EFFECT OF VERTICILLIUM WILT AND BACTERIAL BLIGHT ON COMMERCIAL COTTON VARIETIES IN 2018

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Abstract

Small plot trials were conducted in three Verticillium wilt fields. Some of the top performing entries for these three sites included NexGen (NG) 4792XF, NG 3500XF, NG 3640XF, Fibermax (FM) 2498BLGT and FM 2334GLT. All of these varieties had high yields in heavily infested fields, and generally showed a relatively low incidence of Verticillium wilt and defoliation. *Xanthomonas citri* pv. *malvacearum* (race 18) was inoculated onto small field plots. Newer commercial varieties that were resistant to bacterial blight included DP 1820B3XF, DP 1822XF, DP 1845B3XF, DP 1908B3XF, DP 1909XF, and DP 1848B3XF. All the experimental lines from Deltapine and Phytogen were resistant to bacterial blight.

Introduction

Verticillium wilt is an important disease problem in cotton. The fungus, *Verticillium dahliae*, forms microsclerotia in all parts of the plant after death, which can germinate and infect subsequent cotton crops. The fungus colonizes the roots, and at some point is able to enter the vascular system and spread upwards. Initial symptoms in the Southern High Plains of Texas are a very bright yellow discoloration of lower leaves, which may also include red discoloration, and necrosis. Leaf discoloration moves up the plant over time. Symptom expression can occur after flower initiation, but typically will strongly express by the last week of August in this region. Defoliation will start low in the plant canopy and move upwards, depending on disease severity and temperatures in September.

Cotton variety selection is the most common method of managing Verticillium wilt. Cotton varieties with good tolerance to this disease should minimize wilt incidence, defoliation, and be able to yield well in the presence of the disease (Wheeler and Woodward, 2016). Management of Verticillium wilt is best done with an integrated approach (El-Zik, 1985). Other management options may include crop rotation (Wheeler et al., 2012), reduced irrigation (Leyendecker, 1950, Land et al., 2017), increasing bed height to stimulate warmer and drier soil conditions (Leyendecker, 1950), and increasing seeding rate (Minton et al., 1972; Wheeler et al., 2010). Most of these integrated approaches involve extra cost or practices that are not necessarily the most desirable. Selection of the best cultivars to plant is the one component that has less negative risks or costs. However, today cultivar selection is driven as much by herbicide and Bt traits as by disease tolerance. It is important to group cultivar responses by these traits.

Bacterial blight of cotton in the U.S. is caused by *Xanthomonas citri* pv. *malvacearum* (Xcm) race 18. Historically, this disease has been important in causing defoliation and boll rots. From 2001 to 2008, many of the most commonly planted cotton varieties in the U.S. had resistance to Xcm race 18. Three of the most important resistant varieties in the MidSouth and Southeast were DP 555BR, DP 444BR, and ST 5599BR. In Texas, there were a number of different Fibermax varieties that were planted and had resistance to Xcm. BR (Bollguard I) varieties were discontinued as a method of managing insect resistance. The most popular Deltapine and Stoneville varieties that replaced these earlier popular varieties were susceptible to Xcm. By 2011 bacterial blight began to cause problems in Arkansas and Mississippi, and then in subsequent years spread to most cotton producing states. By 2016 disease losses had become serious and most of the cotton acres were being planted with susceptible cotton varieties. However, there has been a downward trend over the last two years in producers planting varieties that are susceptible to bacterial blight. It is important to screen advanced breeding lines and commercial varieties for resistance to bacterial blight. It is an important characteristic to producers in making variety selections. As with Verticillium wilt, the development of blight resistant varieties in the different herbicide packages is important to note.

Materials and Methods

Verticillium Wilt

Three producer sites with a history of Verticillium wilt were chosen for these experiments. Composite soil samples (two/site) were taken at planting and assayed for *V. dahliae* using 20 cm*3* dried soil mixed in 80 ml tap water, and plating out 1 ml aliquots on 5 plates of semi-selective media ( ). The Floydada site averaged 6.5 microsclerotia/cm^3 soil, Plainview averaged 34 microsclerotia/cm^3 soil, and Ropesville averaged 31 microsclerotia/cm^3 soil. A partially resistant check variety (FM 2484B2F) and susceptible variety (DP 1612B2XF) were included at all three sites. The Floydada site had 36 cultivars, and Ropesville and Plainview sites had 40 cultivars. Cultivars were arranged in a randomized complete block design with four replications. Plots were two rows wide (40-inch centers) and 36 feet long. Plant stand was counted on both rows. In August, particularly during the last week, the number of plants with Verticillium wilt symptoms were counted and divided by the total number of plants to calculate disease incidence. In midSeptember, the plots were rated for defoliation by taking 10 paces through the plot. At each pace a rating was made for that spot in each row separately, for a total of 20 ratings per plot. The scale for rating was 0 = no defoliation, 1 = < 33% defoliation, 2 = 34-66% defoliation, 3 = 67-99% defoliation, 4 = 100% defoliation. The midpoint of these ratings (0%, 16.5%, 49.5%, 82.5%, 100%) were averaged for the 20 ratings in a plot to calculate % defoliation. The plots were harvested with a two-row John Deere 484 cotton stripper and the harvested material was weighed on load cells and then a 1000 g subsample was saved to gin. The ginned sample allow us to calculate the turnout (% lint) of the sample and convert harvested plot into lbs of lint/acre. A sample of lint was sent to Texas Tech Fiber and Biopolymer Center which provided HVI results. The loan value was calculated for 2018 from the lint properties. Analysis of variance was performed on plant stand, wilt incidence, % defoliation, lint yield, and value/acre (lint yield/acre x loan value/lb lint).

