



# Information

DEPARTMENT OF PLANT SCIENCE AND LANDSCAPE ARCHITECTURE  
COLLEGE PARK, MD 20742 • 301.405.1324 • FAX 301.314.9041

Agronomy Facts No. 43  
Revised March 2007

## 2006 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 2006 by the Maryland Agricultural Experiment Station, Department of Plant Science 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 were from Maryland: MD 96-5275, MD 98-5927, MD 99-5144, MD 00-5020, MD 00-5024, MD 00-5159, MD 00-6015, MD 01-5866, and from Nebraska: U9842.

A list of the released entries in the 2006 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 3). 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 on July 26.

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 2006 growing season had above normal total rainfall from the May to October growing season (Table 2). However, high temperatures and low rainfall during late July through August severely reduced seed yields at Pemberton Historical Park for all entries and at LES-REC, Salisbury Facility for entries in the maturity groups III and IV. Even though there were three irrigation applications made at the Salisbury Facility in July, yields of the early entries were still low.

Seed yields are shown in Tables 4-5. 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. However, the number of cysts was low in both fields when we sampled in late July. 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 races 3 and 14 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.

Prepared by: W. J. Kenworthy, B. L. Ikenberry, and J. M. Treacy

Acknowledgements:

The financial support of the Maryland Soybean Board, which helped to provide equipment and funds for conducting this research, is greatly appreciated. The contributions of B.L. Ikenberry, J.M. Treacy, S. Sardanelli, D. Armentrout, R. Harrell, J. Lynch, and F.R. Mulford of the University of Maryland, and personnel in the Department of Recreation and Parks, Wicomico County, are recognized as being essential in the successful completion of this test and are gratefully acknowledged.

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.mdcrops.umd.edu>

Table 1. Maturity group, nematode resistance, and seed supplier of released entries in the 2006 test.

BRAND	ENTRY	Maturity Group	Resistant* to		Supplier
			Cyst Races	Root Knot	
S.States	RT3551N	III	R3;R14	NT	Southern States Coop. Richmond, VA 23260
	RT3760N	III	R3;R14	NT	
	RT4760N	IV-S	R3;R14	NT	
	RT4777N	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. Monthly 2006 and 12-year average precipitation (inches) during May through October at LES-REC, Salisbury Facility.

	May	June	July	Aug.	Sept.	Oct.	Total
2006	1.80	8.85	5.26*	2.05	7.64	6.20	31.80
12-Year Ave.	3.32	3.65	4.75	4.21	4.15	3.40	23.48

\*Irrigation added at LES-REC: July 13,21,and 31 @ 1-inch per date

Table 3. Soybean test plot information

---

LOWER EASTERN SHORE RESEARCH & EDUCATION CENTER, SALISBURY FACILITY  
Wicomico County - Salisbury, MD

Cooperator: D. Armentrout  
Planting Date: June 7  
Row Spacing: 30 inches  
Soil Type: Fort Mott loamy sand  
Soil Test: pH 6.3, P Index- Very high, K Index- Very high  
Previous Crop: Cover crop wheat  
Fertilizer: 500 Lbs/A 05-05-20 + 5% Sulfur+ 0.2% Boron  
Lime: None  
Herbicide: Preemergence: 1 Lb/A Lorox + 1 pt/A Dual II Mag  
Post: 20 fl oz/A Ultra Blazer + 16 fl oz/A Basagran + surfactant  
Insecticide: None  
Cultivation: Once  
Irrigation: July 13, 21, 31 @ 1-inch each date

PEMBERTON HISTORICAL PARK  
Wicomico County - Salisbury, MD

Cooperator: Wicomico County Dept. of Parks and Recreation  
Planting Date: June 7  
Row Spacing: 30 inches  
Soil Type: Fort Mott loamy sand  
Soil Test: pH 6.5, P Index- Very high, K Index- Very high  
Previous Crop: Soybeans followed by cover crop wheat  
Fertilizer: 500 Lbs/A 05-05-20 + 5% Sulfur+ 0.2% Boron  
Lime: None  
Herbicide: Preemergence: 1 Lb/A Lorox + 1 pt/A Dual II Mag  
Post: 20 fl oz/A Ultra Blazer + 16 fl oz/A Basagran + surfactant  
Insecticide: None  
Cultivation: Once  
Irrigation: None

