BREEDING FOR RESISTANCE TO *FUSARIUM* HEAD BLIGHT IN SOFT RED WINTER WHEAT

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OBJECTIVES:

To identify resistance to *Fusarium* head blight in field and greenhouse screens.

INTRODUCTION:

Fusarium head blight (FHB) has caused significant losses in Kentucky's wheat crop in most years since 1991. The prevalent rotation in which growers are planting wheat after corn into minimally or no-tilled soil ensures abundant inoculum in most years. Therefore, breeding for FHB resistance is an essential component of the wheat breeding project at the University of Kentucky.

MATERIALS AND METHODS:

Two inoculated field nurseries were established in 2001. At Lexington, entries in the 2001 Uniform North and South Scab Screening Nurseries, the state variety trial, and a number of advanced breeding lines were planted in a randomized complete block design with four replications on 17 October 2000. Each plot consisted of two rows planted on 7 inch centers with approximately 20 inches of space on either side of the rows. This method was adopted from the CIMMYT scab screening protocols. At Princeton, KY, our second nursery, consisting of a single replication of the state variety trial and several breeding line trials was planted on 25 October 2000. The previous crop at both locations was corn and the seedbed had been chisel plowed and disked. Entries in the greenhouse were planted on 17 November 2000 in a completely randomized design with a variable number of replications.

Field Inoculation - Scabby field corn was spread in wheat plots prior to heading (GS 7) on April 10. To keep the grain inoculum hydrated, plots were directly mist irrigated for approximately 15 minutes and then 3 times daily for a week. Once the wheat started to head, the irrigation system was set on the disease development schedule. Beginning on April 30, plots were mist irrigated for 5 minutes with 15-minute intervals between the hours of 6 to 10 AM and 10 minutes with 20-minute intervals between the hours of 8 and 10 PM. Heading notes were taken daily. Those plots at 50% flowering were sprayed with a spore suspension (110,000 sp/ml).

Disease evaluations were initiated on May 31, when scab symptoms were detected on several of the susceptible cultivars, approximately 3 weeks after the earliest lines began to flower. Those lines that flowered first were read first. Disease incidence was calculated by counting the number of infected heads per plot divided by the total number of heads per plot. This was accomplished by using a fixed rectangular measuring tool made from PVC pipe. Once the sample area was defined, the total number of heads was counted within the box. Counts were taken from ten random plots to get an average number of heads per plot. Likewise, the measuring tool was used to define the sampling area for counting the number of diseased heads per plot. Average head severity was assessed by evaluating 25 infected heads per plot. This was determined by counting the number of infected spikelets divided by the total number of spikelets per head.

Greenhouse Inoculation – Single florets were injected with a spore suspension as reported in previous Wheat Science Reports.

RESULTS AND DISCUSSION:

Field Nurseries - Our goal in 2001 was to create a severe FHB epidemic in at least one of our inoculated nurseries. In the nursery at Lexington, we were successful in reaching this goal. Infection levels in 2001 were much greater than in previous years due to optimal timing of inoculum (Table 1). The nursery at Princeton was a partial success, but infection levels were reduced due to a later than optimal application of the scabby corn in the field. One promising outcome is the strong performance of a Kentucky breeding line, which is under increase for possible release. KY 90C-054-6 showed low severity of infection in two inoculated field nurseries and in the greenhouse in response to Type II injection screening.

Additional data and scab screening protocols can be found at: http://www.uky.edu/Ag/Wheat/wheat_breeding/scabpage.html

Table 1. FHB symptoms in entries from the 2001 Kentucky variety trial at Lexington, Princeton, and in the Greenhouse.

