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Proceedings of the 34th Annual Meeting of the Southern Soybean Disease Workers (February 18-19, 2007, St. Louis, Missouri)

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PROCEEDINGS OF THE SOUTHERN SOYBEAN DISEASE WORKERS

THIRTY – FOURTH ANNUAL MEETING

February 18-19, 2007 St. Louis, MO

PROCEEDINGS OF THE SOUTHERN SOYBEAN DISEASE WORKERS

34th ANNUAL MEETING

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Proceedings of the Southern Soybean Disease Workers are published annually by the Southern Soybean Disease Workers.

34th Annual Meeting of the Southern Soybean Disease Workers
February 18-19, 2007
St. Louis, MO

Joint Meeting with NCERA-137
Sunday February 18, 2007

12:30 –	**Registration**
1:00 – 1:20	**Introductions and Welcome** Dan Poston and Erick DeWolf
1:20 – 1:40	**Stratego 250 EC, Broad Spectrum Disease Control in Soybeans.** J.R. Bloomberg*, R.A. Myers, and R. Kraus.
1:40 – 2:00	**Asian Soybean Rust: Efficacy of Selected Fungicides and Observations on Their Use.** R.W. Schneider*, C.L. Clark, E.P. Mumma, and C.G. Giles.
2:00 – 2:20	**Effects of Light Intensity and Darkness Period on Infection of Soybean Rust in Controlled Conditions.** J. Mo, T. Guo, X. Li, and X.B. Yang.
2:20 – 2:40	**Identification of Maturity Group 3 and 4 Soybean Cultivars and Lines Resistant to *Cercospora sojina* by Field Screening and Molecular Markers.** A. Wrather*, R. Mian, G. Shannon, J. Bond, M. Newman, and W. Wiebold.
2:40 – 3:00	***Phytophthora* Resistance of Soybean Germplasm with High Potential for Asian Soybean Rust Resistance.** D.A. Smith*, T.S. Abney, and A. Westphal.
3:00 – 3:20	**Break**
3:20 – 5:20	**SBR PIPE Workshop - Discussion of new features for the 2007 PIPE that will impact SBR observers and specialists**. S. Isard*****, J. Golod, L. Sconyers and D. Hershman.
5:30 – 7:00	**Social**
7:00 – 8:30	**Dinner**

34th Annual Meeting of the Southern Soybean Disease Workers
February 18-19, 2007
St. Louis, MO

NCERA-137 group will meet concurrently with SSDW
Monday February 19, 2007

6:30 – 7:40	**Breakfast at Hotel**
7:45 – 8:00	**Registration**
	<u>**Graduate Student Presentations**</u>
8:00 – 8:15	**Soybean cultivar disease reaction to inoculation with *Diaporthe phaseolorum* var. *meridionalis*: 2000-2006.** B. Wells* and G. Sciumbato.
8:15 – 8:30	**Molecular Tools to Study the *F. solani* f.sp *glycines*-Soybean Interaction.** S. Mansouri* and A.M. Fakhoury.
8:30 – 8:45	**Inheritance and Genetic Mapping of Resistance to *Pythium* Damping-off caused by *Pythium aphanidermatum* in Soybean Cultivar Archer.** M.L. Rosso*, J.C. Rupe, C.S. Rothrock, and P. Chen.
8:45 – 9:00	**New Hosts to *Phakopsora pachyrhizi* Identified in Quincy, FL.** T.L. Slaminko*.
9:00 – 9:15	**Impact of Fungicide and Defoliation Timing on Disease Control and Soybean Yield.** J.B. Blessitt*, D.H. Poston, G.L. Sciumbato, R.T. Coleman, H.C. Doty, S. Kyei-Boahiem, T.W. Eubank, and B.L. Spinks.
9:15 – 9:30	**Effects of Post-inoculation Night Length and Daytime Light Intensity on Asian Soybean Rust Development.** A.P.S Dias*, X.B. Yang, P.F. Harmon, and C.L. Harmon.
9:30 – 9:50	**Break**
9:50 – 10:10	**Foliar Fungicides: Timing of Application and Cultivar Reactions.** M.A. Newman*, W. Percell, and R. Zawacki.
10:10 – 10:30	**Managing Asian Soybean Rust in Louisiana: The First Year.** G.B. Padgett*, R.W. Schneider, C.A. Hollier, A. Hogan, M.A. Purvis, and C. Robertson.
10:30 – 10:50	**Modeling Light Intensity Patterns to Estimate Soybean Rust Outbreaks: Comparative Analysis in Brazil and South Africa.** A.P.S. Dias, X.B. Yang, and X. Li.
10:50 – 11:10	**Regional Plant Health Trials**. A Grybauskas*.
11:10 – 11:50	**State Reports and Business Meeting** Graduate Student Awards, Election of Officers, 2008 Meeting, etc.
12:00 – 5:00	**Domark Meeting – Lunch provided to attendees (please see accompanying agenda)**

SOUTHERN SOYBEAN DISEASE WORKERS
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SOUTHERN SOYBEAN DISEASE WORKERS 2006 TREASURY REPORT
Operational Account, Planters First Bank, Hawkinsville, GA

Receipt Summary	
Interest on Operational Account	$ 61.34
2006 Meeting Registration Receipts	$ 4,803.00
2006 Soybean Disease Atlas Sales	$ 0.00
Total Receipts	**$ 4,864.34**

Disbursement Summary	
Printing Fees	$ 00
Postage	$ 425.54
2006 Annual Meeting Costs	$ 5,884.21
SSDW Association Awards	$ 1,773.97
Bank Account Fees	$ 0.00
Total Disbursements	**$ 8,083.72**

SSDW Assets – December 31, 2006	
Beginning Balance – 1/01/06	**$ 6,666.79**
Receipts	**$ 4,864.34**
Disbursements	**$ 8,083.72**
Net Assets – 12/31/06	**$ 3,447.41**
Balance of Operational Account	**$ 3,447.41**

Jason P. Bond
Secretary/Treasurer

SOUTHERN UNITED STATES SOYBEAN DISEASE LOSS ESTIMATE FOR 2006

Compiled by Stephen R. Koenning Extension Specialist, Department of Plant Pathology, Campus Box 7616, North Carolina State University, Raleigh, NC 27695-7616

Since 1974, soybean disease loss estimates for the Southern United States have been published in the Southern Soybean Disease Workers Proceedings. Summaries of the results from 1977 (6), 1985 and 1986 (2), 1987 (3), 1988 to 1991 (5), 1992 to 1993 (8), 1994 to 1996 (4) have been published. A summary of the results from 1974 to 1994 for the Southern United States was published (7) in 1995, and soybean losses from disease for the top ten producing countries of 1994 was published in 1997(9). An estimate of soybean losses to disease in the US from 1996-1998 was published in 2001, and a summary of losses from 1999-2002 was published on line in 2003 (10, 11). In 2005 a summary of disease losses for the US from 1996-2004 was published electronically (12), and a summary of losses for 2003-2005 was published in 2006 (13).

