Southern Forest
Nursery Management Cooperative

RESEARCH REPORT 20-04

RESULTS FROM THE 2019 FUSIFORM RUST GREENHOUSE TRIAL, TESTING THE EFFICACY OF TWO POTENTIAL NEW SYNTHETIC FUNGICIDES

by
Ryan Nadel

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 was 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 4 lbs/ac/yr to less than 1 lb/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).

In 2012, the Environmental Protection Agency (EPA), along with the registrant voluntary removed Bayleton® from the market, reducing the availability of fungicides that are effective in controlling fusiform rust to just that of Proline® (Starkey and Enebak 2011). To ensure that alternatives chemistries are available to control fusiform rust, the Nursery Cooperative continues to annually test the effectiveness of viable chemistries in controlling this disease. In 2019, in conjunction with the US Forest Service Rust Testing Laboratory in Asheville, NC, the Nursery Cooperative continued to conduct seedling treatment studies on both Loblolly and Slash pine. The aim of the studies were to test the potential of two new active ingredients to be used as a seedling treatment.

MATERIALS AND METHODS

Seedling treatment

For this study, two chemistries (BanBanner Max II® & Mural®) were tested at the recommended rate along with

Proline® (Table 1). These treatments were applied to both Loblolly and Slash seedlings 2 weeks post germination in the greenhouse in Auburn, AL. After treatment, the seedlings were brought to the Rust Laboratory in Asheville, NC and challenged with basidiospores of *Cronartium quercuum* f.sp. *fusiforme* 8 weeks post germination. After inoculation, the seedlings were maintained at the US Forest Service greenhouse and evaluated for gall formation at both 4 and 8 months after being challenged with Fusiform rust.

RESULTS AND DISCUSSION

The new chemistries tested as a seedling treatment for the control of fusiform rust were found to be less effective (for loblolly pine) or equivalent (slash pine) in controlling the rust when compared to the fusiform resistant pine families (Figure 1 & 2). There was no significant difference in fusiform galling incidence compared to that of the non-treated (Control) or susceptible loblolly (11-218) or slash pine (C223) seedlings (Figure 1 & 2). Proline®, that is currently used and registered for seedling protection against fusiform rust, resulted in galling incidence equivalent to resistant slash pine families (K13 – Slash) and for loblolly pine were less than then the untreated control (Figure 1 & 2). The two new products tested therefore do not provide sufficient protection against fusiform rust when used as a seedling treatment.

Significantly more galls were found to occur on seedlings treated with either of the tested new chemistries when compared to that of the positive control. Fusiform galling incidence at rates seen for the tested products are not considered effective in controlling fusiform rust. Results from this study further indicated that the active ingredients Azoxystrobin + Benzovindiflupyr and Propiconazole gave worse results to that of the untreated controls and are therefore ineffective in reducing the incidence of infection by the fungus.

MANAGEMENT IMPLICATIONS

- Results from this greenhouse study indicate that the active ingredients Azoxystrobin + Benzovindiflupyr and Propiconazole were found to give worse results to that of the untreated controls and are therefore ineffective in reducing the incidence of Fusiform galls.

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.

Starkey, T.E. and Enebak, S.A. (2008). Fungicides for the control of Fusiform rust. Auburn University, Southern Forest Nursery Management Cooperative. Research Report 08-04: 6.

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: 16.

Starkey, T.E. and Enebak, S.A. (2011). The Use of Proline® (Prothioconazole) to Control Pitch Canker, *Rhizoctonia* Foliage Blight, and Fusiform Rust in Forest Seedling Nurseries and Efforts to Acquire Registration. National Proceedings: Forest and Conservation Nursery Associations - 2010. 65: 49-57.

