

Black Rot of Crucifers

Andrew Pape*, UW-Madison Plant Pathology

What is black rot? Black rot is a potentially lethal bacterial disease that affects cruciferous vegetables such as broccoli, Brussels sprouts, cabbage, cauliflower, kale, rutabaga and turnip, as well as cruciferous weeds such as shepherd's purse and wild mustard. Black rot occurs worldwide wherever cruciferous plants are grown and makes cruciferous vegetables unfit for the marketplace or the table.



Black rot causes V-shaped yellow and brown/dead areas in affected leaves. (Photo courtesy of Amanda Gevens)

What does black rot look like?

Black rot symptoms may not develop for more than a month after cruciferous vegetables start to grow. Initial symptoms are irregular, dull, yellow blotches that appear on the edges of leaves. As the disease progresses, these blotches expand into V-shaped areas with the wide part of the "V" at the edge of the leaf and the point of the "V" toward the attachment point of the leaf to the plant. The V-shaped areas are initially yellow, but eventually become brown and necrotic (i.e., dead) in the center with a yellow border or halo. Veins in affected areas are brown or black, forming to a net-like pattern (often most visible when leaves are held up to the light). Later, interior stem tissue (specifically the water conducting tissue) will also turn brown or black. At this point, affected plants tend to show symptoms of wilting.

Black rot can also predispose vegetables to other rot diseases such as bacterial soft rot (see University of Wisconsin Garden Facts XHT1224 "Bacterial Soft Rot").

Where does black rot come from? Black rot of crucifers is caused by *Xanthomonas campestris* pv. *campestris* (Xcc). This bacterium is most often introduced into a garden on or in seeds and transplants of susceptible vegetables. By some estimates, a single infected seed in 10,000 can lead to a severe outbreak of the disease if environmental conditions are favorable. Favorable conditions include warm temperatures (approximately 80 °F) and high humidity. Once introduced into a garden, Xcc can survive in residues from susceptible vegetables or on weed hosts. Xcc can subsequently enter susceptible plants through roots, through natural openings in leaves or through wounds made by tools, rough handling, or insect feeding. Cruciferous plants grown near infected plants and healthy plants handled with the same tools as diseased plants are at highest risk of becoming infected.

How do I save a plant with black rot? There are no curative treatments available to combat black rot once the disease has occurred. However, when disease severity is low, copper-containing fungicides that are labeled for use on cruciferous

vegetables may help limit additional disease development even though this disease is caused by a bacterium. See University of Wisconsin Garden Facts XHT1211, "Home Vegetable Garden Fungicides" for specific products. Be sure to read and follow all label instructions of the fungicide that you select to ensure that you use the product in the safest and most effective manner possible. At harvest, vegetables with low levels of black rot may be salvageable. Remove symptomatic leaves (or other plant parts) and store the remaining parts of the vegetables in a cool, but not overly wet environment.

How do I avoid problems with black rot in the future? Prevent introduction of Xcc into your garden by using certified disease-free crucifer seeds and transplants. If certified disease-free seed is not available, use hot water seed treatments to eliminate Xcc. Treat seeds of Brussels sprouts, collards, and cabbage for 35 minutes in water that is 122°F. Treat seeds of broccoli, cauliflower, kale, kohlrabi, rutabaga, and turnips for 20 minutes in water that is 122°F. DO NOT plant cruciferous vegetables in the same area of your garden every year; rotate (i.e., move) these vegetables to different locations within your garden. For more information on rotation see University of Wisconsin Garden Facts XHT1210, "Using Crop Rotation in the Home Vegetable Garden".

Once your cruciferous vegetables are growing, be sure to fertilize them appropriately. In particular, inadequate nitrogen can predispose plants to black rot. Also, be gentle with cruciferous vegetables to prevent any wounds that might serve as entry points for Xcc. DO NOT use a sprinkler to water your vegetables as this can splash Xcc from plant to plant. Instead use a soaker or drip hose that applies water directly to the soil. Avoid working with plants when they are wet to help limit spread of Xcc. If severe black rot develops, promptly remove symptomatic plants as well as all cruciferous plants within a three to five foot radius. Dispose of these plants by burning (where allowed by local ordinance), burying or composting them. If you decide to compost, make sure your compost pile heats to a high enough temperature and that any infested material decomposes for at least one year before it is reincorporated into your garden. For more information on how to properly compost, contact your local county Extension office. Finally, decontaminate any pots, tools, or other gardening items that have come into contact with Xcc-infected plants or Xcc-infested debris by treating them for at least 30 seconds with 10% bleach or 70% alcohol (preferable for metal tools because of its less corrosive properties). Rubbing alcohol and many spray disinfectants typically contain approximately 70% alcohol.

For more information on black rot: Contact your county Extension agent.

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