

SURVEY OF SEED AND COMMERCIAL CORN DISEASES AND PESTS IN ONTARIO AND QUÉBEC IN 2006 (2006 Report)

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 losses to diseases and other pests.

Methods:

From August 17 to September 11, 2006, a corn pest survey was conducted in Ontario and Quebec. As usual [1, 2, 3, 4, 5, 6, 7], the emphasis of this years survey was to determine the distribution and severity of the bacterial disease Stewart's wilt (*Pantoea stewartii* = *Erwinia stewartii*). The distribution and severity of other diseases and insects including eyespot (*Aureobasidium zeae*), common rust (*Puccinia sorghi*), northern leaf blight (*Exserohilum turcicum*), anthracnose leaf blight (*Colletotrichum graminicola*), common smut (*Ustilago maydis*), head smut (*Sporisorium holci-sorghii* = *Sphecelotheca reiliana*), ear rot (*Fusarium spp.*), stalk rot (*Fusarium spp.*, and *C. graminicola*), 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 164 fields in Ontario and 96 fields in Québec surveyed, the incidence of each pest and the severity of the predominant pests were recorded. Thirty-one Stewart's wilt-like 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).

Results:

Fungal leaf diseases: Eyespot was found in 69 fields in Ontario and 86 fields in Québec (Table 1). Eyespot was rarely found in the surveyed fields in Southern Ontario. Fourteen fields in Québec and three fields in Eastern Ontario had intermediate severity. In most cases, yield losses caused by eyespot were limited; however, in two fields the leaves were necrotic (drying) because of eyespot alone and in five fields the leaves were necrotic (drying) because of both eyespot and anthracnose leaf blight infection. The estimated yield losses for those fields were 5-15%. Some hybrids entered in the Ontario Corn Committee (OCC) trial at Winchester and Lancaster, Stormont Dundas and Glengarry, ON were moderately susceptible to eyespot. Common rust was found in 102 fields in Ontario and 31 fields in Québec (Table 1); only three grain corn and one sweet corn field showed intermediate severity. Southern rust (*Puccinia polysora* Underw.) was found at one field in Elgin, Ontario this year. Typical symptoms of gray leaf spot were found in 78 fields in 14 counties of Ontario (Table 1). As in 2004 and 2005, most gray leaf spot was only found on the lower leaves and symptoms were not severe. Gray leaf spot was one of the most common leaf diseases in Essex, Chatham-Kent, Elgin, and Middlesex counties, Ontario in 2006. Moreover, gray leaf spot was found spreading to Eastern Ontario in Ottawa-Carleton, and Stormont, Dundas and Glengarry areas. In 2006, gray leaf spot observed in 4 fields would be sufficient to caused significant yield losses. No gray leaf spot was found in Quebec. Anthracnose leaf blight (ALB) was found in 131 fields in Ontario and 83 in Québec (Table 1). Unlike 2005 [7], there were 15 corn fields with intermediate to severe ALB in Eastern Ontario and Québec while only two fields were intermediate in Southern Ontario. ALB was the most important leaf disease in Québec in 2006. Northern leaf blight (NLB) was found in 91 fields in Ontario and 31 fields in Québec. This number was higher than 2004 [6] and 2005 [7]. There were 17 fields with intermediate and severe severity in Ontario, including two grain corn fields in which all of plants were dying by the end of August in Huron, and Stormont Dundas and Glengarry counties. The yield losses were estimated up to 20%. This was the fourth year since 2003 that severe NLB was found around Erie Beach, Chatham-Kent County, ON. Of the five seed corn fields surveyed approximately, 3-5 km from this area, three were almost dead on August 18, 2006, while in the other 2 fields, the female parent appeared to have a resistant gene to NLB. In Quebec, three fields planted with the same highly susceptible corn hybrid as in Ontario exhibited an intermediate NLB rating. The results of 2004 [6], 2005[7], and 2006 corn disease survey indicated that northern leaf blight is a more serious problem in Canada and losses are increasing and may pose a significant risk in the future.

Fungal Ear and Stalk diseases: Gibberella/Fusarium ear rots were observed in 34 fields in Ontario and 21 fields in Québec (Table 1) at the survey time late August and early September. Unlike 2005 in which ear rot symptoms showed up earlier than usual because of a warm corn season [7], ear rot symptoms progressed and were very noticeable by late September and early October in 2006, especially in southern Ontario. Subsequent surveys taken after August indicated that 2006 was an outbreak year for ear rot damage and mycotoxin production (DON). Common smut was widely distributed across 101 fields in Ontario and 61 fields in Québec in 2006 (Table 1). There were 4 fields which had more than 2% incidence of common smut in Ontario, including one

