Managing bacterial black rot with pesticides

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Black rot, caused by the bacterium *Xanthomonas campestris* pv. *campestris* (Xcc), is a significant disease of cabbage, and other crucifer crops world-wide. This disease is an annual problem for the cabbage industry in New York. Based on previous research funded by the cabbage research and development program, we know that new strains of Xcc arrive each year either on seed or on diseased transplants and the pathogen then spreads during transplant production and in the field when appropriate environmental conditions exist. With this information in hand, the current research project had the goal of determining the efficacy of available control strategies to prevent the spread of Xcc. Additionally, we isolated Xcc from symptomatic plants collected across New York State. Because we have found that new isolates commonly enter the state each year, we did not plan to DNA fingerprint every isolate collected (as we have in the past). However, since only 14 isolates were collected, we did fingerprint each isolate and found new strains of Xcc which were different from those seen in 2009.

Results

Experiments to study disease control during transplant production were performed in our "disease greenhouse", where biorational and conventional pesticide treatments were applied.

Treatments included:

1. Actigard (Benzo (1,2,3) thiadiazole-7-carbothioic acid- S-methyl ester - a plant defense response inducer)
2. Kocide (copper hydroxide)
3. Compost tea (a protozoan-based tea)
4. Untreated control

Plants were inoculated with Xcc in two ways 1) seed was inoculated prior to planting or 2) plants were inoculated with Xcc 24 hours after the first application of Actigard, Kocide, or compost tea (plants were about three weeks of age). All transplants were treated with a total of three applications in the greenhouse, at approximately 3, 4 and 5 weeks of age. Plants were moved to the field at 6 weeks of age, and three additional applications of the appropriate treatment were applied on a seven day schedule. Black rot symptoms appeared several weeks after transplanting in the field. Plants were counted at three and eight weeks post-transplant to evaluate differences in the % survival of plants in each treatment. Disease incidence and severity were rated weekly, starting at three weeks post-transplant. Plants were evaluated weekly for growth habit to determine if application of black rot control products during transplant production has an impact on normal plant growth in the field. No impact on plant growth was seen, but severe black rot may have masked such symptoms.

Treatments	%survival 3weeks	%survival 8weeks	% disease incidence 3weeks	% disease incidence 8weeks	% disease severity 3weeks	% disease severity 8 weeks
Inoculated seed						
Untreated	72 a*	72 a	83.3 a	94.3 a	23.3 a	36.7 a
Tea	88 a	83 a	83.3 a	94.3 a	16.7 ab	38.3 a
Copper	78 a	78 a	72.3 a	82.3 ab	10.7 b	26.7 a
BTH	72 a	66 a	20.3 b	68.3 b	16.7 ab	36.7 a
Inoculated plants						
Untreated	66 b	62 b	72.5 ab	91.8 a	27.5 a	43.8 a
Tea	96 a	92 a	85.0 a	87.5 a	20.0 ab	35.0 ab
Copper	96 a	75 ab	38.3 b	73.5 a	9.3 b	21.3 b
BTH	96 a	92 a	70.3 ab	90.0 a	23.8 ab	32.5 ab
Uninoculated						
Untreated	75 b	66 b	60.0 a	65.0 a	11.3 a	18.8 ab
Tea	83 ab	75 ab	55.0 a	60.0 a	17.5 a	26.3 a
Copper	96 a	75 ab	8.3 b	56.5 a	2.5 b	16.3 b
BTH	96 a	96 a	4.0 b	72.5 a	11.3 a	21.3 ab

* numbers are the means of 4 replications

*values within a column followed by the same letter are not significantly different

No single product was exceptional at black rot disease control. Interestingly, Actigard (BTH) was most effective at reducing disease incidence in inoculated seed, while Kocide (copper) was most effective at reducing disease incidence when transplants were inoculated. Importantly, 60% of the uninoculated and untreated plants had disease at 3 wks post transplant, while uninoculated plants that were treated with either BTH or copper had significantly less disease. Controlling spread of black rot in the greenhouse can help reduce disease in the field.

Potential black rot samples collected from fields throughout New York were received from August – October 2010. The black rot pathogen, Xcc, was isolated from 13 of the 14 samples collected, and the bacterial leaf spot pathogen (*Xanthomonas campestris* pv. *armoraceae*) was isolated from the other sample. Ten of the isolates had the same DNA fingerprint pattern, and those ten isolates were collected from five different farms. Two additional fingerprint patterns were identified among the three other isolates collected. All patterns identified in 2010 were different from the common isolate collected in 2009.