Bacterial blight

This inoculated experiment was conducted at the Texas A&M AgriLife Research and Extension Center in Lubbock. There were 28 entries, arranged in a RCBD with four replications. Plot size was 1 row-wide (40-inch centers) and 29 feet long. Two isolates of Xcm race 18 were grown on Trypticase soy broth for 1 ½ days on a shaker, and then 1800 ml of this concentrate was added to 50 gallon water + 379 ml Silwet L-77 and sprayed out over the cotton at a rate of 50 gallon/acre. The plots were sprayed on 17 July and rated for incidence of blight on 3 August. To rate plots, 15 paces are made through the plot and at each pace, the plants are examined for blight symptoms. The number of spots out of 15 that are positive are used to calculate % susceptible (i.e. 1 positive plant/15 = 7% susceptible). Analysis of variance was performed on %blight.

Results and Discussion

Verticillium wilt

The trial near Floydada had moderate wilt symptoms in late August and severe defoliation due to Verticillium wilt. The top yielding varieties were: FM 2322GL, FM 2498GLT, NG 3500XF, FM 1911GLT, NG 3640XF, and PHY 320W3FE (Table 1). Wilt incidence ranged from 11% (FM 2484B2F) to 36% (PHY 340W3FE). Defoliation ranged from 25% (PX2BX4W3FE) to 82% (DP 1612B2XF). Loan value ranged from $0.5431 (DP 1646B2XF) to $0.4470 (Croplan Genetics 9178B3XF). Micronaire values $\geq$ 4.0 were AMX1818B3XF, BX1971GLTP, DP 1820B3XF, and NG 3500XF. (Table 2). Micronaire values < 3.0 were CPS182696GLTP, PHY 340W3FE, PX3B07W3FE, and PX3B09W3FE.

The trial near Plainview had severe wilt symptoms in August, but only moderate defoliation in September. The top yielding varieties were: NG 3500XF, NG 3640XF, DP 1822XF, and FM 1830GLT (Table 3). Wilt incidence ranged from 37% (FM 1911GLT) to 82% (DP 1612B2XF). Defoliation ranged from 23% (WU18XC9) to 81% (DP 1612B2XF). Loan value ranged from a high of $0.4998 (NG 3500XF) to a low of $0.4168 (PX3B07W3FE). Micronaire was low for all cultivars, but the highest were: NG 3500XF (2.85), PX2A31W3FE (2.84) and Croplan Genetics 3475B2XF (2.83) (Table 4).

The trial near Ropesville had good wilt development and substantial defoliation. The top yielding varieties were NG 4792XF, FM 1911GLT, FM 2334GLT, and CPS18703GLT (Table 5). Wilt incidence ranged from 26% (FM 1911GLT to 87% (PX4A69W3FE). Defoliation ranged from 26% (WU18XT9) to 86% (Croplan Genetics 9178B3XF). Loan value was good overall and ranged from $0.5590 (DP 1646B2XF and FM 2334GLT) to $0.4275 (PX4A69W3FE). Micronaire was < 4 for all cultivars, with the highest value of 3.96 (DP 1646B2XF) and the lowest micronaire of 2.45 (PX4A69W3FE).

Table 1. Verticillium Wilt Trial at Floydada with moderate disease pressure.

