



Specialty Small Grains in 2021

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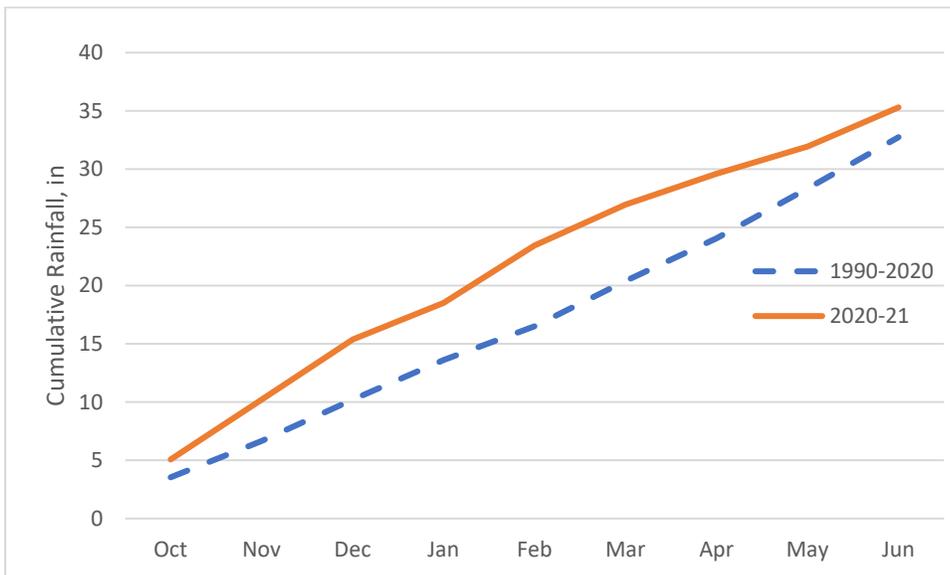
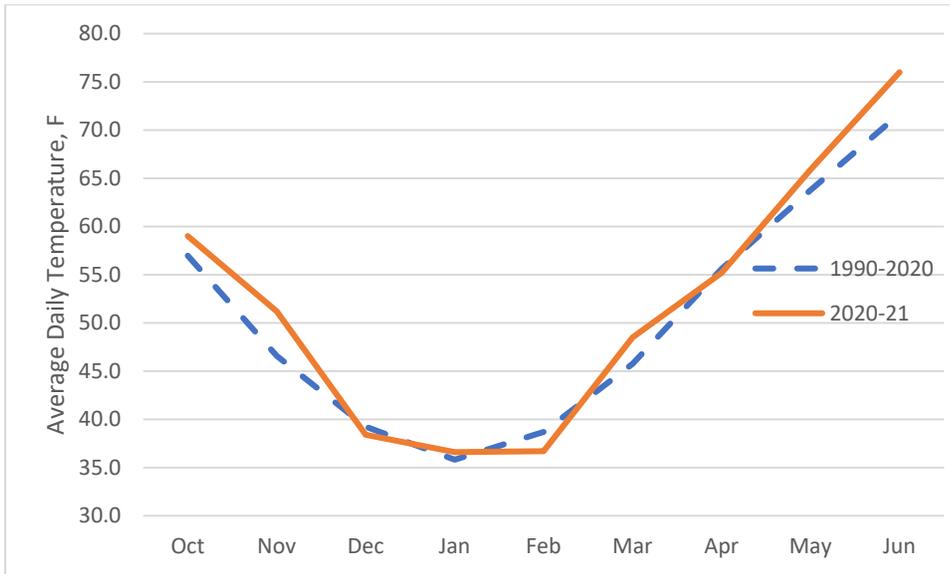
Introduction

The following tables present results from specialty wheat and barley varietal tests conducted in Virginia in 2019-2021. The tests provide information to assist Virginia Cooperative Extension Service agents in formulating cultivar recommendations for small grain producers and to companies developing cultivars and/or marketing seed within the state. Yield data are given for individual locations and across locations and years, where available. Performance of a given variety often varies widely over locations and years which makes multiple location-year averages a more reliable indication of expected performance than data from a single year or location. When available, those data are preferred. Details about management practices for barley and wheat are listed for each experiment location.

The Season

Fall of 2020 had near-normal temperatures and significant rainfall in many areas of the Commonwealth. Some farmers took advantage of favorable weather and by the end of September, 19% of the intended wheat acres has been seeded compared to the 5-year average of 9%. Wet conditions persisted with 20% of the state have 'surplus' soil moisture in late October. By November 8, 66% of wheat acres were planted, exactly matching the 5-year average. Temperatures in late November were above normal, with a little less rain in some areas, but more than 10% of intended acres were still not planted due to wet soils. For the 2020 calendar year, Richmond received 15 more inches of rainfall than the long-term average. Wet weather persisted in many areas in January and February, delaying nitrogen fertilizer applications on many fields and leaving many fields with dead spots due to standing water. This results in only 26% of the crop rated good or excellent in late February. Wet weather and warm temperatures were the norm in March and crop condition improved to 39% of the crop rated good or excellent. The weather pattern persisted into mid-April. Seven percent of the crop had headed by April 18, compared to the five-year average of 11% by this date. Wheat condition improved through early May with heading still 13% behind average date. May was warm and dry for most areas, with over half the state reporting soil moisture deficits. On June 13, 52% of the wheat crop was rated good or excellent. By this date, 30% of barley and 18% of wheat acres were harvested, both behind the normal pace. The Virginia field office of USDA's National Agricultural Statistics Service estimates that Virginia will produce 7.8 million bushels of winter wheat in 2021, unchanged from 2020. Yield is estimated at 60 bu/ac, unchanged from 2020. Farmers planted 220,000 acres in the 2020-21 crop year with 130,000 acres to be harvested for grain.

Figure 1. Daily average temperature and cumulative growing season precipitation for Virginia, 2020-21 and 30-year mean.



Wheat Management Practices for the 2021 harvest season (All rates are given on a per acre basis.)

Blacksburg - Planted October 7, 2020. Pre-plant fertilizer was 30-60-100-10(S). Site was sprayed with 1.2 oz. Harmony Extra SG® and fertilized with 25 units N using 30% UAN on March 13, 2021. Site was fertilized with 50 units N using 30% UAN + 1 qt Manni-Plex® on April 6, 2021. Harvest occurred June 28, 2021.

Blackstone - Planted October 21, 2020. Pre-plant fertilizer was 500 lb. 6-6-18 on October 20, 2020. Site received 60 lb. N using UAN + 0.5 oz. Harmony Extra XP® March 9, 2021. Site received 60 lb. N using UAN + 4 oz. Mustang® Maxx on April 9, 2021. Harvest occurred June 17, 2021.

Warsaw - Planted October 24, 2020. Lime was applied at 1 ton October 8, 2020. Pre-plant fertilizer was 30-60-60-12 applied October 7, 2020. Site was fertilized using 12-0-0-1.5 at 25 lb. on December 10, 2020 and again on January 30, 2021. Harmony Extra SG® was applied at .9 oz. with surfactant on December 11, 2020. Quelex® at 0.75 oz. + surfactant was applied March 9, 2021. Harvest occurred June 17, 2021.

Painter - Planted October 22-23, 2020. Pre-plant fertilizer was 60 lb. N using 30% UAN on October 21, 2020. Application of .75 oz. Harmony Extra SG® + 80 lb. N using 30% UAN was on March 23, 2021. Harvest occurred June 16, 2021.

Barley Management Practices for the 2021 harvest season (All rates are given on a per acre basis.)

Blacksburg - Planted October 6, 2020. Pre-plant fertilizer was 30-60-100-10(S). Site was sprayed with 1.2 oz. Harmony Extra SG® and fertilized with 25 units N using 30% UAN on March 13, 2021. Site was fertilized with 45 units N using 30% UAN + 1 qt Manni-Plex® for small grain April 6, 2021. Harvest occurred June 15, 2021.

Blackstone - Planted October 21, 2020. Pre-plant fertilizer was 500 lb. 6-6-18 on October 20, 2020. Site received 60 lb. N using UAN + 0.5 oz. Harmony Extra XP® March 9, 2021. Site received 60 lb. N using UAN + 4 oz. Mustang® Maxx on April 9, 2021. Harvest occurred June 1, 2021.

Warsaw - Planted October 23, 2020. Lime was applied at 1 ton on October 8, 2020. No lime was applied to the hulless barley. Pre-plant fertilizer was 30-60-60-12 applied October 7, 2020. The hulled barley site was fertilized using 12-0-0-1.5 at 25 lb. on December 9, 2020 and again on January 24, 2021. The hulless barley site was fertilized using 12-0-0-1.5 at 25 lb. on December 12, 2020 and again on January 24, 2021. Harmony Extra SG® at 0.9 oz. with surfactant was applied on December 11-12, 2020. Quelex® at 0.75 oz. + surfactant was applied March 9, 2021. Site was fertilized using 12-0-0-1.5 at 50 lb. on March 13, 2021. Harvest occurred June 7, 2021.

Section 1: Hard Red Winter Wheat Varieties in Virginia

Agronomic Performance

This study has been conducted in Blacksburg, Warsaw, and Painter, Virginia for several years. An additional test site, Blackstone, Virginia, has been added since 2019. Three replications were planted in Blacksburg, Warsaw, and Blackstone. Two replications were planted in Painter.

The over-location agronomic performance data for the 2021 harvest season is presented in Table 1 and test results from individual locations in 2021 are presented in Tables 4 - 7. The two-year (2020 and 2021) and three-year (2019, 2020 and 2021) average test results are presented in Table 2 and Table 3, respectively.

Based on the average performance of four locations (Table 1), the grain yields of five hard red winter (HRW) wheat experimental lines, one released HRW wheat line and 2 soft wheat checks (Hilliard and Liberty 5658) are significantly higher than the test average (77.2 bushels/a) and Vision 45 (74.8 bushels/a). According to the 2020 and 2021 two- year summary (Table 2), the grain yield of three soft wheat checks (Shirley, Hilliard and Liberty 5658), seven HRW wheat experimental lines and HR 5210 HRW wheat were significantly higher than the test mean (85.1 bushels/a). Based on the three-year average performance (2019, 2020 and 2021), the grain yield of six HRW lines (14VDH-HRW02-029, HR 5210, VA14HRW-41, NVIR17-8, DH15HRW-65-142 and 14VDH-HRW02-105) and two soft wheat checks (Shirley and Hilliard) were significantly higher than the test average (80.7 bushels/a). Most of our experimental lines also have good resistance to leaf rust and powdery mildew.

Grain, Milling and Baking Quality

Every year, grain samples from the Warsaw test location were sent to the USDA Hard Winter Wheat Quality Lab in Manhattan, KS for grain, flour, and milling and baking quality analyses. The seeds from the Blacksburg test location were sent for quality testing in 2020 and reported in Table 9. The two quality check varieties are Jagger and Karl 92. The flour yield check variety is Soissons. Generally speaking, the quality of the HRW wheats grown in Virginia is similar to our quality checks, but not comparable to hard red spring wheat grown in the Northern Plains or hard red winter wheat grown in the Great Plains due to rain and other environmental conditions in the Mid-Atlantic region.

