

DP 494 RR: A NEW ROUNDUP READY COTTON VARIETY WITH OUTSTANDING FIBER QUALITY

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Abstract

Delta and Pine Land Company will introduce a new, mid-full maturing picker Roundup Ready variety, DP 494 RR, in the 2004-growing season. DP 494 RR has a tall plant type with semi-smooth leaf and good storm resistance. DP 494 RR was developed as a backcross using DP 491 as the recurrent parent. The yield and HVI fiber quality of DP 494 RR is very similar to DP 491, which is known for outstanding yield potential and excellent fiber quality potential. Field testing of DP 494 RR, both in Delta and Pine Land Company tests and University tests, has indicated yield improvements from 1.1% to 8.5% and crop value improvements from 4.7% to 9.7% compared to other commercial Roundup Ready mid-full maturity varieties. The HVI fiber characteristics for DP 494 RR in the head to head comparisons included a staple of 36.7 to 37.2; micronaire of 4.3 to 4.5; and fiber strength of 32.5 g/tex. The regional performance of DP 494 RR showed the strongest yield and crop value potential in the South Delta and Southern Southeast U.S. Seed supply is expected to be good for commercial introduction in 2004.

Introduction

DP 494 RR will be released as a new mid-full Roundup Ready variety for the 2004 growing season. DP 494 RR was tested as DPLX 03X177R, prior to being given the commercial name DP 494 RR. DP 494 RR was developed by backcrossing a transgenic donor for the Roundup Ready trait 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 494 RR here were extracted from the Delta and Pine Land Company Agronomic Information System database December 23, 2003. 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 2003 USDA loan chart, using a base value of \$0.52 / lb. Comparisons for yield and fiber quality were made with DP 5415 RR, DP 5690 RR, ST 4793R, ST 5303 RR, FM 989R, and FM 991R, and were all balanced head to head comparisons for all locations included. 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 DP 5415 RR.

Results and Discussion

General Characteristics and Plant Growth

DP 494 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 5200 to 5600 seed per pound and seedling vigor has been rated as good. The preliminary disease tolerance ratings of DP 494 RR to Fusarium wilt is very good and Verticillium wilt is good, both similar responses to the recurrent parent, DP 491. Storm resistance on DP 494 RR is very good.

The plant height of DP 494 RR is almost 2 inches taller than DP 5415 RR, while no differences were noted between the varieties for either total nodes, fruiting nodes or node of first fruiting branch (NFFB) (Table 2). The height to node ratio (HNR) is greater for DP 494 RR, due to its taller height with a similar number of nodes compared to DP 5415 RR. The DP 494 RR plants had cracked and harvestable bolls at higher nodes on the plant (NUCB and NUHB) than DP 5415 RR plants, but the node interval between the NUCB and HUHB was similar, resulting in a similar value for DD60's to 100% open. In summary, DP 494 RR has shown to be a taller plant with similar node number and boll opening for maturity to DP 5415 RR.

Yield, Fiber Quality, and Crop Value

The yield and HVI fiber quality of DP 494 RR compared to 6 other Roundup Ready varieties (DP 5415 RR, DP 5690 RR, ST 4793RR, FM 989R, FM 991R, and ST 5303R) are summarized in Table 3. DP 494 RR yielded significantly greater than all the comparison varieties, except ST 4793R, that it yielded equal to. The crop value of DP 494 RR (\$/acre) was significantly greater than all the comparison varieties. The improvement in crop value ranged from 4.7% greater compared to ST 4793 R

to 9.7% greater than ST 5303R. The differences in lint yield for DP 494 RR versus the comparison varieties ranged from 1.1% greater than ST 4793R to 8.5% greater than ST 5303R. The gin turnout may have contributed to a portion of this yield improvement. The turnout of DP 494 RR was significantly greater than each of the comparison RR varieties, ranging from 38.2% to 39.5% gin turnout.

