2004 BELTWIDE COTTON CONFERENCES, SAN ANTONIO, TX – JANUARY 5-9

BAYER CROPCIENCE'S FIBERMAX PRODUCT LINE INTRODUCES NEW HIGH QUALITY BOLLGARD/ROUNDUP READY AND ROUNDUP READY VARIETIES

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Abstract

Four new FiberMax varieties will be introduced by Bayer CropScience, two Bollgard/Roundup Ready® and two Roundup Ready® conversions developed in cooperation with CSIRO. FM 800BR and FM 800R okra-leaf varieties were selected from within a backcross population of a FM 832 relative and have similar adaptation in the USA to FM 832. FM 960BR and FM 960R are medium/early season normal-leaf varieties selected from a backcross population of the same genetic family as FM 958 and FM 966. Performance of FM 800BR shows improved yield and equivalent fiber quality to FM 832 and performance of FM 800R in limited testing shows similar yield and equivalent to reduced fiber length compared to FM 832. FM 960BR shows an average improvement in yield over FM 958 and FM 966, reduced fiber length compared to FM 966, and equivalent to improved fiber strength over both related conventional varieties. FM 960R in limited testing shows similar yield and equivalent fiber quality to FM 966 and FM 958.

Introduction

FiberMax cottonseed varieties were launched in 1998 with the introduction of 5 conventional cotton varieties. The conventional cotton varieties had excellent yield potential in certain areas of the US Cotton Belt, and demonstrated improved fiber quality compared to the available, highest market share varieties in these areas. A growing emphasis on improved fiber quality helped encourage cultivation of these varieties, and growers gained experience with the successful management and production of the new genetic types originally accessed from germplasm developed in Australia by CSIRO.

Bayer CropScience reached an agreement with Monsanto to develop varieties with their technology and commercial access was achieved in 2001. Since that time, FiberMax varieties with Bollgard and Roundup Ready technology have been in development, with the first technology varieties being derived from the popular FM 989 and FM 991 genetic families. These varieties had excellent adaptation in areas of the Lower Mid-Atlantic, Southeast, Southern High Plains and Arizona. Most of Texas, all of the Mid-South, and early-season areas of the Eastern Seaboard had more rapidly adopted the okra-leaf FM 832 (South Texas, South Delta), FM 958 (High Plains, North Delta) and FM 966 (Mid-South, Eastern Seaboard). The four new varieties discussed in this paper are the first Roundup Ready offerings developed from these popular varieties.

Materials and Methods

Gene Equivalency Trials

FM 800BR, FM 800R, FM 960BR and FM 960R were tested for gene equivalency standards according to Monsanto protocols in 2001 and 2002 and received variety performance approval in 2003. The objective of these trials was to determine the tolerance of ROUNDUP READY® cotton varieties to applications of ROUNDUP® HERBICIDE.

Treatments included:

1. ROUNDUP READY® cotton line not sprayed with ROUNDUP® HERBICIDE
2. ROUNDUP READY® cotton line sprayed with Roundup® Ultra or WeatherMax at 0.75 lbs. Acid equivalent/Acre at four different timings:
   - Topical application at the 1-leaf stage
   - Topical application at the 4-leaf stage (before the 5th leaf reaches size of a quarter)
   - Post-Directed ten days after the 4-leaf application (direct spray at the base of the plants minimizing foliar contact)
   - Post-Directed twenty days after the 4-leaf application (direct spray at the base of the plants minimizing foliar contact)

The statistical design was a randomized complete block with 4 replications. Plots were four (4) rows wide by ten (10) meters long. All 4 rows of each plot received the designated treatment and the center two rows were evaluated and harvested. Plots were kept weed free using an appropriate commercial herbicide program and the Roundup treatments were superimposed over this program. All other agronomic practices employed were to maximize yield. Yield, end-of-season plant map and fiber quality data were collected.

