EVALUATION OF COTTON VARIETIES FOR RESISTANCE TO FUSARIUM WILT IN WEST TEXAS

Max A. Batla
Jason E. Woodward
Texas Cooperative Extension
Lubbock, TX
Terry A. Wheeler
Texas A&M University
Lubbock, TX

Abstract

Two field trials were conducted during the 2007 growing season to evaluate the performance of various cotton varieties in fields with a history of Fusarium wilt. A total of thirty-two varieties were included in each trial. Disease development was assessed through the growing season and lint yields were determined for each plot. HVI analysis was conducted on lint samples, loan values were assigned and net returns were determined for each variety. Disease incidence was consistently lower for the varieties AFD 5064F, AFD 5065B2F, All-Tex Apex B2F, All-Tex Arid B2F, and All-Tex Titan B2F, whereas, Fibermax 1740 B2F and Phytogen 485W had consistently higher wilt ratings. Lint yields were highest for DeltaPine 174F, DeltaPine 164B2F, and DeltaPine 143B2F at both locations. In addition, loan values ranged from $0.534 to $0.590 per lb and $0.490 to $0.590 per lb at each of the two locations. Net returns were highest for DeltaPine 174F at both locations; however, several other varieties performed well in both trials.

Introduction

Fusarium wilt, caused by the soilborne fungus *Fusarium oxysporum* f. sp. *vasinfectum* (Atk.) W.C. Snyder & H.N. Hans., is becoming increasingly important throughout production regions of the South Plains. This disease is primarily distributed to the South and West of Lubbock in sandier soil areas. The fungus which causes Fusarium wilt causes little damage alone, but is much more severe in the presence of the root-knot nematode (*Meloidogyne incognita*). Management of Fusarium wilt is primarily achieved by minimizing damage caused by nematodes, and through the use of partially resistant varieties. Therefore there it was necessary to evaluate the performance of various cotton varieties in fields with a history of Fusarium wilt in order to determine the economic returns of varieties differing in their responses to infection by *F. oxysporum* f. sp. *vasinfectum*.

Materials and Methods

Field experiments were conducted in Terry and Dawson counties in 2007. At the Terry Co. field trial, cotton was planted on May 17th with 3.5 lb/A Temik applied in-furrow. Conventional tillage was used with 40" row spacing, and the trial was harvested on November 1st. The Dawson Co. field trial was planted on May 15th and no Temik was applied. Strip-tillage was used with 38" row spacing, and cotton was harvested on November 5th.

Final disease assessments were made on July 22nd and July 17th at the Terry Co. and Dawson Co. site, respectively. Samples were ginned November 14th and HVI analysis was conducted at the Texas Tech University International Textile Center. Net returns were determined for each variety by multiplying the cotton lint yield with the respective loan value and subtracting both the seed and technology fees. Field trials were arranged as a randomized complete block design with four replications. Disease, yield, quality, and net returns were analyzed using PROC GLM in SAS, and means were separated using the Waller-Duncan test (P=0.05). Fusarium wilt development was moderate during the 2007 growing season on the Southern High Plains. Classical symptoms were observed at both field sites, and *F. oxysporum* f. sp. *vasinfectum* was routinely isolated from symptomatic plants throughout the growing season.

Results and Discussion

Fibermax 1740B2F and Phytogen 485WF had the highest wilt ratings in both trials; whereas, ratings were consistently lower for all three All-Tex B2F and both AFD varieties (Table 1). Fiber properties differed for the varieties and varied by location (Table 2); micronaire ranged from 3.40 to 4.33 and 3.75 to 4.65 at the Terry and Dawson Co. trial, respectively. Differences in yield were observed at both locations (Tables 3 & 4); Deltapine 174F, 143B2F, and 164B2F, and Fibermax 1880B2F and 1840B2F consistently had the highest yields. Loan values averaged $0.58 ± $0.01/lb for both the Terry and Dawson Co. trials (Tables 3 & 4). Net returns ranged from $114 to $1,081 and $210 to $656 per acre for the Terry Co. and Dawson Co. trial, respectively, with Deltapine 174F having the highest returns in both trials (Tables 3 & 4). These results indicate that the varieties evaluated vary greatly in their reaction to *F. oxysporum* f. sp. va*infectum* infections; however, additional information regarding commercially available varieties (especially Flex varieties) and advanced breeding lines are needed for producer recommendations.

