Jamie L. Whitten Plant Materials Center

2004 Progress Report of Activities

April 2005

INSIDE THIS ISSUE

This document highlights several activities and products of the USDA-NRCS Jamie L. Whitten Plant Materials Center completed during 2004

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NRCS
Natural Resources Conservation Service

What We Do

The Jamie L. Whitten Plant Materials Center (PMC), located in Coffeeville, Mississippi, is operated by the USDA Natural Resources Conservation Service (NRCS). Our mission is to develop, test, and transfer effective state-of-the-art plant science technology to meet the resource needs of our customers. Our program has an excellent internal system for identifying current and future plant materials needs, coupled with a seamless system of product development and program delivery.

By working with a broad range of plant species, including grasses, forbs, trees, and shrubs, the PMC seeks to address priority needs of NRCS field offices and land managers in both the public and private sectors.

Conservation Objectives

The PMC works closely with NRCS field offices and land managers on a broad range of conservation concerns and issues. Pastureland Improvement, Cropland Erosion Control, Critical Area Erosion Control including Urban Conservation, Wildlife Habitat Enhancement, and Water Quality Improvement are the major conservation issues in our service area, which includes Mississippi, the delta regions of Arkansas, Louisiana, western Tennessee, southeastern Missouri, southwestern Kentucky, and the Blackland prairie of central Alabama.

To accomplish our mission objectives, we generate numerous products including plant releases, written plant science information, and public presentations. This document provides a brief review of many PMC activities accomplished during 2004.

PMC Service Area

Warm-Season Grass Cultivar Development

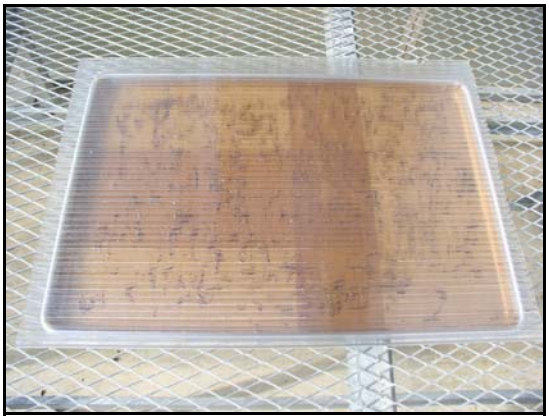
Recognizing the importance of and need for adapted native, warm-season grasses for NRCS conservation practices (e.g., 327, 386, 512, 601, 643, 645) and USDA farm bill programs (e.g. CRP, WRP, EQIP), the PMC began working cooperatively with Mississippi State University (MSU) to accelerate the development of cultivars of little bluestem (*Schizachyrium scoparium*), switchgrass (*Panicum virgatum*), beaked panicum (*P. anceps*), purpletop (*Tridens flavus*), big bluestem *(Andropogon gerardii*), and, Indiangrass (*Sorghastrum nutans*) for the southeastern US.

MSU is concentrating on developing cultivars of big bluestem, Indiangrass and a tall, high-yielding switchgrass for bioenergy production. The PMC is addressing the other species listed, as well as attempting to develop a shorter switchgrass cultivar for forage and conservation use.

Establishing native, warm-season grasses is a challenge. Seed dormancy often hinders uniform seedling emergence and excessive weed competition seriously affects early stand development and seedling growth. The PMC and MSU are using a selection strategy that capitalizes on early germinating seeds within the population to develop cultivars with reduced seed dormancy that germinate quickly, compete with weeds, and are more appealing for use in conservation practices (e.g. erect growth and short stature).

Collecting seed of little bluestem at the PMC

Little bluestem seedlings produced in 2004 were the first cycle of selection, consisting of the earliest germinating of the seeds collected from the mother plant nursery. Testing showed that germination percentages had been improved somewhat in this population compared to seed from the mother plant nursery, but further selection is necessary. The earliest germinating seedlings from these plants will be planted in 2005.



Little bluestem seeds germinating in shallow pans

Purpletop seedlings were from the second generation of selection. Seeds germinated well and the plants were very uniform. This population was selected for increase and release. Additional research conducted at the PMC demonstrated that much of the seed dormancy is caused by the lemma and palea (hulls) surrounding the caryopsis. Effective seed cleaning methods must be developed to remove these coverings in order to facilitate planting and improve germination.

Twelve, low growing (< 5 ft.) switchgrass accessions were identified from an assembly of 92 accessions and used to establish a mother plant nursery in 2002. Seeds were collected from each plant in the nursery in September of 2004. Germination tests are underway to select early germinating elites for further evaluation and testing.

Progress with beaked panicum has been slow compared to the other grasses, but several early germinating plants were identified and planted in a mother plant nursery. Seeds will be collected from these plants in 2005 for further selection.

MSU has isolated early germinating individuals of Indiangrass, big bluestem and switchgrass. They have made significant progress in improving germination rates in all three of these species. They have identified seedlings of switchgrass that can germinate as quickly as 4 days after planting.

