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## Can You Tell The Difference? Is It A Disease or Not!

**Albert Tenuta, Field Crop Plant Pathologist, OMAFRA, Ridgetown**

There are many diseases that can attack field crops in Ontario. Unfortunately, distinguishing between them and other problems in the field can be difficult, time consuming and at times very frustrating. The majority of diseases are caused by infectious micro-organisms (pathogens) such as fungi, bacteria , nematodes and viruses while other problems including environmental factors (non-infectious) such as nutrient deficiencies, temperature, soil moisture, light, pH, herbicide injury etc are often misdiagnosed as a disease. Even though it may be difficult at times the process is important since the effectiveness of your disease control measures depends on a proper identification. If for instance the problem was believed to be due to the environment or chemical but in reality it was a disease. This improper identification could cost you more than time but money as well. Not only the cost of the remedial measures you initiated, but the continued plant and yield losses from the original disease.
In addition, check for contributing factors since there can be several factors involved. For

example, dry hot conditions could increase a crops susceptibility to many diseases. Determining which is the primary cause and which are contributing to the problem is important not only for the present situation but even more important for avoiding the same problems in the future.

Regular scouting of your fields will allow you to determine which diseases are present, at what levels and whether they are increasing. This will provide you an opportunity to stay one step ahead and initiate control strategies to reduce these diseases. It also gives you a way of verifying whether you are effectively managing the diseases.

Keep in mind that although plant breeders have incorporated many new resistance genes there still remains significant differences between varieties, hybrids, inbreds to many common diseases that occur in the province. Knowing which pathogens your crop cultivar in susceptible to will assist in scouting and in effective disease management. For example, some of

So how do you go about identifying a disease (pathogen) from other problems (non-infectious) or as often may be the case a combination of many factors. Start by:

- **Examining the field or affected area for various clues.** Is there a pattern associated with the damage? Does it resemble a chemical drift pattern or do you see the similar damage on other plants within the field (weeds), adjacent fields (different crop) or along the ditches / fence rows. If this is the case then the damage is most likely not due to a disease since most diseases affect certain plants either individually or in patches.

- **Does the damage increase over time?** Plant diseases can occur as single plants but very often they spread from one plant to another. Therefore, the affected area can become larger especially under favourable conditions for disease development. Cool, wet conditions early in the saeson can lead to seedling diseases such as Fusarium, Pythium, Rhizoctonia root rot problems that increase in size when these conditions persist. Damage from abiotic (non-living) factors on the other-hand do not spread from plant to plant.

- **Where on the plant are the symptoms expressed?** Many diseases are associated with certain plant parts (leaves, roots, seed, etc) or growth stages (ex. reproductive stages). Many pathogens though are not very picky and can be found on many plant parts and throughout the season. For example, foliar diseases or leaf blights often start on the lower leaves and move up the plant since most survive within field on crop residues or in the soil. On the other hand, nematodes infect the roots but most often symptoms are expressed in the above parts of the plants.

- **Check the damage plants for signs (physical evidence) of the disease organism.** These “signs” could include fungal growth, fruiting bodies (ascervuli), bacterial streaming (ooze), or nematodes to name a few. These will not be seen if abiotic factors are the cause since no living organism (pathogen) is involved.

the most important seed corn diseases that can cause substantial damage to susceptible inbreds are the foliar disease which include northern leaf blight, common rust, grey leaf spot and anthracnose. Seed corn companies often target fields with susceptible inbreds for increase scouting visits and are aware of potential disease problems. Inbreds that are particularly susceptible to certain diseases may benefit from a fungicide application even when disease severity is low.

# Start Scouting for Stewart's Wilt

**Dr. Ron Pitblado, Weather Innovations Incorporated (WIN) and Albert Tenuta, OMAFRA, Ridgetown**

Over the past week Stewart's wilt symptoms have been observed in some seed corn in southwestern Ontario. Although most field corn varieties are resistant to or tolerant to the bacteria there are differences in seed corn inbred lines and sweet corn hybrids susceptibility to Stewart's wilt. As a result Stewart's wilt can be devastating in seed corn and sweet corn production. Although the disease can be detected every year, Ontario growers have not experienced significant losses since 2002.