	LEXINGTON			PRINCETON			GH
Entry	**% Disease Incidence**	**Mean Severity**	**FHB Index**	**% Disease Incidence**	**Mean Severity**	**FHB Index**	**Mean Severity**
CLARK	47.86	42.96	20.56	30.36	11.48	3.48	92.0
PATTERSON	34.19	30.79	10.53	5.36	7.77	0.42	55.0
MADISON	90.60	51.58	46.73	17.86	10.80	1.93	53.5
ROANE	95.73	21.78	20.84	60.71	32.42	19.69	28.1
KAS INDEPENDENCE	74.36	19.46	14.47	44.64	15.54	6.94	30.2
KAS REVERE	44.44	14.68	6.53	8.93	6.96	0.62	12.7
Hopewell	38.46	24.65	9.48	48.21	35.42	17.08	7.4
Exsegen Esther	97.44	43.62	42.50	26.79	9.10	2.44	43.5
Exsegen Rebekah	88.03	32.76	28.84	42.86	15.92	6.82	61.1
Exsegen Sarah	28.21	16.80	4.74	28.57	15.35	4.39	4.6
SS 522	100.00	70.25	70.25	25.00	16.62	4.16	32.9
SS 566	27.35	32.16	8.80	26.79	21.12	5.66	100.0
SS 555	69.23	47.77	33.07	17.86	10.64	1.90	81.1
SS 558	90.60	28.54	25.85	58.93	12.44	7.33	67.5
SS535 - Raxil	97.44	34.28	33.40	25.00	7.59	1.90	81.5
SS535- Gaucho	92.31	39.01	36.01	33.93	10.28	3.49	90.8
Stine 422	86.32	29.91	25.82	16.07	12.44	2.00	25.5
Stine 454	33.33	30.32	10.11	42.86	25.05	10.74	54.3
AGRIPRO FOSTER	33.33	20.79	6.93	21.43	20.39	4.37	30.8
AGRIPRO PATTON	89.74	16.58	14.88	21.43	12.49	2.68	27.7
AGRIPRO GIBSON	95.73	31.35	30.01	75.00	18.44	13.83	25.7
M95-2883	88.89	39.56	35.16	51.79	21.84	11.31	26.6
NK COKER 9663	28.21	22.23	6.27	50.00	27.62	13.81	74.2
NK COKER 9474	93.16	26.27	24.47	28.57	17.57	5.02	9.2
NK BL930390	100.00	41.80	41.80	37.50	15.96	5.98	72.9
NK BL940582	90.60	37.09	33.60	44.64	31.12	13.89	72.4
NK BL940812	100.00	51.64	51.64	16.07	15.34	2.47	100.0
Croplan Genetics SR218	92.31	29.01	26.78	64.29	20.80	13.37	60.9
Croplan Genetics SR204	88.03	20.73	18.25	71.43	20.36	14.54	55.6
BECK 101	86.32	32.70	28.23	126.79	71.83	91.07	72.9
BECK 104 (EX 6820)	56.41	25.06	14.13	76.79	28.91	22.20	84.7
USG 3209	88.89	41.54	36.92	80.36	30.52	24.53	54.7
VA96W-270	97.44	52.84	51.49	62.50	50.13	31.33	83.8
SISSON	100.00	81.33	81.33	42.86	36.22	15.52	81.4
25R18	36.75	12.10	4.45	.	.	.	6.6
2568	100.00	51.83	51.83	.	.	.	43.0
25R37	90.60	29.89	27.08	44.64	17.50	7.81	13.4
25R44	99.15	35.57	35.27	26.79	13.62	3.65	25.2
25R49	90.60	60.30	54.63	57.14	19.61	11.20	100.0
XW692	96.58	30.91	29.85	80.36	22.26	17.89	46.2
25W60	98.29	46.17	45.38	50.00	17.86	8.93	40.4
25W33	88.89	38.18	33.94	60.71	18.45	11.20	29.3
Cropland Genetics SR211	100.00	45.37	45.37	41.07	19.91	8.18	61.3
90C-054-6	58.97	16.76	9.88	10.71	7.61	0.82	5.4
Ernie	94.02	21.69	20.39	32.14	16.33	5.25	18.2
Ernie	97.44	30.33	29.55	39.29	13.10	5.15	.
Ernie	81.20	17.41	14.14	32.14	10.28	3.30	.
Ernie	97.44	32.79	31.95	41.07	15.13	6.21	.
2555	97.44	70.41	68.60	78.57	30.60	24.04	.
2555	98.29	60.68	59.65	73.21	36.51	26.73	.
2555	93.16	44.26	41.24	100.00	22.22	22.22	.
2555	97.44	58.62	57.12	92.86	31.84	29.57	.
Mean	80.41	36.25	30.98	45.86	20.59	11.58	49.9
LSD $_{(0.05)}$	19.49	31.39	34.01	32.05	15.74	8.29	38.8
C.V.	6.95	25.75	32.24	20.63	21.86	21.40	59.4