Highlander Eastern Gamagrass

In 2003, the PMC, in cooperation with the Mississippi Agricultural and Forestry Experiment Station (MAFES) and the Jimmy Carter PMC in Americus, Georgia, released 'Highlander' eastern gamagrass (*Tripsacum dactyloides*) for forage (512) and erosion control (327) in the Southeast.

Highlander eastern gamagrass

Highlander is capable of producing hay yields in excess of 5 tons per acre per year when properly managed. It can also be grazed; however, it is susceptible to damage from overgrazing and animals should be rotated regularly to allow adequate regrowth. The massive root system of Highlander also provides erosion control and the stems and leaves provide cover for wildlife.

Highlander seed produced at the PMC was provided to the MAFES Foundation Seed Stock for commercial seed increase. Seed should be available for use by landowners in the next 2 to 3 years. Eastern gamagrass seed lots are difficult to clean effectively without specialized seed cleaning equipment (e.g. gravity separator). In order to ensure that all commercial producers produce high quality seed, an application for plant variety protection was submitted in 2004.

A document to register the cultivar in the journal *Crop Science* was prepared in 2004 and published in early 2005. A planting guide is being prepared and will be available for seed growers and other individuals interested in Highlander in 2005.

Hard fruit coverings hinder germination of eastern gamagrass seedlings. This dormancy is typically treated by exposure to cool, moist conditions (stratification).

We wanted to determine what amount of stratification provided best germination of Highlander seeds, so we stratified seeds for 0, 2, 4, 6, 8, and 10 weeks. Seeds harvested in 2003 were treated in a staggered fashion so they were all planted in the greenhouse in early May. Germination counts were taken weekly for five weeks, then ungerminated seeds were recovered from the potting medium, and opened to determine seed quality. From this data, the percentage of good seeds that actually germinated was calculated. In 2004, germination was highest for the 8 week stratification treatment, followed by the 6 and 10 week periods.

Stratified Highlander seeds

We also wanted to determine how long seed producers could hold stratified seeds in storage without impairing germination. Storage periods tested were 0, 2, 4, 6, 8, 10, and 12 months. Procedures were similar to those of the previous test, except that each storage period was tested separately in the germinator. Because more than one calendar year is required to complete this test, final results for the 2002 seed lot were compiled in 2004. Germination percentages were similar for the 2 month, 4 month, and 6 month storage periods and decreased with longer storage. There was a higher percentage of poorly-filled seeds in this lot than were present in the 2001 lot. Seed germination for that lot did not decline with length of the storage period. Testing of seeds harvested in 2003 began in 2004 and will be completed in 2005. Initial seed fill for this lot was high, similar to the 2001 seed lot.

Alley Cropping Demonstration

Alley cropping (311) is an agroforestry practice that may appeal to many landowners. In alley cropping, trees or shrubs are planted in rows, with agronomic, horticultural, or forage crops grown in the alley between the rows of trees, allowing farmers to derive economic returns from the crop in the alley until the woody plants mature.

The PMC is cooperating with the National Agroforestry Center to demonstrate alley cropping on marginal cropland in the Southeast. Tree species include pecan, which can provide income from nut production as well as high value timber, and green ash, a fairly fast-growing timber species. Trees are planted in single rows along the general contour of a five acre field with a 6% slope on angles convenient for farming.

Corn was drilled into the alleys on March 23, 2004. The corn variety used was not Roundup-Ready because we were concerned that the trees might be damaged by three consecutive years of glyphosate applications, however, it did contain the BT gene. Fertilizer and herbicides were applied according to standard agronomic practice. Average yield was 215 bu/acre. The high corn yields on this sloping field can be explained by above normal, well-distributed rainfall during the growing season and ideal soil drainage. Soybeans will be no-till planted in the alleys in 2005.

Combining corn in the alley cropping field

Wildlife Habitat Enhancement

In addition to developing warm-season native grasses that are considered critical for improving wildlife habitat, the PMC is also actively testing other kinds of plants for wildlife food and habitat (643, 645).

In 2004, the PMC began a demonstration, with cooperation from Kevin Nelms, Area 4 Wildlife Biologist, to demonstrate the feasibility of establishing 'Chiwapa' Japanese millet (*Echinochloa frumentacea*) in a standing crop of soybeans on several producer's fields in the Delta. The theory is that Chiwapa seed could be flown on the fields in the summer and produce a seed crop for wildlife in the fall. So far, the June 15 and July 15 planting dates both look promising; however, additional testing is required.

Hopefield Selection trailing wildbean (*Strophostyles helvula*) is a native, vining legume released for wildlife habitat and critical area plantings. Cultural practices to increase seed harvests are being investigated. We used a reduced seeding rate of Lark Selection partridge pea (*Chamaecrista fasciculata*) as a nurse crop for the wildbean to climb on to facilitate combine harvesting, since both mature seed almost concurrently. Grain sorghum, which was grown as a maintenance crop in 2003, was another treatment to see if the standing residue could support the vines. These treatments will be compared to our standard practice, which is to grow the wildbean in rows with no companion crop. Highest yields in 2004 were in the plots with grain sorghum stubble.

