

## Disease Resistance

<b>Cultivar</b>	<b>FHB<sup>†</sup> resistance</b>	<b>Powdery Mildew Resistance</b>	<b>Leaf Rust Resistance</b>	<b>Glume Blotch Resistance</b>	<b>Barley Yellow Dwarf Virus Tolerance</b>
Early Heading Varieties (119-120 d, Julian)					
SS 520*	Weak	Good	Good	Moderate	Weak
Branson	Good	Good	Good	Moderate	Excellent
USG 3120	Excellent	Good	Good	Good	Good
Jamestown	Excellent	Good	Good	Moderate	Excellent
USG 3770	Good	Weak	Moderate	n/a	Good
Mid-Season Heading Varieties (121-122 d, Julian)					
USG 3201	Excellent	Weak	Good	n/a	Good
Dyna-Gro V9723	Excellent	Weak	Weak	Good	Good
USG 3555	Good	Good	Weak	Good	Excellent
Pioneer 25R32	Excellent	Excellent	Weak	n/a	Moderate
Merl	Good	Good	Weak	Good	Weak
SS 5205	Good	Good	Excellent	Weak	Moderate
USG 3665	Excellent	Good	Excellent	Good	Excellent
Pioneer 26R15	Good	Good	Excellent	Weak	Weak
Full-Season Heading Varieties (123-124 d, Julian)					
USG 3251	Excellent	Moderate	Moderate	n/a	Good
USG 3315	Good	Good	Moderate	Moderate	Excellent
Renwood 3434	Moderate	Excellent	Good	Excellent	Weak
SS 8700	Good	Excellent	Weak	n/a	Excellent
SS 560	Moderate	Good	Weak	Moderate	Weak
Pioneer 26R20	Good	Moderate	Good	Moderate	Good
Featherstone VA-258	Weak	Good	Moderate	Excellent	Moderate
Shirley	Moderate	Excellent	Excellent	Good	Excellent
SS-MPV 57	Good	Weak	Weak	Excellent	Weak

\* This line is not daylength sensitive and should not be planted early in order to avoid potential freeze damage.

† FHB - Fusarium head blight

## Section 5: Wheat Scab Research

One of the primary research objectives of the Virginia Tech wheat breeding program is to identify and develop cultivars possessing resistance to Fusarium Head Blight (FHB) or scab. Each year all wheat entries in Virginia's Official State Variety Trials are evaluated for FHB resistance in an inoculated, irrigated nursery at the Blacksburg test site. Data from this test for the current crop year and two- and three-year averages for FHB incidence, FHB severity and FHB Index (incidence x severity / 100) are included in this bulletin (Tables 39 – 41) to aid producers in selection of cultivars on the basis of FHB resistance. Cultivars possessing complete resistance or immunity to FHB have not been identified and resistance levels in currently available cultivars vary from moderately resistant to highly susceptible.

A major goal of the breeding program is to identify and incorporate unique and complementary types of FHB resistance into cultivars to enhance the overall level of resistance. Genes controlling FHB resistance have been identified on more than six chromosomes in wheat and some of these genes are complementary in nature and effect different disease resistance components such as FHB incidence, severity, and DON toxin content. Incorporating such multiple resistance genes having additive effects on FHB resistance into cultivars will enhance the overall level of resistance. Because the individual resistance genes are located on different wheat chromosomes and each gene confers only partial resistance to FHB, identifying wheat lines having multiple resistance genes is difficult using traditional breeding techniques. To overcome this limitation, our program is currently identifying and using DNA markers located close to these resistance genes on the same chromosome as “tags” for selecting wheat lines possessing different combinations of these complementary resistance genes.

