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DP 488 BG/RR: NEW HIGH FIBER QUALITY, MID-FULL MATURITY STACKED GENE VARIETY FROM D&PL

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Abstract

Delta and Pine Land Company will introduce a new, mid-full maturing picker stacked gene variety, DP 488 BG/RR, in the 2005-growing season. DP 488 BG/RR has a medium-tall plant type with semi-smooth leaf and good storm resistance. DP 488 BG/RR was developed as a backcross using DP 491 as the recurrent parent. Field testing of DP 488 BG/RR, both in Delta and Pine Land Company tests and University tests, has indicated yield improvements from 2.5% to 5.1% and crop value improvements from 3.5% to 5.2% compared to other high quality commercial stacked gene varieties. The HVI fiber characteristics for DP 488 BG/RR in the head to head comparisons included a staple of 37.0 to 37.3; micronaire of 4.2 to 4.4; and fiber strength of 31.0 to 31.8 g/tex. The regional performance of DP 488 BG/RR showed the strongest yield potential in the South Delta and Southern Southeast U.S. Seed supply is expected to be good for commercial introduction in 2005.

Introduction

DP 488 BG/RR will be released as a new mid-full stacked gene variety for the 2005 growing season. DP 488 BG/RR was tested as DPLX 03X176BR, prior to being given the commercial name DP 488 BG/RR. DP 488 BG/RR was developed by backcrossing a transgenic donor for both the Bollgard and Roundup Ready stacked gene traits and the recurrent parent, DP 491. Testing in University Official Variety Trials (OVTs) and Delta and Pine Land Company Agronomic Service Trials (ASTs) was initiated in 2003.

Materials and Methods

The data describing DP 488 BG/RR here were extracted from the Delta and Pine Land Company Agronomic Information System database December 28, 2004. This database contains both public data from university OVTs and Delta and Pine Land Company (D&PL) tests from the Research and Technical Services departments. The data extracted from the database included yield and HVI fiber quality data to calculate “loan value” based on the 2004 USDA loan chart, using a base value of $0.52 / lb. Comparisons for yield and fiber quality were made with FM 989BR, FM 991BR, FM 800BR, and DP 449 BG/RR and were all balanced head to head comparisons for all locations available. Crop value per acre was calculated by multiplying the lint yield for each plot by the USDA loan value calculated for that plot. Plant mapping data for maturity comparisons was collected at selected D&PL Technical Service plot sites. The data was collected near maturity when the plants had from 30 percent to 70 percent open bolls. Balanced, head to head comparisons of the plant mapping data were made against FM 989BR. Analysis of variance was run for all comparisons using JMP 5.0 software.

Results and Discussion

General Characteristics and Plant Growth

DP 488 BG/RR is a mid to full maturing variety with semi-smooth leaves and a medium-tall plant type (Table 1). Seed size can range from 4500 to 5600 seed per pound and seedling vigor has been rated as good. The preliminary disease tolerance ratings of DP 488 BG/RR to Fusarium wilt and Verticillium wilt are both very good, similar responses to the recurrent parent, DP 491. Storm resistance on DP 488 BG/RR is rated good.

The plant height of DP 488 BG/RR is 1.2 inches taller than FM 989BR, while DP 488 BG/RR had 1.1 more total nodes, and 0.7 more fruiting nodes (Table 2). The node of first fruiting branch (NFFB) and the height to node ratio (HNR) of the two varieties were not different. The DP 488 BG/RR plants had cracked bolls at 0.4 nodes lower on the plant than FM 989BR, while harvestable bolls on DP 488 BG/RR were 0.7 nodes higher on the plant (NUCB and NUHB). This resulted in a larger node interval between the NUCB and NUHB for DP 488 BG/RR than FM 989BR, with DP488BG/RR maturing approximately 56 DD60's later than FM 989BR (DD60's to 100% open). In summary, DP 488 BG/RR is a taller plant with more total nodes and fruiting nodes and later maturing (based on nodes with open and harvestable bolls) compared to FM 989BR.

