Soybean Seedling Disease Management

(Interim Report)

Purpose:

Producing high soybean yields begins with establishing an even stand of vigorous plants. Producers have often overplanted to compensate for stand losses due to poor seed quality, seedling diseases, adverse environmental conditions or other problems which reduce stand establishment, plant health, emergence and vigor. Unfortunately, there is much we do not know about these factors and as the price of seed continues to rise, seedling diseases increase the cost of production.

In 2012, OMAFRA along with the GFO who obtained funding from Agricultural and Agri-Food Canada's (AAFC) Canadian Agricultural Adaptation Program (CAAP) which is administered by the Agricultural Adaption Council (AAC) has allowed us to participate with US researchers in two projects funded by (1) the USDA (AFRI Program) and (2) US grower check-off (United Soybean Board and North Central Soybean Program).

The research objectives of this international research project are:

1. Identify fungi responsible for causing seedling blights of soybean
2. Develop high throughput diagnostic tools for identification of fungal seedling pathogens
3. Characterize the biology of seedling pathogens and develop assays for Inoculation
4. Identify the impact of environmental conditions on seedling pathogens and disease development.

Methods and Results:

An important aspect of this project was to foster communication and cooperation between the various researchers in the participating states and Ontario. This collaboration allowed for greater efficiency and communication since many of these researchers have been working on various aspects of this research for several years. This project is the first effort to coordinate the activities of the group. In nine states, the survey and collection of fungal pathogens is 75% complete while in Ontario we have collected 40-50% of our committed isolates since the US started in 2011. These isolates came from a wide range of environments, soils and cropping histories and much of that data has been recorded.

In Ontario 120 isolates comprising of Phytophthora, Pythium, Rhizoctonia, Fusarium, Macrophomina (charcoal rot) were collected from soybean seedlings and pure cultures produced for each.

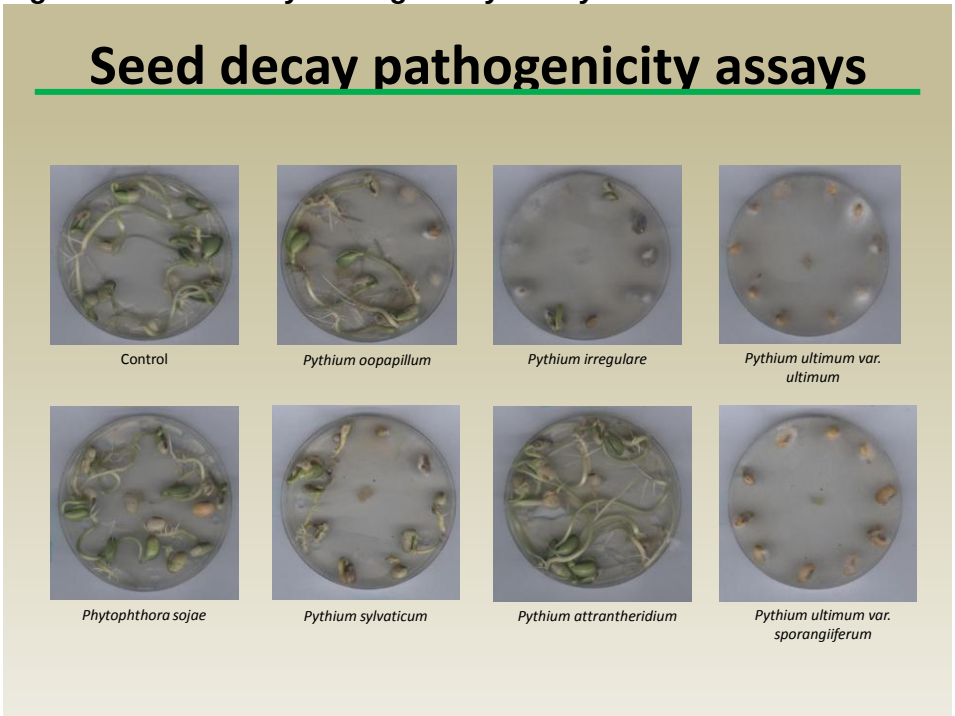
These 2012 isolates have been provided to the US collection and will assist in determining the regional distribution and species/pathotype make-up in the northern soybean producing regions of North America. This information will be useful beyond the practical disease management aspect but will provide much needed guidance to both public and private breeding programs to maximize soybean variety disease resistance development.

