

Soybean Rust Monitoring Via Sentinel Plots in Ontario

Purpose:

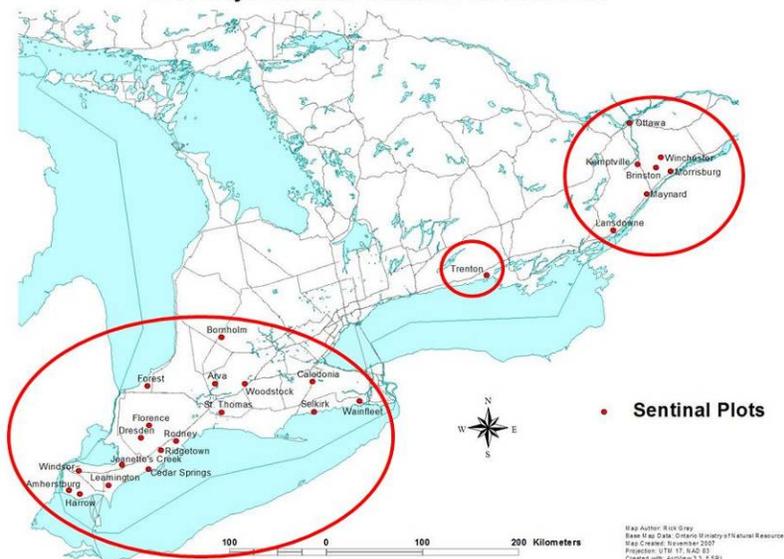
The threat of soybean rust has led to unparalleled international cooperation and partnerships and the comprehensive soybean rust “sentinel plot” monitoring program put in place by the United States Department of Agriculture (USDA) and OMAFRA/OSG is one such example. Ontario’s involvement in this innovative network resulted in a series of soybean sentinel plots being established across the soybean production area of southern Ontario (from Windsor to Ottawa). One of the primary functions of sentinel plot monitoring for soybean rust is to create a warning system for early disease detection in soybean production areas. This “early warning” sentinel plot system in conjunction with education, monitoring, spore traps, prediction models, fungicides give producers the tools or weapons needed to track and combat this destructive disease and limit yield losses.

Methods:

Thirty-one, 38 and 44 soybean sentinel plots (this includes 1 Kudzu – University of Toronto greenhouse root) were established in 2007, 2006 and 2005 respectively from Windsor to Ottawa and although soybeans were the main focus of scouting activities in commercial fields, other legume crops (such as dry edible beans) were scouted throughout the season.

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.

2007 Soybean Rust Sentinel Plot Locations



The sentinel plot program involves intensive scouting for symptoms and field evaluations by the Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) in conjunction with Agriculture and Agri-Food Canada and industry partners. Plots were monitored weekly except for certain locations in the southwest which were scouted twice-a-week based on storm front activity and the risk of spore movement into the province or Great Lakes

region. Beginning at the R1 growth stage, random and questionable leaf samples were collected from the sentinel plots and evaluated in either Ridgetown or Ottawa. Unresolved leaf samples and rainfall filtrate samples were screened for the pathogen by AAFC in Ottawa (Dr. Sarah Hambleton) using conventional PCR and real-time PCR detection techniques developed by the USDA. This was the case in October 2007 which resulted in the first confirmation of Asian soybean rust on an infected plant in Ridgetown, Ontario.

In 2007, 12 sentinel plot locations had rainfall and air samples deployed and also led to the first Canadian detection of DNA of soybean rust spores. 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.

Results:

The most important direct result of this project was the first Canadian detection of soybean rust infected plant which occurred on October 16, 2007 from plots on the University of Guelph Ridgetown Campus in Ridgetown, Ontario, Canada. This detection confirmed that the disease can travel and infect Ontario soybeans.