Entries were inoculated by spraying a *Fusarium graminearum* spore suspension directly onto spikes at the 80% flowering stage. A low FHB infection level was obtained in 2011. Among 87 lines and varieties tested in 2011, the FHB index varied from 0 to 16 with FHB incidence ranging from 20% to 75% and FHB severity ranging from 2% to 22% (Table 39). Twenty lines and 30 varieties had FHB index values lower than the mean (<5) and expressed moderate resistant to FHB in 2011. Based on two year mean data for 2010 and 2011 (Table 40), four lines and 30 varieties had FHB index values lower than the test mean (<6). Twenty varieties tested across three years (2009-2011) had average FHB index values lower than the test mean of 8 (Table 41). Varieties expressing resistance to FHB based on three-year mean data are: Pioneer 25R32, COKER 9553, Dyna-Gro V9723, USG 3665, SS 8309, Jamestown, Dominion, SS 520, SS 560, Progeny 166, Oakes, Branson, USG 3315, NC-Cape Fear, VA05W-251, Massey, SS 8302, Progeny 117, SS 8404, and Dyna-Gro 9922.

**Table 39. Summary of reaction of entries in the Virginia Tech State Wheat Test to Fusarium head blight (scab), 2011 harvest.**

LINE	Heading date (Julian)		FHB Incidence <sup>1</sup> (%)	FHB Severity <sup>2</sup> (%)	FHB Index <sup>3</sup> (0-100)	Rank FHB Index
VA09W-659	135	+	20	2	0	1
Progeny PGX10-2	135	+	30	4	1	2
Pioneer XW09H	134		30	4	1	3
<b>Branson</b>	133	-	30	4	1	4
<b>NC-Cape Fear</b>	133	-	30	4	1	5
<b>COKER 9553</b>	133	-	25	4	1	6
VA08W-630	134		25	3	1	7
<b>USG 3201</b>	133	-	25	3	1	8
VA09W-46	134		20	3	1	9
VA09W-656	134		20	3	1	10
VA09W-75	133	-	20	3	1	11
<b>SS 520</b>	133	-	20	3	1	12
<b>Pioneer 25R32</b>	135	+	20	2	1	13
VA08W-92	133	-	30	7	2	14
VA08W-295	133	-	30	6	2	15
<b>Dyna-Gro 9012</b>	133	-	30	6	2	16
<b>Progeny 125</b>	133	-	30	6	2	17
VA09W-67	133	-	40	5	2	18
VA09W-188WS	133	-	40	5	2	19
NC05-19896	133	-	40	5	2	20
<b>Pioneer 26R20</b>	135	+	35	5	2	21
<b>USG 3251</b>	134		35	5	2	22
GA 00067-8E35	134		35	5	2	23
<b>Jamestown</b>	133	-	35	5	2	24
VA08W-632	133	-	35	5	2	25
VA09W-641	133	-	35	5	2	26
<b>Pioneer 26R12</b>	134		30	5	2	27
<b>USG 3665</b>	133	-	30	5	2	28
<b>W1566</b>	134		30	4	2	29
VA07W-429	134		40	7	3	30
<b>SS-MPV 57</b>	134		40	7	3	31
<b>Shirley</b>	134		40	7	3	32
<b>Progeny 870</b>	133	-	40	7	3	33
<b>Oakes</b>	135	+	40	6	3	34
<b>Chesapeake</b>	133	-	40	6	3	35
<b>Dyna-Gro V9723</b>	134		35	6	3	36
<b>VA05W-251*</b>	134		45	5	3	37
<b>SS 8700</b>	135	+	35	5	3	38
VA08W-176	134		45	9	4	39
VA07W-415	134		40	9	4	40
<b>Dyna-Gro 9171</b>	133	-	40	9	4	41
VA09W-657	134		45	8	4	42
<b>VA05W-151*</b>	133	-	45	8	4	43
<b>SS 560</b>	135	+	40	8	4	44
VA08MAS-369	134		40	8	4	45

**Table 39, continued. Summary of reaction of entries in the Virginia Tech State Wheat Test to Fusarium head blight (scab), 2011 harvest.**

