

**Report for 2003**  
**Tennessee Soybean Promotion Board**  
**By Melvin A. Newman**

**Title:** Evaluation of Soybean Cultivars for Resistance to Frogeye Leaf Spot (FLS).

**Personnel:**

Melvin A. Newman, Professor  
Bob Williams, Extension Area Specialist  
Fred Allen, Professor  
Blake Brown, Superintendent-Milan Experiment Station (MES)

**Objectives**

1. To evaluate the effect of natural infections of Frogeye Leaf Spot (*Cercospora sojina*) on available soybean cultivars.
2. To make this information available to soybean producers in a timely fashion.
3. To increase the exposure of the Soybean Promotion Board and the University of Tennessee to the soybean producers of Tennessee concerning their cooperative efforts to improve the economics of production through better disease control.
4. To increase yields and profits to Tennessee soybean growers.

**Procedures:**

1. Equipment: A 2.6 acre soybean plot was planted no-till at the MES on May 16 & 23, 2003, with a four-row Case I.H. 900 planter with cone seed attachments.
2. Plot information: The 288 varieties were planted in two-row plots with 36" centers and were 25' long. Each plot was randomized and replicated three times. Irrigation was provided with a center pivot system.
3. Disease ratings: FLS ratings were taken on: August 28 = MG III; September 9 = MG's IVE, IVL, and Steyer; September 11 = MGVE and Conventional IV & V; September 19 = MGVL. The rating scale was 0-10 with 0=no detectable disease and 10=complete defoliation and severe yield loss. FLS severity was fairly high this season.

**Observations and Conclusions:** (See charts 1 & 2).

Maturity Group V (Late): The average FLS ratings ranged from 0 to 9 in the 52 late MG V varieties. The average yield was 42 bu/A. The three varieties showing no symptoms of FLS averaged 51.5 bu/A. The 20 varieties in the low susceptibility range averaged 47.4 bu/A. Ten varieties in the medium susceptibility range averaged 41.1 bu/A. There were 19 varieties in the high susceptibility range, and they averaged 34.2 bu/A. The yield difference between the varieties with low and high ratings was 17.3 bu/A.

Maturity Group V (Early): The average FLS ratings for the early MG V varieties ranged from 0 to 9. The average yield was 39 bu/A. The 52 varieties were nearly evenly divided among the low, medium, and high ratings groups. The seven varieties with no FLS symptoms averaged 45.2 bu/A. The seven varieties in the low susceptibility category averaged 41.4 bu/A. Sixteen varieties in the moderately susceptible group averaged 40.9 bu/A. The severely susceptible category had 22 varieties with an average yield of 34.2 bu/A. The varieties in the lowest rating group had a yield average 11 bushels higher than the most susceptible group.

Maturity Group IV (Late): The average FLS ratings for the 48 varieties in the late MG IV test ranged from 0 to 9. The 1 variety with no FLS symptoms had a yield of 38.8 bu/A. There were 15 varieties in the low susceptibility group, and they averaged 50.1 bu/A. The moderately

susceptible group had 13 varieties with an average yield of 46 bu/A. The 19 varieties in the most severe category had an average yield of 43.4 bu/A. The group of varieties in the low range yielded 6.7 bu/A more than the soybeans with the highest susceptibility.

Maturity Group IV (Early): There were 36 varieties tested in this group, and their average ratings ranged from 0 to 10. The seven varieties which showed no FLS symptoms had an average yield of 55.3 bu/A. The low susceptibility category had only two varieties, and they averaged 54.7 bu/A. The moderate group had nine varieties which averaged 48.6 bu/A. Half of the varieties fell into the highest rating category. Their average yield was 49.2 bu/A. The difference in yield between the highest category and the lowest category was 6.1 bu/A.

Maturity Group III: Average ratings for the 32 varieties in this group ranged from 0 to 8. The three varieties with no FLS symptoms averaged 53.9 bu/A. There were ten varieties in the low susceptibility range. They averaged 51.6 bu/A. The moderately susceptible varieties averaged 53 bu/A. The seven varieties in the severe category yielded an average of 46.2 bu/A. The difference in yield between the highest and lowest categories was 7.7 bu/A.

