Jamie L. Whitten Plant Materials Center 2000 Technical Summary

USDA-Natural Resources Conservation Service
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Table of Contents

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Introduction

The Jamie L Whitten Plant Materials Center (PMC), located near Coffeeville, Mississippi, is operated by the USDA Natural Resources Conservation Service. Our mission is to develop, test and transfer state-of-the-art plant science materials and technology to meet the resource needs of a myriad and diverse customer base within our service area. Our program has developed an excellent internal system for identifying future plant materials needs, which is coupled with a seamless system of product development and program delivery. By working with a broad range of plant species, including grasses, forbs, and shrubs, the PMC seeks to address priority needs of its customers in NRCS field offices and land managers in both the public and private sector.

The PMC works closely with its customers to develop solutions for a broad range of conservation concerns and issues. Pastureland Improvement, cropland erosion control, critical area erosion control, wildlife habitat enhancement, and water quality improvement are the major conservation issues in our service area, which includes the state of Mississippi (excluding the coastal counties), the delta regions of Arkansas, Louisiana, Tennessee, Missouri, Kentucky, and the Blackland Prairie of Alabama. Another emerging interest involves the production of perennial biofuel crops on marginal cropland in the region.

Activities

In order to develop improved resource technology, the PMC carries out numerous research studies, both on the center and at other locations within our service area. We often work cooperatively with other agencies and organizations in carrying out this research. Cooperators include the Mississippi Agricultural and Forestry Experiment Station (MAFES), Mississippi State University, Mississippi Association of Conservation Districts, Mississippi Soil and Water Conservation Commission, USDA Forest Service, USDA Agricultural Research Service, and U.S. Department of Energy, as well as other entities within NRCS.

The purpose of this publication is to provide information on studies actively being pursued at the PMC during 2000. Any results should be regarded as highly preliminary and should not be utilized until further testing is completed. An in-depth research report or summary is written after the completion of each study and are published annually in a PMC Technical Reports publication. Past reports and summaries are available from the PMC or will soon be available on the Plant Materials Program web site at **http://Plant-Materials.nrcs.usda.gov**.

PMC Site Information

The PMC occupies more than 200 acres of land within the Holly Springs National Forest. The growing areas consist of both bottomland and upland fields, with most being of irregular size and shape, defined by streams, drainages, roads, and other topographic features. Bottomland fields are composed primarily of Oaklimeter silt loam soils, which are acidic and often wet. With proper drainage and management, these soils can become very productive. Soils on upland sites are predominantly Loring and Grenada silt loams with fragipans. These soils are also acidic and moderately to highly productive.

The PMC, as well as most of the southeastern region of the country experienced above average temperatures and below average rainfall during the growing season in 2000. The rainfall data recorded at the PMC is presented in Table 1 below.

Table 1. Monthly and total rainfall in 2000 and20-year average at the Jamie L. Whitten Plant Materials Center, Coffeeville, MS.

Month	2000	20-yr. avg.
	----------in.----------	
January	7.00	4.33
February	4.97	5.29
March	5.35	6.04
April	7.62	6.04
May	1.58	5.48
June	6.22	5.17
July	1.64	4.37
August	0.15	3.38
September	1.45	4.30
October	0.00	4.12
November	9.90	6.03
December	2.75	6.26
Total	48.63	60.84

Cropland Study Summaries

Title: Field Evaluation of Vegetative Barrier
Study Number: MSPMC-F-9404-CP
Study Leader: J.L. Douglas
Cooperator: Rae Casburn, Farmer; Carl Mason, USDA-NRCS, DC; Tallahatchie County, MS; Seth Dabney, Agronomist, USDA-ARS, National Sedimentation Laboratory
Duration: 1994-2004

Introduction

Vegetative barriers are narrow strips (3-5ft wide) of perennial vegetation planted in parallel lines across concentrated flow areas and are perpendicular to the dominant slope in cropland. They function to trap sediment, disperse concentrated flow and encourage benching (Fig. 1.) A long-term field study to evaluate the effectiveness of vegetative barriers was initiated in Tallahatchie County Mississippi near the town of Sumner in 1994. 'Alamo' switchgrass (*Panicum virgatum*) was chosen as the vegetative barrier plant because of previous research has shown it to be a suitable plant for this purpose. The length of the barrier is 1800 ft.

2000 Data Collected:

Topographical surveys have revealed sediment deposition in excess of 12 inches in some concentrated flow areas since installation of the vegetative barrier (Fig. 2.). Soybean yield was reduced in rows near the barrier due to shading caused by Alamo but yield increased as distance from the barrier increased (Table 1). Soybean yield was much lower this year due to drought conditions in the Mississippi Delta in 2000.

Table 1. Soybean height and yield as influenced by distance from the switchgrass barrier, Sumner, MS 2000.

	Distance from the barrier (feet)					
Plant Parameters	3	4.5	6	9	18	27
Plant Height (in.)	14	18	26	28	27	28
Yield (bu/acre)	6	19	21	21	23	19

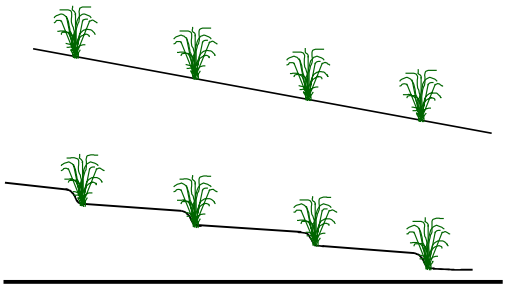


Figure 1. Schematic of landscape before and after installation of vegetative barriers (ill. by SDE).

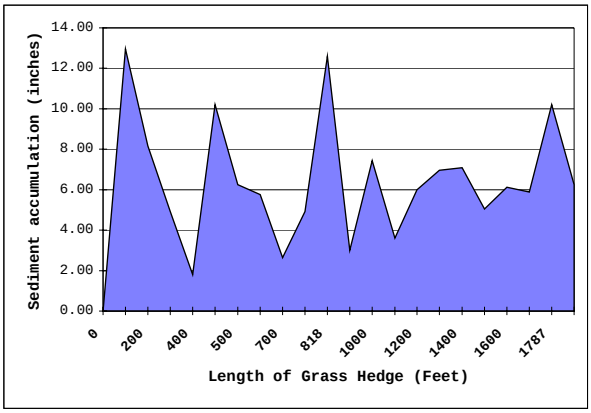


Figure 2. Sediment accumulation on the up slope side of the vegetative barrier near Sumner, MS 2000

Summary

The farmer has found the vegetative barrier to be effective in controlling erosion in the field. A noticeable difference in the landscape has occurred in the low areas. Leveling of these areas has helped to disperse runoff and reduce concentrated flow. This field study as well as other field studies conducted by the PMC and the ARS has provided useful data on the performance of vegetative barriers under field conditions. Input from the district conservationists in Yalobusha, Calhoun, Tallahatchie, and Benton counties were used to refining the interim practice standard used in 1994 to establish vegetative barrier field studies. Information gathered from field studies and recommendations from the district conservationists were used to develop the Vegetative Barrier Conservation Practice Standard 601.

Title: Evaluation of Low Growing Switchgrass Ecotypes for Vegetative Barrier
Study Number: MSPMC-P-9803-CP
Study Leader: J.L. Douglas
Cooperator: Seth Dabney, Agronomist, USDA-ARS, Oxford, MS
Duration: 1998-2001

Introduction

Vegetative barrier (3-5 ft wide) is a type of conservation buffer that is established in parallel lines across concentrated flow areas and perpendicular to the dominant slope in a cropland field. For these narrow strips to function in slowing runoff, trapping sediment and encouraging terrace formation, a plant must have large stems, erect growth habit and the ability to overcome sediment inundation.

'Alamo' switchgrass (*Panicum virgatum*) has shown to be very effective as a vegetative barrier plant but its tall stature and spreading canopy reduces crop yield in adjacent rows. A plant with the same stem properties as Alamo with less effect on crop production is needed.

Previous evaluations of 92 accessions of switchgrass found accessions 9062821 (Kemper Co., MS) and 9062839 (Chickasaw Co., MS) to be comparable to the cultivars, 'Alamo' and 'Blackwell' switchgrass, and miscanthus (*Miscanthus sinensis*) as a vegetative barrier plant.

Objectives of this study were to compare plant architecture (i.e., stem size, plant height and spread) and soybean performance (i.e., height and yield) in rows adjacent to 9062821, 9062839 and 'Alamo' (clipped and unclipped).

2000 Data Collected:

Table 1. Plant architecture measurements for switchgrass entries, 1999-2000, Coffeeville, MS.

