AFFECT OF VERTICILLIUM WILT ON CULTIVARS IN THE SOUTHERN HIGH PLAINS OF TEXAS

T. A. Wheeler
Texas AgriLife Research
Lubbock, TX
J. E. Woodward
Texas AgriLife Extension Service
Lubbock, TX

Abstract

Cultivars were tested at six sites infested with *Verticillium dahliae* in 2010. Entries that yielded in the top 10% in 2010 were Fibermax (FM) 2484B2F, NexGen (NG) 4111RF, Phytogen (PG) 367WRF, Deltapine (DP) 10R050B2R2, PG 519WRF, NG 3410RF, and FM 9160B2F. Cultivars in the more northern sites (Plainview, Littlefield, and Ropesville) had a higher impact on relative yield (61% difference between cultivars) than did cultivars in the more southern sites (Lamesa, Brownfield, and Seminole), where relative yields differed by 31%. Incidence or wilt and defoliation appeared to be more correlated with yield in the northern sites than in the southern sites. Cultivars that were in the top 20% in yield and had among the lowest incidence of wilt and/or defoliation in both 2009 and 2010 were: FM 9160B2F, FM 9170B2F, FM 9180B2F, NG 3348B2RF, and PG 367WRF.

Introduction

Verticillium wilt is among the most yield limiting diseases of cotton in the Southern High Plains of Texas. The fungus, *Verticillium dahliae*, survives in the soil as microsclerotia, which are capable on surviving for many years in the absence of a host. The microsclerotia infect roots of susceptible hosts, and at some point in the season move systemically through the vascular system causing leaf chlorosis, necrosis, and defoliation. No single tactic can be used to effectively control this disease. Management options that should be practiced include selecting partially resistant/tolerant cultivars (Bell, 1992), planting at least 52,324 seed/acre (4 seed/ft row with 40-inch centers) (Wheeler et al., 2010), not overwatering (Cappaert et al., 1992), and practicing crop rotation with non-hosts such as sorghum (Leyendecker, 1950). New cultivars are constantly being released by cotton seed companies. It became necessary to have a data base to know more about new cultivars in advance of their release into the commercial marketplace, particularly with respect to diseases like Verticillium wilt.

Materials and Methods

Six locations in the Southern High Plains of Texas (Plainview, Littlefield, Ropesville, Lamesa, Brownfield, and Seminole) were selected to test cultivars for response to Verticillium wilt. Each test had 32 entries and four replications, arranged in a randomized complete block design. There were a total of 68 entries evaluated, and every entry was included in at least two and usually three sites. An effort was made to match entry maturity (when information was provided by seed companies) to northern or southern locations. Certain entries, identified either as partially resistant or susceptible from previous years, were included in every test as controls. These included Americot 1550B2RF, Fibermax 9160B2F, Fibermax 9180B2F, NexGen 3348B2RF, Stoneville 4288B2F, and Stoneville 4554B2RF. Contributing companies were All-Tex cotton seed, Americot (Americot and NexGen cultivars), Bayer Cropscience (Fibermax and Stoneville cultivars), Croplan Genetics, DynaGro, Monsanto (Deltapine cultivars), and Phytogen.

Plots were two-rows wide, with 40-inch centers, and 35 ft. long. Fields varied enormously, from conventional tillage with a tall bed, to flat ground and heavy residue. All sites were irrigated with center pivot systems. Plots were planted with a four-row cone planter. Soil samples were taken at planting and assayed for microsclerotia of *V. dahliae* (Wheeler and Rowe, 1995). Between 45 and 60 days after planting, stand counts were made on both rows of every plot. Incidence of wilt was measured at each site by counting the number of plants exhibiting symptoms of Verticillium wilt in each plot and dividing by the total number of plants. In September, plots were evaluated for defoliation with the scale of 0 = no defoliation, 1 = < 33% defoliation, 2 = 33 to 66% defoliation and 3 = more than 66% defoliation. A total of 20 to 22 observations for defoliation were taken from each plot and averaged to determine final defoliation ratings. Plots were harvested with a two-row John Deere 484 cotton stripper. Plot weights were weighed with load cells, and a subsample of each plot was kept and two replications were ginned to

determine % lint and seed. A sample of lint was sent to the Texas Tech University Fiber & Biopolymer Research Institute. Loan value was calculated based on the HVI values.

Cultivars were examined for differences in incidence of wilt, defoliation, lint yield, and value ($)/acre (lint yield x loan value) for each site using PROC GLM in SAS, version 9.1 (SAS Institute, Cary, NC). Relative yield and value/acre were calculated by dividing the yield for each plot by the highest average cultivar yield in that test. Relative wilt incidence and defoliation were calculated by dividing the wilt incidence and defoliation rating by the highest average cultivar rating in that test. The relative yield, value, wilt, and defoliation across all tests were combined and analyzed using PROC MIXED in SAS. The estimate for each cultivar was ranked from best to worse and presented.

Results and Discussion

Entries that yielded in the top 10% in 2010 were Fibermax (FM) 2484B2F, NexGen (NG) 4111RF, Phytogen (PG) 367WRF, Deltapine (DP) 10R050B2R2, PG 519WRF, NG 3410RF, and FM 9160B2F (Table 1). Cultivars that had the least amount of wilt included FM 1880B2F, FM 9160B2F, PG 367WRF, DP 1044B2RF, NG 2549B2RF, and PG 525RF. Cultivars with little defoliation were FM 9160B2F, PG 519WRF, FM 2484B2F, FM 9170B2F, PG 525RF, FM 9180B2F, FM 1880B2F, and DP 164B2RF. In general in 2010, defoliation was less than in previous years, and probably not a major factor for most cultivars.

Table 1. Relative yield (RY), value/acre (RV [lint yield x loan value]), wilt (RW), defoliation (RD) of tested cultivars and number of sites (NUM) that cultivars were tested in 2010.