The loss estimates for 2006 published here were solicited from: Edward Sikora in Alabama, Clifford Coker in Arkansas, Robert Mulrooney in Delaware, James Marois, David Wright, and Jim Rich in Florida, Bob Kemerait in Georgia, Don Hershman in Kentucky, Boyd Padgett in Louisiana, Arvydas Grybauskas in Maryland, Gabe Sciumbato in Mississippi, Allen Wrather in Missouri, Steve Koenning in North Carolina, John Damicone in Oklahoma, John Mueller in South Carolina, Melvin Newman in Tennessee, Joseph Krausz in Texas, and Patrick Phipps in Virginia. Various methods were used to obtain the disease losses, and most individuals used more than one. The methods used were: field surveys, plant disease diagnostic clinic samples, variety trials, questionnaires to Cooperative Extension staff, research plots, grower demonstrations, private crop consultant reports, foliar fungicide trials, and "pure guess". The production figures for each state were taken from the USDA/NASS web site in mid January of 2007 with the exception of Florida. Because yield per acre is not estimated for production of less than 10,000 acres by NASS, the per acre yield was estimated by taking the average of per acre yield for Alabama and Georgia. Production losses were based on estimates of yield in the absence of disease. The formula was: potential production without disease loss = actual production ÷ 1-percent loss (decimal fraction).

Soybean acreage in the sixteen southern states covered in this report in 2006 was about 400,000 acres more than in 2005 (1). The 2006 average per acre soybean yield decreased from that reported in 2005, because of drought in the extreme south, though production increases in other areas of the south resulted in a weighted average of 36.77 bushels/ acre which was an increase over 2005. In 2006, 618 million bushels were harvested from over 16 million acres in 16 southern states. The 2006 total acres harvested, average yield in bushels per acre, and total production in each state are presented in Table 1. Percentage loss estimates from each state are specific as to causal organism or the common name of the disease (Table 2). The total average percent disease loss for 2006 was 8.98 % or 52.51

million bushels in potential production. In 2006, Tennessee reported the greatest percent loss at 23.6 %, followed by Texas at 15.10 %.

The estimated reduction of soybean yields is specific as to the causal organism or the common name of the disease (Table 3). The estimated reduction in soybean yield due to diseases during 2006 was greatest in Tennessee with 13.26 million bushels. The total reduction in soybean yield due to diseases in the 16 southern states was 52.51 million bushels in 2006 down from 54.77 million bushels reported in 2005; largely due to drought in much of the mid-south.

The highest average estimated percent loss was caused by charcoal rot at 1.56% (9.78 million bushels) followed by soybean cyst nematode at 1.43 % (12.05 million bushels (Tables 2 & 3).

Although Asiatic soybean rust was detected on soybean in 12 southern states in 2005 (Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, Missouri, North Carolina, South Carolina, Texas, and Virginia) yield losses were reported only from Alabama (1%), Georgia (Florida (1%), Georgia (1.5 %), Louisiana (1.0%), North Carolina (0.13%), South Carolina (1.5%) and Texas (0.10%). The estimated loss in potential soybean production from rust was only about 730,000 bushels in 2006.

Diseases continued to cause significant loss in soybean production throughout the 16 southern states that participated in this disease loss estimate in 2006. It is essential that Extension and University research continue their efforts to discover methods to control these diseases and to educate soybean producers concerning the best methods to prevent yield loss due to soybean diseases.

Table 1. Soybean production for 16 southern states in 2006.

State	Acres harvested	Yield/acre (bu)	Total production (bu)
Alabama	150,000	17	25,550,000
Arkansas	3,060,000	36	110,160,000
Delaware	178,000	31	5,518,000
Florida	5,000	20.5	102,500
Georgia	150,000	24	3,600,000
Kentucky	1,360,000	45	61,200,000
Louisana	830,000	32	25,560,000
Maryland	460,000	35	16,100,000
Mississippi	1,640,000	26	42,640,000
Missouri	5,150,000	40	206,000,000
North Carolina	1,350,000	32	43,200,000
Oklahoma	260,000	19	4,940,000
South Carolina	390,000	28	10,920,000
Tennessee	1,130,000	38	42,940,000
Texas	200,000	21	4,200,000
Virginia	500,000	31	15,500,000
Total	16,813,000	476	618,130,500
Average		30	
Wt. Average		36.77	

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12. Wrather, J. A. and Koenning, S. R. 2005. Soybean disease loss estimates for the United States 1996-2004. http://aes.missouri.edu/delta/research/soyloss.stm

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Table 2. Estimated percentage loss of soybean yield due to diseases for 16 southern states during 2006.

