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How to Recognize and Control Strawberry Red Stele Root Rot
Michigan State University Cooperative Extension Service

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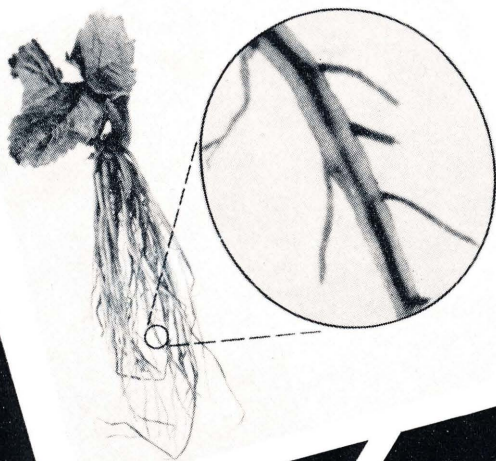
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**How to recognize
and control**

Strawberry Red Stele Root Rot



**Michigan State University
Cooperative Extension Service
East Lansing**

Strawberry Red Stele Root Rot

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Red stele root rot is the most serious fungous disease of Michigan strawberries. Red stele results in reduced growth and few runners. Near harvest-time of the first or second fruiting year, the diseased plants wilt and die; thus, you can lose part or all of your strawberry crop. Worse, the fungus becomes established in the soil, making further planting of susceptible varieties useless.

How to Recognize Red Stele

On Leaves

Just before harvest-time in late spring, certain areas of your planting may look like they are suffering from drought. The older, outer leaves turn brown and die, while the younger leaves are small and short-stemmed. The plants are obviously stunted compared to normal ones. Often, the young, small leaves are metallic blue in color.

On Roots

You can easily tell red stele from any other strawberry trouble if you dig up a suspected plant and look at the roots. Usually, most of the small, secondary feeding rootlets have rotted away (Fig. 1); only the main fleshy roots and a few old, brown "woody" roots remain. These remaining roots, bare of rootlets, are often called "rattails."

The fleshy "rattail" roots may show progressive stages of browning, beginning at the tips. Split open these roots with your knife or thumb-nail; IF the core or center (botanical term: *stele*) is colored red, then the plant is definitely infected with red stele (Fig. 2).

However, this root symptom shows up ONLY from late spring through harvest.

Life Habits of Red Stele

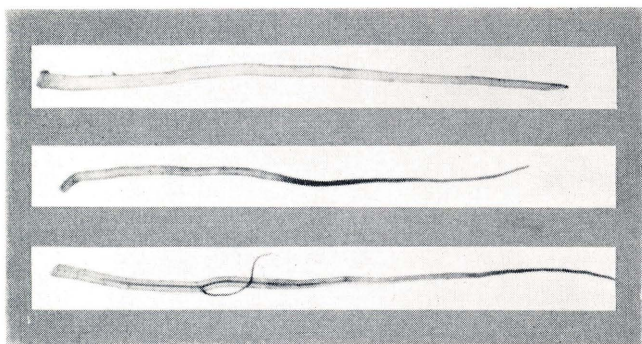
The red stele organism is a water-loving, soil-inhabiting fungus. Low temperature and high moisture cause its activity and spread in your planting. That is why red stele usually appears first in low, heavy, poorly drained soil.

In these surroundings, the fungus becomes active and discharges short-lived spores (zoospores) from previously infected roots. These spores or fungus "seeds" spread from plant to plant through the soil water, infecting the young, fleshy roots and destroying their water- and



USDA photo

Fig. 1. Compare the healthy strawberry plant on the left with the red stele infected plant on the right. Notice the absence of secondary rootlets on the infected plant.



USDA photo

Fig. 2. Top: healthy root; center: infected root showing browning of tip; bottom: infected root split open to show the typical red stele or core symptom.

food-conducting tissues. This stops the flow of nutrients to the developing leaves and fruit; it causes the droughtlike appearance of the affected plant and, eventually, its death.

As the season progresses and soil temperature rises, the fungus forms thick-walled resting spores in the infected root steles (cores). This way, the organism can live during periods of high temperatures.

During this post-harvest period, you may think that the disease is gone. The typical red stele root symptoms disappear because of the complete deterioration of the previously infected roots; the plant seems to recover because new, healthy roots start to grow.

However, this condition is only temporary; as soon as cool, wet soil conditions return, the disease will strike these new roots. That is why crop losses are worse during the second fruiting season.

Conditions Favoring Disease

Since the red stele fungus is a member of the "water mold" family, its activity depends on moisture and low soil temperatures. Watch for these conditions in your planting. In dry years, the disease will spread very little beyond the initial site; in wet years, it may go rapidly through the entire planting. Its course often follows flooded areas or the path of drainage water.

Survival of the Fungus

Microscopic examinations of infected root tissue show that great numbers of the thick-walled resting spores are present. These carry the fungus through extremes of weather and soil conditions. In Michigan, the fungus has lived in certain heavy soils for 12 years, even when crops other than strawberries have been grown there. However, the fungus is *not* known to attack any crop other than strawberries.

Spread

Many tales are told about the spread of red stele through a strawberry-growing area. To date, however, there are only three proven ways by which this disease is spread.

The first and most important is through the illegal sale or use of infected planting stock. The second way is by surface or drainage water flowing from an infected field to another strawberry planting. The final and not too common cause of spread is infected soil particles carried from one field to another on transplanting machinery.

Until recent changes were made in the Michigan Department of Agriculture regulations, red stele was also spread by the nursery propagation of resistant strawberry varieties on contaminated soil. Since the typical disease symptoms were absent on these varieties, they were certified. However, tests showed these varieties could carry the disease, so now it is illegal to sell any resistant variety grown in Michigan on land known to be infected.

Control

The old axiom, "An ounce of prevention is worth a pound of cure," is certainly true for this disease. Since the fungus is deadly to strawberries and can survive for long periods in the soil, *preventing* its start in your planting is the best control method.

By following these A, B, C's, you can keep your planting free of red stele root rot.

A. Select a planting site that has good soil drainage, preferably located where water from adjoining land will not drain through it.



Fig. 3. In the row of strawberries at the left, a susceptible variety shows the stunting and droughtlike conditions caused by red stele infection. The row at the right shows a resistant variety growing vigorously on infected soil.

B. Start your planting with certified, state-inspected stock **ONLY**. *Avoid* the illegal, free neighborhood exchange of uninspected plants.

C. If possible, use your own machinery for setting out the field and carrying out general cultural practices. If you borrow machinery, be sure to clean off the soil and plant debris thoroughly before using it.

D. If your land is free of red stele and you want to try out some of the resistant strawberry varieties, then get Michigan state-certified stock **ONLY**. To date, Michigan is the only state that requires nursery stock of resistant varieties to be grown on soil free of the red stele fungus.

If red stele *is* present in your planting, you can do nothing to control it at the present time. Crop rotation, soil fumigation, or dipping plants in various chemicals won't help.

If your land is infected with red stele, the only control method now known is to use resistant varieties. These varieties will grow well on infected land where susceptible varieties are a total loss (Fig. 3).

Your choice of resistant varieties will depend on conditions in your area. For this information, contact your county agricultural agent.

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