Disease Survey of Seed and Grain Corn in Ontario and Quebec (2010)

Purpose:

Ontario is a world-class producer of seed corn, due to the region's exceptional combination of climate, soils, production expertise and infrastructure. As with other production areas, the competitive nature of the North American seed corn industry has had a significant impact in Ontario. The Ontario seed corn industry has gone through significant changes in recent years and challenges to the industry will remain. Environmental concerns with nutrient and pest management and competition for land base with other rotational crops are part of these production challenges. One advantage the Ontario seed corn industry possesses is “quality”. Maintaining our productivity and quality under variable growing conditions in the future is critical to the ongoing viability of the Ontario industry.

There are many yield limiting factors such as diseases and understanding these factors are critical to the future health and growth of the seed corn industry in Ontario. An enhanced understanding of the barriers to yield and the compensatory management techniques for Ontario seed corn production is key to a sustainable and dependable Ontario seed corn and commercial corn production industry.

With the potential expansion of corn acres in Ontario and other areas within North America the increase in disease and insect pests we have been observing will only increase with a reduction of rotation crop alternatives. The information obtained on disease and insect impacts in Ontario seed corn and commercial corn fields will assist both private and public breeders in hybrid development which will help meet this challenge and potentially reduce loses to diseases and other pests.

Methods and Materials:

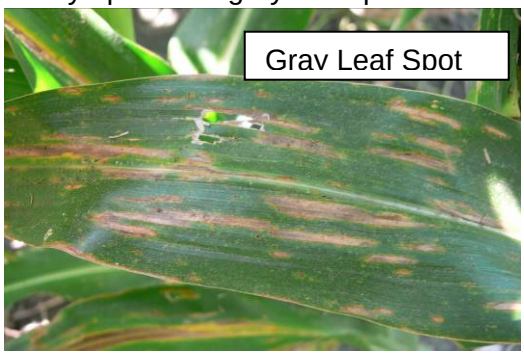
From September 3 to September 16, 2010, a corn pest survey was conducted in Ontario and Qu9bec. the emphasis of the survey was to determine the distribution and severity of corn diseases including eyespot (*Aureobasidium zeae*), common rust (*Puccinia sorghi*), northern leaf blight (*Exserohilum turcicum*), anthracnose leaf blight (*Colletotrichum graminicol*a), common smut (*Ustilago maydis*), head smut (*Sporisorium holci-sorghi = Sphecelotheca reiliana*), ear rot (*Fusarium spp*.), stalk rot (*Fusarium spp*., and *C. graminicol*a), Stewart’s wilt (*Pantoea stewartii = Erwinia stewartii*), as well as European corn borer (*Ostrinia nubilalis*), corn rootworm (*Diabrotica longicornis* and/or *D. virgifera*), and corn flea beetle (*Chaetocnema pulicaria*) were also recorded. In addition, scouting for any newer pests in Canada was conducted, especially for gray leaf spot (*Cercospora zeae-maydis*) in Ontario.

At each of 152 fields surveyed in Ontario and 54 fields in Québec, disease incidence and the severity were recorded. Nine Stewart’s wilt suspect leaf samples were collected in this survey from Southern Ontario. ELISA tests for the pathogen *P. stewartii* (Stewart’s wilt) were done in the Central Experimental Farm laboratory by using reagent sets, protocols, and antibodies provided by AGDIA Inc. (Elkhart, Indiana 46514, USA).

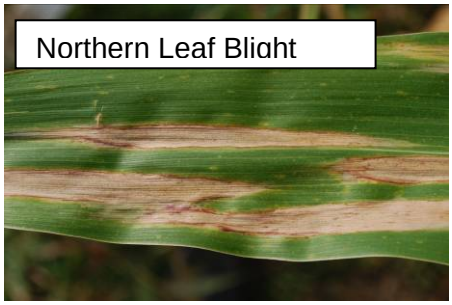
locations consisting of kudzu or soybean scouted for rust this year in 261 individual counties/municipalities across North America.

