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Evaluation of Commercial Cotton Varieties for Resistance and Tolerance to the Reniform Nematode in Alabama

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EVALUATION OF COMMERCIAL COTTON VARIETIES FOR RESISTANCE AND TOLERANCE TO THE RENIFORM NEMATODE IN ALABAMA

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INTRODUCTION

The reniform nematode *(Rotylenchulus reniformis)* has rapidly become the most damaging nematode pest of cotton in the state of Alabama. Since initial identification in 1959, the reniform nematode has spread rapidly throughout cotton-growing regions in Alabama. It is estimated that the reniform nematode causes more than a 9 percent yield loss to Alabama cotton producers.

Producers currently implement nematicides and crop rotations as their primary management tool against the reniform nematode. Nematicides such as Telone II and Temik 15G have proven effective at increasing yields but can be prohibitively expensive and offer only short-term protection from the reniform nematode. Although crop rotations with non-host crops such as corn and sorghum are effective in reducing populations and damage incurred by the reniform nematode, rotations with these crops are often prohibited by the lack of an economic return.

The availability of a resistant cotton variety would be a profitable solution to yield reduction caused by the reniform nematode, but resistance has not been identified in upland cotton varieties. Tolerance to the reniform nematode would also be an effective management tool, but recent reports are conflicting and provide no information regarding commercially available varieties. Tolerance to several plant parasitic nematodes has been successfully identified and implemented in a wide variety of crops. Levels of tolerance to the root-knot nematode have been identified in cotton and successfully implemented in breeding programs. Several reports speculate that tolerance to plant parasitic nematodes is dependent on location and environmental conditions. Selection of a cotton variety that possesses some level of tolerance would not be a total solution to yield damage incurred from the reniform nematode, but would greatly aid its management.

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The current study focuses on identification of tolerance among currently available transgenic and non-transgenic cotton varieties in Alabama. Selection of varieties for testing was based on availability to Alabama cotton producers and suitability to the growing region. The objectives of this study were (1) to evaluate reproductive capacity of the reniform nematode on upland cotton varieties in the greenhouse, (2) to determine if tolerance exists by measuring variety yield suppression in the presence of the reniform nematode in multiple field environments, and (3) to determine if selected varieties adapted to Alabama are tolerant or resistant to the reniform nematode.

MATERIALS AND METHODS

Greenhouse Evaluations

Greenhouse trials were conducted at the Plant Science Research Center of the Alabama Agricultural Experiment Station on the campus of Auburn University, Auburn, Alabama. Fifty-two transgenic and non-transgenic cotton varieties were evaluated for host suitability to *R. reniformis* and early season growth parameters.

Fifty-two varieties were grown in 150cm^3 conetainer® filled with a loamy sand soil. The soil was autoclaved and seeds were planted and allowed to germinate and grow for seven days, at which time standardized solutions of 1,000 reniform nematodes were pipeted into each container.

Greenhouse experiments were arranged in a randomized complete block design with five replications and the test was repeated twice. Sixty days after inoculation, plants were harvested, nematodes were extracted from the soil, and eggs were removed from the roots. Reniform nematodes were extracted from the soil. Reniform nematodes collected from the soil and eggs extracted from the roots were counted separately with the aid of an inverted microscope and recorded. After enumeration of *R. reniformis* vermiform and egg populations, reproductive factor values (Rf = final population / initial population) were determined.

Early-season growth parameters were evaluated. Fifty-two cotton varieties were planted and inoculated using the methods previously described. Twenty days following inoculation, plants were harvested. Plant shoots were cut at the soil line, measured, and a fresh weight was obtained. Following initial weight measurements, cotton shoots were dried in an 80.0°C drying oven for 48 hours and weights were recorded. Roots were washed to remove all soil and foreign matter. Root architecture was assessed by determining total root length, root diameter, root surface area, root projected area, root volume, and number of root tips. These analyses were obtained by utilizing WinRhizo software version 5.0 with a Hewlett Packard scanner. Root fresh weights and dry weights were also collected.