Switchgrass Entry	Plant Height		Canopy Spread		Stem Diameter	
	1999	2000	1999	2000	1999	2000
	---------- ft ----------				------ in ------	
Chickasaw	6.0 a*	6.2 b	4.0 a	5.8 b	.27 a	.24
Kemper	5.0 a	4.3 c	4.2 a	5.3 b	.25 a	.23
Alamo (unclip)	8.0 b	8.3 a	9.5 b	10.0 a	.24 a	.24
Alamo (clip)	7.0 a	6.0 b	4.0 a	7.3 ab	.19 b	.18

Means in columns within a year followed by the same letters are not significantly different at $P \leq 0.05$.

Summary

Switchgrass Performance

Plant height, canopy spread and stem diameter of switchgrass are presented in Table 1. Unclipped Alamo significantly increased plant height and canopy spread compared to the other entries. Clipping Alamo in June significantly reduced height and canopy spread resulting in plant architecture similar to Kemper and Chickasaw. Clipping Alamo produced smaller stems, which suggests that clipping Alamo where it crosses concentrated flow areas should be avoided. Kemper and Chickasaw were significantly shorter with less canopy spread compared to the

unclipped Alamo. Stem diameter of Kemper and Chickasaw were also similar to the unclipped Alamo.

Soybean Performance

Yield was not taken in 2000 due to crop loss caused by dry conditions. However, soybean plant height was collected to show the impact on growth in the first rows adjacent to the barrier. This data will be presented along with results from 1999.

Plant height and yield of soybean were significantly decreased in row 1 adjacent to an unclipped Alamo as compared to other switchgrasses in 1999 (Fig. 1a and 1b.). Reduced soybean height was also evident in 2000 (Fig. 2). Reduction in soybean growth and yield was due to competition from plant height and canopy spread and not soil moisture in rows adjacent to an unclipped Alamo. Moisture at 6 inches was higher in rows 1 and 2 adjacent to an unclipped Alamo barrier and less in soybean rows in 1999 and in early 2000. Because of its deep root system, switchgrass removes moisture from deeper in the soil profile while the soybeans remove moisture from shallower (6-18 inches) depths. High moisture near an unclipped Alamo may be explained by less evapotranspiration caused from shading and less transpiration due to a lower soybean population and smaller plants. Clipping Alamo in June significantly increased soybean plant height and yield by 50% in row 1 in 1999. Soybean yield and plant height were not effected by Kemper or Chickasaw in 1999 and 2000.

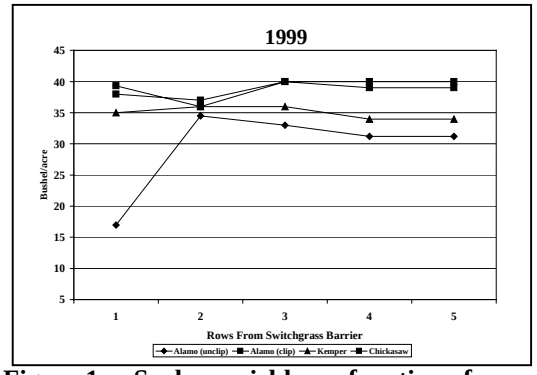


Figure 1a. Soybean yield as a function of rows from the switchgrass barriers in 1999.

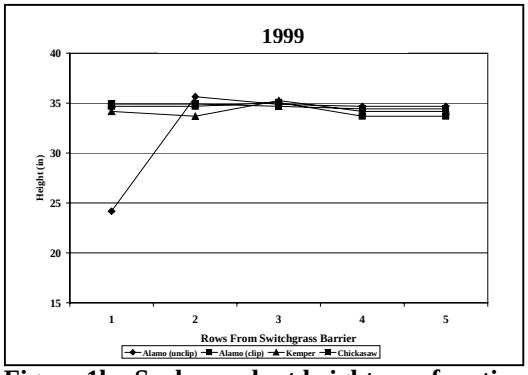


Figure 1b. Soybean plant height as a function of rows from the switchgrass barriers in 1999.

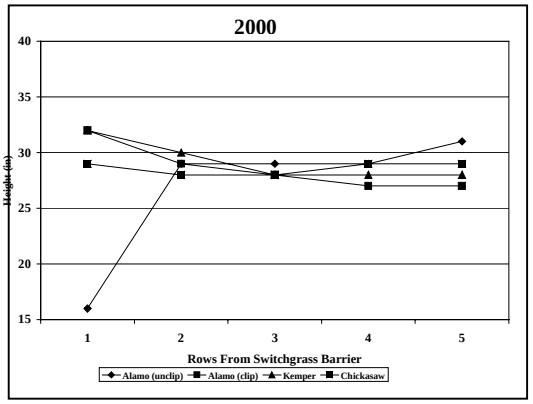


Figure 2. Soybean plant height as a function of rows from the switchgrass barrier in 2000.

Biofuels Study Summaries

Title: Eastern Gamagrass Seeding Depth
Study Number: MSPMC-T-9908-BF
Study Leader: J.L. Douglas
Cooperator: Department of Energy, Oak Ridge National Laboratory
Duration: 1999-2001

Introduction

Placement of stratified eastern gamagrass (*Tripsacum dactyloides*) seed deeper into a higher soil moisture retention zone may prolong stratification and reduce dehydration, thus improving chances for a successful planting. However, placing the seed at deeper depths may reduce seedling emergence and effect seedling growth. Objectives of this study were to compare seedling emergence of PMK-24 and accession 9062680 (680) at depths of 0.5 to 3.0 inches to determine if seed planted deeper than 1.5 inch will significantly reduce seedling emergence and at which depths provide the highest potential for seedling emergence and development.

2000 Data Collected

Table 1. Percent seedling emergence of 680 and PMK-24 by planting depth at 7, 14 and 21 days, Coffeeville, MS, 2000.

	Days after planting					
	7		14		21	
Depth (in)	680	PMK-24	680	PMK-24	680	PMK-24
	----------% emergence----------					
0.5	0	0	65	68	78	70
1.0	0	0	63	65	75	78
1.5	0	0	65	53	70	58
2.0	0	0	40	40	58	55
2.5	0	0	33	35	56	40
3.0	0	0	18	43	35	48

Table 2: Percent seedling emergence as influenced by planting depth at 7, 14 and 21 days, Coffeeville, MS, 2000.

	Days after planting		
Depth (in)	7	14	21
	----------% emergence----------		
0.5	0	66a*	76a
1.0	0	64a	74a
1.5	0	59ab	64ab
2.0	0	40bc	56abc
2.5	0	34c	48bc
3.0	0	30c	41c

* Means in columns followed by the same letters are not significantly different at $P<0.05$.

Summary

Percent emergence of 680 and PMK-24 by seeding depth in 2000 is presented in Table 1. There were no significant differences in 680 and PMK-24 for seedling emergence at 7, 14 and 21 days after planting.

Seeding depths significantly influenced seedling emergence (Table 2). As depth increased, seedling emergence decreased. The 0.5 to 1.5 inch depths significantly increased early emergence over the other depths, which indicates that seed planted at these depths may germinate and emerge rapidly given favorable soil moisture and soil temperature at planting time. Soil moisture at planting was at a moderate level according to an Aquateer ^{200} soil moisture meter. Soil temperature at planting was 75-78° F at one inch. The relatively low number of seedlings that emerged at the 2.5 and 3.0 inch depths were slightly chlorotic but recovered in 7-10 days suggesting that planting seed deeper than 2.5 inches in a silt loam soil should be avoided.

Supplemental water was not used in this study. However, if irrigation is an option, it could be used in a dry spring to maintain adequate soil moisture within shallow seeding depth zones to prevent dehydration and prolong stratification until seed germinate and emerge. Another approach would be to refrain from planting stratified seed until measurable rainfall is forecasted.

Preliminary results from 1998-2000 show that stratified seed planted at 0.5 inch are capable of producing a quicker stand but the risks associated with planting seed this shallowly must be considered. Planting stratified seed at 1.0 to 2.0 inches into a silt loam provided reasonable stands after 21 days with no effect on seedling development and growth. Seed planted at these depths are less likely to dry out as quickly as those planted in shallower depths.

