Lubbock, TX

Abstract

Replicated small plot variety trials in producer fields were conducted for Verticillium wilt and root-knot nematodes. Variety trials were also conducted for bacterial blight, but these were inoculated with *Xanthomonas citri* subsp. *malvacearum*. Verticillium wilt trials were evaluated for wilt incidence, % defoliation, yield, and loan value. The top performing varieties in Verticillium wilt trials were NexGen (NG) 3500XF, Stoneville (ST) 4747GLB2, NG 3640XF, Fibermax (FM) 2484B2F, FM 2322GL, Phytogen (PHY) 243WRF, NG 3699B2XF, and NG 4545B2XF. Results were more variable in root-knot nematode trials. FM 1911GLT, which is not very resistant to root-knot nematode, was a top performing variety in 3 of 4 trials. ST 4946GLB2 and Deltapine (DP) 1558NRB2RF were among the best performing varieties in 2 of 4 root-knot nematode trials. Recent varieties that are at least partially resistant to bacterial blight are: DP 1518B2XF, DP 1639B2XF, DP 1646B2XF; FM 1888GL, FM 1911GLT, FM 1953GLTP; NG 3500XF, NG3640XF, NG 3699B2XF, NG 4545B2XF, NG 4689B2XF; PHY 223WRF, PHY 243WRF, PHY 300W3FE, PHY 490W3FE; ST 5020GLT.

Introduction

Diseases of cotton in the Southern High Plains that can impact yield include Verticillium wilt (*Verticillium dahliae*), root-knot nematode (*Meloidogyne incognita*), and bacterial blight (*Xanthomonas citri* subsp. *malvacearum*). Varieties that have either good resistance or tolerance to each of these diseases can generally yield better in fields that are infested with these pathogens. Since new varieties are introduced each year, as well as previously well characterized varieties are discontinued, it is important to determine the relative disease response and yield in fields that have these diseases. The objective of this study was to conduct small plot variety trials in fields naturally infested with *V. dahliae* and/or *M. incognita*, and measure their disease response and yield. The occurrence and distribution of bacterial blight is more difficult to predict, so disease response, but not yield was measured after artificially infecting varieties with the pathogen. Since the yield response to this disease is so different depending on what part of the plant is affected and timing of infection, that yield was not measured.

Materials and Methods

Verticillium wilt: Three locations were selected in Plainview, Floydada, and Ropesville that had a history of Verticillium wilt. A fourth location was chosen in Plains, which had some history of wilt, but also was infested with root-knot nematode. Plots were two rows wide, 36 feet long. There were between 32 and 40 entries planted at each site, and arranged in a randomized complete block design with four replications. Data collected were: plant stand (all plants in both rows), incidence of wilt generally in late August, and % defoliation in mid-September. Plots were harvested with a two-row cotton stripper modified to weigh harvested plots with load cells. Samples of harvested cotton were taken and two of the replications were ginned to determine lint turnout. HVI was also obtained on these lint samples. A combined analysis was conducted with these variety trials as well as similar one in 2014 and 2015. Every plot was scaled by subtracting the minimum value for yield, wilt, and defoliation and the dividing that number by the range of values ($y_i - y_{min}$)/($y_{max}-y_{min}$). All the scaled data sets were analyzed in a mixed model analysis. The resultant least squares mean values for yield, wilt incidence and defoliation were given an "a" if it did not differ significantly (*P*=0.10) from Fibermax (FM) 2484B2F; a "b" value if it was worse than FM 2484B2F, but significantly better than the susceptible check Phytogen (PHY) 333WRF; a "c" value if it were equal to PHY 333WRF; and a "d" value if it was significantly worse than PHY 333WRF. The varieties with an "a" values for yield, wilt incidence, and defoliation were considered the best varieties to plant in Verticillium wilt fields.

Root-knot nematodes: Two locations (Seminole and Lamesa) were chosen to test a complete set of varieties that had at least partial resistance to root-knot nematodes; and two locations (Brownfield and Plains) were chosen to test

a subset of the varieties of interest. Varieties tested with 2-gene resistance and the number of sites in parentheses were Phytogen (PHY) 417WRF (3), Deltapine (DP) 1558NRB2RF (4), DP 1454NRB2RF (2), and DP 1747NRB2XF (2). Varieties which are advertised as partially resistant (1-gene system) include ST 4946GLB2 (4) and PHY 487WRF (3). Varieties that were tested that probably represent a blend of germplasms with partially resistant and susceptible genes included Fibermax (FM) 1911GLT (4), FM 2011GT (2), and PHY 308WRF (3). Susceptible checks for the trials were PHY 499WRF (3) and NexGen 3406B2XF (3). All sites except the Plains, which was setup as a Verticillium site, had four-row plots, 36 feet long, and entries were arranged in a randomized complete block design with six replications. Data collected included plant stand in one of the rows; galls/plant at 35-45 days after planting, collected on 10 plants/plot; root-knot nematode eggs and second-stage juveniles (J2) late in the growing season (typically late August), and yield. The middle two rows were harvested of each plot, and handled similar to the Verticillium wilt plots.

