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Proceedings of the 41st Annual Meeting, Southern Soybean Disease Workers (March 5-6, 2014, Pensacola Beach, Florida)

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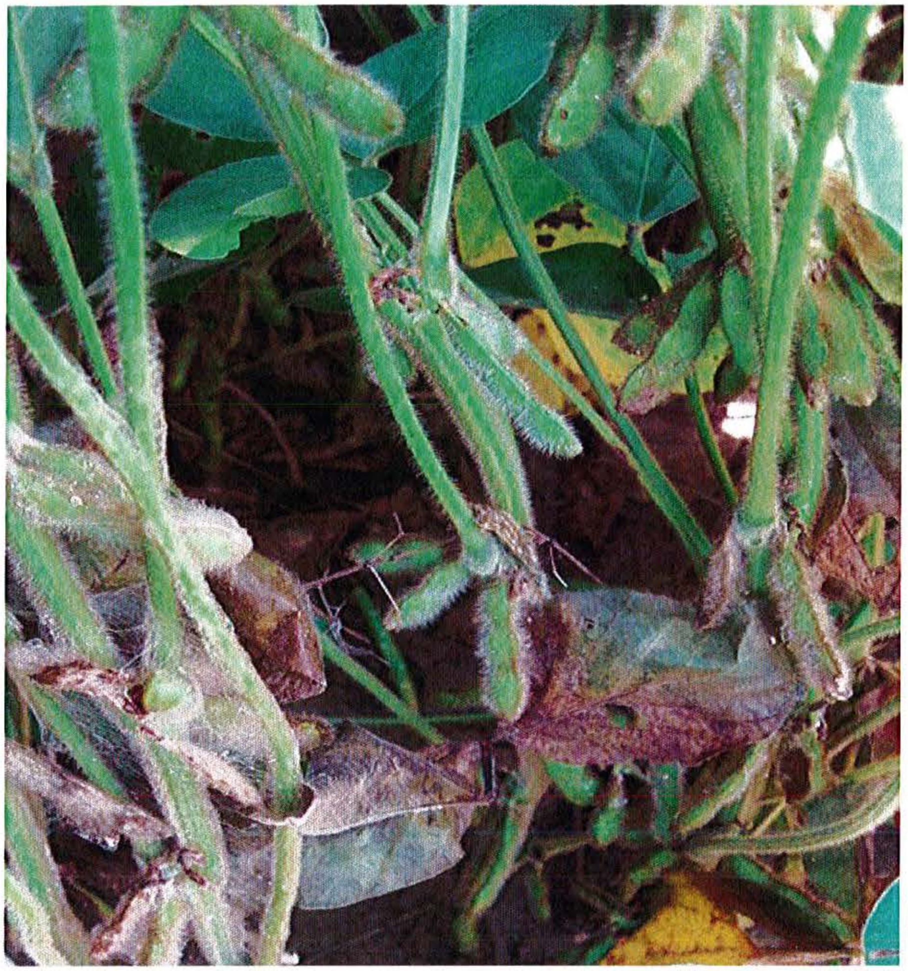

Proceedings of the Southern Soybean Disease Workers

MARCH 5TH TO 6TH, 2014

41ST ANNUAL MEETING OF SSDW

Southern Soybean Disease Workers

HILTON PENSACOLA BEACH GULF FRONT HOTEL

PROCEEDINGS OF THE SOUTHERN SOYBEAN DISEASE WORKERS

41ST ANNUAL MEETING

March 5th to 6th, 2014

Pensacola Beach, Florida

Southern Soybean Disease Workers

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

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41st SOUTHERN SOYBEAN DISEASE WORKERS PROGRAM

WEDNESDAY March 5th		**White Sands Room**
Time	Title	**Presenter**
11:30-1:00	Registration for SSDW	Outside White Sands Room
1:15-1:30	Introductions	Ed. Sikora - President SSDW
	Graduate Student Paper Competition	**Ed Sikora**, Moderator
1:30-1:45	Association of *Phomopsis longicolla* and *Macrophomina phaseolina* with zone lines in soybean roots at maturity	**M. L. Zaccaron**, J. C. Rupe, and R.T. Holland
1:45-2:00	A molecular phylogenetic redefinition of *Cercospora kikuchii*	**S. Albu,** P. Price, V. Doyle, and R. Schneider
2:00-2:15	The effects of salinity on Pythium rot of soybean	**T. J. Stetina**, C. S. Rothrock, and J. C. Rupe
2:15-2:30	Distribution of *Cercospora sojina* and sensitivity to QoI fungicides in Mississippi soybean fields	**J. Standish**, M. Tomaso-Peterson, T. W. Allen, S. Sabanadzovic, and N. Aboughanem
2:30-2:45	Effect of crop rotation, location and isolation temperature on *Pythium* spp. population composition in Arkansas	**K. E. Urrea,** J. C. Rupe, C. S. Rothrock, M. I. Chilvers, and J. A. Rojas
2:45-3:20	BREAK	

WEDNESDAY March 5th		White Sands Room
Time	Title	**Presenter**
3:20-3:40	Soybean cultivars and fungicide responses to frogeye leaf spot – ten years of field data	**H. M. Kelly**, W. J. Jordan, and M. Newman
3:40-4:00	Observations on soybean rust and soybean vein necrosis in Alabama, 2013.	**E. Sikora**, K. Conner, D. Delaney, L. Zhang, and M. Delaney
4:00-4:20	Importance of kudzu as a reservoir for soybean viruses: Preliminary data	**N. Aboughanem-Sabanadzovic,** W.F. Moore, T. Allen, A. Lawrence, and S. Sabanadzovic
4:20-4:40	Management of Cercospora leaf blight of soybean with foliar applications of iron	**F. C. Silva,** A. K. Chanda, T. Garcia Aroca, C. L. Robertson, E. Tubana, B. Ward, S. Albu, and R. W. Schneider
4:40-5:00	Late fungicide applications to manage frogeye leaf spot in the Mississippi soybean production system	**T. W. Allen**, T.H., Wilkerson, T. Irby, and B. R. Golden
5:00-6:00	Business meeting and bar Old business New Business	
Adjourn	Dinner on your own	

