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Proceedings of the 33rd Annual Meeting, Southern Soybean Disease Workers (March 8-9, 2006, Jackson, Tennessee)

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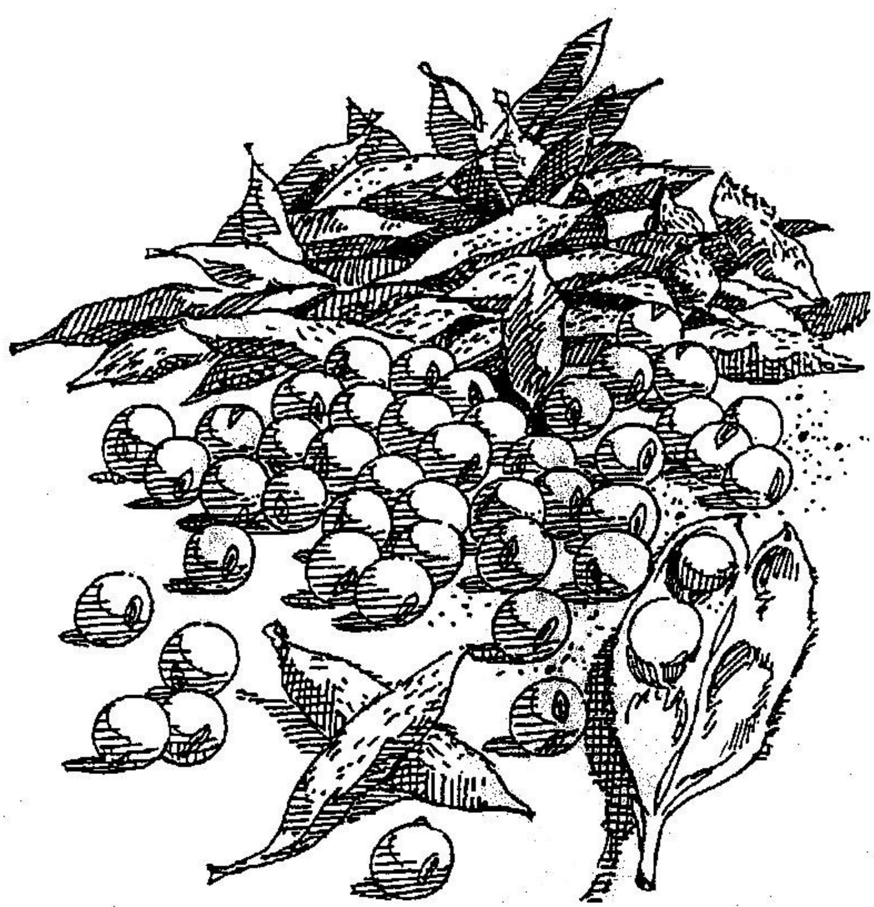
PROCEEDINGS OF THE SOUTHERN SOYBEAN DISEASE WORKERS



THIRTY-THIRD ANNUAL MEETING

March 8–9, 2006 | Jackson, Tennessee

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PROCEEDINGS OF THE SOUTHERN SOYBEAN DISEASE WORKERS

33RD ANNUAL MEETING

March 8 - 9, 2006

Jackson, Tennessee

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5+P

33rd Annual Meeting of the Southern Soybean Disease Workers
March 8-9, 2006
Jackson, Tennessee

March 8, 2006

12:30 –	Registration
1:00 – 1:15	Introductions M. Schmidt, M. Newman, and Dr. B. Hayes
1:15 – 1:45	Virulence in *Phytophthora Sojae* Isolates to Soybeans with Rps8 Resistance D.A. Smith, T.S. Abney, and J.G. Shannon
1:45 – 2:15	New sources of Resistance to SCN in Soybean P.R. Arelli
2:15 – 2:30	*Break*
2:30 – 3:00	Soybean Disease Management in Louisiana B. Padgett, M.A. Purvis, and B.W. Garber
3:00 – 3:30	Efficacy and Profitability of Foliar Fungicides in the Absence of Soybean Rust M. Newman and W. Percell
3:30 – 4:00	Overview of Soybean Rust Monitoring in the US J.C. Rupe
4:00 – 5:30	Tour of WTREC/USDA Facilities
5:30 – 5:45	Leave for Hotel
6:00	Reception followed by Dinner

33rd Annual Meeting of the Southern Soybean Disease Workers

March 9, 2006

6:30 – 7:40	Breakfast at Hotel
7:45 – 8:00	Transfer to WTREC (~ 5-10 min drive)
8:15 – 8:30	Yield Enhancement of Probable Asian Soybean Rust Control Fungicides J.B. Blessitt, D.H. Poston, G.L. Sciumbato, C.H. Koger, and N. Buehring
8:30 – 8:45	Occurrence of Disease and Insect Pests in Select Sorghum and Soybean Rotations in Mississippi - S.T. Pichardo, R.E. Baird, and H.N. Pitre
8:45 – 9:00	A Preliminary Evaluation of Spore Trapping Technology for *Phakopsora pachyrhizi* E. P. Mumma, E.P. Mumma, R.W. Schneider, C.L. Robertson, C.G. Giles, J.J. Marois, and D.L. Wright
9:00 – 9:15	Influence of Host Genotype and Soybean Cyst Nematode on Charcoal Rot of Soybean T.M. Dorton, J.P. Bond, M.E. Schmidt, C.M. Vick, and A.K Gregor
9:15 – 9:30	Comparison of Disease Assessments of Soybean Genotypes in the Presence of Charcoal Rot - A. Mengistu, R.L. Paris, J.R. Smith and J.D. Ray
9:30 – 10:00	Break
10:00 – 10:15	Twenty Years of Soybean Variety Testing for SDS C. Schmidt, J. Klein, M. Schmidt and J. Bond
10:15 – 10:30	SCN-Resistant Soybeans Offer a False Sense of Security to Producers R. Heinz, L.E. Sweets, and M.G. Mitchum
10:30 – 10:45	Roundup Ready and Conventional Soybeans with Broad Resistance to SCN HG Types J.G. Shannon, J.A. Wrather, D.A. Sleper, H.T. Nguyen and S.C. Anand
10:45 – 11:00	A Review of Reniform Nematode Resistance on Soybean B. Robbins
11:00 – 11:15	Effect of Seed Treatments on Soybean Stand and Yield in Arkansas, 2005 J.C. Rupe, C.S. Rothrock, T.L. Kirkpatrick, M.L. Rosso, and A.J. Steger
11:15 – 11:30	Inheritance of Resistance to Phomopsis Seed Decay in Soybean PI 360841 S.E. Smith, P. Fenn, P.K. Miller, and P. Chen
11:30 – 12:00	State Reports
12:00 – 1:00	Lunch provided at WTREC - Business Meeting **Business Meeting (Treasury Report/Election of Officers/2007 Meeting)**
1:00 – 4:00	Optional Tour

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SOUTHERN SOYBEAN DISEASE WORKERS 2005 TREASURY REPORT
Operational [redacted] Planters First Bank, Hawkinsville, GA

Receipt Summary	
Interest on Operational Account	$ 64.44
2005 Meeting Registration Receipts	$ 19,002.76
2005 Soybean Disease Atlas Sales	$ 0.00
Total Receipts	**$19,067.20**

Disbursement Summary	
Printing Fees	$ 337.00
Postage	$ 280.26
2005 Annual Meeting Costs	$ 14,414.25
SSDW Association Awards	$ 96.14
Bank Account Fees	$ 0.00
Total Disbursements	**$ 15,127.65**

SSDW Assets – December 31, 2005	
Beginning Balance – 1/01/05	**$ 2,724.13**
Receipts	**$19,067.20**
Disbursements	**$15,127.65**
Net Assets – 12/31/05	**$ 6,663.68**
Balance of Operational Account	**$ 6,663.68**

[redacted]

Jason P. Bond
Secretary/Treasurer

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SOUTHERN UNITED STATES SOYBEAN DISEASE LOSS ESTIMATE FOR 2005

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).

