Comparison of Switchgrasses for Vegetative Barriers

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1999 Summary

Background

A vegetative collection of 92 switchgrass (*Panicum virgatum* L.) accessions was made by the USDA-NRCS, Jamie L. Whitten Plant Materials Center (PMC) near Coffeeville, Mississippi in September-November, 1994. Plants were obtained from native stands in Mississippi, Arkansas, and Alabama, and transplanted in replicated plots on an Oaklimeter silt loam soil at the PMC. In October 1996, the collection was screened for accessions with short stature and large stem size and density for potential use as a vegetative barrier. Six accessions were chosen from this initial screening. These accession were 9062821 Kemper Co., MS; 9062839 Chickasaw Co., MS; 9062836 Madison Co., MS; 9062788 Monroe Co., MS; 9062807 Webster Co., MS; 9062780 Pontotoc Co., MS.

Comparative evaluations for stem size and stem density found these switchgrass accessions to be comparable to the cultivars, 'Alamo' and 'Blackwell' switchgrass, and miscanthus (*Miscanthus sinensis* Anderss). Rather than pursue work on all six accessions, accessions 9062821 (Kemper) and 9062839 (Chickasaw) were chosen for additional testing because they represented both the tall (Chickasaw) and short (Kemper) stature of the six accessions. Objectives of this study were to compare Chickasaw, Kemper, and Alamo (clipped and unclipped) for stem size, height and canopy spread and their effect on soybean yield in rows adjacent to them.

Procedure

Two 160' x 3.3' main plots, spaced 29.7' apart and positioned in an east to west direction, were divided into four, 40' x 3.3' sub plots on a Grenada silt loam soil at the PMC. Vegetative rootstock of Kemper, Chickasaw and Alamo (clip plot and unclip plot) was established in each sub plot in March 1997 and arranged as a randomized complete block. Switchgrasses were allowed to establish in 1997.

Switchgrass accessions were clipped to a height of 6" with a rotary mower on 14 March 1999 to remove previous years' residue. Sixty pounds of N fertilizer, as ammonium nitrate, was applied to the switchgrass plots on 29 April 1999. Soybeans (*Glycine max*) were conventionally planted in 40" rows parallel to the switchgrass plots on 19 May 1999 creating a southern and northern environmental exposure in relation to the soybeans. Soybeans were managed for optimum yield under non-irrigated conditions. One of the Alamo barriers was clipped to a 12" height on 16 June 1999, after reaching a height of 5'.

Switchgrass plant height was determined by measuring from ground level to the top of the seedhead. Canopy spread was determined by positioning a standard measuring tape 3' above ground level and measuring the average length of stems perpendicular to the rows.

Stem diameter was determined by randomly selecting 10 stems/replication from each accession at a 12" height and measuring the diameter of the stem. Measurements for switchgrass plant height, canopy spread and stem diameter were taken 14 July 1999 and 14 September 1999.

Soybean plant height and yield were collected 14 September 1999 from rows 1, 2, 3, and 5 representing distances from the switchgrass of 3.3, 6.7, 10, 13, and 16 ft., respectively. Switchgrass plant architecture and soybean data were analyzed using analysis of variance procedure, and means that differ significantly were separated at the 5% level of probability using Duncan's Multiple Range Test.

Results

Switchgrass Performance

Plant height, canopy spread and stem diameter of the switchgrasses for July are presented in Table 1 and 2. There were significant differences in switchgrasses for plant architecture measurements in July and September. Unclipped Alamo was significantly taller than Kemper, Chickasaw and clipped Alamo. This same trend was found for canopy spread. Clipping Alamo in June significantly reduced stem size. Stem size of Chickasaw, Kemper and unclipped Alamo were similar. Plant measurements in September for canopy spread and height increased significantly over the July measurements because of plant maturity.

Table 1. Plant architecture measurements for switchgrass July 1999, Coffeeville, MS.

Switchgrass	Plant Height	Canopy Spread	Stem Diameter
	---------- ft ----------		-- in --
Chickasaw	6.0a*	4.0a	.27a
Kemper	4.5a	4.2a	.25a
Alamo (unclip)	8.0b	9.5b	.24a
Alamo (clip)	4.0a	4.0a	.19b

