Black-rot of Crucifers

Walter R. Stevenson

Donald H. Scott

Paul C. Pecknold
Black-rot of Crucifers

Walter R. Stevenson, Donald H. Scott, Paul C. Pecknold
Extension Plant Pathologists

Black-rot is a potentially serious disease of crucifers in Indiana. In a year when plentiful rainfall or heavy dews and average temperatures of 60 to 70 degrees F are present, black-rot can be a major limiting factor to cultivation of cruciferous crops in Indiana. Commercially-grown crucifer crops as well as a number of crucifer weeds are susceptible to black-rot.

Losses caused by black-rot can be significantly reduced by following a well-planned, integrated control program.

Causal Organism and Disease Cycle

Black-rot is caused by a bacterial pathogen, Xanthomonas campestris, which successfully survives from one season to the next, both in diseased plant debris and seed. Bacteria are spread to seedlings or older plants throughout the growing season. Infection occurs most often through water pores (hyathodes) located along the leaf margins. Droplets of water exuded from these pores are particularly noticeable in

Figure 1. Typical V-shaped marginal leaf lesions.

Figure 2. Heavily-infected cabbage plant with numerous V-shaped marginal leaf lesions.

Cooperative Extension Work in Agriculture and Home Economics, State of Indiana, Purdue University and U. S. Department of Agriculture Cooperating. H. G. Diehl, Director. West Lafayette, Ind. Issued in furtherance of the Acts of May 8 and June 30, 1914. It is the policy of the Cooperative Extension Service of Purdue University that all persons shall have equal opportunity and access to its programs and facilities without regard to race, religion, color, sex or national origin.
the early morning hours on undisturbed plants. These water droplets are retracted into the plant during the day, and any bacteria gaining entrance to these droplets are pulled back into the plant with the water. Chewing insects can also transmit this pathogen while feeding.

Once initial infection has taken place and the bacterial population begins to multiply within a susceptible plant, black-rot bacteria can move throughout the field by several methods. These include wind-blown rain, overhead irrigation water, cultivating and other farm implements, surface drainage water, and insects.

Symptoms

Early symptoms can be recognized by localized areas of yellow tissue which enlarge from the margin toward the center of the leaf. When held up against a strong light, leaf veins in these chlorotic areas appear unusually dark in color. As these areas enlarge, they most often are V-shaped with the base of the V pointing toward the leaf midrib. The V-shaped areas soon die, turn brown, and dry as the disease progresses (Figures 1 and 2). A cross-section of the stem and petioles of plants in advanced stages of the disease will show a blackening of vascular tissue (veins) (Figure 3). Dwarfing and one-sided growth are additional symptoms that may be present in advanced stages.

Control

Cultural practices provide the best means of controlling black-rot. Particular emphasis should be placed upon controlling entry of black-rot into seedbeds and fields. Seed from the Pacific Northwest is usually free from black-rot bacteria because of very low rainfall during periods of seed production in that area. If certified disease-free and/or hot water-treated seed is not available, you should perform your own hot water treatment. Place seeds loosely in a cloth bag and soak for 10 minutes in water at 100 degrees F to warm the seed prior to heat treatment. Seeds of brussels sprouts and cabbage are then placed in a water bath at 122 degrees F for 25 minutes. Seeds of broccoli, cauliflower, chinese cabbage, collard, kale, kohlrabi, rape, rutabaga and turnip are treated at 122 degrees F for 20 minutes. Maintenance of exact temperatures for the specified periods is critical and requires a carefully-calibrated water bath. A temperature that is 2 or 3 degrees too high may kill or injure seeds while too low a temperature might not completely eliminate the pathogen. After treatment, seeds should be cooled in cold water and spread out to dry. Protective fungicides such as captan or thiram are generally applied to hot water-treated seed after treatment to protect seedlings from damping off fungi. Improper hot water treatment can result in severe seed injury particularly on old seed. Thus a small sample of any seed lot over 1 year old should be treated and tested for germination to determine the amount of injury, if any, that might occur.

Seedbeds and fields must be kept free of black rot bacteria. Only hot water treated seed or certified disease-free transplants should be planted. It is suggested that a 3- or 4-year rotation be followed between crops of the crucifer family. It is also wise not to plant crucifer crops in adjoining fields during

Figure 3. Cross section of cabbage stem with extensive vascular discoloration.
consecutive years. Cruciferous weeds such as shepherds purse and mustard must be controlled during all phases of rotation.

Care must be taken during seedbed watering to avoid splashing water from plant to plant and thus avoid dissemination of bacteria. Transplants should not be clipped to improve size uniformity. Only new crates or crates that have never been used for shipping crucifers should be used for shipping transplants.

Crucifer fields should be inspected frequently for symptoms of black-rot. Removal of individual plants showing symptoms of black-rot early in the season may help to reduce secondary field spread. Fields with suspected symptoms of black-rot should be cultivated and/or sprayed last in sequence to avoid carrying the bacterial pathogen to new areas on equipment. Never cultivate, spray, or move irrigation pipe when foliage is wet. Spraying infected fields with a fixed copper fungicide may help in control of secondary spread of black-rot to healthy plants depending upon environmental conditions. Follow manufacturers' label directions.

Cruciferous planting should be plowed as soon after harvest as possible to hasten breakdown of plant refuse. Where black-rot is known to be a problem, all equipment including crates, cultivators, and harvest equipment should be treated with either live steam or a disinfectant such as a 10% Clorox solution after use to prevent movement to additional fields or carryover to next year's crop.

Varieties of crucifers resistant to black-rot are not yet available although inheritance of resistance in cabbage has been studied extensively. Plant breeders are attempting to incorporate resistance into commercially acceptable cabbage varieties. Resistance or high tolerance offers an inexpensive, but highly effective method of black-rot control.

---
The information given herein is supplied with the understanding that no discrimination is intended and no endorsement by the Indiana Cooperative Extension Service is implied.