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G92-1090 Black Dot Disease of Potato

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Black Dot Disease of Potato

The cause, symptom, disease cycle, influencing factors, effects and control of black dot are described.

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- Symptoms
- Disease Cycle
- Factors Related to Infection and Spread
- Control Measures

Black dot of potato, a disease caused by the fungus *Colletotrichum coccodes*, was recognized in Australia and Europe, then was observed and described in Canada in 1921. Since then this disease has spread to many potato production areas of the United States; its occurrence was first reported in Nebraska in 1988.

In the past few years, black dot has been recognized on infected potato tissue from several areas of the state. The increased incidence of black dot in Nebraska may have been favored by high temperatures and heavy irrigation. Black dot often has been reported as a minor disease. Under favorable conditions, especially on poorly drained, sandy soils, it can result in significant yield losses in the field and loss of quality of infected tubers in storage.

Symptoms

Black dot symptoms are first visible in the field in mid to late summer as yellowing and wilting of foliage in the tops of plants. These symptoms may go unrecognized because of their similarity to those caused by *Fusarium* and *Verticillium* spp.

As the disease progresses, infected plants turn brown and die. Numerous small (1/50 inch) black "dots" (sclerotia, dormant fungal masses) may appear on infected stem tissue. The most striking symptoms appear on the below-ground stem tissue. The cortical tissue scales away, exposing the woody vascular tissue that turns an amethyst color (*Figure 1*). The fungus produces black sclerotia on the internal and external woody stem surfaces (*Figure 1*).

The amethyst coloration, sclerotia, and cortical sloughing are also found on infected stolons. Remnants of infected stolons may remain attached to tubers and aid in the identification of the disease in storage (*Figure 2*). Infected tubers exhibit grayish lesions on the surface that resemble silver scurf (*Figure 3*). Tuber injury is more severe on thin-skinned than on netted-skinned cultivars.

Black dot may be more of a problem than previously considered since its foliar symptoms during the season are similar to early blight and several other diseases. This could explain the occasional failure of chemical controls for early blight, since the disease present may be black dot. There is no chemical means to control black dot.

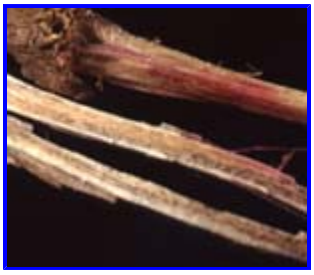

Figure 1. Amethyst coloration and black sclerotia on dead vines, 'Russet Burbank.'

Figure 2. Infected stolons attached to a tuber, 'Russet Burbank.'

Figure 3. Grayish lesions on stored tuber, 'Monona.'

Disease Cycle

Sclerotia surviving on the surface of infected tubers is the source of inoculum that spreads the disease into new fields. Once the disease is established, the fungus sclerotia survive on infected plant residue in the soil for long periods of time.

Potato plants growing in infested soil are exposed to inoculum arising from the sclerotia. When conditions are favorable the fungus invades underground stem tissue and moves upward in the plant. Airborne spores also infect the foliage, especially when tissue is injured by windblown sand, and the disease progresses downward into the stem and roots. In late stages of disease development, new sclerotia are produced, and the fungus population again builds to a high level in the soil.

The fungus also invades several vegetable species in the potato family, and a few weed species common to Nebraska potato fields.

Factors Related to Infection and Spread

Seed: Black dot is introduced into soil by infected seed pieces or tubers. Once introduced, it will remain there for years.

The most recent recommendations suggest cropping for five years with non-host plants before planting potatoes in a previously infested field. Surface-sterilizing seeds is not suggested as a control measure since this may increase the risk of root infection due to the killing of natural antagonists or competing organisms. Thin-skinned potato cultivars, such as many chipping cultivars, are more susceptible to black dot than thicker-skinned ones (*Table I*).

