Jamie L. Whitten Plant Materials Center

2004 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 2004. 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 about normal during the spring and early summer of 2004. The slightly drier than normal March allowed us to plant many of our crops earlier than we are generally able to. Rainfall in July was lower than normal; however; there was excess rainfall in June and August so the effect on crop growth was minimal. However, the same cannot be said for the month of September, when no measurable rain fell. This absence of rain during seed set affected seed fill and quality of 'Chiwapa' Japanese millet, Lark selection partridge pea, and 'Quail Haven' reseeding soybean. Yields of 'Highlander' eastern gamagrass, harvested in July, were higher than we have obtained in any other production year to date. Temperatures (Table 2) during 2004 were fairly typical for this location, with the exception of slightly cooler than normal temperatures during July and August.

Table 1. Monthly and total rainfall in 2004 and 20-year averages at the Jamie L. Whitten Plant Materials Center, Coffeeville, MS.

Month	2004	20-yr. avg.
	--------------------in.--------------------	
January	5.70	4.54
February	6.74	5.88
March	3.17	5.47
April	6.43	5.76
May	5.67	5.72
June	10.99	5.25
July	1.95	4.42
August	6.12	3.57
September	0.00	4.23
October	4.02	4.22
November	11.05	6.42
December	7.61	5.94
Total	69.45	61.41

Table 2. Average monthly high and low temperatures recorded for Coffeeville, MS in 2004 and 20-year averages

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Avg.
							°F						
High	51	51	67	71	82	86	87	86	86	79	66	54	72
Low	32	31	44	49	63	68	68	63	61	57	47	31	51
20-yr High	52	58	66	74	81	87	91	90	86	75	64	54	73
20-yr Low	30	34	39	47	57	65	70	69	61	49	40	33	49

Cropland Study Summaries

Title: Improving Soil Degradation Created by Vegetative Barriers
Study No: MSPMC-T-0112-CP
Study Leader: Joel Douglas
Cooperator: Seth Dabney, Agronomist, ARS, Oxford, MS
Duration: 2001 - 2006

Introduction

Conservation 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 through tillage and erosion from the upper portion of the area between the barriers and deposited above the next barrier, soil quality below each 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 restoring crop productivity and profitability.

Treatments:

1) No poultry litter
2) 1X rate (4 tons) of poultry litter
3) 2X rate (8 tons) of poultry litter

Tillage (disking) vs. no tillage over all litter treatments
Deep tillage (paratilling) vs. no deep tillage immediately below the hedge only

Summary

No treatments were applied in 2004. Soybeans were planted in late May to early June when the wheat that was planted the previous fall was harvested. A second planting of soybeans was required due to poor stands. USDA-ARS personnel from Oxford and Starkville monitored yields of the wheat and soybeans and conducted soil testing at multiple depths during the mid-summer. The treatments and crop rotation will be implemented in 2005. Further soil testing will also be conducted to determine the effect of the treatments on soil quality.

Title: Evaluation of Little Barley as a Potential Cover Crop
Study No: MSPMC-P-0114-CP
Study Leader: Janet Grabowski
Duration: 2001 - 2005

Introduction

Utilization of cover crops (Conservation Practice 340 and 327) 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.

2004 Data Collected

Plots were planted on September 25, 2003. The conventional cover crops were planted at the recommended rates, which were 90 lb/ac wheat, 20 lb/ac crimson clover, and 30 lb/ac hairy vetch. The legumes were inoculated at planting. Little barley was planted at approximately 75 seeds per ft^2. There were three replications of each cover crop and the plots 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. 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 plants in the little barley plots. On March 16, 2,4-D Amine 4L at a rate of 1 qt/ac plus nonionic surfactant (0.25% v/v) was sprayed on the plots to control the clover. Stand ratings, determined using line transects of the plots, were taken on January 16, March 12, and April 15. A 3-square-foot section from the center of each plot was harvested on April 15 and air-dried to determine dry matter (DM) yields. Data is presented in Table 1. Additional plots were planted on October 14 for evaluation in 2005. A lack of little barley seed required planting rates for the 2005 plots to be reduced to 40 seeds per ft^2. The little barley and wheat plots were sprayed on November 16 with 2,4-D plus surfactant at same rates used on the previous year's plots to control broadleaf weeds. Select was applied at 10 oz/ac plus 1.0% (v/v) crop oil on the vetch and clover plots to control annual ryegrass.

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

Cover Crop	Stand Ratings			DM Yield
	01/16	03/12	04/15	
	-----------------------------	%	-----------------------------	-------lb/ac-------
Little barley	89	94	96	4 991
Wheat	65	76	42	6 655
Crimson clover	80	83	88	3 328
Hairy vetch	47	65	97	5 143
LSD (0.05)	19	NS[†]	22	1 161

[†] Not significant at $P < 0.05$.

Summary

Stands of little barley were excellent at all rating periods. Wheat stands were somewhat low, but high quality seed was planted at the recommended rates, so the stands should be comparable to what would be present in a producer's field. Crimson clover stands were high at all rating periods. Hairy vetch provided little ground cover during the early ratings, but formed an almost solid stand by the final rating. This growth pattern is typical of hairy vetch. The yields of wheat were significantly higher than any of the other cover crops. Hairy vetch and little barley provided comparable yields. Crimson clover yields were lower than all other species. 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.

Title: Initial Evaluation of Little Barley
Study No: MSPMC-P-0411-CP
Study Leader: Janet Grabowski
Duration: 2004 - 2006

Introduction

The cover crop comparison study (MSPMC-P-0114-CP) has demonstrated that little barley can provide ample ground cover and produce sufficient biomass to validate an initial evaluation study with the goal of developing a little barley seed source for release. It is desirable to assemble accessions from several locations in order to develop a cultivar or other plant release type with the widest possible region of adaptation. Desirable plant characteristics would be vigorous plants that produce seeds as early as possible in the spring. Early seed set might allow reseeding before burndown for agronomic crops, resulting in a self-sustaining stand. Germination and establishment are not a major concern for development of a little barley release, because it generally germinates in high numbers in the field and will naturally establish on a variety of sites.

Summary

Seed collections were made at various locations in Mississippi in April to May of 2004 to begin development of a little barley release. These collections will be compared to other accessions obtained from the PMCs in Georgia and Maryland. These collections came from Georgia, South Carolina, Maryland, and North Carolina. On September 23, a total of 53 accessions were planted in the little barley initial evaluation planting. Several of the collections had a low number of seeds for testing, so it was not possible to plant the seeds in rows. Instead, clumps of from 5 to 10 seeds were planted 3 ft apart. There were two replications of each accession. The plants will be evaluated for vigor, flowering chronology, and height in 2005. Plants will also be harvested and dry weights determined.

Testing was also required to determine the pollination mechanism of this species. Seeds were sown in containers in the greenhouse in the fall of 2004. They were placed in the shade house to provide a vernalization treatment to promote flowering. The flowers will be bagged to prevent cross pollination, the seed produced collected and germinated to determine if the plants are normally cross or self-pollinated. Self-pollinated plants produce seedlings that are fairly uniform in appearance and, because selfing is their normal pollination mechanism, they would still retain their normal vigor. Normally cross-pollinated plants either will not produce seed when isolated or, if they are adapted for self-pollination, the seedlings often become less vigorous. Since common barley is largely self-pollinated, chances are high that little barley is as well.