Table 1. Over locations summary of performance of entries in the Virginia Tech Hard Red Winter Wheat Test over locations, 2021 harvest.

Line	Yield (Bu/a)	Test Weight (Lb/bu)	Heading Date (Julian)	Height (In)	Lodging (0-9)	Powdery Mildew (0-9)	BYDV (0-9)
	(4)	(4)	(2)	(2)	(2)	(1)	(1)
14VDH-HRW02-029	87.0 +	59.9	126	34	0.0	0.0	1.3
VA18HRW-98	86.6 +	58.8 -	125	37	0.0	0.7 +	1.0
HILLIARD (SRW)	84.5 +	59.5	124 -	35	0.0	0.0	1.0
Liberty 5658 (SRW)	84.3 +	60.3 +	123 -	36	0.0	0.0	1.0
HR 5210	84.1 +	58.2 -	126	31 -	0.0	0.0	1.0
VA18HRW-57	83.5 +	59.6	128 +	36	0.7	0.7 +	1.0
VA19HRW-12	83.3 +	60.0	127 +	36	0.0	0.0	1.0
14VDH-HRW02-105	83.0 +	60.1 +	126	33 -	0.0	0.0	1.3
VA19HRW-151	82.5	59.1	125	34	0.0	0.3	1.0
NVIR17-8	82.4	59.2	126	32 -	0.0	0.0	1.0
VA19HRW-9	82.3	58.7 -	128 +	37	1.5 +	0.0	1.3
VA19HRW-11	82.2	59.4	126	37	0.0	0.0	1.0
VA18HRW-58	81.6	60.2 +	129 +	39 +	0.0	0.0	1.0
VA18HRW-51	81.3	59.8	128 +	37	0.7	0.0	1.0
VA19HRW-33	81.2	59.6	128 +	37	0.0	0.0	1.3
VA19HRW-149	80.8	58.8 -	125	33 -	0.0	0.0	1.3
15VDH-HRW19-018	80.6	60.6 +	128 +	38 +	0.0	0.0	1.0
VA19HRW-62	80.4	59.6	125	35	0.0	0.0	1.0
SHIRLEY (SRW)	80.2	58.3 -	125	33 -	0.0	0.0	1.0
VA18HRW-45	79.9	59.6	129 +	35	0.0	0.0	1.0
VA19HRW-47	79.8	60.7 +	126	40 +	0.0	0.0	2.0 +
VA19HRW-59	79.8	60.8 +	126	43 +	1.7 +	0.0	1.0
VA19HRW-17	79.7	59.2	127 +	34	0.0	0.0	1.0
MAS1417-117-5-3-4	79.4	59.5	127 +	40 +	0.5	0.0	1.0
VA19HRW-63	79.3	59.4	125	34	0.3	0.0	1.0
HARDY 2519	79.3	60.6 +	125	36	0.3	0.3	1.0
DH15HRW-65-142	79.2	59.6	127 +	34	1.5 +	0.0	1.0
MAS1417-148-3-1	79.1	58.4 -	126	38 +	0.0	0.0	1.3

DH16HRW-72-134	78.9	60.1	+	125	34	0.0	0.0	1.0			
VA18HRW-68	78.6	59.3		125	39	+	2.2	+	0.0	1.0	
VA19HRW-152	78.6	60.3	+	125	36		0.2	0.0	1.0		
VA19HRW-31	78.6	59.4		125	38	+	0.0	0.0	1.0		
VA19HRW-37	78.3	59.0		128	+	35	0.0	0.0	1.3		
DH17HRW-127-100	78.2	58.8	-	124	-	38	+	0.2	0.0	1.0	
VA19HRW-58	77.9	61.3	+	124	-	38	+	0.0	2.3	+	1.7
VA19HRW-53	77.6	59.8		127	+	33	-	0.0	0.0	1.0	
VA19HRW-77	77.5	59.8		126	37		0.0	0.0	1.0		
DH15HRW-69-50	77.4	59.6		125	32	-	0.0	0.0	1.0		
15VDH-HRW15-062	77.3	59.1		127	+	31	-	0.0	0.0	1.0	
VA19HRW-41	77.2	59.7		126	39	+	0.7	0.0	1.3		
VA19HRW-80	77.0	58.9		124	-	37	1.2	0.0	1.0		
VA18HRW-96	76.9	58.5	-	127	+	36	0.0	0.0	1.0		
VA16HRW-22	76.7	61.1	+	125	36		0.0	0.0	1.0		
VA19HRW-64	76.6	60.6	+	124	-	34	0.2	0.0	1.0		
VA19HRW-49	76.4	58.4	-	125	36		0.0	0.0	1.0		
MAS1417-006-6-4	76.3	58.8	-	126	33	-	0.0	0.0	1.0		
16VDH-HRW13-090	76.3	58.2	-	127	+	38	+	0.5	0.0	1.0	
NVIR17-1	76.2	59.7		122	-	34	0.0	0.0	1.0		
VA19HRW-36	76.1	59.6		127	+	36	0.0	0.0	1.3		
VA19HRW-76	76.0	60.2	+	124	-	33	-	0.0	0.0	1.0	
VA19HRW-73	75.9	59.6		126	36		0.0	0.0	1.0		
17VDH-HRW12-169	75.6	60.8	+	125	30	-	0.0	0.0	1.0		
14VDH-HRW01-019	75.5	60.1	+	127	+	38	+	0.0	0.0	1.0	
ARS14W0947	75.3	59.8		126	39	+	1.2	0.0	1.3		
VA19HRW-26	75.3	59.4		127	+	39	+	0.7	0.0	1.0	
VA19HRW-19	75.2	59.6		126	40	+	0.0	0.0	1.0		
VA09HRW-43	75.1	57.9	-	125	35		0.7	0.0	1.0		
15VDH-HRW16-110	75.0	57.6	-	129	-	32	-	0.0	0.0	1.0	
DH12HRW50-11	75.0	57.8	-	126	33	-	0.2	0.0	1.3		
VISION 45	74.8	59.7		127	+	41	+	0.0	0.0	1.0	
VA19HRW-22	74.5	59.0		126	40	+	1.3	+	0.0	1.7	
SOISSONS	74.5	57.7	-	126	34		0.2	0.0	1.0		

VA19HRW-4	73.9	58.4	-	127	+	36	0.8	2.7	+	1.0
16VDH-HRW14-008	73.5	58.3	-	124	-	30	0.0	0.0		1.0
VA19HRW-34	73.5	59.2		127	+	34	0.0	0.0		1.3
VA19HRW-35	73.4	59.2		128	+	36	0.0	0.0		1.7
VA18HRW-7	73.0	59.9		125		35	0.0	0.0		1.0
VA19HRW-147	72.9	58.9		127	+	38	+	0.0		0.0
VA17HRW-43	72.9	60.1	+	126		34		0.0		0.0
Everest	72.2	60.6	+	120	-	33	-	0.3		0.0
VA19HRW-43	72.0	60.8	+	126		35		0.2		0.0
15VDH-HRW15-199	71.9	59.8		126		32	-	0.0		0.0
VA13MAS14-1992-3-4	71.9	58.8	-	124	-	34		0.0		0.0
VISION 30	71.2	-	59.7	125		35		0.2		0.0
KARL 92	70.9	-	60.0	122	-	34		0.2		3.7
JAGGER	70.7	-	60.6	+	121	-	35	0.2		3.7
DH12HRW46-8	69.9	-	59.6	125		29	-	0.0		0.0
DH13HRW07-30	69.9	-	59.0	126		37		0.0		0.0
Vision 50	68.0	-	59.1	126		35		0.0		0.0
17VDH-HRW12-113	67.8	-	59.8	124	-	33	-	0.0		0.0
Average (n=80)	77.2	59.5		126		35		0.2		0.2
LSD (0.05)	5.5	0.6		1		2		1.1		0.4
C.V.	8.4	1.1		1		4		---		---

Note: The number in parentheses below column headings indicates the number of locations on which data are based. Released cultivars are shown in bold print.

Note: Varieties are ordered by descending yield averages. A plus or minus sign indicates a performance significantly above or below the test average.

Note: The 0-9 ratings indicate a genotype's response to disease or lodging where 0 = highly resistant and 9 = highly susceptible.

Table 2. Two-year summary of performance of entries in the Virginia Tech Hard Red Winter Wheat Test over locations, 2020-2021 harvests.

Line	Yield (Bu/a)		Test Weight (Lb/bu)		Heading Date (Julian)		Height (In)		Lodging (0-9)		Powdery Mildew (0-9)		Leaf Rust (0-9)		BYDV (0-9)		Leaf Blotch (0-9)	
	(6)	(6)	(6)	(6)	(4)	(4)	(4)	(4)	(4)	(4)	(3)	(3)	(2)	(2)	(1)	(1)	(1)	(1)
HILLIARD (SRW)	94.2	+	59.5		119	-	37		0.1		0.2		0.0		1.0		1.3	-
VA18HRW-57	93.0	+	59.7		126	+	38	+	0.7		1.7	+	0.0		1.0		2.0	
SHIRLEY (SRW)	92.5	+	58.4	-	122		34	-	0.1		0.0	-	0.2		1.0		3.7	
HR 5210	92.4	+	58.3	-	124	+	32	-	0.1		0.1		0.3		1.0		2.3	
Liberty 5658 (SRW)	92.3	+	60.2	+	119	-	37		0.1		0.6		0.0		1.0		3.7	
NVIR17-8	91.9	+	59.3		123		33	-	0.0		0.4		0.2		1.0		2.3	
VA18HRW-58	91.8	+	60.7	+	126	+	38	+	0.3		0.3		0.2		1.0		2.7	
14VDH-HRW02-029	91.2	+	60.0		123		35		0.3		0.3		0.3		1.3		3.3	
VA18HRW-98	90.9	+	59.0		122		37		0.7		1.3	+	1.0		1.0		3.3	
VA18HRW-96	90.4	+	59.2		124	+	37		0.2		0.1		0.2		1.0		2.3	
DH15HRW-65-142	90.4	+	59.7		124	+	36		2.2	+	0.3		0.0		1.0		1.3	-
VA18HRW-51	90.2		60.3	+	126	+	39	+	0.8		0.2		0.5		1.0		2.7	
15VDH-HRW19-018	88.5		60.7	+	124	+	40	+	1.4	+	0.4		0.2		1.0		2.0	
15VDH-HRW16-110	88.5		58.2	-	126	+	34	-	0.2		0.0	-	0.0		1.0		2.3	
MAS1417-148-3-1	88.3		58.7	-	123		39	+	0.4		0.0	-	0.5		1.3		2.3	
14VDH-HRW02-105	88.2		60.3	+	123		35		0.8		0.7		0.5		1.3		2.3	
VA18HRW-45	87.8		59.4		126	+	38	+	0.1		0.0	-	0.0		1.0		1.3	-
NVIR17-1	86.7		59.7		120	-	36		0.4		1.2	+	0.3		1.0		1.7	
16VDH-HRW13-090	86.2		58.6	-	125	+	39	+	0.8		0.0	-	1.2		1.0		2.7	
MAS1417-006-6-4	86.0		59.1		122		34	-	0.2		0.2		0.3		1.0		3.0	
DH16HRW-72-134	85.4	-	59.9		121		36		0.2		0.9		0.3		1.0		4.3	
15VDH-HRW15-062	85.2		59.2		124	+	33	-	0.4		0.2		0.2		1.0		3.0	
14VDH-HRW01-019	84.9		60.0		124	+	39	+	1.1		1.0		0.2		1.0		2.0	
VA09HRW-43	84.6		57.6	-	120	-	35		1.2		0.1		0.7		1.0		3.0	
DH12HRW50-11	84.4		58.3	-	122		32	-	0.3		0.2		0.2		1.3		2.0	
DH15HRW-69-50	83.9		59.7		121		33	-	0.3		0.2		0.2		1.0		4.3	