Field Evaluations of Tolerance

Field experiments were conducted throughout 2002, 2003, and 2004 in both north Alabama and south Alabama. The north Alabama test was located in a producer's field in Limestone County that was naturally infested with *R. reniformis*. The soil

was classified as a silt loam. Plots were conventionally tilled in all years. Varieties were compared with and without a nematicide in all years.

In 2002, 5 pounds per acre Temik 15G was applied to nematicide-treated plots. Temik 15G was applied at planting in the seed furrow with chemical granular applicators attached to the planter. In 2003 and 2004, 3 gallons per acre of Telone II was applied one month before planting. The Telone II was applied using a modified John Deere ripper/bedder injection device. Di-Syston 15G was used to control insects in non-Temik plots in 2002 and in all plots in 2003 and 2004.

Varieties were planted on April 18, 2002, April 22, 2003, and April 29, 2004 with a MaxEmerge® plot planter. Plots consisted of two rows, 25 feet long with 40-inch row spacing in all years. The 2002 test was arranged as paired plots in a randomized complete block design with four replications. The 2003 and 2004 tests were arranged in a split plot in a randomized complete block design with four replications.

In all years, plots were sampled for reniform nematode populations at planting, mid-season, and maturity. All plots in 2004 were evaluated for early season vigor characteristics after planting at the two true leaf growth stage. A visual vigor rating on a 1-5 scale with 1 being the least vigorous and 5 being the most vigorous was performed. Stand counts and plant height measurements were determined on all plots in 2004. Plant height measurements consisted of a five plant sub-sample of each plot. Plots were harvested on September 30, 2002, October 14, 2003, and October 27, 2004. Seed cotton weights were recorded for each plot in all years.

Thirty-two transgenic and non-transgenic cotton varieties were examined with and without the nematicide Telone II in south Alabama in Escambia County in 2003. The southern Alabama field was a sandy loam, naturally infested with the reniform nematode. The Telone II was injected at 3 gallons per acre one month prior to planting.

The test was planted April 30, 2003. Di-Syston 15G was used to control insects in all plots. Plots consisted of one row, 25 feet long with a 38-inch row spacing and were arranged as a split plot in a randomized complete block design with six replications. All plots were sampled for *R. reniformis* populations at planting and maturity. The plots were harvested on October 25, 2003. Seed cotton was weighed and recorded at harvest.

RESULTS AND DISCUSSION

Greenhouse Evaluations

All cotton varieties tested supported reniform nematode reproduction, with reproductive factors between 59.4 and 4.1 (Table 1). While statistical differences existed between total populations of reniform nematodes, the lack of any variety exhibiting a reproductive factor lower than 1.0 indicated that all varieties are susceptible to the reniform nematode. Reproductive factors of SG 105, DPLX 03Q301DR, DPLX 01W93BR, and FM 989 R were in the lowest 5 percent of the varieties tested.

It was theorized that larger root systems of certain varieties could support more reniform nematode populations; however, the lack of a correlation between early sea-

GREENHOUSE EVALUATIONS OF 52 COTTON VARIETIES FOR RENIFORM NEMATODE REPRODUCTION[1]