Conventional MG IV and V: The 60 conventional soybean varieties ranged from 0 to 8 for FLS susceptibility. There was only one variety with no FLS symptoms. It yielded 55 bu/A. There were 33 varieties in the low category. This represented 55% of the varieties in the test. The average yield for this group was 50.8 bu/A. The moderate category had 19 varieties with an average yield of 44.7 bu/A. There were seven varieties in the severe category. Their average yield was 42.8 bu/A. The yield difference between the variety with no symptoms and the group with the highest FLS ratings was 12.2 bu/A.

All maturity groups had some varieties with no FLS symptoms. The conventional test had the smallest percentage of varieties with severe symptoms.

In general, FLS disease pressure was severe in this plot location. Variety response ranged from no disease symptoms (0) to severe (10). Producers should use this information to select varieties that have low susceptibility to FLS. The yield savings could be as much as 10-30 bu/A, depending on the disease pressure.

**Report for 2003**  
**Tennessee Soybean Promotion Board**  
**By Melvin A. Newman, Professor**

**Title:** Evaluation of Soybean Cultivars for Resistance to and Control of Foliar Diseases such as Anthracnose, Diaporthe/Phomopsis Complex, Frogeye Leaf Spot, and Cercospora Leaf Blight.

**Personnel:**

Melvin Newman, Principal Investigator  
Bob Williams, Area Extension Specialist  
Fred Allen, Variety Specialist and Coordinator  
Blake Brown, Milan Experiment Station (MES)

**Objectives:**

1. To evaluate the relative field resistance of available commercial soybean cultivars to foliar diseases.
2. To evaluate the degree of control by the use of a foliar fungicide for available commercial soybean cultivars.
3. To make information available to all soybean producers in a timely manner so they may use this information to help reduce foliar disease losses and thereby increase profits.
4. To increase exposure of the Soybean Promotion Board and the University of Tennessee to soybean producers of Tennessee concerning their cooperative efforts to improve the economics of production through better disease control.

**Procedures:**

1. A two-acre soybean plot was established under pivot irrigation at the MES where foliar diseases are known to occur. Forty commercial soybean cultivars were planted in a randomized complete block design with three replications. All varieties were from MG IVs and Vs and were Roundup Ready.
2. Each variety was sprayed with a foliar fungicide (Quadris at 6 oz/A). Each variety also had an unsprayed plot beside it.
3. Disease ratings were made for Frogeye Leaf Spot (FLS) and Sudden Death Syndrome (SDS) using the usual scale of 0-10.
4. Yields were determined by harvesting with a two-row combine.
5. Data were summarized and subjected to statistical analysis.

**Observation and Conclusions:**

There are many variables in disease control and in the use of fungicides to control foliar diseases. Varieties differ in their genetic ability to produce seed as well as their susceptibility to other non-foliar diseases such as SDS or charcoal rot. However, good results were obtained with one application of fungicide (Quadris at 6 oz/A) at early pod set. Each of the 40 varieties tested had treated and untreated side-by-side plots. There were 28 varieties in the maturity group V and 12 varieties in the maturity group IV.

Significant SDS and stem canker presence in the plots provided additional disease information, but severe flooding and deer damage prevented accurate yield information.

Foliar Fungicide Spray Tests Average Frogeye Leaf Spot Ratings* Milan Experiment Station – 2003						
Average FLS Rating	Percent for MG V	MGV (28)		MG IV (12)		Percent for MG IV
		Unsprayed	Sprayed	Unsprayed	Sprayed	
None (0)	None	--	--	0	0	8
Low (1-3)	39	2.0	0.5	--	--	17
Moderate (4-6)	36	5.0	1.2	6.0	1.0	--
Severe (7-10)	25	7.7	2.4	8.1	2.0	75

\* Notes: Each variety was split with 2 rows sprayed with Quadris at 6.0 oz/A and 2 rows (side-by-side) with no fungicide treatment. Spray applications were made when pods were approximately ¼ inch (R3 stage) for each maturity group. FLS ratings were made on a scale of 0-10, where 0=leaf spots and 10=as much disease as possible.