Cultivar[a]	RY	Rank RY	RV	Rank RV	RW	Rank RW	RD	Rank (RD)	NUM
FM 2484B2F	1.037	1	1.028	1	0.558	23	0.306	3	2
NG 4111RF	0.974	2	0.981	2	0.506	15	0.504	19	3
PG 367WRF	0.954	3	0.928	6	0.406	3	0.628	37	2
DP 10R050B2R2	0.940	4	0.946	3	0.567	25	0.422	10	3
PG 519WRF	0.936	5	0.936	5	0.529	17	0.286	2	3
NG 3410RF	0.936	6	0.900	9	0.594	26	0.545	23	2
FM 9160B2F	0.935	7	0.945	4	0.361	2	0.216	1	6
NG 4012B2RF	0.932	8	0.926	7	0.559	24	0.651	41	2
FM 9170B2F	0.927	9	0.920	8	0.500	14	0.343	4	3
FM 9058RF	0.900	10	0.893	12	0.600	30	0.503	17	3
DP EXP	0.895	11	0.894	11	0.537	19	0.596	31	2
DP 104B2RF	0.889	12	0.859	17	0.595	27	0.540	22	1
NG 3348B2RF	0.884	13	0.884	13	0.480	11	0.449	13	6
FM 9180B2F	0.882	14	0.898	10	0.552	22	0.364	6	6
DP EXP	0.875	15	0.813	33	0.690	50	0.784	57	2
BCSX EXP	0.870	16	0.854	18	0.445	6	0.787	58	3
DG EXP1	0.864	17	0.878	14	0.669	46	0.736	54	3
PG 569WRF	0.861	18	0.861	16	0.705	53	0.423	11	2
ST 5288B2F	0.857	19	0.842	19	0.528	16	0.546	24	3
DP 0912B2RF	0.848	20	0.836	22	0.601	31	0.725	50	3
ST 4554B2RF	0.847	21	0.836	23	0.550	21	0.691	45	6
BCSX EXP	0.846	22	0.867	15	0.451	7	0.559	28	3
DP EXP	0.844	23	0.839	20	0.690	51	0.932	65	3
PG 499WRF	0.840	24	0.830	28	0.640	38	0.706	49	3
ST 4288B2F	0.838	26	0.833	25	0.646	40	0.511	20	2
PG 525RF	0.838	25	0.813	34	0.456	8	0.345	5	6
DP 1044B2RF	0.832	27	0.831	27	0.427	4	0.443	12	4
DP 164B2RF	0.828	28	0.830	29	0.534	18	0.369	8	2
FM 1740B2RF	0.823	29	0.834	24	0.600	29	0.489	16	4
NG 4010B2RF	0.822	30	0.839	21	0.673	48	0.583	30	4

DP 0949B2RF	0.821	31	0.820	31	0.491	13	0.463	14	3
DP 0935B2RF	0.820	32	0.818	32	0.611	35	0.645	39	3
DP 1133B2RF	0.819	33	0.831	26	0.767	56	0.551	26	2
PG 315RF	0.809	34	0.776	40	0.641	39	0.888	63	2
DG EXP2	0.804	35	0.821	30	0.633	37	0.677	44	2
AT 65207B2RF	0.798	36	0.786	36	0.547	20	0.609	33	3
PG 565WRF	0.794	37	0.764	43	0.649	41	0.732	53	2
DP EXP	0.792	38	0.792	35	0.883	64	0.625	36	3
DP 0920B2RF	0.788	39	0.782	37	0.607	33	0.548	25	2
PG 425RF	0.788	40	0.766	41	0.598	28	0.651	40	1
NG 2549B2RF	0.784	41	0.745	50	0.444	5	0.464	15	3
FM 1880B2RF	0.782	42	0.778	38	0.336	1	0.367	7	2
DP 141B2RF	0.780	43	0.754	46	0.460	9	0.504	18	2
DG EXP3	0.773	44	0.765	42	0.660	45	0.699	46	3
DP 0924B2RF	0.772	45	0.764	44	0.481	12	0.617	34	2
DP 161B2RF	0.763	46	0.763	45	0.703	52	0.398	9	2
DP EXP	0.761	47	0.776	39	0.969	68	0.730	52	3
NG EXP	0.754	48	0.738	52	0.602	32	0.628	38	2
DG EXP5	0.752	49	0.747	49	0.812	58	0.700	47	2
DG EXP4	0.743	50	0.751	47	0.652	42	0.778	56	3
DP 1032B2RF	0.739	51	0.749	48	0.674	49	0.702	48	3
BCSX EXP	0.738	52	0.712	60	0.611	34	0.795	60	3
DP EXP	0.736	54	0.730	53	0.734	55	0.621	35	2
DP EXP	0.736	53	0.711	61	0.655	43	0.562	29	2
AM 1550B2RF	0.736	55	0.708	62	0.728	54	0.987	66	6
DP 1028B2RF	0.735	56	0.744	51	0.806	57	0.725	51	3
BCSX EXP	0.724	57	0.714	57	0.477	10	0.511	21	2
CG 3220B2RF	0.723	58	0.724	55	0.849	59	0.987	67	2
DP 1050B2RF	0.722	59	0.730	54	0.947	67	0.596	32	3
BCSX EXP	0.714	60	0.684	63	0.658	44	0.662	42	3
DP EXP	0.710	61	0.720	56	0.863	63	0.863	62	3
DP 1137B2RF	0.708	62	0.714	58	0.860	62	0.788	59	3
NG 1551RF	0.704	63	0.713	59	0.672	47	0.700	43	1
DP 1048B2RF	0.671	64	0.656	64	0.900	65	0.776	55	3
CG 3035RF	0.658	65	0.649	65	0.927	66	0.555	27	2
AM 1664B2RF	0.629	66	0.619	66	0.630	36	1.060	68	1
DP 1034B2RF	0.603	67	0.599	67	0.850	60	0.806	61	4
DP EXP	0.583	68	0.570	68	0.857	61	0.908	64	2

[a]AT = All-Tex, AM = Americot, BCSX = Bayer Cropscience Experimental, CG=Croplan Genetics, DP = Deltapine, DG = DynaGro, FM = Fibermax, NG = NexGen, PG=Phytogen, and ST = Stoneville.

