Executive Summary of Annual Report: New Variety Development and Testing of Small Grains in Maryland for Higher Yield and Disease Resistance
MGPUB Grant Proposal Number 2016332

Jason P. Wight – Field Trials Coordinator, jpwight@umd.edu
Angus Murphy – Professor and Chair
Aaron Cooper – Laboratory Research Technician
Louis Thorne – Laboratory Research Technician
Alyssa Mills – Undergraduate Lab Assistant

- **Performed statewide evaluation using data from 56 commercial wheat lines in a total number of 1,008 plots across five locations within Maryland. Selection of the highest-yielding Maryland State Trial Varieties versus average performers resulted in a yield gain of 6.9 bu/A. Top performer had an average statewide yield of 82.5 bu/A while the lowest yielding variety averaged 67.6 bu/A, statewide.**
- **Performed statewide evaluation using data from seven commercial barley lines in a total number of 42 plots across two locations. The statewide leader was 89.5 bu/A while selection of the poorest yielder averaged 53.9 bu/A.**
- **Planted Statewide Trials of 57 commercial wheat lines and 6 barley lines for a total of 1,062 plots. Data collected will include yield, test weight, maturity, height, lodging, baking and milling quality.**
- **Performed an inoculated and misted scab nursery to measure the fusarium resistance of all wheat lines submitted to the statewide variety trials.**
- **Released six lines with high yield potential and excellent scab resistance to Limagrain Cereal Seeds, they are 15MW134 15MW64134, 15MW315, 15 MDX19, 15MDX20. These likes are on an accelerated release schedule to speed their availability to producers.**
- **Increased (planted a small block of each) 7 elite wheat breeding lines for final testing and preparation to release.**
- **Collaborated with breeders in three uniform wheat nursery trials and two uniform barley nursery trials, planting 529 total plots for evaluation of new germplasm under Maryland's conditions.**

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Jason P. Wight – Field Trials Coordinator, jpwight@umd.edu
Angus Murphy – Professor and Chair
Nathan M. Kleczewski – Extension Plant Pathologist
Aaron Cooper – Agriculture Technician Supervisor
Andrew Bauer – Undergraduate Lab and Field Assistant
Alyssa Mills – Undergraduate Lab Assistant

Overview

In preparation for the 2015 – 16 cropping year, Wight, Costa, Cooper and Murphy continued the advancement of wheat crosses made by Dr. Jose Costa. Investigators collaboratively planted with several public breeding programs; participating in five regional breeding nursery field tests, published the results of the 2015 Maryland State Wheat and Barley Trials, and planted the Trials for 2016. To improve options available to producers, six elite wheat lines were licensed to Limagrain Cereal Seeds. Another line, 15MW117 was released as a public variety that producers can save for cover crop, or yield under higher input management systems. Further, to assist producers in choosing lines which will help them meet reduced wheat DON goals, the research group performed an inoculated scab nursery, which stress tested all entries in the statewide trials for fusarium resistance.

Goals and Measurable Objectives

The Small Grains Breeding and Evaluation Program at the University of Maryland has two main objectives:

1) To produce impartial, statewide evaluation of the commercial and experimental lines of winter wheat and barley available to Maryland growers.
2) The collaborative misted Fusarium Head Blight Nursery between the Universities of Maryland and Delaware to evaluate new and current varieties of winter wheat and barley with increased disease resistance, high yield, and high quality for the mid-Atlantic Region.
3) To assist in the development of new varieties of winter wheat, grain barley, malting barley and triticale with increased disease resistance, high yield and high quality for Maryland.
4) To increase cool season small grains and cover crop planting options available to Maryland producers through new germplasm releases.

Objective 1) Statewide Variety Trials:

State trials grown across Maryland are an effective tool to compare the performance of new and current small grains varieties. Results from these trials provide growers with unbiased information for making decisions regarding their choice of variety, with a very broad number of entries from both private and public institutions.

