



# Information

**Agronomy Facts No. 43**  
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## **2003 CYST NEMATODE- RESISTANT SOYBEAN VARIETY TEST**

Soybean cyst nematode (*Heterodera glycines*) was found in Maryland for the first time in 1980. Since the first discovery, damaging levels of cyst nematodes have been identified in most Eastern Shore counties and in two counties west of the Chesapeake Bay. Typical aboveground soybean plant symptoms are stunting, yellowing, and wilting under moisture stress. These symptoms usually appear on scattered patches of plants in infested fields.

The selection and use of resistant soybean varieties is one of the best production practices available to reduce yield losses due to nematodes. Most resistant varieties are not immune to attack by all cyst nematodes because the plant's resistance is specific for individual cyst nematode races. Infested fields may contain a mixture of cyst nematode races. A resistant variety planted in these fields must carry resistance to the most prevalent race of cyst nematode in the field to produce satisfactory yields. However, continuous production of a variety resistant to the same races could shift the prevalence of races in that field to ones that can infect the resistant variety. Therefore, it is best to rotate nonhost crops such as corn or sorghum with resistant soybean varieties in cyst-infested fields.

A variety test was established in 2003 by the Maryland Agricultural Experiment Station, Department of Natural Resource Sciences and Landscape Architecture, to provide soybean growers with the latest information on agronomic performance of varieties with resistance to cyst nematodes. Entries in the test included public and private brands, varieties, and experimental lines that have resistance to various races of cyst nematodes. The susceptible varieties Chesapeake, Hutcheson, Stressland, and Williams 82 were used as control plots. Several experimental lines were also evaluated in the tests. These lines and their origin are MD 96-5275, MD 96-5502, MD 97-6065, MD 97-6156, MD 98-5927, MD 99-5144, MD 99-5720, MD 99-0687-3RR, MD 99-0700-2RR, MD 99-1353-2RR, MD 00-5020, MD 00-5159, MD 00-5535, and MD 00-6036 from Maryland; and V 99-2453, V 99-2461, V 99-2534, V 99-2588, V 99-2589, V 99-2609, and V 99-2610 from Virginia.

A list of the released entries in the 2003 test, their respective maturity group designation, the races of cyst nematodes to which each has resistance, and the suppliers of the private entries who paid a fee for testing are listed in Table 1. Since cyst-infested fields can also contain other nematode species, a rating for resistance to root-knot nematode (*Meloidogyne incognita*) is also given in Table 1 if the supplier provided this information.

Two tests were planted near Salisbury, MD in Wicomico County. One test was located at the Pemberton Historical Park in a field that is primarily infested with cyst nematode races 1 and 5. The other test was located at the Lower Eastern Shore Research and Education Center, Salisbury Facility in a field that is infested with a mixture of races 1, 3, and 5. At planting, the soil in the test area at the Pemberton Historical Park and the Salisbury Facility averaged less than 10

full cysts/250 cc of soil. Even though the initial number of cysts in the soil in the test sites was relatively low at planting, the nematode population can build quickly to damaging levels.

The entries were divided into their designated maturity groups so that entries within a test would be of similar maturity. Each entry was evaluated in a four-row plot, 11 feet in length, replicated three times. Row spacing was 30 inches and the seeding rate was 8 seeds/foot. Recommended cultural practices were followed in establishing and maintaining the plots (Table 2). Yield data were determined by harvesting an 8-foot section from the center rows of each plot. Plant height was determined at maturity when 95% of the pods on each entry had attained their mature color. The total number of full cysts on four plants from each plot was determined at each site approximately 30-35 days after planting.

All data were statistically analyzed. A least significant difference (LSD) value was calculated for each characteristic. This number is a statistical test calculated at the 20% probability level to aid in comparing the differences among entries. When two entries are compared and the difference between them is greater than the calculated LSD value, the entries are judged to be statistically different. This means that there is an 80% probability that the differences observed in the test are real and not due to chance. A designation of "NS" indicates that there are no statistically significant differences among the entries in the test for that characteristic.