The loss estimates for 2005 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 2006. 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 2005 was about 700,000 acres less than in 2004 (1). The 2005 average per acre soybean yield decreased from that reported in 2004. In 2005, 576.3 bushels were harvested from over 16 million acres in 16 southern states. The overall average for the 16 reporting states was 31.5 bushels/acre in 2005, while the overall average reported in 2004 was 34.3 bushels/acre. The Average yield (weighted by production) in 2005 was 34.5 bushels/acre (Table 1). The 2005 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 2005 was 10.65 % or 54.77 million bushels in potential production. In 2005, Tennessee reported the greatest percent loss at 25.8 %, followed by Florida at 17.0 %.

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 2005 was greatest in Tennessee with 14.53 million bushels. The total reduction in soybean yield due to diseases in the 16 southern states was 54.77 million bushels in 2005 down from 87.23 million bushels reported in 2004; largely due to lower production as a result of drought and decreased acreage in most states.

The highest average estimated percent loss was caused by soybean cyst nematode at 1.53% (11.41 million bushels) followed by frogeye leaf spot at 1.24 % (5.57 million bushels (Tables 2 & 3). Although the average percent loss for charcoal rot was only 1.05%, this translated into an estimated loss in production of 8.39 million bushels.

Although Asiatic soybean rust was detected in 9 states in 2005 (Alabama, Florida, Georgia, Louisiana, Mississippi, North Carolina, and South Carolina on soybean, and Texas and Kentucky on kudzu) yield losses were reported only from Florida (1%), Georgia (7%), and South Carolina (1.5%). The estimated loss in potential soybean production from rust was only about 52,000 bushels in 2005.

Diseases continued to cause significant loss in soybean production throughout the 16 southern states that participated in this disease loss estimate in 2005. 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 2005.

State	Acres harvested	Yield/acre (bu)	Total production (bu)
Alabama	145,000	33	4,785,000
Arkansas	3,000,000	34	102,000,000
Delaware	182,000	26	4,732,000
Florida	8,000	32	256,000
Georgia	175,000	26	4,550,000
Kentucky	1,250,000	43	53,750,000
Louisiana	850,000	34	28,900,000
Maryland	470,000	34	15,980,000
Mississippi	1,590,000	37	58,830,000
Missouri	4,960,000	37	183,520,000
North Carolina	1,460000	27	39,420,000
Oklahoma	305,000	26	7,930,000
South Carolina	420,000	21	8,610,000
Tennessee	1,130,000	38	41,800,000
Texas	230,000	26	5,980,000
Virginia	510,000	30	15,300,000
Total	16,685,000	Avg.=31.5/Wt.Avg.=34.5	576,343,000

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Table 2. Estimated percentage loss of soybean yield due to diseases for 16 southern states during 2005.[a]

Disease	AL	AR	DE	FL	GA	KY	LA	MD	MS	MO	NC	OK	SC	TN	TX	VA	Avg.
Anthracnose	0.00	0.04	0.50	0.00	TR	0.02	0.50	0.00	2.00	0.10	0.10	0.10	0.50	3.00	1.50	1.00	0.59
Bacterial diseases	0.50	0.00	0.00	0.00	TR	0.01	0.00	0.00	TR	TR	0.01	TR	0.10	0.00	0.10	0.20	0.06
Brown leaf spot	0.00	0.01	TR	0.00	TR	0.15	0.00	0.00	1.50	TR	0.10	1.00	0.25	3.00	0.20	0.50	0.42
Charcoal rot	0.00	2.50	TR	1.00	0.00	2.00	1.00	TR	1.00	1.00	0.05	3.00	0.25	2.00	3.00	TR	1.05
Diaporthe/Phomopsis	4.00	0.03	1.00	0.00	1.00	1.50	0.50	0.00	1.50	TR	0.50	TR	0.25	2.00	1.00	0.00	0.83
Downy mildew	0.00	0.00	0.00	5.00	0.50	0.01	0.00	TR	TR	0.00	0.40	TR	0.75	0.00	0.10	TR	0.42
Frogeye	2.00	0.01	TR	5.00	1.00	0.05	0.00	TR	1.00	0.50	1.00	0.00	0.75	5.00	2.00	1.50	1.24
Fusarium wilt and rot	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	TR	0.00	0.20	0.00	0.01
Other diseases[b]	2.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.25	0.00	0.00	0.80	0.24
Phytophthora rot	0.00	0.00	0.00	0.00	0.00	0.01	0.50	0.00	TR	0.50	0.55	0.10	TR	0.00	0.00	0.00	0.10
Pod & stem blight	0.00	0.06	0.00	1.00	0.00	0.30	1.00	0.10	1.00	0.10	0.40	0.10	0.25	0.10	0.50	0.50	0.34
Purple seed stain	2.00	0.00	0.00	0.00	0.00	0.10	2.00	0.50	2.00	0.00	0.50	0.50	0.10	0.50	2.00	0.50	0.67
Aerial blight	0.50	0.00	0.00	0.00	0.00	0.00	1.00	0.00	TR	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.13
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	0.20	0.00	0.01
Seedling diseases	1.00	0.05	0.00	1.00	1.00	0.20	0.00	0.00	1.50	0.10	0.05	0.75	0.10	2.00	0.50	0.50	0.55
Southern blight	0.00	0.00	0.00	0.00	0.25	0.01	0.00	0.00	TR	0.00	0.20	0.10	0.50	0.00	0.20	0.20	0.09
Soybean cyst nematode	0.00	1.90	3.00	0.00	TR	1.50	0.00	2.00	TR	1.50	5.00	1.50	2.00	4.00	0.00	2.00	1.53
Root-knot nematode	1.00	1.20	1.00	2.00	3.00	0.00	1.00	0.50	TR	TR	1.20	0.10	3.00	0.10	0.30	1.50	0.99
Other nematodes[c]	0.00	0.01	TR	1.00	0.50	0.00	1.00	0.00	0.00	0.00	0.60	0.00	2.00	0.00	0.00	0.40	0.34
Stem Canker	0.00	0.08	0.00	0.00	0.00	0.05	0.00	0.00	0.50	0.00	TR	TR	0.00	2.00	0.10	0.10	0.18
Sudden death syndrome	0.00	0.15	TR	0.00	0.00	0.10	0.00	TR	TR	0.10	0.00	0.00	0.00	2.00	0.10	TR	0.15
Virus[d]	0.00	0.00	0.00	0.00	0.00	0.20	0.00	0.00	TR	TR	0.20	TR	1.00	0.10	0.20	TR	0.11
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	0.30	0.02
Soybean rust	0.00	0.00	0.00	1.00	7.00	0.00	0.00	0.00	0.00	0.00	TR	0.00	1.50	0.00	0.00	0.00	0.59
Total disease %	13.00	6.04	5.50	17.00	14.50	6.23	8.50	3.10	12.00	3.90	11.36	7.25	13.55	25.80	12.70	10.00	10.65

[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; target spot caused by *Corynospora cassicola* in Al, NC; cercospora blight caused by *Cercospora kikuchii* in AL, NC, VA.

