HERBACEOUS WEED CONTROL IN AN OLD-FIELD PLANTED LONGLEAF PINE STAND

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Abstract—Over 110,000 acres of longleaf pine (*Pinus palustris* Mill.) have been planted on old fields in Georgia since 1998 in the Conservation Reserve Program (CRP). Part of the CRP guidelines mandate that no more than 500 trees acre^{-1} are planted. This relatively low planting density, coupled with shade intolerance and high cost of containerized longleaf pine seedlings, make optimizing early survival a high priority. A study area in Emanuel County, GA, was installed (spring 2000) to discern the effectiveness of various herbicides banded over newly planted longleaf seedlings in a former cotton field. Survival and height growth data after herbicide treatment indicate that the early (April 7, 2000) Oust+Velpar L herbicide treatment gave greater initial survival and height growth than nine later herbicide treatments (May 9, 2000) or an untreated control. First-year survival ranged between 90 percent with the April 7 Oust+Velpar L treatment and 40 to 65 percent with the May 9 herbicide treatments. After 3 years, the number of trees out of the grass stage and mean heights of the trees were significantly greater with the April 7 herbicide application. During the spring of 2000, rainfall patterns were 5 percent of normal in this region. It appears that the April 7 herbicide treatment allowed the seedlings to survive this critical dry spell. These results indicate that substantial establishment costs can be saved with an earlier herbicide application under severe spring drought conditions.

INTRODUCTION

Herbaceous weed control has been identified as one of the most important factors in successfully converting old fields to longleaf pine (*Pinus palustris* Mill.) plantations. This is due in part to the fact that longleaf pine remains in a grass stage for 1 to 7 years after planting. During this period, competition with herbaceous weeds for light, nutrients, and water can significantly reduce the survival and growth of longleaf pine seedlings.

Many sites in the Coastal Plain of Georgia are being converted from row crops to pine plantations. Since 1998, these old-field sites are commonly converted to longleaf pine plantations. Over 110,000 acres have been converted to longleaf pine plantations in Georgia, including sites located in Emanuel County. This study addressed the efficacy of several herbicide mixtures, dosages, and timing in controlling herbaceous weeds on an old field during the establishment of longleaf pine in the middle coastal plain of Georgia.

MATERIALS AND METHODS

Longleaf pine containerized seedlings were planted on an old-field site (previous crop cotton) in December, 1999. The study area is located on the Tifton soil series (Plinthic Kandiudults). Experimental design was randomized block with four replications per treatment (table 1). Individual plots consisted of four treated rows of trees with each row containing 10 surviving seedlings as of May 8, 2000. An additional row of trees was treated adjacent to the measurement rows. On April 8, 2000, an over-the-top banded (4 feet) application of Oust + Velpar L was applied to the majority of the planted area as an operational treatment. On May 9, 2000, the balance of this study area's treatments were applied. Seedlings that died during the first growing season were replaced in December, 2000. Data were subjected to a one-way analysis of variance. Least squares means were calculated and compared using Duncan's Multiple Range test ($\alpha = 0.05$). Parameters tested were seedling survival, percentage of seedlings out of the grass stage, and the height of those seedlings out of the grass stage.

RESULTS

First-year survival was the most dramatic result found in this study. The Oust Velpar treatment applied in April had significantly greater survival (90 percent) over all treatments applied in May (40 to 64 percent) (fig. 1). This treatment timing effect continued through year 3 (fig. 2). The percentage of trees that had extended out of the grass stage (fig. 3) was significantly

Table 1—Treatments applied in 2002 to an old field longleaf pine stand located in Emanuel County, GA

Code[a]	Treatment	Application date
C	Control, no treatment	May 9
A4	Arsenal 4 oz ac^{-1}	May 9
A6	Arsenal 6 oz ac^{-1}	May 9
A8	Arsenal 8 oz ac^{-1}	May 9
A4P1.2	Arsenal 4 oz ac^{-1} and Pendulum 1.2 qt ac^{-1}	May 9
A6P1.2	Arsenal 6 oz ac^{-1} and Pendulum 1.2 qt ac^{-1}	May 9
A4O2	Arsenal 4 oz ac^{-1} and Oust 2 oz ac^{-1}	May 9
A4V24	Arsenal 4 oz ac^{-1} and Velpar L 24 oz ac^{-1}	May 9
A4OS6.5	Arsenal 4 oz ac^{-1} and Oustar 6.5 oz ac^{-1}	May 9
OS13	Oustar 13 oz ac^{-1}	May 9
O2V32	Oust 2 oz ac^{-1} and Velpar L 32 oz ac^{-1}	April 7

[a] Treatment codes will be used throughout this paper.