Potential Economic Impact of Variety Selection Using Maryland's State Trial Data:

There was a statewide overall **performance spread of 14.9 bu/A**, from a maximum of 82.5 to a minimum of 67.6 bu/A**.** Mean yields were 76 bu/A. A conservative estimate of the financial benefit to producers, which would be **selecting the highest yielding variety versus the average yield, would mean an average gain of 6.5 bu/A. This would result in $31.14 profit per acre with wheat at $4.79/bu. Given the 260,000**

acres under wheat production in Maryland, this would translate to a statewide gain of $8.1 million annually. This information was derived from data collected on **1,026 wheat and 42 barley plots planted across Maryland in the 2015-16 season.**

The full information of the 56 lines tested in the State Variety Trials is posted online in the Agronomy Update No. 19 and was available beginning August 2016.
https://www.psla.umd.edu/extension/extension-project-pages/small-grains-maryland.

Table 1. Maryland State Barley Trials 2015-16 Yield Summary Table

		Wye		Heading	
		Yield	Test Wt	Date	Awn
Brand	Entry	bu/A	lbs/bu	(Julian)	Type
Virginia Tech University	Secretariat	89.5 *	47.9	109	A
Virginia Tech University	Thoroughbred	78.7 *	49.7	112	A
Virginia Tech University	Nomini	72.4	44.7	107	Al
Growmark FS	FS 501	65.1	44.5	111	Al
University of Maryland	12 PB #6	59.9	45.8	117	A
Virginia Tech University	Amaze 10	54.8	52.4	114	A
University of Maryland	12 PB #7	53.9	46.7	112	A
Mean		67.8	47.4		
Coefficient of Variation (%)		12.4	6.2		
LSD_{05} ‡		14.9	2.7		

† All yields and test weights are reported at a 13.5% grain moisture content.

‡ Values followed by * are not significantly different from the leading entry.

Plant Date	13-Oct
Harvest Date	14-Jun
Tillage	Minimum
Fertilization	80 lbs March
Weed Control	Harmony

There were 7 entries in the Barley State Trials in 2015-2016. Locations are: Wye and Clarksville. Seeding density is 18 seeds per foot of row. The experimental design is a randomized complete block with 3 replications. The tillage and fertility are conventional. Nitrogen applications vary between sites depending on previous crop. **There was a statewide overall performance spread of 35.6 bu/A, from a maximum of 89.5 to a minimum of 53.9.** Statewide variation for each variety was high, (as measured by the C.V.). The 2014-15 seasonal conditions were particularly harsh for barley across the Mid-Atlantic region.

Table 2. Maryland State Wheat Trials 2015-16 Yield Summary Table.

