



# Information

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## 2005 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 2005 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 Maryland experimental lines were also evaluated in the tests. These lines were MD 96-5275, MD 98-5927, MD 99-0687-3RR, MD 99-5144, MD 00-5020, MD 00-5024, MD 00-5159, MD 00-6015, MD 01-063 RR, and MD 01-5866.

A list of the released entries in the 2005 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 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. 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 2005 growing season had above normal or adequate rainfall from May through July but became very dry in August and September while October was very wet as shown in Table 3. The tests at the Salisbury Facility also received irrigation amounts of 1 inch on July 5 and 20 and on August 4, but yields were low at the Salisbury Facility and additional irrigation would have been beneficial.

Seed yields are shown in Tables 4-5. Except for Stressland, the yields of the susceptible varieties (Chesapeake, Hutcheson, Stressland, and Williams 82) were 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. The test at Pemberton Historical Park had low levels of cysts across the test. Although we try to locate the test in an area with high cyst populations, temperature, soil moisture, plant growth, and sample date affect the number of cysts that are found on root systems.

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 4-5.

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 by selecting "Soybeans" on the Department's Cropping Systems webpage and choosing the appropriate publication:

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

Table 1. Maturity group, nematode resistance, and seed supplier of released entries in the 2005 test.

BRAND	ENTRY	Maturity Group	Resistant* to		Supplier
			Cyst Races	Root Knot	
Garst	3824 RR/N	III	R3;MR14*	NT	Garst Seed Company Danville, IN 46122
	3960 RR/N	III	R3;MR14	NT	
	4212	IV	R3;MS14	NT	
Pioneer	94M30	IV	R3	S	Pioneer, a DuPont Co. Mount Joy, PA 17552
Vigoro	V49C5RR	IV-S	All	S	Royster-Clark, Inc. Washington C.H., OH 43160
S.States	RT 3551N	III	R3;R14	NT	Southern States Coop. Richmond, VA 23260
	RT 3951N	III	R3;R14	NT	
	RT 4230N	IV	R3;R14	NT	
	RT 4440N	IV	R3;R14	NT	
	RT 4808N	IV-S	R3;R14	NT	
PUBLIC	INA	IV	R1-R5	NT	IL Ag Experiment Station
	KS 4602N	IV-S	R3	NT	KS Ag Experiment Station
	KS 5502N	V	R2-4;R14	NT	KS Ag Experiment Station
	LS 93-0375	IV	R3;R14	NT	Southern IL Univ.-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; NT=not tested

Table 2. Soybean test plot information.

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LOWER EASTERN SHORE RESEARCH & EDUCATION CENTER, SALISBURY FACILITY

Wicomico County - Salisbury, MD

Cooperator: D. Armentrout  
 Planting Date: May 27  
 Row Spacing: 30 inches  
 Soil Type: Norfolk loamy sand  
 Soil Test: pH 6.2, P Index-Very High, K Index- Very High  
 Previous Crop: Soybeans  
 Fertilizer: 500 lbs/A 0-5-18 + sulfur @ 5%+ Boron @ 0.2%  
 Lime: None  
 Herbicide: Preemerge:0.7 lb/A Lorox DF and 0.75 pt/A Dual Magnum II  
 Post:20 oz/A Ultra Blazer, 16oz/A Basagran, 14 oz/A surfactant  
 Insecticide: None  
 Cultivation: Once  
 Irrigation: Three= July 5 (1 inch), July 20 (1 inch), August 4 (1 inch)

PEMBERTON HISTORICAL PARK

Wicomico County - Salisbury, MD

Cooperator: Wicomico County Dept. of Parks and Recreation  
 Planting Date: May 27  
 Row Spacing: 30 inches  
 Soil Type: Norfolk loamy sand  
 Soil Test: pH 6.9, P Index-Very High, K Index- Very High  
 Previous Crop: Soybeans  
 Fertilizer: 500 lbs/A 0-5-18 + sulfur @ 5%+ Boron @ 0.2%  
 Lime: None  
 Herbicide: Preemerge:0.7 lb/A Lorox DF and 0.75 pt/A Dual Magnum II  
 Post:20 oz/A Ultra Blazer, 16oz/A Basagran, 14 oz/A surfactant  
 Insecticide: None  
 Cultivation: Once  
 Irrigation: None

