Auburn University
Southern Forest Nursery
Management Cooperative

RESEARCH REPORT 18-05

TESTING FUNGICIDES FOR THE CONTROL OF FUSIFORM RUST

by
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INTRODUCTION

Cronartium quercuum f.sp. *fusiforme*, the causal agent of Fusiform rust is still of major concern to many Loblolly (*Pinus taeda*) and Slash (*Pinus elliottii*) seedling growers. Although both genetic and cultural control options are available to reduce the risk of this disease, the most effective control in nursery production is the use of fungicides. Seedling infections can be significantly reduced by applying registered fungicides either as a seed treatment before sowing or as a foliar spray following germination (Carey 2004, Starkey and Enebak 2008, 2010).

One of the major accomplishments of the Nursery Cooperative in 1980 was to assist in the registration of Triadimefon (Bayleton®) for fusiform rust control (Carey and Kelley 1993). At that time it was estimated that the incidence of rust fell from 2.5% to 0.01% of all seedlings due to this chemistry. In addition the fungicide usage fell from 4lbs/ac/yr to less than 1lb/ac/yr due to the reduced number of applications required per season. The Southern Forest Nursery Management Cooperative continued to look for alternative chemistries to assist with the control of Fusiform rust and was instrumental in obtaining a registration for the active ingredient Prothioconazole (Proline®) in 2011 as both a foliar spray and seed treatment (Starkey and Enebak 2010).

As a seed treatment, the current labelled rate for Proline® is 10fl oz./50lb of seed. These current label rates for conifer seed treatment are based on the use of Triadimefon activity. Label rates for others agronomic seeds are 10 -100 x less active ingredient (a.i.) per unit of treated seed and thus the need to identify the effect of lowering the rate was required. The ability to identify the lowest effective rate for Proline® for use on conifer seed at the time of sowing could potentially help decrease fungicide usage by pine seedling growers.

In 2017, in conjunction with the US Forest Service Rust Testing Laboratory in Asheville, NC, the Nursery Coop conducted both seed and seedling treatment studies on both Loblolly and Slash pine. The aim of the studies were to (1) Test two potential new active ingredients for seed/ seedling treatment (2) To determine whether the current labelled rate for Proline® seed treatment was the most effective.

MATERIALS AND METHODS

Seed Treatment

For this study conifer seed (loblolly and slash) were treated (Table 1 and 2) in Auburn and sown into USFS container systems until germination at which time the seedlings were challenged with basidiospores of *Cronartium quercuum* f.sp. *fusiforme*. Seedlings were evaluated for any gall formation at both 4 and 8 months after being challenged with Fusiform rust.

Seedling Treatment

For this component of the study we tested two new active ingredients (Table 3) which were applied to the seedlings 2-weeks post germination (Loblolly and Slash). Seedlings were sent to the Rust Lab and challenged with basidiospores of *Cronartium quercuum* f.sp. *fusiforme* 8 weeks post germination. As with the seed treatment, the pine seedlings were evaluated for any gall formation at both 4 and 8 months after being challenged with Fusiform rust.

RESULTS AND DISCUSSION

For seed treatment, the labelled Proline® rate (X) was most effective in the controlling Fusiform rust infection (Figure 1 & 2). Reducing the rate of Proline® (0.5X – 0.0625X) resulted in a significant increase in Fusiform galling incidence, no different than the non-treated (Control) or susceptible check loblolly (11-218) or slash pine (C223). The recommended seed treatment rate of 10 oz/ 50 lbs seed resulted in galling incidence equivalent to seed treated with Bayleton® and that of seed from Fusiform resistant pine families (22-62 – Loblolly; K13 – Slash) (Figure 1 & 2). The labelled rate of Proline® provides effective control against Fusiform rust when used as a seed treatment.

The new chemistries tested as a seedling control were found to be effective in reducing the incidence of Fusiform rust (Figure 3 & 4). The active ingredients Trifloxystrobin and Propiconazole + Trifloxystrobin were found to be as effective as Triadimefon, the active ingredient of Bayleton® (Figure 3 & 4). Significantly less galls were found to occur on treated seedlings than that of the control treated seedlings or the untreated susceptible and tolerant family standards. These new chemistries have the potential to be alternative fungicides that can be used to reduce the incidence of Fusiform rust on seedlings.

Results from this study indicate that the current labelled rate for Proline® was the most effective as a seed treatment and the rate should not be reduced. In addition we identified two alternative chemistries that show promise to be used as seedling treatments to reduce the incidence of Fusiform rust on pine seedlings.