41st SOUTHERN SOYBEAN DISEASE WORKERS PROGRAM

	THURSDAY, March 6th	White Sands Room
7:30-8:30	**Breakfast**	**CORAL REEF ROOM**
8:00-8:30	Registration for SSDW	Outside White Sands Room
Time	Title	**Presenter**
8:30-8:50	Development and optimization of a weather-based disease advisory model for soybean	**H. L. Mehl** and P. M. Phipps
8:50-9:10	An encounter with target spot and its management with fungicides	**R. W. Schneider**, C. L. Robertson, E. Chagas Silva, and B. Ward
9:10-9:30	Cercospora leaf blight of soybean: Latent infection and symptom development	**A. K. Chanda**, Z.Y. Chen, E. C. da Silva, and R. W. Schneider.
9:30-9:50	Effect of long-term potassium fertilization rate on sudden death syndrome, Cercospora leaf blight and frogeye leaf spot of soybean.	**J.C. Rupe**, N.A. Slaton, R.T. Holland,, A.J. Steger, R. Delong, and M. L. Zaccaron
9:50-10:20	Industry updates	
10:20-10:50	BREAK	
10:50-11:10	Sensitivity of *Meloidogyne incognita* and *Rotylenchulus reniformis* to fluopyram	**T. Faske** and K.Hurd
11:10-11:30	Reniform nematode influence on soybean production in Louisiana	**C. E. Overstreet**, E. C. McGawley, D. M. Xavier, and M. T. Kularathna
11:30-11:50	Rhizoctonias associated with soybean in the Southeast United States	**C. S. Rothrock**, S. A. Winters, and T. N. Spurlock
12:00-1:00	Lunch on your own	
1:00-3:00	SSDW subcommittee meetings	

pinwill - inclusion bodies

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SOUTHERN UNITED STATES SOYBEAN DISEASE LOSS ESTIMATE FOR 2013

Compiled by S. 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 (10), 1985 and 1986 (6), 1987 (7), 1988 to 1991 (9), 1992 to 1993 (12), 1994 to 1996 (8) have been published. A summary of the results from 1974 to 1994 for the Southern United States was published (11) in 1995, and soybean losses from disease for the top ten producing countries of 1994 was published in 1997 (13). 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 online in 2003 (14, 15). In 2005, a summary of disease losses for the US from 1996-2004 was published electronically (16) in 2006, a summary of 2003 to 2005 was published in the Journal of Nematology (17), a 2009 summary of losses from 1996-2007 (14), and a 2010 summary focusing on soybean rust was published on line in Plant Health Progress (4, 18). The 2012 disease loss estimates were published in the SSDW proceeding in 2013 (1).

The loss estimates for 2013 published here were solicited from: Edward Sikora in Alabama, Travis Faske in Arkansas, Nathan Kleczewski in Delaware, Nicholas Dufualt in Florida, Bob Kemerait in Georgia, Don Hershman in Kentucky, Clayton Hollier and Boyd Padgett in Louisiana, Tom Allen in Mississippi, Steve Koenning in North Carolina, John Damicone in Oklahoma, John Mueller in South Carolina, Heather Young in Tennessee, Tom Isakeit in Texas, and Hillary Mehl in Virginia. Arv Grabaskas in Maryland has retired so I am using the Delaware estimate for Maryland also. 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, and questionnaires to Cooperative Extension staff, research plots, grower demonstrations, private crop consultant reports, foliar fungicide trials, sentinel plot data, and "pure guess". The production figures for each state were taken from the USDA/NASS website in mid-January of 2013. 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 2013 increased compared to that reported in 2012 (2). The 2013 average per acre soybean yield was 39 bushels averaged on a per state basis and the weighted average was 40 bushels for the region. In 2013, 775 million bushels were harvested from over 19 million acres in 16 Southern States. The 2013 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 2013 was 7.93 % or 93.5 million bushels in potential production.

Table 1. Soybean production in 16 Southern States in 2013.			
State	Acres (1,000's)	Bu/Acre	Yield in Bu (1,000's)
Alabama	435	43	18,275
Arkansas	3,280	43.5	140,505
Delaware	165	40	6,500
Florida	32	41	1,230
Georgia	230	40	9,000
Kentucky	1,650	49.5	81,180
Louisiana	1,120	48	53,280
Maryland	480	39	18,525
Mississippi	2,010	45	89,550
Missouri	5,600	35.5	197,025
North Carolina	1,460	33	46,860
Oklahoma	345,000	30	10,050
South Carolina	320	28	8,680
Tennessee	1,560	46	69,920
Texas	105	25	2,375
Virginia	600	38	22,420
Total	19,382		775,375
	Avg.	39	
	Wt Avg	40	

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

Disease	AL	AR	DE	FL	GA	KY	LA	MD	MS	MO	NC	OK	SC	TN	TX	VA	Avg.
Anthracnose	0.50	0.60	0.00	0.25	0.01	0.02	<1	0.00	Tr	0.00	0.10	0.10	0.05	0.50	0.00	0.20	0.17
Bacterial diseases	0.00	0.01	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.10	0.03	0.00	0.00	0.01	0.05
Brown leaf spot	0.00	0.01	0.05	0.00	Tr	0.20	0.00	0.05	0.10	0.00	0.10	0.20	0.10	1.50	0.00	0.10	0.16
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	0.50	0.03
Charcoal rot	0.00	2.50	0.00	0.25	0.00	0.01	1.00	0.00	1.00	0.00	0.03	2.00	Tr	2.00	0.10	0.01	0.59
Diaporthe/Phomopsis	0.50	0.01	0.00	0.25	0.50	1.00	<1	0.00	0.00	0.00	0.50	0.20	0.05	1.00	0.00	0.01	0.27
Downy mildew	0.00	0.01	0.01	0.20	0.00	0.00	0.00	0.01	0.00	0.00	0.00	Tr	0.03	0.01	0.00	0.01	0.02
Frogeye	0.50	0.10	5.00	1.00	0.00	0.50	1.50	5.00	3.00	1.00	0.50	0.10	0.05	3.00	0.00	2.00	1.45
Fusarium wilt and rot	0.00	0.00	0.10	0.25	0.00	0.01	0.00	0.10	Tr	2.00	0.00	0.00	Tr	0.00	0.00	0.00	0.18
Other diseases b	0.00	0.05	0.00	0.00	Tr	0.00	0.00	0.00	1.00	0.00	0.20	Tr	0.04	0.00	0.10	1.10	0.18
Phytophthora rot	0.00	0.01	0.00	0.00	0.00	0.20	0.00	0.00	Tr	1.00	0.50	Tr	0.05	0.00	0.00	0.00	0.13
Pod & stem blight	Tr	0.05	0.00	0.00	0.50	1.00	<1	0.00	Tr	1.00	0.80	0.20	Tr	0.00	0.00	0.20	0.31
Purple seed stain	0.50	0.01	0.00	0.00	Tr	0.01	2.00	0.00	Tr	0.00	0.10	0.20	0.05	0.10	0.10	0.10	0.23
Soybean cyst nematode	0.25	0.90	2.00	0.00	Tr	3.00	0.00	2.00	1.50	6.00	2.00	2.00	1.00	2.50	0.00	3.00	1.74
Root-knot nematode	0.25	2.70	2.00	0.00	2.00	0.00	1.00	2.00	1.00	1.00	0.80	0.20	2.00	0.01	0.00	1.00	1.00
Other nematodes c	0.25	0.00	0.00	0.00	0.50	0.00	1.00	0.00	0.50	0.00	0.50	Tr	2.50	0.01	0.00	0.00	0.35
Rhizoctonia aerial blight	Tr	0.10	0.00	1.00	0.00	0.00	0.50	0.00	TR	0.00	Tr	0.00	Tr	0.00	0.00	0.00	0.13
Sclerotinia	0.00	0.00	0.01	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	0.00
Seedling diseases	1.00	0.03	0.03	0.25	Tr	0.50	0.00	0.03	Tr	0.00	0.06	0.50	0.10	2.00	0.00	0.10	0.33
Southern blight	Tr	0.02	0.02	0.00	0.20	0.00	0.00	0.02	0.02	0.00	0.01	Tr	0.10	0.01	0.00	0.00	0.03
Soybean rust	2.50	0.01	0.00	3.00	0.50	0.00	<1	0.00	0.02	0.00	0.05	0.00	0.05	0.50	0.00	0.00	0.44
Stem Canker	0.00	0.00	0.00	0.25	0.00	0.20	<1	0.00	0.50	0.00	0.00	Tr	0.00	0.10	0.00	0.10	0.08
Sudden death syndrome	0.25	2.00	0.01	0.00	0.00	1.00	<1	0.01	0.02	2.00	0.01	Tr	0.00	1.00	0.00	0.01	0.45

