Jamie L. Whitten Plant Materials Center

2003 Annual Technical Report

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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 select, test and transfer state-of-the-art plant 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. Cropland erosion control, pastureland improvement, critical area erosion control, including urban conservation concerns, water quality improvement, and wildlife habitat enhancement 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.

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, Alcorn State University, Mississippi Association of Conservation Districts, Mississippi Soil and Water Conservation Commission, USDA Forest Service, and USDA Agricultural Research Service, and as well as other federal and state agencies and entities within NRCS.

The purpose of this publication is to provide information on studies actively being pursued at the PMC during 2003. 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 are 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.

Rainfall (Table 1) was somewhat lower than average early in the growing season (March and April), but was generally at or above average during the rest of the growing season. Several heavy storms in May resulted in a total amount that greatly exceeded normal rainfall for that month. The drier spring was actually helpful because it did not interfere with planting operations and the evenly distributed rainfall throughout the rest of the growing season creating ideal crop production conditions. Temperatures (Table 2) during 2003 were fairly typical for this location.

Table 1. Monthly and total rainfall in 2003 and 20-year averages at the Jamie L. Whitten Plant Materials Center, Coffeeville, MS.

Month	2003	20-yr. avg.
	----------in.----------	
January	1.47	4.70
February	7.81	5.78
March	2.27	5.63
April	2.85	5.91
May	11.18	5.44
June	5.12	5.25
July	5.53	4.36
August	5.10	3.50
September	3.90	4.25
October	3.50	4.26
November	4.73	6.51
December	4.42	6.02
Total	57.88	61.59

Table 2. Average monthly high and low temperatures recorded for Coffeeville, MS in 2003 and 20-year averages

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Avg.
	----------°F----------												
High	48	51	65	75	81	85	90	91	84	75	69	55	72
Low	25	32	41	49	60	62	68	69	59	50	42	32	49
20-yr High	52	58	66	74	80	87	91	90	86	74	63	53	73
20-yr Low	30	34	39	47	57	65	70	69	61	49	40	33	50

Cropland Study Summaries

Title: Management of Spatial Variability Created by Vegetative Barriers
Study No: MSPMC-P-0112-CP
Study Leader: Joel Douglas
Cooperator: Seth Dabney, Agronomist, ARS, Oxford, MS
Duration: 2001 - 2006

Introduction

Practice standard 601 was developed to govern the use of vegetative barriers to control erosion in sloping cropland. These barriers are highly effective in preventing soil from leaving agricultural fields, but because soil is moved from the upper portion of the area between the barriers and deposited above the barrier through tillage and erosion, soil quality below the barrier decreases.

Objectives of the study are: 1) determine if benching has altered soil properties affecting crop productivity; 2) determine effectiveness of management alternatives at varying positions within benches for optimal crop productivity and profitability

Treatments:

1) "Check" (3000 lb/a limestone, about ½ rate of recommended based on soil test)
2) "Lime" (6000 lb/a limestone)
3) "M1" (3000 lb lime plus poultry litter to supply 50 lbs P_2O_5/a/year; about ½ rate of recommended P)
4) "M2" (3000 lb limestone plus poultry litter to supply 100 lbs P_2O_5/a/year)
5) "P1" (6000 lb lime plus superphosphate to supply 50 lbs P_2O_5/a/year)
6) "P2" (3000 lb lime plus poultry litter to supply 100 lbs)

Summary

No treatments were applied in 2003. Wheat and soybean yield monitoring is being conducted by USDA-ARS, Oxford and Starkville. Additional plots have been added to the study area to further characterize the performance of the vegetative barriers and for comparison purposes of sediment benching. Several new vegetative barriers were established above the research plots using 'Alamo' switchgrass.

Title: Evaluation of Little Barley as a Potential Cover Crop
Study No: MSPMC-P-0114-CP
Study Leader: Janet Grabowski
Duration: 2001 - 2004

Introduction

Utilization of cover crops has been limited by a perception that the benefits of their use do not justify the additional expense involved in planting. Little barley (*Hordeum pusillum* Nutt.) is a native, annual cool-season grass that matures its seeds in late spring to early summer. A limited amount of research on using little barley as a cover crop has been conducted by NRCS in North Carolina and Georgia. This study will evaluate its growth characteristics to determine if it will provide suitable erosion protection. Standard cover crops used for comparison will be wheat (*Triticum aestivum* L.), crimson clover (*Trifolium incarnatum* L.), and hairy vetch (*Vicia villosa* Roth). We will also determine if sufficient seeds will be mature at the time of spring burndown to sustain little barley populations into the next year, thereby reducing or eliminating the need for replanting.

2003 Data Collected

Plots were planted on October 17, 2002. There were three replications of each cover crop planted in plots that were 5 foot x 10 foot. After planting, 60 lb/acre P and K were applied to all plots and 25 lb/acre N was applied to the wheat and little barley plots. A visual estimation of % stand was made on January 9 to determine winter cover values. Stand ratings were determined using line transects of the plots on March 7 and April 2. A 3-square-foot section from the center of each plot was harvested on April 18 and air-dried to determine dry matter (DM) yields. Data is presented in Table 1. Additional plots were planted on September 25 for evaluation in 2004.

Table 1. Stand ratings and dry matter yields of cover crops.

		Stand Ratings			
Cover Crop	01/09	03/07	04/02		DM Yield
	----------%----------				-------lb/ac-------
Little barley	95	100	100		4 991
Wheat	42	32	52		3 479
Crimson clover	45	72	83		4 840
Hairy vetch	17	30	77		2 723
LSD (0.05)	15	13	22		1 121

Summary

Little barley provided excellent ground cover at all rating periods. The little barley seed used for planting was harvested from natural stands on the PMC and it was not possible to remove many other types of seed during the cleaning operation, which resulted in some crimson clover being present in the little barley plots. The stand ratings are for the little barley alone and crimson clover plants were manually removed from the sample that was harvested to determine yield. The wheat seed used for this planting came from the PMC seed cooler and may have lost viability during storage leading to its lower DM yield than expected. Newly-purchased seed was used in the fall planting to avoid a similar situation next year. Hairy vetch provided little early cover and would therefore provide less erosion protection than the other species during the winter and early spring. The planting rate of little barley was high (75 seeds per square foot) and the high

percentage of ground cover obtained is probably not necessary to provide adequate erosion control. Further research needs to be conducted on planting rates to determine a rate that would be economically feasible for commercial use. Also, selections need to be made to develop and release a commercial source of little barley.

Title: Burndown Chemicals for Little Barley
Study No: MSPMC-P-0115-CP
Study Leader: Janet Grabowski
Duration: 2001 - 2004

Introduction

The cost of chemically burning down cover crops before planting is one factor that limits their use in crop production systems. Glyphosate and paraquat are two herbicides that are commonly used to provide cover crop burndown. Paraquat provides quicker burndown, but is a restricted-use pesticide, which may make it less desirable for some producers.

Little barley (*Hordeum pusillum* Nutt.) is a native grass that matures seed in early summer. Although genetic variability in maturity dates within native populations is likely, personal observations indicate that most plants will have begun or will soon begin to senesce at the normal cover crop burndown date of April 15. Therefore, burndown chemicals may not be required or, if needed, normal application rates might be reduced and still provide control of the little barley cover crop. Herbicide rates tested will be no burndown chemicals and glyphosate and paraquat at 1 lb ai/acre, 0.75 lb ai/acre, 0.5 lb ai/acre, 0.25 lb ai/acre for both herbicides (1X, 3/4X, 1/2X and 1/4X recommended burndown rates).