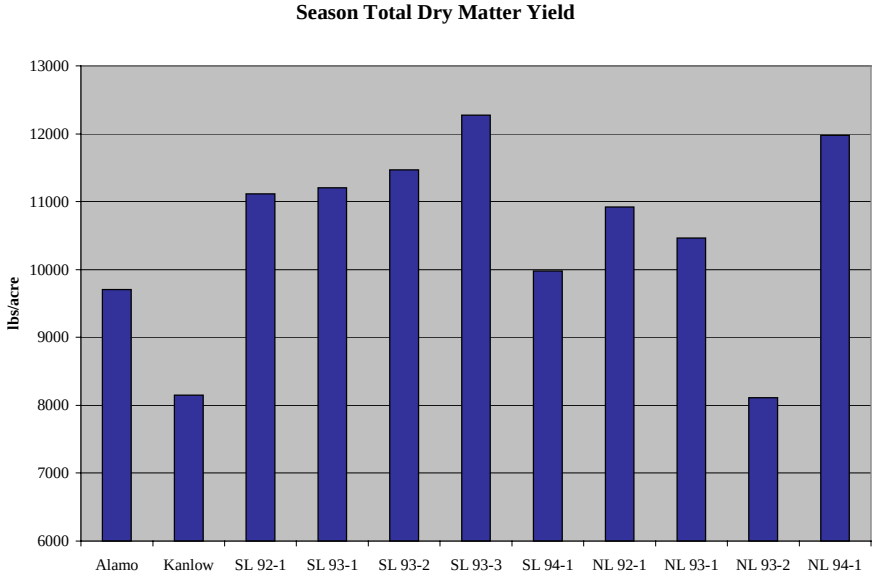
Title: A Comparison of 9 Switchgrass Lines and Two Cultivars for Biomass Production
Study No: MSPMC-T-9913-BF
Study Leader: Scott Edwards
Cooperators: Charles Taliaferro, Oklahoma State University, Stillwater OK.
Duration: 1999 - 2002

Introduction

Switchgrass is one of several perennial grass crops chosen as an alternative energy source because of superior agronomic traits including biomass production. Oklahoma State University emphasized increased biomass production as one of the essential elements in breeding switchgrass as a biofuel. As result of this effort, nine breeding lines have been developed for further evaluation in variety trials on different soils and climatic conditions in regions where switchgrass commonly occurs. The objective of this study is to compare nine switchgrass breeding lines to 'Alamo' and 'Kanlow' cultivars for biomass production and ash content in a single harvest system.

2000 Data Collected

The following breeding lines were included in the study SL 92-1, SL 93-1, SL 93-2, SL 93-3, SL 94-1, NL 92-1, NL 93-1, NL 93-2, and NL 94-1. Alamo and Kanlow switchgrass were included as standards for comparison in this trial. There was one harvest made September 18, 2000 for biomass yield.



Summary

The highest yielding line was SL 93-3 (6.1 tons/acre), which was 1.3 and 2.1 tons/acre more than Alamo and Kanlow, respectively. This study will be continued for two more years before final recommendations can be made.

Title: Evaluations of Harvest Systems for Biomass Production of Accession 9062680 Eastern Gamagrass
Study No: MSPMC-T-0005-BF
Study Leader: Scott Edwards
Cooperators: Sandy McLaughlin, Oak Ridge National Laboratory
Duration: 2000 - 2002

Introduction

Eastern gamagrass (Tripsacum dactyloides) has potential as a herbaceous biomass energy crop for marginal cropland in the southeastern states. In addition to clipping frequency and fertility, genotype greatly influences biomass production. The PMC selected accession 9062680, a tetraploid genotype, for release as a perennial forage crop for the southeastern states because of its wide range of adaptation, yield and resistance to disease. Information is needed on a harvest system that maximizes biomass production before accession 9062680 can be considered for use as a bioenergy crop. The objective of this study is to determine the optimum clipping frequency to maximize production of 9062680 eastern gamagrass using a one and two cut harvest system.

2000 Data Collected

Table 1. Dry matter yield of accession 9062680 eastern gamagrass as affected by harvest frequency at the Jamie L. Whitten Plant Material Center, Coffeeville, MS.

One Cut Harvest System		Two Cut Harvest System	
Date	**Yield lb/acre**	**Date**	**Yield lb/acre**
September 14	7,797	June 13	8,689
		September 14	4,534
Season Total	**7,797 a***	**Season Total**	**13,223 b**

*Season total yields by harvest system followed different letters are significantly different P<0.05

Summary

There were significant differences in season total dry matter yield between systems (Table 1). The one cut system had a season total yield of 7,797 lb/acre. The two cut harvest system had a season total dry matter yield of 13,223 lb/acre. The first harvest in the two cut system yielded 8,689 lb/acre and the second harvest produced 4,534 lb/acre. Below normal rainfall from July to September reduced late season growth. Mid way through the growing season, the eastern gamagrass only received 3.2 inches of rain, which is 75% below the 20-year average rainfall.

The first harvest of the two cut system was made June 13. This mid season harvest yielded 892 lb/acre more than the one cut system that was allowed to grow 93 more days before being clipped on September 14. The additional vegetative regrowth in the two cut system yielded an additional 4,534 lb/acre bringing the season total dry matter yield to 13,223. This is over 5,000 lb/acre more then the one cut system total.

A one cut system can be used for eastern gamagrass if the harvest is made within 30 days of seed maturity. However, by clipping in the vegetative stage additional harvest can be made with substantial yield. This study will be continued for two more years before final recommendations can be made on harvest system.

Title: Evaluations of Harvest Systems for Biomass Production of Weeping Lovegrass
Study No: MSPMC-T-0006-BF
Study Leader: Scott Edwards
Cooperators: Sandy McLaughlin, Oak Ridge National Laboratory
Duration: 2000 - 2002

Introduction

Weeping lovegrass is a long-lived, tufted perennial bunchgrass forming large clumps with abundant drooping basal leaves. Weeping lovegrass is well adapted to a wide range of soils from coarse sand to heavy silts and clays. Weeping lovegrass will grow on a wide range of soil pH. It has performed well in acid mine spoils with a pH as low as 4 and on alkaline soils in southern New Mexico and Arizona with a pH of 8. The grass is drought resistant but it does perform well in areas with higher rainfall and well-drained soils.

In comparison trials, weeping lovegrass has compared favorably to switchgrass in total biomass production. Weeping lovegrass yield 8,296 lbs/acre as compared to 8,418 lbs/acre for switchgrass. These reported yields have been obtained when weeping lovegrass was managed primarily as a forage crop. Forage crops must maintain a balance between forage quality and total yield. When managed as a biofuel crop, weeping lovegrass has the potential to produce higher yields. Therefore, the objective of this study is to determine the optimum clipping frequency to maximize biomass production. This study will compare a one, two and three cut harvest system.

Summary

Plots of weeping lovegrass were established May 9, 2000 using a Marlis Pasture King no-till drill at 2 PLS lb/acre. Stand ratings were good to fair despite limited rainfall and weed heavy weed competition. Study design is a randomized complete block with four replications. Erratic rainfall during the growing season limited growth during the establishment year. No yield was taken during the establishment year. Harvest will begin in 2001.

Title: Evaluations of Harvest Systems for Biomass Production of Caucasian Bluestem`in Mississippi
Study No: MSPMC-T-0007-BF
Study Leader: Janet Grabowski
Cooperators: Department of Energy, Oak Ridge National Laboratory
Duration: 2000-2002

Introduction

Caucasian bluestem [*Bothriochloa bladhii* (Retz.) S.T. Blake] is an introduced grass that has been widely planted for forage production in the Southern Plains. It is not commonly planted in the southeastern states, however, there are reports of it having been utilized in Louisiana and Florida. It is highly productive, tolerant of both cold and drought and requires less nitrogen fertilizer than many other forage crops. Plants will tolerate close mowing and require frequent clipping or grazing to prevent damage to the plant stand. Caucasian bluestem apparently can be managed for forage production in a similar manner as bermudagrass, a crop with which a majority of southeastern producers already have production experience. Because this grass is capable of producing high yields, it may have potential as a biofuel crop. However, yields and management schemes for optimum biomass production would need to be determined before Caucasian bluestem could be grown for this purpose. Therefore, the objective of this study is to compare one and two cut systems for biomass production of Caucasian bluestem.

2000 Data Collected

An extensive literature review on Caucasian bluestem was conducted in 2000 and plots were established that summer. P and K were applied to the field on May 3 at a rate of 60 lb/ac (both). Caucasian bluestem seeds were planted May 5 using a Marliss no-till drill calibrated to deliver 2 lb PLS/ac (seeds needed to be mixed with rice hulls to deliver the appropriate rate through the fluffy seed box). The plots were cultipacked after planting and then sprayed with 1.5 pt/ac atrazine. Soil crusting affected germination and stands were poor from this initial planting, so the plots were replanted on June 13. The planting rate was increased to 4 lb PLS/ac to ensure a good stand. N was applied on July 12 at a rate of 20 lb/ac and again on August 18 at a rate of 50 lb/ac. On September 14, four 3 ft X 10 ft areas were harvested to determine average yields. A representative grab sample was taken to determine DM percentage and ash content. The yields are reported in Table 1, but the laboratory analyses of ash content have not been completed at the present time.

