IPM Fact Sheet Series

UMass Extension Fruit Team
Fact Sheet #SD-002

Strawberry - Black Root Rot (Disease complex including the fungi *Rhizoctonia* spp., *Pythium* spp., and *Fusarium* spp., and the lesion nematode *Pratylenchus penetrans*)

ID/Disease Cycle: Above-ground symptoms of Black Root Rot (BRR) include a general lack of vigor, stunted growth, reduced yield, and eventual collapse of plants especially during hot or dry weather. Root symptoms consist of blackened feeder roots and, eventually, structural and perennial roots. Feeder roots may be completely absent or may lack a cortex, producing a 'rat tail' look. Structural roots will rot from the outside to the center, leaving the core white for a period of time, unlike red stele where the core is usually red.

Black root rot has no simple causes or remedies. It is caused by a disease complex involving several pathogens and is exacerbated by plant stress. Key pathogens include *Rhizoctonia* spp., *Pythium* spp., *Fusarium* spp., and often the lesion nematode *Pratylenchus penetrans*. Other fungal pathogens may also be involved, but these are much less common. Cases of BRR typically involve two or more pathogens. Small populations of the above named pathogens are commonly found in soils but normally do not cause disease symptoms on healthy plants. Strawberry plants may be stressed in a number of ways including drought, excess soil water, winter injury, root feeding insects or nematodes, poor nutrition, soil compaction, low organic matter or improper herbicide use. The presence of susceptible host plants allows the pathogens to proliferate. Pathogens may overwinter on plant debris or in field soil and can persist for several years after the field has been plowed down.

BRR is often associated with the build-up of pathogens in 2- to 3-year old fields or fields where strawberries are grown in succession without rotation to another crop. It can also occur in new fields when small amounts of BRR pathogens are brought in on the roots of nursery plant material. If the soil in the new field is dense and compacted, or poor in organic matter and therefore low in microbial activity, even small amounts of BRR fungi on the roots of field grown nursery plants can proliferate quickly and weaken new plants. This is not the fault of the nursery but occurs because few, if any, beneficial microbes are present in a compacted or low organic matter soil to keep the pathogens in check and the BRR pathogens are common in any soil in small amounts. This can also happen after soil fumigation and is sometimes called 'the boomerang effect'.

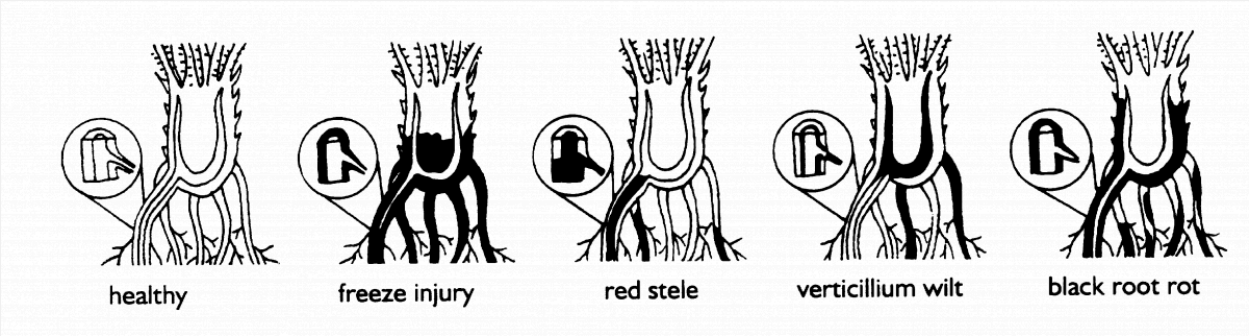

Figure 1) Black Root Rot symptoms on strawberry roots. [**Photo**: Ontario IPM]

Damage: Plants may be weakened by poor root function or may collapse completely. The impact ranges from a reduction of yield in affected areas to the premature death of an entire planting.

Management:
Monitoring: Consult scouting records from previous years to determine if build-up of this disease is likely. Scout fields after bloom to identify areas of weak vigor. Dig up live, symptomatic plants (dead plants are not useful for diagnostics), in weak areas and examine the roots for dieback and discoloration. Sample multiple plants from multiple areas of the field to assess the root damage and potential cause. Plant material can also be sent to a diagnostic lab to make a conclusive determination. The UMass Diagnostic Lab sample submission instructions can be found at: http://ag.umass.edu/services/plant-diagnostics-laboratory/tree-fruit-small-fruit-diagnostics.

Control strategies:
Cultural/Biological:

- Perform a nematode test prior to planting and control nematodes or avoid planting in fields with high nematode populations.
- Plant only disease-free transplants obtained from a reputable nursery.
- Avoid planting highly susceptible cultivars (e.g., 'Honeoye' or 'Jewel'), when possible and when BRR is anticipated. Some cultivars are more tolerant of BRR than others, but no truly resistant cultivars are currently available.
- Avoid planting strawberries in compacted soils or in heavy, wet soils. Improve drainage prior to planting in marginal soils by installing drainage tiles or constructing raised beds.
- Root dips with biological fungicides (e.g., containing protective microbes such as *Trichoderma* spp., *Gliocladium* spp., *Bacillus amyloliquefaciens* or *Reynoutria sachalinensis*) can be beneficial.
- Rotate strawberry fields to alternative cash or cover crops for 3-6 years before replanting to strawberries to disrupt disease build-up. Rotation crops should be non-hosts to lesion nematodes and the BRR pathogens (e.g. corn, millet, pumpkin) or bio-fumigant crops (e.g., certain cruciferous crops like mustard species like *Sinapis alba* and *Brassica juncea*).
- Legumes can be used in the rotation but should be planted in the first year only.
- Minimize soil compaction, increase tilth, and improve soil microbial activity by incorporating organic matter such as straw prior to planting.
- Chisel or subsoil 18 to 20 inches deep between rows in late fall to increase drainage.
- Be sure to keep the field irrigated during periods of active growth to avoid stress on the plants.
- Maintain good plant health with proper fertilization.

- Maintain good winter mulch cover to protect plants from winter injury.
- Control insect pests and weeds.

Chemical:

- See New England Small Fruit Management Guide for currently recommended spray, root dip and/or fumigation materials for Black Root Rot.
- Preventative treatments for high risk situations (pre-plant root dips and soil treatments) will be yield better results than foliar or soil applied sprays or 'rescue treatments', which may be most useful when Black Root Rot symptoms are sparse in the field. Avoiding high risk situations is, by far, the most effective approach.

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