

EVALUATION OF TRANSGENIC VERSUS CONVENTIONAL COTTON VARIETIES (1998-2002)

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Introduction

Most public sector cotton variety trials are conducted to determine the genetic potential of each entry; hence, all varieties are produced with the same management and with a goal of producing maximum yields. Transgenic varieties have provided new tools for pest management but raised concerns about the relative performance of these varieties compared to conventional recurrent parent varieties and the relative profitability of the technology systems compared to conventional management. This five year study was conducted to compare yield and economics of transgenic and conventional varieties in the respective technology systems.

Materials and Methods

This five year (1998-2002) study was undertaken at the Jud Greene and Jeffery Barber Farms in Decatur County, Georgia, under center pivot irrigation on a Lucy soil. Each variety was planted in a block according to its technology system-bollgard (Bt), roundup ready (RR), stacked (Bt/RR) or conventional and managed according to University of Georgia Extension recommendations.

Sixteen conventional and seventeen transgenic cotton varieties in 2002 were randomly replicated four times in a split block design. Plots were four rows (36 inch centers) and 150 feet in length. The two inside rows were harvested.

Planting, Growth Regulator, Defoliation, and Harvest

All Plots: Plot size- 4 (36 inch) rows, length (150 feet)
alleys - 25 feet
border rows planted in DPL 458B/RR

November 27, 2001	planted 2.1 bushels oats/acre
April 19	sprayed 26 ounces Roundup UltraMax/acre
May 15	laid off rows
May 20-21	planted (strip-tilled in oats) seeding rate- 3.5 seed/foot applied 3.5 pounds Temik/acre (in-furrow)
July 6	applied 12.5 ounces Mepex/acre
July 19	applied 16 ounces Mepex + 1.5 pounds Solubor/acre
September 3	applied 16 ounces Mepex/acre
September 28	applied 6 ounces Ginstar + 1.5 pints Finish/acre
October 18-19	harvested cotton

Fertilization

All Plots:

May 15	applied 18 gallons 10-34-0/acre (dribbled 2 inches to side of seed on surface)
May 21	applied 280 pounds 0-7-28/acre
June 5	applied 20 gallons 28-0-0-5/acre (sidedressed)
June 27	applied 27.5 gallons 28-0-0-5/acre (sidedressed)
July 1	applied 260 pounds 0-0-40 (plus 9 pounds of sulfur and 4 pounds magnesium)/acre
July 3	applied 25 gallons 28-0-0-5/acre
July 29	applied 1 pound of solubor/acre

Weed Control

RR and Bt/RR:

May 17 applied 1.33 quarts Prowl 3.3 EC + 26 ounces Roundup UltraMax/acre
June 10 applied 26 ounces Roundup UltraMax/acre
June 11 cultivated and applied 1.4 pints MSMA + 1 pint FloMet + 1 pint crop oil concentrate in 18 inch band
June 20 applied 2.7 pints MSMA + 1 quart crop oil concentrate/acre

Bt and Conventional:

May 17 applied 1.33 quarts Prowl 3.3 EC + 26 ounces Roundup UltraMax/acre
June 11 cultivated and applied 1.4 pints MSMA + 1 pint FloMet + 1 pint crop oil concentrate in 18 inch band
June 20 applied 2.7 pints MSMA + 1 quart crop oil concentrate/acre
June 25 applied 8 ounces Select + 1 quart crop oil concentrate/acre

Insect Control

RR and Conventional:

July 6 applied 1.5 ounces Tracer/acre
July 19 applied 1.5 ounces Tracer/acre
July 29 applied 1.5 ounces Tracer/acre
August 3 applied 1.5 ounces Tracer + 1 pint methyl parathion 4 EC/acre
September 9 applied 1 pint methyl parathion 4 EC/acre

Bt and Bt/RR:

August 3 applied 1 pint methyl parathion 4 EC/acre
September 9 applied 1 pint methyl parathion 4 EC/acre

Results

Yields of varieties by technology group were similar for 1998-2002, although there was a trend for RR varieties to be about 100 lb/acre less than the conventional variety average. For specific conventional recurrent parents and transgenic progeny, yields were comparable with minor variations by year. Economically, Bt and stacked Bt/RR technology systems were more profitable than conventional management. The RR system resulted in slightly less profit than the conventional system.

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Table 1. 2002 Decatur County Cotton Variety Trial Evaluation of Transgenic Versus Conventional Cotton Varieties