[c] Other nematodes listed were: Stubby root, Lesion, Sting and common Lance in VA; Columbia lance in NC,SC, and Georgia; sting in DE, and reniform in AL, AR, FL,NC, and SC.

[d] Viruses were identified as: SMV in AR, KY, MS, NC, OK, SC, and VA; BPMV in AR, KY, MS, NC, OK, and VA; TobRSV in AR, NC, and SC; and PMV in NC and VA.

Table 3. Estimated suppression of soybean yield (bushels in millions) as a result of disease for 16 southern states during 2005.[a]

Disease	AL	AR	DE	FL	GA	KY	LA	MD	MS	MO	NC	OK	SC	TN	TX	VA	Total
Anthracnose	0.00	0.04	0.03	0.00	0.00	0.01	0.16	0.00	1.34	0.19	0.04	0.01	0.05	1.69	0.10	0.17	3.83
Bacterial diseases	0.03	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.03	0.09
Brown leaf spot	0.00	0.01	0.00	0.00	0.00	0.09	0.00	0.00	1.00	0.00	0.04	0.09	0.02	1.69	0.01	0.09	3.04
Charcoal rot	0.00	2.71	0.00	0.00	0.00	1.15	0.32	0.00	0.67	1.91	0.02	0.26	0.02	1.13	0.20	0.00	8.39
Diaporthe/Phomopsis	0.22	0.03	0.05	0.00	0.05	0.86	0.16	0.00	1.00	0.00	0.22	0.00	0.02	1.13	0.07	0.00	3.82
Downy mildew	0.00	0.00	0.00	0.02	0.03	0.01	0.00	0.00	0.00	0.00	0.18	0.00	0.07	0.00	0.01	0.00	0.31
Frogeye	0.11	0.01	0.00	0.02	0.05	0.03	0.00	0.00	0.67	0.95	0.45	0.00	0.07	2.82	0.14	0.26	5.57
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	0.00	0.00	0.01	0.00	0.03
Other diseases[b]	0.11	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.22	0.00	0.02	0.00	0.00	0.14	0.51
Phytophthora rot	0.00	0.00	0.00	0.00	0.00	0.01	0.16	0.00	0.00	0.95	0.24	0.01	0.00	0.00	0.00	0.00	1.37
Pod & stem blight	0.00	0.06	0.00	0.00	0.00	0.17	0.32	0.02	0.67	0.19	0.18	0.01	0.02	0.06	0.03	0.09	1.81
Purple seed stain	0.11	0.00	0.00	0.00	0.00	0.06	0.63	0.08	1.34	0.00	0.22	0.04	0.01	0.28	0.14	0.09	3.00
Aerial blight	0.03	0.00	0.00	0.00	0.00	0.00	0.32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.38
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	0.01	0.00	0.01
Seedling diseases	0.06	0.05	0.00	0.00	0.05	0.11	0.00	0.00	1.00	0.19	0.02	0.06	0.01	1.13	0.03	0.09	2.82
Southern blight	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.09	0.01	0.05	0.00	0.01	0.03	0.22
Soybean cyst nematode	0.00	2.06	0.15	0.00	0.00	0.86	0.00	0.33	0.00	2.86	2.23	0.13	0.20	2.25	0.00	0.34	11.41
Root-knot nematode	0.06	1.30	0.05	0.01	0.16	0.00	0.32	0.08	0.00	0.00	0.53	0.01	0.30	0.06	0.02	0.26	3.14
Other nematodes[c]	0.00	0.01	0.00	0.00	0.03	0.00	0.32	0.00	0.00	0.00	0.31	0.00	0.20	0.00	0.00	0.07	0.93
Stem Canker	0.00	0.08	0.00	0.00	0.00	0.03	0.00	0.00	0.33	0.00	0.00	0.00	0.00	1.13	0.01	0.02	1.59
Sudden death syndrome	0.00	0.16	0.00	0.00	0.00	0.06	0.00	0.00	0.00	0.19	0.00	0.00	0.00	1.13	0.01	0.00	1.54
Virus[d]	0.00	0.00	0.00	0.00	0.00	0.11	0.00	0.00	0.00	0.00	0.09	0.00	0.10	0.06	0.01	0.00	0.37
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	0.05	0.05
Soybean rust	0.00	0.00	0.00	0.00	0.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.00	0.00	0.00	0.52
Total loss	0.72	6.56	0.28	0.05	0.76	3.57	2.68	0.51	8.02	7.45	5.10	0.62	1.35	14.53	0.86	1.70	54.77

[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; target spot caused by *Corynospora cassicola* in Al, NC; cercospora blight caused by *Cercospora kikuchii* in AL, NC, VA.

[c] Other nematodes listed were: Stubby root, Lesion, Sting and common Lance in VA; Columbia lance in NC,SC, and Georgia; sting in DE, and reniform in AL, AR, FL,NC, and SC.

[d] Viruses were identified as: SMV in AR, KY, MS, NC, OK, SC, and VA; BPMV in AR, KY, MS, NC, OK, and VA; TobRSV in AR, NC, and SC; and PMV in NC and VA.