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 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).

2004 Data Collected

The plots were planted on September 25, 2003. There were three replications for each burndown treatment planted in plots that were 5 foot x 10 foot. Planting rate was approximately 75 seeds per ft^2. After planting, 25 lb/acre N and 60 lb/acre P and K were applied to all plots. On March 16, 2,4-D Amine 4L at a rate of 1 qt/ac plus nonionic surfactant (0.25% v/v) was sprayed on the plots to control crimson clover. Burndown herbicides were sprayed April 11 using a CO_2 plot sprayer calibrated to apply 20 gallons per acre. Formulations used were Roundup Weather Max (5.5 lb a.i./gal) and Gramoxone Max (3 lb a.i./gal). The nonionic surfactant was inadvertently admitted from the paraquat treatments. Visual control ratings were made on April 22 (7 DAT) and 29 (14 DAT) (Table 1). On April 29, 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 with the seeds placed between two blue blotters in Petri dishes. The containers were placed in the germinator on November 1 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, except the planting rate was reduced to 40 seeds per ft^2. The plots were sprayed on November 16 with 2,4-D plus surfactant at same rates used on the previous year's plots to control broadleaf weeds.

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

Treatment	Visual Control Rating[1]		
	7 DAT	14 DAT	Dead Plant
			------------%------------
Control	10	10	0
Glyphosate 1X	3	1	100
Glyphosate 3/4X	5	1	98
Glyphosate 1/2X	7	2	92
Glyphosate 1/4X	7	4	47
Paraquat 1X	4	4	43
Paraquat 3/4X	5	5	28
Paraquat 1/2X	6	6	23
Paraquat 1/4X	8	7	20
LSD (0.05)	3	1	17

[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 either treatment germinated.

Summary

The higher injury ratings at 7 DAT for the glyphosate treatment reflect the period of time required for the herbicide to translocate within the plant. By 14 DAT, the full rate of glyphosate provided 100% control of the little barley plants. There was no difference in injury ratings between the full and 3/4X rate and in percentage of dead plants between the full, 3/4X, and 1/2X rate. This indicates that the treatment rates of glphosate can be reduced, probably to 0.5 lb a.i./ac and still provide adequate burndown of little barley. Without surfactant, the paraquat did not provide the same level of control as in the previous year, when it was added to the spray solution. None of the paraquat treatments provided adequate burndown of little barley. Since paraquat is a contact, not systemic herbicide, like glyphosate, plants that are not killed can recover.

Title:	Agroforestry Alley Cropping Demonstration
Study No:	MSPMC-T-0117-CP
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 the option of growing different crops in the same field to create a diversified farming enterprise. Conservation benefits of alley cropping include but are 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 planted 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* (Wangenh.) K. Koch], which will provide an intermediate income from nut production in addition to future timber production, and green ash (*Fraxinus pennsylvanica* Marsh.), which is a fairly fast-growing timber species.

Summary

The green ash seedlings were planted in 2002 and there were no losses in 2004. Average basal diameter, measured on July 2, was 1.29 inches and the average height was 7.7 ft. Pressure from deer rubbing after planting affected their growth, creating multiple stem specimens. Alan Holditch, Mississippi NRCS State Forester, examined the trees in December and indicated that they would require pruning to redevelop a central leader. This pruning was scheduled for January 25, 2005, when Alan and other individuals from the State Office Ecological Sciences Section and Lynn Ellison, Mississippi NRCS Area 1 Forester, could provide assistance.

The pecan trees had been replanted in January of 2003. Average basal diameter and height of these trees, measured on July 2, was 0.86 inches and 4 ft, respectively. An electric fence had been installed around the perimeter of the field in September of 2003 to prevent further rubbing by deer, however, they still damaged some of the pecan trees in the winter of 2004. Alan Holditch suggested that instead of replacing the most severely damaged ones with additional pecans, we should dig seedlings of yellow poplar (*Liriodendron tulipifera* L.) from native stands on the PMC and plant them alongside the pecans. If the pecans do not recover, the fast-growing yellow poplar can act as a substitute. This was scheduled to be done at the same time as the pruning.

The alleys were burned down on March 22 using 1 qt/ac of a generic glyphosate formulation plus 1 qt/ac of 2,4-D. Corn (Dekalb 69-70YG) was planted using a no-till drill on March 31. This

non-Roundup-tolerant variety was selected because there was a concern that another year of glyphosate applications might damage the trees; it does however carry the BT gene to reduce the need for insecticide applications. A preemergence application of atrazine (2 qt/ac) plus metolachlor (Dual Magnum) (2 pt/ac) was made after planting. A synthetic pyrethroid (Fury) was applied in April to control army worms. Fertilizer was applied in April at a rate of 119 lbs N/ac. Sample areas were harvested on September 19 and the corn was shelled to determine an average yield of 215 bu/ac Yields were higher than expected on this sloping hillside due to well distributed rainfall and a nearly perfect growing season. After the sample harvest, the corn was combined and removed from the field. Soybeans will be planted in the alleys in 2005.

Title: Evaluation of Low Growing Switchgrass 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

Many of the switchgrass cultivars that were released by the PM program, University, and ARS grass breeders are tall, robust types that may not be as well suited as low-growing ecotypes for some conservation practices such as vegetative barriers (Conservation Practice 601), critical areas (Conservation Practice 342), and wildlife habitat plantings (Conservation Practice 645) in the southeastern U.S. Selection for reduced seed dormancy in switchgrass (*Panicum virgatum* L.) has been shown to be a viable method for cultivar development. The PMC has an assembly of 92 collections of switchgrass with varying heights ranging from tall (7-8 or more ft), medium (5-6 ft), and short (4-3 ft) from which new selections can be made for cultivar release. We are using recurrent selection breeding techniques, selecting seedlings that germinate in the shortest period of time from switchgrass accessions in the short stature range that will then be allowed to cross and produce a short cultivar that establishes quickly to out-compete weeds.

2004 Data Collected

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). Accession 9062816 lodged severely and 9062767 did not produce viable seed, so they were replaced with low-growing switchgrass plants from Dr. Brian Baldwin's research at Mississippi State University. This planting constitutes the mother block nursery. Seeds will be collected from these elites in the fall of 2004 for selection of early-germinating seedlings (Cycle 1 in the selection process) to be planted in a polycross block in 2005. Any plants that exceed the desired height range must be removed from all crossing blocks.

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

* Replaced with MSU selections.

Pasture/Hayland Study Summaries

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* L. (L.)] 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 proved to be a superior eastern gamagrass for much of the Southeast and it was released 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.

2004 Data Collected

Seeds used for testing were harvested from production fields at the PMC in 2003 and cleaned according to standard practices. Random samples of 3 replications of 10 seeds were opened and seed fill was estimated to be 87%. 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 3 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 12. The extended stratification treatments were tested in the germinator, so all treatments were stratified on March 5 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 9, 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 final germination counts, 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	2	3
2 week	8	16
4 week	13	24
6 week	23	48
8 week	26	63
10 week	22	45
LSD (0.05)	7	15

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

Stratification Period[1]	Germination	Germinable
	----------------------------%----------------------------	
10 month (2003 study)	10	22
12 month (2003 study)	3	11
0 month	3	5
2 month	29	68
4 month	39	83
6 month	28	NA[2]
8 month	19	NA[2]

[1] Stratification periods 10 month and 12 month for the 2004 study were not planted until 2005.
[2] Seed fill has not been determined at this time.

