A COMPARISON OF HERBICIDE TANK MIXTURES FOR MID-ROTATION GALLBERRY COMPETITION RELEASE IN SLASH PINE

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ABSTRACT

Ten different herbicide combinations including Forestry Garlon® 4, Garlon® 4 Ultra, Forestry Garlon® XRT, Chopper®, and Milestone® VM were tested for gallberry (*Ilex glabra*) control. Treatments were applied to the understory of a 9-year-old slash pine (*Pinus elliottii* Engelm.) plantation in South Georgia. Herbicide tank mixture treatments were broadcast foliar applied at a total delivery volume of 20 GPA and replicated three times in a randomized complete block design. One and two years after treatment plots were evaluated and treatments ranked based on level of gallberry control. Forestry Garlon® 4 performed similar to the new formulations, Garlon® 4 Ultra and Forestry Garlon® XRT. The most effective herbicide treatments for gallberry were achieved with 4 quarts/acre of Forestry Garlon® 4 or 3 quarts/acre of Forestry Garlon® 4 (or Garlon® 4 Ultra or Forestry Garlon® XRT) tank-mixed with 16 oz/acre of Arsenal®.

INTRODUCTION

When not controlled at site preparation, woody vegetation competes with crop trees for site resources. A number of studies have shown a pine growth response to the control of this understory woody vegetation (FNC 2005, Oppenheimer et al. 1989). In the flatwoods of Georgia and Florida waxy-leafed species, such as gallberry (*Ilex galbra*) and waxmyrtle (*Myrica cerifera* L.), dominate the understory and can be controlled by herbicide formulations of triclopyr and imazapyr. Since pines are sensitive to triclopyr, waxy-leafed species are best controlled at mid-rotation when the crowns of the crop trees are high enough that herbicides can be applied from below.

Forestry Garlon® 4 is a kerosene-based ester formulation of triclopyr with four pounds of acid equivalent (ae) per gallon. It is widely used for understory release treatments to control waxy-leafed species. Products using kerosene as its solvent are facing regulatory scrutiny by states needing to comply with mandated reductions of volatile organic compounds. Consequently, it would be good to know if other formulations of triclopyr are as effective as Forestry Garlon® 4. Garlon® 3A is an anime formulation with three pounds of ae per gallon which contains ethanol alcohol. Garlon® XRT and Garlon® 4 Ultra, which are ester formulations of triclopyr, use methylated seed oil (MSO) as the solvent as opposed to alcohol or kerosene. Forestry Garlon® XRT contains 6.3 pounds of ae per gallon, whereas Garlon® 4 Ultra contains four pounds ae per gallon. This study evaluates the performance of Forestry Garlon® 4 compared to the newer triclopyr formulations of Forestry Garlon® XRT and Garlon® 4 Ultra. These Garlon formulations were tested with and without imazapyr and Milestone® VM (aminopyralid).

MATERIALS AND METHODS

The study was established in Wayne County Georgia. The soils at the study site are somewhat poorly drained Spodosols (CRIFF C). The site was double-bedded and did not receive any chemical site preparation. The study site was operationally planted in the winter of 1998-99 with slash pine. In April of 2005, 200 lbs/acre of diammonium phosphate and 80 lbs/acre of KCL per acre were operationally applied. The study design was a randomized complete block with three replications of single-row plots. Each row-plot consisted of the inter-bed (10 feet wide) area and measured 100 feet in length. On October 18, 2006, the study was installed with 10 tank mixtures (Table 1). All treatments included a 0.25% non-ionic surfactant with a total application volume of 20 gallons per acre.

Plots were ranked by the effectiveness of gallberry control two growing seasons after treatment. Control of other understory vegetation was also noted. Plots were assigned a ranking of one to five based on the percentage of gallberry control by two reviewers and averaged together. The rankings for gallberry control are: 1 = 100% to 90%, 2 = 90% to 80%, 3 = 80% to 60%, 4 = 60% to 40%, and 5 < 40%. Other species were placed into one of the following three competition control groups: control = > 80%, moderate control 80 to 40%, and resistant = < 40%.

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RESULTS AND DISCUSSION

Results after two years show similar levels of gallberry control among the new formulations of triclopyr (Garlon® XRT and Garlon® 4 Ultra) and Forestry Garlon® 4 (Table 1). Gallberry was effectively controlled by Garlon® 4 (or equivalent formulation) alone at 128 oz per acre. However, at lower rates (< 96 oz/ac) Garlon® 4 and equivalent formulations, failed to provide consistent control of gallberry.