Virus d	0.50	0.00	0.50	0.00	0.00	0.01	0.00	0.50	1.00	0.00	0.20	Tr	0.05	0.00	0.00	0.00	0.18
Total disease %	7.00	9.12	9.72	7.20	4.21	7.66	7.00	9.72	9.66	14.00	6.56	5.80	6.24	14.24	0.30	8.45	7.93

a Rounding errors present. Tr indicates Trace.

b Other diseases listed were: Cylindrocladium parasiticum, Cercospora blight ; black root rot and Neocomospora .

c Other nematodes listed were: stubby root, sting, Columbia lance, and reniform.

d Viruses were identified as: SVNV, SMV, BPMV , PMV.

Table 3. Estimated suppression of soybean yield (Millions of Bushels) as a result of disease during 2013

Disease	AL	AR	DE	FL	GA	KY	LA	MD	MS	MO	NC	OK	SC	TN	TX	VA	TOTAL
Anthracnose	0.10	1.01	0.00	0.00	0.00	0.02	0.30	0.00	0.00	0.00	0.05	0.01	0.00	0.37	0.00	0.05	1.91
Bacterial diseases	0.00	0.02	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.01	0.00	0.00	0.00	0.00	0.09
Brown leaf spot	0.00	0.02	0.00	0.00	0.00	0.18	0.00	0.01	0.10	0.00	0.05	0.02	0.01	1.12	0.00	0.02	1.53
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	0.12	0.12
Charcoal rot	0.00	4.19	0.00	0.00	0.00	0.01	0.59	0.00	0.99	0.00	0.01	0.21	0.00	1.49	0.00	0.00	7.51
Diaporthe/Phomopsis	0.10	0.02	0.00	0.00	0.05	0.88	0.30	0.00	0.00	0.00	0.25	0.02	0.00	0.75	0.00	0.00	2.36
Downy mildew	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.02
Frogeye	0.10	1.68	0.36	0.01	0.00	0.44	0.89	1.03	2.97	2.29	0.25	0.01	0.00	2.24	0.00	0.49	12.76
Fusarium wilt and rot	0.00	0.17	0.01	0.00	0.00	0.01	0.00	0.02	0.00	4.58	0.00	0.00	0.00	0.00	0.00	0.00	4.79
Other diseases	0.00	0.00	0.00	0.00	0.00	0.00	0.59	0.00	0.99	0.00	0.10	0.00	0.00	0.00	0.00	0.27	1.96
Phytophthora rot	0.00	0.08	0.00	0.00	0.00	0.18	0.00	0.00	0.00	2.29	0.25	0.00	0.00	0.00	0.00	0.00	2.80
Pod & stem blight	0.00	0.02	0.00	0.00	0.05	0.88	0.30	0.00	0.00	2.29	0.40	0.02	0.00	0.00	0.00	0.05	4.00
Purple seed stain	0.10	0.08	0.00	0.00	0.00	0.01	1.18	0.00	0.00	0.00	0.05	0.02	0.00	0.07	0.00	0.02	1.55
Soybean cyst nematode	0.05	0.02	0.14	0.00	0.00	2.64	0.00	0.41	1.49	13.75	0.99	0.21	0.09	1.86	0.00	0.73	22.39
Root-knot nematode	0.05	1.51	0.14	0.00	0.19	0.00	0.59	0.41	0.99	2.29	0.40	0.02	0.18	0.01	0.00	0.24	7.03
Other nematodes	0.05	4.52	0.00	0.00	0.05	0.00	0.59	0.00	0.50	0.00	0.25	0.00	0.23	0.01	0.00	0.00	6.19
Rhizoctonia aerial blight	0.00	0.00	0.00	0.01	0.00	0.00	0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.31
Sclerotinia	0.00	0.17	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	0.17
Seedling diseases	0.20	0.00	0.00	0.00	0.00	0.44	0.00	0.01	0.00	0.00	0.03	0.05	0.01	1.49	0.00	0.02	2.26

Southern blight	0.00	0.05	0.00	0.00	0.02	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.11
Soybean rust	0.49	0.03	0.00	0.04	0.05	0.00	0.30	0.00	0.02	0.00	0.02	0.00	0.00	0.37	0.00	0.00	1.32
Stem Canker	0.00	0.02	0.00	0.00	0.00	0.18	0.30	0.00	0.50	0.00	0.00	0.00	0.00	0.07	0.00	0.02	1.09
Sudden death syndrome	0.05	0.00	0.00	0.00	0.00	0.88	0.30	0.00	0.02	4.58	0.00	0.00	0.00	0.75	0.00	0.00	6.58
Virus	0.10	3.35	0.04	0.00	0.00	0.01	0.00	0.10	0.99	0.00	0.10	0.00	0.00	0.00	0.00	0.00	4.69
Total disease loss	1.38	16.94	0.70	0.10	0.40	6.73	5.92	1.99	9.58	32.07	3.26	0.62	0.57	10.62	0.01	2.07	93.54

Association of *Phomopsis longicolla* and *Macrophomina phaseolina* with zone lines in soybean roots at maturity