The staple length of DP 494 RR was significantly longer than all of the comparison varieties (Table 3). The staple of DP 494 RR ranged from 36.7 to 37.1 in the various comparisons, while the staple of the other RR varieties ranged from 34.8 to 36.2. The micronaire of DP 494 RR was similar to 4 of the 6 comparison varieties, except in the case of ST 4793R, where the DP 494 RR micronaire was lower; and in the case of FM 989R, where the DP 494 RR micronaire was significantly higher. The fiber strength of DP 494 RR was significantly greater than 4 of the 6 comparison varieties; in the cases of DP 5690 RR and FM 991R, DP 494 R had equal fiber strength. The improved fiber properties for DP 494 RR in these comparisons resulted in a greater loan value in all cases except DP 5690RR and FM 991R, where the loan value was not different from DP 494 RR.

When DP 494 RR was compared to the related varieties of DP 491 (recurrent parent) and DP 488 BG/RR (stacked DP 491 version), the three varieties were not different for crop value, yield, or HVI fiber quality parameters (Table 4). The only factor that showed significance was % gin turnout. The turnout of DP 494 RR was intermediate to the DP 491 and the DP 488 BG/RR, and not different to either the conventional or stacked variety, although the conventional DP 491 had greater turnout than the DP 488 BG/RR. Overall, the three varieties in the DP 491 family were found to be very similar in yield, crop value, and HVI fiber quality.

Regional Performance

DP 494 RR showed its strongest performance in the Southern Southeast and the South Delta (Table 5) compared to ST 4793R. As might be expected for a mid-full maturing variety, the yield performance in the North Delta and Northern Southeast was not better than ST 4793R. However, in regions with more full season environments (i.e. S. Delta and S. Southeast), DP 494 RR had greater yield (S. Southeast only) and greater crop value (both regions). This regional analysis would point to the strongest performance potential for DP 494 RR in regions that fit the mid-full maturity of this variety.

Summary

DP 494 RR is a new mid-full maturity Roundup Ready variety with improved yield and fiber quality potential over several comparison RR varieties (DP 5415 RR, DP 5690 RR, ST 4793RR, FM 989R, FM 991R, and ST 5303R). The yield of DP 494 RR was 1.1% to 8.7% greater than the comparison varieties and the crop value (\$/acre) was 4.7% to 9.7% greater than the comparison varieties. The HVI fiber properties of DP 494 RR showed the following differences: staple was significantly longer than all the comparison varieties and strength was significantly greater for 4 of the 6 comparisons (and equal in the other 2 comparisons). DP 494 RR is a tall plant with maturity similar to DP 5415 RR and showed the strongest yield and value 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 494 RR.

Former Design.	DPLX03X177R
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)	5,200-5,600
Storm Resist.	Very Good
Fusarium tolerance	Prelim. – Very Good ¹
Verticillium tolerance	Prelim. – Good ¹
Bronze Wilt	Not Observed

¹Limited observations for wilt tolerance determination

Table 2. Plant Mapping parameters for DP 494 RR and DP 5415 RR averaged over 27 locations of Delta and Pine Land Company trials across the Cotton Belt in 2003.

	DP 494 RR	DP 5415 RR	t-Test
Plant Height (in.)	35.7	33.8	0.004
Total Nodes	20.4	19.9	NS
Fruiting Nodes	10.7	10.4	NS
HNR *	1.75	1.69	0.01
NFFB	6.6	6.4	NS
NUCB	12.0	11.6	0.03
NUHB	16.3	15.8	0.01
DD60's to 100% open	214	209	NS
N	27	27	

*HNR – Height to node ratio (inches per node)

NFFB – Node of First Fruiting Branch

NUCB – Node Uppermost Cracked Boll

NUHB – Node Uppermost Harvestable Boll

Table 3. Head to Head Yield and HVI Performance of DP 494 RR compared to Delta and Pine Land Company and competitor Roundup Ready varieties. Data includes both DPL AST data and University OVT data from DPL AIS database as of 12.23.03.