Summary

Both percent germination and the percentage of germinable seeds that germinated were significantly lower for the 0, 2, and 4 week treatments than for the longer stratification periods (Table 1). There were no significant differences in germination between the 6, 8, and 10 week periods; however, the percentage of germinable seeds that actually germinated for the 8 week period was significantly higher than the 10 week period, but not different from the 6 week treatment.

Seed fill percentage was lower for the seed lot collected in 2002 (67%) and this lead to lower germination counts for the 10 and 12 month treatments from the 2003 study (Table 2) than we had seen during the first year of testing. Initial seed fill was much higher for the 2003 seed lot used for the stratification period testing and the 0 to 8 month stratification treatments listed in Table 2. Response to all stratification treatments was more uniform between replications, similar to the first year of testing. This study will be completed in 2005, when the 10 and 12 month extended stratification periods will be planted. A publication on this testing will be written on this study and submitted for publication to a peer-reviewed or popular journal.

Critical Area Study Summaries

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 (Conservation Practice 612) 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.

2004 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)

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, 2003 in 10 foot rows, spaced 7 foot apart in the row. There were three replications of each treatment. Final basal stem diameter and height measurements were taken on January 23, 2004 (Table 1). Basal diameters (1 mm = 0.04 inches) were measured below the lowest branch on each seedling.

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)	Survival
	----------mm----------	----------cm----------	-----------%---------
Control	5.2	47	90
Mowing	6.4	48	83
Roundup	7.4	55	93
Roundup + Oust	6.8	50	91
Roundup + Oust + Arsenal	8.3	54	91
Arsenal + Oust	5.9	47	88
Arsenal + Oust + Transline	6.7	47	91
LSD (0.05)	NS[1]	NS	NS

[1] Not significant at $P<0.05$.

Summary

Planting conditions were much less favorable in 2003 than in the previous year. Excess rainfall in the spring left many of the seedlings in standing water for a prolonged period of time. Because of this, no differences in plant growth or survival could be detected between any of the treatments. A plant note was written in 2004 presenting the results of this study and the most current herbicide recommendations for pine establishment as provided by Lynn Ellison. This planting was mowed down during 2004. The site where the 2002 planting was located was retained. Every other row of seedlings was removed to create 20-foot-wide areas that will be used for a silvopasture forage quality study that will be established in 2005.

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 (*P. virgatum*) and these techniques may also be possible to develop beaked panicum sources with reduced dormancy.

2004 Data Collected

The original mother plant nursery (Cycle 0), planted in 2002, contained seedlings of eight accessions of beaked panicum (9002928, 9028510, 9067071, 9067121, 9067102, 9067094, 9067079, and an unnumbered collection from Carroll Co., MS). This nursery was destroyed in 2004; however, seeds were collected from this block in both 2002 and 2003. Since this block was destroyed, the seedlings that resulted from its seed constituted the new mother plant nursery. There were 35 early germinating seedlings from seeds collected from the mother plant nursery in 2002 that were planted in the field on August 5, 2003.

This was not enough seedlings to constitute an acceptable crossing block, so additional plantings using the seeds collected from the original mother plant nursery in both 2002 and 2003 were made on January 20, 2004. In the previous year, the seeds were planted in flats of potting media and exposed to ambient conditions in the greenhouse for germination. However, in 2004, we counted 50 samples of 50 seeds of each seed lot and germinated them on filter paper in Petri dishes. The dishes were placed in a germinator maintained at 20°C/30°C (night/day) with lights on for 10 hours per day during the day cycle. The seeds were allowed to germinate for 14 days, with counts made at 7 day intervals. After 14 days, the seedlings were transplanted into cell packs; however, there were only 19 seedlings planted from the 2002 seed lot containers and 10 from the 2003. We decided to extend the germination period for an additional 14 days. Counts were again made at 7 day intervals and seedlings were transplanted into cell packs when large enough to survive this process. During this period, a total of 29 additional 2002 lot seedlings and 9 2003 lot seedlings were planted. Germination percentages averaged only 2.6% for the 2002 lot and 1% for the 2003 lot. A few seedlings were too weak or deformed and were not transplanted.

The dishes were then placed into a cooler maintained at approximately 7°C to expose the seeds to cold stratification. Germination counts were made every 7 days for 21 days. No seedlings were retained after stratification; this treatment was only to judge the levels of dormancy in the seed lots. The 2002 seed lot averaged 12% and the 2003 seed lot averaged 36% germination, indicating that dormancy was reduced in the 2002 seed, which had been stored at room temperature since collection. The seedlings were transplanted into 4” square containers when they had reached sufficient size. They were then added to the new mother plant nursery in May.

Currently, there are 81 plants in the new mother plant nursery. None of the plants in the new nursery produced sufficient seed to harvest in 2004.

Accession 9002928 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 seed increase field would be planted. It was planted in the fall of 2002 using a Lilliston no-till drill. A large quantity of seed was planted to ensure a full stand and it germinated well in the field. The rows were spaced closer than was practical to maintain, so the field was sprayed with glyphosate in July or August using a hooded sprayer to define wider rows. The first year, little seed was produced, so this field was not harvested; however, seeds will be harvested in the fall of 2005.

Summary

We have not made as much progress with beaked panicum as we have with some of the other native warm-season grasses that we are developing using similar techniques. We should be able to harvest seeds from the new mother plant nursery in 2005 and can initiate the selection process. We can also pursue release of 9002928 if it proves to be easy to establish. This will need to be determined using fresh seed, not seed lots that have been stored in the cooler for 10 or more years. Various researchers have demonstrated that dormancy of switchgrass seeds can be relieved by storing the seeds at room temperature. From the results of the stratification treatment, it appears that dormancy of the closely-related beaked panicum can also be reduced by this treatment.

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 a large collection with 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 (*P. virgatum*). Recurrent selection techniques could also be used to develop sources of purpletop with reduced seed dormancy.

2004 Data Collected

The mother plant nursery that was planted in 2002 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). Each year seeds are collected from the mother plant nursery (Cycle 0) and the subsequent selection cycles and germination tests are performed to determine the progress that has been made in improving germination. The Cycle 1 crossing block was planted in 2003 and assigned the accession number 9077113.

Seeds collected from the Cycle 1 crossing block in the fall of 2003 were planted in germination flats containing a commercial seed germination potting mix on February 18 and placed in the germinator set at 20°C/30°C (night/day) with lights on for 10 hours per day during the day cycle. The seedlings became leggy due to low light levels, so they were moved to the greenhouse on March 4. Seed germination was good and only the largest, most vigorous seedlings were selected for transplanting. The crossing block (Cycle 2) to be planted in the field was to contain 12 rows with 12 plants in each row (144 seedlings); however, additional seedlings were transplanted into cell packs to allow for any potential losses. The seedlings were moved up into 4" pots when they reached sufficient size. The Cycle 2 crossing block was planted on June 7. These seedlings were assigned the accession number 9077134. All seedlings survived and flowered. Seeds were collected from all crossing blocks in September and October.