VIRULENCE IN PHYTOPHTHORA SOJAE ISOLATES TO SOYBEANS WITH RPS8 RESISTANCE

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Phytophthora root rot, caused by *Phytophthora sojae*, is a serious yield-limiting disease in most soybean production regions of the U.S. Major emphasis for the control of this disease has been directed toward the use of *Rps*1-c, *Rps*1-k, and/or *Rps*3- resistance genes until the recent identification of *Rps*8. It was initially suggested that *Rps*8 provided resistance to all *P. sojae* races, but ongoing research in the north central soybean production region of the U.S. evaluating *P. sojae* isolates suggests that more specific information documenting *Rps*8 virulence is needed. This information is needed to assess the potential threat of *P. sojae* to soybean production and to facilitate management of the disease. Soil was collected from soybean fields with a history of Phytophthora root rot in central Indiana and southeast Missouri in 2005. Isolates of *P. sojae* were obtained from the soil samples using a soybean seedling bioassay. Race determinations were based on differential virulence following hypocotyl inoculation of soybeans with different *Rps* genes. Additional isolates of *P. sojae* maintained by Abney from IN, KY, MO, and MS were also selected and re-evaluated for virulence on the differential cultivars including *Rps*8. The predominant race among the isolates of *P. sojae* evaluated (was race 1, but there were distinct differences in prevalence of races from the southern compared to the northern locations. Races 1, 2, 13, 15, 17, 24, and 26 were commonly found among the isolates from the southern locations; whereas, races 1, 3, 4, 7, 13, 25, and 28 were common to central and northern Indiana. At least one isolate of races identified as1, 3, 7, and 25 based on the standard set of *Rps*-differentials was virulent on *Rps*8; and, more alarming is the awareness that almost all isolates designated as race 15, 17, 24, or 26 were highly virulent on soybeans with the *Rps*8 gene. Thus, more isolates must be evaluated to expand our knowledge of the effectiveness of *Rps*8 in management of *P. sojae* in the northern and southern soybean production regions. The data reported in this study continue to document the necessity of using multiple genes to effectively manage *P. sojae*.

∘ Undertaken

S = susceptible or plant killed

R = Resistance or plant not killed

(*) Data for Rps8 gene

(*) More resistant CV. are needed to face this pathogen.

NEW SOURCES OF RESISTANCE TO SOYBEAN CYST NEMATODE IN SOYBEAN

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In the United States, soybean cyst nematode (SCN) (*Heterodera glycines* Ichinohe) caused more estimated total yield loss in soybean [*Glycine max* (L.) Merr.] from 1999 to 2002 than any other disease. These losses have remained stable with the use of resistant cultivars and cultural practices. Current resistant cultivars trace their resistance primarily to Peking and/or PI 88788. Nematodes can quickly adapt to resistant cultivars. Using cluster analyses, we have identified unique sources of SCN resistance in soybean. These include PI 89772, PI 438489B, PI 567516C, PI 437655, PI 507354 and PI 567286. We have evaluated over 1000 *soja* accessions and identified resistance types including PI 468916. These are characterized for resistance to develop broad based germplasm for durable resistance to SCN.

Dr. Prakash Arelli

SCN — Most important pathogen in the USA from 1999 - 2002

Yield losses in the South - - -

(*) Resistant cultivars impose selection pressure favoring more virulent SCN populations.

(*) Likewise:

SOYBEAN DISEASE MANAGEMENT IN LOUISIANA

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In Louisiana, diseases can reduce soybean yield and quality each year. In 2005 diseases reduced soybean yield an estimated 10 percent. The hot, humid climate in Louisiana is conducive for the development of aerial blight, Cercospora foliar blight, purple seed stain, frogeye leaf spot, pod and stem blight, and anthracnose. Except for aerial blight, these diseases occur statewide and are present almost every year. To offset potential losses, these diseases are primarily managed using genetic resistance and chemical fungicides. However, even with management tools, the recent increase in the incidence and severity of Cercospora foliar blight (purple seed stain) and frogeye leaf spot has caused growing concern among Louisiana soybean producers. Cercospora foliar blight is considered a significant problem in Louisiana and genetic resistance and current fungicide programs provide only limited control. Therefore, research programs have focused on developing effective management programs for this disease.

In an effort to identify disease resistant, agronomically acceptable soybean varieties, disease reactions are quantified on entries in the LSU AgCenter official variety trials (OVT). These trials are conducted on several research stations located throughout the state. These trials have enabled producers to incorporate genetic resistance into their programs. Unfortunately, genetic resistance may not always be available or resistance may be specific to some diseases and not others. Therefore, fungicides are needed to supplement genetic resistance. LSU AgCenter scientists have evaluated the impact of fungicides and application timing on disease progress and grain yield and quality. Fungicides are usually applied once at R3 (pod initiation) to R5 (seed initiation). In northeast Louisiana, benefits can be realized from fungicide applications in some years. In summaries from 21 tests conducted from 2001 to 2005, R3 applications of Quadris 2.08F (azoxystrobin) at 6.2 fl oz/A resulted in an average 3.4 bushel increase over the non-treated in 62.5% of the tests. An average 3.6 bushel increase over the non-treated was realized when applications were made at R5 in 76.0% of the tests. When Quadris 2.08F was applied sequentially at R3 and R5, an average 4.4 bushel increase was observed in 93.0% of the tests. These applications also resulted in less disease relative to the non-treated, and R5 applications resulted in less pod diseases compared to R3 applications. Other fungicides evaluated have produced similar results.

It is apparent that genetic resistance and fungicides can be used to manage soybean diseases in Louisiana. However, this research must be continued with the introduction of new varieties and fungicides. Finally, since fungicide applications do not always result in an economical benefit, more research is needed to identify when these applications are needed.

Melvin A Newman

EFFICACY AND PROFITABILITY OF FOLIAR FUNGICIDES IN ABSENCE OF SOYBEAN RUST

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It is estimated that foliar diseases of soybeans reduced yields in Tennessee by an average of 12.5 % for the last four years. Frogeye leaf spot (FLS) is responsible for at least half of that loss or about 6.7 %. In 2003 FLS reduced yields across the state by 8 %. This is the most loss from that disease since records have been kept starting in 1973. Other diseases, such as anthracnose and brown spot, can cause significant yield loss as well. Frequent rainfall during the flowering and pod fill stages is necessary for high yields but can also increase the possibility of more foliar disease.

In addition, farming practices that allow old soybean residue to remain on top of the soil may increase availability of disease-causing organisms. This, along with failure of producers to rotate their soybean crops, can significantly increase foliar disease pressure. In a test using twenty-two soybean varieties where each variety had a foliar fungicide-treated plot (Headline SBR @ 7.8 oz/A) with an untreated plot (side-by-side), yields were increased by an average of 10.6 bu/A. The test area at the Milan Research and Education Center (MREC) has a history of foliar diseases and received frequent irrigation during dry periods. In contrast, the same varieties were planted at another location near the Jackson airport with only 1.6 bu/A increase in the treated plots when compared to the untreated plots. The airport location had been in a corn/soybean/cotton rotation for many years and received no irrigation. In 2004, this location was planted in corn, so there was very little soybean disease pressure.

Under heavy FLS pressure at the MREC, forty varieties were tested for FLS susceptibility and response to one application of Headline SBR @ 7.8 oz/A at the reproductive (R3) growth stage. Each variety was split (side-by-side) with 2 rows sprayed and 2 rows with no foliar fungicide treatment. Twelve maturity group (MG) III varieties averaged 6.0 bu/A increase over the untreated. The twelve early MG IV varieties averaged an increase of 13.7 bu/A over the untreated, and the sixteen late MG IV varieties had an average increase of 11.8 bu/A. FLS ratings were also significantly reduced with the foliar fungicide application.

In another foliar fungicide test at the MREC location using Asgrow 4603 as a susceptible variety, several fungicides were used to spray some plots once at the R3 growth stage, and other plots were sprayed twice at the R3 and R5 growth stages. All fungicide treatments reduced FLS ratings and increased yields. Using local retail prices, all fungicides produced profits ranging from $9.94 to $61.01 per acre for the single application. A second application did not increase profit significantly for any of the fungicides except for Headline @ 6.0 oz/A at R3 & R5, which increased profit by $30.21 per acre over only one application.

