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Results of Insect Control Evaluations on Corn, Sorghum, Cotton and Bermudagrass in Texas Coastal Bend Counties

Texas Cooperative Extension, Dr. Edward G. Smith, Director, The Texas A&M University System, College Station, Texas

BEHMANN BROTHERS FOUNDATION SUPPORT

The Behmann Brothers Foundation has provided grant funds supporting Texas Cooperative Extension educational programs in production agriculture since 1980. Their generosity led to greatly expanded applied research activity in Coastal Bend counties. Behmann funding has been used for purchase of farm tractors, farming implements, sprayers, trailers to haul equipment, grain threshers, moisture meters, fertilizer spreaders, scales to weigh cotton and grain samples, repairs to laboratory gin stands, and other items too numerous to list. Funding has also been used for equipment maintenance, and for a portion of the salary of one employee.

Behmann Foundation funding has become so essential to the operation of the Texas Cooperative Extension program, that virtually every demonstration and applied research project is assisted through it. We acknowledge the support by the Behmann Brothers Foundation to help improve South Texas agricultural productivity.

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REPORT PREPARATION

Special thanks are extended to Mrs. Stephanie A. Klock, Administrative Assistant for Entomology, Soil and Crop Sciences, and Agricultural Economics at the Texas A&M University Agricultural Research and Extension Center, Corpus Christi for preparation of this report.

FOREWORD

This document contains reports of applied research/demonstration projects conducted by Texas Cooperative Extension dealing with management of arthropod pests and production practices. Objectives of the studies were to find more cost effective ways to manage pests and to improve production practices. 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. Normally more than a dozen projects are conducted at the Texas Agricultural Experiment Station at Corpus Christi, but due to "exceptional" drought conditions in 2006, only six projects were conducted there. Four of these field studies were only partially completed due to the dry conditions.

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 judgements concerning economic returns.

Gulf Coast hybrid/variety evaluations for corn, sorghum and cotton are included. These research/ demonstration projects were conducted by County Extension Agents, Extension Agronomists and Extension Agents-IPM. Special thanks are extended to Dr. Stephen D. Livingston, Extension Agronomist, for leading and compiling most of these studies. The stacked cotton variety experiments were conducted by Extension Agents in cooperation with Dr. Robert Lemon, Extension State Cotton Specialist, Dan D. Fromme, Extension Agent-IPM and Stephen P. Biles, Extension Agent-IPM.

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

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EVALUATION OF GARST 8270 RR AND 8302 CRW/RR CORN HYBRIDS WITH AND WITHOUT CRUISER SEED TREATMENT

M&M Farms, Wharton County, 2006

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SUMMARY: Garst 8302 CRW/RR transgenic Bt corn hybrid developed for control of corn rootworm (Mexican, western, and northern species) was compared to Garst 8270 RR hybrid with and without Cruiser seed treatment to determine parameters of control for insect pests and yield levels. Both rates of Cruiser were effective in reducing chinch bug numbers to non-economic levels. Plant damage ratings reflected protection provided by the seed treatment. Root damage ratings due to Mexican corn rootworm were significantly different for all treatments with the least damage in the transgenic Bt hybrid (Garst 8302 CRW/RR). All treatment had significantly different yield levels with the higher yields produced by Garst 8270 RR hybrid treated with Cruiser followed by Garst 8302 CRW/RR treated with Cruiser. Although the most effective protection of corn roots was achieved with the transgenic Bt hybrid developed for certain corn rootworm species, yield was not as good as the conventional hybrid. Garst 8302 CRW/RR hybrid may not be adapted to the Texas Gulf Coast environment.

OBJECTIVES: The field study was established to study the effects of conventional and transgenic corn hybrids with and without Cruiser seed treatments (two rates) on insect numbers, plant and root ratings, and yield.

