

National Pest Alert

Ralstonia solanacearum race 3 biovar 2

Host Range

Ralstonia solanacearum is a bacterial pathogen that causes several diseases on a wide range of plants. Strains of *R. solanacearum* are differentiated into five races according to host range and five biovars based on biochemical tests. *R. solanacearum* race 1 biovar 1, endemic in the southeastern United States, infects tomatoes and many other vegetable and ornamental species and is not a quarantine pest. *R. solanacearum* race 3 biovar 2 infects certain solanaceous vegetables and ornamental crops, causing brown rot of potato, bacterial wilt of tomato and eggplant, and southern wilt of geranium. A few ornamentals and some common solanaceous weed species, including bittersweet, nightshade, and stinging nettle also are hosts. Tobacco is not a host of race 3 biovar 2.

In 2003, race 3 biovar 2 of *R. solanacearum* was detected in greenhouse geraniums in the United States and Canada that were imported from Kenya and Guatemala. In Europe, after accidental introduction on potatoes used for processing, *R. solanacearum* has persisted in the environment, resulting in significant economic losses to the European potato industry. Race 3 biovar 2 is listed as a select agent by the USDA Agricultural Bioterrorism Protection Act of 2002.

Symptoms

Symptomatic geraniums have upwardly curling leaves, often beginning with the lower leaves and progressing upward. Affected leaves become limp, wilted, and yellowed. Symptoms are very similar to those of bacterial blight, caused by *Xanthomonas campestris* pv. *pelargonii*; however, *Xanthomonas* also causes leaf spots that are not typical of *R. solanacearum*. Vascular discoloration in the lower stem and browning of roots can occur in advanced stages of southern bacterial wilt.

Symptoms of potato brown rot (also known as bacterial wilt) include wilting, stunting, and yellowing of the foliage, and eventually death. Leaves often curl upwards and symptoms may occur at any stage of potato growth. Wilting may be severe in young plants of highly susceptible varieties. Often, one branch in a hill may show wilting. With rapid disease development, all stems in a hill may



Geranium plant infected by R. solanacearum R. 3, B. 2, exhibiting southern wilt symptoms.

wilt quickly. Wilting can occur without much change in leaf color. Infected vascular strands in young potato stems can sometimes be seen as dark narrow streaks visible through the stem epidermis or upon cutting the stem.

On tubers, grayish brown discoloration indicates well-established infection. However, tubers from infected plants may not show symptoms. Cross sections usually show a ring of distinct grayish brown vascular discoloration that may extend into the pith or cortex from the xylem tissue. Grayish white droplets of bacterial slime ooze out of the vascular ring when light pressure is applied to cross sections of infected tubers. Often the eyes at the bud or apical end become grayish brown, and a sticky exudate may form on them or at the stolon connection. The bacterial ooze mixes with the soil, causing soil particles to adhere to the tuber surface. Symptoms in tubers can be confused with bacterial ring rot, *Clavibacter michiganensis* subsp. *sepedonicus*.

Bacterial wilt of eggplant and tomato shows similar disease symptomology for both races of *R. solanacearum*, characterized by severe rapid wilting of leaves and in the field



symptoms may occur first in lower areas where moisture accumulates. Infected tomato plants may be chlorotic or stunted with adventitious roots on the stem. As with symptoms in potatoes, these symptoms can be confused with those of other diseases.

Bacterial wilt-affected plants can have glistening beads of dark gray slimy ooze from the infected xylem in stem cross sections. Bacterial streaming of fine, milky white strands from xylem vessels occurs when stems are cut and placed in water. The streaming is easily visible with the naked eye. Infected plants may be asymptomatic for long periods.

Transmission

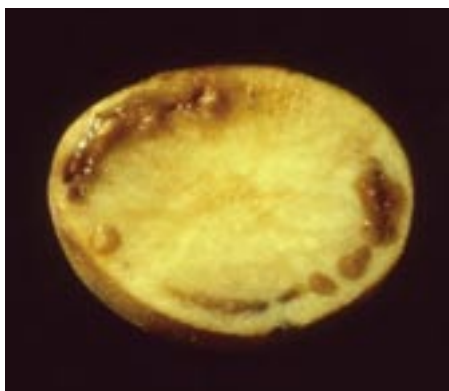
R. solanacearum race 3 biovar 2 is transmitted by contaminated soil, water, equipment, and personnel or by transplantation of infected plants, tubers, or cuttings. Transmission can occur from plant to plant or through contaminated shared irrigation water systems such as ebb and flow. The bacterium is not spread aerially. Bacteria can remain viable in soil for more than a year in the presence of a host. Sound sanitation practices reduce transmission of this pathogen.

In geraniums, transmission occurs primarily from root system to root system through water movement such as in recirculating sub-irrigation systems. Sap transmission when taking cuttings without proper sanitation also can spread the pathogen. Infected geraniums located in hanging baskets may transmit *R. solanacearum* to plants located below through dripping irrigation water. Latently infected plants can shed large numbers of bacteria through their roots, making runoff water an important source of infections.

Infected seed potatoes are an important factor in the distribution of the disease. Transmission of *R. solanacearum* in potato occurs from plant to plant in the soil, usually by water movement. *Ralstonia*-contaminated water used for irrigation can transmit the pathogen to plants. In cool conditions, infected potato plants may harbor the bacterium without exhibiting symptoms and transmit the disease to progeny tubers, resulting in severe outbreaks if grown under warmer conditions.

Management and Diagnosis

In geranium, purchasing clean cuttings is the most effective method of managing *R. solanacearum*. Keep varieties of geraniums separate and well labeled. The use of greenhouse subirrigation systems should be avoided for susceptible hosts. Use sanitary practices,



Potato tuber infected with *R. solanacearum* R. 3, B. 2, exuding bacteria.

including wearing gloves or washing hands between handling of varieties, and use footbaths between houses. Keep areas free of weed hosts. A quaternary ammonium compound or other labeled greenhouse disinfectant should be used on benches and equipment after an outbreak.



Potato field exhibiting symptoms of *R. solanacearum* R.3, B. 2



Potato plant infected by *R. solanacearum* R. 3, B. 2

In potato, clean seed is essential for avoiding *R. solanacearum* race 3 biovar 2.

There is no effective chemical control for *R. solanacearum* on geranium, potato, or other hosts. If *R. solanacearum* is suspected in geranium, potato, tomato, pepper, or eggplant, contact your state's Department of Agriculture or Animal and Plant Health Inspection Service (APHIS) office immediately for further instructions.

For more information on *R. solanacearum*, visit our Web site at:

<http://www.ncipmc.org/ralstonia/>

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