The sites were divided into north (Plainview, Littlefield, and Ropesville) and south (Lamesa, Brownfield, and Seminole). The most interesting aspect was that the relative yield ranged from 1 to 0.395, indicating a 60.5% difference in yield in the northern sites, depending on cultivar choice (Table 2). In the southern sites, the relative differences ranged form 1 to 0.69, indicating a 31% change in yield, depending on cultivar choice (Table 2).

Table 2. Relative yield (RY), rank, and number of sites (NUM) tested with cultivars in northern sites (Plainview, Littlefield, and Ropesville) and southern sites (Lamesa, Brownfield, and Seminole) in 2010.

Northern Site				Southern Sites			
Cultivars[a]	RY	Rank RY	NUM	Cultivar	RY	Rank RY	NUM
FM 2484B2F	1.001	1	2	DP EXP	0.997	1	2
PG 367WRF	0.996	2	1	NG 4111RF	0.994	2	2
NG 4111RF	0.940	3	1	BCSX EXP	0.976	3	1
FM 9160B2F	0.936	4	3	DP 0912B2RF	0.969	4	1
FM 9058RF	0.922	5	2	PG 519WRF	0.969	5	3
NG 3410RF	0.900	6	2	DP EXP	0.949	6	1
NG 3348B2RF	0.899	7	3	FM 9160B2F	0.935	7	3
NG 4012B2RF	0.896	8	2	PG 367WRF	0.915	8	1
FM 9170B2F	0.895	9	3	DP EXP	0.908	9	1
BCSX EXP	0.889	10	1	FM 9180B2F	0.905	10	3
DP 104B2RF	0.865	11	1	ST 4288B2F	0.904	11	3
FM 9180B2F	0.860	12	3	PG 569WRF	0.898	12	2
DP EXP	0.852	13	1	DG EXP1	0.893	13	1
DP EXP	0.842	14	1	DP 1044B2RF	0.890	14	2
DP EXP	0.840	15	1	ST 5288B2F	0.887	15	2
DG EXP1	0.836	16	2	PG 525RF	0.875	16	2
FM 1740B2RF	0.836	17	2	ST 4554B2RF	0.870	17	3
ST 4554B2RF	0.822	18	3	NG 3348B2RF	0.870	18	3
DP 1133B2RF	0.821	19	1	DP 164B2RF	0.866	19	2
DP EXP	0.820	20	2	DP EXP	0.863	20	1
ST 5288B2F	0.804	21	1	PG 499WRF	0.861	21	2
PG 499WRF	0.803	22	1	NG 4010B2RF	0.861	22	2
DP 0935B2RF	0.803	23	1	AT 65207B2RF	0.858	23	1
BCSX EXP	0.798	24	2	DG EXP4	0.855	24	2
NG 4010B2RF	0.777	25	2	DP 0949B2RF	0.854	25	3
DG EXP3	0.773	26	2	BCSX EXP	0.851	26	2
DP 1044B2RF	0.773	27	2	PG 315RF	0.850	27	1
ST 4288B2F	0.770	28	3	DP 0935B2RF	0.842	28	2
DG EXP2	0.766	29	2	BCSX EXP	0.835	29	1
AM 1550B2RF	0.765	30	3	PG 565WRF	0.831	30	2
DP 0912B2RF	0.764	31	2	FM 9058RF	0.831	31	1
DP 0920B2RF	0.763	32	2	DP EXP	0.825	32	3
NG 2549B2RF	0.750	33	3	FM 1880B2RF	0.820	33	2
DP 0924B2RF	0.747	34	2	FM 1740B2RF	0.813	34	2
AT 65207B2RF	0.744	35	2	DP 1133B2RF	0.812	35	1
PG 315RF	0.743	36	1	DG EXP5	0.808	36	1
DP 141B2RF	0.742	37	2	DP 1137B2RF	0.801	37	2
PG 425RF	0.740	38	1	DP 161B2RF	0.800	38	2
CG 3220B2RF	0.731	39	1	DP 1048B2RF	0.798	39	2
NG EXP	0.729	40	2	DP EXP	0.798	40	2
BCSX EXP	0.715	41	1	DP EXP	0.794	41	3
DP EXP	0.711	42	2	DP 1028B2RF	0.776	42	2
DP EXP	0.700	43	2	DP 1032B2RF	0.772	43	3
DG EXP5	0.691	44	1	DG EXP3	0.768	44	1
BCSX EXP	0.686	45	2	DP 1050B2RF	0.754	45	3
NG 1551RF	0.680	46	1	BCSX EXP	0.735	46	2
DP 1028B2RF	0.679	47	1	CG 3220B2RF	0.714	47	1
BCSX EXP	0.666	48	2	AM 1550B2RF	0.707	48	3
CG 3035RF	0.632	49	2	DP 1034B2RF	0.690	49	3
AM 1664B2RF	0.602	50	1				

DP EXP	0.561	51	1
DG EXP4	0.550	52	1
DP EXP	0.547	53	2
DP 1137B2RF	0.547	54	1
DP 1048B2RF	0.446	55	1
DP 1034B2RF	0.395	56	1

[a]AT = All-Tex, AM = Americot, BCSX = Bayer Cropscience Experimental, CG=Croplan Genetics, DP = Deltapine, DG = DynaGro, FM = Fibermax, NG = NexGen, PG=Phytogen, and ST = Stoneville.

To further explore the effect of north versus south location, wilt parameters (wilt incidence and defolation) were regressed against yield for a typical north and south location. The top yielding cultivars at the northern Littlefield site all had low to moderate wilt and defoliation ratings (Fig. 1A,B), while the poorest yielding cultivars typically had high wilt incidence ratings, and high defoliation. However, with the southern site (Lamesa), there was a poorer relationship between wilt incidence and yield (compared with the Littlefield site), and essentially no relationship with defoliation and yield (Fig. 1C,D). There does seem to be a fundamental difference with the way cultivars perform in the northern sites infested with Verticillium wilt than in the southern sites. These differences may be related to temperature or other unknown factors. Microsclerotia density does not explain the differences.