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Charcoal rot is an economically important soybean disease caused by *Macrophomina phaseolina*. During plant senescence *M. phaseolina* produces large numbers of melanized microsclerotia in stem and root tissues that serve as primary inoculum for future epidemics. The amount of microsclerotia in soybean tap rots and the extent of stem in which they are produced are used to rate charcoal rot disease severity. While splitting soybean plants for disease rating, zone lines were observed to restrict the presence of microsclerotia in root and stem tissues. Zone lines are often associated with wood decaying fungi that densely colonize a layer of three to five host cells with dark pigmented hyphae. In the growing season of 2012, a set of 18 cultivars of maturity groups (MG) II to V were grown at two locations, Rohwer and Stuttgart, AR. A second set of cultivars, 14 from MG IV and 12 from MG V, was grown in Marianna, AR. Only the cultivars Osage and DK4866 were present at all locations. Cultivars were planted in 6.1 m long four row plots, using a random complete block design with four replications. All plots were artificially infested at planting with 1.64 g $m^{-1}$of dried *M. phaseolina* colonized millet seeds. At maturity, ten plants per plot were collected and their tap roots split. Cultivar had a significant effect on the presence of zone lines at Stuttgart (*P* 0.002) and at Rohwer (P<0001), where incidence ranged from 0-49% and 5-72%, respectively, but not at Marianna (*P* 0.519) where incidence ranged from 38-87%. Incidence was significantly higher at Rohwer than at Stuttgart (P<.0001), but there was a significant interaction between location and cultivar (P<0.001). After evaluation of incidence, isolations were made from all tap roots with zone lines from one replication at each location. Tap roots were washed and surface disinfested for one minute in a solution of 0.5% sodium hypochlorite, air dried and stored at 4°C till isolation. Under aseptic conditions, a sterile knife was used to remove a 2-3 mm layer of root tissues atop the site to be dissected, than a scalpel and a dissecting scope were used to remove two small pieces, approximately 2-5 mm in diameter, from tissues 1) enclosed by the zone lines, 2) on the zone lines, and 3) outside the zone lines. *P. longicolla* was isolated at frequencies of 95.4%, 91.3% and 31.5%, while *M. phaseolinaonly* frequencies were 2.5%, 15.2%, and 50%, and other filamentous fungi were 1.9%, 7.1%, and 20.9%, from sites 1, 2, and 3, respectively (n=368). Over half of other filamentous fungi were *Fusarium* spp. The production of zone lines in senesced soybean tap roots seems to be common and affected by cultivar and location. Charcoal rot severity ratings in soybean are primarily based upon the amount and extent of colonization by *M. phaseolina* after senescence. Our results indicate that zone lines in soybean tap roots associated with *P. longicolla* seem to restrict colonization by *M. phaseolina*, which could be a confounding variable when screening for charcoal rot resistance, especially since zone lines incidence seems to be affected by cultivar and location.

A Molecular Phylogenetic Redefinition of *Cercospora kikuchii*

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Cercospora kikuchii is considered to be the causal agent of Cercospora leaf blight (CLB) and purple seed stain (PSS), two economically important diseases of soybean (*Glycine max*) in the Gulf South. Identification of *C. kikuchii* is predominantly based upon host association, cercosporin production and conidial morphology. However, these characters are unreliable for differentiating closely related species. Cercosporin production is variable among isolates, and it can be difficult to induce sporulation *in vitro*. Furthermore, recent molecular phylogenetic studies have shown that multiple cryptic species of *Cercospora* are capable of infecting a single host species. Studies using microsatellites, RAPD-PCR fingerprinting and vegetative compatibility group pairings determined that there is genetic diversity among cercosporoid fungi isolated form infected soybean seeds and leaves. Therefore, the etiology of CLB and PSS remains in question. In this study, we used a 5-gene multilocus phylogenetic approach to determine if fungal isolates responsible for CLB and PSS are monophyletic. We also addressed the phylogenetic utility of actin (ACT), calmodulin (CAL), elongation factor 1 alpha (EF1α), histone (H3), and the internal transcribed spacer (ITS) region for evaluating intraspecific relationships among taxa. We collected isolates of *C. kikuchii* from symptomatic soybean seeds and leaves in 27 parishes throughout Louisiana during 2000, 2011 and 2012 and included two isolates from Arkansas. Multiple haplotypes were observed at each of the five loci tested, although individual markers varied in their resolving power. There was insufficient phylogenetic signal at ITS to resolve specific or subspecific lineages within the genus *Cercospora*. ACT, CAL, EF1α and H3 provided higher resolution than ITS, and *C. kikuchii* was paraphyletic in all independent gene trees. However, node support values were generally low across all topologies indicating the need to develop better phylogenetic markers for *Cercospora*. These results suggest that *C. kikuchii* is not the organism responsible for causing CLB and PSS in Louisiana. We need to expand geographic sampling in North America and elsewhere to determine the true identity of the causal agent of CLB and PSS in other soybean producing regions. Implications of these findings will be discussed.

The effects of salinity on Pythium rot of soybean

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Increasing salinity is an important factor limiting agricultural productivity worldwide. In addition to direct effects on plant growth and yield, plants grown under saline conditions may become more susceptible to biotic and other environmental stresses. Chloride accumulation is the most important factor in determining soybean sensitivity to soil salinity. Salt-tolerant soybean cultivars restrict chloride accumulation to the root system and are called "excluders," while salt sensitive soybean cultivars distribute chloride throughout the plant and are called "includers." This study characterized the effects of soil salinity on Pythium rot of soybean seedlings using cultivars which differ in chloride tolerance. Plants were grown from seed for 21 days in controlled environments at temperatures consistent with soybean planting in Arkansas; 25°C light/18°C dark with a 12-hour photoperiod. Soil was treated with a calcium chloride solution to create electrical conductivity (EC) levels ranging from 0.6 to 2.6 dS/m using the dilution soil extract method with a soil:water (v:v) ratio of 1:2. Soil was either not infested or infested with *Pythium sylvaticum*, *P. aphanidermatum* (pathogenic to soybean), or *P. oligandrum* (not pathogenic to soybean). Salinity reduced seedling stand at or above 2.0 dS/m. Leaf number, shoot weight and root altitude decreased at or above 2.0 dS/m. Root volume and root tips decreased at 2.6 dS/m (Exp 2) but not at lower EC levels. Reductions in shoot growth were generally additive with increasing salinity and the presence of a pathogen. Shoot growth decreased with *P. aphanidermatum* and *P. sylvaticum* at moderate salinity compared to the control. Increased disease under saline conditions was not observed for root development, which was less sensitive to salinity in general. There was a hormetic effect for root volume in the presence of virulent *Pythium* spp. at the base EC levels. In addition, there was evidence that *P. oligandrum* may have had a protective effect on root altitude and number of root tips at 2.1 dS/m. Cultivars responded similarly across treatments, suggesting that genotype may be an unreliable indicator of chloride tolerance at emergence. Both includers and excluders may be more susceptible to Pythium rots under moderately saline conditions. Additional experiments on *Pythium* growth, oospore germination, and zoospore production and motility suggest that changes in growth or development were not due to salinity effects on the pathogen.

Distribution of *Cercospora sojina* and sensitivity to QoI fungicides in Mississippi soybean fields.