Soybean producers should consider the variety reactions to FLS as well as other diseases and nematodes. In these tests, the maturity group IV varieties were much more susceptible to FLS than group V. Several varieties, such as Anand, are resistant to FLS or other diseases and can produce high yields, especially where nematodes and FLS have been limiting factors.

**Report for 2003**  
**Tennessee Soybean Promotion Board**  
**By Melvin A. Newman, Professor**

**Title:** Evaluation of Soybean Cultivars for Resistance to Sudden Death Syndrome (SDS).

**Personnel:**

Melvin A. Newman, Principal Investigator  
Bob Williams, Extension Area Specialist  
Blake Brown, Superintendent-Milan Experiment Station (MES)

**Objectives:**

1. To evaluate the effect of SDS on all available soybean cultivars.
2. To make this information available in a timely fashion to soybean producers so that they might use resistant cultivars for control of SDS.
3. To increase the exposure of the Soybean Promotion Board and the University of Tennessee to the soybean producers in Tennessee concerning their cooperative efforts to improve the economics of production through better disease control.

**Procedures:**

1. A four-acre soybean plot was prepared and planted in a conventional manner on May 27, 2003, in Weakley County, TN.
2. Planting equipment: a four-row Case I.H. planter modified with Almaco cone seed hoppers.
3. Plot information: Plots were two rows wide and 25' long and trimmed to 22'. Rows were 36" apart. Plots were randomized in a complete block design. Grain sorghum seed inoculated with the SDS fungus was placed in-furrow. Squadron was sprayed at 3 pts/A in 15 gallons of water/A. B.C. after planting. A total of 220 varieties were replicated three times. The plots were sprayed with Quadris at 6 oz/A and Karate at 2 oz/A for disease and insect control.
4. Harvest: Yields were harvested on September 18 for Group III. Group IV soybeans were harvested on October 2 & 3, and the Group V plots were harvested on October 22 & 23. Seed moisture was adjusted to 13 percent for all varieties.

**Observation and Conclusions:** (also see charts 1 & 2).

Maturity Group V (Late): In the MG V (Late) test, the SDS ratings ranged from 1 to 8 with an average rating of 4.12 and an average yield of 57 bu/A. There were 20 varieties that rated 1-3 (low susceptibility) for SDS and averaged 58 bu/A; 23 varieties rated 4-6 (medium susceptibility) and averaged 57 bu/A; and, five varieties rated 7-10 (high susceptibility) and averaged 51 bu/A. That is an average increase of 9.0 bu/A from low susceptibility to high susceptibility.

Maturity Group V (Early): The SDS rating for 52 varieties in the MG V (Early) group ranged from 1 to 9 with an average rating of 4.42 and an average yield of 55 bu/A. There were 19 varieties that rated 1-3 (low) and averaged 58 bu/A; 23 varieties rated 4-6 (moderate) and averaged 55 bu/A; and, 10 varieties rated 7-10 (severe) and averaged 49 bu/A.

Maturity Group IV (Late): The SDS rating for 52 varieties in the MG IV (Late) plots ranged from 1 to 8 with an average rating of 3.43 and an average yield of 46 bu/A. There were 26 varieties that rated 1-3 (low) and averaged 49 bu/A; 23 varieties rated 4-6 (moderate) and averaged 45 bu/A; and, 3 varieties rated 7-10 (severe) and averaged only 36 bu/A.

Maturity Group IV (Early): In the MG IV (Early) test, the SDS ratings ranged from 1 to 8 with an average rating of 3.32 and an average yield of 52 bu/A. There were 21 varieties that were rated between 1-3 (low) with an average yield of 55 bu/A; 14 varieties rated between 4-6 (moderate) with an average yield of 47 bu/A; and, there was only one variety with a rating between 7-10 (severe), and it produced 47 bu/A.