Disease	AL	AR	DE	FL	GA	KY	LA	MD	MS	MO	NC	OK	SC	TN	TX
Anthracnose	0.00	0.10	TR	0.00	1.00	0.03	0.50	TR	1.00	0.20	0.10	0.10	0.25	2.00	1.00
Bacterial diseases	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	TR	TR	0.01	0.10	0.10	0.00	0.10
Brown leaf spot	0.00	0.02	TR	0.00	0.50	0.25	0.00	0.10	0.75	0.10	0.10	0.10	0.50	4.00	0.20
Charcoal rot	2.00	2.80	TR	1.00	1.00	0.25	1.00	TR	3.00	1.00	0.10	3.00	0.05	2.50	4.00
Diaporthe/Phomopsis	0.50	0.03	0.50	0.00	0.50	1.50	0.50	0.00	1.30	TR	0.50	0.10	0.10	2.00	0.50
Downy mildew	0.00	0.00	0.00	2.00	0.00	0.01	0.00	TR	TR	0.00	0.20	TR	0.50	0.00	0.10
Frogeye	0.00	0.05	TR	5.00	1.00	0.05	0.00	0.00	0.25	0.30	0.50	0.00	0.25	4.00	2.50
Fusarium wilt and rot	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	TR	0.00	0.50
Other diseases b	0.00	0.00	0.00	0.00	TR	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.10	0.00	0.00
Phytophthora rot	0.00	0.00	0.00	0.00	0.00	0.01	0.50	0.00	TR	0.70	0.25	0.10	TR	0.50	0.10
Pod & stem blight	0.00	0.08	TR	1.00	TR	0.20	1.00	0.10	1.00	0.20	0.40	0.10	0.10	0.50	0.50
Purple seed stain	0.50	0.00	0.00	0.00	TR	0.10	1.50	0.10	2.00	0.00	0.30	0.10	0.15	0.40	2.50
Aerial blight	0.00	0.01	0.00	0.00	0.00	0.00	1.50	0.00	TR	0.00	0.00	0.00	TR	0.00	0.50
Sclerotinia	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10
Seedling diseases	0.00	0.15	TR	1.00	1.00	0.10	0.50	0.00	1.50	0.20	0.01	0.50	0.10	1.00	1.00
Southern blight	0.00	0.00	0.00	0.00	TR	0.01	0.00	0.00	TR	0.00	0.20	0.10	0.25	0.00	0.50
Soybean cyst nematode	0.00	2.00	1.00	0.00	0.00	1.75	0.00	1.50	TR	1.50	4.50	1.50	1.50	4.00	0.00
Root-knot nematode	1.00	1.30	0.50	2.00	3.00	0.00	1.50	0.25	TR	TR	1.00	0.10	2.00	0.10	0.30
Other nematodes c	0.00	0.01	0.00	0.00	1.00	0.00	1.50	0.00	0.00	0.00	0.70	0.00	2.00	0.00	0.20
Stem Canker	0.00	0.05	TR	0.00	0.00	0.10	0.00	0.00	0.20	0.00	TR	0.00	0.00	1.00	0.10
Sudden death syndrome	0.00	0.10	0.00	0.00	0.00	0.05	0.00	0.00	TR	0.30	0.05	0.00	0.00	1.50	0.10
Virus d	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.00	TR	0.00	0.02	TR	1.00	0.10	0.20
Brown stem rot	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Soybean rust	1.00	0.00	0.00	1.00	2.50	0.00	1.00	0.00	0.00	0.00	0.13	0.00	1.50	0.00	0.10
Total disease %	5.00	6.70	2.00	13.00	11.50	4.53	11.00	2.05	11.00	4.50	9.57	5.90	10.45	23.60	15.10

[a] Rounding errors present. TR indicates Trace.
[b] Other diseases listed were: red crown rot caused by *Cylindrocladium parasiticum* in NC, GA, SC, and VA.
[c] Other nematodes listed were: Stubby root, Lesion, Sting and common Lance in VA; Columbia Lance in NC, SC, and Georgia.
[d] Viruses were identified as: SMV in AL, AR, GA, KY, MS, NC, OK and VA; BPMV AR, KY, LA, MS, NC, OK, and VA; TobRSV in AR, NC, and SC; and PMV in NC and VA.

Table 3. Estimated suppression of soybean yield due (bushels in millions) as a result of disease for 16 southern states during 2006.

Disease	AL	AR	DE	FL	GA	KY	LA	MD	MS	MO	NC	OK	SC	TN	TX	VA
Anthracnose	0.00	0.11	0.00	0.00	0.04	0.02	0.14	0.00	0.48	0.43	0.05	0.01	0.03	1.12	0.05	0.08
Bacterial diseases	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.03
Brown leaf spot	0.00	0.02	0.00	0.00	0.02	0.16	0.00	0.02	0.36	0.22	0.05	0.01	0.06	2.25	0.01	0.03
Charcoal rot	0.54	3.31	0.00	0.00	0.04	0.16	0.29	0.00	1.44	2.16	0.05	0.16	0.01	1.41	0.20	0.03
Diaporthe/Phomops	0.13	0.04	0.03	0.00	0.02	0.96	0.14	0.00	0.62	0.00	0.24	0.01	0.01	1.12	0.02	0.00
Downy mildew	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.10	0.00	0.06	0.00	0.00	0.00
Frogeye	0.00	0.06	0.00	0.01	0.04	0.03	0.00	0.00	0.12	0.65	0.24	0.00	0.03	2.25	0.12	0.07
Fusarium wilt and r	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00
Other diseases b	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.24	0.00	0.01	0.00	0.00	0.08
Phytophthora rot	0.00	0.00	0.00	0.00	0.00	0.01	0.14	0.00	0.00	1.51	0.12	0.01	0.00	0.28	0.00	0.00
Pod & stem blight	0.00	0.09	0.00	0.00	0.00	0.13	0.29	0.02	0.48	0.43	0.19	0.01	0.01	0.28	0.02	0.02
Purple seed stain	0.13	0.00	0.00	0.00	0.00	0.06	0.43	0.02	0.96	0.00	0.14	0.01	0.02	0.22	0.12	0.02
Aerial blight	0.00	0.01	0.00	0.00	0.00	0.00	0.43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00
Sclerotinia	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Seedling diseases	0.00	0.18	0.00	0.00	0.04	0.06	0.14	0.00	0.72	0.43	0.00	0.03	0.01	0.56	0.05	0.13
Southern blight	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.10	0.01	0.03	0.00	0.02	0.02
Soybean cyst nema	0.00	2.36	0.06	0.00	0.00	1.12	0.00	0.25	0.00	3.24	2.15	0.08	0.18	2.25	0.00	0.37
Root-knot nematod	0.27	1.53	0.03	0.00	0.12	0.00	0.43	0.04	0.00	0.00	0.48	0.01	0.24	0.06	0.01	0.30
Other nematodes c	0.00	0.01	0.00	0.00	0.04	0.00	0.43	0.00	0.00	0.00	0.33	0.00	0.24	0.00	0.01	0.08
Stem Canker	0.00	0.06	0.00	0.00	0.00	0.06	0.00	0.00	0.10	0.00	0.00	0.00	0.00	0.56	0.00	0.00
Sudden death synd	0.00	0.12	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.65	0.02	0.00	0.00	0.84	0.00	0.00
Virus d	0.00	0.00	0.00	0.00	0.00	0.06	0.00	0.00	0.00	0.00	0.01	0.00	0.12	0.06	0.01	0.02
Brown stem rot	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02
Soybean rust	0.27	0.00	0.00	0.00	0.10	0.00	0.29	0.00	0.00	0.00	0.06	0.00	0.00	0.00	0.00	0.00
Total loss	1.34	7.91	0.11	0.02	0.47	2.90	3.16	0.34	5.27	9.71	4.57	0.31	1.07	13.26	0.75	1.31

