AgriLIFE EXTENSION
Texas A&M System

- 2010-

Results of Insect Control Evaluations on Corn, Sorghum, Cotton, Pecan & Pastures in Texas Coastal Bend Counties

TEXAS IPM
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TRIBUTE TO THE NATIONAL COTTON COUNCIL

Oscar G. Johnston known as "Mr. U. S. Cotton" was called on by leaders in the cotton industry in 1937 to bring to life what would become the National Cotton Council of America. He believed that people must be brought together to promote cotton and that it would require support from all industry segments. He drafted a proposal for creation of the "Council" to be representative of all segments (originally five: producers, ginners, warehousemen, merchants, and cottonseed crushers). On November 21, 1938 at the Peabody Hotel in Memphis, Tennessee Johnston stood before a cotton audience: "Is there any reason why representatives of each of the five interests should not come together, perfect and organization, and fight for the advancement of the industry?" The NCC began operations in February 1939. It was the first industry-wide, commodity-specific organization in the history of American agriculture.

The NCC sponsored the first Beltwide Cotton Mechanization Conference in 1947 at the Delta Branch Experiment Station in Stoneville, Mississippi. That same year the first Cotton Insect Control Conference convened in Columbia, South Carolina. These meetings led to all seven industry segments meeting each year for the Beltwide Cotton Conferences. The Conferences evolved into the global champion for accelerating technology transfer to cotton producers and processors. The Council was also responsible for establishing Cotton Incorporated out of the Cotton Producers Institute. It also spun off Cotton Council International.

The council championed funding for integrated pest management research and programs to eradicate boll weevil and pink bollworm. In 1958 at the annual meeting of the NCC a resolution passed that had been drafted by South Carolina grower Robert Coker to find the funds to eliminate the boll weevil as a threat to U. S. cotton "at the earliest possible time." To that end the USDA-ARS Boll Weevil Research Laboratory was established at Mississippi State University in Starkville in 1962. The NCC has been very active in the program for many years as can be seen from their website www.cotton.org.

Today, the NCC has taken the lead in keeping U. S. cotton strong in domestic and international markets. This has been accomplished through programs developed and approved by delegates representing the cotton industry's seven segments. Areas of work include farm policy, trade, environmental issues, international market development, research, cotton flow, and public relations. Texas Gulf Coast leadership to NCC currently includes Sid Brough, Jimmy Dodson, Craig Shook, Cliett Lowman, Jeff Nunley, David Fields, Toby Robinson, Jon Whatley, David Wyatt, Mike Polk, and Lee Tiller.

A highlight of my career in cotton entomology has been participation in the Beltwide Cotton Conferences and other activities of the NCC. It has been a rewarding experience to see the cotton industry working to solve problems and promote cotton.

FOREWORD

This document contains reports of applied research/demonstration projects conducted by Texas AgriLife Extension Service dealing with management of arthropod pests and production practices. Objectives of the studies were to find cost effective ways to manage pests and to improve production. Experiments were conducted with commercial agricultural producers in cooperation with county Extension agents, county row crop committees, agricultural consultants, and agribusiness companies. Coastal Bend farm cooperators are acknowledged for providing land, equipment, labor, time, ideas, and other assistance in support of these projects.

Trade names of commercial products used in this report are included only for better understanding and clarity. Reference to commercial products or trade names is made with the understanding that no discrimination is intended and no endorsement by the Texas A&M University System is implied. Results from one experiment may not represent conclusive evidence that the same response would occur where conditions vary.

A few reports contain calculations of added return over treatment costs based on numerical differences in yield. It must be kept in mind that the returns attributed to treatment are not absolute, i.e. the yield differences may have been the result of other variables not associated with the treatment. The reader should always consider the statistical analysis and data from multiple tests over space and time in making judgments concerning economic returns.

This report and others are available for previous years at the following web site http://agfacts.tamu.edu/~rparker. If you have comments or questions about the reports contained herein, contact:

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COMPARISON OF PONCHO AND CRUISER RATES ON CORN SEED FOR CONTROL OF CHINCH BUG

Rancho Grande Farms, Wharton County, 2010

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SUMMARY: All insecticide treatments and rates significantly reduced chinch bug numbers at 34 and 40 days after planting (DAP) compared to the nontreated corn. When comparing the two insecticides rate-for-rate, we found at 34 DAP that Poncho had significantly fewer chinch bugs than Cruiser at the 0.25 mg ai/seed rate. There were no differences statistically in rate-for-rate comparison at 0.50 and 1.25 mg ai/seed at 34 DAP, but in each case Poncho treated corn had fewer chinch bugs than did Cruiser. At 34 DAP only two treatments (Cruiser 0.25 and 0.50 mg ai/seed) and the nontreated plots exceeded the established foliar treatment threshold of 40 bugs/100 plants for 6-inch or less tall corn. However, it should be noted that corn plants were already 12 inches tall by this time. Similar results in rate-for-rate comparisons were maintained through 40 DAP, except by that time one rate of Poncho (0.25 mg ai/seed) and two rates of Cruiser (0.25 and 0.50 mg ai/seed) exceeded 40 bugs/100 plants, but again, note that plants far exceeded the 6-inch tall cutoff on which this economic treatment threshold is based.

No differences were found in harvested ears/plot, shelled corn/ear, bushel weight, grain moisture at harvest, or yield. Yield ranged numerically from a low of 130.6 bu/acre for the Cruiser 0.50 mg ai/seed treatment to a high of 147.2 bu/acre in the Cruiser 0.25 mg ai/seed treatment. It seems obvious that chinch bugs were not present early enough under the favorable moisture conditions to adversely affect production factors. Therefore, we were unable to establish the most cost effective rates under conditions of the test.

OBJECTIVES: The seed treatments were evaluated to measure the effectiveness of various rates of tested products on soil dwelling insect pests and to determine the most cost effective rates.

MATERIALS/METHODS: BH 8881RR hybrid corn seed was obtained from B&H Genetics Company and treated by mixing appropriate rates of seed treatments with the planting seed in a small concrete mixer. Seed was then packaged for planting in 6-row by 34-foot plots with a 2-row John Deere model 7100 planter equipped with cone planter devices to deliver seed in each plot at a rate of 22,000 kernels/acre on rows with 40-inch centers. The test was planted March 11, 2010 on Rancho Grande Farms, 3.2 miles north of HWY 59 on FM 961 in Wharton County. Treatments were arranged in a randomized complete block design with 4 replications. Buffer plots were planted on each end of the test. All data were obtained from the center 2 rows of plots. Grower applied fertilizer consisted of 540 lb/acre 25-5-0 with 2 S and 10 lb zinc/acre. Herbicide consisted of grower applied Atrazine 4L (1.0 qt/acre), and we added herbicide at-planting consisting of Dual II Magnum (1.3 pints/acre) + Roundup Weather Max (28 oz/acre). Later, glyphosate was applied by the grower, and we spot treated a few areas of weeds with the same product with a backpack sprayer two weeks later. The soil temperature at planting was

58°F, and moisture content was excellent with dry soil surface which made it difficult to plant seed at even depth. The clay loam soil (43% sand, 24% silt, 33% clay) with 7.3 pH contained 2.22% organic matter.

Treatments were assessed by (1) counting the number of emerged corn plants on 13.1 ft row on each of the center rows in each plot on 3/29, (2) counting the number of chinch bugs on 20 plants/plot on 4/15 [34 DAP] and 4/21 [40 DAP], (3) harvesting by hand and counting the ears from 0.001 acres (13.1 ft.) on each of the center 2 rows in plots on 7/27, (4) shelling harvested ears with an Almaco research machine, and (5) measuring bushel weight and grain moisture of harvested corn. Yield weights were converted to the standard 15% moisture level.

The software program Agriculture Research Manager (ARM revision 6.1.13) was used to conduct analysis of variance of the data. Means were separated using LSD.

RESULTS/DISCUSSION: No differences were found in plant stand, but major statistical differences were found in chinch bug numbers (Table 1). Insecticides reduced chinch bug numbers on both inspection dates compared with the number found in nontreated corn, and there were significantly fewer chinch bugs between the low and high rates for both seed treatments on both inspection dates except for the 34 DAP counts made in Poncho treated corn. Numerically, the higher the seed treatment rate, the fewer chinch bug numbers encountered. When comparing the insecticides rate-for-rate, Poncho had significantly fewer chinch bugs than Cruiser at the 0.25 mg ai/seed rate at 34 and 40 DAP. At 34 DAP only Cruiser (0.25 and 0.50 mg ai/acre) and nontreated corn exceeded 40 bugs/100 plants which we use as the economic treatment threshold to recommend foliar treatment for 6-inch or less tall corn (plants by that time, however, exceeded the 6-inch tall stage). By 40 DAP one other treatment (Poncho 0.25 mg ai/acre) exceeded the treatment threshold of 40 bugs/100 plants. It appears that Cruiser was not as effective as Poncho in controlling chinch bug under conditions of the study with significant differences at the low seed treatment rate and numerically at the two higher rates tested.

Statistical differences were not found in the number of harvested ears, grain/ear weight, bushel weight, grain moisture at harvest, or yield (Table 2). The chinch bugs did not reach high enough numbers in the test site early when corn plants were small and most susceptible to damage. Moisture stress was not evident during the season as supplemental irrigation and rainfall created very good growing conditions. The primary objective of the test to determine cost effective treatment rates for chinch bugs was not accomplished as they did not affect yield level.

ACKNOWLEDGEMENTS: Special thanks are extended to B&H Genetics for obtaining nontreated seed for use in conducting this experiment. Wayne Waters is acknowledged for providing the site for testing and his support during conduct of the study. Rudy Alaniz and Clint Livingston, Demonstration Assistants, are thanked for their assistance with planting, harvest, and processing of samples.

Table 1. Comparison of Poncho and Cruiser insecticide seed treatment rates on corn for control of Chinch bug, Rancho Grande Farms, Wharton County, TX, 2010.

Seed treatment	Rate mg ai/seed	Plants 1000's/acre	Chinch bugs/100 plants		
			34 DAP[2/]	40 DAP	Average
Poncho	0.25	21.9[a]	18.8[cd]	46.3[c]	32.5[cd]
	0.50	22.1[a]	13.8[cd]	15.0[cd]	14.4[d]
	1.25	23.5[a]	3.8[d]	2.5[d]	3.1[d]
Cruiser	0.25	24.4[a]	76.3[b]	87.5[b]	81.9[b]
	0.50	21.9[a]	61.3[bc]	45.0[c]	53.1[bc]
	1.25	23.4[a]	16.3[cd]	30.0[cd]	23.1[cd]
Nontreated		22.8[a]	160.0[a]	132.5[a]	146.3[a]
LSD (P = 0.05)		NS[1/]	50.39	32.87	32.28
P > F		.1050	.0001	.0001	.0001

Means in a column followed by the same letter are not significantly different by ANOVA.

[1/]NS= Not Significant

[2/]DAP = Days After Planting

Table 2. Corn production following use of Poncho and Cruiser insecticide seed treatments, Rancho Grande Farms, Wharton County, TX 2010.

Seed treatment	Rate mg ai/seed	Harvested ears #/plot[1/]	Shelled corn grams/ear	Bushel weight	% grain moisture	Yield bu/acre[3/]
Poncho	0.25	45.3[a]	149.6[a]	56.3[a]	15.3[a]	132.6[a]
	0.50	47.0[a]	145.7[a]	56.3[a]	15.4[a]	133.8[a]
	1.25	47.8[a]	148.4[a]	56.1[a]	15.2[a]	139.0[a]
Cruiser	0.25	49.3[a]	152.6[a]	56.5[a]	15.3[a]	147.2[a]
	0.50	44.3[a]	149.9[a]	56.5[a]	15.1[a]	130.6[a]
	1.25	50.3[a]	143.4[a]	56.4[a]	15.2[a]	141.4[a]
Nontreated		46.8[a]	153.5[a]	56.1[a]	15.1[a]	140.9[a]
LSD (P = 0.05)		NS[2/]	NS	NS	NS	NS
P > F		.2901	.3592	.8871	.9203	.3861

Means in a column followed by the same letter are not significantly different by ANOVA.
[1/] Hand harvest of 0.002 acres from center two rows of each plot.
[2/] NS = Not Significant
[3/] Yield at 15% moisture

EVALUATON OF VARIOUS RATES OF CRUISER AND PONCHO ON CORN FOR CONTROL OF SOIL AND SEEDLING INSECTS

Lawrence Hinze Farm, Lavaca County, 2010

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SUMMARY: Insect pressure (chinch bug) was so low that full counts were not made in the test, and the objective of determining the cost effective rates for the two seed treatments could not be measured. The yield data supported the lack of insect damage as differences in production were not found.

OBJECTIVES: The field study was established to measure the effect of soil insect pests, especially chinch bug, on corn growth and yield.

MATERIALS/METHODS: B&H Genetics corn hybrid BH 8881RR (relative maturity 116-118 day) was treated with 3 rates of Cruiser and Poncho in a small concrete mixer. The test was planted on March 3, 2010 in 4-row plots of various lengths (704 to 931 feet) with a blackland type planter on 38-inch spaced rows, and treatments were replicated 4 times in a randomized complete block experimental design. The location was one mile east of Highway 95 along FM Road 1891 north of Shiner, Texas. Corn has been planted on the site for many years, but Mexican corn rootworm has not been a problem at the site. The planting rate was approximately 16,000 seed/acre. Soil moisture at planting was excellent. The sandy clay loam soil (53% sand, 20% silt, 27% clay) with a 7.5 pH contained 2.03% organic matter.

Fertilizer applied was 88-24-8-8S + 0.4 lb zinc. Herbicide included Atrazine 4L (1.0 pint/acre) in a 10-inch band followed later in the season with glyphosate.

Treatments were assessed by (1) counting plants on March 22 in the center 2 rows on 10-row feet at 2 locations on each end of plots approximately 25 yards from the field margin, (2) examining 20 plants in non-insecticide treated corn plots on several dates to determine if more extensive counts should be made, and (3) harvesting entire plots with a 4-row corn header and weighing the grain on a weigh wagon on 8/13. Grain moisture and bushel weights were determined for each plot, and yield data were converted to the weight at the 15% moisture standard. Data were analyzed by ANOVA using Agriculture Research Manager (ARM revision 6.1.13) software.

RESULTS/DISCUSSION: Several inspections were made to determine the presence of insect pests, especially chinch bug. Since very few were found in non-insecticide treated corn, more extensive counts were not made. Even so, we decided to obtain yield data (Table 1). No differences were found in plant population, bushel weight, corn moisture level at harvest, or yield. Numerically, yield levels ranged from a low of 80.5 to a high of 88.9 bushels/acre. The test objective of determining cost effective treatment rates for chinch bug was not achieved

ACKNOWLEDGMENTS: Thanks are extended to Mr. and Mrs. Hinze for their long-time support of field studies on corn. They provide time, equipment, and labor to each project and take great interest in the conduct of the studies. Special thanks are extended to David Little, B&H Genetics, for providing the weighing equipment and spending nearly and entire day assisting with corn harvest. B&H Genetics is also acknowledged for providing non-insecticide treated corn seed for our use, as non-insecticide treated corn seed has been difficult to obtain in recent years.

Table 1. Comparison of Poncho and Cruiser on corn for insect control, Lawrence Hinze Farm,Lavaca County, TX, 2010.

Seed treatment	Rate mg ai/seed	Plants 1000's/acre	Bushel weight	% moisture at harvest	Yield bu/acre
Poncho	0.25	15.6[a]	56.1[a]	11.2[a]	88.9[a]
	0.50	15.9[a]	55.9[a]	11.0[a]	88.7[a]
	1.25	15.4[a]	56.4[a]	11.0[a]	88.1[a]
Cruiser	0.25	15.8[a]	56.0[a]	11.1[a]	88.4[a]
	0.50	15.6[a]	55.9[a]	10.5[a]	87.1[a]
	1.25	14.3[a]	56.0[a]	10.8[a]	80.5[a]
Nontreated		16.0[a]	56.0[a]	11.3[a]	83.4[a]
LSD (P = 0.05)		NS[1/]	NS	NS	NS
P > F		.4639	.1634	.3727	.1209

Means in a column followed by the same letter are not significantly different by ANOVA.
[1/]NS= Not Significant

EFFECT OF CORN EARWORM ON CORN HYBRIDS OF DIFFERENT RELATIVE DAYS TO MATURITY PLANTED ON TWO DATES

Texas AgriLife Research and Extension Center, Nueces County, 2010

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SUMMARY: In general the two Bt-gene hybrids (VT3 Pro) provided greater protection from corn earworm in early and late plantings, but in many cases the single Bt-gene hybrids from Pioneer provided nearly as good control under the pest pressure encountered in the study. Corn earworm damage was judged to be moderately heavy, especially in the later planted corn, and greater differences were found in the late planted corn (3/23 versus 3/3). Whether the VT3 Pro provided a yield advantage over other hybrids was not always evident; more tests are needed to determine if caterpillar pressure (corn earworm and fall armyworm) can be reduced enough to warrant the extra cost of the two Bt–gene hybrids. VT3 Pro hybrids did not eliminate the caterpillar pests, but generally a reduction in larvae and damage to ears was observed. Aflatoxin accumulation was generally greater in the VT3 Pro hybrids compared with other tested hybrids.

OBJECTIVES: Corn was planted on early and late dates to compare the effect of the hybrids on ear feeding caterpillars (corn earworm and fall armyworm) and their damage. Other objectives included determination of yield and impact of hybrids on aflatoxin accumulation.

MATERIALS/METHODS: The two tests were planted side-by-side on the Meaney Annex of the Texas AgriLife Research and Extension Center at Corpus on March 3, 3010 (early) and March 23 (late) with a 4-row John Deere 6100 planter equipped with research seed dispensing cones to deliver seed to the 4-row by 35 foot plots with rows spaced on 38-inch centers. The seeding rate was 20,634/acre for the dryland production field. Treatments were arranged in a randomized complete block design with 4 replications of the treatments.

Hybrids containing VT3 Pro contain two genes (pyramid of toxins) for caterpillar control. Pioneer 33F87 HX1RRLL and Pioneer P1615 HR contain one gene toxin for caterpillar control. The non-Bt hybrids tested were near isolines (similar genetics) of the corresponding Bt hybrids.

Herbicide applied on the planting date consisted of Atrazine 4L (1.0 quart/acre) + Dual II Magnum (1.3 pints/acre) using 80003XR spray nozzles at a pressure of 30 psi with a sprayer speed of 4.0 mph and applying 20 gpa total volume. No fertilizer was applied since the ground was maintained clean in 2009 due to severe drought.

Treatments were assessed by (1) counting the number of corn plants on 13.75 feet of row on each of the two center rows of plots on 3/26 [early plant date] and on 4/9 [late plant date], (2) examining 10 ears from the outside row of plots for corn earworm and fall armyworm [corn earworms were divided into categories as small worms = up to 3/8-inch, medium worms = greater than 3/8 inch up to 1/2-inch, and large worms = greater than 1/2-inch in length] at brown silk stage on 5/19 for the early planting date and 6/1 for the late planting date, (3) harvesting and examining ears on 6/25 and 7/5 for various types of damage measurements for the early and late plantings, respectively, and (4) harvesting 13.75 feet of row from each of the center two rows in each plot by hand on 7/23 and 8/9 for the two planting dates respectively. The number of harvested ears, bushel weight, and grain moisture were determined. Harvested ear samples were threshed on a research laboratory machine, and corn weight was converted to 15% moisture.

Ears that were harvested about initial dry-down time were measured for number of caterpillar (nearly all corn earworm) damaged kernels, centimeters of damage down from the ear tips, and square centimeters of kernel damage.

Agriculture Research Manager (ARM revision 6.1.13) software was used to conduct analysis of variance, and means were separated by LSD.

RESULTS/DISCUSSION: Early planted test (3/3) – Corn ears were examined at brown-silk, and observed caterpillars were divided as to small, medium, and large size (Table 1). VT3 Pro hybrids generally contained fewer corn earworm larvae, and the ones that were found in these hybrids tended to be smaller size. Large larvae were more often found in DKC non-Bt hybrids, but there were no differences in the number of large larvae when comparing the VT3 Pro hybrids with the Pioneer hybrids. No large larvae were detected in VT3 Pro hybrids, but some large larvae were found on all the Pioneer hybrids. The VT3 Pro hybrids contain two genes for caterpillar control whereas the Bt Pioneer hybrids contained only one gene targeting caterpillars. Fall armyworm numbers were very low; no significant differences were observed.

Corn earworm damage assessment was made on ears about the time kernels began to dry (Table 2). No differences were found in the number of damaged kernel on ears, but numerically, fewer were counted on VT3 Pro ears. Centimeters of ear tip damage were significantly lower in VT3 Pro hybrids except that statistically there were no differences in the VT3 Pro and the two 116 day relative maturity Pioneer hybrids. Square centimeters damage on ears was generally lower (but not always statistically significant) in the VT3 Pro hybrids. These data showed generally less kernel feeding damage in the VT3 Pro hybrids, but that damage was generally not excessive even in the non-Bt hybrids especially in the two 116 day Pioneer hybrids.

Aflatoxin accumulation in the early planted corn test was significantly greater in DKC 66-96 VT3 Pro hybrid (116 day maturity), and except for the DKC 66-94 R hybrid, it was also higher in the DKC 61-35 VT3 Pro hybrid (111 day hybrids) (Table 2). Reason for the higher aflatoxin levels in the two VT3 Pro hybrids are not known; kernel integrity measurements were not taken to see if there were any issues which may have led to kernel surface splitting etc.

Production factors measured included plant stand, number of harvested ears, bushel weight, grain moisture, and yield. No statistical differences were found in any of these production parameters (Table 3).

Late planted test (3/23) – Generally, data collected in the late planted experiment were similar to that found in the earlier planting for corn earworm, and even though higher numbers of fall armyworm were detected in more plots, significant differences were not measured for that insect

(Table 4). No large corn earworm larvae were found in VT3 Pro hybrids, but in this test few large corn earworm larvae were found in any of the Bt hybrids. Significantly more large corn earworms were counted in the non-Bt hybrids. For total earworm larvae, one of the VT3 Pro hybrids contained significantly fewer than all other hybrids except for the other VT3 Pro hybrid tested.

Significant differences were detected in all ear measurements (Table 5). Although not always significantly different from other test hybrids, particularly the single gene Bt hybrids, the two VT3 Pro hybrids contained fewer damaged kernels, had the least depth of ear tip damage, and the least number of ears with tip damage. Square centimeter damage was lowest in the two VT3 Pro hybrids and the single Bt-gene Pioneer P16155 HR hybrid.

Just as in the early planted test reported herein, and in spite of less insect damage in the VT3 Pro hybrids, aflatoxin accumulation was significantly greater in these hybrids in the late planted study (Table 5). Reasons for higher aflatoxin in these hybrids are not known. Again, it may be due to an issue with kernel integrity, but we did not evaluate corn for that characteristic.

Differences were not found in plant stand or the number of ears harvested among the treatments (Table 6), but bushel weights, moisture levels of harvested grain, and yield contained significant differences among the tested hybrids. Readily apparent reasons for differences in bushel weight and moisture level due to insect attack were not identified. Generally higher yields were found in the Bt hybrids tested whether they had one or two genes for caterpillars. When near isogenic corn hybrids were compared, the non-Bt hybrid yields were always less and ranged from a 3.9 bu/acre less (Pioneer P33F85 RR versus Pioneer P33F87 HX1RRLL) up to a 16.3 bu/acre less (DKC 61-36 R versus DKC 61-35 VT3 Pro). However, across all hybrids it was not always evident that the VT3 Pro hybrids yielded any more than even some non-Bt hybrids under moderately high numbers of corn earworm. Higher corn earworm damage has been observed in some years in the Coastal Bend region of Texas, and under that situation, the more advanced hybrids might have resulted in greater differences, but that advantage has yet to be proved.

ACKNOWLEDGEMENTS: Atila Deak, Monsanto Company, is acknowledged for his assistance and monetary support of the field studies. Rudy Alaniz and Clint Livingston, Demonstration Assistants, are thanked for their work in conducting the study.

Table 1. Corn earworm and fall armyworm on ears at brown silk in **early planted** corn, Texas AgriLife Research and Extension Center, Nueces County, TX, 2010.

