

FUSARIUM HEAD BLIGHT SURVEY 1998-99

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OBJECTIVE:

Survey wheat fields to assess possible relationships between Fusarium head blight (FHB) and various independent variables, including: level of corn residue in the fall, wheat variety, planting date, crop head density, and crop stage and date when FHB was rated.

METHODS:

One hundred wheat fields, representing 16 counties and four states, were selected for scouting (Table 1). Fields surveyed were those already under contract with either Opti-Crop or Wheat Tech. Each group was responsible for scouting 50 fields. Data recorded from each field in the fall included County and State, planting date, variety, and percent residue cover. Residue cover was determined using a standardized procedure recognized by NRCS. Fields which were not in corn prior to wheat being planted were recorded as having zero corn residue. In the spring, starting around the late milk stage of crop development, 25 heads were collected from four locations in each field surveyed. Individual heads were then assessed for the severity of FHB. Consistency among the various scouts rating FHB was achieved using a pictorial disease rating aid developed at North Dakota State University. Other field data recorded included: stage of plants when rated, rating date and head density. Data were subjected to SAS analysis of variance as well linear regression analysis, where appropriate.

RESULTS:

Nine survey fields were lost in the spring due to low prices. Thus, data were only collected for 91 of the 100 original fields. Overall, FHB incidence and severity across the 91 fields surveyed were low and

moderate, respectively (Table 2). Average field severity for FHB, which is a fairly good indicator of maximum yield lost due to FHB, was 2.7% across all fields surveyed. The fields surveyed represented 25 different soft red winter wheat varieties. The three most commonly encountered varieties were Pioneer 2552 (20 fields), Pioneer 2545 (11 fields) and Pioneer 25R26 (9 fields). The overall incidence and severity of FHB in these varieties were similar. Other varieties were represented by five or fewer fields.

Various independent variables were significantly related to FHB incidence, severity, and/or field severity in 1998-99 (Table 3). For example, corn surface residue in the fall had a highly significant relationship with both FHB incidence and field severity. However, very low r^2 values (0.17 and 0.11, respectively) indicate extensive variability exists in the relationships. This suggests that other factors, such as weather, are much more influential than corn surface residue in the development of local FHB epidemics when disease pressure is low. The same situation was found to exist during the 1997-98 survey when disease pressure was moderate.

Similarly, rating date was significant for FHB incidence, severity and field severity, but r^2 values were extremely low (i.e., $r^2 < 0.1$). There was a significant relationship between head density and field severity, and plant stage was significantly related to severity. However, in both these instances r^2 values were very poor, so very little should be made of the associations. Planting date was not significantly associated with FHB in either survey year.

TABLE 1. LOCATIONS OF WHEAT FIELDS SURVEYED FOR FUSARIUM HEAD BLIGHT (FHB) DURING 1998-99.

STATE	COUNTY	NO. FIELDS
Indiana	Perry	6
	Posey	5
	Spencer	10
	Warrick	1
Kentucky	Christian	7
	Daviess	8
	Hancock	2
	Henderson	4
	Logan	17
	Simpson	5
	Todd	10

	Trigg	2
	Warren	3
Missouri	Dunklin	2
	Scott	3
Tennessee	Robertson	6
TOTAL SURVEYED 91*		

*Nine survey fields were lost because of low prices.

TABLE 2. FUSARIUM HEAD BLIGHT (FHB) INCIDENCE, SEVERITY AND FIELD SEVERITY BY AREA/STATE AND WHEAT VARIETY.

