

North Carolina Flower Growers' Bulletin

Volume 48, Number 2
April 2003



Official Publication of the North Carolina Commercial Flower Growers' Association

Ralstonia solanacearum race 3 biovar 2 Update

Colleen Warfield and Brian E. Whipker
North Carolina State University

On February 14, 2003, the USDA-APHIS (Animal Plant Health Inspection Service) confirmed *Ralstonia solanacearum* race 3 biovar 2 on geraniums in four commercial greenhouses in Illinois, Indiana and Wisconsin. Each of these greenhouses received infected cuttings that originated at the Goldsmith Plants, Inc. geranium stock production facilities in Kenya. The infected plants were traced to shipments of rooted geranium cuttings from Glass Corner Greenhouses, Grand Rapids, MI and from Pleasant View Gardens, Loudon, NH rooting facilities. Customers that received rooted cuttings from either of these facilities that were shipped between 11/4/



Initial leaf wilting is a typical symptom of *Ralstonia solanacearum* race 3 biovar 2.

2002 and 2/14/2003 are included on a confidential list of destination nurseries that received a Federal Emergency Action Notification (EAN) on 2/21/2003. If your greenhouse facility did not receive an EAN, APHIS determined that you received cuttings during a time period in which there was no perceived risk, and therefore, your operation is not being regulated by APHIS at this time.

Ralstonia solanacearum is a bacterium with one of the widest host ranges of any bacterial plant pathogen. Strains of this bacterium are pathogenic on several hundred plant species, representing more than 50 plant families. Each of these bacterial strains is quite specific as to what host plants it is capable of infecting. Therefore, *R. solanacearum* is classified into five races based on the host plants it is known to infect, and further divided into biovars, which are based on differences in the ability of the bacterium to metabolize specific sugars when grown in culture. *R. solanacearum* race 1 is endemic in the southern United States, and shows up from time to time causing Southern bacterial wilt on geraniums. *R. solanacearum* race 3 biovar 2, which has been implicated in the present outbreak, is not known to occur in the United States although it is present in many other areas of the world. *R. solanacearum* race 3 biovar 2 is known to

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- ▶ cause a very destructive disease on potatoes in other parts of the world. From a regulatory standpoint, the biggest concern is the introduction and establishment of this specific pathogen in to the United States where it could potentially destroy potato, tomato, eggplant, and possibly tobacco crops. *R. solanacearum* race 3 biovar 2 is on the USDA's Agricultural Bioterrorism Act of 2002 Select Agents and Toxins, which elevated the issue and heightened sensitivities for government agencies, plant supply companies, and greenhouse growers. The incident has been declared an unintentional movement and does not relate to any terrorist activities.

The primary symptom of this disease is wilt and collapse of the leaves, followed by death of the plant. The wilting can be very subtle at first, and plants are likely to "recover" overnight or when temperatures are cool. The bacterium attacks the root system, moves through the vascular system, and eventually causes the characteristic umbrella-like wilt symptom on individual leaves. The lower leaves are often the first to show signs of wilt, followed by chlorosis and finally necrosis (death) of the leaf tissue. In severe cases, the stem turns black and watery at the soil surface and the plant collapses. The leaf symptoms (V-shaped chlorotic lesions and wilt) can easily be confused with those caused by *Xanthomonas campestris* pv. *pelargonii*, the causal agent of bacterial blight. Many other factors (such as *Pythium* root rot) can cause geraniums to wilt, so it is important to determine the exact cause.

Approximately 800 greenhouse facilities nationwide, which included 51 growers in North Carolina, received an Emergency Action Notification in February. Suspect geranium samples collected by state and federal inspectors are being submitted to the NC State University Plant Disease and Insect Clinic (PDIC) for preliminary diagnosis. While the PDIC is approved to test to the species level, the determination of the race and biovar of *R. solanacearum* can only be confirmed by an official APHIS testing laboratory in Maryland. As of March 18, 2003, plants testing positive for *R. solanacearum* (at the species level) have been found in nine greenhouse operations in North Carolina. Confirmation of race and biovar has not yet been reported for all nine operations, but in each of the suspected cases reported to date, race 3 biovar 2 has been confirmed. The first geranium crop confirmed with this pathogen in North Carolina was destroyed on March 10. Presently there are 27 nursery locations, among 13 states, with confirmed cases of this pathogen on geranium.

If growers see wilted geraniums, it is very important that they DO NOT discard any symptomatic plants (but plants

should be bagged and isolated from the rest of the crop to avoid potential spread, taking care to mark the original location of the plant). If your operation is under quarantine, and you are seeing suspicious symptoms, you must contact your designated inspector for further instructions and all actions must be carried out according to the APHIS Action Plan. If you did not receive an Emergency Action Notification and are not under quarantine, you may submit plants with disease symptoms directly to the PDIC for diagnosis.