Hybrid	Relative days to maturity	Number corn earworm /10 ears small	medium	large	total	Fall armyworm #/10 ears
DKC 61-36 R (non-Bt)	111	4.8[bc]	10.0[a]	5.3[a]	20.0[a]	0.0[a]
DK 61-35 VT3 Pro	111	1.3[c]	0.0[d]	0.0[b]	1.3[e]	0.0[a]
Pioneer P33F85 R (non-Bt)	114	8.0[ab]	5.0[b]	2.0[b]	15.0[b]	0.0[a]
Pioneer P33F87 HX1RRLL	114	11.8 [a]	3.0[bc]	0.3[b]	15.0[b]	0.0[a]
DKC 66-94 R (non-Bt)	116	7.8[ab]	9.0[a]	6.5[a]	23.3[a]	0.3[a]
DKC 66-96 VT3 Pro	116	2.5[c]	0.3[d]	0.0[b]	2.8[de]	0.0[a]
Pioneer P1615 R (non-Bt)	116	9.3[ab]	1.3[cd]	0.3[b]	10.8[bc]	0.0[a]
Pioneer P1615 HR	116	4.8[bc]	1.8[cd]	0.5[b]	7.0[cd]	0.3[a]
LSD (P = 0.05)		4.54	2.56	2.06	4.87	NS[1/]
P > F		.0013	.0001	.0001	.0001	.5828

Means in a column followed by the same letter are not significantly different by ANOVA.
[1/]NS = Not Significant

Table 2. Corn earworm damage to ears and aflatoxin accumulation in **early planted** corn, Texas AgriLife Research and Extension Center, Nueces County, TX, 2010.

Hybrid	Relative days to maturity	# da. kernels/ear	Max da. cm/ear tip	Ear da. sq cm/ear	% ears with tip da.	Aflatoxin ppb
DKC 61-36 R (non Bt)	111	20.6[a]	3.5[a]	5.6[a]	100[a]	12.3[c]
DK 61-35 VT3 Pro	111	13.3[a]	2.1[c]	2.9[bc]	82.5[a]	347.5[b]
Pioneer P33F85 R (non Bt)	114	16.1[a]	2.8[ab]	3.7[bc]	97.5[a]	96.2[c]
Pioneer P33F87 HX1RRLL	114	16.8[a]	3.1[a]	4.0[b]	100.0[a]	22.5[c]
DKC 66-94 R (non Bt)	116	16.1[a]	3.1[ab]	4.0[b]	97.5[a]	136.8[bc]
DKC 66-96 VT3 Pro	116	9.9[a]	1.8[c]	2.5[c]	92.5[a]	910.0[a]
Pioneer P1615 R (non Bt)	116	14.4[a]	2.4[bc]	3.1[bc]	90.0[a]	60.8[c]
Pioneer P1615 HR	116	14.3[a]	2.4[bc]	3.1[bc]	90.0[a]	72.0[c]
LSD (P = 0.05)		NS[1/]	0.70	1.35	NS	217.25
P > F		.0669	.0007	.0045	.0938	.0001

Means in a column followed by the same letter are not significantly different by ANOVA.
[1/]NS = Not Significant

Table 3. Plant population and production factors in **early planted** corn evaluated for caterpillar control, Texas AgriLife Research and Extension Center, Nueces County, TX, 2010.

Hybrid	Relative days to maturity	Plants 1000's/acre	Ears harvested 1000's/acre	Bushel weight	Moisture %	Yield bu/acre[2/]
DKC 61-36 R (non-Bt)	111	20.3[a]	20.4[a]	56.9[a]	14.0[a]	107.3[a]
DK 61-35 VT3 Pro	111	19.9[a]	20.0[a]	56.3[a]	13.7[a]	113.9[a]
Pioneer P33F85 R (non-Bt)	114	19.8[a]	19.5[a]	57.3[a]	14.1[a]	114.2[a]
Pioneer P33F87 HX1RRLL	114	20.1[a]	19.6[a]	56.1[a]	13.8[a]	111.2[a]
DKC 66-94 R (non-Bt)	116	16.3[a]	20.9[a]	57.9[a]	14.1[a]	110.5[a]
DKC 66-96 VT3 Pro	116	21.3[a]	20.4[a]	57.5[a]	13.9[a]	110.6[a]
Pioneer P1615 R (non-Bt)	116	20.0[a]	19.9[a]	57.4[a]	13.8[a]	107.3[a]
Pioneer P1615 HR	116	20.3[a]	20.3[a]	58.1[a]	14.0[a]	113.5[a]
LSD (P = 0.05)		NS[1/]	NS	NS	NS	NS
P > F		.2893	.9847	.1418	.7281	.9022

Means in a column followed by the same letter are not significantly different by ANOVA.
[1/]NS = Not Significant
[2/]Yield at 15% moisture corn

Table 4. Corn earworm and fall armyworm on ears at brown silk in **late planted** corn, Texas AgriLife Research and Extension Center, Nueces County, TX, 2010.

Hybrid	Relative days to maturity	Number corn earworm /10 ears				Fall armyworm #/10 ears
		small	medium	large	Total	
DKC 61-36 R (non-Bt)	111	1.8[d]	5.0[b]	5.5[b]	12.3[b]	1.8[a]
DK 61-35 VT3 Pro	111	2.3[cd]	0.0[d]	0.0[d]	2.3[d]	1.0[a]
Pioneer 33F85 R (non-Bt)	114	2.3[cd]	8.3[a]	3.5[c]	14.0[b]	0.8[a]
Pioneer 33F87 HX1RRLL	114	9.3[a]	3.8[bc]	1.3[d]	14.3[b]	3.0[a]
DKC 66-94 R (non-Bt)	116	3.0[cd]	6.0[ab]	9.3[a]	18.3[a]	3.8[a]
DKC 66-96 VT3 Pro	116	3.8[cd]	0.5[d]	0.0[d]	4.3[cd]	0.5[a]
Pioneer P1615 R (non-Bt)	116	4.8[bc]	2.0[cd]	0.3[d]	7.0[c]	1.8[a]
Pioneer P1615 HR	116	6.5[b]	0.3[d]	0.0[d]	6.8[c]	1.5[a]
LSD (P = 0.05)		2.61	2.64	1.80	3.56	NS[1/]
P > F		.0001	.0001	.0001	.0001	.6326

Means in a column followed by the same letter are not significantly different by ANOVA.
[1/]NS = Not Significant

Table 5. Corn earworm damage to ears and aflatoxin accumulation in **late planted** corn, Texas AgriLife Research and Extension Center, Nueces County, TX, 2010.

Hybrid	Relative days to maturity	# da. kernels/ear	Max da. cm/ear tip	Ear da. sq cm/ear	% ears with tip da.[1/]	Aflatoxin ppb
DKC 61-36 R (non-Bt)	111	26.3[a]	4.8[a]	9.1[a]	97.5[a]	16.3[b]
DK 61-35 VT3 Pro	111	11.7[c]	2.0[d]	3.0[d]	30.0[d]	113.3[b]
Pioneer P33F85 R (non-Bt)	114	19.3[b]	3.8[b]	5.8[bc]	97.5[a]	22.2[b]
Pioneer P33F87 HX1RRLL	114	21.6[ab]	3.8[b]	7.3[b]	90.0[ab]	7.1[b]
DKC 66-94 R (non-Bt)	116	16.3[bc]	4.2[ab]	7.2[b]	100.0[a]	73.8[b]
DKC 66-96 VT3 Pro	116	11.3[c]	2.8[c]	4.5[cd]	40.0[d]	383.5[a]
Pioneer P1615 R (non-Bt)	116	20.6[ab]	3.8[b]	5.3[c]	75.0[bc]	75.0[b]
Pioneer P1615 HR	116	15.8[bc]	2.9[c]	3.4[d]	62.5[c]	99.3[b]
LSD (P = 0.05)		6.94	0.78	1.77	17.99	193.7
P > F		.0026	.0001	.0001	.0001	.0136

Means in a column followed by the same letter are not significantly different by ANOVA.
[1/]Early damage observed during caterpillar counts.

Table 6. Plant population and production factors in **late planted** corn evaluated for caterpillar control, Texas AgriLife Research and Extension Center, Nueces County, TX, 2010.

Hybrid	Relative days to maturity	Plants 1000's/acre	Ears harvested 1000's/acre	Bushel weight	Moisture %	Yield bu/acre[2/]
DKC 61-36 R (non-Bt)	111	19.4[a]	20.1[a]	55.3[e]	13.8[c]	87.5[c]
DK 61-35 VT3 Pro	111	20.0[a]	21.3[a]	56.5[cd]	14.3[ab]	103.8[a]
Pioneer P33F85 R (non-Bt)	114	21.1[a]	20.9[a]	56.9[c]	14.4[ab]	97.0[ab]
Pioneer P33F87 HX1RRLL	114	19.6[a]	20.3[a]	55.9[de]	14.6[a]	100.9[a]
DKC 66-94 R (non-Bt)	116	19.6[a]	19.5[a]	57.3[bc]	14.1[bc]	90.6[bc]
DKC 66-96 VT3 Pro	116	18.1[a]	19.0[a]	57.0[c]	14.3[ab]	99.4[a]
Pioneer P1615 R (non-Bt)	116	19.8[a]	20.1[a]	58.0[b]	14.3[ab]	88.6[c]
Pioneer P16155 HR	116	18.5[a]	19.5[a]	59.0[a]	14.4[ab]	98.5[ab]
LSD (P = 0.05)		NS[1/]	NS	0.85	0.45	7.87
P > F		.6292	.7582	.0001	.0469	.0015

Means in a column followed by the same letter are not significantly different by ANOVA.
[1/]NS = Not Significant
[2/]Yield at 15% moisture corn

CORN EARWORM INFESTATION IN BT AND NON-BT CORN HYBRIDS

Texas AgriLife Research and Extension Center, Nueces County, 2010

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SUMMARY: Corn hybrids containing two Bt genes for caterpillar control were found to be more effective in reducing corn earworm ear damage than hybrids with single gene technology. In this test fewer corn earworm larvae were found in the two gene hybrid (VT3 Pro) compared with the non-Bt hybrids, but their numbers were not statistically different in the Pioneer Bt hybrid. Other than numerically, no differences were found in ear damage measurements or in production factors including yield among the tested hybrids.

OBJECTIVES: The field study was conducted to determine the effect of Bt corn hybrids on caterpillar pests (corn earworm) and their damage. Another objective was to measure production levels of the tested hybrids.

MATERIALS/METHODS: The corn test was planted March 4, 2010 on the Texas AgriLife Research and Extension Center at Corpus Christi with a 4-row John Deere model 6100 planter equipped with cone units to distribute seed in plots. The test was arranged in a randomized complete block design with 4 replications of each treatment in 4-row by 35 foot plots with the rows spaced on 38-inch centers. Corn was seeded at 20,634/acre. Atrazine 4L (1.0 quart/acre) + Dual II Magnum (1.3 pint/acre) was applied for weed control after planting.

Hybrids containing VT3 Pro contain two genes (pyramid of toxins) for caterpillar control. Pioneer 33F87 HX1RRLL and Pioneer P1615 HR contain one gene toxin for caterpillar control. The non-Bt hybrids tested were near isolines (similar genetics) of the corresponding Bt hybrids.

Treatments were assessed by (1) counting the number of corn plants on 13.75 feet of row on each of the center rows of plots on 3/26, (2) examining 10 ears from the outside rows of plots for corn earworm and fall armyworm [corn earworms were divided into size categories as small = up to 3/8-inch, medium = greater than 3/8-inch up to 1/2-inch, and large = greater than 1/2-inch in length] at the brown silk stage on 5/26, (3) examining 10 ears at initial dry-down stage taken from outside plot rows on 6/25 for damaged kernels and ear damage by corn earworm, and (4) harvesting for yield determination by hand 13.75 feet of row from each of the center two rows in plots on 7/24. Harvested ears were threshed on a laboratory machine; bushel weight and moisture levels were determined; and corn samples were adjusted for weight to the 15% moisture level.

Agriculture Research Manager (ARM revision 6.1.13) software was used to conduct analysis of variance, and means were separated by LSD.

RESULTS/DISCUSSION: Fewer corn earworm larvae were found in the VT3 Pro hybrid (two genes for caterpillars), and significantly fewer large larvae were found in this hybrid compared with the non-Bt hybrids in the test (Table 1). A statistical difference was not found in the VT3 Pro hybrid (two genes for caterpillars) and the Pioneer Bt hybrid (one gene for caterpillars) in corn earworm larval numbers. Ear measurements showed not differences in number of damaged kernels, centimeters ear tip damage, square centimeters of kernel damage, or percentage of ears with corn earworm damage (Table 2). However, for each of these measurements the VT3 Pro corn hybrid had numerically less damage. No statistical differences were found in aflatoxin accumulation among the three hybrids which ranged from 70.3 to 116.0 ppb. One hybrid, Pioneer 1615 R, measured only 1.0 ppb aflatoxin. The corn earworm damage was not great enough to affect yield (Table 3). Numerically, both Pioneer corn hybrids produced more corn than the DeKalb hybrids.

ACKNOWLEDGMENTS: Atila Deak, Monsanto Company, is acknowledged for his assistance. Rudy Alaniz and Clint Livingston, Demonstration Assistants, are thanked for their work in conducting the study.

Table 1. Corn earworm and fall armyworm on ears of corn, Texas AgriLife Research and Extension Center, Nueces County, TX, 2010.

	Number corn earworm /10 ears				
Hybrid	small	medium	large	Total	Fall armyworm #/10 ears
DKC 66-94 R (non-Bt)	0.0[a]	0.8[a]	9.5[a]	10.3[a]	0.0[a]
DKC 66-96 VT3 Pro	1.5[a]	3.0[a]	0.3[c]	4.8[b]	0.0[a]
Pioneer 1615 R (non-Bt)	0.5[a]	2.8[a]	4.0[b]	7.3[ab]	0.0[a]
Pioneer 1615 HR	2.3[a]	2.8[a]	1.5[bc]	6.5[b]	0.0[a]
LSD (P = 0.05)	NS[1/]	NS	3.25	3.54	NS
P > F	.1567	.2330	.0006	.0384	1.000

Means in a column followed by the same letter are not significantly different by ANOVA.
[1/]NS = Not Significant

Table 2. Corn earworm damage to ears and aflatoxin accumulation in corn hybrids, Texas AgriLife Research and Extension Center, Nueces County, TX, 2010.

Hybrid	# da. kernels/ear	Max da. cm/ear tip	Ear da. sq cm/ear	% ears with tip da.[1/]	Aflatoxin ppb
DKC 66-94 R (non-Bt)	8.2[a]	2.8[a]	3.0[a]	95.0[a]	70.3[a]
DKC 66-96 VT3 Pro	3.7[a]	1.4[a]	1.4[a]	67.5[a]	85.5[a]
Pioneer 1615 R (non-Bt)	6.1[a]	2.4[a]	2.2[a]	80.0[a]	1.0[a]
Pioneer 1615 HR	7.1[a]	2.1[a]	2.2[a]	70.0[a]	116.0[a]
LSD (P = 0.05)	NS[2/]	NS	NS	NS	NS
P > F	.3589	.1361	.3303	.1374	.5261

Means in a column followed by the same letter are not significantly different by ANOVA.
[1/]Damage observed during late season.
[2/]NS = Not Significant

Table 3. Plant population and production factors in corn hybrids evaluated for caterpillar control, Texas AgriLife Research and Extension Center, Nueces County, TX, 2010.

Hybrid	Plants 1000's/acre	Ears harvested 1000's/acre	Bushel weight	Moisture %	Yield bu/acre[2/]
DKC 66-94 R (non-Bt)	18.3[a]	18.9[a]	57.8[a]	16.2[a]	113.7[a]
DKC 66-96 VT3 Pro	17.6[a]	17.6[a]	58.1[a]	15.8[a]	114.7[a]
Pioneer 1615 R (non-Bt)	18.5[a]	19.4[a]	58.3[a]	16.0[a]	121.5[a]
Pioneer 1615 HR	19.9[a]	20.1[a]	58.8[a]	16.6[a]	127.8[a]
LSD (P = 0.05)	NS[1/]	NS	NS	NS	NS
P > F	.2870	.1511	.5030	.6630	.1040

Means in a column followed by the same letter are not significantly different by ANOVA.
[1/]NS = Not Significant
[2/]Yield at 15% moisture corn

CORN EARWORM DAMAGE IN BT AND NON-BT CORN HYBRIDS OF VARYING RELATIVE DAYS TO MATURITY

M Plus Land Company, Colorado County, 2010

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SUMMARY: The lowest number of corn earworm larvae and least amount of damage from that insect was found in the two VT3 Pro hybrids tested, but even the one gene corn hybrids from Pioneer generally had lower damage than non-Bt hybrids. However, yield increases were not found due to improved caterpillar control. Additional testing over time will be needed to determine what advantage, if any, will accrue from improved control of corn earworm and other caterpillar pests with the two gene VT3 Pro corn hybrids. Other factors which should be considered include hybrid adaption for the region in which grown and changes in susceptibility to aflatoxin development (whether more or less) compared with well adapted hybrids. No differences in aflatoxin accumulation were observed in this study.

OBJECTIVES: This field study was conducted to determine the level of corn earworm control in corn hybrids containing one gene (Herculex hybrids) or two genes (VT3 Pro hybrids). Another objective was to measure impact on yield among the hybrids.

MATERIALS/METHODS: Corn was planted on March 15, 2010 with a 2-row John Deere 7100 planter equipped with cone seed distributors in 4-row by 27-foot plots arranged in a randomized complete block design with 4 replications of the treatments. Original rows were spaced on 36-inch centers. Herbicide applied just after planting included Atrazine 4L (1 quart/acre) + Dual II Magnum (1.3 pint/acre). The producer later applied Glyphosate for emerged weeds. Fertilizer included pre-plant 85-50-0+23 S+0.5 gallons of 10% zinc. Fifty units of nitrogen were side-dressed as anhydrous ammonia.

Hybrids containing VT3 Pro contain two genes (pyramid of toxins) for caterpillar control. Pioneer 33F87 HX1RRLL and Pioneer P1615 HR contain one gene toxin for caterpillar control. The non-Bt hybrids tested were near isolines (similar genetics) of the corresponding Bt hybrids.

Treatments were assessed by (1) counting the number of plants on 13.75 feet in each of the two center rows on 4/8, (2) examining 10 ears from the outside rows in plots for corn earworm larvae at the brown silk stage [small = up to 3/8-inch, medium = larger than 3/8-inch up to 1/2-inch, large = greater than 1/2-inch] on 6/2, (3) harvesting 10 ears/plot on 6/28 to determine kernel damage and ear feeding by corn earworm, and (4) harvesting 13.75 feet row from one of the center rows in each plot on 7/29 to determine yield and other production factors. Corn samples were threshed on a research machine, moisture level was measured, and bushel weights were determined. Grain weight was corrected to that at 15% moisture.

Agriculture Research Manager (ARM revision 6.1.13) software was used to conduct analysis of variance. Means were separated by LSD.

RESULTS/DISCUSSION: Low numbers of corn earworm larvae were found at the brown silk stage in the VT3 Pro hybrids (two genes for caterpillars), and generally reduced numbers were observed in the Pioneer Herculex hybrids (one gene for caterpillars) (Table 1). Overall, corn earworm numbers were relatively low compared with other tests conducted in the region. The low level of corn earworm larvae was also reflected in the ear infestation rate. Examination of damage to ears showed significantly less damage to kernels and ear tips in the VT3 Pro hybrids compared to the other hybrids tested (Table 2). Aflatoxin accumulation was not different among the tested hybrids. Levels ranged from a low of 27.3 to a high of 111.3 ppb. No differences were observed in plant stand, number of harvested ears, grain moisture at harvest, or yield; but there were differences in bushel weight (Table 3). Pioneer P1615 HR hybrid had the highest bushel weight in this and the other 3 field studies conducted.

The reduced damage in the VT3 Pro hybrids in the study did not result in observed yield increase possibly due to the relative low infestation and damage caused by the corn earworm.

ACKNOWLEDGMENTS: Thanks are extended to M Plus Land Company for their support of the study. Monsanto Company is acknowledged for their support of this project. Rudy Alaniz and Clint Livingston, Demonstration Assistants, are thanked for planting, harvest, and processing corn samples from the test.

Table 1. Corn earworm number and size on corn ears at brown silk in various hybrids, M Plus Land Company, Colorado County, TX 2010.

Hybrid	Reltative days to maturity	Number corn earworm /10 ears				% CEW[2/] infested ears at brown silk
		small	medium	large	total	
DKC 61-36 R (non-Bt)	111	0.8[a]	1.0[bc]	3.8[a]	5.5[ab]	65.0[a]
DKC 61-35 VT3 Pro	111	0.0[a]	0.0[c]	0.0[a]	0.0[c]	0.0[c]
Pioneer 33F85 R (non-Bt)	114	1.3[a]	4.0[a]	1.5[a]	6.8[a]	47.5[ab]
Pioneer 33F87 HX1 RRLL	114	1.0[a]	0.3[c]	0.0[a]	1.3[c]	12.5[c]
DKC 66-94 R (non-Bt)	116	1.0[a]	2.3[b]	2.8[a]	6.0[ab]	55.0[ab]
DKC 66-96 VT3 Pro	116	0.3[a]	0.0[c]	0.3[a]	0.5[c]	2.5[c]
Pioneer P1615 R (non-Bt)	116	2.0[a]	0.8[bc]	0.0[a]	2.8[bc]	27.5[bc]
Pioneer P1615 HR	116	1.8[a]	0.3[c]	0.5[a]	2.5[bc]	25.0[bc]
LSD (P = 0.05)		NS[1/]	1.50	2.76	3.76	31.75
P > F		.1972	.0001	.0599	.0051	.0017

Means in a column followed by the same letter are not significantly different by ANOVA.
[1/]NS = Not Significant
[2/]CEW = Corn earworm

Table 2. Damage to corn ears and aflatoxin accumulation in various hybrids, M Plus Land Company, Colorado County, TX, 2010.

Cultivar	Relative days maturity	# da. kernels/ear	Max da. cm/ear tip	Ear da. sq cm/ear	% ears with tip da.	Aflatoxin ppb
DKC 61-36 R (non-Bt)	111	13.5[ab]	2.5[bc]	3.5[b]	75.0[a]	74.0[a]
DKC 61-35 VT3 Pro	111	0.8[c]	0.3[d]	0.3[c]	17.5[b]	69.9[a]
Pioneer 33F85 R (non-Bt)	114	12.9[ab]	2.8[ab]	3.7[ab]	77.5[a]	66.8[a]
Pioneer 33F87 HX1 RRLL	114	10.9[b]	2.2[bc]	3.4[b]	75.0[a]	31.5[a]
DKC 66-94 R (non-Bt)	116	10.4[b]	1.8[c]	2.7[b]	70.0[a]	111.3[a]
DKC 66-96 VT3 Pro	116	1.1[c]	0.2[d]	0.3[c]	20.0[b]	60.5[a]
Pioneer P1615 R (non-Bt)	116	18.3[a]	3.7[a]	5.7[a]	90.0[a]	27.3[a]
Pioneer P1615 HR	116	12.6[ab]	2.3[bc]	3.6[ab]	77.5[a]	69.7[a]
LSD (P = 0.05)		6.22	1.02	2.09	24.63	NS[1/]
P > F		.0001	.0001	.0003	.0001	.8476

Means in a column followed by the same letter are not significantly different by ANOVA.
[1/]NS = Not Significant

Table 3. Plant density and grain production parameters for various corn hybrids, M Plus Land Company, Colorado County, TX, 2010.

Cultivar	Relative days to maturity	Plants 1000's/acre	Ears harvested 1000's/acre	Bushel weight	Moisture %	Yield bu/acre[1/]
DKC 61-36 R (non-Bt)	111	21.9[a]	26.8[a]	55.0[c]	17.1[a]	158.6[a]
DK 61-35 VT3 Pro	111	22.4[a]	23.3[a]	56.0[b]	17.5[a]	158.2[a]
Pioneer P33F85 R (non-Bt)	114	23.3[a]	25.0[a]	56.4[ab]	17.4[a]	179.6[a]
Pioneer P33F87 HX1RRLL	114	24.4[a]	25.3[a]	55.8[bc]	17.6[a]	163.9[a]
DKC 66-94 R (non Bt)	116	22.1[a]	22.0[a]	56.9[a]	17.5[a]	158.6[a]
DKC 66-96 VT3 Pro	116	22.5[a]	23.5[a]	56.5[ab]	17.6[a]	167.0[a]
Pioneer P1615 R (non Bt)	116	22.8[a]	24.8[a]	56.4[ab]	17.8[a]	176.4[a]
Pioneer P1615 HR	116	22.9[a]	25.0[a]	57.0[a]	17.8[a]	174.9[a]
LSD (P = 0.05)		NS[1/]	NS	0.86	NS	NS
P > F		.1277	.5271	.0021	.9228	.8476

Means in a column followed by the same letter are not significantly different by ANOVA.
[1/]NS = Not Significant
[2/]Yield at 15% moisture corn

EFFECT OF BAYTHROID APPLIED TO NON-BT CORN FOR CORN EARWORM WITH AND WITHOUT HEADLINE FUNGICIDE

Albert Andel Farm, Jackson County, 2010

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SUMMARY: Baythroid applied to corn at early silk and 7 days later, and Baythroid + Headline applied one time resulted in a statistical increase in yield. There was a slight trend for fewer corn earworm larvae in the Baythroid plots which were treated twice, and there was no difference in ear damage in these plots. This study is the second one of 6 studies where insecticide treated corn had significantly higher yield.