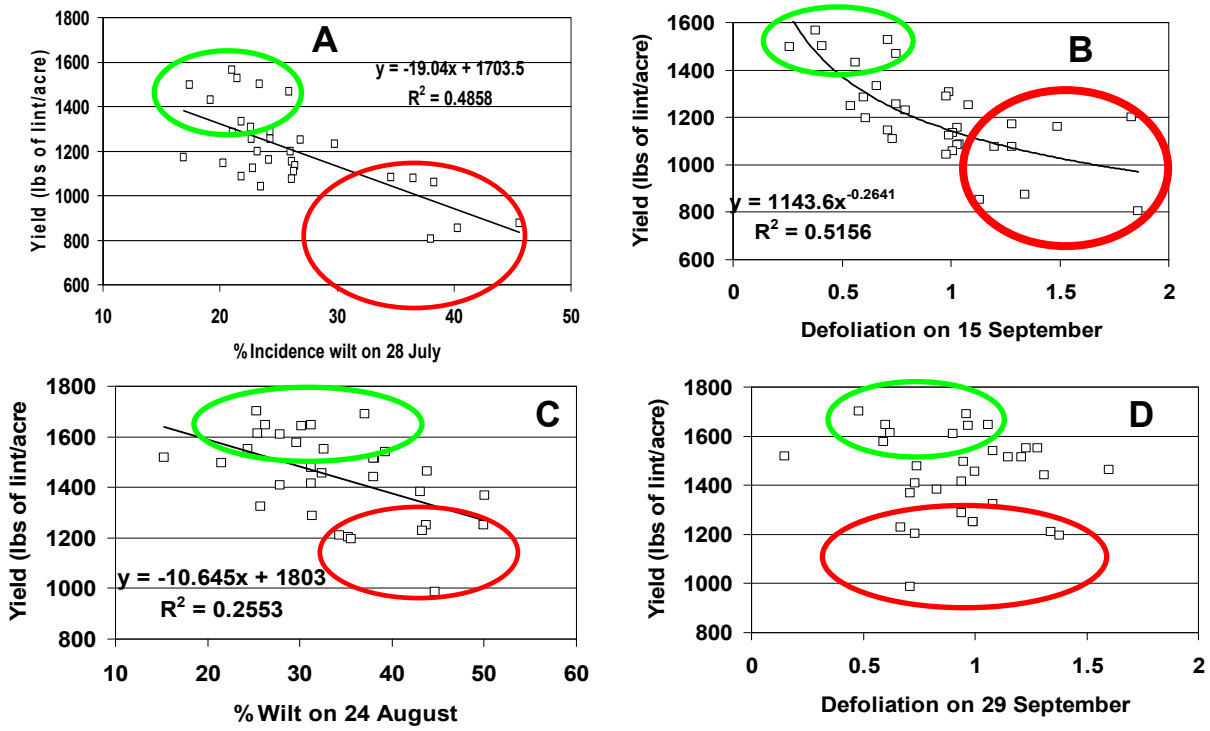

Figure 1. Influence of wilt incidence (1A and 1C) and defoliation (1B and 1D) on yield. Squares represent the average value for 32 different cultivars at the Littlefield (1A,B) and Lamesa (1C,D) sites.

Results from one year to the next can be dramatic in these tests, so cultivars that were tested in both 2009 and 2010 were ranked by relative yield, value, wilt, and defoliation (Table 3). The best cultivars over both years were FM 9170B2F, NG 4111RF, FM 9160B2F, NG 3410RF, NG 3348B2RF, PG 367WRF, DP 104B2RF, and NG 4012B2RF (Table 3). Results from individual tests are found in Tables 4-9.

Table 3. Ranking of cultivars that were tested in both 2009 and 2010 for relative yield (RY), value/acre (RV), wilt (RW), and defoliation (RD).

Cultivar	RY	Rank RY	RV	Rank RV	RW	Rank RW	RD	Rank RD
Fibermax 9170B2F	0.950	1	0.930	2	0.523	10	0.411	2
NexGen 4111RF	0.946	2	0.939	1	0.538	13	0.580	9
Fibermax 9160B2F	0.936	3	0.912	3	0.403	2	0.382	1
NexGen 3410RF	0.933	4	0.880	6	0.535	12	0.636	17
NexGen 3348B2RF	0.911	5	0.888	4	0.415	4	0.557	7
Phytogen 367WRF	0.911	6	0.851	9	0.405	3	0.740	27
Deltapine 104B2RF	0.893	7	0.817	14	0.584	23	0.693	22
NexGen 4012B2RF	0.890	8	0.866	8	0.593	24	0.617	13
Fibermax 9180B2F	0.885	9	0.879	7	0.551	15	0.499	3
NexGen 4010B2RF	0.871	10	0.881	5	0.557	19	0.662	20
Deltapine 0912B2RF	0.868	11	0.830	12	0.604	26	0.761	31
NexGen 2549B2RF	0.865	12	0.799	16	0.456	5	0.591	11
Stoneville 4288B2F	0.864	13	0.845	10	0.581	22	0.640	19
Stoneville 5288B2F	0.852	14	0.780	19	0.527	11	0.619	14
Fibermax 1740B2RF	0.850	15	0.830	11	0.575	21	0.616	12
Stoneville 4554B2RF	0.843	16	0.794	17	0.555	17	0.750	29
Deltapine 0920B2RF	0.834	17	0.804	15	0.468	7	0.629	15
Deltapine 1133B2RF	0.829	18	0.819	13	0.677	30	0.638	18
Deltapine 1044B2RF	0.816	19	0.755	24	0.459	6	0.568	8
Deltapine 0924B2RF	0.812	20	0.769	22	0.555	18	0.709	25
Deltapine 0935B2RF	0.809	21	0.729	27	0.554	16	0.766	32
Deltapine 0949B2RF	0.808	22	0.771	21	0.499	8	0.632	16
Deltapine 164B2RF	0.803	23	0.763	23	0.511	9	0.520	4
Fibermax 1880B2RF	0.802	24	0.774	20	0.313	1	0.538	5
Phytogen 565WRF	0.801	25	0.714	28	0.655	27	0.753	30
Phytogen 315RF	0.775	26	0.693	32	0.598	25	0.915	37
Phytogen 425RF	0.775	27	0.701	30	0.667	28	0.698	23
Deltapine 1032B2RF	0.767	28	0.742	25	0.739	33	0.791	33
Deltapine 161B2RF	0.762	29	0.700	31	0.714	31	0.587	10
NexGen 1551RF	0.758	30	0.787	18	0.676	29	0.668	21
Deltapine 1028B2RF	0.758	31	0.736	26	0.799	35	0.812	34
Deltapine 141B2RF	0.748	32	0.650	35	0.572	20	0.544	6
BCSX EXP	0.748	33	0.707	29	0.543	14	0.706	24
Americot 1550B2RF	0.725	34	0.665	33	0.723	32	1.067	39
Croplan Genetics 3220B2RF	0.700	35	0.646	38	0.767	34	0.937	38
Deltapine 1050B2RF	0.699	36	0.659	34	0.908	38	0.749	28
Deltapine 1137B2RF	0.695	37	0.650	36	0.828	36	0.851	36
Deltapine 1034B2RF	0.689	38	0.647	37	0.847	37	0.850	35
Croplan Genetics 3035RF	0.684	39	0.641	39	0.957	39	0.723	26

