

Diagnosing and Managing Soilborne Pathogens of Strawberries and Raspberries

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Understanding the root diseases of brambles and strawberry

Root diseases are particularly devastating and frustrating to identify and manage in small fruit production operations for several reasons. The first reason for frustrations is that the most effective management practices must be implemented prior to planting offering growers with established plantings few options. The second the most diagnostic symptoms are also often caused by abiotic stresses and occur below ground, which prevents one from recognizing the problem during time when action could be taken to save the planting. Once, the decline was progressed too far, it will become impossible to cure. Finally, pathogens causing root diseases are all soilborne and remain protected within the soil.

In NY, the most common root diseases and disorders affect both raspberry and strawberry. Identifying the characteristics of these problems will help one understand their occurrence and prevent seasonal plant decline. These root diseases and disorders include:

1. Winter Injury (raspberry & strawberry): Decline from winter injury occurs when plants aren't well insulated against freezing during winter or when young tissue isn't protected against frost in the spring. Plants stressed by disease or abiotic factors prior to dormancy will be more susceptible to winter injury. Winter injury can result in reduced vigor and productivity, or kill plants outright. Winter injury to the roots can be diagnosed by cutting longitudinally through the crown of dying (not dead) plants. Initially, the cortex of roots and crown tissue will appear brown while the vascular tissue remains white and healthy. By contrast, most root diseases will preferentially affect the vascular tissue, and decay in the cortex occurs by opportunistic decay fungi. Cold injury can even occur to planting material that gets too cold or are poorly insulated when stored. It's always a good idea to order extra plants to cut a few in each bundle assess the potential for any winter injury. In raspberries, winter injured plants will lose floricanes first, but new primocanes will emerge and remain healthy through the season. By comparison, a root disease will cause decline of canes throughout the season.
2. *Phytophthora* root rots (raspberry & strawberry-red stele): *Phytophthora* is an aquatic pathogen that prefers cool weather and free moisture (e.g. wet spots in the field). During *Phytophthora* infections, fine/lateral roots will decay first leaving only large primary roots, resulting in a reduced mass of fine roots, which has a rattail appearance in strawberries. When the roots and crown are sectioned longitudinally, the vascular tissues will be reddish brown. As infection progresses and the plant dies, opportunistic decay fungi will rot the cortex of roots and the crown, which will confuse diagnosis. Even after the plants die, infective propagules will remain in dead plant tissue and the soil. These are capable of causing

infections in later seasons after replanting. In both strawberries and raspberries there are varieties with differing levels of susceptibility to *Phytophthora* root rot.

3. *Verticillium* wilt (raspberry & strawberry): *Verticillium* wilt has the most distinctive symptoms of the root diseases presented here, and is easiest to arrive at a tentative visual diagnosis. In strawberries, plants wilt and decline more slowly than other root diseases. The outer and older leaves wilt first, while the younger leaves remain small and stunted in the center. One will often find bluish streak-shaped lesions on the runners and petioles. In raspberry, the youngest canes will wilt first beginning from the base to the tip. On such canes, the petioles will remain attached with the oldest leaves at the base looking scorched and youngest leaves at the tip looking stunted, but often still green. Similar to strawberries, infected raspberry canes will also have bluish streak-shaped lesions within infected canes. In both strawberries and raspberries there are resistant varieties to *Verticillium* wilt.
4. Black root rot (strawberry): Black root rot of strawberry is a root disease caused by a complex of several pathogens. One of the pathogens, *Pythium*, is another aquatic organism similar to *Phytophthora*. Because of the similarities, the management practices for *Phytophthora* root rot are often effective for managing black root rot as well. Decline from black root rot usually occurs during the year of establishment, and like *Phytophthora* root rot, this disease primarily occurs in wet spots or in compacted soils with poor drainage. By harvest, infected plants will have decreased vigor, are stunted, and lack productivity. However, severely infected plants may be killed prior to harvest. Below the soil, the lateral/feeder roots will have decayed (similar to *Phytophthora* root rot), and the large primary roots will have dark lesions that expand overtime. Initially, the vascular tissue of infected roots appears white and healthy, but ultimately turns black as infection progresses. It is important not to confuse the black root rot with the natural blackening of strawberry roots that occurs with age. Older roots will have a black epidermal covering, but the cortex and vascular tissue will be firm and white instead of having dark lesions.

Preparing for root diseases and decline in 2018

Given wet 2017 seasons in certain areas of the state, there could be considerable root disease inoculum present in small fruit plantings in 2018. There may also be infections from the 2017 season that may not become apparent until 2018. In plantings with severe plant decline in low-lying wet areas, a phosphorous fungicide program may be warranted to prevent additional loss to *Phytophthora* or black root rot. Such an application may also save plants that could have become infected in the fall, but appeared healthy by dormancy. In addition to diseases, winter injury could be more severe in 2018. Plants with high levels of disease (even foliar diseases like leaf spot) at harvest may be stressed or weakened as they enter dormancy and would be more susceptible to winter injury. In order to avoid plant decline in 2018, producers would be best served by ensuring plant insulation during winter and scouting during spring and early summer for the first signs of plant decline (e.g. wilting). If recognized early, the extent of losses could be mitigated.

Literature

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