2003 Data Collected

The plots were planted on October 18, 2002. There were three replications for each burndown treatment planted in plots that were 5 foot x 10 foot. After planting, 25 lb/acre N and 60 lb/acre P and K were applied to all plots. Burndown herbicides were sprayed April 11 using a CO_2 plot sprayer calibrated to apply 20 gallons per acre. Formulations used were Roundup Ultra Max (5 lb ai/gal) and Gramoxone Max (3 lb ai/gal) and surfactant was added to the paraquat treatments. Visual control ratings were made on April 18 (7 DAT) and 25 (14 DAT) (Table 1). On April 25, a line transect was used to determine the percentage of dead plants. A sample of seeds was taken from the 1X rate plots of both herbicides. Germination tests using three replications of 100 seeds from each herbicide treatment were conducted using two media; on blotters in Petri dishes and planted in commercial potting media. The containers were placed in the germinator on November 19 and germination counts were made every seven days for five weeks. Additional plots were planted in the field on September 25 using the same planting methods outlined above for evaluation in 2004.

Table 1. Visual control ratings and percentage of dead plants of little barley burndown plots.

	Visual Control Rating[1]			
Treatment	7 DAT	14 DAT		Dead Plant
				----------%----------
Control	10	10		0
Glyphosate 1X	8	2		98
Glyphosate 3/4X	9	1		72
Glyphosate 1/2X	9	1		72
Glyphosate 1/4X	9	9		32
Paraquat 1X	2	1		86
Paraquat 3/4X	1	2		78
Paraquat 1/2X	2	3		52
Paraquat 1/4X	6	5		83
LSD (0.05)	1	1		36

[1] Visual control ratings 1 = dead; 3 = 75% dead; 5 = 50% dead; 7 = 25% dead; 9 = slight injury; and 10 = no injury.

None of the seeds from the glyphosate-treated plants germinated. One paraquat-treated seed on the blotters (0.3% germination) and two seeds (0.7% germination) in one container with potting mix germinated.

Summary

The full rate of paraquat was the most effective burndown treatment. Since paraquat is a contact, not systemic herbicide, like glyphosate, plants that are not killed can regrow. This is probably why injury ratings for some of the lower rates increased from 7 to 14 DAT. The seed lot used contained some crimson clover seed as a contaminant. The 1X paraquat treatment burned down the crimson clover as well as the little barley. Although the number of dead little barley plants that contacted the points on the line transect was fairly high for the 1/4X paraquat rate, leading to a higher percentage of dead plants, the visual control rating for this treatment was poor. When looking at the general condition of the plots, all rates except for the full rate still had surviving plants of little barley and most of the crimson clover and other weeds were not killed Glyphosate is a much slower-acting herbicide and this is why the visual control ratings were poor at 7 DAT. By 14 DAT, all but the 1/4X rate had excellent visual control ratings. Although little barley was controlled by all but the lowest rate of glyphosate, control of the crimson clover in all plots was not as effective as for the 1X rate of paraquat by 14 DAT. However, as mentioned previously, paraquat has usage restrictions that must be taken into account and is generally somewhat more expensive than glyphosate. The only seeds that germinated were from plants sprayed with paraquat, which is somewhat surprising because paraquat killed the plants more quickly than glyphosate and the seeds therefore had less time to mature.

Title: Agroforestry Alley Cropping Demonstration
Study No: MSPMC-T-0117-CR
Study Leader: Joel Douglas
Cooperators: National Agroforestry Center; Jim Robbins, NRCS, Ft. Worth, TX
Jerry Lemunyon, NRCS, Ft. Worth, TX and Seth Dabney, USDA-ARS, Oxford, MS
Duration: 2001 - 2010

Introduction

Agroforestry combines agriculture and forestry technologies to create diverse, profitable and sustainable land-use systems. One of the agroforestry practices that may appeal to many landowners is alley cropping (Conservation Practice 311). Alley cropping is the planting of trees or shrubs with agronomic, horticultural or forage crops cultivated in the alley between the rows of woody plants, giving farmers an option of growing different crops in the same field creating a diversified farming enterprise. Conservation benefits of alley cropping include but not limited to reducing surface runoff and erosion, improving nutrient management and increasing wildlife habitat.

In 2002 the PMC began cooperating with the National Agroforestry Center to demonstrate the potential for alley cropping in the Southeast using high value trees combined with no-till crops on sloping topography. A 5 acre hillside of Loring silt loam soil (up to an 8% slope) at the PMC was chosen as the study site. Trees were planted in single rows along the general contour of the field and perpendicular to the dominant slope on angles convenient for farming using the CORE4 recommendations. Trees species include pecan (*Carya illinoinensis*), which will provide an intermediate income from nut production in addition to future timber production, and green ash (*Fraxinus pennsylvanica*), which is a fairly fast-growing timber species.

Summary

Pecan trees planted in 2002 (cv. 'Choctaw') did not survive due to poor planting stock. Two-year old-seedlings of 'Sumner' pecan were planted in February 2003 in the same manner as the 2002 planting. Wire cages were constructed and positioned over the young seedlings to prevent deer damage. An electric fence was installed around the perimeter of the field in September 2003.

Average basal diameter of the pecan and green ash in July 2004 was .86 and 1.29 inches, and the average height was 4ft. and 7.7 ft.

Wheat that was drilled on 2 October 2002 was harvested on 4 June 2004 and produced 50 + bu/acre. A late Roundup tolerant group 5 soybean (DP&L 5915) was drilled into the wheat stubble 5 June 2003. Two applications of round up were applied. Soybeans were harvested 30 October 2003 and the average yield was 41 bu/acre. Yields were higher than expected on this sloping hillside due to well distributed rainfall and near perfect growing season. Corn will be planted in the alleys in 2004.

Title: Evaluation of Low Growing Switchgrass Ecotypes for Reduced Seed Dormancy
Study No: MSPMC-P-0208-CR
Study Leader: J.L. Douglas
Cooperator: Brian Baldwin and Paul Meints, Mississippi State University
Duration: 2002-2006

Introduction

Selection for reduce seed dormancy in switchgrass (*Panicum virgatum*) has shown to be a viable method for cultivar development. Many of the switchgrass cultivars released by the PM program, University and ARS grass breeders are tall, robust types that may not be as suited as a lowing ecotype for some conservation practices such as vegetative barriers, critical areas and wildlife habitat in the southeastern U.S. The PMC has an assembly of 92 collections of switchgrass with varying heights ranging from tall (7-8 ft.) medium (5-6 ft.) and short (4-3ft.) from which new selections can be made for cultivar release.

2003 Data

Twelve accessions were selected from the assembly that ranged in heights from 3 to 4.5 ft. These selections were transplanted in a 12 x 12 latin square on 16 April 2002 (Table 1). No seed was collected from the polycross in 2003. Three, low growing switchgrass plants from Dr. Brian Baldwin's switchgrass research were added to the polycross. Seed will be collected from the elites in the fall of 2004 for germination test in 2005.

Table 1. Accessions and origins of 12 elite switchgrasses.

Accession	**Origin**
9062767	Monroe Co., MS
9062836	Madison Co., MS
9062764	Chickasaw Co., MS
9062852	Montgomery Co., MS
9062788	Monroe Co., MS
9062816	Carroll Co., MS
9062828	Clay Co., MS
9062763	Chickasaw Co., MS
9062829	Chickasaw Co., MS
9062789	Lamar Co., AL
9062802	Winston Co., MS
9062811	Lonoke Co., AR

Pasture/Hayland Study Summaries

Title: Seed Production of 9062680 Eastern Gamagrass as Influenced by N Fertility
Study Number: MSPMC-T-0019-PA
Study Leader: J.L. Douglas and Janet Grabowski
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

Low seed yield is an obstacle that limits seed production acreage of eastern gamagrass (*Tripsacum dactyloides*). Average seed yield range from 64 to 293 bulk lb/acre at PMCs in Texas and Kansas. Fertilization with nitrogen has shown to be an effective method for stimulating growth of fertile tillers and increasing seed yields and quality of agronomic grass crops. A cooperative study began with Mississippi State University in 2001 to determine the effect of N fertility on seed production and quality of 9062680 eastern gamagrass. The study was conducted at the PMC (Coffeeville), Prairie (Experiment Station) and Starkville (MSU South Farm). Nitrogen rates of 0, 100, 200 lb/acre were applied in single applications in the spring when plants reached 8 inches (mid-April) and N rates of 100 and 200 lb/acre were split into two equal rates of 50 and 100 lb/acre. The first split application rate was applied when the plants reached 8 inches (mid-April) and the second application was applied when 50 percent of the reproductive stems were in the boot stage (mid-May).