Table 1. Active ingredients tested when Loblolly and Slash seedlings were challenged with basidiospores of *Cronartium quercuum* f.sp. *fusiforme*

Fungicide	Manufacturer	Active Ingredient	Rate tested
BanBanner Max II®	Syngenta	Propiconazole - 14.3%	6 fl oz. per 100 gallons of water
Mural®	Syngenta	Azoxystrobin - 30% Benzovindiflupyr - 15%	3oz of product per 50 gallons of water
Proline®	Bayer Cropscience	Prothioconazole – 41%	5 fl oz. per acre

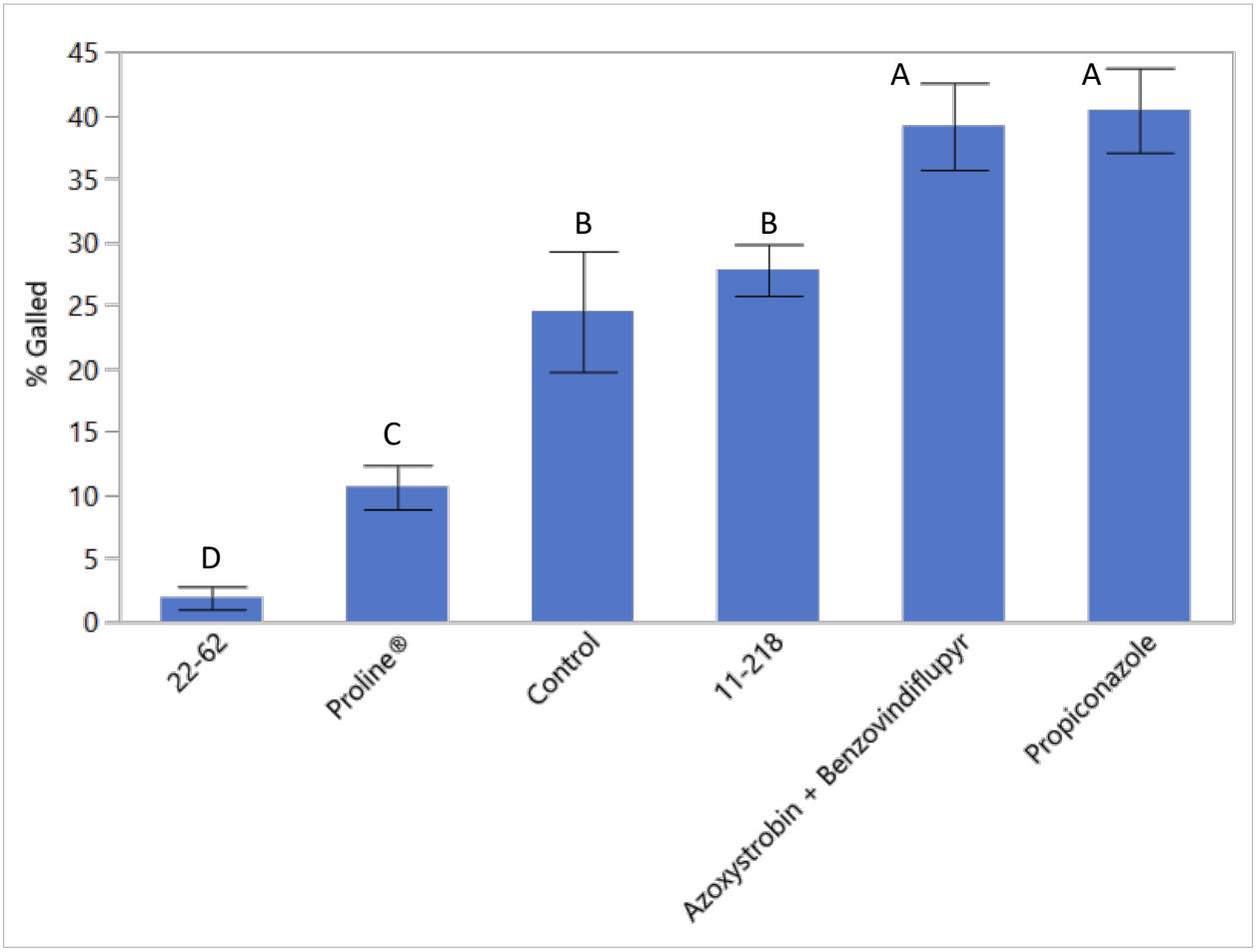

Figure1. Loblolly pine seedlings treated with new chemistries compared to standard controls. (Different letters on bars indicate significant differences at $p<0.05$)