Table I. Field survey of black dot and silver scurf incidence on tubers in Colorado.			
		Percent of Infected Tubers	
Cultivar	Skin Type	Black Dot	Silver Scurf
Monona	thin	40	0
Norchip	thin	44	12
Norgold Russet	netted	0	10
Red McClure	thin	35	0
Russet Burbank	netted	2	4
(from Hunger, R.M. and G.A. McIntyre. Amer. Potato Jour. 56:289-306. 1979.)			

Field: Losses in yield and quality (dry matter content) of tubers by black dot result from the destruction of conductive tissue in stems, roots and stolons (underground branches to which tubers are attached). The number of large tubers harvested is reduced, as well as the weight of tubers as indicated by a reduction in specific gravity. As part of the "early dying syndrome," black dot accelerates the dying of plants already infected with Verticillium wilt (early dying), *Erwinia* (black leg) and possibly other diseases.

Black dot infection often is associated with sandy or coarse-textured soils. The severity of infection is related to the soil environment and the level of the fungus (inoculant) in the soil. Soil factors affecting black dot infection are poor drainage and soil aeration, high soil temperature, low soil moisture (less than 65 percent available moisture), and either low or excessive levels of nitrogen (N) or phosphorous (P).

Diseased seed pieces usually rot rapidly under irrigation. Irrigating for up to 18 weeks after planting decreases black dot infection of stem bases, roots and tubers.

Black dot in Nebraska has been found to occur more on the windward side of potato circles. Injury due to wind and sandblasting contribute to the development and spread of infection.

Plants under stress are susceptible to black dot. Stress may be due to high air temperature (heat), drought, and low fertility. Black dot readily attacks plants whose petiole N and P levels are 4,000 to 5,000 ppm below recommended levels. Black dot attacks aging, injured and/or stressed plants. It invades plants weakened by other diseases and often is found in association with these diseases.

Storage: Tuber infection is usually superficial, resembling silver scurf, but it can become significant in seed stock and during storage. Tuber discoloration has been noted on chipping types in Colorado and on french fries in Idaho. Black dot can cause greater shrinkage of infected tubers in storage than non-infected ones. The amount of shrinkage is increased with infection severity (*Table II*).

Table II. Interaction between black dot severity on tubers and time in storage at 50°F on percent shrinkage of 'Norchip' potato tubers.				
	Weeks in storage[1]			
% Infected surface area at harvest	10	14	16	18
	%	%	%	%
0-1	1.9	3.5	4.5	5.6
1-10	2.0	4.1	5.3	6.5
10-30	2.1	4.5	6.0	7.6
30-60	2.3	5.2	6.6	8.3

(from Hunger and McIntyre, 1979)
[1]After 8 weeks of storage, relative humidity was lowered to 90 percent.

Storing at a relative humidity below 90 percent will increase loss. With unwashed lots, shrinkage was increased when temperature was raised from 40°F to 60°F in storage. Black dot develops and spreads well in storage at 50°F, which is commonly used for storing chipping cultivars that are often thin-skinned.

Control Measures

Seed: Use certified seed, since seed is the only way known to infest a clean field. There are no resistant potato cultivars. Thin-skinned cultivars are more susceptible. Do not sterilize seed pieces.

Field: Rotate crops with grains, preferably five years before replanting potatoes on infested ground. Besides potatoes, other solanaceous crops and weeds can be hosts to black dot. Examples are tomatoes, peppers, eggplant, and nightshades.

Keep potato fields free of nightshades. Fields should be clean of debris where black dot can overwinter. Keep soil adequately fertilized; petiole sampling will help. Keep fields irrigationd but avoid excess watering, especially in low spots or poorly drained soils. Windbreaks may be useful on sandy soils in high wind areas. Avoid skinning or bruising tubers at harvest. Note: there are no chemical control measures for black dot.

Storage: Keep relative humidity at or above 90 percent. If possible, store at 40°F. If the field was infected, wash tubers going into storage. Use good sanitary practices.

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