HARDY 2519	83.3	59.9	119	-	38	+	0.7	1.3	+	0.0	1.0	4.7	+	
VISION 45	83.2	60.1	+	125	+	42	+	0.1	0.4	0.0	1.0	4.0		
15VDH-HRW15-199	82.9	59.8	123	32	-	0.2	0.0	-	0.2	1.0	4.7	+		
ARS14W0947	82.3	59.3	123	40	+	1.6	+	0.0	-	0.3	1.3	2.7		
VA18HRW-68	82.2	59.6	123	40	+	2.2	+	0.0	-	0.3	1.0	2.3		
DH12HRW46-8	81.6	59.4	121	31	-	0.0	0.0	-	0.2	1.0	2.3			
VA17HRW-43	81.6	59.8	122	36	0.2	0.1	0.2	1.0	4.7	+				
VA16HRW-22	81.2	60.8	+	121	37	+	0.5	0.8	0.0	1.0	6.7	+		
SOISSONS	80.4	58.1	-	124	+	35	0.2	0.8	3.2	+	1.0	3.3		
16VDH-HRW14-008	80.1	58.6	-	121	30	-	0.0	0.0	-	0.0	1.0	4.0		
VA13MAS14-1992-3-4	79.6	-	58.1	-	119	-	35	0.1	0.1	0.2	1.0	4.0		
VA18HRW-7	79.2	-	59.6	120	-	37	0.2	0.7	0.3	1.0	3.7			
DH13HRW07-30	79.2	-	59.3	123	37	0.0	0.3	0.7	1.3	2.7				
Vision 50	78.5	-	59.2	121	35	0.5	1.8	+	0.2	1.7	+	3.3		
VISION 30	77.0	-	59.4	119	-	36	0.5	0.0	-	3.2	+	1.0	5.7	+
Everest	75.4	-	60.1	+	115	-	35	0.3	0.8	0.0	1.0	5.3	+	
JAGGER	74.3	-	60.1	+	116	-	36	0.8	4.7	+	1.5	+	1.0	2.0
KARL 92	71.9	-	59.5	117	-	35	0.6	3.6	+	2.5	+	1.0	4.7	+
Average (n=44)	85.1	59.4	122	36	0.5	0.6	0.5	1.1	3.1					
LSD (0.05)	5.2	0.6	1	1	0.8	0.6	0.9	0.4	1.4					
C.V.	10.4	1.7	1	4	---	---	---	---	---					

Note: The number in parentheses below column headings indicates the number of locations on which data are based. Released cultivars are shown in bold print.

Note: Varieties are ordered by descending yield averages. A plus or minus sign indicates a performance significantly above or below the test average.

Note: The 0-9 ratings indicate a genotype's response to disease or lodging where 0 = highly resistant and 9 = highly susceptible.

Table 3. Three-year summary of performance of entries in the Virginia Tech Hard Red Winter Wheat Test over locations, 2019-2021 harvests.

Line	Yield (Bu/a)		Test Weight (Lb/bu)		Heading Date (Julian)		Height (In)		Lodging (0-9)		Powdery Mildew (0-9)		Leaf Rust (0-9)		BYDV (0-9)		Leaf Blotch (0-9)	
	(9)	(9)	(9)	(9)	(6)	(6)	(6)	(6)	(7)	(7)	(3)	(3)	(4)	(4)	(1)	(1)	(1)	(1)
Hilliard (SRW)	89.8	+	58.6		118	-	36	+	0.1		0.2		0.5		1.0		1.3	-
14VDH-HRW02-029	88.5	+	59.6	+	121		34		0.2		0.3		0.5		1.1		3.3	
HR 5210	87.7	+	57.4	-	122	+	31	-	0.1		0.1		0.5		1.1		2.3	
VA14HRW-41	87.4	+	59.5	+	119		36	+	0.3		0.6		0.2		1.0		3.7	
Shirley (SRW)	86.9	+	57.8	-	120		33		0.1		0.0	-	0.6		1.0		3.7	
NVIR17-8	86.3	+	58.2	-	121		31	-	0.0		0.4		0.3		1.0		2.3	
DH15HRW-65-142	86.1	+	58.9		123	+	35		2.2	+	0.3		0.4		1.0		1.3	-
14VDH-HRW02-105	84.7	+	59.7	+	121		33		0.6		0.7		0.7		1.2		2.3	
15VDH-HRW19-018	84.5		59.9	+	123	+	38	+	0.9		0.4		0.6		1.0		2.0	
NVIR17-1	83.2		59.0		119		34		0.4		1.2		0.3		1.0		1.7	-
14VDH-HRW01-019	82.4		59.3	+	122	+	38	+	0.9		1.0		0.2		1.0		2.0	
VA09HRW-43	81.5		57.1	-	120		34		1.1		0.1		0.6		1.0		3.0	
15VDH-HRW15-062	81.5		58.5		122	+	32	-	0.6		0.2		0.4		1.1		3.0	
HARDY 2519	81.3		59.4	+	118	-	37	+	0.7		1.3		0.3		1.0		4.7	+
DH12HRW50-11	80.8		57.7	-	121		32	-	0.3		0.2		0.5		1.1		2.0	
VA16HRW-22	80.0		60.1	+	120		36	+	0.7		0.8		0.2		1.0		6.7	+
ARS14W0947	79.2		58.8		121		38	+	1.5	+	0.0	-	0.4		1.3	+	2.7	
DH15HRW-69-50	79.1		59.1		120		32	-	0.4		0.2		0.3		1.0		4.3	
DH12HRW46-8	79.0		58.4		120		30	-	0.1		0.0	-	0.4		1.0		2.3	
Vision 45	78.8		59.3	+	124	+	40	+	0.2		0.4		0.3		1.0		4.0	
VA17HRW-43	77.9		59.1		121		34		0.2		0.1		0.2		1.0		4.7	+
DH13HRW07-30	77.6		58.5		121		36	+	0.1		0.3		0.8		1.1		2.7	
Vision 50	76.6	-	57.9	-	121		34		0.5		1.8	+	0.4		1.3	+	3.3	
Soissons	76.1	-	57.3	-	123	+	33		0.1		0.8		2.9	+	1.0		3.3	
VA13MAS14-1992-3-4	76.0	-	57.6	-	118	-	34		0.1		0.1		0.2		1.1		4.0	
Vision 30	74.8	-	58.9		118	-	35		0.9		0.0	-	2.7	+	1.0		5.7	+
Everest	72.1	-	59.8	+	115	-	34		0.5		0.8		0.3		1.0		5.3	+

Jagger	70.6	-	59.4	+	116	-	34	0.7	4.7	+	1.1	1.0	2.0		
Karl 92	68.5	-	59.1		117	-	34	0.8	3.6	+	1.5	+	1.1	4.7	+
Average (n=29)	80.7		58.8		120		34	0.5	0.7		0.6		1.1	3.3	
LSD (0.05)	3.9		0.4		1		1	0.6	0.7		0.8		0.2	1.4	
C.V.	10.8		1.5		1		4	---	---		---		---	---	

Note: The number in parentheses below column headings indicates the number of locations on which data are based. Released cultivars are shown in bold print.

Note: Varieties are ordered by descending yield averages. A plus or minus sign indicates a performance significantly above or below the test average.

Note: The 0-9 ratings indicate a genotype's response to disease or lodging where 0 = highly resistant and 9 = highly susceptible.

Table 4. Summary of performance of entries in the Virginia Tech Hard Red Winter Wheat Test at Blackstone, 2021 harvest.

Line	Yield (Bu/a)	Test Weight (Lb/bu)	BYDV (0-9)
VA18HRW-98	72.3	57.7	1.0
HILLIARD (SRW)	71.4	58.3	1.0
DH16HRW-72-134	71.2	59.1	1.0
14VDH-HRW02-029	70.2	58.4	1.3
DH15HRW-69-50	70.0	58.6	1.0
VA19HRW-73	69.7	58.3	1.0
14VDH-HRW02-105	69.3	59.0	1.3
HR 5210	69.2	57.4 -	1.0
DH12HRW50-11	68.7	55.7 -	1.3
VA19HRW-11	67.7	58.6	1.0
14VDH-HRW01-019	67.4	59.2	1.0
VA16HRW-22	67.0	60.4 +	1.0
VA19HRW-12	66.8	58.7	1.0
VA19HRW-9	66.5	57.4 -	1.3
VA19HRW-53	66.5	59.0	1.0
15VDH-HRW19-018	65.4	58.9	1.0
VA19HRW-62	65.4	59.7 +	1.0
VA19HRW-76	65.3	59.0	1.0
VA19HRW-22	65.2	58.7	1.7
VA19HRW-47	65.1	59.7 +	2.0 +
16VDH-HRW13-090	65.1	57.5	1.0
SHIRLEY (SRW)	64.9	57.5	1.0
VA18HRW-68	64.6	58.1	1.0
MAS1417-117-5-3-4	64.6	58.1	1.0
VA19HRW-152	64.1	59.5 +	1.0
VA19HRW-63	64.1	58.9	1.0
MAS1417-148-3-1	64.1	56.6 -	1.3
15VDH-HRW15-062	63.7	58.3	1.0
VA18HRW-57	63.5	58.9	1.0