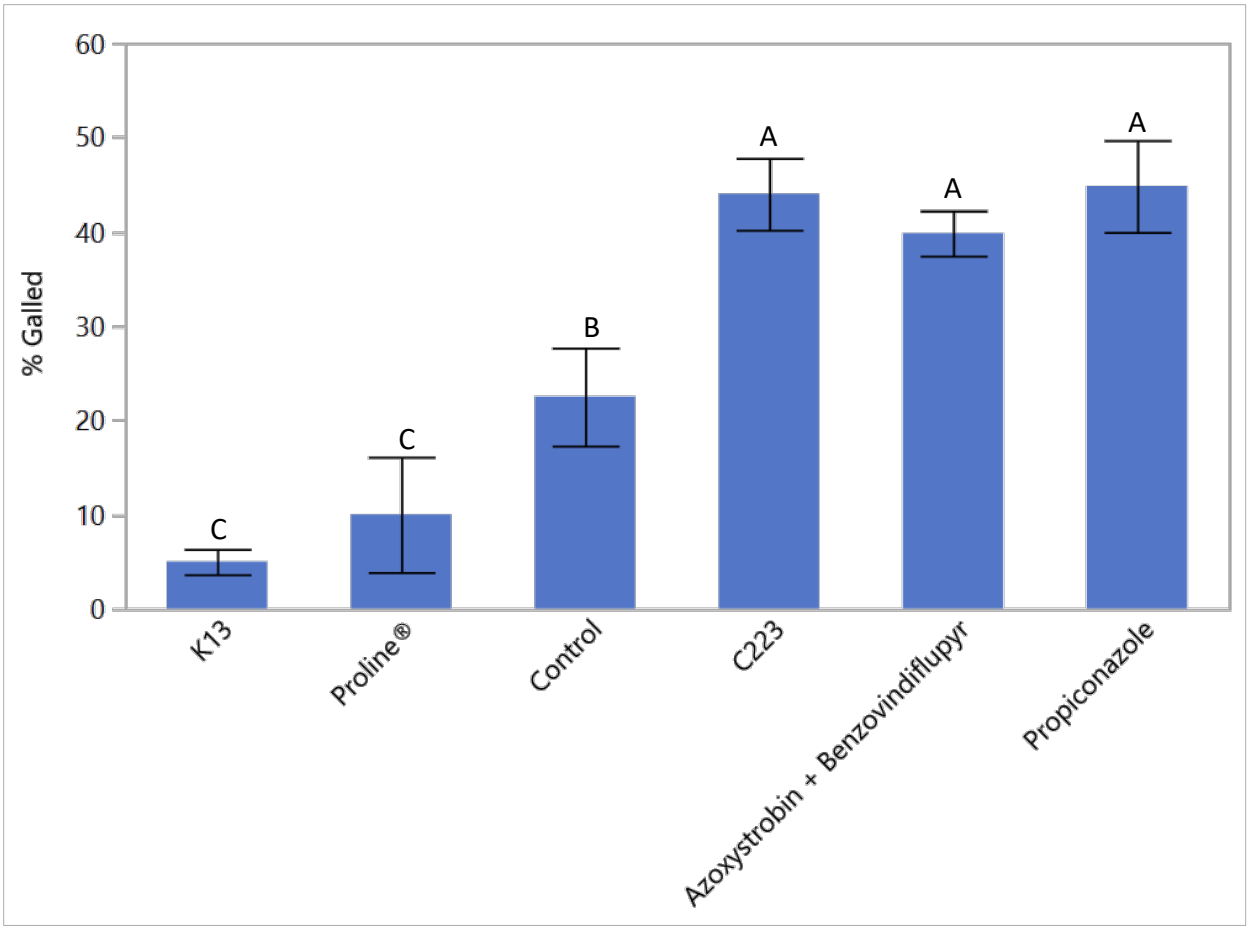

Figure 2. Slash pine seedlings treated with new chemistries compared to standard controls. (Different letters on bars indicate significant differences at $p<0.05$)