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Table 1. Final Fusarium wilt ratings from two trials conducted in west Texas

Variety	Terry Co.		Dawson Co.	
AFD 5064 F	2.1	ef*	2.1	k
AFD 5065B2 F	1.9	ef	2.3	k
All-Tex Apex B2F	1.2	f	8.1	h-k
All-Tex Arid B2F	2.1	ef	4.9	ijk
All-Tex Titan B2F	2.2	ef	5.3	ijk
Americot 1622 B2F	2.4	ef	9.3	g-k
Americot 1664 B2F	- - -	- - -	23.4	b-e
Americot 2220 F	8.5	ab	22.4	b-e
Deltapine 117 B2F	- - -	- - -	18.9	c-g
Deltapine 143 B2F	3.1	ef	14.3	e-j
Deltapine 147 F	3.4	ef	29.1	a-d
Deltapine 164 B2F	3.1	ef	2.1	k
Deltapine 167 F	2.4	ef	3.3	k
Deltapine 174 F	2.8	ef	6.3	ijk
Deltapine 454 BR	10.6	a	- - -	- - -
Deltapine 455 BR	5.1	dcde	- - -	- - -
Deltapine 488 BR	3.7	ef	- - -	- - -
Fibermax 1740 B2F	7.5	abcd	30.5	ab
Fibermax 1840 B2F	2.1	ef	2.5	k
Fibermax 1880 B2F	2.2	ef	6.9	h-k
Fibermax 9058 F	8.1	abc	- - -	- - -
Fibermax 9060 F	- - -	- - -	38.1	a
Fibermax 9063 B2F	4.1	def	20.5	b-f
Fibermax 9068 F	3.6	ef	18.8	d-g
Fibermax 9180 B2F	- - -	- - -	11.1	f-k
Fibermax 960 B2R	9.0	a	- - -	- - -
Fibermax 960 BR	2.0	ef	- - -	- - -
Fibermax 989 B2R	2.3	ef	- - -	- - -
NexGen 3550 F	- - -	- - -	7.2	h-k
Paymaster 2140 B2F	- - -	- - -	24.7	b-e
Paymaster 2326 R	1.9	ef	- - -	- - -
Phytogen 125 F	- - -	- - -	5.9	ijk
Phytogen 425 F	- - -	- - -	29.6	abc
Phytogen 480 WR	4.9	cde	- - -	- - -
Phytogen 485 WF	9.2	a	36.5	a
Stoneville 4427 B2F	- - -	- - -	17	e-h
Stoneville 4554 B2F	3.1	ef	3.9	jk
Stoneville 5283 F	- - -	- - -	14.9	e-i
Stoneville 5327 F	4.0	ef	9.8	g-k
Stoneville 5599 BF	3.5	ef	- - -	- - -
Stoneville 6611 B2F	3.7	ef	2.7	k
Stoneville 6622 F	2.5	ef	4.1	jk

* Data are the means from four replications. Means within a column followed by the same letter are not significantly different according to the Waller-Duncan multiple range test (P=0.05).

Table 2. Fiber quality parameters for cotton varieties evaluated in Fusarium wilt trials in west Texas [a]