In 2001, FM 960R was tested in Moultrie, GA, Shorter, AL, Willow Spring, NC and Roseboro, NC; FM 960BR, FM 800BR and FM 800R were tested in Leland, MS, Clarksdale, MS, Tallulah, LA and Tillar, AR. In 2002, all four varieties were tested against other FiberMax lines, including BGII proposed varieties, in Leland, MS, Clarksdale, MS, Sellers, SC and Trenton, NC.

Multi-Location Variety Performance Testing

The proposed new varieties were included in variety trials conducted by BCSI in the Mid-Atlantic and Southeast and in the Mid-South in 2002 prior to a commercial decision in 2003. Thirty-two commercial and proposed commercial varieties were tested in a randomized complete block design with 4 replications and managed to determine variety yield and fiber quality potential independent of technology. Locations included Leland, MS, Wilson, AR, Clarksdale, MS, Tallulah, LA, and St. Joseph, LA in the Mid-South; and Sellers, SC (irrigated and dryland), Wadley, GA, Moultrie, GA, Trenton, NC and Scotland Neck, NC in the Southeast.

In 2003, FM 960R was tested in state OVT trials in South and West Texas. FM 960R was also tested in Arkansas in 2002, but delay in receiving seed from counter-season nursery increase prevented entry in other OVT trials in 2003. FM 960BR was entered in OVT trials in Alabama, Arkansas, Arizona, California, Georgia, Louisiana, Mississippi, Missouri, New Mexico, North Carolina, Oklahoma, South Carolina, Tennessee, Texas and Virginia. FM 800BR was entered in OVT trials in Louisiana, Mississippi, New Mexico and Texas. FM 800R was entered in OVT trials in Louisiana, New Mexico and Texas.

Results and Discussion

Gene Equivalency Trials

Results from the Mid-South location testing of FM 800BR, FM 800R and FM 960BR show no significant differences across locations in yield or fiber quality between sprayed and unsprayed treatments for any of the varieties (Table 1). The varieties also showed equivalent or better performance to existing commercial varieties. In addition, there were no abnormal fruiting characteristics indicated by the spray treatment according to end-of-season plant map (data not shown). FM 960R, tested in the Southeast locations showed equivalent performance between the sprayed and unsprayed treatments and was equal or better in yield and quality performance to the commercial checks (Table 2). FM 960R had no abnormal fruiting characteristics indicated by the spray treatment according to end-of-season plant map (data not shown).

In 2002, there were no significant differences between sprayed and unsprayed varieties for yield and quality among the varieties tested (Table 3). Roundup herbicide sprayed according to the protocol had no significant effect of fruit retention for any of the varieties tested (data not shown).

Multi-Location Variety Performance Testing

FM 960BR was the top-yielding variety across locations in the Mid-South (Table 4), and individually in St. Joseph, LA, and showed statistically significant improvement in fiber length and fiber strength over PM 1218BG/RR, SG 215BG/RR, and ST 4892BR. FM 960R was equivalent in yield to the popular Mid-South variety DP 451BG/RR, had the highest fiber strength in the test and was second in fiber length only to the FM 832 okra-leaf series. FM 800BR had the third-highest yield in Clarksdale and the best staple length in the trial. FM 800R was equivalent to some existing commercial varieties and had superior fiber length and strength.

Table 5 shows the highest yielding variety across locations in the Southeast was FM 960R, and FM 800R was third. FM 960BR ranked 4th and FM 800BR ranked 5th out of the 32 varieties tested. None of the varieties were statistically different from the top-yielding variety, and all showed equivalent or better fiber quality to DP 458BG/RR, and better fiber quality than ST 4892BR. These results show the new FiberMax varieties to be more than competitive in yield and generally better in fiber quality than existing available varieties.

OVT results can be accessed through each state's publication to see the relative performance of FM 960BR, FM 960R, FM 800BR and FM 800R to current popular varieties as well as the newest varieties on the market.

Table 1. 2001 Roundup gene equivalency results across locations in the Mid-South, FM 960BR, FM 800BR, FM 800R.