Trailing wildbean climbing partridge pea plants

Little Barley Cover Crop

Cover crops (340, 327) can prevent soil erosion on cropland during the winter months, but are not widely used in the mid-South due to the annual costs of replanting. Little barley (*Hordeum pusillum*) is a native, cool-season grass that can form dense natural stands in some crop fields. NRCS agronomists in Mississippi, North Carolina, and Georgia have expressed an interest in demonstrating the benefits of using natural stands as cover crops for cotton and also in developing seed sources that could be planted for this purpose. Assuming that burndown for cotton planting would take place on April 15, the naturally early-flowering little barley might produce enough viable seed to maintain stands without replanting, which would increase its usefulness.

Little barley inflorescences (center)

In order to determine the cover crop potential of little barley, we began a study in 2002 to compare it to typical cover crops like wheat, hairy vetch, and crimson clover. The cover crops were planted in October 2003 at their recommended planting rates and little barley was planted at a rate of 75 seeds per square foot. Stand ratings were taken once during the winter to determine early cover and in mid-March and mid-April. A small plot harvest was made on the final rating date to determine dry matter yields. Little barley provided 89-96% ground cover at all rating dates in 2004 and wheat had the highest yields. Further research on planting rates is needed to determine a rate that would be economically feasible. Hairy vetch provided little early cover compared to the other species.

Burndown chemicals are another expense associated with cover crops. We wanted to determine if it was possible to reduce the recommended rates of glyphosate (Roundup) and paraquat (Gramoxone)(1 lb a.i./acre for both) by 1/4, 1/2, and 3/4 and still attain adequate control of little barley. Visual control ratings were made at 7 and 14 days after spraying and percent control was determined at 14 days. Roundup rates could be reduced by 1/2 and still provide comparable control to the full rate. Gramoxone rates could only be reduced by 1/4 and still provide adequate burndown.

The usefulness of little barley as a cover crop has been demonstrated by this testing and the experience of growers using it for this purpose. The next logical step is to develop a source of little barley for commercial production. We made collections of little barley seed in Mississippi in 2004 and obtained others from the PMCs in Georgia and Maryland. These accessions were planted in October of 2004 and will be evaluated to select a vigorous, early flowering population of plants for seed increase and release.

Improving Soil Below Vegetative Barriers

In 1991, the PMC established a demonstration planting to show the effectiveness of vegetative barriers (601) to prevent soil movement off sloping cropland. Vegetative barriers are narrow rows of stiff grasses planted perpendicular to the slope of the field to slow water movement and intercept sediment that moves with the water. We planted several types of plants in the barriers and fallowed the areas between to accelerate erosion. The barriers were very effective in preventing soil loss; however, the soil immediately below the barriers is now highly degraded. Seth Dabney at the ARS Sedimentation Lab in Oxford was interested in looking at methods to improve the soil below the barriers. Up to this point we, have not been able to implement this study, so we have grown crops in the areas between the barriers. However, in 2005, another ARS researcher, Ardeshir Adeli, will assist with this study using poultry litter and tillage treatments to improve the soil. The crop rotation will be corn followed by wheat, double-cropped with soybeans.

2004 Highlights

Technology from the Jamie L. Whitten PMC is an integral part of the NRCS strategic plan. The goals of providing a productive natural resource base and a high quality environment can not be realized without sound plant science technology.

Plant Materials in Production

Lark Selection Partridge Pea
'Quail Haven' Reseeding Soybean
'Halifax' Maidencane
'Highlander' Eastern Gamagrass
'Chiwapa' Japanese Millet
'Meechee' Arrowleaf Clover
Morton Germplasm Shrub Willow
9062821 Switchgrass
9002928 Beaked Panicum
Pangburn Switchgrass
Wetland Plants (3 species)
Mississippi Wildflowers (7 species)

Active Studies

PMC Objectives	Number
Cropland	5
Pasture/Hayland	4
Critical Area/Buffers	4
Wildlife Habitat	4
Total Studies	**17**

Written Technology Transfer

Type of Publication	Number
Annual Reports	2
Major Publications	1
Abstracts	2
Technical Papers	2
Plant Notes	1
PVP Application	1
Newsletters	2
Total Publications	**11**

Oral Technology Transfer

Type of Presentation	Number
National Presentations	3
Regional Presentations	0
Local Presentations	7
Training Presentations	2
PMC Tours	5
Total Presentations	**17**

Looking for Information on Vegetative Solutions to Conservation Problems?

Visit the Plant Materials Program Website!
Plant-Materials.nrcs.usda.gov

- Plant Fact Sheets on conservation plants
- Information on obtaining conservation plants
- Publications and technology development from 26 PMCs across the country
- New improved plants, uses, and technology
- Links to websites with additional or supporting information

United States Department of Agriculture
Natural Resources Conservation Service

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