An annual seed corn and commercial corn disease survey conducted by Agriculture and Agri-Food Canada (AAFC) Ottawa (Zhu, Reid, Woldemariam) in conjunction with OMAFRA Ridgetown (Tenuta, Van Herk) support these observations (Figure 1). From 1999 to 2002, the percentage of Ontario fields surveyed that had Stewart's wilt ranged from 30 to 55 %. The following three years were very low and not until 2006 did we see an increase (20%).

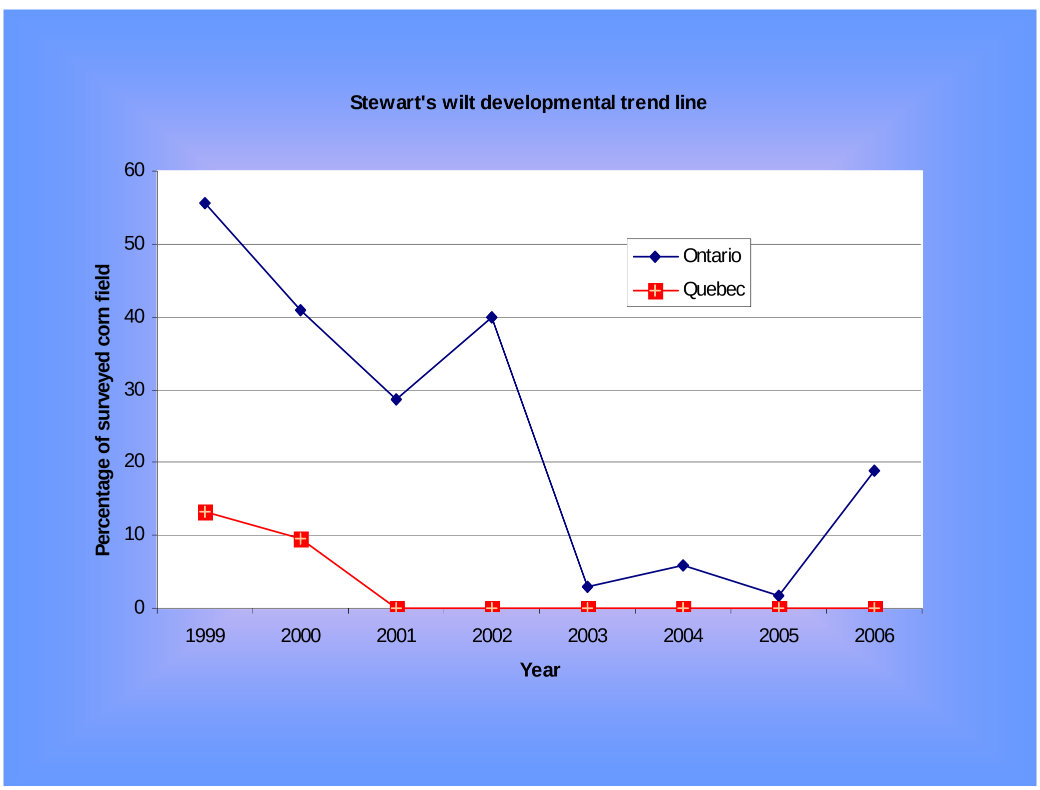


**Figure 1 – Stewart's wilt survey results indicate the disease could be on the rise again after a brief reprieve.**

The corn flea beetle is the predominant vector of the disease in Ontario and as shown in Figure 2, the disease is highest in years when corn flea beetle populations are also high. Mild winters allow more corn flea beetles to survive the winter. In contrast, our Canadian cold winters kill most of the flea beetles. The beetles move from grassy areas into adjacent corn plants, therefore, the incidence of Stewart's disease is usually higher along grassy areas of fields or in areas with grass weed pressure.