					HVI FIBER QUALITY				
ENTRY	**TRMT**	**LINT %**	**YIELD**	**RANK**	**LEN**	**UNIF**	**STREN**	**ELONG**	**MIC**
PM 1218BG/RR	0xRU	37.3	994	2	1.11	83.7	27.5	8.3	4.9
PM 1218BG/RR	4xRU	37.5	996	1	1.11	84.0	27.0	8.1	4.9
FM 800BR	0xRU	36.7	797	6	1.22	85.6	31.6	7.6	4.1
FM 800BR	4xRU	37.1	842	3	1.22	85.7	31.8	7.6	4.0
FM 960BR	0xRU	36.8	836	4	1.12	83.9	32.6	7.4	4.3
FM 960BR	4xRU	36.7	822	5	1.13	84.0	32.9	7.4	4.2
ST 4892BR	0xRU	36.5	790	7	1.11	84.4	28.3	8.4	4.7
ST 4892BR	4xRU	37.2	784	8	1.11	84.2	28.8	8.2	4.7
FM 989BR	0xRU	35.2	718	9	1.14	83.7	29.4	7.6	4.3
FM 989BR	4xRU	35.6	716	10	1.14	83.9	29.2	7.6	4.3
FM 800R	0xRU	37.0	666	12	1.21	85.5	31.9	7.6	4.3
FM 800R	4xRU	36.9	580	14	1.20	85.6	32.0	7.5	4.3
ST 4793RR	0xRU	37.4	663	13	1.11	84.1	28.8	8.1	4.8
ST 4793RR	4xRU	37.3	691	11	1.11	84.2	28.6	8.3	4.8
DP 458BG/RR	0xRU	35.1	553	15	1.13	83.7	28.8	8.2	4.4
DP 458BG/RR	4xRU	35.7	552	16	1.14	83.7	28.9	8.0	4.5
GRAND MEAN		36.6	750		1.14	84.4	29.9	7.9	4.5
CV %		2.8	9.7		1.3	0.7	3.4	2.4	5.2
LSD 0.05		1.1	88		0.03	0.8	1.3	0.3	0.2

Table 2. 2001 Roundup gene equivalency results across locations in the Southeast, FM 960R.

					HVI FIBER QUALITY				
ENTRY	**TRMT**	**LINT %**	**YIELD**	**RANK**	**LEN**	**UNIF**	**STREN**	**ELONG**	**MIC**
FM 991BR	0xRU	40.2	790	9	1.12	83.5	33.1	8.1	4.0
FM 991BR	4xRU	39.5	788	10	1.14	83.0	32.9	8.0	3.7
FM 960R	0xRU	41.6	929	1	1.15	83.7	33.6	8.0	3.7
FM 960R	4xRU	39.7	826	7	1.14	84.1	34.0	7.8	3.6
FM 819R	0xRU	42.7	821	8	1.14	84.5	31.7	8.3	3.8
FM 819R	4xRU	42.9	786	11	1.14	84.4	31.9	8.4	4.1
FM 989R	0xRU	40.3	827	5	1.12	83.2	32.7	7.9	3.7
FM 989R	4xRU	41.8	902	3	1.10	83.3	32.3	7.9	3.6
FM 991R	0xRU	38.5	693	16	1.14	83.0	32.8	8.3	3.7
FM 991R	4xRU	39.4	698	14	1.15	83.2	33.2	8.3	3.7
FM 989BR	0xRU	38.2	899	4	1.14	83.2	31.4	8.0	4.0
FM 989BR	4xRU	39.9	919	2	1.13	83.3	31.2	7.9	3.9
DP 5415RR	0xRU	40.4	753	12	1.10	82.8	29.4	8.3	3.7
DP 5415RR	4xRU	39.1	693	15	1.12	82.9	30.0	8.8	3.7
DP 458BG/RR	0xRU	37.8	827	6	1.11	83.1	30.9	8.1	3.8
DP 458BG/RR	4xRU	38.0	751	13	1.10	82.4	30.5	7.5	3.7
GRAND MEAN		40.0	806		1.13	83.4	32.0	8.1	3.8
CV %		4.2	15.2		2.30	1.6	4.5	3.4	6.9
LSD 0.05		2.6	124		0.05	1.2	1.5	0.5	0.5

Table 3. 2002 Roundup gene equivalency results across locations.