OBJECTIVES: The field study was conducted to determine the efficacy of applying a foliar insecticide to a non-Bt corn hybrid for control of caterpillar pests and to determine impact, if any, on aflatoxin accumulation. The primary target insects were corn earworm and fall armyworm.

MATERIALS/METHODS: Pioneer 33F85 RR corn hybrid (non-Bt) grown on the Albert Andel Farm north of HWY 59 on FM 234 in Jackson County was used for the field study. Plots were 60 rows (38-inch centers) by 670 feet, and treatments were arranged in a randomized complete block design with 3 replications of each treatment. Baythroid XL 1EC (2.8 ounces/acre) was applied by air on 5/17 and 5/24 with the first treatment timed to coincide with silks showing on nearly all the developing corn ears. Headline (6.0 ounces/acre) along with the Baythroid was applied one time on 5/20. Total volume for the treatments was 3 gpa and crop oil concentrate (1.0 pint/acre) was added to the mixture.

Treatments were assessed by (1) examining 10 ears near the center of each plot on 6/2 at brown silk for corn earworm and fall armyworm [larvae: small = up to 3/8-inch, medium = 3/8-inch to 1/2-inch, large = greater than 1/2-inch], (2) harvesting 10 plants plus another 10 ears from near the center of plots to examine for sugarcane borer and caterpillar damage to stalks and ears on 6/28, and (3) harvesting 8 rows of each plot on 8/9 with a commercial John Deere 9610 combine equipped with a Greenstar 2600 GPS and yield monitor, and (4) using a Vicam Series-4 Flormeter Model V2 testing kit (Afla Test FGIS method) to measure the level of aflatoxin present in the machine harvested corn samples. Bushel weight and moisture levels were determined and grain weight was converted to the 15% moisture standard.

Agriculture Research Manager (ARM revision 6.1.13) software was used to conduct analysis of variance, and means were separated by LSD.

RESULTS/DISCUSSION: Corn earworm numbers were reduced numerically in corn where two treatments of Baythroid were applied (first silk and 7 days later); the difference in larval numbers was not as great where only one treatment was applied with Headline fungicide (Table

1). Ears examined later about the time they began to dry did not indicate protection from damage by use of Baythroid (Table 2). However, significant yield gains were found where Baythroid was applied (Table 3). Headline did not add to increased yield. This study accounted for only the second time in 6 studies over the years that a statistical increase in yield was obtained by treating for corn earworm at early silk.

ACKNOWLEDGMENTS: Albert Andel is thanked for providing the test site and harvesting samples to determine yield level. Special acknowledgment is given Don Wright, Coastal Flying Service, for applying the chemicals. Gary Schwarzlose, Bayer CropScience, is thanked for supplying the Baythroid, and Brian Vercellino, BASF Corporation, is thanked for providing the Headline.

Table 1. Corn earworm and fall armyworm on non-Bt corn treated with insecticide, with or without fungicide, Albert Andel Farm, Jackson County, TX, 2010.

Treatment (rate)[1/]	Corn earworm per 10 ears[2/]				FAW/10 ears[3/]
	small	medium	large	total	
Baythroid XL IEC (2.8 oz/acre)	0.7[a]	1.7[a]	1.0[a]	3.3[a]	1.0[a]
Baythroid XL IEC (2.8 oz/acre) + Headline 2.09 EC (6.0 oz/acre)	1.3[a]	1.7[a]	3.0[a]	6.0[a]	0.0[a]
Nontreated	0.3[a]	2.7[a]	5.3[a]	8.3[a]	0.0[a]
LSD (P = 0.05)	NS[4/]	NS	NS	NS	NS
P > F	.4444	.1600	.0798	.1451	.4444

Means in a column followed by the same letter are not significantly different by ANOVA.
[1/]Baythroid alone plots were treated 5/17 and 5/24. Headline+Baythroid plots were treated 5/20.
[2/]Corn earworm counts were made at brown silk stage on 6/2.
[3/]FAW = Fall Armyworm per 10 ears
[4/]NS = Not Significant

Table 2. Corn earworm damage on ears in non-Bt corn treated with insecticide, with or without fungicide, Albert Andel Farm, Jackson County, TX, 2010.

Treatment (rate)[1/]	% CEW infested ears[2/]	CEW[4/] damage/ear[5/]			
		# kernels	cm/ear tip	sq cm	%
Baythroid XL IEC (2.8 oz/acre)	50.0[a]	22.0[a]	4.0[a]	6.6[a]	98.3[a]
Baythroid XL IEC (2.8 oz/acre) + Headline 2.09 EC (6.0 oz/acre)	56.7[a]	19.7[a]	3.8[a]	6.4[a]	96.7[a]
Nontreated	73.3[a]	21.0[a]	4.0[a]	7.4[a]	96.7[a]
LSD (P = 0.05)	NS[3/]	NS	NS	NS	NS
P > F	.6587	.8627	.9696	.8112	.8711

Means in a column followed by the same letter are not significantly different by ANOVA.
[1/]Baythroid alone plots were treated 5/17 and 5/24. Headline+Baythroid plots were treated 5/20.
[2/]Evaluation made at brown silk, 6/2.
[3/]NS = Not Significant
[4/]CEW = Corn Earworm
[5/]Evaluation of ears made on 6/28.

Table 3. Aflatoxin accumulation and yield in non-Bt corn treated with insecticide, with or without fungicide, Albert Andel Farm, Jackson County, TX, 2010.

Treatment (rate)[1/]	Aflatoxin ppb	Bushel weight	Moisture %	Yield bu/acre[3/]
Baythroid XL IEC (2.8 oz/acre)	3.3[a]	58.2[a]	14.1[a]	130.1[a]
Baythroid XL IEC (2.8 oz/acre) + Headline 2.09 EC (6.0 oz/acre)	26.8[a]	58.3[a]	14.0[a]	129.6[a]
Nontreated	6.3[a]	58.0[a]	14.0[a]	118.7[b]
LSD (P = 0.05)	NS[2/]	NS	NS	6.44
P > F	.4872	.2500	.8252	.0132

Means in a column followed by the same letter are not significantly different by ANOVA.
[1/]Baythroid alone plots were treated 5/17 and 5/24. Headline+Baythroid plots were treated 5/20.
[2/]NS = Not Significant
[3/]Yield at 15% moisture corn

ENHANCED CONTROL OF CORN EARWORM WITH SYNGENTA AGRISURE VIPTERA CORN HYBRIDS

Alan Stasney Farm, Fort Bend County, Texas, 2010

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SUMMARY: Four of the 7 corn hybrids tested were extremely effective in reducing corn earworm larvae with very few caterpillars found on the ears. Damage to ears was very low in these same 4 hybrids. The treatment which contained a seed mixture of two hybrids (Bt11+MIR162+HX1+ 5% non-Bt seed) had little damage, but that damage was numerically slightly higher than that found in the other highly effective hybrids. No statistical differences were observed in the yield data, but the highly effective hybrids averaged 8.3 bu/acre more corn compared to the others tested. Low yields were thought to be the result of pollination under high night temperatures. Tests need to be conducted under earlier planting dates that match the proper dates for the region.

OBJECTIVES: The corn test was established to (1) measure the effectiveness of dual (pyramid) genes in controlling caterpillars and their damage, (2) determine effect on yield, and (3) evaluate the effects of corn hybrids on aflatoxin accumulation.

MATERIALS/METHODS: Corn was planted on the Alan Stasney Farm near Kendleton, Texas on April 21, 2001 with a two-row John Deere model 7100 planter equipped with cone seed dispensers. Plots were 4 rows by 17.5 feet with treatments (hybrids or hybrid mixtures) arranged in a randomized complete block design with 4 replications. Four border rows not included in the test were planted on each side of the field. Rows were spaced on 38-inch centers, and 35 seed was planted in each row.

The test was conducted under USDA APHIS regulatory guidelines for experimental genetically modified organisms. Isolation from other corn and monitoring of the test site was maintained.

Treatments were assessed by (1) observing emerged plants for caterpillars at about 10-day intervals; (2) counting the number of emerged plants on all 4 rows in plots on 5/12; (3) examining 10 ears/plot on the outside rows of each plot for corn earworm [small = up to 3/8-inch, medium = 3/8-inch up to 1/2-inch, large = greater than 1/2-inch] at the brown silk stage on 6/24; (4) pulling 10 ears from the outside rows in plots on 7/12 to examine for number of kernels damaged, square centimeters of kernel damage, centimeters depth of caterpillar feeding down the ear, and amount of kernels damaged on the sides of ears; (5) counting the number of lodged plants on the center two rows in plots on 8/10; and (6) harvesting the center two rows of each plot on 8/10 with a research combine equipped with moisture and weight determination instruments. Grain weights were expressed at a level of 15% moisture. Corn from each plot was obtained and ground with a Romar Mill (series 2a). Aflatoxin levels were then measured using a vicam Series-4 Fluorometer Model V2 testing kit (Afla Test FGIS method).

Agriculture Research Manager (ARM 6.1.13) software was used to conduct analysis of variance, and means were separated by LSD at the 0.05 probability level.

RESULTS/DISCUSSION: Corn earworm numbers were dramatically reduced on 4 of 7 corn hybrids tested (Table 1). These 4 hybrids all contained event MIR162, the Agrisure Viptera trait. The number of corn earworm larvae present in the other 3 hybrids ranged from 1.68 to 2.00/ear; whereas, where their numbers were suppressed the number ranged from 0.0 to 0.1 larvae/ear. Nearly all of the larvae found in the most effective hybrids were in plots containing a seed mixture (Bt11+MIR162+HX1+5% non-Bt seed). Evidence of ear infestation was very low in the 4 hybrids.

Closer examination of damage taken later after ears had begun to dry down confirmed the low larval survival rate (corn earworm larvae) found in 4 of the treatments sustaining little damage (Table 2). Only the hybrid (Bt11+MIR162+HX1+5% non-Bt seed) had numerically elevated larval numbers and damage. No differences were detected in aflatoxin accumulation among the tested hybrids. The accumulation of aflatoxin was high probably due to heat stress as a result of the late planting date. Aflatoxin amounts ranged from a low of 127.8 ppb to a high of 435.3 ppb. No differences were observed in plant stand, lodged plants, grain moisture at harvest or yield (Table 3). It was somewhat surprising not to find yield differences given the amount of corn earworm damage in 3 hybrids that did not include MIR162. However, 2 out of 3 of these hybrids had numerically lower yields.

ACKNOWLEDGMENTS: Alan Stasney is acknowledged for providing part of his farm on which this study was conducted. Brad Minton and Brian Bacak, Syngenta Crop Protection, are thanked for their assistance in conducting the experiment, and Syngenta Seeds are thanked for providing the grant fund.

NOTE: The following trade names are anticipated to be associated with the tested trait stacks once all approvals have been granted: GA21+Bt11 = Agrisure GT/CB/LL trait stack, GA21+Bt11+MIR162 = Agrisure Viptera 3110 trait stack, GA21+Bt11+MIR162+HX1 (TC1507) = Agrisure Viptera 3220 trait stack*, GA21+Bt11+MIR162+MIR604 = Agrisure Viptera 3111 trait stack, GA21+Bt11+HX1(TC1507)+HXRW(DAS59122-7) = Agrisure 3122* trait stack. Agrisure and Agrisure Viptera are trademarks of a Syngenta Group Company.

*The Agrisure Viptera 3220 trait stack and the Agrisure 3122 trait stack are not yet registered for sale or use in the United States.

Table 1. Corn earworm number and size on corn ears at brown silk in corn hybrids evaluated for caterpillar control, Alan Stasney Farm, Fort Bend County, TX 2010.

Hybrid[1/]	Number corn earworm/10 ears				% CEW[3/] infested ears
	small	medium	large	total	
Non-Bt	0.3[b]	5.0[a]	11.0[a]	16.3[b]	100.0[a]
Bt11	14.5[a]	4.5[a]	1.0[b]	20.0[a]	97.5[a]
Bt11+MIR162	0.0[b]	0.0[b]	0.0[b]	0.0[c]	5.0[c]
Bt11+MIR162+HX1	0.0[b]	0.3[b]	0.0[b]	0.3[c]	0.0[c]
Bt11+MIR162+HX1[2/]	0.0[b]	0.3[b]	0.8[b]	1.0[c]	7.5[c]
Bt11+MIR162+MIR604	0.0[b]	0.0[b]	0.0[b]	0.0[c]	7.5[c]
Bt11+HX1+HXRW	13.5[a]	3.3[a]	0.0[b]	16.8[b]	82.5[b]
LSD (P = 0.05)	3.83	2.11	1.37	2.53	11.54
P > F	.0001	.0001	.0001	.0001	.0001

Means in a column followed by the same letter are not significantly different by ANOVA.
[1/]All hybrids tested contain the glyphosate gene (GA21).
[2/]Contained 5% non-Bt hybrid seed
[3/]CEW = Corn earworm

Table 2. Damage to corn ears and aflatoxin accumulation in hybrids evaluated for caterpillar control, Alan Stasney Farm, Fort Bend County, TX 2010.

Hybrid[1/]	#da kernels/ear	Max da. cm/ear tip	Ear da. sq cm/ear	% ears with tip da.	% ears side kernel da.	Aflatoxin Ppb
Non-Bt	24.8[a]	5.3[a]	7.4[a]	98.8[a]	10.1[a]	196.8[a]
Bt11	10.8[b]	3.3[b]	2.9[b]	83.8[b]	7.6[ab]	201.5[a]
Bt11+MIR162	0.0[d]	0.1[d]	0.0[d]	1.3[d]	0.0[c]	412.0[a]
Bt11+MIR162+HX1	0.0[d]	0.1[d]	0.0[d]	6.3[d]	0.0[c]	435.3[a]
Bt11+MIR162+HX1[2/]	1.3[cd]	0.3[d]	0.3[cd]	8.8[d]	1.1[c]	127.8[a]
Bt11+MIR162+MIR604	0.0[d]	0.0[d]	0.0[d]	0.0[d]	0.0[c]	135.5[a]
Bt11+HX1+HXRW	5.6[c]	2.7[c]	1.8[bc]	59.5[c]	2.4[bc]	252.5[a]
LSD (P = 0.05)	4.83	0.66	1.53	12.66	5.62	NS[3]
P > F	.0001	.0001	.0001	.0001	.0043	.5286

Means in a column followed by the same letter are not significantly different by ANOVA.
[1/]All hybrids tested contain the glyphosate gene (GA21).
[2/]Contained 5% non-Bt hybrid seed
[3/]NS = Not Significant

Table 3. Plant population, stalk lodging, grain moisture and yield in corn hybrids evaluated for effectiveness on corn earworm, Alan Stasney Farm, Fort Bend County, TX 2010.

Hybrid[1/]	Plants[3/] avg. #/row	Lodged plants #/2 rows	Moisture %	Yield bu/acre[5/]
Non-Bt	33.6[a]	12.5[a]	10.7[a]	52.5[a]
Bt11	33.5[a]	16.0[a]	9.3[a]	41.2[a]
Bt11+MIR162	33.7[a]	22.8[a]	9.9[a]	49.6[a]
Bt11+MIR162+HX1	33.0[a]	17.0[a]	10.1[a]	50.9[a]
Bt11+MIR162+HX1[2/]	33.4[a]	14.5[a]	10.0[a]	56.6[a]
Bt11+MIR162+MIR604	33.5[a]	30.5[a]	10.2[a]	63.7[a]
Bt11+HX1+HXRW	34.3[a]	12.5[a]	10.1[a]	47.0[a]
LSD (P = 0.05)	NS[4/]	NS	NS	NS
P > F	.0897	.2082	.4957	.6361

Means in a column followed by the same letter are not significantly different by ANOVA.
[1/]All hybrids tested contain the glyphosate gene (GA21).
[2/]Contained 5% non-Bt hybrid seed
[3/]Average number plants on each 4-row plot
[4/]NS = Not Significant
[5/]Yield at 15% moisture corn

EFFICACY OF SYNGENTA COMPLETE CORN ON EARLY SEASON INSECTS AND NEMATODES

Ralph Koopmann Farm, DeWitt County, 2010

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SUMMARY: The objectives of the study were not met due to the lack of nematodes or chinch bugs at the test site. Statistical differences were not observed in any of the data obtained from the site. Plant parasitic nematodes were not present in initial samples but were detected in low numbers in a subsequent sample. These numbers were not expected to cause significant damage which was borne out by data obtained on corn plant growth ratings and yield.

OBJECTIVES: The corn field study was conducted to determine the efficacy of Avicta Complete Corn on early season insects and to measure the impact of treatments on nematodes, chinch bug, or other soil organisms.

MATERIALS/METHODS: In 2008 stubby root nematodes were detected in corn at the test site at levels above the treatment threshold which prompted using this location for the test. We also believed chinch bugs were likely to be present in the field based on numbers found in the area in past years.

The test site was located 0.25 mile from State Hwy 119 on County Road 3041 in DeWitt County on land farmed by Ralph Koopmann. Corn was planted on March 15, 2010 with a John Deere 7100 2-row planter equipped with cone seed dispensers which delivered 24,850 seed/acre into 6-row by 31-foot plots with 4-foot alleys at ends of plots. Rows were spaced on 38-inch centers. Treatments were arranged in a randomized complete block design with 4 replications. Counter 15G (8.0 ounces/1000 ft) was applied to appropriate plots in a 6-inch band as a “T-band.”

Herbicide consisted of Dual II Magnum (1.3 pints/acre) + Roundup Weather Max (22 ounces/acre) following planting.. The grower had previously applied Banvel (4.0 ounces/acre + Atrazine 4L (1.25 quarts/acre). Fertilizer knifed 6 inches to the side of rows consisted of 84-28-0 + 2 gpa 11-37-0 + 0.8 gpa of 75% zinc. The loamy sand soil (85% sand, 4% silt, 11% clay) with a pH of 4.8 contained 0.53% organic matter.

Treatments were assessed by (1) obtaining soil samples on the planting date and again on 5/24 for nematode analysis by the Plant Diagnostic Laboratory at Texas A&M University at College Station; (2) counting the number of corn plants on 4/8 on 13.75 feet of row on each of the center two rows in plots; (3) assigning a vigor rating to plots 16 and 29 days after emergence [DAE] on 4/8 and 4/21, respectively, based on 0-100% scale; (4) measuring height of 10 plants/plot on 4/8 [16 DAE] and 4/26 [34 DAE]; and (5) harvesting the center two rows of plots with a 2-row research combine on 8/5. Grain moisture was determined and plot weight was converted to that at 15% moisture.

Agriculture Research Manager (ARM revision 6.1.13) software was used to conduct analysis of variance, and means were separated by L
SD at the 0.05 probability level.

RESULTS/DISCUSSION: Plant parasitic nematodes were not present in initial soil samples taken on the planting date (3/15). Another set of samples was obtained on 5/24 in which 28 lesion and a few saprophytic nematodes per 25 cc of soil were found. These low numbers were not expected to cause significant damage. Chinch bugs were also so low that counts in all plots were not made since few were observed on 3 dates in non-insecticide treated corn. Differences were not observed in plant stand counts or in plant height and vigor ratings taken 16 and 29 days after emergence (Table 1). However, the P value for vigor rating at 29 days after emergence (DAE) was 0.0773 shows indication of lower vigor in the A16115 treated corn and the nontreated corn. No conclusions could be made from this observation. No differences were found in grain moisture at harvest or in yield (Table 2). The objectives of the study were not met due to lack of insect or nematode pests.

ACKNOWLEDGMENTS: Ralph Koopmann is thanked for providing the site and for working with us in establishment of the field experiment. Brad Minton and Brian Bacak, Syngenta Crop Protection, are thanked for monetary support and for harvesting the test. Rudy Alaniz and Clint Livingston, Demonstration Assistants are acknowledged for planting the corn.

Table 1. Comparison of seed and granular insecticide treatments for effect on corn plant growth, Ralph Koopman, DeWitt County, TX 2010.

Treatment (rate)	Plants 1000's/acre	Plant height (cm)		Vigor rating (0 – 100%)[3/]	
		16 DAE[2/]	29 DAE	16 DAE	29 DAE
Cruiser 5FS (0.25 mg ai/seed)	22.0[a]	12.3[a]	54.7[a]	90.6[a]	95.8[a]
Cruiser 5FS (0.50 mg ai/seed)	20.9[a]	12.7[a]	51.4[a]	90.6[a]	94.5[a]
STP 15201 (0.50 mg ai/seed)	20.0[a]	11.8[a]	51.0[a]	86.3[a]	90.0[a]
A16115 (0.72 mg ai/seed)	20.0[a]	11.7[a]	50.0[a]	81.3[a]	85.0[a]
Cruiser 5FS+A17015 (0.25+0.45 mg ai/seed)	20.9[a]	12.1[a]	49.9[a]	88.8[a]	89.5[a]
STP15201+A17015 (0.25+0.45 mg ai/seed)	19.8[a]	11.4[a]	50.2[a]	85.0[a]	88.8[a]
A17015 (0.45 mg ai/seed)	19.3[a]	12.7[a]	51.4[a]	89.4[a]	92.5[a]
Counter 15G (8.0 oz/1,000 ft.)	22.4[a]	12.6[a]	54.9[a]	93.1[a]	97.5[a]
Nontreated	20.5[a]	12.6[a]	51.0[a]	85.0[a]	86.3[a]
LSD (P = 0.05)	NS[1/]	NS	NS	NS	NS
P > F	.6014	.8972	.8389	.3809	.0773

Means in a column followed by the same letter are not significantly different by ANOVA.
[1/] NS = Not Significant
[2/] DAE = Days After Emergence
[3/] Vigor rating: 0 = poor uneven plant growth up to 100 = vigorous growth

Table 2. Comparison on corn of seed and granular insecticide treatments for effect on production, Ralph Koopman Farm, DeWitt County, TX 2010.

Treatment (rate)	Grain Moisture %	Yield bu/acre
Cruiser 5FS (0.25 mg ai/seed)	9.7[a]	76.6[a]
Cruiser 5FS (0.50 mg ai/seed)	10.1[a]	73.9[a]
STP 15201 (0.50 mg ai/seed)	10.3[a]	70.1[a]
A16115 (0.72 mg ai/seed)	10.4[a]	73.1[a]
Cruiser 5FS+A17015 (0.25+0.45 mg ai/seed)	10.4[a]	70.1[a]
STP15201+A17015 (0.25+0.45 mg ai/seed)	10.1[a]	73.5[a]
A17015 (0.45 mg ai/seed)	10.6[a]	66.9[a]
Counter 15G (8.0 oz/1,000 ft.)	10.3[a]	73.1[a]
Nontreated	10.2[a]	69.2[a]
LSD (P = 0.05)	NS[1/]	NS
P > F	.1702	.8076

Means in a column followed by the same letter are not significantly different by ANOVA.
[1/] NS = Not Significant

EVALUATION OF SYSTEMIC INSECTICIDE SEED AND PLANTER BOX TREATMENTS ON SORGHUM

Texas AgriLife Research and Extension Center, Nueces County, 2010

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SUMMARY: The only insect pest of consequence in the test was white grub, but the insect caused only minor observable damage. The nontreated sorghum had 6.6% infested plants compared with no damage in the highest Cruiser rate tested; no significant differences in control level were observed among any of the insecticide treatments. Even so, the amount of damage in the various insecticide treatments seemed to follow numerically what would be expected as to effectiveness of the various treatments. Based on reports of growers in the area, with much higher white grub numbers, both Poncho and Cruiser treated sorghum seed provided adequate protection from the white grub; that is, they did not have to replant sorghum which was treated with the insecticides; whereas, in many cases they did replant fields where no insecticide seed treatment was used.

OBJECTIVES: The sorghum insecticide seed treatment field study was established to continue evaluation of the various treatments offered in the marketplace and to study the effects of a higher Cruiser rate than is normally used on planting seed.

MATERIALS/METHODS: Sorghum hybrid DKS 3707 seed was treated by mixing the insecticide and seed in a small concrete mixer for approximately 3 minutes. Seed was then packaged and planted on March 9, 2010 on the Meaney Annex of the Texas AgriLife Research and Extension Center at Corpus Christi with a 4-row model 6100 John Deer planter equipped with cone seed dispensers. No crop had been grown on the site in 2009 due to drought conditions. Individual plots were 4 rows by 35 feet with a 5-foot alley between each of the 4 replications. The test design was a randomized complete block. Row spacing was 38-inch.

Herbicide consisted of Atrazine 4L (1.0 quarts/acre) + Dual II Magnum (1.3 pints/acre) applied on the date of planting. The few weeds present were removed by hand near the boot stage. Fertilizer was applied as 88-44-0 + 4 lb zinc in 2009 (fallow that year). Soil at the site was a clay loam (44% sand, 18% silt, 38% clay) with a pH of 7.9 and 1.34% organic matter.

