A2559

Geranium disorder: Bacterial stem rot and leaf spot

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Bacterial stem rot and leaf spot is perhaps the most important disease affecting geraniums. The disease is likely worldwide in distribution and has destroyed entire commercial crops. In Wisconsin, commercial and home gardeners have lost many plants to bacterial stem rot and leaf spot.

Symptoms and effects

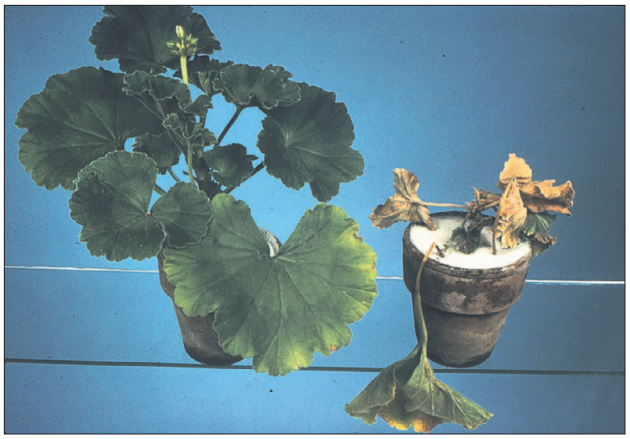
This disease produces three distinct types of symptoms: stem rot and leaf wilt, leaf spot, and general unhealthiness of the plant. The disease-causing organism may also be present in the geranium without the plant showing any noticeable effects—that is, it may be symptomless.

Symptoms are most likely to occur during periods of warm weather and when plants have been on a high-nitrogen fertilizer program and are, therefore, growing luxuriantly.

Stem rot and leaf wilt are the most conspicuous symptoms. On young plants growing vigorously the leaves may wilt suddenly and remain small even though they are still green. This occurs on one or more branches, usually during a warm period. Drooping leaves may remain attached or fall off. Stem rot may never develop, or it may appear later.

Stem rot and leaf wilt symptoms. Note the darkened, shrivelled areas of the stem and wilting leaves.

These seed geraniums are showing many spotted and yellow leaves because of bacterial blight. Such plants usually collapse after a few days.



During periods of warm weather and rapid growth, young geranium plants affected by stem rot may suddenly wilt and die. The plant on the right was inoculated with the bacterium 3 weeks earlier.

Stem rot symptoms, commonly called "black rot," are more likely to develop before wilt in young cuttings, in propagation beds, or in older plants such as garden geraniums during midsummer. Stems develop a rather grassy, green-gray discoloration, then turn darker and collapse. Leaves in the affected stem area then wilt, turn brown and die. Leaves near the top of the affected stem remain small, dark green, and in tuft-like clumps before finally dying.

Leaf spot symptoms may appear alone or with the wilt symptoms. Spots are small at first, generally circular, sunken, water-soaked and about ⅛ to ¼ inch in size. Spots usually enlarge rapidly and the leaf then wilts and collapses. In other instances the leaf may show a yellow to brown spot between the veins which radiates in a pie shape outward from the center of the leaf to the margin. The leaf then collapses and dies. Stem rot symptoms often appear where affected leaves are attached to the stem.

Internal symptoms sometimes help diagnose this disease. The water-conducting vessels in stems and branches of infected geraniums become brown to black 2–4 weeks after infection. At this time usually one or more leaves on a branch wilt. The bacteria soon spread from the water-conducting vessels inward to the pith and outward to the outer stem tissue causing sharply defined brown to black discoloration of the stem. If a stem or branch is cut, a yellow bacterial ooze can often be seen at the ends of the water-conducting tissues. Roots of affected plants turn black, but do not rot.

The disease may progress through the plant quite rapidly, or it may remain as a slow-developing, lingering sickness. Plants do not necessarily die. If they recover, they usually have a stunted, unthrifty appearance. In some instances, plants may contain the disease-causing organism, but show no evidence of it.

Although the disease organism is not present in seeds, they are certainly susceptible. One of the most severe cases of bacterial blight observed in Wisconsin was in a large planting of several seed geranium cultivars. Leaf spot symptoms developed and quickly spread, destroying the crop in a few weeks. A few varieties primarily showed a wilt pattern with considerable leaf yellowing before the plants collapsed.

