Soybean Rust Monitoring Activities in Ontario

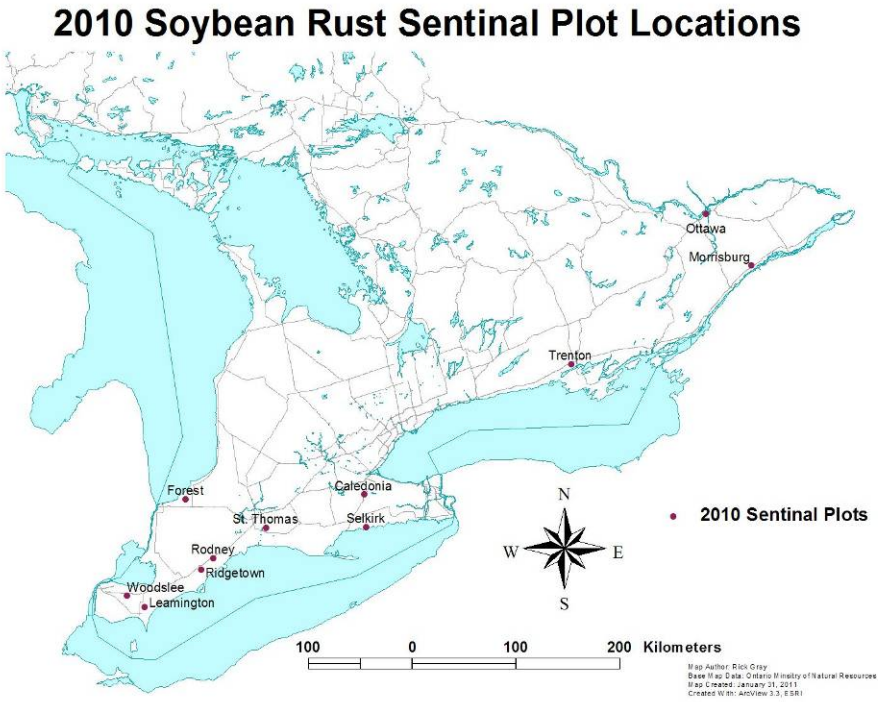
Purpose:

Asian soybean rust (Phakopsora pachyrhizi) is a new and invasive fungal disease of soybean in North America and as we found with the first confirmed soybean infection in 2007 (Ridgetown), the disease can occur in Ontario. The establishment of the disease in the southern United States and Mexico continues to develop and like many “new” diseases the overall pattern will take a few more years to determine and will vary annually.

The purpose of this project is not only to coordinate soybean rust monitoring efforts in Ontario with those of the United States and Mexico but to create an “early warning system” for early disease detection for the soybean production areas of North America. This innovative program includes the establishment of sentinel plots and a spore trapping network which is used as a decision support tool for producers and advisors considering fungicide applications. This “early warning” sentinel plot system in conjunction with education, monitoring, prediction models, fungicides give producers the tools or weapons needed to track and combat this destructive disease and limit yield losses as well as increased awareness.

Materials and Results:

1) As part of Ontario’s commitment to the North American Soybean Rust Monitoring Network a series of sentinel plots were established across the soybean production areas of southern Ontario (from Windsor to Ottawa) in 2010. These consisted of 11 dedicated



soybean sentinel plots, one Kudzu location between Kingsville and Leamington plus 55 mobile/random locations (Figure 1). The sentinel plot program involves intensive scouting for soybean rust symptoms and field evaluations by the Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) in conjunction with Agriculture and Agri-Food Canada (AAFC) and industry partners. Scouting results are posted on the USDA ipmPIPE soybean rust website (www.sbrusa.net) with links through the Grain Farmers of Ontario. The establishment of both sentinel and mobile plots allowed us to survey for other soybean pests such as Soybean Cyst Nematode, aphids, viruses and other diseases as well.

In 2010 the continued development of the North American soybean rust sentinel program consisted of over 4,832 sentinel and kudzu and soybean observations were uploaded into the ipmPIPE from 37 states/Ontario in 2010 (Figure 2). There were 405 sentinel locations consisting of kudzu or soybean scouted for rust this year in 261 individual counties/municipalities across North America.

Although soybean rust infection was not detected in Ontario in 2010, the North American Soybean Rust Monitoring Network as of December 31, 2010 was able to detect the disease in 45 counties in 7 states in the U.S. In addition, 3 states and 17 municipalities in Mexico reported soybean rust. This is the first year since 2004 where a decrease in the overall total number of positive counties decreased in the continental North America (131 in 2005, 274 in 2006, 301 in 2007, 392 in 2008, and 583 in 2009).