LINE	Heading date (Julian)		FHB Incidence <sup>1</sup> (%)	FHB Severity <sup>2</sup> (%)	FHB Index <sup>3</sup> (0-100)	Rank FHB Index
<b>Pioneer 26R15</b>	134		40	8	4	46
<b>USG 3438</b>	133	-	35	8	4	47
<b>USG 3315</b>	134		55	7	4	48
<b>Dyna-Gro 9922</b>	133	-	50	7	4	49
<b>USG 3770</b>	133	-	40	7	4	50
<b>Progeny 117</b>	133	-	40	11	5	51
VA09W-73	135	+	45	10	5	52
VA08MAS-412	134		45	10	5	53
VA09W-45	133	-	45	10	5	54
<b>SS 8340</b>	133	-	45	10	5	55
<b>Progeny 166</b>	133	-	40	10	5	56
<b>Pioneer 26R22</b>	134		50	9	5	57
<b>Dominion</b>	133	-	40	9	5	58
<b>SS 8309</b>	134		45	12	6	59
<b>USG 3592</b>	135	+	55	11	6	60
<b>SS 8404</b>	134		55	11	6	61
VA10W-119	133	-	50	11	6	62
VA09W-52	133	-	40	13	7	63
<b>Progeny 185</b>	133	-	50	12	7	64
VA06W-392	134		50	15	8	65
<b>Progeny 357</b>	133	-	55	12	8	66
VA08W-294	134		65	11	8	67
<b>Massey</b>	135	+	50	18	9	68
VA05W-70	134		65	14	9	69
<b>NC-Yadkin</b>	133	-	60	14	9	70
<b>SS 8302</b>	133	-	50	14	9	71
VA09W-623	134		55	13	9	72
VA08W-193	134		60	15	10	73
<b>SS 8500</b>	133	-	55	14	10	74
<b>Renwood 3434</b>	134		65	16	11	75
VA09W-112	135	+	65	20	13	76
GA 001138-8E36	135	+	65	20	13	77
<b>SS 5205</b>	133	-	65	20	13	78
<b>SY 9978</b>	135	+	60	19	13	79
VA09W-110	135	+	65	17	13	80
<b>Pioneer 26R31</b>	133	-	75	18	14	81
<b>USG 3120</b>	133	-	75	18	14	82
<b>VA05W-139*</b>	133	-	70	18	14	83
<b>USG 3555</b>	133	-	60	21	15	84
VA06W-412	135	+	65	22	16	85
<b>Merl</b>	134		75	21	16	86
<b>Featherstone VA-258</b>	134		65	20	16	87

<b>Table 39, continued. Summary of reaction of entries in the Virginia Tech State Wheat Test to Fusarium head blight (scab), 2011 harvest.</b>					
<b>LINE</b>	<b>Heading date (Julian)</b>	<b>FHB Incidence<sup>1</sup> (%)</b>	<b>FHB Severity<sup>2</sup> (%)</b>	<b>FHB Index<sup>3</sup> (0-100)</b>	<b>Rank FHB Index</b>
Average	134	44	9	5	
LSD (O.05)	1	32	13	11	
C.V.	0	---	---	---	
Released cultivars are shown in bold print. Varieties are ordered by ascending index averages.					
* Released line yet to be named.					
A plus or minus sign indicates a performance significantly above or below the average.					
Entries were planted in 2-row plots, 4 ft in length at Blacksburg, VA and were inoculated at 50% and 100% heading stages with <i>Fusarium graminearum</i> spore suspension (50,000 spores/ml).					
<sup>1</sup> Scab Incidence (%): Percentage of infected spikes among 10 randomly selected spikes.					
<sup>2</sup> Scab Severity (%): Percentage of infected spikelets among 10 infected spikes.					
<sup>3</sup> Scab Index = Incidence X Severity/100; it is an overall indicator of scab resistance/susceptibility level.					

