New Developments in Controlling Alternaria Leaf Spot in Cole Crops

INVESTIGATORS: **Helene Dillard, Joi Strauss, and Alissa Carissimi**
Department of Plant Pathology and Plant-Microbe Biology
NYSAES, Cornell University, Geneva, NY

Julie Kikkert and Christy Hoepting
Cornell Cooperative Extension Regional Vegetable Program
Canandaigua and Albion, NY

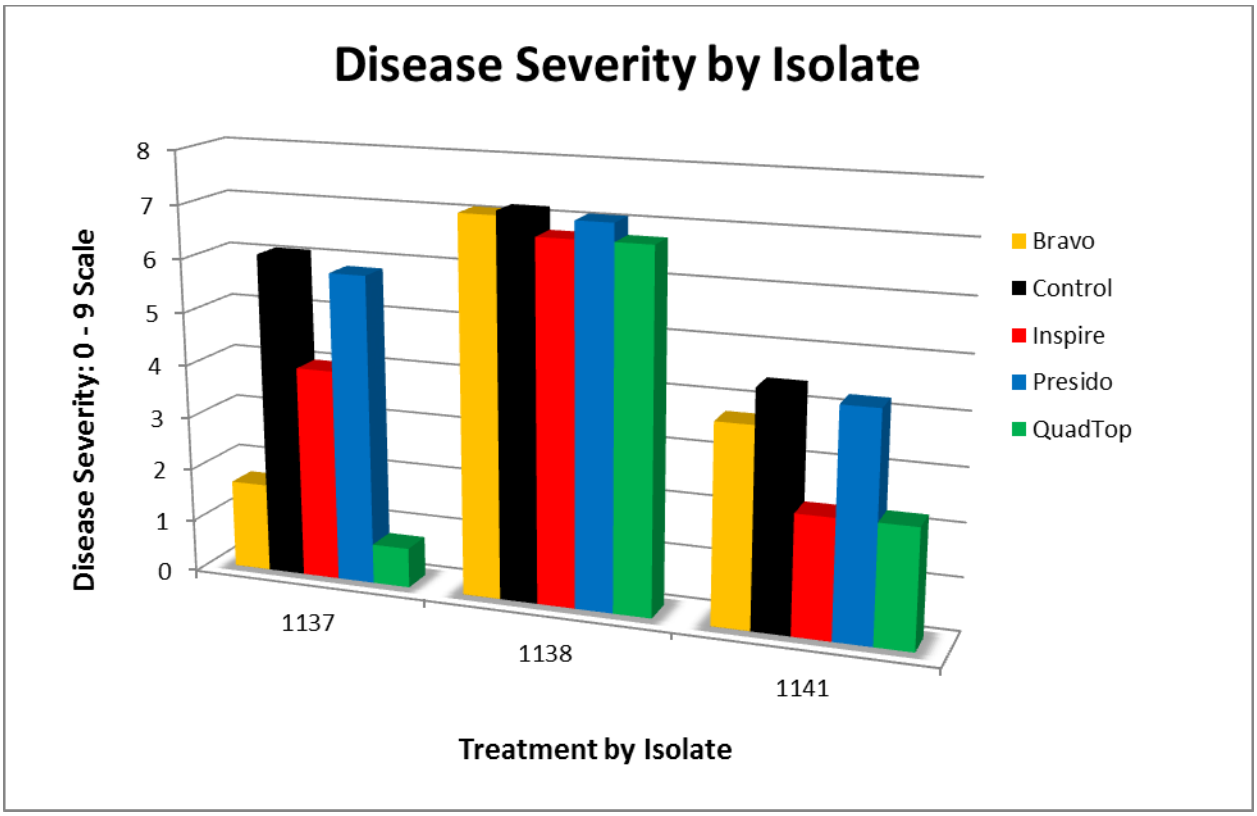
BACKGROUND

Alternaria leaf spot is difficult to control because there are several sources of the fungus: infected and/or infested seed, infested debris in soil, infected weeds and nearby infected cruciferous crops. The disease can be caused by either *Alternaria brassicae* or *Alternaria brassicicola*. The predominant fungal species found on cabbage in New York State is *A. brassicicola*. The symptoms of Alternaria leaf spot start off as innocent dark spots on the leaves, which enlarge over time and result in substantial lesions with concentric rings where dark spores are produced. Defoliation of the outer leaves may occur on severely infected plants, and extensive trimming may be required to remove infected leaves from the cabbage head at harvest. In susceptible varieties, significant yield loss and quality reduction may occur.