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Table 3. Monthly 2005 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
2005	5.89	3.29	6.39	2.34	1.17	8.12	27.20
Average	3.32	3.62	3.76	5.72	3.59	3.63	23.64

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\*Irrigation added at LES-REC: 3 inches more (1 inch on each date- July 5,20, & Aug. 4)

Table 4. Seed yields (2004 and 2005) and performance of entries grown at the Salisbury Facility in a cyst-infested soil. (Races 1,3, and 5)

MATURITY	BRAND - ENTRY	Seed Yield, Bu/A		Height, Inches	Full Cysts/ 4 Plants*
		2005	2004		
<b>GROUP III</b>	S.STATES - RT 3951N	25.4	-	33	27
	GARST - 3960 RR/N	24.2	-	29	113
	S.STATES - RT 3551N	23.5	-	25	27
	GARST - 3824 RR/N	22.5	-	22	37
	PUBLIC - PANA	21.9	20.2	33	47
	PUBLIC - WILLIAMS 82 (S)	18.9	18.3	31	103
	<b>Mean</b>	<b>22.7</b>	<b>19.0</b>	<b>29</b>	<b>59</b>
	<b>LSD (0.20)</b>	<b>NS</b>	<b>NS</b>	<b>2</b>	<b>54</b>
<b>GROUP IV</b>	PUBLIC - REND	23.0	27.3	29	133
	PUBLIC - INA	22.6	35.8	35	17
	PUBLIC - LS 93-0375	20.8	24.1	28	223
	EXPERIMENTAL - MD 01-063 RR	19.2	-	29	213
	PIONEER - 94M30	18.5	-	28	70
	EXPERIMENTAL - MD 99-5144	18.4	36.5	31	30
	S.STATES - RT 4440N	16.4	-	30	53
	GARST - 4212	15.4	-	26	170
	S.STATES - RT 4230N	13.4	33.3	28	57
	PUBLIC - STRESSLAND (S)	21.2	18.8	33	230
	<b>Mean</b>	<b>18.9</b>	<b>26.8</b>	<b>30</b>	<b>120</b>
	<b>LSD (0.20)</b>	<b>3.3</b>	<b>7.2</b>	<b>3</b>	<b>116</b>
<b>GROUP IV-S</b>	PUBLIC - KS 4602N	19.4	24.5	32	50
	PUBLIC - MANOKIN	19.1	40.0	34	30
	S.STATES - RT 4808N	18.0	-	33	40
	EXPERIMENTAL - MD 00-5020	17.3	47.8	30	10
	EXPERIMENTAL - MD 00-5024	16.7	-	35	37
	VIGORO - V49C5RR	16.3	37.3	30	13
	EXPERIMENTAL - MD 01-5866	15.6	-	30	23
	EXPERIMENTAL - MD 96-5275	13.7	43.9	31	3
	PUBLIC - CHESAPEAKE (S)	9.9	23.0	32	50
	<b>Mean</b>	<b>16.2</b>	<b>33.4</b>	<b>32</b>	<b>29</b>
<b>LSD (0.20)</b>	<b>4.3</b>	<b>4.4</b>	<b>2</b>	<b>NS</b>	
<b>GROUP V</b>	PUBLIC - KS 5502N	14.5	48.3	31	0
	EXPERIMENTAL - MD 98-5927	12.3	42.8	26	0
	EXPERIMENTAL - MD 00-6015	10.2	-	23	243
	EXPERIMENTAL - MD 99-0687-3 RR	8.5	31.7	34	113
	EXPERIMENTAL - MD 00-5159	7.7	37.9	30	30
	PUBLIC - HUTCHESON (S)	5.6	23.4	28	283
	<b>Mean</b>	<b>9.8</b>	<b>35.5</b>	<b>29</b>	<b>112</b>
<b>LSD (0.20)</b>	<b>3.5</b>	<b>7.4</b>	<b>1</b>	<b>127</b>	