A germination test was conducted on seeds from the mother plant nursery and the Cycle 1 crossing block. An electronic seed counter was used to count five replications of 100 seeds of each lot which were placed in between two sheets of filter paper in Petri dishes and put in the germinator on January 20. Hairs on the lemma and palea, caused the seed to clump together and they did not count accurately. Seeds from the mother plant nursery averaged 1.4% and those from the Cycle 1 lot averaged 4.4% germination. The dishes were placed in a refrigerator for 14 days to provide a stratification treatment. Germination counts were conducted weekly for an additional 14 days, and then the number of seeds remaining in the dish were counted to determine the total number of seeds in each dish so that we could calculate germination percentages. Additional germination for the mother plant nursery seeds was 95% and for the Cycle 1 seeds additional germination was 90%. Because of the counting problems encountered in the first germination test, another test was initiated on April 27. For this test, the seeds were run through a brush machine to remove the lemma and palea. Samples of 100 seeds were counted and tested as above, except the germination period was 21 days and no stratification treatment was applied. Seeds from the mother plant nursery averaged 63% and those from the Cycle 1 lot averaged 73% germination.

Additional testing was also conducted in 2004 to attempt to determine the sources of dormancy in purpletop seed. The lemma and palea that surrounds the caryopsis was removed (hulled) from Cycle 1 seeds collected in 2003 by rubbing them between two sheets of sandpaper in a small box. Six replications of 100 hulled and unhulled seeds were counted out by hand; for the unhulled seed care was taken to select single, fully formed spikelets to avoid immature ones and ones that had not separated completely from neighboring ones in the panicle. The seeds were placed in Petri dishes between layers of filter paper and germinated for 14 days in the germinator (same settings as used for the germination test above), beginning on February 18. The seeds were then stratified for 14 days in the refrigerator using the same methods as for the germination test. Germination counts were made for an additional 14 days with counts made every 7 days. The second run of this experiment, which began on November 23, was identical to the first, except the lemma and palea were removed by running the seeds through a brush machine. Results are presented in Table 1.

Table 1. Effect of removing the palea and lemma on germination of purpletop seeds.

Test date	Treatment	Germination		
		Initial	Stratified	Total
		--------------------------%------------------------		
02/18/04	intact	23	58a	81a
	hull	32NS[1]	4b	32b
11/23/04	intact	38b[2]	59a	96NS
	hull	79a	5b	81

[1] Not significant at $P<0.05$.
[2] Pairs of values in columns with different letters are significantly different at $P<0.05$.

During the course of conducting the hulling test, we noticed that the hulled seeds were often covered with fungal growth and it was generally less pronounced for the intact seeds. We wanted to determine if we could use a fungicide (Captan) to prevent this fungal growth and further improve germination of the hulled seeds. This study was initiated on April 1. The seeds were hulled as was done in the initial hulling test (i.e. using sandpaper). The seeds were separated from the chaff using a South Dakota, they were screened using a 6 X 22 screen, and four replications of 100 hulled seeds were counted for each treatment by hand and placed in a Petri dish between two layers of filter paper. Captan (wettable powder formulation containing 48.9% Captan and 1.1 % related derivatives) was applied at the applied at the label rate of 3 tablespoons per gallon. The Captan dishes were treated using 3 ml of the fungicide solution at initial wetting and they were watered using distilled water alone at subsequent irrigations. The Petri dishes were placed in the germinator set at 15°C/30°C (night/day) with lights on for 10 hours per day during the day cycle. Germination counts were made weekly for 21 days. This test was only run once.

Table 2. Effect of Captan treatment on germination of hulled purpletop seeds.

Treatment	Initial (7 days)	Total
	--------------------------%------------------------	
Control	14b[1]	52b
Captan	32a	83a

[1] Pairs of values in columns with different letters are significantly different at $P<0.05$.

An additional test was conducted to attempt to determine if water-soluble inhibitors are present in the lemma and palea prevent germination and promote dormancy. For this test seeds collected in the fall of 2003 from the Cycle 1 crossing block were used. The lemma and palea were removed by squeezing between the fingernails of the thumb and index finger. The treatments consisted of hulled seeds being germinated in the dish with the hulled material present (but not touching) the seeds and the other treatment with the hulls removed. This hulling method was extremely time-consuming, so 4 reps of only 25 seeds were used for each treatment. The dishes for the first run were placed in the germinator on March 31 and it was set at 15°C/30°C (night/day) with lights on for 10 hours per day during the day cycle. Seeds were germinated for 21 days with counts made weekly. In most dishes, all seeds had germinated by the end of the germination period. This test was repeated on November 22, using the same methods except the germinator was set at the standard 20°C/30°C temperatures. Germination in most all of the dishes was at or near 100%, except for two that dried severely after the first count. Germination in those dishes was still 92% and 84%.

To determine how the results of these germinator studies translate to seeds planted in the field, another study was initiated to determine germination of hulled and unhulled seeds that were either treated with Captan or left untreated. A sample of seeds from the 2003 Cycle 1 seed lot was run through brush machine for the hulling treatment. They were then cleaned by using a South Dakota seed blower and screened to produce a clean seed sample. The treatments consisted of 250 seeds for each treatment replicated three times. The hulled seeds were counted with a mechanical seed counter and the intact seeds were counted by hand. Captan was applied by dusting the same formulation used in the previous study on the seeds at planting. The area in the field where this study was to be planted was initially burned down using 1 qt/ac or a generic glyphosate formulation (4 lb a.i/gal) on March 25. Although weed control was fairly good, an additional treatment using Gramoxone (1 lb ai/ac) was made right before planting. The seeds were planted on April 28 in shallow rows (10 feet long) formed in the soil. The soil was then firmed back over the seeds. Accurate germination counts were difficult because of weed growth and also due to plant tillering. Counts were made sporadically during the growing season, with the final count in December after annual weeds had senesced. Also on December 7, a 3-foot-long section of the row was sampled to determine the number of flowering culms. Data is presented in Table 3; however, no statistical analysis was possible due to the sampling difficulty.

Table 3. Germination counts and number of culms recorded for purpletop seed hulling/Captan treatment field test

Treatment	Seedling counts				# Culms
	05/20	06/15	09/03	12/03	
	------------Per row (250 seeds planted)------------				--Per 3 ft row--
Intact	2	60	81	51	44
Hulled	2	40	55	60	32
Intact with Captan	1	57	55	41	24
Hulled with Captan	6	42	54	40	31

Summary

Germination percentages have been improved during each cycle of selection as expected. There is little phenotypic diversity in purpletop plants, so once germination percentages have reached an acceptable point, there is little if any other selection that needs to be made. It appears that germination rate and vigor of the Cycle 2 plants (accession 9077134) were high enough to justify release of this material. All available seed was hand-collected from this block to plant a field to increase in order to obtain enough for release. The field selected for the increase planting required an additional year of preparation to control weeds, so the planting is scheduled for 2006. Further germination testing will take place in 2005 on seed collected the previous fall to verify that germination percentages continued to improve for seeds collected from the Cycle 2 plants compared to the previous cycles.