Table 1. Establishment year yields of Caucasian bluestem.

Sample	FW yield	DM yield
	----------lb/ac----------	
1	5517	1876
2	5082	1728
3	10 164	3456
4	11 471	3900
Average	8059	2740

Summary

The late planting date, lack of rainfall and uneven plant stands probably were the reasons that yields were variable and somewhat lower than the 3 tons/ac first year forage yield potential

reported in the literature. Established 'Tifton 44' bermudagrass growing during roughly the same time period at Coffeeville (second and third cut in a three cut system, with first cut on May 20) yielded 9816 lb/ac DM (see progress report submitted for bermudagrass study). The average yield of Caucasian bluestem was 28% of that of the established bermudagrass and should be considered fairly good for a stand in its establishment year. Normal plant growth should cause the stands to fill in subsequent years, which should reduce some of the yield variability next year when the mowing treatments begin.

Title: Evaluations of Harvest Systems for Biomass Production of 'Alamo' Switchgrass
Study No: MSPMC-T-0008-BF
Study Leader: Scott Edwards
Cooperators: Sandy McLaughlin, Oak Ridge National Laboratory
Duration: 2000 - 2002

Introduction

'Alamo' switchgrass is a perennial warm season native grass that has performed well in switchgrass variety trials at Auburn University for biomass production (D. Bransby, personal communication). Because of these and other trials, Alamo has become the recommended switchgrass cultivar for biofuel production in the southeastern states.

A one and two cut harvest system that maximizes yield of switchgrass has given varying degrees of success depending on cultivar and location. Timing of the last harvest is critical for long-term sustainable yields in either system. To maximize yield of Alamo in a one or two cut system and promote regrowth in the spring, the plants should be clipped either once in early September (one cut) or in mid June and again on September 1 (two cut). This strategy would appear to allow the plants adequate time for regrowth before frost; thus, providing the plants with a protective insulation for the winter months and reducing late winter and early spring weed competition. The objective of this study is to compare a one and two cut system on biomass production of 'Alamo' switchgrass.

2000 Data Collected

Table 1. Dry matter yield of Alamo switchgrass as affected by harvest frequency at the Jamie L. Whitten Plant Material Center, Coffeeville, MS.

One Cut Harvest System		**Two Cut Harvest System**	
Date	**Yield lb/acre**	**Date**	**Yield lb/acre**
September 14	18,480	June 13	8,521
		September 14	8,648
Season Total	**18,480***	**Season Total**	**17,169***

* No significant differences at $p<0.05$

Summary

There were no significant differences in season total dry matter yield between systems (Table 1). The one cut system had a season total yield of 18,480 lb/acre. Season total dry matter yield was evenly distributed between harvest dates in the two cut system. The first harvest yielded 8,521 lb/acre and the second cut produced 8,648 lb/acre giving a season total yield of 17,169 lb/acre.

The yield for the second harvest in the two cut system was lower than expected. Regrowth was slowed by lack of moisture. Yields are expected to increase in both clipping systems if adequate moisture is available. This study will be continued for two more years before final recommendations can be made on harvest system.

Title: Evaluations of Harvest Systems for Biomass Production of 'Tifton 44' Bermudagrass
Study No: MSPMC-T-0009-BF
Study Leader: Scott Edwards
Cooperators: Sandy McLaughlin, Oak Ridge National Laboratory
Duration: 2000 - 2002

Introduction

In the southeastern United States, forage producers have relied on the introduced species bermudagrass as a major component in their forage programs. Current management techniques for bermudagrass strive for a balance between biomass production and forage quality. Bermudagrass should be harvested every 4 to 5 weeks to maintain optimum forage quality. In this region, a forage producer can typically make 3 to 4 harvests per growing season with an average yield of 3 to 5 tons/acre.

However, there is limited information on the yield potential of bermudagrass when forage quality is not a concern. Research is needed to determine a harvest system that optimizes biomass production of Tifton 44 for use as a biofuels crop. The objective of this study was to determine the harvest frequency needed to maximize season total biomass production of Tifton 44 bermudagrass using a two and three cut system.

2000 Data Collected

Table 1. Dry matter yield of Tifton 44 bermudagrass as affected by harvest frequency at the Jamie L. Whitten Plant Material Center, Coffeeville, MS.

Two Harvest System		**Three Harvest System**	
Date	**Yield lb/acre**	**Date**	**Yield lb/acre**
June 13	5,026	May 20	1,670
September 14	5,670	July 17	6,368
		September 14	2,467
Season Total	**10,696 a***	**Season Total**	**10,505 b**

*Season total yields by harvest system followed different letters are significantly different $P<0.05$

Summary

There were significant differences in yield between clipping systems (Table 1). However, the magnitude of these differences was very small. The two cut system yielded 191 lbs more than the three cut system. Total biomass production was evenly distributed between harvest dates in the two cut system. The second harvest in the three cut system had the highest yield.

The yields obtained during the first year of the study were exceptionally high considering the low N applications and limited moisture. Nitrogen recommendations for this region are 2 to 3 times higher per growing season. Yields are expected to increase in both clipping systems if adequate moisture is available. This study will be continued for two more years before final recommendations can be made on harvest system.

Pasture/Hayland Study Summaries

Title: Switchgrass Establishment Techniques
Study No: MSPMC-T-9801-PA
Study Leader: Scott Edwards
Duration: 1998 - 2001

Introduction

A limiting factor in the wide spread use of switchgrass is slow and inconsistent establishment. Weed competition is a major factor limiting the success of switchgrass plantings in the Mid-South. A possible solution to this problem is to choose a planting date and seedbed preparation technique that minimizes weed competition. The objective of this study is to compare mechanical planting practices of switchgrass as effected by planting date. Planting dates ranged from October 1 (4 treatments), before April 15 (3 treatments) and June 1 (1 treatment). Switchgrass was broadcast and no-till drilled in the fall and spring.

2000 Data Collected

Plots were established beginning in October 1998. Percent stand measurements were made March 31, three weeks after spring green up and again at the end of the growing season.

Summary

Only two treatments had percent stands of ten percent or higher. Treatment 5 averaged 40% and treatment 7 averaged 60%. Treatment number 5 consisted of spaying Roundup at 1 lb/ai on August 19 then preparing the seedbed that fall and then without disturbing the seedbed, no till drill the seed on April 18. Treatment number 7 consisted of no fall activity but instead controlled weeds with Gramoxone at 1 lb/ai on April 7 then preparing the seedbed and broadcast planting on April 18 with no seedbed disturbance. Second year percent stand will be taken after spring green up during this growing season.

Title: Effect of clipping management on seed quality of low-growing switchgrass
Study No: MSPMC-T-9807-PA
Study Leader: Janet Grabowski
Duration: 1998-2003

Introduction

Switchgrass (*Panicum virgatum* L.) is a native warm season grass used for forage, erosion control, biomass production and other resource conservation uses. Seed quality is often adversely affected by a high number of immature seeds and infection by diseases (ergot). Preliminary findings at MSPMC and Mississippi State University indicated that seed quality appeared to be better if plants were clipped during the growing season. Clipping would also allow the producer to market a hay crop in addition to the seed crop produced. This study examines the effect of clipping once during the growing season (targeted at the boot stage) on seed quality of several switchgrass accessions.

2000 Data Collected

The clipping treatments were cut June 27 and dry matter weights were determined (Table 1). Fertilizer was applied April 12 at a rate of 50 lb/ac N and K and N was applied after clipping (June 30) at a rate of 50 lb/ac. A grab sample of seeds were harvested in late September and early October. Harvested material was weighed, seeds removed from the spikelets by rubbing and inert matter and immature seeds removed by blowing in a South Dakota seed blower (Table 2). Germination tests will be conducted in 2001.

Table 1. Plant yields for switchgrass clipping study.

	Yields	
Accession	Fresh Weight	Dry Matter
	----------lb/10 ft row----------	
Blackwell	7.6	2.6
9062746	7.2	2.3
9062747	7.7	2.3
9062759	3.9	1.4
9062760	2.9	0.9
LSD (P<0.05)	2.3	0.7

Table 2. Seed yields for switchgrass clipping study

Accession	Treatment	Seed yield		
		Before cleaning	After cleaning	Percentage
		----------g----------		
9062746	Clip	2.15	0.32	15
	Unclip	6.42	0.58	10
9062747	Clip	2.89	0.44	15
	Unclip	9.13	0.48	5
9062760	Clip	1.69	0.33	17
	Unclip	2.80	0.18	6
LSD (P<0.05)		2.06	*	**

* Accession and clipping treatment were both significantly different, but not the interaction between factors.
** Clipping treatment only was significant.