Table 4. Affect of Verticillium wilt on cultivars grown near Plainview in 2010.

Cultivar	Lint Yield X Loan ($/acre)	Lbs of Lint / acre	Loan Value ($)	% Lint	% Wilt on 8/2	Defol. on 9/13[a]	Plants/ ft. row
Fibermax 2484B2F	760	1376	0.553	29.9	53.2	0.43	1.99
Fibermax 9160B2F	777	1375	0.565	29.2	47.9	0.40	1.75
NexGen 4012B2RF	739	1330	0.554	28.1	48.5	1.00	1.69
Fibermax 9058F	748	1306	0.573	28.0	57.0	0.56	1.62
Fibermax 9170B2F	690	1241	0.556	28.8	49.2	0.42	1.67
Fibermax 9180B2F	698	1217	0.574	27.1	44.2	0.57	2.06
NexGen 3348B2RF	659	1194	0.552	26.4	48.9	0.73	1.51
Deltapine 104B2RF	652	1190	0.548	26.4	50.9	0.79	1.66
Deltapine 0920B2RF	677	1190	0.569	30.6	46.9	1.00	1.38
Deltapine EXP	613	1157	0.530	28.4	53.3	1.25	2.26
Deltapine EXP	654	1155	0.567	29.9	47.9	0.85	1.78
Fibermax 1740B2F	644	1138	0.567	29.2	50.1	0.43	1.69
NexGen 3410RF	617	1133	0.545	27.2	57.5	0.89	1.34
Deltapine 1133B2RF	646	1128	0.573	29.8	58.8	0.77	0.74
Deltapine 0912B2RF	630	1111	0.568	30.4	59.0	1.31	1.24
Dyna-Gro EXP1	618	1107	0.558	29.2	53.2	0.99	1.94
Deltapine 0924B2RF	622	1096	0.568	28.8	52.8	1.02	1.33
Stoneville 4554B2RF	608	1072	0.568	28.5	48.3	1.08	1.71
All-Tex 65207B2RF	582	1047	0.556	28.5	39.2	0.74	1.14
Stoneville 4288B2F	589	1036	0.569	27.8	53.6	0.64	1.29
Dyna-Gro EXP3	581	1026	0.567	29.5	55.3	0.82	1.36
NexGen 2549B2RF	542	1010	0.537	28.1	45.1	0.76	1.26
Deltapine EXP	566	988	0.573	30.4	52.6	0.62	0.86
BCSX EXP[c]	549	983	0.559	24.6	50.6	1.19	2.26
Americot 1550B2RF	527	973	0.542	26.6	50.7	1.53	1.88
Deltapine EXP	546	972	0.562	29.2	56.9	0.86	1.05
NexGen EXP	528	963	0.548	25.4	53.4	1.09	1.29
Deltapine EXP	541	949	0.570	28.6	59.2	1.26	1.54
NexGen 1551RF	538	935	0.575	24.8	56.2	0.98	1.64
BCSX EXP	486	883	0.551	25.2	54.3	1.43	2.05
Croplan Genetics 3035RF	491	873	0.562	28.7	69.4	0.59	0.82
Deltapine EXP	436	793	0.550	27.1	69.0	1.06	1.29
MSD (0.05)[b]	**90**	**160**	**0.027**	**1.8**	**20.3**	**0.40**	**0.43**

[a]Defol. is defoliation on 13 September. The scale was from 0 to 3 with 0 = no defoliation, 1 = < 33% defoliation, 2 = 33 to 66% defoliation and 3 > 66% defoliation.

[b]MSD is the minimum significant difference at a Probability of 0.05 between cultivars based on the Waller-Duncan k-ratio t-test.

[c]BCSX is an experimental from Bayer Cropscience.

Table 5. Affect of Verticillium wilt on cultivars grown near Littlefield in 2010.