Soybean producers in Tennessee have generally been successful in producing increased yields from the use of one application of a foliar fungicide. Where foliar diseases have built up along with adequate rainfall events, foliar fungicides have significantly increased profits in most years. Managing soybean diseases with foliar fungicides, crop rotation, resistant varieties, adequate moisture and a desirable fertility program can result in significantly higher yields and profits.

FUNGICIDE AND INSECTICIDE COMBINATIONS FOR ENHANCING SOYBEAN HEALTH AND YIELD

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The strobilurin fungicides Quadris and Headline were evaluated in three field trials conducted in 2004 and 2005 with and without pyrethroid insecticides for soybean disease control and plant health benefits. One site each in 2004 and 2005 was irrigated. A single application was made both years at the R3 stage of growth. Several parameters were evaluated including yield, maturity, disease occurrence, seed quality, and many agronomic components such as number of pods per plant, seeds per pound, and seeds per pod.

In 2004, significant yield increases of 4.0 and 3.3 bu/A were noted for Headline 6.0 fl. oz/A and Quadris 6.2 fl oz/A respectively. There was no response with Quadris plus Warrior above Quadris alone or any response to Headline plus Mustang Max above Headline alone. Headline treatments delayed maturity the most as indicated by % mature pods or number of green stems six days before harvest. Quadris also produced a "greening effect" but not as pronounced as Headline. All the fungicide treatments significantly reduced stem diseases mostly anthracnose and Phomopsis. Foliar disease incidence was very low and no discernable differences were evident. Headline significantly reduced purple seed stain infected seed. Headline plus Mustang Max significantly reduced overall seed infection compared to the untreated control. None of the treatments significantly affected fiber, oil, or protein content of the seed.

In 2005, yields from non-irrigated soybeans treated with fungicide (5.9 bu/A increase) and fungicide plus insecticide (4.5 bu/A increase) were significantly greater than the control. At the irrigated site, the yield of Headline treated soybeans was not significantly greater than the control. Also at this site, the yield of Headline plus Mustang Max treated soybeans provided the greatest yield increase (6.5 bu/A). Fungicide treatments delayed maturity at both locations but not as great as in 2004. Stem and pod disease ratings for fungicide treated plots also were lower than the controls. At the dryland location, Headline and Headline + Mustang Max treatments significantly increased seed oil content but did not affect protein or fiber content. At the irrigated site, protein content was significantly reduced and oil and fiber significantly increased with Quadris + Warrior and Headline + Mustang Max although the changes were very small.

In 2004, significant differences were noted for seed weight, number of seed/lb, and seed weight/plant. In 2005 under dryland conditions, seed weight/plant, pods/plant, and seeds/plant were significantly affected by treatment. Under irrigated conditions in 2005, pods/plant and seeds/pod were significantly impacted by treatment.

OVERVIEW OF SOYBEAN RUST MONITORING IN THE US

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Asian soybean rust, caused by *Phakopsora pachyrhizi*, was first found in the continental US in the fall of 2004. In 2005, ASBR was confined to the southeastern US, primarily in FL, GA and AL. While limited last year, soybean rust has the potential to cause major soybean losses throughout the US soybean growing areas. The only effective control at this time is the use of fungicides, but for them to be effective application timing is critical. Fungicides work best when applied at the very beginning of disease development in the field, often before symptoms are found. This usually is during reproductive development of the plant, but when or if disease will occur depends on the environment and the presence of the pathogen. These factors make disease and pathogen monitoring very important.

There are a number of approaches to monitoring soybean rust. Monitoring starts with training people in how to recognize symptoms that might be soybean rust through grower meetings and fact sheets. Many states have provided more in-depth first detector training. Programs vary from websites to workshops. First detectors are people such as crop consultants, extension agents, and farm managers who will be in soybean fields throughout the season. They are trained, not only to recognize soybean rust-like symptoms and signs, but how to collect samples and to mail the suspect leaves to the plant diagnostic clinic in the state. The state plant diagnostic clinics are connected through the National Plant Diagnostic Network, which allows information on findings of soybean rust to be shared on a regional and national basis. The clinics also are used to communicate the first find of soybean rust in a state to the USDA.

To detect soybean rust early, most states have established a series of sentinel plots. These are soybean plots that are planted early and/or use earlier maturing cultivars than the surrounding commercial fields. Since the sentinel plots will flower before the commercial fields and soybean rust begins at or after flowering, it is hoped that soybean rust will develop in the sentinel plots before the commercial fields warning growers that fungicide sprays are needed. Results from the sentinel plots are recorded at a USDA website which maps disease progress nationally. In Georgia last year, sentinel plots developed ASBR before surrounding grower fields and were useful in effectively timing fungicide applications.

There are a couple of experimental monitoring approaches for soybean rust. Spore trapping was conducted by either sampling air (Syngenta project) or rainwater (USDA project). With air sampling, soybean rust-like spores were identified microscopically and represent both spores produced locally or distantly. The rainwater system identified soybean rust with PCR and represented spores transported long distances by storms. Both systems indicated that the pathogen was widely dispersed in 2005 even though the disease was limited to the southeastern USA. There are also several disease modeling projects that are relating weather and spore movement to soybean rust development.

It is clear that as long as fungicides are used to control soybean rust, disease monitoring on a national scale will be necessary. In coming years we will determine which approach or approaches are the most effective, cost efficient, and sustainable.

YIELD ENHANCEMENT OF PROBABLE ASIAN SOYBEAN RUST CONTROL FUNGICIDES

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Over the last several years, research has indicated a yield response in soybeans to fungicide application, most significantly when fungicides are applied at the R3 growth stage. Historically, fungicide applications on soybeans have been limited due to the expense of fungicides. With the current threat of Asian Soybean Rust (*Phakopsora pachyrhizi*) to Mississippi soybean production, research on efficacy as well as economics of potential control agents is needed. The purpose of this study was 1) to evaluate the efficacy of various fungicides likely to be used in MS and 2) to evaluate a yield response of these fungicides.

Studies were conducted at four locations: two at Stoneville, MS, one at Verona, MS, and one at Morgan City, MS. Each location had a different variety as well as a different planting date. Trial design was randomized complete block with factorial treatment arrangement and four replications. Plots were 4 rows 40' long. Fungicides were applied at R2 to R4 followed by sequential application approximately 21 days later or a single application at R2 to R4 only. Data collected included disease incidence, yield, and weight of 100 seed. Data was analyzed at a 5% significance level at each location and across locations.

Rust did not occur in research plots, though several locations did see minimal disease incidence with Frogeye Leaf Spot (*Cercospora sojina*) and Purple Stain (*Cercospora kikuchii*). Eleven of the 16 treatments did significantly increase yield over the nontreated control. Domark 1.9 ME was the only triazole to significantly increase yield over the nontreated control, but was not better than the significantly highest treatment. In the absence of rust, Headline 2.09 EC (a strobilurin) + Induce increase yield the most at 8.1% or 4.6 Bu/a. Eleven of the 16 treatments also significantly increased hundred seed weight but no correlation between increased hundred seed weight and increased yield were seen.