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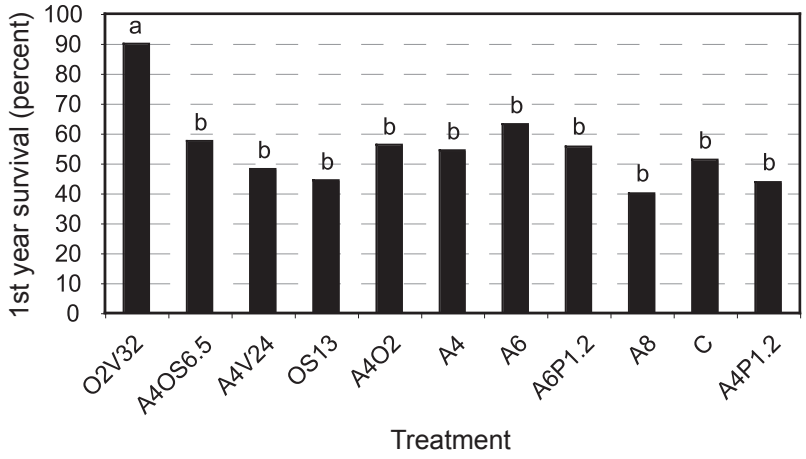

Figure 1—First-year survival on an old field planted longleaf pine stand in Emanuel County, GA, treated with Oust+Velpar L on April 7, 2000, and remaining treatments on May 9, 2000.

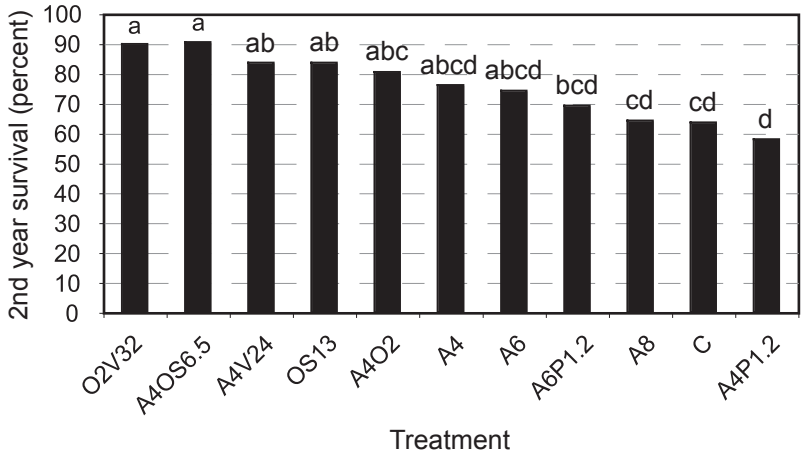

Figure 2—Second-year survival, including replanting, on an old field planted longleaf pine stand in Emanuel County, GA, treated with Oust+Velpar L on April 7, 2000, and remaining treatments on May 9, 2000.

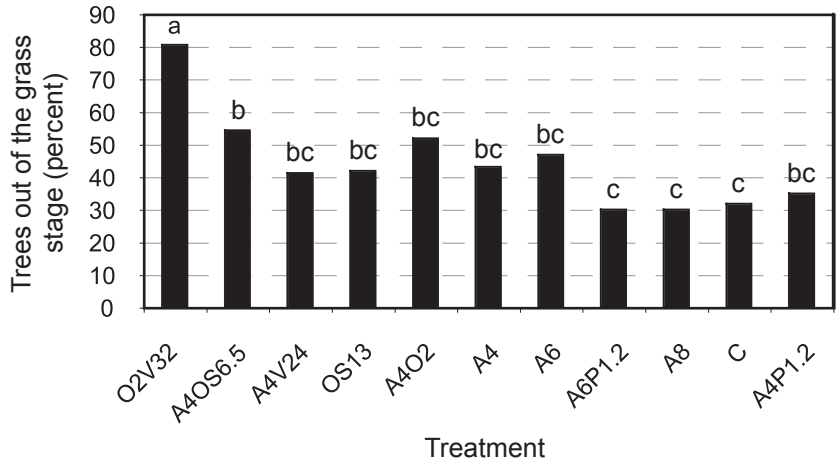

Figure 3—Percentage of longleaf pine trees out of the grass stage three growing seasons after treatment on an old-field planted site in Emanuel County, GA, treated with Oust+Velpar L on April 7, 2000, and remaining treatments on May 9, 2000.

higher in the Oust + Velpar L treatment applied in April (80 percent) over all treatments applied in May (30 to 55 percent). The mean total height (fig. 4) of all trees that had extended out of the grass stage was also significantly higher for the April Oust + Velpar L treatment (3.95 feet) compared to the majority of the herbicide treatments applied in May (2.04 to 3.50 feet).