Cultivar	$ /acre[a]	Lbs of Lint / acre	Loan Value ($)	% Lint	% Wilt 7/28	Defol. on 9/15[b]	Plants/ ft. row
Fibermax 2484B2F	902	1566	0.576	31.7	21.0	0.38	3.10
NexGen 3410RF	837	1526	0.548	31.1	21.5	0.71	2.97
Fibermax 9170B2F	866	1502	0.577	29.1	23.4	0.41	3.19
Fibermax 9160B2F	864	1499	0.577	29.7	17.4	0.26	3.06
NexGen 4111RF	844	1469	0.575	28.5	25.9	0.75	2.76
NexGen 3348B2RF	823	1430	0.576	28.0	19.2	0.56	2.90
Deltapine EXP	766	1331	0.576	28.1	21.8	0.66	3.08
Stoneville 4554B2RF	742	1308	0.567	30.0	22.6	0.99	3.26
NexGen 4012B2RF	742	1288	0.576	28.9	24.3	0.98	2.89
Deltapine1044B2RF	723	1284	0.563	27.0	21.1	0.60	3.10
Stoneville 5288B2F	701	1255	0.559	28.0	22.7	0.75	3.08
Phytogen 499WRF	703	1253	0.561	29.8	24.3	1.08	3.25
Fibermax 9180B2F	719	1249	0.576	26.7	26.9	0.54	3.19
Stoneville 4288B2F	678	1231	0.550	29.6	29.8	0.79	2.66
Americot 1550B2RF	651	1199	0.543	35.5	23.2	1.83	2.94
Deltapine 141B2RF	677	1198	0.565	26.5	26.0	0.61	2.88
BCSX[d] EXP	633	1173	0.540	27.7	16.9	1.28	3.47
Phytogen 315RF	639	1160	0.551	29.1	24.2	1.49	3.00
Phytogen 425RF	639	1155	0.553	26.8	26.1	1.03	3.06
NexGen 2549B2RF	587	1144	0.513	27.1	20.3	0.71	2.75
All-Tex 65207B2RF	640	1135	0.563	30.3	26.4	1.01	2.91
Deltapine 0912B2RF	623	1122	0.555	29.0	22.8	0.99	2.63
NexGen 4010B2RF	634	1108	0.573	26.2	26.3	0.73	2.07
BCSX EXP	599	1086	0.552	29.8	21.8	1.04	2.91
Deltapine EXP	612	1082	0.566	31.0	34.6	1.03	2.51
Dyna-Gro EXP5	613	1077	0.569	33.4	36.5	1.20	3.08
BCSX EXP	592	1076	0.551	26.8	26.1	1.28	3.15
Deltapine 1028B2RF	599	1059	0.566	33.5	38.3	1.01	3.11
Dyna-Gro EXP2	591	1042	0.567	26.5	23.5	0.98	3.09
Deltapine EXP	502	875	0.574	30.1	45.6	1.34	2.74
Deltapine EXP	481	853	0.564	28.0	40.3	1.13	2.88
Deltapine EXP	452	806	0.561	27.2	38.0	1.86	2.88
MSD (0.05)[c]	**59**	**105**	**0.019**	**3.6**	**6.0**	**0.21**	**0.28**

[a]The lint yield multiplied by the loan value.

[b]Defol. is defoliation on 15 September. The scale was from 0 to 3 with 0 = no defoliation, 1 = < 33% defoliation, 2 = 33 to 66% defoliation and 3 > 66% defoliation.

[c]MSD is the minimum significant difference at a Probability of 0.05 between cultivars based on the Waller-Duncan k-ratio t-test.

[d]BCSX is Bayer CropScience experimental.

Table 6. Affect of Verticillium wilt and root-knot nematode (RK) on cultivars grown near Ropesville in 2010.

Cultivar	Lint Yield X Loan ($/acre)	Lbs of Lint / acre	Loan Value ($)	% Lint	% Wilt on 8/24	Defol. on 9/21[a]	Plants/ ft. row	RK/ 500 cc soil	LRK/ 500cc soil[d]
Phytogen 367WRF	539	1038	0.520	27.3	4.6	0.48	2.69	620	0.98
Deltapine EXP	540	1005	0.537	30.0	6.9	1.05	2.26	2,142	3.02
NexGen 3348B2RF	539	955	0.565	31.9	5.1	0.55	2.08	1,182	2.63
Fibermax 9180B2F	519	937	0.554	28.3	9.3	0.35	2.62	762	2.65
Fibermax 9058RF	501	930	0.539	28.3	9.2	0.65	2.24	2922	3.28
BCSX[c] EXP	515	927	0.556	28.0	8.4	0.57	2.41	678	2.81
Dyna-Gro EXP2	511	912	0.560	26.8	12.1	0.79	1.71	2,233	3.12
Dyna-Gro EXP1	512	907	0.566	31.0	10.2	0.95	2.24	2,832	2.88
Stoneville 4554B2RF	479	890	0.539	29.9	5.7	0.91	1.78	1,212	2.87
NexGen 4010B2RF	497	889	0.559	27.1	12.6	0.57	1.66	2,335	3.70
BCSX EXP	487	887	0.529	29.0	8.3	0.71	2.71	2,148	2.72
Fibermax 1740B2F	494	881	0.560	32.2	7.4	0.74	1.90	1,782	2.97
Fibermax 9160B2F	487	876	0.556	29.6	2.8	0.45	1.78	1,268	2.97
Americot 1550B2RF	443	862	0.514	27.9	18.4	0.96	2.21	967	2.91
Fibermax 9170B2F	450	847	0.532	29.4	4.9	0.50	2.26	1,482	3.05
Dyna-Gro EXP3	450	838	0.537	30.5	11.0	0.79	1.68	1,405	2.64
Deltapine 935B2RF	470	837	0.561	31.3	8.9	0.71	1.47	1,302	2.29
NexGen 2549B2RF	444	822	0.540	29.1	4.2	0.58	2.02	622	2.73
Stoneville 4288B2F	427	802	0.533	27.9	9.4	0.60	1.85	42	1.60
NexGen EXP	425	793	0.536	26.7	8.7	0.53	1.56	792	2.13
CG 3220B2RF[c]	425	763	0.557	28.5	18.7	1.09	1.55	4,062	3.39
Deltapine 1044B2RF	394	749	0.527	27.7	5.6	0.50	1.32	342	2.48
Deltapine 141B2RF	379	745	0.509	30.3	3.5	0.58	1.78	942	2.11
Deltapine EXP	366	732	0.500	29.4	11.2	0.76	1.37	1,248	2.46
Deltapine 924B2RF	383	721	0.531	28.7	3.8	0.57	1.35	2,202	3.20
BCSX EXP	384	705	0.544	29.8	6.4	0.39	1.46	1,448	3.05
Deltapine 920B2RF	362	678	0.535	29.7	11.1	0.47	1.44	3,702	3.24
CG 3035RF	353	658	0.537	29.9	17.0	0.94	1.30	3,828	2.52
Americot 1664B2RF	338	629	0.538	26.5	9.9	1.02	1.54	2,300	3.39
Dyna-Gro EXP4	315	575	0.548	29.2	10.4	1.05	1.08	1,212	2.82
Deltapine 1048B2RF	233	467	0.500	27.8	16.0	0.79	0.88	3,972	3.11
Deltapine 1034B2RF	209	414	0.504	27.0	14.4	0.83	0.77	873	2.08
MSD(0.05)[b]	**85**	**161**		**2.5**	**14.1**	**0.47**	**0.41**		**1.12**

[a]Defol. is defoliation on 21 September. The scale was from 0 to 3 with 0 = no defoliation, 1 = < 33% defoliation, 2 = 33 to 66% defoliation and 3 > 66% defoliation.

