

**Agronomy Facts No. 43**  
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**2002 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 2002 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 95-5358, MD 96-5275, MD 96-5502, MD 97-6065, MD 97-6156, MD 98-5095, MD 98-5579, MD 98-5927, and MD 99-0687-3RR from Maryland; and V 95-0016, V 97-1911, V 97-2276, V 99-2461, V 99-2609, and V 99-2453 from Virginia.

A list of the released entries in the 2002 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. 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 four 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 2002 growing season was very dry from May through July, but very wet in September and October as shown in Table 3. The tests at the Salisbury Facility also received irrigation amounts of 1.7 inches in July and 1.4 inches in August.

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.

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 2002 test.

BRAND	ENTRY	Maturity Group	Resistant* to		Supplier
			Cyst Races	Root Knot	
AGWAY	APK366NRR	III	R3,R14	NT	Agway Farm Seed
	APK371NRR	III	R3,R14	NT	Tully, NY 13159
	APK432NRR	IV	R3,R14	NT	
S. STATES	RT3799N	III	R3,R14	NT	Southern States Coop.
	RT3802N	III	R3,R14	NT	Richmond, VA 23260
	RT4720N	IV-S	R3,R14	NT	
	RT4810N	IV-S	R3,R14	NT	
PUBLIC	ACCOMAC	V	R1,R3	R	VA Ag Experiment Station
	ANAND	V	R3,R5,R14	S	MO Ag Experiment Station
	DELSOY 5710	V	R1-R5,R14+	R	MO Ag Experiment Station
	FOWLER	V	R2,R3,R5,R14	S	USDA & TN Ag Experiment Station
	INA	IV	R1-R5	NT	IL Ag Experiment Station
	IA 3014	III	R3	NT	IA Ag Experiment Station
	JACK	III	R3	NT	IL 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
	WICOMICO	V	R1,R3	S	MD 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 10  
 Row Spacing: 30 inches  
 Soil Type: Norfolk loamy sand  
 Soil Test: pH 6.8, P Index- Excess, K Index- Medium  
 Previous Crop: Soybeans  
 Fertilizer: 300 lbs/A 0-7-33  
 Lime: None  
 Herbicide: 0.7 lb Lorox-DF and 1pt/A Dual II Magnum  
 Insecticide: None  
 Cultivation: Once  
 Irrigation: 1 inch- July 11; 0.7 inch- July 17, Aug. 15 & 19

Pemberton Historical Park  
 Wicomico County, Salisbury

Cooperator: J.E. Terrell, Jr.  
 Planting Date: June 10  
 Row Spacing: 30 inches  
 Soil Type: Norfolk loamy sand  
 Soil Test: pH 6.3, P Index- Excess, K Index- Medium  
 Previous Crop: Soybeans  
 Fertilizer: 300 lbs/A 0-7-33  
 Lime: None  
 Herbicide: 0.7 lb Lorox-DF and 1 pt/A Dual II Magnum  
 Insecticide: None  
 Cultivation: Once  
 Irrigation: None

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Table 3. Monthly 2002 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.	Season
2002	1.94	1.33	1.09	5.69	4.71	8.45	23.21
Average	3.32	3.62	3.76	5.72	3.59	3.63	23.64

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Irrigation in addition to rainfall at Salisbury Facility: 1.7 in. July and 1.4 in. Aug.