2003 Data

Separate analyses were conducted in 2001-2002 for tiller and seed production parameters. Analyses presented in this report combines tillers and seed production parameters over years (2001-2003) and locations (Coffeeville, Prairie and Starkville) using the Mixed Procedure in SAS (Table 1 and 2). Analysis of variance was conducted using orthogonal contrasts and pairwise comparisons were conducted between single or split applications of N fertilizer and the control using least square means.

Table 1. Tiller and seed production parameters of 680 eastern gamagrass as influenced by N fertilization applied in a single application.

N Rate (kg ha^{-1}) [1/]	VT[2]	FT[3]	Yield[4]	Grain wt.[5]	Fill[6]	Germ.[7]
	--number/plant--		--kg ha^{-1}--	--mg--	----------%	----------
0	42	10	152	52	67	50
112	55	14	149	51	65	50
224	61	14	166	52	66	46
N Linear (P<0.05)	.0006	NS[8]	NS	NS	NS	NS

[1] N fertilizer applied in the spring when regrowth reached 15-25 cm
[2] Vegetative tillers per plant (avg. of three plants per plot)
[3] Fertile tillers per plant (avg. of three plants per plot)
[4] Seed yield
[5] Grain weights of three replicates of ten grains
[6] Percent filled seed determined by dissecting two replicates of 5% of the seed units in the first fraction of each lot to examine the condition of the grain
[7] Seed germination consisted of three replicates of 100 seed units
[8] Not significant

Table 2. Tiller and seed production parameters of 680 eastern gamagrass as influenced by N fertilization applied in a split application.

N Rate (kg ha^{-1}) [1/]	VT[2]	FT[3]	Yield[4]	Grain wt.[5]	Fill[6]	Germ.[7]
	--number/plant--		--kg ha^{-1}--	--mg--	----------%	----------
0	42	10	152	52	67	50
112 (56)	59	14	147	51	67	52
224 (112)	61	15	140	52	71	48
N Linear (P<0.05)	.0007	NS[8]	NS	NS	NS	NS

[1] N fertilizer applied in split application when spring regrowth reached 15-25 cm and the second application when 50% of the fertile tillers reached the boot stage
[2] Vegetative tillers (avg. of three plants per plot)
[3] Fertile tillers (avg. of three plants per plot)
[4] Seed yield
[5] Grain weights of three replicates of ten grains
[6] Percent filled seed determined by dissecting two replicates of 5% of the seed units in the first fraction of each lot to examine the condition of the grain
[7] Seed germination consisted of three replicates of 100 seed units
[8] Not significant

Summary

Nitrogen was effective in increasing the number of vegetative and fertile tillers but the increase in fertile tillers did not result in higher seed yields due to environmental conditions and shattering prior to harvest. Seed production parameters of seed yield, germination, and grain weights were not influenced by N fertilization. There was a slight increase in the percent of filled seed with N, but the increase was not significant. There was no advantage to applying N in single or split applications on tiller or seed production parameters. Results of this study suggest 50 to 75 lb/acre N applied in a single application in the spring when regrowth reaches 10 inches would be economically feasible and maintain plant productivity for seed production. In addition to fertilizer management, moisture and timing of harvest are critical factors that impact seed yield.

Title: Comparison of Silage Quality of 9062680 Eastern Gamagrass
Study No: MSPMC-T-0020-PA
Study Leader: Joel Douglas
Cooperators: Billy Johnson and Joey Murphey, MAFES, Coastal Plain Experiment Station, Newton, MS; Joe Johnson and Randy Saunders, MAFES, Holly Springs, MS
Duration: 2001 - 2003

Introduction

Corn (*Zea mays* L.) is recognized as the best agronomic crop for making high-energy silage. One of the disadvantages of using corn for silage is annual establishment costs and considerable soil loss on marginal or sloping cropland. A more sustainable silage production system that would lessen soil erosion and reduce establishment costs is to utilize perennial grass crops as opposed to annual crops.

Eastern gamagrass [*Tripsacum dactyloides* (L.) L.], a native warm season perennial grass, has shown to produce high yields with favorable quality when timely harvested and has yielded excellent animal performance when properly grazed.

Previous research in Missouri has shown eastern gamagrass has potential for use as a perennial silage crop. However, additional work is needed in the Southeast to determine the suitability of using accession 9062680 (released as Highlander in 2993) as a perennial silage crop.

2003 Data Collected

Table 1. 2003 silage yield and quality estimates of Highlander eastern gamagrass and corn at Mississippi Agricultural and Forestry Experiment Station, Holly Springs, MS.

Variety	Yield†	CP‡	ADF§	NDF¶	TDN#
	---tons/acre---	----------%----------			
Highlander††	21	NA*			
Pioneer 32K61	5				

† Silage yields (total yield based gamagrass plots harvested 6/20 and 9/23 and corn harvested 9/23); ‡ crude protein; § acid detergent fiber; ¶ neutral detergent fiber; # *in vitro* true digestibility; †† forage quality estimates were not available (NA) at the time this report was written.

Table 2. 2003 silage yield and quality estimates of Highlander eastern gamagrass and corn varieties at Mississippi Agricultural and Forestry Experiment Station, Newton, MS.

Variety	Yield†	CP‡	ADF§	NDF¶	TDN#
	---tons/acre---	----------%----------			
Highlander ††	27	10	46	79	48
UAP 57 K39 ‡‡	21	6	25	46	69
Pioneer 30F33 ‡‡	19	6	32	56	64

† Silage yields (total yield based on gamagrass plots harvested 5/21, 7/21 and 10/22, corn harvested 7/21)
‡ crude protein; § acid detergent fiber; ¶ neutral detergent fiber; # total digestible nutrients; †† forage quality estimates of Highlander were obtained by averaging the quality estimates of CP, ADF, NDF and TDN from harvests made 5/21, 7/21 and 10/22; ‡‡ forage quality estimates for corn varieties were obtained from one harvest made 7/21.

Summary

Total silage yields of Highlander exceeded those of corn at both locations (Table 1 and 2). Forage quality estimate for crude protein was slightly higher in Highlander than the corn varieties. Fiber analyses and TDN of corn varieties were much more appealing than those of Highlander.

Title: Response of Eastern Gamagrass Accession 9062680 Seeds to Various Stratification Periods
Study No: MSPMC-T-0222-PA
Study Leader: Janet Grabowski
Duration: 2002 - 2004

Introduction

Eastern gamagrass (*Tripsacum dactyloides*) seeds require a cool, moist stratification period to overcome dormancy. Standard commercial practice is for growers to stratify eastern gamagrass seeds for 6 to 8 weeks at 5-10°C prior to sale. However, all lots of eastern gamagrass seed do not respond similarly to this stratification treatment. Also, scheduling problems may require growers to hold seed in stratification for a longer period of time before it can be shipped. Accession 9062680 has been extensively tested and shown to be a superior eastern gamagrass for much of the Southeast and the Jamie L. Whitten PMC released it as 'Highlander' in 2003. Its response to seed stratification has not been documented. Therefore, the objectives of this study were to evaluate germination of seeds from stratification periods of 0, 2, 4, 6, 8, and 10 weeks and to determine the response to extended stratification periods of 0, 2, 4, 6, 8, 10 and 12 months.

