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Proceedings of the 30th Annual Meeting, Southern Soybean Disease Workers (March 3, 2003, Little Rock, Arkansas)

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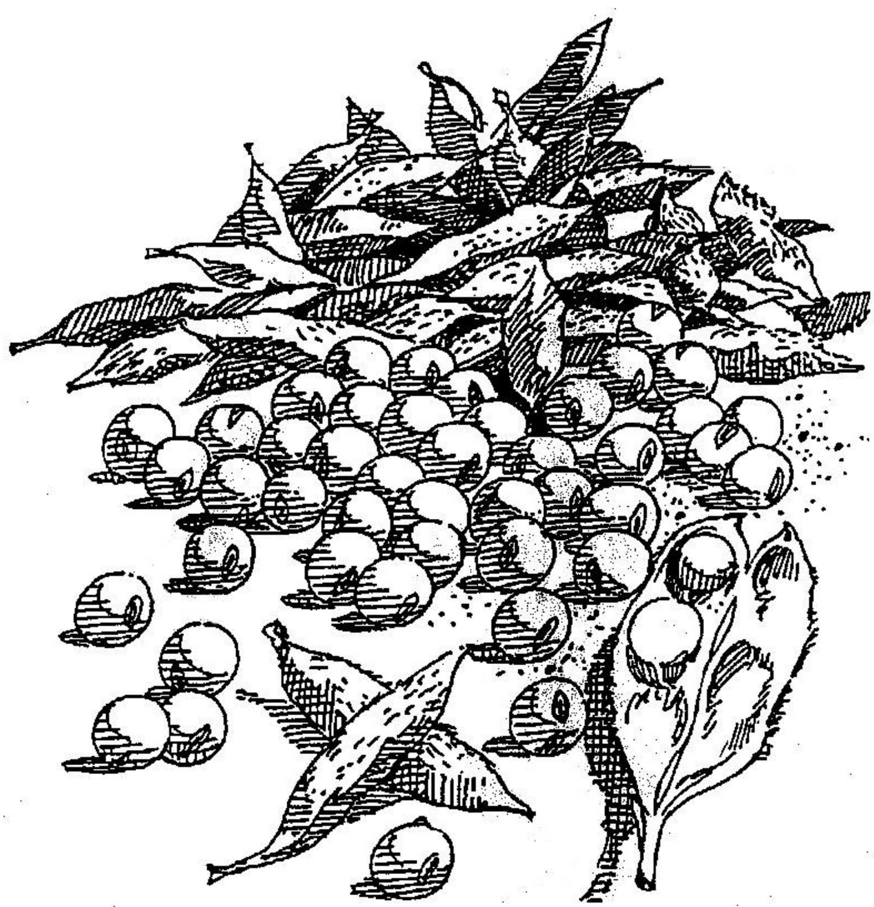
PROCEEDINGS OF THE SOUTHERN SOYBEAN DISEASE WORKERS



30TH ANNUAL MEETING

March 3, 2003 | Little Rock, Arkansas

PROCEEDINGS OF THE SOUTHERN SOYBEAN DISEASE WORKERS 30TH ANNUAL MEETING MARCH 3, 2003 LITTLE ROCK, ARKANSAS

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

30th Annual Meeting of the Southern Soybean Disease Workers
March 3, 2003
Little Rock, Arkansas