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hybrid with 40% incidence in an Ottawa-Carleton farm. Deer damage could have had impact on the incidence of common smut on this hybrid since 80-90% of damaged plants were located 2-3 rows from the field border while the incidence in the field was 40%. In Québec, there were four fields with a relatively high incidence of common smut, from 5-20%. Head smut was only found in 3 fields with very low incidence (<1%), one in Ontario and two in Québec (Table 1). Head smut could not be found in some fields which had head smut in 2004 and 2005, this might be the results of warmer May in 2006 resulting in fast germination. As in 2005, few *Aspergillus* ear rot and *Cladosporium* rot ears were found at harvest time in Ottawa-Carleton, ON in 2006. 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 60 fields in Ontario and 47 fields in Québec (Table 1). None of these occurrences amounted to any serious damage in Southern Ontario at the surveying time; however, seven fields in Québec and two fields in Eastern Ontario had incidence of top-die back of up to 50-90%.

Bacterial diseases: Unlike 2003, 2004, and 2005 [5, 6, 7], Stewart's wilt was much more frequent in 2006, but the yield losses were limited because of low severity. Of the 31 Stewart's wilt samples, all were positive to *P. stewartii* by ELISA test. Stewart's wilt were found at 21 fields in Southern Ontario in the counties of Essex, Chatham-Kent, Elgin, Huron, Lambton, Middlesex, Perth, and Lennox and Addington (Table 1). Stewart's wilt was also found at 10 fields in Eastern Ontario in the counties of Leeds and Grenville, Lanark, Renfrew, Ottawa-Carleton, and Stormont, Dundas and Glengarry. The same hybrid from a seed company showed Stewart's wilt symptoms at three demonstrations in Renfrew, Lanark, and Ottawa-Carleton. It was observed that the insect populations of Corn flea beetle were still very low in Southern Ontario in 2006 as they were in 2003, 2004, and 2005 [5, 6, 7]. No Stewart's wilt was found in Québec.

Holcus leaf spot (*Pseudomonas syringae*) was found once in Stormont, Dundas and Glengarry, ON.

Viral diseases: Maize dwarf mosaic symptoms were observed in one seed corn field in Chatham-Kent, ON in 2006. No other viral disease was observed, including late seeded sweet corn fields which were at silking stage at survey time.

Insects: European corn borer (ECB) damage was observed at 127 fields in Ontario and 72 fields in Québec (Table 1). As usual, ECB damage was higher in Eastern Ontario and Québec than in Southern Ontario. ECB damage incidences ranged from 10-25% with some hybrids at OCC trials in Waterloo, Ontario in 2006. Corn rootworm (CRW) damage was observed at 123 fields in Ontario and 88 fields in Québec (Table 1). As in other years, the main damage of CRW in most fields was leaf feeding and silk pruning; however, western corn rootworm was found causing 85-90% root lodging and heavy silk pruning at one field in Oxford, ON; the grain yield losses of this field estimated up to 35%.

As in 2004 and 2005, aphid populations were lower than usual, but were numerous in three fields in Québec in 2006 and one field in Eastern Ontario. Corn blotch leaf miner (*Agramyza parvicornis* Loew), the most common insect of corn in Canada, was found in all fields surveyed in both Ontario and Québec, but damage was very low.

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Grasshoppers, most likely red-legged grasshopper [*Melanoplus femur-rubrum* (De Geer)], had decreasing populations as in 2005 in both Ontario and Québec. Brown stink bug (*Euschistus servus*) was found in a few fields in both Ontario and Québec, but populations were very low.

Three kind of black beetles were found causing damage on corn kernels. Picnic Beetle (*Glischrochilus quadrisignatus*) was found at one field in Lambton, ON. Milk weed beetle (*Labidomera trimaculata*) was found once in Maskinonge and red head flea beetle (*Systema frontalis*) was found once in D'Argenteuil in Québec.

Mites: Two-spotted spider mite (*Tetranychus urticae* Koch = *T. bimaculatus* Harvey) populations was relatively low in 2006 and no severe damage in both Ontario and Québec.