Maturity Group III: In the MG III test, the SDS ratings ranged from 0 to 7 with an average rating of 3.05 and an average yield of 56 bu/A. There were two varieties that rated 0 (no symptoms) and averaged 74 bu/A. Asgrow 3703 yielded 82 bu/A with no symptoms of SDS. There were 17 varieties that rated 1-3 (low) and averaged 57 bu/A; 11 varieties rated 4-6 (moderate) and averaged 52 bu/A; and, only one variety rated 7-10 (severe) with a yield of 44 bu/A.

In general, SDS symptoms were moderate to severe and uniform across all replications. The yields were still fairly high due to good moisture and high pH (7.0) and high P&K according to University of Tennessee soil test analysis. Soybean cyst nematode (SCN) soil samples were obtained from each variety, but from only one replication. They can serve as an indication of the relative SCN population for each variety in only one location in the field.

**Chart 1**

<b>Average Yields &amp; SDS Ratings by Maturity Group Weakley County, TN – 2003</b>					
<b>Comparison of Yields &amp; Ratings Average, Highest, and Lowest</b>	<b>Maturity Group</b>				
	<b>VL</b>	<b>VE</b>	<b>IVL</b>	<b>IVE</b>	<b>III</b>
Average Yield (bu/A)	57	55	46	52	56
Average SDS Rating	4.12	4.42	3.43	3.32	3.05
Highest Yielding Variety	65	64	59	63	82
SDS Rating for that Variety	1.0	4.0	1.0	2.0	0.0
Lowest Yielding Variety	43	39	29	40	42
SDS Rating for that Variety	4.0	9.0	8.0	6.0	5.0

It is clear that susceptibility to SDS can vary greatly from one variety to another. SDS was shown to be very destructive, and producers could increase or decrease their yields significantly simply by choosing a certain variety. Although these tests were conducted using the best scientific methods available, environmental and disease conditions could vary greatly for producers from field-to-field and from year-to-year and cause research results to vary as well.

**Chart 2**

<b>SDS Test – Percent Diseased Weakley County, TN – 2003</b>					
SDS Rating	48 entries	52 entries	52 entries	36 entries	31 entries
	VL	VE	IVL	IVE	III
None (0)	0	0	0	0	0
Low (1-3)	42	37	50	58	55
Moderate (4-6)	48	44	44	39	36
Severe (7-10)	10	19	6	3	3

The highest percentage of SDS infection occurred in the MG Vs with 10-19 percent of the ratings in the severe category. The MG III and IV varieties had the lowest amount of SDS with only 3–6 percent in the severe ratings (see above chart).

**Report for 2003**  
**Tennessee Soybean Promotion Board**  
**By Melvin A. Newman, Professor**

**Title:** Evaluation of Soybean Cultivars for Resistance to Stem Canker.

**Personnel:**

Melvin A. Newman, Professor

Bob Williams, Extension Area Specialist

Bob Hayes, Superintendent, West Tennessee Experiment Station (WTES)

**Objectives:**

1. To inoculate and rate the available varieties for resistance to stem canker. This work was done on the WTES.
2. To make readily available to producers a more reliable list of cultivars resistant to stem canker.
3. To reduce yield loss from stem canker and hence increase the net income of Tennessee soybean growers.
4. To provide valuable information to soybean breeders about the relative susceptibility or resistance of their breeding lines.
5. To increase the exposure of the Soybean Promotion Board and the University of Tennessee to the producers of Tennessee concerning their cooperative efforts to improve the economics of production through better disease management.