8:00-8:30	**Registration**
8:30-8:40	**Welcome and Opening Remarks** Patrick Fenn, SSDW President
8:40-9:00	**Evaluation of Reduced Rates and Timing of Azoxystrobin on Frogeye Leaf Spot** Cliff M. Coker
9:00-9:20	**Effect of Fungicides on Soybean Diseases, Yield and Seed Quality** R. W. Schneider, J. D. Siebert, C. A. Jones and J. L. Griffin
9:20-9:40	**Effect of Fungicide Seed Treatment on Soybean Establishment** M.L. Rosso, C. Boger, G. Bates, C. Rothrock, T. Kirkpatrick and J. Rupe
9:40-10:00	**Influence of Soybean Cyst Nematode on Sudden Death Syndrome Development in Field Microplots in Arkansas** S. L. Giammaria, C. B. Boger and J. C. Rupe
10:00-10:20	**Possible Mechanisms for Resistance to *Pythium* spp. in the Soybean Cultivar Archer** G.D. Bates, C.S. Rothrock and J.C. Rupe
10:20-11:00	**Break**
11:00-11:20	**Late Season Diseases Have Major Impact on Soybean Crop in Mississippi in 2001 and 2002** G.L. Sciumbato and Alemu Mengistu
11:20-11:40	**Identification and Characterization of Soybean Germplasm with Resistance to Seed Infection by *Phomopsis longicolla* and *Cercospora kikuchii*** Eric W. Jackson, P. Fenn and P.K. Miller
11:40-12:00	**Soybean Green Stem Caused by Selected Strains of BPMV** You-Keng Goh, Said A. Ghabrial, John S. Russin and Jason P. Bond
12:00-12:20	***Meloidogyne incognita*, Moving on to Greener Pastures** Jonathan B. Allen, Jason P. Bond and Michael E. Schmidt
12:20-1:30	**Lunch**
1:30-2:00	**State Reports**

2:00-2:30	**Open Discussion; Reports from other meetings and the future of SSDW**
2:30-2:45	**Business Session**

SOUTHERN SOYBEAN DISEASE WORKERS

2002-2003 OFFICERS

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SOUTHERN SOYBEAN DISEASE WORKERS 2002 TREASURY REPORT
Operatio[redacted]24 Planters First Bank, Hawkinsville, GA

Receipt Summary		
Interest on Operational Account	$	47.60
2002 Meeting Registration Receipts	$	0.00
2002 Soybean Disease Atlas Sales	$	0.00
Total Receipts	**$**	**47.60**

Disbursement Summary		
Printing Fees	$	86.80
Postage	$	140.80
2002 Annual Meeting Costs	$	0.00
SSDW Association Awards	$	172.04
Bank Account Fees	$	0.00
Total Disbursements	$	399.64

SSDW Assets – December 31, 2002		
Beginning Balance – 1/01/02	**$**	**4,115.93**
Receipts	**$**	**47.60**
Disbursements	**$**	**399.64**
Net Assets – 12/31/02	**$**	**3,763.89**
Balance of Operational Account	**$**	**3,763.89**

[redacted]

Jason P. Bond
Treasurer

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SOUTHERN UNITED STATES SOYBEAN DISEASE LOSS ESTIMATE FOR 2002

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 the 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, which includes the southern losses for that period (10).

The loss estimates for 2002 published here were solicited from: Edward Sikora in Alabama, Clifford Coker in Arkansas, Robert Mulrooney in Delaware, Tom Kucharek in Florida, Dan Phillips in Georgia, Don Hershman in Kentucky, Ken Whitam in Louisiana, Arvydas Grybauskas in Maryland, Gabe Sciumbato in Mississippi, Allen Wrather in Missouri, Steve Koenning in North Carolina, Phil Pratt 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 supplied by the state crop reporting services. 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).

In the southern states, the 2002 average soybean yield and acreage decreased from that reported in 2001. In 2002, 482.8 million bushels were harvested from 15.7 million acres in 16 southern states. The overall average for the 16 reporting states was 26.7 bushels/acre. The overall average reported in 2001 was 32.1 bushels/acre. The Average yield (weighted by production) in 2002 was 30.7 Bushels/Acre. The 2002 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 2002 was 12.25%, a substantial increase from the 11.63 % loss for 2001. In 2002, Tennessee reported the greatest percent loss at 28.9%, followed by Alabama at 21.5 %. In general, the highest losses occurred in the gulf coast states.

The estimated reduction of soybean yields is specific as to the causal organism or the common name of the disease (Table 3). Percent losses are reported for the 16 states, but actual losses for Florida are not included because less than ten thousand acres were harvested in 2002. Louisiana reported that 150,000 acres were not harvested because of weather. The estimated reduction in soybean yield due to diseases during 2002 was greatest in Tennessee with 14.57 million bushels. The total reduction in soybean yield due to diseases in the 15 southern states was 70.27 million bushels in 2002 down from 75.89 million bushels in 2001; largely because of lower production as a result of reduced acreage in most states and low yields in the Atlantic coast states because of drought.

In 2002, the highest average estimated percent loss was caused soybean cyst nematode 2.07% (13.4 million bushels), followed by Diaporthe/phomopsis complex 1.77 (9.27 million bushels), and Charcoal rot at 1.65% (12.97 million bushels)(Tables 2 & 3).

