



Fig. 1. Symptoms of corky root, caused by *Pyrenochaeta lycopersici*, on tomato. Pathogen infections cause brown lesions on segments of main and lateral roots, that turn brown, swollen and become fissured. As the disease develops, lesions may affect the entire length of the roots.

Disease: Corky root (or corky root rot)

Classification: K: Fungi, P: Ascomycota, C: Dothideomycetes, O: Pleosporales, F: Incertae sedis

Corky root is caused by *Pyrenochaeta lycopersici*, a soil-borne plant pathogen producing conidia within pycnidia and melanized microsclerotia. On agar media, the fungus appears as a so-called 'gray sterile fungus', because it produces only mycelium and dark microsclerotia, but not pycnidia. For a definitive species identification, particular procedures can be adopted to stimulate the production of pycnidia or a PCR-based protocol can be used.

Biology and Ecology:

The fungus survives in the soil as microsclerotia (40-60µm in size) for 5 or more years, even in the absence of a plant host. Probably stimulated by root exudates, microsclerotia germinate and hyphae infect young roots by colonizing the epidermal cells. Infections first occur on portion of roots, but they can extend to long segments or the entire main and lateral roots. Affected root segments turn brown, swollen and become fissured, an aspect that gives the name to the disease. No sub-specific specialization is known for *P. lycopersici*.

Impact:

In tomato, corky root may cause yield losses of 30-40% on average, with peaks of 75%. Besides of the yield losses, no evident symptoms occur on the foliage. Under a high disease pressure, a general suffering of plants, such as growth stunting and yellowing of basal leaves, could be observed. This contributes often to underestimate the disease impact. *P. lycopersici* inoculum increases in soil repeatedly cultivated with tomato or other susceptible crops.

Host Range:

The pathogen attacks primarily tomato, but it can also infect a number of species in the Solanaceae and Cucurbitaceae families, such as pepper, tobacco, eggplant, melon, cucumber, squash, etc., or in other families (e.g. strawberry, lettuce, spinach, safflower, etc.).

Distribution:

After the first report in England (1929), *P. lycopersici* has been reported from several Countries: Germany, New Zealand, Lebanon, Massachusetts, Florida, California, Italy, Korea, Russia, Crete, Albania and Sweden. It is very likely present in all areas cultivated with tomato.

Management options:

Soil fumigation is the most effective means of control, and soil applications of fungicides, such as thiophanate-methyl, can provide partial disease control.

Crop rotation alone cannot control the disease because of the wide host range of *P. lycopersici*, but it is recommended to avoid dramatic increases of disease pressure. Soil solarization slows down the inoculum, but often it is not reliable in intensive agriculture and at high latitudes where solar radiation is insufficient to create lethal soil temperatures. Organic amendments can sometimes provide some disease control, but often results have not been consistent.

Due to high costs, grafting of tomato varieties on to resistant rootstocks is an option limited to high-value cultivations, such as fresh-market greenhouse crops. The recessive gene *py1* was introgressed in tomato from *Solanum peruvianum* many years ago, but no commercial varieties have been released yet.

Further Reading:

Amenduni, M., Colella, C., D'Amico, M., Bubici, G., Cirulli, M., 2008. Effect of an organic amendment on corky root susceptible and resistant tomatoes. Proceedings of the Fifteenth Meeting of the Eucarpia Tomato Working Group 789, 115-118.

Bubici, G., Amenduni, M., Colella, C., D'Amico, M., Cirulli, M., 2006. Efficacy of acibenzolar-S-methyl and two strobilurins, azoxystrobin and trifloxystrobin, for the control of corky root of tomato and Verticillium wilt of eggplant. Crop Prot. 25, 814-820.

Hasna, M.K., Ögren, E., Persson, P., Mårtensson, A., Rämert, B., 2009. Management of corky root disease of tomato in participation with organic tomato growers. Crop Prot. 28, 155-161.

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