Summary

'Blackwell' is only marginally adapted this far south and it was well past the boot stage at clipping; the other locally collected accessions were not. Although dry matter yields for Blackwell were highest, forage quality would be very poor at this growth stage. Blackwell and 9062759 showed little regrowth after clipping and did not produce sufficient seed heads to harvest seed. Prolonged drought during the summer of 2000 adversely affected seed yields. The clipping treatment reduced seed harvests; however, higher quality seeds averaged 16% of total harvest weight from the clipped plots but only 7% from the unclipped plots. In 2001, an irrigation system has been installed at the PMC and will be available to provide water to the plots if needed. If results still do not indicate a beneficial effect from the clipping treatment, then the study will be discontinued.

Title: Evaluation of Switchgrass Selections for Forage
Study No: MSPMC-P-9904-PA
Study Leader: Scott Edwards
Cooperators: Dr. David Lang, Mississippi State University
Duration: 1999 - 2003

Introduction

The PMC has selected 13 accessions of switchgrass (*Panicum virgatum*) from an initial evaluation of locally collected ecotypes that have potential as a forage crop. Accessions were selected based on forage quality estimates ADF, NDF, leaf width, stem size, diseases resistance, forage abundance, seed abundance, and plant height. The following switchgrass accessions were selected for advanced evaluation on April 19, 1999 (Table 1). The objective of this study is to compare 'Alamo' switchgrass to 13 locally collected accessions of switchgrass.

2000 Data Collected

Accession	Location	%N	% ADF	% NDF	Stem dia. (in)	Leaf width (in)
422006	Alamo	1.5	38	68	0.28	0.68
421999	Pangburn Co. AR	1.6	41	71	0.24	0.71
9062794	Grenada Co. MS	1.6	38	71	0.21	0.84
9062841	Pontotoc Co. MS	2.2	36	66	0.2	0.7
9062814	Monroe Co. AR.	1.5	39	69	0.18	0.42
9062795	Carroll Co. MS	1.9	38	67	0.22	0.79
9062799	Yalobusha Co MS	1.6	39	69	0.25	0.77
9062824	Tate Co. MS	1.5	39	68	0.26	0.84
9062849	Grenada Co. MS	1.8	39	70	0.23	0.84
9062787	Monroe Co. MS	1.6	39	69	0.22	0.78
9062801	Choctaw Co. MS	1.6	39	72	0.2	0.62
9062848	Grenada Co. MS	1.8	38	68	0.3	0.97
9062840	Chickasas Co. MS	2.1	36	66	0.32	0.99
9062818	Attala Co. MS	1.7	39	69	0.18	0.48
	LSD (0.05)	**0.43**	**NS***	**3.07**	**0.05**	**0.09**

* NS = Not significant

Summary

Accession 9062759 (Amite County) did not survive the first growing season and has been removed from the study. Due to extreme drought this growing season, overall seed yields were low. Accessions 9062759, 9062794, 9062818, and 9062840 did not produce before the first frost.

Forage samples were taken when a majority of the plants reached the boot stage. There was a significant difference in stem size between switchgrasses. Many of these switchgrasses were selected because of finer stem size. Eleven accessions had smaller stem size than Alamo. However, there was no correlation between stem size and percent ADF or NDF. After one year of collecting data, it appears all accessions have equal to or better forage quality attributes than Alamo.

Title: Seed treatments to overcome eastern gamagrass dormancy
Study No: MSPMC-T-9906-PA
Study Leader: Janet Grabowski
Cooperators: Department of Energy, Oak Ridge National Laboratory
Duration: 1999-2002

Introduction

Poor establishment of eastern gamagrass [*Tripsacum dactyloides* (L.) L.] from seed is one factor that limits its use as a forage crop. Present commercial practice involves six to twelve weeks of stratification prior to planting eastern gamagrass seeds to overcome dormancy and ensure a stand. The potential problems with stratification are that seeds must be planted within days of removal from the stratification treatment, and if environmental conditions are not ideal for germination after planting, seeds may enter secondary dormancy, which will delay germination.

Chemical stimulants can be used to overcome seed dormancy. The initial test in the germinator tested 24 hour soak in solutions of the chemical stimulants, gibberellic acid (GA) and potassium nitrate (KNO_3) for their effect on germination of eastern gamagrass seeds. The GA treatment increased early germination of seeds that were then stratified before planting, however, the rate used (1000 mg L^{-1}) was too high and caused abnormal growth of the seedlings. Further testing was warranted because an increase in the rate of germination may reduce the possibility of stratified seeds entering secondary dormancy.

The objective of this study is to examine chemical stimulant treatments that might improve field establishment of eastern gamagrass seeds. Treatments used are various combinations of GA (100 mg L^{-1} solution), Kinetin (100 mg L^{-1} solution), and potassium nitrate (0.2% solution). The effects of the treatments on plant growth were examined by harvesting shoots at the end of the growing season and comparing shoot dry matter weight and shoot number between treatments.

2000 Data Collected

A preliminary test was conducted in the winter of 1999 and spring of 2000 to establish a recommended rate of GA that did not cause abnormal seedling elongation. A rate of 100 ppm, as noted above, was selected for the field test. Stratification treatments for the field test were treated with the chemical stimulant treatments March 30 and placed in the cooler the following day. Non-stratified treatments were chemically treated May 11 and all treatments were planted May 12. Atrazine (0.57 kg ha^{-1}) was sprayed over all plots on May 16. Germination counts were taken weekly for 8 weeks until weed growth made counting difficult. Final stand counts were taken October 17. The maximum stand percentage recorded for each plot was analyzed statistically (Table 1). Germination counts at three weeks after planting are also presented to provide information on the rate of germination. On October 17 and October 19, shoots from two plants in each plot with two or more plants were harvested to determine differences in shoot numbers, dry matter weights of forage production, and basal shoot weights (Table 2). Forage weights were not analyzed statistically because of extreme variability between plots.

Table 1. Mean stand ratings for eastern gamagrass seed dormancy treatments.

Treatment Combinations	Stand 3 weeks	Stand Maximum
	----------%----------	
Control	0	1
Dry + GA + Kinetin	1	4
Stratified	6	12
Stratified + GA	13	19
Stratified + Kinetin	7	11
Stratified + GA + Kinetin	11	18
Stratified + GA + Kinetin + KNO_3	12	19
LSD (P<0.05)	10	11

Table 2. Shoot data for eastern gamagrass seed dormancy treatments.

Treatment Combinations	Number of Shoots	Basal Shoot Weight
		----------g----------
Stratified	5	2.9
Stratified + GA	5	2.7
Stratified + Kinetin	6	2.8
Stratified + GA + Kinetin	5	2.3
Stratified + GA + Kinetin + KNO_3	10	3.0
LSD (P<0.05)	NS	NS

Summary

Germination percentages were poor in 2000 due to a lack of rainfall immediately after planting. Germination was highest for all stratified GA treatments, however, these treatments were not significantly different from stratification alone. The somewhat higher germination of GA treated seeds is unusual because previous studies have shown that GA increased early but not total germination of eastern gamagrass seeds. Germination rate was also faster for those treatments including GA as shown by the 3-week germination percentages, but again not different from stratified seeds. The GA treatment did appear to have any affect on shoot number or basal shoot dry weight. This indicates that the lower 100 ppm rate did not cause the abnormal growth seen for seeds treated with 1000 ppm GA. At this time, it does not appear that any of the chemical stimulant treatments are highly beneficial. If this trend continues during further testing, then no adjustment in current seed handling practices will be warranted.

Title: Estimating Digestibility of 'Alamo' Switchgrass
Study Number: MSPMC-T-9916-PA
Study Leader: J.L. Douglas, S.D. Edwards
Cooperator: D. Lang, Agronomist, Department of Plant and Soil Science, Mississippi State University
Duration: 2001-2002

Introduction

'Alamo' switchgrass (*Panicum virgatum*) has performed well in adaptation studies in Mississippi. Grazing trials will be conducted on the South Farm at Mississippi State University in 2001 that compares Alamo with various bermudagrass varieties. In addition to grazing trials, information on forage quality is needed to support its usefulness as a forage crop. This study determines if quality estimates for crude protein (CP), acid detergent fiber (ADF), neutral detergent fiber (NDF) and lignin (L) can be used to estimate *in vitro* dry matter digestibility.