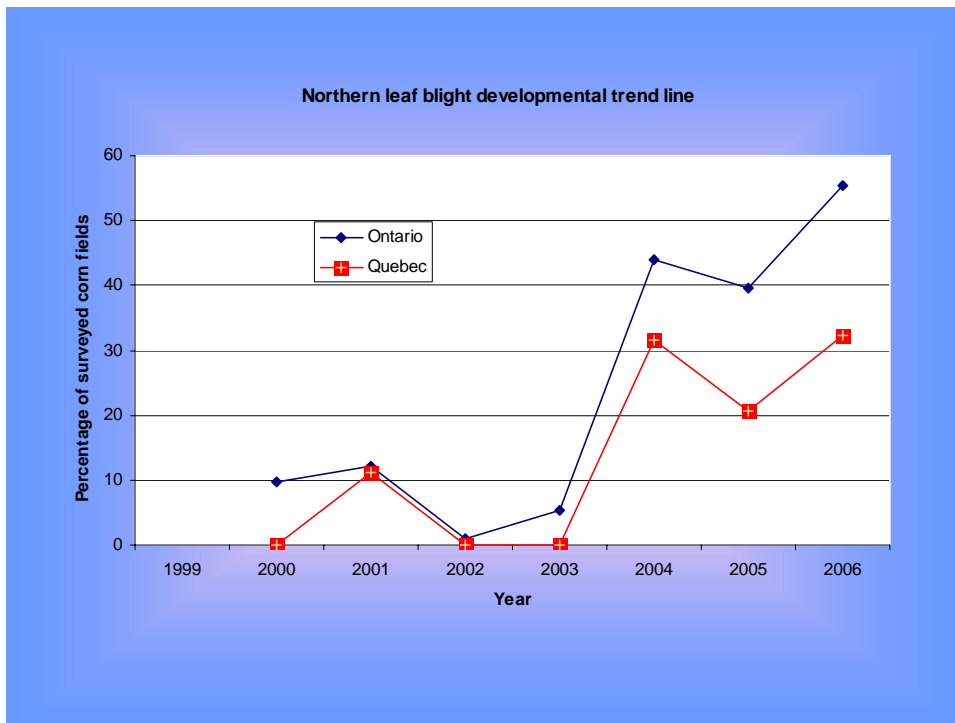
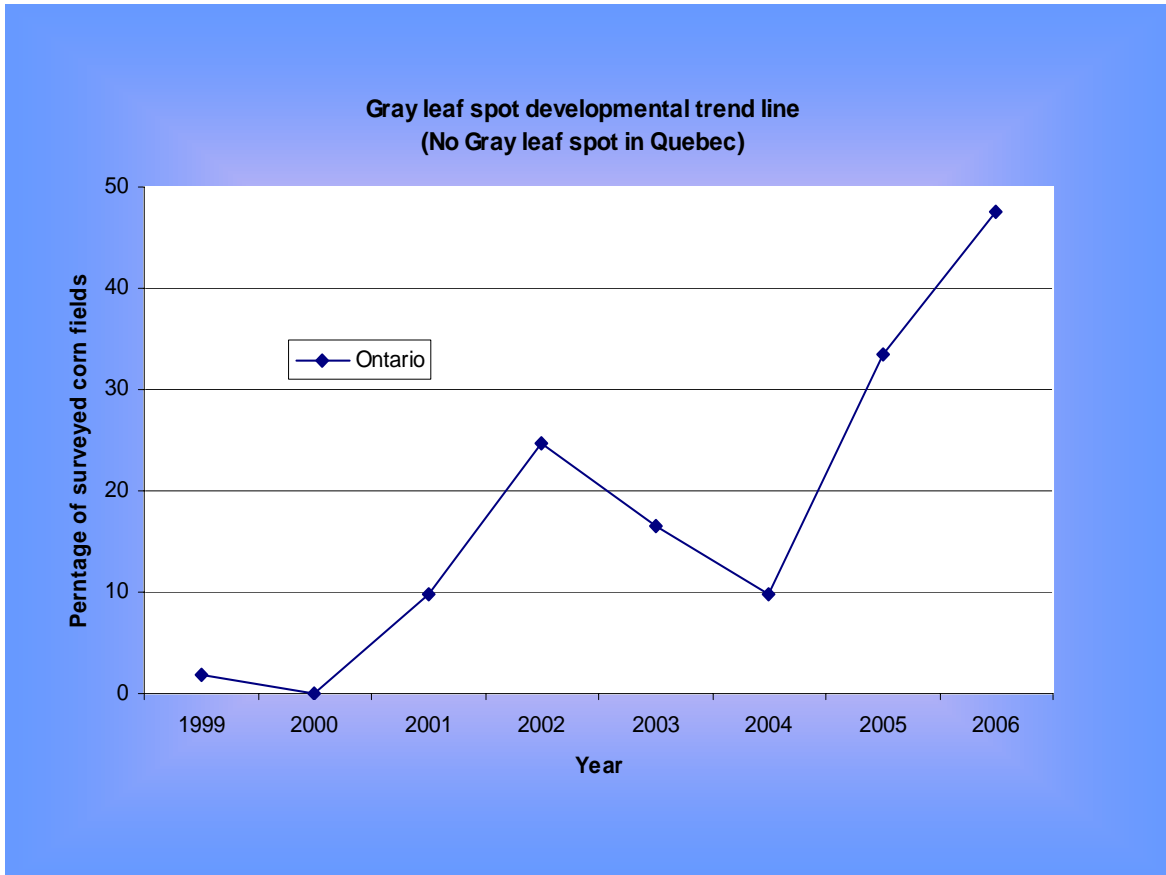
Others: Bird and other animal damage were severe in many fields in both Ontario and Québec.