Bacterial blight: Two trials were conducted. Plots were one row wide, and 36 feet long. Varieties were arranged in a randomized complete block design with four replications in one test and eight replications in the second test. The bacteria (*X. citri* subsp. *malvacearum*) were grown in liquid shake culture on soybean trypticase broth for $1\frac{1}{2}$ days, which increased the bacteria to 10^8 /ml. The bacteria were added to a 50-gal tank (1.8 L of bacteria/50 gal water = 10^6 /ml). Silwet L-77 was included at 0.2% v/v. In test 1, the plots were sprayed with a mixture of 3 isolates (92, 219, and M1). In the second trial, plots in 6 of the replications were sprayed with different individual isolates of the pathogen, and replications 7 and 8 were treated with a combination of two isolates. Plots were rated for incidence of bacterial blight symptoms 14 days after application.

Results and Discussion

Verticillium wilt: The Plainview site had the most severe Verticillium wilt. Nearly every plant in the field displayed disease symptoms by mid-September. Defoliation was lowest in FM 2484B2F (Table 1). NG 3640XF and ST 4747GLB2 had the highest lint yields, and relatively low defoliation. However, the fiber quality was poor for ST 4747GLB2 (\$0.393/lb lint) compared to NG 3640XF (\$0.506/lb lint), resulting in a much higher value for NG 4630XF than any other commercial variety in the trials (Table 1). At the Floydada site, Verticillium wilt incidence and defoliation was also substantial, though yields ended up much higher than the Plainview site. FM 2484B2F had among the lowest wilt incidence and defoliation, and had a much higher yield than any other variety at this site (Table 2). At the Ropesville site, FM 1911GLT had the lowest wilt and defoliation rating and the highest yield (Table 3). Other varieties that performed well at this site included NG 3500XF and NG 3699B2XF. The level of Verticillium wilt was much lower at the Plains site, and it appeared that root-knot nematode dominated the yield results. Therefore, the results will be discussed in the root-knot nematode section. The top performing varieties in Verticillium wilt trials were NexGen (NG) 3500XF, Stoneville (ST) 4747GLB2, NG 3640XF, Fibermax (FM) 2484B2F, FM 2322GL, Phytogen (PHY) 243WRF, NG 3699B2XF, and NG 4545B2XF (Table 4).

Root-knot nematode trials: The Seminole location had the highest overall root-knot nematode densities, but the least differences in yield between entries (Table 5). However, fiber quality and subsequent loan values were quite different between varieties. The highest valued varieties (lint yield x loan value) in numerical order were: FM 1911GLT, ST 4946GLB2, PHY 499WRF (susceptible check), NG 3406B2XF (susceptible check), and DP 1747NRB2XF (Table 5). Loan value ranged from a low of \$0.47/lb for DP 1747NRB2XF to a high of \$0.556/lb for NG 3406B2XF. Root-knot nematode density ranged from a low of 212/500 cm³ soil for PHY 417WRF to a high of 22,920/500 cm³ soil for NG 3406B2XF. DP 1747NRB2XF, DP 1558NRB2RF and DP 1454NRB2RF all had poor stands relative to the other varieties, which would have reduced their yield potential to some degree. At the Lamesa site, there were a number of factors that affected variety performance. Heavy rain events and blowing sand caused the test to grow slowly initially, and it was clear that varieties needing a long growing season were at a disadvantage. There was also some Verticillium wilt in the test and bacterial blight affected all varieties except for the resistant FM 2011GT and FM 1911GLT. The top performing varieties were those that combined an early maturity, Verticillium wilt tolerance, bacterial blight resistance and nematode tolerance (FM 1911GLT and FM 2011GT, Table 6). The lowest root-knot nematode density was with PHY 417WRF (60/500 cm³ soil) and the highest root-knot nematode density was with NG 3406B2XF (13,460/500 cm³ soil). At the Brownfield site, only a subset of the varieties of interest were planted. This location had the most limitations in terms of irrigation, so the yield potential was a bit lower. Also a hail event occurred in October which knocked off a lot of lint from the plants. The highest yielding variety was DP 1558NRB2RF, and the highest valued varieties were DP 1558NRB2RF and FM 1911GLT (Table 7). FM 1911GLT greatly helped its value by having the highest loan value at this site

