Fungicide Efficacy and Spore Dispersal of Cercosporidium Needle Blight on Leyland Cypress

Jean L. Williams-Woodward
University of Georgia, Department of Plant Pathology, Athens, GA 30602

Nature of Work: Needle blight, caused by *Cercosporidium sequoiae* (Ellis and Everh.) Baker and Partridge [syn. *Asperisporium sequioae* (Ellis and Everh.) Sutton and Hodges; *Cercospora sequoiae* Ellis and Everh.), has become a serious disease of Leyland cypress (×*Cupressocyparis leylandii*) within container and field tree nurseries. Symptoms of the disease are first seen on lower branches closest to the main stem. Infected individual needles and small twigs turn yellow, brown, and eventually gray, and drop from the plant. During warmer, humid conditions, the fungus produces olive-brown "tufts" consisting of conidiophores and fungal spores on the blighted tissues that can be seen through a hand lens or dissecting microscope. The disease spreads upward and outward within infected trees until only the tips of infected branches remain green. Severely infected young plants can be killed. Older infected trees have open, thin, brown foliage, and are not salable.

Information on needle blight disease development and control on Leyland cypress is mostly based upon general observations and extrapolations from what is known about the disease on juniper species. Needle blight symptoms on Leyland cypress and junipers are most commonly seen in the late summer and fall, but infection on junipers has been reported to occur in the late spring and summer. Information on Leyland cypress varies somewhat in that infection has been stated to possibly occur year round in Florida, and that spores are present throughout the spring and summer in North Carolina and spring and fall in Alabama. Fungicide control recommendations vary from applying fungicides in the spring from bud break until new growth matures to applications made throughout the summer and fall. It is recommended on junipers to begin fungicide application by June 1 and continue until mid-July, and that fungicide applications at other times of the year are ineffective. Since little is known about needle blight disease on Leyland cypress, it is difficult to provide disease control recommendations.

Cercosporidium spore dispersal was monitored within a field planting of naturally infected Leyland cypress trees. Twenty 7-gal trees were planted in five rows of four trees equidistantly spaced 6 feet apart at the University of Georgia Horticultural Research Farm in Watkinsville, GA in May 2001. Trees were mulched with pine straw, but were not irrigated or fertilized after planting. A spore sampler (Rotorod® sampler Model 20; Multidata LLC, St. Louis Park, MN) was placed with collector rods 3 ft off the ground in the center of the planting. Collector rods were exposed to air for 30 seconds every 10 minutes. Spore collector rods were replaced every week beginning 22 June 2001. Spores of *Cercosporidium* were identified and counted by mounting spore collector rods on a microscope slide adapter and viewing at 200-400X. Spore numbers were recorded as the number of spores per 10 m^3 of air per week (Figure 1).

Spore dispersal also was monitored within a nursery block of naturally-infected Leyland cypress trees. Forty 15-gal trees were grouped in eight rows of five trees equidistantly spaced 5 feet apart at the Center for Applied Nursery Research at Dearing, GA in June 2002. Trees were sprinkler irrigated throughout the study. A spore sampler (Rotorod® sampler Model 20;

Multidata LLC, St. Louis Park, MN) was placed with collector rods 3 ft off the ground adjacent to the grouping. Collector rods were exposed to air for 30 seconds every 5 minutes. Spore collector rods were replaced every week beginning 13 June 2002. Spore numbers were recorded as the number of spores per 20 m^3 of air per week. Spore dispersal will be monitored through 2004. However only data from June to November 2002 is presented (Figure 2).

Fungicide efficacy was determined by spraying five single-plant replications of each of 14 fungicide treatments arranged in a randomized block design at the Center for Applied Nursery Research, Dearing, GA. Naturally infected 3-gal Leyland cypress cv. Leighton Green trees were shifted into 7-gal containers in July 2001. Plants were irrigated overhead daily for 40 minutes. Fungicides were applied beginning 5 September 2001 with the last application being made to all treatments on 31 October 2001. Fungicide active ingredients evaluated included azoxystrobin (Heritage®, Syngenta, Greensboro, NC), propiconazole (Banner MAXX®, Syngenta), fludioxonil (Medallion®, Syngenta), (BAS 500; BASF Corp., Research Triangle Park, NC), myclobutanil (Systhane®, Dow AgroSciences, Indianapolis, IN), copper hydroxide (Kocide 2000®; Griffin Corp., Valdosta, GA), chlorothalonil (Daconil Ultrex®; Syngenta), mancozeb (Fore WSP Rainshield®, Dow AgroSciences). Plants were rated for percentage of plant canopy defoliated due to needle blight disease and the number of infection sites on the uppermost 6-inch section of the previous season's growth on 12 December 2001.