[b]MSD is the minimum significant difference at a Probability of 0.05 between cultivars based on the Waller-Duncan k-ratio t-test.

[c]BCSX is Bayer CropScience experimental, CG=Croplan Genetics

[d]LRK is a $\log_{10}$ transformation of root-knot nematode/500 cm^3 soil.

Table 7. Affect of Verticillium wilt on cultivars grown near Lamesa in 2010.

Cultivar	Lint Yield X Loan ($/acre)	Lbs of Lint / acre	Loan Value ($)	% Lint	% Wilt on 8/24	Defol on 9/29[a]	Plants /ft. row
Phytogen 519WRF	970	1701	0.570	28.9	25.3	0.48	2.65
Stoneville 4288B2F	963	1690	0.570	28.8	37.1	0.96	1.94
NexGen 4111RF	946	1647	0.574	29.6	26.3	0.60	2.04
Phytogen 499WRF	921	1645	0.560	29.3	31.2	1.06	3.02
Deltapine 0912B2RF	909	1644	0.553	30.2	30.2	0.97	1.92
NexGen 3348B2RF	918	1612	0.569	28.8	25.4	0.62	2.18
Deltapine EXP	905	1610	0.562	31.7	27.9	0.90	2.86
Fibermax 9180B2F	906	1576	0.575	27.7	29.7	0.59	2.74
Phytogen 367WRF	851	1552	0.549	28.2	24.4	1.28	3.01
Stoneville 4554B2F	853	1551	0.550	29.1	32.6	1.23	2.44
Deltapine EXP	800	1539	0.520	29.5	39.3	1.08	2.79
Fibermax 9160B2F	869	1518	0.573	29.1	15.3	0.15	2.18
Dyna-Gro EXP1	863	1515	0.570	31.8	38.1	1.21	2.66
Deltapine EXP	865	1514	0.571	32.0	38	1.15	1.90
Stoneville 5288B2F	815	1497	0.545	30.6	21.5	0.95	2.06
NexGen 4010B2RF	851	1479	0.575	27.9	31.2	0.74	1.85
Deltapine EXP	802	1463	0.548	29.6	43.8	1.60	2.76
All-Tex 65207B2RF	804	1455	0.552	29.5	32.4	1.00	2.10
Phytogen 315RF	771	1441	0.535	29.2	38	1.31	1.79
BCSX[c] EXP	759	1416	0.536	26.3	31.3	0.94	2.57
Fibermax 9058F	762	1409	0.541	27.4	27.9	0.73	2.30
Deltapine 1133B2RF	791	1381	0.573	30.7	43.1	0.83	0.96
Deltapine 1050B2RF	764	1366	0.559	32.4	50.1	0.71	1.26
Deltapine 949B2RF	747	1323	0.565	30.0	25.8	1.08	1.72
Deltapine 935B2RF	720	1287	0.559	28.8	31.4	0.94	1.69
Deltapine EXP	714	1251	0.570	32.0	50	0.99	1.26
BCSX EXP	651	1249	0.521	27.3	43.7	0.99	2.65
Fibermax 1740B2F	692	1227	0.564	30.2	43.3	0.67	1.63
Croplan Genetics 3220B2RF	660	1210	0.546	28.5	34.3	1.34	2.25
Deltapine 1032B2RF	687	1204	0.571	30.3	35.3	0.73	0.69
Americot 1550B2RF	628	1197	0.525	28.0	35.6	1.38	2.03
Deltapine1034B2RF	566	986	0.574	30.7	44.7	0.71	0.76
MSD(0.05)[b]	**144**	**265**	**0.037**	**3.7**	**10.7**	**0.38**	**0.55**

[a]Defol. is defoliation on 29 September. The scale was from 0 to 3 with 0 = no defoliation, 1 = < 33% defoliation, 2 = 33 to 66% defoliation and 3 > 66% defoliation.

[b]MSD is the minimum significant difference at a Probability of 0.05 between cultivars based on the Waller-Duncan k-ratio t-test.

[c]BCSX is Bayer Cropscience experimental.

Table 8. Affect of Verticillium wilt on cultivars grown near Brownfield in 2010.