Diseases continued to cause significant loss in soybean production throughout the 16 southern that participated in this disease loss estimate states in 2002. 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 2002.

State	Acres harvested	Yield/acre (bu)	Total production (bu)
Alabama	155,000	24	3,720,000
Arkansas	2,900,000	35	101,500,000
Delaware	192,000	22	4,224,000
Florida	<10,000	NA	NA
Georgia	145,000	23	3,335,000
Kentucky	1,220,000	33	39,930,000
Louisiana	650,000	32	20,800,000
Maryland	505,000	21	10,605,000
Mississippi	1,420,000	34	48,300,000
Missouri	4,650,000	33	153,450,000
North Carolina	1,360,000	24	31,960,000
Oklahoma	250,000	20	5,000,000
South Carolina	430,000	18	7,740,000
Tennessee	1,120,000	32	35,840,000
Texas	240,000	28	6,720,000
Virginia	460,000	21	9,660,000
Total	15,707,000	Avg. =26.7 /Wt. Avg. 30.7	482,784,000

Table 2. Estimated percentage loss of soybean yield due to diseases for 16 southern states during 2002a.

Disease	AL	AR	DE	FL	GA	KY	LA	MD	MS	MO	NC	OK	SC	TN	TX	VA	Avg.
Anthracnose	1.00	0.75	0.25	1.00	0.20	0.20	1.00	0.50	1.00	0.01	0.02	0.25	1.00	3.00	2.00	0.50	0.79
Bacterial diseases	TR	0.01	0.00	0.00	0.00	0.01	0.00	0.00	TR	0.00	0.00	0.10	0.25	0.00	0.10	TR	0.04
Brown leaf spot	TR	0.01	TR	TR	0.00	0.50	0.00	0.00	0.20	0.09	0.00	TR	0.05	2.00	0.20	TR	0.27
Charcoal rot	0.50	4.50	1.00	2.00	0.30	2.50	1.00	0.50	2.00	1.50	0.10	1.25	0.05	4.00	5.00	0.20	1.65
Diaporthe/Phomopsis	7.00	1.00	0.50	1.00	0.30	1.50	2.00	0.25	8.00	0.01	1.00	0.70	1.00	2.00	2.00	0.00	1.77
Downy mildew	0.20	0.00	TR	TR	0.00	0.01	0.00	0.00	TR	0.00	0.01	TR	TR	0.00	0.00	0.00	0.02
Frogeye	0.10	0.38	0.00	0.50	0.25	0.30	0.20	0.00	1.00	0.01	0.00	0.10	0.05	7.80	2.00	0.00	0.79
Fusarium wilt and rot	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.01	TR	0.10	0.00	0.00	TR	0.00	0.20	0.00	0.02
Other diseases b	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.00	TR	0.00	5.00	0.00	0.25	0.00	0.00	0.00	0.38
Phytophthora rot	0.00	0.01	0.00	0.00	0.00	0.01	1.00	0.00	TR	2.00	0.10	0.05	TR	0.00	0.10	0.00	0.23
Pod & stem blight	3.00	1.00	0.00	1.00	0.20	0.30	2.00	0.00	3.50	0.00	0.50	0.75	0.50	0.00	0.50	0.20	0.84
Purple seed stain	3.00	0.20	TR	0.10	0.10	0.02	3.00	0.01	2.00	0.01	0.30	0.25	0.01	1.50	2.00	0.20	0.85
Aerial blight	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00	0.75	0.00	0.00	0.00	0.00	0.00	0.20	0.00	0.18
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	0.00
Seedling diseases	TR	0.03	0.25	2.00	0.10	0.30	0.05	0.00	1.50	0.10	0.01	0.50	0.10	1.50	0.50	1.00	0.53
Southern blight	0.10	0.04	0.00	TR	0.10	0.02	0.00	0.00	TR	0.00	0.10	TR	0.75	0.00	0.20	TR	0.11
Soybean cyst nematode	0.50	3.50	3.00	TR	3.00	3.50	0.20	2.00	0.10	1.50	5.00	0.75	2.00	5.00	0.00	1.00	2.07
Root-knot nematode	1.00	1.85	1.00	1.00	3.50	0.00	2.00	0.25	TR	0.00	1.10	0.10	4.00	0.00	0.10	0.50	1.09
Other nematodes c	TR	0.05	0.00	0.00	0.25	0.00	0.10	0.00	TR	0.00	0.50	0.00	4.00	0.00	0.00	TR	0.38
Stem Canker	5.00	0.20	0.00	0.00	0.50	0.01	0.00	0.00	0.30	0.00	0.00	0.00	0.00	0.10	0.10	0.00	0.39
Sudden death syndrome	0.10	0.11	0.00	0.00	0.00	0.01	0.00	0.00	0.40	0.10	0.00	0.00	0.00	2.00	0.20	0.00	0.18
Virus d	TR	0.01	0.00	0.00	0.00	0.05	0.20	0.00	TR	0.10	0.20	0.00	2.00	0.00	0.20	0.20	0.21
Brown stem rot	TR	0.00	0.00	0.00	0.00	0.01	TR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	TR	0.00
Total disease %	21.50	14.25	6.00	8.60	9.30	9.26	15.00	3.52	20.75	5.41	13.94	4.80	15.87	28.90	15.60	3.30	**12.25**