RESEARCH RESULTS

Collection of isolates of Alternaria brassicae and Alternaria brassicicola for use in research.
In 2011, Alternaria leaf spot did not develop in fields until August due to delayed plantings and hot dry conditions in July. A total of 19 distinct isolates were cultured and an additional 6 isolates are in the process of being cultured at the time of this report preparation. The majority of isolates came from cabbage, but isolates were also cultured from cauliflower, Brussels sprouts, broccoli, and kale. The isolates were obtained from Seneca, Ontario, Monroe, Suffolk, Washington, Orleans, Genesee, Ulster and Albany counties.

Last winter, we initiated studies in the greenhouse with three new materials – Presidio, Inspire, Quadris Top - and recorded their ability to suppress disease caused by the Alternaria isolates collected in 2010. We found that the isolates of Alternaria that we tested varied significantly in their ability to cause disease in the presence of the test fungicides. Some isolates seem to be very aggressive, and only minimally suppressed by fungicides. An illustration of the variability we observed in greenhouse studies is shown below.



This winter we will conduct the same greenhouse studies on the isolates collected in 2011. We are very concerned that part of the reason some producers are having difficulty controlling Alternaria leaf spot is because the isolates in the fields are not sensitive to certain fungicides. Characterization of these isolates will provide producers with a better understanding of which fungicides are most effective against the isolates of Alternaria that are in New York State, which fungicides are not effective against these isolates, geographic locations where the problem is greatest and strategies that can be deployed by producers to combat the disease. This research will ultimately save growers time and money by discontinuing the use of ineffective materials.

Fungicide trials in 2011. ***NOTE THAT SEVERAL OF THE TEST FUNGICIDES ARE NOT REGISTERED IN NEW YORK STATE. ALWAYS FOLLOW LABEL INSTRUCTIONS.*** ***Cabbage*** was transplanted on June 28 at the NY State Agricultural Experiment Station in Geneva. Fungicides were applied on September 9 and 23 using a CO_2 backpack sprayer fitted with three 8003 flat fan nozzles delivering 50 gal/A at 50 psi at 2.25 mph. The sprayer was configured with one nozzle positioned above the center of the row and two 9-in. drop nozzles horizontally angling into the rows. Because disease development was slow, we inoculated the plants with spores of *Alternaria brassicicola* using a Swissmex SP1 backpack sprayer at the rate of 25 gal/A. On August 26 spores were applied on the buffer rows. Spore applications on the treatment rows were applied on September 15 and 27. Due to dry conditions in July and to enhance disease development so that the fungicides could be challenged, the trials were irrigated. Disease severity of Alternaria leaf spot was rated on 2, 13 and 27 September and 11 and 25 October. Severity was determined on a scale of 0 to 9 as defined in the table below.

On October 28, ten cabbage heads from each replicate treatment row were harvested by hand. Heads were weighed, trimmed to remove diseased leaves and then reweighed. Mean disease severities were calculated. Alternaria leaf spot increased as the cabbage approached maturity. Final disease severity on the lower, mid, upper leaves and cabbage head in all of the treated plots was statistically less than in the control plot. Disease severity was generally greatest on the lower leaves. Endura and Quadris resulted in the lowest severity ratings on the lower and mid leaves. Endura resulted in the lowest severity ratings on the upper leaves and cabbage heads. There was a minimal significant difference in marketable yield, and no significant difference in total yield.