[a] Rounding errors present. TR indicates Trace.
[b] Other diseases listed were: ozone in NC, red crown rot caused by *Cylindrocladium parasiticum* in NC, GA, SC, and VA; and green bean syndrome in AR.
[c] Other nematodes listed were: Stubby root, Lesion, Sting and common Lance in VA; Columbia Lance in NC,SC, and Georgia; Lance and Stubby root in LA;
[d] Viruses were identified as: SMV in AL, AR, GA, KY, MS, NC, MO, and VA; BPMV AR, KY, LA, MS, NC, and VA; TobRSV in AR, NC, and SC; and PMV in NC and VA.

STRATEGO 250 EC, BROAD-SPECTRUM DISEASE CONTROL IN SOYBEANS.
J.R. Bloomberg, R.A. Myers, and R. Kraus. Bayer CropScience, Research Triangle Park, NC.

Stratego from Bayer CropScience is a premix fungicide consisting of trifloxystrobin & propiconazole. The product is registered and utilized on a number of important crops in the USA including rice, cereals, corn, peanut and pecans. In 2005, Stratego was approved by EPA for a Sec. 18 Quarantine Emergency Exemption registration for the control of Asian soybean rust. Stratego has been successfully utilized by growers for the preventative control of the disease during the 2005-06 growing seasons in those areas where soybean rust has been a problem. Stratego has also been broadly evaluated in internal Bayer CropScience and University replicated and non-replicated soybean field trials for control foliar soybean disease, plant health and yield benefits. Results of these multi-year trials indicate Stratego is effective for control of Alternaria leaf spot, anthracnose, Asian soybean rust, brown spot, Cercospora blight, frogeye leafspot, pod and stem blight, powdery mildew and Rhizoctonia aerial blight when applied at the R1 to R6 soybean growth stage and/or prior to disease development. In addition, plant health and yield benefits have been documented following application of Stratego. Stratego is expected to receive Federal Sec. 3 soybean registration prior to the 2007 growing season.

ASIAN SOYBEAN RUST: EFFICACY OF SELECTED FUNGICIDES AND OBSERVATIONS ON THEIR USE. R. W. Schneider, C. L. Clark, E. P. Mumma and C. G. Giles. Department of Plant Pathology and Crop Physiology, Louisiana State University Agricultural Center, Baton Rouge, LA 70803.

A large field experiment was conducted in 2006 to evaluate efficacy of most Section 18 and Section 3 fungicides for control of Asian soybean rust (ASR). Numerous treatments included different rates and times of application as well as different combinations. Fortuitously, because of our drought, the experiment was replanted in late June with a maturity group VI variety (Asgrow 6202) on 30-inch centers. The R3/R4 and R6 sprays (about 18 gal/A) were applied August 31 and September 25, respectively. Nozzles were spaced at 15 inches with one directly above the row and the next one between rows. The field was scouted frequently for symptoms, and ASR was first detected on September 19. Plots were evaluated quantitatively for disease incidence and severity on October 3 when about 10% of the pods were mature. It is important to note that symptoms were first observed during early R6, and that within a 14-day span, disease severity exploded from less than 5% to more than 80% with 100% incidence. Severe defoliation began within 3 weeks of first infection.

Several observations were made that may be of interest to producers and researchers:

- The dogma from observations in other countries has been that yield will be little affected if disease commences at the R6 stage of reproductive growth. This was not the case in this trial. Yields in the better treatments were about 55 bu/A, and the nontreated controls averaged about 40 bu/A.
- Almost all of the triazoles provided excellent season-long control when they were applied at R3. This was well before first symptoms appeared, and we speculate that this application was made before initial infection or possibly during the latent stage of infection. These same materials, even at higher rates, were considerably less effective following the R6 application. None of the tested fungicides were effective at stopping infection when applied at R6.
- ASR developed in spite of our very dry and hot weather conditions.
- The dramatic explosive nature of the disease suggests that leaves were uniformly cryptically infected, and that symptom expression was triggered either by an environmental queue or by a change in host physiology associated with reproductive development.

The lesson to be learned from our experience is that it will be virtually impossible to detect 5% incidence in commercial fields, and that fungicides will have to be applied as preventatives when disease threatens. Once ASR is observed in the field, fungicidal efficacy will be greatly compromised.

EFFECTS OF LIGHT INTENSITY AND DARKNESS PERIOD ON INFECTION OF SOYBEAN RUST IN CONTROLLED CONDITIONS. Jianyou Mo[1], Tangxun Guo[1], Xu Li[2], and X.B. Yang[2]. [1]Institute of Plant Protection, Guangxi Agricultural Academy, Nanning, China and [2]Iowa State University, Ames, Iowa.

Field observations showed levels of soybean rust (caused by *Phakopsora pachyrhizi*) were significant higher in shaded areas than in open ground, which suggests possible effects of light on the occurrence of soybean rust. To demonstrate the effects of light on infection of the disease, cultured leaf inoculation method was used. Detached soybean leaves were cultured in media to regenerate roots and then inoculated with spore suspension followed by different light treatments for incubation (21C with free moisture). Treatments differed in lengths of darkness immediately after inoculation or in light intensity immediately after inoculation. Number of lesions per leaflet was counted. The preliminary results are: 1) a period of darkness was required for infection even under low light intensity; 2) treatment of 8 hr darkness immediately after inoculation had the highest number of lesions; 3) alternative light intensity 1 week after inoculation increased the number of infection. Results of our preliminary study suggest a significant effect of light on infection process.

IDENTIFICATION OF MATURITY GROUP 3 AND 4 SOYBEAN CULTIVARS AND LINES RESISTANT TO C*ERCOSPORA SOJINA* BY FIELD SCREENING AND MOLECULAR MARKERS. Allen Wrather, Rouf Mian, Grover Shannon, Jason Bond, Melvin Newman, and Bill Wiebold.

