Epidemiology and Control of Alternaria Leaf Blight

Project No.: 01-BT-00 Correct Project Number 01-BT-01

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Objectives

1) Compare the environmental parameters occurring at the edges and within an orchard and relate these to disease development.

2) A. Determine the pathogen species composition present in selected orchards.
   B. Investigate the genetic variability among the pathogens and relationship to pathogenicity.

3) Determine the temperature for germination and sporulation of representative isolates of the three species of *Alternaria* identified.

4) Compare relative pathogenicity of representative isolates of the three species of *Alternaria*.

5) Test the efficacy of early spring treatments with iprodione on disease control and evaluate fungicides for disease control.

Summary

Alternaria leaf spot causes leaf lesions and defoliation, and can be found in orchards throughout the state. In most instances, noticeable defoliation occurs only after harvest and causes no apparent damage. Where severe and repeated preharvest defoliation occurs, most commonly in southern valley areas, trees are weakened and yield losses can exceed 50%. The disease appears to be exacerbated by dews and high humidity and often is worse on trees that have spreading canopies than those that are more upright.

The pathogen, *Alternaria alternata*, is actually a complex of several forms of the fungus. Recent advances in the taxonomy of *A. alternata* have elevated the forms to distinct species. Thus far we have identified three species, *A. alternata*, *A. arborescens* and *A. tenuissima* among our collection of isolates that were derived from lesions on almond leaves. The studies on the genetic variability among these isolates are in progress.

The field experiments were conducted in a commercial orchard in Kern County within a multiple-year experiment on the effects of tree architecture on disease development (see project on the effects of tree architecture on Alternaria leaf spot, Mario Viveros). One data logger equipped to measure leaf wetness, temperature and relative humidity was located in each of two cv. Butte rows. The rows were selected based upon the level of disease recorded in 2000: disease was light in row 4 and severe in row 24. Leaf infection was monitored at 7-10 day intervals on the same 100 leaves in each quadrant of the tree in which weather data were collected and one adjacent tree on each side in the row. The percent infected leaves was greater (22.6) in row 4 than in row 24 (15.7), on the north (21.1) than the south (17.9) and the east (20.4) than the west (18.6) sides of the tree. Weather information has not been analyzed. In addition, temperature and relative humidity were recorded by a 'Hobo' device located in one tree in each of the tree architecture plots. Weather data have not been analyzed.

The effect of fruit load on susceptibility to infection was examined. One pair of similar nearby branches was selected on each of 10 trees in rows 4 and 24. All fruit were removed in spring from one branch in each pair. In both rows, there were significantly more infected leaves at harvest on the branches with fruit.

Treatment timing and fungicide efficacy trials were conducted in cv. Sonora and cv. Butte rows, respectively. Materials were applied by hand-gun sprayer to single-tree replications. Disease was evaluated on 100 leaves collected randomly just before harvest. All fungicides were better than the control (36.6%). Rovral was superior, and Vangard, Abound, BAS 500 and BAS 510 similar and slightly less effective. Previous tests showing Vangard to be ineffective employed lower rates (4.8 oz/acre) than in this trial (10.0 oz/acre).

In the timing trial, trees were treated once, twice or three times with Rovral in various timings beginning at bloom and ending at 5 weeks after petal fall (5WK). All were then treated with two or three applications of Abound beginning at mid April and ending in mid May. One treatment compared Rovral with Rovral+Ziram. Two and three treatments of Abound were included as standard controls. Because disease incidence was so low (12.8% in the non treated control), differences among treatments were minor. The efficacy of Abound was improved by applications of Rovral at a) 2 and 5WK and b) at bloom, 2 and 5WK but not c) once at bloom, 2 or 5 WK and d) at bloom and 2WK. The combination of Rovral + Ziram was numerically but not statistically better than Rovral alone.

The pathogenicity of *Alternaria* isolates was tested by inoculation of cv. Butte trees at the Kearney Agricultural Center. Conidial suspensions were spray-inoculated onto 50 leaves on each of six trees and kept wet by covering them with plastic bags for 72 hours. In one test, trees were inoculated at approximately 3-week intervals with one, two and three isolates of *A. arborescens*, *A. tenuissima*, and *A. alternata*, respectively, beginning in early April through mid August. As occurred in previous similar experiments with these isolates, one *A. tenuissima* isolate caused high percentages of infection at every inoculation date. The remaining isolates did not differ from the controls until the early June inoculation date. From that time through the summer, they caused less disease than the highly pathogenic *A. tenuissima* but more than in the control. In the second test, three isolates each of the three species were compared in inoculations made on 26 July and 9 August. There were no differences among isolates in the percent infected leaves and all caused significantly more disease than occurred in the controls.

The lesions resulting from the inoculations are invariably small, tan necrotic spots. They never attain the size nor develop the typical black sporulation of naturally occurring lesions. To examine the possible effect of climate on symptom expression, we wetted and covered inoculated leaves with these small tan lesions for an additional 4 and 7 days. Lesions enlarged after 4 days and by 7 days had increased further in size and many had developed the typical black sporulation.

Leaves have been collected from four orchards for the survey of the pathogen population.