

Pesticide Certification Information

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TUBER DISEASES
OF
POTATOES

WEST VIRGINIA UNIVERSITY
EXTENSION SERVICE
AN EQUAL OPPORTUNITY/
AFFIRMATIVE ACTION INSTITUTION

TUBER DISEASES OF POTATOES

POTATO TUBER DISEASES---IDENTIFICATION AND CONTROL

LEAK (PYTHIUM SEED ROT AND WATERY WOUND ROT)

PYTHIUM SEED ROT

Symptoms: This disease is characterized by the extremely watery nature of the infected seed piece. Seed that is planted in warm, moist soil will become infected, turn yellowish to brown, and then black. When the seed piece is uncovered, it is very watery (but not slimy). There is no distinct foul odor. The water is usually clear, but may also be yellowish or brown.

PYTHIUM TUBER ROT

Symptoms: Tubers are believed to become infected only through wounds, bruises, or insect injuries. Infections do not usually become clearly visible until the tubers are placed in storage. After two to four weeks in storage, infected tubers become watery and soft. When the tuber is squeezed, a clear, yellowish water will be expressed. The rotted, central portion of the tuber is dark-brown to black. A sharp line sets off the healthy external tissue from the infected internal tissue. Unless bacterial soft rot has set in, the tuber will not be slimy or foul smelling. Leak disease is not transmitted from tuber to tuber in storage.

Causal Fungus: The tuber and seed rot phase of leak is caused by a soilborne fungus, Pythium ultimum. This fungus is found in almost all cultivated soils and is responsible for seedling diseases in many crops. Potato seed and tubers become infected in the field through wounds that may or may not be visible. Wet, warm soils are necessary for infection. Late planted, cut potato seed is very vulnerable to infection. Potatoes harvested when temperatures are above normal for the season are very susceptible, especially if the soil is moist.

Control for seed rot:

- 1) Use whole seed for late plantings.
- 2) Handle seed gently to avoid new wounds.
- 3) Treat seed with a recommended fungicide. Presently available seed treatments are not completely effective against the leak fungus. However, they protect seed against other seed rotting fungi and thus protect against subsequent invasion by the leak fungus.
- 4) Plant deep; cover shallow. Get the young plant up as quickly as possible. A seedling under stress is more susceptible to seedling and seed rot disease.

Control for Pythium tuber rot:

- 1) Avoid mechanical injury at harvest.
- 2) Do not harvest when temperatures are above normal and soil is moist.
- 3) Do not allow harvested potatoes to stand in the sun.
- 4) Heal-in tubers: temperature 50 to 60⁰F and relative humidity 85 to 90 percent for 7 to 14 days.
- 5) If leak develops in storage (based on accurate symptom identification):
 - a) If potatoes are destined for processing, do not lower temperature.
 - b) Force dry, warm air through the pile and exhaust moist air.
 - c) Do not regrade. Regrading opens new wounds which are susceptible to ever-present bacterial rots.
 - d) If potatoes are for table stock, drop temperature to 40⁰ F or lower.

TUBER LATE BLIGHT

Symptoms: The earliest symptoms of tuber blight are small, irregular, pink, red, or brickish-red areas just beneath the skin. As the disease progresses, these areas enlarge, become depressed, and may turn brown. These blighted areas usually do not extend to the center of the tuber beyond the vascular ring. If foliage blight has been noticeable in the field, the first tuber blight symptoms may appear at the stem end of the tuber. In this case, a round, sunken, brick-red area will surround the stem end. Tuber blight lesions are excellent entry-ways for soft rot bacteria. Tubers blighted before harvest will usually decay rapidly due to secondary invasion by soft rot bacteria.

Casual fungus: Tuber blight is caused by the late blight fungus, Phytophthora infestans. This is a water mold which requires high humidity or free water for reproduction and infection. Tubers become infected in two ways: 1) by spores washing down through soil or soil cracks; and 2) by harvesting potatoes when the vines are green and moist. Tuber blight is most common and most severe in heavy, moist soils. However, loose, shale soils will allow tuber blight to develop if the soil remains wet.

Control:

- 1) Control foliage blight in the field.
- 2) Be sure potatoes are hilled well.
- 3) If blight has occurred in a field:
 - a) Kill vines as soon as possible; consider potential yield and potential loss.
 - b) Apply fungicide before or with vine killer.
 - c) Maintain a five to seven day fungicide application schedule until all vines are dead.
 - d) Harvest 7 to 14 days after vines are dead.
 - e) If rotten tubers are visible at proposed harvest date, delay harvest until all infected tubers are rotted. (It is better to have blighted tubers rot in the field than in storage.)
- 4) If blight is present in storage:
 - a) Do not attempt to heal-in potatoes.
 - b) Move processing potatoes as soon as possible, or plan to sell potatoes as table stock.
 - c) Drop temperature as low as possible, and keep tubers dry.

POTATO RING ROT

One of the most feared potato diseases, ring rot, has occurred occasionally in storages. Economic loss due to this disease is slight; however, since this disease is so easily spread in seed potatoes, it is important that precautions be taken to keep all seed free of the disease organism.

Tuber Symptoms: The first sign of ring rot in tubers is the appearance of a light, creamy-yellow to brown discoloration of the vascular ring at the stem end. When the freshly cut tuber is squeezed, a creamy-yellow or light brown exudate (scrud) will appear. In more advanced stages, the entire vascular ring will rot with cavities extending to the center of the tuber. The outer surface of such tubers will sometimes be cracked and depressed. Secondary soft rot bacteria may invade these tubers.

