

Section 2: Barley Scab Research

One of the primary research objectives of the Virginia Tech barley breeding program is to identify and develop cultivars possessing resistance to *Fusarium* head blight (FHB) or scab. Each year all barley and hulless barley entries in Virginia's Official State Variety Trials are evaluated for FHB at the Virginia Crop Improvement Association (VCIA) test site in Mt. Holly, VA. 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. Incorporating 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 barley chromosomes and each gene confers only partial resistance to FHB, identifying lines having multiple resistance genes is difficult using traditional breeding techniques. To overcome this limitation, our program will incorporate the available markers to help select FHB resistant cultivars.

In 2017, entries were inoculated by spreading scabby corn kernels (50g/4-rows) in plots at the booting stage. A moderately low level of FHB infection was obtained in 2017 as an unseasonably warm February was followed by a drastic cold spell during the inoculation period. Among 31 hulless lines and varieties tested in 2017, the FHB index ranged from 1.4 to 25 with FHB incidence ranging from 52% to 94% and FHB severity from 2% to 26% (Table 19). Thirteen lines and two varieties had FHB index values lower than the mean (<13.4) in 2017 (Table 19). One line, VA15H-73 (2R) had FHB incidence, severity and index values significantly lower than the test mean.

Among 41 barley lines and varieties tested in 2017, the FHB index varied from 1.2 to 25.4 with FHB incidence ranging from 45% to 100% and FHB Severity from 2% to 27% (Table 20). Fourteen lines and eight varieties had FHB index values lower than the mean (<11.5) in 2017 (Table 20). Two elite malt barley varieties, Violetta and Flavia, developed in Europe, are currently being recommended for production in the mid-Atlantic and the eastern United States. They both had FHB incidence, severity and index values significantly lower than the test mean.

Table 19. Summary of reaction of entries in the Virginia Tech State Hulless Barley Test to Fusarium head blight (scab), 2017 harvest.

Line	FHB Incidence ¹ (%)	FHB Severity ² (%)	FHB Index ³ (0-100)	Rank FHB Index	Flowering Date (Julian)				
VA15H-73 (2R)	56.3	-	2.6	-	1.4	-	1	105.0	+
Eve	61.3	-	8.5	-	5.0	-	2	95.5	-
VA15H-12	52.5	-	13.8		7.3		3	104.0	+
VA06H-25	67.5		12.3		8.3		4	104.5	+
VA15H-85 WS	72.5		12.1		8.9		5	103.3	
VA15H-118 WS	81.3		12.6		10.2		6	104.0	+
VA15H-11	70.0		14.6		10.2		7	104.8	+
VA08H-79 WS	73.8		13.8		10.2		8	106.5	+
VA07H-35 WS	71.3		14.6		10.3		9	104.5	+
VA15H-140 WS	81.3		12.8		10.6		10	103.0	
VA14H-110	72.5		14.5		11.2		11	102.5	
VA14H-195 WS	81.3		14.0		11.4		12	103.5	
VA14H-33	72.5		15.8		11.6		13	97.3	-
Amaze 10	81.3		15.4		12.7		14	103.8	
VA15H-100 WS	85.0		15.0		12.7		15	104.3	+
VA15H-9	72.5		19.3		13.9		16	104.3	+
VA15H-116 WS	78.8		17.7		14.0		17	104.0	+
VA15H-138 WS	75.0		18.4		14.1		18	102.0	
VA14H-58	77.5		18.0		14.4		19	102.8	
VA15H-119 WS	85.0		17.4		14.7		20	103.0	
VA15H-131 WS	67.5		21.5		14.7		21	103.8	
VA15H-110 WS	86.3		17.3		14.9		22	102.3	
VA15H-90 WS	80.0		18.1		15.0		23	104.0	+
VA15H-141 WS	88.8		17.1		15.3		24	102.8	
VA15H-139 WS	87.5		17.9		16.4		25	104.0	+
VA15H-111 WS	77.5		22.8		17.6		26	103.3	
VA14H-3	86.3		20.8		18.2		27	97.0	-
VA15H-79 WS	93.8	+	20.8		19.5		28	101.3	
Doyce	88.8		21.8		19.8		29	97.3	-
VA06H-79	90.0		26.9	+	25.2	+	30	103.5	
Average	77.7		16.6		13.4			102.5	
LSD (0.05)	14.3		7.5		7.2			1.4	
C.V.	13.1		32.2		38.4			1.0	

Released cultivars are shown in bold print.