Variety	Crop Value (\$/Acre)	Yield (lb/acre)	% Gin Turn Out	Staple (32 nd inch)	Micro- naire	Strength (g/tex)	Uniformity Index (%)	Loan Value (cents/lb)
DP 494 RR	601	1107	38.0	37.0	4.45	32.8	83.2	54.20
DP 5415 RR	549	1028	36.8	35.4	4.54	30.9	82.4	53.33
n	91	91	91	87	87	87	87	72
t-Test	<.0001	<.0001	<.0001	<.0001	NS	<.0001	0.0001	<.0001
% Difference	9.5	7.7	3.1	4.5	-1.9	6.1	1.0	1.6
DP 494 RR	519	968	38.2	36.7	4.35	32.5	82.7	53.79
DP 5690 RR	483	901	35.3	35.3	4.20	31.6	81.3	53.54
n	34	34	34	32	32	32	32	32
t-Test	0.02	0.02	<.0001	<.0001	NS	NS	<.0001	NS
% Difference	7.5	7.4	8.2	3.9	3.5	3.0	1.7	0.5
DP 494 RR	570	1044	38.2	37.0	4.35	32.6	83.1	54.50
ST4793RR	544	1033	37.6	34.8	4.59	30.3	82.5	52.63
n	88	88	88	87	87	87	87	72
t-Test	0.0092	NS	0.0009	<.0001	0.0008	<.0001	0.003	<.0001
% Difference	4.7	1.1	1.6	6.5	-5.3	7.7	0.7	3.6
DP 494 RR	590	1098	39.3	36.9	4.45	32.5	83.0	53.79
FM991RR	557	1024	37.0	36.2	4.36	32.0	82.6	54.39
n	38	38	38	35	35	35	35	35
t-Test	0.007	0.001	<.0001	0.0015	NS	NS	NS	NS
% Difference	5.9	7.2	6.3	2.1	2.0	1.7	0.5	-1.1
DP 494 RR	585	1078	38.7	36.9	4.43	32.6	83.1	54.20
FM989RR	540	1003	37.4	35.5	4.10	31.8	82.2	53.78
n	86	86	86	84	84	84	84	69
t-Test	<.0001	<.0001	<.0001	<.0001	<.0001	0.018	<.0001	0.03
% Difference	8.2	7.5	3.7	4.0	8.0	2.6	1.1	0.8
DP 494 RR	592	1099	39.5	37.1	4.40	32.6	83.3	53.88
ST5303R	540	1013	37.4	35.0	4.34	31.9	83.2	53.28
n	82	82	82	80	80	80	80	65
t-Test	<.0001	<.0001	<.0001	<.0001	NS	0.01	NS	0.02
% Difference	9.7	8.5	5.4	6.0	1.4	2.3	0.1	1.1

Table 4. Head to Head Yield and HVI Performance of DP 494 RR compared to DP 491 and DP 488 BG/RR. Data includes both DPL AST data and University OVT data from DPL AIS database as of 12.23.03.

Variety	Crop Value (\$/Acre)	Yield (lb/acre)	% Gin Turn Out	Staple (32 nd inch)	Micro- naire	Strength (g/tex)	Uniformity Index (%)	Loan Value (cents/lb)
DP 491	649	1223	38.0	37.8	4.40	31.8	82.5	54.24
DP 494 RR	644	1196	37.4	37.0	4.53	32.6	83.3	54.51
DP 488 BG/RR	679	1264	37.0	37.6	4.40	31.7	83.1	54.52
n	27	27	27	25	25	25	25	25
Prob. > F	NS	NS	0.003	NS	NS	NS	NS	NS

Table 5. Regional Head to Head Yield and Crop Value comparisons of DP 494 RR vs. ST 4793R. Data includes both DPL AST data and University OVT data from DPL AIS database as of 12.23.03.

	Cent. TX	S. Delta	N. Delta	S. Southeast	N. Southeast
Yield					
DP 494 RR	780	1297	906	1126	955
ST 4793RR	774	1253	938	1046	944
Prob>t	NS	NS	NS	0.003	NS
% difference	0.8	3.5	-3.4	7.7	1.2
n	5	14	23	22	17
Value					
DP 494 RR	427	716	495	607	519
ST 4793RR	396	662	502	539	505
Prob>t	NS	0.02	NS	<.0001	NS
% difference	7.8	8.2	-1.5	12.6	2.8
n	5	14	23	22	17