

# ELSBERRY PLANT MATERIALS CENTER

## 2009 Progress Report of Activities

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## Biofuel Evaluation

### PMC Study: In-Field Weathering effects on Biomass Yield and Biofuel Quality of Warm Season Grasses

In the third year of this study, the objective is to provide information on biofuel quality and biomass yield of selected warm season grasses in relation to the effects of weathering in the field throughout the winter. The quality of biomass is very important, whether it is to be used for direct combustion or gasification. Conventional boilers can incur problems when the amount of alkali metals present, in the biomass being used, are too high. In the gasification process, the biomass needs to have a high concentration of lignocellulose, while maintaining low moisture, nitrogen and ash content. Biomass quality tests

from this study are being performed at Mississippi State University. The biomass yield data comes from the cuttings taken at the plant materials center. Six different cultivars are currently being tested. Each cultivar has been planted into four replications in plots containing 7 rows, 20 feet long, with 36 inch row spacing. There are five different harvest dates that began with seed maturity harvest and continued every six weeks for four more cuttings. Seed maturity started approximately around September 15 and the last cuttings were completed around mid-March. The interior 5 rows were clipped for biomass quantity and small samples taken for biofuel quality estimates. These small samples have been sent to Mississippi State University for quality testing. The data collected from these plots will evaluate the affects of fall, winter and early spring harvest on dry matter production and biofuel quality.

**Species being evaluated in this study:**

- ‘Cave-In-Rock’ switchgrass
- ‘Kanlow’ switchgrass
- ‘Rumsey’ Indiangrass
- 9083274 big bluestem (MOPMC)
- ‘Alamo’ switchgrass
- ‘Freedom’ *Miscanthus giganteus* (sterile)

This study is in cooperation with the USDA-NRCS Technical Center, Fort Worth, TX; USDA-ARS, Temple TX; Mississippi State University, Starkville, MS; and the USDA-NRCS PMC in Knoxville, TN.



A *Miscanthus giganteus* plot can be seen in this photo standing above the other warm season grasses. Miscanthus is a non-native perennial grass that has potential in the production of ethanol and energy, but caution is apparent with this non-native species.

**2008 Averages for Lodging and Biomass Quantity**

	Lodging at Harvest 1=No Lodging 5=Extreme Lodging						Yield (Pounds/Acre)					
	Seed Maturity Cutting	2 <sup>nd</sup> Cutting	3 <sup>rd</sup> Cutting	4 <sup>th</sup> Cutting	5 <sup>th</sup> Cutting	Ave.	Seed Maturity Cutting	2 <sup>nd</sup> Cutting	3 <sup>rd</sup> Cutting	4 <sup>th</sup> Cutting	5 <sup>th</sup> Cutting	Ave.
Cave-In-Rock Switchgrass	1.3	1.3	1.4	1.5	1.5	1.4	9,944	10,177	11,628	6,749	6,880	9076
Big Bluestem 9083274 (Epic)	2.0	2.0	2.8	3.6	3.8	2.8	11,118	12,264	10,802	7,788	8,698	10134
Alamo Switch	3.7	2.8	1.9	2.0	1.5	2.4	15,894	15,818	12,944	12,879	12,514	14010
‘Freedom’ Miscanthus	1.3	1.0	1.1	1.0	1.0	1.1	21,630	24,388	23,619	29,011	24,515	24633
Kanlow Switch	2.3	2.3	3.4	2.1	1.6	2.3	15,835	15,124	15,869	12,182	12,624	14327
Rumsey Indiangrass	4.3	4.3	4.3	4.3	4.4	4.3	13,150	12,811	13,528	10,097	11,192	12156

The data in the chart above shows lodging ratings and amount of biomass harvested starting at seed maturity and continuing every six weeks for four more cuttings. These cuttings started approximately mid Sept. and ran through the beginning of March.

## 2009 New Releases

In 2009, the Elsberry Plant Materials Center released two source identified plants, Northern and Western Missouri Germplasm pale purple coneflower (*Echinacea pallida*). These two releases originated from the former Missouri Ecotype Program, but with commercial interest still high for this species, the decision was made to continue with these releases. The Northern Missouri Germplasm collections came from counties north of the Missouri River in Missouri. The Western Missouri Germplasm collections came from counties south of the Missouri and are along the western side of the state. These counties make up the Osage prairies in Missouri.



Pale purple coneflower, *Echinacea pallida*, attracting a bee.