Cultivar[a]	Lint Yield (lbs/a)	Yield x Loan ($/A)	%Wilt	% Defol-iation	Plants /foot of row	Turnout	Loan Value (µ/lb)
FM 2322GL	1,450	735.15	19.2	41.3	1.72	0.335	50.70
FM 2498GLT	1,402	744.75	15.7	53.6	2.93	0.304	53.13
NG 3500XF	1,300	663.00	24.8	54.2	1.71	0.312	51.02
FM 1911GLT	1,288	674.39	12.6	34.1	2.55	0.308	52.37
NG 3640XF	1,263	648.68	24.1	46.1	2.06	0.284	51.35
PHY 320W3FE	1,257	593.56	24.3	56.1	2.78	0.292	47.22
CPS18703GLT	1,246	620.13	18.2	51.4	2.61	0.305	49.79
NG 3517B2XF	1,235	647.27	23.9	49.2	1.97	0.292	52.40
FM 1888GL	1,233	623.78	21.3	36.0	1.88	0.305	50.58
FM 2484B2F	1,223	603.31	11.1	27.9	2.50	0.299	49.33
AMX1813B3XF	1,221	588.77	15.1	38.9	2.59	0.294	48.24
CPS18505CB3XF	1,195	567.63	28.2	51.5	2.14	0.297	47.52
DP 1822XF	1,186	620.96	16.3	52.5	2.07	0.299	52.38
BX1971GLTP	1,170	629.69	11.5	30.9	1.89	0.332	53.82
PHY 250W3FE	1,148	564.70	15.4	39.6	2.84	0.297	49.19
PX2A31W3FE	1,141	575.99	23.5	33.1	2.73	0.297	50.47
PX3C06W3FE	1,138	564.23	21.1	30.6	2.52	0.295	49.57
DP 1820B3XF	1,134	567.57	33.1	47.2	1.02	0.325	50.05
FM 2574GLT	1,132	572.54	17.1	52.9	1.72	0.311	50.60
PHY 350W3FE	1,128	566.01	16.4	34.2	2.78	0.295	50.20
PX3B07W3FE	1,128	544.02	22.5	69.8	2.75	0.294	48.25
PHY 330W3FE	1,074	490.60	45.0	72.5	2.20	0.284	45.69
PX2BX4W3FE	1,061	494.19	11.0	24.6	2.76	0.285	46.60
NG 3780B2XF	1,058	511.54	22.5	71.3	1.86	0.272	48.35
PX3B09W3FE	1,052	497.71	21.2	64.7	2.83	0.294	47.30
NG 4545B2XF	1,042	532.88	33.8	52.5	1.52	0.288	51.14
DP 1612B2XF	1,034	495.68	34.3	81.9	2.31	0.291	47.95
CG 3885B2XF	1,022	535.25	27.8	79.0	2.17	0.313	52.36
NG 4689B2XF	1,002	482.36	20.5	50.5	2.06	0.292	48.14
DP 1646B2XF	995	540.25	32.9	60.9	1.38	0.333	54.31
AMX1818B3XF	986	499.45	22.4	45.5	1.53	0.302	50.68
NG 3699B2XF	974	435.49	31.5	61.8	1.50	0.265	44.70
PHY340W3FE	967	435.75	35.6	70.9	2.26	0.271	45.05
FM 1830GLT	950	498.96	13.8	43.6	1.95	0.325	52.55
CPS18269GLTP	929	453.57	23.8	76.7	2.15	0.306	48.85
CG 9178B3XF	868	409.40	39.8	75.5	1.09	0.302	47.18
MSD[b]	194	92.96	12.4	13.1	0.26	0.023	4.28

[a]Cultivars that start with AMX are experimental lines for Americot; BX are experimental lines for BASF; CG are varieties for Croplan Genetics; CPS are experimental lines for Dynagro/All-Tex Cotton; DP are Deltapine, FM are Fibermax; NG are NexGen, PHY are Phytogen; PX are experimental lines for Phytogen.

[b]MSD is the minimum significant different (P=0.05).

Table 2. Fiber data for Verticillium trial at Floydada.

Cultivar[a]	Mic[b]	Length	Unif.	Stren.	Elong.	Rd	+b	Leaf	Color grade
AMX1813B3XF	3.39	1.15	82.8	31.3	5.7	72.3	6.7	4.0	51-1
AMX1818B3XF	4.20	1.15	82.6	33.2	6.8	73.1	6.5	4.0	51-1
BX1971GLTP	4.02	1.14	82.0	32.2	5.3	74.2	7.0	3.0	41-1,41-2
CG3885B2XF	3.74	1.07	80.9	29.6	7.6	73.4	7.0	2.0	41-2
CG9178B3XF	3.21	1.13	82.0	33.8	6.0	71.3	7.1	5.5	51-1
CPS18269GLTP	2.92	1.14	81.9	33.4	6.8	73.1	7.4	4.5	41-2
CPS18505CB3XF	3.68	1.03	81.5	31.7	8.5	71.8	7.5	3.5	51-1,41-2
CPS18703GLT	3.39	1.14	80.9	31.3	5.7	74.9	6.7	4.0	51-1,41-2
DP1612B2XF	3.34	1.12	81.0	33.0	7.4	70.4	7.0	4.5	51-1
DP1646B2XF	3.70	1.16	80.9	30.6	6.5	75.1	6.7	2.5	41-2
DP1820B3XF	4.06	1.14	79.9	31.2	4.6	71.8	6.8	3.5	51-1
DP1822XF	3.71	1.14	81.8	33.5	5.5	73.5	6.8	3.0	51-1,41-2
FM1830GLT	3.74	1.18	81.4	32.1	5.2	74.1	6.3	3.5	51-1,41-2
FM1888GL	3.54	1.15	82.2	32.9	4.1	73.5	6.3	5.0	51-1
FM1911GLT	3.57	1.17	81.9	31.3	5.4	73.9	6.4	4.0	51-1,41-2
FM2322GL	3.71	1.16	81.7	32.6	4.1	71.9	6.4	5.0	51-1
FM2484B2F	3.17	1.18	82.4	33.2	5.7	75.3	5.9	4.5	51-1,41-2
FM2498GLT	3.47	1.16	82.1	32.8	5.3	75.0	6.3	4.0	41-2
FM2574GLT	3.54	1.17	80.8	32.7	5.3	74.0	6.1	4.5	51-1
NG3500XF	4.00	1.09	82.4	31.3	6.8	71.4	7.5	3.5	51-1,41-2
NG3517B2XF	3.41	1.14	82.2	32.4	6.6	73.8	6.9	4.5	41-2
NG3640XF	3.77	1.10	82.6	32.8	7.1	72.3	7.3	4.5	51-1,41-2
NG3699B2XF	3.01	1.14	80.4	31.5	5.3	71.7	7.0	5.5	51-1
NG3780B2XF	3.32	1.13	80.7	32.0	6.8	71.3	6.6	6.5	51-1
NG4545B2XF	3.55	1.10	80.8	31.1	5.0	73.3	7.4	3.5	41-2
NG4689B2XF	3.53	1.07	80.4	31.6	5.1	72.2	7.3	4.0	51-1
PHY250W3FE	3.54	1.13	81.9	31.7	5.1	73.5	6.2	4.5	51-1
PHY320W3FE	3.17	1.13	82.5	31.9	6.6	71.4	6.3	5.0	51-1
PHY330W3FE	3.07	1.12	81.0	31.2	5.7	71.0	7.0	5.0	51-1
PHY340W3FE	2.97	1.12	81.2	30.5	5.7	71.5	6.9	5.5	51-1
PHY350W3FE	3.51	1.13	81.4	31.5	6.7	73.6	6.6	4.0	51-1,41-2
PX2A31W3FE	3.73	1.13	82.6	32.0	5.0	73.7	6.6	3.5	51-1
PX2BX4W3FE	3.30	1.16	79.9	32.0	5.6	73.1	6.6	5.5	51-1
PX3B07W3FE	2.93	1.12	80.1	32.3	5.9	74.3	6.7	4.0	41-2
PX3C06W3FE	3.54	1.11	80.1	29.9	5.7	70.6	5.9	6.0	51-1,51-2
PX3B09W3FE	2.94	1.12	79.8	31.6	5.7	74.8	6.8	4.0	41-2
MSD[c]	0.36	0.04	2.1	2.68	1.9	1.7	0.6	1.9	