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; and Reniform in AL, AR, NC, and SC.

d Viruses were identified as: SMV in AL, AR, GA, KY, MS, NC, MO, and VA; BPMV AR, KY, LA, MO, MS,NC, 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 15 southern states during 2002.

Disease	AL	AR	DE	GA	KY	LA	MD	MS	MO	NC	OK	SC	TN	TX	VA	Total
Anthracnose	0.05	0.89	0.01	0.01	0.09	0.24	0.05	0.61	0.02	0.01	0.01	0.09	1.51	0.16	0.05	3.79
Bacterial diseases	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.00	0.01	0.00	0.05
Brown leaf spot	0.00	0.01	0.00	0.00	0.22	0.00	0.00	0.12	0.00	0.00	0.00	0.00	1.01	0.02	0.00	1.38
Charcoal rot	0.02	5.31	0.04	0.01	1.10	0.24	0.05	1.22	2.43	0.04	0.07	0.00	2.02	0.40	0.02	12.97
Diaporthe/Phomopsis	0.33	1.18	0.02	0.01	0.66	0.48	0.03	4.87	0.02	0.37	0.04	0.09	1.01	0.16	0.00	9.27
Downy mildew	0.01	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
Frogeye	0.00	0.45	0.00	0.01	0.13	0.05	0.00	0.61	0.02	0.00	0.01	0.00	3.93	0.16	0.00	5.37
Fusarium wilt and rot	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.16	0.00	0.00	0.00	0.00	0.02	0.00	0.19
Other diseases b	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	1.86	0.00	0.02	0.00	0.00	0.00	1.90
Phytophthora rot	0.00	0.01	0.00	0.00	0.00	0.24	0.00	0.00	3.24	0.04	0.00	0.00	0.00	0.01	0.00	3.54
Pod & stem blight	0.14	1.18	0.00	0.01	0.13	0.48	0.00	2.13	0.00	0.19	0.04	0.05	0.00	0.04	0.02	4.40
Purple seed stain	0.14	0.24	0.00	0.00	0.01	0.72	0.00	1.22	0.02	0.11	0.01	0.00	0.76	0.16	0.02	3.41
Aerial blight	0.00	0.00	0.00	0.00	0.00	0.48	0.00	0.46	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.95
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	0.04	0.01	0.00	0.13	0.01	0.00	0.91	0.16	0.00	0.03	0.01	0.76	0.04	0.10	2.21
Southern blight	0.00	0.04	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.04	0.00	0.07	0.00	0.02	0.00	0.18
Soybean cyst nematode	0.02	4.13	0.13	0.11	1.54	0.05	0.22	0.06	2.43	1.86	0.04	0.18	2.52	0.00	0.10	13.40
Root-knot nematode	0.05	2.18	0.04	0.13	0.00	0.48	0.03	0.00	0.00	0.41	0.01	0.37	0.00	0.01	0.05	3.75
Other nematodes c	0.00	0.06	0.00	0.01	0.00	0.02	0.00	0.00	0.00	0.19	0.00	0.37	0.00	0.00	0.00	0.65
Stem Canker	0.24	0.24	0.00	0.02	0.00	0.00	0.00	0.18	0.00	0.00	0.00	0.00	0.05	0.01	0.00	0.74
Sudden death syndrome	0.00	0.13	0.00	0.00	0.00	0.00	0.00	0.24	0.16	0.00	0.00	0.00	1.01	0.02	0.00	1.57
Virus d	0.00	0.01	0.00	0.00	0.02	0.05	0.00	0.00	0.16	0.07	0.00	0.18	0.00	0.02	0.02	0.54
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	0.00
Total loss	1.02	16.10	0.27	0.34	4.07	3.54	0.39	12.64	8.81	5.17	0.25	1.47	14.57	1.24	0.38	70.27