2003 Data Collected

Seeds used for testing were harvested from production fields at the PMC in 2002. Random samples of 3 replications of 10 seeds were opened and seed fill was estimated to be 67%. Stratification of seed samples for the stratification period phase of the study was staggered to allow planting of all treatments in the greenhouse at the same time. Seeds were soaked in tap water for 24 hours, drained, and placed in a refrigerator maintained at 42°F (5.6°C). Seeds for the 10 week treatment were stratified on March 5 and every two weeks subsequent treatments were also stratified. Seeds were planted in flats in a commercial potting medium and put in the greenhouse on May 14. The extended stratification treatments were tested in the germinator, so all treatments were stratified on March 6 and treatments were planted every two months as scheduled. The germinator was set at 20°C/30°C and lights were on during the 10-hour 30°C period. Germination counts were made every 7 days for 35 days. The 0 month treatment was planted on April 10, immediately after the 12 month treatment from the previous year was completed. Because the 2 month treatment was planted on May 6, the 0 month flats were moved to greenhouse until their germination counts were completed. Following the final germination count, the potting medium was dried to facilitate recovery of seeds that did not germinate to determine seed quality. Recovered seeds were soaked in water over night and then opened and the caryopsis (if present) was examined. This allowed adjustment of the germination percentages in each treatment based on the number of seeds that had the potential to germinate. Results from the short-term stratifications period are presented in Table 1 and from the extended stratification periods in Table 2.

Table 1. Germination of 9062680 eastern gamagrass seeds from various stratification periods tested in the greenhouse.

Stratification Period	Germination	Germinable
	----------%----------	
0 week	8	15
2 week	12	25
4 week	11	23
6 week	14	34
8 week	15	32
10 week	12	30
LSD (0.05)	4	8

Table 2. Germination of 9062680 eastern gamagrass seeds exposed to extended stratification periods tested in the germinator.

Stratification Period[1]	Germination	Germinable
	----------%----------	
10 month (2002 study)	21	44
12 month (2002 study)	22	58
0 month	13	21
2 month	29	56
4 month	19	NA[2]
6 month	15	NA[2]
8 month	11	NA[2]

[1] Stratification periods 10 month and 12 month for the 2003 study were not planted until 2004.
[2] Seed fill has not been determined at this time.

Summary

Seed fill percentage was lower for the seed lot collected in 2002 than in the previous year, so actual germination percentages in both stratification regimes were lower. There were only significant differences in actual germination were between 0 weeks of stratification (lowest) and 8 (highest), 6, and 10 weeks (Table 1). Poor germination of the 0 week treatment is expected because numerous researchers have demonstrated that eastern gamagrass seed responds positively to stratification. However, when germination percentages were adjusted for the number of unfilled seeds, germination of the 6 week treatment was highest. It was significantly different than the 0, 2 and 4 week treatments, although the adjusted germination percentage was not different than those of the 8 and 10 week treatments. In the previous year, both measures of germination were highest for the 10 week treatment; however, it also was not different than the 6 and 8 week treatments. The extended stratification phase of the study is still in progress for this year. In the previous year, seed germination was not affected by extended storage; however, the percentage of good seeds decreased after 6 months of cool, moist storage. This study will be repeated once more using seed harvested in 2003 to determine if stratification response is stable for different lots of 9062680 seed.

Critical Area Study Summaries

Title: Evaluation of Virginia Wildrye Selections and Cultivar
Study No: MSPMC-P-0107-CR
Study Leader: Janet Grabowski
Duration: 2001 - 2003

Introduction

Virginia wildrye (*Elymus virginicus* L.) is a native cool-season grass often found in the Southeast growing in low woods, along ditches, and in waste places. Several PMCs have studied it for use as an early-season forage, however, it has not been found to produce enough plant matter for this use. Some desirable attributes that it does possess are shade tolerance and little or no seed dormancy that results in fairly high germination rates compared to many native grasses. This indicates that it could be a useful component in revegetation mixtures, replacing some or all of the introduced species currently used for immediate stabilization, and it could act as a nurse crop for other native species in the mix. 'O'Ma'Ha', originating from the southwestern US, is the only commercially available cultivar of this species. This study will compare this cultivar to several accessions of Virginia wildrye, from this and other PMCs, to determine if additional releases should be made for the Southeast.

2003 Data Collected

Plants were established in the plots in 2001 and evaluations were completed in 2003. Plots were fertilized with 30 lb/acre N on May 12 using ammonium nitrate. Plots were sprayed atrazine (1.5 lb ai/ac) on March 28 and were hand-weeded in early June. A general examination of the plots was made on February 3 and plant vigor was evaluated May 15 (Table 1).

Table 1 Plant evaluation data for Virginia wildrye accessions at Coffeeville, Mississippi.

Selection	Origin	Vigor[1]
O'Ma'Ha	Stock Seed Co.	6
Local	MSPMC	4
Natchez Trace Parkway	Southern Mississippi	1
436971	ETPMC	3
45763	STPMC	5
45845	STPMC	7
LSD (P<0.05)		3

[1] Vigor ratings used were 1 = excellent; 3 = good; 5 = fair; 7 = poor; and 9 = very poor.

Summary

When the plots were examined in February, accession 436971 from the East Texas PMC and the Natchez Trace Parkway selection were the only ones that re-flowered after mowing in September of 2002. Seedheads were found on all plots of these two accessions. There was profuse seedling establishment in all plots and alleyways which made identification of the initial plants in the plots difficult. When vigor ratings were made later in the summer, the Natchez Trace accession was the most vigorous, followed by the accession from the East Texas PMC. Initial survival of plants in the Natchez Trace plots had been lower than for the other selections because the plants were had been dug and transplanted from the field rather than planted using containerized seedlings;

however, the surviving plants were very vigorous. Vigor ratings of both south Texas accessions were very poor because the plants were stunted and weak. These selections appear to be poorly suited for the climate and soils at Coffeeville. In each evaluation year, O'Ma'Ha plants were always smaller than the East Texas accession and the two Mississippi collections; however, in 2003 vigor of the plants decreased dramatically and the plants appeared to be stressed. O'Ma'Ha originated from the western US and several years of growing in the wetter soils of Mississippi may have taken their toll on the plants. The genetic makeup of the three most vigorous accessions is not known; they might be larger ecotypes or they could be the result of hybridization with the larger species, Canada wildrye (*Elymus canadensis* L.). Because the long-term performance of O'Ma'Ha was poor, it appears that there is ample justification for releasing one of the other accessions. The Georgia PMC is in the process of releasing 436971 as Kinchafoonee germplasm, so we see no reason at this point to release another accession. The plots were destroyed in the late summer, but a few plants of the Natchez Trace Parkway collection were dug and planted in pots to maintain them if a future release were to be pursued.

Title: Agroforestry Site Preparation Demonstration
Study No: MSPMC-T-0118-CR
Study Leader: Janet Grabowski
Cooperators: Lynn Ellison, NRCS Area I Forester, Tupelo, MS
Duration: 2001 - 2003

Introduction

Forestry is ranked as one of the top revenue producing crops in Mississippi, which means that many acres of trees are planted in the state. Additional interest has been spurred by the Conservation Reserve Program that offers financial incentives to encourage tree planting on marginal cropland.

