

EVALUATING BREEDING MATERIAL FOR SCAB RESISTANCE

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Favorable weather conditions and low disease pressure made 2006 a record year for wheat production in Kentucky. Even though scab had little overall impact this year, scattered fields in areas of moderate risk suffered severe losses. This underlines the importance of identifying scab resistance in breeding material to cut the risk of losses from this disease.

To evaluate resistance in advanced breeding material, scab epidemics were created in an irrigated nursery in Lexington, KY and a non-irrigated nursery in Princeton, KY. Scabby corn was spread for inoculum in both nurseries, and conidial spore sprays were done in Princeton to compensate for the lack of irrigation.

Numerous varieties and breeding lines, including the wheat variety trial, were evaluated in the field for severity and incidence in the Lexington nursery (Tables 1-3). After harvest, material from both Lexington and Princeton was analyzed for Fusarium damaged kernels (FDK) and deoxynivalenol concentration (DON ppm).

Disease progress was measured by taking severity readings from random plots of susceptible variety Pioneer 2555 and resistant variety Pioneer 25R18 at 9, 14, 21 and 28 days after flowering. The results (Figure 1) form an area under the disease progress curve (AUDPC) and show that, at 21 days, Pioneer 2555 had a predictably high severity of 70% and Pioneer 25R18 showed resistance with severity less than 15%.

Average disease severity in the Lexington scab nursery was 41% and average incidence was 38%. The range for FDK from material harvested in Lexington was 0.6 to 76% with an average of 21%. This is significantly ($P < 0.05$) higher than FDK from Princeton where harvested material had an FDK range of 0.2 to 58.8% with an average of 6.7. DON levels were also significantly higher ($P < 0.05$) in the Lexington FHB nursery, averaging 11.7 ppm, than at Princeton, where the average was 3.2 ppm. Given the variability of scab, it is useful to have data from multiple locations and different environmental conditions. The level of disease in the 2006 nurseries enabled selection of breeding material for advancement or use as parents.

Table 1: Wheat Variety Trial Scab Ratings

Variety	Lexington Nursery				Princeton Nursery	
	Incidence %	Severity %	FDK % by weight	DON ppm	FDK % by weight	DON ppm
Adler 575BB	70.73	37.29	35.06	8.23	0.60	3.35
AgriPro COKER Branson	49.11	19.75	21.01	13.44	0.24	1.05
AgriPro COKER COKER 9511	54.19	14.39	7.38	3.00	3.64	4.94
AgriPro COKER COKER 9553	50.31	19.93	9.62	10.41	2.76	5.91
AgriPro COKER Cooper	47.30	28.20	12.36	11.52	1.96	2.19
Alder 545	87.60	38.97	9.36	10.67	3.88	0.35
Alder 625	74.04	33.09	13.83	7.82	3.48	1.51
Alma	74.01	42.39	42.39	10.08	1.18	2.09
Beck 117	76.03	28.18	10.40	12.24	2.38	0.71
Beck 122	53.30	29.91	28.29	14.29	7.55	0.80
Bravo	59.98	26.20	15.85	9.00	4.22	1.60
Clark	71.95	38.25	31.16	6.53	1.52	0.38
Croplan Genetics 8301	79.48	26.64	7.17	9.15	1.56	0.65
Cumberland	74.42	45.05	8.59	10.18	3.52	2.03
Delta Grow 1600	66.35	30.36	14.35	10.90	1.12	*ND
Delta Grow 4100	58.44	32.98	10.32	4.81	1.82	ND
Delta King 7710	57.86	26.38	26.13	6.54	5.09	1.17
Delta King 7830	84.82	54.50	23.37	5.90	1.21	0.63
Delta King 9410	83.33	44.99	13.60	5.54	2.03	2.62
Delta King 9577	72.87	24.44	16.41	9.61	0.51	1.44
Ebberts 501	44.63	19.03	6.93	7.17	2.62	2.26
Ebberts 518	76.36	35.02	21.64	12.53	2.75	ND
Excel 173	45.35	38.41	14.18	7.17	3.37	0.84
Excel 211	61.60	35.53	7.41	9.57	2.26	2.15
Excel 212	51.34	25.89	7.50	8.32	5.35	3.06
Excel 307	93.65	38.95	7.25	3.25	2.47	0.72
Excel 361	59.37	21.03	6.84	6.11	9.39	0.91
Excel 392	77.08	36.09	17.99	7.39	7.25	5.15
Excel 399	74.98	24.62	5.40	6.37	0.63	1.36
Excel 410tw	94.45	40.97	39.29	3.25	0.46	3.04
Exsegen Judith	37.83	18.64	12.50	8.05	14.75	0.59
Exsegen Leah	60.74	16.65	16.63	8.54	0.46	2.02
Exsegen Lydia	62.08	23.22	54.74	11.93	1.85	4.35
Exsegen Rachel	39.12	14.49	22.17	3.98	2.73	1.33
IMI 95047-6-3-18	65.05	36.61	48.20	9.28	6.64	3.90
IMI 95053-1A-11-6	74.74	34.17	17.96	4.39	3.89	3.09
JGL EXP 603	67.60	43.91	20.07	8.02	2.38	1.34
JGL EXP 604	61.20	26.44	28.12	6.54	3.36	1.55
KY93C-0004-22-1	91.73	42.28	19.80	22.02	3.22	2.01
KY93C-0378-5-2	85.90	33.20	35.81	21.59	9.97	4.38
KY93C-1238-17-1	96.95	42.11	17.88	6.48	13.40	0.88
KY93C-1238-17-2	85.48	72.82	71.75	16.13	2.25	1.13
KY93C-1238-17-5	94.00	44.14	53.46	16.60	2.43	0.15
KY94C-0094-11-2	58.77	16.80	9.82	9.99	4.60	1.53
KY96C-0770-3	64.81	32.54	24.64	8.60	1.67	2.78
KY96C-0772-6-2	61.28	36.16	21.61	15.87	1.45	0.47
KY96C-0786-3-2	76.98	39.36	33.12	15.62	5.11	2.09