The bacteria which cause ring rot are persistent in storages, bags, bins, and on equipment. The bacteria can infect seed and cause drastic losses in the field. The only way bacteria persist under field conditions is in plant debris and cull tubers. Therefore, disease loss due to residual bacteria in the soil will be minimal if plant and tuber debris is destroyed during the winter or rotational period.

Certified or foundation seed has a zero tolerance for ring rot. Therefore, any significant amount of ring rot must originate from home grown seed, contaminated equipment or storage facilities, or volunteer plants in the field.

Control: If you even suspect that you have seen some ring rot, follow these precautions:

- 1) Do not put seed in non-cleaned, non-disinfected trucks, bags, bins, or storages.
- 2) Hose down and disinfect seed handling equipment.
- 3) Use only certified or foundation seed.

FUSARIUM SEED AND STORAGE ROTS

Symptoms: Fusarium dry rot occurs only on seed and stored tubers. Initial symptoms are sunken, shriveled, or broken areas occurring almost anywhere on the tuber surface. These areas are usually brown to black and may have a white, yellow, or reddish mold growth on or in them. Depending on the fungus involved, the tissue beneath the sunken areas may be jelly-like (Fusarium wet rot) or dry (Fusarium dry rot). If the rot is dry, it may extend far into the tuber or be only superficial. If the dry lesion extends into the tuber, the cavities may be covered with a brightly colored fungus growth. Fusarium rots are usually dry at low temperatures and wet at high temperatures. These rots do not have a foul odor unless accompanied by other fungi and bacteria.

The symptoms of fusarium rots vary greatly depending on the species of Fusarium involved and the environmental conditions under which the rot takes place. The above description is general and should be applicable in most instances.

The Causal Fungi: Fusarium rots are caused by Fusarium roseum and Fusarium solani. These fungi infect the tuber through wounds and bruises caused during or after harvest. Seed decay is intensified when infected seed is cut and the fungus spores are spread to the cut surfaces. Infection of both seed and stored tubers depends on warm temperatures, open wound, and moist conditions. Tubers can become completely rotted in four to six days under ideal conditions.

Control for seed piece decay:

- 1) When seed is received, place it in storage and circulate air to dry it; maintain high humidity to speed healing of any wounds.
- 2) When seed is cut, treat it immediately with a recommended fungicide. This fungicide will prevent Fusarium spores from germinating on freshly cut surfaces and will thus prevent infection.
- 3) Treat the whole seed. Fungicide dusts do not adhere well to whole seed. Therefore, sprinkle the recommended rate on the seed as it is placed in the planter box.
- 4) Avoid “de-sprouting” of seed. This weakens the seed, creates many wounds, and thus makes the seed very susceptible to Fusarium rots.

Control for stored-tuber rots:

- 1) Avoid mechanical damage.
- 2) Heal-in the tubers. After tubers are placed in storage, dry them off; but maintain an 80 to 90 percent relative humidity if possible. If there are no late blight-infected or frozen tubers, maintain a 50 to 60° F temperature for 7 to 14 days. This will promote maximum wound healing and thus prevent most Fusarium rot development.

KEY TO TUBER DISEASES

A. Tubers with rots, spots, discolorations, or other abnormalities

1. Tubers externally abnormal, but not rotten
 - a. Corky spots present and irregularly spaced over surface..... COMMON SCAB
 - b. Irregular brownish spots in skin which appear silvery when wet..... SILVER SCURF
 - c. Black crusty fungus growth on surface of tuber..... RHIZOCTONIA

2. Tubers externally normal, interior abnormal.
 - a. Discolored strands or rings varying from light yellow to brown or black extending for varying distances into tuber at stem end from point of stolon attachment. Discoloration confined to vascular ring about 1/4 below tuber surface.....FUSARIUM OR VERTICILLIUM WILT
 - b. Irregular brown spots varying in size but usually small and scattered through the potato..... YELLOW DWARF
 - c. Extensive network of small brown strands of discolored tissue extending throughout the tuber..... NET NECROSIS (leaf roll)
 - d. Irregular dead, black area in center of tuber..... BLACK HEART
3. Tubers rotted or partially rotted²
 - a. Slightly sunken dark, reddish-brown, rotted areas usually extending only a slight distance below the surface..... LATE BLIGHT
 - b. Large sunken rotted areas that remain firm, usually starting at a wound. Sometimes surface of affected portions shows numerous bluish or white protuberances.....FUSARIUM DRY ROT
 - c. Soft, slimy rot often starting at stem end of tuber..... BLACK LEG
 - d. Rot in vascular ring gray, creamy yellow, or light brown and crumbly in advanced stages. Pressure causes a separation of the tissues inside and outside the vascular ring. Skin reddish-brown and cracked..... RING ROT
 - e. Dark to black sunken areas usually starting at injuries. Interior reddish to black with thin shell of firm tissue on outside of tubers..... LEAK
 - f. Bud end of tubers soft with jelly-like consistency; finally withered and dry..... FUSARIUM WET ROT
- B. Tubers elongate; spindle shaped with stem end pointed..... SPINDLE TUBER

²Complications in these symptoms often occur through the entrance of secondary organisms. Once the skin is broken by disease or other injuries, a number of organisms are able to gain entrance and cause various types of breakdown. It will help in determining which disease is present if the tubers are free from injury and have just started any of the above symptoms.