\*Full Cysts/4 Plants on July 19

Table 5. Seed yields (2004 and 2005) and performance of entries grown at Pemberton Historical Park in a cyst nematode-infested soil. (Races 1 & 5)

MATURITY	BRAND - ENTRY	Seed Yield, Bu/A		Height, Inches	Full Cysts/ 4 Plants*
		2005	2004		
<b>GROUP III</b>	PUBLIC - PANA	27.0	12.0	27	27
	GARST - 3824 RR/N	27.0	-	20	23
	S.STATES - RT 3551N	26.5	-	21	33
	GARST - 3960 RR/N	26.2	-	25	47
	S.STATES - RT 3951N	22.6	-	24	50
	PUBLIC - WILLIAMS 82 (S)	21.6	11.1	27	77
	<b>Mean</b>	<b>25.1</b>	<b>12.2</b>	<b>24</b>	<b>43</b>
	<b>LSD (0.20)</b>	<b>2.0</b>	<b>NS</b>	<b>2</b>	<b>23</b>
<b>GROUP IV</b>	PUBLIC - INA	36.8	23.5	34	0
	PUBLIC - REND	34.7	17.4	29	20
	PUBLIC - LS 93-0375	32.6	20.4	29	7
	PIONEER - 94M30	29.1	-	26	17
	S.STATES - RT 4440N	28.9	-	27	23
	EXPERIMENTAL - MD 99-5144	28.3	20.9	29	23
	EXPERIMENTAL - MD 01-063 RR	28.0	-	28	7
	GARST - 4212	27.2	-	24	20
	S.STATES - RT 4230N	23.1	13.4	26	17
	PUBLIC - STRESSLAND (S)	35.4	15.4	32	7
	<b>Mean</b>	<b>30.4</b>	<b>14.9</b>	<b>28</b>	<b>14</b>
<b>LSD (0.20)</b>	<b>2.3</b>	<b>3.7</b>	<b>2</b>	<b>NS</b>	
<b>GROUP IV-S</b>	VIGORO - V49C5RR	36.1	19.7	34	3
	EXPERIMENTAL - MD 00-5020	35.5	25.1	28	0
	EXPERIMENTAL - MD 00-5024	32.9	-	38	7
	PUBLIC - KS 4602N	37.5	17.5	27	20
	EXPERIMENTAL - MD 01-5866	31.6	-	27	13
	S.STATES - RT 4808N	30.2	-	35	30
	EXPERIMENTAL - MD 96-5275	29.9	25.1	27	10
	PUBLIC - MANOKIN	29.4	21.8	29	17
	PUBLIC - CHESAPEAKE (S)	29.6	12.2	34	17
<b>Mean</b>	<b>32.5</b>	<b>18.8</b>	<b>31</b>	<b>13</b>	
<b>LSD (0.20)</b>	<b>4.4</b>	<b>3.7</b>	<b>3</b>	<b>NS</b>	
<b>GROUP V</b>	PUBLIC - KS 5502N	42.9	28.7	32	0
	EXPERIMENTAL - MD 99-0687-3 RR	36.4	19.4	32	3
	EXPERIMENTAL - MD 00-6015	33.8	-	21	40
	EXPERIMENTAL - MD 00-5159	29.8	24.2	30	13
	EXPERIMENTAL - MD 98-5927	29.2	31.2	26	0
	PUBLIC - HUTCHESON (S)	31.1	15.1	28	13
	<b>Mean</b>	<b>33.9</b>	<b>35.5</b>	<b>28</b>	<b>12</b>
<b>LSD (0.20)</b>	<b>1.9</b>	<b>7.4</b>	<b>2</b>	<b>NS</b>	

\*Full Cysts/ 4 Plants on July 13