Variety	Reniform nematodes[2]		Reniform nematode eggs		Rf value[3]	Shoot dry weight (g)		Root dry weight (g)	
SG 105	1646	i-k	2446	p	4.1	0.256	a-m	0.140	c-i
DPLX 03Q301DR	520	k	4252	op	4.8	0.270	a-i	0.161	a-e
DPLX 01W93BR	595	k	5264	n-p	5.9	0.206	i-r	0.079	i-n
FM 989 R	833	jk	6682	m-p	7.5	0.212	h-r	0.100	e-n
DP 5690 R	2124	h-k	9154	l-p	11.3	0.274	a-h	0.106	d-n
ST 4793 R	3361	f-k	8285	l-p	11.6	0.302	ab	0.107	d-n
STX 6848 R	1151	jk	11225	j-p	12.4	0.261	a-k	0.132	c-j
SG 747	2441	g-k	10480	k-p	12.9	0.239	b-n	0.129	c-k
SG 215 BR	3546	f-k	10477	k-p	14.0	0.259	a-l	0.118	d-l
ST5599 BR	2078	h-k	14160	i-p	16.2	0.297	a-c	0.129	c-k
STX 3636 B2R	1715	i-k	16029	h-p	17.7	0.252	b-n	0.142	c-h
STX 4575 BR	2472	g-k	17266	g-p	19.7	0.267	a-j	0.098	f-n
SG 521 R	1840	i-k	17974	g-p	19.8	0.198	k-r	0.101	e-n
DP 432 R	2673	g-k	17582	g-p	20.3	0.201	j-r	0.078	i-n
DP Deltapearl	4929	d-k	18849	f-o	23.8	0.229	e-q	0.064	l-n
FM 991 R	5122	c-k	18669	f-o	23.8	0.228	e-q	0.079	i-n
PM 1218 BR	7802	c-g	16429	h-p	24.2	0.297	a-c	0.149	c-h
BCG 28 R	4738	e-k	20291	e-n	25.0	0.199	k-r	0.048	n
DP 434 R	4574	e-k	20832	e-n	25.4	0.216	g-r	0.092	g-n
DP 555 BR	2001	h-k	23828	e-l	25.8	0.231	c-p	0.090	h-n
ST 5303 R	5622	c-k	21012	e-m	26.6	0.236	b-p	0.113	d-m
DP 494 R	5817	c-k	22017	e-m	27.8	0.227	e-r	0.219	a
BCG 24 R	1978	h-k	25879	d-k	27.9	0.163	qr	0.051	mn
STX 4686 R	2943	g-k	26072	d-j	29.0	0.298	ab	0.128	c-k
STX 5454 B2R	2804	g-k	26729	d-j	29.5	0.170	p-r	0.069	k-n
STX 6636 BR	4581	e-k	25161	d-k	29.7	0.292	a-e	0.120	d-l
ST 4892 BR	10066	b-e	19856	e-n	29.9	0.222	f-r	0.078	i-n
FM 966 LL	3811	f-k	26858	d-i	30.7	0.228	e-q	0.108	d-n
FM 960 BR	3438	f-k	27424	d-i	30.9	0.219	g-r	0.089	h-n
DP 493	4612	e-k	27115	d-i	31.7	0.172	o-r	0.088	h-n
DP 451 BR	3925	f-k	28093	d-i	32.0	0.246	b-n	0.114	d-l
DP 458 BR	6034	c-k	28712	d-i	34.7	0.250	b-n	0.072	j-n
ST 5242 BR	4319	f-k	30952	d-h	35.3	0.290	a-e	0.212	ab
FM 989 BR	4604	e-k	30720	d-h	35.3	0.281	a-g	0.184	a-c
DP 449 BR	15280	ab	20111	e-n	35.4	0.217	g-r	0.157	a-f
FM 991 B2R	6798	c-i	29123	d-i	35.9	0.296	a-d	0.167	a-d
FM 960 R	2094	h-k	34067	b-f	36.2	0.247	b-n	0.153	b-g
DP 444 BR	10344	b-d	26085	d-j	36.4	0.227	e-r	0.120	d-l
DP 424 B2R	8490	c-f	28300	d-i	36.8	0.231	c-p	0.092	g-n
DP 5415 R	7409	c-h	30214	d-h	37.6	0.190	m-r	0.051	mn
FM 991 BR	10626	bc	27066	d-i	37.7	0.286	a-f	0.150	b-h
DPLX 00W12	3623	f-k	34067	b-f	37.7	0.226	e-r	0.130	c-k
DPLX 02T57R	4427	f-k	34029	b-f	38.5	0.258	a-l	0.089	h-n
DP 436 RR	6273	c-j	32316	c-g	38.6	0.191	m-r	0.137	c-i
PHY 410 R	5670	c-k	34631	b-e	40.3	0.230	d-p	0.127	c-k
FM 958 LL	20487	a	26291	d-j	46.8	0.221	f-r	0.078	i-n
DP 491	18834	a	28145	d-i	47.0	0.187	n-r	0.100	e-n
FM 960 B2R	2457	g-k	46543	a-c	49.0	0.194	l-r	0.134	c-j
DPLX 02X39BR	4015	f-k	48050	ab	52.1	0.319	a	0.138	c-i
ST 4646 B2R	5524	c-j	47535	a-c	53.1	0.237	b-o	0.094	g-n
BCG 50 R	3909	f-k	51325	a	55.2	0.291	a-e	0.131	c-k
DP 488 BR	19699	a	39655	a-d	59.4	0.161	r	0.060	l-n
LSD (P ≤ 0.05)	***5528***		***15582***		***---***	***0.0669***		***0.0628***	

