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Establishment Methods for 'Alamo' Switchgrass[1]

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ABSTRACT

Switchgrass (*Panicum virgatum* L.) is a native warm season grass that is capable of producing high yields across may soil types and environmental conditions. A limiting factor in the widespread use of switchgrass is slow and inconsistent establishment due to weed competition. A possible solution to this problem is to select a planting date and seedbed preparation technique that minimizes weed competition. The objective of this study was to evaluate establishment method (broadcast and no-till drill) and planting date (fall and spring). Planting dates included April 15 (3 treatments, June 1 (1 treatment), and October 1 (4 treatments). Percent stand measurements were made three weeks after green up and at the end of the growing season. In 1999, only two treatments had measurable stands. The treatment with Roundup at 1 lb ai/ac in mid August then planting no-till into fall prepared seedbed averaged a 40% stand. The treatment with Gramoxone at 1 lb ai/ac in April then planting broadcast into a spring prepared seedbed (G1SD) averaged 60%. The G1SD treatment had a 100% stand in 2000, while no other treatment produced more than a 5% stand. It appears that broadcast planting in the spring into a chemically controlled seedbed increases switchgrass establishment

INTRODUCTION

Switchgrass is a native, warm season grass that is capable of producing high yields across many soil types and environmental conditions. Potential uses include forage, wildlife habitat, renewable biofuel crop, and soil conservation. A limiting factor in the wide spread use of switchgrass is slow and inconsistent establishment. Planting dates, rates, and methods of switchgrass vary greatly across the southeastern U.S. by location, cultivar and intended use.

There are many factors that affect establishment including precipitation, temperature, planting depth, date, rate, and weed competition (Panciera, 1984, Miller and Owsley, 1994 and Cassida et al., 2000). Poor weed control is often the most damaging factor for unsuccessful establishment in the southeastern U.S. Perennial warm season grasses such as, bermudagrass (*Cynodon dactylon*) and bahiagrass (*Paspalum notatum*) must be controlled for successful fall plantings. With spring and early summer plantings crabgrass (*Digitaria sp.*) and broadleaf signal grass (*Bracharia platyphylla*) must be controlled.

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There are no pre or post emerge herbicides currently labeled for use with switchgrass. The objective of this demonstration was to evaluate planting date and seedbed preparation methods to minimizes weed competition allowing for successful establishment of switchgrass.

MATERIALS AND METHODS

Eight establishment systems were evaluated on Oaklimeter silt loam (coarse-silty, mixed, thermic, Fluvaquentic Dystrochrepts) from 1998 through 2001 near Coffeeville, Mississippi at the Jamie L. Whitten Plant Materials Center. Planting dates ranged from October 1, before April 15, and June 1 (Fig. 1).

Alamo switchgrass was broadcast and no-till drilled at 6 pls pounds per acre in the fall and spring into mixed bermudagrass. In the broadcast plots, seed was had distributed then cultipacked using a 5 ft Brillion cultipacking seeder. A Marlis Pasture King no till drill was used to plant the no till plots.

Herbicides used included Gramoxone (paraquat) and Roundup Ultra (glyphosate). Roundup was applied mid August to control perennial warm season grass species and Gramoxone was applied in early March to control cool season annuals and perennials. Fire was used in treatment 2 to remove chemically treated bermudagrass residue to facilitate disking.

Figure 1. Planting dates, weed control method and seedbed preparation for Alamo switchgrass.

Establishment		Weed Control Prior to Planting			Seedbed	Treatment
Method	Date	Method	Date	Lead Time	Preparation	Number
Fall Planting						
Broadcast	1-Oct	Roundup 1 lb/ai*	15-Aug	45 days	Disk and Harrow	1
Broadcast	1-Oct	Roundup 1 lb/ai	15-Aug	45 days	Fire, Disk, Harrow	2
Broadcast	1-Oct	Disk and Harrow	15-Aug	45 days	Disk and Harrow	3
No-Till Drill	1-Oct	Roundup 1 lb/ai	15-Aug	45 days	No disturbance	4
Spring Planting						
No-Till Drill	1-Mar	Mow to 1 inch	1-Oct	150 days	No disturbance	5
No-Till Drill	15-Apr	Roundup 1 lb/ai	15-Aug	240 days	Disk and Harrow	6
Broadcast	15-Apr	Gramoxone 1 lb/ai	1-Mar	30 days	Disk and Harrow	7
Summer Planting						
No-Till Drill	1-Jun	Roundup 1 lb/ai	1-May	30 days	No disturbance	8

* ai = active ingredient

Switchgrass stands were visually scored (0=no switchgrass, 100 = full stand) three weeks after spring green up (March 15) and at the end of the growing season (October 15). Experimental design was a randomized complete block with three replications. The demonstration was duplicated at a different location in year two with similar bermudagrass cover and soils.