**Procedures:**

1. **Inoculum:** *Diaporthe phaseolorum* var. *caulivora* (DPC), the fungus that causes stem canker, was grown in the lab for three months on both PDA agar and on sterile white grain sorghum seeds. Starting when soybean plants were at the V<sub>3</sub> growth stage, plots were field-inoculated four times on a weekly basis – twice with infected grain sorghum and twice with a spore suspension grown on PDA. Infected soybean debris was distributed over the plot area with a straw blower the day after planting.
2. **Equipment:** The plot was planted on May 13 at the WTES with a four-row Case I.H. 900 planter with Almaco seed cone attachments.
3. **Plot information:** Plots were one row wide, spaced at 36", and 25' long. Each variety was randomized and replicated three times in a complete block design. Squadron herbicide was sprayed at 3 pt/A in 15 gallons of water/A and B.C. after planting. A total of 360 varieties were replicated three times.
4. **Disease ratings:** Stem canker ratings were made on August 29 for MG III; September 15 for MG IV (Early and Late) and MG V (Early); September 24 for MG V (Late) on a scale of 0-10, where 0=no disease and 10=most disease possible with 100 percent dead plants.

**Observations and Conclusions:**

In the MG V (Late) varieties (84) there were almost no stem canker symptoms except for a rating of 1.0 on Delta Pine DP 5634.

The MG V (Early) varieties (76) had no visible symptoms of stem canker on any variety.

In the MG IV (Late) varieties (56), there were five varieties with stem canker ratings:

Delta Grow 4960 (rating = 1.0)

MPV 4904 (rating = 4.0)

Syngenta BA 040815 (rating = 2.0)

Terral TVX 47 R1 K2 (rating = 5.0)

Terral TVX 48 R1 U1 (rating = 5.0)

The MG IV (Early) varieties (36) had no visible symptoms of stem canker.

In the MG III varieties (32), there was one variety that had symptoms of stem canker:

Asgrow AG 3905 (rating 1.0)

Yields were harvested on September 25 only for comparison.

In general, stem canker symptoms were unusually light this year, although everything was done to increase stem canker in the plot. Environmental conditions play a big role in disease development. Disease occurrence is a complicated process involving a susceptible host, pathogen, and the correct environment. If one or more of these factors are lacking, disease will not occur. Apparently, one of these factors was missing this year.

**Report for 2003**  
**Tennessee Soybean Promotion Board**  
**By Melvin A. Newman**

**Title:** Soybean Cyst Nematode Sampling and Advisory Program (SCN)

**Personnel:**

Melvin A. Newman, Principal Investigator  
Pat Donald, USDA-ARS, Nematologist  
Prakash Arelli, USDA-ARS, Soybean Breeder

**Objectives:**

1. To assist and stimulate producers into taking more SCN samples.
2. Reduce loss from SCN and hence increase the net income of Tennessee soybean growers.
3. To provide valuable information to soybean growers on control of SCN.
4. To increase exposure of the Soybean Promotion Board and UT to the producers of Tennessee concerning their cooperative efforts to improve the economics of production through better disease and nematode management.
5. To identify new races of SCN and help the producers devise control methods.

**Procedures:**

1. Two part-time college summer/fall assistants were hired to help producers obtain soil samples for SCN analysis. The County Extension Agents coordinated the program in those counties that had SCN problems. Each county was allocated a certain number of "free" samples based on their history of soybean acres.
2. Soil samples were analyzed for the number of SCN per pint of soil.
3. Upon receipt of the SCN analysis form, the Extension agent scheduled visits with each producer to build a variety selection strategy for SCN control.
4. Certain fields were selected by Dr. Patricia Donald, USDA/ARS, to be resampled and located by aid of the Global Positioning System (GPS) for race determination in the greenhouse.

**Results:**

In 2003, 785 soybean cyst nematode samples were pulled from 395 fields in 16 counties. Of the total samples, 241 (31%) had some cysts present. Twenty-two percent (174 samples) contained 1-50 cysts/pt of soil and 8.5 percent (67) had damaging levels of 50+ cysts/pt. of soil. The highest cyst counts were from Weakley County where 46 of the 76 samples submitted were infested with cysts. Eight of those infested samples were at damaging levels. The sampling program will continue this fall and winter to obtain as many more samples as possible (Chart 2 on p. 58).