		Statewide		Wye		Beltsville		Quantico		Woodsboro	
		Yield[†]	Test Wt[†]	Yield	Test Wt	Yield	Test Wt	Yield	Test Wt	Yield	Test Wt
Brand	**Entry**	**bu/A**	**lbs/bu**	**bu/A**	**lbs/bu**	**bu/A**	**lbs/bu**	**bu/A**	**lbs/bu**	**bu/A**	**lbs/bu**
Growmark FS	FSX 872	82.5 *	55.5	81.9	54.1	85.2 *	52.6	67.1 *	55.1	95.8 *	60.5
Pioneer	P 25R40	82.2 *	56.1	83.1 *	56.3	78.1 *	51.2	70.9 *	56.0	96.7 *	60.9
UniSouth Genetics	USG 3895	82.1 *	54.4	84.7 *	53.4	75.0 *	51.7	72.2 *	53.4	96.6 *	58.9
Southern States	SS 8415	81.1 *	54.8	79.3 *	56.1	68.1	49.7	72.1 *	56.3	104.9	57.2
Eddie Mercer Agriservices	MBX 16-A-206	80.8 *	55.1	88.4 *	54.0	67.2	52.8	70.0 *	54.2	97.5 *	59.5
Growmark FS	FSX 870	80.5 *	55.2	81.6	54.8	77.5 *	51.0	70.0 *	55.4	92.8 *	59.7
Virginia Tech University	Hilliard	79.6 *	55.3	85.6	55.8	70.0	49.2	65.6 *	55.9	97.4 *	60.2
UniSouth Genetics	USG 3201	79.4 *	57.2	84.5 *	58.8	69.9	50.9	70.4 *	57.9	92.7 *	61.0
Growmark FS	FS 850	79.3 *	55.9	65.4	56.1	80.9 *	52.2	72.0 *	55.7	99.0 *	59.7
Southern States	SS 8360	79.1 *	55.0	80.1 *	55.7	74.5 *	50.4	60.8	53.5	100.9 *	60.4
Pioneer	P 25R50	78.9 *	54.1	75.7	53.6	73.5 *	50.3	64.9 *	53.3	101.4 *	59.3
Growmark FS	FS 860	78.8 *	54.5	76.5	54.2	69.0	49.5	65.5 *	54.0	104.1	60.3
Dyna-Gro	DG 9552	78.7 *	55.8	84.6	55.2	64.1	52.5	64.5 *	54.9	101.6 *	60.7
Seedway	SW 63SR	78.7 *	54.6	69.1	52.5	83.0 *	51.9	62.5	53.2	100.2 *	60.9
Syngenta	SY Viper	78.5 *	56.8	85.8 *	56.9	66.5	51.4	71.2 *	58.4	90.7 *	60.6
UniSouth Genetics	USG 3197	78.5 *	54.7	85.6 *	54.0	68.2	50.9	68.1 *	54.2	92.0 *	59.8
Limagrain Cereal Seeds	L 11941	78.3 *	56.0	77.4	55.3	66.4	50.4	66.9 *	57.5	102.5 *	60.9
Limagrain Cereal Seeds	L 11541	77.7 *	56.1	75.0	55.6	67.7	51.8	69.8 *	56.8	98.4 *	60.2
Syngenta	SY 483	77.7 *	55.4	69.0	55.4	73.8 *	50.6	64.5 *	55.2	103.3 *	60.4
Mid-Atlantic Seeds	MAS#67	77.6 *	50.7	82.3	52.9	73.9 *	50.4	52.4	53.6	102.0 *	59.1
Dyna-Gro	DG SHIRLEY	77.6 *	54.2	77.6	50.1	63.6	51.8	68.3 *	54.7	100.8 *	60.0
UniSouth Genetics	USG 3251	77.3 *	55.4	72.7	55.4	69.8	51.3	64.5 *	54.9	102.1 *	59.8
Syngenta	SY 007	77.2 *	55.0	63.2	55.6	82.8 *	51.8	59.7	54.8	103.1 *	57.7
Eddie Mercer Agriservices	MBX 14-K-297	76.7 *	55.0	73.4	54.8	68.5	51.0	67.5 *	54.3	97.5 *	59.8
UniSouth Genetics	USG 3013	76.6 *	55.7	71.4	54.8	75.7 *	53.3	60.6	53.9	98.8 *	60.9
Virginia Tech University	VA12W-72	76.5 *	56.6	73.3	56.9	70.7	51.7	67.9 *	56.8	93.9 *	60.9
University of Maryland	15 MW 133	76.5 *	56.2	71.9	55.8	71.5 *	51.7	65.8 *	56.8	96.7 *	60.5
Southern States	SS 8340	76.0 *	56.4	81.1 *	58.2	72.8 *	50.4	63.5	56.7	86.5	60.5
