Fungicidal Control of Entomosporium Leaf Spot on Photinia

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ABSTRACT

Cobb, G. S., Hagan, A. K., Gilliam, C. H., and Mullen, J. M. 1985. Fungicidal control of Entomosporium leaf spot on photinia. Plant Disease 69:684-685.

Weekly foliar applications of triforine at 0.24–0.48 g a.i./L of water or thiophanate-methyl + zinc ion + maneb at 1.35 g a.i./L of water provided excellent protection of *Photinia* × *fraseri* against leaf spot caused by *Entomosporium maculatum*. Weekly treatments of chlorothalonil (1.35 g a.i./L) or vinclozolin (0.90 g a.i./L) were less effective. Triadimefon (0.30 g a.i./L) and propiconazole (0.28 g a.i./L) controlled the disease but were phytotoxic. Iprodione, copper hydroxide, benomyl, and mancozeb were ineffective.

Leaf spot caused by *Entomosporium maculatum* Lev. (=*E. mespili* (DC. ex Duby Sacc.) (teleomorph *Diplocarpon maculatum* (Atk.) Jorstad) is a persistent and destructive disease of *Photinia* and some other species of Roseacae (1,4). Photinias susceptible to *E. maculatum* include *P. glabra* (Thunb.) Maxim (3), *P. serrulata* Lindl. (9), and *P.* × *fraseri* Dress. (7). Entomosporium leaf spot is particularly damaging and difficult to control during periods of frequent rainfall and in nurseries with overhead irrigation, since splashing water and high humidity are conducive to disease development and spread (2,3). Benomyl (5,8) and chlorothalonil (2) have been reported to be effective protectants against *E. maculatum*, but in commercial nurseries, results with these materials are often unsatisfactory. Severe disease and the lack of effective control measures have resulted in some nurseries ceasing photinia production (2). The objectives of this work were to identify fungicide application programs that would control the disease under conditions highly conducive to infection.

MATERIALS AND METHODS

Experiments were conducted at Mobile and Auburn, AL. In spring 1983, several fungicides were screened for phytotoxicity and efficacy in protecting *P.* × *fraseri* from Entomosporium leaf spot. The most effective material was studied further to determine appropriate application practices. A second fungicide comparison was made in autumn 1983, with application rate, frequency, and phytotoxicity studies conducted in spring 1984. All experiments were conducted using photinias grown in an amended pine bark medium in 11-L plastic containers. Plants were pruned 6 wk before treatments began. Inoculum of *E. maculatum* was provided by placing severely diseased photinias on container rims of test plants. With daily overhead irrigation (1.2 cm of water), severe leaf spot symptoms consistently developed on control plants within 4 wk. Fungicides were sprayed on all leaf surfaces until runoff with hand-pump, compressed-air sprayers, and plants were not irrigated for 24 hr after application. An adjuvant, Chevron Spray Sticker (0.6 ml/L; principal active agents, olefin aromatic polymers), was included with all treatments unless otherwise noted. Single-plant replicates were arranged in a completely randomized design with the number of replicates varying among tests. Percent leaves infected and phytotoxicity on new foliage were assessed 4 wk after treatments began.

In the initial test, triforine (0.48 g a.i./L, Triforine 18.2EC), triadimefon (0.30 g a.i./L, Bayleton 25WP), chlorothalonil (1.35 g a.i./L, Daconil 2787 75WP), vinclozolin (0.90 g a.i./L, Ornalin 50WP), benomyl (0.60 g a.i./L, Benlate 50WP), mancozeb (1.44 g a.i./L, Manzate 200 80WP), and a check (surfactant in water) were compared using weekly applications on seven single-plant replicates.

Three experiments with triforine, each with five single-plant replicates, were conducted simultaneously in summer 1983. In one experiment, triforine at 0 (surfactant in water), 0.12, 0.24, 0.36, and 0.48 g a.i./L of water was applied weekly for 4 wk. In a second experiment, triforine at 0.48 g a.i./L was applied at 7-, 14-, 21-, and 28-day intervals. Effects of weekly application of triforine at 0.48 g a.i./L with and without the spray sticker were investigated in a third experiment. Overhead irrigation (equivalent to 1.2 cm) was applied 24 hr after treatment and at 24-hr intervals thereafter.

Weekly applications of triforine (0.24 g a.i./L), triadimefon (0.30 g a.i./L), propiconazole (0.28 g a.i./L, Tilt 3.6EC), thiophanate-methyl + zinc ion + maneb (1.35 g a.i./L, Zyban 75WP), iprodione (0.60 g a.i./L, Rovral 50WP), and copper hydroxide (1.34 g a.i./L, Kocide 101 77WP) on three replicate plants were evaluated in autumn 1983. In spring 1984, thiophanate-methyl + zinc ion + maneb was applied weekly at 0 (surfactant in water), 0.45, 0.90, and 1.35 g a.i./L and at 7-, 14-, and 21-day intervals at 1.35 g a.i./L to four replicate plants. To investigate phytotoxicity, 12 uninfected photinias were pruned and subjected to four weekly applications of triadimefon at 0.30 g a.i./L. New shoot growth was compared with that on 12 untreated plants.

