

UNITED STATES DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE
SOMERSET, NJ

and

RUTGERS UNIVERSITY-AGRICULTURAL EXPERIMENT STATION
NEW BRUNSWICK, NJ

NOTICE OF RELEASE OF TIMBER GERMPLASM
SELECTED CLASS SWITCHGRASS

The Natural Resources Conservation Service, U.S. Department of Agriculture and Rutgers University-Agricultural Experiment Station announce the naming and release of **Timber Germplasm** switchgrass (*Panicum virgatum* L.). Timber Germplasm switchgrass has been tested under the NRCS accession number 9081259. Timber Germplasm is being released as a Mid-Atlantic biofeedstock/biofuels crop.

Production Site Information: The production site is located at the Cape May Plant Materials Center in Cape May Court House, NJ. Cape May County, New Jersey is located in the Outer Coastal Plain (MLRA 153 D-Northern Tidewater Area.) Soil series at the Plant Materials Center include Downer loamy sand and sandy loam (NJ State Soil), Hammonton sandy loam, and Ingleside sandy loam. Average annual precipitation is about 42 inches. Approximately 52 percent of this amount falls during the growing season between April and September. The growing season ranges from 143 to 185 days. The Center is located in Plant Hardiness Zone 7b.

Plant Description: Timber Germplasm switchgrass is a native, perennial warm-season grass. Genetically, it appears to be a lowland type similar to the cultivar 'Kanlow'. It grows to a height of 6-8 feet (2.0-2.7m) and spreads by short rhizomes. Foliage height of mature plants is mostly between 5 and 6 feet (1.7-2 m), the panicle is open with a length ranging from 21-24 inches long (54-61 cm), often extending to a height of 6 to 8 feet (1.5-2.7 m).

Switchgrass has both sod and bunch-forming ecotypes. Bunch-forming ecotypes are generally encountered on uplands. In the Southeast, bunch-forming ecotypes have only short, vertically oriented rhizomes averaging 0.5 inch (1.4 cm) in length, while sod-forming ecotypes have both short, vertically-oriented rhizomes and long horizontally-oriented rhizomes (2 to 4 times longer than vertical rhizomes). Switchgrass roots may reach depths of 10 feet (3 m) or more.

Method of Selection: Timber Germplasm switchgrass is a composite of six experimental synthetic lines received from North Carolina State University in the early 1990s. Individual plants exhibiting high biomass production were selected from the original mix of experimental synthetic lines. These selected plants were transplanted to a 2000 sq. ft. polycross nursery in 1994. From 1995 to 2008, seed yields from the polycross nursery averaged between 4-8 pounds (cleaned). In 2009, seed from the polycross nursery was combined and plugs were grown and transplanted to establish a new larger (G1) seed production field of approximately ¼ acre. This was done to increase the seed production in anticipation of its release to the commercial market.

Tables 1 and 2 summarize the data collected by Dr. Stacy Bonos, Assistant Professor of Plant Breeding, and her colleagues at Rutgers University-Adelphia Research Farm in central New Jersey. These tables compare morphological and agronomic characteristics of Mid-Atlantic/Northeast germplasm of switchgrass to the Midwestern germplasm. Timber Germplasm compares closely to the Kanlow variety in plant height and panicle length and tends to lodge a little less than Kanlow. (Table 1.) Timber was also the highest yielding entry in 2006. (Table 2.)

In March 2009, samples were harvested from the Cape May PMC seed production fields to get an estimate of biomass production. The results are displayed in Table 3. Timber Germplasm was the highest yielding in biomass production.

Table 1. Morphological and agronomic characteristics of switchgrass cultivars grown in NJ in 2005 and 2006 (from Cortese et al., 2009).

