

# BACTERIAL SOFT ROT and black leg *of potato*

Cooperative Extension Service  
and the  
Agricultural Experiment Station  
MICHIGAN STATE UNIVERSITY



Early wet rot of pith area

BY H. S. POTTER AND W. J. HOOKER  
Department of Botany and Plant Pathology

*Bacterial soft rot and black leg are caused by the same group of bacterial organisms. Black leg is simply soft rot that has spread from a rotted seed piece into the stem of the developing potato plant.*

Soft rot of potato tubers is characterized by a wet, stringy to slimy rot. The disease usually develops in tubers during the later periods of enlargement and growth in the field or in storage. It occasionally shows up in cut seed improperly stored before planting. It will attack seed in the soil after planting, particularly if conditions do not favor wound healing.

Affected tissue may be quite watery. The line of demarcation between healthy and diseased tissue is usually rather clear. Decay is accompanied by an unpleasant odor. Rot will spread from tuber to tuber in storage, particularly if conditions are favorable.

Occasionally after harvest, particularly if potatoes have been washed commercially, bacterial invasion of lenticels causes circular discolored spots more or less scattered over the tuber surface. If numerous, the spots may coalesce. The rot may become extensive, penetrating deep into the tuber.

## CAUSAL ORGANISM

The most commonly associated pathogens are at least two closely related bacterial species: *Erwinia carotovora* (Jones) Holland, or *Erwinia atroseptica* (van Hall) Jennison. These are small rod-shaped bacteria capable of causing rot in fleshy parts of many plants unrelated to potato.

## DISEASE CYCLE

Soft rot bacteria are common in most soils. Usually, they cause little difficulty except for decay of fleshy plant parts. They enter the tuber:

1. Through insect or mechanical wounds in the surface.
2. Through natural openings such as the lenticels.

Normally, potatoes produce wound-healing barriers which wall out the soft rot organism rather effectively unless insect activity penetrates the wound barrier. Conditions which permit active wound healing in the tuber generally reduce soft rot.

The presence of *tuber injuries* (for example, low-temperature injury, sun scald, ring rot, or late blight) predispose tubers to infection. *Unfavorable environmental conditions* such as low



Advanced decay of pith area



Infection through lenticels in the unbroken tuber surface often takes place during washing.





**Black Leg symptoms in the field. Symptoms on lower stems after bacterial soft rot seed piece decay and spread of bacteria into the stem from the seed tuber**

soil temperature (below 50°F), excessive soil moisture, and reduced oxygen supply may do the same. Planting Potatoes in cold, wet soil inhibits wound healing processes.

*Black Leg*, actually bacterial soft rot infection of the potato stem, often follows soft rot of the seed piece. When the seed piece rots, resulting toxic substances may cause the plant to become discolored and wilt. The plant may eventually die.

Very often, soft rot extends from the seed piece into the outer tissues of the stem, causing the plant to collapse. This process is characterized by a black, wet discoloration of the stem—usually greatest near the soil line and gradually less severe further up the plant. Affected plants become yellowed or bronze. Very young leaves may become rolled and either yellow or red. Such plants generally die prematurely, and survivors yield very poorly.

## **CONTROL**

### **Soft Rot**

*Avoid bruising and injury* during harvest and grading operations. Soft rot bacteria present on the surface of tubers readily enter and infect the underlying tissue wherever a break in the skin occurs. Rapid healing of wounds may be promoted by supplying tubers with an abundance of oxygen.

*Store only healthy tubers.* Harvest before field frost has caused some injury.

Proper hilling after vine killing offers some protection from field frost.

Where some injury from field frost has occurred, allow sufficient time for affected tubers to begin to break down by soft rot so they can be easily detected and removed before storing the crop.

Avoid even short periods of intense sunlight between potato digging and pick-up. Solar irradiation injures tuber tissues. Such injured tubers may develop storage rot even though the tubers appear healthy at harvest.

When ring rot is present, excessive soft rot decay commonly follows. Do not attempt to store such tubers any longer than necessary.

When late blight is present, delay harvest for 10 days to 2 weeks after vines are killed. Then infected tubers will rot in the field and can be sorted out before storage.

*Maintain proper storage conditions.* Hold storage temperatures at 50 to 75 degrees and relative humidity above 85% for the first few days after harvest. Do not place freshly harvested or washed tubers directly into refrigerated storage. Ventilate well to insure an adequate supply of oxygen. This requirement is particularly important while tuber wounds are healing.

*Never place wet potatoes in storage.* Harvesting should be done when it is possible to dry tubers before storage.

Lenticel invasion after washing is frequent. Chlorine should be used in all wash water at concentrations of 150 to 200 parts per million (200 ppm) to disinfect the surface of tubers and to reduce the chance of infection through wounds. **DRYING AFTER WASHING IS ESSENTIAL.**

Where potatoes are flumed, there should be a continuous inflow of clean water. Chlorine should be introduced at the point of inflow and when necessary at other locations in the flume system to maintain a uniform chlorine concentration of 150 to 200 ppm.

### **Black Leg**

Use B-sized tubers to avoid wounding associated with cutting of large seed pieces.

Plant promptly after seed is cut.

Delay cutting and planting until soil is well tilled. Avoid planting in cold, wet soil.

Store cut seed in cool (not cold) well aerated protected places.

Cover cut seed to prevent bacterial soft rot inoculation by insects.

Seed which has been exposed to the *seed corn maggot* often carries eggs of this fly. The maggot, which is contaminated with soft rot bacteria, burrows into the tuber, providing excellent points of entry for soft rot bacteria. Furthermore, the maggot activity prevents wound healing processes from being effective.