e-GRO Alert

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Bacterial Soft Rot causing death of succulents

Bacterial soft rot occurs sporadically in ornamental production, but when it does, it can be very damaging and cause significant crop loss. It is also difficult to control.

Succulents have year-round popularity, and many greenhouses have increased production due to demand for individual plants and decorative combination containers. Often when plants brown, collapse and die, the root and crown rot pathogens of *Phytophthora*, *Pythium* or *Rhizoctonia* are usually suspected. However, during a recent greenhouse visit, Zebra Haworthia (*Haworthiopsis attenuata*) was collapsing and dying not from the usual suspects, but by bacterial soft rot.

Fig 1: Succulent combination containers and Zebra Haworthia plants showing dieback. (Image by J. Williams-Woodward)

Bacterial soft rot is most often caused by the bacterium, *Pectobacterium carotovorum subsp. carotovorum* (formerly known as *Erwinia carotovora*). Other bacterial species causing soft rot include *Pectobacterium atrosepticum* and *Dickeya chrysanthemi* (formerly *E. chrysanthemi*). Bacterial soft rot disease is not common within greenhouses and nurseries; however, it is seen sporadically and can cause soft rots of crowns, corms, rhizomes or stems on numerous ornamental plants including cyclamen, hosta, osteospermum, and poinsettia.

Although bacterial soft rot disease is not common, *Pectobacterium* may be present and surviving as an epiphyte on plant surfaces, without causing disease, throughout a crop cycle. Soft rot bacteria are often associated with plants, previous crop plant debris, water, rooting media, and soil. *Pectobacterium* has been recovered from irrigation water making it a concern for operations that use recirculated water for irrigation.

The soft rot bacteria are opportunistic pathogens and require wounded or stressed tissues, as well as favorable environmental conditions, to infect and cause disease. Stress and wounding may be due to environmental (heat, freeze, drought) stresses or propagation and production activities (cutting, dividing, or pinching, etc.). *Pectobacterium* can survive in anaerobic conditions, and often exposing plants to anaerobic conditions by either planting plants too deeply or from flooding will increase bacterial soft rot disease development.

Initially, bacterial soft rot symptoms can be confused with other fungal root pathogens; however, infected tissues soften and rapidly collapse (Figures 2, 3, 5 and 6). The main diagnostic feature of bacterial soft rot is the smell. Taking a whiff of suspected *Pectobacterium* bacterial soft rot-infected tissues is memorable. It smells terrible similar to a dead fish.

In this case of the bacterial soft rot on the succulents, the disease became a problem because the greenhouse floor flooded under the Haworthia creating an anaerobic condition, as well as spread the bacterium among the surrounding plants. It is one of the reasons why the problem was so widespread throughout the crop (Figure 4).

Figure 2: Plant collapse, softening of succulent leaves, and death of Zebra Haworthia infected with bacterial soft rot. (Image by J. Williams-Woodward)

Figure 3: Softening, slimy crown of Zebra Haworthia infected with the bacterial soft rot pathogen, *Pectobacterium carotovorum subsp. carotovorum*. The foul smell of the rotting tissue is characteristic of bacterial soft rot infection. (Image by J. Williams-Woodward)

Figure 4: Widespread infection and death of Zebra Haworthia from bacterial soft rot was most likely a result of anaerobic conditions that developed from an accidental flooded greenhouse floor. (Image by J. Williams-Woodward)

Figure 5: Early bacterial soft rot symptoms of discolored leaves and wilting can resemble symptoms caused by fungal root pathogens. Plant quickly collapse as the tissues soften due to bacterial infection. (Image by J. Williams-Woodward)

Figure 6: Curled, discolored, softening leaves of Zebra Haworthia are easily removed from the crown due to bacterial soft rot infection. Dieback can resemble other root/crown diseases, but the foul smell of bacterial soft rot sets it apart. (Image by J. Williams-Woodward)

There is no control for bacterial soft rot once plants symptoms are seen. The flats or strips containing infected plants should be removed and discarded. Even symptomless plants are likely carrying the bacterium and can spread it to other parts of the greenhouse.

Bacterial soft rot disease management revolves around sanitation. The bacterium can survive for months within soil and plant debris on surfaces. Prompt disposal of infected plants and cleaning the area will reduce the risk of spreading the bacterium to surrounding and subsequent crops. Chemical control is marginally effective. Fungicides/bactericides containing QST 713 strain of *Bacillus subtilis,* copper sulfate pentahydrate, or the quaternary ammonium product, Didecyldimethylammonium chloride (DDAC), can reduce bacterial soft rot infection. In my own research studying bacterial soft rot on Hosta, I found that spraying plants with hydrogen peroxide-containing products actually increased bacterial soft rot disease development. I suspect that the products caused damage to plant epidermal cells and provided entry points for the bacterium. Hydrogen peroxide products were very effective in reducing *Pectobacterium* populations on surfaces.

**The mention of specific active ingredients does not constitute an endorsement or recommendation of, or discrimination against similar products not mentioned. ALWAYS READ PRODUCT LABELS AND USE THEM AS DIRECTED ON THE LABEL.

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