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Frogeye leaf spot (FLS) is a disease affecting soybean caused by the fungus *Cercospora sojina*. This pathogen causes circular to angular lesions to develop primarily on foliage. Mature lesions may expand and coalesce to form larger, irregular spots. When lesions cover 30% or more of the leaf surface, blighting occurs, leading to potential yield loss. Quinone outside inhibitor (QoI) fungicides are often used to control FLS, but according to the fungicide resistance action committee, resistance to this class of fungicides has been identified in various phytopathogens. The objectives of this study were to survey Mississippi soybean fields for FLS symptoms, isolate *C. sojina*, and evaluate isolates for resistance to the QoI fungicide azoxystrobin. A survey of Mississippi soybean production fields occurred during the 2013 growing season resulting in the identification of over 100 fields symptomatic for FLS located in 49 soybean producing counties. Greater than 100 mono-conidial isolates of *C. sojina* were collected as a result of the survey. *C. sojina* isolates and a sensitive baseline were cultured on soybean stem-lima bean agar (SSLBA) to promote sporulation for *in vitro* bioassays. Conidial suspensions were distributed onto the surface of potato dextrose agar (PDA) plates amended with various rates of azoxystrobin, plus Salicylhydroxamic acid (SHAM) to prevent an alternative oxidative pathway. Following incubation, the percentage of conidial germination was determined for 50 conidia per replicate, per isolate and repeated to determine relative sensitivity to azoxystrobin. Results indicate an apparent shift towards insensitivity among *C. sojina* isolates from Mississippi soybean fields in response to azoxystrobin-amended media used for *in vitro* bioassays.

Effect of crop rotation, location and isolation temperature on *Pythium* spp. population composition in Arkansas

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Pythium spp. are an important group of pathogens associated with stand losses in soybean and rice. Soybean and rice is a common rotation in Arkansas. The objectives of this study were i) determine the effect of soybean-soybean and soybean-rice rotation on *Pythium* spp. diversity in three locations in Arkansas and, ii) determine influence of baiting temperature conditions on recovery of *Pythium* spp. Soils from a soybean-rice and a soybean-soybean rotation were collected from three locations in 2012, placed in cups, wetted to saturation, planted with ten seeds of the soybean cultivar Hutcheson, and incubated at 20°C or 30°C. After three days, seeds were collected and washed in running water and placed on the selective medium CMA-PARP+B. Hyphal tips were transferred to a fresh selective medium. DNA was extracted, the ITS region sequenced, and Blast analysis to a curated reference database was done. A total of 275 isolates were identified representing 25 species. The most frequently recovered species were *P. irregulare, P. paroecandrum*, *P. sylvaticum*, *P. coloratum* and *P. spinosum*. In both continuous soybean, production and rice-soybean production *P. irregulare* was the most prevalent species isolated. In Pine Tree and Stuttgart, *P. irregulare* and *P. paroecandrum* were the most isolated species, while in Kaiser, *P. coloratum* and *P. sylvaticum* were the most isolated species. In the soybean-soybean rotation. At 30°C, *P. torulosum*, *P. aff. dissotocum*, and *P. oopapilumm* were isolated but not at 20°C. *P. irregulare, P. pareocandrum*, and *P. sylvaticum* were isolated at almost the same frequency from both temperatures. Overall, location was the main factor influencing *Pythium* spp. diversity in Arkansas in this study. Diversity of *Pythium* spp. may vary between crop rotations and baiting temperature

Soybean Cultivars and Fungicide Responses to Frogeye Leaf Spot – Ten Years of Field Data

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Frogeye leaf spot (FLS) caused by *Cercospora sojina* Hara is a common foliar pathogen of soybean in the southern United States and regularly present in parts of the Midwestern United States. Infection due to this disease can lead to dramatic loses of photosynthetic area on green leaves, premature loss of leaves, and can lead to compromised stems, pods, and seeds. Yield losses ranging from 20-40% are not uncommon in years where weather conditions are favorable for fungal growth and cultivars lack genetic resistance. Producers, in areas where FLS has historically caused yield losses, have attempted to combat the disease with cultivar selection and a foliar fungicide spray regime. To screen cultivars for FLS resistance yearly cultivar trials were conducted in Milan, TN from 2003 – 2013 in a continuous no-till. Cultivars were arranged in a randomized split-plot design, with cultivars as the main plot and fungicide application at growth stage R3 as sub plots with 4 replications. Cultivars tested included maturity group (MG) III, MG IV, and MG V. The severity of FLS and yield on treated and nontreated plots were recorded to determine FLS effect on cultivar and the effect of fungicide application on FLS severity and yield of each cultivar. Results based on this research continue to support that some of the most useful techniques for producers to manage FLS and increase yield are to use cultivar selection coupled with an appropriate fungicide regime. Further classification of cultivars into low, moderate, and highly susceptible categories may better guide fungicide decisions based on the results of these trials.

Observations on Soybean Rust and Soybean Vein Necrosis Virus in Alabama in 2013

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Soybean rust (SBR) survived through the winter of 2012-2013 on kudzu in at least five counties in Alabama. The pathogen quickly spread northward within the state during the soybean growing season because of a relatively cool, wet spring and early summer. SBR appeared to move about 3-4 weeks faster in 2013 compared to 2012 based on observations from soybean sentinel plots and commercial fields. The disease was found throughout central Alabama in late July and North Alabama, near the Tennessee border, by the first week of August. SBR was eventually found in all 67 counties in the state.

Losses from SBR in commercial soybeans fields were observed in North Alabama for the first time in 2013, whereas damage from the disease in previous years was usually restricted to southern portions of the state. Yield losses up to 40% were estimated in some unprotected or poorly protected fields. We suspect losses would have been greater if not for increased fungicide use in North Alabama due to early warnings provided by the SBR monitoring program coupled with a late season drought that slowed progress of the disease.

The combination of rapid disease spread early in the season and environmental conditions that resulted in over 60% of soybean acreage planted after June 15th meant that a high percentage of soybeans were exposed to the disease at an earlier stage of crop development. End-of-year estimates suggest that SBR reduced yields by 2.5% statewide. In response to alerts provided by the SBR monitoring program, many growers in North Alabama applied fungicides for the first time resulting in an estimated 20% increase in the number of fungicide-treated soybean acres in the state. The monitoring program saved the Alabama soybean industry an estimated $2.5 million in 2013 by providing early season warnings concerning SBR spread allowing for timely fungicide applications to prevent yield loss from the disease.

Soybean vein necrosis virus (SVNV) was first identified in Alabama during 2012 in Limestone County in North Alabama. In response to its discovery a survey was conducted in 2013 to determine the distribution of the disease within the state. Sampling was conducted in September from 15 locations across 10 counties. Approximately 50leaveswere collected from each site and screened for SVNV, *Soybean mosaic virus* (SMV) and *Bean pod mottle virus* (BPMV) using ELISA. SVNV was detected in 14 new counties with the majority found in North Alabama where the survey was focused. The virus was also detected at low levels in a few counties from central Alabama. Incidence of SVNV within a field ranged from 0-56%, while incidence of SMV and BPMV did not occur at levels above 4% in any field surveyed.

Importance of kudzu as a reservoir for soybean viruses: preliminary data

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Virus-like symptoms, consisting of mosaic, ringspots, vein feathering, necrosis and leaf deformation, were observed on several kudzu patches during a survey carried out in summer/fall of 2013 in Mississippi. Laboratory analyses showed the presence of two viruses in tested samples.