Frogeye leaf spot (FLS) of soybean, caused by C*ercospora sojina* K. Hara, has been a problem in the south US for many years, and some resistant cultivars have been developed. This disease has not been a severe problem in the north US until recently. Unfortunately, few soybean cultivars adapted to the north US have resistance to FLS. The objectives of this project were, 1) to identify maturity group 3 and 4 soybean cultivars and lines (genotypes) with resistance to FLS by field screening at multiple locations and over years, and 2) to determine if the genotypes with field resistance had the Rcs_3 gene for resistance to *C. sojina*. Approximately 520 different genotypes were evaluated in field trials for resistance to *C. sojina* during each of three years. Thirteen maturity group 3 and 30 maturity group 4 genotypes had no FLS symptoms in field trials. These were subsequently tested for the presence of Rcs_3 gene using three SNP markers located within 2 cM of the gene. None of the maturity group 3 soybeans tested had the Rcs_3 haplotype of cultivar Davis, the source of the gene. Four of the maturity group 4 genotypes had the Rcs_3 haplotype including LN 97-15076, 14 had the haplotype of the universal susceptible cultivar Blackhawk, and the results from 12 genotypes were questionable. The genotypes with Rcs_3 haplotype will be screened against a core set of *C. sojina* isolates to confirm the results of marker assisted selection. The soybean genotypes confirmed to have the Rcs_3 gene could be useful in breeding soybean cultivars with broad resistance to FLS and adapted to the north US.

PHYTOPHTHORA RESISTANCE OF SOYBEAN GERMPLASM WITH HIGH POTENTIAL FOR ASIAN SOYBEAN RUST RESISTANCE. D. A. Smith, T. S. Abney, and A. Westphal. Department of Botany & Plant Pathology, Purdue University and U.S. Department of Agriculture, ARS, W. Lafayette, IN.

Multiple disease resistance is an important component of production agriculture. Major challenges include resistance to Phytophthora root rot caused by evolving *Phytophthora sojae* races and the recently introduced invasive Asian soybean rust (ASBR) caused by *Phakopsora pachyrhizi*. The diseases caused by these two pathogens pose a major threat to soybean production and profitability for U.S. soybean growers. This report includes data on *P. sojae* resistance in soybean lines evaluated for Asian soybean rust at the University of Georgia in 2005 and 2006 by R. Boerma et. al. (http://edge.cropsoil.uga.edu/soylab/rustresistance.html). These *Phytophthora* resistance data are directly applicable to breeding programs focused on maintaining resistance as it impacts sustainability. Seed of the soybean lines included in the University of Georgia rust resistance studies were obtained from the USDA Soybean Germplasm Collection (R.L. Nelson, Urbana, IL). *Phytophthora* resistance of soybean seedlings was identified in greenhouse studies following hypocotyl inoculations with selected *P. sojae* race isolates. Initial assessments of *Phytophthora* resistance identified 22 of the 46 soybean lines as having *Phytophthora* resistance based on inoculations with an Indiana isolate of *P. sojae* race-1 (*Rps*7 virulence). Soybean lines identified with Phytophthora resistance include: PI 230970*, PI 398288, PI 398399, PI 416834*, PI 417089B*, PI 437658*, PI 470227B*, PI 476905A*, PI 506965, PI 567024*, PI 567027A*, PI 567046A, PI 567058D*, PI 567085B*, PI 567129*, PI 567139B*, PI 567141*, PI 567145C, PI 605781A, PI 605830A, PI 606440A, and PI 616498. Thirteen of these lines identified with an asterisk (*) are among the 30 soybean lines identified by R. Boerma et. al. as having a field rating of less than 3.0 for ASBR in 2006. Additional information for *Phytophthora* resistance was also determined with Indiana isolates of race-7 (*Rps*1-a, 2, 3-a, 3c, 5, 6, and 7 virulence), race-25 (*Rps*1-a, 1-b, 1-c, 1-k, and 7 virulence), and race-17 (*Rps* 1-b, 1-d, 3-a, 3-b, 3-c, 4, 5, 6, and 7 virulence as previously described plus virulence to *Rps* 8 and 2). This additional information will be discussed and can be used by breeders and pathologists working with the soybean germplasm to more precisely identify *Rps* gene(s) that are involved in conferring resistance.

SBR PIPE WORKSHOP - DISCUSSION OF NEW FEATURES FOR THE 2007 PIPE THAT WILL IMPACT SBR OBSERVERS AND SPECIALISTS. Scott Isard[1], Julie Golod[1], Layla Sconyers[2], Loren Giesler[3], and Don Hershman[4]. Departments of Plant Pathology - [1]Penn State University; [2]University of Georgia, [3]University of Nebraska and [4]University of Kentucky.

Discussion of new features for the 2007 PIPE that will impact SBR observers and specialists. Topics will include: 1) Overview of web-site changes for 2007, 2) The 2007 SBR sentinel plot and mobile scouting protocol, 3) Extension materials for 2007, 4) Presentation of the 2007 PDA SBR observation software, and 5) an open discussion. The organizers are offering a breakfast from 6:30-7:40 on Monday 19 February for those who attend the workshop.

SOYBEAN CULTIVAR DISEASE REACTION TO INOCULATION WITH *DIAPORTHE PHASEOLORUM* VAR. *MERIDIONALIS*: 2000-2006. Bonnie C. Wells and Gabriel L. Sciumbato. Mississippi State University, Delta Research and Extension Center, Stoneville, MS, 38776.

In recent years, southern stem canker, caused by *Diaporthe phaseolorum* var. *meridionalis*, has become one of the most dramatic and destructive soybean diseases in the Mid-South. Stem canker, which can increase from negligible amounts in one year to epidemic levels the next, has cost soybean producers an average loss of seven million bushels annually since 2000, ranging from the lowest loss of 2.5 million bushels in 2000 to the highest loss of 15 million bushels in 2004. Infection takes place during the early vegetative stages, and cool, rainy weather promotes infection. Foliar fungicides applied during the early vegetative stages can effectively decrease disease severity; however, control cannot be achieved on highly susceptible cultivars. Therefore, the planting of resistant cultivars is the first line of defense for controlling the disease in production systems.

