Improving Management of Soybean Cyst Nematode through Extension Demonstration and Outreach

Purpose:

In these times of turmoil on the financial markets one strategy which can provide you with consistent returns on your investment is the use of SCN resistant varieties. Soybean Cyst Nematode is the most yield limiting disease of soybean in Ontario and the northern United States. Unfortunately many soybean growers continue to lose yield to the disease and although effective and practical management tools are available many growers still are not properly managing SCN or are unaware of the problem. It is for these reasons SCN is often referred to as the "silent yield robber". Many researchers believe the stagnant soybean yields in certain parts of the province and the US North Central is partly due to diseases and insects but particularly soybean cyst nematode.

The research objectives of this international multi-year project is to:

1) Reduce losses and improve soybean cyst nematode (SCN) management in Ontario and the North Central US states.

2) Demonstrate the effects of different SCN resistance sources on SCN field populations in a single cropping season.

3) Produce annual fact sheets summarizing the results of this effort across all collaborating states and Ontario.

Methods:

1) A field protocol was developed and followed by all state cooperators including Ontario. This protocol was used for trial establishment, SCN population assessment and yield determination. Twenty eight sites were established with this project. On farm strip trials were established in the following states (Number of locations): IL(2), NE (2), IA (3), OH (2), MN (3), MO (2), ND (2), WI (2), KS (2) one conventional planted and one double crop, MI (3), SD (2) and ON (2) – Ontario, Canada. All locations utilized large plots with the exception of ND where only small areas of a small number of fields are known to have SCN at this time. At most of the locations there were multiple varieties which represent the main resistance genes for SCN management. Some trials varied from four to up to eight varieties in some locations. In a few of the locations, we were unable to secure varieties with some resistance genes due to the time of year in which the project was approved. Several states including Ontario utilized multiple PI88788 varieties when they could not identify other genetic sources.

2) In Ontario and all states, two or more locations were established for large scale demonstration purposes. Grower fields were used in all cases possible, and in Ontario locations near Highgate (Chatham-Kent) and Leamington (Essex County) were established in fields with known SCN infestations. Replicated strip plots of 250 ft in

length were established with a minimum of four replications at each site. Each location has a minimum of four soybean varieties, which will represent an SCN-susceptible variety, and varieties with SCN resistance from PI 88788 and PI 548402 (a.k.a. 'Peking'). In some locations in the US another resistance source PI 437654 was used where available but unfortunately PI 437654 (CystX) derived varieties were not available for Ontario in 2010. These are the most commonly used sources of resistance to SCN in the North soybean production areas. Additionally, resistance from PI 209332 is being incorporated into northern soybean varieties developed by the University of Minnesota, and this may be evaluated as additional variety that represents this source of resistance but no varieties were available for Ontario in 2010. Regionally-adapted varieties with similar yield potentials were used at each location.

2) Soil cores were collected at planting and at harvest from each strip plot at both locations in each year of the study. Because of the size of the strip plots, multiple cores needed to be collected to represent the SCN population density as best as possible. The individual plots were divided into 25 ft length sections, and 10 samples per section were collected and bulked for SCN egg density counts. A total of 640 SCN soil samples were collected from each of the four locations over the two years (spring (320) and harvest (320)) in order to determine reproduction of SCN, egg densities from each plot.

3) A modified HG SCN type test is being done on both the spring and at harvest fall samples for both 2008 and 2009. The differential lines of the SCN resistance sources to be used are Lee 74, PI 88788, PI 548402, PI 437654 and PI 209332. This modified HG type test will be used to characterize the SCN population at planting for the entire area as well as in individual plots at the end of the season. All HG typing are being conducted through Dr. Terry Niblack's lab (University of Illinois) and we have obtained the necessary permits from the USDA to facilitate the movement of soil to Dr. Niblack's nematode lab in Illinois.

Results and Summary:

The SCN resistant varieties out yielded the susceptible varieties at both locations (Figure 1 and 2) in 2010 as expected with the greatest yield difference (25.57 bu/acre) occurring in Highgate. In 2009, the SCN resistant varieties out yielded the susceptible varieties by 52.8 % in Highgate and 20.3% at the Lemington location. These results emphasize the importance and effectiveness SCN varieties have when used even under low SCN pressure. As expected the greatest increase in SCN population densities occurred when a susceptible variety was used while in general a reduction in SCN populations were observed for both the PI88788 and Peking sources of resistance. The HG Type (old races) profile data was not available at the time of publication but known SCN shifts have been occurring in Essex county and the yield data from Leamington in 2010 found the Peking source of resistance out yielded the PI 88788 varieties which could be caused by a SCN population shift.

