

Wet Rots of Potato in Storage

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Protect stored potatoes from wet rots by digging when the soil is not wet; avoiding bruising when handling; and storing under cool, dry, and well-ventilated conditions.

Potato tubers have been dug out of the ground and placed in dark storage for eating later in the fall and winter, but after just a few weeks the potatoes are soft, rotten, and emit a foul smell. What happened? Wet rot.

There are three types of wet rots:

- Soft rot (*Pectobacterium* spp.)
- Leak (*Pythium* spp.)
- Pink rot (*Phytophthora erythroseptica*)

Actually, the stored tubers were initially infected at or before harvest because all three of these pathogens exist in the soil. When the potato tubers are cut or skinned during harvest, pathogens can enter through the wounds. If storage conditions are favorable, these pathogens cause wet rots. Storage conditions also influence the spread of the wet rots through the storage area.

There are no potato varieties known to be resistant or tolerant to wet rots. The key factors used to avoid wet rots and their spread are COOLNESS, DRYNESS, and AERATION.

While no potato pathogen or disease will harm people, infected potatoes tend to be very unappetizing. Potato tubers infected with wet rots might best be discarded. Rotting potato tubers may be fed to livestock if properly processed and mixed with feed (more information is available in the Potato Education Guide, cropwatch.unl.edu/potato, under “Value-Added” section).

Soft Rot

Soft rot, the most common wet rot of potato, is caused by bacteria commonly found in soils. It also can be found on seed tubers, floating on water, carried by insects, and spread by equipment and clothes. Crops related to potato, such as tomato, and related weeds, such as the nightshades, may be infected as well.



Figure 1. Swollen lenticels (cultivar Russet Norkotah)

Assume the pathogen is present. The aim of control is to keep conditions unfavorable for bacteria to be able to attack the potato tuber. The bacteria enter tubers two ways: through cuts or abrasions, such as skinning, and through swollen lenticels, small pores on the tuber that allow it to breathe (Figure 1). Abrasions occur during handling especially if the tuber is immature and has not set its skin. Lenticels swell when tubers are exposed to highly moist soil or standing water for several days.

When the bacteria enter the tuber, the cut, abrasion, or lenticel begins to discolor, decay, and even liquefy. The discoloration is creamy to tan and often outlined by a brown to black margin (Figure 2). Over time, the rot widens inside



Figure 2. Bacterial soft rot (note entry portal on left)

the tuber, gradually liquefying it. The bacteria can spread throughout the storage area in the ooze leaching from decaying tubers. Bacterial soft rot has little odor; usually any smell attached to an infection is due to a secondary infection by opportunistic organisms that attack later. Soft rot infection is highest shortly after harvest and declines thereafter.

Since the bacteria can only cause soft rot if they have an entry portal into the tuber, a key control measure is to avoid bruising and to allow wound healing by keeping tubers at 50-60°F for two to three weeks. The bacteria are most damaging in a low oxygen environment. Therefore, avoid conditions that leave a wet film on the tuber especially around lenticels and eyes. A quick rinse with chlorinated or fluoridated water might avoid bacterial spread. Use clean storage areas because the bacteria can survive in debris from year to year.

Leak or Shell Rot

Several species of the fungi *Pythium* cause this rancid internal decay of potato tubers. These fungi are strictly found in soil but can survive a long time and can be found in nearly all potato-growing areas.

The pathogen survives winter in plant debris. It can attack many crops and weeds, not just those related to potato. Like soft rot, avoid conditions favorable to the fungi just before and during harvest, and in storage. Like soft rot, the fungi cause disease only if they enter the tuber through a cut, abrasion, or swollen lenticel. Therefore, having mature tuber skin, gentle handling, and conditions for wound healing are critical.

Early symptoms of leak include very moist, gray or brown lesions around wounds. The internal tissue of infected tubers breaks down, appearing grayish and creamy. It will darken upon exposure to air (*Figure 3*). Within a short time a vinegary smell may be evident. As the disease progresses, the tuber starts liquefying from the inside out and deep cavities often form. The skin will remain intact, a papery shell, unless ruptured (“shell rot”) as the inside hollows out. Also very noticeable is a strong stench much like rotting fish. No mold is usually seen. Leak occurs quickly, often appearing virtually overnight. Infected tubers rot rapidly, often in a few days.



Figure 3. *Pythium* leak

The black-bordered creamy cavities are similar to bacterial soft rot, but leak is not slimy and it has a characteristic pungent odor. In many cases, leak and bacterial soft rot will occur together since both are favored by the same conditions. When tubers infected with *Pythium* leak are gently squeezed, the tissue exudes a clear fluid, hence the term “watery wound rot” has been used to describe it.

Like the soft rot bacteria, the leak fungi can only enter a tuber and cause the disease through openings; therefore, avoid bruising and allow wound healing. In storage, leak does not move from tuber to tuber on its own, but infected tubers will be attacked by soft rot bacteria and spread along with soft rot.