MATERIALS/METHODS: Test corn was planted on the Neal Mahalitc Farm (M&M Farms) on March 3, 2006 located one mile south of FM 2614 on CR 267 near the Elm Mott Community in Wharton County. Plots were 8 rows wide by approximately 1500 feet with a row spacing of 36 inches, and treatments were replicated 3 times in a randomized complete block design. The silt loam soil (42% sand, 16% silt, 42 % clay), with 7.7 pH, and 1.59% organic matter had excellent moisture at planting. Corn had been grown in the field for several years. The soil temperature was 70°F on the planting date, and kernels were seeded with a John Deere finger planter at approximately 24,000 per acre.

Treatments were assessed by (1) counting the number of living plants on 14.5 feet of row at two locations in the center rows of plots 20 and 31 days after planting [DAP], (2) counting the number of chinch bugs by examining and digging around 20 plants in the center two rows of each plot 20, 31, and 40 DAP, (3) determining the number of wilted plants on 14.5 feet of row 20 and 31 DAP, (4) assigning a damage rating [1 = no damage up to 5 = severe stunting, wilting, and/or yellow color] to each plot at 31 and 40 DAP, (5) digging 6 plants from the center rows in plots on April 28 and evaluating the root system with the node injury 0-3 scale [0 = no damage, 1 = a complete node of roots destroyed, 2 = two nodes of roots destroyed, and 3 = three or more nodes of roots destroyed] and with the root rating 1-6 scale [1 = no damage up to 6 = three or more nodes of roots destroyed], (6) establishing a visual root vigor rating where the higher % represents the greatest vigor, and (7) harvesting varying lengths of the 8-row plots on August 3 to obtain yields. Grain weight was adjusted to that at 15% moisture.

RESULTS/DISCUSSION: Plant stand was not affected by treatments on two inspection dates, although all but one of the treatments had fewer plants remaining on the second date (Table 1). Chinch bugs were not found in plots at 20 DAP where Cruiser treated seed was present, but a few were found in plots without Cruiser treated seed. At 31 and 40 DAP chinch bug numbers were significantly lower in Cruiser treatments and the lowest numbers were found in the Cruiser 1.25 mg ai/seed treatment. Only the treatment where no Cruiser was applied to the seed did chinch bug numbers exceed the treatment threshold of 40 bugs/100 plants (86.5 chinch bugs/100 plants were detected). No differences were found in the number of wilted plants, but plant damage was higher in the treatment that did not contain Cruiser treated seed (Table 2). Each treatment was statistically different in root damage ratings from all the other treatments with the greatest damage in the treatment where no Cruiser was used, followed by the low Cruiser treatment, then the high Cruiser treatment, and the least damage was in the CRW trasgenic Bt hybrid (Table 3). Lowest yield was in the treatment where no Cruiser was used and the highest yield was the Cruiser 0.25 mg ai/seed treatment. The Garst 8302 CRW/RR hybrid may not be adapted to the Texas Gulf Coast environment.

ACKNOWLEDGMENTS: We acknowledge Neal Mahalitc for use of land and equipment for conduct of this study.

Table 1. Plant stand and chinch bug numbers in Garst 8270 RR and 8302 CRW/RR corn hybrids with and without Cruiser seed treatment, M&M Farms, Wharton County, TX, 2006.

Hybrid & Treatment	Plants (1000's/acre)		Chinch bugs/20 plants			
	20 DAP[a]	31 DAP	20 DAP	31 DAP	40 DAP	Avg
Garst 8270 RR Cruiser 5FS 1.25 mg ai/seed	23.3 a	20.3 a	0.0 a	1.3 b	1.7 c	1.0 c
Garst 8270 RR Cruiser 5FS 0.25 mg ai/seed	26.3 a	24.3 a	0.0 a	3.0 b	7.0 b	3.3 b
Garst 8302 CRW/RR Cruiser 5FS 0.25 mg ai/seed	23.2 a	23.3 a	0.0 a	4.7 b	5.3 bc	3.3 b
Garst 8270 RR	23.5 a	21.8 a	0.7 a	17.3 a	14.7 a	10.9 a
LSD (P = 0.05)	NS	NS	NS	3.59	3.77	1.59
P > F	.2746	.1183	.4547	.0001	.0008	.0001

Means in a column followed by the same letter are not significantly different by ANOVA.
[a] DAP = Days After Planting

Table 2. Visual plant ratings in Garst 8270 RR and 8302 CRW/RR corn hybrids with and without Cruiser seed treatment, M&M Farms, Wharton County, TX, 2006.

