

Cole Crop Disease Management

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Managing diseases of cole crops can be a challenge. Cool and wet weather will certainly increase disease pressure on these crops (as well as on everything else you are growing), while hot dry weather can stress the plants. Some of the more common diseases we saw in New York in 2014 were black rot, downy mildew, and *Alternaria* leaf spot. The best way to manage disease is to 1) grow resistant varieties when available 2) start with disease-free seed or transplants 3) rotation is critical – minimum three year rotation before growing another brassica crop 4) foliar pathogens generally need water on the plant leaves to cause disease so reducing overhead irrigation can go a long way in disease management as long as we don't get too much rain! This overview provides a description and control strategies for each of these common diseases.

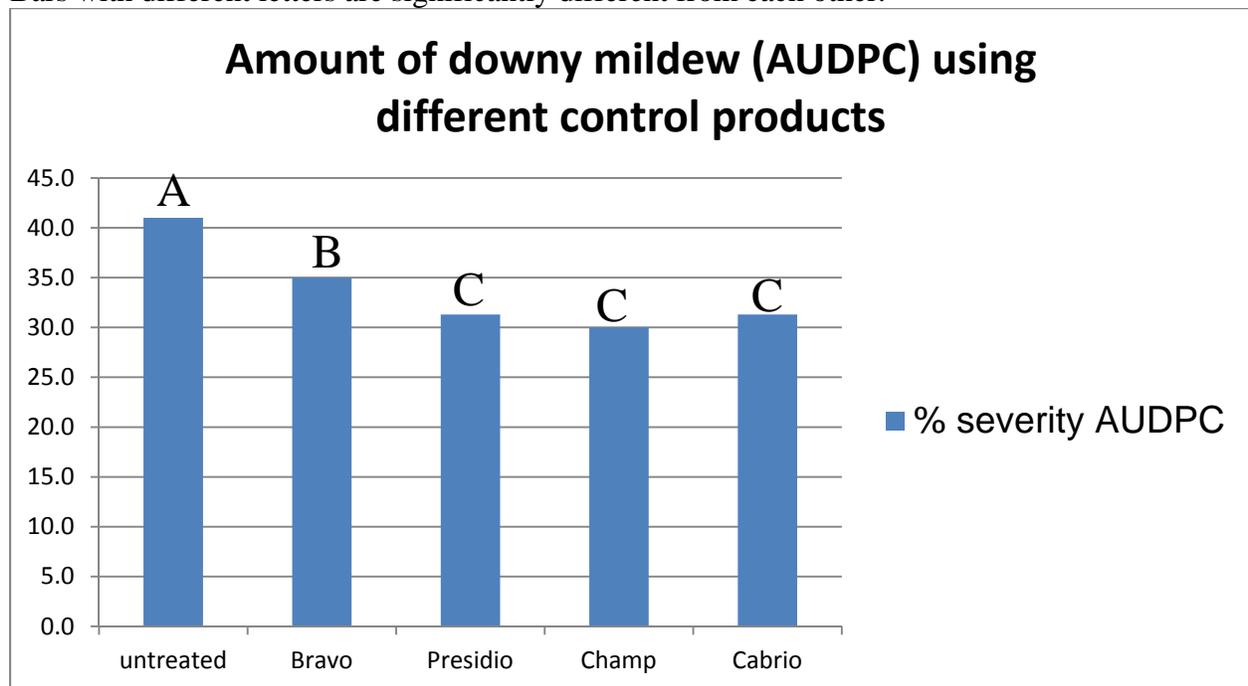
Black rot is a disease that my lab has studied for quite some time. Caused by the bacterial pathogen *Xanthomonas campestris* pv. *campestris* (Xcc), black rot thrives in wet and warm weather. Symptoms of black rot generally begin with yellowing at the leaf margin, which expands into the characteristic V-shaped lesion. This pathogen is systemic, meaning that it can enter the veins of the plant and spread throughout the plant and even into the cabbage head. Blackening of the vascular tissue is typical in severe infections. As with most bacterial pathogens, control can be very difficult when the weather is conducive for disease. Once a plant is infected, there is no rescue treatment since the pathogen is systemic. Copper-based products are effective in controlling spread to healthy plants. Work done in my lab has shown that new strains of Xcc enter the state each year, and that the pathogen generally does not overwinter in NY.