The 2003 growing season was very wet across the state. The wet weather delayed planting of full-season soybeans in many areas of the state. Monthly rainfall amounts for May through October are shown in Table 3. No irrigation was added at either test location.

Seed yields are shown in Tables 4-7. The yields of the susceptible varieties Chesapeake, Hutcheson, Stressland, and Williams 82 were usually below the maturity group mean in the tests. Note the number of cysts found on the susceptible varieties. Varieties are usually classified as resistant if they have less than 10% of the number of cysts found on susceptible varieties. Although some of the susceptible varieties have fewer cysts than other entries in the test, this probably reflects the variation in distribution of cysts in the soil and the lower levels of cysts observed in this year's test.

Although all of the entries in the test except the susceptible varieties carry some resistance to cyst nematodes, it is evident that entries differ in their level of resistance. These test results also illustrate the importance of growing varieties that carry resistance to the race of nematodes present in specific infested fields. Cyst nematode races 1 and 3 are the most frequently observed races in Maryland. Soybean growers must determine the race of cyst nematode that is present in their infested fields so that they can select an appropriate soybean variety. Frequently growers do not know the race of cyst nematode in their fields and they plant a variety with resistance to race 3 because these varieties are the most widely available. Growers who have planted cyst nematode-resistant varieties but have observed damage on the variety should check with their county extension office for assistance in determining the race present in their infested fields.

The performance of a variety for several years gives the best measure of its yield potential and agronomic characteristics. The average yields of those varieties grown for two years at each location can be determined from data in Tables 4-7.

The information provided here should be used as a guide and growers should select a variety with great care based on personal experience as well as other available information.

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Additional information:

Inclusion of entries in the Cyst Nematode-Resistant Soybean Variety Test does not constitute an endorsement or recommendation of a specific entry by the University of Maryland. Advertising statements by an individual company about the performance of its entries can be made as long as they are accurate statements about the data as published, with no reference to other companies' varieties. Statements similar to the "See the official Cyst Nematode-Resistant Variety Test, Agronomy Facts No. 43" and "Endorsement or recommendation by the University of Maryland is not implied" must accompany any information that is reproduced. Agronomy Facts No. 43 can be downloaded from the new University of Maryland Cropping Systems webpage:

<http://www.nrsl.umd.edu/extension/crops>

Table 1. Maturity group, nematode resistance and seed supplier of released entries grown in the 2003 test.

BRAND	ENTRY	Maturity Group	Resistant* to		Supplier
			Cyst Races	Root Knot	
CLARK	CL441NRR	IV	R3,R14	NT	Clark Seeds, Inc. Kenton, DE 19955
	CL482NRR	IV-S	R3,R14	NT	
VIGORO	V36C4RR	III	R3,R14	NT	Royster-Clark, Inc. Collinsville, IL 62234
S. STATES	RT3799N	III	R3,R14	NT	Southern States Coop. Richmond, VA 23260
	RT3802N	III	R3,R14	NT	
	RT4502N	IV	R3,R14	NT	
	RT4810N	IV-S	R3,R14	NT	
	RT4930N	IV-S	R3,R14	NT	
PUBLIC	DEL SOY 5710	V	R1-R5,R14+	R	MO Ag Experiment Station
	INA	IV	R1-R5	NT	IL Ag Experiment Station
	IA 3014	III	R3	NT	IA Ag Experiment Station
	KS 4602N	IV-S	R3	NT	KS Ag Experiment Station
	KS 5502N	V	R2-4,R14	S	KS Ag Experiment Station
	LS 93-0375	IV	R3,R14	NT	Southern IL University-Carbondale
	MANOKIN	IV-S	R1,R3	MR	MD Ag Experiment Station
	PANA	III	R2-4,MR5,R14	NT	IL Ag Experiment Station
	REND	IV	R3,R4,R14	NT	IL Ag Experiment Station

\*R=resistant; MR=moderately resistant; S=susceptible; +=resistant to other races; NT=not tested

Table 2. Soybean test plot information.