2000 Data Collected

Samples used to conduct this experiment were collected from a previous study where 'Alamo' was cut on a four and six week interval. Chemical analysis for CP, ADF, NDF, and lignin were collected on 60 samples in 2000 bringing the total number of analyses for the model to 172 (112 samples in 1999).

Summary

Forage analysis has been performed but an equation has not been developed at the time this report was written.

Title: Estimating Digestibility of Eastern Gamagrass
Study Number: MSPMC-T-0015-PA
Study Leader: J.L. Douglas, S.D. Edwards
Cooperator: D. Lang, Agronomist, Department of Plant and Soil Science, Mississippi State University
Duration: 1999-2001

Introduction

Livestock producers and forage specialists use total digestible nutrients (TDN) equations to estimate feed value of different forages to determine amount of nutrient supplements needed for various animal classes. Quality estimates for crude protein (CP), acid detergent fiber (ADF) and neutral detergent fiber (NDF) are used in various equations to predict TDN. The purpose of this study was to determine if standard forage quality estimates of CP, ADF, NDF and lignin could be used in an equation to estimate *in vitro* dry matter digestibility (IVDMD) of accession 9062680 eastern gamagrass.

2000 Data Collected

Samples used to conduct this experiment were collected from a previous experiment that compared yield, quality and persistence of warm season grasses as effected by a 30 and 45 day clipping frequency. Chemical analysis for CP, ADF, NDF, and lignin (L) were collected on 60 samples in 2000 bringing the total number of analyses for the model to 172 (112 samples in 1999). The following equations were generated using stepwise regression for general linear models.

Table 1. Regression equations, R^2 and P values for IVDMD (Y) vs. quality estimates (ADF[1], NDF[2], CP[3] and L[4]) of 9062680 eastern gamagrass for 1996-1998 and combined over years.

Year	Regression equation	R^2	P value
1996	Y = 85.6 – 0.33 * NDF + 1.63 * CP + 0.24 * L	0.63	0.0001
1997	Y = 67.7 – 0.27 * ADF + 0.22 * NDF	0.16	0.0242
1998	Y = 77.3 – 0.43 * L	0.19	0.0112
Combined	Y = 75.2 – 0.21 * ADF + 0.56 * CP	0.13	0.0004

1 - acid detergent fiber; 2 - neutral detergent fiber; 3 - crude protein; 4 - lignin.

Summary

Undersander et al. (1993) identify numerous digestibility equations for different regions of the U.S. utilizing ADF, CP, and NDF to predict TDN of various perennial and annual grasses, legumes, and other crops. Regression analysis gave different equations each year (Table 1). Although the regression equations for 1996-1998 were highly significant, their correlation was weak. Bidlack et al. (1999) found that IVDMD was highly correlated with L and CP in some genotypes of eastern gamagrass. The equation produced in 1996 with NDF, CP and L gave the highest correlation. When combined over years, no combination of quality estimates produced a consistent equation. However, ADF and CP remained in the over all equation but was a weak primary influence. Many state and university forage testing laboratories in the southeastern U.S. use ADF and CP for predicting TDN of cool and warm season grasses and legumes, grass-legume combinations, and other forages (www.uark.edu/depts/agronomy/facpage/west/tdn). The over all equation has relevance for estimating digestibility of 9062680. Additional laboratory analyses are being conducted to verify this equation. In addition, *in vivo* digestibility studies need to be conducted.

Title: Yield Response of 9062680 Eastern Gamagrass to Nitrogen Fertility
Study Number: MSPMC-T-0017-PA
Study Leader: J.L. Douglas
Cooperator: D. Lang, Agronomist, Department of Plant and Soil Science, Mississippi State University; R.L. Ivy, Agronomist, Mississippi Agricultural and Forestry Experiment Station (MAFES), Prairie, MS
Duration: 2001-2003

Introduction

Nitrogen fertility is important for the production of grass crops. Previous studies have shown that eastern gamagrass (*Tripsacum dactyloides*) responds to increased nitrogen but response varies with genotype/cultivar and geographical location. A cooperative study with Mississippi State University will determine the effect of N rates on production of 9062680 eastern gamagrass on different soil types in Mississippi. Test locations include the PMC, Prairie (experiment station) and Starkville (MSU South farm). Experimental design is a randomized complete block replicated three times. N rates are 0, 120, 240, 360 and 480 lb N/acre and will be broadcast applied in split applications. Plots will be harvested on a 45 day interval.

Summary

Plots were established at all locations in 2000. PMC and MAFES personnel collected plant diameter data to determine uniformity within plots and have baseline data to access the effect of nitrogen on tillering. Average plant diameter was 34 cm at the PMC, 20 cm at MSU, and 30 cm at Prairie. Soil samples for nitrate nitrogen were also collected at incremental depths of 0-6, 6-12, 12-18 and 18-24 inches. Yield data will be collected beginning in May 2001.

Title: Increase uniformity of seed ripening in eastern gamagrass using ethephon
Study No: MSPMC-T-0018-PA
Study Leader: Janet Grabowski
Duration: 2000-2002

Introduction

Indeterminant flowering of eastern gamagrass [*Tripsacum dactyloides* (L.) L.] results in combine seed harvests containing a mixture of immature fruit structures that do not contain a caryopsis and mature ones that do. It is difficult to separate filled fruits from unfilled ones using normal seed cleaning techniques. Ethephon is an ethylene-generating compound that can be used to promote ripening and increase harvest uniformity. A preliminary test indicatedthat ethephon may improve uniformity of seed ripening of eastern gamagrass. Prep is the formulation of ethephon generally used on cotton and is therefore the chemical most readily available for local purchase. The objective of this study is to determine if applications of Prep to eastern gamagrass (accession 9062680) inflorescences can improve uniformity of seed ripening.

2000 Data Collected

Developing seed heads were sprayed June 14 and again on July 11. Plants were harvested on July 19. Culms were separated from the plant material and fruits were loosened from the culm using a bundle plot thresher. Samples were weighed, inert matter and most empty seeds were removed by blowing in a South Dakota seed blower, and remaining seeds were weighed again to determine the percentage of higher quality seeds (Table 1). Germination tests will be conducted in 2001 to determine if the ethephon treatment had an adverse effect on seed viability.

Table 1. Seed yields for eastern gamagrass accession 9062680 treated with ethephon.

	Seed yield		
Treatment	Before cleaning	After cleaning	Percentage
	----------g----------		
Control	129.38	39.65	30
Ethephon	89.86	29.44	33
	NS	NS	NS

Summary

Ethephon decreased seed harvests, but the difference was not significant. It slightly increased the percentage of higher quality seeds in the harvested material, but the difference was also not significant. Drought conditions during seed ripening may have had some effect on seed quality. The ethephon treatment appeared to increase the rate of senescence in the seed head because more fruits fell from the infrutescence on the Prep treated plants than the control plants. Often the first fruits to mature at the top of the spike are of lesser quality than the later maturing ones closer to the bottom of the spike. This may explain the increased percentage of higher quality seeds in the ethephon treatment. However, increasing the rate of senescence would probably increase the possibility of missing the harvest all together. In 2001, if seed yields from the ethephon treatment do not improve, or if it has an adverse effect on seed germination is proven, then this study will not be continued in 2002.

Title: Warm Season Grass Evaluation
Study No: SPMC-P-0018-PA
Study Leader: Scott Edwards
Cooperators: Patricia Rogers, NRCS Wiggins FO
Roscoe Ivy, MAFES Prairie Research Station
Duration: 2000 - 2003

Introduction

This project will determine the adaptability of two eastern gamagrass varieties and one test accession. Plots of 'Pete', 'Jackson' and accession 9062680 were established in Coffeeville, Wiggins and Prairie, MS. Beginning in 2001, plants will be rated on survival, vigor, and biomass production. At the Wiggins location, seven other warm season grasses were planted to determine their potential adaptability in southern Mississippi.

Summary

In addition to the eastern gamagrass, the following species were transplanted in 6 by 6 ft plots in a randomized complete block design with three replications at the Wiggins, MS location.

Plants	**Scientific**
514673 Indiangrass	*Sorghastrum nutans* (L.) Nash.
Little bluestem	*Schizachyrium scoparium* (Michx.) Nash
'Alamo' switchgrass	*Panicum virgatum* (L.)
'Pangburn' switchgrass	*Panicum virgatum* (L.)
Johnson grass	*Sorghum halepense* (L.) Pers.
Weeping lovegrass	*Eragrostis curvula* Schrad. Nees
Caucasian bluestem	*Bothrichloa caucasica* (Trin.)

