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W273 Black Rot of Crucifers

Steve Bost

UT Extension
W273

Plant Diseases

Black Rot of Crucifers

Steve Bost, Professor, Entomology and Plant Pathology

Black rot, caused by the bacterium *Xanthomonas campestris* pv. *campestris*, is a common and sometimes serious disease of plants belonging to the cabbage family (crucifers). These plants include broccoli, Brussels sprouts, cabbage, cauliflower, collards, kale, kohlrabi, mustard, radish, rutabaga and turnip. Although the disease is often of minor importance, it can become serious and cause severe losses if weather conditions are suitable.

Symptoms

A common early symptom of black rot is marginal leaf yellowing, often in a wedge or "V" shape (Figure 1). Within the yellowed areas, tissues may become necrotic (deadened) and leaf veins become darkened, usually black.

Figure 1. V-shaped lesions of black rot.

From seed, leaf or root infections, the bacterium can become systemic in the plant, spreading throughout it in vascular tissue. A cut through a stem or petiole will reveal a black discoloration of the vascular tissue. A general yellowing of the leaves will occur, and in advanced stages, the leaves may become necrotic and drop from the stem. Infected cabbage heads often do not reach full size and deteriorate rapidly after harvest. Soft-rotting bacteria often colonize tissues affected by black rot, resulting in a foul-smelling decay of stalks and/or heads (Figure 2).

Figure 2. Soft rot of cabbage head following black rot infection.

Seedling infection is often difficult to detect. Affected leaves may drop from the plant, and only a few of the seedlings in a lot may have the disease. Infected seedlings may be stunted, light green, exhibit one-sided growth and contain darkened stem vascular tissue. Seedlings produced from infected seeds usually die soon after emergence but serve as a source of inoculum for other seedlings.

Although the distribution of diseased plants in the field is usually quite uniform, the disease may be more severe in low and shaded areas. If a few infected seedlings were set in the field, scattered pockets of diseased plants would appear in the field early in the growing season. Diseased plants often appear in the same rows as a result of spread during cultural operations.

Disease Cycle

The causal bacterium overwinters in crop debris and cruciferous weeds, such as wild radish, wild turnip, wild mustards, Virginia pepperweed and shepherdspurse. Infected crop seeds allow long-distance spread of the disease, giving rise to infected plants. The bacterium can be spread within and between fields on windblown plant debris, splashing water, farm machinery, insects and animals. The bacterium can cycle from crop to crop, or from crop to weeds and back to crop. Survival in the soil can last as long as the plant debris remains undecomposed, perhaps as long as two years in some areas.

The bacterium enters the plant through injuries and natural openings (hydathodes, stomates). Entry through hydathodes, which are present on leaf margins, is responsible for the marginal yellowing. The bacterium can enter the plant roots through wounds that occur during transplanting or through the normal tissue breaks that occur in a root system as it grows. These portals of entry are most significant if the soil is saturated with water from rain or irrigation. Wet, warm weather favors spread and disease development.

The optimum temperature range for growth of the bacterium is 80-86 degrees F. The minimum temperature is 41 degrees, and the maximum, 97 degrees. After plants are infected, marginal leaf lesions can be found within eight to 12 days. Under cool conditions, symptom expression may require six weeks or more.

Control

- Obtaining certified disease-free seed or transplants is a must. Seed should be produced in arid regions, such as the western United States, and tested for black rot. If the seedlot is known to be contaminated, i.e., testing positive at any level, it should not be used. The seed can be treated with hot water, preferably by the seed producer, but this practice can reduce germination. Other seed treatments can be used, but are not effective in reducing bacteria inside the seeds. Seeds of cabbage, broccoli and Brussels sprouts are soaked at 122 degrees F for 25 minutes; those of cauliflower, kohlrabi, kale, turnip and rutabaga for 15 minutes.

- In transplant production, use new trays or, if re-using trays, wash and bleach-sanitize them to avoid potential infection from carryover debris. To discourage plant-to-plant spread, avoid clipping transplants, and don't purchase transplants that have been clipped. Do not handle plants when they are wet. Tools or containers used to transport plants to the field may need to be disinfested.

- In the field, follow at least a three-year rotation (two years between cruciferous crops), to allow time for decomposition of crop debris and to allow you time to eliminate cruciferous weeds in the field. Make a concerted effort to eliminate these weeds (see Disease Cycle) and volunteer cruciferous plants in and around fields.

- Avoid sprinkler irrigation and contacting plants when they are wet. If black rot is present, airblast sprayers can spread the bacterium.

- Do not allow machinery and equipment movement from infested to non-infested fields.

- Plow-down production fields as soon as possible after harvest to hasten tissue decomposition.

- Chemical control is very limited. Sprays of fixed copper products may slow the spread of black rot. However, the effectiveness of copper can be negated during periods of high disease pressure, such as rainy periods. Also, copper has been known to cause undesirable black specks on cabbage.

- Cabbage and broccoli varieties with moderate to high levels of resistance are available. The Southeastern U.S. Vegetable Crop Handbook contains recommended varieties for Tennessee. Resistant varieties are not available for other crucifer crops.

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