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Incidence of *Xylella fastidiosa* Wells et al. on Plum and Peach in Alabama[1]

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Abstract

Alabama cooperative extension personnel in 22 of the 67 counties responded to a request for peach and plum twig/leaf samples to be tested for *X. fastidiosa,* the causal organism of phony peach and plum leaf scald. Enzyme-linked immunosorbant assay results indicated that 14% of peach and 12%, of plum samples were positive. The highest incidence of the pathogen was in Mobile County with 44% of the samples testing positive. Additionally, two plum variety trials were sampled at Shorter in Macon County and Thorsby in Chilton County. All of the cultivars at Shorter and 37.5% of the cultivars at Thorsby had assay results significantly higher than uninfected seedlings. Trees in the Shorter and Thorsby trials were also rated visually, with 'AU-Producer' having the lowest average rating of 0.4 on a 0-5 scale.

Xylella fastidiosa Wells et al., the causal organism of phony peach on peach and plum leaf scald (PLS) on plum, can be a devastating disease in both crops. This bacterium infects the xylem tissue of the host plant resulting in stunted growth and reduced fruit size in peach. On plum it causes leaf margin necrosis and death of entire branches, and can eventually kill the entire tree.

The organism is spread from one host to another by leafhoppers (*Homalodisca coagulata* (Say)) and *Oncometopia nigricans* (Walker) (8). Further, the organism is known to be transmitted by budding and grafting (1, 2, 3, 5).

This study was undertaken to determine the relative incidence of *X. fastidiosa* on plum and peach in Alabama.

Materials and Methods

Requests were made to Cooperative Extension offices in 67 counties of Alabama for plum and peach twig/leaf samples in May 1994. Each office was supplied with plastic bags to collect the samples, forms to identify the samples, and U.S. Postal Next-Day mailers to return the samples.

Collectors were asked to collect samples randomly without regard to symptom expression from mature trees. Samples came from both commercial orchards and private residences. Eight of the plum samples were from feral trees. Samples returned consisted of 1-2 year old twigs with leaves and petioles intact or just leaves and petioles.

Returned samples were stored at 5C until processed. Material from each

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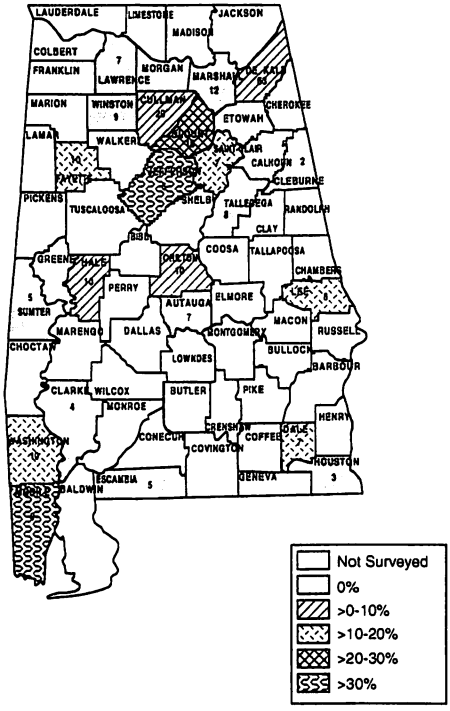


Figure 1. Incidence of *Xylella fastidiosa* in Alabama (Number in county indicates number of samples processed).

sample consisting of 0.1 g of fully expanded leaf and petiole tissue was prepared according to manufacturer's (Agdia Inc., Elkhart, IN) directions for enzyme-linked immunosorbant assay (ELISA). Readings were made at 490 nm on a Spectra Shell Microplate Reader (Tecan U.S. Labinstruments, Inc., Research Triangle Park, NC). Two microplate wells of each sample were run. At least two microplate wells of tissue from plum seedlings grown in an insect-free greenhouse were used as uninfected checks on each plate. The mean and standard deviation were calculated for the negative checks within each plate. A reading was considered positive within a plate, if it was at least two standard deviation units greater than the mean of the negative check.