RESULTS AND DISCUSSION

Because results at the two locations were similar, only data from Mobile are reported. In spring 1983, all fungicides reduced severity of Entomosporium leaf spot compared with the control; however, efficacy varied among materials (Table 1). Greatest disease control was observed with applications of either triforine or triadimefon. No phytotoxicity was observed with triforine but leaves of

Table 1. Comparison of six fungicides as protectants against Entomosporium leaf spot on photinia, spring 1983

Fungicide[y]	Rate (g a.i./L)	Disease severity[z] (%)
Triforine	0.48	1 a
Triadimefon	0.30	5 a
Chlorothalonil	1.35	18 b
Vinclozolin	0.90	22 b
Benomyl	0.60	53 c
Mancozeb	1.44	61 c
Check	...	95 d

[y] All treatments, applied as sprays weekly for 4 wk, included Chevron Spray Sticker (0.6 ml/L).

[z] Average percentage of new leaves infected on seven replicate plants. Means followed by the same letter are not significantly different according to Duncan's multiple range test ($P = 0.05$).

Accepted for publication 2 February 1985 (submitted for electronic processing).

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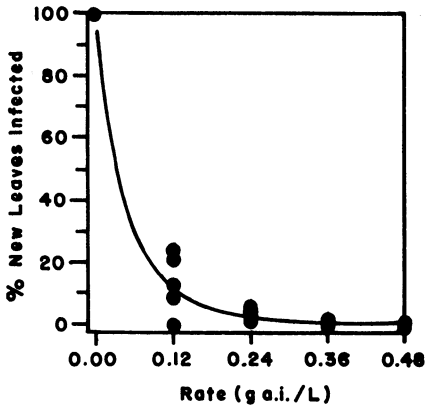

Fig. 1. Effects of rate of triforine on percentage of new leaves of *Photinia* × *fraseri* infected by *Entomosporium maculatum* ($y = 1.06 \times 10^{-16}$ $(x+1)^{-62.14}$ $e^{41.34(x+1)} - 1$, $r^2 = 0.88$).

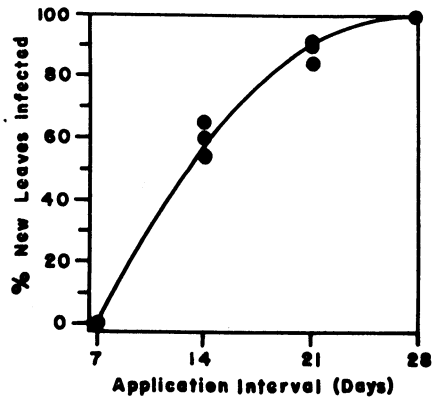

Fig. 2. Effects of application interval of triforine (0.48 g a.i./L) on percentage of new leaves of *Photinia* × *fraseri* infected by *Entosporium maculatum* ($y = -78.42 + 90.82x - 11.58x^2$, $r^2 = 0.99$).

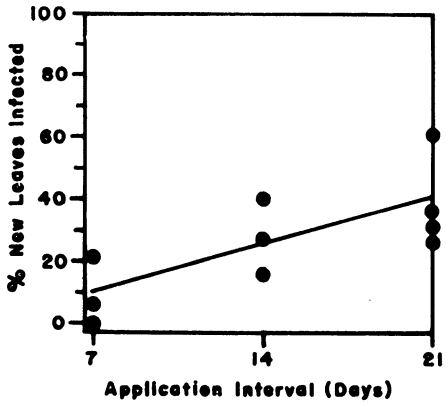

Fig. 4. Effects of application interval of thiophanate-methyl + zinc ion + maneb (1.35 g a.i./L) on percentage of new leaves of *Photinia* × *fraseri* infected by *Entosporium maculatum* ($y = -4.25 + 2.14x$, $r^2 = 0.55$).

Table 2. Comparison of six fungicides as protectants against Entomosporium leaf spot on photinia, autumn 1983

Fungicide[y]	Rate (g a.i./L)	Disease severity[z] (%)
Triforine	0.24	2 a
Propiconazole	0.28	0 a
Thiophanate-methyl + zinc ion + maneb	1.35	5 a
Triadimefon	0.30	19 b
Iprodione	0.60	80 c
Copper hydroxide	1.34	85 c
Check	···	100 d

[y] All treatments, applied as sprays weekly for 4 wk, included Chevron Spray Sticker (0.6 ml/L).

[z] Average percentage of new leaves infected on three replicate plants. Means followed by the same letter are not significantly different according to Duncan's multiple range test ($P = 0.05$.