MANAGEMENT IMPLICATIONS

- For seed treatment the current labelled rate for Proline® of 10 fl. oz./50 lb. of seed was most effective against Fusiform rust and reducing the labelled rate resulted in an increase in rust incidence.
- New chemistries show promise as potential alternatives as a Fusiform rust seedling treatment. Theses chemistries, however, require further field testing and registration prior to being used commercially.

REFERENCES

Carey, B. (2004). Evaluating fungicides for the control of fusiform rust in a greenhouse study. Auburn University, Southern Forest Nursery Management Cooperative. Research Report 04-06: 3p.

Carey, W.A. and Kelley, W.D. (1993). "Seedling Production Trends and Fusiform Rust Control Practices at Southern Nurseries, 1981-1991." Southern Journal of Applied Forestry 17(4): 207-211.

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Starkey, T.E. and Enebak, S.A. (2010). Control of Pitch Canker, *Rhizoctonia* foliage blight and fusiform rust using Proline® and efforts to aquire registration. Auburn University, Southern Forest Nursery Management Cooperative. Research Report 10-11: 16p.

Table 1. Seed treatments for both loblolly and slash pine

Fungicide	**Manufacturer**	**Active Ingredient**
Bayleton®	Bayer Cropscience	Triadimefon - 50%
Proline® 480SC	Bayer Cropscience	Prothioconazole – 41.0%

Table 2. Rates of Proline® tested in study

Active ingredient	**1x rate (recommended)**	**0.5 x rate**	**0.25 x rate**	**0.125 x rate**	**0. 0625 x rate**
Control (water)	N/A				
Triadimefon 50%	8 oz./ac				
Prothioconazole 41.0%	10 fl oz./ 50 lb. of seed	5 fl oz./ 50 lb. of seed	2.5 fl oz./ 50 lb. of seed	1.25 fl oz./ 50 lb. of seed	0.625 fl oz./ 50 lb. of seed

Table 3. Active ingredients tested when Loblolly and Slash seedlings were challenged with basidiospores of *Cronartium quercuum* f.sp. *fusiforme*

Fungicide	**Manufacturer**	**Active Ingredient**
Bayleton®	Bayer Cropscience	Triadimefon - 50%
Compass®	Bayer Cropscience	Trifloxystrobin – 50%
Stratego®	Bayer Cropscience	Propiconazole – 11.4% Trifloxystrobin – 11.4%