Treatments were assessed by (1) counting the number of plants on 10-row feet in each of the center rows when they were about 8 inches tall on 4/9, (2) counting the number of obvious white grub damaged plants on 5-row feet of each of the center two rows on 4/9, (3) inspecting plots weekly through the early season to determine if pest insects were at high enough level for a complete count, and (4) harvesting 13.75 feet of row on one of the center rows in plots on 7/6. Harvested sorghum heads were threshed on a research machine and grain weights were adjusted to 14% moisture. Agriculture Research Manager (ARM revision 6.1.13) software was used to conduct analysis of variance, and means were separated by LSD for ease of presentation.

RESULTS/DISCUSSION: Significant differences were not observed in plant populations for the various treatments, but there was nearly a 10 thousand plant per acre numerical difference from the highest population (nontreated) to the lowest (Poncho treated) (Table 1). The number of heads harvested compared with the plant stand was the greatest in the Cruiser (7.6 mg ai/seed) treated sorghum compared with any of the other treatments. It indicated possibly more "sucker" development in this treatment, although no mechanism is known that would cause such suckering. It was probably a chance occurrence.

All insecticide treated sorghum had fewer observable white grub infested plants than did the nontreated sorghum (Table 1). Although their numbers were not high, the infestation seemed to follow a pattern; that is, low damage in the Poncho treated and high Cruiser rate with the highest infestation rate among the insecticides in Latitude treated sorghum.

The fact that no differences were observed in yield level was not unexpected given the lack of pest insect activity in sorghum including the white grub infestation. White grubs were just not in sufficient numbers to reduce yield given the compensation ability of sorghum plants.

ACKNOWLEDGMENTS: Thanks are extended to Monsanto Company for providing the sorghum seed (non-insecticide treated) for the study. Rudy Alaniz and Clint Livingston, Demonstration Assistants, are acknowledged for conducting all aspects of the study from the standpoint of land preparation, planting, cultivation, harvest, and processing of grain samples.

Table 1. Seed and planter box insecticide treatments on sorghum, Texas AgriLife Research and Extension Center, Nueces County, TX 2010.

Treatment (rate)	1000's/acre plants	1000's/acre harvested heads/plot	White grubs % da. plants	Yield lb/acre[3/]
Poncho 5FS (5.3 oz/cwt seed)	54.7[a]	57.8[c]	0.5[b]	4363[a]
Cruiser 5FS (5.1 oz/cwt seed)	61.7[a]	68.5[ab]	2.3[b]	4436[a]
Cruiser 5FS (7.6 oz/cwt seed)	60.2[a]	75.3[a]	0.0[b]	4661[a]
Latitude[1/] (5.0 oz/cwt seed)	58.3[a]	61.5[bc]	1.8[b]	4626[a]
Nontreated	64.1[a]	67.0[abc]	6.6[a]	4519[a]
LSD (P = 0.05)	NS[2/]	10.63	3.38	NS
P > F	.8344	.0319	.0079	.8996

Means in a column followed by the same letter are not significantly different by ANOVA.
[1/]A planter box treatment
[2/]NS = Not Significant
[3/]Yield at 14% moisture sorghum

COMPARISON OF INSECTICIDES FOR EFFECTIVENESS ON HEADWORMS AND RICE STINK BUGS IN SORGHUM

Texas AgriLife Research and Extension Center, Nueces County, 2010

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SUMMARY: All foliar insecticides provided control of the corn earworm feeding on sorghum heads in the dough stage of development. However, infestations did not persist long enough to determine which products provided extended control. The older insecticide, Asana, provided very effective control of corn earworm, and at 4 DAT (days after treatment) it provided a statistically higher level of control compared with some of the other insecticides as measured by post treatment average counts. It should be noted that many of the other insecticides tested are inherently slower in acting upon insects and may not have had time to express their full efficacy.

OBJECTIVES: The field study was conducted to determine the effectiveness of foliar insecticide treatments upon head feeding caterpillars in sorghum and to determine their effect on other sorghum insect pests such as rice stink bug.

MATERIALS/METHODS: The sorghum hybrid Garst 5556 was planted on May 14, 2010 on the Texas AgriLife Research and Extension Center at Corpus Christi. Six-row by 35-foot plots were established and the center 4 rows of each plot were designated for treatment from which the center 2 rows were used to collect data. Rows were on 38-inch centers. The test was arranged in a randomized complete block with 4 replications of treatments. Insecticide treatments were applied to headed sorghum in the soft dough stage on 6/21 with a Spider Trac sprayer calibrated to deliver 5.1 gpa total volume through 4X hollow cone nozzles at 40 psi and at a speed of 4.3 mph.

Treatments were assessed by shaking 10 heads/plot into a 2.5 gallon bucket and counting the number of corn earworm, fall armyworm, and rice stink bug on 6/21 the day of treatment and at 2 (6/23) and 4 (6/25) days after treatment. Counts were made each time on a different section of row so as not to take samples from the same plants more than one time.

Agricultural Research Manager (ARM revision 6.1.13) software was used to conduct analysis of variance, and means were separated by LSD for ease of presentation.

RESULTS/DISCUSSION: Even though pretreatment headworm (corn earworm) counts were high their numbers began to decline rapidly due to natural enemies including fungal disease after treatments were applied (Table 1). Caterpillars, especially of medium size, were observed to be affected by a naturally occurring disease. Even so, data indicated that all products significantly reduced corn earworm numbers at 4 DAT. When data were analyzed for post-treatment average affect, additional statistical differences were evident. Asana clearly provided very effective control, but it was no better statistically than all 3 rates of Prevathon (rynaxypyr), DPX-HGW86 (chlorantraniliprole), Intrepid, CGA293343 (Syngenta formulation), or Endigo (lambdacyhalothrin). Numerically, Prevathon provided more control as rates were increased. Differences were not found in fall armyworm or rice stink bug infestation at 2 or 4 DAT (Table 2). Fall armyworm numbers were low at the beginning, and the additional infestation was not high enough or sustained to determine true impact of the products on this insect.

Insect numbers continued to decline in all plots as sorghum matured to the hard dough stage as indicated by spot checks in selected plots (data not recorded). Yields were not obtained due to the nature of the study site; it had been a long term soils study.

ACKNOWLEDGMENTS: DuPont Crop Protection and Bayer CropScience are thanked for their support of the study. Rudy Alaniz and Clint Livingston, Demonstration Assistants, provided support by preparing the site for the study and applying the insecticides.

Table 1. Evaluation of insecticides for control of corn earworm on headed sorghum, Texas AgriLife Research and Extension Center, Nueces County, TX, 2010.

Treatment	Rate oz/acre	Corn earworm/10 heads Pretrt.	2 DAT[2/]	4 DAT	Post-Trt. Avg
Prevathon	6.7	5.8[a]	2.0[a]	0.5[b]	1.3[abc]
Prevathon	9.8	7.0[a]	1.5[a]	0.3[b]	0.9[bc]
Prevathon	13.3	6.3[a]	1.0[a]	0.0[b]	0.5[bc]
Prevathon + Asana	9.8+5.5	5.3[a]	0.5[a]	0.0[b]	0.3[c]
DPX-HGW86	13.5	7.3[a]	2.3[a]	0.0[b]	1.1[bc]
Belt 4SC	3.0	5.8[a]	3.0[a]	0.3[b]	1.6[ab]
Intrepid 2SC	6.0	5.5[a]	2.0[a]	0.5[b]	1.3[abc]
Asana .66 XL	5.8	7.3[a]	0.3[a]	0.0[b]	0.1[c]
CGA293343 ZC	5.5	9.8[a]	1.0[a]	0.3[b]	0.6[bc]
Endigo	5.5	7.8[a]	0.5[a]	0.0[b]	0.3[c]
Nontreated		5.8[a]	2.8[a]	2.3[a]	2.5[a]
LSD (P = 0.05)		NS[1/]	NS	0.94	1.36
P > F		.3039	.3289	.0013	.0395

Means in a column followed by the same letter are not significantly different by ANOVA.
[1/]NS = Not Significant
[2/]DAT = Days After Treatment

Table 2. Evaluation of insecticides for control of fall armyworm and rice stink bug on headed sorghum, Texas AgriLife Research and Extension Center, Nueces County, TX, 2010.

		Number per 10 heads					
	Rate	Fall Armyworm			Rice stink bug		
Treatment	Oz/acre	Pretrt.	2 DAT[2/]	4 DAT	Pretrt.	2 DAT	4 DAT
Prevathon	6.7	0.3[a]	0.0[a]	0.0[a]	0.0[a]	0.8[a]	0.5[a]
Prevathon	9.8	0.3[a]	0.0[a]	0.0[a]	1.3[a]	0.3[a]	0.5[a]
Prevathon	13.3	0.3[a]	0.0[a]	0.0[a]	0.5[a]	1.0[a]	2.5[a]
Prevathon + Asana	9.8+5.5	0.5[a]	0.0[a]	0.0[a]	0.3[a]	0.5[a]	0.8[a]
DPX-HGW86	13.5	0.0[a]	0.0[a]	0.0[a]	0.3[a]	1.3[a]	4.8[a]
Belt 4SC	3.0	0.5[a]	0.3[a]	0.3[a]	0.8[a]	0.8[a]	1.8[a]
Intrepid 2SC	6.0	0.8[a]	0.0[a]	0.0[a]	0.0[a]	1.3[a]	3.8[a]
Asana .66 XL	5.8	0.5[a]	0.3[a]	0.0[a]	0.8[a]	0.3[a]	0.5[a]
CGA293343 ZC	5.5	0.8[a]	0.0[a]	0.0[a]	0.5[a]	0.5[a]	0.3[a]
Endigo	5.5	0.5[a]	0.5[a]	0.0[a]	2.0[a]	0.3[a]	0.5[a]
Nontreated		0.0[a]	0.0[a]	0.5[a]	0.5[a]	0.3[a]	0.0[a]
LSD (P = 0.05)		NS[1/]	NS	NS	NS	NS	NS
P > F		.5754	.6089	.5480	.1744	.7768	.4345

Means in a column followed by the same letter are not significantly different by ANOVA.

[1/]NS Not Significant

[2/]DAT = Days After Treatment

SYSTEMIC INSECTICDES APPLIED TO SEED OR IN-FURROW AT-PLANTING ON COTTON

Hansen Farm, Matagorda County, 2010

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SUMMARY: Thrips can cause significant damage to cotton which often results in yield loss. The most effective way to protect cotton from thrips is through use of systemic insecticide at planting applied into the seed furrow or as a seed treatment. In this study standard seed treatments and granular Temik were evaluated. Thrips infestation and damage was so low that no differences were observed in plant vigor ratings or lint production.

OBJECTIVES: Systemic insecticides applied at planting were evaluated to determine impact on early season insects such as thrips, aphids, and spider mites; and to measure any impact on plant growth or lint production.

MATERIALS/METHODS: Cotton variety FM 1740 B2F was planted on April 6, 2010 on the Hansen Farm in Matagorda County 1 mile east of the intersection of FM 1095 and FM 521. Sorghum had been grown on the site in 2009. A 2-row John Deere 7100 planter equipped with Almaco cone seed dispensers was used to plant the 4-row by 35-foot plots with treatments arranged in a randomized complete block design with 4 replications of treatments. The seeding rate was 48,000/acre. Temik 15G (3.5 and 5.0 lb/acre) was applied into the seed furrows through 6-inch banders oriented parallel with the rows.

Soil moisture on the planting date was excellent below the surface, but some difficulty was experienced in seed depth placement. The soil contained 2.72% organic matter, had a pH of 7.2, and was classified as a clay (34% sand, 17% silt, 49% clay). Following planting Cotoran (1.0 quart/acre) + Dual II Magnum (1.3 pints/acre) was broadcast over the test. Weeds that emerged later were removed by hand.

Treatments were assessed by (1) pulling 10 plants from each plot at the 2-leaf stage [24 DAP on 4/29] and at the 4-leaf stage [31 DAP on 5/6] and placing them in 70% ETOH for later examination for thrips, aphids, spider mites, and fire ants; (2) assigning a plant damage rating to each plot at 35 DAP where 1 = no damage up to 5 = severe stunting and curling of leaves; and (3) harvesting the third row of each plot on 8/31 with an IH model 120A spindle picker. Seed cotton weights were measured, samples were obtained and ginned on a 10-saw Eagle laboratory machine for percentage lint, and 50 grams of lint were sent to the Fiber and Biopolymer Research Institute at Lubbock, Texas for fiber analysis.

Agriculture Research Manager (ARM revision 6.1.13) software was used to conduct analysis of variance (ANOVA). Means were separated by least significant difference (LSD) for ease of table presentation.

RESULTS/DISCUSSION: Thrips numbers were relatively low at both the 2 and 4-leaf stages of plant development where their numbers remained below the established treatment threshold levels for both leaf stages (Table 1). The thrips action threshold for 2-leaf cotton = 2/plant and 4-leaf cotton = 4/plant. At the 2-leaf stage highest number of thrips (nymphs and adults) were observed in the Cruiser treatment; but their numbers were not significantly different from that found in the Avicta treatment or in nontreated cotton. By the 4-leaf stage only Temik (5.0 lb/acre) treated cotton had statistically fewer thrips than the nontreated cotton. The 2-date average number of total thrips showed that only two treatments, (1) Avicta + Temik (3.5 lb/acre) and (2) Temik (5.0 lb/acre) had fewer thrips than nontreated cotton. These observations have been made before and tend to obscure the effect of thrips on cotton as the damage ratings, rather than the number of thrips, correlate better with lint yield.

Aphid numbers at the 2-leaf stage were significantly greater, although not in damaging numbers, in the nontreated cotton compared with all other treatments except for the Aeris (used alone) treatment (Table 2). No differences were found in aphid numbers at the 4-leaf stage. No differences were detected in mite infestation or in plant damage rating conducted at 35 days after planting (DAP).

No effects were observed on cotton fiber characteristics or lint production (Table 3).

ACKNOWLEDGMENTS: Bill Hansen is thanked for providing land for conduct of this study and for his continued interest and time in these type field experiments. Bayer CropScience is acknowledged for providing seed and monetary support. Rudy Alaniz and Clint Livingston, Demonstration Assistants, are thanked for treating the seed, planting, harvest, ginning, and processing of samples and compiling data for the yield component. Credit is given to the Texas Department of Agriculture Food and Fibers Research Council for paying for fiber analysis, and Texas Tech University Fiber and Biopolymer Research Institute is thanked for providing fiber analysis data.

Table 1. Number of thrips on cotton treated with systemic insecticide applied to seed or placed into the seed furrow, Hansen Farm, Matagorda County, TX, 2010.

	Number thrips per 10 plants						
	2-leaf (24 DAP)[1/]			4-leaf (31 DAP)			
Treatment (rate)	larva	adult	total	larva	adult	total	2-date avg. (total)
Aeris 5FS (0.75 mg ai/seed)	0.0[a]	1.0[bc]	1.0[bc]	4.5[a]	19.0[bcd]	23.5[bcd]	12.3[b-e]
Avicta CP 5FS (0.49 mg ai/seed)	0.0[a]	2.5[a]	2.5[ab]	3.5[a]	34.0[a]	37.5[a]	20.0[a]
Aeris 5FS+Temik 15G (0.75 mg ai/seed+3.5 lb/a.)	0.0[a]	0.3[c]	0.3[c]	0.0[a]	30.0[ab]	30.0[abc]	15.1[a-d]
Avicta CP 5FS+Temik 15G (0.49 mg ai/seed+3.5 lb/a.)	0.0[a]	0.8[c]	0.8[c]	0.5[a]	17.0[cd]	17.5[cd]	9.1[de]
Temik 15G (3.5 lb/acre)	0.0[a]	0.5[c]	0.5[c]	0.5[a]	18.0[bcd]	18.5[bcd]	9.5[cde]
Temik 15G (5.0 lb/acre)	0.0[a]	0.5[c]	0.5[c]	0.0[a]	14.0[d]	14.0[d]	7.3[e]
Gaucho Grande 5FS (0.375 mg ai/seed)	0.0[a]	0.8[c]	0.8[c]	1.5[a]	27.5[abc]	29.0[abc]	14.9[a-d]
Cruiser 5FS (0.340 mg ai/seed)	0.8[a]	2.3[ab]	3.0[a]	2.5[a]	29.0[abc]	31.5[ab]	17.3[ab]
Nontreated	0.5[a]	1.3[abc]	1.8[abc]	4.5[a]	26.5[a-d]	31.0[abc]	16.4[abc]
LSD (P = 0.05)	NS[2/]	1.49	1.58	NS	12.81	13.91	7.04
P > F	.3568	.0472	.0126	.4299	.0376	.0283	.0148

Means in a column followed by the same letter are not significantly different by ANOVA.

[1/] DAP = Days After Planting

[2/] NS = Not Significant

Table 2. Aphid and mite numbers, and vigor rating in cotton treated with systemic insecticide applied to seed or placed into the seed furrow, Hansen Farm, Matagorda County, TX, 2010.

Treatment (rate)	Number aphids/10 plants 2-leaf (24 DAP)[1/]	Number aphids/10 plants 4-leaf (31 DAP)	Number mites/10 plants 2-leaf (24 DAP)	Number mites/10 plants 4-leaf (31 DAP)	Vigor Rating[3/] 35 DAP
Aeris 5FS (0.75 mg ai/seed)	8.8[ab]	1.5[a]	0.5[a]	3.5[a]	1.3[a]
Avicta CP 5FS (0.49 mg ai/seed)	4.5[bc]	0.5[a]	0.8[a]	3.5[a]	1.5[a]
Aeris 5FS+Temik 15G (0.75 mg ai/seed+3.5 lb/a.)	0.5[c]	0.0[a]	0.5[a]	8.0[a]	1.6[a]
Avicta CP 5FS+Temik 15G (0.49 mg ai/seed+3.5 lb/a.)	1.3[c]	66.5[a]	1.5[a]	5.0[a]	1.3[a]
Temik 15G (3.5 lb/acre)	2.3[bc]	1.0[a]	1.5[a]	2.5[a]	1.5[a]
Temik 15G (5.0 lb/acre)	2.5[bc]	0.5[a]	1.8[a]	4.5[a]	1.1[a]
Gaucho Grande 5FS (0.375 mg ai/seed)	5.0[bc]	0.0[a]	0.3[a]	8.5[a]	1.4[a]
Cruiser 5FS (0.340 mg ai/seed)	4.8[bc]	0.5[a]	1.3[a]	5.5[a]	1.4[a]
Nontreated	15.8[a]	2.0[a]	0.5[a]	2.0[a]	1.4[a]
LSD (P = 0.05)	7.31	NS[2/]	NS	NS	NS
P > F	.0075	.4785	.6361	.4030	.9123

Means in a column followed by the same letter are not significantly different by ANOVA.
[1/]DAP = Days After Planting
[2/]NS = Not Significant
[3/]Vigor ratings range from 1 = no damage up to 5 = severe stunting, cupped-up leaves, and uneven plant growth.

Table 3. Fiber characteristics and yield of cotton treated with systemic insecticide applied to seed or placed into the seed furrow, Hansen Farm, Matagorda County, TX, 2010.

Treatment (rate)	Mic	Length inches	Unif ratio	Strength g/tex	Elong %	Lint yield lb/acre
Aeris 5FS (0.75 mg ai/seed)	4.6[a]	1.17[a]	83.9[a]	31.6[a]	5.6[a]	862[a]
Avicta CP 5FS (0.49 mg ai/seed)	4.6[a]	1.17[a]	83.4[a]	30.5[a]	5.6[a]	842[a]
Aeris 5FS+Temik 15G (0.75 mg ai/seed+3.5 lb/a.)	4.4[a]	1.18[a]	84.5[a]	31.2[a]	5.7[a]	827[a]
Avicta CP 5FS+Temik 15G (0.49 mg ai/seed+3.5 lb/a.)	4.4[a]	1.17[a]	83.6[a]	31.2[a]	5.7[a]	847[a]
Temik 15G (3.5 lb/acre)	4.5[a]	1.17[a]	83.7[a]	30.3[a]	5.6[a]	794[a]
Temik 15G (5.0 lb/acre)	4.5[a]	1.17[a]	83.9[a]	30.8[a]	5.8[a]	858[a]
Gaucho Grande 5FS (0.375 mg ai/seed)	4.5[a]	1.17[a]	83.2[a]	31.4[a]	5.7[a]	879[a]
Cruiser 5FS (0.340 mg ai/seed)	4.5[a]	1.17[a]	83.9[a]	31.8[a]	5.7[a]	838[a]
Nontreated	4.7[a]	1.19[a]	84.6[a]	31.8[a]	5.4[a]	848[a]
LSD (P = 0.05)	NS[1/]	NS	NS	NS	NS	NS
P > F	.6738	.8680	.1430	.3259	.9008	.8872

Means in a column followed by the same letter are not significantly different by ANOVA.
[1/]NS = Not Significant

EVALUATION ON COTTON OF SYSTEMIC GRANULAR AND SEED TREATMENT INSECTICIDES FOR THRIPS CONTROL WITH AND WITHOUT FOLIAR ORTHENE

Hansen Farm, Matagorda County, 2010

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SUMMARY: Temik applied in-furrow at-planting, Gaucho Grande and Cruiser applied as seed treatments were compared with and without acephate (Orthene) as overspray on 3 dates to determine impact on thrips numbers and other cotton insects, plant vigor, and lint production. No effects were found on aphids, mites, or fire ants. Thrips were generally reduced by the treatments although their numbers in non-insecticide treated cotton were relatively low. As in other tests conducted in the past, plant vigor rating was more important than thrips numbers in predicting affects on lint production. In this test all insecticides provided significantly better vigor ratings compared to ratings in the nontreated cotton, but Orthene used as a foliar spray did not have as good a vigor rating as Temik, Gaucho Grande, or Cruiser. No yield improvement was obtained by over-spraying cotton treated with at-plant insecticides. Gaucho Grande with and without Orthene, and Cruiser alone treated cotton had significantly more lint production than did the nontreated cotton. Numerically, all Temik, Gaucho Grande, and Cruiser treated cotton had higher yields compared to the nontreated; however, the yield level where Orthene was used alone as a foliar spray was numerically less than the nontreated cotton.

OBJECTIVES: The primary objectives were to determine the effect of foliar applied Orthene used alone or as an overspray on Temik, Gaucho Grande, or Cruiser at-plant insecticide treatments for thrips, and to measure the impact of treatments on lint production.

MATERIALS/METHODS: The test was conducted on Hansen Farm in Matogorda County about 1 mile east of FM 1095 on the north side of FM 521. Sorghum had been grown on the site the previous season. Cotton variety FM 1740B2F was planted on April 6, 2010 with a 2-row John Deere model 7100 planter equipped with Almaco research cone seed dispensers in 4-row by 35-foot plots arranged in a randomized complete block design with 4 replications of treatments. A total of 48,000 seed was planted/acre. Gaucho Grande and Cruiser were applied to seed in a small concrete mixer which was rotated for 3 minutes after the treatments were applied to coat the seeds. Temik 15G (3.5 lb/acre) was applied into the seed furrows through 6-inch banders oriented parallel with the rows. Foliar Orthene 97 (4 ounces/acre) was applied on 4/22 (17 DAP) (4 rows, 12 gpa volume, 25 psi, 5 mph, 8003 XR nozzles), 4/29 (24 DAP) (2 center rows, 10 gpa volume, 30 psi, 4 mph, 110015 nozzles), and 5/4 (29 DAP) (4 rows, 5.1 gpa, 30 psi, 4.2 mph, 4X hollow cone nozzles). Variation in the spraying operation was due to windy conditions at the test site on the first two foliar treatment dates so we took action to reduce potential for drift.

Soil moisture on the date of planting was excellent below the surface but some difficulty was experienced in seed depth placement. The soil contained 2.72% organic matter, had a 7.2 pH, and was classified as clay (34% sand, 17% silt, 49% clay). Following planting Cotoran (1.0

quarts/acre) + Dual II Magnum (1.3 pints/acre) was broadcast over the test. The few weeds that emerged later were removed by hand.

Treatments were assessed by (1) cutting 10 plants/plot and placing them in 70% ETOH for later examination with magnification after washing and filtering for thrips, aphids, mites, and fire ants on 4/27 at the 2-true leaf stage [22 DAP] and again on 5/6 at the 4-true leaf stage [30 DAP], (2) estimating visually plant vigor and damage where 1 = no damage up to 5 = severe stunting and leaf curling at 4 true leaves on 5/5, and (3) harvesting the third row in each plot on 8/31 with an International Harvester model 120A 1-row spindle picker. Seed cotton was weighed, a sample was taken for ginning on a 10-saw Eagle laboratory machine for lint percentage, and 50 grams of lint were sent to the Fiber and Biopolymer Research Institute at Lubbock, Texas for fiber analysis.

