HERBACEOUS WEED CONTROL IMPROVES SURVIVAL OF PLANTED SHUMARD OAK SEEDLINGS

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Abstract—Shumard oak seedlings were planted on a cutoversite in the Mississippi River floodplain, which had received both chemical and mechanical site preparation treatments. Soil at the site was a commerce silt loam and the elevation was such that the area does not flood. Planting stock was 1-0, bareroot seedlings. A total of seven active herbicide treatments were applied at a preemergent timing over the top of the planted seedlings prior to the onset of the 1998 growing season. In addition, an untreated check was established and all treatments were replicated three times. Each plot consisted of 200 linear feet of planted row with 20 seedlings. Seedlings were tagged and flagged for measurement purposes. Competition control was evaluated at 30, 60, 90 and 150 days after treatment. At each evaluation timing, the seedlings were evaluated for any symptoms of herbicide damage. In November of 1998 and 1999, seedling survival was recorded. Overall, herbaceous competition control significantly increased seedling survival. Differences exist among treatments and between year of observation. Without herbaceous competition control, seedling survival and plantation establishment may be questionable in areas of severe weed pressure.

INTRODUCTION

Thousands of acres are being planted with hardwood species in the South each year. These hardwood seedlings cost more than pine seedlings and planting costs are typically greater for hardwoods. Higher planting costs combined with longer rotation lengths combine to create a scenario in which high survival rates are essential to improve the cost-efficiency of the planting operation.

Unfortunately, survival in many of these planting efforts has been less than desirable (James 2000). The lack of desirable survival rates has been especially true of the oak species planted. In oak planting, initial survival is principally dependent upon three factors: seedling quality, planting quality, and competition control (or the lack thereof). For optimal results in oak plantings, larger, rigorous seedlings must be handled and planted properly, and the herbaceous competition should be controlled for at least a portion of the first growing season (Ezell 2000). Depending on the site, species planted, and growing conditions during the first year following planting, the control of competing vegetation con improve oak seedling survival from an appreciable amount (20 percent) to what could be considered a critical amount (80 percent or greater) (Ezell and Catchot 1997, Ezell 2000).

MATERIALS AND METHODS

Study Site

The study was installed on land owned by Anderson-Tully Company in Bolivar County, MS. The site is in the Mississippi River floodplain but does not flood, and the soil series across the area is a commerce silt loam. The stand had been harvested in 1997 with a complete removal of all merchantable stems, and an aerial application of herbicide was applied late in the growing season of 1997 to control residual undesirable woody vegetation. The area was hand planted with 1-0, bareroot Shumard oak seedlings in January 1998.

Treatments

On March 18, 1998, a total of seven herbicide treatments were applied to the planted area. These applications are considered preemergent in reference to the fact that the oak seedlings had not visibly broken dormancy (no bad swelling, bad break, etc.). A complete list of treatments is found in table 1.

All treatments were applied over-the-tops of the planted oak seedlings as a banded treatment. Each treatment band was a 6-foot wide spray swath, which had the planted oaks as the center of the band. All treatments were replicated three times in a randomized complete black design. Each treatment plot was a linear area 200 feet long, which contained a minimum of 16 oak seedlings. All treatments were applied using a CO_2 powered backpack sprayer with a TK 2.5 Floodjet nozzle on a hand-held wand, which delivered a total spray volume of 20 gallons per acre at a pressure setting of 30 psi.

Seedling Measurements

Each oak seedling in the treatment plots were identified by placing a pin flag carrying a permanent number aluminum tag approximately two inches from the base of the seedling. This permanent number identified the seedling to facilitate consistency of data recording and comparison of data from different evaluation times. Initial height (centimeters) and groundline diameter (millimeter) were recorded for each seedling.