Entries in the Mississippi Soybean Variety Trials were annually evaluated for their resistance to stem canker at the Delta Research and Extension Center in Stoneville, MS, from 2000-2006. Soybean cultivars representing maturity groups III-V were planted at a rate of 10 seed per row ft in a randomized complete block design with four replications. Plots were one row wide, 13.3 in. spacing, and 20 ft long. The first 12 plants of each plot were inoculated prior to R1 with *D. phaseolorum* var. *meridionalis* by inserting infested toothpicks in the upper 1/3 region of the stem. Disease resistance was rated based on a 1-5 scale where 1 represents resistance and 5 represents the most advanced disease symptoms.

Results indicate that the later-maturing cultivars are more susceptible to stem canker. Because these cultivars take longer to mature, they are in the field longer allowing the slow growing pathogen ample time for disease progression. Results also indicate that the percentage of susceptible cultivars within each maturity group has increased slightly since 2000. Results follow weather patterns in the Delta with the most susceptibility occurring when rainfall was highest during infection. The increasing trend of susceptibility may be a result of the implementation of the early soybean planting system (ESPS), where later-maturing cultivars are planted earlier during the rainiest and most disease favorable part of the season. Selecting cultivars with a high level of resistance to stem canker may prevent serious economic loss for southern soybean producers adopting the ESPS.

MOLECULAR TOOLS TO STUDY THE *F. SOLANI* F.SP *GLYCINES*-SOYBEAN INTERACTION. Saara Mansouri and Ahmad M. Fakhoury. Department of Plant, Soil and Agricultural Systems, Southern Illinois University, Carbondale, IL-USA.

F. solani f. sp. *glycines* (FSG), is a soil born pathogen that causes Sudden Death Syndrome (SDS) in soybean. Soybean growers incur losses of up to 100 million dollars per year because of SDS. Since the use of resistant soybean varieties is still the most effective way to combat the disease, the need to develop new molecular tools to study the interaction between the fungus and the plant is required. To reach this goal, we have developed a protoplast based fungal transformation system for FSG. One of the applications of the transformation system was the production of a Green Fluorescent Protein (GFP)-expressing fungal mutant. The GFP-expressing fungus can be used to study the fungal infection process including fungal penetration, colonization, and spread, especially at the early stages of disease development. We have also developed a library of GFP expressing FSG strains with tagged mutations. One of these fungal strains lost its ability to infect soybean. In summary, we have developed novel molecular tools to study the interaction between *F. virguliforme* and soybean. The use of these tools will allow us to explore different aspects of the biology of the fungus and its interaction with soybean.

INHERITANCE AND GENETIC MAPPING OF RESISTANCE TO *PYTHIUM* DAMPING-OFF CAUSED BY *PYTHIUM APHANIDERMATUM* IN SOYBEAN CULTIVAR ARCHER. M.L. ROSSO[1], J.C. Rupe[1], C.S. Rothrock[1], P. Chen[2]. [1]Department of Plant Pathology, University of Arkansas, Fayetteville, AR. [2]Department of Crop, Soil and Environmental Science, University of Arkansas, Fayetteville, AR.

Pythium damping-off and root rot can cause poor stand and consequently lower yield in soybean [*Glycine max* (L.) Merr.] across all soybean-producing regions of the world. This disease is caused by at least seven species of *Pythium: Pythium ultimum, P. aphanidermatum, P. debaryanum, P. irregulare, P. myriotylum, P. torulosum* and *P. vexans* (Kirkpatrick *et al.*, 2006a; Yang, 1999). *Pythium* damping-off and root rot is generally controlled with fungicide seed treatments, but recently the cultivar Archer was reported to be more resistant to seedling diseases caused by *Pythium* spp. than Hutcheson (Kirkpatrick *et al*., 2006b). The resistance of Archer to *Pythium* appeared to be associated with the *Rps*1k gene that confers resistance to *Phytophthora sojae* (Bates *et al*., 2004; Rosso *et al*., 2005). However, the genetics of resistance to *Pythium* spp. was not known. The objective of this research was to characterize the inheritance of *Pythium* damping-off resistance in Archer. Crosses were made between the resistant cultivar Archer with the susceptible cultivar Hutcheson and $F_{2:4}$ lines were generated. The parents and $F_{2:4}$ lines were screened in a growth chamber at 28 °C with *P. aphanidermatum* using a hypocotyl inoculation technique. Five days after inoculation, plant survival was scored. There were 21 resistant, 48 intermediate and 17 susceptible lines. These results fit the (1:2:1) model for a single dominant gene in Archer that confers resistance to damping-off caused by *P. aphanidermatum*. To identify the genomic location of the *Pythium* resistant gene, the $F_{2:4}$ plants were screened with SSR markers from all the soybean major linkage groups (MLG). Of the 88 markers screened, only Satt 510 and Satt 114 from MLG F were polymorphic between the parents and resistant and susceptible bulks. The *Pythium* resistant gene is located on the MLG F, 10.6 cM from Satt510 and 26.6 cM from the Satt114 marker. The new resistant gene is tentatively named *Rpa*1 and is not linked to *Rps*1k, which is located on the MLG N. The MLG F of the soybean genome contains clusters of numerous other resistant gene loci as well as pathogen and pest resistance QTLs. The identification of SSR markers linked to this new resistant gene could make possible the incorporation of the *Pythium* resistant gene into breeding lines and commercial cultivars through marker assisted selection.

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NEW HOSTS TO *PHAKOPSORA PACHYRHIZI* IDENTIFIED IN QUINCY, FL. T.L. Slaminko, Department of Crop Sciences, University of Illinois, Urbana, IL.

Phakopsora pachyrhizi Syd. & P. Syd., the causal agent of soybean rust, was introduced to the continental U.S. in November 2004 and was observed in 15 states in 2006 (6). *P. pachyrhizi* is known to occur on approximately 90 species of legumes. In the U.S., it has only been shown to infect soybean, *Glycine max* (L.) Merr. (4); kudzu, *Pueraria lobata* (Willd.) Ohwi (1); Florida beggarweed, *Desmodium tortuosum* (Sw) DC. (5); dry bean, *Phaseolus vulgaris* L.; lima bean, *P. lunatus* L.; and scarlet runner bean, *P. coccineus* L. (2). With the introduction of soybean rust to the U.S., the potential host range of the fungus expanded to include previously unexposed native legumes. This study aims at identifying native legume hosts, which may impact the distribution and spread of *P. pachyrhizi* in important soybean regions of the U.S.