Chart 1

**2003 SCN Sampling Season  
Summary of Findings**

County	# Fields	# Samples	1 to 50	51 to 100	>100
Benton	1	1	1		
Cannon	109	236	66	14	4
Chester	4	8	0	3	3
Coffee	20	63	14	0	2
Crockett	3	10	0	0	0
Dyer	9	9	1	0	0
Gibson	133	166	49	9	6
Hardeman	1	1	0	0	0
Hardin	10	34	0	1	0
Haywood	1	1	0	0	0
Henry	2	2	0	0	0
Lauderdale	10	49	3	1	0
Madison	24	67	7	1	0
Obion	3	3	0	0	0
Warren	28	59	8	1	1
Weakley	37	76	25	13	8
<b>TOTALS</b>	<b>395</b>	<b>785</b>	<b>174</b>	<b>43</b>	<b>24</b>

Chart 2

<b>Soybean Cyst Nematode Survey Program Selected Counties in 2003</b>							
County	<b>No. of Samples with levels of Cysts*</b>					<b># Samples with Cysts</b>	<b>% Infested</b>
	<b>0</b>	<b>1-50</b>	<b>51-100</b>	<b>100 +</b>			
Cannon	152	66	14	4		84	36
Gibson	102	49	9	6		64	39
Weakley	30	25	13	8		46	61

\*Note: Cysts per pint of soil.

Each sample represents approximately 25 acres.

Sampling sites were selected by individual Extension agents.

Sixteen counties participated in this program in 2003.

**Observation and Conclusions:**

Since the program started, we have sampled approximately 115,000 acres and pulled about 4,567 samples. Approximately 31 percent of the samples contained SCN in 2003 (Chart 1, p. 58). This is less than the usual 40-50 percent in previous years.

Value: When soybean producers receive their “free” soil analysis report for SCN, they will be able to select soybean varieties, cultural practices, nematicides and control strategies that will increase their production and reduce the populations of SCN and at the same time slow down the advancement of new races. Hopefully, other producers not on this program will see the value of sampling their fields.

An even greater value stems from the fact that, through this program, we were able to show that a significant percentage of SCN-infested fields contain Race 2. This is a very important finding since there are only two commercially available “conventional” varieties with resistance to Race 2. There are no Roundup Ready varieties on the market with Race 2 resistance. Breeders were alerted so that they can begin to incorporate Race 2 resistance into their breeding programs.

There is no doubt that the cyst nematode numbers vary from field to field. Producers should soil sample every soybean field every year and keep a record so they can be proactive about their control strategies. This is an especially good year to sample because SCN counts will probably be high, and the UT Extension Service will run the samples free-of-charge through the Soybean Promotion Board grant.

Although not specified in the proposal, we sampled one replication of the 220 varieties at the Weakley County SDS variety trials. Most of the varieties produced cyst counts in the 100-200 cysts/pt. of soil range. A few were in the 300-500 range. There was a much higher level of cyst/pt. of soil in the late group Vs than in the other maturity groups. The late group IVs had the least. This is possible because the longer the maturity, the more time the nematodes have to reproduce (Chart 3).

**Chart 3**

**Soybean Cyst Nematode Results – 2003  
Weakley County – SDS Plot  
Number of Varieties by Maturity Group**

<b>Cyst/pt. Soil</b>	<b>III</b>	<b>IV (E)</b>	<b>IV (L)</b>	<b>V (E)</b>	<b>V (L)</b>
None (0)	0	1	2	2	0
1-100	16	18	35	30	15
101-200	15	15	15	15	21
201-300	1	1	0	3	7
301-400	0	1	0	0	3
401-500	0	0	0	1	2
Average # of cyst/pt.	95	103	74	98	165
# of varieties	32	36	52	52	48

**Note:** Cyst counts were made from soil taken after harvest on November 7, 2003, from one replication of each of 220 soybean varieties. This land was in soybeans in 2001 and corn in 2002.