Effect of Fungicide Treatment to Control Shot-Hole Disease of Cherry Laurel

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Nature of Work: Common cherry laurel, *Prunus laurocerasus* cv. Otto Luyken, is an economically important broadleaf evergreen nursery and landscape plant. The most limiting factor to cherry laurel production is shot-hole disease. Symptoms of shot-hole disease range from small reddish spots with yellow halos in which the center of the spot drops out as the spot ages to larger, irregular, reddish-brown spots that are usually along the leaf margin where the affected area also drops out. The disease is most severe under wet conditions in mid- to late-summer. Overhead sprinkler irrigation and closely spaced plants favor disease development.

The primary causal pathogen of shot-hole disease was described as *Xanthomonas pruni*. This bacterium in association with another bacterium, *Xanthomonas campestris*, have been blamed for all the damage. Preliminary evidence suggests that shot-hole disease is not caused solely by bacteria but also by one to several fungal pathogens. The fungi *Cercospora circumscissa* and *Microgloeum pruni* (anamorph of *Blumeriella jaapi*) were recovered from diseased leaves throughout 1998. Pathogenicity studies to prove the fungi are causing some of the shot-hole damage will be conducted in early 1999.

A fungicide trial conducted in 1997 tested the effectiveness of Daconil Ultrex, Cleary's 3336WP and Fore tank mix, and Kocide 101 on reducing shot-hole disease. The fungicides Daconil and Cleary's 3336 and Fore combination gave the best results. This trial was repeated and expanded during 1998 to further test the effectiveness of various fungicides to control shot-hole disease.

Materials and Methods: Eight *P. laurocerasus* cv. Otto Luyken plants per fungicide treatment and eight untreated plants (for a total of 56 plants) were spaced in full-sun and overhead sprinkler irrigated. The fungicides Kocide 101 (copper hydroxide) at 1 lb/100 gal rate, Phyton 27 (copper sulfate pentahydrate) at 2 oz/10 gal and 3.5 oz/10 gal rates, Daconil 2787 (chlorothalonil) at 1.25 lb/100 gal rate, Cleary's 3336WP (thiophanate methyl) at 12 oz/100gal rate and Fore (mancozeb) at 1.5 lb/100gal rate were applied individually every 7-14 days beginning in June 1998. The average number of shot-hole spots per leaf was calculated by counting the number of spots per leaf on three branches containing 20 leaves each. Shot-hole spots were counted on a monthly basis beginning in June 1998 and ending in October 1998 (Table 2). The number of dead leaves present per branch of 20 leaves also was recorded at each sampling date.

Results: Disease pressure within this test was very high and all plants in the test showed symptoms of shot-hole disease. Disease incidence was high in June, September and October 1998 with the greatest amount of shot-hole spots, 2.8 spots per leaf, being recorded in September from the untreated control plants (Table 1). The lowest number of leaf spots were recorded in July and August 1998. This may correspond to the hot, dry weather conditions at the time. The greatest amount of leaf death per branch of 20 leaves was recorded in October 1998 (Table 1).

Presumably the high number of dead leaves counted at the October sampling date was the result of the higher incidence of shot-hole spots in September.

Of the fungicides tested only Cleary's 3336 and Fore significantly reduced shot-hole leaf spots compared to the untreated plants when the number of spots per leaf was averaged across all sampling dates (Table 2). Fore (mancozeb) was the only fungicide to significantly reduce the number of leaf spots present per leaf at all sampling dates following fungicide treatment compared to the untreated plants. In June, none of the fungicide treatments were significantly different from the untreated control plants because the fungicide treatments had not been applied at the time of sampling. All fungicide treatments reduced the number of dead leaves present per branch of 20 leaves compared to the untreated plants (data not shown).

Traditionally, copper-containing fungicide mixtures have been used to control shot-hole. In 1997, applications of Kocide 101 (copper hydroxide) resulted in the greatest number of shot-hole spots per leaf, even greater than the untreated plants. It was hypothesized that the the disease increase may be due to sensitivity of cherry laurel to the product (phytotoxicity), the presence of copper-resistant bacteria, or that the pathogen was primarily fungal rather than bacterial. Pathogenicity trials still need to be conducted to prove the two fungal pathogens most commonly associated with the infected leaves, *Cercospora circumscissa* and *Microgloeum pruni* (anamorph of *Blumeriella jaapi*), are causing some of the leaf spot damage. The bacterium, *Xanthomonas campestris*, also can be recovered from infected leaves and it is believed that the bacterium is causing some of the leaf spots. The bacterial isolates obtained from the infected leaves will be tested for possible copper resistance.