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EVALUATION OF REDUCED RATES & TIMING OF AZOXYSTROBIN ON FROGEYE LEAF SPOT

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Frogeye leaf spot (FLS), caused by *Cercospora sojina* Hara, is a worldwide foliar soybean disease favored by the warm, humid conditions in the tropical and subtropical soybean-growing areas. This destructive disease occurs sporadically in the mid-south and southeastern US. It can become severe and is capable of causing yield losses up to 40% on susceptible cultivars in years with abundant rainfall during the growing season.

A foliar fungicide test was conducted on furrow irrigated soybeans at the Southeast Branch Experiment Station at Kelso, Arkansas to determine the effectiveness of reduced rates of azoxystrobin (Quadris 2.08 SC) at various timings to control FLS. The soybean cultivar DeltaKing 4996RR was planted May 22, 2002 at a rate of six seeds per row foot in a RCBD with four replications. Plots consisted of five rows twenty-five feet long in nineteen-inch row spacing. All azoxystrobin treatments were applied as a foliar broadcast spray using a CO_2 charged backpack sprayer with 110015VS nozzles calibrated at 35 PSI to 10 GPA. Fungicide treatment rates (lbs ai/ac) and application timing were as follows: untreated check (UTC), (0.0446) at R2, (0.446, 0.0723, & 0.1) at R3, (0.446, 0.0723, & 0.1) at R5, (0.0446 & 0.1) at R3 and R5. Stand counts were determined 21 DAP. Foliar disease rating were made at R3, R4, R5, late R6. Soybean plots were harvested October 19, 2002 at 11% seed moisture; yields were measured and recorded.

Frogeye leaf spot was first observed in plots at R4. Diseased rating collected at R6 ranged from 7, 5, 2, 0.75, 1.0, 4.5, 4.0, 4.06, 0.75, to 0 for the treatments untreated check, (0.0446) at R2, (0.446, 0.0723, & 0.1) at R3, (0.446, 0.0723, & 0.1) at R5, (0.0446 & 0.1) at R3 and R5 respectively. Yields ranged from 56.46, 67.15, 71.99, 74.18, 74.95, 60.98, 67.37, 67.97, 75.13, to 75.06 for the treatments untreated check, (0.0446) at R2, (0.446, 0.0723, & 0.1) at R3, (0.446, 0.0723, & 0.1) at R5, (0.0446 & 0.1) at R3 and R5 respectively. CV 5.88. LSD(P=.05) 5.68
FLS severity was significantly reduced and soybean yields were significantly increased when foliar sprays of azoxystrobin were applied at R3 or R3 & R5 over the UTC, R2, or R5 application timings.

EFFECT OF FUNGICIDES ON SOYBEAN DISEASES, YIELD AND SEED QUALITY

R. W. Schneider, J. D. Siebert, C. A. Jones and J. L. Griffin

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ABSTRACT

The fungicides Bravo, BAS 500, Folicur, Quadris, and Stratego were evaluated in two field trials for control of Cercospora leaf blight (CLB) and aerial blight (AB) in soybean in 2001. Applications were made at R3 and R5, and rates of application were the highest labeled rates on crops for which these compounds are registered. Folicur and Stratego are used to control Cercospora diseases in peanuts and sugar beets, crops that are extremely susceptible to this disease. There were significant differences in disease development, pod and seed quality, yield and time to maturity with several chemicals. Quadris continues to be very effective in controlling AB, although Stratego and BAS 500 also performed well. The latter two compounds were effective against CLB, while Quadris showed little activity against this disease. Pod and seed quality benefited significantly from BAS 500 and Quadris, although the latter was exceptional in this regard. Significant yield responses in the CLB test were seen with BAS 500 and Stratego but not Quadris; Stratego, Quadris, and BAS 500 enhanced yield in the AB test; and the latter two caused significant yield increases in the noninoculated plots as compared with untreated controls. These results were confirmed in 2002. In addition, Topsin M was effective against CLB when applied at R5, but it was less effective at R3. A mixture of Topsin M (12 oz/A) and Quadris (6 oz/A) was very effective against all three diseases when applied at R3.