Several other diseases and disorders can produce one or more of the symptoms associated with bacterial stem rot and leaf spot. Leaves may wilt and collapse from Verticillium wilt, a fungus disease which also invades and plugs the water-conducting vessels, but does not cause extensive stem discoloration. Verticillium is as destructive as bacterial stem rot to individual plants, but does not occur as frequently.

Rust, oedema, and certain viruses can also cause leaf spot of geraniums. Neither rust nor edema are as serious as bacterial stem rot, however, and can be distinguished from it in the field by careful examination.

The crinkle virus disease produces some symptoms that are similar to bacterial stem rot. Since both diseases are carried from one generation to the next, discard suspect plants regardless of specific cause of disorder.

Bacterial stem rot in the propagating bed is often confused with Pythium blackleg. Blackleg-affected cuttings usually die more rapidly and are darker in color with a rather moist appearance. Pythium is carried in the soil, rather than through plants.

Certain physiological conditions such as excess heat and sudden drouth during a period of rapid growth can cause extensive wilting and browning of geranium leaves. Other environmental factors such as low fertility, excessive fertility, inadequate sunlight and low temperatures should also be eliminated as possible causes of the observed symptoms.

If a positive diagnosis is necessary, collect stem and leaf samples from diseased plants and submit them to the county Extension office.

Cause

The causal bacteria, *Xanthomonas pelargonii,* can spread throughout the entire plant including the roots. The bacterium can survive for a few months in infested soil, and probably on work benches. It spreads easily by splashing rain or irrigation water during warm periods and can cause an epidemic on greenhouse benches as well as out-of-doors. White flies spread the disease occasionally. The bacterium is also readily spread by contaminated knives and other tools.

Control

Commercial production

Commercial production of healthy geraniums depends upon two primary factors for success:

1. The use of cuttings known to be free of the bacteria.
2. Production of plants in a clean house free of any source of bacteria.

Lots of details are involved in succeeding with these factors, however! There is no cure for this

disease. Thus, prevention is the key to successful production of healthy plants. The following cultural practices should help to limit the chance of disease introduction to your greenhouse:

1. Obtain cuttings only from a reliable source, preferably a specialty grower whose propagating stock is routinely indexed by laboratory procedures to assure that it is free of the bacterium and other pathogens.
2. Do not "carryover" stock from one season to another.
3. If you are maintaining stock plants (which are recently derived from cultured cuttings) take extra precautions to keep them clean, e.g., limit visitors, intensify sanitation measures, etc.
4. Take cuttings by breaking if possible. If knives are used, sterilize with LF-10, alcohol, flaming, or some other satisfactory way.
5. Take cuttings off dry plants only, and do not dip them. If using rooting hormones and fungicides, dust the cuttings. The bacteria will survive the chemicals in the water and move into clean plants very easily.
6. Use sterile soil or media and clean containers.
7. Sterilize working areas and benches with LF-10 or similar sterilant. Keep benches physically clean.
8. Keep hands clean!
9. Check plants routinely. Discard suspicious-looking plants quickly, before the disease can spread.
10. Keep work area and greenhouse clean and free of old plant debris, old containers, etc.
11. Keep insects under strict control.
12. Control Botrytis and other less serious diseases so that they will not cause troubles and, perhaps, hide more serious bacterial disease symptoms.
13. Use clean irrigation water, and keep the foliage as dry as practical. This is especially important if any symptoms have appeared!
14. Provide as much spacing and aeration as you can.
15. Return to cultured cuttings frequently.
16. Do not assume seed geraniums are always healthy. Use the same precautions with them.

Hobbyist production

Home horticulturists depend primarily upon the purchase of healthy, disease-free plants as their means of controlling this disease. Hobbyists who produce their own plants can follow the guidelines offered above. Once the disease is encountered, it is best to discard materials, clean the area thoroughly, sterilize the soil and benches, and start with clean stock.

Fortunately, the pathogen does not easily survive outside. If the gardener obtains healthy, disease-free plants to begin with and does not contaminate them from some other source, the crop should thrive and produce beautifully without concern of bacterial blight.

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