

Soybean Rust Monitoring Activities in Ontario

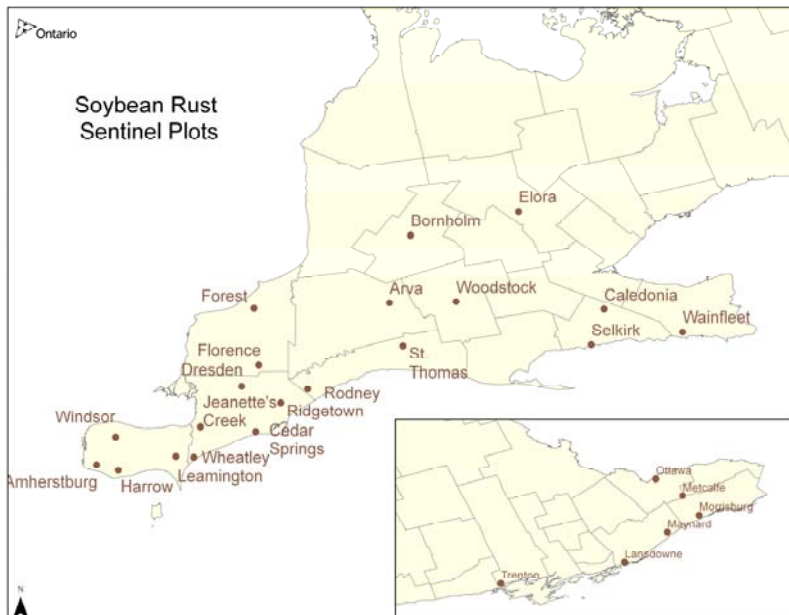
Purpose:

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.

Materials and Results:

1) Ontario has been involved in The North American Soybean Rust Monitoring Network since 2005 and each year a series of sentinel plots are established across the soybean production areas of southern Ontario (from Windsor to Ottawa). In 2009 this consisted of 31 sentinel plots (30 soybean and 1 kudzu) plus 53 mobile 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 website (www.sbrusa.net) as well as the Ontario Soybean Growers soybean rust website at (www.soybean.on.ca).

Figure 2 – The rainfall and airborne spore detection equipment used in the Canadian soybean rust spore detection network.



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 2009 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) The majority of 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 2009 to deploy DNA-based screening techniques and airborne spore detection equipment (rainfall and air) as well (Figure 2). 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. 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.

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.

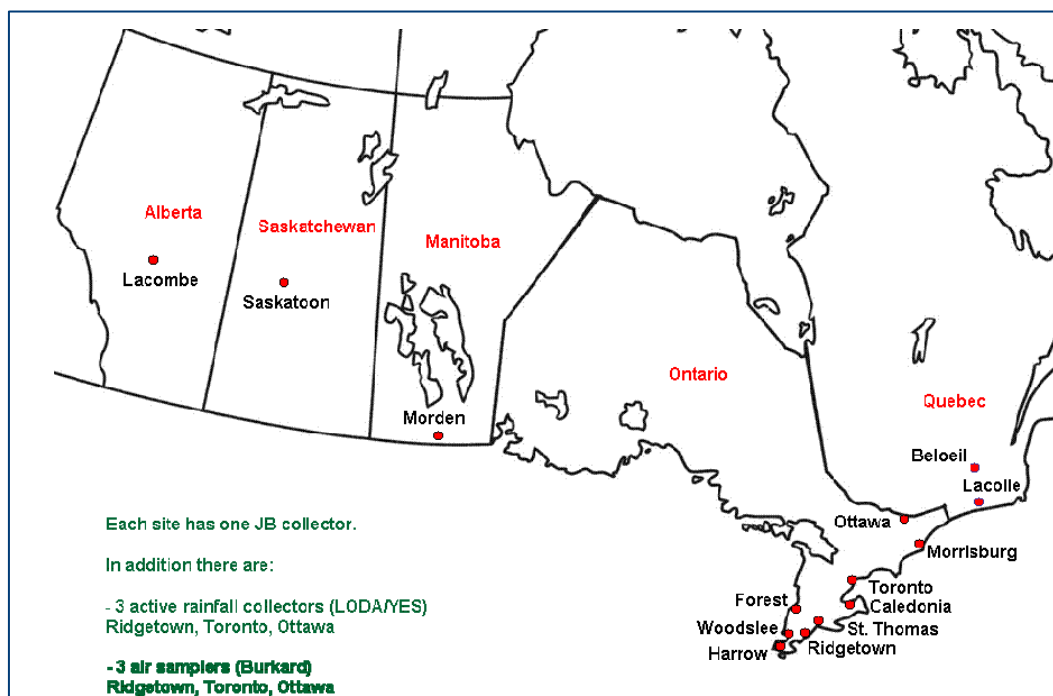


Figure 3 - Canadian soybean rust spore detection network has been established primarily in Ontario but other provinces (Alberta, Saskatchewan, Manitoba, and Quebec) are included.

2009 Canadian ASR Spore Trap Positives

2009 Week #	Positive qPCR	Site	Collector Type	Installed date	Collected date
8	above threshold	Caledonia	JB	21/07/2009	28/07/2009
8	above threshold	Forest	YES/LODA	21/07/2009	28/07/2009
10	above threshold	Toronto	JB	03/08/2009	11/08/2009
10	above threshold	Toronto	JB	03/08/2009	11/08/2009
14	above threshold	Woodslee	JB	01/09/2009	08/09/2009
17	above threshold	Ottawa	Burkard	22/09/2009	29/09/2009
17	above threshold	Woodslee	JB	22/09/2009	29/09/2009
17	above threshold	Ridgetown	JB	22/09/2009	29/09/2009
17	above threshold	St. Thomas	JB	22/09/2009	29/09/2009
17	above threshold	Lacolle	JB	22/09/2009	29/09/2009
18	above threshold	Ridgetown	YES/LODA	09-29-2009	10/06/2009
18	above threshold	Toronto	Burkard	09-29-2009	10/06/2009
18	above threshold	St. Thomas	JB	09-29-2009	10/06/2009
18	above threshold	Ottawa	YES/LODA	09-29-2009	10/06/2009
18	above threshold	Woodslee	JB	09-29-2009	10/06/2009

Summary:

The information collected from this North American “early warning system” is posted on the Ontario Soybean Growers website (www.soybean.on.ca) and the USDA soybean rust website (www.sbrusa.net). 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:

Now that we know soybean rust can make it to Ontario and infect our crop, it will be even more critical for Ontario’s participating in the most comprehensive disease monitoring and forecasting program in North America.

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.

Acknowledgements:

Funding for these soybean rust monitoring activities were provided in part by OMAFRA, AAFC through the CanAdvance Program administered by the Agricultural Adaptation Council's and Pest Management Centre, the Ontario Research Development (ORD) program, the Ontario Soybean Growers (Grain Farmers of Ontario) 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 Dr. Terry Anderson 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 website (www.sbrusa.net).

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Location of Project Final Report:

Please visit the Ontario Soybean Growers Website (www.soybean.on.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.