BAS 500 is an excellent candidate for further development in soybean because it is effective against CLB and AB, although Quadris excels with the latter disease. Also, both of these compounds were very effective in controlling pod diseases and in preserving seed quality under conditions that were favorable for seed deterioration. This aspect, in addition to disease control and yield enhancement, must be considered in cost/benefit analyses. Stratego and Topsin M warrant further investigation if AB is not a threat.

Effect of Fungicide Seed Treatment on Soybean Establishment

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Seedling diseases, caused by *Pythium* spp. and other pathogens, can significantly reduce soybean stands and seedling vigor causing serious problems in Arkansas soybean production. Seedling diseases, particularly those caused by *Pythium* spp., are more common in soils with prolonged periods of saturated conditions and cool temperatures. Seed treatment with fungicides is the most widely used strategy to reduce damage from seedling diseases. Resistant cultivars could be a new control option that maybe useful. Recent research indicated that the cultivar Archer is more resistant to seedling diseases caused by *Pythium* spp. than Hutcheson, a widely grown soybean cultivar in Arkansas. To determine the effects of cultivar resistance to *Pythium* spp., fungicide seed treatment, soil saturation, and seed vigor on stand establishment, tests were planted on three dates (mid-April, mid-May and mid-June) at five locations in Arkansas. At each site, the tests were either flooded for 24 hours at emergence or not flooded. Two seed lots (high and low vigor) of Archer and Hutcheson were treated with fungicides that are effective against *Pythium* spp. (metalaxyl), *Rhizoctonia solani* (PCNB + Vitarax), *Fusarium* spp. (fludioxonil), or a broad spectrum fungicide (Stilleto: metalaxyl, thiram and carboxin). Stand counts were made 2 and 4 weeks after planting and plant samples were collected to evaluate root discoloration. Stilletto was the most effective fungicide across locations and planting dates. Metalaxyl was more effective with the cultivar Hutcheson than Archer. Root discoloration was lower on Archer than Hutcheson in 8 of 32 tests. Other fungicides effective against *Rhizoctonia solani* and *Fusarium* spp. were occasionally improved stands, indicating the importance of these pathogens. Soil saturation at emergence reduced stands in most cases, but fungicide seed treatment did not fully restore stands, suggesting the importance of abiotic as well as biotic factors in stand loss. Low seed quality reduced stands. In some cases, fungicide seed treatments were effective in low, but not high, quality seed lots. These data show that soybean stand establishment can be enhanced though the use of high quality seed, the appropriate fungicide seed treatment and the avoidance of saturated soil conditions. Cultivar resistance to *Pythium* spp. may further protect against soybean stand loss.

Influence of Soybean Cyst Nematode on Sudden Death Syndrome Development in Field Microplots in Arkansas

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Heterodera glycines, the soybean cyst nematode (SCN), has often been associated with soybean sudden death syndrome (SDS) in the field. Previous studies have shown that co-inoculation with SCN and the SDS pathogen, *Fusarium solani* f.sp. *glycines*, resulted in more rapid and severe disease development. Soybean cyst nematode is not necessary for the infection of soybean by the fungus, but its presence can hasten symptom expression and increase severity of SDS. The effect of cultivar resistance to one or both of these pathogens was studied in a microplot experiment conducted in 2002 at the University of Arkansas in Fayetteville, AR. Four cultivars - Pioneer 9594, resistant to SDS and susceptible to SCN, Asgrow 5603, resistant to SCN and susceptible to SDS, Hartwig, resistant to both pathogens, and Essex, susceptible to both pathogens - were inoculated with either the fungus, the nematode, both, or not inoculated. Percentage of symptomatic leaf area was assessed twice a week after flowering. SDS ratings were highest for Essex followed by Pioneer 9594 and then Asgrow 5603. With each of these cultivars, SDS was greater in the co-inoculated plots than the plots inoculated with just the fungus, irrespective of the cultivars reaction to SCN. Although SCN increased SDS in all cultivars except Hartwig -in which no disease developed in any treatment-, the relative rankings between the cultivars did not change. The effect of SCN and SDS interaction will be discussed.