		<u>Plant Height</u>		<u>Panicle length</u>		<u>Anthesis Date</u>		<u>Spot Blotch Disease</u>	<u>Lodging</u>
		2005	2006	2005	2006	2005	2006	2005	2006
		cm				--Julian day--		--1-10 scale†--	
Timber*	Lowland‡	157.2	240.6	53.9	61.2	242.1	202.6	7.2	7.3
Kanlow	Lowland	159.5	232.4	52.9	57.2	243.3	210.1	9.2	6.9
High Tide*	Upland	117.4	174.8	46.2	48.7	236.5	197.4	9.4	7.9
Pathfinder	Upland	106.5	158.7	47.5	44.9	233.7	190.6	6.7	3.5
Carthage*	Upland	122.5	180.2	63.9	63.8	233.9	194.0	6.9	6.3
196	Unknown	109.4	154.3	45.9	47.2	234.1	192.3	7.5	5.2
Turkey	Unknown	110.0	158.4	45.1	41.9	230.4	185.7	8.4	3.3
Caddo	Upland	106.4	158.7	47.5	44.6	230.3	187.4	4.8	4.0
Contract*	Upland	99.0	157.3	43.1	44.8	231.3	184.4	8.8	6.2
Shelter	Upland	100.0	158.4	37.0	36.6	233.1	181.0	8.3	7.5
Shawnee	Upland	110.4	154.9	47.2	42.1	234.7	190.7	4.9	4.2
Sunburst	Upland	109.8	160.4	35.8	39.7	236.1	185.3	7.5	6.6
Blackwell	Upland	124.2	175.1	46.9	46.2	234.3	192.8	5.3	4.3
Pav12	Unknown	103.3	155.5	34.0	36.2	230.7	178.3	10.0	4.7
LSD**		9.5	10.4	7.1	5.5	3.5	3.8	1.3	1.2

† Spot blotch disease and lodging were rated on a 1-10 scale, where 10= least disease or lodging.

* Northeast populations

‡ This population was not characterized but appears to exhibit very similar characteristics to the cultivar 'Kanlow' indicating that it appears to be a Lowland ecotype.

**LSD = Least Significant Difference $P=0.05$

Table 2. Biomass, lignin, and chemical composition of stems of switchgrass germplasm grown in NJ in 2006.

Population	Biomass	Lignin Content (ADL)	Cellulose Content (NDF)	Hemi-cellulose Content (ADF)	Ash Content	Cl Content
-----g/pl-----% dry weight-----						
Timber*	1292	9.41	38.12	32.38	1.34	0.15
Kanlow	1072	6.46	45.43	27.16	1.59	0.22
High Tide*	1012	9.29	41.79	26.68	0.38	0.25
Pathfinder	958	5.15	44.40	26.37	2.45	0.23
Carthage*	929	7.86	26.96	43.45	0.82	0.21
196	848	7.16	44.12	29.69	1.36	0.23
Turkey	848	8.03	44.05	29.07	1.70	0.21
Caddo	774	7.36	41.35	29.29	1.84	0.19
Contract*	735	6.87	41.54	26.99	1.19	0.27
Shelter	721	4.85	38.59	16.47	1.31	0.31
Shawnee	710	6.37	43.00	31.05	1.92	0.20
Sunburst	392	5.67	41.19	30.60	1.73	0.40
LSD**	405	1.6	NS	NS	0.6	0.12

* Northeast populations

**LSD = Least Significant Difference $P=0.05$

Table 3. Cape May PMC Biomass Yield Data –March 2009

	-----Variety-----				
	Carthage Switchgrass	High Tide Switchgrass	Atlantic Coastal Panic	Contract Switchgrass	Timber Germplasm Switchgrass
Sample A	4.25	4.19	5.44	4.88	5.94
Sample B	4.56	3.88	5.94	4.00	10.00
Sample C	4.56	4.19	5.56	4.44	7.06
Sample D	3.25	4.06	6.00	5.25	7.62
Sample E	3.75	4.75	5.94	4.25	7.94
Sample F	3.62	3.88	5.31	2.25	9.62
Average	4.00	4.17	5.70	4.18	8.03
Approximate yield/acre (tons)	5.16	5.36	7.35	5.39	10.30
Stand. Dev.	0.54	0.32	0.30	1.0	1.54
Harvested?	no	yes (combine)	no	no	yes (hand)
Area (Ft. ²)	≈16.875	≈16.875	≈16.875	≈16.875	≈16.875

Ecological Considerations and Evaluation: The Environmental Evaluation Worksheet developed by the Plant Materials Program was completed in 2000. (See attachment). This assessment indicated that this release has a low chance of negatively impacting the environment and was suitable for release to the commercial market.

Conservation Use: Primary use is for biomass production. Secondary uses include: critical area planting, conservation buffers and vegetative barriers.