Yield, Fiber Quality, and Crop Value

The yield and HVI fiber quality of DP 488 BG/RR compared to 4 other high-quality stacked gene varieties (FM 989BR, FM 991BR, FM 800BR and DP449BR) are summarized in Table 3. DP 488 BG/RR yielded significantly greater than all the comparison varieties. The crop value of DP 488 BG/RR ($/acre) was also significantly greater than all the comparison varieties.

The improvement in crop value ranged from 3.5% greater compared to DP449 BG/RR to 5.2% greater than FM 991BR. The differences in lint yield for DP 488 BG/RR versus the comparison varieties ranged from 2.5% greater than DP 449 BG/RR to 5.1% greater than FM 991BR. The gin turnout may have contributed to a portion of this yield improvement. The turnout of DP 488 BG/RR was significantly greater than each of the comparison stacked varieties, ranging from 378.2% to 39.3% gin turnout.

The staple length of DP 488 BG/RR was longer than DP449 BG/RR, FM 989BR, and FM 991BR, while it was shorter than FM800BR (Table 3). The staple of DP 488 BG/RR ranged from 37.0 to 37.3 in the various comparisons, while the staple of the other stacked varieties ranged from 35.6 to 37.8. The micronaire of DP 488 BG/RR was similar to DP 449 BG/RR, and lower than FM 991BR, while it was higher than the micronaire of FM989BR and FM 800BR. The micronaire of DP 488 BG/RR ranged from 4.22 to 4.39 in the various comparisons. The fiber strength of DP 488 BG/RR was greater than FM 989BR, the same as DP 449 BG/RR, and less than FM 991BR and FM 800BR. The fiber strength of DP 488 BG/RR ranged from 31.0 to 31.8 g/tex. The uniformity index of DP 488 BG/RR was greater than FM 989BR, FM991BR, and DP 449 BG/RR, while it was less than FM 800BR. The improved fiber properties for DP 488 BG/RR in these comparisons resulted in loan value equal to FM 989BR and FM 991BR, greater loan value than DP 449 BG/RR and lower loan value than FM 800BR.

Regional Performance

DP 488 BG/RR showed its strongest performance in the Southern Southeast and the South Delta (Table 4) compared to FM 989BR. In the remainder of the data regions the two varieties had statistically similar yields, except in the Southern High Plains, where FM 989BR outyielded DP 488BG/RR.. The yield performance of DP 488 BG/RR in the Southern High plains may have been penalized by its more full season nature, especially with most of the data coming from a season of fewer heat units: 2004. However, in regions with more full season environments (i.e. S. Delta and S. Southeast), DP 488 BG/RR had greater yield. This regional analysis would point to the strongest performance potential for DP 488 BG/RR in regions that fit the mid-full maturity of this variety.

Summary

DP 488 BG/RR is a new mid-full maturity stacked gene variety with improved yield and fiber quality potential over several comparison high quality stacked varieties (FM 989BR, FM 991BR, FM 800BR, and DP 449 BG/RR). The yield of DP 488 BG/RR was 2.5% to 5.1% greater than the comparison varieties and the crop value ($/acre) was 3.5% to 5.2% greater than the comparison varieties. The HVI fiber properties of DP 488 BG/RR showed the following differences: staple was significantly longer than 3 of the 4 comparison varieties, while fiber strength was equal or greater for 2 of the 4 comparisons. The micronaire of DP 488 BG/RR was equal or lower than 2 of the 4 comparison varieties. DP 488 BG/RR is a tall plant with later maturity than FM 989BR and showed the strongest yield performance in the Southern Southeast and South Delta regions, where mid-full varieties have sufficient season length to match their maturity. Seed supply is expected to be good for commercial introduction in 2004.

Table 1. Characteristics of DP 488 BG/RR.

Former Design.	DPLX03X176BR
Recurrent Parent	DP 491
Breeders	Don L. Keim, Doug Shoemaker

Maturity	Mid - Full
Plant Height	Medium-Tall
Leaf Hair	Semi-smooth
Seedling Vigor	Good
Seed Size (#/lb)	4,500 - 5,600
Storm Resist.	Very Good
Fusarium tolerance	Prelim. – Very Good[1]
Verticillium tolerance	Prelim. – Good[1]

[1] Limited observations for wilt tolerance determination

Table 2. Plant Mapping parameters for DP 488 BG/RR and FM 989 BR averaged over 41 locations of Delta and Pine Land Company trials across the Cotton Belt in 2004.