UniSouth Genetics	USG 3404	76.0 *	54.7	78.1 *	54.5	75.2 *	50.8	57.5	53.6	93.1 *	60.0
Dyna-Gro	DG 9522	75.8 *	54.9	76.8	54.1	68.4	51.8	62.8	53.3	95.4 *	60.4
Southern States	SS 8513	75.8 *	56.9	75.1	57.9	62.6	51.5	67.1 *	58.2	98.5 *	60.0
Syngenta	SY 547	75.8 *	55.1	70.5	54.9	61.9	49.4	70.0 *	56.8	100.6 *	59.6
Mid-Atlantic Seeds	MAS#425	75.7 *	53.8	56.9	52.0	79.1 *	49.5	68.3 *	53.5	98.7 *	60.4
Southern States	SS EXP 8550	75.7 *	55.8	75.2	54.6	63.5	50.7	65.3 *	57.3	98.6 *	60.5
Dyna-Gro	DG 9223	75.4 *	55.1	66.3	54.8	74.5 *	52.7	61.3	54.0	99.6 *	59.0
Seedway	SW 59SR	75.3 *	55.1	78.8 *	54.6	60.0	51.6	63.4	53.9	99.1 *	60.4
Growmark FS	FSX 871	74.8 *	54.1	75.3	53.4	68.3	49.8	60.1	53.9	95.6 *	59.3
UniSouth Genetics	USG 3523	74.8 *	55.1	73.6	55.2	62.9	50.1	61.2	54.7	101.5 *	60.4
Limagrain Cereal Seeds	L 3677	74.7 *	55.0	65.6	53.6	83.7 *	52.4	56.0	53.2	93.6 *	60.8
Eddie Mercer Agriservices	MBX 15-E-229	74.5 *	52.8	70.0	49.9	74.5 *	50.0	61.6	51.0	91.9 *	60.3
Eddie Mercer Agriservices	MBX 14-S-210	74.4 *	55.0	68.3	54.8	75.0 *	51.0	59.3	53.9	95.0 *	60.4
Mid-Atlantic Seeds	MAS#7	74.3 *	54.3	63.7	53.3	79.2 *	49.6	58.2	54.7	96.2 *	59.7
University of Maryland	15 MW 315	74.2 *	56.6	67.6	57.5	72.2 *	49.9	55.8	58.3	101.1 *	60.7
Eddie Mercer Agriservices	MBX 11-V-258	73.8 *	54.9	58.7	52.5	77.4 *	51.2	62.9	55.4	96.3 *	60.7
University of Maryland	15 MDX 19	73.7 *	56.0	64.9	55.3	78.1 *	52.8	53.5	55.7	98.1 *	60.2
Eddie Mercer Agriservices	MBX 16-B-203	73.3 *	54.1	71.4	53.4	53.7	49.8	65.1 *	52.7	102.9 *	60.6
Dyna-Gro	WX 16771	73.0 *	55.2	68.9	54.7	67.9	50.9	56.7	55.0	98.7 *	60.1
UniSouth Genetics	USG 3316	72.7 *	54.4	57.0	53.4	71.2 *	51.2	63.8	53.1	98.7 *	59.9
Growmark FS	FS 854	72.4 *	54.3	71.1	53.7	65.0	50.0	58.2	53.5	95.3 *	59.9
Growmark FS	FS 865	71.9 *	54.3	60.8	52.7	68.1	50.3	63.8	53.5	95.0 *	60.5
Southern States	SS 8530	71.5 *	52.0	59.7	50.0	70.9 *	49.8	59.8	49.0	95.7 *	59.2
University of Maryland	15 MDX 20	71.1 *	56.1	74.5	55.6	55.3	52.8	59.9	55.6	94.6 *	60.5
Dyna-Gro	DG 9692	70.9 *	54.0	56.5	51.7	66.8	50.7	57.0	52.3	103.2 *	61.3
Mid-Atlantic Seeds	MAS#6	70.7 *	53.7	60.6	52.1	70.9 *	51.3	50.1	51.1	101.4 *	60.1
Mid-Atlantic Seeds	MAS#66	69.5	55.7	57.9	55.8	75.5 *	51.2	52.5	56.1	92.2 *	59.5
University of Maryland	15 MW 64-134	68.7	56.7	59.7	58.3	67.3	51.1	51.8	57.0	96.1 *	60.4
Virginia Tech University	Jamestown	67.6	57.9	66.4	61.5	64.2	51.0	52.4	59.1	87.5	59.9
Mean		76.0	55.1	72.5	54.7	71.0	51.0	63.0	54.9	97.6	60.1
Coefficient of Variation (%)		11.7	4.0	14.3	4	12.8	6.3	11.1	3.7	8.7	2.1
LSD_{05}[‡]		11.8	2.7	10.4	1.2	14.3	3.9	7.8	1.3	14.7	2.1

