Auburn University Southern Forest Nursery Management Cooperative

RESEARCH REPORT 03-04

EVALUATING FUNGICIDES FOR CONTROL OF *RHIZOCTONIA* FOLIAGE BLIGHT OF LOBLOLLY

by
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INTRODUCTION

Both longleaf (*Pinus palustris* Mill) and loblolly (*P taeda* L.) pine seedlings are susceptible to foliage blight caused by a *Rhizoctonia* in the *Ceratobasidium* anastomosis group (CAG)-3 (English et al. 1986, Runion and Kelley 1993). The disease, which is favored within dense masses of needles, occurs regularly enough in several longleaf nurseries that prophylactic control is practiced but has been sporadic on loblolly (Runion and Kelley 1993) so that treatment is generally applied after symptoms are observed. In loblolly, foliar blight can become extensive among interior needles of nursery beds before symptoms become visible on surface foliage. Disease is often discovered only when surface needles are top-clipped, revealing patches of brown, dead, needles and bare stems.

Foliar blight was severe enough at some loblolly nurseries in 2001 that prophylactic control would have been economical. Before its withdrawal, benomyl was used (Gilly et al 1985) and although iprodione is effective (Boone and Carey 1999) one product is not enough in the current regulatory climate. In addition, basic information is needed to describe those conditions where disease should be expected. These considerations prompted this evaluation of fungicides for foliage blight control.

METHODOLOGY

Three fungicides were evaluated at the Plum Creek Timber Company's Pearl River Nursery for control of foliar blight of loblolly pine. Each fungicide was applied at the high average rate listed by Thompson (1997). Iprodione (Chipco-26019) was applied at 16 oz ai/ac, fludioxonil (Medallion) at 204 oz ai/ac and azoxystrobin (Heritage) at 12.5 oz ai/ac. Each fungicide was applied to one of four plots and one plot was not treated (control plot) in three blocks of three

randomized complete blocks (RCB) for a total of 9 plots per treatment. Each RCB was a riser-line-section (9-beds-wide) in a different nursery field and consisted of twelve 9-ft-long by 58-ft-wide treatment plots separated by buffer plots of the same size. Each application was delivered in a single pass of Hardee 550 gallon sprayer with a 9-bed (58 foot long) spray boom with nozzles on 20 inch centers. The first application was 8/6/02, the second 24 days later, and the third, fourth and fifth applications were at 16 day intervals except there was no 5th application for Medallion.

Temperature, dew-point and relative humidity (RH) were recorded in one block (RCB 3) using a Hobo Pro Temp/RH data logger and Boxcar 3.6 software with sensor held within the seedling canopy using a Hobo Pro Temp/RH Rain Shield from Forestry Suppliers. Hours when dew point temperatures (DP) were greater than the ambient temperature are assumed to indicate the presence of dew (free water) on interior needles.

The study area was inspected for *Rhizoctonia* foliar blight on October 23, 2002 by determining incidence in buffer plots and severity in treatment plots. Incidence was assessed as 0 or 1 for each of the three interior buffer plots of 8 beds in each RCB (for 24 buffer plots per block) by looking for foliar blight symptoms on the lower needles. In treatment plots with symptoms (incidence = 1), severity was assessed as the length of effected drill for each one foot increment of the 72 drill-feet per plot. Differences in incidence and severity between RCB's and the correlation between incidence and severity were analyzed using SAS ANOVA and Regression.

Mycorrhizae and root development were assessed for seedlings from each treatment plot in RCB 1. Approximately 30 seedlings per plot were lifted the first week of January and mailed to Auburn where mycorrhizae and RCD's were measured for 25 randomly picked seedlings per replicate. Five of each 25 were then root-scanned (HewlettPackard® 600 4C Scanner and Win RHIZO® software). Mycorrhizae were assessed macroscopically by ordering the 12 seedling replicates, without knowledge of treatment, by apparent degree of mycorrhizal colonization and separating groups by apparent differences.

RESULTS

The three tested fungicides completely prevented foliar blight within the test plots (disease incidence and severity both equal zero) and since statistical comparisons of larger numbers to zero are not necessary, the data that is presented here is to demonstrate beyond reasonable doubt that disease was prevented and not absent due to random distribution of inoculum.