Table 1: Wheat Variety Trial Scab Ratings (Continued)

Variety	Lexington Nursery				Princeton Nursery	
	Incidence %	Severity %	FDK % by weight	DON ppm	FDK % by weight	DON ppm
KY97C-0232-2-2	65.04	19.00	29.43	21.59	2.19	5.61
McLane	54.29	22.35	18.07	11.03	3.45	1.28
Merrell	80.53	38.86	11.38	14.67	2.56	1.08
Morral	68.53	23.81	6.89	6.70	1.79	1.94
Pioneer Brand 25R37	78.52	26.86	13.63	3.66	2.30	1.35
Pioneer Brand 25R54	95.25	31.77	14.26	4.86	1.54	1.05
Pioneer Brand 26R15	100.64	44.72	35.11	10.28	1.44	1.61
Pioneer Brand 26R22	95.42	44.83	16.28	10.37	0.26	0.10
Pioneer Brand XW04C	94.83	58.70	29.04	11.32	4.42	0.05
SS 520	55.53	73.75	11.70	5.39	6.05	ND
SS 560	50.63	28.02	15.61	5.61	1.51	ND
SS 8302	50.95	18.92	18.54	10.00	0.98	1.22
SS 8309	32.04	12.43	5.82	9.50	0.27	ND
SS 8404	57.44	34.23	37.24	15.68	4.13	ND
SS MPV-57	62.48	26.78	57.00	9.35	2.24	ND
UMD Choptank	96.94	48.95	18.95	12.04	0.99	2.16
UMD MV5-46	74.58	33.25	15.93	10.37	0.81	1.44
USG 3209	82.95	62.13	27.07	9.40	3.72	5.09
USG 3244	76.23	22.16	14.09	5.12	2.44	1.27
USG 3350	65.27	21.64	5.63	4.60	5.84	0.33
USG 3665	81.73	40.57	8.69	9.45	2.21	4.71
USG 3910	46.11	21.21	9.02	4.03	1.20	0.86
Vigoro V9410	62.68	28.59	37.34	7.60	2.13	2.89
Vigoro V9412	45.83	23.12	7.40	8.26	0.88	ND
Vigoro WX8501	76.78	24.65	12.39	9.50	4.85	0.66
Average	68.9	32.8	20.5	9.4	3.2	1.9

Ratings: 0=excellent, 100=poor.