The study on removal of the palea and lemma shows that early germination can be greatly improved by this treatment (Table 1). Hulled seed would be easier to plant because a planter with a fluffy seed box would not be necessary. The low total germination for the hulled seed in the first run shows that the method used to remove the coverings (rubbing between sand paper) was too vigorous and damaged the seeds. Germination of the hulled seeds in the second run was slightly lower than for the intact seeds (Table 1); however, the difference was not significant, indicating that if the hull can be removed though gentler means, it will not adversely affect germination. Although removal of the lemma and palea improved early germination, it could affect the ability of the seeds to withstand adverse environmental conditions or fungal attack in the field. This would need to be determined using larger-scale field plantings. Even with this concern, it appears that developing commercially feasible methods to hull purpletop seeds, possibly using a roller-type device similar to those used to hull rice seeds, is a avenue that should be explored.

The Captan test shows that this fungicide can improve the germination of hulled seeds (Table 2). It is not known if this increase is due entirely to the suppression of fungal growth or if Captan has some germination-promoting effects on purpletop seeds, as this has been noted for some other species. Interestingly, the germination of the Captan-treated seed was high, even though the seeds were hulled using sandpaper. It is difficult to provide uniform treatment of all seeds using this method and perhaps the seed coats and/or embryos were not as seriously damaged during this treatment for this test.

Results of the test with the removed lemma and palea being either present or absent from the germination containers shows that there are no water soluble inhibitors in these structures that affects germination. Either the inhibitors are not water soluble, which is highly unlikely, or the effect of the palea and lemma is mechanical. These structures adhere tightly to the caryopsis and it appears they may interfere with emergence of the seedling until natural forces in the soil can soften or degrade them.

It is difficult to glean any trends from the field planting; however, it does appear that the hulling treatment did not adversely affect establishment. Also, the Captan treatment did not appear to promote germination in the field. The planting rate used, which converts to 25 seeds per foot, provided a uniform stand of purpletop and, until further research determines the optimum planting rate, may be an acceptable one for seed production stands.

Water Quality Study Summaries

Title: Response of 'Highlander' Eastern Gamagrass to Poultry Litter Application
Study No: MSPMC-P-0303-NU
Study Leader: Joel Douglas
Cooperators: Joe Johnson, MAFES, Holly Spring, MS
David Lang, Mississippi State University, Mississippi State, MS
Duration: 2004 - 2007

Introduction

The environmental impacts of land-applied poultry litter on water quality are dependent on many variables, including but not limited to soils, climate, rainfall, topography, application rate, and the plant species present on the land receiving the litter. Over 97% of the poultry litter in the mid-South is applied on land with stands of bermudagrass [*Cynodon dactylon* (L.) Pers.] or bahiagrass (*Paspalum notatum* Flugge). Highlander eastern gamagrass is a warm-season perennial bunchgrass released for use in the southeastern U.S. Because Highlander produces a large amount of biomass and can utilize fairly high levels of nitrogen, it may have potential for use in waste utilization plans (Conservation Practice 633). This study was developed to determine its response to poultry litter applications of 0, 4, 6 tons per acre in a single application in the spring and 8 tons per acre in a split application, with 4 tons applied in the spring and the other 4 tons in mid-summer. There will two different types of poultry litter used, one normal poultry litter, unaltered from the form removed from the houses, and the other a pelletized source.

2004 Data Collected

The plots to be used in this study were established for two previous fertilizer utilization studies, one looking at forage production (biomass) and the other looking at seed production response to N rate that were completed in 2003 and 2004, respectively. Because the plots had been given differing rates of fertilizer in the previous studies, this year we attempted to equalize conditions between the plots. Soil samples were taken from each plot on March 9 and fertilizer was applied to each individual plot on April 29 based on the recommendations received from the tests. The biomass was harvested from the plots on July 7 (Table 1 and Table 2). Nitrogen was applied on all plots at a rate of 60 lb/ac immediately after harvest.

Table 1. 2004 Biomass yield from previous biomass response to N rate study after plots were fertilized according to soil test recommendations.

Previous N rate	Yield
---------------------------lb/ac---------------------------	
0	2 849
112	2 534
112 split	2 574
224	2 566
224 split	2 953
LSD (0.05)	NS†

† Not significant at $P < 0.05$.

Table 2. 2004 Biomass yield from previous seed production response to N rate study after plots were fertilized according to soil test recommendations.

Previous N rate	Yield
---------------------------lb/ac---------------------------	
0	5 400
40	7 638
80	7 344
120	6 199
160	6 093
LSD (0.05)	NS[†]

[†] Not significant at $P < 0.05$.

Summary

The fertilization regime successfully equalized yields for the plots in each study that had received differing rates of N fertilizer (i.e. statistical analysis showed the differences were not significant). The yields of the seed production plots were higher than the biomass plots and this was probably due to the greater harvesting pressure applied to the biomass plots. Only one type of poultry litter (normal or pelletized) will be applied to each set of plots from the previous studies, so any yield differences between the two sites will have no effect on response to the varying poultry litter rates. The poultry litter treatments were to be implemented in 2005; however, due to staffing changes that occurred late in the year, it was decided that this study would be put on hold. The poultry litter applications should now begin in 2006.

Wildlife Habitat Improvement Study Summaries

Title: Partridge Pea Inter-center Strain Trial
Study No: MSPMC-P-0207-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.

2004 Data Collected

A germination test was run on all seed lots on January 13 to determine current germination percentages. Germination counts were taken weekly and the germination test was terminated on February 3. The amount of seed to include in each planting packet was adjusted based on the results of this test. Seed packets and planting instructions were mailed to cooperators on April 12. The seed was scarified using a small-lot mechanical scarifier and a small zip-loc bag of inoculant was included in the mailing packet. The South Texas PMC and the site in North Carolina asked to be removed from the study in 2004, so no seed was sent. All partridge pea selections were poorly adapted in South Texas. 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 April 29 and it rained heavily the next day. Fertilizer was applied on May 6 at a rate of 60 lb/acre P and K. Dual (2 lb a.i./acre) was sprayed over the treatment plots on May 4. Evaluations were made at this PMC on July 28 and October 12. Plots at the other locations were planted, managed, and evaluated based on local conditions. Lack of rainfall during the seed set period in September also impacted seed production of Comanche and Lark Selection; however, there was no effect on Riley Selection because it had set seed earlier in the summer. No evaluation data were received from the Arkansas PMC. Hurricanes severely impacted evaluation of seed production at the Florida PMC. All data is recorded in Table 1. Time constraints prevented statistical analysis of the data.

We felt we needed to obtain more objective data on growth characteristics of Lark Selection in order to validate advancing this germplasm to cultivar status. We decided to compare it only with

Comanche because it is the currently available release and the growth and flowering pattern of the release from Kansas is vastly different than these two southern sources. Plant height and weight measurements were taken at the Jamie L. Whitten PMC. These measurements were made when the plants were at approximately 50% of full flower, which meant that measurements for each release were taken at different times. The average height of Comanche plants were determined on August 10 and then five randomly selected plants from each plot were cut at ground level, placed in a ventilated fabric bag, and placed in the greenhouse to dry. The same methods were used for the Lark Selection plots on August 17. Air-dry weights were determined for all samples on September 30 (Table 2).