Results and Discussion: *Cercosporidium* spores were detected during the week of 22-29 June 2001 for the field planting. Spore counts remained relatively small and constant until the last week of July when the number of spores caught on the spore collector rods began to increase (Figure 1). Spore dispersal and capture continued to increase through August, September and October. Spikes in spore capture may be related to weather events, however, data analysis and correlation with weather events has not been completed. Spore numbers decreased through November and December 2001, and no *Cercosporidium* spores were captured on the spore collector rods from January through 10 June 2002. Spore counts from mid-June through 25 July 2002 were similar to the same period in 2001. Cercosporidium spores were detected during the week of 13-20 June 2002 in the nursery grouping. Spore capture remained low until mid-September, and then increased linearly until peaking in mid-October. This study is on-going and the data is still preliminary. However, it appears that in Georgia fungicide applications to control Cercosporidium needle blight disease should begin by 1 July. However, applications made when symptoms first appear in August through September have been shown to be effective in reducing disease spread and development the following year (not all data shown).

Fungicide recommendations for Cercosporidium needle blight are varied, with copper-containing fungicides being the most recommended. All fungicides evaluated reduced Cercosporidium infection compared to untreated plants (Table 1). Defoliation was also reduced with all fungicides evaluated except propiconazole (Banner MAXX®) and fludioxonil (Medallion®). Disease pressure was high, and the first fungicide application in this study was applied in early September, later than applications should begin in nurseries and Christmas tree plantings. However, fungicide application beginning when symptoms are first apparent in late August to early September are effective in reducing disease development and symptom expression, and should be initiated to reduce disease in subsequent years.

Significance to the Industry: Cercosporidium needle blight is the most damaging disease of Leyland cypress in container and field nurseries, Christmas trees, and landscapes. Cover spraying Leyland cypress trees every 7 to 10 days from spring through fall is not practical, therefore identifying when to target fungicide applications by evaluating spore dispersal can reduce pesticide and labor costs. Identifying fungicides that effectively control the disease gives growers options for fungicide rotations and intervals.

Figure 1. Number of *Cercosporidium sequoiae* spores, cause of needle blight disease of Leyland cypress, captured per 10 m^3 of air per week using a Rotorod® sampler in Watkinsville, GA from June 2001 to July 2002.

