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Use of Carfentrazone for Control of Natural Pine in Forestry Site Preparation Areas

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USE OF CARFENTRAZONE FOR CONTROL OF NATURAL PINE IN FORESTRY SITE PREPARATION AREAS

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Abstract—Carfentrazone was applied in combination with imazapyr alone and three-way mixes with imazapyr and glyphosate to evaluate efficacy of natural pine control during site preparation activities. Results from four sites (two in MS, and one each in TX and SC) indicated that carfentrazone could assist in the control of small pine seedlings (less than six inches tall), but the control provided was not at a level considered acceptable for operational purposes. Larger pine seedlings (greater than one foot tall) were not adequately controlled by any of the treatments and shielding by other vegetation was an important factor in the control of smaller pine seedlings. Carfentrazone is not labeled for use in forestry applications and results from this study did not provide any rationale for pursuit of such labeling.

INTRODUCTION

Site preparation continues to be a major emphasis in stand establishment. The importance of the control of hardwood species has been researched extensively (Lockaby and others 1988, Morris and Lowery 1988, Shiver and Fortson 1979, and Slay and others 1987) but the control of pine seedlings has received less emphasis. Historically, control of natural pine seedlings was not considered a problem. In some situations these seedlings were a welcome addition to the planted seedlings as higher initial seedling densities were more desirable, survival of planted stock was often less than desirable, and genetically improved seedlings were not available for use. In addition, the use of intensive mechanical methods and/or fire often provided extensive control of any naturally occurring pine seedlings. Even as the shift from mechanical to chemical site preparation occurred, the use of fire continued to provide control of natural pine seedlings until recently when fire has become a site preparation tool which is utilized infrequently across the South. Currently, forest land managers are often faced with planting areas which have very little hardwood competition but may have tens of thousands or hundreds of thousands of naturally occurring pine seedlings per acre. These seedlings represent intense competition for the planted genetically improved seedlings which will result in a significant loss of growth and quite often result in the necessity of precommercial thinning. The objectives of this study were to (1) evaluate the use of carfentrazone for control of natural loblolly pine seedlings and (2) evaluate control of hardwood species using tank mixes which include carfentrazone.

METHODS

The study was installed on a total of four sites. Two sites were in MS and included one study area with small (less than six inch height) and one study area with large (greater than one foot height) pine seedlings. One study site was located in both TX and SC, both of which had small pine seedlings. With the exception of one site in MS, all sites had been harvested the year prior to study installation. All were representative of pine regeneration areas in the middle and upper coastal plain in that they were covered with herbaceous and woody vegetation of undesirable species. Study sites were also selected on the presence of natural pine seedlings. Pine seedling density in the study areas ranged from about 800 seedlings per acre (large seedling site in MS) to about 500,000 seedlings per acre.

A total of eight herbicide treatments were applied at each site (table 1). In addition, an untreated check was utilized as a treatment at each site. All treatments were replicated four times at each site in a randomized complete block design. Treatments were applied as an aerial spray simulation using CO_2-powered backpack sprayers with a pole extension and KLC-9 nozzle. Spray volume was 10 gallons per acre (g.p.a.). Each treatment plot was 30 by 100 feet with a sample area of 10 by 80 feet centered in the treatment plot. All treatments were applied during the first two weeks of August, depending on the study site.

Prior to treatment, all hardwood stems in the sample areas were recorded by species and height class. Small pines were recorded as subsamples (three sample points within the sample area) for small pines or as a total count for the area (large seedlings). Percent brownout was evaluated ocularly for all vegetation classes at two weeks after treatment (2WAT) and 4WAT. Control of pine and hardwoods was evaluated by recording living stems in October of the year following treatment (14 months after treatment). Data was analyzed using ANOVA and means were separated with Duncan's New Multiple Range Test.

RESULTS AND DISCUSSION

Brownout

Average percent 4WAT brownout is presented in table 2. Brownout at 2WAT was appreciably less than 4WAT (as expected) and would not represent conditions that would carry a fire. By 4WAT, treated sites would have carried a fire if the treatments contained glyphosate (Treatments 4-7). These were the only treatments that provided acceptable brownout by 4WAT. Imazapyr is known to be slow but thorough and provide slow brownout response. The addition of carfentrazone did not provide enhanced brownout.

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Table 1—List of treatments in carfentrazone field trials

Trt. No.	Herbicide and Rate/A
1	Chopper EC (40 oz) + Carfentrazone (2 oz) + NIS[1] (0.25% v/v)
2	Chopper EC (40 oz) + Carfentrazone (4 oz) + NIS (0.25% v/v)
3	Chopper EC (40 oz) + Carfentrazone (6 oz) + NIS (0.25% v/v)
4	Chopper EC (32 oz) + Carfentrazone (2 oz) + Razor Pro (64 oz)
5	Chopper EC (32 oz) + Carfentrazone (4 oz) + Razor Pro (64 oz)
6	Chopper EC (32 oz) + Carfentrazone (6 oz) + Razor Pro (64 oz)
7	Chopper EC (32 oz) + Razor Pro (64 oz)
8	Chopper EC (40 oz) + MSO[2] (10% v/v)
9	Untreated Check

[1]NIS = nonionic surfactant
[2]MSO = methylated seed oil

Hardwood Control

Hardwood species on the study sites included most of the major species (or species groups) encountered on site preparation areas across the South (table 3). Control of blackgum, sweetgum, white oak, post oak, and red maple was very good for all treatments in most, if not all, replications. Hickory control varied and that is believed to be due to layering of vegetation and resultant shielding of target of stems. It was noted that all surviving hickory stems were in the lower height classes and imazapyr alone (Treatment 8) provided excellent control as compared to Treatments 1-3 wherein taller hickory stems were controlled, but not all shorter stems. Control of the red oak group was variable, and this has been noted before (Harrington and others 2002). Overall, hardwood control in the study could be considered very good to excellent.