The success or failure of a new tree planting is influenced primarily by the ability of the root system to begin quickly taking up water and nutrients. Perennial weed competition from both grass and woody species can affect survival, vigor, and production of young seedlings. This demonstration will provide hard data on how various herbicide and cultural treatments affect survival and growth of loblolly pine (*Pinus taeda* L.) seedlings. The planting sites were chosen to represent what a landowner would encounter on land that had been in pasture or that is coming out of a CRP contract that was planted with perennial grasses.

2003 Data Collected

Site Preparation Treatments:
1. Control – No activity
2. Mowing – (05/29)
3. Roundup – 4 qt/acre (9/19/02)
4. Roundup – 4 qt/acre (9/19/02) + Oust – 3 oz/acre no surfactant (12/16/02)
5. Roundup – 4 qt/acre (9/19/02) + Oust – 3 oz/acre no surfactant (12/16/02) + Arsenal 4 oz/acre (04/03)
6. Arsenal 4 oz/acre (04/03) + 2 oz/acre Oust no surfactant (04/03)
7. Arsenal 4 oz/acre (04/03) + 2 oz/acre Oust no surfactant (04/03) + Transline 4 oz (04/03)

The planting area was mowed to height of 3 inches in September 2002. Herbicide treatments were sprayed in a 6-foot band over the planting row. Formulations used were Roundup Ultra Max (5 lb ai/gal glyphosate), Oust (75% sulfometuron methyl), Arsenal (2 lb ae/gal imazapyr), and Transline (3 lb ae/gal clopyralid). The mowing treatment consisted of one pass of a 3-foot wide bushhog on either side of the planting row. Superior loblolly pine seedlings from International Paper were planted on January 30 in 10 foot rows, spaced 7 foot apart in the row. A chemical application error made during the December spraying required the planting of additional rows of seedlings to accommodate the treatments. Seedlings were graded to a uniform size and the appropriate number for each treatment row were bundled together prior to planting. There were three replications of each treatment. Initial basal stem diameter and height measurements were taken on April 2 (Table 1). Basal diameters (1 mm = 0.04 inches) were measured below the lowest branch on each seedling. Final basal stem diameter and plant height measurements and survival of these seedlings will be evaluated in January of 2004. Weed cover was estimated in the treatment row (Table 1) and a listing of the major species present was made on July 16. Basal stem diameter and height of seedlings from the previous year's planting were measured on January 9 (Table 2).

Table 1. Initial basal stem basal diameters, height and percent weed stand of loblolly pine seedlings planted in 2003 using different site preparation treatments.

Treatment	Diameter (mm)	Height (cm)	% Weed Stand
	----------mm----------	----------cm----------	---------%---------
Control	4.2	23	100
Mowing	4.1	25	100
Roundup	4.3	24	95
Roundup + Oust	4.5	24	80
Roundup + Oust + Arsenal	4.3	27	62
Arsenal + Oust	4.5	25	97
Arsenal + Oust + Transline	4.5	24	93
LSD (0.05)	NS[1]	NS	12

[1] Not significant at P<0.05.

Table 2. Second-season stem basal diameter and height of loblolly pine seedlings planted using different site preparation treatments in 2002.

Treatment	Stem Diameter	Height	Survival
	----------mm----------	----------cm----------	---------%---------
Control	6.6	52	96
Mowing	8.1	61	100
Roundup	9.9	65	100
Roundup + Oust	10.5	64	96
Roundup + Oust + Arsenal	11.1	74	100
Arsenal + Oust	8.9	58	100
Arsenal + Oust + Transline	8.2	54	100
LSD (0.05)	2.1	12	NS[1]

[1] Not significant at P<0.05.

Summary

Planting conditions were much less favorable in 2003. Excess rainfall in the spring left many of the seedlings in standing water for a prolonged period of time. The Roundup + Oust + Arsenal and the Roundup + Oust treatments provided the best weed control (Table 1). Roundup alone does not provide adequate weed control during the first growing season. Weed stands in the Arsenal + Oust and the Arsenal + Oust + Transline treatments were only slightly lower than those in the control plots. The majority of the weeds present on this site were grasses and herbaceous broadleaves. If competing woody species had been present, weed control ratings for these treatments might have been much higher than in this study. There were no initial differences in plant measurements between the any of the treatments, which means that any differences detected in 2004 can probably be attributed to the site preparation treatments.

Weed control in the 2002 planting (data not presented) followed the exact same pattern as in 2003. Those same treatments that resulted in the lowest weed stands resulted in significantly improved basal diameters and plant heights (Table 2). Although the Roundup-only treatment did not provide the same level of weed control as the two treatments that combined Roundup with other herbicides, the plant growth parameters were not significantly different for these three treatments. The planting holes were much easier to dig in the Roundup-treated plots compared to the dense sod cover present in the other plots. This probably resulted in improved root growth in these treatments, which directly correlates with larger stem diameters. There were no differences in plant survival for any of these treatments (Table 2). This is probably due to superior seedlings,

careful planting, and ideal weather conditions following planting. Losses would be expected to be much higher on larger tracts that did not receive herbicide treatments, especially if lower quality seedlings were used. The seedlings from these plantings will be removed and the sites will be used in the future to study additional preparation techniques and herbicide treatments.

Title: Selecting for Improved Seedling Establishment in Beaked Panicum
Study Number: MSPMC-P-0209-BU
Study Leader: Janet Grabowski
Cooperator: Brian Baldwin, Mississippi State University
Paul Meints, Mississippi State University
Duration: 2002 - 2006

Introduction

The PMC evaluated large collections of numerous accessions of beaked panicum (*Panicum anceps* Michx.) in the 1980s and the East Texas PMC is currently evaluating several accessions. Beaked panicum is not highly productive as a forage crop, but it has potential for critical area stabilization and is shade tolerant. Seeds exhibit dormancy that affects germination. Stratification has been shown to overcome this dormancy, but stratified seeds would be difficult to plant using conventional equipment. Selection for reduced dormancy has been illustrated in native warm-season grasses such as switchgrass (*Panicum virgatum* L.) and these techniques may also be possible to develop beaked panicum sources with reduced dormancy.

2003 Data Collected

The mother plant nursery contained seedlings of eight accessions of beaked panicum (9002928, 9028510, 9067071, 9067121, 9067102, 9067094, 9067079, and an unnumbered collection from Carroll Co., MS). Seeds collected from the mother plant nursery in the fall of 2002 were planted in germination flats containing a commercial seed germination potting mix and placed in the greenhouse on March 7. Germination was poor and only 8 seedlings were transplanted, 2 of which died prior to planting in the field. The germination flats were then placed in the refrigerator for 2 weeks of stratification. After stratification, the flats were moved back into greenhouse. Germination was still poor after the stratification treatment and only 29 seedlings were transplanted for planting in the crossing block (cycle 1) in the field. The 35 seedlings were planted on August 8 in a block containing 5 rows of 6 plants and one row of 5 plants. These seedlings produced few flowers and did not produce a sufficient amount of seed to harvest by the fall. Seeds were again collected from the mother plant nursery in October. Additional seedlings will be grown in 2004 to add to the cycle 1 crossing block. Accession 900928 was identified as a superior accession during prior PMC testing and seed stocks had been increased for several years. This accession germinated well in the greenhouse in 2002, so it was decided that a new increase field would be planted in the fall of this year to allow the seeds to be exposed to chilling temperatures to overcome dormancy. It was planted on November 14 using a Lilliston no-till drill.

Title: Selecting for Improved Seedling Establishment in Purpletop
Study Number: MSPMC-P-0210-BU
Study Leader: Janet Grabowski
Cooperator: Brian Baldwin, Mississippi State University
Paul Meints, Mississippi State University
Duration: 2002 - 2006

Introduction

The PMC evaluated large collections of numerous accessions of purpletop [*Tridens flavus* (L.) A.S. Hitchc.] in the 1980s. It has limited potential as a forage crop, but can be used for critical area stabilization and has some shade tolerance. Seeds exhibit dormancy that adversely affects germination. Stratification has been shown to overcome this dormancy, but stratified seeds would be difficult to plant using conventional equipment. Selection for reduced dormancy has been illustrated in native warm-season grasses such as switchgrass (*Panicum virgatum* L.). Recurrent selection techniques could also be used to develop sources of purpletop with reduced seed dormancy.

