

EVALUATION OF BOLLGARD II COTTON IN COMPARISON WITH DP5415 AND NUCOTTN 33B

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ABSTRACT: Second generation transgenic (Bt) cotton, Bollgard II[®], was evaluated in a spray-as-needed-evaluation with NUCOTTN 33B containing the Bollgard I[®] gene, and DP5415, a nontransgenic variety. Populations of damaging insects were extremely light during the season. All plots received protective applications of insecticide for tarnished plant bug control, but heliothine larvae were sprayed on an as-needed basis. DP5415 plots received 3 applications (one repeated because of rain) of insecticide for heliothine management. Plant stand, node to first square, and other plant parameters were essentially equal among varieties. Although percent gin turn-out was essentially equal in all treatments, DP5415 had significantly less seed-cotton (gr) per boll and grams of seed per boll than the other treatments. Although there was a trend toward increased yield in plots with Bollgard II and NUCOTTN 33B treatments as compared with the DP5415 plots, there were no statistically significant differences in yield.

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KEY WORDS: Boll/budworm, cotton, insecticides, seed-treatment

MATERIALS AND METHODS: The experimental design was randomized complete block with 4 replicates. Cotton, variety Bollgard II, Nucottn 33B and DP5415, was planted at the North Mississippi Research and Extension Center on 5/20/02 at a seed rate of 3 per ft. Plots were 8 rows wide (38 in spacing) and 50 ft long and were separated on each end with a 10 ft buffer. A John Deere 7100 planter equipped with Almaco plot applicators for seed and granule insecticides was used for planting. Bidrin (dicotophos) was applied for plant bug management by spray tractor on 6/13/02 and 7/09/02, and Orthene (acephate) was applied by airplane on 6/24/02. Ammo (cypermethrin) was applied for boll/budworm larvae treatment on 7/22/02, 7/25/02, 8/06/02 and Tracer (spinosad) and Provado (imidacloprid) was applied on 8/10/02 for DP5415 plots. Plots were sampled at 3 to 4 day intervals throughout the growing season for square damage, larvae in terminals and squares, eggs in terminals, and tarnished plant bugs. Twenty-five randomly selected terminals and squares in each plot were sampled, and treatment was initiated when population levels reached treatment threshold according to recommendations in the Mississippi Cotton Insect Control Guide. Tarnished plant bugs were sampled by making 25 sweeps with a sweep net per plot. Yield was estimated by mechanically harvesting the center 2 rows of each plot. In addition, 5 consecutive 'normal' plants in each plot were cut and evaluated

for boll weight by node and position. This cotton was ginned on a laboratory gin and weight of seed-cotton, seed, and lint were determined as well as the percent turn-out.

RESULTS AND DISCUSSION: Insect populations were low throughout the growing season. Heliothine egg numbers were uniformly distributed on all plots (Table 1), however, the number of larvae in terminals on Bollgard II plots (Table 2) was significantly different from that of the DP5415 plots only on 7/22/02. There were no significant differences in number of larvae found on squares (Table 3), but significant differences at the $p=0.10$ level of probability in numbers of worm damaged squares (Table 4) were found on 7/22/02, 8/8/02 and 8/15/02. On the latter date, there was significantly more damage in the DP5415 cotton than in the Bollgard II plots. Differences in shed squares (Table 5) occurred on 8/1/02 and 8/15/02, with more damage occurring in plots with DP5415 cotton than in the two transgenic varieties. Boll damage as evaluated on 8/25/02 and 9/5/02 did not differ between treatments (Table 6). Stand count, node to first square, and yield did not differ between varieties (Table 6), however there was a trend for yield to be distributed as Bollgard II > NUCOTTN 33B > DP5415. Aphids did not develop to high populations and since tarnished plant bug were managed with blanket sprays over all plots, there were no significant differences in aphid or plant bug numbers between treatments. Grams of lint per boll and percent turn-out did not differ between treatments, but DP5415 resulted in lower seed-cotton and seed weight than the transgenic varieties. There was a general trend for less seed-cotton, seed, lint and percent turn-out in the Bollgard II cotton as compared with the NUCOTTN 33B variety.

There were virtually no species of Lepidoptera in the plots other than heliothines, and the degree of protection from heliothines with both transgenic varieties was adequate for the populations of insects that occurred during the season. Because of this, no comment can be made on the basis of this trial concerning any economic advantage associated with either of the Bollgard varieties.

Table 1. Mean number of eggs per 25 terminals.

