

Strawberry Root Problems
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Strawberry root problems such as disease or insect feeding damage can result in significant loss in plant vigor and yield. These problems may be difficult to diagnose and to manage as they occur in the soil, out of sight and easy access for management. The varied nature of the diseases and management approaches as well as the fact that they may occur in combination has resulted in our historical reliance on broad-spectrum soil fumigation. Diseases such as red stele (caused by *Phytophthora fragariae*) and pythium root rot are caused by water molds. Red stele is a severe disease that can kill plants and may produce a diagnostic discoloration of roots (the red vascular tissue that results in the common name). *Pythium* spp. typically act as root nibblers and prune feeder roots, reducing plant vigor. Both can be managed by improving drainage and compaction to reduce standing water. Resistance to red stele is available in a number of strawberry cultivars. Verticillium wilts cause crown dieback from the oldest to the youngest leaves (which can be helpful in diagnosing this disease) and can result in plant death. It is important to avoid rotation to solanaceous crops that can introduce or increase the fungal wilt pathogen in soils. Again, there are resistant cultivars available.

Lesion (*Pratylenchus penetrans*) and root knot nematodes (*Meloidogyne hapla*) are plant parasitic roundworms that infect roots and reduce plant vigor. Plant parasitic nematodes typically stunt but do not kill plants. *Meloidogyne hapla* can be managed by rotation with nonhost crops such as small grains. Lesion nematodes have a much wider host range and can interact with *Rhizoctonia fragariae* to increase the severity of black root rot, a cortical root disease that is probably the most common and destructive root problem affecting strawberry. The cell death and cortical damage produced in roots by the lesion nematode increase *R. fragariae* infection of the senescing tissues, resulting in the black root rot complex. Lesion nematode numbers increase under rotation to most small grains, but sorghosudangrass or millets can help reduce populations over time.

Root-feeding insects such as weevils and white grubs can cause severe injury due to cutting and feeding, but does not increase black root rot as does the les nematode. *Rhizoctonia fragariae* is common on strawberry roots. Reducing lesion nematode numbers and other stresses may reduce black root rot severity. While they do not interact, the combination of root diseases such as black root rot and root loss due to insect feeding can result in dramatic losses in strawberry fields. We are currently researching and developing germplasm with non-preference for root weevil feeding and resistance or tolerance to *R. fragariae*.