2003 Data Collected

The mother plant nursery contained seedlings from three accessions (9028270, 9041780, and 9028355) and eleven unnumbered local collections (one from the Natchez Trace Parkway, five from Carroll Co., MS and one each from Franklin Co., Yalobusha Co., Lincoln Co., Pontotoc Co., and Grenada Co., MS). Seeds collected from the mother plant nursery in the fall of 2002 were planted in germination flats containing a commercial seed germination potting mix and placed in the greenhouse on March 7. Seed germination was fairly good and only the largest, most vigorous seedlings were selected for transplanting. The crossing block (cycle 1) to be planted in the field was to contain 10 rows with 10 plants in each row (100 seedlings); however, 126 seedlings were transplanted to allow for any potential losses. The cycle 1 crossing block was planted on June 25. All the seedlings survived and flowered. Seeds were collected from both the mother plant nursery and the cycle 1 crossing block in September and October. Seeds from both sources will undergo germination testing in 2004 to determine if improvements in seed dormancy levels have been realized in the second generation.

Water Quality Study Summaries

Title: Effect of Land Applied Poultry Litter on Yield, N and P Content of Warm Season Grasses
Study No: MSPMC-T-0002-NU
Study Leader: Joel Douglas
Cooperators: Randy Saunders and 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 began requiring all poultry facilities that generate dry litter or waste must obtain a permit. The NRCS is charged with supplying the technical support for these plans.

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 warm season grass species receiving poultry litter as the fertilizer source.

2003 Data

Coffeeville

Table 1. Yield response of warm season grasses using poultry litter as a N source, Coffeeville, MS 2003.

240 lb/acre N	DM Yield			
	Harvest Date			
Entry	05/29	07/03	09/03	Total
	----------lb/acre----------			
Johnsongrass	1160	1717	2972	5849
'Sumerall 007' bermudagrass	2666	1724	2982	7373
'Pensacola' bahiagrass	974	2229	2432	5635
'Alamo' switchgrass	2370	2960	2135	7465
'Highlander' eastern gamagrass	2609	2076	1761	6446
Mean	1956	2141	2457	6554
LSD (0.05)[1/]	1088	NS[2/]	498	NS

1 – least significant difference. 2 – Not significant

Table 2. Yield response of warm season grasses using poultry litter as a N source Coffeeville, MS 2003.

140 lb/acre N	DM Yield			
	Harvest Date			
Entry	05/29	07/03	09/03	Total
	----------lb/acre----------			
Weeping lovegrass	1907	2038	1026	4972
Caucasian bluestem	1159	1717	2973	5745
Common bermudagrass	1026	1054	1984	4346
Dallisgrass	905	885	3224	4836
Mean	1249	1423	2301	4975
LSD (0.05) [1/]	280	860	1117	NS[2/]

1 – least significant difference2 – Not significant.

Analyses for N and P concentrations for 2003 data were not available at the time this report was written. Below are the season total yields, N and P uptake for the warm season grass in 2001 and 2002. These values were determined from the season total yields and the average nutrient concentrations obtained from three cuttings at Coffeeville and two cuttings at Holly Springs. Average nutrient concentrations are presented in the uptake column in bold type.

Table 3. Season total yield and nutrient uptake of warm season grasses fertilized with 4.0 tons of poultry litter (250 N and 400 P) Coffeeville, MS 2001-2002.

Grass	Yield lb/acre		N Uptake lb/acre		P_2O_5 Uptake lb/acre	
	2001	2002	2001	2002	2001	2002
'Sumrall 007' bermudagrass	7861	7517	77 **1.01 - 1.46**	104	49 **.28 - .32**	69
'Highlander' eastern gamagrass	9885	8689	128 **1.29 – 1.34**	64	44 **.19-.24**	32
'Alamo' switchgrass	9337	8521	122 **1.31 – 1.51**	87	37 **.17 - .22**	32
'Pensacola' bahiagrass		6780	 **1.29**	89	 **.23**	34
Johnsongrass	9626	7985	128	64	60	44
			1.33 – 1.57		**.27 - .40**	

Table 4. Season total yield and nutrient uptake of warm season grasses fertilized with 2 tons/acre of poultry litter (150 N and 200 P) Coffeeville, MS 2001-2002.

Grass	Yield lb/acre		N Uptake lb/acre		P_2O_5 Uptake lb/acre	
	2001	2002	2001	2002	2001	2002
Weeping lovegrass	10 919	8035	117	65	27	32
			1.07 – 1.32		**.16 - .20**	
Common bermudagrass	6646	5470	66	42	23	30
			.99 – 1.22		**.24 - .31**	
Caucasian bluestem	7000	2107	107	24	21	10
			1.53 – 1.10		**.17 - .19**	
Dallisgrass		3115[1/]		43	16	18
			.93		**.17**	

1/ - harvested once in 2002.

Summary

Coffeeville

Overall average yields were higher in 2003 (Table 1 and 2) compared to 2002. Dallisgrass, Caucasian bluestem and 'Sumrall' bermudagrass yields were especially higher in 2003 than in 2002. Yields of the native grasses ('Alamo' switchgrass and eastern gamagrass) were as high as or higher than the introduced grasses (bermudagrass, bahiagrass and Johnsongrass) in the high N group. Yields of the grasses in the low N group were similar with Caucasian bluestem producing the highest yields.

Season total yield, nutrient uptake and nutrient concentrations varied between grasses in 2001 and 2002 (Table 3 and 4). Removal values were generally higher in grasses with higher yields.

2003 Data

Holly Springs

Table 5. Yield response of warm season grasses using poultry litter as a N source Holly Springs, MS 2003.

240 lb/acre	DM Yield Harvest Date		
Entry	06/13	08/27	Total
	------lb/acre------		
Johnsongrass	5353	4811	10 164
'Sumrall 007' bermudagrass	5737	6189	11 926
'Pensacola' bahiagrass	3704	4698	8402
'Alamo' switchgrass	21 525	6934	22 361
'Highlander' eastern gamagrass	14 952	7408	28 459
Mean	10 254	6008	16 262
LSD (0.05)[1/]	3311	NS[2/]	3975

1 – least significant difference. 2 – not significant.

Table 6. Yield response of warm season grasses using poultry litter as a N source, Holly Springs, MS 2003.

140 lb/acre	DM Yield Harvest Date		
Entry	06/13	08/27	Total
	----------lb/acre---------		
Weeping lovegrass	4810	5104	9916
Caucasian bluestem	6324	5918	12 242
Common bermudagrass	4675	4901	9577
Dallisgrass	3659	5917	9577
Mean	4867	5460	10 327
LSD (0.05) [1/]	1544	NS[2/]	677

1 – least significant difference; 2 – Not significant

Table 7. Season total yield and nutrient uptake of warm season grasses fertilized with 4.0 tons of poultry litter (250 N and 400 P) Coffeeville, MS 2001-2002.

Grass	Yield lb/acre		N Uptake lb/acre		P_2O_5 Uptake lb/acre	
	2001	2002	2001	2002	2001	2002
'Sumrall 007' bermudagrass	7861	11 752	42	127	25	82
			1.09 – 1.10		**.28 - .29**	
'Highlander' eastern gamagrass	6846	16 570	57	184	30	121
			.99 – 1.12		**.23. - 25**	
'Alamo' switchgrass	7068	17 604	76	192	32	92
			1.08 – 1.11		**.20 - .22**	
'Pensacola' bahiagrass	4176	8586	25	81	25	50
			.96 – 1.25		**.26 - .27**	
Johnsongrass	4535	13 140	76	123	23	96
			.93 - .96		**.22 - .30**	

Table 8. Season total yield and nutrient uptake of warm season grasses fertilized with 2 tons/acre of poultry litter (150 N and 200 P) Coffeeville, MS 2001-2002.