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Lower Eastern Shore Research & Education Center, Salisbury Facility  
 Wicomico County, Salisbury

Cooperator: F.L. Wells  
 Planting Date: June 2  
 Row Spacing: 30 inches  
 Soil Type: Norfolk loamy sand  
 Soil Test: pH 6.5, P Index- Excess, K Index- Medium  
 Previous Crop: Soybeans  
 Fertilizer: 210 lbs/A 0-14-41  
 Lime: None  
 Herbicide: Preemergence: 0.7 lb Lorox -DF and 0.75 pt/A Dual II Magnum  
 Post: 20 oz/A Blazer Ultra, 16 oz/A Basagran, 1.5 oz/A 2,4-DB  
 Insecticide: None  
 Cultivation: Once  
 Irrigation: None

Pemberton Historical Park  
 Wicomico County, Salisbury

Cooperator: J.E. Terrell, Jr.  
 Planting Date: June 2  
 Row Spacing: 30 inches  
 Soil Type: Norfolk loamy sand  
 Soil Test: pH 6.1, P Index- Excess, K Index- Medium  
 Previous Crop: Soybeans  
 Fertilizer: 210 lbs/A 0-14-41  
 Lime: None  
 Herbicide: Preemergence: 0.7 lb Lorox -DF and 1 pt/A Dual II Magnum  
 Post: 20 oz/A Blazer Ultra, 16 oz/A Basagran, 1.5 oz/A 2,4-DB  
 Insecticide: None  
 Cultivation: Once  
 Irrigation: None

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Table 3. Monthly 2003 and 30-year average precipitation (inches) during May through October at LES-REC, Salisbury Facility.

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	May	June	July	Aug.	Sept.	Oct.	Total
2003	5.36	5.18	3.94	4.71	7.17	3.90	30.26
Average	3.32	3.62	3.76	5.72	3.59	3.63	23.64

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Table 4. Seed yields (2002 and 2003) and performance of entries of Maturity Groups III, IV, and IV-S grown at the Salisbury Facility in a cyst nematode-infested soil. (Races 1,3, & 5)

BRAND - ENTRY	Seed Yield, Bu/A		Height, Inches	Full Cysts/ 4 Plants
	2003	2002		
<b>MATURITY GROUP III</b>				
VIGORO - V36C4RR	25.8	-	20	13
S.STATES - RT3799N	24.6	22.1	24	10
PUBLIC - IA 3014	21.0	20.9	23	47
PUBLIC - PANA	19.3	26.7	23	30
S.STATES - RT3802N	17.9	21.4	23	20
PUBLIC - WILLIAMS 82 (S)	16.2	19.6	24	63
	<b>Mean</b>	<b>20.8</b>	<b>20.5</b>	<b>23</b>
	<b>LSD (0.20)</b>	<b>5.0</b>	<b>2.5</b>	<b>NS</b>
<b>MATURITY GROUP IV</b>				
EXPERIMENTAL - MD 99-5144	35.4	-	26	7
PUBLIC - INA	34.5	25.4	26	7
EXPERIMENTAL - MD 97-6156	32.1	17.7	27	17
PUBLIC - REND	31.7	20.2	28	30
EXPERIMENTAL - MD 00-5535	30.3	-	26	73
CLARK - CL441NRR	29.0	-	23	73
PUBLIC - LS 93-0375	27.4	18.9	22	57
S.STATES - RT4502N	25.7	-	27	57
EXPERIMENTAL - MD 00-6036	22.9	-	27	63
EXPERIMENTAL - MD 99-5720	19.3	-	21	27
PUBLIC - STRESSLAND (S)	17.6	14.3	24	140
	<b>Mean</b>	<b>27.8</b>	<b>19.8</b>	<b>50</b>
	<b>LSD (0.20)</b>	<b>5.7</b>	<b>3.7</b>	<b>NS</b>
<b>MATURITY GROUP IV-S</b>				
EXPERIMENTAL - MD 00-5020	52.5	-	24	0
PUBLIC - MANOKIN	45.8	20.6	29	40
EXPERIMENTAL - MD 96-5275	42.7	23.2	25	13
S.STATES - RT4930N	36.1	-	28	39
EXPERIMENTAL - MD 99-1353-2RR	35.7	-	23	83
PUBLIC - KS 4602N	33.4	12.9	29	93
S.STATES - RT4810N	31.3	11.9	29	47
CLARK - CL482NRR	30.2	-	27	67
PUBLIC - CHESAPEAKE (S)	41.0	8.9	33	53
	<b>Mean</b>	<b>38.7</b>	<b>15.0</b>	<b>48</b>
	<b>LSD (0.20)</b>	<b>5.8</b>	<b>1.9</b>	<b>NS</b>