(\$0.571/lb lint). The lowest root-knot nematode density at Brownfield was with ST 4946GLB2 (180/500 cm³ soil) and the highest was with PHY 499WRF (5,220/500 cm³ soil). There was a lot of pigweed at this site that may have influenced the nematode densities to some degree. The Plains site was planted as a Verticillium wilt site. It was sampled late in the year when root-knot nematode populations had already begun to decline rapidly, so those data are not reported. This site was planted early enough to allow those varieties needing a longer maturation time to reach their yield potential. The top overall valued varieties were DP 1558NRB2RF, ST 4946GLB2, DP 1553B2XF, DP 1646B2XF, DP 1538B2XF, and NG 3406B2XF (Table 8). There was a relationship between yield of root-knot nematode resistant varieties and those susceptible to root-knot nematodes as a function of defoliation by Verticillium wilt. The root-knot nematode resistant varieties had lower yields as defoliation increased (Fig. 1).

Bacterial blight: New varieties with partial to full resistance in test 1 were: DP 1518B2XF, DP 1639B2XF, DP 1646B2XF, FM 1888GL, FM 1911GLT, FM 1953GLTP, NG 3500XF, NG 4545B2XF, PHY 223WRF, PHY 243WRF, PHY 300W3FE, PHY 490W3FE, and ST 5020GLT (Table 9). Additional varieties that were identified in test 2 as partially or fully resistant to bacterial blight were: NG 3640XF, NG 3699B2XF, and NG 4689B2XF (Table 9).

	Vield v loon	Lint	Dlante/		0/_	Turnout	Loon
Cultivar ¹	(\$/acre)	$\frac{1}{1}$	f trow	% Wilt	70 Defaliation		\$/lb
NG 2640VE	<u>(\$/acie)</u>	10/A	1.09	70 WIII	27.8	25.5	0.506
NG 3040AF	520.78	1,191	1.90	00.1	27.8	23.3	0.300
FM 1900GL1	550.78	1,009	1.75	08.1 50.(55.9 21.4	21.2	0.497
FM 2322GL	486.21	992	1.27	59.0 92.6	31.4	26.6	0.490
ST 4/4/GLB2	483.70	1,230	1.58	82.6	24.3	24.9	0.393
PHY 223WRF	4/1.03	1,043	1.62	80.3	27.0	23.7	0.452
FM 1888GL	437.20	1,017	1.42	68.0	32.4	24.6	0.430
FM 2484B2F	421.82	917	2.02	52.1	10.0	23.1	0.460
PHY 243WRF	404.32	974	1.63	62.7	29.9	22.0	0.415
FM 2334GLT	398.60	825	1.48	43.6	21.0	23.8	0.483
FM 1911GLT	396.74	853	1.44	63.2	37.4	23.5	0.465
FM 1830GLT	342.59	712	1.44	58.2	30.5	23.5	0.481
FM 2011GT	335.05	699	1.88	58.0	52.6	25.4	0.480
CG 3226B2XF	311.23	671	1.22	62.8	17.7	27.6	0.464
PHY 333WRF	289.49	645	2.09	66.7	58.0	22.2	0.449
ST 5115GLT	281.39	688	1.68	64.2	43.0	22.7	0.409
NG 3406B2XF	253.22	558	1.50	91.6	80.6	23.8	0.454
DP 1518B2XF	235.90	605	1.95	66.6	67.3	24.5	0.390
NG 3517B2XF	228.38	547	1.82	58.2	49.6	19.3	0.418
PHY 308WRF	218.83	561	2.06	51.4	59.7	18.4	0.390
ST 4949GLT	216.83	514	1.52	58.8	44.2	21.7	0.422
PHY 312WRF	213.42	565	1.74	65.8	61.7	20.8	0.378
PHY 222WRF	212.98	524	1.81	55.2	58.8	20.7	0.406
NG 3405B2XF	204.19	479	1.90	60.3	74.4	22.4	0.427
DP 1612B2XF	194.65	467	1.54	85.7	79.6	22.8	0.417
CG 3475B2XF	179.62	473	1.76	65.0	80.6	19.5	0.380
FM 1953GLTP	163.75	392	1.63	72.3	66.3	17.3	0.418
DP 1410B2RF	162.53	412	1.81	61.1	58.0	17.4	0.394
DP 1614B2XF	133.86	347	1 27	60.8	69.4	21.9	0.386
MSD (0.05)	69.38	154	0.56	25.9	14.5	51	0.081

Table 1. Cultivar responses to Verticillium wilt near Plainview

¹ CG=Croplan Genetics; DP=Deltapine; FM=Fibermax; NG=NexGen; PHY=Phytogen; ST=Stoneville.