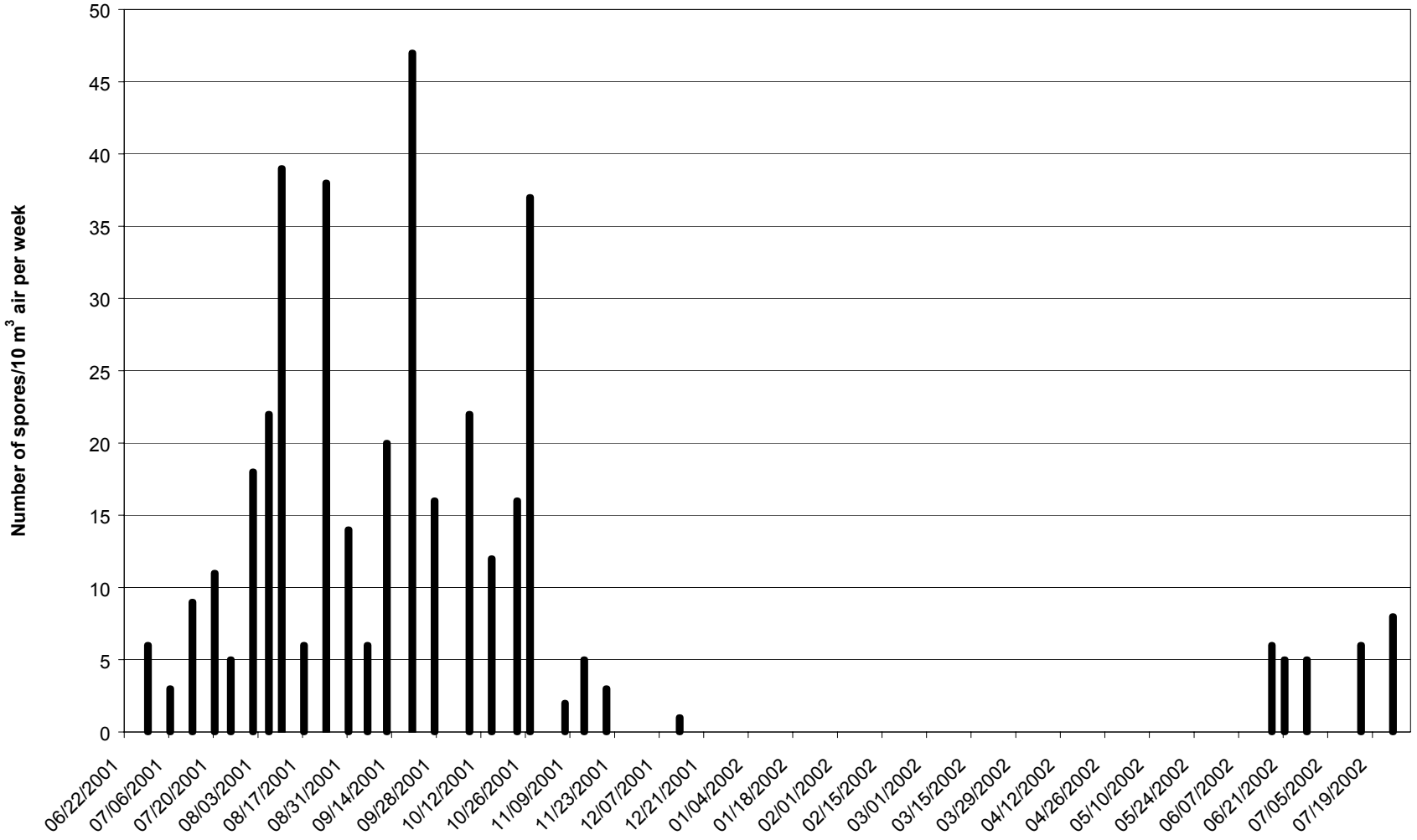

Figure 2. *Cercosporidium* spore capture from overhead irrigated naturally-infected Leyland cypress trees in a nursery setting (June - Novemeber 2002)