The first virus, *Tobacco ring spot virus* (TRSV), was originally isolated from a sample collected in Kemper Co and partially characterized by mechanical transmission to two soybean varieties, virion purification, cloning and sequencing. Kudzu isolate of TRSV from Mississippi shared 91-96% and 98-99% common nucleotides and amino acids with sequences of this virus currently available in NCBI/GenBank. Another 11 kudzu samples, collected from 8 different counties in Mississippi, resulted infected by TRSV.

The second virus, isolated from a symptomatic kudzu patch from Choctaw Co, is apparently a new virus in the genus *Potyvirus* (fam. *Potyviridae*) and related to *Soybean mosaic virus* (SMV). During the characterization, this virus was mechanically transmitted to other plants, including soybean where it induces mosaic symptoms. In addition to the original source the virus was found in several other kudzu patches in Mississippi.

The results of our investigation suggest that kudzu could serve as a major source for known and yet-to-be-discovered viruses capable of infecting soybeans. This research is ongoing.

Management of Cercospora Leaf Blight of Soybean with Foliar Applications of Iron

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Since 2005, the Louisiana State University Agricultural Center has reported an increase of Cercospora leaf blight (CLB) severity in soybean, a devastating disease caused by *Cercospora kikuchii*. Losses in Louisiana have ranged from 20% to complete crop failure. In addition, all soybean varieties planted were found to be susceptible to CLB, and fungicide resistance was reported. Since current genetic and chemical management are no longer sufficient to control the disease, foliar applications of micronutrients offered a possible alternative method to be tested. Previous work evaluated foliar applications of reagent grade micronutrients and showed that iron repeatedly suppressed CLB severity. The objective of this work was to test commercial formulations of Fe for their effects on leaf colonization by *C. kikuchii,* symptom development (blight and purple leaves), and yield. Field experiments were conducted using cultivar Pioneer 95Y61. Plants were treated with two commercial formulations of Fe, Manni-Plex Fe and Fe EDTA (Brandt Consolidated Inc., Springfield, IL). Four rates of each formulation were applied with a boom sprayer at the R3 and R5 growth stages. Leaf tissue analyses for microelements and qPCR testing for the pathogen were performed to verify Fe uptake and fungal leaf colonization, respectively. Disease severity was assessed quantitatively for leaf blight and purple symptoms, and yield data were collected. Results showed there was no correlation between leaf colonization by the pathogen and severity of either purple leaves or blight. In addition, Fe concentrations in leaves did not affect either biomass of *C. kikuchii* or severity of purple leaf symptoms. However, Fe concentrations above 280 ppm completely suppressed blight symptoms. These results suggest Fe is not involved with growth and development of *C. kikuchii*, but it may reduce fungal virulence. Results also showed a lack of correlation between purple leaf and blight symptoms. Yield data as well as its correlation with other variables will be discussed.

Late Fungicide Applications to Manage Frogeye Leaf Spot in the Mississippi Soybean Production System

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Frogeye leaf spot (*Cercospora sojina*) (FLS) can be a yield-limiting disease in the Mississippi soybean production system. In the past, tolerant soybean varieties as well as fungicides have been important FLS management tools. Historically, strobilurin-based (QoI) fungicide management programs have effectively managed FLS in Mississippi. During the early 2000s, fungicide trials were conducted throughout the MS Delta at 10 locations over a period of several years to determine the benefit of a timed (R3/R4 or R5/R6) fungicide application on yield and FLS management. Visual assessments were conducted post-application using a 0-9 scale where 0=no disease and 9=severe disease characterized by 90% of the leaf surface covered in lesions. Over the three-year period, azoxystrobin reduced FLS severity by 55.6% compared to the nontreated when azoxystrobin was applied at the R3/R4 timing and 32.6% when azoxystrobin was applied at R5/R6. Yield, when compared between azoxystrobin and nontreated plots, was 76% and 6.2% greater for the R3/R4 and R5/R6 timings, respectively. However, with the observation of azoxystrobin-resistant FLS in two MS counties in 2012, fungicide trials were conducted during the 2013 season to determine product efficacy. During 2013, 10 fungicide trials were conducted with azoxystrobin and products from numerous additional fungicide classes to determine their efficacy on FLS using a popular frogeye-susceptible soybean variety, Armor DK 4744. Applications were made at either R5 (9 trials) or R5.5 (1 trial). Similar to the previous research trials, plots were rated for FLS severity 2-4 weeks post-application using a 0-9 scale. Averaged over all trials two weeks post-application, azoxystrobin resulted in a 9% reduction in the severity of FLS compared to the nontreated. In addition, azoxystrobin resulted in a minimal, 4% yield loss reduction compared to the nontreated suggesting that azoxystrobin is losing efficacy against *C. sojina*. In the 2013 fungicide trials, yield losses were greatly reduced as a result of FLS when applications consisted of stand-alone triazole products as well as strobilurin + triazole, strobilurin + SDHI, and tank mix combinations of a strobilurin + triazole. Three main trials highlighted the late effects of a fungicide application on observable FLS. One trial was conducted in Starkville, MS at R5, while the other two were conducted in Stoneville: one at R5.5 and the other at R5 in a soybean following wheat situation. In the late application trial (R5.5), the greatest reduction in FLS severity, 25%, was observed following an application of flutriafol (7 oz/a). However, the greatest reduction in yield loss, 12.7%, resulted following an application of azoxystrobin + propiconazole (14 oz/a) when compared with the nontreated. Results from the trials conducted at R5 were similar; however, marked differences in the fungicide producing the greatest yield advantage as well as reducing the observable severity of FLS differed by location. In the trial conducted in Starkville, azoxystrobin (4 oz/a) + tetraconazole (3 oz/a) reduced the observable FLS symptoms 19 days post application by 33.3%. However, a 19.3% yield advantage resulted from an application of azoxystrobin + difenoconazole (8 oz/a) compared to the nontreated. In the double-crop situation, two weeks post-application the greatest reduction in observable FLS resulted in the flutriafol (7 oz/a) treated plots compared to the nontreated. The yield benefit, 3.7%, was greatest in the plots that received chlorothalonil + tebuconazole (1 pt/a) compared to the nontreated plots.

Development and Optimization of a Weather-based Disease Advisory for Soybean

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Soybean consistently ranks as one of the top crops in Virginia both in acreage and value. In 2013, soybean was harvested from approximately 590,000 acres and was valued at over $290 million. As the market value of soybean has strengthened, managing the crop to maximize yields has become increasingly profitable. Yield responses of soybean following foliar fungicide applications are inconsistent, but even small increases in yield provide a significant economic return. Currently it is estimated that fungicide applications in soybean result in a positive yield response 1/3 of the time; when yield responses do occur, they both pay for themselves and the 2/3 of the time that fungicide applications fail to improve yields. However, increasing the frequency with which fungicide applications improve yield, either through optimized timing or forgoing applications when risk of yield loss to disease is low, will increase the overall profitability and decrease environmental impacts of fungicides in soybean production. Currently, timing of fungicide sprays in soybean is based on growth stage (typically R3, beginning pod), but growth stage does not always coincide with periods conducive to crop infection by foliar pathogens. Weather-based advisories have the potential to both reduce total fungicide inputs and increase the efficacy of fungicides when they are applied.

