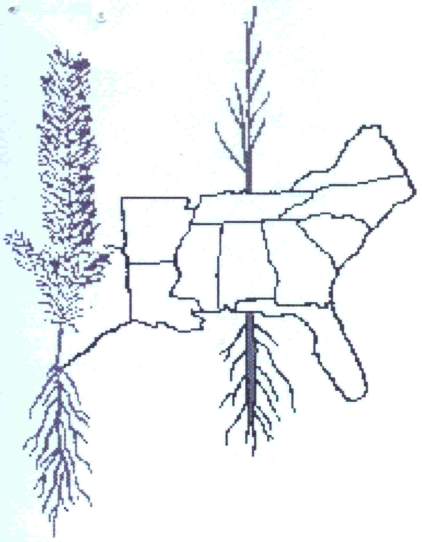

Auburn University
Southern Forest
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RESEARCH REPORT 04-6

EVALUATING FUNGICIDES FOR THE CONTROL OF FUSIFORM RUST IN A GREENHOUSE STUDY

by

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INTRODUCTION

Our industry has used Bayleton® (triadimefon) for rust control in nurseries for over 20 years and as far as effectiveness goes the fungicide is as good as ever. Regular applications of 4 oz ai per acre every 21 days through the rust season (May to June) provide all but absolute protection from rust infection in most years. However, pesticide options can change for reasons not related to product efficacy. Therefore, we never stop evaluating fungicides for rust control and have tested all the products that seemed to us potentially effective both before and after the adoption of Bayleton® in the early 1980's. From a large number of evaluated fungicides, both before and after the adoption of Bayleton®, only two fungicides (Cyproconazole and Triticonazole) have had comparable efficacy against fusiform rust but these never became registered for use in forest-tree nurseries. We keep trying, and this year we added two potential fungicides, Heritage® (azoxystrobin) and Folicure® (tebuconazole) to the list of evaluated fungicides. Both Heritage® and Folicure® are labeled for some foliar rusts and could be expected to have activity on *Cronartium* spp.

METHODOLOGY

All seed were loblolly from a bulk collection from the Alabama State Seed Orchard. Seed used to produce seedlings to evaluate foliar sprays were sown without chemical treatment on April 11. Those to evaluate seed treatments were treated with fungicide on May 29 and sown on June 30. Seedlings were grown as specified by the Rust Resistance Screening Center (RRSC) (Knighten 1988) in 1.5" by 8" conical pots (Cone-tainers®) containing a mixture primarily of peat and perlite (Premier Pro-Mix®). Twenty single seedling containers in a rectangular rack comprised a replicate and 5 replicates were used for each treatment.

Bayleton® 50% WP was the standard-practice-control treatments for seed at 2.0 oz ai/100 lb of seed (1.2 g ai / kg seed) and for foliar spray at 4 oz ai / ac. Experimental seed treatments were Folicure® 3.6 F at the equivalent of 0.3 oz ai/100 lb seed (0.2 g ai/kg) and two rates of Heritage® at 0.16 oz ai/100 lb (0.1 gm ai/kg) and at 0.23 ai/100 lbs seed. Experimental foliar sprays were Heritage® at 4.4 and at 8.8 oz ai/ac and Folicure® at 3 and at 6 oz ai/ac. For foliar sprays the higher rate was obtained by spraying the seedlings twice at the lower rate. All foliar sprays were applied in an automatic spray chamber at the equivalent of 170 gal/ac of spray solution.

Artificially inoculated oaks with mature telia of *C. fusiforme* were obtained from the RRSC on June 13. Leaves from these oaks were placed in moist chambers over acidified water to collect basidiospores using the techniques of Matthews and Rowan (1972) on June 16. Basidiospores were removed from the acidified water, after 12 hours, and kept on moist Millipore® filters at 36E F until June 20 then suspended in distilled water to a concentration to 32,000 spores /ml. All seedlings were inoculated June 20 with approximately 30,000 spores per seedling in an automatic spray chamber. This was 14 days after foliar sprays, when those seedlings were 70 days old, or 21 days after treated seed were sown.

Immediately after inoculation, seedlings were removed from the spray chamber, placed in plastic bags (moist chambers) and misted with distilled water to prevent drying. They remained in these bags for 24 hrs at 70E F and were returned to the greenhouse June 21, 2003 and randomly distributed on two tables.

Seedlings were examined for rust galls on January 16, 2004 (210 days post inoculation). Numbers of galls per 20 seedling replicate were analyzed for differences attributable to fungicide treatment using SAS ANOVA.

RESULTS AND DISCUSSION

Mean numbers of rust galls per treatment are presented in Table 1. There were no significant differences among treatments ($Pr > F = 0.51$). The percentage differences among treatment were less than normal, but not too small to preclude the difference from being significant, had the variability within treatments not been larger than normal. Although, in artificial inoculations, the percentage of galled seedlings in the control treatment is usually greater than 50% (not the 9.8% in the current study). The lower percentage could be attributed to less than optimal conditions during either inoculation, incubation or the succeeding months in the greenhouse. However, the relatively large percentages of infected seedlings in the Bayleton® treatments are difficult to reconcile with the small percentage in the Control. Considerable experience in similar studies indicates that differences between Bayleton® and non-fungicide treated seedlings should be significant even when the overall percentage in the control treatment is small. In short, a reason for the low rate of disease symptoms among controls is more difficult to understand because of the relatively large percentage in the reliably effective control treatment.

MANAGEMENT IMPLICATIONS

No decisions can be made with confidence based on the data in this study. Optimistically it could be said that Heritage® performed as well as Bayleton® but with the variability of percent galls within treatments it is best to try this study again.

Table 1. Percentage of fusiform rust galls on inoculated loblolly pine seedlings by fungicide treatment.

Treatment	Rate	Percent Galls
Control	None	9.8
Bayleton Seed Treatment	2.0 oz ai / 100 lbs	3.4
Bayleton Foliar Spray	4.0 oz ai / ac	2.0
Heritage Seed Treatment	0.16 oz ai / 100 lbs	8.0
Heritage Seed Treatment	0.23 oz ai / 100 lbs	2.8
Heritage Foliar Spray	4.4 oz ai / ac	5.0
Heritage Foliar Spray	8.8 oz ai / ac	7.8
Folicure Seed Treatment	0.3 oz ai / 100 lbs	4.0
Folicure Foliar Spray	3.0 oz ai / ac	8.0
Folicure Foliar Spray	6.0 oz ai / ac	7.0

Knighten, J. L., C. H. Young, T. McCartney, and J.L. Anderson. 1988. (Rev.). Resistance screening center procedures manual.: A step-by-step guide used in the operational screening of southern pines for resistance to fusiform rust. USDA For. Serv. For. Pest Manage. Region 8. Asheville, NC.

Matthews, F.R., and S. J. Rowan. 1972. An improved method for large-scale inoculations of pine and oak with *Cronartium fusiforme*. Plant Dis. Rep. 56:931-934.