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Table 1—List of treatments applied in Shumard oak study

Treatment No.	Herbicide (rate per acre)[a]
1	2 oz Oust
2	64 oz Goal 2XL
3	5.6 oz Scepter 70DG
4	96 oz Goal 2XL
5	64 oz Goal + 5.6 oz Scepter 70DG
6	2.8 oz Pursuit DG
7	2.8 oz Pursuit DG + 5.6 oz Scepter 70DG
8	Untreated check

[a.] All rates are expressed in amount of product per acre

Table 2—Average survival of Shumard oak seedlings in treatment plots

Survival Treatment No.	1998	1999
	Percent	
1	69.4b[a]	63.9b
2	80.6a	80.6a
3	63.9b	70.8b
4	86.1a	66.7b
5	91.7a	80.6a
6	66.7b	58.3bc
7	52.8c	47.2c
8	77.8ab	44.4c

[a.] Values followed by the same letter do not differ at P=0.05

Plot Evaluation

All treatment plots were evaluated at 30, 60, 90, 120 and 150 days after treatment (DAT) for an assessment of herbaceous competition control and any symptomology of herbicide impact on the seedlings. In November 1998 and October 1999, seedling survival was recorded for each treatment plot. Competition control was recorded as percent clear ground with attention given to the principal species across the study area and any species, which occurred in the treatment plots.

RESULTS

At the end of the first growing season, only 3 of the herbicide treatments had an average survival, which was greater than the untreated plots (table 2). Overall survival across all plots was less than observed responses in other studies (Ezell 2000) and 2 factors are given credit for the lack of a positive treatment response and lower overall survival. First, the study site experienced severe drought conditions during the growing season, and it is probable that the shading provided by the competition may have benefited the seedlings in the untreated areas. Second, herbivory by deer was greater in the treated plots, as the open areas created by the treatment bands facilitated the movement of the animals and they occasionally browsed the seedlings as they moved through the area. While this type of herbivory done would probably not have resulted in overt mortality, it may have been a factor in weakening seedlings, which were also stressed by the droughty conditions.

At no time during the evaluations did any of the seedlings exhibit any symptoms of herbicide damage. Thus, the mortality can not be related to a lack of crop tolerance, and these products can be considered safe to use on Shumard oak as they were applied in this study, Even though first year survival was not as high as desirable, all treatments had acceptable survival except Trt. #7 and while 52.8 percent survival would result in marginally sufficient stocking for management, greater survival is expected when herbaceous weeds are controlled following proper plating operations.

Survival at the end of the second growing season provided interesting results. Generally average survival was slightly lower for treatments with 2 exceptions. Survival in Trt. #3 (5.6 oz of Sceptor 70 dg) was actually higher at the end of the second season than was recorded after the first growing season. This was due to resprouting of seedlings, which were necrotic from ground level and above in 1998 and were recorded as mortality at that time. Widely scattered occurrence of this resprouting was noted in other treatments, but not to the extent as found in Trt. #3 plots.

Survival in the untreated plots (Trt. #8) was drastically reduced at the end of the second growing season (table 2). The overall reduction of 77.8 percent (1998) to 44.4 percent (1999) represents a 43 percent change in these areas and was representative of what was occurring across the larger operational area outside the research plots. While the competing vegetation may have provided some shading during the first growing season, it also established a root system, which competed for any available soil moisture. While no indices of competing vegetation were undertaken in 1999, it seems that the trees in the treated plots were better able to establish a root system during the first growing season and were subsequently better able to compete for soil moisture during 1999. Land managers would do well to note that first year survival of planted oak seedlings in areas not receiving herbaceous competition control may not be indicative of “final establishment” survival.

SUMMARY

Six of the 7 herbicide treatments resulted in average survival, which was significantly greater than the untreated areas by the end of the second growing season. None of the treatments caused any damage to any oak seedlings and are considered safe to use. However, as of 2001, only OUST® and Goal 2XL® have labels for operational applications as were conducted in this study. Good seedlings and proper planting will always be important factors in obtaining desirable levels of initial survival of planted oak seedlings, and herbaceous weed control can result in significant benefits. Without herbaceous weed control, the cost and effort of properly planting high quality oak seedlings may not be enough to achieve desirable survival rates.

REFERENCES

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