MAS1417-006-6-4	63.5	57.2	-	1.0
VA19HRW-37	63.5	57.4	-	1.3
VA19HRW-49	63.4	57.4	-	1.0
VA19HRW-80	63.2	57.8		1.0
VA19HRW-26	62.8	58.5		1.0
VA18HRW-58	62.6	58.4		1.0
ARS14W0947	62.6	58.3		1.3
JAGGER	62.5	60.2	+	1.0
VA19HRW-17	62.4	58.2		1.0
VA14HRW-25	62.4	59.4	+	1.0
VA19HRW-31	62.3	58.5		1.0
NVIR17-1	62.1	58.9		1.0
15VDH-HRW16-110	62.0	55.3	-	1.0
VA19HRW-151	61.9	59.3		1.0
VA19HRW-4	61.6	57.3	-	1.0
DH15HRW-65-142	61.6	58.1		1.0
Liberty 5658	61.6	59.8	+	1.0
VA19HRW-33	60.8	58.0		1.3
NVIR17-8	60.3	57.8		1.0
VA18HRW-51	60.2	58.3		1.0
Vision 50	60.1	57.8		1.7
KARL 92	60.1	59.1		1.0
DH17HRW-127-100	60.1	57.0	-	1.0
VA19HRW-34	60.1	58.8		1.3
VA19HRW-149	59.9	57.2	-	1.3
17VDH-HRW12-169	59.9	59.3		1.0
VA19HRW-36	59.8	59.1		1.3
VA18HRW-45	59.8	57.6		1.0
VA19HRW-59	59.7	60.4	+	1.0
VA09HRW-43	59.5	56.1	-	1.0
VISION 30	59.2	58.4		1.0
SOISSONS	59.0	56.2	-	1.0
VA19HRW-58	59.0	60.4	+	1.7
VA19HRW-147	58.7	58.4		1.0

16VDH-HRW14-008	58.2	57.1	-	1.0
15VDH-HRW15-199	58.2	59.1		1.0
VA19HRW-64	58.2	59.7	+	1.0
DH13HRW07-30	58.2	57.8		1.3
VA19HRW-43	58.0	59.9	+	1.0
VA19HRW-35	57.6	57.8		1.7
VA18HRW-96	57.4	57.4	-	1.0
VISION 45	56.5	58.8		1.0
VA19HRW-77	56.4	58.4		1.0
17VDH-HRW12-113	56.1	59.0		1.3
VA19HRW-41	56.0	59.8	+	1.3
Everest	56.0	59.9	+	1.0
VA17HRW-43	55.6	59.3		1.0
VA19HRW-19	55.6	58.4		1.0
VA18HRW-7	55.5	59.2		1.0
VA13MAS14-1992-3-4	53.3	57.8		1.0
DH12HRW46-8	47.1	59.5	+	1.0
Average (n=80)	62.1	58.4		1.1
LSD (0.05)	11.5	0.9		0.6
C.V.	11.5	0.9		---

Note: The number in parentheses below column headings indicates the number of locations on which data are based. Released cultivars are shown in bold print.

Note: Varieties are ordered by descending yield averages. A plus or minus sign indicates a performance significantly above or below the test average.

Note: The 0-9 ratings indicate a genotype's response to disease or lodging where 0 = highly resistant and 9 = highly susceptible.

Table 5. Summary of performance of entries in the Virginia Tech Hard Red Winter Wheat Test at Blacksburg, 2021 harvest.

Line	Yield (Bu/a)	Test Weight (Lb/bu)	Heading Date (Julian)	Height (In)	Lodging (0-9)
VA18HRW-57	100.2 +	60.8	135 +	37	0.0
VA18HRW-45	97.6 +	61.7 +	134 +	36	0.0
VA19HRW-12	96.9 +	61.8 +	133	36	0.0
VA19HRW-62	95.5	60.0	131	36	0.0
14VDH-HRW02-105	95.5	61.5	131	34	0.0
NVIR17-8	95.2	60.9	131	33	0.0
VA19HRW-17	95.0	60.9	133 +	31	0.0
14VDH-HRW02-029	94.9	61.4	132	33	0.0
VA19HRW-149	94.7	60.5	131	33	0.0
VA18HRW-51	94.6	61.7 +	133	40	1.3
VA19HRW-33	93.7	61.2	134 +	38	0.0
Liberty 5658 (SRW)	93.6	61.2	129 -	36	0.0
VA18HRW-98	93.1	60.0	131	34	0.0
VA19HRW-11	93.0	60.5	132	39	0.0
VA19HRW-19	91.7	60.9	133	38	0.0
SHIRLEY (SRW)	91.7	59.3 -	130 -	32	0.0
VA18HRW-68	91.6	61.0	131	38	2.0 +
VA19HRW-77	91.6	61.8 +	132	39	0.0
HILLIARD (SRW)	91.5	60.9	130 -	31	0.0
VA18HRW-58	91.0	62.3 +	135 +	40	0.0
VA19HRW-9	91.0	60.6	134 +	37	3.0 +
VA19HRW-59	90.2	61.0	131	42	3.0 +
VA19HRW-151	90.0	59.2 -	130 -	34	0.0
VA19HRW-152	89.9	61.8 +	131	37	0.0
VA19HRW-47	89.9	62.1 +	132	41	0.0
VA19HRW-41	89.9	59.6 -	131	41	0.0
VA19HRW-58	89.9	62.1 +	130 -	36	0.0
15VDH-HRW15-062	89.4	60.0	133 +	31	0.0

MAS1417-148-3-1	89.1	60.2		133	35	0.0	
DH15HRW-69-50	88.8	60.0		130 -	33	0.0	
DH16HRW-72-134	88.8	61.3		130 -	34	0.0	
HR 5210	88.7	59.0 -		132	32	0.0	
VA18HRW-96	88.2	61.1		133	36	0.0	
SOISSONS	88.0	58.8 -		132	36	0.0	
VISION 45	87.8	60.9		134 +	40	0.0	
VA19HRW-31	87.3	60.6		131	36	0.0	
VA19HRW-80	87.2	60.0		130 -	38	0.3	
15VDH-HRW19-018	86.6	62.2 +		135 +	38	0.0	
MAS1417-117-5-3-4	86.4	61.5		134 +	42	0.0	
VA16HRW-22	86.1	61.5		131	37	0.0	
VA19HRW-37	85.9	60.6		134 +	36	0.0	
MAS1417-006-6-4	85.7	60.8		132	33	0.0	
VA19HRW-76	85.6	62.4 +		130 -	34	0.0	
DH17HRW-127-100	85.4	60.8		130 -	36	0.0	
HARDY 2519	85.1	61.8 +		131	35	0.0	
VA19HRW-64	84.9	61.3		131	32	0.0	
VA09HRW-43	84.9	59.7 -		131	34	0.0	
VA19HRW-53	84.7	61.2		134 +	33	0.0	
VA18HRW-7	84.7	61.3		130 -	35	0.0	
VA19HRW-63	84.5	60.4		131	36	0.0	
VA19HRW-36	84.1	60.8		134 +	37	0.0	
17VDH-HRW12-169	83.8	61.7 +		130 -	29	0.0	
Everest	83.6	61.9 +		126 -	30	0.0	
DH12HRW46-8	83.5	60.1		131	27	0.0	
VA17HRW-43	83.3	61.0		132	35	0.0	
KARL 92	83.1	61.5		127 -	34	0.0	
16VDH-HRW14-008	82.9	59.6 -		130 -	28	0.0	
15VDH-HRW16-110	82.3	59.6 -		135 +	34	0.0	
ARS14W0947	82.3	62.3 +		133 +	40	2.3 +	
VA19HRW-73	81.8	61.4		134 +	.	0.0	
DH15HRW-65-142	81.8	61.6		134 +	34	0.7	
VA19HRW-34	81.6	59.8 -		134 +	35	0.0	

VA19HRW-49	81.3	59.3	-	132	38	0.0	
DH12HRW50-11	81.2	60.2		132	34	0.0	
VA19HRW-35	81.0	60.3		134	+	40	0.0
VA19HRW-22	80.4	60.2		132		38	0.0
VA19HRW-147	80.4	59.6	-	133	+	38	0.0
15VDH-HRW15-199	80.4	60.7		132		32	0.0
NVIR17-1	80.3	61.3		126	-	33	0.0
VA13MAS14-1992-3-4	80.2	59.9	-	129	-	33	0.0
VA19HRW-4	79.9	59.5	-	133	+	37	0.0
VA19HRW-26	79.8	60.6		134	+	39	1.3
14VDH-HRW01-019	79.8	61.2		133		39	0.0
16VDH-HRW13-090	77.7	59.2	-	134	+	38	0.0
JAGGER	77.4	61.7	+	125	-	34	0.0
Vision 50	74.7	-	61.1	132		35	0.0
VISION 30	74.6	-	61.4	131		36	0.0
17VDH-HRW12-113	73.9	-	60.8	130	-	32	0.0
DH13HRW07-30	73.9	-	61.2	132		36	0.0
VA19HRW-43	73.6	-	62.1	+	131	37	0.0
Average (n=80)	86.4	60.8		131.7		35.5	0.2
LSD (0.05)	9.9	0.8		1.1		---	1.6
C.V.	7.0	0.8		0.5		---	---

Note: The number in parentheses below column headings indicates the number of locations on which data are based. Released cultivars are shown in bold print.

Note: Varieties are ordered by descending yield averages. A plus or minus sign indicates a performance significantly above or below the test average.

Note: The 0-9 ratings indicate a genotype's response to disease or lodging where 0 = highly resistant and 9 = highly susceptible.

Table 6. Summary of performance of entries in the Virginia Tech Hard Red Winter Wheat Test at Painter, 2021 harvest.

Line	Yield (Bu/a)	Test Weight (Lb/bu)
VA19HRW-151	77.7 +	58.2
14VDH-HRW02-029	75.9 +	58.9
HR 5210	74.9 +	57.6
VA19HRW-31	73.3	58.6
VA18HRW-98	73.2	58.5
VA19HRW-80	73.2	58.4
VA19HRW-64	72.9	59.6
VA19HRW-33	72.3	58.7
VA19HRW-63	72.2	58.8
MAS1417-117-5-3-4	71.8	58.7
MAS1417-006-6-4	71.4	58.7
14VDH-HRW02-105	71.0	59.6
DH17HRW-127-100	70.6	58.8
Liberty 5658 (SRW)	69.5	59.5
NVIR17-8	69.3	57.9
VA18HRW-57	69.3	58.9
VA19HRW-4	69.2	58.2
VA19HRW-149	68.1	57.7
VA19HRW-9	68.1	58.1
VA19HRW-11	68.0	58.4
VA19HRW-41	67.9	59.0
16VDH-HRW13-090	67.8	57.6
15VDH-HRW19-018	67.7	58.7
HILLIARD (SRW)	66.9	58.4
VA18HRW-58	66.9	59.6
VA19HRW-37	66.5	58.0
MAS1417-148-3-1	66.4	57.6
VA19HRW-49	65.6	57.7