Furthermore, these collections allow us to study various aspects of the biology of disease development and determine differences in ability to cause disease as shown below on seed and seedlings.

Table 1: Number of Collections per Pathogen in Ontario

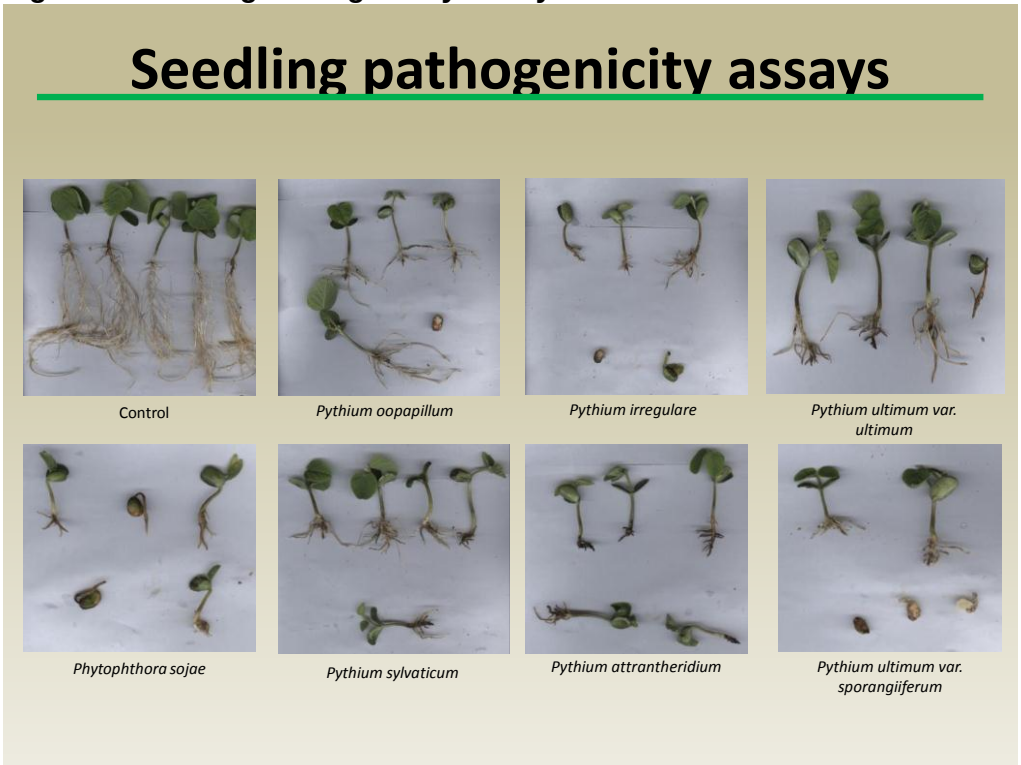
Fungal Pathogens Isolated From Soybean Seedlings	Number Of Isolates Per Pathogen
Phytophthora sojae	51
Pythium spp.	11
Fusarium spp.	31
Rhizoctonia spp.	11
Macrophomina	7
Diaporthe	3
Unknowns	6

Figure 1: Seed Decay Pathogenicity Assays A



Summary:
Next to soybean cyst nematode, seedling disease complex are the number two yield limiting diseases in Ontario soybean production and is composed on primarily the oomycetes (Pythium spp. and Phytophthora sojae) and fungi (Fusarium and Rhizoctonia) pathogens. While a few individual species of these pathogens have been studied, very little is known about the complexes these pathogens form or how these complexes cause diseases. Understanding which specific pathogens make up the seedling disease complex, and the factors that enhance the damage they cause will increase our understanding of seedling diseases and help develop better management strategies.

Figure 2: Seedling Pathogenicity Assays B



Next Steps:

2012 was the first year for Ontario to participate in these international projects and will continue to participate in 2013 with further field and laboratory studies.

Acknowledgements:

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Project Contacts:

Albert Tenuta, OMAFRA, albert.tenuta@ontario.ca
Tom Welacky, AAFC, welactyt@agr.gc.ga