We as an industry have the responsibility to do everything in our power to control and eradicate this pathogen. This bacterium is capable of surviving in the soil, and should plants be improperly discarded into a compost pile, the potential exists for the bacterium to spread to other host plants, which includes common weeds such as the nightshades, horse nettle, Jimson weed, purslane, and lambsquarter. This bacterium is easily moved by water, and could potentially move into irrigation ponds and streams by run-off from improperly disposed plants.

The APHIS Action Plan for controlling this outbreak of *Ralstonia solanacearum* race 3, biovar 2 was released Friday, February 27. A copy can be found at <http://www.ces.ncsu.edu/depts/ent/clinic/Ralstonia/Ralstonia.htm> along with color photographs of disease symptoms. The purpose of the plan is to eradicate this pathogen from US greenhouses where it has been detected. The plan will be used in conjunction with other agency regulations, guidelines, and manuals. NCDCA, in conjunction with USDA will work together to implement the plan and has assured the North Carolina Flower Growers' Association that their top priority is to ensure the industry functions smoothly while preventing the spread of this serious disease.

The APHIS Action Plan outlines specific options for dealing with this disease. This plan is the authoritative document to follow. Any information provided here is done so for informational purposes only, please refer to the plan and consult with the APHIS PPQ state director for specific regulatory questions or concerns.

If you received an Emergency Action Notice, and are therefore under quarantine, your options according the APHIS action plan include:

1. *Growers may opt to destroy or dispose of the plant material on hold. This is an option for growers who may prefer not to follow those procedures that include waiting for appearance of disease symptoms and subsequent retesting of the plants.*

- 2. In consultation with USDA or NCDA field inspectors, growers can hold plant material for a specific period of time as outlined in the plan. This "Observation Period" is based on the day and night temperatures you are using in the greenhouse. For instance if you have an average of 79F days and 66F night temperatures, your "Observation Period" would be 16 consecutive days. Symptoms are expressed more readily at warmer temperatures and the "Observation Period" will be longer with cooler temperature regimes. If wilting symptoms are observed, the inspector will address the infected plant material and the time and temperature clock are reset. (Note: if the wilted plants are confirmed to have *R. solanacearum* race 3 biovar 2, the entire shipment will be destroyed, and the time/temperature holding period becomes obsolete).

If *Ralstonia solanacearum* race 3, biovar 2 is confirmed in your greenhouse operation, you will receive a 72 hour notice to destroy ALL geranium plants from the shipment that tested positive (regardless of whether the shipment consisted of one or multiple boxes of cuttings). In addition, any other plants in the greenhouse that may have been commingled with geranium plants from the positive shipment (such as plants grown on the ground where water may have run between the pots; or plants growing beneath benches with suspect geraniums), or plants growing within 1 meter of the positive shipment plants will also be destroyed. Baskets, hanging above infected or positive shipment plants, are not considered at risk for infection and typically should not be destroyed even if within 1 meter of

the positive shipment plants. If you have this specific situation in your greenhouse, or other unique situations, consult the APHIS state director for clarification prior to destruction of the crop. Arrangements for disposal should be made through your assigned inspector. DISPOSAL MUST BE DONE IN THE PRESENCE OF THE STATE OR FEDERAL INSPECTOR.

The APHIS Action Plan lists specific protocols to follow in regards to destroying plant material and sanitation of your greenhouse. Exact steps vary by the irrigation system you have and placement of the infected plants. DO NOT THROW WILTED PLANTS IN TO YOUR COMPOST PILE OR ANY MUNICIPAL COLLECTION SITE. Improper disposal of infected plants or improper disinfection of your greenhouse not only places you at risk for re-infesting your own greenhouse, but could also seriously jeopardize agricultural crops in our state.

For additional information regarding the status of facilities, testing results, and regulatory guidance, please contact Debbie Stewart, State Plant Health Director for North Carolina at (919) 716-5990. USDA-APHIS PPQ is assuming oversight for managing this disease in North Carolina.

For more information, please visit the following websites:
www.growertalks.com
www.ppd.l.purdue.edu/ppdl/
www.aphis.usda.gov/ppq



If you have additional questions (or need moral support), feel free to contact Colleen Warfield, Plant Pathology- Ornamental Extension Specialist (919-513-0215), Brian Whipker, Floriculture Extension Specialist (919-515-5374), or Tom Creswell at the NCSU Plant Disease and Insect Clinic (919-515-3619).

Note the "umbrella"-like wilting (back leaf) and that symptoms typically begin at the bottom leaves for *Ralstonia solanacearum* race 3 biovar 2.