

Florida Soybean Rust Sentinel Plots – 2005

J. J. Marois¹, D. L. Wright¹, C. L. Harmon², J. W. Walker³, H. C. Mellinger⁴, P. F. Harmon¹
¹University of Florida, ²Southern Plant Diagnostic Network, ³Florida CAPS, ⁴Glades Crop Care, Inc.

Introduction

In 2005 a series of soybean sentinel plots were established across the soybean producing states to monitor the occurrence and development of soybean rust (*Phakopsora pachyrhizi*) (SBR) in North America. As part of the coordinated project, 26 sentinel plots were established across Florida (Figure 1). The first sentinel plot found positive for soybean rust in the United States in 2005 was in Marion County (central Florida), on June 29. It was also the plot furthest south to become positive. The next plot to become positive was in Escambia County (western Florida) on July 18. Most sentinel plots became positive in August. Ultimately, all of the sentinel plots became positive from Marion County to Escambia County except for Madison County (north-central Florida). In Madison County rust was detected in a nearby commercial field. The 6 plots south of Lake Okeechobee never developed disease. In every positive plot, the disease was first observed on the MG3 plants. In general, it took about 4 weeks after detection before the disease began to reach a logarithmic growth phase. In 2005, Florida experienced a wet spring/early summer but in the middle of August it turned dry, slowing the advance of the epidemic in the sentinel plots.

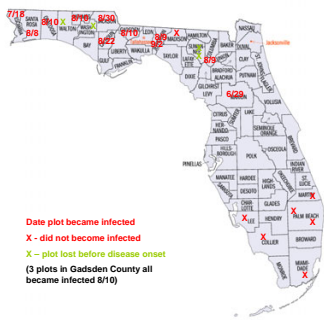


Figure 1. Counties with soybean sentinel plots and date SBR was first found.

Figure 2. Marion County site July 11, 2005, disease first detected June 29, 2005

Materials and Methods

All of the 15 X 15 m sentinel plots in Florida were planted in March with MG3 (DP&L3861), MG5 (DP&L5915), and MG7 (DP&L7870) RoundUp-Ready soybeans. Most of the plots received at least one application of glyphosate. Plots were monitored at least weekly for SBR. After detection, 100 random leaf samples were taken from mid canopy and rated for incidence and severity. The severity index used was 0 = 0%, 1 = 1-2.5%, 2 = 2.5-5%, 3 = 5-10%, 4 = 10-15%, 5 = 15-25%, 6 = 25-35%, 7 = 35-67.5%, 8 = 67.5-100%, using the charts developed by Bayer CropScience. Incidence was from 0 to 100% (0 to 1 in the following graphs).

Results

In all of the positive plots, the MG3 were the first soybeans to have SBR. It then spread to the MG5 and MG7 soybeans. SBR was first detected in a sentinel plot in Marion County Florida on June 29 (Figure 1). The second sentinel site to become infected in Florida, July 18, was in Escambia County. Discrete foci developed for several weeks until a general infection area developed (Figure 2). In Escambia County disease severity assessment began one month after detection. By then most of the leaves were diseased, but severity continued to increase (Figure 3). Disease progress (Figure 3) and frequency analysis over time (Figure 4) indicated that disease increased by one severity index point about every week.

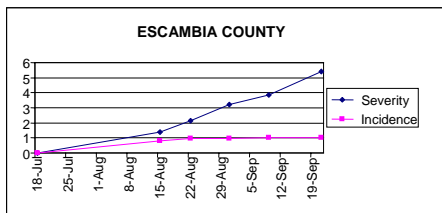


Figure 3. Disease incidence and severity over time in Escambia County sentinel plot

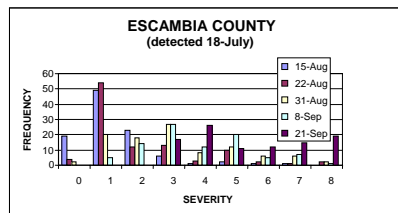


Figure 4. Frequency of severity ratings in 100 random leaves sampled weekly

Results (cont.)

In the Santa Rosa County (just east of Escambia County) sentinel plot, disease was not detected until August 8 and 100 leaf samples were started August 15. There was a rapid increase in disease incidence and severity (Figures 5 and 6) beginning one month after the initial infection was detected.