Grass	Yield lb/acre		N Uptake lb/acre		P_2O_5 Uptake lb/acre	
	2001	2002	2001	2002	2001	2002
Weeping lovegrass	5344	8035	50	114	27	83
			.94 - .98		**.22 - .28**	
Common bermudagrass	4066	12 030	43	79	23	73
			.98 – 1.06		**.25 - .35**	
Caucasian bluestem	4245	12 711	39	114	21	53
			.90 - .92		**.20 - .22**	
Dallisgrass	3095	10 222	42	99	16	64
			.98 – 1.36		**.23 - .27**	

Summary

Holly Springs

Yields at Holly Springs were much higher than those at Coffeeville (Table 5 and 6). Fewer harvests and a later first harvest date is the reason for much higher yields at Holly Springs than at Coffeeville (2 vs. 3 harvests). 'Highlander' eastern gamagrass and 'Alamo' switchgrass produced the greatest yields. In fact, these cultivars produced > 9 tons/acre more than 'Sumrall', a hybrid bermudagrass variety. The native grasses were also the highest yielding entries at

Coffeeville. Caucasian bluestem produced the highest yield in the low N group. Dallisgrass, common bermudagrass, and weeping lovegrass produced similar yields.

Tissue analyses for N and P were not available at the time this report was written; therefore, removal rates are pending until analyses can be completed.

Season total yield, nutrient uptake and nutrient concentrations varied between grass entries in 2001 and 2002 at Holly Springs (Table 7 and 8). Removal values of N and P were generally higher in grasses with higher yields.

Wildlife Habitat Improvement Study Summaries

Title: Southern Crabapple Evaluation
Study No: MSPMC-P-0106-WL
Study Leader: Janet Grabowski
Duration: 2001 - 2003

Introduction

There is a need for additional native species for wildlife habitat improvement. Several southeastern crabapple (*Malus* spp.) accessions, originally obtained from the Georgia PMC, were planted at Coffeeville in 1976 and 1977. Five trees of each accession were planted in the original study plots. They were evaluated until 1983, but the trees were not mature enough at that time to determine their fruiting characteristics. A change in program direction resulted in inactivation of the original study. Recently, wildlife biologists have indicated a need for crabapple selections that are well adapted to the Southeast. The surviving accessions will be evaluated and selections made.

2003 Data Collected

Selections were made in 2001 based on based on fruit production, vigor, and plant growth characteristics. Accession 434121, released by the Georgia PMC as 'Big O' is the commercial standard for comparison. Accessions 434115, 434122, and 434112 were selected as possible releases. Accessions 434125, 434126, and 434114 had lesser potential, but were still worthy of consideration. Cuttings did not root successfully in 2002, so air-layering was attempted March 12-14, 2003 on the three accessions of main interest and Big O. Twigs were girdled by removing a ring of bark and the denuded stem section was scraped to ensure that the cambium was removed. Rootone F was applied to the adaxial portion of the wound, a handful of moist sphagnum moss was wrapped around the stem, and wrapped in sections of plastic sheeting that were secured at the top and the bottom with twist-ties. Aluminum foil was wrapped around the plastic to help reflect light and keep the air-layer cooler. The air-layers were checked periodically and removed from the trees on July 25.

Summary

A few of the air-layers were knocked off the trees by storms and maintenance operations. We also lost some of the parent trees due to damage from storm events. None of the air-layers rooted successfully. Surviving trees have been subjected to considerable abuse from mowers, insects, diseases, and animals. This severely limits their annual growth, which decreases the chances of successfully propagating them by vegetative means. Seeds of these trees do germinate in the study area, but because all the trees are located in close proximity, the seedlings likely will not maintain the desirable characteristics of the mother plant. We have attempted every propagation method that we have the facilities and capability to try. Either a nurseryman with more advanced propagation skills would need to take over the plant increase, or the trees would need to be isolated by moving or disposing of all accessions except one so that plants could be increased by seed propagation of plants that have been self-pollinated. Neither option is acceptable to us at this point in time, so further work on this study has been suspended. We will continue to maintain the trees at their present location until either tree losses become too great to maintain the block or until the planting area is needed for some other use.

Title: Partridge Pea Inter-center Strain Trial
Study No: MSPMC-P-0106-WL
Study Leader: Janet Grabowski
Cooperators: Randy King, Arkansas PMC
Jim Stevens, East Texas PMC
John Lloyd-Reilley, South Texas PMC
Rich Wynia, Kansas PMC
John Vandevender, West Virginia PMC
Mike Owsley, Georgia PMC
Clarence Maura, Jr., Florida PMC
Roger Hansard, North Carolina PMS
Duration: 2002 - 2004

Introduction

The annual legume, partridge pea [*Chamaecrista fasciculata* (Michx.) Greene], is an excellent food source for wildlife and is also suitable for planting on many critical areas. The only commercially available cultivar of partridge pea is 'Comanche', released by the Texas PMC in Knox City; it was originally collected in Throckmorton County, Texas. Lark Selection, collected in Marion County, Arkansas, was released by this PMC in 1997 and Riley Germplasm, collected in Riley County, Kansas, was released by the Kansas PMC, Manhattan, Kansas, in 1999. The full range of adaptation of these two pre-varietal releases is not known. This inter-center strain trial will determine the survival and growth potential of these releases at sites throughout the Southeast and southern Plains states, using Comanche as the standard of comparison.

2003 Data Collected

Seed packets and planting instructions were mailed to cooperators on April 22. The seed was scarified using a small-lot mechanical scarifier and a small zip-loc bag of inoculant was included in the packet. The West Texas PMC requested that seed not be sent in 2003 because the continuing drought would prevent meaningful evaluations. Although seed packets were sent to West Virginia and North Carolina, they were not planted because excessive rainfall that occurred in the spring prevented field work. The planting rate was 6 lb/ac PLS and plot size was 5 foot x 10 foot. Plots were planted at the Mississippi PMC on May 1 and fertilizer was applied on May 12 at a rate of 60 lb/acre P and K. Dual (2 lb a.i./acre) was sprayed over the treatment plots on May 2. Evaluations were made on July 25 and September 30. Plots at the other locations were planted, managed, and evaluated based on local conditions. Plots at the Kansas PMC had to be replanted because of a planter malfunction; both plantings were evaluated, but data presented (Table 1) is for the second planting date where stands were more uniform. Only early season ratings were available from the South Texas location because plants died during the summer. No evaluation data were received from the Arkansas PMC.

Table 1. Stand, vigor, and seed production ratings of three partridge pea sources at five locations.

Location	Strain	07/25			09/30			
		Stand[1]	Vigor		Stand	Vigor	Seed Prod.	% Seed Mat.
Mississippi	Comanche	6	6		4	4	5	15
	Lark	5	4		5	3	2	15
	Riley	2	2		4	2	4	98
LSD (0.05)		NS[2]	NS		NS	NS	NS	21
		07/28						
East Texas	Comanche	2	1		2	1	1	100
	Lark	5	3		5	3	3	100
	Riley	4	2		4	2	5	100
LSD (0.05)		NS	2		NS	2	NS	
		07/23			10/06			
South Tex.	Comanche	10	10		10	10	----	----
	Lark	7	10		10	10	----	----
	Riley	10	10		10	10	----	----
LSD (0.05)		NS	NS		NS	NS		
		07/09						
Florida	Comanche	1	3		2	3	3	80
	Lark	3	4		3	4	4	77
	Riley	6	5		7	7	6	100
LSD (0.05)		2	2		2	2	1	8
		07/28			10/05			
Kansas	Comanche	6	5		5	2	10	0
	Lark	9	4		8	3	10	0
	Riley	6	2		6	5	1	60
LSD (0.05)		NS	2		2	1	1	13

[1] Stand, vigor and seed production ratings used were 1 = excellent; 3 = good; 5 = fair; 7 = poor; 9 = very poor; and 10 = none.