Leak can be controlled by adding metalaxyl to seed or young plants early in the growing season. Leak is almost exclusively associated with high temperatures (70°F or higher) during harvest and handling. Harvesting when temperatures are below 60°F is recommended to help avoid this disease.

Pink Rot

The fungus that causes pink rot disease is in the same genus but different species as the fungus that causes late blight (historically notorious for being responsible for the Irish famine).

The pink rot fungus lives in most soils and survives long periods without a host. Unlike leak or shell rot, pink rot may be detected in mature plants prior to harvest. The disease appears as a late-season wilt starting at the base of the plant and moving up the vine. Tubers can be dug by hand and checked for pink rot before harvest. Potato tubers usually become infected while still in the field. Like leak, pink rot commonly appears at harvest and early storage. Pink rot may spread from tuber to tuber in storage if tubers are wet. Infection usually occurs through the stolon, where the tuber attaches to the plant, and enters through the stem end before harvest. Pink rot also may enter tubers through wounds and swollen lenticels and eyes, and have a leak-like phase. Pink rot-infected tissue, as with leak, can easily be invaded by soft rot bacteria, and tubers often rot within two weeks. Infection of 5 percent of tubers in storage is considered unmanageable.

Near the end of the season, prior to harvest, a wilt caused by pink rot-causing fungi may start at the base of the stem and move up, causing leaf yellowing and drying followed by defoliation. Aerial tubers may appear. However, pink rot is generally considered to be more of a tuber problem than a wilt. When infected, the surface of the potato tuber shows dark lesions delineated from healthy tissue by a blackish band. Tubers tend to be flaccid, even rubbery, and may give off a small amount of liquid when squeezed. The key symptom, which also gives the disease its name, is a pink coloring inside the tuber that develops in 10 to 20 minutes after being cut (*Figure 4*). The discolored area is not mushy or slimy, and is often delineated by a nearly straight line between diseased and healthy tissue. In time, the pink discoloration will change to brown and finally

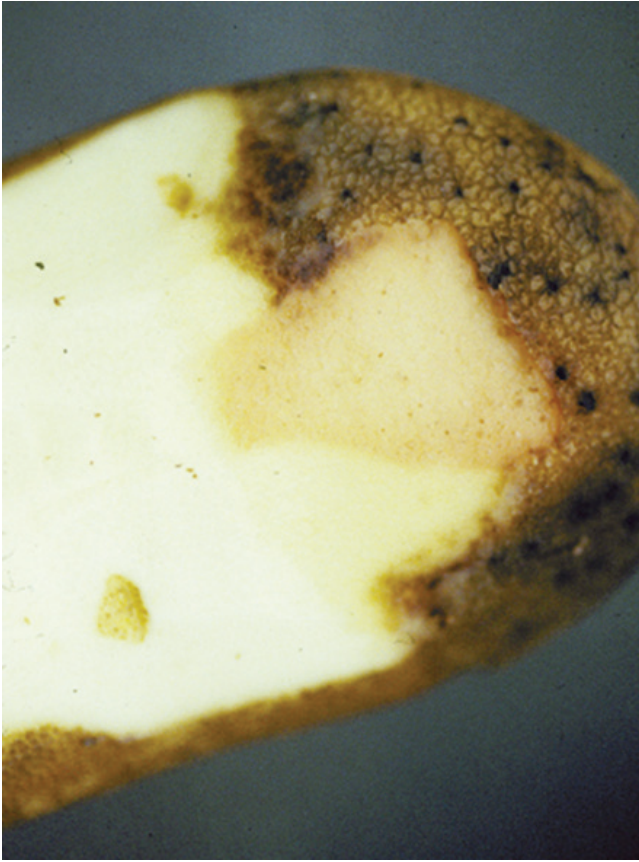


Figure 4. Pink rot after slicing tuber.

black. A slight pungent odor similar to formaldehyde may occur. Cavities do not develop as with leak.

Pink rot fungi do not require an opening to cause the disease but will take advantage of wounds. The fungi favors very wet conditions. Like leak, pink rot fungi can be controlled by applying metalaxyl early in the season.

Common Management Practices for the Three Wet Rots

Field:

- Plant clean, certified seed.
- Let potatoes mature and harden (set) their skin.
- Avoid harvesting from wet ground.
- Harvest when air temperature is below 70°F.
- Harvest when tuber pulp temperature is below 50°F.
- Avoid bruises such as cuts and scrapes.
- Remove soil and debris from tubers.

Storage:

- Store in clean area; disinfect with bleach.
- Do not allow any condensation; store tubers dry.
- Keep area well ventilated. Use fans.
- Allow wounds to heal at 50-60°F for two or more weeks.
- Do not wash tubers.
- If you rinse with treated water, dry tubers quickly.
- To avoid greening, store in the dark.
- For boiling and baking, store at about 38°F.
- For frying, store at about 45°F.
- Monitor for the development of wet spot and eliminate.

Keys to avoid wet rots:

- Keep potato tubers cool, dry, and aerated.

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