Southern Forest
Nursery Management Cooperative

RESEARCH REPORT 19-01

RESULTS FROM THE 2018 FUSIFORM RUST TRIAL, TESTING THE EFFICACY OF POTENTIAL NEW SYNTHETIC AND BIOLOGICAL FUNGICIDES

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 was assisting in the registration of Triadimefon (Bayleton®) for fusiform rust control in 1980 (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 2018, 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 was to: (1) Test the potential of new active ingredients for seedling treatment; (2) Test the effectiveness of a biological product compared to the synthetic fungicide for the control of fusiform rust; and (3) Determine the impact of application rate of the biological product on the effectiveness of the product.

MATERIALS AND METHODS

Seedling treatment

For this study, we tested one new active ingredient at the recommended rate and a biological

fungicide at both recommended (x) and doubled recommended rate (2x) (Table 1). These treatments were applied to the seedlings 2-weeks post germination to both Loblolly and Slash seedlings. After treatment in Auburn, 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 in controlling the fungus 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). Products currently used and registered for seedling protection against fusiform rust, result in galling incidence equivalent to or less than resistant pine families (22-62 – Loblolly; K13 – Slash) (Figure 1 & 2). The tested products therefore do not provide sufficient protection against fusiform rust when used as a seedling treatment.

Significantly fewer galls were found to occur on seedlings treated with *Bacillus subtilis* GB03 (Loblolly seedlings treated at both rates and Slash seedlings at the x rate) compared to that of the positive control. Fusiform galling incidence at rates of 40% are, however, not considered effective in controlling fusiform rust. The study further revealed that despite the application of double (2x) the recommended rate of this biological fungicide, the efficacy of reducing galling was not achieved. Results from this study further indicated that the active ingredient Fluxapyroxad + Pyraclostrobin were found to give similar 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 study indicate that the active ingredients Fluxapyroxad + Pyraclostrobin were found to give similar results to that of the untreated controls and are therefore ineffective in reducing the incidence of Fusiform galls.
- The biological fungicide (a.i. *Bacillus subtilis* GB03), although producing fewer galls than the untreated controls, levels were still too high to be considered providing protection against fusiform rust.
- *Bacillus subtilis* GB03 applied at both the recommended and double the recommended rate did not reduce the galling incidence to resistant family levels.

REFERENCES

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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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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/s tested
Orkestra™ Intrinsic	BASF	Fluxapyroxad – 21.26% Pyraclostrobin – 21.26%	8 fl. oz./ 100 gal
Companion® Biological Fungicide	Growth Products	*Bacillus subtilis* GB03 – 0.03%	16 fl. oz. / acre in 22 gal water (x) 32 fl. oz. / acre in 22 gal. water (2x)