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

Location	Release	07/23		09/30			
		Stand[1]	Vigor	Stand[2]	Vigor	Seed Prod.	% Seed Mat.
Mississippi	Comanche	2	3	NA	2	3	4
	Lark	2	1	NA	3	3	15
	Riley	1	1	NA	NA	1	98
		07/07		09/02			
East Texas	Comanche	1	1	1	1	1	87
	Lark	1	1	1	1	2	88
	Riley	4	3	4	3	4	100
		07/21					
Florida	Comanche	4	3	2	2	2	50
	Lark	5	5	4	4	6	25
	Riley	5	5	4	4	6	32
		07/28		09/30			
Kansas	Comanche	6	4	4	3	10	0
	Lark	3	2	3	1	10	0
	Riley	1	1	5	2	1	80
		07/21		09/05			
Georgia	Comanche	1	3	1	2	5	NA
	Lark	2	1	1	3	3	NA
	Riley	2	3	3	5	1	NA

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

[2] Stand was not evaluated during the second evaluation period at the Mississippi PMC because plants had been removed from each plot earlier in the season for the plant weight measurements.

Table 2. Plant height and air-dry weights of two partridge pea sources at the Jamie L. Whitten PMC, Coffeeville, MS.

Release	Height	Air-dry weight/plant
	------------in------------	-------------g-------------
Comanche	35	38
Lark Selection	58	63

Summary

The germination testing performed this year provided better comparisons of stands between the releases than in the previous years of testing. No trend in stand ratings could be detected across all locations (Table 1). Vigor of all releases appeared to be fairly good for all locations. A cool, wet spring resulted in good performance of Riley at the Mississippi location; it matures earlier than the two other selections, which was an advantage during this year, when a prolonged dry spell occurred during the fall. The ratings for Comanche and Lark were fairly similar at the East Texas location this year. Throughout the course of the study though, Comanche seemed to perform better at this location, which is not surprising because Comanche is from Texas. None appeared to perform especially well at Florida and this may be because all were moved far south of their collection locations. Comanche appeared to be the best at this site which is probably because it has the most southerly point of origin of these releases. Riley was the lowest ranked at the Georgia PMC, where both Comanche and Lark appeared fairly comparable. Once again 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.

The plant growth data (Table 2) shows that Lark Selection is a larger more vigorous plant than Comanche in Mississippi. Plant height and weight were almost double those of Comanche. Personal communication with Jim Stevens at the East Texas PMC indicates that the reverse was true at their location. Lark Selection is better adapted to the Mid-South region and satisfied landowners have planted thousands of acres since it became commercially available. Although measurements were not made for Riley Selection, it appeared to be comparable to Lark Selection in height and size. This study is now completed and a determination must now be made as to whether to elevate Lark Selection to cultivar status.

Title: Evaluation of Little Bluestem Ecotypes for Reduced Seed Dormancy
Study No: MSPMC-P-0208-WL
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 [*Schizachyrium scoparium* (Michx.) Nash] 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 [*Nassella viridula* (Trin.) Barkworth].

2004 Data Collected

A mother plant nursery (Cycle 0) was planted with 300 selections from isolated areas on PMC property and transplanted in four complete blocks (5 rows, 15 plants/row) in 2002. Seeds were collected from individual plants in mother plant nursery in November 2002, placed in paper bags, and stored at room temperature. Replicated germination tests were conducted in January/February 2003 to identify plants that produced seeds that germinated in 14 days without stratification. Analysis of variance was used to determine the top 20 performers. From these 20, the top 12 plants with the highest germination percentages were identified. The seedlings from these 12 and early germinating ones from two other collections made in Madison County were planted in a 14 X 14 Latin square crossing block (Cycle 1) in 2003. Some of these died and sections of the identified plants in the mother block were dug to replace the lost ones on January 14, 2004, taking care to not cause much damage to the original mother plant. A germination test was initiated on March 3 to determine the relative levels of dormancy present in both seed sources. Data for this test is not available.

Summary

We have made some progress in selecting early germinating little bluestem plants for crossing. There is a great deal of phenotypic variability in the both crossing blocks. This is not an undesirable situation; however, we will need to be sure to remove plants with weak stems that lodge from later selection cycles because that tendency interferes with harvesting. Seeds were collected from both the mother plant nursery and the Cycle 1 block in November 2004 for germination testing and further selection will be performed on the Cycle 1 seed lot.

Title: Cultural Practices for Improving Trailing Wildbean Seed Production
Study No: MSPMC-T-0308-WL
Study Leader: Janet Grabowski
Duration: 2003 - 2007

Introduction

Trailing wildbean (*Strophostyles helvula* (L.) Ell.) is an annual, trailing, herbaceous legume that is a good source of food for upland game bird species and has potential for controlling erosion on field borders and sandy banks. The Jamie L. Whitten PMC evaluated several selections of trailing wildbean and released one of these as Hopefield Selection in 1997. The trailing habit of this plant creates difficulties in harvesting seed and has so far prevented it from being produced on a commercial scale. 'Quail Haven' reseeding soybean (*Glycine soja* Sieb. & Zucc.) is another legume with trailing stems that was released by the PMC. We normally grow it with a light stand of corn to support the stems and improve harvest. Using corn as a companion crop limits the use of herbicides that can be used on the Quail Haven crop and also attracts some types of wildlife that can damage the planting. For these reasons, grain sorghum stubble from the previous season is being examined to replace the need for corn in PMC Quail Haven production fields. This practice will also be tested on Hopefield Selection to see if it can support the plant and improve harvest. Trailing wildbean has been found growing in several production fields of Lark Selection partridge pea. Partridge pea has an upright growth habit and a similar ripening period as Hopefield Selection and they could be grown together, allowing production of both species on the same acreage. Yields of these two treatments will be compared to Hopefield Selection planted alone. A Lark Selection only treatment was included to determine what effect the trailing wildbean has on its seed production.

2004 Data Collected

The field selected for this study has an Oaklimiter silt loam soil. The grain sorghum stubble needed to be removed from all other treatments before planting. In order to do this, the stubble treatment plots were located in the field and a Lawn Genie was used to cut the stubble on the rest of the field, vacuum it up, and remove it from the field. This was accomplished on April 6. The field was limed at a rate of 2 ton/ac on April 7. The field was fertilized according to soil test recommendations with 152 lbs P and 60 lbs K by combining the appropriate amounts of 0-46-0 and 0-20-20; this was applied on May 10. Existing weeds were burned down using 1 qt/ac of a generic glyphosate formulation (4 lb a.i/gal) and 1 qt/ac 2,4-D (4 lb a.i/gal). The tractor was used to spray all areas of the field except the grain sorghum stubble plots on April 27 and the stubble plots were sprayed on April 28 using a hand sprayer. Each treatment plot was 13.5 feet wide to accommodate the 4-row planter and 20 feet long and there were four replications. The alleyways between replications were 20 feet wide to provide room for the tractor at planting and the plot combine at harvest. The plots were planted on May 10. The partridge pea seeds was scarified and inoculated (Cowpea type) before planting. The trailing wildbean seeds were inoculated using Strophostyles Special inoculant before it was planted. The recommended planting rate for Hopefield Selection (8 lb/ac) equals approximately 6 seeds per foot of row and the planter was calibrated to deliver as close to this number as seeds as was possible. The recommended rate of Lark Selection is 5 lb/ac and this equals approximately 22 seeds per foot; approximately this number of seeds were planted per foot or row in the plots with partridge pea only. Lark Selection is a large, vigorous plant and will provide a great deal of competition for the trailing wildbean plants in the treatment where they are both planted. Therefore, the planting rate in the treatment with both species was reduced by half (11 seeds per foot of row). After planting, Dual Magnum (1.5 pt/ac) was sprayed on the plots. On June 25, a post-emergent application of Select was sprayed to control grassy weeds. The plots were harvested on October 3. We had hoped to harvest them using a plot combine, but mechanical problems required the plots to be harvested using two passes of a walk-behind sicklebar mower, which harvested 6 feet from the center of each plot. The harvested plant material was collected, loosely bagged, and placed in a greenhouse to dry thoroughly.

