AgriLIFE EXTENSION
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Boll Damage Survey of Bt and Non-Bt Cotton Varieties in the South Plains Region of Texas 2007-10

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South Plains

Summary:

Late-season boll damage surveys were conducted in 2007, 2008 and 2009 to evaluate the amount of Lepidoptera induced damage in Bt cotton varieties relative to non-Bt cotton varieties. Additional, data was collected on the number of insecticide applications required for these varieties to manage lepiopterous pests, and the number of bolls damaged by sucking pests in 2009. Boll damage was light in 2007; however, more damaged bolls where found in the non-Bt fields (3.11%) than in the Bollgard (0.52%) and Bollgard II (0.25%) fields, but did not differ from the Widestrike fields (1.29%). Very few insecticide applications were made targeting bollworm in any of the 2007 survey fields and there were no significant differences among variety types. None of the Bt cotton fields were treated for bollworms, whereas 9% on the non-Bt field received a single insecticide application. Late season bollworm damage in 2008 was similar to 2007. All of the Bt cotton variety types had significantly fewer damaged bolls than the non-Bt varieties and none of the Bt varieties required insecticide applications for lepidopterous pests, but unlike 2007, more non-Bt cotton was treated for bollworm and/or beet armyworms in 2008 (41% of the fields received a single insecticide application). In 2009, none of the surveyed fields were treated for lepidopterous pests. Worm damaged bolls were 2.83, 0.13 and 0.40% in non-Bt, Bollgard II and Widestrike varieties respectively. There were no differences among the variety types in sucking bug damaged which averaged 1.96% across all varieties. In 2010, 3.08% of bolls in the non-Bt fields were damaged, and 0.45 insecticide

applications were required per field on average. Damage did not exceed 0.27% in Bt cotton, and no Bt cotton field required treatment for lepidoterous pests. There were no differences among variety types regarding Lygus or stinkbug damaged bolls, which slight over 1% per field.

Objective:

The objective of this study was to compare the qualitative value of Bollgard II, Widestrike and Bollgard insect control traits in grower fields relative to each other and to non-Bt cotton varieties.

Materials and Methods:

In 2007, 2008, 2009 and 2010, boll damage surveys were conducted to quantify bollworm damage in late season Bt and non-Bt cotton varieties. Although the source of the damage is not certain, most of it is suspected to have come from cotton bollworms although beet armyworms were present in some fields in 2008, and fall armyworms were present in 2009 and 2010. Two of the non-Bt were treated for a mixed population of bollworms and beet armyworms in Bailey County in 2008, and non-Bt field in Gaines County in 2009 and 2010 contained about 20% fall armyworms and 80% bollworms. Fall armyworms were also present in Bailey County and Hale County experienced isolated beet armyworms problems. Additionally, cotton square borers were common throughout the southwestern and western areas of the South Plains in 2010. The survey was conducted late season because Bt levels in mature/senescent cotton tends to deteriorate relative to rapidly growing plants. Thus, late season would represent the time period when Bt levels would be less intensely expressed and damage would be more likely to occur.

Grower fields of non-Bt, Bollgard, Bollgard II and Widestrike cotton were sampled throughout the South Plains region of Texas (Table 1). Samples were taken after the last possible insecticide applications and before approximately 20% of the boll were open. Three distinct areas were sampled within each field, and 100 consecutive harvestable bolls were sampled from each location. Each field by variety type served as a replicate. Bolls were considered damaged if the carpal was breached through to the lint. The insecticide history in regard to insecticides targeting bollworms was recorded. In addition to bollworm damage, external Lygus and/or stinkbug damage to bolls was sampled for in most fields in 2009 and within 14 fields in 2010.

All data were analyzed using PROC MIXED and the means were separated using an F protected LSD ($P \leq 0.10$).

Results and Discussion:

In 2007, damage was very light across all of the field types. However, more damaged bolls where found in the non-Bt fields (3.11%) than in the Bollgard (0.52%) and Bollgard II (0.25%) fields, but did not differ from the Widestrike fields (1.29%) (Table 2). Damage in the Widestrike fields did not differ from the Bollgard and Bollgard II fields. The fact that Widestrike did not differ from the non-Bt fields does not appear to indicate a lack of efficacy, but probably indicates a lack of area wide bollworm pressure. Very few insecticide applications were made targeting bollworm

in any of the 2007 survey fields and there were no significant differences among variety types. None of the Bt cotton fields were treated for bollworms, whereas 9% on the non-Bt field received a single insecticide application.

Late season bollworm damage in 2008 was similar to 2007. All of the Bt cotton variety types had significantly fewer damaged bolls than the non-Bt varieties (Table 3). There were no differences in boll damage among the Bt types. Similar to 2007, none of the Bt varieties required insecticide applications for bollworms, but unlike 2007, more non-Bt cotton was treated for bollworms and/or beet armyworms in 2008 (41% of the fields received a single insecticide application).

Bollworm populations were exceptionally light during 2009 with the exception of Gaines County. Both Bollgard II and Widestrike varieties suffered very low damage to boll feeding lepidopterous pest in 2009 and had significantly fewer damaged bolls than the non-Bt varieties (no Bollgard fields were sampled in 2009) (Table 4). There were no differences in damaged bolls between the Bt types, and there were no differences among any of the varietal types in sucking bug damage. None of the fields sampled in the 2009 survey were treated for lepipoterous pests. Much of the South Plains had significant acreage of late-planted grain sorghum and corn, and these crops tended to act as trap crops, essentially preferentially attracting bollworms and fall armyworms away for the cotton.