Foliar blight was widely distributed in control and in buffer plots in two fields (RCB's) but absent from all fungicide treated plots. Symptom distributions by nursery field (RCB) in buffer and in control plots is presented in Figure 1 A and the correlation of incidence with severity, by block, is presented in Figure 1 B. Mean incidence, severity, and seedbed density by RCB is in Table 1.

Table 1. Foliar blight in not treated plots at Pearl River in 2002.

Field	Incidence †	Severity *	Seedlings /ft²§
1	17.3 a	48.3 a	22.6
2	1.3 b	1.67 b	19.1
3	14.7 a	34.67 a	22.2
lsd	5.6	25.37	na

† Incidence is number of 24 buffer plots with foliar blight present.

* Severity is the number of the 72 linear-bed-ft per control plot with foliar blight symptoms.

§ Seedbed density is from nursery inventory data.

Because fungicide treatments were not expected to affect seedling growth or mycorrhizae, those assessments were added later to address concerns about suppression of mycorrhizae. Seedlings from each treatment plot of field 1 were mailed to Auburn. Although a little too dry for optimal evaluation, it was still apparent none lacked "adequate" mycorrhizae. Gross mycorrhizal colonization was compared among replicate groups. Six of the 12 replicates were not visibly different from the most colonized and designated 100%, four were slightly less mycorrhizal (designated 90%) and one each was designated as 80% and as 70%. No treatments differed for mycorrhizal assessment, RCD or root scanner variables (a = 0.05) by treatment (Table 2).

Table 2. Root collar diameter, root scan data, and mycorrhizal assessment by fungicide treatment for January lifted loblolly seedlings.

Treatment	RCD (mm)	Length†	Fine roots	Tips *	Forks *	Mycorrhizae§
Iprodione	5.94	545	226	554	1190	87
Azoxystrobin	6.22	495	270	695	1387	100
fludioxonil	5.87	441	240	602	1238	90
none	5.99	441	223	598	1194	93
lsd	1.17	135	68	162	488	20

† Length is the total length of the scanned root system in cm and Fine roots is the length in cm of roots with a diameter < 0.5 mm.

* Tips and Forks, respectively, are the number of root tips and forks in the root systems.

§ Where the seedlings with the most mycorrhizae are considered 100% colonized and other are estimated reductions from those.

Only when foliar blight was noticed in many buffer plots was assessing that variable added to the evaluation. Difficulties in starting and stopping spray equipment make buffers necessary and can cause their unsprayed areas to vary in size and so affect the distribution of disease. However, the

strong correlation between incidence in buffers and severity in control plots (of constant size) indicates that over-spray was relatively uniform.

The correlation of foliar blight with seedbed density (Gilly et al 1985) suggests that disease spreads best with prolonged moisture. Disease in container loblolly has been controlled by removing infected container racks so that foliage dried more effectively (Carey unpublished) and although not replicated in this study, foliage blight was most severe in the denser seedbeds (Table 2). Those data for temperature and moisture within the seedbed canopy at Pearl River are a starting point for understanding the effects of seedling density on micro environment and that environment on foliage blight. Hopefully, additional years of data will allow us to characterize disease conditions and when control will be necessary.

Moisture within the seedling canopy at Pearl River was surprisingly high (Figure 2). The relationship between moisture and many plant diseases is such that accumulating rainfall, or hours of dew during favorable temperatures is often all that is needed to predict disease outbreaks or to time control sprays. As measured in standard weather shelters, RH normally reaches 100% only about nightfall and persists till about sunrise (on days without rain). On exposed foliage, which cools faster than the air, dew may form before RH reaches 100% and may persist a short time after the RH falls below 100% in the morning. We expect exposed leaves to have dew for less than 12hr (on rainless days) during the summer but data from within a seed-bed with 22 seedlings /ft^2 indicate there were few days with less than 15 hours when dew point temperature was not greater than ambient temperature. On about half the days between mid-August and late October those conditions lasted for closer to 20 hours within the seedbed foliage.

Abundant inoculum and ideal conditions for the disease development were widespread at Pearl River and in much of the South in 2002. The data from buffer plots and severity in control plots increases our confidence that the fungicides were effective despite severe disease pressure. The environment for foliar blight was such across the South in 2002 that several nurseries reported seeing the disease for the first time on loblolly. Could we have predicted such conditions we would have evaluated more rates at fewer replicates per treatment.