	2002 Yield (Lbs/Acre)	Staple (Length)	Micronaire	Strength	Loan Rate (cents/lb)	Total \$ (Per Acre)
DPL 555 B/R	1329	35	41	27.0	55.80	741.58
DPL 493	1287	36	48	31.4	56.65	729.09
PH 98M-2983	1232	35	48	25.5	55.55	684.38
GC271	1224	36	49	27.0	56.05	686.05
DPL 99X35	1201	36	45	27.1	55.85	670.76
SG 215B/R	1196	35	50	25.9	51.60	617.14
FM 958	1166	37	44	32.4	56.65	660.54
FM 989 B/RR	1163	35	44	28.9	55.70	647.79
SG 501 B/R	1162	37	51	30.0	52.90	614.70
SG 105	1157	7	48	30.3	55.65	643.87
HS 12	1148	37	49	31.2	56.90	653.21
DPL 436RR	1139	37	50	29.0	52.35	596.27
SG 521RR	1128	35	49	26.3	55.55	626.60
DPL 565	1126	37	51	30.0	52.90	595.65
DPL 458B/RR	1115	35	50	28.6	51.60	575.34
DPL 5415RR	1113	37	51	30.0	51.60	574.31
FM 991RR	1112	37	45	30.5	56.65	629.95
ST 457	1112	37	48	29.8	55.65	618.83
FM 966	1110	36	44	31.7	56.55	627.71
GA 161	1095	38	49	31.0	56.65	620.32
DPL 491	1088	37	47	33.2	56.80	617.98
ST 4691B	1076	34	48	27.0	54.20	583.19
DPL 5690RR	1060	35	45	28.9	55.55	588.83
DELTA PEARL	1058	35	49	27.9	55.70	589.31
DPL 33B	1056	35	50	27.0	51.75	546.48
DPL 451B/RR	1052	36	46	29.4	56.20	591.22
ST 580	1040	35	44	27.4	55.70	579.28
FM 989	1028	36	47	31.2	56.55	581.33
FM 989RR	1027	36	44	27.9	55.85	573.48
ST 4793RR	1002	36	50	25.9	50.85	509.52
ST 4892BR	986	34	50	28.0	50.45	497.43
PSC 355	937	37	49	28.4	54.90	514.41
FM 832B	915	37	35	29.8	56.35	515.60

Table 2. Decatur Cotton Variety Trial Evaluation of Transgenic Conventional Cotton Varieties (1998-2002).

	2002 Yield (Lbs/Acre)	2001-2002 2 Year Average	2000-2002 3 Year Average	1999-2002 4 Year Average	1998-2002 Year Average
DPL 555 B/R	1329	1433			
DPL 493	1287				
PH 98M-2983	1232				
GC271	1224				
DPL 99X35	1201				
SG 215B/R	1196	1393			
FM 958	1166	1259			
FM 989 B/RR	1163	1325			
SG 501 B/R	1162	1337	1356	1320	1272
SG 105	1157	1290	1291	1247	
HS 12	1148	1169	1212	1214	1259
DPL 436RR	1139	1204	1184		
SG 521RR	1128	1196			
DPL 565	1126	1250			
DPL 458B/RR	1115	1208	1312	1294	1268
DPL 5415RR	1113	1196			
FM 991RR	1112	1169			
ST 457	1112				
FM 966	1110	1273	1299		
GA 161	1095	1182	1202	1198	
DPL 491	1088	1336			
ST 4691B	1076	1229	1346		
DPL 5690RR	1060	1138	1169	1152	1160
DELTA PEARL	1058	1320	1401	1383	
DPL 33B	1056	1220	1248	1229	1238
DPL 451B/RR	1052	1262	1285	1258	
ST 580	1040	1254	1231		
FM 989	1028	1177	1181	1183	1141
FM 989RR	1027	1117			
ST 4793RR	1002	1218	1237		
ST 4892BR	986	1260	1353		
PSC 355	937	1182	1252		
FM 832B	915				

Table 3. Lint Yield (lb/A) Comparison of Technology Systems as a Group, 1998-2002.

Technology	1998		1999		2000		2001		2002		1998- 2002
	No.	Yield	No.	Yield	No.	Yield	No.	Yield	No.	Yield	Yield
Conventional	26	1212	27	1223	24	1306	20	1368	16	1126	1247
Bt	9	1180	8	1107	4	1396	5	1352	3	1016	1210
Stacked (Bt/RR)	5	1117	10	1127	9	1400	9	1452	7	1143	1248
Roundup Ready (RR)	9	1105	5	1134	6	1200	9	1256	7	1083	1156

Table 4. 2002 Comparison Conventional Parents and Transgenic Progeny.

Parent	Conventional		Bt Yield	Bt/RR Yield	RR Yield
	Yield				
Delta Pearl	1058			1329 (DPL 555 B/RR)	
FiberMax 989	1028			1163 (FiberMax 989 B/RR)	1027(FiberMax 989 RR)

Table 5. Averages of Conventional Parents and Transgenic Progeny by Year, Lint (Lb/A).

Year	Conventional		Transgenic Progeny	
	Parents, No.	Yield	No./Technology	Yield
1998	3	1250	3 B/RR	1143
1998	3	1195	3 Bt	1193
1998	5	1206	5 RR	1103
1999	6	1176	6 B/RR	1150
1999	3	1173	3 Bt	1196
1999	4	1176	4 RR	1148
2000	3	1330	3 B/RR	1450
2000	3	1330	3 Bt	1444
2000	3	1279	3 RR	1247
2001	4	1359	4 B/RR	1405
2001	2	1265	3 Bt	1359
2001	4	1304	5 RR	1223
2002	2	1043	2 B/RR	1246
2002	1	1028	1 RR	1027

Table 6. Economic Evaluation of Transgenic Varieties, Profit (+) or Loss (-) Compared to Conventional Production System, (1998-2002).

Technology	1998	1999	2000	2001	2002	Average (1998-2002)
Bt	+\$71.72	+\$35.44	+\$41.81	+\$26.84	+\$12.89	+\$37.74
Bt/RR	+\$31.46	+\$26.69	+\$44.41	+\$16.37	+\$0.80	+\$23.95
RR	-\$40.26	-\$8.75	+\$2.60	-\$10.47	-\$12.09	-\$13.79

Chemical prices based on University of Georgia Extension estimated prices quoted from dealer's average.

Custom work based on local rates. Technology fees based on 3.5 seed/ft as planted in tests 1998-2002.