[a]Cultivars that start with AMX are experimental lines for Americot; BX are experimental lines for BASF; CG are varieties for Croplan Genetics; CPS are experimental lines for Dynagro/All-Tex Cotton; DP are Deltapine, FM are Fibermax; NG are NexGen, PHY are Phytogen; PX are experimental lines for Phytogen.

[b]Micronaire (mic), uniformity (unif), strength (stren), and elongation (elon).

[c]MSD is the minimum significant different (P=0.05).

Table 3. Variety trial near Plainview with severe Verticillium wilt.

Cultivar[a]	Lint Yield (lbs/a)	Lint yield X loan ($/acre)	Loan Value (µ/lb)	Turnout	%Wilt	%Defol-iation on	Plants/ ft. of row
NG 3500XF	1,021	510.05	49.98	0.238	67.0	41.4	1.95
NG 3640XF	968	471.10	48.68	0.237	54.4	29.2	1.97
DP 1822XF	958	464.99	48.55	0.260	70.7	47.2	1.90
FM 1830GLT	950	427.86	45.05	0.284	59.4	32.4	1.89
AMX1823B3XF	897	394.95	44.03	0.240	48.5	48.6	2.08
FM 2484B2F	827	359.12	43.45	0.233	46.8	25.4	2.07
FM 1888GL	797	369.30	46.35	0.245	60.2	35.2	1.68
PX2BX4W3FE	792	343.62	43.40	0.230	67.3	24.8	2.08
AMX1819B3XF	787	364.11	46.25	0.239	47.7	57.8	2.37
PHY 350W3FE	749	329.52	43.98	0.231	55.3	46.8	2.16
PX2A31W3FE	731	362.92	49.63	0.252	73.8	37.3	1.99
PX3C06W3FE	720	321.12	44.63	0.246	63.1	56.0	2.13
DP 1820B3XF	709	335.33	47.33	0.244	67.2	39.8	1.72
CPS18506BB3XF	700	317.91	45.40	0.293	62.4	54.7	2.02
WU18XC9	700	312.31	44.60	0.213	63.5	22.8	1.80
NG 3517B2XF	698	324.80	46.55	0.229	58.3	72.3	2.21
FM 1911GLT	696	306.37	44.05	0.245	37.3	29.0	2.05
PHY 250W3FE	652	292.07	44.83	0.222	67.3	44.3	2.11
PHY 320W3FE	611	262.70	43.03	0.214	47.0	46.8	2.20
CPS18450B2F	604	293.61	48.65	0.242	60.9	66.1	2.03
CG 3527B2XF	590	274.12	46.48	0.251	58.0	50.6	1.95
BX1921GL	583	254.48	43.65	0.228	56.6	35.8	1.91
NG 3780B2XF	577	279.56	48.45	0.211	61.2	61.9	2.13
CG 3475B2XF	570	271.20	47.60	0.272	81.7	78.2	2.15
DP 1725B2XF	556	252.82	45.45	0.231	71.2	50.6	1.66
ST 5122GLT	556	240.47	43.23	0.232	66.7	66.0	2.07
AMX1815B3XF	545	237.78	43.65	0.228	57.2	59.9	1.93
NG 3699B2XF	537	230.54	42.93	0.219	55.4	66.9	1.89
PX3B09W3FE	494	206.75	41.83	0.245	67.0	72.0	2.14
FM 2322GL	487	222.97	45.83	0.233	55.1	49.8	1.58
CPS18506DB3XF	478	204.00	42.70	0.192	57.3	28.6	1.73
PX3B07W3FE	452	188.29	41.68	0.238	63.2	64.9	2.30
CPS18864GLTP	450	199.49	44.33	0.213	64.7	40.0	1.90
CPS18504DB3XF	449	190.84	42.48	0.213	82.5	28.2	1.16
PHY 300W3FE	427	183.74	43.03	0.214	67.5	64.0	2.12
DP 1612B2XF	424	195.89	46.20	0.237	82.3	81.2	2.03
PHY 330W3FE	420	178.10	42.43	0.227	63.4	60.4	2.10
BX1972GLTP	411	180.64	43.95	0.210	70.7	51.7	1.88
FM 1953GLTP	402	185.24	46.05	0.235	79.4	75.3	2.07
PHY 340W3FE	351	149.42	42.60	0.218	67.4	71.3	2.18
MSD[b]	74	33.89	4.54	0.045	19.0	13.1	0.24