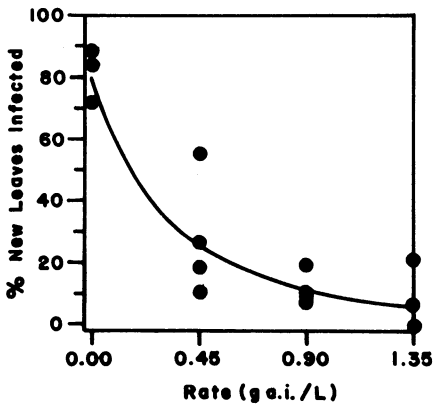

Fig. 3. Effects of rate of thiophanate-methyl + zinc ion + maneb on percentage of new leaves of *Photinia* × *fraseri* infected by *Entosporium maculatum* ($y = 80.86\,(x+1)^{-3.05} - 1$, $r^2 = 0.69$).

triadimefon-treated plants were narrow and bronze in color, and plant height was reduced compared with the check. Leaf spot severity was suppressed by chlorothalonil and vinclozolin, which were not phytotoxic. Photinias treated with benomyl or mancozeb developed leaf spots on more than 50% of the leaves. Lesions developed on 95% of leaves on control plants within 4 wk and defoliation followed, indicating conditions highly conducive to infection.

All rates of triforine tested controlled the disease (Fig. 1). Weekly applications of triforine at 0.48 g a.i./L resulted in only 2% infected leaves regardless of whether the spray sticker was included. When triforine at 0.48 g a.i./L was applied at intervals exceeding 1 wk, disease severity increased dramatically (Fig. 2). At a 2-wk spray interval, 55% of the new leaves were infected.

In autumn 1983, triforine, propiconazole, and thiophanate-methyl + zinc ion + maneb provided excellent control of leaf spot (Table 2); however, propiconazole caused reddening, spotting, and some distortion of expanding foliage. Triadimefon was less effective than propiconazole, but no phytotoxicity was observed, possibly because of cooler temperatures during this time of the year. Iprodione and copper hydroxide were ineffective.

In spring 1984, disease control increased as the rate of thiophanate-methyl + zinc ion + maneb increased, with greatest control at 1.35 g a.i./L (Fig. 3). Weekly applications of thiophanate-methyl + zinc ion + maneb provided the greatest protection, with control decreasing linearly as the spray interval increased (Fig. 4). Four weekly applications of triadimefon at 0.30 g a.i./L reduced dry weight of new shoot growth of photinia 43% compared with the untreated check ($P < 0.01$).

Results using fungicides for control of Entomosporium leaf spot have often conflicted (2,5–9), possibly because of differences in plant material and disease pressure and cultural and environmental variation. Although time of year varied, our results were obtained under similar experimental conditions highly conducive to infection. Weekly applications of triforine at 0.24–0.48 g a.i./L gave nearly complete disease control, and subsequent trials in commercial nurseries have substantiated these results. Under conditions less favorable to disease development, fewer applications and/or lower rates of triforine may be sufficient. Thiophanate-methyl + zinc ion + maneb at 1.35 g a.i./L applied weekly provided excellent disease protection without phytotoxicity.

LITERATURE CITED

1. Alfieri, S. A., Jr. 1969. Entomosporium leaf spot of loquat. Fla. Dep. Agric. Consumer Serv. Div. Plant Ind. Plant Pathol. Circ. 82. 2 pp.
2. Hagan, A. K., Gilliam, C. H., Mullen, J. M., Crockett, J. S., and Shumack, R. L. 1982. Fungicidal control of Entomosporium leafspot on photinia. J. Environ. Hortic. 1:31-33.
3. Horie, H., and Kobayashi, T. 1979. Entomosporium leaf spot of Pomoideae (Rosaceae) in Japan. I. Distribution of the disease; morphology and physiology of the fungus. Eur. J. For. Pathol. 9:366-379.
4. Horie, H., and Kobayashi, T. 1980. Entomosporium leaf spot of Pomoideae (Roseacae) in Japan. III. Additional basis for identification of the fungus, and distribution of the disease. Eur. J. For. Pathol. 10:225-235.
5. Lambe, R. C. 1981. Entomosporium leafspot. Am. Nurseryman 153:14.
6. Lambe, R. C., and Lackner, A. 1981. Control of Entomosporium leafspot with Bayleton. Fungic. Nematic. Tests 37:139.
7. Lambe, R. C., and Ridings, W. 1979. Entomosporium leafspot of photinia. Fla. Dep. Agric. Consumer Serv. Div. Plant Ind. Plant Pathol. Circ. 206. 2 pp.
8. McCain, A. H. 1971. *Raphiolepis indica* leaf spot. Fungic. Nematic. Tests 26:116.
9. Stathis, P. D., and Plakidis, A. G. 1959. Entomosporium leaf spot of *Photinia glabra* and *P. serrulata*. Phytopathology 49:361-365.