Title: Yield and Persistence of Four Experimental Lines of Eastern Gamagrass, Pete, Jackson and 9062680
Study Number: MSPMC-P-0019-PA
Study Leader: J.L. Douglas
Cooperator: Tim Springer, Agronomist, ARS, Woodward, OK
Duration: 2001-2003

Introduction

The PMC is working cooperatively with Agriculture Research Service (ARS) in Woodward, Oklahoma to evaluate yield and persistence of four experimental lines of eastern gamagrass (*Tripsacum dactyloides*). The experimental lines are FGT-I, FT-II, FT-IV and FT 94-8. 'Pete', 'Jackson' and 9062680 were included in the trial for comparison. Plots were planted in April 2000 in a randomized complete block with four replications. A 45 clipping interval will be used to determine forage production and persistence.

Summary

No yield data was collected during the establishment year. Percent stand was recorded in August 2000. Percent stand for Pete, FGT-I, FT-11, FT-IV, FT 94-8, 9062680 and Jackson was 98, 98, 100, 97, 100, 100, and 80%, respectively. Yield data will be collected in 2001.

Title: Seed Production of 9062680 Eastern Gamagrass as Influenced by N Fertility
Study Number: MSPMC-T-0020-PA
Study Leader: J.L. Douglas
Cooperator: D. Lang, Agronomist and Paul Meints, Agronomist, Department of Plant and Soil Science, Mississippi State University; R.L. Ivy, Agronomist, Mississippi Agricultural and Forestry Experiment Station (MAFES), Prairie, MS
Duration: 2001-2003

Introduction

Nitrogen fertilizer has shown to increase seed yields of warm and cool season grasses. A cooperative study with Mississippi State University will determine the effect of N fertility on seed production of 9062680 eastern gamagrass. This study will be conducted at the PMC, Prairie (experiment station) and Starkville (MSU South farm). Soil types represented at these locations are silt loam and clay loam soils. Nitrogen rates are: 0, 100, 200 single application, 100 split (50 lbs applied at green up and the other 50 applied at late vegetative stage), and 200 split (split with 100 lbs applied at green up and the other 100 applied at late vegetative stage).

Summary

Plots were established at all locations in 2000. PMC and MAFES personnel collected plant diameter data to determine plot uniformity. Average plant diameter was 32 cm at the PMC, 20 cm at MSU, and 32 cm at Prairie. Seed production parameters will be collected beginning in May 2001.

Critical Area Study Summaries

Title: Evaluation of mowing and burning treatments on selected native plants
Study No: MSPMC-T-9603-CR
Study Leader: Janet Grabowski
Duration: 1996-2002

Introduction

In order to maintain stands of wildflowers or other desirable herbaceous plants, control of competing plant species is usually necessary. If left unchecked, woody plants or other aggressive perennials will gradually displace the favored species. Both mowing and burning have been shown to have merits in managing stands of wildflowers and certain grasses and legumes. The objective of this study is to compare the effect of four different management treatments, consisting of three different mowing regimes (regularly mowed, highway regime, PMC regime) or a dormant season burn on selected species of grasses and forbs.

2000 Data Collected

The dormant season burn plot was burned March 6. The regularly mowed plot was first mowed on May 25 and again on June 12 and July 17. The mowing regime following the Mississippi highway department normal schedule was mowed on June 12. The mowing regime following PMC normal practice was mowed on July 17. The normal fall mowing for all mowing regime plots was not done. The reason for this is that populations of many of the wildflowers have declined during the course of this study, mainly due to competition from plants and plant residue. On August 30, all plots were lightly disked to determine if this treatment could allow several of the wildflower species to become reestablished without greatly disrupting stands of species that were already present. Stand evaluations were taken on May 22 and July 21 and averages are presented in Table 1.

Table 1. Stand ratings for native plant management study.

Species	05/22				07/21			
	Reg.	PMC	Hwy	Burn	Reg.	PMC	Hwy	Burn
	----------Stand Ratings----------							
Black-eyed susan	1(1)	1(1)	2(7)	3(4)	--	--	1(2)	1(1)
Clasping coneflower	--	--	--	1(4)	--	--	--	--
Lance-leaf coreopsis	1(3)	1(1)	1(2)	--	--	--	--	--
Lyre-leaf sage	2(8)	1(7)	2(7)	3(3)	2(6)	1(6)	1(7)	1(3)
Little barley	3(4)	3(3)	3(7)	--	--	--	--	--
Little bluestem	1(4)	1(1)	1(2)	1(1)	1(1)	1(1)	1(1)	1(1)
Partridge pea	--	--	1(1)	2(5)	--	--	--	1(1)
Virginia wildrye	--	--	--	--	--	--	--	1(8)

Stand ratings 1 =1-10 plants per square meter (poor stand); 2 = 11-30 plants (fair stand); 3 = 31-50 plants (good stand); 4 = >50 (excellent stand).
Number in parentheses is number of samples in which species were found.

Summary

Little barley (*Hordeum pusillum* Nutt.) and Virginia wildrye (*Elymus virginicus* L.) were only evaluated when their populations were clearly evident, so the lack of data for these species for one evaluation date should not be construed as a poor stand. The wildflower species were easy to identify at both evaluation dates. Lyre-leaf sage (*Salvia lyrata* L.) is a perennial that has good shade tolerance and can withstand competition from other species; therefore it has been capable of maintaining itself most successfully throughout the years. Its population is reduced in the burned plots, probably because the fire kills or severely injures perenniating plants. Regular mowing did appear to improve its stands because it reduces competition and the decumbent habit of lyre-leaf sage gives it great mowing tolerance. Populations of black-eyed susan (*Rudbeckia hirta* L.) maintained themselves better than most of the other wildflowers that were originally planted on the site, such a clasping coneflower [*Dracopis amplexicaulis* (Vahl) Cass.], lance-leaf coreopsis (*Coreopsis lanceolata* L.), and plains coreopsis (*Coreopsis tinctoria* Nutt.). Partridge pea [*Chamaecrista fasciculata* (Michx.) Greene] was favored in the burned plots because burning reduced plant residue levels on the soil surface. Little bluestem [*Schizachyrium scoparium* (Michx.) Nash] existed as a scattered component in the plots. Overall, best species diversity was in the highway and burned plots. The earlier mowing date in the highway plots probably reduced competition and plant residue levels; however, it did prevent species such as black-eyed susan and clasping coneflower from setting seed.

Title: Effect of postemergence herbicides on selected native wildflowers and grasses
Study No: MSPMC-T-9702-CR
Study Leader: Janet Grabowski
Duration: 1997-2000

Introduction

Various species of native grasses, forbs, and legumes are used for forage production, erosion control, wildlife food and cover production, and as ornamentals along roadsides and in home gardens. It is probable that greater use would be made of some native species if their requirements for establishment and management were better known. Certain herbicides need to be tested to determine whether their judicious use could be utilized for establishment and maintenance of such plants. This study is the second phase of this research, examining the effect of post-emergence herbicides.

2000 Data Collected

This study was completed in 2000 (last herbicide treatments were applied in 1999). Damage ratings were taken on plots with the sulfometuron methyl (Oust) treatment applied the previous fall and stand ratings were taken on all plots May 17. Germination tests were conducted beginning on August 16 on those treatments were seeds were collected. A technical note will be prepared in 2001 which will contain all the pertinent data tables and analyses.

Summary

Imazapic (Plateau) caused none to minimal plant damage, with the exception of purpletop [*Tridens flavus* (L.) A.S. Hitchc.] and partridge pea [*Chamaecrista fasciculata* (Michx.) Greene] and it is a herbicide that is being incorporated into the production scheme for several wildflower species. Dicamba (Banvel) caused no damage to purpletop, eastern gamagrass [*Tripsacum dactyloides* (L.) L.], and Virginia wildrye (*Elymus virginicus* L.), but did damage black-eyed susan (*Rudbeckia hirta* L.) plants. It could be used safely on annual wildflower such as plains coreopsis (*Coreopsis tinctoria* Nutt.) and clasping coneflower [*Dracopis amplexicaulis* (Vahl) Cass.] after seed production. Bentazon (Basagran) caused only minimal damage to the three wildflowers listed previously as well as lyre-leaf sage (*Salvia lyrata* L.) and partridge pea. MSMA caused severe damage to the wildflower species, but caused little damage to the grasses. Oust did little damage to the grasses, but did prevent reestablishment of many of the wildflowers. None of the herbicides appeared to have a deleterious effect on seed germination for those species and treatments where seeds were collected.