VA19HRW-62	65.6	58.7	
SHIRLEY (SRW)	65.6	57.8	
DH15HRW-65-142	65.4	58.5	
17VDH-HRW12-169	65.3	60.2	+
HARDY 2519	64.7	59.2	
VA19HRW-26	64.6	58.3	
VA18HRW-51	64.4	58.8	
14VDH-HRW01-019	64.3	58.7	
VA19HRW-147	64.2	57.7	
DH15HRW-69-50	64.1	59.4	
VA19HRW-152	64.1	59.2	
VA19HRW-59	63.9	60.4	+
VA19HRW-43	63.8	60.0	+
DH12HRW50-11	63.7	56.8	-
VA18HRW-45	63.5	58.4	
VA19HRW-36	63.3	58.1	
VA19HRW-35	62.7	59.1	
VA18HRW-68	62.6	58.2	
SOISSONS	62.5	57.8	
DH13HRW07-30	62.3	58.0	
VA13MAS14-1992-3-4	62.2	57.8	
VA19HRW-58	61.8	60.9	+
VA19HRW-19	61.5	58.7	
15VDH-HRW16-110	61.4	56.8	-
NVIR17-1	61.3	57.8	
ARS14W0947	61.2	58.2	
VA19HRW-76	61.2	58.7	
VA19HRW-12	61.1	58.2	
VA18HRW-96	60.9	57.2	-
16VDH-HRW14-008	60.9	57.1	-
VA16HRW-22	60.2	61.2	+
VA18HRW-7	60.2	59.0	
VA19HRW-53	60.1	59.0	
DH12HRW46-8	60.0	58.6	

VA19HRW-22	59.7	57.8	
VA19HRW-77	59.6	58.4	
VISION 45	59.3	58.8	
VA09HRW-43	59.2	57.3	
VA17HRW-43	59.0	59.3	
VA19HRW-73	59.0	58.1	
JAGGER	58.6	59.2	
VA19HRW-34	58.3	58.0	
VISION 30	58.2	59.0	
DH16HRW-72-134	58.1	58.9	
15VDH-HRW15-199	57.2	58.4	
KARL 92	56.6	58.9	
15VDH-HRW15-062	56.5	57.1	-
Everest	55.5	58.8	
VA19HRW-47	54.6	59.0	
17VDH-HRW12-113	53.1	-	58.2
VA19HRW-17	52.4	-	57.4
Vision 50	51.1	-	57.4
Average (n=80)	64.1	58.5	
LSD (0.05)	10.3	1.2	
C.V.	8.0	1.1	

Note: The number in parentheses below column headings indicates the number of locations on which data are based. Released cultivars are shown in bold print.

Note: Varieties are ordered by descending yield averages. A plus or minus sign indicates a performance significantly above or below the test average.

Note: The 0-9 ratings indicate a genotype's response to disease or lodging where 0 = highly resistant and 9 = highly susceptible.

Table 7. Summary of performance of entries in the Virginia Tech Hard Red Winter Wheat Test at Warsaw, 2021 harvest.

Line	Yield (Bu/a)	Test Weight (Lb/bu)	Heading Date (Julian)	Height (In)	Lodging (0-9)	Powdery Mildew (0-9)
Liberty 5658 (SRW)	107.5 +	60.5	117 -	36	0.0	0.0
DH15HRW-65-142	103.5 +	59.9	120	34	2.3 +	0.0
VA18HRW-98	103.3 +	58.8 -	119	37	0.0	0.7 +
14VDH-HRW02-029	103.3 +	60.6	120	34	0.0	0.0
HILLIARD (SRW)	102.4 +	60.2	118	36	0.0	0.0
VA19HRW-47	101.3 +	61.3 +	120	39 +	0.0	0.0
VA18HRW-58	101.1 +	60.4	122 +	38 +	0.0	0.0
VA19HRW-12	101.0 +	60.8 +	122 +	35	0.0	0.0
HR 5210	100.6	58.6 -	120	30 -	0.0	0.0
NVIR17-8	100.3	59.7	120	31 -	0.0	0.0
VA18HRW-51	100.3	60.0	123 +	36	0.0	0.0
HARDY 2519	100.1	61.6 +	118	37	0.7	0.3
VA19HRW-59	100.0	61.4 +	120	44 +	0.3	0.0
VA19HRW-17	99.7	59.9	120	35	0.0	0.0
VA19HRW-9	98.7	58.4 -	122 +	37	0.0	0.0
VA19HRW-151	98.6	59.5	119	33	0.0	0.3
15VDH-HRW19-018	98.4	62.0 +	120	38 +	0.0	0.0
VA19HRW-77	96.6	60.3	120	36	0.0	0.0
NVIR17-1	96.3	60.3	117 -	34	0.0	0.0
VA19HRW-149	96.2	59.4	119	33	0.0	0.0
VA18HRW-57	96.2	59.7	121	36	1.3	0.7 +
VA19HRW-58	95.8	61.8 +	119	39 +	0.0	2.3 +
VA18HRW-96	95.7	57.7 -	121	36	0.0	0.0
VA19HRW-11	95.2	59.9	120	36	0.0	0.0
VA19HRW-33	95.1	60.3	121	37	0.0	0.0
VA19HRW-63	94.2	59.4	118	33	0.7	0.0
DH17HRW-127-100	94.1	58.7 -	118	38 +	0.3	0.0
SHIRLEY (SRW)	93.8	58.5 -	119	33	0.0	0.0

VA19HRW-37	93.4	59.6	122	+	34	0.0	0.0
VA19HRW-53	93.4	59.9	120		32	-	0.0
VA18HRW-45	93.2	60.1	123	+	34	0.0	0.0
15VDH-HRW15-062	92.5	60.3	120		31	-	0.0
MAS1417-148-3-1	92.5	58.9	-	120	39	+	0.0
MAS1417-117-5-3-4	92.3	59.4	120		40	+	1.0
14VDH-HRW02-105	92.1	60.2	120		33		0.0
VA19HRW-41	92.0	60.2	120		38	+	1.3
VA19HRW-49	91.6	59.1	119		36		0.0
VA09HRW-43	91.5	58.4	-	118	35		1.3
VA19HRW-152	91.5	60.3	119		36		0.3
VA19HRW-43	90.5	61.5	+	120	35		0.3
DH16HRW-72-134	90.5	60.7	119		34		0.0
VA19HRW-26	90.4	59.7	120		39	+	0.0
ARS14W0947	90.4	59.9	119		38	+	0.0
VA18HRW-68	90.3	59.5	120		40	+	2.3
VISION 45	90.3	60.1	121		42	+	0.0
VA19HRW-62	90.2	59.9	119		35		0.0
17VDH-HRW12-169	90.0	61.6	+	119	31	-	0.0
15VDH-HRW16-110	89.7	58.5	-	123	+	32	-
VA19HRW-31	89.6	59.6	120		39	+	0.0
VA19HRW-34	89.0	59.6	120		33		0.0
VA19HRW-64	89.0	61.4	+	118	34		0.3
VA17HRW-43	88.9	60.4	120		33		0.0
16VDH-HRW13-090	88.9	58.2	-	121	37		1.0
VA19HRW-35	88.6	59.7	121		35		0.0
VA13MAS14-1992-3-4	88.6	59.6	118		34		0.0
VISION 30	88.6	59.6	119		35		0.3
VA19HRW-36	88.6	60.0	121		36		0.0
Everest	88.3	61.2	+	114	-	34	0.7
VA16HRW-22	88.1	61.5	+	119	35		0.0
VA19HRW-22	88.0	59.0	-	119	40	+	2.7
VA19HRW-147	87.9	59.8	120		38	+	0.0
16VDH-HRW14-008	87.9	59.1	118		30	-	0.0

VA19HRW-73	87.5	60.0	120	36	0.0	0.0
VA19HRW-19	87.3	60.0	120	40 +	0.0	0.0
VA18HRW-7	87.2	59.8	119	35	0.0	0.0
15VDH-HRW15-199	87.1	60.6	120	32 -	0.0	0.0
VA19HRW-76	87.0	60.2	117 -	33	0.0	0.0
14VDH-HRW01-019	86.6	60.7	121	37	0.0	0.0
DH12HRW46-8	85.7	60.1	119	30 -	0.0	0.0
SOISSONS	84.6	58.1 -	120	33	0.3	0.0
DH13HRW07-30	83.9	59.3	119	37	0.0	0.0
VA19HRW-4	83.3	58.4 -	120	36	1.7	2.7 +
17VDH-HRW12-113	83.2	60.7	118	34	0.0	0.0
VA19HRW-80	83.2	59.2	118	37	2.0 +	0.0
MAS1417-006-6-4	83.0 -	58.5 -	120	33	0.0	0.0
DH12HRW50-11	82.5 -	58.3 -	120	32 -	0.3	0.0
DH15HRW-69-50	82.2 -	60.5	119	31 -	0.0	0.0
Vision 50	80.5 -	59.7	119	34	0.0	0.0
JAGGER	80.1 -	60.9 +	117 -	35	0.3	3.7 +
KARL 92	79.1 -	60.2	117 -	34	0.3	3.7 +
Average (n=80)	91.9	59.9	119.6	35.4	0.3	0.2
LSD (0.05)	8.8	0.8	1.5	1.9	1.6	0.4
C.V.	6.0	0.8	0.8	3.3	---	---

Note: The number in parentheses below column headings indicates the number of locations on which data are based. Released cultivars are shown in bold print.

Note: Varieties are ordered by descending yield averages. A plus or minus sign indicates a performance significantly above or below the test average.

Note: The 0-9 ratings indicate a genotype's response to disease or lodging where 0 = highly resistant and 9 = highly susceptible.

Table 8. Summary of reaction of entries in the Virginia Tech Hard Red Winter Wheat Test to Fusarium head blight (scab), Eastern Virginia AREC, Warsaw, VA 2021 harvest.

Line	Flowering Date (Julian)	FHB (0-9)	FDK (%)	ISK (%)
14VDH-HRW01-019	127	1.0	17.5	6.1
MAS1417-148-3-1	126	1.0	15.0	6.1
Hardy 2519	124	1.5	7.5 -	9.0
14VDH-HRW02-029	126	1.5	9.0 -	9.0
VA19HRW-22	126	1.5	6.5 -	9.0
VA19HRW-26	127	1.5	9.0 -	9.0
VA19HRW-31	124	1.5	7.5 -	9.0
VA19HRW-33	129	1.5	7.5 -	9.0
HILLIARD (SRW)	125	1.5	20.0	9.1
VISION 30	127	1.5	22.5	9.1
NVIR17-8	126	1.5	32.5	9.1
VA13MAS14-1992-3-4	126	1.5	25.0	9.1
VA16HRW-22	126	1.5	20.0	9.1
VA19HRW-80	126	1.5	12.5	9.1
VA19HRW-58	125	2.0	7.5 -	12.0
NVIR17-1	127	2.0	22.5	12.1
VA18HRW-58	128	2.0	12.5	12.1
VA18HRW-68	126	2.0	12.5	12.1
VA19HRW-11	128	2.0	30.0	12.1
VA19HRW-147	127	2.0	20.0	12.1
VA19HRW-152	127	2.0	17.5	12.1
VA19HRW-47	126	2.0	12.5	12.1
VA19HRW-77	127	2.0	17.5	12.1
VA17HRW-43	125	2.5	11.0	15.0
VA19HRW-43	125	2.5	8.0 -	15.0
VA19HRW-59	127	2.5	10.0	15.0
15VDH-HRW15-062	128	2.5	17.5	15.1
VA09HRW-43	125	2.5	30.0	15.1
VA19HRW-37	128	2.5	15.0	15.1
VA19HRW-49	127	2.5	17.5	15.1
Liberty 5658 (SRW)	126	3.0	11.0	18.0
5210 (EXP21)	129	3.0	21.0	18.1
VISION 45	132 +	3.0	17.5	18.1
14VDH-HRW02-105	125	3.0	15.0	18.1
16VDH-HRW14-008	128	3.0	25.0	18.1
DH12HRW50-11	126	3.0	17.5	18.1