Treatment	Eggs Per 25 Terminals					
	7/3/02	7/8/02	7/11/02	7/15/02	7/18/02	7/22/02
BOLLGARD II	0.0 a	0.5 a	0.3 a	1.8 a	1.0 a	2.5 a
NUCOTTN 33B	0.0 a	1.3 a	0.3 a	1.8 a	3.3 a	1.8 a
DP5415	0.0 a	0.3 a	1.3 a	0.8 a	2.5 a	6.5 a
LSD (P=.05)	0.00	1.98	2.45	2.08	2.40	4.71
P>F	1.0000	0.4807	0.5477	0.4472	0.1428	0.0976
	7/25/02	7/29/02	8/1/02	8/5/02	8/8/02	8/13/02
BOLLGARD II	0.8 a	0.8 a	0.5 a	0.5	1.5 a	1.0 a
NUCOTTN 33B	0.5 a	1.0 a	2.5 a	1.5	1.0 a	1.0 a
DP5415	1.3 a	1.8 a	0.8 a	0.8	0.0 a	1.0 a
LSD (P=.05)	1.04	1.80	2.69	3.40	2.23	1.63
P>F	0.2746	0.4219	0.2205	0.7647	0.3170	1.0000
	8/15/02	8/19/02	8/25/02	9/5/02	9/12/02	
BOLLGARD II	0.5 a	0.5 a	0.8 a	0.0 a	2.0 a	
NUCOTTN 33B	0.3 a	0.8 a	1.5 a	0.0 a	1.3 a	
DP5415	0.3 a	0.5 a	0.8 a	0.0 a	1.3 a	
LSD (P=.05)	0.96	1.89	3.25	0.00	3.04	
P>F	0.7703	0.9334	0.8143	1.0000	0.7915	

Means within a date not sharing common letters differ significantly (LSD; p=0.05).

Table 2. Mean heliothine larvae per 25 terminals.

Treatment	Larvae Per 25 Terminals					
	6/27/02	7/8/02	7/11/02	7/15/02	7/18/02	7/22/02
BOLLGARD II	0.0 a	0.3 a	0.0 a	0.0 a	0.0 a	0.3 b
NUCOTTN 33B	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 b
DP5415	0.3 a	0.0 a	0.0 a	0.3 a	0.3 a	3.5 a
LSD (P=.05)	0.50	0.50	0.00	0.50	0.50	2.53
P>F	0.4219	0.4219	1.0000	0.4219	0.4219	0.0260
	7/25/02	7/29/02	8/1/02	8/5/02	8/8/02	8/13/02
BOLLGARD II	0.3 a	0.0 a	0.3 a	0.0 a	0.0 a	0.0 a
NUCOTTN 33B	0.0 a	0.0 a	0.0 a	0.5 a	0.0 a	0.0 a
DP5415	1.5 a	0.0 a	0.0 a	1.5 a	0.5 a	0.0 a
LSD (P=.05)	1.55	0.00	0.50	1.53	0.58	0.00
P>F	0.1129	1.0000	0.4219	0.1250	0.1250	1.0000
	8/15/02	8/19/02	8/25/02	9/5/02	9/12/02	
BOLLGARD II	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	
NUCOTTN 33B	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	
DP5415	0.0 a	0.0 a	0.0 a	0.0 a	0.3 a	
LSD (P=.05)	0.00	0.00	0.00	0.00	0.50	
P>F	1.0000	1.0000	1.0000	1.0000	0.4219	

Means within a date not sharing common letters differ significantly (LSD; p=0.05).

Table 3. Mean number of larvae per 25 squares.

Treatment	Larvae Per 25 Squares					
	7/3/02	7/8/02	7/11/02	7/15/02	7/18/02	7/22/02
BOLLGARD II	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a
NUCOTTN 33B	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a
DP5415	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	1.3 a
LSD (P=.05)	0.00	0.00	0.00	0.00	0.00	1.26
P>F	1.0000	1.0000	1.0000	1.0000	1.0000	0.0805
	7/25/02	7/29/02	8/1/02	8/5/02	8/8/02	
BOLLGARD II	0.0 a	0.0 a	0.0 a	0.0 a	0.3 a	
NUCOTTN 33B	0.0 a	0.0 a	0.0 a	0.0 a	0.3 a	
DP5415	0.3 a	0.5 a	0.3 a	0.0 a	1.0 a	
LSD (P=.05)	0.50	1.00	0.50	0.00	1.38	
P>F	0.4219	0.4219	0.4219	1.0000	0.3713	
	8/13/02	8/15/02	8/19/02	8/25/02	9/12/02	
BOLLGARD II	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	
NUCOTTN 33B	0.5 a	0.3 a	0.0 a	0.3 a	0.3 a	
DP5415	0.0 a	0.0 a	0.0 a	0.3 a	0.3 a	
LSD (P=.05)	0.58	0.50	0.00	0.76	0.76	
P>F	0.1250	0.4219	1.0000	0.6699	0.6699	

Means within a date not sharing common letters differ significantly (LSD; p=0.05).

Table 4. Mean number of worm damaged squares per 25 squares.