Agriculture Research Manager (ARM revision 6.1.13) software was used to conduct analysis of variance (ANOVA). Means were separated by least significant difference (LSD) for ease of data presentation.

RESULTS/DISCUSSION: Thrips infestation at the 2-leaf stage was relatively low numbering slightly over 1/plant in the nontreated cotton (Table 1). Their numbers had increased by the 4-leaf stage in insecticide treated cotton, but numbers were still below treatment threshold for cotton at that growth stage. Significantly fewer total thrips (larvae + adults) were found in insecticide treated cotton at the 2-leaf stage, but by the 4-true leaf stage the greatest number of thrips were found in the Cruiser and Gaucho Grande treated cotton on which no Orthene had been applied. Except for these same two treatments, the average thrips numbers over both leaf stages were below 1/plant in insecticide treated cotton. Nontreated cotton also had 1.41 thrips per plant averaged over both leaf stages. The Orthene treatment did not significantly reduce thrips numbers compared to Temik or Gaucho Grande, but significantly fewer were found in Cruiser + foliar Orthene treated cotton compared to Cruiser alone. In summary, thrips numbers were relatively low with impact on plants expected only at the 2-leaf stage.

Except for aphid numbers at the 2-leaf stage where significantly more were found in nontreated cotton, no differences were found in aphid or mite numbers (Table 2). There was, however, a striking decrease in plant vigor at 29 days after planting in the nontreated cotton. Furthermore, Orthene alone treated plants showed less vigor than the Temik, Gaucho Grande, and Cruiser treatments with or without foliar Orthene. Just as found in previous tests, plant vigor ratings appear to provide better information as to plant response from thrips control than the number of thrips.

No differences were observed in fire ant numbers (Table 3). Generally fire ant numbers are greater where aphid populations are high. Aphid numbers were not high in the test.

No differences were found in cotton fiber characteristics, but there was significant improvement in lint production in some treatments (Table 4). Numerically the lowest yield was in the Orthene alone treated cotton. Treatments with statistically more lint yield compared to nontreated cotton included Gaucho, Gaucho + Orthene, and Cruiser (without foliar treatment). Again, with the exception of Orthene alone treated cotton, all other treatments produced more lint compared with the non-insecticide treated cotton.

ACKNOWLEDGMENTS: Bill Hansen is thanked for providing land and his time in conduct of the field study. Rudy Alaniz and Clint Livingston, Demonstration Assistants, provided help in planting, treating, harvesting, and processing of seed cotton samples. The Texas Department of Agriculture Food and Fibers Research Council is thanked for funding the cost of fiber analysis, and Texas Tech University Fiber and Biopolymer Research Institute is acknowledged for providing fiber analysis data.

Table 1. Thrips numbers on cotton treated with systemic insecticide applied to seed or placed into the seed furrow compared with these treatments where foliar Orthene was applied, Hansen Farm, Matagorda County, TX, 2010.

Treatment (rate)	Orthene foliar[1/]	Number thrips per 10 plants						
		2-leaf (22 DAP)[2/]			4-leaf (30 DAP)			2-date avg. (total)
		larva	adult	total	larva	adult	total	
Temik 15G (3.5 lb/acre)	No	1.3[b]	1.8[b]	3.0[bc]	2.5[a]	13.5[abc]	16.0[bc]	9.5[bc]
Temik 15G (3.5 lb/acre)	Yes	0.5[b]	2.0[b]	2.5[bc]	0.0[a]	4.5[c]	4.5[c]	3.5[c]
Gaucho Grande 5FS (0.375 mg ai/seed)	No	0.0[b]	3.0[b]	3.0[bc]	7.0[a]	14.5[ab]	21.5[ab]	12.3[abc]
Gaucho Grande 5FS (0.375 mg ai/seed)	Yes	0.0[b]	1.0[b]	1.0[c]	0.5[a]	6.5[bc]	7.0[bc]	4.0[c]
Cruiser 5FS (0.34 mg ai/seed)	No	0.3[b]	5.5[a]	5.8[b]	16.5[a]	19.5[a]	36.0[a]	20.9[a]
Cruiser 5FS (0.34 mg ai/seed)	Yes	0.0[b]	2.8[b]	2.8[bc]	0.0[a]	6.5[bc]	6.5[bc]	4.6[c]
Orthene 97 (4.0 oz/acre)	Yes	2.0[b]	1.5[b]	3.5[bc]	0.0[a]	8.5[bc]	8.5[bc]	6.0[bc]
Nontreated	No	7.5[a]	2.8[b]	10.3[a]	6.5[a]	11.5[abc]	18.0[bc]	14.1[ab]
LSD (P = 0.05)		3.64	2.27	4.35	NS[3/]	9.20	16.94	9.03
P > F		.0045	.0174	.0088	.0837	.0416	.0144	.0067

Means in a column followed by the same letter are not significantly different by ANOVA.

[1/] Orthene 97 (4.0 oz/acre) was applied on 4/22, 4/29, and 5/4 (16, 23 and 28 DAP, respectively).

[2/] DAP = Days After Planting

[3/] NS = Not Significant

Table 2. Aphid and mite numbers, and vigor rating in cotton treated with systemic insecticide applied to seed or placed into the seed furrow compared with these treatments where foliar Orthene was applied, Hansen Farm, Matagorda County, TX, 2010

		Number aphids/10 plants		Number mites/10 plants		
Treatment (rate)	Orthene foliar[1/]	2-leaf (22 DAP)[2/]	4-leaf (30 DAP)	2-leaf (22 DAP)	4-leaf (30 DAP)	Vigor Rating[4/] (29 DAP)
Temik 15G (3.5 lb/acre)	No	5.5[b]	6.5[a]	0.5[a]	0.0[a]	1.5[c]
Temik 15G (3.5 lb/acre)	Yes	1.3[b]	0.5[a]	0.0[a]	1.5[a]	1.4[c]
Gaucho Grande 5FS (0.375 mg ai/seed)	No	8.5[b]	7.0[a]	0.5[a]	5.5[a]	1.9[c]
Gaucho Grande 5FS (0.375 mg ai/seed)	Yes	8.5[b]	3.5[a]	0.5[a]	38.5[a]	1.4[c]
Cruiser 5FS (0.34 mg ai/seed)	No	5.3[b]	4.5[a]	1.3[a]	7.5[a]	1.4[c]
Cruiser 5FS (0.34 mg ai/seed)	Yes	7.5[b]	0.0[a]	0.0[a]	1.5[a]	1.5[c]
Orthene 97 (4.0 oz/acre)	Yes	14.8[b]	2.5[a]	0.5[a]	1.5[a]	2.6[b]
Nontreated	No	75.8[a]	543.0[a]	1.8[a]	17.0[a]	3.9[a]
LSD (P = 0.05)		36.64	NS	NS[3/]	NS	0.65
P > F		.0074	.1245	.6576	.5625	.0001

Means in a column followed by the same letter are not significantly different by ANOVA.

[1/]Orthene 97 (4.0 oz/acre) was applied on 4/22, 4/29, and 5/4 (16, 23 and 28 DAP, respectively).

[2/]DAP = Days After Planting

[3/]NS = Not Significant

[4/]Vigor ratings range from 1 = No damage up to 5 = severe stunting, cupped-up leaves, and uneven plant growth.

Table 3. Fire ant number on cotton treated with systemic insecticide applied to seed or placed into the seed furrow compared with these treatments where foliar Orthene was applied, Hansen Farm, Matagorda County, TX, 2010

		Number fire ants/10 plants	
Treatment (rate)	Orthene Foliar[1/]	2-leaf (22 DAP)[2/]	4-leaf (30 DAP)
Temik 15G (3.5 lb/acre)	No	0.5[a]	4.0[a]
Temik 15G (3.5 lb/acre)	Yes	0.0[a]	0.0[a]
Gaucho Grande 5FS (0.375 mg ai/seed)	No	0.0[a]	1.5[a]
Gaucho Grande 5FS (0.375 mg ai/seed)	Yes	0.0[a]	0.0[a]
Cruiser 5FS (0.34 mg ai/seed))	No	0.0[a]	0.0[a]
Cruiser 5FS (0.34 mg ai/seed)	Yes	0.0[a]	0.0[a]
Orthene 97 (4.0 oz/acre)	Yes	0.3[a]	0.5[a]
Nontreated	No	3.8[a]	32.5[a]
LSD (P = 0.05)		NS[3/]	NS
P > F		.1117	.3113

Means in a column followed by the same letter are not significantly different by ANOVA.
[1/]Orthene 97 (4.0 oz/acre) was applied on 4/22, 4/29, and 5/4 (16, 23 and 28 DAP, respectively).
[2/]DAP = Days After Planting
[3/]NS = Not Significant

Table 4. Fiber characteristics and yield of cotton treated with systemic insecticide applied to seed or placed into the seed furrow compared with these treatments where foliar Orthene was applied, Hansen Farm, Matagorda County, TX, 2010.

Treatment (rate)	Orthene foliar	Mic	Length Inches	Unif Ratio	Strength g/tex	Elong %	Lint yield lb/acre
Temik 15G (3.5 lb/acre)	No	4.5[a]	1.15[a]	83.4[a]	31.3[a]	5.7[a]	798[abc]
Temik 15G (3.5 lb/acre)	Yes	4.5[a]	1.18[a]	83.9[a]	31.5[a]	5.7[a]	769[abc]
Gaucho Grande 5FS (0.375 mg ai/seed)	No	4.5[a]	1.17[a]	83.3[a]	31.1[a]	5.6[a]	852[a]
Gaucho Grande 5FS (0.375 mg ai/seed)	Yes	4.6[a]	1.17[a]	83.9[a]	31.3[a]	5.6[a]	870[a]
Cruiser 5FS (0.34 mg ai/seed))	No	4.5[a]	1.16[a]	84.0[a]	31.3[a]	5.6[a]	858[a]
Cruiser 5FS (0.34 mg ai/seed)	Yes	4.4[a]	1.18[a]	84.2[a]	31.4[a]	5.7[a]	826[ab]
Orthene 97 (4.0 oz/acre)	Yes	4.6[a]	1.16[a]	84.2[a]	30.6[a]	5.6[a]	700[c]
Nontreated	No	4.5[a]	1.16[a]	83.4[a]	31.3[a]	5.7[a]	746[bc]
LSD (P = 0.05)		NS[2/]	NS	NS	NS	NS	103.5
P > F		.8961	.2241	.4127	.8969	.9871	.0258

Means in a column followed by the same letter are not significantly different by ANOVA.
[1/]Orthene 97 (4.0 oz/acre) was applied on 4/22, 4/29, and 5/4 (16, 23 and 28 DAP, respectively).
[2/]NS = Not Significant

EVALUATION OF NEW INSECTICIDES FOR COTTON FLEAHOPPER CONTROL

Texas AgriLife Research and Extension Center, Nueces County, 2010

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SUMMARY: The cotton fleahopper is a key pest that feeds on small squares of cotton across Texas and is usually present in damaging numbers every year along the Gulf Coast. The insect has not been difficult to control with insecticide, but information is constantly needed on insecticide secondary effects, cost, length of control, and the effectiveness of new chemistry.

In this study all insecticides kept post-treatment fleahopper average counts below the economic treatment threshold which consisted of counts at 2 and 6 DAT-1 and 2, 6, and 10 DAT-2. Higher spider mite damage ratings (average of ratings at 2 and 6 DAT-2) were found in Centric and Belay (alone) treated cotton although the rating was not statistically greater than that found in the sulfoxaflor treatments. Treatments did not affect fiber characteristics nor were statistical differences observed in lint production. However, all insecticide treatments showed a numerical increase in lint production, and with the exception of the low rate of sulfoxaflor, insecticide treated cotton yields exceeded the nontreated cotton by more than 50 lb lint/acre (54-141 lb). It appears that the yield increases were real, but with a probability value of 0.11 instead of 0.05 such claim is questionable.

OBJECTIVES: Insecticides were evaluated for effectiveness on cotton fleahopper, other arthropods, and for impact on cotton lint production.

MATERIALS/METHODS: The cotton variety PHY 367WRF was planted at 55,000 seed/acre on March 26, 2010 at the Texas AgriLife Research and Extension Center Meaney Annex at Corpus Christi, Texas with a 4-row John Deere model 6100 planter equipped with Almaco cone seed dispensers. No crop was on the land in 2009 due to serve drought conditions. The treatments were arranged in a randomized complete block design with 4 replications in 8-row by 35 foot plots with rows spaced on a 38-inch pattern and with a 5-foot alley between replications. Herbicide consisted of Cotoran (1.0 quarts/acre) + Dual II Magnum (1.0 pints/acre) applied just after planting. Treflan 4L (1.0 quarts/acre) had been applied and incorporated in November 2009. Glysophate was applied during first bloom for emerged weeds. Plant growth regulator (Stance 3.0 ounces/acre) was applied on 6/14 in 15 gpa total volume. The only other insecticide applied during the season was Bidrin 4E (8.0 ounces/acre) on 7/14 for brown stink bug.

Fleahopper treatments were applied to the center 4 rows in plots with a Spider Trac sprayer calibrated to deliver 5.1 gpa through 4X hollow cone nozzles at 40 psi traveling at 4.25 mph. Dyne-Amic at 0.25% v/v was used with all insecticides. UAN was used with the CMT4586 treatment at 2.5% v/v. Insecticide treatments were applied on 5/14 and 5/21. There were 8-rows of buffer cotton between the treated rows.

Treatments were assessed by (1) counting fleahopper nymphs and adults on 20 plants/plot on 5/12 during the second week of squaring for pretreatment counts; (2) visually examining 20 plants/plot for fleahopper nymphs and adults on 5/17 [3 DAT-1], 5/20 [6 DAT-1], 5/24 [3 DAT-2], 5/27 [6 DAT-2], and on 5/31 [10 DAT-2]; (3) rating plots on a 1 to 5 scale for mite and aphid infestation and damage where 1 = none up to 5 = noticeable mites or aphids and effects on leaves; and (4) harvesting the center 2 rows in plots with a John Deere model 9900L spindle picker on 8/16. Seed cotton samples were weighed, a sample taken for ginning on a 10-saw Eagle laboratory machine, and a 50-gram sample was taken for fiber analysis. Fiber analysis was conducted by the Texas Tech University Fiber and Biopolymer Research Institute at Lubbock Texas.

Agriculture Research Manager (ARM revision 6.1.13) software was used to conduct analysis of variance (ANOVA). Means were separated by least significant difference (LSD) for ease of table presentation.

RESULTS/DISCUSSION: Fleahopper nymph, adult, and total counts are shown in Tables 1-3. Nymph + adult fleahoppers averaged 24.7/100 plants two days before first treatment with about equal numbers of nymphs and adults represented in the counts. By 3 DAT-1 (DAT = days after treatment) total fleahopper numbers had been reduced to below the 15/100 plant treatment threshold except for treatment CMT4586 which was slightly above the treatment threshold. Fleahopper counts in nontreated cotton had risen to 75 fleahoppers/100 plants. At 6 DAT-1 (5/20) only two treatments (Sulfoxaflor low rate and CMT4586) exceeded by a small margin the treatment threshold and numbers in nontreated cotton by that time exceeded 1/plant. A second treatment was applied on 5/21, and 3 DAT-2 number of fleahoppers were very low in insecticide treated cotton; whereas, they still exceeded 1/plant in the nontreated cotton. By 6 and 10 DAT-2 treatment effects were still obvious. All insecticide treatments maintained the post-treatment average counts below treatment threshold through 10 DAT-2; cotton by that time had been blooming for over one week. The most dramatic numerical reduction in fleahopper numbers was found in Belay treated cotton.

No differences were observed in aphid ratings among the treatments, but mite damage ratings were elevated in Centric and Belay (used alone) treated cotton but were not statistically different from the sulfoxaflor treatments (Table 4). Both Centric and Belay are in the neonicotinoid chemical class and have been suspected of contributing to increased spider mite activity. The mite damage was noticeable and may have had some effect on lint production.

Dry conditions were evident at the test site as indicated by the cotton being at 7 nodes above white bloom (NAWB) early in the first week of bloom. Although rainfall was received about 10 days later, the crop proceeded quickly to 5 NAWB. Statistical effect on lint production was not found (Table 5). The probability level (0.11) tended toward a statistical effect on lint production, and all insecticide treatments numerically produced more lint. No effect was observed on lint characteristics. Using lint figures alone without regard to lack of statistical differences, insecticide treated cotton averaged 75 lb lint/acre more than the nontreated cotton. It was surprising that we could not show a statistically significant difference in yield at the 5% probability; our inability to show a statistical difference may have been due to lack of spindle picker efficiency; that is, the doffers were not operating correctly.

ACKNOWLEDGMENTS: Dow AgroSciences, Valent, and Bayer CropScience are acknowledged for their support of the study. Rudy Alaniz and Clint Livingston, Demonstration Assistants, are thanked for every aspect of production, treating, harvesting, and processing seed cotton. Thanks are extended to the Texas Department of Agriculture Food and Fibers Research Council for paying for fiber analysis, and to Texas Tech University Fiber and Biopolymer Research Institute for providing fiber analysis.

Table 1. Fleahopper **nymphs** in insecticide treated cotton, Texas AgriLife Research and Extension Center, Nueces County, TX, 2010.

Treatment[1/] (rate)	Average number per 100 plant terminals						Post-treat. average
	Pretreat	3 DAT-1	6 DAT-1	3 DAT-2	6 DAT-2	10 DAT-2	
Centric 40WG (1.25 oz/acre)	15.0[a]	1.3[b]	6.3[b]	0.0[b]	1.3[b]	2.5[b]	2.3[b]
Sulfoxaflor 50WP (0.714 oz/acre)	12.5[a]	5.0[b]	13.8[b]	1.3[b]	3.8[b]	5.0[b]	5.8[b]
Sulfoxaflor 50WP (1.427 oz/acre)	11.3[a]	1.3[b]	5.0[b]	0.0[b]	0.0[b]	0.0[b]	1.3[b]
Belay 2.13SC (4.0 oz/acre)	11.3[a]	0.0[b]	0.0[b]	0.0[b]	0.0[b]	1.3[b]	0.3[b]
Belay +Discipline 2EC (4.0 + 2.0 oz/acre)	12.5[a]	0.0[b]	0.0[b]	0.0[b]	0.0[b]	0.0[b]	0.0[b]
CMT4586 2SC (8.0 oz/acre)	15.0[a]	7.5[b]	5.0[b]	0.0[b]	3.8[b]	7.5[b]	4.8[b]
Nontreated	11.3[a]	57.5[a]	87.5[a]	107.5[a]	90.0[a]	47.5[a]	78.0[a]
LSD (P = 0.05)	NS[2/]	7.93	25.36	12.26	26.40	17.55	9.81
P > F	.8806	.0001	.0001	.0001	.0001	.0002	.0001

Means in a column followed by the same letter are not significantly different by ANOVA.
[1/]Treatments were applied on 5/14 and 5/21.
[2/]NS = Not Significant.

Table 2. Fleahopper **adults** in insecticide treated cotton, Texas AgriLife Research and Extension Center, Nueces County, TX, 2010.

Treatment[1/] (rate)	Average number per 100 plant terminals						Post-treat. Average
	Pretreat	3 DAT-1	6 DAT-1	3 DAT-2	6 DAT-2	10 DAT-2	
Centric 40WG (1.25 oz/acre)	18.8[a]	7.5[bc]	2.5[c]	1.3[a]	5.0[a]	7.5[b]	4.8[c]
Sulfoxaflor 50WP (0.714 oz/acre)	6.3[a]	3.8[bcd]	3.8[c]	0.0[a]	15.0[a]	3.8[b]	5.3[c]
Sulfoxaflor 50WP (1.427 oz/acre)	7.5[a]	3.8[bcd]	1.3[c]	1.3[a]	13.8[a]	5.0[b]	5.0[c]
Belay 2.13SC (4.0 oz/acre)	13.8[a]	0.0[d]	1.3[c]	0.0[a]	6.3[a]	3.8[b]	2.3[c]
Belay +Discipline 2EC (4.0 + 2.0 oz/acre)	16.3[a]	1.3[cd]	1.3[c]	0.0[a]	3.8[a]	3.8[b]	2.0[c]
CMT4586 25C (8.0 oz/acre)	8.8[a]	8.8[b]	12.5[b]	1.3[a]	16.3[a]	7.5[b]	9.3[b]
Nontreated	12.5[a]	17.5[a]	25.0[a]	10.0[a]	11.3[a]	22.5[a]	17.3[a]
LSD (P = 0.05)	NS[2/]	7.13	5.62	NS	NS	8.47	3.34
P > F	.4499	.0012	.0001	.1931	.1010	.0020	.0001

Means in a column followed by the same letter are not significantly different by ANOVA.

[1/]Treatments were applied on 5/14 and 5/21

[2/]NS = Not Significant.

Table 3. Fleahopper **nymphs and adults** in insecticide treated cotton, Texas AgriLife Research and Extension Center, Nueces County, TX, 2010.

Treatment[1/] (rate)	Average number per 100 plant terminals						Post-treat. average
	Pretreat	3 DAT-1	6 DAT-1	3 DAT-2	6 DAT-2	10 DAT-2	
Centric 40WG (1.25 oz/acre)	33.8[a]	8.8[bc]	8.8[b]	1.3[b]	6.3[b]	10.0[b]	7.0[bc]
Sulfoxaflor 50WP (0.714 oz/acre)	18.8[a]	8.8[bc]	17.5[b]	1.3[b]	18.8[b]	8.8[b]	11.0[bc]
Sulfoxaflor 50WP (1.427 oz/acre)	18.8[a]	5.0[bc]	6.3[b]	1.3[b]	13.8[b]	5.0[b]	6.3[bc]
Belay 2.13SC (4.0 oz/acre)	25.0[a]	0.0[c]	1.3[b]	0.0[b]	6.3[b]	5.0[b]	2.5[c]
Belay +Discipline 2EC (4.0 + 2.0 oz/acre)	28.8[a]	1.3[c]	1.3[b]	0.0[b]	3.8[b]	3.8[b]	2.0[c]
CMT4586 25C (8.0 oz/acre)	23.8[a]	16.3[b]	17.5[b]	1.3[b]	20.0[b]	15.0[b]	14.0[b]
Nontreated	23.8[a]	75.0[a]	112.5[a]	117.5[a]	101.3[a]	70.0[a]	95.3[a]
LSD (P = 0.05)	NS[2/]	12.57	29.04	17.09	28.40	16.15	11.05
P > F	.6746	.0001	.0001	.0001	.0001	.0001	.0001

Means in a column followed by the same letter are not significantly different by ANOVA.

[1/]Treatments were applied on 5/14 and 5/21.

[2/]NS = Not Significant

Table 4. Impact of fleahopper insecticides on spider mites and aphid ratings, Texas AgriLife Research and Extension Center, Nueces County, TX, 2010.

Treatment[1/] (rate)	Mite damage rating[2/]				Aphid[5/] rating
	3 DAT-2[3/]	6 DAT-2	10 DAT-2	Avg.	
Centric 40WG (1.25 oz/acre)	3.3[a]	2.3[a]	3.8[a]	3.1[a]	2.0[a]
Sulfoxaflor 50WP (0.714 oz/acre)	2.5[a]	2.0[a]	2.3[bc]	2.3[ab]	2.3[a]
Sulfoxaflor 50WP (1.427 oz/acre)	2.3[a]	2.0[a]	2.5[b]	2.3[ab]	1.5[a]
Belay 2.13SC (4.0 oz/acre)	3.3[a]	2.5[a]	4.5[a]	3.4[a]	1.8[a]
Belay +Discipline 2EC (4.0 + 2.0 oz/acre)	1.0[a]	1.0[a]	1.3[c]	1.1[b]	2.3[a]
CMT4586 25C (8.0 oz/acre)	1.0[a]	1.0[a]	1.3[c]	1.1[b]	2.0[a]
Nontreated	1.5[a]	1.3[a]	1.8[bc]	1.5[b]	1.8[a]
LSD (P = 0.05)	NS[4/]	NS	1.24	1.27	NS
P > F	.1348	.1281	.0001	.0048	.1794

Means in a column followed by the same letter are not significantly different by ANOVA.
[1/]Treatments were applied on 5/14 and 5/21.
[2/]Damage ratings: 1 = no damage up to 5 = most leaves exhibiting mite damage.
[3/]DAT = Days After Treatment
[4/]NS = Not Significant
[5/]Aphid rating: 1 = very few aphids up to 5 = 50+aphids/leaf.

Table 5. Cotton fiber characteristics and lint production in cotton treated with various insecticides for fleahopper control, Texas AgriLife Research and Extension Center, Nueces County, TX, 2010.