Results and Comments:

Fungal leaf diseases: Eyespot was found in 101 fields in Ontario and 51 fields in Québec (Table 1). In 2010, Southern Ontario had a greater incidence of common rust than in Eastern Ontario and Québec; however, two fields showed intermediate severities in Eastern Ontario and three fields had intermediate severities in Québec. Southern rust (*Puccinia polysora* Underw.) was not found in 2010. Typical symptoms of gray leaf spot (GLS) were found in 90 fields in 18 counties of Ontario and in 2 counties in Québec (Table 1). GLS was found at intermediate severities in two Middlesex, one Oxford, and one Wellington fields. The 2010 survey results indicate that GLS could be epidemic in favorable conditions in Ontario. Gray leaf spot was first found in Québec in 2010. Anthracnose leaf blight (ALB) was found in 96 fields in Ontario and 43 in Québec (Table 1). Overall, ALB is one of the most common leaf diseases in Canada; however, all fields were sporadic in 2010.



Northern leaf blight (NLB) was found in 149 fields in Ontario and 53 fields in Québec. NLB continues to be the most common leaf disease in Canada and in 2010, only 4 surveyed corn fields did not have the disease (Table 1). Both resistant and susceptible lesions of NLB were observed at 29 fields in Ontario and 19 fields in Québec, some even on the same leaf. Observing both resistant and susceptible lesion types on the same hybrid, especially on the same leaf, indicated that different pathogenic races exist in both Ontario and Québec. Five fields had very severe NLB even though they had both resistant and susceptible lesions. Compared with AAFC Ottawa screening results, it is most likely the NLB resistant gene *Ht1* is susceptible in Canada. Other resistant genes, such as *Ht2, Ht3, HtN,* and *Htm1* should be used more in Canadian hybrids. A new disease, Northern leaf spot (NLS), had symptoms of narrow, long strips along the leaf vein. Its pathogen *Cochliobolus carbonum,* has similar spores with NLB, but it is shorter and darker. NLS were found in 7 fields in Ontario (Table 1) and 3 fields in Québec.



Fungal Ear and Stalk diseases: Gibberella/Fusarium ear rots were observed in 61 fields in Ontario and 25 fields in Québec (Table 1). Two seed corn fields, one had more than 10% incidence and another had 100% ear rot. Penicillum ear rot was found in a single Tilbury trial field. Common smut was distributed across 90 fields in Ontario and 24 fields in Québec in 2010 (Table 1). Head smut was found in 4 fields in Eastern Ontario and 16 fields in Québec. Many ears had black mold /spores on kernels damaged by birds or insects.

Stalk rot, including Anthracnose stalk rot/top-die back, *Fusarium* stalk rot, and *Pythium* stalk rot were found in 111 fields in Ontario and 47 fields in Québec (Table 1). Only 8 fields in Ontario and 2 fields in Québec had severe top-die back with 80-100% incidence. *Pythium* stalk rot, or called early death, was detected more in irrigated seed corn fields or wet grain corn fields at the time the survey was done.

Bacterial diseases: In 2010, no Stewart's wilt was detected, all 9 samples were negative for *P. stewartii* by ELISA test. It was observed that the insect populations of Corn flea beetle (CFB) were very low in Southern Ontario in 2010.

No Goss's bacterial wilt (*Clavibacter michiganensis* subsp. *nebraskensis* = *Corynebacterium michiganense* pv. *nebraskense*) and no Holcus leaf spot (*Pseudomonas syringae*) was found in 2010.

Viral diseases: No viral disease were observed in 2010, including 5 sweet corn fields at the survey time.

Others: Bird and other animal damage were severe in many fields in both Ontario and Québec.

Summary:
Warm temperatures with good precipitation made for favorable conditions for diseases such as northern leaf blight, common rust, eyespot, and gray leaf spot during the 2010 corn season. Eyespot and common rust were severe in some counties in both Ontario and Québec. Ninty-eight percent of surveyed corn fields with NLB, including 14 highly susceptible fields in 12 counties in both Ontario and Québec made 2010 an epidemic year for NLB. Stewart's wilt was not found in 2010. Common smut was found mostly in seed corn fields in Southern Ontario whereas head smut was more commonly found in Eastern Ontario and Québec. Ear rot was severe at two seed corn fields. Anthracnose leaf blight and stalk rot were less important diseases in 2010.

Next Steps and Acknowledgements:
Plans for 2011 are to continue with the disease survey. This survey was supported by the Seed Corn Growers of Ontario which obtained funding through the Farm Innovation Program (FIP) which is a component of Growing Forward and administered by the Agricultural Adaptation Council. We would also like to thank our grower co-operators and the following seed corn companies (Horizon Seeds, Hyland Seeds, Maizex, Pioneer Hi-Bred) for their financial support and access their fields.