[†] All yields and test weights are reported at a 13.5% grain moisture content.

[‡] Values followed by * are not significantly different from the leading entry.

Plant Date	13-Oct	9-Oct	8-Oct	15-Oct
Harvest Date	27-Jun	1-Jul	24-Jun	2-Jul
Tillage	Minimum	Minimum	Minimum	Conventional
Fertilization	100 lbs March	45lbs Mar., 45lbs Apr.	45lbs Mar., 45lbs Apr.	70lbs Mar, 30 lbs Apr.
Weed Control	Harmony	Harmony Extra	Harmony Extra	Grizzly
Fungicide				Presario

There were 56 entries in the Wheat State Trials in 2015-2016. Locations are: Quantico, Wye, Clarksville, Beltsville, and Woodsboro. Seeding density is 22 seeds per foot of row on 6"rows. The experimental design is a randomized complete block with 3 replications. The tillage and fertility are conventional. Nitrogen applications vary between sites depending on previous crop (we generally follow a corn crop).

There was a statewide overall performance spread of 14.9 bu/A, from a maximum of 82.5 to a minimum of 67.6. Statewide variation for each variety was acceptably low, (as measured by the C.V.). However, due to natural data variation, the average statewide performance of the top 53 entries are not significantly different from each other (Table 2).

Table 3. 2015-2016 Maryland State Wheat Variety Trial Two and Three Year Means.

		Two Year		Three Year		2014-2015		2013-2014		2015-2016	
		Yield†	Test Wt†	Yield†	Test Wt†	Yield†	Test Wt†	Yield†	Test Wt†	Yield†	Test Wt†
	Entry	bu/A	lbs/bu	bu/A	lbs/bu	bu/A	lbs/bu	bu/A	lbs/bu	bu/A	lbs/bu
Syngenta	SY 007	65.1	53.4	67.2	55.7	53.1	51.7	71.4	60.5	77.2	55.0
Southern States	SS 8340	65.9	54.9	69.9	57.2	55.9	53.4	77.8	61.7	76.0	56.4
Mid-Atlantic Seeds	MAS#7	66.4	53.5	70.2	55.1	58.6	52.6	77.6	58.4	74.3	54.3
Eddie Mercer Agriservices	MBX 14-K-297	66.5	53.4	70.0	54.6	56.2	51.9	76.9	56.8	76.7	55.0
Growmark FS	FS 854	66.6	53.6	72.0	55.5	60.7	52.9	83.0	59.4	72.4	54.3
Eddie Mercer Agriservices	MBX 11-V-258	67.6	54.1	70.0	55.9	61.4	53.2	74.9	59.4	73.8	54.9
Syngenta	SY 483	68.4	53.9	68.4	53.9	59.2	52.5	-	-	77.7	55.4
Southern States	SS 8360	69.4	53.7	75.6	55.7	59.7	52.3	88.0	59.9	79.1	55.0
UniSouth Genetics	USG 3404	69.4	53.7	75.8	55.5	62.9	52.7	88.6	59.3	76.0	54.7
UniSouth Genetics	USG 3251	69.5	53.5	72.5	55.5	61.8	51.6	78.3	59.5	77.3	55.4
Dyna-Gro	DG SHIRLEY	70.0	53.8	73.1	55.3	62.3	53.5	79.4	58.3	77.6	54.2
UniSouth Genetics	USG 3201	70.1	55.7	74.3	57.9	60.9	54.3	82.6	62.2	79.4	57.2
Growmark FS	FS 850	70.7	55.3	73.4	56.8	62.1	54.7	78.8	59.8	79.3	55.9
Dyna-Gro	DG 9223	70.8	55.4	72.8	56.1	66.2	55.6	76.8	57.6	75.4	55.1
Southern States	SS 8415	71.7	54.3	74.5	56.1	62.3	53.8	80.1	59.8	81.1	54.8
UniSouth Genetics	USG 3523	72.1	54.0	74.8	55.7	69.4	52.9	80.2	59.2	74.8	55.1

† All yields and test weights are reported at a 13.5% grain moisture content.

Of the 56 entries in the Wheat State Trials in 2015-2016, on 16 have longevity of three years or more. **There was a 8.6 bu/A yield difference in the 3-year average between highest and lowest-yielding varieties.**

Table 4. 2015-16 Milling and Baking Quality of University of Maryland Wheat Lines Within State Variety Trial.

