

# BACTERIAL RING ROT

## *of potato*

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RING ROT was first identified in the United States and Canada in the 1930's. It has since been a major potential threat to the potato industry.

### VINE SYMPTOMS

Vine symptoms consist of a wilting which at first may not be associated with a leaf discoloration. However, the area between the leaf veins often later becomes lemon yellow to brown, and the veins tend to maintain the normal green color. Wilting usually accompanies this symptom. Stems of wilted plants produce masses of whitish bacterial exudate when cut below the soil line and squeezed.

Ring rot, except where the disease is severe, is extremely difficult to diagnose in the field when other foliage disorders such as early blight, late blight, black leg, water damage, or other unsatisfactory growing conditions are encountered.

### TUBER SYMPTOMS

At harvest or early during the storage period, diseased tubers break down rapidly with bacterial soft rot, and it is often difficult to find typically ring rot infected tubers. One of the first causes for suspicion of ring rot is bacterial soft rot of the tubers which cannot be attributed to a condition ordinarily associated with soft rot development. Ring rot infected tubers at first develop a breakdown in the vascular ring, the area approximately one-quarter inch below the tuber surface. At first, this area is a straw-to-yellowish-to-cream color, and the tissue is somewhat the consistency of a cooked potato. When the tuber is squeezed, affected tissue showing the cream-to-straw colored discoloration will ooze from the vascular area

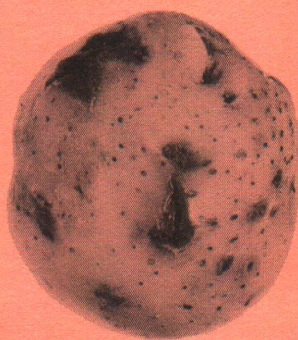
much as toothpaste is squeezed from a tube. Such oozing suggests a high probability of ring rot. Later the vascular area may become reddish to brown in color. In the final stages of development, the tissue in the vascular ring may have disintegrated until a brown cavity is formed. When tubers are severely infected, the skin may crack.

### CAUSAL ORGANISM

Ring rot is caused by a bacterium known as *Corynebacterium sepedonicum* (Spieck. and Kott.) Skap. and Burk. This bacterial type is relatively unusual among plant parasites in that it has a characteristic blue staining reaction with the gram stain. Thus it is possible to differentiate ring rot bacteria from the ordinary soft rot bacteria and from many different bacteria parasitic to other plants. The staining method is quite diagnostic, providing the bacterial smear has been obtained carefully with generally accepted laboratory methods.



Leaves first slightly wilt and may remain green. Soon they turn a lemon yellow color and wilt and dry along the margins. Tissue between the veins often turns yellow first and later dies. The leaf below is typical of an advanced stage. Soon leaves are completely wilted and dead.



Left—Ring rot symptoms of skin cracking and tissue discoloration often develop near potato eyes. This is apparent at harvest. Center—Early internal symp-

toms of cream to straw colored vascular tissue. Right—Scattered areas of discoloration appear in the vascular ring along with some breakdown in the pith.



## DISEASE CYCLE

Bacterial ring rot is carried only in potato vines and tubers. It does not survive in soil, so crop rotation provides no control. Volunteer plants which may have grown from infected tubers left over by the previous crop will establish the disease in a new crop of potatoes. For this reason, crops should be rotated where volunteer plants develop. The disease spreads mainly by infected seed tubers. Since it is highly infectious, even a small amount of ring rot in seed presents a serious threat to the succeeding crop.

Bacteria will survive for some time in dried bacterial masses from spoiled tubers in sacks, bins, warehouses, and on the surface of potato handling, grading, and planting equipment. Spread of ring rot occurs primarily during seed cutting, planting with a picker-planter, and digging. Ring rot is spread from plant to plant in the field by cultivating and other machinery.

## CONTROL

Best control method is to use ring rot free certified seed. The potato industry would indeed be in serious condition without such seed. One of the most important reasons for consistent use of certified seed is that it is the best means of avoiding the disease.

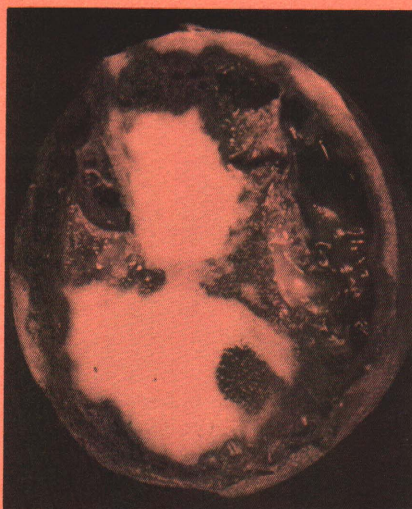
### Remove Infected Seed

All infected potato stocks should be removed from the farm and storage facilities. Equipment should be thoroughly disinfected before new disease-free seed is delivered.

### Disinfect

NOTE—It is important to remove all dirt and trash from surfaces to be treated.

Bins, crates, warehouses, potato handling equipment, and the like should be disinfected using a chlorine solution (sodium or calcium hypochlorite) 1,000 to 2,000 parts per million concentration. (Commercial formulations vary in concentration; therefore follow manufacturers' recommendations in making solutions of proper concentration. Example:



Top and center—More advanced stages involve rot of the pith and the vascular ring. Bottom—here only the tuber shell remains after destruction by ring rot and soft rot.

Perchlorin is a granule containing 70% calcium hypochlorite. It takes 5 tsp. of the formulation in 3 gals. of water to make a solution of 1,000 ppm.)

Chlorox containing 5.25% active chlorine may be used (1 pint per gal. of water).

OR

Quaternary ammonium compounds HYAMINE 2389 (Rohm & Haas), ODORLESS DISINFECTANT (Haviland), AQUAHYME (E-Z-Flo), used according to manufacturer's recommendations. The addition of a wetting agent with quaternary ammonium sprays or drenches is suggested, in order to get more uniform coverage of surfaces. Use only those wetting agents recommended by the manufacturer, since some are not compatible.

OR

Soluble copper sulfate (BLUE VITRIOL, BLUESTONE, etc.), 10 to 15 lbs. per 100 gals. of water.

OR

Formaldehyde 37% commercial formulations 2½ gals. per 100 gals. of water. Since this material is highly volatile and has a fumigating action, heated storages should be closed or treated equipment covered for 24 hours, then aired until there is no longer an odor. (Not to be used for bags.)

OR

Mercuric chloride (bichloride of mercury, corrosive sublimate, sold in powder or tablet form) is used to disinfect cutting knives at 1 or 2 parts in 1,000 parts of water (1 or 2 oz. of powder in 7½ gals. of water or 1 or 2 7.3 grain tablets in 1 pint of water).

MERCURIC CHLORIDE IS DEADLY POISON! USE WITH CAUTION! FOLLOW DIRECTIONS ON LABEL!

### Resistant Varieties

Certain varieties, such as the Merrimack and Teton, are resistant to ring rot. However, most commercial varieties of potatoes can only be grown by the use of rigorous control measures to eliminate ring rot and by the use of ring rot free seed.