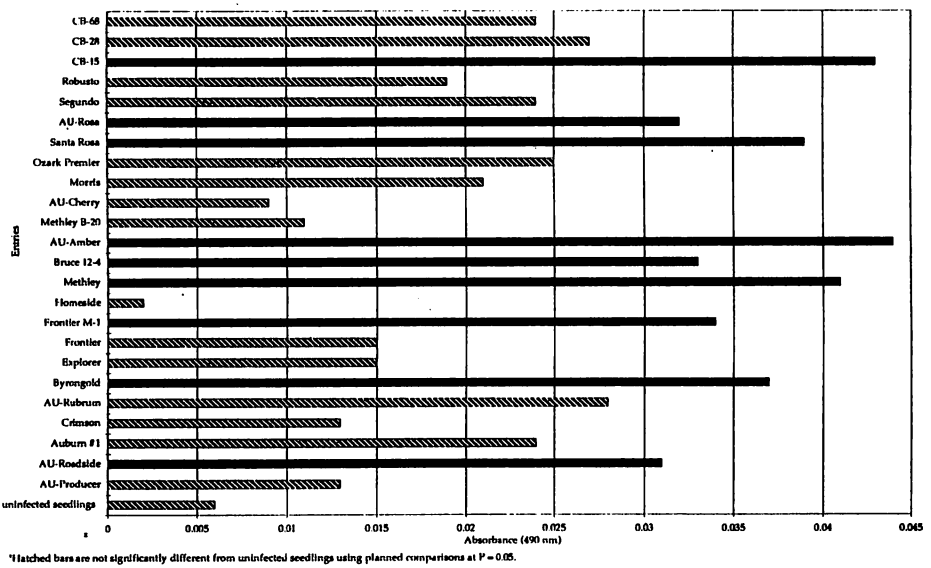
Each tree in plum variety trials at the Chilton Area Horticulture Substation (CAHS), Thorsby, Ala. (Chilton County) and E. V. Smith Research Center (EVSRC), Shorter, Ala. (Macon County) was also sampled as described above. The CAHS trial was planted in 1986 and the EVSRC trial was planted in 1990 with trees propagated in a commercial nursery in McMinnville, TN using standard propagation methods. These trials consisted of 24 and 42 entries, respectively, arranged in a randomized complete block design of six and four single tree replications. The EVSRC planting consisted of released cultivars and Auburn University advanced breeding lines. We report on 15 of the most important selections in this paper. Entries within these trials were considered positive for PLS if they were significantly different from uninfected seedlings by planned comparisons at $P = 0.05$.

The trials at both CAHS and EVSRC were also evaluated for visual symptoms in late summer 1994 on a 0-5 scale where 0 = symptomless and 5 = severe PLS symptoms. Additionally, the trial at EVSRC was evaluated for PLS symptoms in late summer of 1995 using this same scale.

Results and Discussion

Of the 67 counties solicited for information 22 responded with a total of 232 samples (Figure 1). There were 98 peach and 134 plum samples. These numbers do not reflect the relative acreage of these crops grown in the state, but rather our specific solicitation of plum germplasm over peach. In fact the peach acreage far outstrips plums in Alabama. Of the 8 feral plum samples, 1 was positive for PLS.

The number of samples processed from each county ranged from 2 in Cleburne County to 63 in Dekalb county with an average of 11 samples per county. The total number of locations represented by these samples was 94 with a low of 1 location for Cleburne,



[z]Hatched bars are not significantly different from uninfected seedlings using planned comparisons at P = 0.05.

Figure 2. Enzyme-linked immunosorbant assay results of plum variety trial for plum leaf scald, Chilton Area Horticultural Substation, Thorsby, AL.

Table 1. Plum leaf scald ratings of plum variety trials at the Chilton Area Horticulture Substation, Thorsby and E. V. Smith Research Center, Shorter, Al.

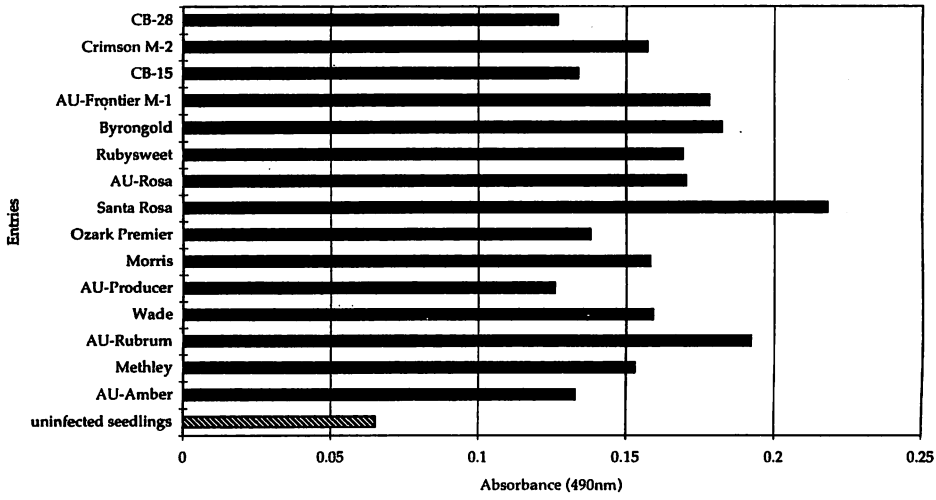
	Visual Index Rating[z]		
	Thorsby	Shorter	
Entry	1994	1994	1995
Au-Producer	0	0.8	0.3
Crimson	2.0	-	-
AU-Rubrum	0	1.8	4.0
Byrongold	2.0	1.0	0.5
Explorer	0	-	-
Frontier M-1	4.2	3.4	4.0
Methley	3.3	3.8	1.3
AU-Amber	4.8	5.0	2.5
AU-Cherry	0.5	-	-
Morris	1.0	1.0	2.5
Ozark Premier	2.2	4.4	4.5
AU-Rosa	3.0	4.4	3.0
Segundo	2.2	-	-
CB-15	0.6	2.0	2.0
CB-28	0.4	-	1.8
CB-68	1.5	-	-

[z]Visual Rating Index: 0 = No symptoms, 5 = Severe symptoms on entire tree.