	Yield x loan	Lint,	Plants/	2	%	Turnout	Loan
Cultivar ¹	\$/acre	lb/A	ft row	% Wilt	Defoliation	%	\$/lb
FM 2484B2F	994.71	1,751	2.59	20.4	25.6	29.5	0.568
NG 3500XF	864.02	1,551	2.47	19.7	35.1	27.8	0.557
NG 4545B2XF	859.77	1,579	2.63	22.6	36.1	30.6	0.545
FM 2322GL	855.78	1,666	2.41	11.8	10.5	28.5	0.514
FM 2334GLT	810.28	1,539	2.00	26.9	29.3	29.5	0.527
NG 4689B2XF	792.16	1,425	3.10	17.0	44.0	29.6	0.556
PHY 243WRF	786.27	1,593	3.22	8.6	17.4	26.9	0.494
FM 1900GLT	769.71	1,414	2.77	30.7	56.5	30.1	0.544
FM 1830GLT	764.03	1,412	1.99	27.7	38.8	29.4	0.541
FM 1911GLT	761.31	1,530	2.76	13.7	33.6	28.5	0.498
PHY 333WRF	705.89	1,342	2.57	40.0	64.2	28.9	0.526
NG 3306B2RF	704.09	1,397	2.19	36.2	58.8	30.5	0.504
DP 1321B2RF	696.55	1,416	2.74	30.3	54.9	28.5	0.492
ST 4848GLT	692.45	1,401	2.34	31.5	59.5	29.2	0.494
CG 3475B2XF	679.59	1,270	2.74	41.8	59.0	26.8	0.535
NG 3405B2XF	677.46	1,326	2.72	32.5	60.9	28.1	0.511
NG 3699B2XF	676.75	1,310	3.14	14.7	42.7	25.7	0.517
DP 1522B2XF	669.40	1,353	2.51	34.8	65.0	28.0	0.495
DP 1518B2XF	661.54	1,242	3.02	36.8	62.9	27.8	0.533
DP 1614B2XF	653.92	1,294	1.75	37.4	62.7	28.8	0.505
PHY 312WRF	645.02	1,362	2.63	35.0	50.8	28.2	0.474
FM 2007GLT	642.85	1,361	2.71	23.3	46.8	27.2	0.472
PHY 222WRF	640.24	1,255	2.55	34.0	51.6	27.3	0.510
PHY 223WRF	634.32	1,334	3.04	27.7	46.0	25.0	0.476
DP 1612B2XF	614.23	1,252	2.89	34.1	59.4	27.3	0.491
ST 5020GLT	608.11	1,298	2.78	34.8	64.0	28.0	0.469
DP 1219B2RF	592.56	1,235	2.57	31.4	52.6	26.4	0.480
NG 3522B2XF	584.57	1,199	2.66	33.8	57.2	25.8	0.488
MSD (0.05)	64.45	132	0.28	20.0	15.3	NS	0.121

Table 2. Cultivar response to Verticillium wilt near Floydada.

¹CG=Croplan Genetics; DP=Deltapine; FM=Fibermax; NG=NexGen; PHY=Phytogen; ST=Stoneville.