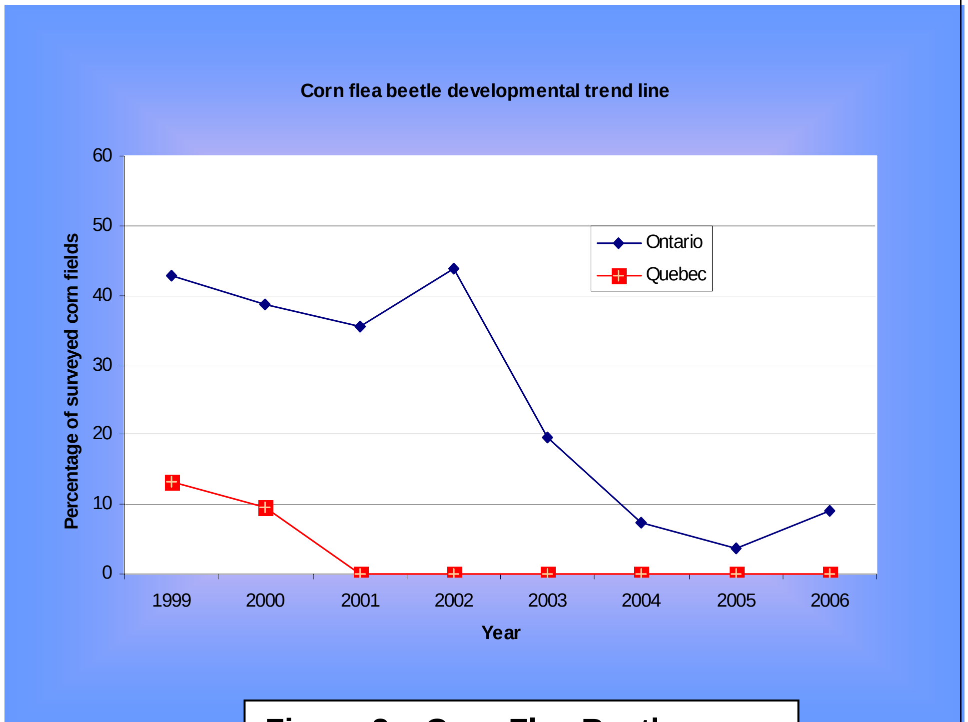


**Figure 2 – Corn Flea Beetle populations in most years mirror those of Stewart's wilt. In other words, the more corn flea beetles present the more disease we see.**

## What had the insect models forecasted for 2007?

Since the early 40's the Steven-Boewe's model has been used to alert growers and company representatives of the potential risks of Stewart's Wilt. This bacterial disease, when infected early, causes severe wilting and death of corn seedlings. However when infection occurred later in the season, which is more the case in Ontario, the foliage shows long wavy streaks which later turn yellow, then brown giving a leaf blight appearance. Not only are there losses in corn yields but the most serious impact may be on export of seed from fields with confirmed diagnosis of Stewart's Wilt. Several countries include the Stewart's Wilt bacterium among their quarantined pests. In those countries, quarantine regulations require seed from fields with confirmed Stewart's Wilt disease must be tested by a certified laboratory prior to export and the seed be certified as pathogen-free. Stewart's Wilt can be confirmed using a commercially available antibody-based detection kit.

The insect vector of this bacterial disease is the corn flea beetle (Figs. 3 and 4). All of the known predictive models attempt to determine the rate of insect survival. The greater the winter mortality of this pest, the less risk of Stewart's Wilt.

**Figure 3. Corn flea beetle (Photo by M. Rice)**

**Figure 4 – Stewart's Wilt Symptoms**

The predictive insect model developed by Steven & Boewe, summed the average daily air temperature for the winter months of December, January and February. The developers set a criteria that ranked the survival risk from Moderate-Severe to Trace.