Cullman, and Houston Counties. Marshall County had the highest number of locations evaluated with 12. The average number of locations per county was 4.

The percentage of samples infected with *X. fastidiosa* from each county ranged from 0-44%. The highest percentage was in Mobile County with 44% of samples infected and Jefferson County having the second highest incidence with 33% of samples infected. Blount County, which is second to Chilton County in number of peach acres, also had a high percentage, 30% of the samples were infected. Chilton County with 8 times more peach acreage than Blount had 10% of the samples infected.

Overall 14% of peach samples were infected and 12% of plum. These percentages do not reflect the difference between plum and peach in ease of transmission of *X. fastidiosa* through asexual propagation techniques (1, 2, 3). Transmission in plum, through asexual propagation, is much easier than in peach. The fact that these percentages do not differ from each other suggest



*All entries are significantly different from uninfected seedlings using planned comparisons at P=0.05

Figure 3. Enzyme-linked immunosorbant assay results of plum variety trial for plum leaf scald, E. V. Smith Research Center, Horticulture Unit, Shorter, AL.

that mechanisms besides asexual propagation are important in transmission.

It has always been assumed that *X. fastidiosa* was more severe in the southern part of the state reflecting a greater leafhopper population in this area (7). However, this study suggests that the incidence of *X. fastidiosa* may also be related to the quantity of trees in any particular area as seen by the relatively high percentage infection in Blount County which has significant peach acreage. Chilton County accounted for over 65% of the total Alabama peach production (4) in 1994 and had 10% of the samples test positive for *X. fastidiosa*. This percentage of positive samples is close to the statewide average (13%).

Two plum variety trials were also sampled for the presence of *X. fastidiosa*. At the CAHS, 37.5% of the samples had significantly higher readings compared to the uninfected seedlings (Figure 2). At the EVSRC all of the cultivars and Auburn University advanced breeding lines had significantly greater absorbance readings for *X. fastidiosa* compared to uninfected seedlings (Figure 3). These relatively higher percentages compared to the state in general probably reflect the fact that we do not rogue infected trees, whereas growers tend to aggressively rogue and destroy infected trees to prevent pathogen spread. Additionally, many of the samples came from private residents where 1-2 trees were planted in relative isolation which may have resulted in lower percent infection.

Trees at CAHS and EVSRC were also evaluated by visual ratings (Table 1). 'AU-Producer' had lowest visible symptoms of any trees at CAHS and for the two evaluation years at EVSRC. Additionally, 'AU-Producer' did not differ significantly from uninfected seedlings at CAHS although it did differ significantly at EVSRC (Figures 2 and 3). 'AU-Producers' lack of visual symptoms, even with a positive ELISA test at EVSRC, is particularly interesting and suggests a tolerance for the disease which may be exploitable in breeding new cultivars. These results confirm previous publications indicating 'AU-Producer' has a high degree

of tolerance to *X. fastidiosa* (6). Entries 'AU-Amber,' 'AU-Rosa,' and 'AU-Rubrum' which were reported previously as having high levels of tolerance, in our study had mean ratings of 4.1, 3.5, and 1.9, respectively, compared to 0, 1, and 1 as previously reported (6). These relatively higher ratings in this study suggest that true resistance is still an elusive goal in plum breeding.

Two entries in the EVSRC trial, 'Methley' and 'AU-Amber,' had higher readings in 1994 than in 1995. This may be due to an uneven distribution of the pathogen in tissue of these cultivars. Hutchins et al. (3) found this to be a particular problem with peach, which may also occur in plums. 'AU-Rubrum's evaluation went up from 1994 to 1995 which may also indicate this uneven distribution in plant tissue or a natural progression of the disease.

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Effect of Periodical Cicada Injury and Degree of Fire Blight Severity on Asian Pear Cultivars

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Abstract

Sixteen Asian pear cultivars grown at Virginia Gold Orchard near Natural Bridge, VA were evaluated for shoot damage from the seventeen-year cicada (*Magicicada septemdecim* L.), followed by fire blight infection by the bacterium *Erwinia amylovora* [(Burr.) Winsl. et al.]. The Japanese pear cultivars, 'Yoi nashi' and 'Ichiban nashi,' proved to be the most susceptible; whereas two Korean types, 'Ar-rirang 1' and 'Korean Giant,' were most resistant. Two Japanese cultivars, 'Shinko' and 'Singo,' proved to have intermediate resistance. All cultivars exhibited some degree of cicada damage and 68% showed a strong correlation between cicada injury and fire blight severity. Those with the softest woody branches were attacked and injured most severely.

Asian pears [*Pyrus pyrifolia* (Burm.) Nak.] and their hybrids have been grown in Japan, China and Korea for at least 1,000 years. The fruit are known as "nashi," "li," and "beh," respectively. In addition, they have been known in North America by the term "sand pears," in reference to the stone cells

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