***ND** = no data

Table 2: MAX1 Scab Ratings

Name	Lexington Nursery				Princeton Nursery	
	Incidence %	Severity %	FDK % by weight	DON ppm	FDK % by weight	DON ppm
McCormick	30.82	28.27	11.76	11.06	0.29	1.42
Cumberland	35.27	66.15	11.40	19.30	10.37	5.98
Truman	10.82	39.16	2.62	2.91	7.41	7.99
26R58	44.70	46.94	38.51	21.49	8.13	11.15
97C-0277-01-06	20.54	52.30	6.71	18.87	3.00	2.67
97C-0277-01-08	43.77	83.82	17.17	24.63	13.92	2.42
97C-0277-03-01	25.85	71.26	8.64	18.95	3.43	6.66
97C-0299-13-01	45.40	81.94	11.28	22.13	5.42	5.27
97C-0304-26-03	29.89	64.81	9.28	14.90	6.85	11.66
97C-0306-01	36.05	69.06	13.75	18.06	6.29	6.31
97C-0316-01-01	19.81	48.81	8.77	20.30	6.91	3.59
97C-0316-16-01	26.74	57.47	16.76	28.30	1.95	6.95
97C-0316-16-04	34.47	48.98	15.68	21.59	9.62	1.88
97C-0321-02-01	22.95	60.35	30.79	18.79	14.83	4.24
97C-0383-01B-1	30.01	60.09	18.22	22.69	14.71	9.81
97C-0383-01B-2	21.07	44.20	19.41	27.50	4.00	7.77
97C-0508-01-01A-1	30.43	29.07	16.26	18.22	6.63	4.96
97C-0508-01-01A-2	29.25	42.96	31.36	14.73	5.10	2.57
97C-0508-01-01A-3	25.33	52.67	29.76	15.68	9.55	2.72
97C-0508-01-02	34.80	62.07	44.68	16.80	7.38	5.05
97C-0519-04-05	19.50	42.38	19.88	18.62	5.83	4.41
97C-0519-04-07	20.99	34.01	16.11	14.45	7.49	6.18
97C-0540-01-01	26.94	38.80	11.52	12.03	7.21	6.41
97C-0540-01-03	13.85	51.67	20.25	7.18	7.81	2.88
97C-0546-17-01	20.80	53.28	17.41	17.52	7.96	2.69
97C-0546-17-03	32.36	80.45	9.12	24.90	1.61	6.69
97C-0546-17-04	30.94	55.35	24.74	27.18	6.12	4.67
97C-0546-17-05	24.79	53.91	29.76	27.50	11.62	2.86
Average	28.1	54.3	18.3	18.8	7.2	5.3

Ratings: 0=excellent, 100=poor.

Table 3. MAX2 Scab Ratings

Name	Lexington Nursery				Princeton Nursery	
	Incidence %	Severity %	FDK % by weight	DON ppm	FDK % by weight	DON ppm
McCormick	29.99	77.94	10.33	12.41	3.78	9.14
Cumberland	37.75	75.96	33.61	18.62	11.38	3.21
Truman	14.35	77.74	6.38	17.52	18.03	5.54
26R58	51.45	79.83	16.47	10.81	14.78	10.79
97C-0546-20-05	33.34	78.10	30.20	19.04	9.93	4.83
97C-0554-01	28.29	61.81	11.22	8.38	7.77	7.67
97C-0554-02-09	28.87	57.38	16.59	18.30	0.32	2.81
97C-0554-03-02	32.77	83.44	15.61	13.32	2.06	1.95
97C-0554-03-05	28.67	65.68	30.83	14.51	0.24	0.68
97C-0554-03-06	32.29	56.76	7.57	5.21	15.16	1.75
97C-0554-04-03	22.69	65.69	19.48	16.80	1.29	0.76
97C-0554-04-05	40.13	89.17	12.40	6.42	3.50	1.31
97C-0554-04-06	62.87	95.71	52.34	19.30	1.98	1.13
97C-0554-04-07	53.77	97.35	23.32	17.60	0.30	0.56
97C-0574-01-03	42.61	83.72	26.51	14.90	3.47	0.87
97C-0574-01-04	37.81	91.97	29.12	26.43	7.11	6.92
97C-0321-05-2	20.88	77.09	31.90	10.67	6.88	11.93
Average	35.2	77.4	22.0	14.7	6.4	4.2

Ratings: 0=excellent,
100=poor.

Figure 1: 2006 Area under the disease progress curve (AUDPC)