Entry	Test Weight (LB/BU)	NIR Kernel Protein (at 12%)	Adjusted Flour Yield (%)	Softness Equivalent (%)	Flour Protein (at 14%)	Lactic Acid SRC (%)	Cookie Diameter (cm)	Top Grade (0-9)
Hilliard	55.9	9.5	66.9	64.3	7.4	111.8	19.3	5
Shirley	54.2	9.4	67.8	62.7	7.3	86.8	19.5	5
15 MW 133	57.4	9.7	69.1	61.6	7.4	110.0	19.8	5
15 MW 134	57.8	9.6	69.3	62.0	7.5	100.4	19.7	5
15 MW 315	56.9	10.7	65.6	60.0	9.0	96.9	19.0	2
15 MW 64-134	58.2	10.0	68.3	67.4	8.2	87.5	19.3	3
15 MDX 19	55.7	10.2	65.8	64.3	8.5	102.0	18.8	3
15 MDX 20	55.7	10.3	65.9	64.4	8.5	87.4	19.0	2
GRAND MEAN	56.5	9.9	67.3	63.3	8.0	97.8	19.3	4

The 56 entries in the Wheat State Trials in 2015-2016 were submitted for milling and baking quality analysis. Results of the elite Maryland breeding lines are shown.

Objective 2) Innoculated Wheat Scab Nursery:

A special inoculated nursery (scabby corn) with misting irrigation was planted at the USDA Research and Experiment Station at Beltsville in October, 2016. This experiment will stress test all varieties submitted to the Maryland Wheat and Barley State Trials for scab resistance. For the 2016/2017 season, a misted nursery will be grown and innoculated with fusarium head blight (scab), with assistance from Dr. Nathan Kleczewski, plant pathologist at the University of Delaware.

To replicate producer practices, seed weight and DON will be measured from samples taken from combine-harvested material. This will include measurements of Fusarium damaged kernels (FDK), seed weight, and DON (at a USWBSI accredited testing facility). Analysis of DON takes significantly longer than the other measurements, so DON results will be posted several months after the initial results. We have partial support from the Maryland Crop Improvement Association and Trial participants.

Table 5. DON, incidence (heads with any FHB symptoms), severity (amount of head with symptoms), and index (overall amount of plot with symptoms) for the 2016 wheat misted nursery trial located in Beltsville, MD.

Variety	DON (ppm)	Incidence (%)	Severity (%)	Index
MBX 15-E-229	7.9	36.0	14.1	5.1
MAS#67	8.9	34.7	19.0	7.0
FS 860	8.9	41.3	19.5	7.9
MAS#66	10.7	52.0	25.6	12.8
USG 3197	12.3	38.7	16.9	7.0
SW 59SR	12.5	37.3	23.8	8.6
FSX 871	12.6	29.3	23.3	7.4
JAMESTOWN	**13.2**	**54.7**	**36.4**	**20.5**
L 11941	14.2	45.3	15.1	7.0
SS8530	14.5	26.7	25.4	6.5
SY VIPER	14.9	62.7	25.9	15.5
SSEXP 8550	16.5	52.0	15.9	8.8
15 MDX 19	16.6	45.3	21.5	10.4
15 MDX 20	16.9	36.0	23.1	8.3
15 MW 134	17.4	48.0	14.1	6.7
SY 007	17.5	56.0	22.8	13.8
P 25R50	17.6	45.3	22.6	10.2
15 MW 133	17.7	48.0	20.3	9.9
USG 3201	18.0	48.0	18.2	8.7
SS8340	19.7	41.3	17.9	7.3
DG 9223	20.7	53.3	25.4	13.7
MBX 14-S-210	20.7	57.3	28.7	16.6
DG 9522	20.9	62.7	20.0	13.1
FSX 870	21.0	64.0	25.6	16.4
FS 854	21.1	52.0	21.3	11.2
15 MW 315	21.1	48.0	27.4	12.8
L 3677	21.4	77.3	31.5	24.4
USG 3316	21.9	46.7	25.1	12.8
USG 3523	21.9	49.3	19.0	9.6
SS8513	22.5	48.0	34.4	17.7
MBX 16-B-203	22.7	68.0	28.2	18.5
USG 3404	22.9	54.7	22.8	13.1
USG 3013	23.4	49.3	19.5	9.8
MAS#6	24.9	56.0	27.2	16.1
15 MW 64-134	25.0	60.0	38.2	23.2
FSX 872	25.1	60.0	36.2	22.2
WX 16771	25.9	38.7	21.8	8.6
DG SHIRLEY	**26.4**	**57.3**	**37.4**	**21.5**
DG 9692	26.6	53.3	18.2	10.3
MBX 14-K-297	26.7	68.0	21.3	14.5
HILLIARD	26.8	70.7	30.8	21.6
SW 63SR	26.9	62.7	24.9	15.9
MAS#7	27.4	64.0	25.9	16.6
MBX 11-V-258	28.0	64.0	31.3	20.5
VA12W-72	29.2	57.3	22.1	13.0
USG 3895	29.8	77.3	29.7	23.3
FS 865	31.1	62.7	21.5	13.4
SY 547	31.5	42.7	22.6	9.6
USG 3251	31.8	65.3	27.7	18.0
MBX 16-A-206	33.1	80.0	25.4	20.3
SS8360	33.6	58.7	30.8	18.6
SS8415	48.9	80.0	51.5	40.9
MAS#425	50.5	72.0	21.5	15.6
DG 9552	53.8	77.3	28.5	22.0
FS 850	57.4	89.3	53.3	47.7
P 25R40	**60.6**	**68.0**	**36.9**	**25.0**
SY 483	97.2	69.3	39.0	29.0