[a]AMX are experimental lines for Americot; BX are experimental lines for BASF; CG is Croplan Genetics; CPS are experimental lines for Dynagro/All-Tex Cotton; DP is Deltapine, FM is Fibermax; NG is NexGen, PHY is Phytogen; PX are experimental lines for Phytogen; ST is Stoneville; WU are experimental lines for Winfield.

[b]MSD is the minimum significant different (P=0.05).

Table 4. Fiber data from the Verticillium wilt trial at Plainview.

Cultivar[a]	Mic	Length	Unif.	Stren.	Elong.	Rd	+b	Leaf	Color grade
AMX1815B3XF	2.43	1.13	81.5	32.0	6.9	74.8	6.2	6.5	41-2
AMX1819B3XF	2.65	1.13	80.7	29.0	7.4	79.0	6.8	5.5	31-2,41-1
AMX1823B3XF	2.46	1.11	79.2	28.0	7.2	79.5	7.4	4.0	31-1,31-2
BX1921GL	2.47	1.15	80.7	28.6	6.0	77.0	6.5	7.5	41-1,41-2
BX1972GLTP	2.40	1.13	79.5	28.1	6.8	79.5	6.8	5.0	31-2,41-1
CG 3475B2XF	2.83	1.11	80.4	30.0	7.4	77.9	7.2	5.0	31-1,41-1
CG 3527B2XF	2.71	1.13	79.8	27.3	6.9	77.6	7.0	5.5	31-2,41-1
CPS18450B2F	2.59	1.15	80.5	29.9	6.5	81.7	7.3	3.0	21-2,31-1
CPS18504DB3XF	2.27	1.12	77.6	25.2	6.5	81.1	6.7	3.5	31-1,31-2
CPS18506BB3XF	2.69	1.10	78.2	28.0	5.9	77.4	7.1	4.0	31-2,41-1
CPS18506DB3XF	2.13	1.10	78.2	26.6	7.0	78.2	7.5	5.0	21-2,41-1
CPS18864GLTP	2.19	1.12	78.5	29.1	5.7	78.7	7.8	4.5	21-2,31-2
DP 1612B2XF	2.63	1.13	80.6	30.1	7.4	76.3	7.0	5.5	41-1
DP 1725B2XF	2.47	1.11	78.2	27.4	5.9	79.7	7.8	3.0	31-1
DP 1820B3XF	2.59	1.18	80.5	30.2	5.9	81.5	6.8	3.5	31-1
DP 1822XF	2.65	1.19	80.6	30.5	6.0	80.6	7.0	4.0	31-1,31-2
FM 1830GLT	2.47	1.19	80.2	30.4	6.1	79.2	6.9	5.5	31-1,41-1
FM 1888GL	2.56	1.16	81.4	30.2	5.2	76.7	7.0	6.0	31-2,41-2
FM 1911GLT	2.23	1.13	78.6	27.8	6.1	82.2	6.5	4.5	31-1
FM 1953GLTP	2.50	1.13	79.4	29.1	7.3	81.3	7.0	4.0	21-2,31-1
FM 2322GL	2.53	1.17	81.1	30.0	5.6	77.2	6.4	5.5	41-1,41-2
FM 2484B2F	2.26	1.16	78.8	27.7	5.6	80.0	6.6	4.5	31-1,41-1
NG 3500XF	2.85	1.11	81.4	29.9	7.1	79.0	7.9	4.0	31-1
NG 3517B2XF	2.71	1.11	80.6	30.3	6.9	79.7	7.3	4.0	31-1,41-1
NG 3640XF	2.71	1.11	80.6	30.3	6.7	78.9	8.1	3.5	31-1
NG 3699B2XF	2.42	1.14	78.2	27.6	5.4	76.5	7.0	5.0	41-1
NG 3780B2XF	2.70	1.12	79.1	28.9	7.3	78.3	7.5	4.5	31-2
PHY 250W3FE	2.38	1.13	79.6	29.2	5.1	80.8	6.8	4.0	31-1,31-2
PHY 300W3FE	2.39	1.09	79.7	27.3	6.4	76.4	7.4	3.5	31-1,41-2
PHY 320W3FE	2.18	1.10	79.2	28.1	7.0	79.7	7.2	4.0	31-1,31-2
PHY 330W3FE	2.46	1.10	78.4	27.5	6.1	77.4	7.2	5.5	41-1
PHY 340W3FE	2.38	1.09	79.0	26.7	6.5	77.3	7.5	5.5	31-2,41-1
PHY 350W3FE	2.33	1.11	78.1	27.4	6.6	80.8	6.8	4.0	31-1,31-2
PX2A31W3FE	2.84	1.13	81.3	30.0	6.3	81.6	6.9	2.5	21-1,31-1
PX2BX4W3FE	2.43	1.17	79.6	28.9	6.1	77.4	6.8	5.0	41-1
PX3B07W3FE	2.35	1.10	78.6	27.2	6.1	79.1	6.9	4.5	31-2,41-1
PX3B09W3FE	2.33	1.09	77.8	27.3	6.1	78.1	6.8	6.0	31-2,41-1
PX3C06W3FE	2.63	1.09	78.1	27.6	7.0	77.3	6.8	5.0	31-2,41-2
ST 5122GLT	2.43	1.10	78.5	27.8	6.8	81.1	7.5	3.5	31-1
WU18XC9	2.44	1.17	79.5	29.3	6.7	79.5	6.9	4.0	31-1,41-1
MSD[c]	0.29	0.03	2.2	1.7	0.7	3.6	0.7	2.6	