MANAGEMENT IMPLICATIONS

Each fungicide (iprodione, azoxystrobin or fludioxonil) effectively prevented *Rhizoctonia* foliar blight when applied at high rates. It is good to have three active ingredients to rely on at this time. The one to use could be based on cost at the tested rates. However, we intend to reevaluate at lower rates in order to try and determine the most cost effective alternative.

LITERATURE CITED

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Figure 1A: Locations of Rhizoctonia symptoms by RCB, bed and plot for incidence in buffers (ovals) and severity in control plots (cones)

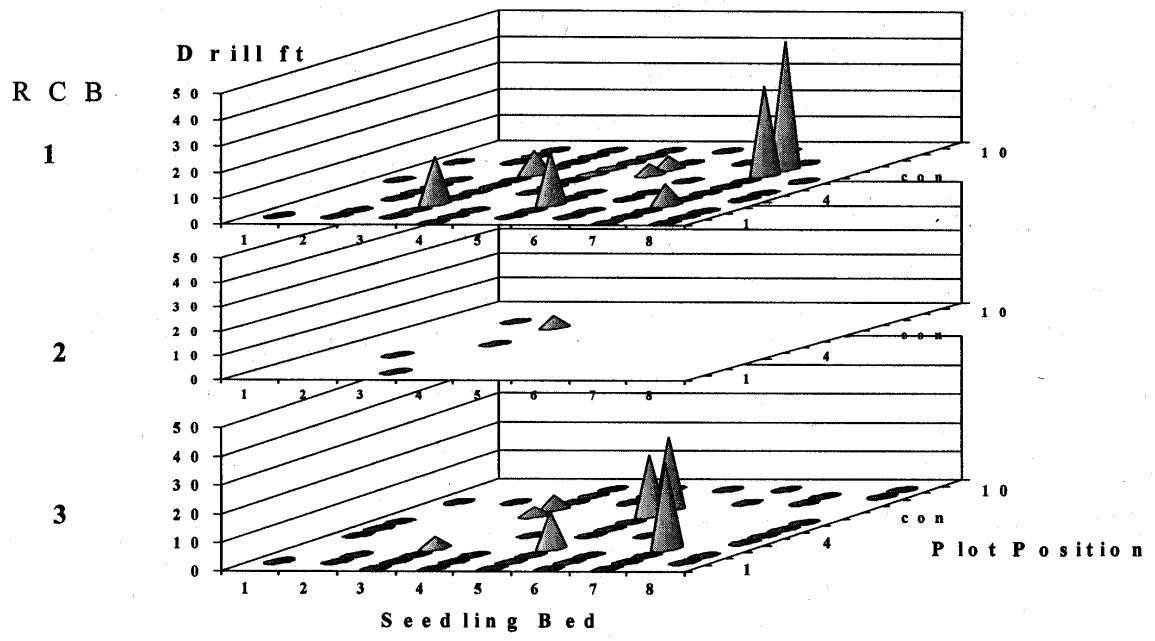
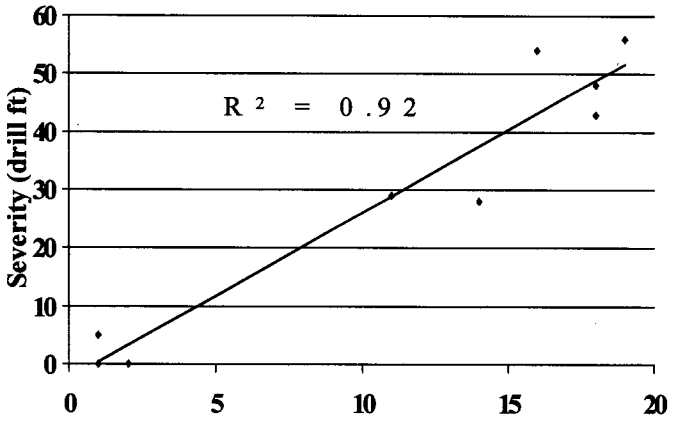
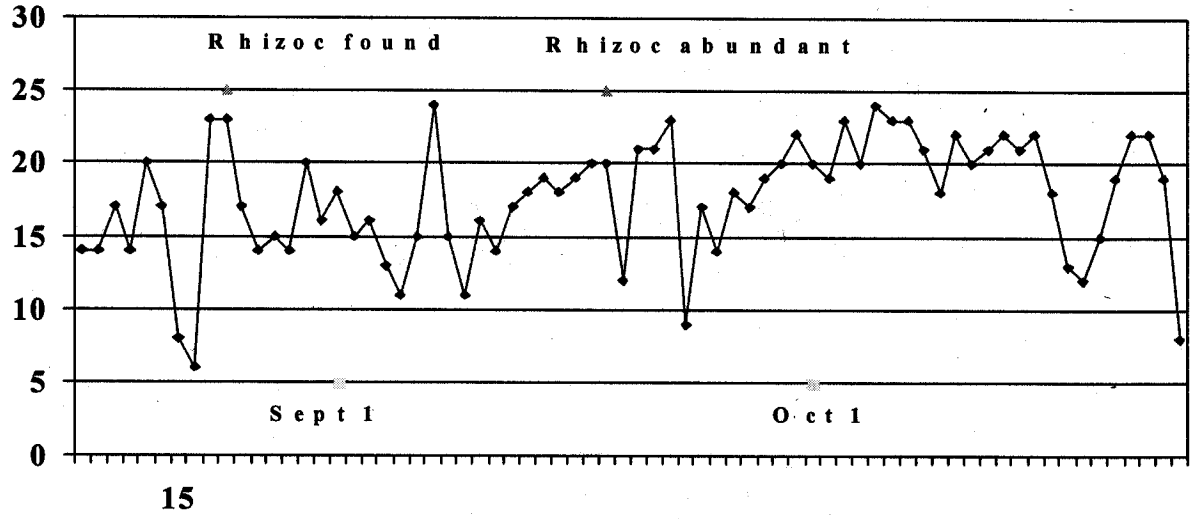