Research conducted since 2006 has identified diseases most likely to reduce soybean yields in Virginia and weather-related parameters conducive to disease development. Parameters currently being tested as favorable for leaf infection and disease development are daily average temperatures between 65 and 78 °F and 10 or more hours per day of 95% or greater relative humidity (RH). A weather station at the Tidewater Agricultural Research and Extension Center (AREC) in Suffolk, VA collects hourly data, and if environmental parameters fall within these ranges in a 24 hour period, it is recorded as a "favorable day" for disease development. Data from trials conducted at the Tidewater AREC from 2006-2013 indicate the number of favorable days for disease development between soybean growth stages R3 and R6 are predictive of whether or not a fungicide application will increase yield. In years with greater than 15 favorable days during the period corresponding to pod filling, the average yield increase with a single fungicide application was 4 bu/A (a value of $50/A at current market price) and the maximum yield increase was 8 bu/A ($100/A value). The extent to which fungicide applications reduce foliar disease incidence and decrease premature defoliation is also influenced by environmental conditions. Trials using these parameters to determine timing of fungicide sprays have been conducted at the Tidewater AREC since 2011. Before the advisory model can be deployed for use by extension agents and growers, the model needs to be validated and further optimized for a range of environmental conditions and cropping systems.

An Encounter with Target Spot and its Management with Fungicides

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We have been evaluating fungicides for management of Cercospora leaf blight (CLB) and rust for several years. These were usually large field trials with four replications and multiple rates and times of application for several fungicides, and individual plots were large enough to get meaningful yield data. In addition, our 2013 trials included numerous minor element treatments in order to confirm previous work on the effects of certain minor elements on CLB. We thought that we had accounted for all the variables until Mother Nature dealt us a strange poker hand with no opportunity for a draw. The wild card was target spot, caused in soybean by *Corynespora cassiicola* (Berk. & Curt.). This disease has been considered to be of minor importance, more of a curiosity than a cause for concern. Koenning, et al. (2006) reported an increase in occurrence of this disease in 2005 in several southeastern states, and they documented yield losses of 20-40%. They speculated that this large increase in incidence of target spot may be related to changes in weather patterns, changes in pathogen virulence, or the introduction of more susceptible host genotypes. We had an unusually cool and wet spring in south Louisiana in 2013.

Our fungicide test was planted on 22 April 2013 with the variety Progeny RR 4710. We observed the usual low incidence of what we thought was brown spot (*Septoria glycines*) within 10 days of planting. But this disease usually subsides and remains at relatively low levels as plants develop through the vegetative stages. However, in this case symptoms persisted, and leaves with very few spots fell from plants to the extent that only the youngest leaves remained on the plants beginning at R1. We observed similar disease development in variety trials at three locations in Louisiana, although disease severity was not as high in these tests, which were planted later.

We continued with our fungicide evaluations, and we are now able to report on fungicide efficacy for management of target spot. The primary effect of this disease was to cause leaves to drop from plants at relatively low disease severities, and the primary determinant of yield as affected by the fungicide treatments was leaf retention before mid R6. In other words, even minor defoliation caused by target spot as assessed during R5 had a pronounced effect on yield. This disease needs to be monitored because it has the potential to become highly destructive.

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Cercospora Leaf Blight of Soybean: Latent Infection and Symptom Development

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Cercospora kikuchii is the causal agent of Cercospora leaf blight (CLB) and purple seed stain (PSS) diseases of soybean. CLB can cause yield losses of 15-20% and complete crop failures in severe cases, whereas PSS diminishes seed quality and vigor. CLB has emerged as one of the major constraints to soybean production in the southern United States during the past decade. Symptoms of CLB include bronzing of uppermost leaves, development of lesions on petioles, stems, and necrosis. One interesting component of CLB is that symptoms appear beginning at the pod filling stage (R5) until maturity, and this would be very late in the growing season to implement effective disease management practices to minimize yield loss. Results from our fungicide evaluations during the past few years in which materials were applied at R3 or R5 were not satisfactory, and most commercial soybean varieties are susceptible to CLB. We developed a highly specific and sensitive TaqMan probe-based real-time quantitative PCR (qPCR) assay to detect *C. kikuchii* in naturally infected soybean leaves. *Cercospora kikuchii* was consistently detected in all soybean leaves collected from vegetative and reproduction stages indicating a very long latent infection period for this pathogen before the appearance of visible symptoms. We also used this qPCR assay to evaluate the efficacy of fungicides commonly used for managing late season soybean diseases by quantifying biomass of *C. kikuchii* in leaves collected during various growth stages. Our results showed that multiple fungicide applications beginning at flowering (R1) suppressed the development of *C. kikuchii* in leaves and delayed symptom expression. Furthermore, different fungicide chemistries had differential effects on the amount of latent infection and symptom expression during late reproductive growth stages. Currently we are evaluating the relationship between biomass of *C. kikuchii* and severity of CLB symptoms.

Effect of Long-term Potassium Fertilization Rate on Sudden Death Syndrome, Cercospora Leaf Blight and Frogeye Leaf Spot of Soybean.

