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IPM Fact Sheet Series

UMass Extension Fruit Team

Fact Sheet #SD-004

## Strawberry - Red Stele (Phytophthora fragariae)

**ID/Disease Cycle**: Symptoms of Red Stele infection are variable and include wilting and/or stunting, young leaves with a bluish-green tint, and older leaves turning red, orange, or yellow. Plants with mild infections may show no symptoms, while severely diseased plants may die or remain stunted, producing few runners and little fruit. When roots are cut open lengthwise, the core (stele) will show a reddish-brown discoloration; however, a reddish core does not guarantee that red stele is present. Plants showing symptoms usually occur in patches or swaths in the field where the soil is wettest.

Red Stele is caused by the soil-borne oomycete *Phytophthora fragariae*. It may be introduced by the movement of soil on equipment, runoff water from infested fields, or on nursery stock. *P. fragariae* affects only strawberries, raspberries, and a handful of other plants- it should not be confused with those species of *Phytophthora* that infect vegetables (*P. capsici* and *P. infestans*).

The pathogen is very persistent and can survive in a field for many years once it has become established, even if no strawberries are grown during that time. It persists in soil as thick-walled resting spores called oospores. In early spring when the soil is chilly (40-50°F) and wet, oospores germinate and produce structures that release zoospores. Zoospores are motile spores that swim through water in the soil and are chemically attracted to strawberry root tips. Once zoospores have infected the root tip, the pathogen begins to grow up into other parts of the root, causing the characteristic dark rot and red stele symptoms. The pathogen produces new oospores within infected roots as they begin to rot and die, and these oospores are released into the soil when the roots decay, thus completing the disease cycle.



verticillium wilt

black root rot

**Damage**: This pathogen causes root rot. Depending on the extent of the infection and the plant's resistance, stunting or wilting and collapse of the plant will result. Compromised plants may produce little or no fruit.

## Management:

**Monitoring:** Consult scouting records from previous years to determine if build-up of this disease is indicated. Scout fields after bloom to identify areas of weak vigor. Dig up live plants (dead plants are not useful for diagnostics) and examine the roots. Examine roots from multiple plants and from multiple areas of the field to determine if the characteristic



'red core' symptom is found. 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: <u>http://ag.umass.edu/services/plant-diagnostics-laboratory/tree-fruit-small-fruit-diagnostics</u>.

*Control strategies: Cultural/Biological:* 



**Figure 1)** Red stele (core) of infected roots. [**Photo**: <u>Ontario Crop IPM</u>]

• Avoid planting in heavy, wet soils and improve drainage in marginal soils by installing drainage tile before planting or planting on 10" raised beds to get the majority of roots out of the wettest zone of the soil.

• Rotate strawberry fields to alternative cash or cover crops for at least 8 years before replanting to strawberries to disrupt disease build-up.

• Plant resistant varieties in high risk fields. See the <u>New England Small Fruit Management</u> <u>Guide</u> for a chart of resistant varieties or speak to your nursery about resistant varieties. Note that Red Stele resistance is often for a certain race of the pathogen and may not always protect plants from infection by a different race.

- Plant only disease free transplants obtained from a reputable nursery.
- Take care not to transfer soil on farm implements, tools, or shoes from an infested field into a clean one.

Chemical:

- See <u>New England Small Fruit Management Guide</u> for currently recommended spray materials for Red Stele.
- Apply recommended fungicides in spring and/or fall in combination with recommended cultural practices.
- Rotate fungicide materials from different FRAC groups to avoid promoting the development of resistant strains of this disease.

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