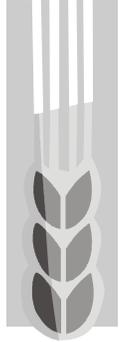


2003 North Dakota Wheat Disease Survey



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■ Introduction

The North Dakota State University Extension Service has conducted a statewide IPM pest survey program on all classes of wheat for a number of years (McMullen and Nelson 1992; McMullen 2002). The purpose of the survey is to monitor for key insect pests and diseases of this major North Dakota crop during strategic periods of the growing season. Since 2001, field scouts have used GPS (Global Positioning System) units that allow easy illustration of distribution of sampled fields, pest occurrences, and pest severity. The survey information is provided to stakeholders to assist in timely management decisions and is rapidly delivered to them via WWW newsletters, an area-wide e-mail list serve, crop and pest reports, local ag alerts, and other media outlets. This report provides a summary of the 2003 wheat disease detections.

■ Materials and Methods

Field scouts surveyed for leaf and head diseases of hard red winter wheat, hard red spring wheat and durum wheat. Fields were surveyed in all 53 counties, with approximately one field per 7,500 acres per county as the goal for survey coverage. Survey scouts operated out of the Dickinson Research Extension Center, the North Central Research Extension Center in Minot, the Carrington Research Extension Center, the Devils Lake Area Extension Office, and the Fargo Experiment Station. Each scout had a designated territory within his/her field scouting area.

Fields were surveyed on a representative route, with approximately one field per 10 miles examined. Data for each field was recorded on handheld iPAQ computers in an Excel spreadsheet. Data collected for each field included: date, county, field location in GPS units and legal description, previous crop (based on residue present or volunteers), crop, growth stage (using Zadoks growth stage system), grasshopper, aphid, and cereal leaf beetle numbers, **and** incidence and severity of fungal, viral, and bacterial diseases of leaves and grain heads. Crops were surveyed from the two-leaf stage (Zadoks 12) through kernel hard dough stage (Zadoks 89). In each field, the field scout examined five locations along a W pattern, 10 main stems per location, for a total of 50 plants. Incidence was recorded as a percentage of main stems showing symptoms, while severity was based on percentage leaf or head area showing symptoms. Percent leaf area was determined based on top leaf infections at each growth stage surveyed. Prevalence was determined as percentage of fields showing symptoms of a particular disease.

The specific diseases scouted for included: leaf rust, tan spot, Septoria diseases, spot blotch, barley yellow dwarf, wheat streak mosaic, loose smut, glume blotch, ergot, Fusarium head blight (scab), bacterial leaf streak, black chaff, and stem rust. Diseases not known to occur in North Dakota, but of export concern, were also scouted for and included flag smut, dwarf bunt, and Cephalosporium stripe.



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Results

A total of 1,278 wheat fields were surveyed in 2003 across all North Dakota counties. The numbers represented approximately one field surveyed per each 7,000 total wheat acres/county. Surveys began on May 25 and continued through Aug. 13. The August date surveys were primarily in the northeast and north central crop reporting districts where crops had been planted later. Of the total fields surveyed, 54.7 percent were from flag leaf stage or beyond, 39.9 percent were heading or beyond, and 30 percent were post-flowering.

Wheat leaf rust: Wheat leaf rust (*Puccinia triticina*) was found in 284 or 22.2 percent of all fields surveyed (Table 1). Leaf rust was found in all counties but nine, and primarily absent in the southwest and far northwest counties (Figure 1). The average wheat leaf rust severity was 6.2 percent, but the average in a county ranged from 0 to 18.6 percent. Highest severities in individual fields were found in Sargent County and in later maturing fields in counties in the northeast and north central crop reporting districts (Table 1).

Tan Spot: Tan spot (*Pyrenophora tritici-repentis*) was the most frequently occurring disease observed, found in 59.9 percent of all fields surveyed (Table 1). The average severity of the disease was 4.7 percent, across all fields and counties; the highest average severity (16.8 percent) of tan spot was observed in Eddy County (Table 1). The greatest concentration of tan spot observations was in the southwest crop reporting district (Figure 2).

Septoria Leaf Disease Complex: The Septoria leaf disease complex (*Septoria tritici*, *Stagonospora nodorum*, *Stagonospora avenae* f. sp. *triticea*) was observed in fewer fields than tan spot (24.7 percent vs. 59.9 percent), but the average severity was higher (7.4 percent vs. 4.7 percent for tan spot) (Table 1). The highest average severities of Septoria were observed in the east central district. Septoria was primarily observed in fields surveyed after flag leaf emergence. The most frequent occurrence of Septoria leaf disease was in the east central, northeast and north central districts (Figure 3). The head infection of Septoria fungi, **glume blotch**, was observed in 22.7 percent of post-flowering fields, all in counties in the east central, southeast or northeast crop reporting districts.