[1] Reprodution measured by numbers of reniform nematodes, eggs per root system, and the reproduction factor, and plant growth parameters measured by shoot dry weight and root dry weight. [2] Populations per 150cm^3 of soil. [3] Rf = total vermiform nematodes and eggs / initial populations. Means within columns followed by different letters are significantly different according to Fisher's protected least significant difference test ($P \leq 0.05$).

son growth parameters and reniform nematode populations did not support this theory. Root architecture analyses measuring total root length, total root surface area, total projected area, total root volume, average root diameter, and total number of root tips were determined for 17 varieties. ST 5599 BR had the highest values for each parameter tested (Table 2). Correlation coefficients indicated there were no relationships between any of the root architecture parameters tested and the populations of reniform nematodes.

Field Evaluations of Tolerance

Limestone County, Alabama: Reniform nematode populations in 2002 were extremely high; however, seed cotton yield differences between varieties treated with a nematicide and untreated varieties were not observed. Soil from the north Alabama location was analyzed for Temik microbial degradation. The results of the Temik microbial degradation test indicated that microbial degradation occurred within 10 days after planting and Temik was ineffective in reducing populations of the reniform nematode.

Due to the microbial degradation of Temik, differences between nematicide-treated and untreated varieties were undetectable in 2002.

In 2003 reniform nematode populations at planting were extremely low. Although seed cotton yield differences existed between Telone II-treated varieties and untreated varieties, differences were minimal possibly due to low populations of reniform nematodes at planting. Seed cotton yields varied from a high of 5,260 pounds per acre for ST 5599 BR treated with Telone II to a low of 3,623 pounds per

TABLE 2. GREENHOUSE EVALUATIONS OF 17 COTTON VARIETIES ROOT ARCHITECTURE[1]