\*Full Cysts/ 4 Plants on July 10

Table 5. Seed yields (2002 and 2003) and performance of entries of Maturity Group V grown at the Salisbury Facility in a cyst nematode-infested soil. (Races 1,3, & 5)

BRAND - ENTRY	Seed Yield, Bu/A		Height, Inches	Full Cysts/ 4 Plants	
	2003	2002			
<b>MATURITY GROUP V</b>					
PUBLIC - KS 5502N	52.5	37.7	29	10	
EXPERIMENTAL - MD 98-5927	47.8	31.5	24	13	
EXPERIMENTAL - MD 96-5502	47.2	30.0	29	7	
PUBLIC - DELSOY 5710	46.0	34.7	35	10	
EXPERIMENTAL - MD 00-5159	40.8	-	26	7	
EXPERIMENTAL - MD 99-0700-2RR	39.4	-	30	30	
EXPERIMENTAL - MD 97-6065	37.7	22.0	27	37	
EXPERIMENTAL - MD 99-0687-3RR	35.9	27.4	26	23	
EXPERIMENTAL - V 99-2453	35.9	20.2	26	50	
EXPERIMENTAL - V 99-2609	35.0	23.1	23	37	
EXPERIMENTAL - V 99-2589	34.5	-	24	50	
EXPERIMENTAL - V 99-2588	34.3	-	26	50	
EXPERIMENTAL - V 99-2461	33.1	23.2	28	43	
EXPERIMENTAL - V 99-2534	28.4	-	22	47	
EXPERIMENTAL - V 99-2610	26.7	-	22	30	
PUBLIC - HUTCHESON (S)	18.6	12.9	25	17	
	<b>Mean</b>	<b>37.1</b>	<b>27.6</b>	<b>26</b>	<b>29</b>
	<b>LSD (0.20)</b>	<b>6.9</b>	<b>4.5</b>	<b>3</b>	<b>24</b>

\*Full Cysts/ 4 Plants on July 10

Table 6. Seed yields (2002 and 2003) and performance of entries of Maturity Groups III, IV, and IV-S grown at Pemberton Historical Park in a cyst nematode-infested soil. (Races 1 & 5)

