Deciduous Orchard Diseases—Chemical Control

Pre- and Post-Inoculation Control of Eastern Filbert Blight on Seedlings of European Hazelnut

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Three-week-old hazelnut seedlings grown from open pollinated seed of cv. 'Royal' were inoculated with ascospores of *Anisogramma anomala* (1 x 10^5 spores per ml) and then incubated for either 4, 7, or 14 days in an intermittent mist chamber constructed over a greenhouse bench. The fungicides Nustar, Rubigan or Bravo were either applied to trees before inoculation or after the period of post-inoculation mist. Hand-held pump sprayers were used to apply the chemicals to runoff. Individual replications of the experiment were initiated on 5 April, 19 April, and 31 May 1990. Each replication had 10 seedlings per treatment combination. After incubation in the mist chamber, trees were grown and overwintered in an unheated greenhouse for 12-13 mo. The initial determination of disease incidence was made in March 1991 by examining each tree for a chocolate brown discoloration in the cambial layer, which is indicative of infection by *A. anomala*. These determinations required stripping 20 to 30% of the bark from the lower stem of each seedling. Experimental trees were then incubated for an additional 2 mo during which time stomata of *A. anomala* developed on most trees (>90%) that showed browning in the cambial layer. On trees with discolored cambium but no stomata, hand sections were made of xylem tissue just below the discolored cambial layer and examined microscopically for characteristic hyphae of *A. anomala*. Trees were considered infected if stomata of *A. anomala* were present on stems or if hyphae of the fungus were present in xylem tissues. To summarize results, disease incidence data from pre-inoculation and post-mist fungicide treatments were analyzed separately because within-treatment variances differed qualitatively among the fungicide application times. Each data set was analyzed as a balanced split plot design with fungicide as the whole plot and duration of the mist treatment as the split plot. The transformation arcsine (square root (x)) was applied to both data sets before analysis to reduce non-homogeneity of within-treatment variance.

In analysis of the pre-inoculation fungicide treatments, the main effect of fungicide was significant ($P<0.0001$). Disease incidence in the inoculated control averaged 53.4% across mist treatments, whereas incidence of eastern filbert blight in Bravo, Nustar, and Rubigan averaged 1, 3, and 2%, respectively (Table 1). Differences among fungicide treatments were not significantly different ($P>0.05$). For each fungicide, the highest incidence of disease occurred on trees misted for 14 days but the effect of mist duration on disease incidence was not significant ($P=0.53$) (Table 1). Analysis of the data in which fungicides were applied after the mist periods resulted in significant main effects for fungicide ($P=0.012$) and mist duration ($P=0.007$). Overall incidence of disease in trees treated with Nustar and Rubigan averaged 18 and 32%, respectively, compared to 53% in the inoculated control (Table 2). Disease incidence in trees misted for 4 days averaged 23% compared to 44% in plants misted for 7 or 14 days (Table 2). For trees misted for 4 days and treated with Bravo, Nustar, or Rubigan, disease incidence was 25, 5, and

23%, respectively, compared to 47% in the inoculated control. Mist treatment for 7 days followed by treatment with Nustar or Rubigan resulted in disease incidence values of 16 and 33%, respectively, compared to 60 and 68% in inoculated control and Bravo treated trees, respectively.

Each tested fungicide effectively controlled eastern filbert blight when applied prior to inoculation. Post-inoculation fungicide treatments resulted in partial control of the disease, possibly up to 7 days after inoculation for Nustar and Rubigan. The temperature of the greenhouse during inoculation and misting was comparatively warmer (in the range of 17 to 25°C) than usual spring conditions when hazelnut is infected in the field (mean daily temperature in the range of 10 to 20°C). The effect of these cooler temperatures on post-inoculation efficacy of Bravo, Nustar, and Rubigan requires further investigation.

Table 1. Pre-inoculation.

Treatment and rate/100 gal	Duration of mist treatment (days)	Incidence of infection[1]
Inoculated control	4	46.7
	7	60.1
	14	53.4
Bravo 720F 2 pt	4	0.0
	7	1.1
	14	3.7
Nustar 20DF 2 oz	4	6.7
	7	0.0
	14	6.7
Rubigan 1EC 4 fl oz	4	1.1
	7	1.1
	14	3.7

[1]Analysis of variance based on arcsine (square root (x)); values presented are back transformed means.

Table 2. Post-mist.

Treatment and rate/100 gal	Duration of mist treatment (days)	Incidence of infection[1]
Inoculated control	4	46.6
	7	60.1
	14	53.4
Bravo 720F 2 pt	4	25.0
	7	68.4
	14	43.2
Nustar 20DF 2 oz	4	4.5
	7	16.4
	14	39.9
Rubigan 1EC 4 fl oz	4	23.1
	7	32.9
	14	39.4

[1]Analysis of variance based on arcsine (square root (x)); values presented are back transformed means.

This report contains information concerning experimental use of nonlabeled fungicides on hazelnuts. The results should not be interpreted as recommendations for use. Use of fungicides on commodities for which they are not labeled is against both federal and state law.