**Table 40. Two year average summary of reaction of entries in the Virginia Tech State Wheat Tests to Fusarium head blight (scab), 2010 and 2011 harvests.**

LINE	Heading date (Julian)		FHB Incidence <sup>1</sup> (%)	FHB Severity <sup>2</sup> (%)	FHB Index <sup>3</sup> (0-100)	Rank FHB Index	Don Value 2010 <sup>4</sup>
Pioneer 25R32	131	+	14	6	1	1	0.20
SS 520	128	-	15	8	1	2	0.15
USG 3251	131	+	24	6	1	3	0.30
VA08W-92	128	-	19	8	1	4	0.10
USG 3201	129		19	11	2	5	1.03
SS 8700	131	+	23	9	2	6	0.14
Branson	129		20	17	2	7	0.76
NC05-19896	129		28	9	2	8	0.75
VA05W-251*	129		30	8	2	9	0.65
USG 3770	128	-	24	7	2	10	0.00
COKER 9553	128	-	23	12	3	11	0.41
SS-MPV 57	130	+	26	12	3	12	0.28
W1566	130	+	21	15	3	13	0.26
VA08W-176	130	+	30	10	3	14	0.95
VA08W-295	129		23	13	3	15	0.70
Dominion	130	+	26	11	3	16	0.24
NC-Cape Fear	128	-	25	12	3	17	0.77
Pioneer 26R20	130	+	30	10	3	18	0.12
Progeny 117	128	-	28	12	3	19	0.70
USG 3665	129		24	16	3	20	0.51
Dyna-Gro V9723	129		30	12	3	21	0.46
Jamestown	128	-	29	14	3	22	0.31
Shirley	130	+	30	16	4	23	0.43
USG 3315	130	+	40	10	4	24	0.10
SS 8309	130	+	29	12	4	25	0.14
SS 8404	130	+	35	13	4	26	0.20
Dyna-Gro 9922	130	+	34	13	4	27	0.20
Pioneer 26R15	129		33	14	5	28	0.66
VA07W-415	130	+	30	18	5	29	0.61
Progeny 166	129		26	20	5	30	0.79
SS 560	130	+	30	19	5	31	0.40
SS 8302	129		30	16	5	32	0.40
USG 3592	129		34	25	5	33	0.93
Pioneer 26R22	130	+	40	14	5	34	0.44
Oakes	131	+	38	16	6	35	0.42
Massey	129		33	15	6	36	0.23
Progeny 185	129		34	22	7	37	0.42
SY 9978	130	+	38	17	7	38	0.60
Renwood 3434	130	+	45	17	7	39	0.57
USG 3120	127	-	44	14	7	40	0.50
VA08W-294	129		48	17	8	41	0.50
VA08W-193	128	-	44	18	8	42	0.32
Pioneer 26R12	129		38	18	9	43	1.68
VA05W-151*	128	-	35	29	9	44	0.04

**Table 40, continued. Two year average summary of reaction of entries in the Virginia Tech State Wheat Tests to Fusarium head blight (scab), 2010 and 2011 harvests.**

LINE	Heading date (Julian)		FHB Incidence <sup>1</sup> (%)	FHB Severity <sup>2</sup> (%)	FHB Index <sup>3</sup> (0-100)	Rank FHB Index	Don Value 2010 <sup>4</sup>				
<b>Chesapeake</b>	129		39	19	9	45	0.83				
VA06W-392	129		41	19	9	46	0.21				
<b>VA05W-139*</b>	129		41	31	+	10	47	0.72			
<b>NC-Yadkin</b>	129		48	21		10	48	0.55			
VA06W-412	130	+	39	36	+	11	49	0.52			
<b>USG 3555</b>	129		48	21		11	50	0.55			
<b>Featherstone VA-258</b>	130	+	48	21		12	51	0.15			
VA05W-70	129		50	22		12	52	0.06			
<b>SS 5205</b>	129		56	+	25	14	+	53	0.99		
<b>Pioneer 26R31</b>	128	-	58	+	28	15	+	54	1.08		
<b>Merl</b>	129		58	+	30	+	17	+	55	1.51	+
Average	129		34		16	6		0.50			
LSD (O.05)	1		20		14	8		0.85			
C.V.	0		---		---	---		---			
Released cultivars are shown in bold print. Varieties are ordered by ascending index averages.											
* Released line yet to be named.											
A plus or minus sign indicates a performance significantly above or below the average.											
Entries were planted in 2-row plots, 4 ft in length at Blacksburg, VA and were inoculated at 50% and 100% heading stages with Fusarium graminearum spore suspension (50,000 spores/ml).											
<sup>1</sup> Scab Incidence (%): Percentage of infected spikes among 10 randomly selected spikes.											
<sup>2</sup> Scab Severity (%): Percentage of infected spikelets among 10 infected spikes.											
<sup>3</sup> Scab Index = Incidence X Severity/100; it is an overall indicator of scab resistance/susceptibility level.											
<sup>4</sup> Don Values were measured from the 2010 harvest year.											