Variety	Total root length cm	Total root surface area cm^2	Total projected area cm^2	Total root volume cm^3	Average root diameter mm	Total number of root tips
ST 5599 BR	326.5 a	153.3 a	49.128 a	5.97 a	1.498 a	333.6 a
FM 989 BR	312.7 ab	126.0 a-d	40.118 a-d	4.09 b-d	1.284 a-d	257.2 a-d
DP 5415 R	305.0 a-c	128.2 a-c	40.816 a-c	4.43 a-c	1.339 a-c	302.2 ab
FM 960 BR	304.2 a-c	102.9 b-f	32.756 b-g	2.80 c-f	1.067 de	269.6 a-c
DP 444 BR	302.9 a-c	135.7 ab	43.202 ab	4.98 ab	1.430 ab	222.2 b-d
DP 451 BR	294.5 a-d	130.8 a-c	36.512 b-e	3.61 b-e	1.236 b-e	219.8 b-d
PM 1218 BR	275.8 a-e	87.8 d-f	31.758 d-h	2.90 c-f	1.148 c-e	211.8 cd
FM 989 R	266.4 a-f	111.0 c-e	35.344 b-f	3.80 b-d	1.340 a-c	227.8 b-d
STX 4686 R	250.0 b-f	87.7 d-f	27.924 e-h	2.48 d-f	1.105 c-e	264.6 a-c
DP 458 BR	248.7 c-f	93.5 c-f	29.750 d-h	2.89 c-f	1.159 c-e	217.2 cd
SG 215 BR	234.9 d-f	93.9 c-f	29.880 d-h	3.02 c-f	1.267 a-d	230.0 b-d
FM 991 BR	232.2 d-f	86.9 d-f	27.676 e-h	2.63 d-f	1.194 b-e	241.0 b-d
ST 4892 BR	226.3 e-f	102.4 b-f	29.414 e-h	3.14 c-f	1.305 a-d	178.2 d
DP 555 BR	224.6 e-f	95.0 c-f	30.220 c-h	3.20 c-f	1.347 a-c	194.0 cd
DP 449 BR	222.1 e-f	77.1 ef	24.552 gh	2.07 ef	1.070 de	222.6 b-d
ST 4793 R	217.5 e-f	68.6 f	21.838 h	1.73 f	0.996 e	212.2 cd
DP 436 R	210.5 f	80.2 ef	25.532 f-h	2.45 d-f	1.175 c-e	207.0 cd
LSD (P≤0.05)	***63.2***	***39.1***	***10.657***	***1.6512***	***0.2482***	***83.343***

[1] Root architecture measured by total root length, root surface area, projected area, root volume, number of root tips, and average root diameter. Means within columns followed by different letters are significantly different according to Fisher's protected least significant difference test ($P \leq 0.05$).

acre for PM 1199 R untreated (Table 3). DP 451 BR and ST 4793 R produced equal or greater seed cotton yields in untreated plots compared to Telone II treated plots.

In 2004, no variety performed as well as its nematicide-treated counterpart. Seed cotton yields varied from a high of 5,237 pounds per acre for ST 5599 BR treated with Telone II to a low of 3,579 pounds per acre for ST 4793 R untreated (Table 4). The greatest response to Telone II was recorded on ST 4793 R with a seed cotton increase of 19.4 percent and the least response on FM 989 R with an increase of 2.1 percent.

Consistent tolerance to the reniform nematode was not observed across three years of testing. Out of a possible four varieties tested in the three-year period, DP 451 BR was the higher-yielding variety in the untreated plots in 2003 and 2004. Compared to eight varieties tested in 2003 and 2004, DP 451 BR produced the greatest yields in the untreated plots with the exception of 2004, when ST 5599 BR outyielded it by 8.8 pounds per acre. While DP 451 BR consistently produced greater yields in the untreated plots, the application of Telone II in 2004 increased yields, thus eliminating the possibility of tolerance. Although no tolerance is present in DP 451 BR and ST 5599 BR, the positive performances of these varieties in the absence of a nematicide indicates they should be economically profitable selections in the north Alabama growing region.

ST 5599 BR produced comparable yields to DP 451 BR in the untreated plots in 2003 and 2004. Root architecture data of total root length and total root surface area collected from the greenhouse revealed that ST 5599 BR and DP 451 BR have a prolific root structure compared to other varieties tested. We hypothesize that the larger root systems of ST 5599 BR and DP 451 BR gives them a competitive advantage in soils naturally infested with the reniform nematode.

Escambia County, Alabama: Although tests were set up in 2002, 2003, and 2004 at Escambia County, Alabama, hurricanes in south Alabama prohibited collection of seed cotton yields in 2002 and 2004.