Varieties are ordered by ascending index averages.

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 Mt. Holly, VA and were inoculated at booting stage with scabby corn kernels (50g/4-rows).

¹Scab Incidence (%): Percentage of infected spikes among 20 randomly selected spikes.

²Scab Severity (%): Percentage of infected spikelets among 20 infected spikes.

³Scab Index = Incidence X Severity/100; it is an overall indicator of scab resistance/susceptibility level.

Table 20. Summary of reaction of entries in the Virginia Tech State Barley Test to Fusarium head blight (scab), 2017 harvest.

Line	FHB Incidence ¹ (%)	FHB Severity ² (%)	FHB Index ³ (0-100)	Rank FHB Index	Flowering Date (Julian)				
Violetta	45.0	-	2.9	-	1.2	-	1	106.0	+
Flavia	65.0	-	2.6	-	1.6	-	2	111.0	+
Nomini	61.3	-	8.0		4.9		3	97.8	-
VA12B-8 LA	78.8		6.2		4.9		4	102.5	+
Thoroughbred	83.8		6.1		5.1		5	102.5	+
VA13B-25 LA	70.0	-	7.7		5.3		6	97.0	-
VA15B-98 (LA)	83.8		6.7		5.6		7	102.0	+
VA11B-141 LA	81.3		6.9		5.7		8	102.0	+
VA08B-95	88.8		8.0		7.4		9	99.3	
VA15B-65	78.8		9.7		7.7		10	97.5	-
Secretariat	77.5		9.6		7.7		11	99.8	
VA12B-56	86.3		9.0		7.8		12	97.5	-
Atlantic	85.0		9.9		8.5		13	96.3	-
VA15B-60	85.0		10.4		8.9		14	97.0	-
VA15B-67	90.0		10.5		9.5		15	96.5	-
VA15B-83 (LA)	88.8		11.5		10.3		16	94.8	-
VA14B-57	97.5		10.7		10.5		17	100.8	
Barsoy	86.3		12.2		10.6		18	100.0	
VA14B-71	95.0		11.2		10.7		19	100.3	
VA15B-89 (LA)	75.0	-	14.6		11.0		20	103.8	+
VA15B-54	95.0		11.7		11.1		21	98.5	-
Price	90.0		12.7		11.3		22	98.8	
VA15B-33	98.8		11.9		11.8		23	100.0	
VA14B-74	100.0	+	12.3		12.3		24	102.0	+
VA15B-78	88.8		13.2		12.4		25	101.3	
VA14B-73	92.5		13.7		12.6		26	99.0	
VA92-42-46	83.8		14.8		12.7		27	100.0	
VA14BFHB-83	87.5		14.7		13.0		28	97.8	-
VA14B-78	96.3		13.7		13.1		29	98.8	
Callao	92.5		14.6		13.4		30	97.5	-
VA14B-63	100.0	+	13.5		13.5		31	102.5	+
VA14B-79	98.8		14.5		14.3		32	100.8	
VA15B-79	95.0		15.2		14.4		33	100.3	
VA14B-75	96.3		15.3		14.6		34	99.3	
VA14B-59	98.8		15.1		14.9		35	99.3	
VA11B-102 LA	90.0		19.5		17.2		36	103.3	+
VA15B-8	100.0	+	19.9		19.9	+	37	100.3	
Wysor	95.0		22.4	+	21.6	+	38	101.0	
VA12B-41	97.5		22.6	+	21.8	+	39	102.5	+
VA12B-30	96.3		26.0	+	24.9	+	40	103.5	+
VA15B-5	92.5		27.2	+	25.4	+	41	98.5	-

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Line	FHB Incidence ¹ (%)	FHB Severity ² (%)	FHB Index ³ (0-100)	Rank FHB Index	Flowering Date (Julian)
Average	87.5	12.7	11.5		100.2
LSD (0.05)	11.4	7.8	7.5		1.7
C.V.	9.3	43.8	46.5		1.2

Released cultivars are shown in bold print.

Varieties are ordered by ascending index averages.

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 Mt. Holly, VA and were inoculated at booting stage with scabby corn kernels (50g/4-rows).

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