Triclopyr and imazapyr combinations improved gallberry control and provided a larger spectrum of species control than triclopyr alone (Table 1). No antagonism was found between imazapyr and ester formulations of triclopyr at the rates tested in this study. Gallberry control provided by triclopyr and imazapyr tank-mixtures was improved with the use of higher imazapyr rates (Table 1). All tank-mixtures with 16 oz of 4# imazapyr (equivalent to 32 oz 2# imazapyr) and 64 oz Garlon® 4 (or equivalent) ranked "1", on a 1 to 5 scale for gallberry control (Table 1). Poor gallberry control was observed when 16 oz of imazapyr 2# and the equivalent of 64 oz. of Garlon® 4 was applied. No herbicide damage to the slash pine was observed with any of the tank mixtures tested.

The addition of Milestone® VM (aminopyralid) to triclopyr alone did not enhance the control of gallberry. The addition of Milestone® VM to tank mixtures with both triclopyr (ester) and imazapyr controlled yaupon (*Ilex vomitoria*) (Table 1). Although labeled for St. John's wort (*Hypericum* spp), these studies showed no additional control when Milestone® VM was used. Moderate saw palmetto (*Serenoa repens*) control was observed with triclopyr by itself and when tank-mixed with imazapyr but results were inconsistent.

CONCLUSIONS

Based on the results of these studies the broadest spectrum of flatwoods species control was achieved by tank mixtures of triclopyr and imazapyr. New formulations of triclopyr, Forestry Garlon® XRT (6.3#) and Garlon® 4 Ultra (4#) produced similar or better gallberry control as kerosene-based Forestry Garlon® 4 after two years. A tank mixture 16 oz of 4# imazapyr, plus 40 oz 6.3# triclopyr (or equivalent formulation) is recommended for where a broad spectrum of competition control is desired such as renovating stands for pine straw production. This tank-mix will effectively control gallberry and several other understory species which are typically found on Lower Coastal Plain sites. Newer formulations of triclopyr are recommended were reduction of volatile organic compounds is an objective.

ACKNOWLEDGMENTS

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Table 1—Summary of 2006 Dow AgroSciences, Lower Coastal Plain study treated 10/18/06 and evaluated 10/07/08. All treatment costs include 0.25% non-ionic surfactant (v/v). Plot ranking based on gallberry control. Gallberry control ranking assigned on a scale of 1-5, with ratings of 1 and 5 providing the most and least control, respectively. Other species were placed into one of the following four competition control groups: control (C) = > 80%, moderate control (M) = 80 to 40%, resistant (R) = < 40% or not present (-)

Treatment (per acre)	Ranking for Gallberry Control	*Acer rubrum*	*Hypericum* spp.	*Ilex vomitoria*	*Lyonia ferruginea*	*Lyonia lucida*	*Myrica cerifera*	*Persea borbonia*	*Quercus* spp.	*Serenoa repens*	*Smilax*	*Vaccinium* spp.
40 oz Garlon XRT + 16 oz, 4# imazapyr	1.0	-	C	-	C	M	M	C	-	M	-	C
64 oz Garlon 4 Ultra + 16 oz, 4# imazapyr	1.0	-	C	-	C	M	M	C	R	M	-	C
64 oz Garlon 4 Ultra + 16 oz, 4# imazapyr + 7 oz MilestoneVM	1.0	C	C	C	C	M	M	C	-	M	-	C
96 oz Garlon 4 Ultra	1.2	-	M	-	-	-	M	-	-	M	M	M
60 oz Garlon XRT	1.8	-	R	-	M	-	-	M	-	R	-	R
96 oz Garlon 4	2.0	R	R	-	M	M	M	-	R	R	-	R
40 oz Garlon XRT	2.0	-	M	M	M	-	-	-	R	-	R	R
64 oz Garlon 4	2.7	-	R	-	M	-	-	-	R	R	R	R
64 oz Garlon 4 Ultra + 7 oz MilestoneVM	2.7	-	R	-	M	M	M	M	-	R	-	R
64 oz Garlon 4 Ultra	2.8	M	R	M	M	R	-	M	-	R	-	R