Hybrid & Treatment	Wilted plants (1000's/acre)		Plant damage rating[b]	
	20 DAP[a]	31 DAP	31 DAP	40 DAP
Garst 8270 RR Cruiser 5FS 1.25 mg ai/seed	0.0 a	0.3 a	2.0 b	2.6 a
Garst 8270 RR Cruiser 5FS 0.25 mg ai/seed	0.0 a	0.3 a	1.3 b	1.9 ab
Garst 8302 CRW/RR Cruiser 5FS 0.25 mg ai/seed	0.0 a	0.5 a	1.0 b	1.2 b
Garst 8270 RR	0.7 a	1.7 a	3.7 a	2.7 a
LSD (P = 0.05)	NS	NS	1.104	1.030
P > F	.0701	.0593	.0042	.0372

Means in a column followed by the same letter are not significantly different by ANOVA.
[a] DAP = Days After Planting
[b] Plant damage rating: 1 = no damage up to 5 = severe stunting, wilting, and yellow color.

Table 3. Root damage and vigor ratings, grain moisture at harvest, and yield in Garst 8270 RR

and 8302 CRW/RR corn hybrids with and without Cruiser seed treatment, M&M Farms, Wharton County, TX, 2006.

Hybrid & Treatment	Root damage ratings 0-3[a]	Root damage ratings 1-6[b]	Root vigor rating[c] (%)	% grain moisture	Yield bu/acre
Garst 8270 RR Cruiser 5FS 1.25 mg ai/seed	0.25 c	2.88 c	71.8 b	15.4 a	124 b
Garst 8270 RR Cruiser 5FS 0.25 mg ai/seed	0.59 b	3.60 b	47.6 c	14.8 c	128 a
Garst 8302 CRW/RR Cruiser 5FS 0.25 mg ai/seed	0.02 d	1.25 d	90.1 a	14.6 d	120 c
Garst 8270 RR	1.27 a	4.18 a	33.1 c	15.2 b	105 d
LSD (P = 0.05)	.226	.386	15.42	0.14	2.94
P > F	.0001	.0001	.0004	.0001	.0001

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

[a] New method - Iowa State 0 -3 node-injury scale: 0 = no feeding damage, 1 = 1 node of roots eaten within 2 inches of the stalk, 2 = 2 nodes of roots eaten, and 3 = 3 or more nodes of roots eaten.

[b] Old method - Iowa State 1 - 6 root-rating scale: 1 = no visible feeding damage, 2 = feeding scars, 3 = at least 1 root eaten to within 1.5 inches of stalk, 4 = 1 complete node of roots eaten, 5 = 2 complete nodes of roots eaten, and 6 = 3 or more nodes of roots eaten.

[c] Highest plant vigor would be 100%

EFFICACY OF CRUISER TREATED CORN SEED FOR CHINCH BUG CONTROL

Fred and Chad Hahn Farm, DeWitt County, 2006

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SUMMARY: Drought conditions were so severe that only limited data could be reported from this study on evaluation of Cruiser seed treatments on two Garst corn hybrids. Chinch bug numbers exceeded the economic injury level of 40/100 plants only in the treatment that did not contain Cruiser treated seed; this treatment contained 110.0 and 62.5 chinch bugs/100 plants at 30 and 41 days after planting, respectively. Yields were very low and ranged from 10.1 to 12.7 bushels/acre due to the drought; therefore, these yields were not useful in evaluation of effects of the chinch bug control on production.