Treatment and rate/A	Final disease severity rating lower leaf[z]	Final disease severity rating mid leaf	Final disease severity rating upper leaf	Final disease severity rating head	Total wt (lb) for 10 heads	Marketable wt (lb) for 10 heads
Control ……....	8.8a[y]	7.3a	6.2a	5.6a	28.7a	23.1ab
Quadris F, 15.4 fl oz …….	5.8d	4.8cd	4.1c	4.0bc	26.7a	21.7ab
Endura 70 WDG, 9 oz ……..	5.3e	4.0g	3.9d	3.6e	24.8a	19.6b
Bravo WS, 1.5 pt ……..	6.4b	5.0c	4.1c	4.0b	25.0a	20.3ab
Switch 62.5 WG, 14 oz ……	5.7d	4.5ef	4.0c	3.9cd	30.0a	24.3ab
Cabrio EG, 16 oz ……..	5.7d	4.4f	4.0c	3.9cd	30.4a	25.2a
Inspire, 7 fl oz …….....	6.2c	4.6de	4.0c	4.0b	27.0a	22.3ab
Inspire Super, 20 fl oz …….	5.8d	4.3f	4.0c	4.0b	27.5a	22.1ab
Presidio, 4 fl oz …….....	6.6b	5.2b	4.3b	4.0b	26.8a	22.0ab
Quadris Top, 14 fl oz ..…….	5.3e	4.1g	4.0c	3.8de	24.7a	20.0ab
LSD ($P \leq 0.05$)	0.2	0.2	0.1	0.1	ns	5.5

[z] Mean disease severity rating based on a scale of 0-9: 0 = healthy, no apparent disease; 1= <5 pinpoint lesions (flecks); 2 = 6 to 10 flecks; 3 = 11 to 15 flecks; 4 = >15 flecks or a few large concentric-ring lesions; 5 = moderate flecking or a few large lesions; 6 = heavy flecking or moderate larger lesions; 7 = heavy flecking or many large lesions with mild tissue collapse; 8 = heavy flecking or many large lesions with moderate tissue collapse; and 9 = heavy flecking or many large lesions with extensive tissue collapse. [y]Means in the same column with different letters differ significantly according to Fisher's Protected LSD ($p \leq 0.05$).

Cauliflower was transplanted on July 7 at the same location as the cabbage trial, and treatments were administered in a similar fashion as the cabbage trial. At harvest on October 12, ten cauliflower heads from each replicate treatment row were harvested by hand. Heads were weighed and mean disease severities calculated. Final disease severity on the cauliflower head, and on the lower, mid, and upper leaves in all of the treated plots was statistically less than in the control plot. Disease severity was generally greatest on the lower leaves. Endura resulted in the lowest disease severity ratings on the upper leaves. Endura and Q8Y78 resulted in the lowest disease severity ratings on the cauliflower heads. Approach at the 8 oz rate, Approach plus NIS Induce, and Endura significantly increased total yield.

Treatment and rate/A	Final disease severity rating lower leaf[z]	Final disease severity rating mid leaf	Final disease severity rating upper leaf	Final disease severity rating head	Total YLD wt (lb) for 10 heads
Control ……....	7.9a[y]	5.6a	4.4a	7.8a	8.6b
Fontelis SC, 1 pt ……..…….	4.0b	3.3b	2.0b	3.4b	11.3ab
Fontelis SC, 1.5 pt ….……...	4.0b	3.3b	1.7c	3.4b	11.4ab
Q8Y78 240 SC, 18 fl oz ……...	4.0b	3.1c	1.3d	2.3d	12.3ab
Aproach 2.08 SC, 8 fl oz ..……	4.0b	3.3b	1.6c	2.9c	12.6a
Aproach 2.08 SC, 12 fl oz ……	4.0b	3.2bc	1.3d	2.7c	12.3ab
Aproach 2.08 SC, 12 fl oz + NIS Induce, v/v 0.25…….……	4.0b	3.1c	1.6c	3.1bc	13.2a
Endura 70 WG, 8 oz ….……...	4.0b	3.2bc	0.9e	2.0d	13.7a
LSD ($P \leq 0.05$)	0.1	0.2	0.3	0.5	3.7