[a]AMX are experimental lines for Americot; BX are experimental lines for BASF; CG is Croplan Genetics; CPS are experimental lines for Dynagro/All-Tex Cotton; DP is Deltapine, FM is Fibermax; NG is NexGen, PHY is Phytogen; PX are experimental lines for Phytogen; ST is Stoneville; WU are experimental lines for Winfield.

[b]Micronaire (mic), uniformity (unif), strength (stren), and elongation (elon).

[c]MSD is the minimum significant different (P=0.05).

Table 5. Verticillium wilt trial in Ropesville with moderate disease pressure and some root-knot nematode (RK/500 cm^3 soil).

Cultivar[a]	Lint yield (lbs/a)	Yield X loan ($/acre)	Loan Value (µ/lb)	Turn out	%Wilt	Defolia-tion (%)	Plants/ ft. row	RK[c]
NG 4792XF	1,365	748.43	54.83	0.314	38.1	39.3	2.44	1,810
FM 1911GLT	1,352	742.25	54.90	0.314	25.6	31.3	2.41	1,530
FM 2334GLT	1,258	703.08	55.90	0.285	37.6	40.3	2.38	970
CPS18703GLT	1,222	648.51	53.08	0.321	44.9	55.7	2.46	2,150
WU18XT9	1,188	634.29	53.38	0.299	41.9	25.5	2.03	920
FM 2498GLT	1,148	615.10	53.58	0.297	26.6	35.1	2.26	1,820
FM 2574GLT	1,136	609.81	53.68	0.323	61.9	44.1	2.24	3,030
BX1921GL	1,136	622.60	54.83	0.298	43.4	43.9	2.43	1,250
AMX1819B3XF	1,126	600.16	53.30	0.296	44.2	61.0	2.44	650
AMX1823B3XF	1,086	580.12	53.43	0.282	44.8	55.2	2.50	1,160
FM 1830GLT	1,084	595.31	54.93	0.314	38.4	45.6	2.24	2,130
NG 4777B2XF	1,039	580.94	55.90	0.284	43.7	60.6	2.23	1,680
NG 4545B2XF	998	533.67	53.50	0.284	36.9	47.8	2.25	1,150
FM 2484B2F	994	545.85	54.90	0.304	31.7	33.2	2.27	6,060
CPS18503DB3XF	979	502.26	51.33	0.291	37.1	52.3	2.73	2,250
CPS18501AB3XF	971	522.05	53.75	0.302	40.5	59.9	2.83	1,850
CPS18506DB3XF	968	520.78	53.80	0.301	64.8	50.7	2.19	1,130
CPS18506BB3XF	963	516.67	53.68	0.305	56.4	67.0	2.41	330
PHY 300W3FE	959	462.53	48.23	0.277	29.7	60.5	2.38	1,720
CPS18505CB3XF	887	467.58	52.73	0.305	57.2	55.1	2.11	2,320
DP 1840B3XF	883	482.87	54.70	0.311	64.5	60.8	2.50	1,500
DP 1646B2XF	874	478.95	54.80	0.275	47.6	57.2	2.67	1,410
CPS18450B2F	866	436.03	50.35	0.291	47.2	61.6	2.20	2,390
AMX1815B3XF	864	405.24	46.93	0.272	71.8	71.5	2.33	1,930
WU18XC9	860	472.12	54.93	0.313	35.5	54.9	2.13	2,310
CPS18503AB3XF	847	422.36	49.85	0.270	55.8	58.7	2.49	3,840
DP 1612B2XF	828	426.58	51.55	0.290	46.2	84.5	2.33	200
PX4A64W3FE	811	372.61	45.93	0.279	63.1	66.2	2.00	210
NG 5711B3XF	800	395.88	49.50	0.286	46.6	59.8	2.43	690
NG 4601B2XF	748	399.04	53.33	0.325	54.7	69.7	2.30	440
ST 5517GLTP	746	372.88	50.00	0.275	46.4	51.2	2.41	2,000
ST 5471GLTP	737	357.55	48.53	0.263	37.8	50.0	2.34	2,500
DP 1725B2XF	712	351.89	49.40	0.292	50.7	71.9	1.81	400
CPS18864GLTP	678	345.09	50.88	0.275	62.1	56.8	2.02	1,930
BX1972GLTP	668	326.41	48.90	0.280	78.1	70.7	2.06	5,980
CG 9178B3XF	633	307.08	48.55	0.290	57.5	86.2	2.10	400
CPS18502CB3XF	631	293.69	46.58	0.284	57.9	80.7	2.05	750
CPS18502AB3XF	620	283.77	45.75	0.281	68.8	83.7	2.17	1,460
PX4A69W3FE	585	250.09	42.75	0.255	87.4	74.3	2.30	50
DP 1835B3XF	560	274.96	49.10	0.297	77.1	79.6	2.25	1,030
MSD[b]	154	78.16	4.65	0.314	30.1	14.1	0.52	