More recently researchers at Iowa State developed their own model. They averaged the air temperatures during these same winter months of December, January and February, then counted the number of those months where the average temperatures were equal or greater than -4.4C. The warmer the months, the greater risk of corn flea beetle survival, thus increasing the risk of more insects spreading the Stewart's Wilt bacteria.

Even more recently researchers are using average monthly soil temperatures for these same winter months.

**What did each of these models predict?**

It would be helpful if each model predicted the same risk levels for each of the locations studied. However, even though there are variations in the predictions, there appears to be a trend. Fields in southwestern Ontario experienced winter weather conditions that appeared to favour the survival of the corn flea beetle across all three models.

It was indeed another strange winter we experienced where the first two months were warmer than the months of February, and also March. March is not included in any of these models and it may have played the significant role in killing these insects. Since no one included March in their predictive models we will learn this summer how significant March weather conditions were for the survival of the corn flea beetle.

The ability to accurately predict Stewart's Wilt of corn can allow for better management of the disease and the corn flea beetle. Field evaluations of the various disease predicting models is one component of a larger "Best Management Practices for Ontario Seed Corn Project" that is under way. This project is supported by the Seed Corn Growers of Ontario which obtained funding through contributions by Canada and the Province of Ontario under the Canada-Ontario Research and Development (CORD) Program, an initative of the federal-provincial-territorial Agricultural Plicy Framework designed to postion Canada's agri-food sector as a world leader. The Agricultural Adaptation Council administers the CORD program on behalf of the province.

***1. Steven-Boewe – sum of the monthly average air temperatures***

| Locations | Average Temperatures | | | Sum | Prediction |
|---|---|---|---|---|---|
| | Dec. | Jan. | Feb. | | |
| Windsor | 3.1 | -1.4 | -7.5 | -5.8 | Moderate - Severe |
| Leamington | 3.0 | -1.1 | -7.2 | -5.3 | Moderate - Severe |
| Sarnia | 2.2 | -2.5 | -8.4 | -8.7 | Light - Moderate |
| Ridgetown | 2.1 | -2.4 | -8.8 | -9.1 | Trace |
| London | 1.5 | -3.1 | -9.3 | -11.0 | Trace |
| Hamilton | 1.6 | -3.5 | -9.5 | -11.4 | Trace |

***2. Iowa State Model – number of months >= -4.4C***

| Locations | Number of Months >= -4.4C | | | SUM | Prediction |
|---|---|---|---|---|---|
| | Dec. | Jan. | Feb. | | |
| Windsor | 1 | 1 | 0 | 2 | Moderate to High |
| Leamington | 1 | 1 | 0 | 2 | Moderate to High |
| Sarnia | 1 | 1 | 0 | 2 | Moderate to High |
| Ridgetown | 1 | 1 | 0 | 2 | Moderate to High |
| London | 1 | 1 | 0 | 2 | Moderate to High |
| Hamilton | 1 | 1 | 0 | 2 | Moderate to High |

***3. Insect survival prediction based on average soil temperature ranges***

| Locations | Average Temperatures | | | Average Temp | Prediction |
|---|---|---|---|---|---|
| | Dec. | Jan. | Feb. | | |
| Colchester | 3.2 | 1.5 | -1.9 | 0.9 | High |
| Leamington | 7.0 | 5.1 | 1.7 | 4.6 | High |
| Woodslee | 3.6 | 1.7 | -3.9 | 0.5 | Moderate |
| Ilderton | 3.7 | 3.3 | 1.4 | 2.8 | High |

**Rhizoctonia in soybeans** is showing up in the southwest, particularly in fields or areas that are water stressed (wilting). Rhizoctonia has been observed on all soil types and often the worst cases are found on light ground. Characteristic reddish-brown lesions appear at the base of the stem and on roots just below the soil line. They can enlarge into sunken lesions which may girdle the stem resulting in damping-off. – **A. Tenuta**