	Terry Co.				Dawson Co.			
Variety	**Mic.**	**Len.**	**Unif.**	**Stren.**	**Mic.**	**Len.**	**Unif.**	**Stren.**
AFD 5064 F	4.30	1.12	81.3	30.0	4.65	1.08	81.4	29.3
AFD 5065 B2F	3.88	1.17	81.1	29.4	4.50	1.08	80.7	26.9
All-Tex Apex B2F	4.28	1.10	80.3	28.0	4.10	1.13	79.9	26.0
All-Tex Arid B2F	3.93	1.12	80.7	28.9	4.35	1.09	80.2	27.5
All-Tex Titan B2F	3.68	1.21	82.6	29.8	4.00	1.15	80.6	26.8
Americot 1622 B2F	3.83	1.19	82.0	27.8	4.25	1.16	81.3	26.8
Americot 1664 B2F	- - -	- - -	- - -	- - -	4.45	1.11	80.2	26.3
Americot 2220 RF	3.58	1.13	82.0	30.9	3.95	1.15	82.2	28.9
Deltapine 117 B2F	- - -	- - -	- - -	- - -	4.20	1.10	80.6	30.6
Deltapine 143 B2F	3.60	1.12	80.3	30.1	3.75	1.17	78.5	28.9
Deltapine 147 F	3.60	1.16	80.4	29.0	3.75	1.17	80.4	28.2
Deltapine 164 B2F	3.43	1.17	79.7	29.1	4.15	1.15	80.0	27.9
Deltapine 167 F	3.65	1.13	80.5	29.4	3.85	1.17	79.9	29.4
Deltapine 174 F	4.08	1.17	82.3	28.3	4.20	1.14	80.6	25.3
Deltapine 454 BR	3.40	1.09	80.2	28.7	- - -	- - -	- - -	- - -
Deltapine 455 BR	3.70	1.13	81.3	30.1	- - -	- - -	- - -	- - -
Deltapine 488 BR	3.63	1.19	81.1	31.0	- - -	- - -	- - -	- - -
Fibermax 1740 B2F	3.98	1.08	79.9	28.1	4.45	1.07	79.4	27.4
Fibermax 1840 B2F	3.80	1.03	81.6	30.5	4.50	0.98	79.9	28.2
Fibermax 1880 B2F	3.78	1.17	81.3	29.3	4.35	1.13	80.9	28.5
Fibermax 9058 F	3.60	1.17	80.8	29.0	- - -	- - -	- - -	- - -
Fibermax 9060 F	- - -	- - -	- - -	- - -	4.05	1.17	80.2	28.4
Fibermax 9063 B2F	4.20	1.19	81.7	30.7	4.40	1.16	81.4	30.1
Fibermax 9068 F	3.98	1.19	82.9	30.5	4.30	1.17	80.5	28.8
Fibermax 9180 B2F	- - -	- - -	- - -	- - -	4.30	1.15	81.2	28.8
Fibermax 960 B2R	3.93	1.10	79.4	28.7	- - -	- - -	- - -	- - -
Fibermax 960 BR	3.70	1.12	80.4	31.1	- - -	- - -	- - -	- - -
Fibermax 989 B2R	4.00	1.11	81.4	30.7	- - -	- - -	- - -	- - -
Nexgen 3550 F	- - -	- - -	- - -	- - -	4.40	1.13	81.1	27.9
Paymaster 2140 B2F	- - -	- - -	- - -	- - -	4.20	1.09	80.6	28.3
Paymaster 2326 R	4.33	1.09	83.1	29.3	- - -	- - -	- - -	- - -
Phytogen 125 F	- - -	- - -	- - -	- - -	4.15	1.11	81.8	28.8
Phytogen 425 F	- - -	- - -	- - -	- - -	4.35	1.14	82.7	29.6
Phytogen 480 WR	4.00	1.13	81.8	29.9	- - -	- - -	- - -	- - -
Phytogen 485 WF	3.95	1.12	81.8	28.5	4.40	1.13	81.4	28.8
Stoneville 4427 B2F	- - -	- - -	- - -	- - -	4.40	1.14	81.9	27.4
Stoneville 4554 B2F	3.83	1.12	81.3	29.7	4.60	1.13	81.1	28.4
Stoneville 5283 F	- - -	- - -	- - -	- - -	3.95	1.10	80.9	29.0
Stoneville 5327 F	3.53	1.12	81.7	30.2	4.40	1.09	80.7	28.2
Stoneville 5599 BF	3.88	1.16	81.2	27.2	- - -	- - -	- - -	- - -
Stoneville 6611 B2F	3.88	1.13	81.9	30.9	4.50	1.12	82.0	29.6
Stoneville 6622 F	3.65	1.19	82.2	31.4	4.45	1.15	82.5	29.5

[a] Mic. = micronaire, Len.= length , Unif. = uniformity, Stren. = strength.