Figure 1B: Symptom severity in control plots by incidence in buffer plots among 9 blocks in 2002



Appendix Figure 1A: Hrs of dew for foliage within seedling beds at Pearl River in 2002



Appendix Figure 1B: Relationship between hrs of dew and hrs of RH>97% within foliage of beds.

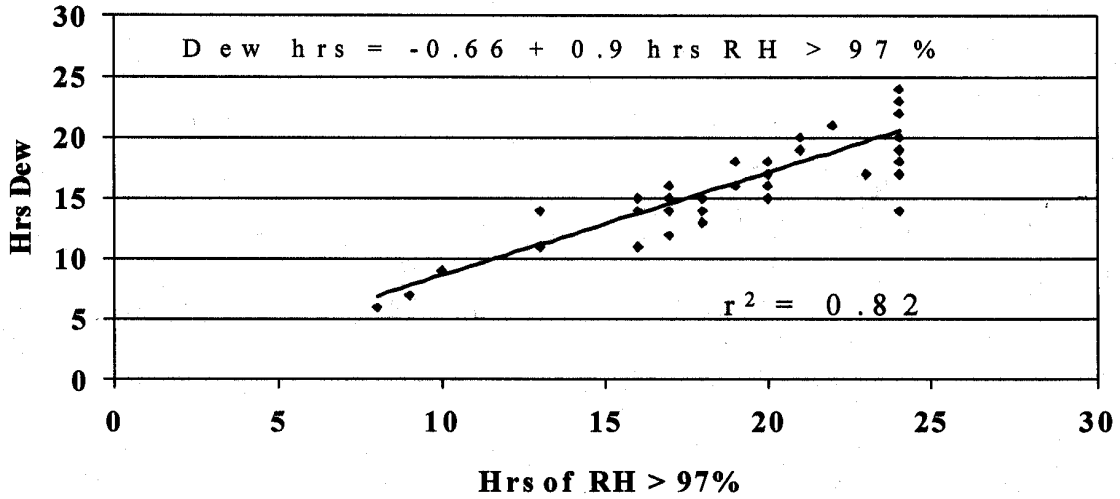


Chart Data from Aug - mid Sept regression data Aug - Oct