Area of Adaptation: Timber Germplasm is well adapted to the Middle-Atlantic states of North Carolina, Virginia, Delaware, Maryland and New Jersey. (USDA-Plant Hardiness Zones 5b to 8a) but its northern limit is undetermined. Optimum soil type is a loamy to sandy, well drained soil however it will also grow on somewhat droughty to somewhat poorly-drained soils.

Availability of Plant Materials: Foundation seed will be maintained by the USDA-NRCS Cape May, NJ Plant Materials Center. Interested growers may request foundation seed by contacting the Plant Materials Center at 1536 Route 9 North, Cape May Court House, NJ 08210. Telephone: (609) 465-5901, Fax: (609) 465-9284

Acknowledgements: This release would not have been possible without the work of the following individuals who planted field evaluations, collected data and documented the research: Michael Fournier and Donald Hamer (retired), former Managers of the Cape May Plant Materials Center and Dr. Sandra Primard, former plant breeder, Cape May Plant Materials Center. Also, more recently the data collected by Dr. Stacy Bonos and her colleagues at the Rutgers University, Agricultural Experiment Station.

Literature cited:

1. Bonos, Stacy A., L. Cortese, Jo. A. Crouch, E. Weibel, C.F. Miller, and W.B. Skaradek, "Morphological and Molecular Analysis of Fourteen Switchgrass Populations Grown in New Jersey." New Jersey Turfgrass Symposium Proceedings/ 5th Eastern Native Grass Symposium, Harrisburg, PA
2. Bonos, Stacy , Zane Helsel , and William Hlubik. Switchgrass Production and Use in New Jersey. Rutgers Cooperative Extension Service Fact Sheet 1075. 2008
3. Cortese, Laura, J. Honig, C. Miller, and S.A. Bonos. Genetic Diversity of Twelve Switchgrass Populations Using Molecular and Morphological Markers. Submitted to Bioenergy Research September 16, 2009.
4. Cortese, Laura, and Stacy Bonos. "Evaluation of Bioenergy Traits in Ten Populations of Switchgrass Grown in New Jersey." For Presentation at the ASA-CSSA-SSSA 2009 International Meeting in Pittsburgh, PA.

5. J.C. Burns, E.B. Godshalk, and D.H. Timothy. Registration of BoMaster Switchgrass. Journal of Plant Registrations, Vol. 2, No. 1, January 2008.
6. Moore, Kenneth J., and Bruce E. Anderson. 2000. **Native Warm Season Grasses: Research Trends and Issues**. Crop Science Society of America. Special Publication # 30.
7. Alderson, James and W.C. Sharp. **Grass Varieties of the United States**. Agricultural Handbook No. 170. USDA-SCS. 1994
8. USDA-Natural Resources Conservation Service. 2000. **National Plant Materials Manual**, Title 190. Washington, D.C., U.S. Government Printing Office, June 2000.

Prepared by:

Christopher F. Miller
Plant Materials Specialist
Cape May Plant Materials Center
Cape May Court House, NJ 08210

Reviewed by:

Ramona Garner
Regional Plant Materials Specialist
USDA-NRCS
East Region Technology Support Center
Greensboro, North Carolina

Dr. Stacy Bonos
Assistant Professor
Dept. of Plant Biology and Pathology
Cook College, Rutgers, The State University of NJ

8/28/2009

Signatures for release of:

Timber germplasm switchgrass (*Panicum virgatum*)



Name

Thomas Drewes

State Conservationist, New Jersey

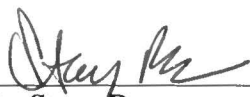
United States Department of Agriculture

Natural Resources Conservation Service

Somerset, New Jersey

Date

9-17-09



Dr. Stacy Bonos

Asst. Professor, Dept. of Plant Biology and Pathology

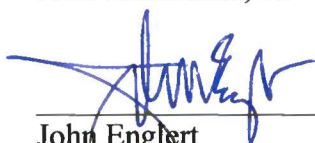
Cook College

Rutgers, The State University of NJ

New Brunswick, NJ

Date

9/17/09



John Englert

Program Leader, National Plant Materials Program

United States Department of Agriculture

Natural Resources Conservation Service

Washington, D.C.

Date

9/18/09