Table J. Cultival	response to ven	lonnum	witt at a		Ropesvine.		
	Yield x loan	Lint,	Plants/		%	Turnout	Loan
Cultivar ¹	\$/acre	lb/A	ft row	% Wilt	Defoliation	%	\$/lb
FM 1911GLT	739.32	1,358	3.07	3.6	0.0	29.1	0.544
NG 3500XF	664.07	1,318	2.98	17.3	7.2	26.5	0.505
NG 3699B2XF	622.06	1,188	3.15	14.6	7.9	26.3	0.524
FM 2334GLT	614.72	1,251	2.36	28.6	4.8	28.1	0.491
NG 4689B2XF	563.31	1,082	3.36	15.4	0.0	24.3	0.518
NG 4545B2XF	555.49	1,162	3.15	23.7	1.7	25.8	0.478
FM 2484B2F	555.13	1,195	3.01	21.8	1.7	26.3	0.458
FM 1830GLT	520.31	1,121	2.66	25.1	5.2	27.6	0.465
CG 3226B2XF	474.53	1,056	2.52	23.3	2.7	28.2	0.446
DP 1646B2XF	452.43	1,015	2.25	36.6	27.4	28.6	0.445
FM 2007GLT	448.74	1,013	2.92	19.8	4.3	25.4	0.442
DP 1522B2XF	437.50	972	2.55	25.4	21.7	25.7	0.445
ST 4946GLB2	431.20	1,069	2.69	29.1	14.9	25.9	0.403
DP 1321B2RF	429.85	944	2.83	14.7	25.0	25.8	0.455
ST 5020GLT	399.29	885	2.95	46.9	43.3	26.2	0.446
NG 3306B2RF	387.42	848	2.54	45.8	24.4	24.3	0.440
DP 1639B2XF	385.44	820	2.55	35.1	30.5	25.2	0.458
PHY 487WRF	364.17	916	3.01	33.4	30.6	25.4	0.397
ST 6182GLT	360.19	751	2.25	42.5	47.7	27.7	0.464
PHY 333WRF	358.51	819	2.90	40.6	53.2	24.6	0.422
PHY 490W3FE	355.83	843	3.07	35.2	17.3	23.2	0.414
ST 4848GLT	351.46	811	2.46	31.2	19.4	24.3	0.431
DP 1410B2RF	332.96	724	2.89	43.9	17.3	22.2	0.443
PHY 495W3RF	331.56	869	2.87	42.1	34.5	27.8	0.383
NG 4601B2XF	326.31	669	2.40	34.8	35.7	24.8	0.480
DP 1359B2RF	319.86	751	2.28	29.6	16.1	27.1	0.424
DP 1549B2XF	298.15	691	2.44	29.0	18.0	21.1	0.431
NG 5007B2XF	292.61	654	2.18	46.5	34.3	22.6	0.430
NG 3522B2XF	279.81	692	2.84	41.6	45.4	25.1	0.403
PHY 444WRF	277.34	676	2.75	53.3	30.5	26.6	0.408
DP 1553B2XF	270.34	612	1.97	32.9	22.3	21.4	0.441
DP 1538B2XF	229.96	542	1.96	57.9	44.0	20.7	0.405
CG 3885B2XF	219.70	546	2.23	62.0	43.5	20.4	0.382
MSD (0.05)	110.74	195	0.27	24.5	29.3	NS	0.140

Table 3. Cultivar response to Verticillium wilt at a field near Ropesville.

¹ CG=Croplan Genetics; DP=Deltapine; FM=Fibermax; NG=NexGen; PHY=Phytogen; ST=Stoneville.

Table 4. Combined a	inarysis or	verticilit	ini wiit van	ety triais	$110111 \ 2014 \ -2$	2010.
	Relative	Rating	Relative	Rating	Relative	Rating
Variety ¹	yield	yield	% wilt	wilt	defoliation	defoliation
NG 3500XF	0.7393	а	0.1933	а	0.2203	а
DP 1558NRB2RF	0.7018	а	0.2428	а	0.3929	с
ST 4747GLB2	0.6782	а	0.2963	а	0.2054	а
NG 3640XF	0.6722	а	0.2318	а	0.2487	а
FM 2484B2F	0.6703	а	0.2165	а	0.1319	а
FM 2322GL	0.6403	а	0.2180	а	0.1444	а
DG 2615B2RF	0.6271	а	0.1820	а	0.2740	b
PHY 243WRF	0.6260	а	0.2315	а	0.1900	а
NG 3699B2XF	0.6144	а	0.1140	а	0.2169	а
NG 4545B2XF	0.6073	а	0.1784	а	0.2162	а
DP 1441RF	0.6058	а	0.3989	с	0.2976	а
FM 2011GT	0.5920	b	0.2577	а	0.3561	b
ST 4946GLB2	0.5830	b	0.3023	b	0.4121	b
FM 9250GL	0.5714	b	0.3313	b	0.3257	b
NG 4111RF	0.5705	b	0.3447	b	0.3063	b
NG 4689B2XF	0.5621	b	0.1302	а	0.1769	а
FM 1911GLT	0.5617	b	0.1205	а	0.2135	а
PHY 223WR	0.5377	b	0.3542	b	0.2866	b
FM 1944GLB2	0.5269	b	0.2924	a	0.2884	b
PHY 487WRF	0.5258	b	0 4001	c	0 4630	c
FM 9180B2F	0.5246	b	0 4020	c	0 2833	b
FM 2007GLT	0 5164	ĥ	0 2935	a	0.2907	b
FM 1320GL	0.5101	h	0.4354	c C	0.3264	b
FM 1830GLT	0.5121	h	0.4554	a	0.1961	8 2
DP 1522B2XF	0.4879	c	0.2828	a	0.4665	ů
EM 2334GI T	0.4859	b b	0.2020	u a	0.1318	2
DP 1646R2XF	0.4852	C	0.2012	a	0.3218	a b
ST 5115GLT	0.4845	c	0.2164	u a	0.2542	b
FM 1888GI	0.4785	C	0.2104	a h	0.2542	b
PHV 490W3FF	0.4757	c	0.3239	C	0.2392	b
FM 1000GI T	0.4600	C	0.3580	b b	0.3403	b
DHV 220WDE	0.4614	C	0.3580	0	0.4277	b
PHV 308WPF	0.4014	C	0.2393	a	0.2790	b
	0.4509	C	0.2237	a	0.3093	b
DF 1511D2KF $DD 1540D2VE$	0.4532	C	0.2811	a	0.2461	U
DF 1349D2AF ST 4949CI T	0.4342	C	0.2743	a	0.2227	a b
NC 2406D2VE	0.4460	C	0.2901	a	0.3914	0
NU 3400D2AF	0.4470	C	0.4819	C h	0.3030	C b
DP 1410B2KF	0.4408	c	0.3040	D	0.3038	D b
DP 1039B2AF	0.4463	С	0.2/3/	a 1.	0.3090	D 1
PHY 312WKF	0.4441	С	0.3448	D	0.4383	b
CG 3226B2XF	0.4437	c	0.2957	C 1	0.0712	a
DP 0912B2RF	0.4327	с	0.3464	b	0.3/6/	b
ST 5020GLT	0.4249	c	0.4042	с	0.5647	c
PHY 417WRF	0.4224	c	0.3108	а	0.4771	с
PHY 333WRF	0.4137	c	0.4635	с	0.5636	с
DP 1321B2RF	0.4124	c	0.3011	b	0.4509	b
DP 1553B2XF	0.4064	с	0.2863	а	0.2690	b
NG 3517B2XF	0.4027	с	0.2191	а	0.2769	b
DP 1518B2XF	0.3937	c	0.3386	b	0.5476	c
PHY 222WRF	0.3934	с	0.2906	b	0.5118	с