OCCURRENCE OF DISEASE AND INSECT PESTS IN SELECT SORGHUM AND SOYBEAN ROTATIONS IN MISSISSIPPI

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A field study is currently being conducted over a three year-period from 2004-2006 in Starkville, MS to determine the occurrence of disease and insect pests in select sorghum (*Sorghum bicolor*) and soybean (*Glycine max*) rotations in Mississippi. Six sorghum and soybean rotation treatments were established including: 1) continuous sorghum, 2) continuous soybean, 3) sorghum-soybean-sorghum, 4) soybean-sorghum-soybean, 5) sorghum-soybean-soybean, and 6) soybean-sorghum-sorghum rotations. Four replicate plots (332.52 m^2 each) per treatment were established in a randomized complete block design. The same sorghum (Terral TV1050) and soybean (Pioneer 95B96) hybrids were used across treatments and years. Data were collected at 10 day intervals for insect pests and monthly for diseases from June through August each year. To further evaluate occurrence of pathogens and associated mycoflora in all treatments, roots from both crops were sampled twice during the growing season in 2004 and 2005. Nematode samples were collected twice yearly to determine population levels within treatments.

Results showed that three cornered alfalfa hopper (Spissistilus festinus), bean leaf beetle (*Cerotoma trifurcata*), and velvetbean caterpillar (*Anticarsia gemmatalis*) were most prevalent insects on soybean. Corn earworm (*Helicoverpa zea*), sorghum webworm (*Nola sorghiella*), and sorghum midge (*Stenodiplosis sorghicola*) were most prevalent insect pests in sorghum in both years, although were below economic threshold levels on the respective crops. The most prevalent disease found on sorghum was zonate spot caused by *Gleocercospora sorghi*. Disease severity ratings, although not significant across treatments averaged 1.5 and 2.0 using a 0-5 scale. *Cercospora sojina* and *Diaporthe phaseolorum* attacked soybean in both 2004 and 2005, but no significant differences in disease ratings occurred between treatments in 2004. In 2005, *D. phaseolorum* had significantly greater disease severity ratings in treatment 2 compared to treatments 3 and 5. Treatments 3 and 5 had significantly greater soybean yields than treatment 27 indicating that *D. phaseolorum* may have been responsible for the differences. The most common fungal pathogens isolated from both crops *Macrophomina phaseolina*, *Rhizoctonia* spp. (3 AG's), and *Fusarium* spp. Additional saprophytic fungi, *Aspergillus* and *Trichoderma* spp. were also cultured. Two nematode species were identified in soybean and sorghum plots, but their levels were below recommended thresholds and no significant differences were observed between treatments. When aflatoxin levels in sorghum seed were compared, no significant differences occurred among treatments. Levels ranged from 0 to 5.1 and 0 to 2.4 ppb in 2004 and 2005, respectively.

A PRELIMINARY EVALUATION OF SPORE TRAPPING TECHNOLOGY FOR PHAKOPSORA PACHYRHIZI

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Asian soybean rust (ASR) was first detected in Louisiana in November 2004. By the end of the year, the disease had been confirmed in eight other southern states. Early observations indicated that ASR infection is more likely to occur after a soybean plant has reached its reproductive stage. Without proper management practices, the infection of a single plant could theoretically lead to infection of an entire crop, causing significant yield losses. As early detection is the key to managing ASR, a sentinel network was developed to alert growers when and where soybean rust appears in soybean-producing states. Spore traps also were used as an early detection mechanism, and they seemed to be useful in detecting the pathogen weeks before symptoms appeared on plants. Research was conducted at the North Florida Research and Education Center, a University of Florida research facility, in Quincy, FL, where a severe rust epidemic was in progress. The objective was to correlate spore counts among three different spore traps: a homemade weather vane style passive trap, a Burkard 7-day recording volumetric spore trap, and a Burkard Cyclone sampler. The sampling period was two hours. Weather data were collected and spore counts were analyzed to determine spore production and dispersion during several 7-day study periods. Results will be presented regarding spore dispersion patterns and the veracity of passive traps.

INFLUENCE OF HOST GENOTYPE AND SOYBEAN CYST NEMATODE ON CHARCOAL ROT OF SOYBEAN

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Macrophomina phaseolina, the causal agent of charcoal rot of soybean, is a soilborne pathogen that is capable of infecting soybean plants throughout the growing season. Infections during the seedling to vegetative growth stages allow the fungus to extensively colonize and damage the vascular tissues of the roots and stem. Hot and dry conditions in the mid to late reproductive stages favor the pathogen and exacerbate the damage in the vascular tissues. Past research at SIUC has identified a small subset of varieties in which the colonization by *M. phaseolina* appears to be restricted. The objectives of this research are to determine if these varieties differ in their ability to restrict colonization, and to determine if additional stress caused by *Heterodera glycines* influences this relationship. In 2004 and 2005, two planting dates in infested fields were used to insure infection and an environment that is conducive for disease. Each variety was replicated 6 times per planting date. The trial was arranged in a randomized complete block design. Data collected included ratings of foliar and root symptoms, fungal colonization (CFU/g root), and soybean yield. For two growing seasons, field microplots were planted with varieties that support varying levels of root colonization by *M. phaseolina. Heterodera glycines* and *M. phaseolina* were added a two infestation levels for each variety in all possible combinations for a total of 6 treatments with 6 replications. Data collected included those variables in the field trial in addition to SCN population densities at harvest.

In the field trial, varieties differed regarding colonization by *M. phaseolina* and soybean yield. For the susceptible check, there was an inverse relationship between soybean yield and increased colonization by *M. phaseolina.* In the microplots, interactions between *H. glycines* and *M. phaseolina* were detected. Colonization by *M. phaseolina* was increased in the presence of *H. glycines* in one year of the study. In both years, population densities of *H. glycines* were not affected by the presence of *M. phaseolina.*

COMPARISON OF DISEASE ASSESSMENTS OF SOYBEAN GENOTYPES IN THE PRESENCE OF CHARCOAL ROT

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Charcoal rot [*Macrophomina phaseolina (*Tassi) Goid] of soybean [*Glycine max* (L.) Merr.] is a disease of economic importance in the United States that causes significant yield losses. In 2002 (30), 2003 (30), 2004 (44) and 2005 (81) a total of 185 soybean genotypes in maturity groups III, IV and V were evaluated using five methods of disease assessments: 1. Internal stem discoloration (PSHD), 2. Colony forming units (CFU), 3. Foliar symptoms, 4. Area under disease progress curve for foliar symptoms (AUDPC) and 5. Severity based on the intensity of internal stem discoloration. Linear regression of disease assessment as a function of the intensity of internal stem severity was significantly correlated (r^2=0.559, P≤0.0001) with CFU. However, when all disease measurements were combined the regression trend improved significantly (r^2=0.85, P≤0.0001). Genotypes that ranked high for resistance as measured by CFU also ranked high using combined measurements of severity, PHSD, foliar and AUDPC. Such methodology is more feasible for measurement of resistance than quantification with CFU. Using this protocol, 'DT97-4290' (a maturity group IV breeding line) was identified as having moderate resistance to charcoal rot. This line was released in December 2004 because of its high yield potential, charcoal rot resistance, and resistance to southern stem canker (*Diaporthe phaseolorum* var. *meridionalis*).