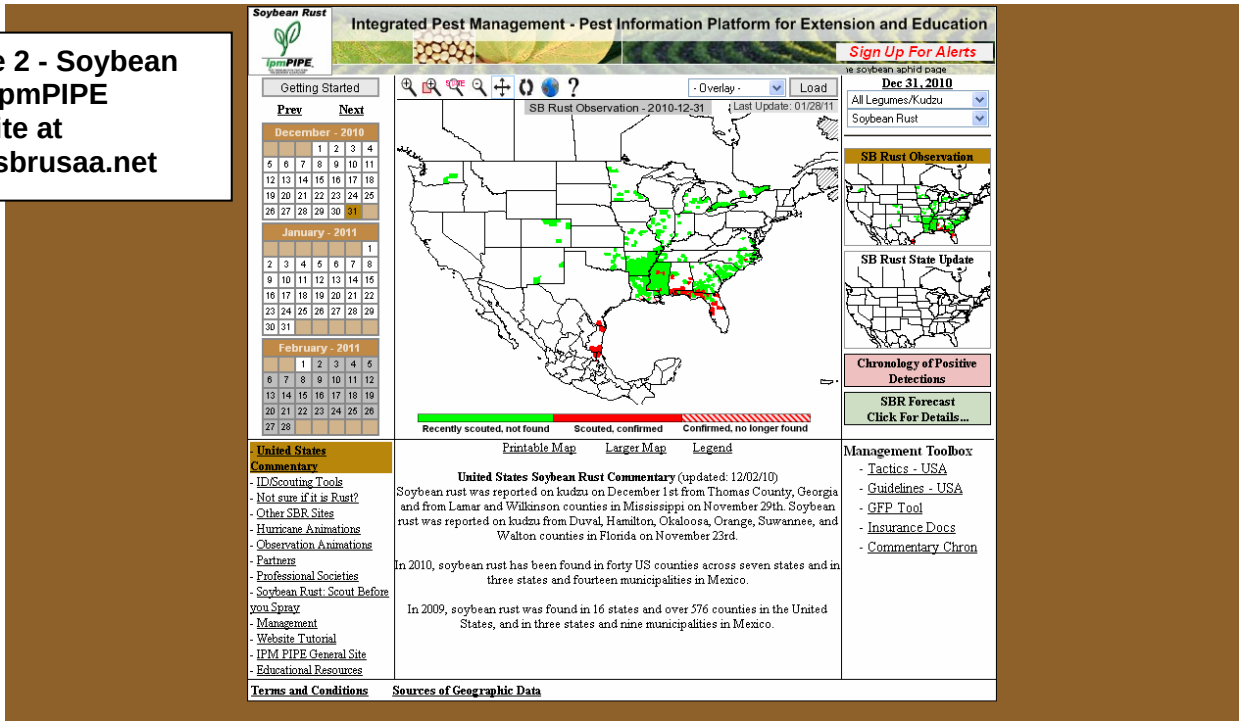


Figure 2 - Soybean Rust ipmPIPE Website at www.sbrusaa.net

2) The establishment of both sentinel and mobile plots allowed us to survey for other soybean pests such as Soybean Cyst Nematode, aphids, viruses and other diseases. Unlike 2007, soybean rust infection was not detected in 2010 on either soybeans from sentinel plots or commercial fields. To date the only confirmed Canadian detection of a

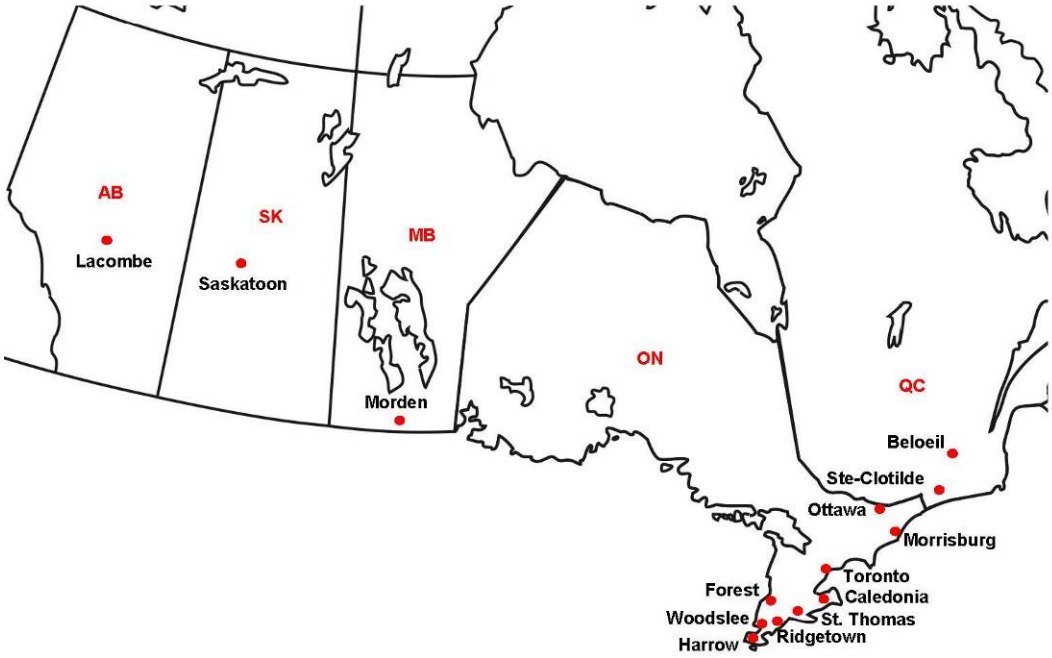
plant infected with soybean rust occurred from plots on the University of Guelph Ridgetown Campus in Ridgetown, Ontario, Canada in the fall of 2007. This detection was important since it confirmed that the disease can travel and infect Ontario soybeans. 3) Many of the sentinel plots were planted 5 to 14 days ahead of most of the grower fields in the areas with the majority having a single planted variety however multiply variety locations were established primarily on research stations. Varieties were selected based on appropriateness for the selected region. Due to the variation in growing areas within the province, maturity groups ranged from late group 2 in the southwest to mid group 0 in the east.