	DP 488 BG/RR	FM 989BR	t-Test[2]
Plant Height (in.)	33.0	31.8	*
Total Nodes	20.5	19.4	***
Fruiting Nodes	10.6	9.9	**
HNR [1]	1.6	1.6	NS
NFFB	6.5	6.5	NS
NUCB	11.2	11.6	*
NUHB	16.1	15.4	**
DD60's to 100% open	243.5	187.4	***
N	41	41	

[1]HNR – Height to node ratio (inches per node)
NFFB – Node of First Fruiting Branch
NUCB – Node Uppermost Cracked Boll
NUHB – Node Uppermost Harvestable Boll
[2] *, **, *** = t test significance @ 0.05, 0.01, and 0.001 levels

Table 3. Head to Head Yield and HVI Performance of DP 488 BG/RR compared to Delta and Pine Land Company and competitor stacked gene varieties. Data includes both DPL AST data and University OVT data from DPL AIS database as of 12.28.04.

Variety	Crop Value ($/Acre)	Yield (lb/acre)	% Gin Turn Out	Staple (32nd inch)	Micro-naire	Strength (g/tex)	Uniformity Index (%)	Loan Value (cents/lb)
DP 488 BG/RR	624	1156	37.6	37.1	4.27	31.4	82.8	53.96
FM 989BR	595	1104	36.1	35.7	4.17	30.9	82.2	53.87
n	152	152	152	141	141	141	137	140
Sig. Level[1]	***	***	***	***	***	***	***	NS
% Difference	4.8	4.7	4.0	3.9	2.4	1.6	0.8	0.2
DP 488 BG/RR	630	1165	37.2	37.1	4.31	31.0	83.2	54.07
FM 800BR	607	1109	36.4	37.8	3.96	32.1	83.9	54.75
n	51	51	51	48	48	48	46	48
Sig. Level	*	**	***	***	***	***	***	*
% Difference	3.7	5.0	2.3	-1.8	8.9	-3.5	-0.9	-1.2
DP 488 BG/RR	636	1179	37.2	37.0	4.22	31.5	82.6	54.00
DP 449 BG/RR	615	1150	36.3	35.6	4.22	31.3	82.4	53.48
n	296	296	296	279	279	279	278	278

Sig. Level	***	**	***	***	NS	NS	**	***
% Difference	3.5	2.5	2.6	4.1	0.0	0.6	0.3	1.0
DP 488 BG/RR	642	1202	39.3	37.3	4.39	31.8	83.2	53.46
FM991BR	611	1143	37.6	36.1	4.52	33.4	82.9	53.43
n	80	80	80	72	72	72	71	72
Sig. Level	***	***	***	***	***	***	*	NS
% Difference	5.2	5.1	4.6	3.3	-2.8	-4.8	0.4	0.1

[1] *, **, *** = t test significance @ 0.05, 0.01, and 0.001 levels

Table 4. Regional Head to Head Yield and comparisons of DP 488 BG/RR vs. FM 989BR and DP 449 BG/RR. Data includes both DPL AST data and University OVT data from DPL AIS database as of 12.28.04.

Data Region	n	DP 488 B/RR	FM989 B/RR	% Difference	Sig. Level [1]
Arizona	3	1400	1296	8.0	NS
Trans Pecos	5	1454	1402	3.7	NS
South High Plains	9	1197	1302	-8.1	*
Rolling Plains	12	932	947	-1.6	NS
South Texas	19	942	978	-3.7	NS
Central Texas	13	848	796	6.4	NS
South Delta	15	1412	1244	13.5	***
North Delta	13	1196	1125	6.3	NS
Southern Southeast	38	1303	1161	12.2	***
Northern Southeast	25	1082	1100	-1.6	NS

[1] *, **, *** = t test significance @ 0.05, 0.01, and 0.001 levels