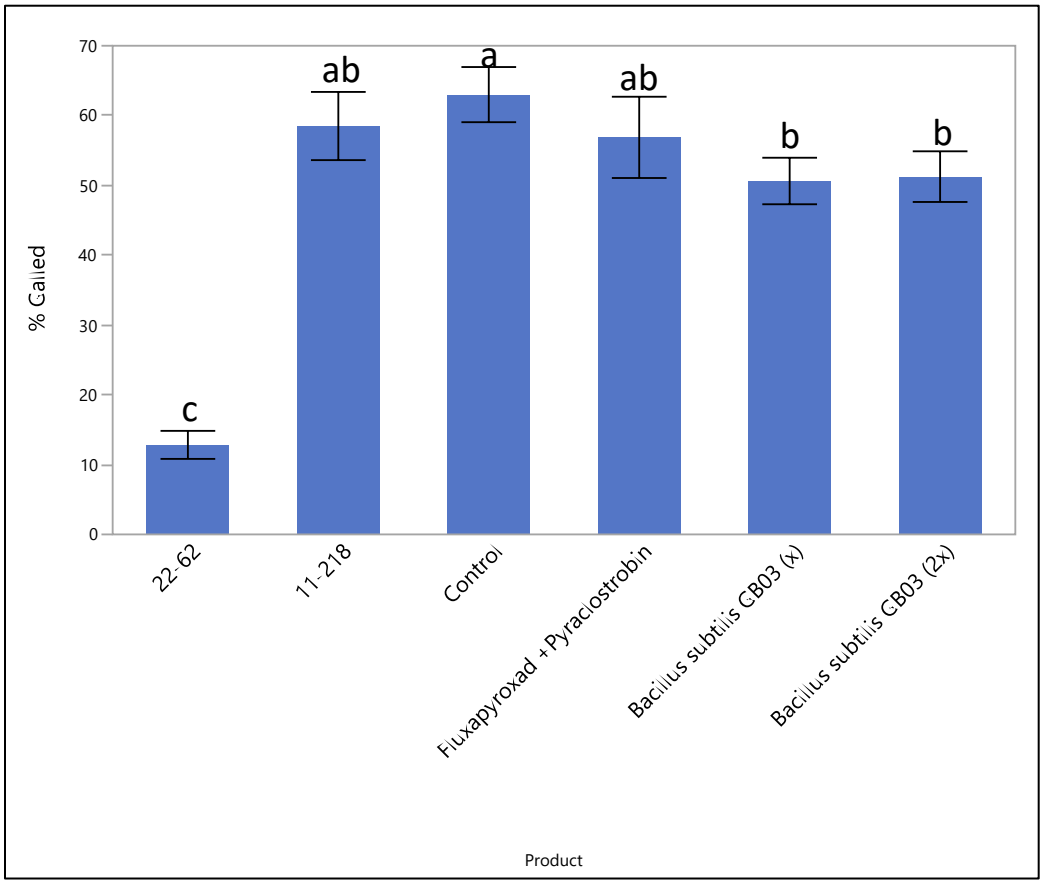

Figure 1. Loblolly pine seedlings treated with new chemistries compared to standard controls. (Different letters on bars indicate significant differences at $p<0.05$)

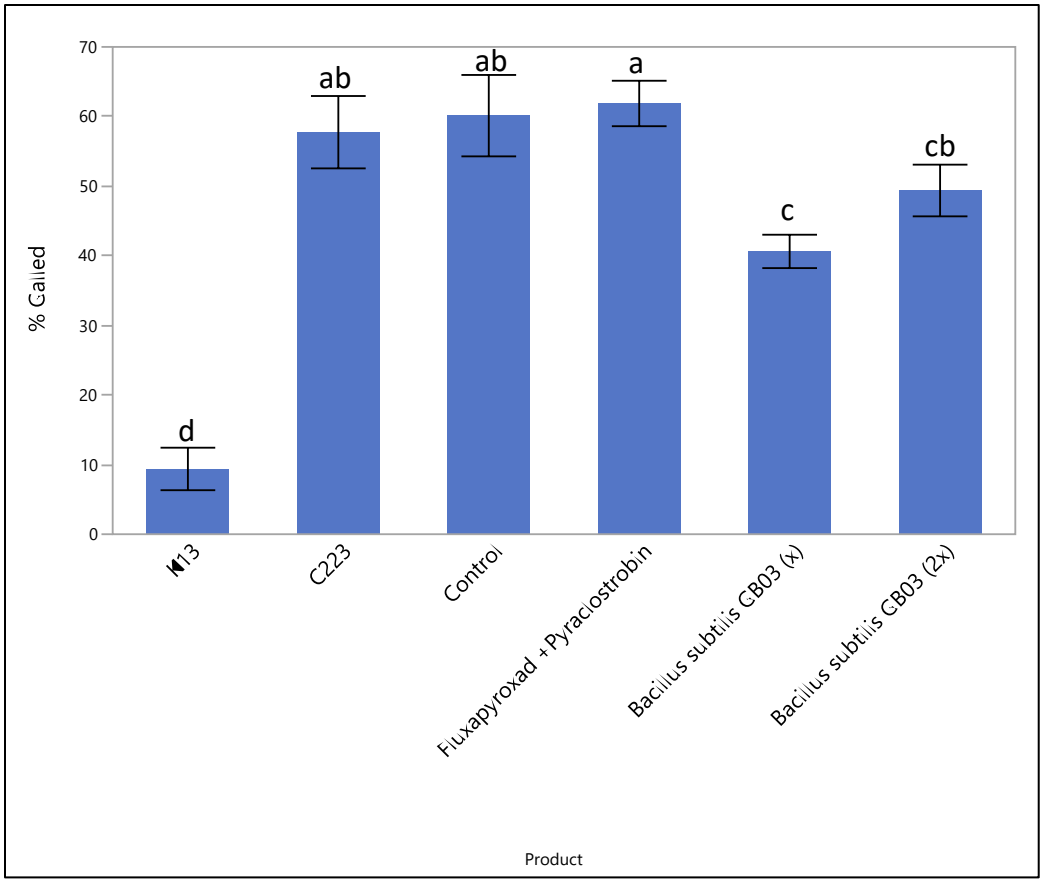

Figure 2. Slash pine seedlings treated with new chemistries compared to standard controls. (Different letters on bars indicate significant differences at $p<0.05$)