

## 34. Phytophthora Root Rot of Black Walnut

Ralph J. Green, Jr.

### Hosts

Seedlings of black walnut are highly susceptible to a root rot disease caused by *Phytophthora* spp., especially *P. cinnamomi*, *P. cactorum*, and *P. citricola*.

### Distribution

Phytophthora root rot occurs wherever black walnut seedlings are grown. It is especially damaging in the North-Central United States. The disease is limited to nursery seedbeds; it is not recognized as a problem in natural regeneration.

### Damage

Black walnut seedlings may be severely damaged by *Phytophthora* root rot; often significant mortality occurs in nursery beds.

In the Northern States, walnut seedlings are usually lifted in the fall and stored in heeling-in yards or cold storage until spring. The fungi may spread in bundles of dormant seedlings as part of a molding root rot complex, causing further losses during storage and transit.

Seedlings with incipient infection often die following outplanting.

### Diagnosis

Walnut seedlings affected with *Phytophthora* root rot become chlorotic and wilt rapidly (fig. 34-1). In later stages, the leaves collapse, and the entire seedling turns black. The tissues of infected seedlings are soft, watery, and black, beginning at the root collar and extending through the root and lower stem (fig. 34-2). Infected seedlings usually occur in patches in the seedbed, suggesting that the fungus spreads from plant to plant



**Figure 34-1**—Black walnut seedlings affected with *Phytophthora* root rot, showing chlorosis, wilting, and blackening of foliage.

after infection begins. Root rot is always more severe in low areas of the plant beds, where drainage is poor (fig. 34-3).

Infected seedlings are rapidly colonized by secondary organisms, making isolation of the primary pathogen difficult. Use of selective culture media is often required.



**Figure 34-2**—Blackened tissues of stem and roots of black walnut seedlings affected by *Phytophthora* root rot.



**Figure 34-3**—Losses to *Phytophthora* root rot are greatest in low areas where water stands.

Identification of individual species of *Phytophthora* is usually left to specialists in this group of fungi.

### Biology

*Phytophthora* spp. survive in soil either as dormant chlamydospores, oospores, or both, and require high soil moisture to activate their motile zoospores. They are considered weak pathogens, and infection is usually limited to young seedlings or plants that have been damaged or weakened. Disease incidence is greatest following periods of heavy rains, when surface water may accumulate for periods of 24 to 72 hours or more.

### Control

**Cultural**—Root rot of black walnut seedlings is always associated with poor surface and internal soil drainage in the nursery. The nursery area used for black walnut should be tilled and well drained. This disease will also develop during winter storage if moisture and temperature conditions are favorable; therefore, the heeling-in beds also should be located in areas with good drainage.

**Chemical**—Although soil fumigation and other chemical treatments of the soil and seed may reduce the impact of this disease, at present there is no completely effective chemical control. The fungicide metalaxyl, applied as a soil drench, will provide some control of *Phytophthora* root rot on black walnut seedlings in nursery beds.

### Selected References

- Green, R.J. 1975. *Phytophthora* root rot of black walnut seedlings. In: Peterson, Glenn W.; Smith, Richard S., Jr., tech. coords. Forest nursery diseases in the United States. Agric. Handb. 470. Washington, DC: U.S. Department of Agriculture: 19-22.
- Green, R.J.; Pratt, R.G. 1970. Root rot of black walnut seedlings caused by *Phytophthora citricola*. Plant Disease Reporter. 54: 583-585.