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A common fertility problem in soybean/rice rotations in Arkansas is potassium deficiency. Low levels of soil potassium can not only lead to reduced yields, but can affect the plants response to disease. A long-term potassium fertilization study was established in two adjacent fields at the Pine Tree Station, Colt, AR, on a Calhoun silt loam in 2000. Each year, potassium was applied at 0, 40, 80, 120 or 160 lb/a to the same plots in each field. The test has been no-till since 2007. The treatments were arranged in a split plot design with K fertility as the main plot and cultivar was the subplot. There were eight replications. In 2012 and 2013, foliar disease ratings for sudden death syndrome (SDS), Cercospora leaf blight (CLB), and frogeye leaf spot (FLS) were made at R6 on the two soybean cultivars in the test, Armor 48-R40 and Armor 53-R15. Each disease had distinctive foliar symptoms and was rated as the percent of leaf area affected by each disease. Soil and leaf levels of K were also measured and yield was taken at the end of each year. In 2012, there were significant effects for cultivar (P=0.0025) and fertility (P=0.07) for SDS, fertility X cultivar (P=0.0282) for CLB, and cultivar (P<0.0001) for FLS. In 2013, there were significant effects for fertility X cultivar (P=0.0738) for SDS, fertility X cultivar (P<0.0001) for CLB, and cultivar (P<0.0001) for FLS. With SDS in 2012, disease increased with increasing K treatments ranging from 0.8% at 0 K to 16.4% at 160 K. SDS was significantly greater in Armor48-R40 than in Armor 53-R15 (11.3 and 4.4%, respectively). In 2013, SDS in Armor 53-R15 was significantly lower at 0 K (1.3%) than the other treatments and was highest at the 160 K (9.2%). While SDS in Armor 48-R40 was lowest at 0 K (3.9%) and greatest at 120 K (6.8%), this difference was not statistically significant. CLB in 2012 was significantly lower at 160 K (8.6%) than 0 K (22.8%) with Armor 53-R40. With Armor 48-R40, CLB was 0.6% at 160 K and 3.1% at 0 K, but this difference was not statistically significant. In 2013, CLB did not develop on Armor 48-R40, but with Armor 53-R15 was significantly higher at 0 K than 160 K (18.6% and 0.5%, respectively). In both years, FSL was significantly greater on Armor 48-R40 than Armor 53-R15, but was not affected by K treatment. In both years soil fertility levels increased significantly (P<0.0001) with increasing rates of K (64 to 91ppm and 64 to 81ppm for 0 K and 160 K in 2012 and 2013, respectively). Leaf K increased significantly both years (P<0.0001) from 1.18 % to 2.10% in 2012 and 1.09% to 2.21 % in 2013 for 0 K and 160 K, respectively. Yields were significantly lower for 0 K (60 and 53 bu/a in 2012 and 2013, respectively) than the other treatments which ranged from 64 to 66 bu/a and 70 to 73 bu/a in 2012 and 2013, respectively. In this study each disease had a unique response to K fertility. SDS, a disease associated with high yield environments, increased as K fertility increased while CLB decreased with increased fertility. FLS was not affected by K fertility. Understanding the impact of K fertility on specific disease may be important in developing effective management strategies and in understanding disease distribution within and between fields.

Sensitivity of *Meloidogyne incognita* and *Rotylenchulus reniformis* to fluopyram

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Fluopyram is an SDHI fungicide that is being evaluated as a seed and in-furrow treatment to manage soilborne fungal diseases and suppress plant-parasitic nematodes on row crops. *Meloidogyne incognita* (root-knot nematode) and *Rotylenchulus reniformis* (reniform nematode) are important nematodes species that affect soybean production across the southern U.S. Currently, there is no available LD_{50} values, data on nematode recovery, or effects of sub-lethal concentrations of fluopyram on nematode infection for *M. incognita* or *R. reniformis*. Three separate experiments were conducted to evaluate the response of both nematode species to fluopyram. Only 24-hr-old J2 of *M. incognita* or 48-hr-old mixed-life stages of *R. reniformis* were used in these experiments. Paralysis was observed after 2 hr of continuous exposure at 1.0 µg/ml fluopyram for both nematode species. Based on an assay of nematode motility, LD_{50} values of 5.19µg/ml and 12.99µg/ml fluopyram were calculated after 2 hr of exposure for *M. incognita* and *R. reniformis*, respectively. Recovery of nematode motility was observed for both nematode species from a 1 hr exposure to fluopyram at their respective LD_{50} concentration. Exposing *M. incognita* for 1 hr at sub-lethal concentrations of 5.2 and 3.9 µg/ml fluopyram reduced ($P \leq 0.05$) infection on tomato roots. These data support a very unique response by root-knot and reniform nematodes to fluopyram.

Reniform nematode influence on soybean production in Louisiana

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Reniform nematode (*Rotylenchulus reniformis*) is a widespread pathogen of soybean throughout Louisiana. In a survey of 165 soybean fields in Louisiana conducted during 2011 and 2012, 49% of the samples were found to have some level of this nematode. Populations of the reniform nematode ranged from barely detectable levels of 100 to a maximum of 50,880 per 500 cm^3 soil. Fewer fields were found with reniform present in Madison, Pointe Coupee, Concordia, and St. Landry parishes compared to a survey of cotton fields during 1994 and 1995. East and West Carroll parishes had a much higher incidence of fields with reniform during 2011 compared to the earlier survey. Two soybean fields were evaluated in Tensas parish during 2012 for the influence of population development of the reniform nematode on soybean production in a field with variable soil texture. Each field was divided into five zones based on apparent electrical conductivity ($EC_{a\text{-}deep}$) and sampling points assigned to each zone for nematode populations, soil texture, and yield. Population densities of reniform at planting, mid-season, or at harvest were not correlated with yield, $EC_{a\text{-}deep}$, clay, sand, or zones. There were significant correlations, $P< 0.001$ between sand and $EC_{a\text{-}deep}$ ($R^2 = 0.63$), zone and clay ($R^2 = 0.77$), zone and sand ($R^2 = 0.84$), and zone and $EC_{a\text{-}deep}$ ($R^2 = 0.92$) A nematicide and variety study was also conducted in 2012 and 2013 to determine the influence of Telone II on both resistant and susceptible varieties to reniform nematode. The resistant soybean variety to reniform nematode, MPV 5212R reduced populations by 81 and 85% at harvest in 2011 and 2012, respectively compared the susceptible check HBK RY5421. The fumigant provided a 2.5 and 6.7 bushel yield increase for HBK RY5421 in 2012 and 2013, respectively. No differences in yield were observed between treated and untreated MPV 5212 and HBK 5226 (susceptible to reniform) in 2012 and MPV 5212 and Pioneer 94Y82 (susceptible to reniform) in 2013. Although reniform nematode is considered to be a serious pest of soybean, apparently soybean varieties, soil types, and different isolates of the nematode influence pathogenicity on this crop.

Rhizoctonias associated with soybean in the Southeast United States

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A survey of the frequency and diversity of *Rhizoctonia* species on row crops important in the southern United States was conducted in 2011 and 2012. Fields selected represented the production areas for each crop from Texas east to the Atlantic coast. Samples consisted of 50 arbitrary seedlings from a field and a composite soil sample. Isolation was done after surface disinfesting tissue and plating on a non-selective medium. A toothpick baiting assay using the selective medium TS1 were used to isolate *Rhizoctonia* spp. from soil, a total volume of 425 cm^3 soil per field. Isolates of *Rhizoctonia solani (Thanatephorus cucumeris)* included AGs 2, 4, 7 and 11. Isolates of *R. solani* from soybean included AGs 2, 4, and 7. Binucleate *Rhizoctonia* species (*Ceratobasidium* spp.) were more frequently isolated from soil and all crops examined compared to *R.solani*. Isolation frequency and diversity from seedlings generally reflected populations recovered from soil using the toothpick baiting procedure. *Rhizoctonia* was recovered from almost all fields from soil or seedlings. A much greater diversity of *Rhizoctonia* spp. are associated with row crops in the southern United States than would be suggested from previous studies, with crop having some influence on AG recovered. Those Rhizoctonia populations recognized as causing disease on each crop made up a minority of the isolations from plants suggesting the interaction of Rhizoctonias colonizing plants needs to also examine the parasitic role of nonpathogenic Rhizoctonias on diseases and crop productivity?

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