During the summer of 2014, my lab started a new project to determine if commonly used brassica cover crop species could serve as a host for the black rot pathogen Xcc. Cover crops including; radish, mustard, rapeseed, turnip, and canola, were seeded in the greenhouse and three plants per variety were inoculated with four different strains of Xcc. Plants were monitored for the development of symptoms, and unusual growth. We also attempted to isolate the pathogen from plants at 4 weeks post-inoculation since it is possible that a plant could harbor the bacterium with no symptoms. All cover crops tested (3 radish, 4 turnip, 6 mustard and three rapeseed/canola) could serve as a host for Xcc, with the radishes having the highest incidence of disease symptoms. Four strains of Xcc were tested, and there was a crop/strain interaction in that some crop species were more susceptible to one strain of Xcc compared to another. Additionally it was possible to recover Xcc from plants with no symptoms.

Downy mildew is caused by the fungus-like water mold *Hyaloperonospora parasitica*. This pathogen thrives in cool, wet weather. We see this disease most often on young transplants in early spring, or older plants in the late fall (when there is lots of dew). Symptoms start as small yellow or brown leaf spots. In conditions of high humidity, white spores of the pathogen can be seen on the bottom side of the leaf. The best cultural control is to keep the leaves as dry as possible, since leaf wetness is needed for spore production, germination and infection. Since the pathogen can over-winter in the soil, rotation is key.

We were able to test several products for efficacy against downy mildew during the 2014 season. Cabbage transplants were moved to the field in July, and the experiment was conducted later in the season as downy mildew appears most commonly in the fall. Applications of control products began in August and continued into early September. Products included were Champ (77% copper hydroxide), Bravo weather stik (chlorothalonil), Cabrio (pyraclostrobin) and Presidio (fluopicolide). A non-treated control was also included. Plants were sprayed five times (7 day interval) and no phytotoxicity was observed. While all treatments worked better than the untreated control, Champ, Cabrio and Presidio were significantly better than Bravo (Figure 1). This experiment will be repeated in 2015.

Figure 1. Control of cabbage downy mildew using four different control products. The results shown are the area under the disease progress curve (AUDPC = amount of disease over time). Bars with different letters are significantly different from each other.



Alternaria leaf spot is a fungal disease caused by several species of the fungus *Alternaria* but the most common culprit in NY is *Alternaria brassicicola*. The disease begins as small black or brown dots on the leaf surface, which grow in size and become dark target-shaped lesions on the leaf. The older lesions produce many black spores that can spread to other plants by wind, water or animals. The *Alternaria* pathogen needs either free water or very high humidity for spore production, germination and infection, so wet seasons certainly increase the chances of this disease. The fungal spores can survive on seed, susceptible weeds, or on crop debris in the field. Cultural controls include; removal of diseased seedlings from a greenhouse or seed bed, a three year rotation away from crucifer crops, destroy crop debris after harvest, and increase row spacing to increase air movement.

We are currently completing assays on isolate diversity of the fungus that causes *Alternaria* leaf spot in NY, using about 60 isolates collected from around the state. We know there is diversity, but not yet sure how much. Understanding diversity is important because we need to be certain that a diverse set of isolates are tested for pathogenicity and fungicide resistance. In addition, we tested 12 cauliflower varieties for susceptibility to *Alternaria* and also for beneficial horticultural characteristics such as curd weight and curd width. We found Graffiti and Violet Queen (both purple) to be significantly less susceptible than other white varieties (Fremont and Cassius), but had other undesirable horticultural characteristics. Varieties with the largest curd weight included Candid Charm, Apex, Artica, and White Sails. This trial will be performed again in 2015 to have two seasons of data.