Cultivar	Lint Yield X Loam ($/acre)	Lbs of Lint / acre	Loan Value ($)	% Lint	% Wilt on 8/26	Defol. on 9/16[a]	Plants /ft. row
Deltapine EXP	696	1225	0.569	28.7	18.2	0.53	2.82
NexGen 4111RF	686	1220	0.563	27.7	12.7	0.63	2.86
Fibermax 9160B2F	687	1198	0.574	28.5	8.0	0.27	2.93
Deltapine 949B2RF	651	1160	0.561	30.0	9.7	0.28	3.03
Fibermax 9180B2F	665	1159	0.574	25.8	18.0	0.35	3.02
Phytogen 519WRF	642	1138	0.564	26.4	13.9	0.35	3.20
Deltapine 1044B2RF	637	1111	0.573	26.9	10.7	0.58	2.84
Deltapine 935B2RF	601	1108	0.543	26.9	20.0	0.62	3.10
Fibermax 1740B2F	615	1080	0.570	27.6	13.8	0.55	3.10
NexGen 3348B2RF	607	1080	0.562	26.0	13.8	0.40	2.93
Stoneville 5288B2F	599	1067	0.561	28.0	20.3	0.53	2.85
Deltapine EXP	584	1048	0.557	28.7	27.8	0.60	2.79
Deltapine 164B2RF	594	1047	0.567	26.6	12.4	0.33	2.91
Deltapine 1032B2RF	586	1026	0.572	28.5	14.2	0.73	2.71
Deltapine EXP	575	996	0.577	29.5	31.0	0.90	2.83
Phytogen 569WRF	552	993	0.557	27.4	22.1	0.43	2.95
BCSX[c] EXP	568	989	0.574	26.8	11.0	0.65	3.24
Phytogen 525RF	500	976	0.512	27.1	11.8	0.39	3.25
Dyna-Gro EXP4	555	969	0.573	28.0	21.3	0.87	2.95
Deltapine 1048B2RF	538	967	0.557	26.8	26.4	0.81	2.99
Deltapine 161B2RF	551	964	0.572	26.1	24.5	0.56	2.74
Stoneville 4288B2F	523	944	0.554	25.1	19.8	0.46	2.51
Fibermax 1880B2F	538	942	0.572	25.6	9.4	0.48	3.02
Phytogen 565WRF	489	936	0.523	26.1	19.1	0.85	2.91
Stoneville 4554B2F	496	910	0.545	24.4	17.5	0.51	3.08
Deltapine EXP	514	898	0.572	27.8	26.6	0.92	3.11
Phytogen 499WRF	498	896	0.556	26.0	23.7	0.77	3.17
Deltapine 1028B2RF	504	874	0.576	28.4	23.9	0.83	2.78
Americot 1550B2RF	481	840	0.573	25.3	25.8	0.98	2.97
Deltapine 1137B2RF	455	801	0.569	27.2	29.0	0.82	2.82
Deltapine 1050B2RF	453	791	0.573	26.8	29.1	0.69	2.86
Deltapine 1034B2RF	443	784	0.566	27.2	32.5	1.01	2.95
MSD (0.05)[b]	**73**	**131**	**0.039**	**4.3**	**9.9**	**0.33**	**0.44**

[a]Defol. is defoliation on 29 September. The scale was from 0 to 3 with 0 = no defoliation, 1 = < 33% defoliation, 2 = 33 to 66% defoliation and 3 > 66% defoliation.
[b]MSD is the minimum significant difference at a Probability of 0.05 between cultivars based on the Waller-Duncan k-ratio t-test.
[c]BCSX is Bayer CropScience experimental.

Table 9. Affect of Verticillium wilt on cultivars grown near Seminole in 2010.

Cultivar	$ /acre[a]	Lbs of Lint / acre	Loan Value ($)	% Lint	% Wilt 7/26	Defol. on 9/15[b]	Plants/ Ft. row
BCSX[d] EXP	875	1545	0.567	29.4	20.6	1.35	3.07
Deltapine EXP	868	1540	0.564	30.2	30.1	0.51	2.05
Phytogen 569WRF	867	1528	0.568	30.7	34.9	0.68	2.34
Phytogen 519WRF	836	1510	0.554	25.3	32.8	0.34	2.55
Stoneville 4554B2RF	816	1478	0.552	28.2	29.6	1.05	2.89
Phytogen 525RF	849	1477	0.575	30.8	25.3	0.53	2.51
Deltapine 1137B2RF	838	1470	0.570	30.9	37.4	1.28	1.91
Stoneville 4288B2F	830	1463	0.568	27.5	29.8	0.74	2.10
Fibermax 9160B2F	808	1444	0.560	27.4	18.4	0.23	2.33
Dyna-Gro EXP4	811	1423	0.570	28.8	30.4	0.89	1.79
Phytogen 565WRF	778	1392	0.559	29.5	33.8	0.97	2.25
BCSX EXP	792	1387	0.571	28.7	21.8	0.85	2.65
Deltapine 164B2RF	760	1358	0.560	26.6	32.5	0.67	1.91
Deltapine 1044B2RF	770	1353	0.569	27.3	21.8	0.65	2.59
Fibermax 1880B2RF	740	1349	0.549	26.5	16.6	0.46	2.55
NexGen 4010B2RF	766	1349	0.568	25.9	38.2	1.17	1.45
Deltapine EXP	762	1337	0.570	28.8	35.7	1.3	2.15
Deltapine 1034B2RF	744	1314	0.567	29.8	32.1	1.29	1.76
Deltapine 1028B2RF	744	1300	0.573	30.3	39.4	1.08	1.39
Fibermax 9180B2F	742	1300	0.571	26.4	22.7	0.56	2.74
Deltapine 949B2RF	722	1293	0.559	29.8	33.1	0.64	2.08
Deltapine EXP	734	1287	0.570	28.7	48.5	0.98	1.76
Dyna-Gro EXP5	714	1285	0.556	28.5	40.8	0.96	1.78
Deltapine 161B2RF	697	1260	0.553	24.4	30.9	0.43	1.54
Deltapine 1050B2RF	718	1258	0.571	30.3	48.0	0.96	1.80
Deltapine 1048B2RF	712	1252	0.569	29.2	45.5	1.18	1.78
Dyna-Gro EXP3	668	1222	0.546	27.0	32.3	1.14	2.16
NexGen 3348B2RF	642	1206	0.532	27.3	26.7	0.85	2.09
Deltapine 1032B2RF	672	1191	0.564	30.1	44.7	1.33	1.31
BCSX EXP	630	1168	0.539	24.0	27.4	0.77	2.29
Americot 1550B2RF	609	1132	0.538	27.2	36.7	1.39	2.38
Deltapine EXP	627	1126	0.557	24.8	53.0	0.81	1.49
MSD (0.05)[c]	**149**	**288**	**0.029**	**2.3**	**19.2**	**0.41**	**0.44**

[a]The lint yield multiplied by the loan value.
[b]Defol. is defoliation on 29 September. The scale was from 0 to 3 with 0 = no defoliation, 1 = < 33% defoliation, 2 = 33 to 66% defoliation and 3 > 66% defoliation.
[c]MSD is the minimum significant difference at a Probability of 0.05 between cultivars based on the Waller-Duncan k-ratio t-test.
[d]BCSX is Bayer Cropscience experimental.

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