Table 3. Yield, loan value and net returns for Terry County Fusarium wilt trial

Variety	Lint Yield (lbs/A)	Loan value ($/lb)	Net Returns ($/A)
Deltapine 174 RF	1,916 a*	0.590	1081.10 a
Deltapine 164 B2RF	1,673 a-c	0.553	873.00 b
Deltapine 143 B2RF	1,695 ab	0.541	859.30 b
Fibermax 1880 B2F	1,547 b-d	0.585	819.90 b
Paymaster 2326 RR	1,545 b-d	0.566	847.10 b
Deltapine 455 BG/RR	1,487 b-e	0.589	824.20 bc
Stoneville 5599 BF	1,497 b-e	0.582	819.90 bc
Fibermax 1840 B2F	1,660 a-c	0.527	819.00 bc
AFD 5065B2F	1,479 b-e	0.585	813.80 bc
Fibermax 9068 F	1,461 b-f	0.589	811.50 bc
Fibermax 9063 B2F	1,439 b-f	0.591	795.60 b-d
AFD 5064F	1,452 b-f	0.576	796.30 bc
Americot 1622B2RF	1,445 b-f	0.587	794.50 b-d
All-Tex Titan B2RF	1,446 b-f	0.580	788.80 b-e
Stoneville 6622 RF	1,442 b-f	0.578	786.40 b-e
Deltapine 147 RF	1,397 b-g	0.575	756.80 b-e
Stoneville 4554 B2RF	1,356 c-g	0.587	738.20 b-e
Deltapine 167 RF	1,356 c-g	0.568	719.50 b-e
All-Tex Apex B2RF	1,346 c-g	0.563	709.40 b-e
Phytogen 485 WRF	1,344 c-g	0.565	702.90 b-e
Fibermax 960 BR	1,281 d-g	0.579	697.70 b-e
Stoneville 6611 B2RF	1,251 d-h	0.590	688.80 b-e
Fibermax 989 B2R	1,250 d-h	0.586	688.20 b-e
Stoneville 5327 RF	1,240 d-h	0.573	652.10 c-f
All-Tex Arid B2RF	1,205 e-h	0.580	649.90 c-f
Deltapine 488 BG/RR	1,200 e-h	0.582	646.50 c-f
Americot 2220RF	1,127 f-h	0.575	601.30 d-f
Phytogen 480 WR	1,101 gh	0.587	594.30 ef
Fibermax 960 B2R	916 hi	0.561	472.00 fg
Fibermax 1740 B2F	735 i	0.548	347.00 g
Fibermax 9058 F	675 i	0.572	340.00 g
Deltapine 454 BG/RR	318 j	0.534	114.00 h

* Data are the means from four replications. Means within a column followed by the same letter are not significantly different according to the Waller-Duncan multiple range test (P=0.05).

Table 4. Yield, loan value and net returns for Dawson County Fusarium wilt trial

Variety	Lint Yield lbs/A	Loan value ($/lb)	Net Returns ($/A)
Deltapine 174F	1,207 a*	0.585	655.61 a
Deltapine 143B2F	1,131 ab	0.582	599.32 ab
Deltapine 164B2F	1,108 a-d	0.586	589.71 abc
Stoneville 5283F	1,112 abc	0.574	588.53 abc
Stoneville 4554B2F	1,090 a-d	0.586	580.44 abc
All-Tex Apex B2F	1,031 a-e	0.588	551.48 abc
Fibermax 1840B2F	1,210 a	0.498	546.16 a-d
All-Tex Titan B2F	999 a-f	0.589	533.75 a-e
AFD 5064F	1,026 a-e	0.558	527.97 a-e
Stoneville 6622F	969 a-f	0.591	523.33 a-e
NexGen 3550F	953 a-g	0.586	517.48 a-e
Deltapine 167F	949 a-g	0.589	509.16 a-f
Deltapine 117B2F	962 a-f	0.576	494.84 a-g
Fibermax 1880B2F	936 a-h	0.588	493.90 a-g
Stoneville 5327B2F	933 a-h	0.567	471.28 b-h
Americot 1622B2F	848 b-i	0.589	445.46 b-i
Fibermax 9068F	847 b-i	0.580	440.74 b-i
Fibermax 9063B2F	840 c-i	0.590	438.51 b-i
Fibermax 9180B2F	581 b-i	0.580	437.42 b-i
Stoneville 6611B2F	835 c-i	0.581	427.79 c-i
All-Tex Arid B2F	831 c-i	0.574	426.03 c-i
AFD 5065B2F	820 d-i	0.530	382.24 d-i
Americot 1664B2F	749 e-i	0.579	380.27 d-i
Americot 2220F	710 f-j	0.587	371.46 e-j
Deltapine 147F	669 g-j	0.582	341.93 f-j
Phytogen 485WF	671 g-j	0.579	333.82 g-j
Phytogen 425F	657 hij	0.564	322.20 hij
Phytogen 125F	627 ij	0.577	313.53 hij
Paymaster 2140B2F	656 hij	0.555	312.64 hij
Stoneville 4427B2F	604 ij	0.583	294.04 ij
Fibermax 1740B2F	625 ij	0.557	291.29 ij
Fibermax 9060F	437 j	0.590	209.86 j

* Data are the means from four replications. Means within a column followed by the same letter are not significantly different according to the Waller-Duncan multiple range test (P=0.05).