		N	Ave % FHB Incidence (SE)	Ave % FHB Severity (SE)	Ave % FHB Field Severity
Area/State					
	Mammoth Cave	23	12.0 (2.1)	26.3 (3.1)	3.7 (0.8)
	Penny Rile	19	10.8 (2.3)	24.8 (3.3)	3.2 (0.8)
	Green River	13	7.5 (2.3)	11.5 (2.1)	1.6 (0.6)
	Tennessee	6	15.7 (4.7)	15.4 (2.8)	2.6 (0.9)
	Indiana	23	8.9 (1.6)	31.9 (4.0)	2.8 (0.5)
	Missouri	5	3.2 (1.0)	49.7 (13.5)	2.1 (0.7)
Variety					
	Pioneer 2552	20	14.3 (1.7)	21.1 (2.8)	3.0 (0.5)
	Pioneer 2545	11	11.0 (3.1)	30.3 (3.7)	3.2 (0.9)
	Pioneer 25R26	9	9.0 (3.0)	21.6 (4.7)	3.0 (1.1)
	Becker	5	14.6 (5.4)	46.9 (9.3)	6.2 (2.7)
	Patterson	5	10.0 (5.0)	19.9 (5.6)	1.5 (0.6)
	Pioneer 2568	4	12.0 (3.9)	34.1 (10.1)	5.1 (2.3)
	Coker 9663	4	21.8 (7.1)	27.2 (5.6)	5.3 (1.6)
	Pioneer 25R57	4	3.3 (0.5)	30.1 (5.4)	0.9 (0.2)
	Pioneer 2540	4	7.5 (2.7)	30.9 (14.9)	2.7 (1.1)
	Justice	3	8.7 (7.7)	22.1 (14.0)	0.9 (0.7)
	Madison	3	4.3 (3.0)	11.7 (5.9)	0.8 (0.6)
	Clark	2	19.0 (17.0)	22.7 (5.8)	3.3 (2.8)
	Coker 9474	2	1.5 (0.5)	7.0 (1.1)	0.1 (0.1)
	Esther	2	12.5 (1.5)	52.4 (6.3)	0.6 (1.6)
	LG 1155	2	3.5 (1.5)	15.3 (8.3)	0.7 (0.5)
	Pioneer 2510	2	1.0 (1.0)	3.5 (2.5)	0.1 (0.1)
	Cardinal	1	0.0	0.0	0.0
	FFR 558	1	2.0	7.0	0.2

	LG 1388	1	13.0	33.5	4.4
	LG 1433	1	3.0	66.8	2.0
	Ruther	1	1.0	7.0	0.1
	SW 315	1	1.0	14.0	0.1
	Pioneer 2580	1	6.0	78.8	4.7
	Pioneer 2684	1	3.0	20.3	0.6
	Quantum EH 9723	1	22.0	44.5	9.8

Incidence = Percent of heads with any FHB; **Severity** = Percent surface area of heads with FHB, but only of diseased heads. **Field severity** = Percent surface area diseased of all heads (i.e., estimates maximum yield lost due to FHB). **SE** = Standard Error

TABLE 3. RELATIONSHIPS BETWEEN FUSARIUM HEAD BLIGHT (FHB) INCIDENCE¹, SEVERITY², AND FIELD SEVERITY³ AND VARIOUS DEPENDENT VARIABLES FROM 91 WHEAT FIELDS EVALUATED DURING 1998-99.

Y Variable	-----X VARIABLE-----				
	% Surface Corn Residue (Fall)	Planting Date	Head Density (Plants/Ft ²)	Rating Date	Plant Stage when Rated for FHB
FHB Incidence	0.0001 (0.17) ⁴	NS	NS	0.0002 (0.09)	NS
FHB Severity	NS	NS	NS	0.02 (0.3)	0.01 (0.05)
FHB Field Serv.	0.001 (0.11)	NS	0.03 (0.03)	0.0003 (0.06)	NS

¹ Incidence is percent of heads with any FHB.

² Severity is the surface area affected of diseased heads only.

³ Field severity is average surface area affected across all heads evaluated (i.e., diseased and non-diseased).

⁴ P value (r²); NS = P>0.05

CONCLUSION:

For the second consecutive year, the level of corn residue which exits in a field in the fall has been shown to be significantly related to FHB. However, in both years, the relationship was highly variable. This suggests that other factors are more important than corn residue in determining the incidence and severity of FHB, locally. A third year of

survey data is needed before a definitive conclusion can be made regarding the corn residue/FHB relationship. Of the variables planting date, variety and head density, only head density (an indicator of crop density/yield potential) may also play a role, albeit a minor role based on data from both survey years. Apparently there are other very important factors which are heavily impacting FHB development which are not being picked up by the survey. Environmental conditions impact numerous aspects of FHB epidemiology, and are probably playing a dominant role. For example, environment has an impact on *Fusarium* spore production, release, and movement to wheat; spore survival and infection; and the extent of FHB expansion in heads following infection.