

COMBATING ALTERNARIA LEAF SPOT IN COLE CROPS; NEW FUNGICIDES IN THE PIPELINE

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Alternaria leaf spot is a serious disease of crucifers that can be caused by either *Alternaria brassicae* or *Alternaria brassicicola*. The predominant fungal species found on cabbage in New York State is *A. brassicicola*. *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 symptoms of *Alternaria* leaf spot start off as innocent spots on the leaves, which enlarge over time and result in substantial lesions with concentric rings where 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.

In 1998, the Dillard lab completed a study that described a strong relationship between flea beetles (*Phyllotreta cruciferae*) and development of *Alternaria* leaf spot. Spores of *A. brassicicola* were found on all parts of flea beetle bodies including wings, mouthparts, antennae, and legs. Feces obtained from flea beetles that fed on cabbage infected with *A. brassicicola* contained intact and broken spores of *A. brassicicola* and undigested pieces of cabbage leaf. While this research helps explain outbreaks of *Alternaria* leaf spot in some fields where flea beetle populations are high, it does not explain outbreaks in all cases.

Throughout the 2010 growing season, Helene Dillard & Joi Strauss (NYSAES) and Julie Kikkert & Christy Hoepting (Cornell Regional Vegetable Program) surveyed cabbage fields for symptoms of *Alternaria* leaf spot. Despite the early heavy rains, disease incidence was low until the end of the growing season. In most fields in June, July and August, we found only very low levels of *Alternaria* leaf spot that did not warrant a fungicide spray for disease control. However, in September, October, and November, disease levels increased in most commercial fields.

Fungicide Field Trial: Cabbage transplants (Amtrak) were obtained from a commercial greenhouse and transplanted on July 1 using a water wheel transplanter into Lima silt loam soil at the New York State Agricultural Experiment Station in Geneva. The plots were arranged in a randomized complete block design with four replications. Each replicate plot was 25 ft in length with 30-in. row spacing and 18-in. plant spacing. Plants were inoculated on Sep 22 and Oct 5. Fungicides were applied on Sep 21 and Oct 1. At harvest on November 9, ten heads from each replicate treatment row were hand harvested. Heads were weighed, then trimmed to remove diseased leaves and reweighed. Trim weight (weight of the cabbage head with diseased tissue removed) and mean disease severity were calculated. *Alternaria* leaf spot was low to moderate in all plots and increased as the cabbage approached maturity. Final disease severity on the cabbage 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. There

were no significant differences in total or marketable yield, and no significant differences in the weight of diseased leaves removed from the cabbage heads.

Treatment and rate/A	Final disease severity rating lower leaf ¹	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	Wt of trim (lb) for 10 heads
Control	5.5a	4.5a	3.9a	3.2a	29.4 a	23.7 a	5.6 a
Quadris F, 15.4 fl oz ...	3.9d	3.0c	2.5e	2.0d	29.4 a	24.1 a	5.2 a
Endura 70 WDG, 9 oz .	4.0d	3.3c	2.7cde	2.4cd	33.8 a	27.4 a	6.4 a
Bravo WS, 1.5 pt	4.5bc	3.9b	3.0bc	2.6bc	30.1 a	24.5 a	6.0 a
Switch 62.5 WG, 14 oz.	3.9d	3.0c	2.6de	2.1cd	32.6 a	28.0 a	4.6 a
Cabrio EG, 16 oz	4.2cd	3.3c	3.0bcd	2.3cd	32.3 a	26.8 a	5.5 a
Rovral 4F, 2.0 pt	4.0d	3.2c	2.8cde	2.4cd	34.4 a	28.8 a	5.7 a
Actinovate SP, 12 oz + Induce 0.25% v/v	4.7b	3.9b	3.3b	3.0ab	33.2 a	27.9 a	5.3 a
LSD ($P \leq 0.05$)	0.5	0.4	0.4	0.5	ns	ns	ns

¹ Mean disease severity rating based on a scale of 0-9 as follows: 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.

Fungicide Greenhouse Trials: Twelve distinct isolates of *Alternaria brassicicola* were obtained from cabbage and cauliflower. The isolates were obtained from Ontario, Monroe, and Orleans counties. In addition, 5 isolates of a species of *Fusarium* that was associated with head rotting symptoms were also collected. The 12 *Alternaria* isolates are being used in greenhouse trials this winter to better quantify differences between fungicide treatments under controlled conditions and to look for differences among isolates in their sensitivity to fungicides. The treatments include Quadris Top, Presidio, Bravo and Inspire. Although only preliminary results are available at this time, findings so far indicate that Quadris Top is providing the best control of *Alternaria* leaf spot.

CONSIDERATIONS FOR 2011

From our survey it appears that *Alternaria* leaf spot is not a problem in commercial fields of cabbage early in the growing season. However, as day lengths shorten in early fall, daytime temperatures are lower, overnight dews become more prevalent, and rainfall occurs more often, *Alternaria* leaf spot increases and protectant fungicide sprays are warranted. *Alternaria* spots on cauliflower curds appear to be a problem throughout the growing season. Some producers have complained that Bravo is not providing adequate disease control. The new fungicides Presidio, Inspire and Quadris Top may be available to NY cabbage growers in 2011.