[a]AMX are experimental lines for Americot; BX are experimental lines for BASF; CG is Croplan Genetics; CPS are experimental lines for Dynagro/All-Tex Cotton; DP is Deltapine, FM is Fibermax; NG is NexGen, PHY is Phytogen; PX are experimental lines for Phytogen; ST is Stoneville; WU are experimental lines for Winfield.
[b]MSD is the minimum significant different (P=0.05).
[c]Root-knot nematode/500 cm^3 soil.

Table 6. Fiber data from the Verticillium wilt trial at Ropesville.

Cultivar[a]	Mic	Length	Unif.	Stren.	Elong.	Rd	+b	Leaf	Color grade
AMX1815B3XF	2.97	32.70	81.95	1.10	6.75	74.0	6.2	5.5	41-2,51-1
AMX1819B3XF	3.66	30.15	81.95	1.15	7.30	76.0	6.9	3.5	41-1,41-2
AMX1823B3XF	3.38	29.90	82.60	1.18	7.60	76.7	7.1	4.0	41-1
BX1921GL	3.54	32.60	82.15	1.16	6.15	76.7	7.0	4.5	41-1
BX1972GLTP	2.98	31.25	80.05	1.15	7.80	76.4	6.3	4.0	41-1,2
CPS18450B2F	3.32	31.35	81.70	1.13	7.30	74.1	6.3	3.0	41-2,51-1
CPS18501AB3XF	3.40	32.45	82.70	1.20	7.80	74.8	6.3	4.5	41-2
CPS18502AB3XF	2.90	31.25	79.75	1.13	7.75	74.1	6.6	4.5	41-2,51-1
CPS18502CB3XF	2.72	31.45	80.60	1.15	8.20	75.9	6.5	4.0	41-2
CPS18503AB3XF	2.98	32.35	80.65	1.18	7.80	76.5	7.0	3.0	41-2,31-2
CPS18503DB3XF	3.19	31.35	80.45	1.13	7.90	76.5	7.1	4.0	41-1,41-2
CPS18505CB3XF	3.80	30.45	81.55	1.06	8.95	75.0	7.2	3.5	41-1
CPS18506BB3XF	3.65	29.50	80.85	1.11	6.90	76.5	6.6	3.0	41-1,41-2
CPS18506DB3XF	3.42	29.25	80.60	1.11	8.40	78.8	7.2	3.5	31-1,41-1
CPS18703GLT	3.60	30.55	80.40	1.15	6.40	76.1	6.4	3.5	41-2
CPS18864GLTP	3.16	30.65	79.95	1.13	6.35	77.0	6.8	3.0	41-1
CG 9178B3XF	2.96	32.35	80.50	1.13	6.60	73.6	7.3	3.0	41-2
DP 1612B2XF	3.57	30.95	81.35	1.13	8.15	74.4	6.6	3.5	41-2,51-1
DP 1646B2XF	3.96	30.35	81.40	1.20	7.40	77.9	5.9	4.0	41-2
DP 1725B2XF	2.98	30.85	80.15	1.15	6.90	76.3	6.4	2.5	41-1,41-2
DP 1835B3XF	2.96	30.10	79.00	1.14	6.85	75.7	6.8	3.5	41-1,41-2
DP 1840B3XF	3.93	30.95	81.70	1.16	7.45	75.8	7.3	2.0	41-1
FM 1830GLT	3.75	31.75	81.05	1.20	6.90	78.1	6.1	4.0	41-1
FM 1911GLT	3.92	31.45	81.50	1.16	6.85	77.4	6.5	3.5	41-1
FM 2334GLT	3.74	30.95	82.85	1.22	6.50	79.1	6.7	3.5	31-2,41-1
FM 2484B2F	3.66	31.95	81.65	1.17	5.65	77.4	6.5	3.5	41-1,41-2
FM 2498GLT	3.26	31.60	81.30	1.15	6.15	78.2	7.1	3.5	31-2,41-1
FM 2574GLT	3.40	32.05	81.45	1.21	6.30	77.6	6.7	3.5	41-1
NG 4545B2XF	3.42	31.80	81.05	1.13	6.05	76.8	7.5	2.0	31-2,41-1
NG 4601B2XF	3.82	31.90	80.55	1.13	7.50	76.6	6.3	3.5	41-1,41-2
NG 4777B2XF	3.80	33.00	81.65	1.15	5.70	76.2	7.8	2.5	31-2,41-1
NG 4792XF	3.87	31.55	81.70	1.10	7.95	75.2	8.4	3.0	31-1,41-3
NG 5711B3XF	3.25	31.05	80.40	1.16	7.40	77.9	6.9	2.5	41-1
PHY 300W3FE	2.96	29.95	80.00	1.09	7.00	75.5	7.5	3.5	41-1
PX4A64W3FE	2.70	31.40	80.90	1.09	7.75	76.5	7.2	3.5	31-2,41-2
PX4A69W3FE	2.45	29.40	79.00	1.09	7.50	76.7	7.2	4.0	41-1
ST 5471GLTP	2.78	30.15	78.85	1.12	7.70	79.1	6.8	2.5	31-2
ST 5517GLTP	3.02	30.80	79.30	1.13	7.60	77.2	6.5	3.0	41-1,41-2
WU18XC9	3.89	32.35	81.10	1.20	6.45	76.9	5.9	3.0	41-2
WU18XT9	3.59	30.25	81.50	1.15	7.50	76.6	6.9	3.0	41-1,41-2
MSD[c]	0.69	1.14	1.83	0.04	0.7	2.1	0.8		

