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BACTERIAL RING ROT OF POTATOES

by

C. E. Owens and J. A. Milbrath

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AGRICULTURAL EXPERIMENT STATION
Oregon State College
Wm. A. Schoenfeld, Director
Corvallis

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Bacterial ring rot of potatoes has become widespread and thoroughly established in many regions throughout the United States during the past decade. In the past this disease has also been referred to by such names as bacterial wilt, soft rot or tuber ring rot. Since 1938 the disease has been present in Oregon, and has become an important factor in potato production, particularly in seed potato certification. The greatest hazard of the disease is its extreme infectiousness under favorable conditions. One percent of infected seed may cause up to 50 percent diseased plants.

PRACTICES BY GROWERS
WILL HELP PREVENT
RING ROT

Every potato grower should take precautions against ring rot, even though good seed is used and the disease has not given trouble in the past. Ring rot is very infectious and can be introduced in many ways.

The following practices should be followed even if ring rot is not known to be present.

1. Use certified seed. Since certified seed allows no tolerance for ring rot, use only seed that has been certified.
2. Use disinfectants.
 - a. Seed disinfection or treatment is effective in killing bacteria that may be present on the surface of the whole tuber before it is cut or on the seed pieces after cutting. It will not kill the bacteria in diseased tubers, however, so those should be discarded.

For treating before cutting, corrosive sublimate in proportions of 1:500 or 4 ounces to 15 gallons water, is recommended for a treating period of 20 to 30 minutes.

For treating after cutting, Semesan Bel (follow manufacturer's directions carefully) is recommended, as corrosive sublimate may cause injury to the seed pieces and result in poor stands.

- b. Knife disinfection. Failure to disinfect the knife when cutting seed potatoes may result in a spread of the disease. It has been shown that after cutting through a ring rot tuber, the next 25 or 30 seed pieces may be infected. Boiling water, which kills the bacteria in about 10 seconds, is a good disinfectant. Corrosive sublimate (1:500 or 4 ounces to 15 gallons water) is also effective, but must be used in a nonmetallic container. Do not use other materials without consulting your county agent.

The rotary cutting knife that rotates slowly through boiling water or corrosive sublimate is the best assurance that the knife will be disinfected after each cut.

- c. Sack disinfection. Experimental tests have shown that ring rot bacteria will live for several months in infected sacks. New sacks should be used whenever possible. If old sacks must be used, they should be disinfected. Steam is recommended for this disinfection. The bacteria are killed in a few minutes when exposed to steam at a pressure of 5-10 pounds. The sacks should be as loose as possible for this treatment. Copper sulphate (1 pound to 15 gallons) may be used if discoloration of the bag is not important. The sacks should be soaked in this solution for a few minutes and then spread out to dry. Formaldehyde (1 pint to 15 gallons of water) can be used by dipping the sacks in the solution until thoroughly wet and then covering them with a heavy canvas for at least an hour to allow time for the fumes to act.

3. Use common-sense precautions.

- a. Do not lend equipment to your neighbor or borrow any from him unless it has been thoroughly disinfected.
- b. Do not store potatoes of unknown ring rot history in the same cellar with your own.
- c. Do not allow buyers, neighbors or others to promiscuously cut your potatoes with their knives. They may have come directly from handling a diseased lot.
- d. Do not introduce new varieties just to try them. They may have ring rot.
- e. Do not mix seed lots and do not use the same sacks for various lots of cut seed. If more than one seed lot is necessary, use every precaution such as disinfecting cutting tables, sacks, and planting equipment between lots.

CONTROL MEASURES
ARE NECESSARY IF
RING ROT ALREADY
PRESENT

If a grower finds that ring rot has become established in his potatoes he should take the following steps to eliminate it.

1. Dispose of entire potato stock infected with ring rot. None of this

old stock should be saved for seed purposes. It is impractical to select clean seed from a diseased lot.

2. Clean out and thoroughly disinfect the potato cellar and all equipment in it. Copper sulphate (1 pound to 5 gallons of water) or Lysol (1 percent solution or 1 quart to 25 gallons of water) are the materials most commonly recommended for cellar and equipment disinfection.
3. Disinfect all field equipment such as planters and truck beds.
4. Destroy or disinfect all sacks previously used for handling potatoes.
5. Obtain new certified seed for next planting. This seed should not be stored in a cellar or handled with any equipment used for the infected lot until these have been thoroughly disinfected.