CONCLUSIONS

These results indicate that timing may prove to be important in the application of herbicides for longleaf pine establishment on old fields. In May, 2000, rainfall was only 5 percent (0.21 inches) of the 50 year average for that month (fig. 5). The application of Oust and Velpar that was applied in early April of 2000 appears to have allowed more competition control during that critical dry spell. Earlier competition control, prior to the onset of droughty conditions, may have enabled those trees to obtain enough soil moisture to survive during the extended droughty conditions.

DISCUSSION

Successful longleaf pine establishment can be much more difficult and generally more costly on old fields and pastures than loblolly or slash pine. This study, using various herbicides individually and in tank mixes, indicates that for longleaf pine, post-planting herbaceous weed control prior to mid-April may be critical to optimize early survival and growth on moderately well to well-drained soils. Early herbaceous weed control appears to be especially critical when droughty conditions occur in late April, May, and into mid-June.

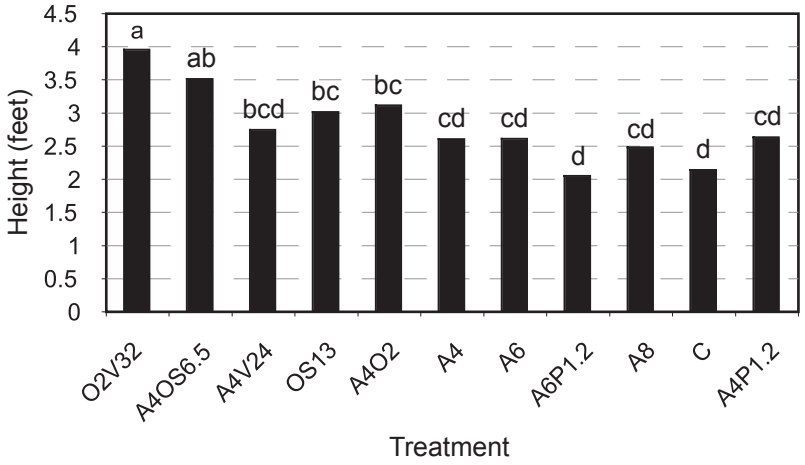

Figure 4—Mean total height of trees that have extended out of the grass stage three growing seasons after treatment in an old-field planted longleaf pine stand in Emanuel County, GA, treated with Oust+Velpar L on April 7, 2000, and remaining treatments on May 9, 2000.

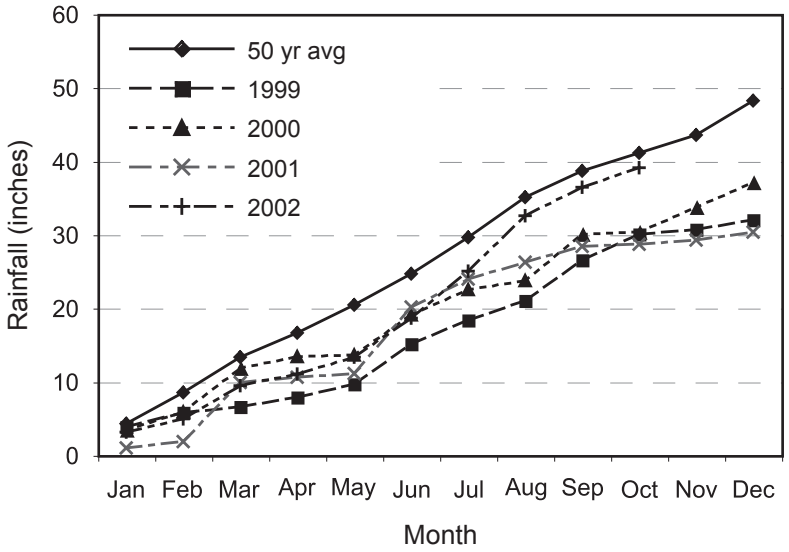

Figure 5—Monthly rainfall patterns from 1999 to 2002 as compared to the 50 year average rainfall as reported by the Georgia Automated Environmental Monitoring Network station in Vidalia, GA.