RESULTS AND DISCUSSION

In 1999, only three spring treatments had measurable stands; treatment 5, 6, and 7 (Fig. 2). Gramoxone at 1 lb/ai on April 1 after active weed growth, preparing a clean tilled seedbed and broadcast planting in mid April (Treatment 7) resulted in a 75% stand. No other

treatments resulted in a successful stand (>50%). Roundup at 1 lb/ai in mid August, preparing the seedbed 14 days after application, and no-till drilling the seed without disturbing the seedbed in April resulted in a 33% stand. Treatments 1, 2, 3, 4 and 8 had no measurable switchgrass. Fall soil disturbance in Treatments 1, 2, and 4 allowed arrowleaf clover (*Trifolium vesiculosum*) to become established.

Only one treatment was successful in 2000. Treatment 7 had 100 percent stands across all replications. This treatment was the only method that was consistent on both sites over a two-year period. Total dry matter yield was estimated the year after establishment. Season total dry matter yield for Treatment 7 averaged 7,890 lb/acre.

Figure 2. Percent stand ratings for Alamo switchgrass, 2000 and 2001.

Establishment		Weed Control Prior to Planting			Seedbed	Percent Stand		Treatment
Method	Date	Method	Date	Lead Time	Preparation	2000	2001	Number
Fall Planting								
Broadcast	1-Oct	Roundup 1 lb/ai*	15-Aug	45 days	Disk and Harrow	0	0	1
Broadcast	1-Oct	Roundup 1 lb/ai	15-Aug	45 days	Fire, Disk, Harrow	0	0	2
Broadcast	1-Oct	Disk and Harrow	15-Aug	45 days	Disk and Harrow	0	0	3
No-Till Drill	1-Oct	Roundup 1 lb/ai	15-Aug	45 days	No disturbance	<5	<5	4
Spring Planting								
No-Till Drill	1-Mar	Mow to 1 inch	1-Oct	150 days	No disturbance	20	<5	5
No-Till Drill	15-Apr	Roundup 1 lb/ai	15-Aug	240 days	Disk and Harrow	33	<5	6
Broadcast	15-Apr	Gramoxone 1 lb/ai	1-Mar	30 days	Disk and Harrow	75	100	7
Summer Planting								
No-Till Drill	1-Jun	Roundup 1 lb/ai	1-May	30 days	No disturbance	0	0	8

* ai = active ingredient

In the spring of 2001, a separate study was planted evaluating different mixtures of switchgrass, big bluestem (*Andropogon gerardii* Vitman), and indiangrass [*Sorghastrum nutans* (L.) Nash]. The switchgrass was planted at 4 and 8 pls lb/acre following the Treatment 7 strategy of spring chemical and seedbed preparation. All plots had 100% stand within 45 days of planting and dry matter yields at the end of the growing season averaged 3,550 lb/acre.

CONCLUSIONS

The objective of this demonstration was to determine if seedbed preparation and planting date alone would allow for successful establishment by limiting weed competition. No attempt was made to control post emerge weeds. Each of the 7 treatments had different effects on the existing seed bank. The fall planted treatments (1, 2, 3 and 4) released Arrowleaf clover (*Trifolium vesiculosum*). Preparing the seedbed in the spring did not have this effect. However, annual weed competition including crabgrass and broadleaf signal grass quickly closed the canopy over switchgrass seedlings in treatments 5 and 6. Currently, there are no herbicides labeled that will effectively control these species in switchgrass. It appears that the controlling annual weeds after the last frost then mechanically controlling warm season perennials, allows the switchgrass to establish.

LITERATURE CITED

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