Figure 1

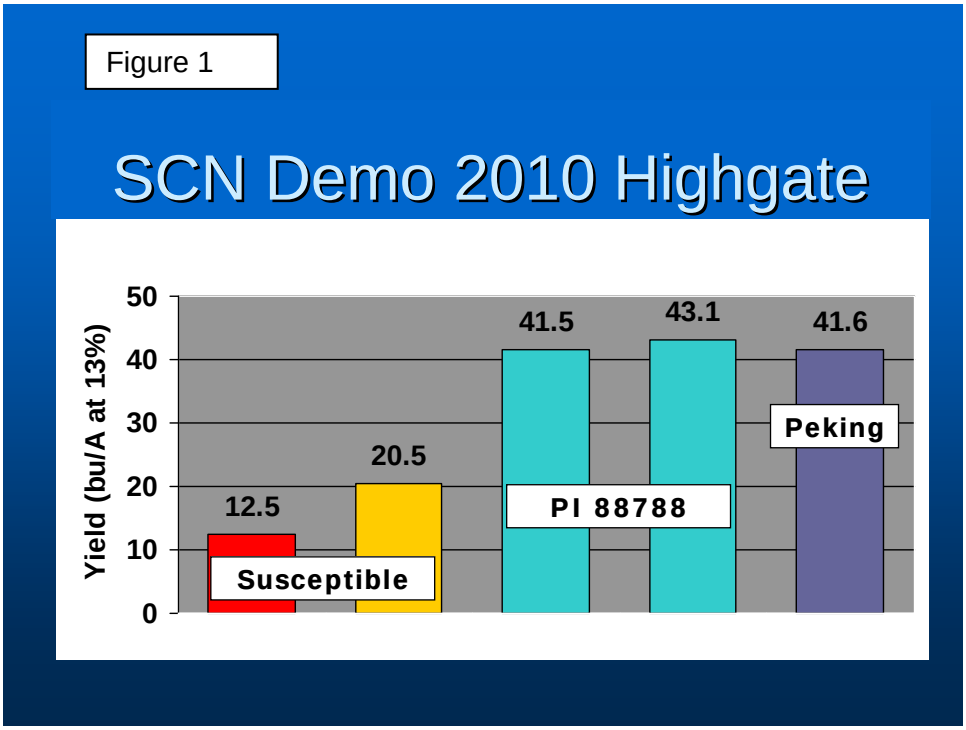


Figure 2

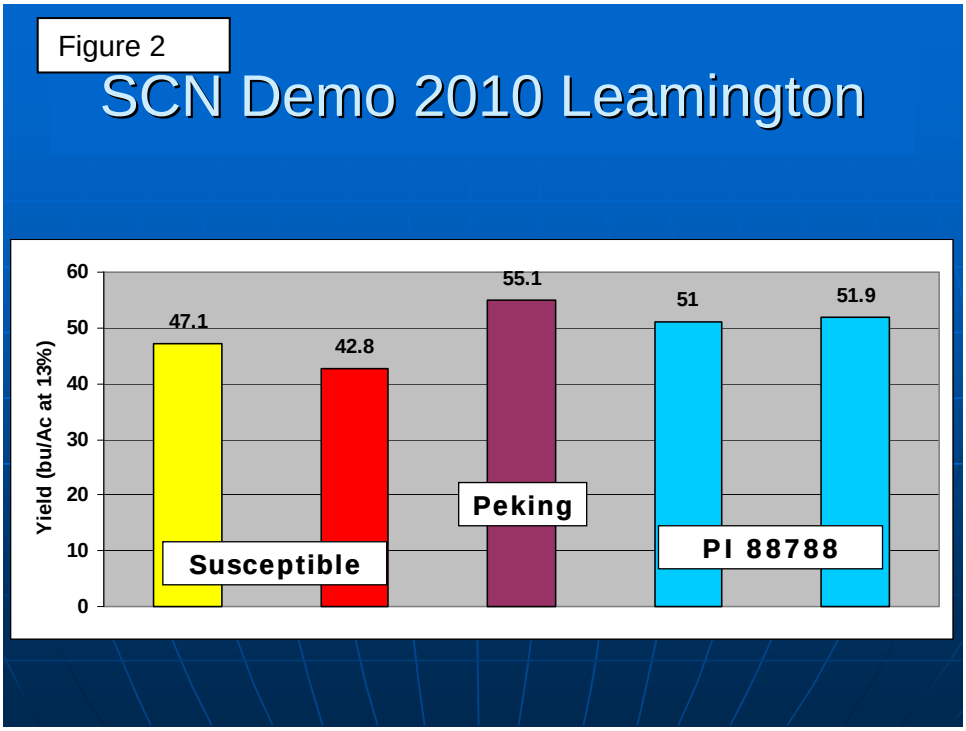


Figure 3- SCN Demo 2009 Highgate

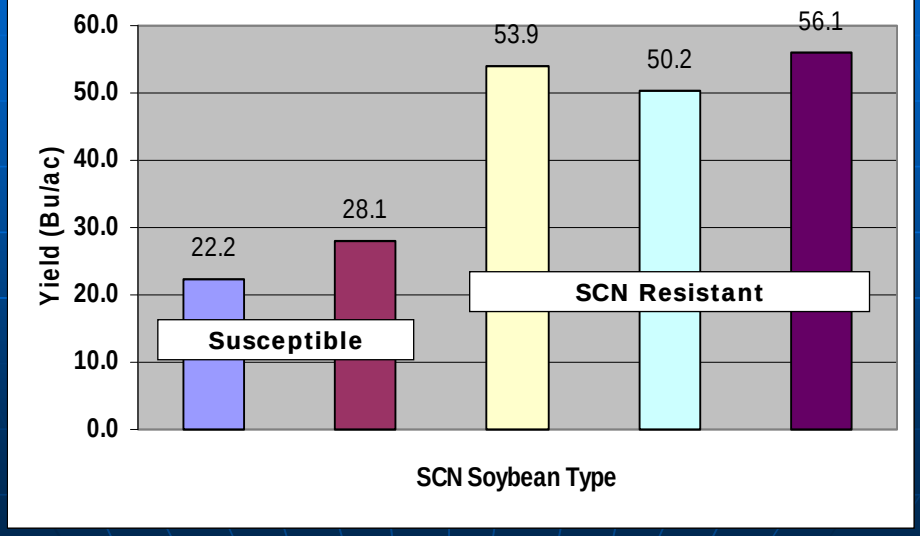
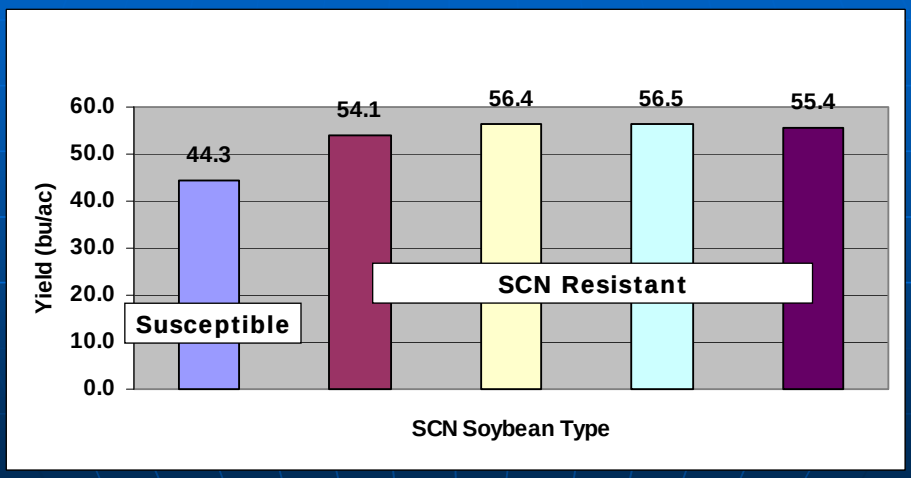


Figure 4 - SCN Demo 2009 Leamington



Next Steps:

This multi-year international project will continue in 2011 and is part of international partnership with the north-central U.S. The information generated from this project is being merged with the US data to help generate a consistent management strategy for SCN. SCN population and HG Type results for 2010 were not complete at this time but updates on the influence of soybean genetics on SCN populations and HG type will be presented later.

The aim is to minimize and educate not only soybean producers but the soybean industry and advisors about this very destructive soybean disease. Participation allows access to research, resources, communication materials, etc which would otherwise be cost prohibitive if done alone. By coordinating efforts this will help deliver a consistent message on SCN and its management across Northern soybean production areas.

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U.S. Investigators/institutions involved in this project: *Loren Giesler co-project leader (University of Nebraska), Carl Bradley co-project leader (University of Illinois), Anne Dorrance (The Ohio State University), Terry Niblack (USDA/ARS/University of Illinois), Greg Tylka (Iowa State University), Doug Jardine (Kansas State University), Dean Malvick (University of Minnesota), Laura Sweets (University of Missouri), Sam Markell (North Dakota State University), Lawrence Osborne (South Dakota State University), Paul Esker (University of Wisconsin), George Bird (Michigan State University).*

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Location of Final Report:

The final report can be located on the Grain Farmers of Ontario website as well as copies of the outreach materials generated through this project at the North Central Soybean Research Project website “Plant Health Initiative” at www.planthealth.info.