- It scavenger
- It thrives
- on depleted soil

TWENTY YEARS OF SOYBEAN VARIETY TESTING FOR SDS

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A team of researchers at SIUC began the testing of varieties against soybean sudden death syndrome (SDS) in 1985. With funding provided by the Illinois Soybean Association, this project has continued and expanded each year. Initially, less than 200 varieties were evaluated at a single location in southern Illinois. This project has grown and the number of varieties now exceeds 1,100. Currently, varieties are evaluated in at least three locations consistent with maturity group (MG). The project accommodates varieties in maturity groups I-V.

Locations were identified that have a history of SDS and proven to be infested with the causal organism, *Fusarium solani* f. sp. *glycines*. Varieties were assigned to trials based on MG and trials were split into an early and a late test (except for MG I). Each test represented a completely randomized design with three replications. Plots consisted of 2 rows on 30" centers, 10' long. Each plot was scored for SDS disease incidence (DI) as the % of plants possessing symptoms and for disease severity on a 1-9 scale with 1=mild chlorosis, 5=severe leaf scorch, and 9= premature plant death. Data were collected as close to the R6 growth stage as possible. The DI and DS ratings were compiled to formulate a disease index (DX) score as DI*DS/9, positioning DX on a 1-100 scale. Plots were harvested for seed yield prior to 1998. With the expansion of the project harvesting was subsequently abandoned.

Obtaining credible field results is difficult. Across the 40+ environments established for this purpose, less than half provided a level of disease pressure to allow viable comparison of varieties. Varieties proved to be quite variable in their reaction to SDS. In one environment that provided an unusually severe disease pressure a highly susceptible variety was assigned a DX of 95 while a few resistant varieties were assigned a DX of less than 10. Prior to 1990, the soybean cyst nematode (SCN)-resistant varieties exhibited a lower mean DX score than those of SCN-susceptible varieties. Glyphosate resistant varieties released in the 1990s exhibited a greater mean DX score than conventional varieties. Data from more recent years no longer support these distinctions. In the MG III late – IV late, resistance has proven to be more available. As a percentage of the total varieties tested in 2000 only 14% of the varieties were resistant as compared to 25% in 2004. Likewise, the ultra-susceptible varieties accounted for 26% and 3% of the varieties tested in 2000 and 2004, respectively. Regarding yield loss as a function of DX, a 7% loss was realized with each 10 unit DX increase. Yield drag has not been associated with SDS resistance as no differences were detected between the mean yield of resistant and susceptible varieties in absence of disease.

SCN-RESISTANT SOYBEANS OFFER A FALSE SENSE OF SECURITY TO PRODUCERS

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In the past 10 years there has been a steady increase in the use of soybean cyst nematode (SCN) resistant cultivars by Missouri producers to manage SCN. An estimated 90% of the SCN resistant soybean lines grown in Missouri derive their resistance from a single source, Plant Introduction (PI) 88788. Repeated planting of soybean varieties with the same source of resistance can select for nematode populations that can grow on these lines. In this study, 122 soil samples were collected from 47 soybean producing counties in Missouri with the help of Regional Agronomists and tested for SCN egg counts. Twenty samples with >10,000 eggs/250cm3 were chosen for HG Type (Race) tests. Producers were asked to submit samples from problem fields and asked to answer 3 short survey questions. Although 62% of the farmers did not feel they had any yield loss due to SCN, the egg count data indicated that 61% of the samples were above the economic threshold. HG Type testing on a subset of these samples indicated that 85% of the samples were above 10% on (PI) 88788. Our results suggest that continuous cropping of soybean deriving resistance from a single genetic source is selecting for nematode populations that increase well on resistant soybean lines, offering a false sense of security to producers.

ROUNDUP AND CONVENTIONAL SOYBEANS WITH BROAD RESISTANCE TO SCN POPULATIONS

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Numerous SCN resistant varieties tracing to PI88788 via Fayette and Bedford have been released. This source of resistance was used to protect against SCN, HG types 0 and 1.3 (races 3 and 14) which were dominant field populations during the 1980's and 1990's. Frequent use of PI88788 type resistance has resulted in SCN population shifts that reproduce on varieties tracing to this source. Thus, most of today's soybean varieties are becoming less effective in protecting against losses to SCN.

The predominance of new populations in Missouri farmer fields was clearly shown in a recent "SCN Awareness Survey" coordinated by Bob Heinz at the University of Missouri. In this 2005 survey 122 soil samples primarily from problem fields were assayed for SCN eggs. Sixty-one percent of the samples had medium to high SCN egg counts. Fields with the highest counts were primarily populations of Races 1, 2, and 5 (H"G types 2.57 and 1.2.5.7). PI88788 resistance source is susceptible and less effective against these HG types. Clearly, varieties with Hartwig type resistance are needed which can protect growers in problem fields with these SCN populations.

One Roundup Ready (RR) and two conventional soybean varieties have been released through the Missouri Agricultural Experiment Station, which trace to PI437654 via Hartwig. They show moderate resistant to HG types 2.5.7, 1.2.5.7, 0, 2.5.7 and 1.3 (races 1, 2, 3, 5, and 14).

The Roundup Ready release is early group V (RM5.2) and is being marketed through Missouri Premium Genetics of Concordia, Missouri as MPV 5206. In addition to SCN resistance, MPV5206 has moderate resistance to stem canker, frogeye leaf spot and SDS. It is susceptible to root knot nematode.

The two conventional varieties released have been named Stoddard (late IV-early V) and Jake (mid-group V). Both varieties have been similar to Anand in yield on loam soils, but significantly higher yielding on clay and sand in Missouri tests. Also they have performed better than Anand in Missouri, Arkansas and Tennessee Agricultural Experiment Station variety tests. In addition to having broad resistance to SCN HG types, they have moderate resistance to stem canker, frogeye leaf spot, SDS and root knot nematode. Jake also has shown resistance to reniform nematode.

Other Roundup ready varieties with Hartwig type SCN resistance, and resistance to other nematodes, SDS and frogeye leaf spot are under development.