Title: Evaluation of purple coneflower accessions
Study No: MSPMC-P-9904-CR
Study Leader: Janet Grabowski
Duration: 1999-2001

Introduction

Purple coneflower [*Echinacea purpurea* (L.) Moench] is a popular wildflower for use in landscapes, prairie plantings, and along roadsides and it also has medicinal uses that have generated increased interest in growing this plant. In Mississippi, it is generally found on areas with Blackland Prairie soils or scattered in a few other locations with well-drained soils. Seeds were collected from the Tombigbee National Forest in Chickasaw County, Mississippi and sent to the PMC for increase for the Mississippi Native Wildflower Conservation Program. The purpose of this plant evaluation study is to compare this local accession to five accessions from commercial sources to determine if there is justification for releasing it.

2000 Data Collected

The plots were planted in 1999 with 25 plants, except for 9077093 where only 24 plants were planted. They were fertilized with 100 lbs/ac 13-13-13 on April 6. Plant survival and vigor was evaluated on June 2; plant survival, vigor and flowering evaluations were taken on September 15 (Table 1). Plant basal circumference was taken in 1999 but not in 2000 due to early sensecence, but this data was taken in 1999 and will be taken in 2001.

Table 1. Plant evaluation data for purple coneflower evaluation study.

	06/02		09/15		
Accession	# plants	Vigor	# plants	Vigor	#Flower heads (avg. of 3 plants)
9077088(local)	11	5	9	3	11
9077092	4	3	5	7	13
9077089	8	7	6	3	19
9077093	14	7	9	1	17
9077090	15	5	14	3	14
9077091	11	5	10	3	11

Vigor 1 = excellent; 2 = good; 5 = average; 7 = fair; 9 = poor.

Summary

Evaluations have shown that the local accession does not appear to be superior to 9077093, 9077090 or 9077093 from commercial sources. This study will be discontinued in 2002 unless evaluations during this year indicate that there is a reason for further study.

Water Quality Study Summaries

Title: Effect of Land Applied Poultry Litter on P Content, Yield and Quality of 10 Species
Study No: MSPMC-T-0002-NU
Study Leader: Scott Edwards
Cooperators: Roscoe Ivy, Prairie Research Unit, Prairie, MS
Joe Johnson, North Mississippi Research Center, Holly Springs, MS
Duration: 2000 - 2003

Introduction

Water quality impacts from land applied poultry litter are dependant on many variables: soil, rainfall, climate, plant species, shallow versus concentrated flow, application rate, waste characteristics, and many others. In an attempt to limit adverse environmental effects, the Mississippi Department of Environmental Quality began requiring all poultry facilities that generate dry litter or waste that would be constructed or significantly altered after February 1994 must obtain a permit. The NRCS is charged with supplying the technical support for these plans.

The plans main function is to calculate the total amount of land needed to utilize the nutrients generated by each animal unit. Application rates and required acreage are based on soil type and the nutrient removal capacity of the plants receiving the land applied poultry litter. Nutrient removal capacity is determined by percent nutrients in the plant tissue and by season total dry matter yield of each crop. The objective of this study is to evaluate the nutrient removal and yield potential of 9 grass species and 1 legume receiving poultry litter as the nutrient source.

2000 Data Collected

The following species were established at three locations, Coffeeville, Prairie, and Holly Springs Mississippi. No data was collected during the establishment year of the study.

Variety	Scientific	Establishment Method	Clipping Frequency
Common bermudagrass	*Cynodon dactylon* (L.) Pers.	Seed	30 days / 4
'Summerall 007' bermudagrass	*Cynodon dactylon* (L.) Pers.	Sprigs	30 days / 4
'Pensacola' bahiagrass	*Paspalum notatum* Fluegge	Seed	30 days / 4
'Alamo' switchgrass	*Panicum virgatum* (L.)	Transplant	45 days / 3
9062680 Eastern gamagrass	*Tripsacum dactyloides* (L.)L.	Transplant	45 days / 3
Weeping lovegrass	*Eragrostis curvula* Schrad. Nees	Seed	45 days / 3
Johnsongrass	*Sorghum halepense* (L.) Pers.	Transplant	45 days / 3
'Tropic Sunn' sun hemp	*Crotalaria juncea* L.	Seed	180 days / 1
Caucasian bluestem	*Bothrichloa caucasica* (Trin.)	Transplant	45 days / 3
Dallisgrass	*Paspalum dilatatum* Poir.	Seed	30 days / 4

Title: Evaluation of native mixtures on WRP sites using sculptured seeding techniques
Study No: MSPMC-T-0003-WE
Study Leader: Janet Grabowski
Cooperators: Paul Rodrigue, National Wetlands Science Institute
Duration: 2000-2002

Introduction

The sculptured seed technique was developed to increase success of prairie seeding projects. This technique involves varying components of the seeding mixture based on changes in topographic and soil features within the planting site. Factors that limit success of planting a single seed mixture on prairie areas also exist on WRP sites. Based on previous planting made on WRP sites, we feel that the major determinant of successful establishment is probably elevation, because this affects the amount and season of ponding. The objective of this study is to utilize sculptured seeding on two WRP planting sites and to evaluate establishment, growth, and survival of native species that can provide potential sources of wildlife food and cover. If possible, spring and summer plantings will be made on each planting site.

2000 Data Collected

A proposed planting scheme, seed mixtures, and a study plan were developed in April. Planting sites were selected in August, one in each of Grenada and Quitman counties. It was decided that the planting sites would be graded to provide a uniform slope up to the winter pool level. If the grading is completed in the spring of 2001, then the Grenada county site will be planted in late spring to early summer, if not then in the fall of that year. The Quitman county site was not under contract at the time it was selected, so it would not be possible to plant that site until fall 2001 at the earliest.

Summary

No data has been collected to summarize.

Technical Reports

Listed below are the most current technical reports written by staff at the Jamie L. Whitten Plant Materials Center. Technical reports written in previous years and other PMC publications are available electronically at the Plant Materials Program web address listed in the Introduction Section.

1997

Preeemergence Herbicides for Native Wildflowers, Legumes, and Grasses -- Janet Grabowski and B. B. Billingsley

Herbicides and Timing for Control of Broomsedge in Conservation Reserve Fields -- Scott Edwards, Herby Bloodworth and Mike Lane

Seed Propagation Techniques for Wetland Plants -- Janet Grabowski

Seed Age, Seed Treatment, and Growing Environment Effects on two *Scirpus* Species -- Janet Grabowski

Establishment Methods of Sweetpotato in Conservation Tillage Systems -- Scott Edwards, Herby Bloodworth and Mike Lane

A Guide to Conservation Tillage Sweetpotato Production -- Scott Edwards, Bill Benoist, Herby Bloodworth and Mike Lane

A Comparison of Seed Cleaning Techniques for Improving Quality of Eastern Gamagrass Seed -- Joel Douglas, Janet Grabowski and Bennie Keith

1998-1999

Evaluation of Sulfuric Acid Scarification for Improving Germination of Yellow Lotus Seed -- Janet Grabowski

Harvest Aid Chemicals for Trailing Wildbean Production -- Janet Grabowski

Eastern Gamagrass Establishment: I. Greenhouse Planting Depth Study -- Joel Douglas

Eastern Gamagrass Establishment: II. Effect of Hot Water Treatment on Seed Germination -- Janet Grabowski and Joel Douglas

Management Systems for Southernpea Double Cropped with Wheat -- Herby Bloodworth

Evaluation Lark Selection Partridge Pea and Hopefield Selection Trailing Wildbean for Use in Critical Area Seed Mixtures -- Janet Grabowski and Joe Snider

Clipping Effect on Yield and Quality of Eastern gamagrass, Switchgrass and Bermudagrass-- Scott Edwards, Joel Douglas and Herby Bloodworth

2000

Tolerance of Legume Species to Postemergence Soybean Herbicides -- Joel Douglas, Janet Grabowski and William Benoist

Wildflower Seed Production at the Jamie L. Whitten Plant Materials Center -- Janet Grabowski

Estimating Digestibility in Eastern Gamagrass -- Joel Douglas, Scott Edwards and David Lang

Germination of Two Genotypes of Eastern Gamagrass With and Without the Cupulate Fruitcase and Stratification -- Joel Douglas and Janet Grabowski

Eastern Gamagrass as a Potential Biofuel Crop -- Joel Douglas

Analysis of the Potential for Using Caucasian Bluestem as a Biofuel Crop in the Southeastern United States -- Janet Grabowski

Weeping Lovegrass as a Potential Bioenergy Crop -- Scott Edwards