The harvested plant material was then threshed using a small plot bundle thresher and seed cleaning techniques were used to recover the seeds. All treatments were screened by hand. Hopefield Selection seeds were run though a 10/64 X 3/4 slotted screen to remove larger pieces of trash and then over a 7 round hole screen to remove smaller trash. They were then blown in a South Dakota seed blower (5.4 mm opening setting) to remove lighter seeds and trash. And then finished with a 9 round hole screen. The Lark Selection seeds were screened through a 5/64 X 3/4 slotted screen, over a 1/12 round hole bottom screen, blown in the South Dakota seed blower (2.7 mm setting) and finished with a 9 round hole screen. The seed sample was then weighed. The treatment with both seed types was initially screened using the ones listed for Hopefield Selection, blown, and the yields of this seed type were determined. All material that passed through the screens was retained, screened and blown using the methods listed for Lark Selection, and the yields of this seed type were also determined. There were morningglory (*Ipomoea* spp. and *Jacquemontia* spp.) and other seeds, as well as inert matter, that were difficult to remove from the seed samples, so 10 g of the Hopefield Selection treatment samples and 3 g of the Lark Selection samples were separated to determine the percentage of pure seed present. Yields were then adjusted based on this purity value to determine the actual yield of each type of seed. Yields per acre were then calculated. Data for Hopefield Selection (Table 1) and Lark Selection (Table 2) are presented separately because yields between species cannot be compared.

Table 1. Seed harvest data for Hopefield Selection trailing wildbean using various planting methods.

Treatment	Seed Yield	
	--------g/plot--------	--------lb/ac---------
Hopefield Alone	82	65
Grain Sorghum Stubble	109	87
Hopefield + Lark	74	59
LSD (0.05)	NS	NS

Table 2. Seed harvest data for Lark Selection partridge pea.

Treatment	Seed Yield	
	--------g/plot--------	--------lb/ac---------
Lark Alone*	62	49
Lark + Hopefield	46	37
LSD (0.05)	NS	NS

* The planting rate for this plot was the full recommended rate of 5 lb/ac, however, in the plots with both species, the rate was halved.

Summary

No yield differences in trailing wildbean yields were detected for any treatment (Table 1). The highest yield was in the grain sorghum plots. The grain sorghum had not grown well in this field in 2002, likely due to a low pH, and the stalks did not hold up as well as if the plants had been growing more vigorously. By late summer, it was difficult to find any standing stalks in the field.

If there was any beneficial effect from the sorghum stubble, it had to either be due to better seed bed conditions in these plots or to some physical protection that the stalks provided for the trailing wildbean seedlings early in the growing season. The trailing wildbean seedlings did not only use the plant supports were intentionally provided in the plots, they also climbed up on any upright weeds and the stakes at the corners of the plots.

Because the planting rate used for Lark Selection in the plots that were also planted with Hopefield selection was half that of the plots with no wildbean planted, it would seem logical that yields of this treatment would be a great deal lower. However, this was not the case. They were slightly reduced, but no different than those of the combination treatment (Table 2). It appears that the recommended seeding rate for Hopefield Selection production fields, which equates to 22 seeds per foot of row may be too high and the plants are competiting with one another. This study will be repeated in 2005.

Title:	Determining Tolerance of Partridge Pea and Trailing Wildbean to Preemergence Herbicides
Study No:	MSPMC-T-0309-WL
Study Leader:	Janet Grabowski
Duration:	2003 - 2007

Introduction

Lark Selection partridge pea and Hopefield Selection trailing wildbean are two native legumes that were released by the Jamie L. Whitten PMC primarily for wildlife habitat improvement. Both species are annuals and do not set seed until fall. Due to the long growing season of these species, weed competition is a problem in PMC production fields. Also, both species are recommended for use in field borders, where they have a high likelihood of being exposed to herbicides sprayed on the adjacent crop. For these reasons, tolerance of these two species to commonly used herbicides needs to be assessed. Previous research has demonstrated the tolerance of these species to several post-emergence herbicides that are recommended locally for soybean production. Both species tolerate Dual (metolachlor) for preemergence applications; however, this herbicide provides poor control of many problem weeds such as morningglories. The tolerance of Lark Selection and Hopefield Selection to additional preemergence herbicides used primarily on soybeans will be determined in this study.

2004 Data Collected

The herbicide treatments used are listed in Table 1. Dual was included as the standard treatment that we typically use. An untreated control was also included. This study was planted in the same field as the trailing wildbean cultural practice study and the soil type was Oaklimeter silt loam. The herbicides were sprayed on May 11. The field was limed at a rate of 2 ton/ac on April 7. The field was fertilized according to soil test recommendations with 152 lbs P and 60 lbs K by combining the appropriate amounts of 0-46-0 and 0-20-20; this was applied on May 10. Existing weeds were burned down using 1 qt/ac of a generic glyphosate formulation (4 lb a.i/gal) and 1 qt/ac 2,4-D (4 lb a.i/gal) on April 27. The plot size was 5 foot by 10 foot and there were three replications. The plots were planted on May 5. The partridge pea seeds was scarified and inoculated (Cowpea type) before planting. The trailing wildbean seed was inoculated using Strophostyles Special inoculant before it was planted. Planting rate was the recommended broadcast rate of 8 lb/ac of Lark Selection and 10 lb/ac of Hopefield Selection. The seeds were planted by broadcasting them over the plots and raking them into the soil. Injury ratings were taken on May 26 and June 9 (Table 2 and 3). Time constraints did not allow statistical analysis of this data before presentation here.

Table 1. Herbicide treatment information.

Herbicide Formulation	Amount Active	Rate
Dual Magnum	7.62 lb/gal	1.5 pt/ac
Prowl 3.3 EC	80%	2 pt/ac
Python WDG	3.3 lb/gal	1 oz/ac
Command 3 ME	3 lb/gal	2-2/3 pt/ac
Pursuit WDG	70%	1.44 oz/ac
Scepter	1.5 lb/gal	10.5 oz/ac
Zorial Rapid 80	78.60%	1.25 lb/ac
Valor	51%	2 oz/ac
Frontier	7.5 lb/gal	21 fl oz/ac

Table 2. Average injury ratings for pre-emergence herbicides applied on Lark Selection partridge pea at the Jamie L. Whitten PMC, Coffeeville, MS.