Fusarium head blight (scab): Fusarium head blight (scab; *Fusarium graminearum*) occurrence and severity were the lowest recorded in disease surveys since the 1993 epidemic. Although scab was observed at some level in 27.6 percent of post-flowering fields (> Zadoks growth stage 70) surveyed, scab was not observed in 26 counties (Table 1, Figure 4)). The average field severity of scab

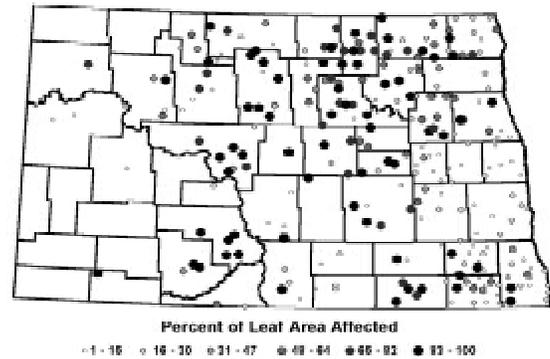


Figure 1. Leaf rust incidence, 2003; Incidence = percent of main stems with symptoms.

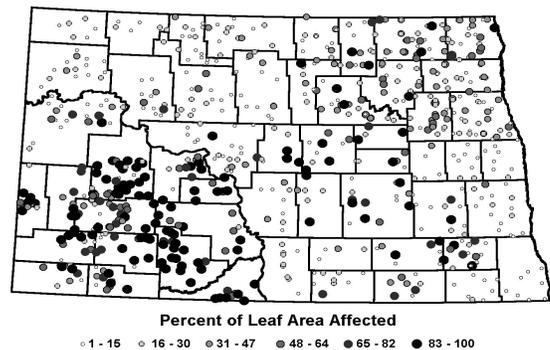


Figure 2. Tan spot incidence, 2003; Incidence = percent of main stems with symptoms.

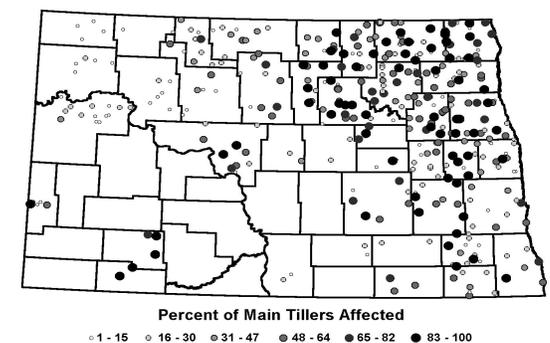


Figure 3. Septoria leaf disease complex incidence, 2003; Incidence = percent of main stems with symptoms.

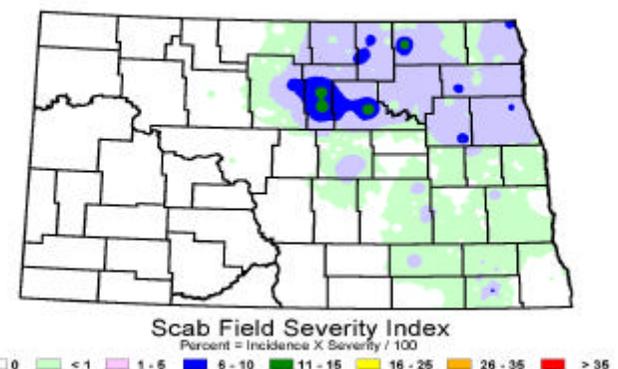


Figure 4. Fusarium head blight (scab) field severity, 2003; Field Severity = incidence x head severity ÷ 100.

■ **Table 1.** Fields surveyed per county and occurrence and severity of leaf rust, tan spot, Septoria and Fusarium head blight (scab).