As was seen in 1997, the copper-containing fungicides tested in 1998 (Kocide 101 and Phyton 27) did no provide good control of the disease. At no sampling date, other than September when disease incidence was greatest in the untreated plants, did Kocide 101 or Phyton 27 at the rates tested significantly reduce disease compared to the untreated plants (Table 2). The increase in disease following copper fungicide applications seen in 1997 did not occur in this test.

From the fungicide trials it is currently my recommendation to include mancozeb-containing fungicides such as Fore, Dithane, Protect T/O, etc. in the fungicide spray program to control shot-hole disease on cherry laurel. Tank mixing mancozeb with a copper product may provide the best control. Another test is planned for 1999 in which mancozeb fungicides will be rotated with or tank mixed with copper products to determine the best disease control approach.

Significance to the Industry: The production of disease-free *Prunus laurocerasus* would greatly benefit Georgia growers. From the accumulated data, the cause of the shot-hole disease on cherry laurel appears to be due to both bacterial and fungal pathogens. Pathogenicity tests will be conducted in the greenhouse to screen *Cercospora circumscissa*, *Microgloeum pruni*, and *Xanthomonas campestris* to determine which organism is causing the various symptoms found on laurel leaves throughout the growing season. Incorporation of a mancozeb-containing fungicide into the spray program for shot-hole disease can significantly increase the effectiveness of control and result in healthier plants.

Table 1. Shot-hole disease development on untreated *P. laurocerasus* cv. Otto Luyken at five sampling dates.

Sampling Date	Number of shot-hole spots per leaf[1]	Number of dead leaves per shoot[2]
June	1.52 b[3]	0.00 d
July	0.78 c	0.21 cd
August	0.74 c	1.63 b
September	2.83 a	0.42 c
October	1.82 b	3.71 a

[1] Average number of shot-hole leaf spots per leaf from three branches per plant. Each branch consisted of 20 leaves.
[2] Average number of dead leaves from three branches per plant. Each branch consisted of 20 leaves.
[3] Numbers followed by the same letter are not significantly different from each other using Tukey (HSD) pairwise comparison of means (p=0.05).

Table 2. Fungicide efficacy in controlling shot-hole leaf spot development on *P. laurocerasus* cv. Otto Luyken.

		Number of shot-hole spots per leaf[1]					
Treatment[2]	Rate[3]	June	July	August	Sept	October	Mean[4]
Untreated		1.5 ab[5]	0.8 ab	0.7 b	2.8 a	1.8 bc	1.5 a
Kocide 101	1 lb	1.9 a	0.8 ab	0.9 b	1.8 b	2.5 a	1.6 a
Phyton 27	2 oz	1.7 ab	0.5 bc	1.0 b	1.7 b	2.5 a	1.5 a
Phyton 27	3.5 oz	1.9 a	1.0 a	0.7 b	1.5 b	2.4 ab	1.5 a
Daconil 2787	1.25 lb	1.4 ab	0.9 ab	1.7 a	1.7 b	1.5 c	1.4 a
Cleary's 3336	12 oz	1.1 b	0.6 bc	1.0 b	1.3 bc	1.2 cd	1.0 b
Fore	1.5 lb	1.2 b	0.3 c	0.2 c	0.8 c	0.6 d	0.6 c

[1] Average number of shot-hole leaf spots per leaf from three branches per plant. Each branch consisted of 20 leaves.
[2] Fungicide treatments were applied every 7-14 days beginning 16 June 1998.
[3] Fungicide rates are per 100 gal water, except Phyton 27 which is per 10 gal water.
[4] Number of shot-hole spots per leaf averaged across all sampling dates per treatment.
[5] Numbers followed by the same letter are not significantly different from each other using Tukey (HSD) pairwise comparison of means (p=0.05).