yellowish (Fig. 2), and the leaf margins roll upward and become necrotic (Fig. 3). The leaves then begin to wilt, and eventually all the leaves are affected, and the plant dies. Sometimes a creamy exudate oozes from the vascular bundles when a wilted stem is cut at the base and is squeezed. The disease also affects one or more progeny tubers of infected plants. Tuber symptoms first become visible in the vascular tissue at the stem end of the tuber, and with time, symptoms progress deeper into the tuber flesh, resulting in discoloration in the vascular tissues. Tubers exhibit characteristic symptoms both internally and externally (Figs. 4 and 5). Infected tubers, when sliced during early stages of the disease, exhibit a ring of light yellow vascular discoloration from which bacterial ooze can sometimes be squeezed (Fig. 6). As the disease advances, a creamy yellow or light brown crumbly or cheesy rot develops in the region of the vascular ring (Fig. 6).

Survival: The pathogen survives and remains infectious for several years on potato bags, on boxes, in storage sheds, and on surfaces that have been contaminated by bacterial ooze. It survives in water for more than a month and may overwinter in soil, usually in association with unharvested potatoes from the previous crop or infested plant debris.

Disease Management

The disease is effectively managed by use of certified pathogen-free seed, coupled with zero-tolerance regulations for certification of seed crops. Production of certified seed usually includes in vitro tissue culturing and production of minitubers in a protected environment. Most important is use of strict sanitation practices to prevent the introduction of the pathogen. Infected potato debris must be eliminated from potato production units, and all

equipment and storage containers should be cleaned and disinfected with bactericides, such as quaternary ammonium, potentiated iodine, or hypochlorite solutions.

References

- Bradbury, J. F. 1986. Guide to Plant Pathogenic Bacteria. CAB International, Slough, U.K.
- De Boer, S. H. 2008. Managing soft rot and ring rot. Pages 171-181 in: Potato Health Management, 2nd ed. D. A. Johnson, ed. American Phytopathological Society, St. Paul, MN.
- Stevenson, W. R., Loria, R., Franc, G. D., and Weingartner, D. P., eds. 2001. Compendium of Potato Diseases, 2nd ed. American Phytopathological Society, St. Paul, MN.



Figure 1. Stunted plant (right) with withered leaves. (Courtesy M. Schroth)



Figure 2. Leaf with advanced stage of interveinal necrosis. (Courtesy S. Thomson)



Figure 3. Advanced stage of ring rot with upward rolling of leaves and marginal necrosis of lower leaves. (Courtesy APS)



Figure 4. Internal and external tuber symptoms of ring rot. (Courtesy APS)



Figure 5. The dark ring does not always extend completely around the tuber. Tissues are wet and cheesy. (Courtesy S. Thomson)



Figure 6. Advanced decay of a tuber causes a vascular ring of a cheesy rot with exudation when thumb squeezed. (Courtesy APS)