Crop Reporting District	County	Total # of Fields Surveyed	All Dates Surveyed	LEAF RUST DATA		TAN SPOT DATA		SEPTORIA DATA		FUSARIUM (SCAB) DATA	
				% of all Fields with Rust	Avg. % Leaf Severity	% of all Fields w/ Tan Spot	Avg. % Leaf Severity	% of all Fields w/Septoria	Avg. % Leaf Severity	% Post-Flwr Fields w/Scab	Avg. % Field Severity ^a
C	Eddy	13	6/4-7/29	30.8	8.9	30.7	16.8	30.7	10.3	0	0
	Foster	18	6/4-7/29	27.8	18.0	27.8	9.5	16.7	6.3	14.3	0.9
	Kidder	15	5/28-7/25	6.7	4.0	40.0	6.2	0	0	0	0
	Sheridan	15	6/3-7/31	6.7	10.0	73.3	11.7	13.3	10.0	0	0
	Stutsman	28	5/27-7/31	21.4	3.8	57.1	6.6	28.6	8.7	27.3	2.7
	Wells	22	6/3-7/30	18.2	7.5	54.5	9.2	9.1	6.5	20.0	3.7
EC	Barnes	38	6/5-7/24	18.4	7.4	31.6	1.5	26.3	33.5	40.0	0.3
	Cass	33	5/23-7/17	21.2	4.9	45.5	1.3	27.3	15.6	70.0	0.7
	Griggs	28	6/3-7/23	28.6	3.6	17.9	1.0	46.4	17.9	61.5	0.3
	Steele	31	6/2-7/22	12.9	9.3	25.8	1.1	38.7	22.0	38.5	0.4
	Traill	30	6/2-7/21	20.0	2.7	26.7	1.1	43.3	13.5	54.5	0.4
NC	Benson	34	5/30-8/13	35.3	5.3	58.8	5.0	58.8	5.1	100	4.5
	Bottineau	22	6/3-8/4	31.8	5.0	59.1	4.2	40.9	9.4	0	0
	McHenry	19	6/3-8/6	52.6	13.7	73.7	3.9	57.9	11.9	37.5	2.6
	Pierce	22	5/30-8/7	22.7	6.4	63.3	3.6	36.4	6.9	100	6.9
	Rollette	19	6/3-8/7	15.8	7.7	68.4	2.6	31.6	3.6	100	2.0
NE	Cavalier	58	6/3-8/15	25.9	8.9	58.6	5.6	51.7	5.1	76.5	2.9
	Grand Fks	44	5/28-8/6	25.0	6.6	70.5	2.4	50.0	6.5	92.9	2.9
	Nelson	32	5/28-8/11	31.3	10.1	68.8	4.0	50.0	5.9	88.9	3.1
	Pembina	47	6/4-8/12	29.8	4.6	57.4	3.5	14.9	13.6	77.8	3.1
	Ramsey	32	6/3-8/15	34.4	7.0	50.0	5.7	62.5	3.8	85.7	1.6
	Towner	24	6/3-8/15	37.5	9.3	50.0	6.7	58.3	5.1	85.7	3.3
	Walsh	41	5/29-8/12	14.6	4.7	56.1	1.7	51.2	5.1	90.9	2.2
NW	Burke	13	6/12-7/23	0.0	0.0	46.1	6.3	15.4	9.0	0	0
	Divide	14	6/12-7/23	0.0	0.0	42.8	2.0	28.6	4.0	0	0
	Mountrail	23	5/30-8/1	26.1	18.5	73.9	2.9	39.1	5.8	0	0
	Renville	18	6/3-8/4	27.8	12.4	83.3	3.5	50.0	8.3	14.3	0.1
	Ward	27	5/27-7/30	29.6	6.5	74.1	4.6	37.0	11.0	28.6	0.1
	Williams	26	5/30-8/8	3.8	3.0	57.7	6.0	15.4	5.0	0	0
SC	Burleigh	15	6/3-7/24	33.3	6.4	60.0	4.4	0	0	0	0
	Emmons	17	6/3-7/24	29.4	5.2	58.9	5.5	11.8	6.0	0	0
	Grant	23	6/9-7/23	13.0	7.3	87.0	4.8	0	0	0	0
	Morton	19	6/9-7/23	26.3	5.2	68.4	6.4	0	0	0	0
	Sioux	11	6/4-7/22	27.3	3.0	100	5.5	0	0	0	0
SW	Adams	16	5/29-7/22	6.3	1.0	68.8	4.0	12.5	2.5	0	0
	Billings	7	6/11-6/20	0.0	0.0	100	2.6	0	0	0	0
	Bowman	11	6/3-7/14	0.0	0.0	81.8	4.4	0	0	0	0
	Gldn. Vly.	18	6/4-7/24	0.0	0.0	66.7	6.2	27.8	4.0	0	0
	Hettinger	19	5/29-7/22	0.0	0.0	73.7	4.4	15.8	2.7	0	0
	Slope	15	6/3-7/21	0.0	0.0	80.0	3.1	0	0	0	0
	Stark	37	5/28-7/24	0.0	0.0	81.1	5.3	0	0	0	0
SE	Dickey	14	5/27-7/22	35.7	18.6	57.1	4.9	21.4	7	0	0
	LaMoure	16	5/27-7/22	18.8	9.7	12.5	10	12.5	8.5	50.0	1.4
	Logan	9	5/28-7/23	22.2	8.0	44.4	5.5	22.2	6.0	0	0
	McIntosh	17	5/28-7/23	17.6	5.3	52.9	4.0	0	0	0	0
	Ransom	34	5/22-7/18	32.4	5.7	47.1	3.4	32.3	15.3	54.5	0.7
	Richland	38	5/27-7/17	50.0	5.3	26.3	1.1	18.4	27.8	23.5	0.2
	Sargent	33	5/28-7/18	54.5	12.8	24.2	1.3	21.2	17.1	17.6	4.5
WC	Dunn	35	6/3-7/24	2.9	10.0	97.1	5.3	0	0	0	0
	McKenzie	42	5/30-7/31	11.9	1.8	73.8	4.4	45.2	7.5	0	0
	McLean	26	5/27-7/24	30.8	10.1	76.9	6.0	38.5	19.3	14.3	0.1
	Mercer	12	6/9-7/23	0.0	0.0	91.7	3.5	0	0	0	0
	Oliver	8	6/9-7/23	12.5	5.0	100	4.4	0	0	0	0
TOTAL	53	1278	—	22.2	6.2	59.9	4.7	24.7	7.4	27.6	0.9

