



AVRDC - The World Vegetable Center

# Fact Sheet

## Pepper Diseases

# Bacterial Soft Rot

*Erwinia carotovora* ssp. *carotovora*

Found worldwide

## Symptoms

Initial symptoms often appear in pepper leaves, which show dark veinal tissue followed by leaf chlorosis and necrosis. The pith and vascular system within nearby stems may show internal dark brown discoloration.

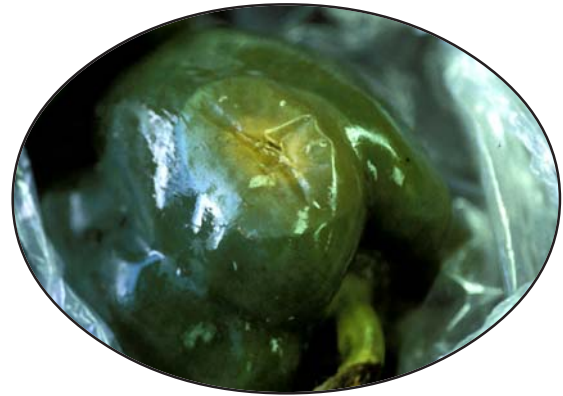
As the disease progresses, dry, dark brown or black stem cankers develop, often resulting in the breakage of branches. Bacterial ooze may or may not be evident from diseased tissues depending upon the bacterial isolates involved. The affected plants wilt and die later.

The fleshy fruit peduncle is highly susceptible and is frequently the initial point of infection. Both ripe and green fruit may be affected. Initially, the lesions on the

fruit are light to dark-colored, water-soaked, and somewhat sunken. The affected areas expand very rapidly, particularly under high temperatures, and tissues lose their texture. In later stages, bacterial ooze may develop from affected areas, and secondary organisms follow, often invading the rotted tissue. The affected fruit hang from the plant like a water-filled bag.

## Conditions for Disease Development

The bacteria may persist in fields where peppers are rotated with other susceptible crops such as cabbage and potato.



## How to Identify Bacterial Soft Rot



Post-harvest softening of stem end of fruit



Collapsed, hanging, rotting fruit

The bacteria may be present as a contaminant on the surface of pepper seed.

The bacteria can be transmitted by drainage water, irrigation water, or by sprinkler irrigation, but a wound is necessary for infection to occur. Wounding often arises from rough handling of plants during weeding, or due to a strong wind, or from insect feeding. European and Asiatic corn borers may introduce bacteria into the fruit peduncle of pepper during feeding.

A high rate of nitrogen fertilization is associated with increased susceptibility to soft rot. Warm, moist weather is also highly favorable for infection.

Once bacterial decay occurs in the fruit, the inoculum from the rotting fruit can be readily dispersed to nearby healthy fruit, or by workers handling the fruit during harvest. Stems of pepper plants infected with the bacteria and subjected to temperatures of 25° to 30°C at a relative humidity (RH) of 95% after infection collapse after 48 hr. At 21°C and 75% RH, stem cankers develop much more slowly, first causing plant wilting and then taking several weeks before plants die.

Post-harvest soft rot of pepper fruit arises when either: infected fruit is harvested with healthy fruit; harvest containers are contaminated with the bacteria; fruit is damaged during packing; or if fruit is subjected to contaminated wash water, contaminated surfaces or soil debris.

## Control

Early detection of symptoms, the disinfection of pruning tools, avoidance of wounding plants, and the maintenance of rigorous sanitation practices will reduce disease incidence and severity.

*Seed treatment* – To prevent contamination from seed, treat seeds with 1% sodium hypochlorite (mixed from commercial bleach) for 30 sec, then rinse with clean water.

*Nethouse/Greenhouse* – Good crop hygiene is essential. Remove and discard strings or stakes that may harbor a bacterial film from infected plants. If the crop was grown in soil, the beds should be disinfested. Soilless growing media from infected plants should be discarded far away from the greenhouse and buried. In both cases this is to destroy small pieces of infected plant tissue that may be present on the surface. It is very important to remove pepper debris such as fallen, diseased leaves from alleyways. The bacteria may persist in this infected tissue for several days.

Avoid handling diseased plants. If only a few plants are infected, they should be removed carefully and placed in a plastic bag. Bury the diseased material at a location away from the greenhouses.

In general, if plant debris is disposed of in a cull pile, then ensure that the cull pile is buried away from the greenhouse as far as possible or that it is covered.

Pruning tools used to handle infected plants should be sanitized by dipping in disinfectant after each contact with the affected plant since bacteria may be present on the stems, petioles or fruit peduncles. After leaving the affected areas, workers, particularly those who come in contact with diseased plant material, should discard disposable gloves and boots in a proper manner, leave shoes/boots for disinfection, and leave coveralls for laundering and disinfection.

Avoid planting young pepper plants in a nethouse/greenhouse while diseased plants remain.

Control weeds around the nethouse/greenhouse since the bacterium has a very wide host range and could persist on these plants.

At the end of the growing season, if many pepper plants are affected, greenhouses/nethouses should be thoroughly cleaned and disinfested.

*Field* – Careful weeding, cultivating, and harvesting are important to minimize fruit injury. Avoid working in fields when the foliage is wet. Work in unaffected areas first, and in affected areas last. Plant in well-drained soil. Use deep well water if surface water is contaminated. Avoid damage to plants during weeding operations or handling of plants. Disinfect hands and tools when working with pepper plants. If small numbers of plants are affected, these may be carefully removed and burned or disposed of in cull piles. In fields where large numbers of pepper plants are affected, rotation with soybean, corn or bean and deep plow-down of crop residues will reduce levels of overwintering inoculum.

Avoid planting pepper crops following crops of potato or cabbage. Rotate instead with crops of bean, corn and soybean. Prevent the occurrence of insect wounds by controlling insects that feed on pepper tissue.

Resistant varieties or pesticides that control this disease are not available.

*Post-harvest* – Use chlorinated wash water to reduce populations of soft rot bacteria and to reduce the risk of infection during washing. This will not reduce soft rot development in fruit infected with the bacterium prior to harvest. Allow fruit to dry thoroughly. During packing and storage, the fruit should be kept clean and maintained in a cool, dry place.

**For more information on the production of pepper and other vegetables, go to <[www.avrdc.org](http://www.avrdc.org)>.**