VA18HRW-7	127		3.0	20.0	18.1
VA19HRW-41	125		3.0	12.5	18.1
VA19HRW-64	126		3.0	22.5	18.1
VA19HRW-73	126		3.0	25.0	18.1
VA19HRW-76	125		3.0	25.0	18.1
Everest	124		3.5	10.0	21.0
ARS14W0947	127		3.5	11.0	21.0
DH13HRW07-30	128		3.5	35.0 +	21.1
DH15HRW-69-50	125		3.5	12.5	21.1
DH16HRW-72-134	129		3.5	25.0	21.1
DH17HRW-127-100	125		3.5	25.0	21.1
VA18HRW-45	133 +		3.5	27.5	21.1
VA19HRW-151	125		3.5	18.5	21.1
VA19HRW-34	131 +		3.5	20.0	21.1
VA19HRW-9	130		3.5	30.0	21.1
VA18HRW-51	131 +		3.5	42.5 +	21.2
VA19HRW-4	129		3.5	40.0 +	21.2
17VDH-HRW12-113	124		4.0	5.0 -	24.0
17VDH-HRW12-169	126		4.0	11.5	24.0
VA18HRW-98	125		4.0	10.0	24.0
VA19HRW-36	130		4.0	5.0 -	24.0
Vision 50	126		4.0	17.5	24.1
VA18HRW-96	129		4.0	30.0	24.1
VA19HRW-149	125		4.0	27.5	24.1
VA19HRW-19	129		4.0	15.0	24.1
VA19HRW-35	131 +		4.0	25.0	24.1
SOISSONS	128		4.0	40.0 +	24.2
VA19HRW-63	125		4.0	37.5 +	24.2
15VDH-HRW15-199	128		4.5	22.5	27.1
15VDH-HRW19-018	131 +		4.5	25.0	27.1
MAS1417-117-5-3-4	129		4.5	25.0	27.1
VA19HRW-12	131 +		4.5	22.5	27.1
VA19HRW-17	133 +		4.5	30.0	27.1
VA19HRW-53	132 +		4.5	45.0 +	27.2
JAGGER	124		5.0	11.0	30.0
16VDH-HRW13-090	130		5.0	35.0 +	30.1
MAS1417-006-6-4	129		5.0	25.0	30.1
VA19HRW-62	126		5.5	11.0	33.0
VA18HRW-57	131 +		5.5	45.0 +	33.2
15VDH-HRW16-110	131 +		6.0	32.5	36.1
DH12HRW46-8	125		6.0	35.0 +	36.1

KARL 92	124	6.0	37.5 +	36.2
SHIRLEY (SRW)	128	6.0	37.5 +	36.2
DH15HRW-65-142	133 +	6.0	50.0 +	36.2
Average (n=80)	127	3.2	21.2	19.4
LSD (0.05)	3	2.9	11.6	17.2
C.V.	1	44.6	27.5	44.4

FHB - Fusarium Head Blight ranking (0-9)

FDK - Fusarium damaged kernels

ISK - Incidence/Severity/Kernel damage index

Note: A plus or minus sign indicates a performance significantly above or below the average.

Table 9. Grain and flour quality parameters of entries in the Virginia Tech Hard Red Winter Wheat Test, 2020 harvest.

Line	1000 Kernel Weight (g)	Wheat Protein (%)	Flour Yield (%)	Flour Protein (%)	Flour Water Absorption (%)	Mixing Time (min)	Adj. Mixing Time (min)	Mixing Tolerance (0-6)
Everest	42.9	10.9	66.3	9.8	60.3	2.63	1.94	2
HR 5210	41.6	9.8	70.3	8.6	58.3	6.50	3.87	3
JAGGER	40.3	10.5	68.3	9.4	59.6	4.13	2.85	3
KARL 92	40.4	10.9	67.0	10.0	60.6	4.75	3.63	3
Liberty 5658 (SRW)	40.9	8.9	63.2	7.3	55.6	6.13	2.69	3
SOISSONS	39.6	10.1	72.1	8.9	58.8	5.88	3.72	4
VISION 30	38.1	10.6	68.1	9.7	60.0	5.25	3.78	3
VISION 45	43.3	10.0	69.6	9.0	58.9	4.50	2.86	2
Vision 50	44.7	10.8	68.0	9.9	60.4	4.13	3.08	3
14VDH-HRW01-019	42.9	9.7	68.3	8.6	58.2	4.25	2.49	3
14VDH-HRW02-029	47.2	9.7	70.6	8.5	58.0	5.75	3.31	3
14VDH-HRW02-105	45.3	9.9	69.7	8.7	58.5	4.38	2.66	2
15VDH-HRW15-062	45.3	10.7	69.0	9.6	59.9	9.00	6.39	4
15VDH-HRW15-199	42.3	10.5	71.9	9.6	60.0	4.75	3.39	4
15VDH-HRW16-110	38.9	10.0	69.0	8.7	58.5	6.00	3.65	4
15VDH-HRW19-018	42.4	10.4	69.4	9.2	60.6	6.50	4.28	4
16VDH-HRW13-090	50.1	9.8	69.7	8.9	59.7	10.00	6.23	4
16VDH-HRW14-008	37.9	11.0	68.5	10.1	60.8	5.50	4.26	4
ARS14W0947	37.8	9.7	62.8	8.8	57.6	2.50	1.54	0
DH12HRW46-8	39.5	10.2	68.0	9.1	61.6	2.25	1.47	2
DH12HRW50-11	44.2	10.1	69.0	9.1	59.0	2.63	1.71	1
DH13HRW07-30	39.1	10.7	67.1	9.9	60.9	5.00	3.73	3
DH15HRW-65-142	42.3	9.9	68.8	8.7	58.4	5.38	3.25	4
DH15HRW-69-50	43.7	10.5	68.5	9.4	59.6	3.25	2.24	1
DH16HRW-72-134	41.1	10.9	63.5	9.7	60.7	3.50	2.55	3
MAS1417-006-6-4	44.3	10.4	69.1	9.4	59.5	2.88	1.97	3

MAS1417-148-3-1	47.4	10.3	68.9	8.9	58.7	2.50	1.56	2
NVIR17-1	40.3	10.4	68.9	9.6	59.9	2.75	1.96	2
NVIR17-8	43.1	9.6	69.8	8.4	57.8	6.00	3.39	4
VA09HRW-43	44.7	9.9	69.5	8.6	57.9	3.25	1.94	2
VA13MAS14-1992-3-4	36.7	10.4	69.1	9.2	59.3	6.00	3.98	4
VA14HRW-25	36.6	10.1	64.6	9.2	59.8	4.13	2.74	3
VA16HRW-22	38.6	10.7	69.0	9.6	60.9	5.25	3.73	4
VA17HRW-43	41.8	10.8	71.7	10.0	61.2	6.25	4.77	5
VA18HRW-45	36.5	10.9	64.5	9.6	59.9	2.75	1.96	3
VA18HRW-51	42.2	10.3	65.9	9.5	59.7	2.50	1.74	2
VA18HRW-57	41.3	10.6	68.2	9.6	60.4	4.88	3.45	4
VA18HRW-58	39.3	10.5	68.7	9.5	60.3	4.13	2.90	3
VA18HRW-68	44.2	10.7	69.0	9.6	60.0	5.50	3.93	4
VA18HRW-7	38.1	10.4	64.2	9.4	59.6	2.00	1.37	1
VA18HRW-96	45.3	10.2	72.2	9.2	59.2	4.38	2.90	4
VA18HRW-98	45.4	9.6	68.7	8.5	58.0	3.75	2.16	3

Note: Cultivars are sorted alphabetically; released lines are in bold print; Jagger is the quality standard check variety.

Section 3: Malt Barley Varieties in Virginia

As interest continues to grow in locally produced ingredients from the craft brewing industry in the mid-Atlantic and eastern U.S., finding malted barley is not easy for those located in the region. Therefore, demands for the production of high-quality winter barley for the malt, brewing and distilling industries have generated new interest in barley.

Malt barley tests were planted in seven-inch rows at Blackstone and in six-inch rows at Warsaw and Blacksburg; at 44 seeds per square foot.

Agronomic performance data for entries in the Eastern Malt Barley Trial conducted at locations in Blacksburg, Blackstone and Warsaw, VA in 2021 are presented in Table 10. Seven lines produced grain yields greater than mean of the test, including three released cultivars, Thoroughbred, Hirondezza and Flavia. Four experimental lines, VA17M-14DH1840, VA17M-13DH1720 (LX), VA18M-DH170740 and VA17M-14DH1476 (LX) also had grain yield greater than the mean (90.2 bu/ac), while VA18M-DH170740 also had test weight that was significantly greater than the mean of the test. The newly released Virginia Tech cultivar Avalon produced 89.2 bu/ac which was similar to the mean of the test and 9 bu/ac greater than Violetta. Test weight of Avalon was 53.7 lb/bu which was significantly greater than the test average and 0.8 lb/bu heavier than the check cultivar Violetta. Over two years, three new experimental lines, VA17M-14DH1840, VA17M-13DH1720 (LX) and VA17M-14DH1476 (LX), had grain yield significantly greater than the mean of the test and equivalent to the check cultivars Thoroughbred and Flavia. Results for these new malt barley lines are encouraging and indicate that significant progress is being made by the breeding program in developing barley cultivars with high yield and improved disease resistance.

Summary of malt quality performance of entries in the 2020 Eastern Malt Barley Trials (EMBT) at Warsaw, VA are presented in Table 16. Malting quality data among malt barley indicates that the Virginia malt barley cultivar Avalon released in 2020 meets or exceeds the desired AMBA target ranges for all of the important malting characteristics including protein (11.0 %), plump kernels >6/64" (98 %), malt extract (81 %), beta-glucan (112 ppm alpha-amylase (73 D.U.), and FAN (162 ppm). Malt extract for Avalon is equivalent to Calypso, Violetta and Flavia. Beta-glucan content of Avalon is over 40% lower than Violetta (201 ppm) or Hirondezza (188 ppm). Malt quality values for the check varieties (Violetta, Flavia, Calypso and Wintmalt) changed to varying degrees that were either lower or higher than the upper or lower limits for all-malt specifications. Our breeding program plans to continue to build on the data collected on these varieties and evaluate and select superior malt barley lines each year from the EMBT and the WMBT, to determine which lines are best suited to provide the yields and quality sought by craft maltsters and brewers in the eastern U.S.

Table 10. Over locations average summary of performance of entries in the Eastern Malt Barley Test, 2021 harvest.