^aFusarium head blight field severity = % incidence of infected tillers x % severity of head infection

across all fields was 0.9 percent (Table 1). Fields with the most frequent observations and highest severities were in the northeast and north central counties (Figure 4), where fields received more rainfall during flowering and grain fill.

■ Other Diseases Observed

Stripe rust: Stripe rust (*Puccinia striiformis*) was observed in 34 fields across the state, primarily in counties on a diagonal line running from the southeast corner to the north central region. The disease was observed in 15 counties, with the most frequent observations (eight) in Mountrail County, followed by five observations in Ward County. Severity was generally less than 2 percent. The occurrence of stripe rust was unusual for the state, as it is a disease generally associated with very cool, wet environments. Cool, wet weather in May and June favored infection. This rust developed in southern plains states prior to moving into North Dakota on prevailing winds.

Spot blotch: Spot blotch (*Cochliobolus sativus*) was observed on leaves of wheat in 11.2 percent of all wheat fields surveyed, primarily in the southwest counties. This leaf spot disease is generally favored by warm, drier conditions than other common fungal leaf spot diseases of wheat.

Bacterial leaf blight (stripe) and Black Chaff: Bacterial leaf blight was observed in 3 percent of fields surveyed, and the head infection, black chaff, was observed in 1 percent of fields surveyed after heading. The fields with symptoms of bacterial infection were all located in the northeast.

Ergot: Ergot infections were observed in 2.7 percent of the post-flowering fields surveyed, all in the northeast.

Loose smut: Of the post-headed fields surveyed, 37.3 percent had symptoms of loose smut. The average infection incidence in fields showing symptoms was 5.4 percent, while the range of incidence was 2 to 30 percent. The highest levels of loose smut were found in southwest counties, but loose smut also was common in the east.

Barley Yellow Dwarf Virus (BYDV): BYDV was observed in 7 percent of the fields surveyed. The predominant location of symptomatic fields was in the northeast, an area where grain aphid populations also were very high. Grain aphids transmit this virus.

■ Diseases Not Observed in Survey

The following diseases were surveyed for and NOT found: Wheat streak mosaic virus; stem rust; flag smut; dwarf bunt; and Cephalosporium stripe.

■ Discussion

Early rains in May and June favored development of tan spot on tillering to jointing wheat. Septoria infections developed primarily after boot stage of development. Economic levels of these two diseases precipitated use of fungicides in many areas. Leaf rust infections were detected early (May 28 in Logan and Sargent counties). Leaf rust was severe in some fields along the South Dakota border, but the warm and relatively dry conditions in late July and August limited development of leaf rust except in late planted spring grains along the northern counties. The dry conditions also limited other diseases, most noticeably Fusarium head blight or scab. The high percentage of fields showing loose smut infection after heading and the high percentage of infected heads in some fields indicates an economic damage from this disease is occurring in many North Dakota wheat fields. The occurrence of stripe rust was more widespread than had been seen before.

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