Pale purple coneflower is a showy forb that blooms from June to July. The flower, with the large dark seed head and long, pink, drooping petals, attracts many insects, primarily bees. This species would make an excellent choice in a pollinator seeding mixture.

### Update on Low Growing and Flood Tolerant Switchgrass

There is a need for an adapted variety of a dense low growing, strongly rhizomatous switchgrass for filter strips and field borders. Back in 1990, the Elsberry PMC started with collections of a low growing switchgrass and proceeded to select the best plant material from these collections. Increase plots of the selected low growing switchgrass were established and test plantings were established. These test plantings proved that

the selection needed improvement to enhance seedling emergence. Compared to Cave-in-Rock, a proven variety, the low growing selection had significant differences when it came to seed dormancy and seedling vigor.

The same held true for the flood tolerant selection of switchgrass. This selection was an accidental finding after the flood of 1993. The evaluation block of low growing switchgrass was located in a bottomland field at the PMC and in 1993 it was flooded for approximately 8 weeks. When the flood waters had receded, the plot of one-hundred and eighteen collections had died, except for 3 collections. These collections made up the selection of flood tolerant switchgrass. This selection performed well under flood conditions, but it still had problems with seed dormancy and seedling vigor.

Non-Stratified Seed	Avg.% Germ
Low Growing Switchgrass SG0	25
Low Growing Switchgrass Cycle 1	68
Flood Tolerant Switchgrass SG0	27
Flood Tolerant Switchgrass Cycle 1	22
Cave-in-Rock Switchgrass	81

  

Stratified Seed	Avg.% Germ
Low Growing Switchgrass SG0	56
Low Growing Switchgrass Cycle 1	85
Flood Tolerant Switchgrass SG0	73
Flood Tolerant Switchgrass Cycle 1	76
Cave-in-Rock Switchgrass	85

The SG0 seed is the seed from the original selection plots and the Cycle 1 seed is the seed from the improved germination plots. In this evaluation, the two generations of low growing and flood tolerant switchgrasses are compared against each other in both stratified and non-stratified seed treatments. The low growing switchgrass, in both cases (stratified and non-stratified), seemed to have made improvements in shortening the seed dormancy. The flood tolerant switchgrass, according to the data, did not make any improvements. One possible reason for this, both the SG0 and Cycle 1 plots were flooded for several weeks in 2008 just prior to flowering. This test will be duplicated using 2009 seed.

In 2007, seed was taken from the increase plots of both the low growing and flood tolerant switchgrass. One hundred plants were grown out in the germinator and the criteria was that each seedling had to germinate within 7 days. These plants were transplanted into a crossing block and allowed to produce seed. This seed was then collected, along with seed from the original blocks, and they were compared against each other for seed germination. Cave-in-Rock switchgrass was also tested as an outside comparison. The data in the chart shows the averages of 4 replications for each generation, 100 seeds each, both stratified and non-stratified.

## Who We Are

The Elsberry Plant Materials Center (PMC) is a program within the Natural Resources Conservation Service (NRCS), a branch of the United States Department of Agriculture. The Elsberry PMC is one of 27 plant materials centers located throughout the United States. Areas serviced by the Elsberry PMC include Missouri, Iowa, and Illinois. The Center is located approximately 60 miles north and west of St. Louis, Missouri on Highway 79.

## Program Emphasis

It is our mission to develop and transfer effective state-of-the-art plant sciences technology to meet customer and resource needs. NRCS Plant Materials activities are consistent with the objectives of the U.S. Department of Agriculture and NRCS Strategic Plans, namely to provide timely and effective vegetative solutions for resource needs. Superior adapted plants are developed, tested, and released to commercial growers with production and management technology. Emphasis is on using native plants.

## Four Major Objectives Addressed:

- 1. Reduce Excessive Soil Erosion and Improve Water Quality through Biodiversity of Plant Species for Wildlife, Wetlands, and Restoration**
- 2. Increase Forage Quality and Quantity through Low Input Sustainable Agriculture**
- 3. Improve Water Quality by Controlling Run-Off, Utilizing**

## Nutrients, and Stabilizing Shorelines

- 4. Meet Additional Conservation Needs of Missouri, Iowa, and Illinois including plants for Biofuels and Urban Landscaping**

## New Employee at the Elsberry PMC



Nick Adams, PMC biological technician, comes to the Elsberry Plant Materials Center after working several years with the Missouri Department of Conservation. Nick has a BS degree in biology and environmental science from Illinois College.

To learn more about these and other Elsberry PMC activities visit our website:

<http://www.Plant-Materials.nrcs.usda.gov>

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