Wheatgrass Biofuel Variety Trial
National Plant Materials Center
Beltsville, Maryland
2007-2008 Interim Report

SUMMARY

Tall wheatgrass and intermediate wheatgrass are well adapted to the Northeast, and other moist and cool environments, and produce large quantities of biomass with potential for use as a biofuel. In cooler growing areas, wheatgrass may require fewer inputs of herbicides to control weeds than switchgrass, another potential biofuel, which is less adapted and less competitive with cool-season weeds. In addition, wheatgrass establishes quickly in 1 year, whereas switchgrass may take 2 or 3 years to reach full production.

This trial is being conducted by NRCS at the National Plant Materials Center (NPMC) in Beltsville, Maryland. Similar wheatgrass biofuel variety trials are being conducted at other plant materials centers (MI, NY, CA, OR, AZ, MT, WA, CO, ID, and NV) as part of an inter-center strain trial.

The objective of the study at the NPMC is to determine the yield differences of tall wheatgrass cultivars and an intermediate wheatgrass when grown in Maryland in a simulated biofuel production system. Yield information will help farmers evaluate varieties of wheatgrass for the production of biofuels and optimize production in a sustainable manner that will conserve natural resources and benefit the farmer's bottom line.

EXPERIMENTAL DESIGN AND CONDUCT

The trial includes 4 varieties of tall wheatgrass and 1 variety of intermediate wheatgrass. The trial was conducted on Galestown-Evesboro loamy sands, 0-8% slope, somewhat excessively drained (available water holding capacity in a 60-inch soil profile is about 3.7 inches). Varieties were seeded in six-row plots with a 5-inch row spacing using a cone-seeder. All varieties were seeded September 25, 2007. Two seeding rates for 'Szarvasi-1' tall wheatgrass at 20 and 40 pounds pure live seed (PLS) were used. The remainder of the entries were seeded at 20 lbs PLS per acre. Varieties and seeding rates are listed in Table 1. The trial was planted in a randomized complete block design with four replications. Plot size was 3 ft. × 20 ft. with yield measurements taken from the entire plot area. Soil test (10/4/07) values were pH 5.6, P = 142 ppm (very high), and K = 65 ppm (low). Pelletized dolomitic lime was applied at 1 ton/acre in early May 2008. Nitrogen was applied at a rate of 100 pounds per acre at the beginning each growing season. Irrigation was only applied during establishment (2007) and was not applied in 2008.

The plots were not harvested until 2008 to allow grasses to fully establish. Cuttings were made using a Carter flail-type harvester and cut to a height of 8 inches. Plots were harvested once on July 2, 2008. Dry matter yields for this harvest are reported in Table 2. Harvested material was

weighed green in the field and samples were collected for dry matter (DM) determinations from 2 of the 4 replications.

Table 1. Cultivars Used and Seeding Rates.

Scientific Name	Common Name	Cultivar Name	Seeding Rate (PLS#/acre)
Thinopyrum ponticum	Tall Wheatgrass	'Alkar'	20
Thinopyrum ponticum	Tall Wheatgrass	'Largo'	20
Thinopyrum ponticum	Tall Wheatgrass	'Jose'	20
Thinopyrum ponticum	Tall Wheatgrass	'Szarvasi 1'	20
Thinopyrum ponticum	Tall Wheatgrass	'Szarvasi 1'	40
Thinopyrum intermedium	Intermediate Wheatgrass	9051920	20

