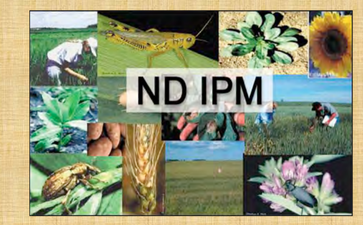

North Dakota Wheat IPM Survey: 10-year Review

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INTRODUCTION

The goal of the Integrated Pest Management (IPM) Survey of North Dakota State University (NDSU) is to detect the presence and estimate the population density or severity of insect pests and diseases in selected agricultural crops grown in North Dakota. Selected results of surveys in wheat are presented for the past 10 years (2005 to 2014). When populations of pests or severity of diseases were high, pest alerts provided timely management information to North Dakota producers, crop consultants and others in agriculture.

MATERIALS AND METHODS

- Five to six crop scouts were trained to scout hard red spring wheat, *Tricitum aestivum* L., fields for major diseases and insect pests, and invasive pests (Fig. 1).
- Approximately 2 million hectares were surveyed in 53 counties in North Dakota each year.
- Scouting Protocol: Scouts examined 50 plants per field (10 plants per 5 spots) when walking a W-pattern. Incidence and severity of pests were recorded.
- Scouts recorded GPS location, date, growth stages, previous crop and pest counts in Excel spreadsheet on hand-held computers.
- Major diseases included: tan spot, leaf rust, Septoria blotch leaf disease complex, Fusarium head blight (scab) and loose smut.
- Major insect pests included: grasshoppers, cereal aphids, wheat stem maggot and wheat stem sawfly.
- Grasshoppers and wheat stem sawfly were surveyed for using a 15-inch sweep net (Fig. 2).
- Invasive diseases: Dwarf bunt, flag smut and black stem rust were surveyed for.
- Regulatory pests: Observations of cereal leaf beetle also were reported to the North Dakota Department of Agriculture.
- Pest data was mapped weekly to show the geographically distribution and severity of pests.

Figure 1. Crop scout, Kyle Aasland, scouting wheat for pests.

Figure 2. Crop scout sweeping for grasshoppers in ditches.

ACKNOWLEDGMENTS

The authors thank the numerous crop scouts over the years, and the ND producers who were always accommodating to crop scouts monitoring pests in their fields. We also thank Dr. Marcia McMullen, Professor Emeritus of the Department of Plant Pathology, who coordinated the IPM Survey in ND from 1997 to 2012.

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RESULTS

IPM information was provided to wheat producers and other stake holders through the NDSU Extension Service *Crop and Pest Report* (weekly ag newsletter and FaceBook), the NDSU IPM Website, the AgDakota list serve, and county Ag Alerts to help growers make timely pest management decisions.

Most Common Diseases Detected (Table 1):

- Number of wheat field surveyed varied from 676 to 1356.
- An average of 33% of the fields surveyed had wheat or a cereal grain crop as the previous crop in the preceding year.
- Tan spot (Fig. 3) was the most common disease and was found in 34 to 90% of the wheat fields surveyed.
- Wheat leaf rust (Fig. 4) was observed in 1 to 28% of wheat fields surveyed. The highest average severity was recorded in 2005 with 7.9, 2008 with 12.0 and 2012 with 9.0.
- Septoria blotch leaf disease complex (Fig. 5) was found in 1 to 25% of wheat field surveyed. 2005 had the highest incidence with an average severity of 23.2.
- Fusarium head blight or scab (FHB; Fig. 6) was found in 6 to 65% of wheat fields surveyed post-flowering. The highest incidence was in 2005 with 65% of the wheat fields positive for FHB with a 8.7 average severity. Wet weather during flowering may have favored FHB development.
- Loose smut (Fig. 7) was observed in 3 to 17% of wheat fields surveyed post-heading. The average % of tiller infected varied from 3.0% in 2006 to 15.9% in 2014.

Figure 3. Tan spot.

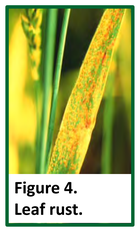

Figure 4. Leaf rust.

Figure 5. Septoria blotch leaf complex and tan spot.

Figure 6. Fusarium head blight.

Figure 7. Loose smut.

Diseases Not Detected:

- Exotic diseases (dwarf bunt, flag smut, and black stem, rust were NOT detected in any field during any year of the Wheat IPM Survey.

Table 1. Most Common Diseases Detected in Wheat IPM Surveys, ND – 2005-2014.