Ninety-nine species within 30 genera of legumes, the majority of which are either native or naturalized to soybean growing areas of the U.S., were tested in Quincy, FL at the North Florida Research and Education Center (NFREC) for their field infection potential and susceptibility to local isolates of *P. pachyrhizi*. Between one and three accessions of each species, a total of 160 accessions, were planted in a greenhouse in Illinois and transplanted four weeks later to the field in Florida. The plants were not inoculated. Severity and sporulation were rated on a 1 to 5 scale (3) nine weeks after being transplanted in the field. Sixty new host species within 20 genera were observed to have lesions similar to those of soybean rust. Of these, 26 were observed to have uredinia similar to those of *P. pachyrhizi*. Ten of the 20 genera have not been previously reported. Five of the new sporulating host species have been confirmed with PCR USDA/APHIS/PPQ/NIS Laboratory in Beltsville, MD.

Newly identified alternative hosts in the U.S. could be epidemiologically important, aiding in the overwintering of the pathogen and providing a source of primary inoculum to soybean. This study gives an indication of the field infection potential and general susceptibility of the tested host species, but a wide variety of environmental conditions exist in their habitats that will affect disease incidence and severity. In the future, scouting new hosts will provide a better estimation of their infection and disease potential and lead to more accurate predictions of their epidemiological impact.

1. P.F. Harmon et al. *Plant Health Progress*. 2. T.N Lynch et al. *Plant Disease* 90:970. 3. M.R. Miles et al. *Plant Health Progress*. 4. R.W. Schneider et al. *Plant Disease* 89:774. 5. L.E. Sconyers et al. *Plant Disease* 90 (972). 6. USDA. http://www.sbrusa.net/.

IMPACT OF FUNGICIDE AND DEFOLIATION TIMING ON SOYBEAN YIELD.
J.B. Blessitt[1], D.H. Poston[1], G.L. Sciumbato[1], R.T. Coleman[1], H.C. Doty[1], T.W. Eubank[1], S. Kyei-Boahen[1], W.F. Moore[2], B.L. Spinks[2]. [1]Mississippi State University, Delta Research and Extension Center, Stoneville, MS 38776, [2]Mississippi State University, Plant and Soil Science Department, Mississippi State, MS 39762.

Field studies were conducted to: 1) determine the impact of fungicide application timing on disease control and soybean yield and 2) assess the impact of varying degrees of lower canopy defoliation on yield of determinate and indeterminate soybean. A randomized complete block experimental design with four replications and a factorial treatment arrangement was used for all studies.

Fungicide Application Timing: Delta and Pineland 4933 soybean was planted mid-April on Sharkey clay. Fungicide treatments were 6 oz/a Headline, 4 oz/a Folicur, and 4.7 oz/a Headline + 3.1 oz/a Folicur. Application timings were single applications at R1, R3, and R5 and sequential applications at R1 followed by (fb) R3, R3 fb R5, and R1 fb R3 fb R5. Disease pressure was minimal during most of the growing season with most ratable levels occurring late in the growing season. However, Headline-based treatments applied at R3 still resulted in 6 to 9 bu/a yield responses compared to the nontreated control. Sequential applications of Headline or Headline + Folicur did not increase yields more than a single application at R3. Three applications of Folicur alone were needed to produce yield responses similar to a single application of Headline at R3. Injury from Folicur was more noticeable with R5 applications.

Defoliation of Indeterminate Soybean: The indeterminate variety Asgrow AG4403 was planted in mid-April on Sharkey clay. Defoliation timings were R1, R3, and R5. At each growth stage soybeans were defoliated 0, 30%, or 60% by manually removing lower canopy foliage to simulate varying degrees of defoliation by soybean rust. Plots were 40 feet long and consisted of 4 rows spaced 40 inches apart. Yield was reduced 6, 17, and 9% when defoliation events occurred at R1, R3, and R5 growth stages respectively. Yield was reduced 12 and 20% by 30 and 60% defoliation respectively.

Defoliation of Indeterminate and Determinate Soybean: The indeterminate variety Delta King DK4967 and the determinate variety Delta King DK5161 were planted mid-April on Sharkey clay. Approximately half (50%) of the lower foliage was manually removed at various timings. Defoliation timings were R1, R3 and R5 timings. Plots were 20 feet long and consisted of 4 rows spaced 18 inches apart. Defoliation at R1 resulted in 12 and 18% yield loss for DK 4967 and DK 5161, respectively. Yield of both indeterminate and determinate varieties were reduced 24% when defoliation occurred at R3. Defoliation at R5 reduced yield 18 and 9% for DK 4967 and DK5161, respectively. Based on these findings, preventative sprays for soybean rust prior to R3 may be more beneficial for determinate varieties that have already acquired most of their foliage when flowering begins compared to indeterminate varieties that acquire a considerable amount of foliage subsequent to R1. In contrast, determinate varieties that have higher overall leaf area indices may be better able to tolerate rust infestations that occur during pod fill or towards the latter part of the growing season. Measures taken to reduce plant stress caused by soybean rust or other factors at the R3 growth stage are likely to result in considerable yield protection.

EFFECTS OF POST-INOCULATION NIGHT LENGTH AND DAYTIME LIGHT INTENSITY ON ASIAN SOYBEAN RUST ESTABLISHMENT. A. P. S. DIAS[1], P. F. Harmon[2], C. L. Harmon[2], and X.B. Yang[1]. [1]Iowa State University, Ames, IA and [2]University of Florida, Gainesville, FL.

Previous studies and field observations have suggested that occurrence of Asian soybean rust (ASR) may be sensitive to light. Initial detections of disease are almost always made in low-light environments such as lower canopy leaves in a field or under shade trees. In tropical regions, severe rust outbreaks are observed following continuous cloudy days. In temperate regions, the disease becomes prevalent in short-day seasons (early fall and late spring). Longer night periods and daytime shading may be necessary for disease outbreaks. To determine the effects of night length after inoculation and daytime light intensity on ASR, studies were carried out at the University of Florida (Gainesville, FL/2006). One-month-old soybeans were inoculated at three different times during the night to simulate 9, 6 or 4 hours night length periods for infection. The plants were covered with shade cloth in different mesh sizes to obtain 4 light intensity levels (LIL): 100% (L1), 70% (L2), 50% (L3) and 20% (L4) of natural sunlight for 12 days until evaluation. There was no effect of night length on ASR infection. Shaded treatments (L2, L3 and L4) had incidence and severity higher than that in full sunlight (L1). These results suggest that ASR infections initiated anytime during the night may require complementary daytime shading to complete initial disease process for establishment.