A REVIEW OF RENIFORM NEMATODE RESISTANCE ON SOYBEAN

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The first report of the reniform nematode, *Rotylenchulus reniformis* Lindford & Oliveira, in the continental United States was in Georgia on cotton in 1940. It was then reported in Louisiana in 1941, Florida in 1942, Alabama and Texas in 1959, North Carolina in 1961, and South Carolina in 1962 all on cotton. The first report of reniform nematode on soybean (Glycines max (L.) Merr. was in 1956 in the Gold Coast, Africa. The first US report of reniform damage to soybean was in 1967 in South Carolina. In 1968 the cultivars "Pickett" and "Dyer" were reported resistant to reniform. In 1971 "Pickett-71", in 1972 "Custer" and in 1973 "Forrest" were reported resistant. "Centennial" was reported resistant in 1977 while "Gregg" and "Padre" were reported resistant in 1988. In 1971 and 1979 several lines and strains were also reported resistant. In 1981 it was reported that all soybeans resistant to reniform were also resistant to the soybean cyst nematode (*Heterodera glycines*) and that ***not*** all soybean resistant to soybean cyst were resistant to reniform. In 1994 30 cultivars commonly grown in Arkansas were tested for reniform resistance (actually reproduction) by comparing their reproduction factors to that of Forrest. Of the 30 "Coker 485," "Centennial," "Sharkey" and "Stonewall" were not different than Forrest. Some cultivar were indeterminate in reaction, with individual plants as "resistant" as Forrest and others very susceptible. In 1996 the 45 germplasm lines shown in 1984 to have soybean cyst resistance were tested for reniform "resistance." Of the 45 tested 16 were as resistant or more resistant than Forrest: PI303652. PI 404198B, Peking, PI 339868B, PI 404166, PI 438498, PI 438489B, PI 84751, PI 437679, PI 404198A, PI 437654, PI 438497, PI 89772, PI 437725, PI 437690, and PI 90763. In this report it was also found that "Cordell" derived from PI 90763 and "Hartwig" were as resistant as Forrest. Also reported were tests of the Soybean cyst race differentials which found PI 88788 to be moderately susceptible, with Pickett, Peking, PI 437654, and PI 90763 to be as resistant as Forrest. In 1999 a total of 282 cultivars were tested for reniform "resistance" with 90 being as resistant as Forrest. In a 2000 report 226 cultivars were tested with 56 not better hosts than Forrest ("Resistant"). In 2001 a total of 118 cultivars were tested 5 were found to be as "resistant as Forrest. In a 2002 report 139 lines were tested with 2 lines not different. Also tested were 35 Clemson breeding lines of which 8 breeding lines and the cultivars "Santee" and "Motte" were not different than Forrest. In a 2003 report mixed results were found. In 2004 of 129 cultivars and lines tested 7 were not different than Forrest, in a 2005 report 11 were not different, and while in a 2006 report only 2 of 209 were not different. It was postulated in 2002 that a reason for the reduction in "resistant" was the almost exclusive use of reniform susceptible PI 88788 in the pedigrees of most soybean cyst resistant varieties. The few varieties left with PI 437654 ("Anand") or Peking type resistance are all that are shown to be reniform resistant recently.

(*) Major SCN resistant parent
PI- 88788 currently used.

EFFECT OF SEED TREATMENTS ON SOYBEAN STAND AND YIELD IN ARKANSAS, 2005

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There are a number of chemical seed treatments available to control seedling diseases and insect pests in soybean. Soybean seed treatments were compared at three locations in Arkansas (Northeast Research and Extension Center, Keiser, Rice Research and Extension Center, Stuttgart, and the Southwest Research and Extension Center, Hope) on three planting dates (mid-April, mid-May and mid-June). Due to wet spring weather, there was no April planting at Stuttgart. The seed treatments were tested on a high and low quality seed lot of the cultivar Pioneer 94M90. The low quality seed lot was produced by artificially aging the high quality seed, otherwise each seed lot was treated the same. Seed treatments were PCNB+Vitavax, Maxim, Allegiance, Stilletto, Stilleto + Gaucho, Trilex +Allegiance, ApronMaxx, ApronMaxx + Quadris, and ApronMaxx + Quadris + Cruiser. Gaucho and Cruiser were insecticides. The tests were planted in four row plots, 6 m long on a row spacing of 76 cm with 100 seed planted per row. Stand counts were taken at 2 and 4 weeks and yields were determined at the end of the season. Over all locations and planting dates, the broad-spectrum fungicides, ApronMaxx and Stilletto, either alone or with other fungicides and insecticides resulted in the highest stands and often in significantly higher yields than the untreated control. Allegiance, specific for *Pythium* spp. and *Phytophthora sojae*, was not significantly better than the control at any location or planting date unlike previous tests in Arkansas. PCNB + Vitavax, specific for *Rhizoctonia solani*, resulted in significantly better stands than the control at all locations in the May and June plantings, but not the April plantings. Stands were significantly higher with high quality seed than low quality seed, but there were no interactions between seed quality and seed treatment except at Hope in the April and June plantings. In those plantings, there were fewer seed treatments that resulted in significantly greater stands than the control with low quality than with high quality seed. These results show that seedling diseases affect both stand and yield of soybean across locations and planting dates and that these diseases are probably caused by a number of different pathogens.

INHERITANCE OF RESISTANCE TO PHOMOPSIS SEED DECAY IN SOYBEAN PI 360841

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Phomopsis seed decay (PSD) can be a major problem where and when warm temperatures and high moisture conditions coincide with the latter stages of soybean development and maturation. In the South, *Phomopsis longicolla* Hobbs is the primary cause of PSD. Resistance to PSD has been reported in some cultivars and plant introductions, but little research has been done to characterize resistance and its inheritance. Earlier work by researchers in Missouri (Crop Sci. 27:895-898) described strong resistance to PSD in PI 360841. The objectives of this study were to determine the mode of inheritance of PSD resistance in PI 360841 and compare it to PSD resistance from PSD-resistant lines MO/PSD-0259 (PI 562694) and PI 80837 that have been shown to carry different single dominant genes for resistance to Phomopsis seed infection. PI 360841 was crossed to PSD-susceptible genotypes Agripro 350 (AP 350) and PI 91113. Additional crosses were made to PSD-resistant MO/PSD-0259 and PI 80837. F_2 populations and parents were grown in the field under overhead irrigation and inoculated at R5-R7 with conidial suspensions of *P. longicolla*. Seeds from individual plants were harvested at maturity and assayed for Phomopsis infection by plating on acidified potato dextrose agar. F_2 population data from PI 360841 x AP 350 and from PI 91113 x PI 360841 fit a 9 resistant : 7 susceptible model (Chi-square analyses) indicating that two complementary dominant genes confer PSD resistance in PI 360841. F_2 segregation data of MO/PSD-0259 x PI 360841 fit a 57 resistant : 7 susceptible model for two complementary dominant genes from PI 360841 plus a different dominant gene from MO/PSD-0259. F_2 segregation data from PI 360841 x PI 80837 fit a 63 resistant :1 susceptible model suggesting the segregation of three dominant genes for resistance. It appears that the dominant gene in PI 80837 (or some genetic factor in PI 80837) has an epistatic effect on complementary dominant gene resistance from PI 360841. These results indicate that the genes for PSD resistance in PI 360841 are different from those found in PI 80837 and MO/PSD-0259. Further characterization of these genes is needed. Resistance found in PI 360841 may be useful in breeding lines and varieties with strong resistance to PSD.

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- Crop rotation is not effective in this case.
- Breeding