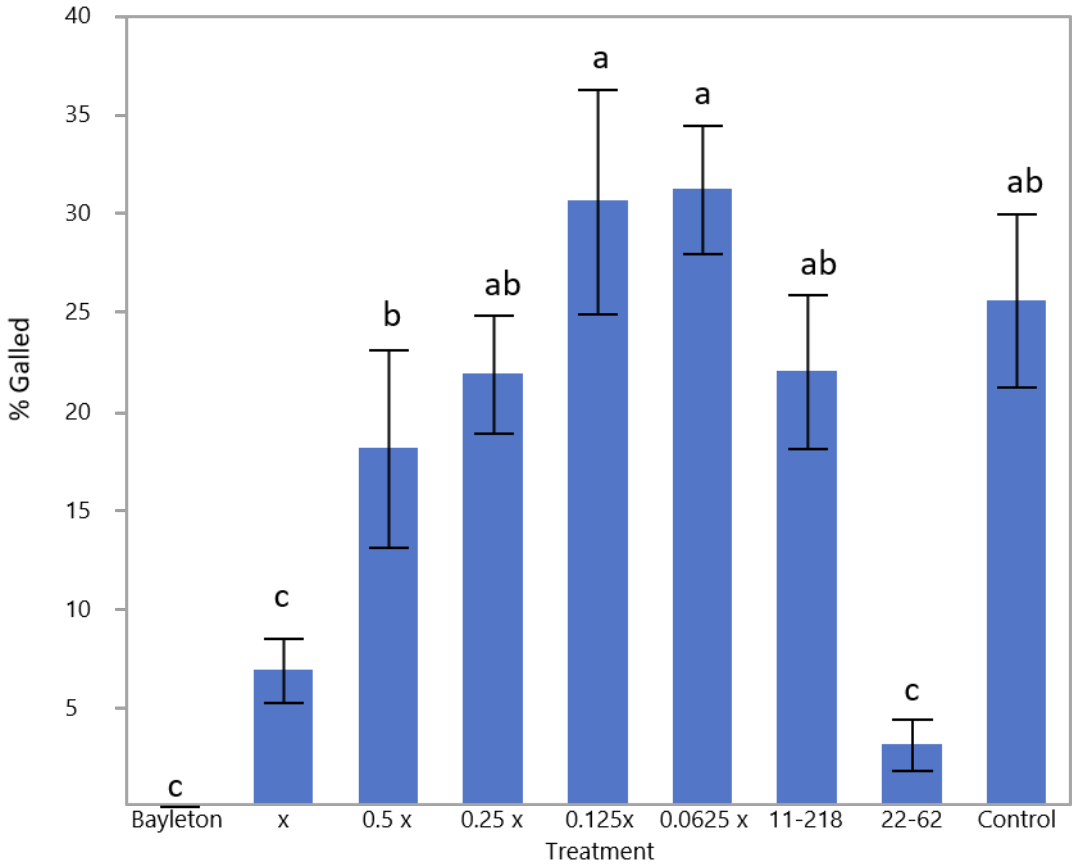

Figure 1. Loblolly pine seed treated with different rates of Proline® compared to standard controls. (Different letters on bars indicate significant differences at $p<0.05$)

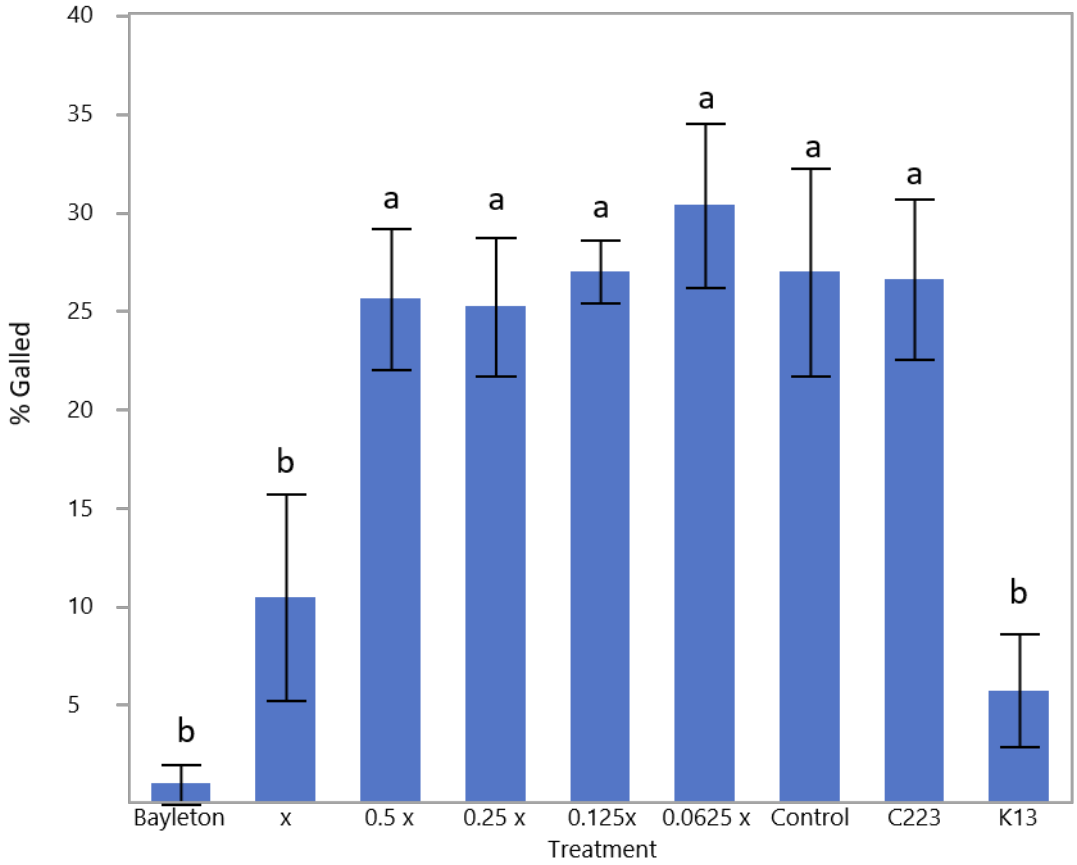

Figure 2. Slash pine seed treated with different rates of Proline® compared to standard controls. (Different letters on bars indicate significant differences at $p<0.05$)