FOLIAR FUNGICIDES: TIMING OF APPLICATION AND CULTIVAR REACTIONS. M. A. Newman, W. Percell, and R. Zawacki. Department of Entomology and Plant Pathology, West Tennessee Research and Education Center, Jackson, TN 38305

In 2005 and 2006, two trials were conducted on AG 4603 and AG4703, respectively, at the Research and Education Center at Milan (RECM). These trials were planted in an RCB design with four replications of each treatment. Five fungicides were sprayed at only growth stage R3 and compared with the same treatments made at both the R3 and R5 growth stages. Included in the trials was an untreated check. All treatments applied twice produced numerically lower Frogeye leaf spot (FLS) ratings, higher yields, and delayed defoliation compared with the same products sprayed only once, except for Stratego in 2006, when one application produced 7.5 Bu/A more than the same treatment applied twice.

All treatments produced significantly lower FLS ratings than the check. In 2006, only Quadris had a significantly lower FLS rating for two applications compared with one application of the same product. FLS ratings were significantly lower in 2005 with two applications of Quadris, Headline, Headline SBR, and Stratego compared with only one application of the same product.

Defoliation was delayed significantly over the check by six treatments in 2006 and by seven treatments in 2005. Defoliation ratings for two applications compared with only one application were not significantly different in 2006 but were significant for two treatments in 2005.

Yield differences were not significant for any treatments in 2006. However, in 2005, all treatments had significantly higher yields than the check. None of the treatments applied twice produced significantly higher yields than the treatments applied only once.

Frogeye leaf spot ratings were taken at RECM for three years (2004-2006) on selected soybean varieties from the state variety trials. These tests were planted in an RCB design with three replications for each variety. About 80 varieties were tested in each of the maturity groups III, IV early, IV late, and V early. All maturity groups (MG) had at least 7% of the varieties with no FLS symptoms and at least 23% of the varieties with severe symptoms. The MG V early varieties had the highest percentage with no symptoms, but they also had the highest percentage with severe symptoms. The MG IV early varieties had the highest percentage in the combined low and none rating categories. These data show the importance of variety selection when growing soybean in a field with a history of FLS.

MANAGING ASIAN SOYBEAN RUST IN LOUISIANA: THE FIRST YEAR. G.B. Padgett[1], R. Schneider[2], C.A. Hollier[2], A. Hogan[3], M.A. Purvis[1], and C. Robertson[2]. [1]Northeast Research Station Macon Ridge Branch, LSU AgCenter, [2]Department of Plant Pathology and Crop Physiology, LSU AgCenter, [3]Jefferson Davis Parish Extension, LSU AgCenter.

The first official report of Asian soybean rust (ASR) in the United States was on soybean grown in East Baton Rouge Parish, Louisiana on November 10, 2004. Since that time, researchers across the United States have initiated research to address this threat and provide producers with effective disease management strategies. While diseases are not uncommon in Louisiana, the recent report of ASR has spawned concern among producers. To provide up-to-minute information on the movement and distribution of ASR a soybean sentinel plot network was established in soybean producing regions in the United States. During the 2005 and 2006 growing seasons, Louisiana was an active participant in this nationwide program. Twenty-one and 19 sentinel plots were located in Louisiana in 2005 and 2006, respectively. In addition to soybean sentinel plots, select areas infested with kudzu were also monitored. This program proved to be very effective. In 2006, ASR was first reported on kudzu in June and in July in soybean sentinel plots. Plans are to continue this nationwide effort in 2007.

Knowledge on the performance of the newer triazole fungicides on ASR and other diseases in Louisiana soybean is limited. Therefore, LSU AgCenter scientists have initiated research to address this concern. Tests were conducted during 2006 on research stations and in producer fields located near Baton Rouge, Jennings, and St. Joseph, Louisiana. Epidemics of ASR, Cercospora leaf blight, and/or aerial blight developed in most test areas. Treatments and application timings varied across locations. Fungicides were applied once or twice during the R1 to R5 reproductive stages using commercial or experimental spray equipment. Disease incidence and severity were quantified periodically during the growing season. When possible, test plots were harvested to assess the impact of disease on soybean yield and quality. In general, triazole fungicides were effective for preventing the development of ASR, but varied in efficacy against other diseases (Cercospora blight and aerial blight). Strobilurin fungicides were effective for limiting ASR, as well as, aerial blight and Cercospora leaf blight. At some locations, yields were 3 to 15 bu/A more in soybeans treated with some fungicides than in non-treated soybeans. More research is needed to determine the utility of the newer fungicides in Louisiana soybeans.

MODELING LIGHT INTENSITY PATTERNS TO ESTIMATE SOYBEAN RUST OUTBREAKS: COMPARATIVE ANALYSIS IN BRAZIL AND SOUTH AFRICA. A. P. S. DIAS, X. Li, and X.B. Yang. Iowa State University, Ames, IA.

Our other studies suggest that Asian soybean rust (ASR) requires daytime shading for successful infection and establishment. ASR outbreaks in Brazil occurred in seasons with large number of cloudy rain days. However, slower disease development was observed in regions with similar rainfall and fewer cloudy days. Those patterns suggest that by adding shading effects from clouds, predictions of ASR epidemics may be improved. This study was to simulate ASR progress using cloudiness patterns in Brazil and South Africa. Daily disease increments were calculated assuming fixed initial inoculum and variable rates as function of cloudiness. In sunny days, disease rates were reduced to 5% of in cloudy days (days with >8 hours of overcast sky). Final disease estimates were compared to field observations. Our simulations were consistent with field reports (Pearson's correlation: $r>0.9$). The unusual epidemic years were successfully predicted by the modified model in both countries. In general, severe ASR outbreaks occurred when at least 15 days of lengthy-cloudiness were observed in two-month periods in a growing season. Non-epidemic years were associated with less than 10 cloudy days.