Project Contacts:

Albert Tenuta, Ridgetown. albert.tenuta@ontario.ca
Xiaoyang Zhu, Agriculture and Agri-Food Canada, zhuxyz@em.agr.ca

Location of Project Final Report:

Please contact the project contacts above for further information or copies.

Table 1a: Distribution of pests in corn fields in Ontario, 2010

County	# of Fields	Eyespot	Rust	GLS	ALB	NLB	NLS	Smut	Head smut	Ear rot	Stalk rot	ECB	CRW	Grasshopper	Mites
Ontario															
Bruce	1		1	1	1	1		1			1	1	1	1	
Chatham-Kent	27	4	26	23	24	27		23		17	15	23	9	15	12
Duffrin	4	4	4	2	2	4		2		1	3	3	4	3	1
Durham	1	1				1					1	1		1	
Elgin	6	6	6	6	6	6		4		2	5	6	5	4	2
Essex	5		5	4	4	5		3		2	5		3	2	2
Hastings	3	1	2		2	3				1	2	2	2	3	1
Huron	10	4	9	10	4	10		7		1	7	4	10		5
Lambton	9	3	7	9	7	9		3		3	9	2	4	8	6
Lanark	8	8	7	1	3	8		4		5	8	7	8	4	4
Leeds & Grenville	7	7	6	1	5	7	2	6		7	7	5	6	4	1
Lennex & Addington	1	1		1	1	1					1		1	1	
Middlesex	7	3	7	7	3	7	1	7		2	5	3	5	5	3
Northumberland	5	5	4	2	3	5		1		1	3	4	3	4	2
Ottawa-Carleton	9	9	6	2	5	9	2	4	3	6	8	5	6	6	5
Oxford	6	6	6	5	1	6	1	4		2	4	4	5	6	1
Perth	7	6	6	6	2	7		6		1	3	6	6	7	2
Prescott & Russel	4	2	3		2	4		1			4	2	4	1	1
Renfrew	14	14	11		5	11		2	1	7	10	3	13	10	6
Stormont, Dundus & Glengary	9	9	7	2	9	9	1	6		2	4	8	8	7	2
Waterloo	5	4	2	4	5	5		3			3	1	5	4	3
Wellington	4	4	4	4	2	4		3		1	3	4	3	3	1
Total	**152**	**101**	**129**	**90**	**96**	**149**	**7**	**90**	**4**	**61**	**111**	**94**	**111**	**99**	**60**

Table 1b: Distribution of pests in corn fields in Quebec, 2010

County	# of Fields	Eyespot	Rust	GLS	ALB	NLB	NLS	Smut	Head smut	Ear rot	Stalk rot	ECB	CRW	Grasshopper	Mites
Québec															
Argenteuil	1	1	1			1				1	1		1	1	
Bas-Richelieu	3	3	2		3	3		2		1	3	1	3	3	1
Brome-Missisquoi	3	3	1		3	3		2		1	3	1	3	3	
D'Autray	2	2	2		1	2		1	2	1	2	1	2	2	
Drummond	3	3	2		3	3	1	1			3	3	3	3	1
Haut-Richelieu	3	3	3		2	3		2			3	1	2	3	2
Jolietle	2	2	2		1	2		1		2	2	2	2	2	1
Maskinonge	5	3	4		3	5		1	3	4	4	4	5	4	3
Maskoutains	7	6	4	1	6	6	2	3	3	3	6	4	7	4	5
Mirabel	3	3	2		1	3			2	1	3	2	3	1	
Montcalm	3	3	1		3	3		1	3	1	3	2	3	3	2
Moulins	2	2	1		2	2			1	1	1	2	2	1	
Nicolet-Yamaska	3	3	2		3	3		2	2	2	3	2	3	3	1
Rouville	5	5	4		5	5		4		2	5	3	5	3	1
Trois-Rivières	2	2	2	1	2	2				2	2	2	2	2	
Vandreuil-Soulanges	7	7	4		5	7		4		3	3	3	7	7	
Total	**54**	**51**	**37**	**2**	**43**	**53**	**3**	**24**	**16**	**25**	**47**	**33**	**53**	**45**	**16**

Rust = common rust. GLS = Gray leaf spot. ALB = Anthracnose leaf blight, NLB = northern leaf blight, NLS = northern leaf spot, Smut = Common smut. Ear rot: including Gibberella ear rot and Fusarium ear rot. Stalk rot: including Fusarium stalk rot, Pythium stalk rot, Anthracnose stalk rot, and top-die back. ECB = European corn borer. CRW = Corn rootworm, including both western and northern corn rootworm.