Year	Total # Wheat Fields Surveyed[1]	% Fields with Wheat Crop in Previous Year	Tan Spot		Leaf Rust		Septoria spp. complex		Fusarium Head Blight		Loose Smut	
			% Positive Fields	Avg. % Severity[1]	% Positive Fields	Avg. Severity[1]	% Positive Fields	Avg. Severity[1]	% Positive Post-flowering Fields	Avg. Fld. Severity[2]	% Positive Post-heading Fields	Avg. % Tillers infected
2005	1341	39	60	6.6	28	7.9	23	23.2	65	8.7	17	6.0
2006	1150	40	80	5.4	12	5.6	16	13	7	1.0	5	3.0
2007	1145	58	80	6.7	11	4.6	10	9.5	6	1.0	19	5.5
2008	974	27	34	8.8	7	12.0	10	5.9	23	1.7	17	7.1
2009	1108	24	85	12	2	3.8	16	4.6	13	2.1	10	4.9
2010	810	31	90	3.4	3	3.0	9	1.9	22	4.1	13	6.5
2011	852	14	36	7.7	2	6.1	19	24.1	25	2.8	5	3.3
2012	676	16	59	4.6	3	9.0	25	13.3	8	2.0	10	5.9
2013	948	48	78	6.1	1	1.8	23	6.1	6	1.4	6	5.1
2014	1356	32	65	5.1	1	4.3	1	12.7	8	1.1	3	15.9

[1] Average % leaf severity in infected fields.
[2] Average % field severity at early to soft dough [field severity = (incidence x head severity)/100]

RESULTS (continued)

Most Common Insect Pests Detected (Table 2):

- Grasshoppers (Fig. 8) can cause severe defoliation of foliage and heads during economic populations (>8 adult grasshoppers per yard^2). Grasshoppers were observed in 15 to 78% of the wheat fields surveyed between 2005 and 2014. 2008 had the highest numbers of grasshoppers per 4 sweeps.
- Cereal aphids (Fig. 9) are a major pest problem due to its vectoring of barley yellow dwarf virus. Aphids were observed in 11 to 37% of the wheat fields surveyed. The years with the higher infestations were 2010, 2011 and 2012.
- Wheat stem maggot infests the stem of wheat causing 'white heads' that have no seed (Fig. 10). Survey work started in 2007 due to high populations and producers' complaints of yield loss due to wheat stem maggot damaged heads. Incidence of white heads is usually <5%. However, white heads occurred at 7.9% in 2007, 5.6% in 2008 and 6.7% in 2010 as well as a high percent (>15%) of fields infested.
- Wheat stem sawfly (Fig. 11) causes stem lodging and reduced yield due to its stem-feeding. Wheat stem sawfly survey work started in 2009 due to high populations in SW ND. However, incidence and populations started to decline from 2011 through 2014.

Figure 8. Adult grasshopper.

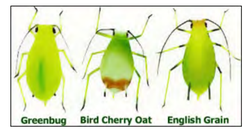

Figure 9. Cereal aphids.

Figure 10. White head.

Figure 11. Adult wheat stem sawfly.

Table 2. Most Common Insect Pests Detected in Wheat IPM Surveys, ND – 2005-2014.

Year	Total # Wheat Fields Surveyed	Grasshoppers		Cereal Aphids		Wheat Stem Maggot		Wheat Stem Sawfly	
		% Positive Fields	Avg. # per 4 sweeps[1]	% Positive Fields	Avg.% Tillers Infested[1]	% Positive Fields	Avg.% White Heads[1]	% Positive Fields	Avg. # per 20 sweeps[1]
2005	1341	41	4.1	15	12.5	-	-	-	-
2006	1150	43	1.7	22	9.7	-	-	-	-
2007	1145	58	3	19	12.7	21	7.9	-	-
2008	974	65	11.6	11	5.8	17	5.6	-	-
2009	1108	51	3.2	20	11.8	19	4.6	4	6.6
2010	810	78	3.8	14	13.5	19	6.7	7	4.8
2011	852	49	3.4	37	13.5	12	4.7	1	2.1
2012	676	54	2.3	22	14.7	19	4.3	1	1.3
2013	948	52	4.8	20	12	3	4.9	1	1.4
2014	1356	57	3.6	19	15	11	5.1	2	7.0

[1] Averages calculated on insect numbers from infested fields.

Regulator Insect Pest on Wheat:

- Cereal leaf beetles (Fig. 12) were detected and confirmed in three additional counties (Burke, Renville and Ward Counties) in NC ND in 2013 (Fig. 13). It was first detected in ND in Williams and McKenzie Counties in 2000. This insect pest is of regulatory concern for producers who ship hay/straw to California or Canada. Cereal leaf beetle also can be an economic pest of wheat and barley. Adults and larvae feed on the leaves, with the larvae being responsible for the majority of the damage.

Figure 12. Adult cereal leaf beetle.

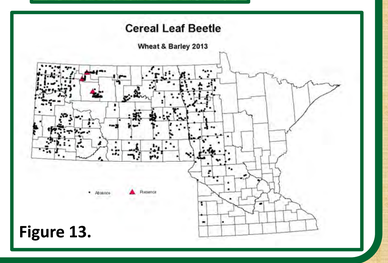

Figure 13.