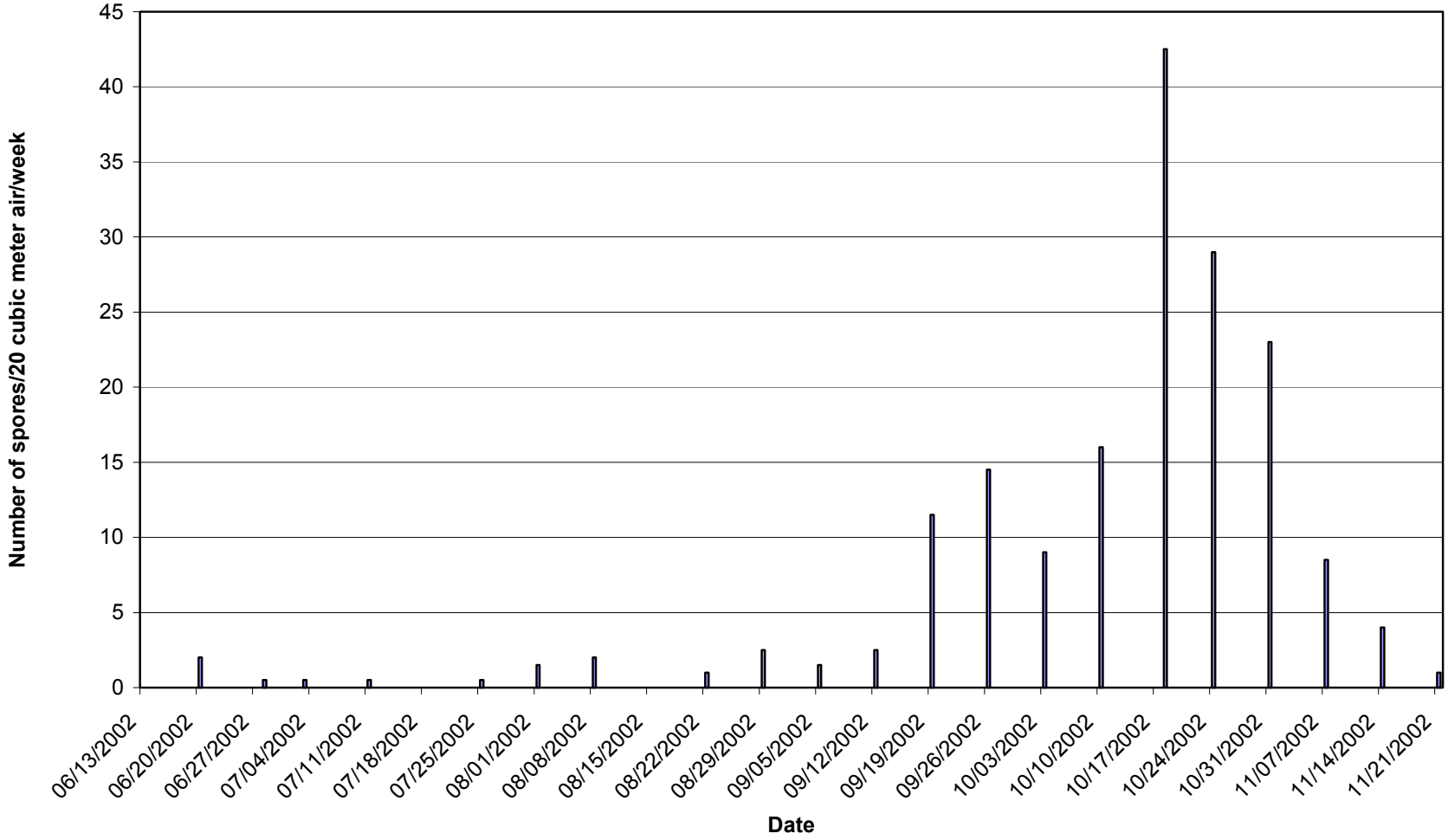

Table 1. Fungicide efficacy for the control of Cercosporidium needle blight on naturally infected 7-gal containerized Leyland cypress trees in Dearing, GA.

Fungicide Treatment	Rate/100 gal	Spray Interval	% Defoliation[1]	Needle Infection[2]
Untreated control	-------	-------	24 abc[3]	36.9 a[3]
Banner MAXX	6 oz	14 days	28 ab	26.4 b
Medallion 50WP	1 oz	14 days	35 a	23.7 bc
Medallion 50WP	2 oz	14 days	26 ab	21.9 bc
Heritage + non-ionic surfactant[4]	2 oz	14 days	13 cde	18.6 cd
Heritage + non-ionic surfactant	4 oz	14 days	20 bcd	12.7 d
Heritage + non-ionic surfactant + Banner MAXX	2 oz +6 oz	14 days	24 abc	18.5 cd
BAS 500	8 oz	14 days	21 bcd	14.8 d
BAS 500	16 oz	14 days	22 bc	16.9 cd
BAS 500	40 oz	14 days	13 cde	14.3 d
Systhane 40WSP	4 oz	10-14 days	19 bcd	12.7 d
Kocide 2000	0.75 lb	7-14 days	19 bcd	13.9 d
Daconil Ultrex	1.4 lb	7-10 days	10 de	12.4 d
Fore WSP Rainshield + spreader[4]	1.5 lb	7-10 days	7 e	12.4 d

[1] Estimated percentage of plant canopy defoliated by disease.
[2] Number of infection sites on 6-inch section of previous season's growth.
[3] Numbers followed by the same letter are not significantly different based upon Fisher's Protected LSD ($P<0.05$).
[4] Surfactant used was Induce® (Setre Chemical Co., Memphis, TN) at 3 pints/100 gal.