Reniform nematode pressure in 2003 in the south Alabama location was sufficient to decrease seed cotton yields in the plots not treated with Telone II. Seed cotton yields ranged from 2,849 to 850 pounds per acre for FM 991 BR treated with Telone II and DP 436 R untreated, respectively (Table 5). ST 4793 R and SG 521 R exhibited greater or equal performance when not treated with a nematicide, which could indicate possible tolerance. While the positive performance in 2003 by ST 4793 R and SG 521 R seem to indicate possible tolerance, the inability to test over multiple years at the same location and poor performance by these two varieties in north Alabama prohibits calling these two varieties tolerant. If further testing indicated that ST 4793 R and SG 521 R could maintain seed cotton yields equal or greater than those produced by the addition of a nematicide, tolerance of a site specific level could possibly be identified. Although ST 4793 R and SG 521 R produced higher yields in the untreated plots compared to the Telone II plots, FM 991 BR in the untreated plots outyielded both varieties by 376 and 718 pounds per acre, respectively, indicating that FM 991 BR could be the most economically profitable variety for the producer at this time.

TABLE 3. COTTON VARIETY EVALUATIONS CONDUCTED IN NORTH ALABAMA IN 2003[1]

Variety	Harvest reniform populations[2] Telone II treated	Harvest reniform populations[2] untreated	Seed cotton lb/ac Telone II treated	Seed cotton lb/ac untreated	% yield increase from Telone II
DP 5415 R	276 b	650 a-c	4312 c-e	4204 bc	2.6
ST 4892 BR	792 ab	405 bc	4152 de	3942 cd	5.3
DP 451 BR	225 b	360 c	4781 a-c	4837 a	-1.2
DP 436 R	270 b	599 a-c	4555 b-d	4361 a-c	4.4
DP 444 BR	1577 a	624 a-c	5135 ab	4532 ab	13.3
DP 449 BR	277 b	418 bc	4673 a-d	4388 a-c	6.5
PM 1218 BR	779 ab	888 ab	4608 b-d	3912 cd	17.8
SG 215 BR	347 b	508 a-c	4676 a-d	4302 a-c	8.7
PM 1199 R	225 b	497 a-c	3876 e	3624 d	6.9
ST 4793 R	277 b	225 c	4431 c-e	4444 a-c	-0.3
ST 5599 BR	476 b	985 a	5260 a	4532 ab	16.1
FM 989 BR	135 b	412 bc	4856 a-c	4266 bc	13.8
LSD (P≤0.05)	***1081.8***	***504.2***	***597.86***	***553.85***	

[1] Measured by reniform nematode harvest populations and seed cotton yields. [2] Populations per 150cm³ of soil.
Means within columns followed by different letters are significantly different according to Fisher's protected least significant difference test (P≤0.05).

TABLE 4. COTTON VARIETY EVALUATIONS CONDUCTED IN NORTH ALABAMA IN 2004[1]

Variety	Harvest reniform populations[2] Telone II treated	Harvest reniform populations[2] untreated	Seed cotton lb/ac Telone II treated	Seed cotton lb/ac untreated	% yield increase from Telone II
DP 444 BR	1410 ab	1931 a	4805 ab	4231 a-c	13.6
DP 449 BR	2028 ab	1776 a	4118 c-d	3801 cd	8.3
DP 451 BR	1777 ab	2105 a	4774 a-c	4441 ab	7.5
DP 5415 R	1448 ab	2143 a	3859 d	3725 cd	3.6
FM 960 BR	1506 ab	2414 a	4770 a-c	4542 a	5.0
FM 989 R	579 ab	1911 a	4474 b-d	4382 ab	2.1
FM 991 BR	811 ab	1429 a	4257 b-d	4166 a-c	2.2
PM 1218 BR	1236 ab	1217 a	4364 b-d	3990 b-d	9.4
ST 4793 R	1081 ab	2259 a	4274 b-d	3579 d	19.4
ST 4892 BR	2395 a	2395 a	4411 b-d	4047 a-d	9.0
ST 5599 BR	444 b	1699 a	5237 a	4450 ab	17.7
STX 4686 R	1255 ab	1467 a	4624 a-c	4425 ab	4.5
LSD (P≤0.05)	***1854.7***	***1534***	***669.32***	***514.26***	

[1] Measured by reniform nematode harvest populations and seed cotton yields. [2] Populations per 150cm³ of soil.
Means within columns followed by different letters are significantly different according to Fisher's protected least significant difference test (P≤0.05).