There were 56 entries in the Wheat State Trials in 2015-2016. The misted nursery was planted in Beltsville, MD. Seeding density is 22 seeds per foot of row on 6"rows. The experimental design is a randomized complete block with 3 replications. The tillage and fertility are conventional. DON was measured from samples taken from combine-harvested material. **Grey = DON levels statistically similar to MR standard Jamestown. Dark grey = reduced DON by >45% compared to MS/S standard, Shirley.**

***Objective 3*:**

Collaborative Line Breeding Nurseries with Public Programs: These regional trials are carried out in collaboration with small grains programs at public institutions to increase the applicability of line selection to both local Maryland environments and for more widespread use. The University of Maryland is actively participating in the Mason-Dixon Test, the Uniform Eastern Winter Nursery, the Uniform Southern Winter Nursery, the Winter Malting Barley, and the Grain Barley Nurseries (Table 5). This allows material from a variety of collaborating breeders to be selected based on their performance under Maryland conditions. **There are currently planted, 529 total plots to evaluate experimental lines for wheat and barley breeders under Maryland's unique conditions.**

Table 6. Regional Public Collaborative Tests

Harvested Spring 2016				**Planted Fall 2016**			
Test	**# Entries**	**UMD Lines**	**Locations**	**Test**	**# Entries**	**UMD Lines**	**Locations**
Mason-Dixon	71	13	2	Mason-Dixon	78	20	2
Uniform Eastern	30	3	1	Uniform Eastern	36	3	1
Uniform Southern	33	4	1	Uniform Southern	36	3	1
				Uniform Grain Barley	17	0	1
				Uniform Malting Barley	28	2	1