Treatment[1/] (rate)	Mic	Length inches	Unif. %	Strength g/tex	Elong. %	Yield lb lint/acre
Centric 40WG (1.25 oz/acre)	5.2[a]	1.09[a]	82.6[a]	28.9[a]	7.4[a]	1404[a]
Sulfoxaflor 50WP (0.714 oz/acre)	4.9[a]	1.10[a]	81.8[a]	29.2[a]	7.6[a]	1477[a]
Sulfoxaflor 50WP (1.427 oz/acre)	4.9[a]	1.10[a]	81.9[a]	29.5[a]	7.8[a]	1348[a]
Belay 2.13SC (4.0 oz/acre)	4.9[a]	1.09[a]	82.6[a]	28.9[a]	7.4[a]	1390[a]
Belay +Discipline 2EC (4.0 + 2.0 oz/acre)	5.0[a]	1.08[a]	82.3[a]	29.6[a]	7.8[a]	1435[a]
CMT4586 25C (8.0 oz/acre)	5.0[a]	1.08[a]	82.4[a]	28.6[a]	7.5[a]	1412[a]
Nontreated	5.1[a]	1.12[a]	82.4[a]	30.7[a]	7.8[a]	1336[a]
LSD (P = 0.05)	NS[2/]	NS	NS	NS	NS	NS
P > F	.1014	.1357	.7195	.1795	.7016	.1100

Means in a column followed by the same letter are not significantly different by ANOVA.
[1/]Treatments were applied on 5/14 and 5/21.
[2/]NS = Not Significant

COMPARISON OF INSECTICDES FOR EFFECT ON COTTON FLEAHOPPER AND IMPACT ON NATURAL ENEMIES AND LINT PRODUCTION

Michael Watz Farm, Wharton County, 2010

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SUMMARY: Cotton fleahopper numbers were very high at the cotton test site from the initiation of squaring. All insecticides provided significant control of the target insect pest, but several factors may not have allowed full yield response of the cotton to the treatments. These factors included minor chemical damage which interfered with initiation of squaring, wet soil conditions which resulted in plant wilt and possible loss of squares, rainfall which prevented timely application of treatments, and problems associated with picker efficiency. Nevertheless, several things were evident to include (1) superior control of fleahopper nymphs and longer residual control with some of the insecticides tested, (2) fewer aphids and respective damage in Intruder-, Centric-, and Trimax Pro-treated cotton, and (3) higher numerical yields in all insecticide-treated cotton. The yield increase averaged 84.6 lb lint/acre over the nontreated cotton with a range of 72 to 132 lb lint/acre more than the nontreated cotton. We admit it is dangerous to suggest a yield increase when it could not be shown statistically; however, given that yields were numerically higher in all insecticide treatments compared with nontreated cotton and that field studies in the past had shown statistical yield response with insecticide treatments, we believed it served a purpose to show the data in the light of a realized true response to cotton fleahopper control.

OBJECTIVES: The test was established to measure the impacts of various insecticides on fleahopper control and non-target arthropods, and the effects on plant fruiting characteristics and lint production.

MATERIALS/METHODS: The fleahopper control study was conducted on PHY 440W variety cotton located on the Michael Watz Farm 0.7 miles from County Road 405 on County Road 400 near El Campo, Texas in Wharton County (N29º 12.828' W096º 13.039'). Rows were spaced on 39-inch centers and 12 rows were set aside for each plot. Treatments were applied to the center 8 rows of the plots. Plots were 50 feet long with treatments randomized down the field thereby reducing the width required for the test. Treatments were replicated 4 times.

Insecticides were applied with a self-propelled Spider Trac ground sprayer where the first treatment on 5/10 was made with alternate spray tips that consisted of 11003 air induction nozzles in a total volume of 12.0 gpa at 25 psi traveling 5.5 mph. Due to windy conditions, only alternate spray tips were used on this first application. Treatments made 5/21 and 6/1 were applied through 4X hollow cone spray nozzles in a total volume of 5.1 gpa at 40 psi traveling at 4.25 mph. The 5/10 treatment was made when the cotton first began to produce small squares (7 true leaf stage). Treatments were assessed by (1) visually counting fleahoppers on 20 plants in each plot just before the first insecticide treatment date; 3 and 10 DAT-1 [days after treatment 1]; 3, 7 and 10 DAT-2; and 6 and 10 DAT-3; (2) rating each plot for aphid infestation level and damage [1 = very few aphids and little damage up to 5 = many aphids and noticeable honeydew]; (3) selecting 6 plants from each plot in the Centric and nontreated cotton for plant mapping using the P-MAP program on 8/25; and (4) harvesting row 5 in each plot on 8/25 with a 1-row International Harvester model 120A spindle picker. Seed cotton samples were weighed, and a subsample was selected for ginning on a 10-saw Eagle laboratory machine to determine percentage lint. Fifty gram lint samples were sent to the Fiber and Biopolymer Research Institute, Texas Tech University, Lubbock, Texas for fiber analysis.

Beneficial arthropod population levels were assessed using a hand-held pneumatic sampler known as the Keep-It-Simple-Sampler (KISS). Plots were sampled on 10 May (pre-treat counts for 1st application), 19 May (9 DAT-1, pre-treat count for 2nd application), 24 May (3 DAT-2), 28 May (7 DAT-2), 1 June (pre-treat counts for 3rd application), 4 June (3 DAT-3), and 10 June (7 DAT-3). On each sampling date, one treated row in each plot was selected (excluding the center two rows) and the entire length of row (50 ft) within the plot was sampled with a KISS. Rows were systematically selected on each date to avoid sampling adjacent rows on consecutive dates and to prevent sampling a row more than once during the study. Captured contents from each plot were transferred into separate sealable plastic bags and were placed in a cooler equipped with ice packs. Upon return to a laboratory, bags were placed in a freezer overnight to kill or at least debilitate captured arthropods. The numbers of spiders, ladybird beetles, lacewings, minute pirate bugs, big-eyed bugs, damsel bugs, syrphid flies, and predaceous stink bugs collected from each plot were recorded. With the exception of spiders, adults and immatures were counted separately.

Numbers of total beneficial arthropods on each sample date were analyzed using a generalized linear model analysis of variance (PROC GLM, SAS Institute 2006). Differences among treatments were identified using the REGWQ option of the means statement (P=0.05). However, arithmetic means and standard errors are reported.

Agriculture Research Manager (ARM revision 6.1.13) software was used to conduct analysis of variance and means were separated by LSD. Partial budgeting was used to compare the dollar returns from treatments using lint and seed value for the treatments compared with the nontreated cotton. Costs included chemical, application, and harvesting/hauling/ginning charges for the extra lint produced in the insecticide treated cotton.

RESULTS/DISCUSSION: At the 7-leaf stage it was noticed that cotton plants had been damaged by an unknown chemical which stunted plant growth, but some squares were present. Pretreatment counts were about double our selected treatment threshold of 15 fleahoppers/100 plants of which about 1/3rd were nymphs (Tables 1-3). The presence of nymphs in such numbers at this early growth stage is somewhat unusual. All insecticides provide excellent control as measured 3 DAT-1; fleahoppers were not detected in the Centric and Discipline treatments on this date. More than 5 inches of rainfall prevented counts from being made until 10 DAT-1 at which time very high numbers of fleahopper nymphs were counted in all treatments. Insecticide was applied again the day following the 10 DAT-1 counts which eliminated nearly all fleahoppers as measured on the 3 DAT-2 count; however, by 7 DAT-2 numbers of fleahoppers (mostly adults) in all insecticide treatments again exceeded the treatment threshold of 15/100 plant terminals. By 10 DAT-2 fleahopper numbers averaged 50/100 plants in the insecticide treated cotton and 130/100 plants in the nontreated cotton. It was noteworthy that no nymphs were detected in Centric treated cotton when counts were made 10 DAT-2. The 3rd treatment was applied 11 DAT-2, and by 6 DAT-3 (rainfall again prevented timely counts after this treatment) the only treatments that exceeded 15 fleahoppers/100 plants were Trimax Pro, Bidrin, and the nontreated cotton. By this date plants had started blooming. The fewest fleahoppers at 10 DAT-3 were found in the Discipline, Centric, and Orthene treatments, but statistically these counts were not different from those found in Bidrin and Intruder treatments. Post-treatment average counts of fleahoppers exceeded the treatment threshold for all insecticides. Centric-treated cotton had the lowest average counts; nontreated post-treatment counts averaged nearly 3 times more fleahoppers than did the insecticide treatments.

The Centric-treated and non-insecticide treated cotton were selected for plant mapping (P-MAP) when most bolls had opened (Table 4). Surprisingly, no differences were found in the plant mapping data, although there were obvious trends. Numbers of open bolls, bolls on fruiting branches 1-5, and percentage boll retention were numerically less in the nontreated cotton. Major differences in these fruiting parameters between Centric and nontreated cotton normally would have been expected due to the high fleahopper populations. Factors which may have contributed to the lack of statistical differences in cotton fruiting may have been (1) early damage to cotton by an unknown chemical, (2) heavy rains on two occasions which caused plant wilting and possible fruit shed, and (3) inability to apply all treatments in a timely fashion due to wet soil.

Aphid damage ratings, cotton fiber characteristics, lint production, and dollar return based on the numerical increase in yield compared with the nontreated cotton is provided in Table 5. Aphid damage was greatest in Discipline (pyrethroid)-treated and Bidrin + Discipline-treated cotton, but the rating was not different from the Orthene and Bidrin treatments. The lowest aphid damage ratings were in the nontreated, Intruder, -Centric, and -Trimax Pro-treated cotton (in that order from least to the highest rating). Statistical differences were only found in cotton fiber characteristics for the strength readings, but the differences could not be explained. There may have been a trend for greater fiber strength readings associated with low aphid damage ratings.

Overall, ladybird beetles and spiders accounted for approximately 50 and 27%, respectively, of the total abundance of arthropod predators encountered in the study. These findings are similar to our findings in 2009, but *Scymnus* spp. constituted the majority of labybird species in 2010 whereas *Hippodamia convergens* and *Harmonia spp*. were the most prevalent ladybird species encountered in 2009.

Counts of total predators were similar among treatments on all of the sample dates except on 4 June (Table 5). On this date, numbers of predators in plots treated with Bidrin + Discipline, Discipline, and Trimax Pro were significantly lower than those observed in nontreated plots. However, considering no differences were detected among treatments on the other sample dates, all of the tested insecticides appeared to have little or no adverse impact on predator abundance. However, several trends were apparent and should not be disregarded. For instance, nontreated plots typically had the highest numbers of natural enemies whereas plots treated with Discipline tended to have low numbers of predators. These trends suggest that at least some of the insecticides likely had an adverse impact on predator populations, although we were not able to demonstrate this impact statistically.

Although not different statistically all insecticide treatments resulted in higher lint yield than the nontreated cotton with an average yield increase of 84.6 lb/acre (range of 72-132 lb lint/acre). Inability to show statistical yield increase is unfortunate; it may have been caused by high variation in harvest due to a problem with the picker. Even though there was lack of statistical lint yield differences, dollar returns are given. Costs to calculate dollar return over the nontreated cotton included chemical and application costs and the cost of harvesting/hauling/ginning the extra lint compared to the nontreated cotton. Extra seed yield and value was also used in the calculations. Dollar return based on the data ranged from $27.04 to $55.75/acre. We acknowledge the fact that showing dollar return without statistical differences in yield is questionable; therefore the data should be used to show trends and basically back up other tests which did show significant differences.

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Table 1. Fleahopper **nymphs** in insecticide treated cotton, Michael Watz Farm, Wharton County, TX, 2010.

Treatment[1/] (rate)	Number per 100 plant terminals								
	Pretreat	3 DAT-1	10 DAT-1	3 DAT-2	7 DAT-2	10 DAT-2	6 DAT-3	10 DAT-3	Post-treat. avg.
Centric 40WG (1.25 oz/acre)	17.5[a]	0.0[b]	88.8[a]	0.0[b]	1.3[a]	0.0[b]	0.0[b]	15.0[d]	15.0[c]
Intruder 70WP (1.0 oz/acre)	10.0[a]	2.5[b]	115.0[a]	0.0[b]	0.0[a]	6.3[b]	1.3[b]	28.8[bcd]	22.0[bc]
Trimax Pro 4.44 (1.25 oz/acre)	10.0[a]	5.0[b]	105.0[a]	0.0[b]	0.0[a]	2.5[b]	6.3[b]	47.5[bc]	23.8[bc]
Orthene 97 (8.0 oz/acre)	12.5[a]	1.3[b]	128.8[a]	0.0[b]	0.0[a]	1.3[b]	1.3[b]	21.3[cd]	22.0[bc]
Bidrin 8E (3.2 oz/acre)	8.8[a]	0.0[b]	108.8[a]	1.3[b]	7.5[a]	12.5[ab]	8.8[b]	55.0[ab]	27.7[b]
Bidrin 8E+Discipline 2EC (1.6 oz/acre + 2.6 oz/acre)	18.8[a]	0.0[b]	90.0[a]	0.0[b]	1.3[a]	6.3[b]	3.8[b]	25.0[cd]	18.0[bc]
Discipline 2EC (5.2 oz/acre)	6.3[a]	0.0[b]	120.0[a]	0.0[b]	1.3[a]	1.3[b]	0.0[b]	10.0[d]	18.9[bc]
Nontreated	6.3[a]	33.8[a]	123.8[b]	43.8[a]	22.5[a]	21.3[a]	28.8[a]	82.5[a]	50.9[a]
LSD (P=0.05)	NS[2/]	6.88	NS	24.87	NS	12.95	9.39	29.56	10.64
P > F	.2337	.0001	.1625	.0153	.0779	.0365	.0001	.0007	.0001

Means in a column followed by the same letter are not significantly different by ANOVA.

[1/]Treatments were applied on 5/10, 5/21, and 6/1

[2/] NS = Not Significant

Table 2. Fleahopper **adults** in insecticide treated cotton, Michael Watz Farm, Wharton County, TX, 2010.

Treatment[1/] (rate)	Number per 100 plant terminals								
	Pretreat	3 DAT-1	10 DAT-1	3 DAT-2	7 DAT-2	10 DAT-2	6 DAT-3	10 DAT-3	Post-treat. avg.
Centric 40WG (1.25 oz/acre)	20.0[a]	0.0[a]	7.5[a]	0.0[b]	15.0[a]	21.3[c]	2.5[c]	6.3[a]	7.5[b]
Intruder 70WP (1.0 oz/acre)	22.5[a]	5.0[a]	2.5[a]	0.0[b]	20.0[a]	58.8[b]	11.3[bc]	10.0[a]	15.4[b]
Trimax Pro 4.44 (1.25 oz/acre)	18.8[a]	3.8[a]	2.5[a]	0.0[b]	13.8[a]	50.0[bc]	18.8[b]	11.3[a]	14.3[b]
Orthene 97 (8.0 oz/acre)	18.8[a]	1.3[a]	16.3[a]	0.0[b]	16.3[a]	33.8[bc]	1.3[c]	3.8[a]	10.4[b]
Bidrin 8E (3.2 oz/acre)	22.5[a]	5.0[a]	0.0[a]	2.5[b]	27.5[a]	52.5[b]	10.0[bc]	3.8[a]	14.5[b]
Bidrin 8E+Discipline 2EC (1.6 oz/acre + 2.6 oz/acre)	26.3[a]	2.5[a]	0.0[a]	0.0[b]	30.0[a]	60.0[b]	7.5[c]	6.3[a]	15.2[b]
Discipline 2EC (5.2 oz/acre)	25.0[a]	0.0[a]	0.0[a]	0.0[b]	23.8[a]	43.8[bc]	2.5[c]	8.8[a]	11.3[b]
Nontreated	18.8[a]	13.8[a]	8.8[a]	11.3[a]	46.3[a]	108.8[a]	53.8[a]	20.0[a]	37.5[a]
LSD (P=0.05)	NS[2/]	NS	NS	3.46	NS	30.54	11.16	NS	8.15
P > F	.5688	.0950	.0631	.0001	.2127	.0005	.0001	.2034	.0001

Means in a column followed by the same letter are not significantly different by ANOVA.
[1/]Treatments were applied on 5/10, 5/21, and 6/1.
[2/] NS = Not Significant

Table 3. Fleahopper **nymphs and adults** in insecticide treated cotton, Michael Watz Farm, Wharton County, TX, 2010.

Treatment[1/] (rate)	Number per 100 plant terminals								
	Pretreat	3 DAT-1	10 DAT-1	3 DAT-2	7 DAT-2	10 DAT-2	6 DAT-3	10 DAT-3	Post-treat.avg.
Centric 40WG (1.25 oz/acre)	37.5[a]	0.0[c]	96.3[a]	0.0[b]	16.3[b]	21.3[c]	2.5[d]	21.3[c]	22.5[c]
Intruder 70WP (1.0 oz/acre)	32.5[a]	7.5[bc]	117.5[a]	0.0[b]	20.0[b]	65.0[b]	12.5[cd]	38.8[bc]	37.3[b]
Trimax Pro 4.44 (1.25 oz/acre)	28.8[a]	8.8[b]	107.5[a]	0.0[b]	13.8[b]	52.5[bc]	25.0[b]	58.8[b]	38.0[b]
Orthene 97 (8.0 oz/acre)	31.3[a]	2.5[bc]	145.0[a]	0.0[b]	16.3[b]	35.0[bc]	2.5[d]	25.0[c]	32.3[bc]
Bidrin 8E (3.2 oz/acre)	31.3[a]	5.0[bc]	108.8[a]	3.8[b]	35.0[b]	65.0[b]	18.8[bc]	58.8[b]	42.1[b]
Bidrin 8E+Discipline 2EC (1.6 oz/acre + 2.6 oz/acre)	45.0[a]	2.5[bc]	90.0[a]	0.0[b]	31.3[b]	66.3[b]	11.3[cd]	31.3[bc]	33.2[bc]
Discipline 2EC (5.2 oz/acre)	31.3[a]	0.0[c]	120.0[a]	0.0[b]	25.0[b]	45.0[bc]	2.5[d]	18.8[c]	30.2[bc]
Nontreated	25.0[a]	47.5[a]	132.5[a]	55.0[a]	68.8[a]	130.0[a]	82.5[a]	102.5[a]	88.4[a]
LSD (P=0.05)	NS[2/]	8.21	NS	24.75	28.90	33.73	10.04	32.68	13.72
P > F	.2128	.0001	.0536	.0014	.0145	.0001	.0001	.0004	.0001

Means in a column followed by the same letter are not significantly different by ANOVA.
[1/]Treatments were applied on 5/10, 5/21 and 6/1.
[2/] NS = Not Significant

Table 4. Influence of insecticides on cotton boll production (per plant) and location on plant at harvest, Michael Watz Farm, Wharton County, TX, 2010.

Treatment[1/] (rate)	Bolls/ plant	% open bolls	No. bolls by branch group			% boll retention by branch group			
			1-5	6-10	11-15	1-5	6-10	11.15	all
Centric 40WG (1.25 oz/acre)	6.6[a]	100[a]	4.0[a]	2.5[a]	0.1[a]	37.5[a]	28.1[a]	2.3[a]	24.1[a]
Nontreated	6.1[a]	93.9[a]	2.9[a]	2.8[a]	0.4[a]	28.8[a]	29.8[a]	7.4[a]	24.6[a]
LSD (P = 0.05)	NS[2/]	NS	NS	NS	NS	NS	NS	NS	NS
P > F	.4928	.3346	.1284	.3813	.1980	.0703	.4200	.1167	.9505

Means in a column followed by the same letter are not significantly different by ANOVA.
[1/]Treatments were applied on 5/10, 5/21 and 6/1.
[2/] NS = Not Significant

Table 5. Impact of cotton fleahopper insecticides on the total abundance of arthropod predators, in Michael Watz Farm,Wharton County, TX, 2010.

Treatment[1/] (rate)	Mean number of total predators per 50 row ft (KISS) [2/]						
	10 May	19 May	24 May	28 May	1 June	4 June	10 June
Centric 40WG (1.25 oz/acre)	8.3[a]	7.5[a]	0.8[a]	5.3[a]	7.0[a]	5.0[ab]	6.5[a]
Intruder 70WP (1.0 oz/acre)	6.0[a]	8.0[a]	3.8[a]	9.0[a]	5.8[a]	3.5[ab]	2.5[a]
Trimax Pro 4.44 (1.25 oz/acre)	7.8[a]	6.8[a]	3.3[a]	5.8[a]	8.5[a]	2.5[b]	5.3[a]
Orthene 97 (8.0 oz/acre)	8.5[a]	6.8[a]	2.8[a]	5.8[a]	6.3[a]	5.5[ab]	7.5[a]
Bidrin 8E (3.2 oz/acre)	7.5[a]	7.0[a]	1.3[a]	5.5[a]	5.5[a]	6.5[ab]	3.5[a]
Bidrin 8E+Discipline 2EC (1.6 oz/acre + 2.6 oz/acre)	8.8[a]	6.3[a]	0.8[a]	6.3[a]	7.5[a]	2.5[b]	5.5[a]
Discipline 2EC (5.2 oz/acre)	8.8[a]	4.8[a]	2.0[a]	4.8[a]	5.0[a]	2.5[b]	5.0[a]
Nontreated	9.0[a]	5.8[a]	3.8[a]	9.8[a]	10.0[a]	7.5[a]	6.8[a]

Within a column, means followed by the same letter are not significantly different (REGWQ, *P*=0.05).

[1/] Insecticide treatments applied 5/10, 5/21, and 6/1.

[2/] Predators included immature and adult stages of spiders, ladybird beetles, minute pirate bugs, big-eyed bugs, damsel bugs, lacewings, syrphid flies, and predaceous stink bugs.

Table 6. Aphid damage rating, fiber characteristics, and lint production in cotton treated with various insecticides for fleahopper, Michael Watz Farm, Wharton County, TX, 2010.

Treatment[1/] (rate)	Aphid da. rating	Cotton fiber characteristics					Yield lb. lint/acre	$ return over
		Mic	Length increases	Unif. %	Strength g/tex	Elong. %		
Centric 40WG (1.25 oz/acre)	2.0[d]	5.2[a]	1.18[a]	84.5[a]	31.3[abc]	5.4[a]	894[a]	54.79
Intruder 70WP (1.0 oz/acre)	1.8[d]	5.2[a]	1.18[a]	83.8[a]	31.4[ab]	5.4[a]	863[a]	30.30
Trimax Pro 4.44 (1.25 oz/acre)	2.3[cd]	5.3[a]	1.17[a]	84.4[a]	31.1[abc]	5.3[a]	865[a]	51.72
Orthene 97 (8.0 oz/acre)	3.1[bc]	5.3[a]	1.17[a]	84.4[a]	31.6[a]	5.3[a]	861[a]	44.00
Bidrin 8E (3.2 oz/acre)	3.5[b]	5.3[a]	1.16[a]	84.4[a]	31.1[abc]	5.4[a]	867[a]	44.79
Bidrin 8E+Discipline 2EC (1.6 oz/acre + 2.6 oz/acre)	3.8[ab]	5.3[a]	1.17[a]	84.3[a]	30.4[c]	5.6[a]	839[a]	27.04
Discipline 2EC (5.2 oz/acre)	4.5[a]	5.4[a]	1.16	83.9	30.7[bc]	5.6[a]	899[a]	55.75
Nontreated	1.4[d]	5.3[a]	1.18[a]	84.6[a]	32.0[a]	5.5[a]	767[a]	
LSD (P=0.05)	0.92	NS[3/]	NS	NS	0.91	NS	NS	
P > F	.0001	.3467	.4370	.3331	.0416	.4055	.3806	

Means in a column followed by the same letter are not significantly different by ANOVA.
[1/]Treatments were applied on 5/10, 5/21 and 6/1.
[2/]Aphid damage rating rating: 1 = very few aphids up to 5 = many aphids and noticeable honeydew.
[3/]NS = Not Significant
[4/]Cotton valve based on $0.72/lb for lint and $0.093/lb for seed using a factor of 1.6 times lint weight. Insecticide costs include Centric 40WG ($19.89/acre), Intruder 70WP ($23.94/acre), Trimax Pro ($3.81/acre), Orthene 97 ($8.93/acre), Bidrin 8E ($7.92/acre), Bidrin+Discipline ($11.39/acre), and Discipline 2EC ($14.85/acre) for 3 treatments. Application cost was $9.00/acre. Harvesting/hauling/ginning the extra lint above nontreated was set at $0.21/lb lint.

EFFECT OF INSECTICIDE TREATMENT TIMING FOR FLEAHOPPERS WITH IMPACT ON COTTON FRUITING CHARACTERISTICS AND LINT PRODUCTION

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SUMMARY: Insecticide applied for fleahopper based on various treatment timings resulted in variation in intensity, duration, and time in the fruiting cycle that fleahoppers were present in specific cotton plots. Differences in this study as to fruiting habits measured by plant mapping and effects on lint production were not as striking as observed in a similar 2007 test at the same location even though fleahopper numbers were higher in the current study. However, the trends in fruiting and lint production were similar to that found in the earlier study. Generally we conclude that (1) for the cotton fleahopper, 2 treatments [possibly 3] are necessary, (2) control in the first week of squaring is not necessarily needed, and (3) available soil moisture can have dramatic effect on response of cotton to fleahopper control. Furthermore, it is dangerous to delay fleahopper control beyond the 2nd week of squaring even though that point was not demonstrated in the current study (shown in the 2007 study).