BRAND - ENTRY	Seed Yield, Bu/A		Height, Inches	Full Cysts/ 4 Plants
	2003	2002		
<b>MATURITY GROUP III</b>				
VIGORO - V36C4RR	32.2	-	21	17
S.STATES - RT3799N	31.0	8.0	23	57
S.STATES - RT3802N	30.8	6.8	27	110
PUBLIC - PANA	28.8	6.9	25	63
PUBLIC - IA 3014	18.3	4.8	19	60
PUBLIC - WILLIAMS 82 (S)	21.4	6.3	24	83
	<b>Mean</b>	<b>27.1</b>	<b>6.3</b>	<b>23</b>
	<b>LSD (0.20)</b>	<b>6.0</b>	<b>2.1</b>	<b>2</b>
<b>MATURITY GROUP IV</b>				
PUBLIC - INA	45.1	13.6	31	3
EXPERIMENTAL - MD 99-5144	40.1	-	24	0
EXPERIMENTAL - MD 00-5535	36.2	-	27	53
PUBLIC - REND	32.3	10.1	28	35
EXPERIMENTAL - MD 97-6156	31.4	13.6	26	77
EXPERIMENTAL - MD 99-5720	31.1	-	21	60
S.STATES - RT4502N	31.0	-	27	73
PUBLIC - LS 93-0375	28.9	12.6	20	57
EXPERIMENTAL - MD 00-6036	28.5	-	26	83
CLARK - CL441NRR	25.9	-	23	83
PUBLIC - STRESSLAND (S)	31.0	13.3	25	70
	<b>Mean</b>	<b>32.9</b>	<b>12.8</b>	<b>25</b>
	<b>LSD (0.20)</b>	<b>6.0</b>	<b>NS</b>	<b>2</b>
<b>MATURITY GROUP IV-S</b>				
EXPERIMENTAL - MD 00-5020	47.1	-	19	7
EXPERIMENTAL - MD 96-5275	44.9	22.1	24	10
PUBLIC - MANOKIN	41.8	25.6	26	7
S.STATES - RT4810N	36.9	17.8	30	53
S.STATES - RT4930N	36.3	-	21	93
PUBLIC - KS 4602N	33.5	16.9	26	53
EXPERIMENTAL - MD 99-1353-2RR	32.5	-	23	133
CLARK - CL482NRR	23.4	-	23	50
PUBLIC - CHESAPEAKE (S)	29.3	12.3	28	83
	<b>Mean</b>	<b>36.2</b>	<b>17.6</b>	<b>25</b>
	<b>LSD (0.20)</b>	<b>3.9</b>	<b>3.8</b>	<b>3</b>

\*Full Cysts/ 4 Plants on July 10

Table 7. Seed yields (2002 and 2003) and performance of entries of Maturity Group V grown at Pemberton Historical Park in a cyst nematode-infested soil. (Races 1 & 5)

BRAND - ENTRY	Seed Yield, Bu/A		Height, Inches	Full Cysts/ 4 Plants	
	2003	2002			
<b>MATURITY GROUP V</b>					
EXPERIMENTAL - MD 98-5927	47.8	35.0	21	0	
EXPERIMENTAL - MD 96-5502	47.4	27.2	26	3	
PUBLIC - KS 5502N	42.0	30.0	26	0	
EXPERIMENTAL - MD 99-0687-3RR	41.5	25.8	24	53	
PUBLIC - DELSOY 5710	40.8	30.0	33	0	
EXPERIMENTAL - MD 00-5159	39.4	-	19	20	
EXPERIMENTAL - MD 99-0700-2RR	36.7	-	24	107	
EXPERIMENTAL - MD 97-6065	35.0	24.5	22	63	
EXPERIMENTAL - V 99-2588	34.5	-	24	87	
EXPERIMENTAL - V 99-2609	31.1	23.3	21	40	
EXPERIMENTAL - V 99-2534	30.3	-	22	90	
EXPERIMENTAL - V 99-2453	30.1	23.4	21	140	
EXPERIMENTAL - V 99-2610	29.9	-	21	20	
EXPERIMENTAL - V 99-2589	29.1	-	21	7	
EXPERIMENTAL - V 99-2461	26.6	18.1	24	57	
PUBLIC - HUTCHESON (S)	32.6	23.8	27	107	
	<b>Mean</b>	<b>35.9</b>	<b>26.3</b>	<b>24</b>	<b>50</b>
	<b>LSD (0.20)</b>	<b>6.2</b>	<b>5.1</b>	<b>2</b>	<b>NS</b>

\*Full Cysts/ 4 Plants on July 10