Bacterial Diseases Of Ornamentals

Bacteria are microscopic, single-celled organisms that have a cell wall.

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Their genetic material, a circular strand of DNA, floats inside the cell and is not surrounded by a nuclear membrane. Therefore, bacteria do not have a true nucleus as do plants, animals, and fungi. Bacteria have other small gene-carrying entities within them called plasmids. Some of the characteristics exhibited by bacteria, such as resistance to streptomycin, copper, and other antibiotics, are controlled by the plasmid genes. While most bacteria in the environment are beneficial, several are able to cause leaf spots, stem rots, root rots, galls wilts, blights, and cankers.

Plant pathogenic bacteria generally survive in infected plants, in debris from infected plants, and in a few cases, in infested soil. Most require a wound or natural opening in the plant to gain entry and require warm, moist conditions in order to cause disease. Bacteria grow between plant cells on the nutrients that leak into that space or within the vascular tissue of the plant. Depending on the species of bacteria involved and the tissue infected, they release enzymes that degrade cell walls, toxins that damage cell membranes, growth regulators that disrupt normal plant growth, and complex sugars that plug water conducting vessels. In most bacterial diseases, photosynthesis and respiration are severely altered to the detriment of the plant.

Bacteria reproduce very rapidly. They are splashed easily from the soil to the leaves and from leaf to

leaf by overhead irrigation. They are also easily moved from soil or debris when a worker handles such material and then handles the live plant. The most important means of avoiding ornamental crop losses caused by bacteria is to purchase plants that have been shown to be free of such pathogens by the process of culture indexing. In this procedure, pieces of plant tissue are incubated in a nutrient broth which will encourage the growth of plant pathogenic bacteria. If the test is repeated two to three times and no pathogenic bacteria are detected, the plant is said to have been indexed and free of bacterial pathogens. Plants are usually indexed at the same time for fungi that grow within the vascular tissue of the plant. In different procedures, elite propagators also index plants for viruses. Plants found to be free of the organisms for which they are tested are said to be culture/virus indexed.

The strict sanitation practices required to control bacterial diseases include the destruction of infected plants as well as cleaning and disinfesting, tools, benches, flats, and pots that are used repeatedly. Soil used in potting should be treated to kill all pathogens. Soil in which infected plants were grown or rooted should be discarded or thoroughly treated. Workers should be trained to not handle soil or debris and then the living plant tissue unless they stop work immediately and wash their hands. Do plant handling procedures and debris/soil handling operations completely separately.

The most important cultural practice used against bacteria is irrigating in a manner that keeps foliage surfaces dry and which avoids splashing. Overhead irrigation should not be used in crops particularly susceptible to bacterial diseases. When overhead watering is employed, watering should be done early in the day so that free moisture evaporates quickly. Provide good air circulation within the crop canopy. It is best to force air under benches and up through the canopy. Horizontal air flow, with rows of plants oriented parallel to the air movement, can greatly reduce relative humidity within the canopy. Various types of trickle irrigation and capillary mat watering are techniques that avoid providing the conditions required for bacterial spread and infection. Some bacteria have been shown to spread in ebb and flow systems. Steps should be taken to filter crop debris out of the water and chemically treat the water.

Once disease begins on the plants, chemical control is not effective. Although research reports may indicate 80 to 90% control with chemicals under experimental conditions, often less than 50% control is achieved under commercial conditions with chemicals.

Erwinia chrysanthemi and *Erwinia carotovora* survive in plant debris that is not completely decomposed, on or in infected plants, on other greenhouse plants without causing disease, and under some conditions, in soil. Both species infect a wide range of plants in the greenhouse. *E. chrysanthemi* has been shown to survive on plants that it does not actually infect. They can cause a mushy, brown, smelly, soft rot or leaf spots.

Pseudomonas cichorii can cause leaf spots and blights on chrysanthemum, geranium, impatiens, and

many other ornamental plants. The spots are generally water-soaked (wet-looking) and dark brown to black. Depending upon the plant infected, the leaf spots may have a yellow halo.

Xanthomonas is another genus of bacteria containing important plant pathogenic species. *Xanthomonas campestris* pv. pelargoni causes bacterial blight or wilt of geranium. Other species of *Xanthomonas* attack Dieffenbachia, Philodendron, Syngonium, Aglaonema, and other foliage plants.

Rhodococcus fascians (formerly Corynebacterium) causes abnormal branching and stem development near the base of infected plants such as geranium. The bacterium is carried on infected cuttings and may enter the propagation medium.

Ralstonia solanacearum (formerly Pseudomonas) causes vascular wilting of many herbaceous ornamentals, including geraniums. Gross symptoms in geraniums mimic those of bacterial blight caused by *Xanthomonas campestris* pv. pelargoni. Unlike most other bacteria, *Ralstonia solanacearum* survives well in the soil. Once a greenhouse is contaminated with this organism, it is difficult to eliminate and poses a threat to many different crops. Symptoms include leaf wilting, discoloration of the vascular tissue, leaf yellowing and death of the plant.

Management

1. Purchase culture-indexed plants known to be free of the most important bacterial pathogens.
2. Discard infected plants.
3. Do not use overhead irrigation.
4. Pasteurize the propagation bed and medium between crops.
5. Do not handle soil or debris on the potting soil surface and then the plant.

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