Possible Mechanism for Resistance to *Pythium* spp. in the Soybean Cultivar Archer

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Previous research in Arkansas indicated that the maturity group one soybean cultivar Archer was more resistant to several *Pythium* spp. than the widely grown maturity group five cultivar Hutcheson. Controlled environmental experiments confirmed Archer was more resistant to the *Pythium* spp. *Pythium aphanidermatum*, *P. ultimum*, *P. irregulare*, and *P. vexans* and group HS than Hutcheson, when *P. oligandrum* was used as a control. Archer was found to produce fewer sugars in its exudates when compared to Hutcheson and studies using zoospore preparations of *P. aphanidermatum* suggested that Archer was less attractive to zoospores. In addition, exudates of Archer stimulated less oospore germination than exudates of Hutcheson. Archer continued to demonstrate resistance when hyphae were placed directly on the seed or injected into seedling hypocotyls suggesting differences other than exudates were important. Archer is known to have two resistance genes for *Phytophthora sojae* (*Rps* 1k and 6). It was speculated that these genes might be responsible for the resistance to *Pythium* spp. Therefore, a set of differential cultivars containing specific resistance genes for *Phytophthora sojae* were planted in vermiculite infested with *P. aphanidermatum* and assessed by a disease index, stand count, percent seed rot and percent damping-off. Among the differentials, the cultivar Williams 82 (*Rps* 1k) demonstrated resistance to *P. aphanidermatum* similar to Archer. The *Rps* gene 3c also conferred some resistance, but resistance was significantly less than *Rps* 1k. This study suggests the Phytophthora resistance gene *Rps* 1k is important in controlling Pythium damping-off and root rot.

LATE SEASON DISEASES HAVE MAJOR IMPACT ON SOYBEAN CROP IN MISSISSIPPI IN 2001 AND 2002

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The Mississippi soybean crop was in excellent condition in late July 2001 and the Maturity Group IV soybeans were in late bloom and beginning pod fill. However, an extended rainy period occurred in August, with many regions of Mississippi reporting rain for 15 consecutive days . The total August rainfall was 8.83 inches with average maximum temperature of 90F with 31 days of 90% or higher relative humidity. This was during the pod fill stage of most of the Group IV soybeans. Pod discoloration and rot was observed on many varieties. However, some varieties remained green. *Phomopsis* was isolated from most of the affected pods. Further isolations revealed a large amount of pod infection with *Cercospora kikuchii,* the casual agent of purple leaf and seed stain. The fungus was inoculated to susceptible soybean varieties and identical symptoms of the disease developed in the greenhouse. The fungus was isolated from diseased pods and used to reinoculate susceptible soybeans. Therefore, we believe that the *Cercospora kikuchii* predisposed the soybeans to *Phomopsis* seed rot. The Maturity group V soybeans matured after the rainy period and were unaffected by the disease. We are currently screening the entries in the Mississippi Variety Trial for resistance to *Cercospora kikuchii* pod rot. Some of the varieties are immune to the pod discoloration. It appears that resistance to the leaf and seed phase of the disease is not completely correlated to resistance to the pod phase of the disease.

In 2002, we had ideal growing conditions throughout the growing season until September. Most of the Maturity Group IV that were harvested during this period produced record or near record yields. Another extended rainy period began in September. Temperatures during this time were not as hot as they were during August 2001. The pod discoloration observed in 2001 did not appear. Producers were unable to harvest the late planted Group IV and the Group V soybean when they were ready. Seed often stayed in the field four to six weeks after it was mature. Severe deterioration of the seed occurred. Isolations from damaged seed revealed that the seed decay was caused primarily by *Phomopsis* Spp. *Phomopsis* has main cause of traditional soybean seed decay. It was observed that there were different degrees of seed decay in different varieties indicating that there may be some resistance to seed decay in some varieties.