					HVI FIBER QUALITY				
ENTRY	TRMT	LINT %	YIELD	RANK	LEN	UNIF	STREN	ELONG	MIC
FM 819R	0xRU	40.4	899	11	1.19	85.7	31.3	8.3	4.5
FM 819R	4xRU	40.7	809	14	1.19	86.1	32.3	8.4	4.6
FM 800R	0xRU	39.8	801	15	1.17	86.0	34.4	8.2	4.8
FM 800R	4xRU	39.6	800	16	1.18	86.4	35.1	8.4	4.8
FM 960R	0xRU	39.3	918	8	1.17	85.1	34.8	8.2	4.5
FM 960R	4xRU	39.4	953	6	1.17	85.3	35.0	8.2	4.5
FM 800BR	0xRU	39.4	998	3	1.21	86.2	33.4	8.1	4.4
FM 800BR	4xRU	39.4	965	5	1.23	86.4	33.3	8.3	4.3
FM 960BR	0xRU	39.3	1080	2	1.14	85.0	35.2	8.2	4.7
FM 960BR	4xRU	39.2	1109	1	1.14	84.7	35.8	8.1	4.7
FM 989BR	0xRU	38.6	899	10	1.14	84.6	32.7	8.0	4.7
FM 989BR	4xRU	38.9	915	9	1.16	84.7	33.2	8.1	4.8
FM 800B2R	0xRU	38.2	888	12	1.23	86.1	33.0	8.1	4.3
FM 800B2R	4xRU	38.4	856	13	1.24	86.4	33.3	8.3	4.4
FM 960B2R	0xRU	38.4	974	4	1.20	85.6	34.2	8.0	4.6
FM 960B2R	4xRU	38.8	947	7	1.19	85.6	35.1	8.2	4.7
GRAND MEAN		39.2	926		1.18	85.6	33.9	8.2	4.6
CV %		1.8	8.3		1.4	0.9	2.5	3.5	3.7
LSD 0.05		0.5	54		0.03	0.7	1.2	0.4	0.2

Table 4. 2002 BCSI cotton variety trial results across locations in the Mid-South.

				BOLL	MEAN HVI FIBER QUALITY				
ENTRY	LINT %	YIELD	RANK	SIZE	LEN	UNIF	STREN	ELONG	MIC
FM 960BR	*38.9*	*987*	*1*	*5.4*	*1.14*	*84.4*	*34.3*	*7.9*	*4.4*
FM 958B	40.1	979	2	4.7	1.17	85.0	33.4	8.1	4.4
PM 1218BG/RR	40.3	976	3	4.9	1.09	84.2	28.2	8.3	4.9
SG 215BG/RR	39.2	962	4	4.6	1.09	84.5	27.2	8.5	4.7
ST 4892BR	40.3	950	5	4.6	1.11	84.4	29.6	8.4	4.8
DP 451BG/RR	36.2	865	13	4.4	1.15	84.0	27.9	8.2	4.6
FM 960R	*39.1*	*864*	*14*	*4.9*	*1.19*	*85.1*	*34.3*	*7.8*	*4.2*
ST BXN47	41.0	864	15	4.4	1.12	84.5	29.7	8.2	4.9
FM 991BR	38.5	861	16	4.3	1.18	84.3	32.1	7.8	4.5
SG 521RR	39.1	842	20	4.7	1.09	84.2	28.5	8.7	4.7
FM 989BR	37.9	826	21	4.6	1.16	84.4	31.8	8.1	4.3
FM 800BR	*39.0*	*824*	*22*	*4.8*	*1.24*	*85.8*	*31.7*	*7.9*	*3.9*
FM 819RR	41.7	819	24	3.8	1.19	85.5	30.1	8.0	4.5
DP 5415RR	39.7	809	25	4.1	1.14	83.7	28.8	8.4	4.5
ST 4793RR	40.1	809	26	4.5	1.10	84.4	30.0	8.4	4.9
FM 800R	*40.1*	*802*	*27*	*4.7*	*1.19*	*86.4*	*33.5*	*8.2*	*4.5*
DP 5690RR	37.2	792	28	4.3	1.16	84.4	32.1	8.1	4.5
DP 436RR	35.4	768	30	4.4	1.16	84.6	27.2	8.3	4.6
PM 1199RR	39.9	763	31	5.1	1.13	85.4	31.2	8.4	4.9
GRAND MEAN	38.8	859		4.6	1.15	84.6	30.4	8.2	4.5
CV %	2.4	12.0		12.6	1.1	0.9	3.6	4.1	4.1
LSD 0.05	0.7	64		0.6	0.02	0.9	1.9	0.6	0.3