Another important result or first detection came about from the additional monitoring efforts around spore trapping. This spore trapping network also resulted in the first

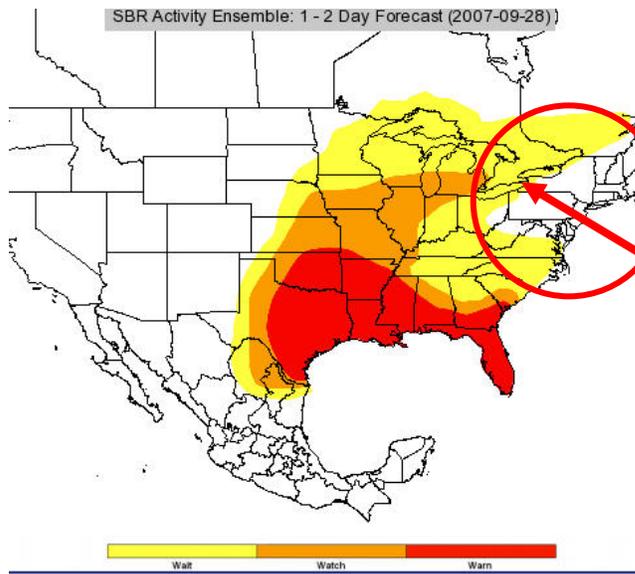


Canadian detection of DNA of soybean rust spores from rainfall and air samples from collectors deployed at 12 sites in Ontario. The most noticeable spore deposit events occurred in mid-July and mid- to late August, when samples from multiple sites across Ontario per week tested positive. Both of these time periods corresponded to a series of storm front events that suggested long distance transport of the spores was possible.

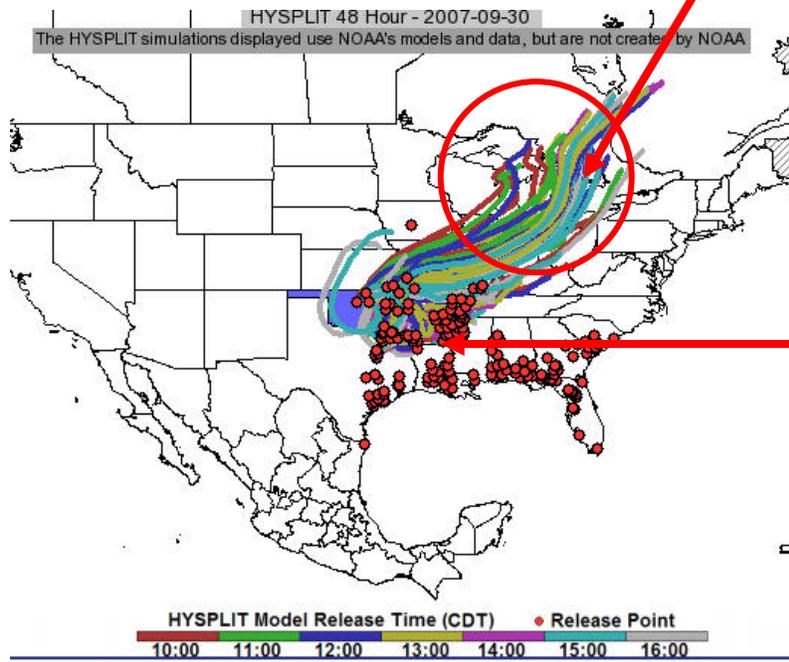
Scouting results were posted on the Ontario Soybean Growers website (www.soybean.on.ca) and the USDA website (www.sbrusa.net).

Soybean Rust Forecasting System Developed and Predicted Soybean Rust Potential in Southwestern Ontario – Confirmed on Oct. 16, 2007

Crop Advances: Field Crop Reports



Participation in the Sentinel Plot System Provides Ontario Producers with resources such as computer models and spore trajectory simulations that would be cost and resource prohibited. Weekly data collected from Ontario helps validate the models and events such as the rust detection in Ontario strengthens predictions.



Wind Trajectories Predicted Movement of Soybean Rust Spores from Infected Areas in Arkansas, Oklahoma, and other states.

Summary:

The sentinel plots and spore trapping networks provide an effective “early warning system” and a decision support tool for producers and advisors considering fungicide applications. 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.

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.

Next Steps:

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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 this project was provided in part by Agriculture and Agri-Food Canada through the Agricultural Adaptation Council's CanAdvance Program and the AAFC Pest Management Centre, the Ontario Soybean Growers and the Ontario Soybean Rust Coalition.

The Ontario Soybean Rust Coalition which is a partnership of key soybean stakeholders encompassing extension (government), producer, researcher, equipment and chemical company representatives.

We would like to thank colleagues at the U of Minnesota (L. Szaebo, C. Barnes and J. Johnson) for sharing information about the JB collectors and all cooperators -growers, retailers, agri-business, retailers, OMAFRA, AAFC, U of Guelph - Ridgetown Campus (R. Gray, D. Fischer and B. Sterling) and many 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!

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:

The Ontario Soybean Growers Website (www.soybean.on.ca).