---

Table 4. Seed yields (2005 and 2006) 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*
		2006	2005		
<b>GROUP III</b>	S.STATES - RT3760N	14.8	-	25	3
	S.STATES - RT3551N	12.1	23.5	21	40
	EXPERIMENTAL - U 9842	10.4	-	18	7
	PUBLIC - PANA	8.6	21.9	26	17
	PUBLIC - WILLIAMS 82 (S)	10.2	18.9	27	3
	<b>Mean</b>	<b>11.2</b>	<b>22.7</b>	<b>23</b>	<b>14</b>
	<b>LSD (0.20)</b>	<b>NS</b>	<b>NS</b>	<b>2</b>	<b>18</b>
<b>GROUP IV</b>	PUBLIC - LS 93-0375	18.6	20.8	25	27
	EXPERIMENTAL - MD 99-5144	17.6	18.4	24	7
	PUBLIC - INA	15.4	22.6	28	10
	PUBLIC - REND	10.3	23.0	28	13
	PUBLIC - STRESSLAND (S)	14.0	21.2	25	47
	<b>Mean</b>	<b>15.2</b>	<b>18.9</b>	<b>26</b>	<b>21</b>
	<b>LSD (0.20)</b>	<b>3.4</b>	<b>3.3</b>	<b>1</b>	<b>33</b>
<b>GROUP IV-S</b>	S.STATES - RT4777N	38.5	-	30	93
	EXPERIMENTAL - MD 00-5020	37.4	17.3	20	0
	EXPERIMENTAL - MD 96-5275	34.9	13.7	21	17
	PUBLIC - MANOKIN	33.8	19.1	25	70
	EXPERIMENTAL - MD 00-5024	32.7	16.7	26	67
	EXPERIMENTAL - MD 01-5866	28.9	15.6	21	40
	S.STATES - RT4760N	27.5	-	26	153
	PUBLIC - KS 4602N	27.2	19.4	23	20
	PUBLIC - CHESAPEAKE (S)	30.4	9.9	25	87
	<b>Mean</b>	<b>32.4</b>	<b>16.2</b>	<b>24</b>	<b>61</b>
	<b>LSD (0.20)</b>	<b>NS</b>	<b>4.3</b>	<b>2</b>	<b>74</b>
<b>GROUP V</b>	EXPERIMENTAL - MD 98-5927	53.2	12.3	19	0
	EXPERIMENTAL - MD 00-5159	44.9	7.7	20	0
	PUBLIC - KS 5502N	43.4	14.5	24	3
	EXPERIMENTAL - MD 00-6015	41.9	10.2	20	300
	PUBLIC - HUTCHESON (S)	42.7	5.6	27	153
	<b>Mean</b>	<b>45.2</b>	<b>9.8</b>	<b>22</b>	<b>91</b>
	<b>LSD (0.20)</b>	<b>NS</b>	<b>3.5</b>	<b>2</b>	<b>160</b>

\*Full cysts/ 4 plants on July 26.

Table 5. Seed yields (2005 and 2006) 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*
		2006	2005		
<b>GROUP III</b>	S.STATES - RT3760N	13.1	-	21	10
	EXPERIMENTAL - U 9842	11.3	-	15	3
	PUBLIC - PANA	10.3	27.0	20	10
	S.STATES - RT3551N	9.0	26.5	15	0
	PUBLIC - WILLIAMS 82 (S)	9.6	21.6	17	60
	<b>Mean</b>	<b>10.7</b>	<b>25.1</b>	<b>18</b>	<b>17</b>
	<b>LSD (0.20)</b>	<b>1.8</b>	<b>2.0</b>	<b>2</b>	<b>19</b>
<b>GROUP IV</b>	PUBLIC - INA	16.1	36.8	23	0
	EXPERIMENTAL - MD 99-5144	15.9	28.3	21	3
	PUBLIC - LS 93-0375	12.1	32.6	19	10
	PUBLIC - REND	9.0	34.7	20	13
	PUBLIC - STRESSLAND (S)	11.0	35.4	20	123
	<b>Mean</b>	<b>12.8</b>	<b>30.4</b>	<b>21</b>	<b>30</b>
	<b>LSD (0.20)</b>	<b>2.6</b>	<b>2.3</b>	<b>2</b>	<b>67</b>
<b>GROUP IV-S</b>	EXPERIMENTAL - MD 00-5020	23.0	35.5	17	3
	EXPERIMENTAL - MD 96-5275	18.2	29.9	15	10
	EXPERIMENTAL - MD 01-5866	15.9	31.6	17	40
	PUBLIC - MANOKIN	15.1	29.4	17	7
	EXPERIMENTAL - MD 00-5024	13.7	32.9	19	3
	S.STATES - RT4760N	13.3	-	20	13
	PUBLIC - KS 4602N	12.6	37.5	19	13
	S.STATES - RT4777N	11.7	-	19	7
	PUBLIC - CHESAPEAKE (S)	9.3	29.6	19	10
	<b>Mean</b>	<b>14.8</b>	<b>32.5</b>	<b>18</b>	<b>12</b>
	<b>LSD (0.20)</b>	<b>3.7</b>	<b>4.4</b>	<b>2</b>	<b>13</b>
<b>GROUP V</b>	EXPERIMENTAL - MD 98-5927	19.1	29.2	15	0
	EXPERIMENTAL - MD 00-5159	18.5	29.8	16	3
	EXPERIMENTAL - MD 00-6015	12.2	33.8	14	3
	PUBLIC - KS 5502N	11.1	42.9	20	0
	PUBLIC - HUTCHESON (S)	7.8	31.1	17	0
	<b>Mean</b>	<b>13.7</b>	<b>33.9</b>	<b>16</b>	<b>1</b>
	<b>LSD (0.20)</b>	<b>3.0</b>	<b>1.9</b>	<b>2</b>	<b>4</b>

\*Full cysts/ 4 plants on July 26.