

Potato Ring Rot: The Pathogen, Plant Symptoms and Disease Cycle

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Bacterial ring rot of potato is likely the most feared disease in the potato industry because it is highly contagious and very destructive. Losses occur in the field and in storage. Ring rot is caused by, *Clavibacter michiganensis* subsp. *sepedonicus*, which is a gram positive, non-motile, non-spore-forming, and rod-shaped bacterium.

The ring rot bacterium is highly contagious and enters plants through wounds. The principal and most rapid dissemination occurs during seed cutting and planting operations. Cutting knives become contaminated with the bacteria when an infected tuber is cut and subsequent seed pieces become infected as seed tubers are cut with the contaminated knife. Bacteria from one infected seed tuber can be disseminated to 30 to 100 seed pieces during seed cutting. There is very little spread of the disease from plant to plant in the field. Contaminated equipment during harvest provides another means of bacterial spread as bacterial slime or ooze on equipment and infected tubers come in contact with wounds on tubers. Ring rot bacteria do not spread to additional tubers in storage.

The incubation period, or time from infection until symptom development, may be two to three months. Consequently, infected tubers with no visible evidence of the disease at harvest may develop symptoms in storage. Tubers infected with a low number of bacteria may remain symptomless, as latent infections. Tubers with latent infections can be an inoculum source for disease spread during seed cutting and planting.

The bacterium lives from season to season chiefly in tubers. It can survive for up to five years in the dried slime from bacterial ooze. Survival can occur on many surfaces including truck beds, harvesting and grading equipment, crates, pallet boxes, bins, and sacks.

Symptoms of ring rot on foliage consist of leaf and stem wilting, interveinal chlorosis of leaves, upward rolling of leaves, and necrotic and brittle margins on lower leaves. Ring rot can cause wilting of leaves and stems any time after midseason. Initially, the lower leaves of infected plants wilt during hot periods and recover at night. Leaves become a pale green color and are slightly rolled at the margins. As the disease progresses, a larger proportion of the above-ground plant is affected with more pronounced wilting, interveinal chlorosis, and necrosis of leaves. In advanced stages of the disease, symptoms include pronounced upward rolling of the leaves and necrotic and brittle margins on lower leaves. A milky exudate can be expelled from infected stems by squeezing the stem after it has been cut near the base. A unique feature of ring rot is the appearance of advanced disease in only one or two stems among healthy stems in the same potato hill. Foliar symptoms in some cultivars, including Russet Burbank, may include a dwarf rosette, which is characterized by chlorosis, shortened internodes, and upright leaf growth.

Symptoms of ring rot in tubers consist of a characteristic odorless decay, which is confined at first to the immediate vicinity of the vascular ring. The decay may be seen after slicing the tuber crosswise near the stem end. In the early stages of infection the vascular ring is cream to pale lemon yellow and approaches the color of the normal ring of a healthy tuber, but in later stages the ring is brownish. The affected areas of ring rot-infected potatoes are soft with a cheesy consistency. The bacterial cheesy material can readily be forced out of the affected vascular ring tissue by squeezing the tuber or by gently pressing a blunt stick against the vascular ring at the cut surface of the tuber. In more severely affected tubers the diseased tissue can readily be pushed aside, leaving a narrow cavity or cleft that extends down into the tuber and runs part way or entirely around the vascular ring. Dehydration follows with advanced lesions becoming dry and powdery. These areas may be invaded by soft rot bacteria, which result in soft mushy consistency of the tissue. Vascular cavities may extend to the pith or cortex and result in canker lesions on the tuber surface.