TABLE 5. COTTON VARIETY EVALUATIONS CONDUCTED IN SOUTH ALABAMA IN 2003[1]

Variety	Harvest reniform populations[2] Telone II treated		Harvest reniform populations[2] untreated		Seed cotton lb/ac Telone II treated		Seed cotton lb/ac untreated		% yield increase from Telone II
BCG 28 R	1158	a-e	1236	b	1611	j-l	1232	h-l	30.8
DP Delta Pearl	1236	a-e	850	b	2380	b-e	1811	c-g	31.4
DP 436 R	695	c-e	875	b	1902	g-k	850	l	123.7
DP 444 BR	953	b-e	1854	b	1575	kl	1385	e-k	13.7
DP 448 B	1390	a-e	4171	a	2359	c-f	1246	h-l	89.3
DP 449 BR	2163	ab	1545	b	2132	d-i	1698	d-h	25.6
DP 451BR	927	b-e	1468	b	1913	g-k	1184	i-l	61.6
DP 458 BR	1236	a-e	1313	b	2402	b-e	1355	f-k	77.3
DP 491	334	e	1545	b	2079	d-i	932	j-l	123.1
DP 493	1004	b-e	2008	ab	1972	f-k	1620	d-i	21.7
DP 5415 R	1622	a-e	1931	ab	2207	d-g	1385	e-k	59.3
DP 555 BR	1957	a-c	2086	ab	2777	ab	2314	ab	20.0
DP 5690 R	1931	a-d	2085	ab	2376	b-f	1866	b-e	27.4
DP 33 B	772	c-e	3090	ab	2423	b-d	1594	d-i	52.0
FM 991R	1390	a-e	1545	b	2656	a-c	2524	a	5.2
FM 958 B	1159	a-e	2472	ab	2041	d-i	1307	h-l	56.2
FM 960 BR	1390	a-e	2703	ab	2001	e-j	1565	e-i	27.9
FM 966	1081	a-e	2240	ab	1734	i-l	1284	h-l	35.0
FM 989	1236	a-e	1622	b	1935	g-k	1180	i-l	64.0
FM 989 BR	1081	a-e	2240	ab	2094	d-i	1133	i-l	84.8
FM 991BR	1159	a-e	1004	b	2849	a	2614	a	9.0
PM 1218 BR	1158	a-e	1390	b	1929	g-k	1384	e-k	39.4
PHY 410 R	618	c-e	1236	b	1922	g-k	891	kl	115.8
PHY 510 R	1159	a-e	1390	b	2226	d-g	1498	d-i	48.6
ST 4793 R	2394	a	1313	b	1891	g-k	2238	a-c	-15.5
ST 4892 BR	1236	a-e	1236	b	1790	h-l	1336	g-l	34.0
ST 5303 R	541	e	1777	b	2173	d-h	1215	h-l	78.8
ST 5599 BR	1236	a-e	1468	b	1800	h-l	1282	h-l	40.4
STX 0203 BR	1339	a-e	1004	b	1483	l	1206	h-l	23.0
SG 215 BR	566	de	2008	ab	2101	d-i	1844	b-f	13.9
SG 521 R	1931	a-d	1236	b	1862	g-l	1896	b-d	-1.8
SG 747	1004	b-e	2086	ab	2104	d-i	1416	d-j	48.6
LSD (P≤0.05)	***1368.9***		***2304.2***		***405.29***		***495.58***		

