

Demonstration to manage pink bollworm with BT cottons Yuma Valley Ag Center 1996

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ABSTRACT

Transgenic cotton with the Bollgard™ gene inserted has shown great promise in controlling pink bollworm infestations in cotton. This trial was superimposed over a variety trial. Evaluations of pbw infestation indicated remarkable control even though the bolls became infested. Yields were increased in this trial when almost 100 % infestation of pbw was allowed to occur. It appears that the transgenic cottons containing Bollgard™ may be an effective method of pbw control.

INTRODUCTION

Transgenic cotton cultivars containing Bollgard™ genes (*Bacillus thuringiensis*) may help in the management of pink bollworm. This demonstration was superimposed on a cotton variety trial containing 2 cultivars with the Bollgard™ gene. They were Deltapine 33B™ and Paymaster 1220BT™. Comparable cultivars which the individual companies placed in the trial were also planted. They were Deltapine 5415 and Paymaster H1660.

MATERIALS AND METHODS

The trial was planted on March 23 in an area 274 feet long. Plot width was 14 feet which contained 4 raised beds 42 inches apart. The beds were pre-irrigated, mulched and then planted with a 4 row planter. There were 3 replications planted in a randomized complete block. The resulting stand of cotton contained 30,000 to 40,000 plants per acre. Counts made in random areas subjected to statistical analysis indicated no significant difference. These data are displayed in TABLE 3. Insecticide treatments used on the test area were predominately aimed at controlling whiteflies and lygus as displayed in TABLE 1. The data in TABLE 2 shows the level of pbw and lygus infestation for the season beginning with the 10th of June. Infestation of pbw were made by collecting susceptible bolls and searching for young larvae and or entrance warts or exit holes. Populations of pbw increased to almost 100% by August 30. No attempt was made to differentiate varietal differences until just before harvest on October 15.

Lygus infestation was determined by sweep net. No attempt was made to evaluate varietal reaction to lygus population.

Per cent pbw infestation data was collected on October 4. Plants were carefully removed by cutting them off at ground level and carrying them to the end of the field. Ten plants were removed at random in each of the 3 replications. The plants were carefully examined for evidence of pbw infestation. Exit holes in the carpel walls and frazz in hollowed out seeds were the main symptoms tabulated for each open boll. Non infested cotton bolls were also tabulated. Another category of damaged bolls from undetermined origin was also tabulated. Only the bolls which could be symptomatically related to pbw damage and freedom from any damage were used in calculating per cent infestation. Dr. John Palumbo was very helpful in establishing this evaluation technique. These data are

displayed in TABLE 4.

Green bolls from each of the cultivars were also examined prior to harvest for infestation of pbw larvae. 100 green bolls were picked at random from the top of the plant from each cultivar on October 4. They were examined for pbw larvae, either dead or alive, exit hole or other evidence of pbw damage. TABLE 5 summarizes this data.

RESULTS AND DISCUSSION

The transgenic cottons containing the Bollgard™ gene outyielded their comparative counterparts in this trial where pbw was not controlled and was allowed to build up to almost 100 % infestation near the end of the season. TABLE 6 displays yield data. Considerable success was obtained in exposing these cultivars to high pbw pressure (TABLE 2). The data collected prior to harvest indicated a statistically significant reduction in pbw infested open bolls during the season, TABLE 4. Deltapine 33B™ was significantly different than the other 3 cultivars observed.

Mature green bolls collected and inspected from each variety prior to harvest showed control of pbw larvae in the BT varieties, even though the bolls were infested by larvae. They appeared to succumb to the inserted BT once they ingested enough of the host material to be lethal. It is difficult to explain the large difference in the per cent of live larvae in Paymaster 1220BT™ 84 % alive as compared to Deltapine 33B™ with 0 % alive. The same type of relationship was present in the open boll pbw damaged boll data. 33B™ had only 3 % infested while 1220BT™ had 39 %.

TABLE 1. 1996 YUMA VALLEY AG CENTER COTTON VARIETY TRIAL
INSECT CONTROL AND DATES

DATE	INSECTICIDE TREATMENT	TARGET PEST**
6/21	KNACK + ORTHENE	WF, LY, PBW
7/18	APPLAUD + VYDATE	WF, LY, PBW
7/26	LORSBAN	PBW
8/5	BOLSTAR	PBW
8/12	CAPTURE + ORTHENE	WF, PBW, PER
8/28	CAPTURE + THIODAN	WF, PBW, PER

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WF-WHITEFLY
LY-LYGUS
PBW-PINK BOLLWORM
PER-COTTON LEAF PERFORATOR

TABLE 2. 1996 YUMA VALLEY AG CENTER COTTON VARIETY TRIAL
INSECT COUNTS

DATE	% PBW(BOLLS INFESTED)	LYGUS/100 SWEEPS
6/12	0	30
6/19	0	11
6/27	0	5
7/3	0	18
7/8	5	5
7/11	NOT COUNTED	12
7/17	25	34
7/24	35	10
8/2	55	NOT COUNTED
8/7	65	NOT COUNTED
8/20	65	NOT COUNTED
8/30	95	NOT COUNTED

**TABLE 3. 1996 YUMA VALLEY AG CENTER COTTON VARIETY TRIAL
PLANT POPULATION DATA**

VARIETY	# of plants in 12' 5" of 42" row (1/1000 acre)				
	REP1	REP2	REP3	TOTAL	AVE.
DPL33B	34	55	33	122	41
SG125	33	31	34	98	33
ST474	37	34	33	104	35
HS46	37	30	36	103	34
PAYM.H1560	30	40	30	100	33
DPL5415	42	29	21	91	30
PAYM.1220BG	26	39	31	96	32
HS44	30	44	31	106	35
ST887	26	41	30	97	32
SG501	44	34	40	118	39

TABLE 4. 1996 YUMA VALLEY AG CENTER COTTON VARIETY TRIAL
 % OPEN BOLLS PBW DAMAGED ON OCT.4
 (10 PLANTS EXAMINED/REP)

VARIETY	% DAMAGE			AVERAGE <u>1/</u>
	REP1	REP 2	REP 3	
DPL33B	4	2	11	3A
PAYM.1220BG	38	32	48	39 B
DPL5415	41	74	50	55 B
PAYM.H1560	52	59	60	57 B

1/ NUMBERS FOLLOWED BY THE SAME LETTER ARE NOT
 SIGNIFICANTLY DIFFERENT AT THE 5% LEVEL

TABLE 5. 1996 YUMA VALLEY AG CENTER COTTON VARIETY TRIAL PBW LARVAE INFESTATION GREEN BOLLS ON OCT. 4

NUMBER BOLLS	COTTON VARIETY	# INFESTED BOLLS		DAMAGE NO WORM
		DEAD	LIVE	
100	DPL 33B	100	0	0
100	PAYM. 1220BG	11	84	5
100	DPL 5415	4	93	1
100	PAYM. H1560	0	97	3

**TABLE 6. 1996 VALLEY AG CENTER COTTON
VARIETY TRIAL LINT YIELDS**

	YIELD POUNDS	
VARIETY	LINT/ACRE	
DPL 33B	1615	a*
STONEVILLE474	1511	ab
PAYMASTER 1220BG	1480	ab
SURE GROW 125	1375	b
SURE GROW 501	1212	c
PAMASTER H1560	1163	cd
HYPERFORMER 44	1157	cd
DPL 5415	1028	d
STONEVILLE887	1009	d
HYPERFORMER 46	772	e

**Means followed by the same letter are not significantly different according to a Duncan's Multiple Range Test*