[a]AMX are experimental lines for Americot; BX are experimental lines for BASF; CG is Croplan Genetics; CPS are experimental lines for Dynagro/All-Tex Cotton; DP is Deltapine, FM is Fibermax; NG is NexGen, PHY is Phytogen; PX are experimental lines for Phytogen; ST is Stoneville; WU are experimental lines for Winfield.

[b]Micronaire (mic), uniformity (unif), strength (stren), and elongation (elon).

[c]MSD is the minimum significant different (P=0.05).

Bacterial Blight

Several new experimental lines that were originally from Bayer CropSciences (now with BASF), were as susceptible as the check DP 1522B2XF (Table 7). DP 1612B2XF and DP 1614B2XF were partially susceptible. PHY 243WRF was a partially resistant check, which no other lines were statistically similar. Approximately ½ of the new BX lines were resistant, as were all the experimental lines from Monsanto (now with Bayer CropScience) and Phytogen. The new Deltapine varieties from 2018 (DP 1822XF, DP 1820B3XF, and DP 1845B3XF) and 2019 (DP 1908B3XF, DP 1909XF, and DP 1948B3XF) were all highly resistant to bacterial blight.

Table 7. Blight ratings for commercial cotton cultivars in 2018.

Cultivar	% Blight	Rating
Bayer CropScience BX 1973GLTP	100.00	Susceptible
Bayer CropScience BX 1974GLTP	100.00	Susceptible
Deltapine DP 1522 B2XF	98.25	Susceptible
Bayer CropScience BX 1975GLTP	95.00	Susceptible
Deltapine DP 1612B2XF	39.75	Partially susceptible
Deltapine DP 1614 B2XF	32.50	Partially Susceptible
Bayer CropScience BX 1976GLTP	29.00	Partially Susceptible
PhytoGen PHY 243WRF	17.25	Partially Resistant
Bayer CropScience BX 1972GLTP	5.00	Resistant
FiberMax FM 2484B2F	5.00	Resistant
Bayer CropScience BX 1971GLTP	3.00	Resistant
Bayer CropScience BX 1921GL	2.50	Resistant
Monsanto 17R818B3XF	1.75	Resistant
Deltapine DP 1822 XF	1.50	Resistant
PhytoGen PX4A69W3FE	1.50	Resistant
Deltapine DP 1820 B3XF	0.00	Resistant
Deltapine DP 1845 B3XF	0.00	Resistant
Deltapine DP 1948 B3XF	0.00	Resistant
Deltapine DP 1909 XF	0.00	Resistant
Monsanto 17R738XF	0.00	Resistant
Deltapine 1908B3 XF	0.00	Resistant
PhytoGen PX2B04W3FE	0.00	Resistant
PhytoGen PX2B10W3FE	0.00	Resistant
PhytoGen PX2B12W3FE	0.00	Resistant
PhytoGen PX3B07W3FE	0.00	Resistant
PhytoGen PX3B09W3FE	0.00	Resistant
PhytoGen PX3C06W3FE	0.00	Resistant
PhytoGen PX4A64W3FE	0.00	Resistant
MSD[a]	8.83	

[a]MSD=minimum significant difference (P=0.05).

Summary

Varieties that performed well in Verticillium wilt fields included DP 1822XF, FM 1830GLT, FM 1911GLT, FM 2334GLT, NG 3500XF, NG 3640XF, and NG 4792XF. Currently the only varieties in this list with insect resistance are the Fibermax varieties. The varieties with dicamba tolerance with the best Verticillium wilt tolerance do not have insect resistance. The best variety with Enlist tolerance was PHY 320W3FE. All of the experimental lines submitted for testing by Monsanto (now part of Bayer CropSciences) and Phytogen were highly resistant to bacterial blight.

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