Table 7. Mason Dixon Summary 2015-16

Line	Yield rank	Yield rank	Yield rank	Yield rank	Yield rank	Yield rank	Yield rank	Yield rank	Yield PCM	Mean Yield PCM	Yield Bu/a	TWT Lb/b	Hdate Jan1+	PLT HT	Lodg 0-9	PM 0-9	LR 0-9	YR 0-9	SBV R.Rot 0-9	BYD Virus 0-9	Sep. tritici 0-9	FHB Rate 0-9	FHB FDK %
Location:	SKY	LKY	RNC	PNC	BVA	WVA	QMD	Avg	Avg	N=6	Avg	Avg	Avg	Avg	Avg	Avg	Avg	Avg	RNC	Avg	SKY	LKY	LKY
Shirley	10	3	31	32	18	20	62	28	107	106	59	50.8	120	31	0.4	1.3	0.4	6.3	2.5	1.2	0	4	15
HILLIARD	1	1	2	11	1	3	15	6	129	129	72	55.1	116	35	0.4	1	2.1	0.3	2	3	1	2	15
Bess	37	45	59	59	68	42	57	55	83	84	47	53.8	118	35	2	5	5.8	4	4	2.9	0	1	10
Pioneer 26R10	4	2	52	61	20	22	38	33	101	104	58	53.4	120	30	0.3	5.3	4.9	1.3	3	1.6	0	3	11
MD08W48-14-1	67	35	3	3	34	14	18	18	119	115	64	56.1	115	35	3.8	1.5	1.5	4	1.5	1.7	6	2	13
MD272-6-14-2	53	65	10	9	53	39	7	31	108	106	59	57.6	113	34	2.4	4.3	2.4	4.5	3.5	3.5	5	3	16
MD07W481-14-1	13	20	33	8	23	36	47	28	109	106	59	56.1	116	30	0.2	4	0.3	2.5	2.5	2.1	0	2	12
MD07W481-14-2	30	53	6	6	42	27	44	30	109	106	59	57.3	112	33	4	0.8	0.9	7	2	4.7	0	1	13
MD07W478-14-1	66	52	9	34	51	24	9	30	106	106	59	56.1	110	33	3	1.3	1.9	6.5	2.5	4.1	7	2	18
MD83-18-2-14-1	35	67	48	30	52	62	30	48	95	94	52	53.6	112	34	0.5	3.5	0.9	2.5	3	3.2	5	2	19
MD272-8-4-14-4	15	12	19	7	16	32	20	18	115	113	63	55.7	117	30	0.3	4.5	0.5	3.5	2	2.4	0	3	16
GRAND MEAN									100	100	55.8	54.6	115	33	1.6	2.6	2.4	3.9	2.9	2.7	4.3	2	14

Objective 4) Release of Improved Wheat Germplasm

Through the longtime support by MDGUP of Dr. Jose Costa and Jason Wight's wheat improvement programs, six total wheat lines were released this year. Six lines are being commercialized through Limagrain Cereal Seeds, and another variety is being made publicly available. All lines show superior yield potential for the Mid-Atlantic region. he developmental designations of these wheat varieties are 15MW134 15MW64134, 15MW315, 15 MDX19, 15MDX20, 15 MDX 10. Further, one line 15 MW 117 is being released as a public variety so producers can save seed for cover crop or have seed with high yield potential when well managed.

In addition to the high yield potential displayed over years of field data, the lines 15 MW 133, 15 MW 134 and 15 MW 64-134 displayed favorable cookie diameter under standardized baking quality tests performed by Dr. Byung-Kee Baik, Director, of the Soft Wheat Quality Laboratory with USDA-ARS-CSWQRU

In total four wheat lines for large (>0.5 acre, each) seed increase were harvested in spring, 2015 (Table 8). For purification and further testing, 35 wheat lines and six triticale lines were harvested from small

increases. Approximately six acres of land were used for seed source production for 2016. Harvested material was thoroughly cleaned and treated for later planting by seedsmen.

Breeding line progression and screening: In fall 2015, six large seed increases were planted, rogued, and screened based on performance in spring of 2015. A further 23 lines were planted into head rows for line purification and later screening based on performance traits (Table 8).

From those selected in 2016, eight wheat lines were planted into increases for 2016-17.

Table 8. Line Development Progress.

2014 - 15 Seed Increases Wheat		2015 - 16 Seed Increases Wheat		2016-17 Seed Increases Wheat	
Line	Area , Ac	Line	Area , Ac	Line	Area, Ac
MD07W64-13-4	0.5	MD07 26-F2-19-13-1	0.5	15 MDX 1	0.03
MD09W272-8-4-13-3	0.5	15 MDX 134	0.5	15 MDX 2	0.01
MDC07026-F2-19-13-3	1	15 MW 133	0.5	15 MDX 4	0.01
MDC07026-F2-19-13-4	1	15 MW 315	0.5	15 MDX 5	0.13
		15 MW 64-134	0.5	15 MDX 6	0.13
		15 MDX 19	0.5	15 MDX 11	0.13
		Head rows (24 lines)	0.75	15 MDX 18	0.13
				14 MW 117	0.13

Wheat was selected based on yield and display of high scab resistance and rust resistance (Table 5).

Meetings Where Investigators' Presentations Credited MGPUB Support in 2016

- Southern Maryland Crops Conference, 2016
- Maryland Commodity Classic, 2016
- Eddie Mercer Field Day, 2016
- Maryland Crop Improvement Association Annual Meeting, 2016
- Dorchester County Agronomy Meeting, 2016