Table 5. 2002 BCSI cotton variety trial results across locations in the Southeast.

				BOLL	HVI FIBER QUALITY				
ENTRY	**LINT %**	**YIELD**	**RANK**	**SIZE**	**LEN**	**UR**	**STR**	**ELONG**	**MIC**
FM 960R	*41.6*	*836*	*1*	*6.0*	*1.15*	*83.6*	*36.2*	*8.3*	*4.7*
FM 958B	42.2	827	2	5.1	1.13	83.5	34.6	8.2	4.7
FM 800R	*42.7*	*824*	*3*	*5.8*	*1.13*	*84.1*	*35.8*	*8.4*	*4.9*
FM 960BR	*41.0*	*811*	*4*	*5.8*	*1.10*	*83.1*	*36.8*	*8.2*	*4.9*
FM 800BR	*41.6*	*810*	*5*	*5.7*	*1.19*	*84.4*	*34.0*	*8.3*	*4.6*
FM 991RR	40.8	794	7	5.1	1.15	81.1	35.4	8.7	5.0
DP 458BG/RR	41.2	769	9	4.8	1.13	83.5	31.8	8.7	5.1
FM 989R	41.7	761	10	5.4	1.12	83.0	35.6	8.3	4.8
SG 215BG/RR	41.6	745	12	5.1	1.08	83.4	30.0	8.8	5.1
DP 451BG/RR	38.2	744	13	5.3	1.13	83.7	29.7	8.3	5.0
FM 991BR	41.6	742	14	5.1	1.15	83.6	35.1	8.5	5.0
ST 4793RR	42.9	737	15	5.3	1.10	83.5	32.4	8.5	5.2
ST BXN47	42.9	727	16	5.0	1.12	83.5	30.8	8.5	5.2
ST 4892BR	42.9	726	17	5.3	1.11	83.4	31.7	8.6	5.2
FM 832B	41.1	714	19	5.8	1.18	84.4	34.4	8.4	4.7
DP 5690RR	40.3	713	20	5.2	1.12	83.2	36.0	8.7	5.1
DP 5415RR	41.7	703	22	4.8	1.13	83.5	32.2	8.8	5.3
SG 501BG/RR	40.9	691	25	5.2	1.08	83.2	32.5	8.9	5.1
DP 436RR	37.9	685	26	5.3	1.12	83.7	30.1	8.7	5.0
DP 655BG/RR	39.7	664	27	5.2	1.13	83.4	34.0	8.5	4.9
FM 989BR	40.3	654	28	5.4	1.13	83.0	33.8	8.2	4.8
PM 1199RR	41.4	651	29	5.6	1.12	83.8	32.2	8.5	5.1
SG 521RR	41.2	641	30	5.2	1.10	83.3	31.5	8.9	5.0
PM 1218BG/RR	42.5	610	32	5.7	1.09	83.2	32.2	8.5	5.0
GRAND MEAN	41.2	729		5.3	1.13	83.4	32.8	8.5	5.0
CV %	2.1	10.4		6.1	1.44	2.2	3.5	3.1	3.9
LSD 0.05	1.2	127		0.5	0.02	2.5	1.6	0.4	0.3