[2] Values are not significantly different at $P<0.05$.

Summary

Stands of Lark were rated lower than the other sources at most locations. Seed testing data indicated that the Lark seed lot contained a high percentage of hard seeds and planting on a PLS basis adds these hard seeds to the seeds that actually germinated to calculate the amount of seed for each plot. The scarification treatment given to the seeds may not have been sufficient to break the seed coats and stimulate germination of many of these hard seeds. Also, the seed lots of all sources used for this study had been stored in the cooler for several years and viability may have declined. Germination testing will be conducted in 2004 to adjust the amount of seed to be planted per plot for all three seed sources.

A cool, wet spring resulted in better performance of Riley at the Mississippi location than was seen in the previous year. Vigor of the Lark plants was slightly better than Comanche at Mississippi, but the differences were not significant. Riley plants matured early at the Mississippi and Florida locations. This more northerly seed source could not make use of the longer growing season at these sites. However, in Kansas, neither Comanche nor Lark produced seed prior to the first killing frost. This indicates that Riley is an important release for areas with shorter growing seasons. In Kansas, they have better success planting partridge pea in early to mid-April, so the seed packets will be sent earlier in 2004 to accommodate their planting needs. Comanche

performed well at the East Texas location, but vigor was not significantly better than Lark. None of the seed sources were adapted to South Texas and this location will be dropped in 2004. This study will be completed in 2004.

Title: Evaluation of Little Bluestem Ecotypes for Reduced Seed Dormancy
Study No: MSPMC-P-0208-BU
Study Leader: J.L. Douglas
Cooperator: Brian Baldwin and Paul Meints, Mississippi State University
Duration: 2002-2006

Introduction

There are few cultivars of little bluestem that are adapted to the PMC service area, especially for the southern reaches of the area, and seed is difficult to obtain from commercial sources. With the growing emphasis on planting native warm-season grasses in many farm programs for erosion control and wildlife habitat, cultivar development is a priority. Seed dormancy is a major factor affecting field establishment of little bluestem. Selection for reduced dormancy has been illustrated in native grasses such as switchgrass and green needlegrass.

2003 Data

300 mother plants were selected from isolated areas on the PMC property and transplanted in four complete blocks (5 rows, 15 plants/row) in April 2002 (cycle 0). Seeds were collected from each individual mother plant in November 2002, placed in paper bags and kept at room temperature until January.

Replicated germination tests were conducted in January/February 2003 to identify plants that produce seed that germinate in 14 days without a two week stratification period. Seed germination test consisted of 50 seed in a petri dish, replicated 3 times and placed in the germinator at 20°C/30°C. Counts made 7 and 14 days. Analysis of variance was used to determine the top 20 performers. From these 20, the best 12 mother plants with the highest germination percentages were identified (Table 1).

To validate that the early germinating seeds contained less dormancy than the remaining seeds, seeds that did not germinate were subjected to a cold storage treatment for 2 weeks and germinated at 20°C/30°C. Counts were made 7 and 14 days. The 14 day counts are presented in Table 1. Several of the accessions responded well to 2 week stratification while others showed minimal response. No additional stratification and germination tests were conducted.

Seeds germinated within the 14 days without stratification were removed from the petri dishes, planted in cell packs and grown in the greenhouse. Twelve elite mother plants (those plants that produced seed that germinated in sufficient numbers in the germinator) were marked and lifted from the original mother plant nursery and transplanted in an isolation block on the PMC. Two collection made by Janet Grabowski in Madison County, MS were added to the 12 (Table 1).

Seedlings from each elite mother plant were grown in the greenhouse in March-May 2003 and planted in a 14 x 14 latin square on 23 June (cycle 1 polycross). Only about 40% of the plants produced an adequate amount of seed by September. Since seed production was low due to the establishment year and several plants missing, no seed was harvested in 2003. In 2004, missing plants will be replaced, seed harvested and germination test conducted in 2005.

Table 1. 14 Accessions identified for early germination and further advancement

Accession	Location in mother plant nursery	14 day germination without stratification	14 day germination following a 2 wk stratification
9077099	AR3P1	11	11
9077100	AR1P2	15	23
9077101	AR3P10	21	15
9077102	AR5P4	14	21
9077103	AR4P14	12	25
9077104	AR5P13	11	13
9077105	BR1P8	21	35
9077106	BR3P7	8	28
9077107	BR5P8	13	44
9077108	BR4P13	9	10
9077109	DR4P15	16	29
9077110	Madison	*	*
9077111	Madison	*	*
9077112	AR5P12	19	21

* Germination counts were not recorded.

Technical Reports

Listed below are the most current technical reports and fact sheets 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.

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

Native vs Introduced: What do these Terms Mean and Why are they Important -- Janet Grabowski

2001

Results of a WRP Planting in the Lower Mississippi Valley Alluvium -- Janet Grabowski, Paul Rodrigue, and Joel Douglas

Influence of Seeding Depth on Seedling Emergence of Eastern Gamagrass -- Joel Douglas

Spring Flood Tolerance of Selected Perennial Grasses -- Joel Douglas

Evaluation of Harvest Systems for Biomass Production of Alamo Switchgrass -- Scott Edwards

Morton Germplasm Shrub Willow -- Janet Grabowski

2002

Response of Native Wildflowers and Grasses to Postemergence Herbicides -- Janet Grabowski

Response of Two Switchgrass (*Panicum virgatum* L.) Ecotypes to Seed Storage Environment, Storage Duration, and Prechilling -- Janet Grabowski, Joel Douglas, David Lang, Paul Meints, and Clarence Watson, Jr.

A New Eastern Gamagrass Cultivar for the Southern United States -- Janet Grabowski, Scott Edwards, and Joel Douglas

Establishment Methods for 'Alamo' Switchgrass -- Scott Edwards

Response of Two Switchgrass (*Panicum virgatum* L) Ecotypes to Seed Storage Environment, Storage Duration, and Prechilling -- Janet Grabowski, Joel Douglas, David Lang, Paul Meints, and Clarence Watson, Jr.

Eastern Gamagrass Response to Nitrogen Fertilization in Northern Mississippi -- Joel Douglas, Scott Edwards, David Lang, Robert Elmore, Roscoe Ivy, and Jimmy Howell

Vegetative Barriers, A New Conservation Buffer Practice -- Joel Douglas, Jerry Lemunyon, David Lightle, Edwin Mas, Robert Glennon, Seth Dabney

Perennial Lespedeza Evaluation -- Joe Snider, Janet Grabowski, and Joel Douglas

2003

Evaluation of Warm Season Grass Species and Management Practices to Improve Biomass Production Potential in the Mid-South -- Janet Grabowski, Scott Edwards, and Joel Douglas

How to Use a Ragdoll Test to Estimate Field Germination -- Joel Douglas, Janet Grabowski, and Lee Daughtry

Yield, Quality and Persistence of Thirteen Genotypes of Eastern Gamagrass at Three Southern Locations -- Joel Douglas, Mike Owsley, and Lance Tharel

Handling Tips for Improving Tree and Shrub Plantings -- Joel Douglas, Janet Grabowski, Alan Holditch, Lynn Ellison