0.4938

0.4370

0.2629

с

c

а

0.4672

0.4466

0.3834

c

c

b

DP 1538B2XF

NG 5007B2XF

NG 2051B2RF

0.3921

0.3864

0.3787

с

с

с

Table 4. Combined analysis of Verticillium wilt variety trials from 2014 – 2016.

NG 1511B2RF	0.3766	c	0.2755	а	0.4792	c
DP 1044B2RF	0.3719	c	0.3436	b	0.2116	а
NG 3522B2XF	0.363	c	0.3681	c	0.5347	c
NG 3306B2RF	0.3629	c	0.4387	c	0.4754	c
DP 1212B2RF	0.3535	c	0.4016	c	0.6676	c
CG 3475B2XF	0.3521	c	0.4051	c	0.6863	с
PHY 444WRF	0.3519	c	0.6338	d	0.4479	b
CG 3885B2XF	0.3476	c	0.4952	c	0.4727	с
DP 1219B2RF	0.3441	c	0.3048	b	0.3070	b
DP 1359B2RF	0.3386	c	0.3393	b	0.3316	b
ST 4949GLT	0.3320	c	0.3917	c	0.3356	b
DP 1133B2RF	0.3295	c	0.4312	c	0.3204	b
DP 1612B2XF	0.3263	c	0.4289	c	0.6825	c
ST 6182GLT	0.3253	c	0.3933	c	0.4997	c
PHY 499WRF	0.3235	d	0.4086	c	0.5024	c
ST 5032GLT	0.3222	c	0.3004	а	0.5423	c
PHY 427WRF	0.3134	d	0.3662	b	0.5241	c
PHY 495W3RF	0.3133	d	0.4620	c	0.5698	c
DP 1137B2RF	0.3104	d	0.5419	c	0.4742	c
NG 4012B2RF	0.2948	c	0.4561	c	0.2401	а
FM 8270GLT	0.2947	c	0.2731	а	0.4219	c
NG 3405B2XF	0.2866	d	0.2861	а	0.6858	d
DG 3109B2XF	0.2819	d	0.2013	а	0.2098	а
DP 1614B2XF	0.2790	d	0.3423	b	0.6423	c
FM 1953GLTP	0.2602	d	0.3282	b	0.5515	c
ST 5289GLT	0.2251	d	0.2686	а	0.2609	а

¹CG=Croplan Genetics; DP=Deltapine; FM=Fibermax; NG=NexGen; PHY=Phytogen; ST=Stoneville.