4) In addition to the intensive monitoring for the disease through the sentinel plots and mobile scouting efforts, we continued in 2010 to deploy DNA-based screening techniques and airborne spore detection equipment (rainfall and air) as well (Figure 3). This spore trap monitoring network was established in 2007 mainly in Ontario (9 locations) but other provinces (Alberta (1), Saskatchewan (1), Manitoba (1), and Quebec (2)) were included as well (Figure 4). Samples were collected weekly and screened using the species-specific real-time PCR (qPCR) assay developed by the USDA, and additional confirmatory DNA-based approaches.

Figure 3 – The rainfall and airborne spore detection equipment used in the Canadian soybean rust spore detection network.

Since the network was established, soybean rust spores have routinely been detected in Ontario usually beginning in late June through late September. Viability of these spores however can not be determined based on the qPCR assay utilized. The Canadian spore detection data has been incorporated into the USDA soybean rust forecasting models. Most of the broad detection events (large geographical areas) corresponded to storm front events from the United States which suggests long distance transport of the spores.

Figure 4 - Canadian soybean rust spore detection network has been established primarily in Ontario but other provinces (Alberta, Saskatchewan, Manitoba, and Quebec) are included.



Summary: The information collected from this North American "early warning system" is posted on the USDA soybean rust ipmPIPE website (www.sbrusa.net) and linke to the Grain Farmers of Ontario website (www.gfo.ca). A "preventative" fungicide for instance, must be applied prior to the disease establishing and this network provides sufficient lead time. In addition, tracking the disease within the province can assist in the switch from "protective" to "curative" fungicides. The sentinel plot system has proven to be a very effective and successful tool for producers, extension, consultants and the soybean industry.

Next Steps: Plans for 2011 are to continue with both the soybean rust sentinel and mobile monitoring program and the spore detection network through funding by the Grain Farmer's 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.

The sentinel plot network also provided an opportunity to evaluate the protocols and technology transfer mechanisms created. Additional observations made in the sentinel plots included other soybean diseases and soybean aphid population levels which assisted in producer management decisions.

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the Agricultural Adaptation Council's and Pest Management Centre, the Farm Innovation Program (FIP) which is a component of Growing Forward and administered by the Agricultural Adaptation Council, The Grain Farmers of Ontario (GFO) and the Ontario Soybean Rust Coalition. We would like to thank all our grower cooperators, retailers, agri-business, OMAFRA (Gilles Quesnel), AAFC (C. Maharg, G. Stasko), U of Guelph - Ridgetown Campus (Cheryl Van Herk, Brian Sterling and Dennis Fischer) and others for their hard work. A special thanks to Dr. Sarah Hambleton and her lab at AAFC-Ottawa as well as Tom Welacky and his lab at AAFC-Harrow. The cooperative effort is greatly appreciated !

The Ontario Soybean Rust Coalition which is a partnership of key soybean stakeholders encompassing extension (government), producer, researcher, equipment and chemical company representatives. These partners are not only committed to collect, compile, disseminate information and resources to tackle this debilitating crop disease but to provide a "unified" voice concerning soybean rust to not only Ontario producers but soybean producers in other provinces as well.

OMAFRA would also like to thank the United States Department of Agriculture (USDA), United Soybean Board (USB) and the North Central Soybean Research Program (NCSRP) for including the Ontario sentinel plot information on the USDA soybean rust ipmPIPE website (www.sbrusa.net).

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Location of Project Final Report:

Please visit the Grain Farmers of Ontario (www.gfo.ca), the USDA Soybean Rust website (www.sbrusa.net) and OMAFRA site (www.omafra.gov.on.ca) for more information on the sentinel plots and other soybean rust related materials.