OBJECTIVES: The treatment timing study was conducted to determine how cotton plants respond from the standpoint of fruiting and growth to the initiation of fleahopper control during various weeks of squaring. Another objective was to measure the impact of treatments on lint production and measure dollar return from the insecticide treatments as related to the non-insecticide treated cotton.

MATERIALS/METHODS: Phytogen 367 WRF cotton variety was planted on March 26, 2010 at the Texas AgriLife Research and Extension Center Meaney Annex. The planting rate was 55,000 seed/acre, and rows were spaced on 38-inch centers. No fertilizer was applied since no crop was grown the previous season due to drought; fertilizer had been applied for the 2009 crop. Weed control consisted of Treflan 4L (1.0 quart/acre) applied and incorporated in November of 2009. Cotoran (1.0 quart/acre) + Dual II Magnum (1.0 pint/acre) was applied just after planting. Roundup Weather Max (22 ounces/acre) was applied one time during the season. Plant growth regulator (Stance 3.0 ounces/acre) was applied on 6/14 and again on 7/13 in 15 gpa total volume with a Melroe Spray Coupe. The only other insecticide applied to the cotton during the season (overspray) was Bidrin 8E (8.0 ounces/acre) on 7/13 for stink bug control with the Melroe Spray Coupe.

Insecticide treatments were initiated for cotton fleahopper in the first week of squaring in two sets of treated plots when adults were approaching the economic treatment threshold of 15/100 plants. Other treatments were applied to plots beginning in the 2nd, 3rd, or 4th weeks of squaring. One set of plots were never treated for fleahopper (nontreated). This arrangement of treatment timings provided various levels and duration of infestations of fleahoppers during the first month of fruiting. Plots were 8 rows wide by 40 feet long (35 feet after alleys were cut) and treatments were replicated 4 times in a randomized complete block experimental design. Insecticide treatments were applied to the center 4 rows of each 8-row plot so that an 8-row buffer of nontreated cotton was maintained between insecticide-treated rows. Fleahopper insecticide treatments were applied with a 4-row self-propelled Spider Trac ground sprayer through 4X hollow cone nozzles (2/row) at 40 psi in a total volume of 5.1 gpa while traveling at 4.25 mph. Treatments were applied beginning 5/4 (beginning of the 1st week of squaring), 5/11 (2nd week of squaring), 5/17 (3rd week of squaring), and 5/25 (4th week of squaring – early bloom).

Treatments were assessed by (1) counting the number of fleahoppers on 20 plants/plot in the center 2 rows on 5/4 [pretreatment], 5/7 [3 DAT-1 week-1], 5/10 [6 DAT-1 week-1], 5/14 [3 DAT-2 week-2], 5/16 [5 DAT-2 week-2], 5/21 [4 DAT-3 week-3], 5/28 [3 DAT-4 week-4], and 6/1 [10 DAT-4 week-4]; (2) obtaining 6 plants from each plot just before all bolls were open on 7/21 for plant mapping using the P-MAP program developed by Dr. Juan Landivar; (3) harvesting the 2 center rows in each plot with a 2-row John Deere model 9900 spindle picker, weighing the seed cotton, and ginning a sample for percentage lint cotton on a 10-saw Eagle laboratory machine; and (4) sending a 50 gram sample of lint to the Fiber and Biopolymer Research Institute at Lubbock, Texas for fiber analysis. Partial budgeting was used to compare the dollar returns from treatments using lint and seed values ($0.72/lb and $0.093/lb, respectively). Costs included chemical, application, and harvesting/hauling/ginning charges ($0.21/lint lb) for the extra lint produced in the insecticide treated cotton.

Agriculture Research Manager (ARM revision 6.1.13) software was used to conduct analysis of variance (ANOVA). Means were separated by least significant difference (LSD) for ease of data presentation.

RESULTS/DISCUSSION: Cotton fleahoppers (all adults) were near the treatment threshold of 15/100 plants at very first square on the date when week-1 treatments were applied (Tables 1-3). It was not until 3 days after treatments were applied in the first week of squaring (3 DAT-1) that any nymphs were detected, and their numbers remained low until counts were made 3 DAT-2 (second week of squaring). The only treatment timing that kept fleahopper numbers below 15/100 plants was where 4 treatments were applied (weeks 1-4). Centric kept fleahopper numbers at relatively low numbers for about two weeks where it was applied only in week-1 of squaring. Each time a new set of plots was treated based on squaring week, fleahopper numbers were reduced accordingly far below the economic treatment threshold. These series of treatments resulted in an excellent range of fleahopper populations above the economic treatment threshold for various periods of time whether it be in early or late squaring weeks or for the entire period of time from week-1 of squaring through early bloom. Meanwhile, fleahopper numbers in the nontreated cotton remained high (20 to 138/100 plants) throughout the test period and averaged 59.1/100 plants from 3 DAT-1 in week-1 through 10 DAT-4 in week-4.

Nodes above white flower (NAWF) measurements were made at very first bloom during an extended dry period that had noticeable effect on plant growth (Table 4). At early bloom it would be best for plants to be at 8 or 9 nodes above white flower for maximum yield potential, but in this case the cotton averaged only 6.7 NAWF. Even following significant rainfall about a week later the cotton did not respond and progressed rapidly to cutout (5 NAWF).

Certain insecticides have been implicated in causing increased spider mite activity including Centric used for fleahopper control in this study. Mite damage ratings were made 7 DAT-3, 3 DAT-4, and 10 DAT-4 (Table 4). No differences were observed at 7 DAT-3, but by 3 DAT-4 statistically significant increased mite activity was found in plots treated the most times for fleahoppers (treatment in weeks 1-4). At 10 DAT-4 the least mite activity was observed in nontreated plots and where Centric had been applied only 1 time (week 1 and week 4). Under very favorable conditions for spider mite outbreak this fact should be kept in mind. Therefore, excessive treatments for fleahopper should be avoided as we have demonstrated the potential for increased spider mite problems where multiple treatments are applied.

We expected to see dramatic effect of fleahoppers on fruiting characteristics based on the plant mapping (P-MAP) data obtained just before harvest similar to that found in a test conducted in 2007, but the effects were not as often statistically significant as found in the earlier study (Table 5). With the exception of percentage retention of bolls on fruiting branches 1-5 and overall boll retention, few statistically significant differences were observed in the plant mapping data. Percentage retention of bolls was lowest in the nontreated cotton. Although not statistically significant, compensation seemed to be obvious based on retention numbers in nontreated cotton on fruiting branches 6-10 and 11-15.

There were no statistically significant differences in bolls/plant, % open bolls, or numbers of bolls on the various fruiting branch groups. However, bolls/plant, % open bolls, and number of bolls on fruiting branches 1-5 were all lower for the nontreated cotton. Similar data in the 2007 study (not as dramatic here) resulted in significant differences in lint production.

Statistically significant differences were not found for any of the fleahopper treatment timings for impact on plant height, fiber characteristics, or yield (Table 6). However, there were several trends in the data similar to that found in the 2007 test. For example, the shortest plants observed were those with the most aggressive treatments (4 treatments), an indication that the increased early boll retention rate affected plant size. Additionally, on a numerical basis all insecticide treated cotton produced more lint than observed in the non-insecticide treated cotton. The least yield increase (numerically) was from plots treated only in the 4th week of squaring. Considering just the numerical lint yield difference from the non-insecticide treated cotton, all treatments except the most aggressive (treated weeks 1, 2, 3, and 4) showed a dollar return over the nontreated cotton. Claims that the yield increase was real without statistical significance cannot be justified based on this test alone however, the trends are so similar to the results of the 2007 test that liberty was taken in showing the dollar return data in spite of the lack of statistical support. Conclusions based on this study, as well as those conducted previously, indicate that along the Texas Gulf Coast (1) generally two treatments are needed for fleahoppers timed in the 2nd or 3rd week of squaring, (2) Centric (1.25 ounces/acre) will provide up to two weeks control, (3) treatment during the first week of squaring generally does not result in as much lint increase as those applied in the 2nd or 3rd week, and (4) weather factors play a major role with respect to response of cotton lint production from fleahopper control treatment timing. In cases where dry conditions exist that restrict plant development early in the season, very aggressive fleahopper control could result in less lint yield due to earlier cutout. However, failure to control fleahoppers by the second week of squaring can result in high lint loss approaching 200 or more pounds/acre.

ACKNOWLEDGMENTS: Special thanks are given to Rudy Alaniz and Clint Livingston, Demonstration Assistants, for carrying out all agronomic practices, applying treatments, plant mapping, harvest and ginning, and gathering samples for lint analysis. The Texas Department of Agriculture Food and Fibers Research Council is acknowledged for paying the cost of fiber analysis. Syngenta Crop Protection is thanked for providing the Centric insecticide.

Table 1. Effect of insecticide treatment timing and intensity on fleahopper **nymphs** in cotton, Texas AgriLife Research and Extension Center, Nueces County, TX, 2010.

Insecticide applied in squaring week[1/]	Number per 100 plants								
	Pretreat	3 DAT-1[2/]	6 DAT-1	3 DAT-2	5 DAT-2	4 DAT-3	3 DAT-4	10 DAT-4	Post-treat. avg.
1	0.0[a]	0.0[a]	1.3[a]	6.3[bc]	6.3[c]	23.8[b]	42.5[a]	23.8[a]	14.8[c]
1, 2, 3, 4	0.0[a]	0.0[a]	0.0[a]	0.0[c]	0.0[c]	0.0[b]	0.0[b]	0.0[b]	0.0[d]
2, 3, 4	0.0[a]	0.0[a]	8.8[a]	0.0[c]	2.5[c]	0.0[b]	0.0[b]	0.0[b]	1.6[d]
3, 4	0.0[a]	1.3[a]	6.3[a]	35.0[a]	66.3[a]	0.0[b]	0.0[b]	0.0[b]	15.5[c]
4	0.0[a]	1.3[a]	5.0[a]	28.8[ab]	41.3[b]	93.8[a]	0.0[b]	0.0[b]	24.3[b]
Nontreated	0.0[a]	3.8[a]	6.3[b]	36.3[a]	51.3[ab]	117.5[a]	53.8[a]	26.3[a]	42.1[a]
LSD (P = 0.05)	NS[3/]	NS	NS	22.5	20.69	24.98	18.18	7.74	8.40
P > F	1.000	.1242	.2940	.0046	.0001	.0001	.0001	.0001	.0001

Means in a column followed by the same letter are not significantly different by ANOVA.
[1/]Centric 40WG was applied at 1.25 oz/acre for the indicated squaring week; treatment dates were 5/4, 5/11, 5/17, and 5/25.
[2/] DAT = Days After Treatment
[3/] NS = Not Significant

Table 2. Effect of insecticide treatment timing and intensity on fleahopper **adults** in insecticide treated cotton, Texas AgriLife Research and Extension Center, Nueces County, TX, 2010.

Insecticide applied in squaring week[1/]	Number per 100 plants								
	Pretreat	3 DAT-1[2/]	6 DAT-1	3 DAT-2	5 DAT-2	4 DAT-3	3 DAT-4	10 DAT-4	Post-treat. avg.
1	10.0[a]	1.3[b]	0.0[c]	8.8[a]	12.5[a]	30.0[a]	21.3[a]	17.5[a]	13.0[ab]
1, 2, 3, 4	12.5[a]	1.3[b]	0.0[c]	0.0[a]	3.8[a]	0.0[b]	3.8[b]	3.8[b]	1.8[d]
2, 3, 4	8.8[a]	21.3[a]	10.0[b]	0.0[a]	6.3[a]	1.3[b]	8.8[b]	3.8[b]	7.3[c]
3, 4	12.5[a]	16.3[a]	18.8[a]	15.0[a]	13.8[a]	1.3[b]	10.0[b]	1.3[b]	10.9[bc]
4	13.8[a]	20.0[a]	17.5[ab]	12.5[a]	18.8[a]	18.8[a]	5.0[b]	5.0[b]	13.9[ab]
Nontreated	8.8[a]	20.0[a]	13.8[ab]	10.0[a]	10.0[a]	20.0[a]	27.5[a]	17.5[a]	17.0[a]
LSD (P=0.05)	NS[3/]	9.66	8.44	NS	NS	11.64	9.08	8.80	4.94
P > F	.9086	.0005	.0004	.0868	.1017	.0001	.0002	.0023	.0001

Means in a column followed by the same letter are not significantly different by ANOVA.
[1/]Centric 40WG was applied at 1.25 oz/acre for the indicated squaring week; treatment dates were 5/4, 5/11, 5/17, and 5/25.
[2/] DAT = Days After Treatment
[3/] NS = Not Significant

Table 3. Effect of insecticide treatment timing and intensity on fleahopper **nymphs and adults** in insecticide treated cotton, Texas AgriLife Research and Extension Center, Nueces County, TX, 2010.

Insecticide applied in squaring week[1/]	Number per 100 plant terminals								
	Pretreat	3 DAT-1[2/]	6 DAT-1	3 DAT-2	5 DAT-2	4 DAT-3	3 DAT-4	10 DAT-4	Post-treat.avg.
1	10.0[a]	1.3[b]	1.3[b]	15.0[bc]	18.8[b]	53.8[b]	63.8[a]	41.3[a]	27.9[bc]
1, 2, 3, 4	12.5[a]	1.3[b]	0.0[b]	0.0[c]	3.8[b]	0.0[c]	3.8[b]	3.8[b]	1.8[d]
2, 3, 4	8.8[a]	21.3[a]	18.8[a]	0.0[c]	8.8[b]	1.3[c]	8.8[b]	3.8[b]	8.9[d]
3, 4	12.5[a]	17.5[a]	25.0[a]	50.0[a]	80.0[a]	1.3[c]	10.0[b]	1.3[b]	26.4[c]
4	13.8[a]	21.3[a]	22.5[a]	41.3[ab]	60.0[a]	112.5[a]	5.0[b]	5.0[b]	38.2[b]
Nontreated	8.8[a]	23.8[a]	20.0[a]	46.3[a]	61.3[a]	137.5[a]	81.3[a]	43.8[a]	59.1[a]
LSD (P=0.05)	NS[3/]	10.71	15.15	26.29	27.25	26.80	19.79	14.33	10.99
P > F	.9086	.0006	.0080	.0014	.0001	.0001	.0001	.0001	.0001

Means in a column followed by the same letter are not significantly different by ANOVA.
[1/]Centric 40WG was applied at 1.25 oz/acre for the indicated squaring week; treatment dates were 5/4, 5/11, 5/17, and 5/25.
[2/] DAT = Days After Treatment
[3/] NS = Not Significant

Table 4. Maturity level of cotton in early June and impact of insecticide treatment intensity on spider mite damage, Texas AgriLife Research and Extension Center, Nueces County, TX, 2010.

Insecticide applied in squaring week[1/]	NAWF[2/] 6/2	Spider mite damage rating[4/]			
		7 DAT-3	3 DAT-4	10 DAT-4	Season Avg
1	6.5[a]	3.8[a]	3.8[ab]	3.0[abc]	3.5[a]
1, 2, 3, 4	6.9[a]	3.8[a]	4.0[a]	3.8[a]	3.8[a]
2, 3, 4	6.4[a]	2.3[a]	3.0[ab]	3.8[a]	3.0[ab]
3, 4	6.9[a]	3.0[a]	3.3[ab]	3.5[ab]	3.3[ab]
4	6.9[a]	1.5[a]	1.5[c]	2.5[bc]	1.8[c]
Nontreated	6.7[a]	2.0[a]	2.5[bc]	2.0[c]	2.2[bc]
LSD (P = 0.05)	NS[3/]	NS	1.34	1.23	1.10
P > F	.3455	.1769	.0140	.0405	.0102

Means in a column followed by the same letter are not significantly different by ANOVA.

[1/] Centric 40WG was applied at 1.25 oz/acre for the indicated squaring week; treatment dates were 5/4, 5/11, 5/17, and 5/25.

[2/] NAWF = Nodes above white flower on June 2.

[3/] NS = Not Significant

[4/] Damage ratings: 1 = very little evidence of spider mites up to 5 = evidence of spider mites and abundant discolored leaves.

Table 5. Influence of fleahopper treatments on cotton boll production per plant and location on plant at harvest, Texas AgriLife Research and Extension Center, Nueces County, TX, 2010.

Insecticide applied in squaring week[1/]	Bolls/ plant	% open bolls	No. bolls by branch group			% boll retention by branch group			
			1-5	6-10	11-15	1-5	6-10	11-15	all
1	7.8[a]	68.8[a]	5.8[a]	1.8[a]	0.1[a]	50.2[a]	17.5[a]	0.9[a]	26.7[b]
1, 2, 3, 4	7.8[a]	70.6[a]	6.1[a]	1.7[a]	0.0[a]	53.6[a]	17.3[a]	0.0[a]	30.2[a]
2, 3, 4	8.2[a]	53.3[a]	5.9[a]	2.3[a]	0.1[a]	48.1[ab]	19.8[a]	1.4[a]	27.8[ab]
3, 4	7.6[a]	55.7[a]	5.3[a]	2.3[a]	0.0[a]	40.8[bc]	20.6[a]	0.9[a]	24.8[bc]
4	7.8[a]	55.6[a]	5.7[a]	2.0[a]	0.0[a]	48.1[ab]	19.0[a]	0.7[a]	27.3[ab]
Nontreated	7.3[a]	41.0[a]	4.5[a]	2.5[a]	0.3[a]	37.3[c]	23.2[a]	4.5[a]	23.3[c]
LSD (P = 0.05)	NS[2/]	NS	NS	NS	NS	8.12	NS	NS	3.09
P > F	.9197	.0966	.1692	.3508	.1494	.0060	.3271	.1112	.0042

Means in a column followed by the same letter are not significantly different by ANOVA.
[1/]Centric 40WG was applied at 1.25 oz/acre for the indicated squaring week; treatment dates were 5/4, 5/11, 5/17, and 5/25.
[2/] NS = Not Significant

Table 6. Effect of fleahopper insecticide treatment timing on cotton plant height, fiber characteristics, yield, and dollar return, Nueces County, TX, 2010.

Treatments by squaring week[1/]	Plant height inches	Mic	Length inches	Unif. ratio	Strength g/tex	Elong. (%)	Yield lb lint/acre	$ return over Nontreated[3/]
1	31.8[a]	4.9[a]	1.09[a]	82.7[a]	29.1[a]	7.5[a]	1436[a]	49.00
1, 2, 3, 4	29.7[a]	5.0[a]	1.10[a]	83.0[a]	30.0[a]	7.4[a]	1397[a]	-5.58
2, 3, 4	33.5[a]	5.0[a]	1.09[a]	81.4[a]	28.2[a]	7.3[a]	1408[a]	11.30
3, 4	31.9 [a]	5.0[a]	1.08[a]	82.0[a]	29.1[a]	7.4[a]	1450[a]	48.60
4	32.5[a]	5.1[a]	1.10[a]	83.1[a]	29.8[a]	7.4[a]	1375[a]	8.82
Nontreated	33.0[a]	5.1[a]	1.11[a]	83.2[a]	29.6[a]	7.1[a]	1347[a]	
LSD (P = 0.05)	NS[2/]	NS	NS	NS	NS	NS	NS	
P > F	.2303	.6745	.6900	.1419	.1420	.7135	.7193	

Means in a column followed by the same letter are not significantly different by ANOVA.

[1/] Centric 40WG was applied at 1.25 oz/acre for the indicated squaring week treatment; dates were 5/4, 5/11, 5/17, and 5/25.

[2/] NS = Not Significant

[3/] Cotton value based on $0.72/lb for lint and $0.093/lb for seed using a factor of 1.6 times lint weight. Costs include Centric 40WG ($5.30 for 1.25 oz/acre) and application ($3.00/acre). Harvesting/hauling/ginning cost for extra lint above nontreated cotton was set at $0.21/lb lint.

BOLLWORM/TOBACCO BUDWORM PHEROMONE TRAP CAPTURES IN NUECES COUNTY DURING 2010

Texas AgriLife Research and Extension Center, Nueces County, 2010

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SUMMARY: Generally higher numbers of bollworm moths were captured in 2010 than 2009 probably as a result of more rainfall and plant growth compared with the previous drought year. However, bollworm moth numbers were less in September of 2010 compared with 2009, probably as a result of differences in rainfall patterns in the two years. Tobacco budworm moth numbers were very low in comparison with the bollworm just as has been the case each year of the survey. Nevertheless, tobacco budworms have been detected in cotton fields but with less frequency compared with the time before the mid-1990's.

OBJECTIVES: Trap catch numbers were monitored in order to measure the relative abundance of bollworm and tobacco budworm moths in the area and to monitor fluctuation in populations over time. A second objective was to collect moths for testing their susceptibility to pyrethroid insecticide (cypermethrin) via the adult vial test procedure.

MATERIALS/METHODS: Two Moth-ZV 30-inch screen wire cone traps (Hartstack) were deployed and equipped with pheromone for the bollworm (corn earworm) and tobacco budworm at the Texas AgriLife Research and Extension Center, Corpus Christi, Texas. Two traps were used for each species. The traps were examined from March 2 through October 18 for bollworm moths (33 weeks) and March 2 through September 13 for tobacco budworm moths (28 weeks). The number of moths was recorded daily and each 7-day catch total was divided by 7 to obtain the average catch for the corresponding 7-day period. Pheromone was changed on a monthly basis.

RESULTS/DISCUSSION: Bollworm and tobacco budworm moth trap capture data for 2010 are shown in Tables 1 and 2. April through August bollworm moth captures were much greater than for the same time period in 2009, but September catches in 2010 were much lower than 2009. Tobacco budworm moth trap catches were generally much higher in 2010 compared with 2009. The tobacco budworm catches were relatively low compared to the bollworm moth trap catch which has been the case for all years of the pheromone trap moth survey. As pointed out in previous reports there has been a general decline in tobacco budworm trap captures from 2004 through 2009. Trap capture levels seem to be influenced by rainfall patterns whereby rainfall that increases plant growth is followed later by higher numbers of both the bollworm and tobacco budworm.

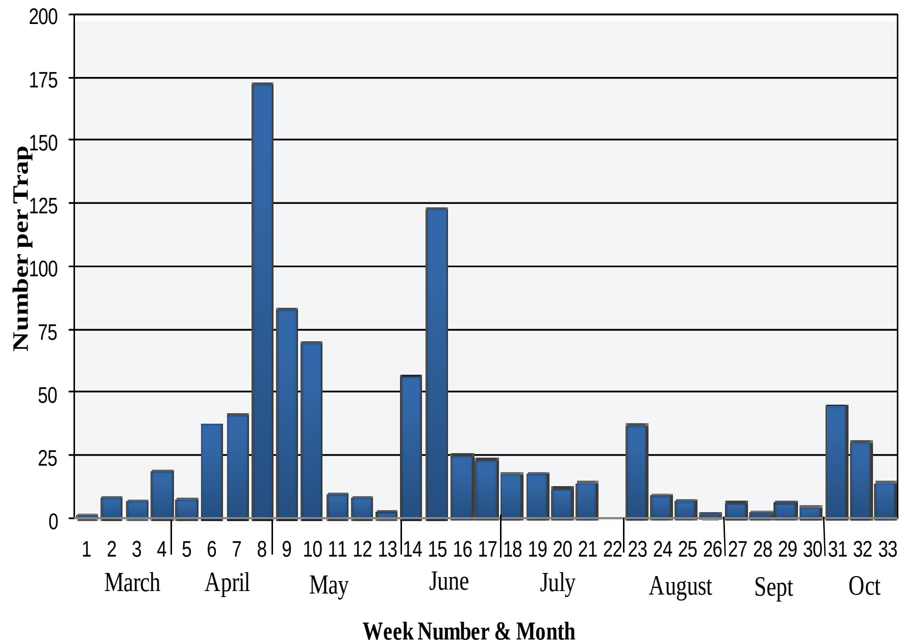

Fig. 1. Bollworm moths captured in pheromone traps per day for the indicated week, Nueces County, TX, 2010. Week one ended March 8 and week 33 ended October 18.