LOSSES FROM
RING ROT CAUSED
BY SEVERAL
FACTORS

Ring rot is of considerable economic importance in the potato industry, as it causes losses in crop yield, in addition to losses after harvesting. The losses incurred from ring rot can be listed as follows:

1. Loss in yield.

Affected seed may rot before the plant develops, thus causing poor stands. The plants may also die prematurely or infected tubers may rot in the ground to further reduce the yield.

2. Loss in transit.

Affected tubers are generally difficult to sort out and in some cases, sorting may be impossible. If the sorting was not thorough enough before shipping, decay in transit may follow, necessitating costly re-sorting at terminal markets. Dealers report that cars containing sacks wet from rotting potatoes are difficult to sell and then at a greatly reduced price. This is usually true even if the actual percentage of rot is small.

3. Loss in storage.

If affected tubers are stored instead of sold from the field, loss from storage rot may be serious. In addition, rotting tubers contaminate others and the appearance of the entire bin is damaged.

4. Loss of sale of certified seed.

Since no tolerance for ring rot is permitted in certified seed potatoes, the discovery of ring rot in lots submitted for certification disqualifies them.

SYMPTOMS OF RING ROT
APPEAR ON BOTH
FOLIAGE AND TUBERS

Ring rot can be spotted in fields by its effect on the plant foliage and in the sack or storage bin by its effect on the tubers.

Symptoms on the foliage appear relatively late in the growing season. The main symptoms are:

1. First an upward rolling of the margins of the leaflets, similar to that occurring on normal plants in hot, dry weather.
2. Soon leaflets lose their turgor, become first dull green and then yellow, and feel thin and soft to the touch. Later the margins of the leaflets die and become brown. Near Corvallis it is noted that sometimes the main body of the leaflet remains green until after the margin is dead and dry.
3. The terminal portion of the main axis of the leaf with the terminal leaflets may wilt, while the basal part and petiole remain turgid. Eventually the entire leaf will wilt prematurely.
4. One or more stems of the plant may be affected, while other stems of the same plant remain healthy. When diseased stems are cut off and squeezed, a bacterial slime may exude from the cut surface.

Symptoms in the tubers may appear in the field before the foliage starts to wilt or may not appear until after harvest. The more prominent and typical symptoms are:

1. Ring rot decay begins at the stolon or stem end of the potato tuber and follows the vascular ring, causing a creamy yellow or light brown necrosis (dead tissue). The necrotic tissue is cheesy or crumbly in texture and does not have a distinct odor, unless secondary organisms are present.
2. The decay may come to the surface at the eyes, or the outer shell may crack exposing the inner decay. In badly affected tubers the outer shell may readily separate from the interior tissue along the vascular ring.
3. Tubers that have been in storage over winter may show a characteristic lemon-yellow decay of the vascular ring. The decayed tissue is of a cheesy consistency and contains large numbers of bacteria. Secondary organisms (other bacteria and fungi) usually enter the tuber after the original bacterial ring rot has made considerable headway, so that in advanced stages other colors or textures than those mentioned above may appear.

NOTE - Ring rot should not be confused with blackleg. The symptoms for the two diseases are distinctly different.

RING ROT BACTERIA
LIVE ONLY SHORT
TIME IN SOIL

The length of time the ring rot bacteria can survive in the soil is an important question. Most of the evidence obtained in the United States seems to indicate that there is little danger from soil-borne ring rot.

The organism may live over in volunteer tubers, but probably does not live

for long when free in the soil.

Certain slightly infected tubers may show no sign of the disease after storage through the winter, but the causal bacteria are still present and alive and will cause the disease in plantings if such tubers are used for seed. Such affected tubers can be responsible for spreading the disease to healthy seed if proper precautions are not followed in cutting and handling.

RING ROT SHOULD BE
REPORTED TO COUNTY
AGENT OR EXPERIMENT
STATION

All indications are that ring rot is an unusually dangerous disease. All growers, inspectors, shippers and others concerned should cooperate closely in trying to stamp out or prevent the spread of the disease. Whenever ring rot or any suspicious trouble on potatoes is discovered anywhere in the state it should be reported immediately to the local county agent or to the Agricultural Experiment Station, Oregon State College.