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The Potato Rot Nematode

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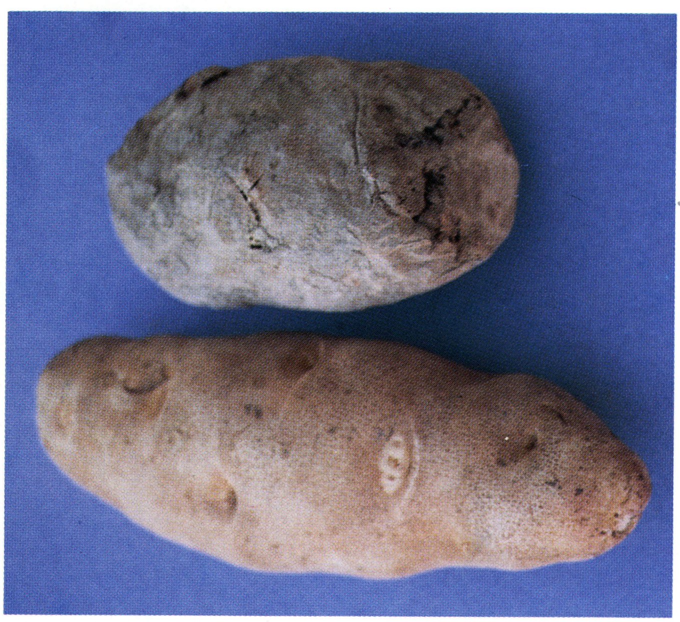
The first reported incidence in North America of the potato rot nematode, *Ditylenchus destructor*, was in 1943 in a potato field near Aberdeen, Idaho. Scattered and infrequent occurrences of this nematode have since been confirmed in a few isolated areas of Idaho, California and Wisconsin. This nematode is widespread in many potato growing areas in Europe and the USSR and has been found in some areas of South America, South Africa and the Mediterranean region.

Rotting of stored potatoes caused by this nematode was serious enough in the Aberdeen area that a quarantine was implemented in 1957. Quarantine regulations required that potatoes be left in storage no later than February 1 and set a maximum tolerance limit of 0.25 percent of potatoes with rot nematode. Research by the University of Idaho in the mid-1950s led to field recommendations relying primarily on fumigation to control the nematode. This disease has been detected infrequently in recent years.

Infestations of potato rot nematode have caused yield losses of up to 40 percent. Storage of potatoes infected with rot nematode can cause additional losses of 10 to 20 percent. This nematode is easily spread to other fields and cannot be eradicated from a field with any conventional farm chemical or management practice.



Healthy (bottom) and potato rot nematode-infected (top) potato tubers of Russet Burbank. Note the depressions and cracks on the surface of the infected tuber.

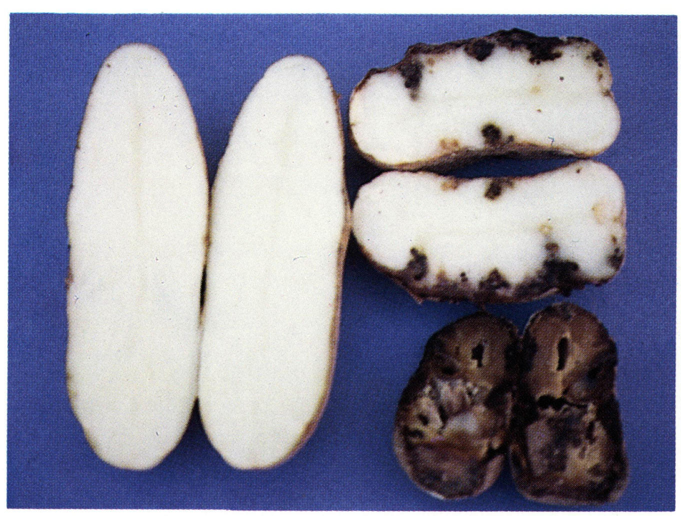
Disease Symptoms

Potato plants infected with rot nematode do not show any recognizable above-ground symptoms. Rare cases of severe infection cause a general lack of plant vigor and some leaf deformation. Symptoms are primarily on tubers and stolons, not on roots. Tuber decay and rotting is usually unnoticed until potatoes are placed in storage.

Symptoms of tuber infection at harvest are easily missed or confused with those of other potato diseases. Small (less than $\frac{1}{32}$-inch), white or pearly spots with pin-sized holes in the center are present just beneath the tuber skin. These holes may resemble those caused by wireworms but are much smaller in diameter and do not penetrate deeply into the tuber flesh. The infected area becomes soft and may be more readily detected by touch than by sight.