Treatment	Worm Damaged Squares per 25 Squares					
	7/3/02	7/8/02	7/11/02	7/15/02	7/18/02	7/22/02
BOLLGARD II	1.3 a	0.0 a	0.0 a	0.5 a	0.0 a	0.0 b
NUCOTTN 33B	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 b
DP5415	0.3 a	0.8 a	0.3 a	1.0 a	0.3 a	4.5 a
LSD (P=.05)	2.39	1.50	0.50	1.73	0.50	4.20
P>F	0.3673	0.4219	0.4219	0.4219	0.4219	0.0619
	7/25/02	7/29/02	8/1/02	8/5/02	8/8/02	
BOLLGARD II	1.0 a	0.0 a	0.0 a	0.0 a	1.0 b	
NUCOTTN 33B	0.0 a	0.5 a	0.3 a	1.0 a	0.5 b	
DP5415	2.3 a	1.0 a	0.8 a	1.5 a	3.3 a	
LSD (P=.05)	2.69	1.73	0.87	2.45	1.66	
P>F	0.2031	0.4219	0.1780	0.3732	0.0143	
	8/13/02	8/15/02	8/19/02	8/25/02	9/12/02	
BOLLGARD II	0.5 a	0.5 b	0.0 a	0.3 a	0.3 a	
NUCOTTN 33B	0.8 a	2.0 a	0.5 a	0.0 a	0.5 a	
DP5415	0.8 a	0.8 ab	0.8 a	0.3 a	1.0 a	
LSD (P=.05)	2.29	1.32	1.55	0.76	1.75	
P>F	0.9539	0.0659	0.5227	0.6699	0.5946	

Means within a date not sharing common letters differ significantly (LSD; p=0.05).

Table 5. Mean number of shed squares per 5 plants.

Treatment	Shed Squares per 5 Plants					
	7/3/02	7/8/02	7/11/02	7/15/02	7/18/02	7/22/02
BOLLGARD II	0.7 a	0.5 a	0.3 a	0.3 a	0.3 a	0.8 a
NUCOTTN 33B	0.3 a	0.8 a	0.3 a	0.0 a	0.8 a	0.0 a
DP5415	1.7 a	1.3 a	0.5 a	0.8 a	0.5 a	1.3 a
LSD (P=.05)	1.51	2.10	1.12	1.66	1.19	1.19
P>F	0.1451	0.6892	0.8240	0.5615	0.6141	0.1053
	7/25/02	7/29/02	8/1/02	8/5/02	8/8/02	
BOLLGARD II	1.3 a	0.0 a	0.0 b	0.0 a	0.0 a	
NUCOTTN 33B	0.8 a	0.8 a	0.3 b	0.5 a	1.3 a	
DP5415	2.8 a	1.5 a	1.5 a	1.5 a	1.5 a	
LSD (P=.05)	2.38	1.66	1.19	1.29	1.55	
P>F	0.1820	0.1664	0.0444	0.0723	0.1129	
	8/13/02	8/15/02	8/19/02	9/5/02	9/12/02	
BOLLGARD II	1.5 a	1.5 b	3.0 a	0.3 a	6.5 a	
NUCOTTN 33B	1.3 a	1.3 b	2.0 a	0.3 a	8.8 a	
DP5415	1.5 a	3.0 a	2.5 a	0.5 a	6.5 a	
LSD (P=.05)	3.73	1.32	2.45	0.50	3.90	
P>F	0.9822	0.0353	0.6297	0.4219	0.3331	

Means within a date not sharing common letters differ significantly (LSD; p=0.05).

Table 6. Mean treatment effects on various plant parameters and yield.

Treatment	Boll Damage / 5 Plants	Worm Damage / 25 Bolls	Larvae / 25 Bolls	Plants / 3 Feet	Node To First Square	Lb Seed Cotton/Ac
	8/25/02	9/5/02	9/5/02	6/17/02	6/27/02	10/17/02
BOLLGARD II	0.5 a	1.0 a	0.0 a	13.0 a	5.5 a	3256.7 a
NUCOTTN 33B	0.3 a	2.0 a	0.0 a	13.3 a	5.4 a	3114.7 a
DP5415	1.0 a	0.8 a	0.0 a	12.5 a	5.7 a	3055.2 a
LSD (P=.05)	1.04	1.50	0.00	1.66	1.14	2.300
P>F	0.2746	0.1780	1.0000	0.5615	0.8186	0.5231

Means within a column not sharing common letters differ significantly (LSD; p=0.05)..

Table 7. Mean grams (SE) seed-cotton, seed, lint per boll and percent turn-out by treatment.

Treatment	Seed-cotton	Seed	Lint	Turnout (%)
Bollgard II	9.32 (0.84) a	5.85 (0.54) a	3.34 (0.31) a	35.5 (4.08) a
NUCOTTN 33B	10.17 (0.89) a	6.30 (0.56) a	3.80 (0.34) a	37.5 (4.54) a
DP5415	7.33 (0.75) b	4.54 (0.44) b	2.92 (0.30) a	41.7 (2.79) a
P>F	0.015	0.008	0.114	0.161

Means within a column not sharing common letters differ significantly (LSD; p=0.05).