In 2010, bollworm populations were moderate to high in portions of Gaines, Terry, Hockley, and Lubbock counties, and occurred late in the season in areas north of Lubbock. Dawson County reported no damage from bollworms or armyworms. Boll damage in 2010 was greatest in the non-Bt varieties, and the Bollgard II and Widestrike varieties did not differ from one another (Table 5). As in previous years, damage was numerically higher in the Widestrike varieties than the Bollgard II, suggesting a slight trend in lesser efficacy. However, no Bt cotton field, Widestrike or Bollgard II, ever required treatment for ledipoterous pests, indicating that both Bt technologies provide excellent control. The non-Bt varieties required 0.45 insecticide applications per field for lepidopterous pests.

Based on these data, Bt cotton appears to continue to be highly effective in preventing boll damage by lepidopterous pests in the South Plains region of Texas.

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Disclaimer Clause:

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Table 1. Number of fields sampled by county and Bt trait in 2007-10.

County	Non-Bt	Bollgard	Bollgard II	Widestrike
		Year 2007		
Bailey	0	3	1	0
Castro	4	0	3	0
Dawson	1	3	2	4
Floyd	3	0	4	0
Gaines	0	0	0	1
Hale	7	0	6	3
Hockley	3	2	2	2
Lubbock	1	5	2	1
Parmer	2	1	0	1
Terry	1	0	3	4
TOTAL	22	14	23	16
		Year 2008		
Bailey	5	0	5	0
Castro	6	0	6	1
Dawson	0	0	0	2
Gaines	4	0	3	10
Hale	3	0	2	1
Hockley	5	5	5	3
Lubbock	6	0	5	0
TOTAL	29	5	26	17
		Year 2009		
Bailey	1	0	1	0
Castro	1	0	2	1
Crosby	1	0	1	0
Dawson	0	0	1	1
Gaines	2	0	2	2
Hale	1	0	1	0
Hockley	1	0	1	0
Swisher	1	0	1	0
TOTAL	8	0	10	4
		Year 2010		
Bailey	2	0	2	2
Crosby	1	0	2	0
Dawson	3	0	3	3
Floyd	1	0	0	0
Gaines	2	0	2	2
Hale	3	0	3	1
Hockley	3	0	3	4
Lubbock	3	0	3	2
Terry	2	0	2	2
TOTAL	20	0	20	16

Table 2. Percentage of damaged bolls and insecticide applications for non-Bt and various Bt technology varieties grown in the South Plains of Texas, 2007.

Variety type	n[a]	% damaged bolls[b]	Mean no. sprays per site[c]
Non-Bt	22	3.11 a	0.09 a
Bollgard	14	0.52 b	0.00 a
Bollgard II	23	0.25 b	0.00 a
WideStrike	14	1.29 ab	0.00 a

Means in a column followed by the same letter are not significantly different based on an F protected Mixed Procedure LSD ($P \leq 0.10$).

[a]Number of fields sampled.

[b]Percentage of damaged bolls from three locations in each field, 100 bolls sampled per locations, 300 bolls per field.

[c]Mean number of insecticide applications targeting lepidopterous pests per site.

Table 3. Percentage of damaged bolls and insecticide applications for non-Bt and various Bt technology varieties grown in the South Plains of Texas, 2008.

Variety type	n[a]	% damaged bolls[b]	Mean no. sprays per site[c]
Non-Bt	29	3.16 a	0.41 a
Bollgard	5	0.53 b	0.00 b
Bollgard II	26	0.04 b	0.00 b
WideStrike	17	0.18 b	0.00 b

Means in a column followed by the same letter are not significantly different based on an F protected Mixed Procedure LSD ($P \leq 0.10$).

[a]Number of fields sampled.

[b]Percentage of damaged bolls from three locations in each field, 100 bolls sampled per locations, 300 bolls per field.

[c]Mean number of insecticide applications targeting lepidopterous pests per site.

Table 4. Percentage of damaged bolls and insecticide applications for non-Bt and various Bt technology varieties grown on the South Plains of Texas, 2009.

Variety type	n[a]	% worm damaged bolls[b]	% sucking bug damaged bolls[b]	Mean no. sprays per site[c]
Non-Bt	8	2.83 a	3.83 a	0.00 a
Bollgard II	10	0.13 b	2.06 a	0.00 a
WideStrike	4	0.40 b	0.00 a	0.00 a

Means in a column followed by the same letter are not significantly different based on an F protected Mixed Procedure LSD ($P \leq 0.10$).
[a]Number of fields sampled.
[b]Percentage of worm or sucking bug damaged bolls from three locations in each field, 100 bolls sampled per locations, 300 bolls per field.
[c]Mean number of insecticide applications targeting lepidopterous pests per site.

Table 5. Percentage of damaged bolls and insecticide applications for non-Bt and various Bt technology varieties grown on the South Plains of Texas, 2010.

Variety type	n[a]	% worm damaged bolls[b]	% sucking bug damaged bolls[b]	Mean no. sprays per site[c]
Non-Bt	20	3.08 a	1.87 a	0.45 a
Bollgard II	20	0.15 b	1.00 a	0.00 b
WideStrike	16	0.27 b	0.58 a	0.00 b

Means in a column followed by the same letter are not significantly different based on an F protected Mixed Procedure LSD ($P \leq 0.10$).
[a]Number of fields sampled.
[b]Percentage of worm or sucking bug damaged bolls from three locations in each field, 100 bolls sampled per locations, 300 bolls per field; only 14 fields sampled for bug damage.
[c]Mean number of insecticide applications targeting lepidopterous pests per site.