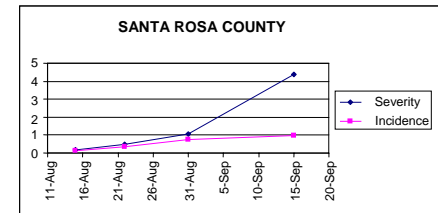


Figure 5. Disease incidence and severity over time in Santa Rosa County Sentinel Plot

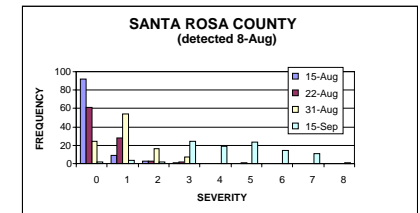


Figure 6. Frequency of severity ratings in 100 random leaves sampled weekly

In the Gadsden County Hill 3 sentinel plot, first detected with rust on August 10, it is apparent that the increase in the severity of the epidemic decreased (Figures 7 and 8) as the weather conditions became dry (Figures 9 and 10) in the plots.

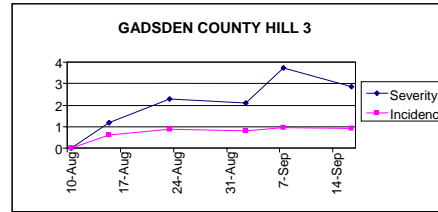


Figure 7. Disease incidence and severity over time in Gadsden County Hill 3 sentinel plot

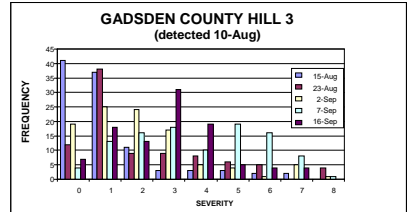


Figure 8. Frequency of severity ratings in 100 random leaves sampled weekly

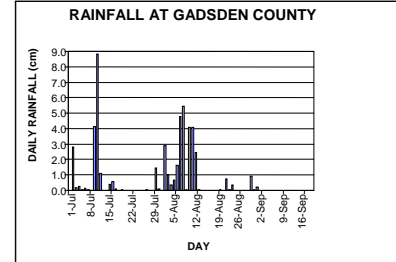


Figure 9. Daily rainfall at Gadsden County

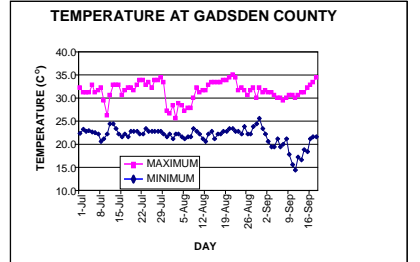


Figure 10. Minimum and maximum daily temperature at Gadsden County

Plots were combined for general analysis, the Marion and Escambia county plots were not used because they developed disease much earlier than the rest of the plots. On average, for the remaining 10 positive plots, disease progressed steadily until about 80% incidence (Figure 11) and a severity value of 3 (5-10%) (Figure 12) before the dry weather stopped the epidemic. By the time the rains began again the plants were mature and undergoing natural/rust induced leaf senescence.

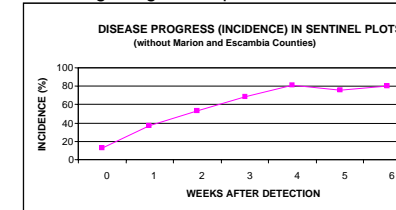


Figure 11. Average increase in disease incidence in 100 leaf sample for 10 plots.

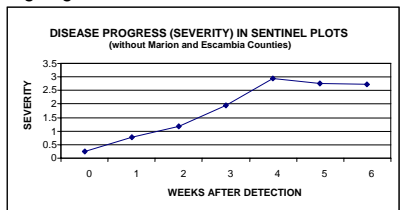


Figure 12. Average increase in disease severity in 100 leaf sample for 10 plots.

Conclusions

The Florida sentinel plot program was very successful in detecting SBR before it was detected in commercial fields. In all positive sentinel plots, the earlier MG3 plants were the first to become infected. Warm weather did not decrease the epidemic progress, but dry weather did. The sentinel plot program shows promise as a means to monitor the annual spread of SBR from south to north Florida and, in association with sentinel plots in more northern states, the annual spread of SBR into the Midwest.

This research was supported by the North Central Soybean Research Program, USDA/APHIS and Florida CAPS.