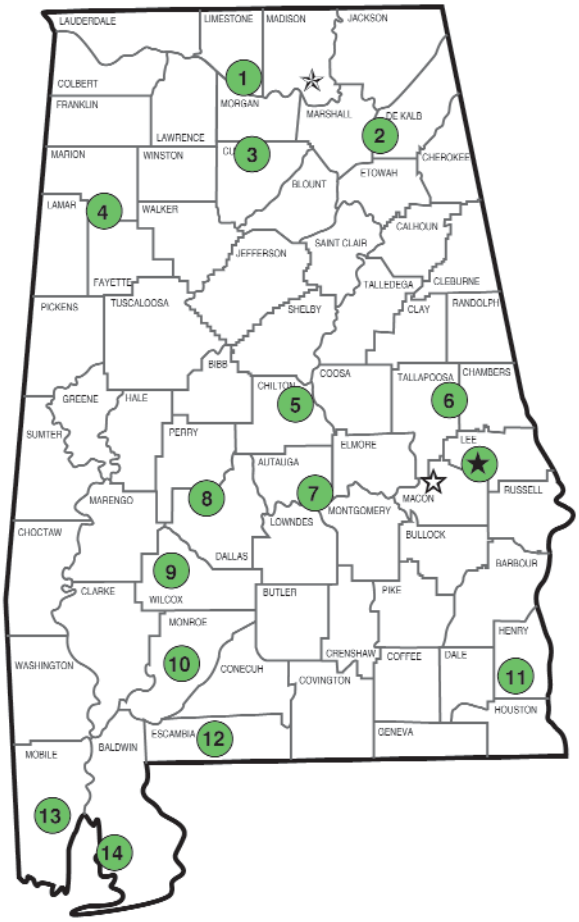
[1] Measured by final reniform nematode populations and seed cotton yields. [2] Populations per 150cm^3 of soil.
Means within columns followed by different letters are significantly different according to Fisher's protected least significant difference test (P≤0.05).

SUMMARY

Our overall results of greenhouse testing and field testing at two locations indicate the absence of a cotton variety tolerant to *R. reniformis.* Although there are available cotton varieties tolerant to the reniform nematode, knowledge of a high-yielding variety suited to the area of production can aid in increased yields in the presence of the reniform nematode. Results from north Alabama and south Alabama locations indicated that varieties such as DP 451 BR, ST 5599 BR, and FM 991 BR, which are considered intolerant, can be of economic value if nematicides are not implemented.

Alabama's Agricultural Experiment Station
AUBURN UNIVERSITY

With an agricultural research unit in every major soil area, Auburn University serves the needs of field crop, livestock, forestry, and horticultural producers in each region in Alabama. Every citizen of the state has a stake in this research program, since any advantage from new and more economical ways of producing and handling farm products directly benefits the consuming public.



Research Unit Identification

★ Main Agricultural Experiment Station, Auburn.
✯ Alabama A&M University.
☆ E. V. Smith Research Center, Shorter.

1. Tennessee Valley Research and Extension Center, Belle Mina.
2. Sand Mountain Research and Extension Center, Crossville.
3. North Alabama Horticulture Research Center, Cullman.
4. Upper Coastal Plain Agricultural Research Center, Winfield.
5. Chilton Research and Extension Center, Clanton.
6. Piedmont Substation, Camp Hill.
7. Prattville Agricultural Research Unit, Prattville.
8. Black Belt Research and Extension Center, Marion Junction.
9. Lower Coastal Plain Substation, Camden.
10. Monroeville Agricultural Research Unit, Monroeville.
11. Wiregrass Research and Extension Center, Headland.
12. Brewton Agricultural Research Unit, Brewton.
13. Ornamental Horticulture Research Center, Spring Hill.
14. Gulf Coast Research and Extension Center, Fairhope.