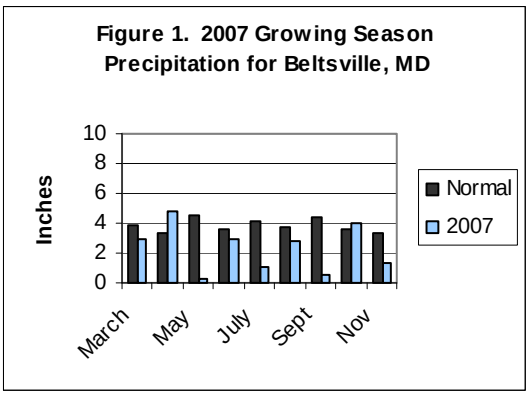
INTERPRETING DATA

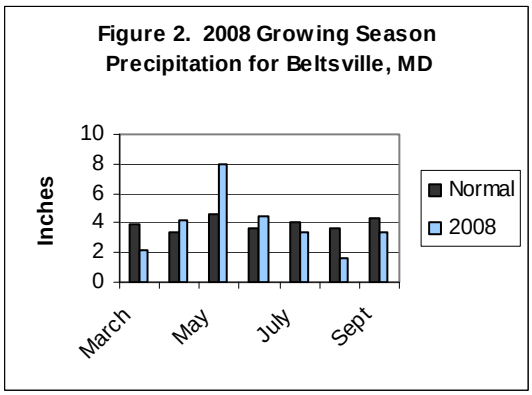
Analysis of variance was conducted using the Randomized Complete Block Model from Statistix 8 (v 8.2, 2007, Analytical Software, Tallahassee, FL). Fisher's Least Significant Difference Test (LSD) was used to determine the differences between variety means for each year. Significance was determined for all analyses at the 0.05 probability level.

The LSD value represents the threshold of forage yield above which varieties must differ in order for the yields to be significantly different, or in other words, not happening by chance alone. The value for coefficient of variation (CV) is a measure of the relative variation. In forage trials, the CV for yield is typically between 5 and 15 percent. Uncontrollable or immeasurable variations in soil type, soil fertility, soil moisture and environmental factors contribute to increased CV values.

PRECIPITATION

The precipitation amounts by monthly total for the trial period growing seasons are reported in Figures 1 and 2. In the 2007 growing season, there was overall below average precipitation and extremely low precipitation in September and early October around the time of seeding. Precipitation in 2008 was above average for April, May and June, but below average in March, July, August, and September.





YIELD

Germination and establishment for all treatments were excellent. All plots achieved and maintained 100% stands with very few weeds. Despite uniform establishment, there was a large amount of variation in growth in 2008. This variation was clearly due to some variation in the field as shown in Figures 3 and 4. The source of this variation was not obvious, but could have been caused by some variation in the pH of the soil. The pH may have varied slightly above and below a pH threshold where the growth of the wheatgrass is greatly limited below this level. Wheatgrass is known to prefer alkaline soil. Prior to planting, the field had a pH of 5.6. Lime was not applied until early May, 2008. The low pH likely limited growth during establishment in fall 2007 and spring 2008. Growth improved after lime application, but adjustment of pH occurs slowly and may not have adjusted uniformly at the same rate over the entire field.

Summary of yields and stand scores are reported in Table 2. Varieties are ranked according to yield performance for 2008.

Table 2. Yield data for 2008, ranked by total.

Cultivar Name	Dry Matter Yield (lbs/acre) July 2, 2008
'Szarvasi 1' (40 lbs/acre)	3772
9051920	3757
'Largo'	3288
'Jose'	3281
'Szarvasi 1' (20 lbs/acre)	3071
'Alkar'	2891
Mean	3343
LSD[1/] (0.05)	2235
% CV[2/]	42

1/ = least significant difference test at 5% level of probability;
2/ = coefficient of variation

RESULTS AND DISCUSSION

Results for 2008 are not significant due to the very large variation in growth that occurred in the field. The large growth differences were apparently related to the location of plots within the field and not the cultivar or replication. This variation occurred within each of the replications and therefore could not be eliminated from the analysis of the data and has resulted in a very high coefficient of variation. With the addition of another 1 Ton of lime per acre in January 2009, and more time for the original application to have adjusted pH, growth and uniformity of growth is expected to improve in 2009.

CONCLUSIONS

No conclusions can be made at this time. The yield results that this study was designed to test are not significant due to very large variations within the study area. The cause of the variation is unknown, but was likely due to differences in soil pH throughout the field, but this was not verified in this study.

For further information, contact:

R. Jay Ugiansky
USDA-NRCS, National Plant Materials Center
Building 509, BARC-East
Beaver Dam Road
Beltsville, MD 20705
Phone: (301) 504-8175
Fax: (301) 504-8741

This document should be cited as:
Ugiansky, R.J., 2009. Wheatgrass Biofuel Variety Trial, National Plant Materials Center, Beltsville Maryland, 2007-2008 Progress Report. USDA, NRCS. 4p.

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February 2009

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