Barley Lines	Yield (Bu/a @ 48 lb/bu)	Test Weight (Lb/bu)	Date Headed (Julian)	Mature Height (In)	Plant Lodging (0-9)
	(3)	(3)	(2)	(2)	(2)
VA17M-14DH1840	113.9 +	52.8	115	28	0.5
Thoroughbred	112.7 +	52.6	115	30 +	0.5
VA17M-13DH1720 (LX)	109.3 +	51.3	117	28	0.3
Hirondella	105.4 +	51.0	120 +	27	0.3
Flavia	104.0 +	51.8	120 +	22 -	0.0
VA18M-DH170740	103.6 +	54.4 +	108 -	28	0.5
VA17M-14DH1476 (LX)	102.5 +	51.1	116	29	2.5 +
VA17M-14DH1815 (LX)	99.9	52.4	110 -	32 +	0.8
Endeavor	93.8	53.1	110 -	28	0.0
12W587-n-23	92.6	51.1	124 +	26	0.2
VA18M-75 LA	92.1	55.2 +	112 -	31 +	0.2
Calypso	92.0	51.7	119 +	27	0.5
VA16M-14DH1312 (2R)	91.8	54.2 +	112 -	28	0.0
ARS15B12	90.9	53.8 +	115	29	0.0
ARS18B071	90.7	50.5	121 +	26	0.3
12W587-n-28	90.4	49.5 -	125 +	25	0.0
12W595-n-74	90.1	50.8	120 +	25	0.2
Avalon (VA16M-81 2R)	89.2	53.7 +	116	31 +	0.5
VA18M-DH170705	88.6	53.8 +	115	30 +	0.7
12W595-n-02	88.5	51.2	122 +	25	0.5
12W595-n-05	88.4	50.5	121 +	26	0.5
VA17M-15DH0272	87.3	51.7	123 +	24 -	0.0
VA18M-DH162217	86.3	54.3 +	108 -	33 +	1.3
ARS18B095	84.8	53.6 +	116	33 +	0.0
Wintmalt	84.4	55.5 +	115	30 +	0.2
12W586-n-28	83.4	46.6 -	122 +	23 -	1.3
VA16M-84 (2R)	82.9	55.0 +	116	31 +	0.2
ARS18B066	82.5	50.0 -	121 +	25	0.5
Violetta	80.1	52.9	116	25	0.8
ARS18B060	76.6 -	46.2 -	125 +	29	0.2
ARS18B158	67.9 -	51.6	111 -	31 +	0.5
ARS18B107	67.8 -	53.6 +	116	29	0.0
ARS18B047	63.7 -	43.1 -	123 +	23 -	3.5 +
Average	90.2	51.8	117.0	27.7	0.5
LSD (0.05)	10.6	1.4	2	2	0.8
C.V.	12.1	2.3	1	6.1	---

Released cultivars are shown in bold print.

Varieties are ordered by descending yield averages.

A plus or minus sign indicates a performance significantly above or below the test average.

The 0-9 ratings indicate a genotype's response to disease or lodging where 0 = highly resistant and 9 = highly susceptible.

The number in parentheses below column headings indicates the number of location-years on which data are based.

Table 11. Two-year average summary of performance of entries in the Eastern Malt Barley Test, 2020 and 2021 harvests.

Barley Lines	Yield (Bu/a @ 48 lb/bu)	Test Weight (Lb/bu)	Date Headed (Julian)	Mature Height (In)	Plant Lodging (0-9)	Net Blotch (0-9)
	(6)	(6)	(4)	(4)	(4)	(2)
VA17M-13DH1720 (LX)	115.1 +	49.4	115	32	1.6	2.2 -
VA17M-14DH1840	114.5 +	51.2	114	31	1.0	1.2 -
Thoroughbred	112.8 +	51.8	113	34 +	1.0	3.5
Flavia	112.4 +	50.4	118 +	26 -	0.1	1.7 -
VA17M-14DH1476 (LX)	109.3 +	49.2 -	114	33 +	2.9 +	2.3 -
Hirondella	108.6 +	49.0 -	117 +	30	1.0	1.7 -
VA17M-14DH1815 (LX)	102.4	50.8	109 -	35 +	0.9	1.3 -
Calypso	101.8	49.4	118 +	31	1.2	2.2 -
12W587-n-28	101.6	50.5	122 +	29	0.6	3.0
Endeavor	101.4	51.7	109 -	32	0.2	2.8
Wintmalt	99.7	52.1 +	116	31	0.3	2.0 -
ARS15B12	99.5	51.9 +	113	32	0.1	1.3 -
VA16M-14DH1312 (2R)	97.7	51.7	110 -	31	0.0	0.8 -
12W587-n-23	96.4	50.4	121 +	30	0.8	3.2
Avalon (VA16M-81 2R)	95.7	52.5 +	115	33 +	0.9	2.2 -
VA18M-75 LA	93.2	52.6 +	109 -	32	0.4	0.5 -
12W595-n-74	91.9	49.1 -	117 +	30	2.1	6.0 +
12W595-n-02	90.9	49.4	118 +	28 -	1.9	4.2 +
VA16M-84 (2R)	89.6 -	53.5 +	115	36 +	0.3	1.8 -
12W595-n-05	89.2 -	48.3 -	118 +	29	2.3 +	5.7 +
VA17M-15DH0272	88.6 -	52.1 +	117 +	30	0.7	1.0 -
Violetta	88.2 -	50.7	113	27 -	1.0	2.0 -
12W586-n-28	82.1 -	45.6 -	119 +	26 -	1.7	5.5 +
Average	99.2	50.6	115	31	1	3
LSD (0.05)	8.7	1.2	2	2	1.1	---

C.V.	12.8	3.3	2	7	---	---
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Released cultivars are shown in bold print.

Varieties are ordered by descending yield averages.

A plus or minus sign indicates a performance significantly above or below the test average.

The 0-9 ratings indicate a genotype's response to disease or lodging where 0 = highly resistant and 9 = highly susceptible.

The number in parentheses below column headings indicates the number of location-years on which data are based.

Table 12. Three-year average summary of performance of entries in the Eastern Malt Barley Test, 2019, 2020, and 2021 harvests.

Barley Lines	Yield (Bu/a @ 48 lb/bu)	Test Weight (Lb/bu)	Date Headed (Julian)	Mature Height (In)	Plant Lodging (0-9)	Net Blotch (0-9)
	(9)	(9)	(6)	(6)	(6)	(2)
Thoroughbred	110.6 +	49.5	112 -	32 +	1.1	3.5 +
Flavia	102.8	48.6	118 +	25 -	0.6	1.7
Hirondella	101.8	46.8 -	117 +	29	1.1	1.7
ARS15B12	98.0	50.5 +	112 -	30	0.6	1.3
Wintmalt	96.9	49.3	117 +	29	0.7	2.0
Calypso	96.6	47.4 -	118 +	29	1.3	2.2
Avalon	94.0	50.9 +	115	31 +	1.2	2.2
VA16M-14DH1312 (2R)	93.3	50.7 +	112 -	29	0.3	0.8
Violetta	90.9	49.1	113 -	26 -	1.2	2.0
VA16M-84 (2R)	88.1 -	52.2 +	115	34 +	0.8	1.8
Average	97.3	49.5	115	29	0.9	1.9
LSD (0.05)	6.8	0.9	1	1	0.7	1.4
C.V.	12.8	3.1	2	6	---	---

Released cultivars are shown in bold print.

Varieties are ordered by descending yield averages.

A plus or minus sign indicates a performance significantly above or below the test average.

The 0-9 ratings indicate a genotype's response to disease or lodging where 0 = highly resistant and 9 = highly susceptible.

The number in parentheses below column headings indicates the number of location-years on which data are based.

Table 13. Summary of performance of entries in the Eastern Malt Barley Test, Kentland Farm, Blacksburg, VA, 2021 harvest.

Barley Lines	Yield (Bu/a @ 48 lb/bu)	Test Weight (Lb/bu)	Date Headed (Julian)	Mature Height (In)	Plant Lodging (0-9)
VA17M-13DH1720 (LX)	120.1 +	50.9 -	118	27	0.0
Hirondella	114.8 +	50.1 -	121 +	26	0.0
12W587-n-28	114.0 +	52.4	127 +	28	0.0
VA18M-DH170740	112.6 +	54.6 +	110 -	28	0.0
Thoroughbred	111.7 +	51.8	117	28	0.0
VA17M-15DH0272	108.3	51.6	125 +	24 -	0.0
Flavia	107.0	51.9	121 +	23 -	0.0
VA17M-14DH1815 (LX)	105.2	52.1	111 -	31 +	0.7
VA17M-14DH1476 (LX)	103.5	50.4 -	116 -	28	0.3
VA18M-75 LA	103.4	55.2 +	112 -	30 +	0.0
ARS18B071	101.8	51.0	122 +	25	0.0
12W595-n-02	101.5	50.7 -	123 +	24 -	0.0
12W587-n-23	100.4	51.6	127 +	26	0.0
VA17M-14DH1840	100.2	52.0	117	26	0.0
12W595-n-74	100.1	50.3 -	122 +	24 -	0.0
ARS15B12	98.4	54.5 +	117	28	0.0
ARS18B066	97.2	49.6 -	122 +	23 -	0.0
Endeavor	96.0	54.1 +	114 -	27	0.0
VA16M-14DH1312 (2R)	94.0	52.6	112 -	29	0.0
12W595-n-05	92.3	50.2 -	122 +	24 -	0.0
12W586-n-28	92.3	45.9 -	124 +	24 -	0.7
Calypso	91.3	51.6	121 +	25	0.0
VA18M-DH162217	90.0	55.1 +	110 -	31 +	0.0
Avalon (VA16M-81 2R)	89.8	53.0 +	117	30 +	0.0
VA18M-DH170705	88.4	53.4 +	116 -	28	0.0
ARS18B095	87.3	54.3 +	118	32 +	0.0
Violetta	85.5	53.2 +	118	24 -	0.0
Wintmalt	84.9	55.9 +	118	29	0.0
ARS18B060	84.7 -	48.4 -	128 +	28	0.0
ARS18B047	83.3 -	43.3 -	124 +	25 -	1.7 +
ARS18B158	82.5 -	52.4	112 -	31 +	0.3
ARS18B107	75.9 -	53.7 +	118	30 +	0.0
VA16M-84 (2R)	72.4 -	54.7 +	118	31 +	0.0
Average	96.7	51.9	119	27	0.1
LSD (0.05)	12.0	0.9	2	2	0.6
C.V.	7.2	1.0	1	5.1	---

Released cultivars are shown in bold print.

Varieties are ordered by descending yield averages.

A plus or minus sign indicates a performance significantly above or below the test average.
The 0-9 ratings indicate a genotype's response to disease or lodging where 0 = highly resistant and 9 = highly susceptible.

Table 14. Summary of performance of entries in the Eastern Malt Barley Test, Southern Piedmont AREC, Blackstone, VA, 2021 harvest.