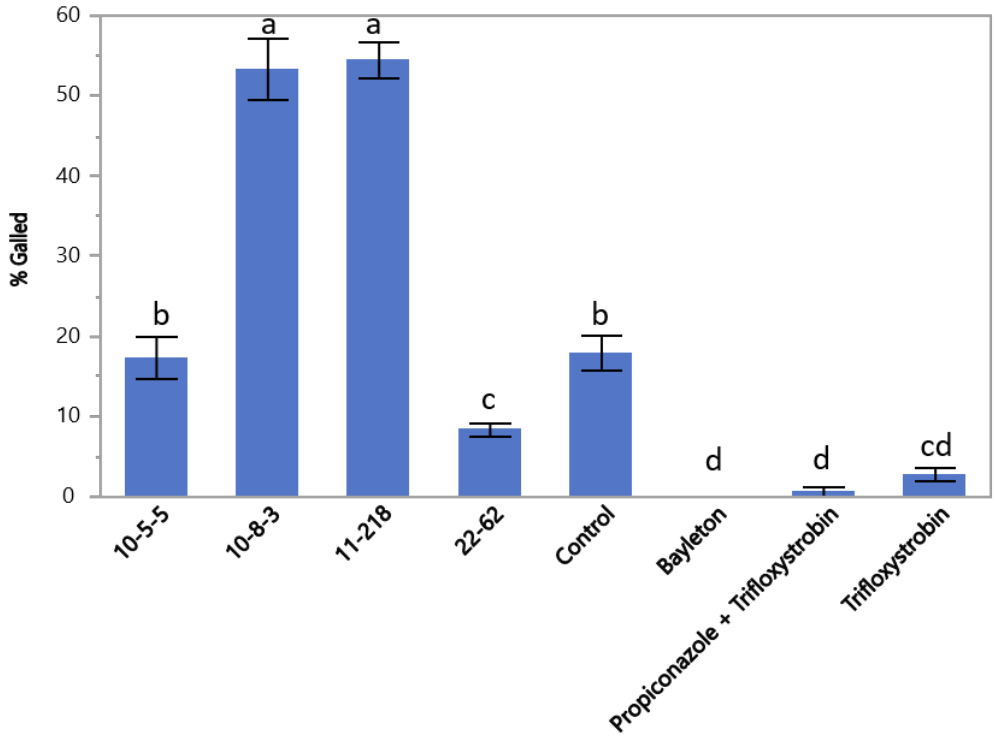

Figure 3. Loblolly pine seedlings treated with new chemistries compared to standard controls. (Different letters on bars indicate significant differences at $p<0.05$)

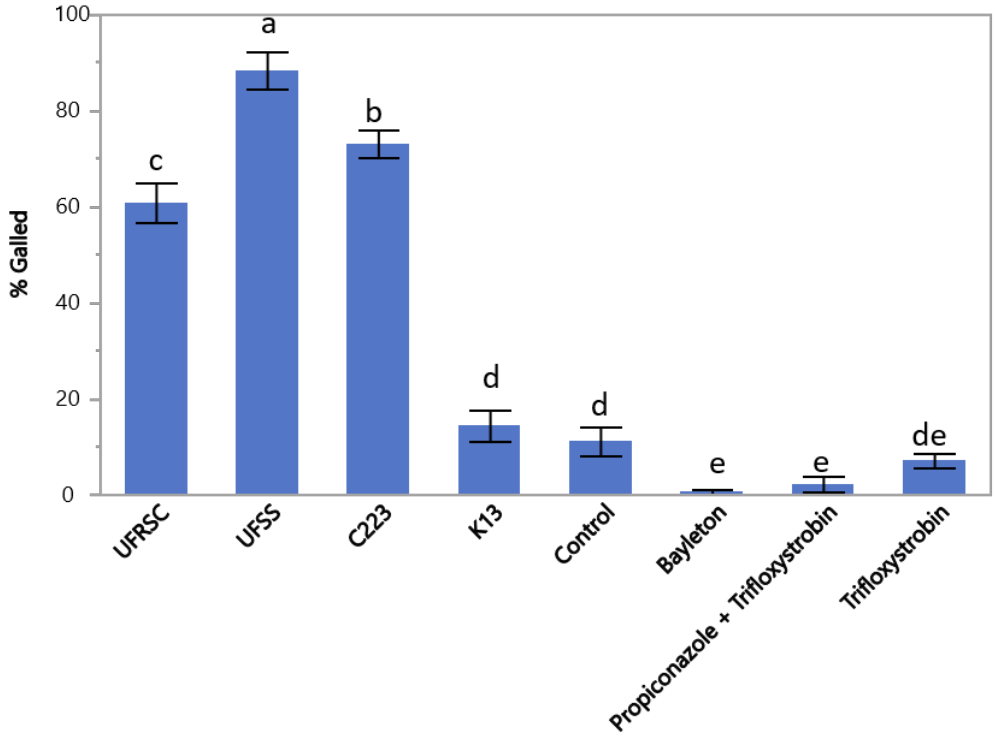

Figure 4: Slash pine seedlings treated with new chemistries compared to standard controls. (Different letters on bars indicate significant differences at $p<0.05$)