Identification and Characterization of Soybean Germplasm with Resistance to Seed Infection by *Phomopsis longicolla* and *Cercospora kikuchii*

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Phomopsis seed decay (*P. longicolla*) and purple seed stain (*C. kikuchii*) can severely impact soybean seed quality. Our objectives are to determine how previously reported resistant germplasm performs under environmental conditions in Arkansas, and to characterize the resistance to both Phomopsis seed infection and purple seed stain in PI 80837. During the 2001 and 2002 seasons, seed from 32 genotypes, grown in *P. longicolla* inoculated plots in two locations, were assayed for seed-infecting fungi. Also, in 2002 seed of F_2 plants from a cross of the Phomopsis and Cercospora resistant PI 80837 with the susceptible variety AP 350, and a cross of PI 80837 with the Phomopsis resistant breeding line MO/PSD-0259 were assayed for *P. longicolla* and *C. kikuchii*. Seed were surface disinfested and plated on acidified potato dextrose agar. Assays showed significant differences in the incidence of Phomopsis seed infection and purple seed stain among the 32 genotypes. Low recoveries of *P. longicolla* and *C. kikuchii* from some genotypes were similar to previous reports. PI 80837 was found to have low incidences of infection by both *P. longicolla* and *C. kikuchii*. Frequency distributions of F_2 plants (PI 80837 · AP 350) were skewed toward the resistant parent (PI 80837) for recoveries of both *P. longicolla* and *C. kikuchii*. The ratio of resistant to susceptible plants was not significantly different from 3:1, suggesting that one or few genes control resistance. Furthermore, F_2 plants from the cross of PI 80837 · MO/PSD-0259 segregated in a ratio not significantly different from 15:1, suggesting that the parents carry different genes for resistance. The overall results suggest that good resistance exists to *P. longicolla* and *C. kikuchii* under environmental conditions in Arkansas, and that resistance in PI 80837 to both diseases is probably due to simply-inherited dominant traits that could be easily utilized and combined. F_3 lines from these crosses will be screened to confirm F_2 data and selections will be made to develop lines adapted to Arkansas and mid-South environments.

Soybean Green Stem Caused by Selected Strains of BPMV

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Bean pod mottle virus (BPMV) is widespread in Illinois soybean fields. A survey across southern Illinois in 2000 and 2001 showed over 80% of soybean fields infested with the virus. BPMV not only can cause up to 52% yield loss, a recent experiment has shown that some strains can cause green stem as well. In a screen house study, soybean Essex$_{Rsv1}$ showed significant green stem symptom and reduction in seed quality when inoculated with the severe (CB-B and Crawford) and intermediate (Ky G7 and CB-4) strains of BPMV, but only when these strains were inoculated at the early growth stages (V2-V4). Yield was reduced only by the severe strains when inoculated at the early growth stages. Inoculating the plants with the mild strains of BPMV (Ullin and Shelby) did not induce the green stem symptom or affect seed quality or yield. These results stress the importance of controlling BPMV infection, and implicate the need to control its vector, at the early stages.

Meloidogyne incognita, Moving on to Greener Pastures

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Meloidogyne incognita is an emerging threat to soybean production in southern Illinois. This pathogen has been identified in nine soybean fields, eight vegetable fields and five peach orchards. The potential impact of *M. incognita* to soybean germplasm in northern latitudes is unknown. In 2001, four soybean varieties (Pioneer 9481, Pioneer 9492, Gateway 493 and LS 94-3207) were selected and planted in infested fields. Nematode population densities were recorded at planting and every 6 weeks until harvest. At planting, the population density of *M. incognita* averaged 8 juveniles/100 cc soil. Reproduction by *M. incognita* was higher in the plots planted to P 9481. At harvest, the population densities (juveniles/100 cc soil) were 508, 41, 37 and 6 for P 9481, P 9492, G 493 and LS 94-3207, respectively. Across the four varieties, the increase in the population density of *M. incognita* was concomitant with a linear decrease in soybean yield.

Fifteen elite germplasm lines resistant to *H. glycines* (Race 3, HG Type 0) and soybean sudden death syndrome and over thirty commercial varieties (MG IV and V) were evaluated for resistance to *M. incognita*. Five of the germplasm lines had a high level of resistance to root galling and egg production. In the commercial varieties, four were resistant to *M. incognita*.