As the decay progresses, the tissue under the skin turns brown and forms slightly grayish-brown depressions, often with a honeycombed appearance. The tuber skin above these depressions becomes papery and frequently splits, exposing dry, chalky, crumbled and decayed tuber tissue. The decay symptoms in the tuber flesh commonly resemble those of Fusarium dry rot. Surface cracks in the tuber skin are usually present.

Infected tubers may be invaded by numerous secondary fungi and bacteria that typically darken tuber tissues and cause



Longitudinal section of a healthy (left) and potato rot nematode-infected (right) tuber of Russet Burbank showing early (upper) and advanced (lower) stages of rot.

greater shriveling and rotting. Fusarium dry rot is a common secondary infection. Infected potatoes in the field or in storage may also have soft rot that effectively masks the nematode rot symptoms. Numerous mites and saprophytic nematodes may also invade infected tubers. Tuber symptoms of potato rot nematode can be confused with those of common scab, bacterial ring rot and late blight. Definitive diagnosis requires microscopic examination of infected tissue for the presence of potato rot nematode.

Disease Development and Nematode Biology

The potato rot nematode attacks stolons and tubers, entering tubers through lenticels, eyes or the skin adjacent to eyes. The nematode releases large amounts of amylase and protease enzymes that disintegrate starch and protein components of the cell, respectively. As rotting and decaying proceed, the nematode migrates to healthier tissues in the tuber.

Temperature is a major factor influencing activity and development of the potato rot nematode. Potato tuber infection occurs at temperatures of 37°F to 99°F but is near optimum at 59°F to 68°F. Nematode development and reproduction occurs at temperatures of 41°F to 93°F but is optimum at 68°F to 79°F. The most severe damage to tubers has been observed at temperatures of 63°F to 72°F. The nematode survives in soils to temperatures as low as −18°F.

The reproductive cycles of the potato rot nematode, including the duration of each of the four larval stages, the number of eggs produced by females and nematode longevity, are not well understood. The number of days for a nematode population to double is termed the "generation time" and typically is 20 to 26 days at 68°F to 75°F for the potato rot nematode. Temperatures of 43°F to 50°F increase generation time to 68 days. A temperature of 82°F decreases generation time to only 18 days.

The potato rot nematode may survive in soil as a free-living organism or on crop and weed hosts. Although these may serve as inoculum sources, the most common source of inoculum is contaminated mother tubers. Spread of the nematode to new areas is primarily by movement of infested potato seed and soil. Dry soils greatly reduce nematode survival.

The occurrence of potato rot nematode in the field is erratic and difficult to predict. Some fields may develop a widespread, intense infestation every time they are planted with potatoes. Other fields may have only patches of infestation. Some fields may appear to have little or no infestation for many years and then suddenly experience an outbreak bringing a major crop loss, even after 30 years of no apparent damage by the nematode. Factors influencing the development and spread of the potato rot nematode under field conditions are not well understood.

Hosts

D. destructor primarily infests parts of the host plant that are below the soil surface: bulbs, corms, rhizomes, roots and stolons. The nematode can penetrate the aerial parts (shoots and leaves) of plants, but it rarely does. In addition to potato, hosts of this nematode include alfalfa, beet, carrot, clover, dahlia, dandelion, gladiolus, hop, iris, lilac, mint, parsnip, rhubarb, tigridia, tomato, tulip and several weed species. *D. destructor* also feeds on a wide range of soil-inhabiting fungi. Even in the absence of an agronomic host crop, this nematode is able to survive in cropland soils for 5 to 10 years.

Control

Potato rot nematode cannot be eradicated from cropland with any conventional farm chemical or management practice, but sanitation and some management practices help prevent the nematode's further spread.

1. Plant only certified potato seed that has originated from a limited generation program. Do not plant year-out or eliminator seed. Resistance among recently released potato cultivars has not been determined, but all older cultivars are considered susceptible.
2. Do not store potatoes if potato rot nematode is detected during harvest. The nematode can grow and develop under normal storage conditions.
3. Do not grow potatoes in infested fields for 4 to 6 years and include cereals and grasses in the rotation.
4. Properly clean and disinfect all storage areas and cultivation and handling equipment that have come in contact with contaminated potatoes. Avoid movement of infested soil or potatoes onto cropland. Properly dispose of infested cull potato piles.
5. Control weeds in infested cropland.
6. Applying a nematicide (Vapam, Telone II) according to label recommendations is presently the best management method for reducing populations of the potato rot nematode in the soil.

Pesticide Residues — These recommendations for use are based on currently available labels for each pesticide listed. If followed carefully, residues should not exceed the established tolerances. To avoid excessive residues, follow label directions carefully with respect to rate, number of applications, and minimum interval between application and reentry or harvest.

Groundwater — To protect groundwater, when there is a choice of pesticides, the applicator should use the product least likely to leach.

Trade Names — To simplify information, trade names have been used. No endorsement of named products is intended nor is criticism implied of similar products not mentioned.

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