Pine Control

Two items were most apparent in the control of pine seedlings in this study. First, small seedlings were much easier to control than larger seedlings (table 4). The only treatments which provided any control of the larger pine seedlings were those which contained glyphosate. Imazapyr is not expected to control loblolly pine, and the addition of carfentrazone (Treatments 1-3) provided no control of the larger seedlings. Second, while the addition of carfentrazone appeared to assist with control of small pines (Treatments 1-3), the level of control provided would not be considered acceptable in operational applications. Only the treatments containing glyphosate (Treatments 4-7) provided levels of control which could be considered acceptable, and in those treatments, the addition of carfentrazone did not significantly improve pine control. Overall, while carfentrazone may provide some assistance in control of natural pines, it is ineffective on larger seedlings and does not provide operationally acceptable levels of control on small pine seedlings.

Table 2—Average percent brownout by vegetation type (average all reps)

Trt. No.	Gross	Forbs	Hardwoods	Pines
	---------- *percent* ----------			
1	8.9	9.7	5.3	2.7
2	23.4	31.6	5.8	7.6
3	19.4	33.7	6.2	7.1
4	70.3	77.4	22.4	68.3
5	70.1	84.6	27.3	72.1
6	78.3	82.7	29.9	81.1
7	77.3	77.4	28.3	63.4
8	15.8	15.7	7.3	8.7
9	3.4	4.2	1.0	0.0

Table 3—Average percent control of principal hardwood species in carfentrazone field trials (average all reps)

Trt. No.	Species[1]						
	BLG	HIC	SWG	REM	REO	POO	WHO
	percent						
1	98.1a[2]	39.4c	88.3a	82.6b	78.3a	95.8a	100.0a
2	100.0a	29.7c	79.8b	77.3b	74.3a	100.0a	100.0a
3	95.3a	61.3b	85.3a	79.4b	90.1a	100.0a	79.3b
4	94.9a	97.4a	90.9a	73.4b	67.5b	100.0a	100.0a
5	91.3a	100.0a	87.6a	74.2b	50.2c	83.3b	100.0a
6	93.0a	100.0a	73.4b	85.1b	65.9b	100.0a	100.0a
7	100.0a	100.0a	97.6a	100.0a	63.6b	94.4a	100.0a
8	95.8a	100.0a	82.6ab	100.0a	86.1a	100.0a	100.0a
9	17.3b	+33.6[3]d	+18.3c	1.6c	+9.3d	22.5c	21.3c

[1] BLG=blackgum, HIC=hickory, SWG=sweetgum, REM=red maple, REO=red oaks, POO=post oak, WHO=white oak
[2] values in a column followed by the same letter do not differ at α=0.05
[3] plus sign indicates an increase in stems

Table 4—Average percent reduction of pines by treatment in carfentrazone field trials (average all reps)

Trt. No.	Small pines (3 sites)	Large pines (1 site)
	percent	
1	47.4b[1]	0.0c
2	39.8b	0.0c
3	34.4b	0.0c
4	83.3a	50.7b
5	79.9a	50.0b
6	88.8a	81.5a
7	81.4a	75.5a
8	41.3b	0.0c
9	36.5b	0.0c

[1] values in a column followed by the same letter do not differ at α=0.05

SUMMARY

Site preparation will continue to be a concern in pine plantation management in the South. Control of natural pine seedlings will become increasingly important as the intensity of plantation management increases. Current site preparation applications provide variable results of natural pines. Carfentrazone will not be the absolute answer to this problem, is not labeled for forestry applications, and will probably not be labeled for such use.

LITERATURE CITED

Harrington, T.B.; Ezell, A.W.; Yeiser, J.L. [and others]. 2002. First-year woody plant control following several formulations and timings of glyphosate with or without imazapyr. Proceedings of the Southern Weed Science Society 55th annual meeting: 78-81.

Lockaby, B.G.; Slay, J.M.; Adams, J.C. [and others]. 1988. Site preparation influences on below ground competing vegetation and loblolly pine seedling growth. New Forest. 2: 131-138.

Morris, L.A.; Lowery, R.F. 1988. Influence of site preparation on soil conditions affecting stand establishment and tree growth. Southern Journal of Applied Forestry. 12: 170-178.

Shiver, B.D.; Fortson, J.C. 1979. Effect of soil type and site preparation method on growth and yield of flatwoods slash pine plantations. Southern Journal of Applied Forestry. 3: 95-100.

Slay, J.M.; Lockaby, B.G.; Adams, J.C. [and others]. 1987. Effects of site preparation on soil physical properties, growth of loblolly pine, and competing vegetation. Southern Journal of Applied Forestry. 11: 83-86.