Table 5.	Results from variety trial	conducted near Seminole.	
	TT ¹ 1 1	D 1	-

	Yield			Root-knot			Loan
	x loan	Plants	Galls	nematodes	Lint,	Turnout	(\$/lb)
Variety ¹	(\$/acre)	/foot	/root	/500cc soil ³	lb/A	%	
FM 1911GLT	766 a ²	2.76 b	1.3	15,912 a	1,426 ab	31.4	0.537
ST 4946GLB2	761 ab	2.17 c	1.2	6,168 abc	1,449 a	29.8	0.525
PHY 499WRF	728 abc	2.52 b	1.6	7,728 ab	1,443 a	29.1	0.505
NG 3406B2XF	720 a-d	2.68 b	2.3	22,920 a	1,295 ab	29.5	0.556
PHY 487WRF	705 a-d	2.53 b	1.1	1,080 cd	1,349 ab	27.9	0.523
DP 1747NRB2XF	667 а-е	1.06 d	0.7	2,208 abc	1,419 ab	28.7	0.470
PHY 417WRF	653 b-e	2.07 c	0.4	212 d	1,379 ab	29.0	0.474
DP 1558NRB2RF	651 cde	1.12 d	1.6	2,592 abc	1,355 ab	26.4	0.481
FM 2011GT	624 cde	2.64 b	1.6	6,084 abc	1,239 ab	29.0	0.504
DP 1454NRB2RF	613 de	0.80 d	1.6	2,256 bc	1,332 ab	28.7	0.460
PHY 308WRF	564 e	3.09 a	1.4	9,624 ab	1,175 b	24.0	0.480

¹DP is Deltapine; FM is Fibermax; NG is NexGen; PHY is Phytogen; and ST is Stoneville. ²Means followed by the same letters are not significantly different at P=0.05.

³Nematode densities were LOG10 transformed to determine statistical differences.

	Yield			Root-knot			
	x loan	Plants	Galls	nematodes	Lint,	Turnout	Loan
Variety ¹	(\$/acre)	/foot	/Root	/500cc soil ³	lb/A	%	(\$/lb)
FM 1911GLT	580 a ²	2.43 ab	3.10 bcd	3,790 ab	1,148 a	28.9	0.505
FM 2011GT	560 a	2.65 a	2.53 cd	2,520 ab	1,121 a	27.4	0.500
FM 1888GL	490 b	2.35 bc	5.13 a	13,360 a	999 b	28.2	0.491
NG 3406B2XF	435 c	2.62 ab	4.85 ab	13,460 a	903 c	27.4	0.482
ST 4946GLB2	402 cd	1.98 def	2.42 cd	1,800 bcd	853 c	24.1	0.471
PHY 308WRF	387 d	2.69 a	2.45 cd	1,233 bcd	890 c	25.1	0.435
DP 1747NRB2XF	329 e	1.86 ef	1.43 d	620 cd	787 de	27.3	0.431
DP 1558NRB2RF	306 ef	1.83 efg	2.72 cd	493 de	719 e	25.1	0.426
PHY 487WRF	307 ef	2.20 cd	3.15 a-e	637 de	733 e	23.5	0.417
PHY 417WRF	304 ef	1.76 fg	1.85 cd	60 e	779 de	26.3	0.390
PHY 499WRF	285 f	2.06 de	2.38 cd	3,360 abc	721 e	25.4	0.400
DP 1454NRB2RF	213 g	1.56 g	3.73 abc	1,340 d	512 f	25.2	0.417

Table 6. Results from a variety trial conducted near Lamesa.

¹DP is Deltapine; FM is Fibermax; NG is NexGen; PHY is Phytogen; and ST is Stoneville.

²Means followed by the same letters are not significantly different at P=0.05.

³Nematode densities were LOG10 transformed to determine statistical differences.

Table 7. Results from a variety trial conducted near Brownfield.

	Yield			Root-knot			
	x loan	Plants	Galls	nematodes	Lint,	Turnout	Loan
Variety ¹	(\$/acre)	/foot	/root	/500cc soil ³	lb/A	%	(\$/lb)
DP 1558NRB2RF	430	1.86	52 ab	1,056 ab	798	28.7	0.5393
FM 1911GLT	400	2.38	54 a	1,740 ab	693	28.3	0.5705
ST 4946GLB2	346	2.19	73 a	180 c	672	26.8	0.5163
PHY 417WRF	321	2.21	25 b	793 ab	635	27.2	0.5065
PHY 499WRF	251	2.19	67 a	5,220 a	462	24.8	0.5438
$MSD (0.05)^2$	63				126		NS

¹DP is Deltapine; FM is Fibermax; PHY is Phytogen; and ST is Stoneville.

 ^{2}MSD is minimum significant difference at P=0.05.

³Nematode densities were LOG10 transformed and galls were square root transformed to determine statistical differences.