Table 4. Seed yields (2001 and 2002) 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	
	2002	2001			
<b>MATURITY GROUP III</b>					
PUBLIC - PANA	26.7	10.2	27	13	
S.STATES - RT3799N	22.1	13.1	19	8	
S.STATES - RT3802N	21.4	-	22	48	
PUBLIC - IA 3014	20.9	10.2	21	13	
AGWAY - APK371NRR	19.7	-	18	48	
AGWAY - APK366NRR	18.3	-	15	45	
PUBLIC - JACK	15.5	7.9	23	23	
PUBLIC - WILLIAMS 82 (S)	19.6	5.6	23	83	
	<b>Mean</b>	<b>20.5</b>	<b>9.4</b>	<b>21</b>	<b>35</b>
	<b>LSD (0.20)</b>	<b>2.5</b>	<b>2.9</b>	<b>2</b>	<b>NS</b>
<b>MATURITY GROUP IV</b>					
PUBLIC - INA	25.4	32.3	22	18	
AGWAY - APK432NRR	23.4	-	20	123	
PUBLIC - REND	20.2	27.5	22	53	
PUBLIC - LS 93-0375	18.9	22.6	17	115	
EXPERIMENTAL - MD 95-5358	18.8	18.4	17	103	
EXPERIMENTAL - MD 97-6156	17.7	21.8	20	123	
PUBLIC - STRESSLAND (S)	14.3	10.5	19	295	
	<b>Mean</b>	<b>19.8</b>	<b>20.7</b>	<b>19</b>	<b>118</b>
	<b>LSD (0.20)</b>	<b>3.7</b>	<b>4.5</b>	<b>2</b>	<b>123</b>
<b>MATURITY GROUP IV-S</b>					
EXPERIMENTAL - MD 96-5275	23.2	20.1	23	20	
PUBLIC - MANOKIN	20.6	17.9	20	63	
S.STATES - RT4720N	13.9	-	19	150	
EXPERIMENTAL - MD 98-5579	13.8	11.3	17	230	
PUBLIC - KS 4602N	12.9	-	15	448	
S.STATES - RT4810N	11.9	-	16	215	
PUBLIC - CHESAPEAKE (S)	8.9	8.5	18	278	
	<b>Mean</b>	<b>15.0</b>	<b>12.9</b>	<b>18</b>	<b>200</b>
	<b>LSD (0.20)</b>	<b>1.9</b>	<b>3.2</b>	<b>1</b>	<b>133</b>

\*Full Cysts/ 4 Plants on July 10

Table 5. Seed yields (2001 and 2002) 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	
	2002	2001			
<b>MATURITY GROUP V</b>					
PUBLIC - KS 5502N	37.7	-	24	0	
EXPERIMENTAL - V 95-0016	35.4	32.6	24	18	
PUBLIC – DELSOY 5710	34.7	28.4	31	0	
PUBLIC – FOWLER	33.6	31.2	24	0	
PUBLIC – ACCOMAC	31.6	26.3	30	10	
EXPERIMENTAL - MD 98-5927	31.5	30.7	19	3	
EXPERIMENTAL - V 97-1911	31.1	-	22	3	
EXPERIMENTAL - MD 96-5502	30.0	33.0	21	10	
PUBLIC – WICOMICO	27.5	27.6	25	10	
EXPERIMENTAL - MD 99-0687-3RR	27.4	-	22	28	
PUBLIC – ANAND	26.8	27.3	19	45	
EXPERIMENTAL - V 97-2276	25.0	-	22	28	
EXPERIMENTAL - V 99-2461	23.2	-	24	65	
EXPERIMENTAL - V 99-2609	23.1	-	22	438	
EXPERIMENTAL - MD 98-5095	22.5	24.5	21	88	
EXPERIMENTAL - MD 97-6065	22.0	25.5	18	110	
EXPERIMENTAL - V 99-2453	20.2	-	24	40	
PUBLIC – HUTCHESON (S)	12.9	19.2	19	709	
	<b>Mean</b>	<b>27.6</b>	<b>27.2</b>	<b>23</b>	<b>89</b>
	<b>LSD (0.20)</b>	<b>4.5</b>	<b>5.6</b>	<b>2</b>	<b>153</b>