Barley Lines	Yield (Bu/a @ 48 lb/bu)	
VA17M-14DH1476 (LX)	77.3	+
Flavia	75.1	+
VA17M-14DH1840	74.5	+
Endeavor	72.5	+
Thoroughbred	70.1	
ARS18B095	69.9	
VA16M-14DH1312 (2R)	69.6	
VA18M-DH162217	67.0	
VA17M-13DH1720 (LX)	66.9	
12W587-n-23	63.9	
VA18M-DH170740	63.8	
Hirondella	63.6	
VA18M-75 LA	62.7	
12W587-n-28	62.5	
ARS15B12	62.3	
Wintmalt	62.1	
VA18M-DH170705	61.8	
VA16M-84 (2R)	61.5	
Calypso	60.4	
VA17M-14DH1815 (LX)	59.6	
Avalon (VA16M-81 2R)	57.2	
VA17M-15DH0272	56.2	
12W595-n-74	54.7	
ARS18B107	53.5	
ARS18B060	52.0	
12W595-n-02	47.9	-
12W586-n-28	47.9	-
Violetta	47.4	-
ARS18B071	47.1	-
12W595-n-05	46.6	-
ARS18B158	44.5	-
ARS18B066	41.7	-
ARS18B047	39.8	-
Average	59.5	
LSD (0.05)	11.3	
C.V.	10.7	

Released cultivars are shown in bold print.

Varieties are ordered by descending yield averages.

A plus or minus sign indicates a performance significantly above or below the test average.
The 0-9 ratings indicate a genotype's response to disease or lodging where 0 = highly resistant and 9 = highly susceptible.

Table 15. Summary of performance of entries in the Eastern Malt Barley Test, Eastern Virginia AREC, Warsaw, VA, 2021 harvest.

Barley Lines	Yield (Bu/a @ 48 lb/bu)	Test Weight (Lb/bu)	Date Headed (Julian)	Mature Height (In)	Plant Lodging (0-9)
VA17M-14DH1840	153.9 +	53.5	113 -	30	1.0
Thoroughbred	142.1 +	53.5	113 -	31 +	1.0
VA17M-13DH1720 (LX)	141.0 +	51.6	116	30	0.7
Hirondella	137.8 +	52.0	118 +	28	0.7
VA17M-14DH1815 (LX)	134.9 +	52.6	109 -	33 +	1.0
Flavia	129.9 +	53.0	119 +	22 -	0.0 -
VA17M-14DH1476 (LX)	126.8	51.8	115	30	4.7 +
Calypso	124.2	51.8	117 +	28	1.0
VA18M-DH170740	121.2	54.2 +	106 -	28	1.0
Avalon (VA16M-81 2R)	120.7	54.4 +	114	31 +	1.0
VA18M-75 LA	117.0	55.2 +	112 -	31 +	0.3
12W595-n-02	116.0	51.6	120 +	25 -	1.0
VA18M-DH170705	115.6	54.1 +	113 -	32 +	1.3
12W587-n-23	113.6	50.6	122 +	26	0.3
Endeavor	113.1	52.0	106 -	29	0.0 -
VA16M-14DH1312 (2R)	112.6	55.3 +	112 -	27	0.0 -
ARS18B071	112.4	50.2	119 +	26 -	0.7
12W595-n-05	112.3	50.9	119 +	27	1.0
ARS15B12	111.9	53.2	113 -	29	0.0 -
12W595-n-74	110.4	51.3	119 +	26	0.3
ARS18B066	108.8	50.4	119 +	26	1.0
VA16M-84 (2R)	107.8	55.3 +	115	32 +	0.3
Violetta	107.4	52.7	115	25 -	1.7
Wintmalt	106.2	55.2 +	113 -	31 +	0.3
VA17M-15DH0272	104.5	51.8	121 +	24 -	0.0 -
12W586-n-28	98.3	47.4 -	121 +	22 -	2.0 +
VA18M-DH162217	96.6	53.8 +	106 -	34 +	2.7 +
12W587-n-28	94.6 -	46.6 -	122 +	23 -	0.0 -
ARS18B095	93.0 -	53.2	113 -	34 +	0.0 -
ARS18B060	93.0 -	42.9 -	122 +	29	0.3
ARS18B158	81.5 -	51.1	109 -	30	0.7
ARS18B107	74.0 -	53.5 +	114	27	0.0 -
ARS18B047	67.9 -	42.9 -	121 +	22 -	5.3 +
Average	112.1	51.8	115	28	0.9
LSD (0.05)	15.5	1.7	2	2	1.0
C.V.	8.1	2.0	1	4.8	---

Released cultivars are shown in bold print.

Varieties are ordered by descending yield averages.

A plus or minus sign indicates a performance significantly above or below the test average.
The 0-9 ratings indicate a genotype's response to disease or lodging where 0 = highly resistant and 9 = highly susceptible.

Table 16. Malting quality of entries in the Eastern Malting Barley Trial at Eastern Virginia AREC, Warsaw, VA, 2020 harvest.

	Kernel	on	Barley	Malt			Barley	Wort			Alpha-	Beta-	
	Weight	6/64"	Color	Extract	Wort	Wort	Protein	Protein	S/T	DP	amylase	glucan	FAN
Variety or Selection	(mg)	(%)	(Agtron)	(%)	Color	Clarity	(%)	(%)	(%)	(°ASBC)	(20°DU)	(ppm)	(ppm)
Thoroughbred	34.9	97.1	50	81.0	1.7	1	8.6	3.97	48.7	128	57.4	347	121
Calypso	44.6	98.5	43	82.5	1.7	1	9.1	4.07	47.3	159	48.1	174	126
Violetta	43.6	98.7	52	81.9	1.7	1	9.7	4.48	49.3	170	61.2	201	157
Flavia	46.8	99.2	45	81.3	1.7	1	10.7	4.14	41.0	152	47.5	96	123
Hirondella	39.4	95.5	48	80.9	1.9	1	8.4	3.90	49.0	138	55.1	188	110
VA16M-14DH1312 (2R)	44.6	99.0	46	82.6	2.4	1	10.2	5.18	53.6	87	94.2	283	229
Avalon	41.8	98.8	47	80.8	1.7	1	11.0	4.49	41.8	166	73.0	112	162
VA16M-82 (2R)	46.2	99.4	45	81.2	1.7	1	11.6	4.69	42.5	160	72.9	239	177
VA16M-84 (2R)	50.0	99.4	48	81.5	1.8	1	10.3	4.33	43.7	127	61.1	395	138
VA16M-115 (2R)	42.4	97.7	45	79.3	1.8	1	12.5	5.22	45.2	115	93.1	491	201
VA17M-14DH1476 (LX)	33.5	90.9	56	81.4	2.3	1	9.8	5.01	54.2	127	109.0	315	220
VA17M-14DH1815 (LX)	34.3	90.3	46	81.5	2.2	1	9.8	5.05	53.9	130	89.4	429	218
VA17M-128 (2R)	49.5	97.9	47	79.7	1.6	1	10.4	4.28	43.0	114	57.1	487	144
VA17M-187 (2R)	48.4	99.4	54	77.6	1.5	1	13.0	4.58	37.6	134	56.8	390	164
VA17M-189 (2R)	46.1	99.2	42	79.3	1.4	1	10.7	4.22	39.4	118	55.2	382	157
VA17M-14DH1801 (LX)	32.6	90.0	51	80.2	1.8	1	10.1	4.04	43.4	120	64.5	507	136
VA17M-13DH1720 (LX)	31.9	89.5	49	78.9	1.7	1	9.9	3.89	40.8	146	48.1	224	128
VA17M-14DH1836	33.2	90.0	48	78.2	1.4	1	11.8	4.02	35.5	95	50.8	642	136
VA17M-14DH1840	32.0	96.0	56	80.2	2.0	2	9.7	3.62	38.7	89	46.3	658	106
VA17M-15DH0272	42.8	98.3	40	78.6	1.9	2	10.7	4.05	38.8	111	52.9	681	143
VA18M-75 LA	32.6	96.7	44	77.9	1.5	1	10.4	4.33	45.2	69	51.3	677	151
ARS15B12	48.4	98.7	45	80.6	1.9	1	10.6	4.55	46.2	97	76.5	226	185
ARS15B19	49.0	99.0	51	80.5	2.1	2	11.6	5.05	45.4	99	81.6	404	218
12W581-n-13	34.8	89.7	48	80.9	1.7	1	9.5	4.31	47.3	148	92.5	123	162
12W581-n-42	29.3	*80.4	57	81.5	1.8	1	9.3	4.14	47.4	157	93.5	56	151
12W589-n-07	36.5	91.3	49	82.7	1.8	1	8.9	4.42	51.9	170	93.6	130	177

12W586-n-28	37.3	97.7	52	79.4	1.7	1	9.5	3.89	42.7	124	49.5	178	132
12W586-n-50	38.6	98.2	53	79.3	1.6	1	10.6	4.07	39.5	150	48.6	364	141
12W586-n-56	38.8	97.7	50	79.4	1.6	1	9.7	3.99	44.9	125	44.1	314	136
12W595-n-02	42.5	98.5	54	81.4	1.6	2	9.6	3.82	43.7	113	51.5	171	135
12W595-n-04	41.4	98.8	52	80.9	1.6	1	10.3	4.33	42.4	126	54.3	121	133
12W595-n-05	40.5	98.6	53	81.8	1.5	1	9.8	4.40	46.7	119	55.3	94	144
12W595-n-16	43.7	99.1	52	80.8	1.4	1	11.1	4.52	44.3	146	55.4	167	148
12W595-n-66	40.9	98.7	50	80.3	1.5	1	10.2	4.23	44.7	122	54.9	102	139
12W595-n-71	42.6	98.8	51	80.8	1.5	1	8.8	4.25	52.5	114	54.9	82	138
12W595-n-74	41.1	98.7	52	81.1	1.5	1	10.3	4.29	43.0	125	55.9	122	143
12W595-n-83	39.8	98.8	53	81.3	1.5	1	9.4	4.11	48.2	122	53.5	58	133
12W595-n-96	40.8	98.7	51	81.1	1.4	1	10.0	4.23	45.9	127	53.4	78	130
12W587-n-23	33.9	90.8	56	79.4	1.5	1	9.2	4.08	44.3	141	53.5	407	115
12W587-n-28	37.7	95.6	44	79.2	1.4	1	10.4	4.31	45.2	131	67.1	213	146
Endeavor	50.0	98.9	55	80.9	1.9	1	9.8	4.78	50.3	97	71.6	215	176
Wintmalt	45.6	99.1	58	81.0	1.6	1	10.2	4.49	46.2	155	55.2	63	155
Average	40.6	96.8	50	80.5	1.7		10.2	4.33	45.1	128	63.4	276	152
CV	14.1	3.5	9	1.5	13.8		9.5	8.67	9.9	19	26.3	66	20
For Wort Clarity - 1 = clear, 2 = slightly hazy, 3 = hazy; Wort Colors were not determined (n.d.) on hazy samples													