**Table 41. Three year average summary of reaction of entries in the Virginia Tech State Wheat Tests to Fusarium head blight (scab), 2009 - 2011 harvests.**

LINE	Heading date (Julian)		FHB Incidence <sup>1</sup> (%)		FHB Severity <sup>2</sup> (%)		FHB Index <sup>3</sup> (0-100)		Rank FHB Index
Pioneer 25R32	130	+	15	-	12		2		1
COKER 9553	127	-	19		13		2		2
Dyna-Gro V9723	128		27		13		3		3
USG 3665	128		21		23		3		4
SS 8309	129	+	24		14		4		5
Jamestown	128		24		19		4		6
Dominion	129	+	29		12		4		7
SS 520	127	-	20		17		4		8
SS 560	130	+	25		21		5		9
Progeny 166	128		24		20		5		10
Oakes	129	+	32		18		5		11
Branson	128		23		25		6		12
USG 3315	129	+	35		17		6		13
NC-Cape Fear	127	-	25		22		6		14
VA05W-251*	128		33		15		6		15
Massey	128		29		20		6		16
SS 8302	128		32		20		7		17
Progeny 117	127	-	29		20		7		18
SS 8404	129	+	34		23		7		19
Dyna-Gro 9922	129	+	33		22		7		20
Pioneer 26R15	129	+	34		23		8		21
SS-MPV 57	129	+	30		23		8		22
Progeny 185	128		33		25		8		23
VA07W-415	129	+	31		26		8		24
Pioneer 26R20	130	+	33		22		8		25
NC-Yadkin	128		38		23		9		26
VA05W-139*	129	+	37		32		10		27
VA05W-151*	128		35		29		10		28
USG 3120	127	-	45		21		10		29
USG 3555	128		41		24		10		30
Renwood 3434	130	+	43		25		11		31
VA06W-392	128		38		27		11		32
Shirley	129	+	35		28		12		33
Pioneer 26R12	129	+	38		26		12		34
Pioneer 26R31	127	-	46		31		13		35
SS 5205	129	+	56	+	25		14		36
VA06W-412	129	+	40		39	+	14		37
Featherstone VA-258	130	+	45		30		14		38
Chesapeake	129	+	41		31		15	+	39
USG 3592	129	+	43		36	+	15	+	40
Merl	128		54	+	34		18	+	41

**Table 41, continued. Three year average summary of reaction of entries in the Virginia Tech State Wheat Tests to Fusarium head blight (scab), 2009 - 2011 harvests.**

<b>LINE</b>	<b>Heading date (Julian)</b>	<b>FHB Incidence<sup>1</sup> (%)</b>	<b>FHB Severity<sup>2</sup> (%)</b>	<b>FHB Index<sup>3</sup> (0-100)</b>	<b>Rank FHB Index</b>
Average	128	33	23	8	
LSD (O.05)	1	15	13	7	
C.V.	0	---	---	---	
Released cultivars are shown in bold print. Varieties are ordered by ascending index averages.					
* Released line yet to be named.					
A plus or minus sign indicates a performance significantly above or below the average.					
Entries were planted in 2-row plots, 4 ft in length at Blacksburg, VA and were inoculated at 50% and 100% heading stages with <i>Fusarium graminearum</i> spore suspension (50,000 spores/ml).					
<sup>1</sup> Scab Incidence (%): Percentage of infected spikes among 10 randomly selected spikes.					
<sup>2</sup> Scab Severity (%): Percentage of infected spikelets among 10 infected spikes.					
<sup>3</sup> Scab Index = Incidence X Severity/100; it is an overall indicator of scab resistance/susceptibility level.					