	Yield x						
Cultivar ¹	loan	Lint,	Plants/ft	%	%	Turnout	Loan
	\$/acre	lb/A	row	Wilt	Defoliation	%	\$/lb
DP 1558NRB2RF	860.45	1,660	2.73	5.1	17.3	30.3	0.519
ST 4946GLB2	849.41	1,610	2.94	7.2	22.9	29.2	0.528
DP 1553B2XF	833.57	1,506	2.58	5.2	8.3	30.8	0.554
DP 1646B2XF	811.40	1,546	2.58	4.9	11.0	31.4	0.525
DP 1538B2XF	808.34	1,460	2.72	9.9	16.7	29.3	0.554
NG 3640XF	791.42	1,594	3.64	4.0	10.4	29.4	0.497
ST 4747GLB2	785.96	1,627	3.46	5.8	6.9	30.0	0.483
NG 3500XF	781.01	1,554	3.07	1.1	4.8	29.9	0.503
NG 5007B2XF	780.07	1,391	2.73	10.6	21.4	29.1	0.561
DP 1639B2XF	773.56	1,469	3.06	3.3	7.1	29.9	0.527
FM 1830GLT	771.97	1,380	3.06	4.2	7.3	29.9	0.560
CG 3885B2XF	761.13	1,365	2.90	8.2	17.7	28.7	0.558
PHY 487WRF	757.37	1,450	3.45	11.6	28.3	26.0	0.523
FM 2484B2F	755.80	1,456	3.42	2.5	9.4	30.6	0.519
DP 1359B2RF	744.66	1,371	2.60	10.5	20.8	30.0	0.543
ST 6182GLT	739.29	1,364	2.72	9.0	17.9	29.9	0.542
ST 5115GLT	739.14	1,375	3.33	4.4	6.3	29.0	0.538
FM 1911GLT	735.14	1,350	3.28	2.2	9.4	29.2	0.545
DP 1549B2XF	730.01	1,476	2.75	5.9	5.8	30.0	0.495
NG 3406B2XF	719.85	1,524	3.21	6.5	8.3	30.0	0.473
FM 1953GLTP	710.93	1,342	3.51	6.8	19.4	30.4	0.530
ST 4949GLT	695.63	1,368	2.75	13.8	9.0	29.6	0.509
PHY 333WRF	695.50	1,453	3.16	17.9	25.0	30.0	0.479
FM 2334GLT	694.52	1,223	2.80	3.0	2.1	28.5	0.568
FM 1888GL	680.33	1,410	3.18	3.6	8.3	30.4	0.483
PHY 490W3FE	679.07	1,328	3.43	15.4	21.0	27.5	0.511
NG 3517B2XF	675.40	1,339	3.09	4.3	6.3	27.3	0.505
PHY 444WRF	659.05	1,338	3.08	17.7	27.7	28.8	0.493
PHY 308WRF	646.71	1,435	3.66	7.7	12.7	26.7	0.451
PHY 495W3RF	564.45	1,252	3.09	24.8	38.3	27.7	0.451
$MSD (0.05)^2$	74.12	148	0.23	6.8	19.9	3.0	

Table 8. Cultivar response to Verticillium wilt and root-knot nematodes near Plains.

¹CG=Croplan Genetics; DP=Deltapine; FM=Fibermax; NG=NexGen; PHY=Phytogen; ST=Stoneville. ²MSD is minimum significant difference at P=0.05.

•	Incidence of	bacterial blight
Cultivar ¹	Test 1	Test 2
CG 3885B2XF		100 a
NG 3522B2XF		100 a
CG 3226B2XF		100 a
PHY 308WRF		100 a
PHY 499WRF	100 a ²	
NG 3517B2XF	96 ab	74 c
NG 4601B2XF		96 ab
PHY 444WRF	91 bc	
DP 1044B2RF	91 bc	95 ab
DP 1614B2XF		90 abc
CG 3475B2XF		89 abc
PHY 312WRF	86 cd	
PHY 220W3FE	81 d	
NG 1511B2RF		78 bc
FM 1320GL	64 e	
DP 1612B2XF		47 d
DP 1646B2XF	28 f	
PHY 243WRF	27 f	
PHY 223WRF	7 g	
FM 1911GLT	4 gh	
FM 1953GLTP	3 gf	
NG 4545B2XF	2 gh	2 f
PHY 339WRF	2 gf	
DP 1518B2XF	1 gf	0 f
FM 1888GL	1 gh	
PHY 300W3FE	1 h	
FM 2484B2F	1 h	3 f
DP 1639B2XF	1 h	
NG 3500XF	0 h	
PHY 490W3FE	0 h	
ST 5020GLT	0 h	
NG 3640XF		0 f
NG 4689B2XF		0 f
NG 3699B2XF		0 f

Table 9. Cultivar response to field inoculations with the bacterial blight pathogen.

¹CG=Croplan Genetics; DP=Deltapine; FM=Fibermax; NG=NexGen; PHY=Phytogen; ST=Stoneville. ²Means followed by the same letters are not significantly different at *P*=0.05.



Figure 1. The relationship between defoliation due to Verticillium wilt and yield for varieties that were either susceptible to root-knot nematode or had at least partial resistance to root-knot nematode.

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