\*Full Cysts/ 4 Plants on July 10

Table 6. Seed yields (2001 and 2002) 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	
	2002	2001			
<b>MATURITY GROUP III</b>					
AGWAY - APK371NRR	8.7	-	15	138	
S.STATES - RT3799N	8.0	9.7	14	128	
AGWAY - APK366NRR	7.2	-	12	398	
PUBLIC - PANA	6.9	9.2	19	83	
S.STATES - RT3802N	6.8	-	18	200	
PUBLIC - IA 3014	4.8	7.9	15	90	
PUBLIC - JACK	2.0	10.1	15	75	
PUBLIC - WILLIAMS 82 (S)	6.3	6.7	16	240	
	<b>Mean</b>	<b>6.3</b>	<b>8.7</b>	<b>15</b>	<b>169</b>
	<b>LSD (0.20)</b>	<b>2.1</b>	<b>NS</b>	<b>2</b>	<b>127</b>
<b>MATURITY GROUP IV</b>					
EXPERIMENTAL - MD 95-5358	15.3	15.4	20	95	
PUBLIC - INA	13.6	20.8	20	13	
EXPERIMENTAL - MD 97-6156	13.6	12.7	19	78	
PUBLIC - LS 93-0375	12.6	7.0	17	38	
AGWAY - APK432NRR	11.0	-	15	153	
PUBLIC - REND	10.1	12.4	20	38	
PUBLIC - STRESSLAND (S)	13.3	12.1	19	143	
	<b>Mean</b>	<b>12.8</b>	<b>11.8</b>	<b>19</b>	<b>79</b>
	<b>LSD (0.20)</b>	<b>NS</b>	<b>3.7</b>	<b>2</b>	<b>41</b>
<b>MATURITY GROUP IV-S</b>					
PUBLIC - MANOKIN	25.6	15.6	23	45	
EXPERIMENTAL - MD 96-5275	22.1	16.3	21	23	
S.STATES - RT4810N	17.8	-	20	183	
PUBLIC - KS 4602N	16.9	-	19	128	
EXPERIMENTAL - MD 98-5579	15.1	7.5	19	163	
S.STATES - RT4720N	13.3	-	18	235	
PUBLIC - CHESAPEAKE (S)	12.3	6.6	20	118	
	<b>Mean</b>	<b>17.6</b>	<b>10.5</b>	<b>20</b>	<b>128</b>
	<b>LSD (0.20)</b>	<b>3.8</b>	<b>3.2</b>	<b>2</b>	<b>88</b>

\*Full Cysts/ 4 Plants on July 10

Table 7. Seed yields (2001 and 2002) 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	
	2002	2001			
<b>MATURITY GROUP V</b>					
EXPERIMENTAL - MD 98-5927	35.0	26.6	20	0	
PUBLIC - DELSOY 5710	30.0	25.4	28	0	
PUBLIC - KS 5502N	30.0	-	22	3	
PUBLIC - ANAND	29.6	25.9	19	68	
PUBLIC - FOWLER	29.5	23.0	24	13	
PUBLIC - ACCOMAC	27.6	26.9	26	25	
EXPERIMENTAL - MD 96-5502	27.2	27.8	19	5	
EXPERIMENTAL - V 97-1911	26.5	-	20	58	
EXPERIMENTAL - V 95-0016	26.1	29.7	23	5	
EXPERIMENTAL - MD 99-0687-3RR	25.8	-	23	45	
EXPERIMENTAL - MD 97-6065	24.5	16.1	21	75	
PUBLIC - WICOMICO	24.4	27.1	23	10	
EXPERIMENTAL - V 97-2276	24.2	-	22	90	
EXPERIMENTAL - MD 98-5095	23.5	17.0	21	70	
EXPERIMENTAL - V 99-2453	23.4	-	22	85	
EXPERIMENTAL - V 99-2609	23.3	-	21	165	
EXPERIMENTAL - V 99-2461	18.1	-	17	153	
PUBLIC - HUTCHESON (S)	23.8	16.5	21	168	
	<b>Mean</b>	<b>26.3</b>	<b>21.4</b>	<b>22</b>	<b>58</b>
	<b>LSD (0.20)</b>	<b>5.1</b>	<b>5.4</b>	<b>2</b>	<b>60</b>

\*Full Cysts/ 4 Plants on July 10