Treatment	Injury rating[1]	
	05/26	06/09
Control	10	10
Dual	7	9
Prowl	8	10
Python	3	3
Command	9	10
Pursuit	7	9
Scepter	5	5
Zorial	1	1
Valor	4	6
Frontier	NA	10

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

Table 3. Average injury ratings for pre-emergence herbicides applied on Hopefield Selection trailing wildbean at the Jamie L. Whitten PMC, Coffeeville, MS.

Treatment	Injury rating[1]	
	05/26	06/09
Control	10	10
Dual	10	9
Prowl	7	9
Python	8	10
Command	7	10
Pursuit	8	9
Scepter	7	9
Zorial	4	2
Valor	4	5
Frontier	7	9

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

Summary

The herbicides that caused the least injury to Lark Selection were Prowl, Command, and Frontier. Frontier and Prowl have greatest activity against grasses, so it is not surprising that they did not injure this legume. The discovery that Command can be safely used on Lark Selection is exciting because it controls many species of morningglories. Dual caused a small amount of injury in the wetter areas of the field. Pursuit also caused some early injury that the plants seemed to recover from by the second rating. Python and Scepter both caused a great deal of injury and Zorial killed all plants.

Trailing wildbean is not as susceptible to herbicide damage as partridge pea. The only herbicides that injured it were Zorial and Valor, and the injury was severe. We noticed in the Valor plots that the plants that survived the treatment were vigorous, but there was only about a half stand compared to the other plots. Again, the only damage from Dual was in wetter areas of the field; however the injury was slight. We often have cool, wet conditions in the spring and for this reason, we might want to examine switching our normal pre-emergence treatment on PMC production fields to one of the herbicides that caused less injury that controls a similar spectrum of weeds.

Title:	Establishing Chiwapa Japanese Millet in Group IV Soybeans for Waterfowl Habitat
Study No:	MSPMC-T-0410-WL
Study Leader:	J.L. Douglas
Cooperator:	Kevin Nelms, NRCS, Greenwood, MS
Duration:	2004 – 2006

Introduction

Many growers in the Mid-South have installed water-control structures to allow retention of water on their fields in the winter months to provide habitat for wildlife (Conservation Practice 644). Waterfowl utilized wasted seed from the agronomic crops in addition to weed seeds and other plant parts as their winter food source. However, research by wildlife biologists has shown that seeds of agronomic crops degrade quickly under flooded conditions. Also, the widespread use of Roundup-ready crops in the past decade has severely impacted the number of weeds that are present in the fields to produce seeds or provide other plant parts for food. To ameliorate these circumstances, some growers plant a late-season crop after they harvest their agronomic crops specifically to provide a food source for waterfowl. One popular crop for this use is a 90-day seed-ripening millet. However, in most years, it is difficult to get the millet established due to lack of rainfall in the late summer after the agronomic crop is harvested.

In 1965, the PMC released 'Chiwapa' Japanese millet (*Echinochloa frumentacea* Link), which is a 120-day millet. In the past, it has not used as extensively as the shorter-season millet cultivars. However, we realized that it might be possible to seed this millet into an established agronomic crop in the mid-summer, when rainfall and overall soil moisture are better. The seeds could be flown on the fields and would germinate and remain as small plants under the canopy of the agronomic crop until harvest allowed more light penetration for growth. Because this plant is an annual, it would make every attempt to produce seed before frost. We began a study to demonstrate the potential of this approach in producer's fields planted with Group IV soybeans in the Delta (Bolivar, Sunflower, Tallahatchie, and Quitman Counties). June 15, July 15, and August 15 were chosen as target planting dates to use for the initial demonstrations.

2004 Data Collected

Actual planting dates were June 16, July 19, and August 13. Each plot was 30 feet by 50 feet. Chiwapa seeds were broadcast by hand on the plot at the recommended rate of 25 lb/ac. The producers managed their fields using standard agronomic practices.

The study sites in Bolivar, Sunflower and Tallahatchie Counties were terminated before seed yield was determined. General observations by Kevin Nelms in early fall at the Sunflower location revealed good to excellent stands. It was anticipated that this site would have produced a substantial seed crop had it not been destroyed.

Percent stand, seed yield, seed quality (seed fill) and available seed on the ground that shattered prior to harvest were determined at the Quitman County site on Hugh Campbell's farm on December 15, 2004 (Table 1). Percent stand was an estimate of standing and lodged seed stalks in each plot. Seed yield by planting date was determined from 2 random locations in each plot by hand harvesting seed from a 4 ft^2. area. Seeds were allowed to dry at room temperature and seed fill determined by removing the palea and lemma to determine condition of the grain.

Table 1. Percent stand, seed yield, seed quality and available seed on the ground of 'Chiwapa' Japanese millet at Quitman county site, 15 December 2004.

Planting Date	Percent Stand	Yield	Seed Fill[1/]	Available Seed on the Ground[2/]
June 16	43	80	3	1
July 19	72	144	5	2
August 13	0	0	0	0

1/ Seed fill rating - 1= good; 3 = fair; 5 = poor
2/ Available seed on the ground - 1= good; 3 = fair; 5 = poor

Summary

The July 19 planting produced the highest percent stands and the highest seed yield, but seed quality was lower than for the June 16 planting. We had expected that percent stand and seed yield should have been higher for the July 19 planting because the soybeans would have reached peak production in late July and begun to senesce, allowing the millet to begin to make growth. Although seed availability was good in December the seed quality, as measured by percent fill, was poor. Poor seed fill was attributed to low rainfall which was encountered in late summer and early fall. We also saw this at the PMC, where a foundation seed field of 'Chiwapa' Japanese millet did not produce as much filled seed as was harvested in the previous year. This was due to extremely low rainfall at the PMC (no measurable rainfall in September) that negatively impacted seed set.

The lowest percent stand was observed in the August 13 and June 16 plantings (Table 1). Observations made in July indicated that a significant amount of seed germinated in the June 16 plots, but canopy cover from the soybean reduced the sunlight available for the millet to make substantial growth. Seedlings observed beneath the soybean canopy in July were extremely weak. It is interesting to note that millet growing in the tractor tracks was vigorous and more productive, which supports the theory that sunlight was the limiting factor effecting June planted millet growth into Group IV soybeans. Although the measured seed yield was lower than expected, a significant amount of seeds that shattered from the plant would be considered available for migratory birds or for reseeding. Seed quality in June 16 plots was fair.

Poor results in the August 13 planting were due to the lack of rainfall at planting time. A limited amount of seed germinated but, because rainfall was sparse, seedlings did not survive.

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

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, and 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, and Lynn Ellison

2004

Efficacy of Chemical Seed Treatments and Stratification to Overcome Dormancy in Eastern Gamagrass Seeds -- Janet Grabowski and Joel Douglas

Converting Pastureland in Mississippi to Loblolly Pine -- Janet Grabowski, Joel Douglas, Lynn Ellison, and Alan Holditch

Cover Crops for Conservation Tilled Cotton -- Joel L. Douglas, Walter J. Jackson, and James Parkman

Using Native Little Barley as a Cover Crop -- Janet M. Grabowski, Joel L. Douglas, James S. Parkman, and Joe R. Johnson

Influence of Nitrogen Fertilization on Seed Production of Highlander Eastern Gamagrass in northern Mississippi -- Joel L. Douglas, Janet M. Grabowski, David Lang, Paul Meints, and Robert Elmore