Summary:

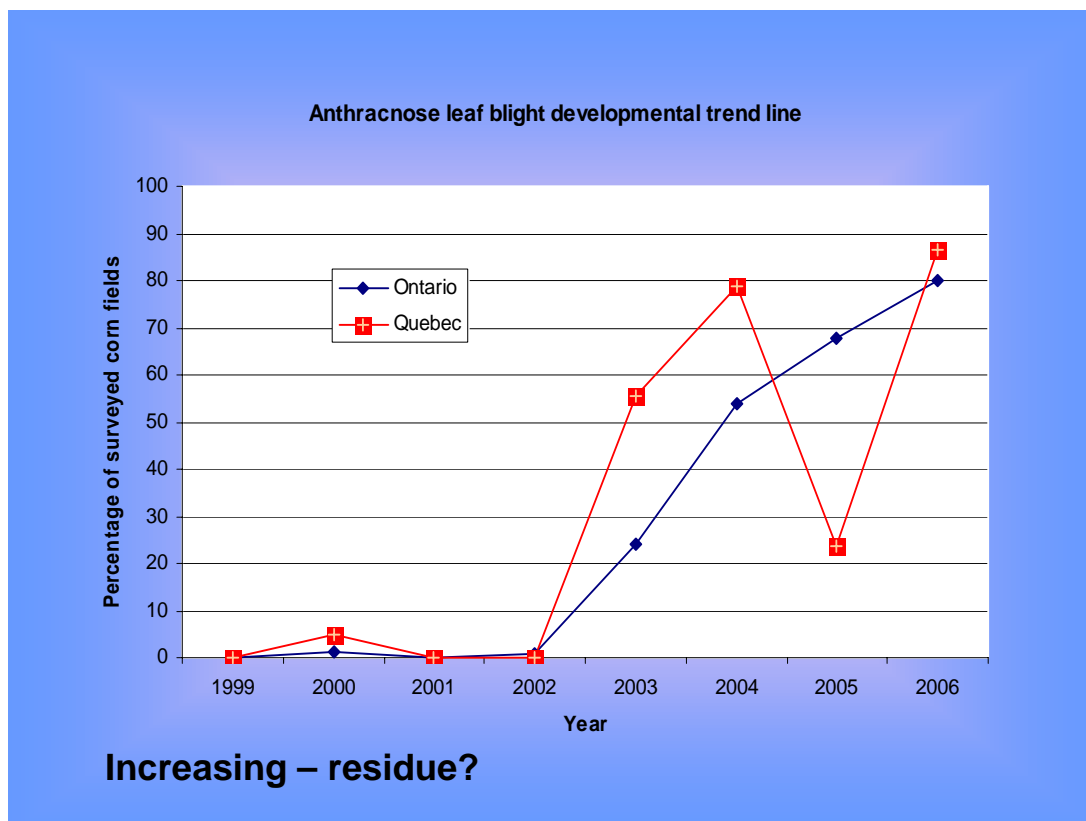
2006 was a warm and moist corn season from May to October. The corn germinated fast and grew normal. A warm season was detrimental for smut disease development as we observed (less head smut and common smut were found in 2006). Conditions in 2006 were however favorable for leaf disease development. Northern leaf blight continues to increase and sporadic NLB outbreaks were observed in Ontario. The damage from anthracnose leaf blight and eyespot has increased in Québec. Gray leaf spot was one of the most common leaf diseases in Southern Ontario and is now established (spread) in Eastern Ontario. Stewart's wilt was found more in Southern Ontario and Eastern Ontario, but was related with specific hybrids. Common rust was not as prevalent as in other years. Excess rain from mid-September slowed grain dry-down creating a *Gibberella* ear rot outbreak in Southern Ontario. There were substantial differences in severity to *Gibberella* amongst commercial corn hybrids. Stalk rot, European corn borer, corn rootworm, mites, and grasshopper were less problematic in 2006 in both Ontario and Québec.

Gray Leaf Spot, Northern Leaf Blight and Anthracnose leaf blight are three economically and potentially destructive seed and commercial corn disease that are increasing. The increase of corn acres and the potential for more corn on corn will increase these and other disease.

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Next Steps:

Seed corn and commercial corn pest survey of Ontario and Québec will be conducted in 2007.

Report Location:

The seed corn growers of Ontario website (www.seedcorngrowers.on.ca)

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