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Asian Soybean Rust Sentinel Plots

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Abstract
Asian soybean rust (SBR) caused by *Phakopsora pachyrhizi* was discovered for the first time in the continental United States in November 2004. It was known that under the right conditions, this pathogen could spread rapidly and cause severe yield losses. There are no resistant soybean varieties available, and management requires proper timing of fungicide treatments. In addition to the impact of the disease itself, there are concerns that producers would be tempted to treat their fields unnecessarily before the fungus was present in their area, making their treatments ineffective and increasing the costs of production.

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Introduction

Asian soybean rust (SBR) caused by *Phakopsora pachyrhizi* was discovered for the first time in the continental United States in November 2004. It was known that under the right conditions, this pathogen could spread rapidly and cause severe yield losses. There are no resistant soybean varieties available, and management requires proper timing of fungicide treatments. In addition to the impact of the disease itself, there are concerns that producers would be tempted to treat their fields unnecessarily before the fungus was present in their area, making their treatments ineffective and increasing the costs of production.

For Iowa producers, management of this disease requires knowledge of fungicides, which in the past have rarely been used in soybean production. Just as important, producers need to know when the fungus is present in Iowa so they can time their fungicide treatment(s) to protect their fields. To monitor the advance of SBR, the North Central Soybean Research Project, the United Soybean Board, and the USDA funded the establishment of 30 sentinel plots across Iowa and other states.

Materials and Methods

Plots were a minimum of 50 ft × 50 ft. It is known that rust infections are more often found on soybeans that have entered the reproductive growth stage. Therefore, the plots were planted earlier than usual and with varieties with a slightly shorter growing season than is typical for the given area. That meant that if the usual maturity group was 2.5, cooperators would sow a 2.0 MG. Most research farms plots were planted in the first two weeks of April. All plots were sown by May 4, except the Andrew Jackson Farm, which was planted on May 10. Plots at Fruitland, Kanawha, and Ames were covered to be protected from a frost the first week of May. Because of this late frost, additional plots were planted at Newell, Chariton, Fruitland, Kanawha, and Crawfordsville after that date. The first sentinel plot began to flower on June 7, and by June 27 all plots were at the reproductive growth stage.

Aside from the slightly shorter maturity group, farm superintendents were free to choose any variety because all soybean varieties available in the United States are susceptible to *P. pachyrhizi*. Cooperators chose Roundup Ready varieties. In May, researchers reported glyphosate could inhibit rust development in wheat and could also deter rust development in soybeans.

We asked superintendents not to use glyphosate on the sentinel plots. This change made weed control difficult because no one had used a preplant herbicide. In addition, we were concerned that many herbicides would burn the soybean foliage and complicate scouting for rust pustules. We recommended imazethapyr for broadleaf control, but in places where waterhemp was present, weed control was a challenge. For effective control, farm managers pulled weeds by hand and used second and third herbicide treatments.

Results and Discussion

During the growing season, plant pathologists and field crop specialists carefully scouted the sentinel plots every week. Bacterial blight caused by *Pseudomonas savastanoi* pv. *glycinea*, brown spot caused by *Septoria glycines,* and frogeye leaf spot caused by *Cercospora sojina* were the most common diseases in the Iowa sentinel plots.

SBR was not found in Iowa. Results of this research was reported to the USDA/APHIS and posted on a national web site (http://www.sbrusa.net) that showed in which counties in the United States SBR had been positively identified. This web site was continuously updated so that producers and researchers could monitor the movement of SBR throughout the growing season.

During the growing season, SBR was first found in Florida as early as February. Fortunately, as the season progressed, the disease advanced very slowly. This may have been due to the warmer and drier than usual conditions in the southeastern United States. By November, the disease had progressed as far north as Kentucky and as far west as Texas.

Like every disease, SBR is dependent on a favorable environment. We know that SBR requires cool, moist conditions for infection and spread. We are still learning the exact conditions that favor its spread in North America. The disease remains a threat to soybean production in the United States and certainly in Iowa.

During the winter season, frost eliminates *P. pachyrhizi's* hosts; because the fungus is an obligate parasite, infection and disease begin in areas where frost did not kill its hosts. It will be important to monitor the disease progress and development again in 2006. Sentinel plots will help producers manage this disease effectively and efficiently in 2006 and for the foreseeable future.

The following ISU Research Farms established soybean rust sentinel plots in 2005:

Ag Engineering/Agronomy Research Farm (Curtiss Farm), Ames; Western Research and Demonstration Farm, Castana; McNay Research and Demonstration Farm, Chariton; Southeast Research and Demonstration Farm, Crawfordsville; Muscatine Island Research and Demonstration Farm, Fruitland; Neely-Kinyon Research and Demonstration Farm, Greenfield; Northern Research and Demonstration Farm, Kanawha; Armstrong Research and Demonstration Farm, Lewis; Andrew Jackson Demonstration Farm, Maquoketa; Northeast Research and Demonstration Farm, Nashua Allee Demonstration Farm, Newell; and Northwest Research and Demonstration Farm, Sutherland.

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