FIRST-YEAR SURVIVAL AND GROWTH OF FERTILIZED SLASH PINE IN SOUTH ALABAMA

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Abstract—Early survival and growth rates are critical to the successful establishment of pine stands. Landowners need options to improve first-year growth on pine stands that will help them meet their land management objectives. One way to improve early stand survival and growth is through fertilization. In January 2008, approximately 5 acres of slash pine (*Pinus elliottii* Englem.) were planted on an old field site in south Alabama. Slash pine seedlings were treated with Accele-Grow-M™, a patent pending fertilizer supplement, to determine if there were any growth differences as a result of foliar application, root dip, or a combination of both and compared to a control group. Comparisons between initial seedling height and root-collar diameter measurements that were taken shortly after planting and first-year growth measurements showed that the control seedlings had increased growth in height and groundline diameter when compared to treated seedlings. In addition to the early effect on growth, it is possible that the fertilized seedlings also invested more in increased foliar density and root mass, parameters that were not measured. If this is the case, we expect to see acceleration in the growth rates of the fertilized seedlings in subsequent years.

INTRODUCTION

Landowners have keen interest in the options available to them that could improve survival and growth on their pine plantations and help them meet their management objectives. One way to improve early pine stand survival and growth is through fertilization (Jokela 2004, Jokela and Stearns-Smith 1993, Jokela and others 1991). Typically, pine stand fertilization recommendations are postplanting, between ages 5 and 10 at the time of canopy closure, and post thinning (Jokela and Stearns-Smith 1993, Jokela and others 1991). Postplanting fertilization is usually used to reduce the time until pines reach sawlog size and to increase pulpwood production. However, in some cases fertilization may actually reduce early slash pine (*Pinus elliottii* Englem.) growth on poorly drained soils (Haywood 1983).

In 1952, the Alabama Forestry Commission established E.A. Hauss Nursery. Located in Escambia County, this 400-acre tree seedling nursery grew an average of 37 million seedlings each year, producing southern pine and hardwood seedlings that were sold to the public. Seedling production ceased in 2006 and the mission of the nursery was realigned the following year. During the winter of 2008, the Alabama Forestry Commission renamed the former nursery the E.A. Hauss Demonstration Forest to reflect growing interest and demand for forestry research and demonstration in Alabama.

As part of the goals for the E.A. Hauss Demonstration Forest, demonstration areas were established that highlight different management techniques landowners could employ to improve returns from their small-scale forest operations. Of these forest research and demonstration plots, 5 acres were planted as a slash pine fertilization demonstration area on the E.A. Hauss Demonstration Forest where slash pine seedlings were treated with a liquid fertilizer supplement, Accele-Grow-M™, prior to planting. Accele-Grow-M™ has been used to enhance growth in agricultural crops such as soybeans and corn. However, limited testing on timber stands has been completed to date.

METHODS

In January 2008, Accele-Grow-M™ treated slash pines were planted on approximately 5 acres at the E.A. Hauss Demonstration Forest to determine differences in growth and survival relative to fertilizer application method. Soils on the site consist predominantly of Greenville fine sandy loam with 0.0 to 2 percent slopes. Since the area has a history of heavy cultivation, the site was subsoiled on 12-foot centers during the fall of 2007. Slash pine seedlings received one of four Accele-Grow-M™ treatments (foliar, root, foliar and root application, and a no-treatment control) prior to planting. Two rows (treatment strip) of trees from each treatment were then hand planted on a 6- by 12-foot spacing. Treatment strips were systematically alternated, maintaining the 12-foot spacing between rows, throughout the remainder of the 5-acre block; resulting in two full replicates.

Initial seedling height and root-collar diameter measurements were taken after planting in February 2008. During the first growing season, the stand was released using a rate of 5-ounce Arsenal per acre to control morning glory (*Ipomoea violacea*). First-year growth measurements of height, root-collar diameter, and survival were taken during October of that same year.

RESULTS

First-year measurements indicate that there is indeed some growth response of Accele-Grow-M™ treated seedlings relative to untreated seedlings on the demonstration forest site. Table 1 illustrates first-year growth comparison of groundline diameter measurements in mm. Growth of foliar-treated trees on the site ranged from an average of 1.7 mm more than the untreated control trees to 3.1 mm more than the trees that were root treated. Of the fertilized trees, foliar-only treatments performed much better than those that had fertilized applied only to the roots or to both roots and foliage with an average groundline diameter growth of 22.4 mm (table 1).

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Table 1—First-year growth comparison of groundline diameter for Accele-Grow-M™ treated slash pine trees on the E.A. Hauss Demonstration Forest

Groundline diameter growth	Root and foliar	Root only	Foliar only	Control
			mm	
Average	11.7	9.6	12.7	11.0
Maximum	21.6	15.7	22.4	18.8
Minimum	1.2	1.3	4.3	3.9

Results were similar when comparing first-year average height growth (table 2). Foliar-treated trees averaged 26.1 cm of growth compared to 23.2 cm for the control trees and 24.2 cm for the root-and-foliar-treated trees. Root-only treatments averaged 20.5 cm of height growth. As with diameter growth, foliar treatments had more height growth than other treatments (table 2). In some cases root-and-foliar and root-only treatments lost height growth as there was Nantucket pine tip moth [*Rhyacionia frustrana* (Comstock)] damage on many trees.

There were little differences in survival among treatment types (table 3). Foliar-only and root-and-foliar treatments had slightly higher survival rates (97.8 and 97.4 percent, respectively) than the control and root-only treatments.

CONCLUSIONS

First-year measurement results indicate that there is some benefit to diameter and height growth from treating slash pine seedlings prior to planting with Accele-Grow-M™ fertilizer when comparing height and groundline diameter growth. However, there are several factors that need further investigation to determine long-term growth effects. Follow-up measurements and research installations are suggested to further investigate Accele-Grow-M™ effects on southern pine growth.

Intermediate treatments are planned to determine how tree growth, form, and cone and seed production is impacted when trees are treated over the course of a rotation. This would include examination of aboveground biomass production. In addition, work is ongoing to determine if there are any differences in root development and growth by treatment type.

Further study is also needed to determine if there is increased damage by tip moth to young Accele-Grow-M™ fertilized slash pines planted in that region. Results of prior research that examines tip moth infestations on young fertilized southern pines has been mixed (Ross and others 2005). For this current study, incidence of tip moth by treatment type was not measured. However, decreases in tree height were noted for some treatments, and would suggest that future studies should measure this specifically.

Finally, there is interest in how other southern pines, such as loblolly (*P. taeda* L.), will respond to treatment.

Today the E.A. Hauss Demonstration Forest offers a valuable opportunity for forestry research and demonstration among partners from the Alabama Forestry Commission, Alabama A&M University, Auburn University, and the U.S. Forest Service. Projects such as this current study will provide real world demonstrations for landowners and land managers who are increasingly seeking information to help them better identify and meet their land management goals.

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Table 2—First-year height growth comparison for Accele-Grow-M™ treated slash pine trees on the E.A. Hauss Demonstration Forest

Total height growth	Root and foliar	Root only	Foliar only	Control
			cm	
Average	24.2	20.5	26.1	23.2
Maximum	42.5	41.0	42.5	56.0
Minimum	–4.0	–6.0	7.5	4.0

Table 3—First-year survival comparison of Accele-Grow-M™ treated slash pine trees on the E.A. Hauss Demonstration Forest

Survival comparison	Root and foliar	Root only	Foliar only	Control
	---------- *percent* ----------			
First growing season	97.4	96.0	97.8	96.3

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