

Idaho Grower News from the University of Idaho Extension System

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March 2009**Rhizoctonia Disease of Potato: The Soil That Won't Wash Off**

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Rhizoctonia disease of potato, also known as "Rhizoctonia canker" and "black scurf," is a problem that is of great concern for many Idaho growers. This disease is caused by the fungus *Rhizoctonia solani*, an organism that not only survives in soil saprophytically (lives on dead tissue) from year to year, but may also survive on seed and in soil as compacted masses of fungal cells called "sclerotia." Sclerotia appear as small, irregular, black bodies that look like dried-on soil on the surface of potato tubers. Unlike soil, however, these black bodies cannot be easily washed off. Rhizoctonia sclerotia on tubers are pathogenic and have the capability of producing the full range of symptoms on potato that are produced by soil-borne inoculum. In fact, sclerotia on potato seed frequently provide a greater source of infection than soil-borne inoculum.

The growing tips of new sprouts are particularly susceptible to *R. solani* infection, and the sprouts may be killed before they emerge from the soil. Rhizoctonia lesions on underground stems and stolons are reddish-brown in appearance. Symptom severity may vary from superficial lesion development to complete girdling and cut-off of stems and stolons. In very severe cases, stand can be reduced.

Since the plant becomes increasingly more resistant with maturity, the effects of the disease are generally more important before emergence than after, but adverse effects can be seen in the above-ground portions of the potato plant as well. Severe infection of underground stems may restrict the downward movement of carbohydrates. As a result of this restriction, aerial tubers may develop. With severe disease development, plants may be stunted and apical leaves may appear purple in color and display a pinched, rosette shape. Because of the striking effects that Rhizocto-

nia can cause on both below and above-ground parts of the potato plant, concern on the part of growers about this disease is certainly understandable.

Rhizoctonia survives from season to season and reproduces as sclerotia in soil and on potato tubers or as fungal mycelium in soil debris. The fungus becomes active in the spring as soil and seed tubers are warming up. Stems and sprouts are usually invaded early on, but both roots and stolons are susceptible all season long. As soon as plants emerge and begin to turn green, they become less susceptible to infection. New

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sclerotia typically form after vine kill, late in the season.

Under certain conditions the fungus can also produce a special type of spore called a "basidiospore." Basidiospores are produced within a sparse, superficial mat of grayish-white fungal mycelium that occurs just above the soil line on the stems of infected plants. Examination of the affected stem below the soil line will usually show a typical reddish-brown rhizoctonia lesion. The role of these basidiospores in the disease cycle is unknown, but they are not believed to be important. This special basidiospore stage of Rhizoctonia bears the scientific name *Thanatephorus cucumeris*.

Previous research has shown that soil temperature is a critical factor in the initiation of Rhizoctonia disease in potato, with disease severity being positively correlated with the temperature that is most favorable for pathogen growth. The temperature range for the growth of *R. solani* isolates

that infect potato is 41° to 77°F, so plants will be most susceptible to infection when the soil temperatures are within this critical range. Cool temperatures, high soil moisture, fertility and a neutral to acid soil (pH 7 or less) are thought to favor development of Rhizoctonia diseases of potato. Damage is most severe at cool temperatures because of reduced rates of emergence and because growth of stems and stolons is slow relative to the growth of the fungus. Wet soils warm up more slowly than dry soils. This exacerbates damage because excessive soil moisture slows plant development and favors fungal growth. It has been shown that high soil temperatures, especially during the early stages of plant development, tend to minimize the impacts of *R. solani*, even when inoculum is abundant.

Management and Disease Suppression

Chemical control of rhizoctonia with labeled fungicides has generally not resulted in significant yield increases in Idaho. Results suggest either that rhizoctonia has no appreciable effect on potato yield or that the effects on yield are too low to be measured by conventional methods. This apparent lack of yield impact due to rhizoctonia may be attributed to an increase of stolons, resulting in more but smaller potatoes under the hill. This relationship may be compared to fruit thinning. If tree fruits are not thinned, the desirable larger size is generally not obtained. Rhizoctonia disease can do an excellent job of thinning potatoes below ground, and because of this, at least in some cases, tubers are larger. Although stem infection and lesions may be extensive on the surface, the fungus frequently fails to penetrate deep enough to cut through conducting tissues. In most instances, the fungus causes no appreciable loss of stem function.

Cultural Management

In addition to chemical control, proper crop management may decrease disease, and the use of clean potato seed (free of seed-borne inoculum) may significantly reduce infection. Good crop rotation practices should be followed to reduce soil inoculum levels. A potato crop should be preceded by cereal crops—barley, wheat, corn—and not by sugarbeets, alfalfa or legume pasture crops. Rhizoctonia disease thrives when conditions are unfavorable for plant emergence. To reduce conditions that favor the disease, farmers should pay close attention to irrigation and tillage. Avoid soil compaction and irrigation practices leading to ponding of water. Shallow planting followed by gradual "hilling up" is also recommended. This speeds emergence and reduces damage.

Recent research has shown that carbamate insecticides applied at planting can increase the incidence of rhizoctonia. This impact on disease can be reduced by moving the placement of insecticides to the side or above the seed, or use of an effective in-furrow fungicide.

Inoculum Sources and Fungicides

If there is a choice between clean seed and *Rhizoctonia*-infected seed, the cleanest

seed should be purchased. Use of a seed-piece treatment capable of controlling seed-borne inoculum (sclerotia) is highly desirable. University of Idaho research has shown certain seed piece treatments to be effective for seed-borne rhizoctonia control. Where soil-borne inoculum is present at high levels, in-furrow fungicides have been shown to provide effective control of stem and stolon infection, as well as reduce the proportion of daughter tubers with black scurf.

Conclusions

To sum up, rhizoctonia occurrence and severity is greatly influenced by a combination of soil temperature and soil moisture factors that come together to create conditions favorable for the pathogen while the host is in a susceptible state. If this combination of factors can be avoided, disease management becomes less difficult.

Rhizoctonia management procedures include use of effective seed piece treatments, which can help reduce the impact of seed-borne rhizoctonia and use of in-furrow treatments for soil-borne rhizoctonia. Cultural practices include delaying planting to avoid cool, wet conditions and management of seed to favor rapid emer-

gence by such practices as shallow planting or dragging down hills after planting and hilling up later.

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Did You Know?

The slogan "Idaho Potatoes" first appeared on Idaho license plates in 1928, and the plate numbers were printed on a picture of a tuber resembling a russet-type to. (Source: Idaho State Historical Society, <http://www.idahohistory.net/license.html>)

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