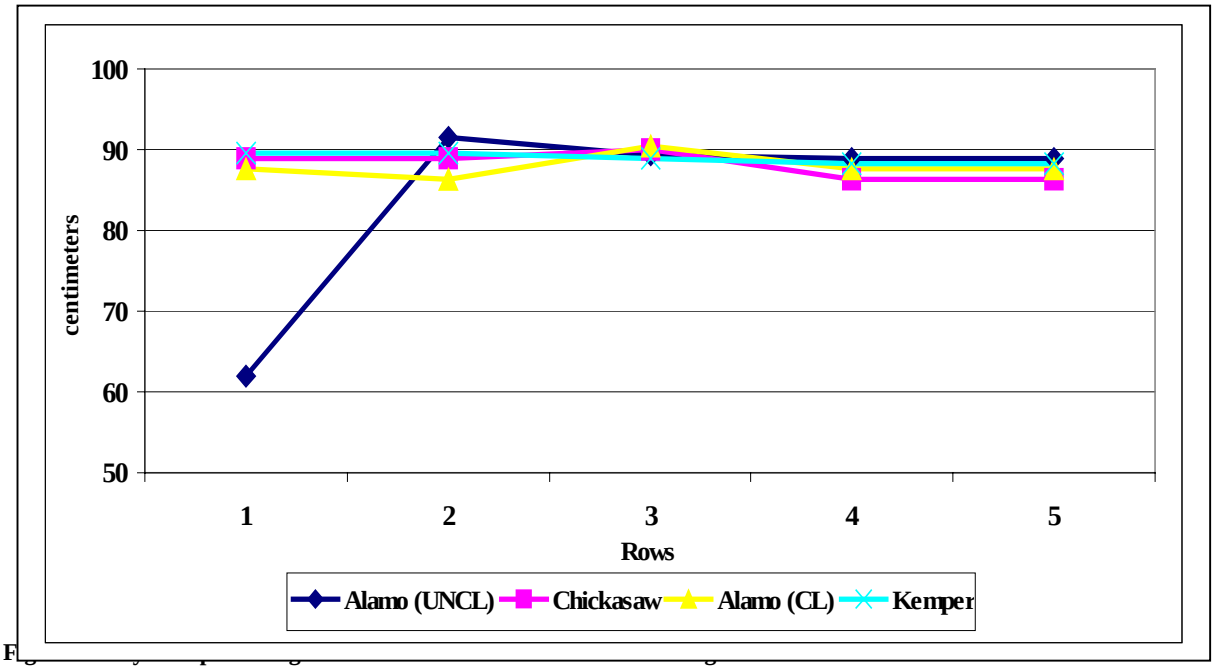
Means in columns followed by the same case letters are not significantly different at $P \leq 0.05$ according to DMRT.

Table 2. Plant architecture measurements for switchgrass, September 1999, Coffeeville, MS.

Switchgrass	Plant Height	Canopy Spread	Stem Diameter
	---------- ft ----------		-- in --
Chickasaw	6.8	6.5	.21
Kemper	5.0	6.5	.22
Alamo (unclip)	8.0	12.5	.23
Alamo (clip)	6.5	7.0	.14

Soybean Performance

Plant height and yield of soybean were significantly decreased in row 1 adjacent to an unclipped Alamo as compared to other switchgrasses. This reduction in soybean growth and yield was contributed to competition from plant height and canopy spread of an unclipped Alamo (Table 1 and 2). Soil moisture was not a limiting factor for soybean growth. Moisture levels at 6"were higher in row 1 adjacent to an Alamo barrier and less near the other switchgrasses (data not shown). This increase in moisture level adjacent to Alamo can be contributed to less evapotranspiration caused by cooling of the soil surface from shading and a decrease in transpiration due to a lower soybean population and smaller soybean plants. Clipping Alamo in June significantly increased soybean plant height and yield in row 1. Soybean yield and plant height were not adversely effected by Kemper, Chickasaw and clipped Alamo.



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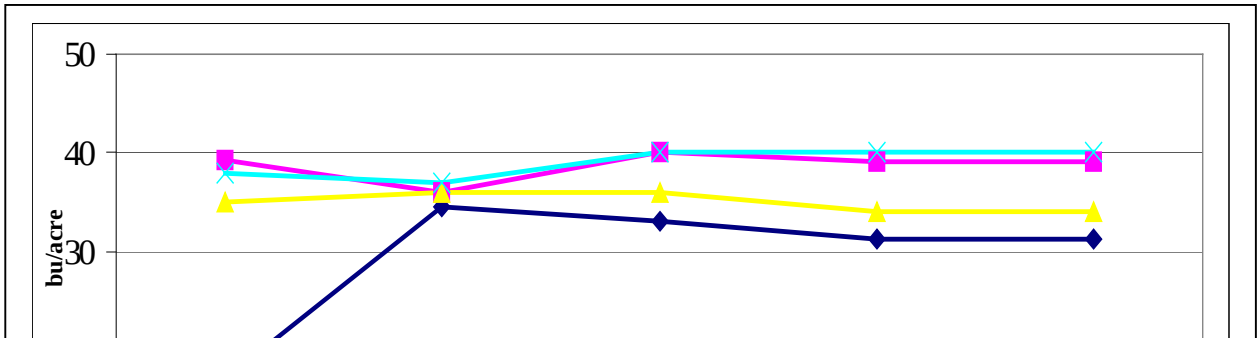

Figure 2. Soybeans yield as a function of rows from the switchgrass barriers.

Discussion

Clipping must be considered as a part of the management requirement for Alamo as a vegetative barrier to prevent crop yield loss near the barrier. In this study, clipping Alamo increased soybean yields in row 1 compared to an unclipped Alamo. However, clipping Alamo significantly reduced stem size (Table 1). This reduction in stem size may weaken the effectiveness of the barrier. Therefore, clipping an Alamo barrier where it crosses concentrated flow areas should be avoided.

Preliminary finds indicate that Kemper and Chickasaw have advantages over Alamo as a vegetative barrier. Both have stem sizes equivalent to or larger than Alamo and their shorter stature and erect growth did not have any effect on soybean yield. Row crop farmers will find Kemper and Chickasaw more appealing than Alamo because of minimal crop loss in adjacent rows and neither would require clipping to control height and residue.

Future Plans

This test will be continued for another year. A seed increase field of Kemper is planned for 2000.