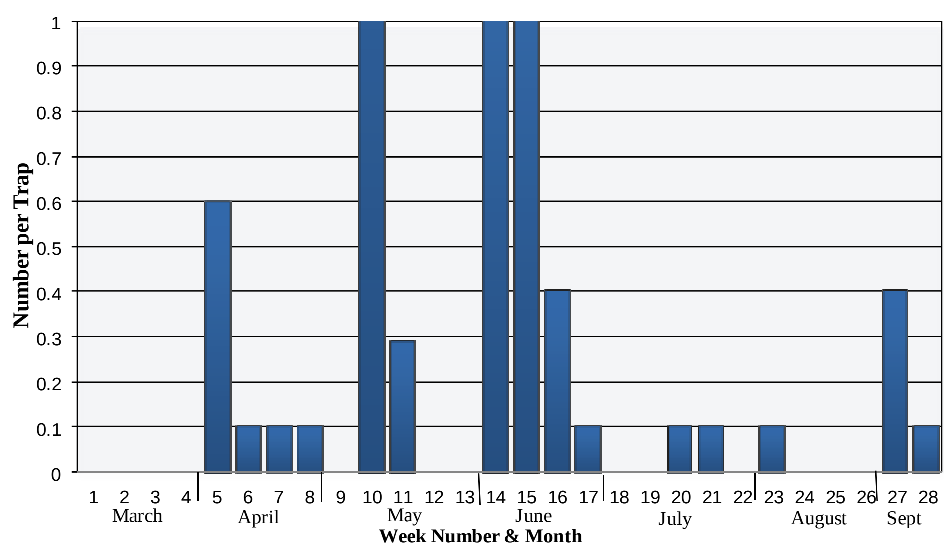

Fig. 2. Tobacco budworm moths captured in pheromone traps per day for the indicated week, Nueces County, TX, 2010. Week one ended March 7 and week 31 ended September 13.

MONITORING OF RESISTANCE LEVELS IN THE BOLLWORM TO PYRETHROID INSECTICIDES IN THE COASTAL BEND OF TEXAS

Texas AgriLife Research and Extension Center, Nueces County, 2010

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SUMMARY: Bollworm moths tested for susceptibility to pyrethroid insecticide using cypermethrin as the standard showed a marked decline in resistance level in 2010 compared with all previous years of testing. Survival at 5 and 10 micrograms cypermethrin/vial never exceeded 10% for the entire season. No survival was found at the 5 or 10 micrograms/vial in early and late June testing. We were unable to explain these results, and suggest that additional testing will be required as early as possible in 2011 to see if the low survival rate is sustained. There are reasons to believe that we could see a return in 2011 to similar levels of resistance as experienced during the past few years. That level was not excessive but it was noticeable in the tests as well as in some difficulty in controlling bollworm in cotton. We would again encourage limited use of pyrethroid chemistry on sorghum which we believe contributes to more difficulty in controlling the insect in the next generation on cotton.

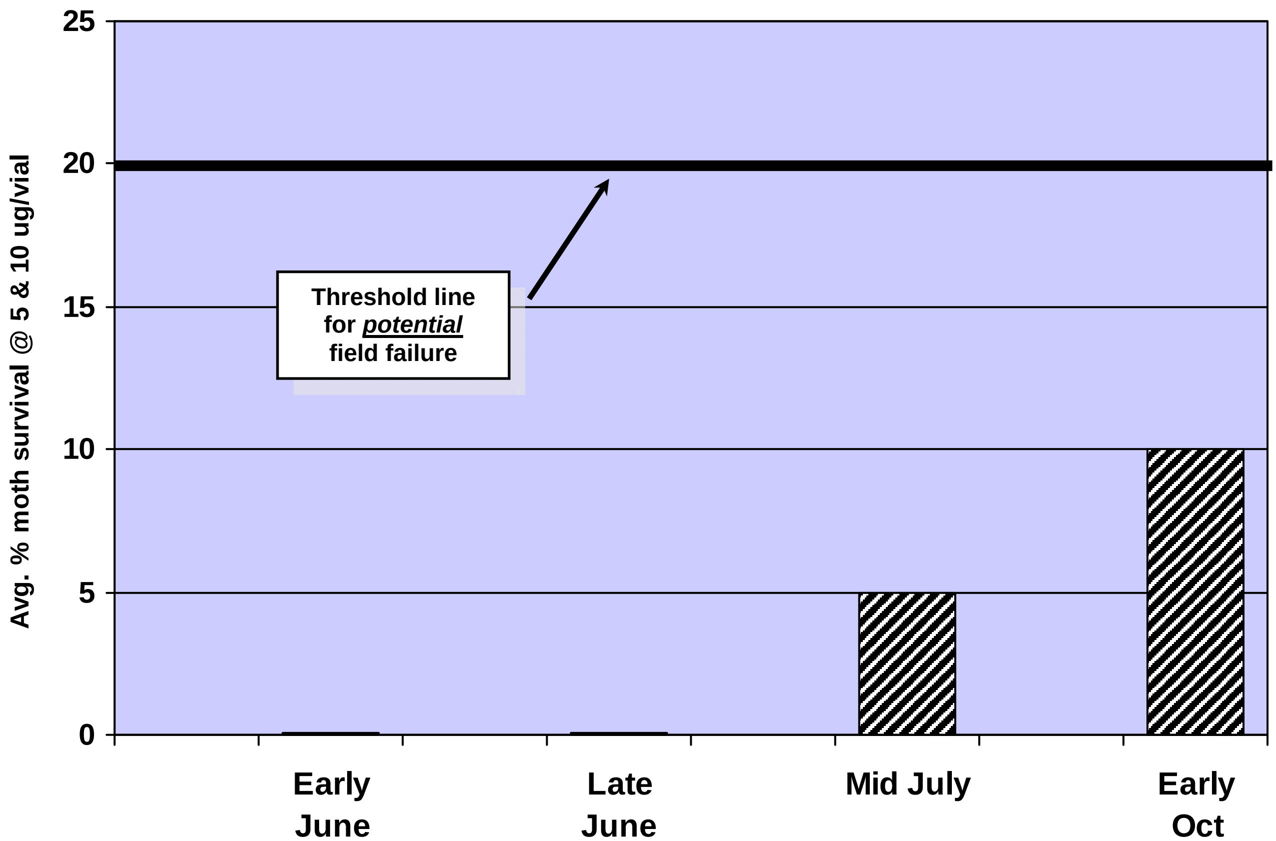
OBJECTIVES: The adult vial tests (AVT) were conducted to determine changes in susceptibility of the bollworm (corn earworm) to the pyrethroid insecticide class of chemistry.

MATERIALS/METHODS: Moths collected early each morning on the day of a screening bioassay from wire cone Hartstack traps baited with pheromone lures were tested in 20 ml glass scintillation vials coated with various concentrations of cypermethrin (0, 0.3, 1.0, 1.5, 2.5, 3.0, 5.0, 10, 30, and 60 micrograms/vial). One moth was placed in each vial, and each vial was held at room temperature (75-76ºF) in a rack oriented at a 45º angle with caps loosened. After 24 hours the condition of tested moths (alive, down or dead) was determined. Recorded data were submitted to the Toxicology Laboratory, Department of Entomology, Texas A&M University, College Station, Texas for further analysis. This paper does not include information developed by the Toxicology Laboratory.

A total of 900 moths were evaluated (90 per exposure level) during the 2010 season from June to early October. There were extended periods in which adequate numbers of moths were not captured in pheromone traps for testing (early July, August, and September).

RESULTS/DISCUSSION: The resistance level in the bollworm population according to the AVT tests with the pyrethroid insecticide was extremely low in 2010 (Fig. 1). In fact, no survival was found at 5 or 10 micrograms/vial cypermethrin in early or late June. Moths surviving at 5 or greater micrograms/per vial was 5% in mid-June and 10% in early-October. These results are surprising given that a certain level of resistance was thought to be entrenched in the Lower Coastal Bend population. Additionally, there was more use of pyrethroid insecticide on both sorghum and cotton in 2010 as a result of the greatly reduced cost of the chemistry. Normally we see increasing survival during the season with some decline in the survival rate by September. This season there was no survival early at or above 5 micrograms cypermethrin/vial and this was followed by a slight increase by the end of the season. The survival rate at 5micrograms and above ended up in October to be near that observed at the end of 2009. It will be interesting to follow the resistance level in 2011 as we might see a return to our normal pattern where pyrethroids on cotton are not as effective in June and July.

ACKNOWLEDGMENTS: Appreciation is expressed to Dr. Patricia Pietrantonio, Department of Entomology, Texas A&M University, College Station, Texas for their support of this project. Her laboratory provides all the materials necessary to carry out the AVT studies and processes the data for this region as well as the rest of the State.



HISTORY OF BOLL WEEVIL PHEROMONE TRAP CATCH IN COASTAL BEND COUNTIES AND PROGRESS TOWARD ERADICATION

South Texas/Winter Garden Boll Weevil Eradication Zone, 2010

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SUMMARY: Additional progress toward boll weevil eradication has been made thus far in 2010 due to very aggressive eradication procedures by the Boll Weevil Foundation. Some problem areas still exist, but on the whole weevil numbers declined significantly. However, more boll weevils have been captured along the trap lines running north along three highways across the ranchland from the Lower Rio Grande Valley. The valley program experienced significant setback attributed to heavy rainfall and flooding which interfered with timely treatment of cotton fields. Mexico also stopped their program which resulted in significant boll weevil reproduction.

OBJECTIVE: This report is to document relative boll weevil populations before and during boll weevil eradication and to measure progress toward complete eradication.

MATERIALS/METHODS: Boll weevil pheromone traps have been operated in 3 areas from 1998 until the present time. These traps have been deployed at the Welder Wildlife Foundation north of Sinton (10 traps), south of Orange Grove and east of Alfred (5 traps) and west of Clarkwood (3 traps). Traps were inspected weekly and pheromone was changed every other week through 2005. Since 2006 traps have been inspected every other week at which time pheromone was changed. The data shown before eradication was collected by Segers et al. during a 6-year period (1977- 1982).

RESULTS/DISCUSSION: Boll weevil numbers in the Nueces, San Patricio, and northern Jim Wells counties have been reduced compared with numbers captured in the same region from 1977 – 1982 (Table 1). In 2006 no weevils were captured on the three trap lines, but following late season extended rainfall in 2007 and inability to obtain proper treatment, reproduction resulted in higher numbers in 2008. A more focused program in 2009 with emphasis on volunteer cotton growing in other crops and exceptional drought led to reductions in trap captures. An especially good sign of program effectiveness was evident during the last five months of 2009 since no boll weevils were detected in these traps during that period. More progress was made in 2010 and, again like 2006, no boll weevils were captured in 2010.

Boll weevil numbers expressed as average per pheromone trap for the year through October for each of the South Texas/Winter Garden Boll Weevil Eradication Foundation district offices are shown in Table 2. Each district showed an alarming increase in weevil numbers in 2007 and 2008. The infestations carried over into 2009, but numbers were reduced greatly with the majority of the weevils remaining in the Uvalde District. Much of the increase can be attributed to volunteer cotton growing in other crops, which until 2009 was not treated by the foundation. Additionally, a more stringent cotton destruction law has been implemented that provides incentive for more effective elimination of cotton stalks following harvest and prevention of hostable cotton growing in other crops. If effective elimination of cotton plants following harvest and prevention of volunteer cotton in other crops can be achieved, finishing boll weevil eradication can be accomplished. Even more progress was made in 2010 with aggressive treatment by the Texas Boll Weevil Eradication Foundation. Two fields that were not monitored in Jim Wells County until peak bloom resulted in significant reproduction and contributed toward more boll weevils than desired in that area.

ACKNOWLEDGMENTS: Thanks are extended to Larry Smith, Program Director, and to Darrell Dusek, Zone Manager, Texas Boll Weevil Eradication Foundation, for providing pheromone for traps and some of the data for this report. Their commitment to final elimination of boll weevils from Texas is appreciated.

Table 1. Boll weevils per pheromone trap per month, for 1977-82 and 1998-2003, Texas AgriLife Extension Service operated traps.

Month	1977-82 (6 yr avg)[a/]	1998	1999	2000	2001	2002	2003
Jan	5.3	0.22	0.22	9.93	0.00	.05	.00
Feb	5.5	0.27	0.00	1.60	0.00	.00	.00
Mar	7.7	3.00	0.33	1.72	0.11	.10	.00
Apr	7.4	30.94	0.00	1.27	0.11	.05	.00
May	2.8	22.00	0.00	0.83	0.17	.05	.00
Jun	4.9	5.10	0.06	0.67	0.00	.00	.00
Jul	188.9	49.50	2.06	11.33	0.35	.00	.00
Aug	645.7	48.40	45.00	14.04	0.94	.17	.04
Sep	309.7	2.28	40.90	1.39	0.11	.00	.00
Oct	165.4	1.39	5.72	0.72	0.06	.00	.00
Nov	55.3	0.28	28.30	0.50	0.11	.00	.00
Dec	15.7	0.22	13.67	0.03	0.00	.00	.00
Avg.	117.9	13.60	11.40	3.67	0.16	.035	.0033

[a/]Traps operated by Segers, et al.

Table 1. (Continued). Boll weevils per pheromone trap per month, for 2004 - 2010, Texas AgriLife Extension Service operated traps.

Month	2004	2005	2006	2007	2008	2009	2010
Jan	.00	.00	.00	.00	.00	.00	.00
Feb	.00	.04	.00	.00	.00	.00	.00
Mar	.04	.00	.00	.00	.17	.06	.00
Apr	.00	.04	.00	.00	1.17	.17	.00
May	.00	.00	.00	.00	1.00	.00	.00
Jun	.00	.00	.00	.00	.17	.33	.00
Jul	00	.00	.00	.00	.22	.06	.00
Aug	.21	.04	.00	.00	.22	.00	.00
Sep	.08	.00	.00	.00	.44	.00	.00
Oct	.00	.00	.00	.04	.39	.00	.00
Nov	.00	.00	.00	.00	.00	.00	.00
Dec	.00	.00	.00	.17	.00	.00	.00
Avg.	.0275	.010	.00	.02	.32	.05	.00

[a/]Traps operated by Segers, et al.

Table 2. Boll weevil pheromone trap catches for 1999 - 2004, year to date through October, Texas Boll Weevil Eradication Foundation.

	Year					
Location	1999	2000	2001	2002	2003	2004
Uvalde	1.92	0.13	0.03	0.034	0.468	3.02
Robstown	1.34	1.47	0.06	0.022	0.048	0.14
Sinton	1.16	0.84	0.03	0.003	0.004	0.01
Kingsville	0.88	1.77	0.45	0.802	0.423	1.96
Victoria	1.61	1.00	0.34	0.266	0.214	0.11
Zone total	1.35	1.14	0.16	0.135	0.138	0.66

Table 2. (Continued). Boll weevil pheromone trap catches for 2005 - 2010, year to date through October, Texas Boll Weevil Eradication Foundation.

	Year					
Location	2005	2006	2007	2008	2009	2010
Uvalde	1.149	0.179	3.699	5.478	1.09	0.187
Robstown	0.020	0.003	0.395	0.524	0.01	0.030
Sinton	0.001	.00001	0.015	0.067	0.004	0.001
Kingsville	0.460	.089	0.393	0.473	0.005	0.005
Victoria	0.009	.002	0.002	0.113	0.008	0.044
Zone total	0.215	.042	0.776	1.107	0.140	0.054

COMPARISON OF ALTACOR AND CONFIRM FOR CONTROL OF PECAN NUT CASEBEARER AND HICKORY SHUCKWORM ON PECAN

Charles Nelson Orchard, Victoria County, 2010

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SUMMARY: Altacor and Confirm provided effective control of pecan nut casebearer under moderately high pressure from the insect. Both rates of Altacor provided pecan nut casebearer control, but there appeared to be a trend for less control with the lower rate. Significantly less hickory shuckworm damage was found in insecticide treated trees, but their numbers were too low to cause significant damage to quality or kernel weight even in the nontreated trees. The low kernel weight in the non-insecticide treated pecan samples was due to the lack of fungicide treatment.

OBJECTIVES: The test was designed to evaluate the control levels achieved on pecan nut casebearer and hickory shuckworm with two rates of Altacor compared to Confirm.

MATERIALS/METHODS: The study was conducted on the Charles Nelson pecan orchard located north of State Highway 59 on FM 444. Trees were selected in blocks to represent 4 replications for each treatment. However, alternate trees had to be used for non-insecticide treated trees for the hickory shuckworm portion of the study since the original nontreated trees were accidently treated with insecticide. The pecan nut casebearer treatments were applied 5/8-9 with an air blast sprayer calibrated to deliver 100 gpa. In addition to insecticide, the fungicide Stratego 2.08 lb/gallon (10 ounces/acre) + non-ionic surfactant (3.2 ounces/acre) was applied with the pecan nut casebearer treatments along with Tracite 17% zinc (1.0 quarts/acre). The hickory shuckworm treatments were applied on 8/17-18 at the half shell hardening stage of nut development. Enable 2F fungicide (8.0 ounces/acre) was applied with the hickory shuckworm treatments.

Treatments were assessed by (1) examining 50 nut clusters for pecan nut casebearer damage in each of the 4 replications on the first inspection date of 5/13 [5 DAT] and 25 nut clusters on 5/17 [9 DAT] and 5/22 [14 DAT], (2) examining 25 nuts and shucks on 10/16 for hickory shuckworm damage using a 0 to 8 damage scale where each of the 4 quadrant shucks was divided into 2 sections creating a maximum damage rating of 8, and (3) collecting 20 – 24 nuts from each replicate to determine kernel weight.

RESULTS/DISCUSSION: The orchard averaged 3 pecan nut casebearer eggs/100 nut clusters along with some previous egg hatching on 5/6, and treatments were initiated two days later. Altacor at both rates and Confirm significantly reduced pecan nut casebearer and hickory shuckworm damage to pecans (Table 1). There seemed to be a trend for more pecan nut casebearer damage in plots receiving the lower rate of Altacor, but this difference should have had no effect on total nut production. Much greater damage was observed in the nontreated pecan trees which in certain years could have a dramatic effect on nut production.

Hickory shuckworm damage was very low in all treatments including the non-insecticide treated trees although statistical differences were observed with less damage in all insecticide treatments compared to the nontreated trees. No shell scaring or shucks sticking to nuts were observed in any of the treatments, and no impact on yield or quality could be found. The lighter kernel weight in the nontreated trees reflected the lack of fungicide used on the alternate trees that had to be used for non-insecticide treated trees following the mistake in over-spraying the original nontreated trees (that is, trees not treated for pecan nut casebearer) with the hickory shuckworm insecticide application.

ACKNOWLEDGMENTS: Charles Nelson is thanked for providing pecan trees, applying insecticides, and making suggestions on various aspects of the study. DuPont Crop Protection is acknowledged for their monetary support.

Table 1. Pecan nut casebearer and hickory shuckworm intestation as affected by insecticide, Charles Nelson Orchard, Victoria County, TX, 2010.

	Pecan nut casebearer % damaged nut clusters			Hickory shuckworm	
Treatment[1/] (rate)	5/13	5/17	5/22	damage rating [2/]	weight grams/kernel
Altacor 35WG (3.0 oz/acre)	2.0[b]	1.0[b]	2.0[b]	0.3[b]	5.1[a]
Altacor 35WG (2.0 oz/acre)	4.5[b]	3.0[b]	6.0[b]	0.5[b]	5.2[a]
Confirm 2F (12.8 oz/acre)	4.5[b]	3.0[b]	1.0[b]	1.0[b]	5.9[a]
Nontreated	15.5[a]	33.0[a]	45.0[a]	2.5[a]	1.8[b] [3/]
LSD (P = 0.05)	5.07	12.16	17.16	1.31	1.72
P > F	.0009	.0006	.0007	.0155	.0019

Means in a column followed by the same letter are not significantly different by ANOVA.

[1/]Treatments were applied 5/8 to 5/9 for pecan nut casebearer and 8/17 to 8/18 for hickory shuckworm.

[2/]Hickory shuckworm damage ratings based on 0-8 scale where 0 = no damage up to 8 = all 4 shucks on nuts with tunneling in bottom and top halves.

[3/]Note: low kernel weight cannot be attributed to hickory shuckworm; it was due to lack of fungicide application on these trees.

COMPARISON OF INSECTICIDES FOR CONTROL OF GRASSHOPPERS ON BERMUDAGRASS PASTURE

Herbert B. Schumann Farm, Austin County, 2010

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SUMMARY: Grasshoppers were reduced to low numbers with all insecticides tested although it did take, as expected, a longer period to gain control with Dimilin.

OBJECTIVES: The insecticide comparison was made to determine effectiveness of various materials in controlling grasshoppers and to evaluate length of the control period. Cages were installed to measure grass response, but cows uprooted these barriers and no data were obtained.

MATERIALS/METHODS: The insecticide comparison was conducted on coastal bermudagrass pasture owned by Herbert Schumann north of Belleville, Texas in Austin County. The soil at the site was acid and very sandy and conducive for grasshopper egg laying. A 15-inch sweep net was used to measure relative abundance of grasshoppers by taking 5 sweeps at 4 locations within each treatment before the insecticides were applied on 5/21. Following treatment, exclusion cages were erected to prevent cattle from feeding on grass for a measure of grass growth response following treatment. Unfortunately, the cages did not prevent cows from feeding in the cage areas. Additional grasshopper samples were taken 3, 7, 17, 24, and 88 DAT (days after treatment).

Insecticide was applied with a Terrigator sprayer equipped with a global positioning system and a 60 foot spray boom with nozzles spaced on 60-inch centers. A total spray volume of 20 gpa at a pressure of 20-25 psi was applied through flat fan nozzles (hollow cone nozzles would have been preferred). Treatments included Dimilin 2L (2.0 ounces/acre), Dimilin 2L (2.0 ounces/acre) + Baythroid XL 1E (1.4 ounces/acre), Baythroid XL 1E (2.8 ounces/acre), and Sevin XLR 4F (32.0 ounces/acre).

RESULTS/DISCUSSION: Grasshopper counts taken before treatments were applied were significantly higher in plots to be treated with Dimilin and Dimilin + Baythroid compared to the remaining treatments (Fig. 1). By 3 DAT (days after treatment) all insecticides with the exception of Dimilin reduced grasshopper numbers significantly compared to the nontreated. Dimilin requires a longer period to show activity since it is an insect growth regulator that is not active until insect molt; consequently, it is only effective on immature grasshoppers. A high percentage of the grasshoppers on the day of treatment were nymphs. By 17 DAT all insecticide treated plots contained significantly fewer grasshoppers than the nontreated. At 24 DAT the Sevin treated plots had statistically more grasshoppers than the other insecticides. Overall, the activity of Baythroid was impressive. The grasshopper population declined naturally in the nontreated plots on each inspection date through 24 DAT. A final count at 88 DAT showed no differences among any of the treatments and grasshopper numbers had rebounded to damaging numbers. This rebound was not so much movement in from other areas as it was emergence of another generation of grasshoppers. Alternatives need to be found to reduce grasshopper numbers since insecticide alone provides only temporary reduction in their numbers.

Pyrethroid insecticides (Baythroid is an example) provide effective and lower cost control of grasshoppers. In addition there are relatively few restrictions as to grazing or haying operations compared to Sevin. Dimilin also has few restrictions.

ACKNOWLEDGMENTS: Special acknowledgment is given to Bayer CropScience for supplying Baythroid and Sevin, and to Chemtura Corporation for supplying the Dimilin. The large plots required substantial amounts of these insecticides. Dr. Herbert Schumann is thanked for providing the site for the study and his interest in conducting these type studies.

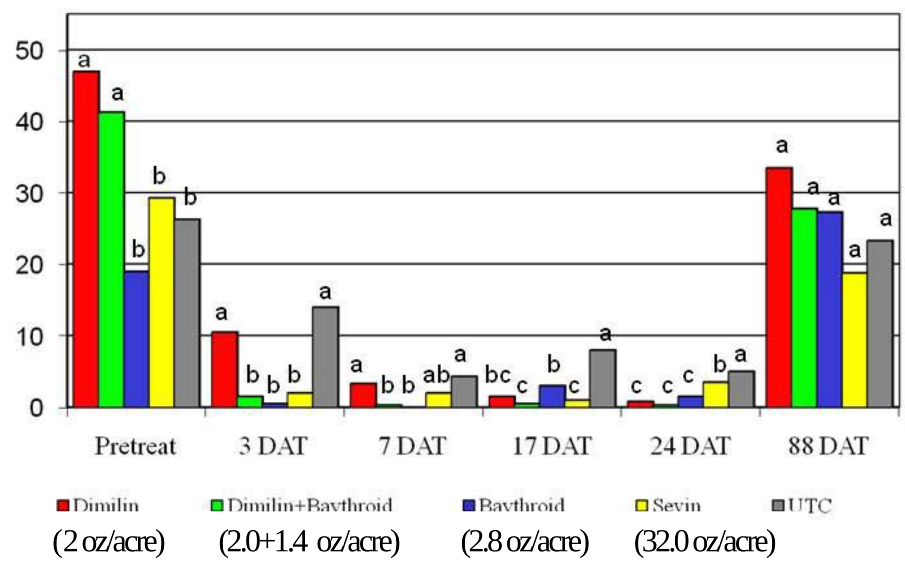

Fig. 1. Grasshoppers per 5 sweeps at various intervals following insecticide treatment, Herbert B. Schumann Farm, Austin County, TX, 2010. DAT = days after treatment.

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