OBJECTIVES: The purpose of this study was to compare corn production of two Garst Seed Company hybrids with and without the insecticide Cruiser as a seed treatment, and to measure the effects of two rates of Cruiser seed treatment.

MATERIALS/METHODS: The field experiment was conducted on the Fred and Chad Hahn Farm on Highway 119, five miles northwest of Yorktown. Garst 8270 RR and Garst 8302 CRW/RR hybrids were planted on rows with 30-inch centers at 18,000 seed/acre with a John Deere 1760 Vacuum planter on March 7, 2006. Plots were 5 rows by 1165 feet, and treatments were replicated 3 times in a randomized complete block design. Corn had been grown in the field for many years, but the Mexican corn rootworm has not been present at the site for the past two years. This rootworm was not a factor in the current study. Marginal soil moisture was available at planting, and limited rainfall was received during the important growth stages of corn plants. The soil was a sandy clay loam (64% sand, 13% silt, and 23% clay) which contained 1.8% organic matter, and it had a 7.9 pH as measured in 2004. Fertilizer applied was 62-26-8.

Treatments were assessed by (1) counting the number of corn plants on 17.4 feet of row on each of the center 3 rows/plot on April 6, (2) examining 20 plants/plot for chinch bugs on April 6 [30 DAP = days after planting] and again on April 17 [41 DAP], and (3) harvesting the 5-row plots with a commercial combine on August 12. Plot weights were adjusted for moisture to 15%.

RESULTS/DISCUSSION: Statistical differences were not observed in plant stands among the treatments, but treatments did differ in numbers of chinch bugs (Table 1). At 30-DAP all treatments where Cruiser was used had fewer chinch bugs compared to the treatment without Cruiser. Numerically the Cruiser 5FS (1.25 mg ai/seed) treatment had fewer chinch bugs at 30-DAP and again at 41 DAP. Only the Garst 8270 RR hybrid (0.25 mg ai/seed) treatment was not significantly different from the higher rate of Cruiser in number of Chinch bugs on the second inspection date. No differences were found in grain moisture or yield. Yields were very low and could not be used to measure efficacy of the two Cruiser rates evaluated.

ACKNOWLEDGMENTS: Thanks are extended to Fred and Chad Hahn for their continued interest in field studies of this nature even under the adverse conditions encountered in 2006. Their donation of equipment and time for conduct of the study is acknowledged.

Table 1. Plant stand, chinch bug numbers and yield of Garst 8270 RR and 8302 CRW/RR corn hybrids with and without Cruiser seed treatment, Fred and Chad Hahn Farm, DeWitt County, TX, 2006.

Hybrid & Treatment	Plants 1000's/acre	Chinch bugs/20 plants		% grain moisture	Yield bu/acre
		30 DAP[a]	41 DAP		
Garst 8270 RR Cruiser 5FS 1.25 mg ai/seed	16.2 a	1.0 b	4.3 bc	11.6 a	10.1 a
Garst 8270 RR Cruiser 5FS 0.25 mg ai/seed	15.6 a	0.3 b	0.3 c	11.4 a	10.4 a
Garst 8302 CRW/RR Cruiser 5FS 0.25 mg ai/seed	17.5 a	2.7 b	6.7 b	11.2 a	11.5 a
Garst 8270 RR	16.3 a	22.0 a	12.7 a	11.3 a	12.7 a
LSD (P = 0.05)	NS	4.98	5.17	NS	NS
P > F	.1704	.0001	.0061	.5700	.6565

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

[a] DAP = Days After Planting

EVALUATION OF THE USE OF BAYTHROID ON CORN APPLIED AT SILKING FOR CATERPILLAR CONTROL AND EFFECT ON AFLATOXIN LEVELS

Keith Orsak Farm, Jackson County, 2006

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SUMMARY: It was not possible to draw firm conclusions in this study to evaluate the effects of applying pyrethroid insecticide treatment to field corn beginning at first silk. No effects were found in previous similar studies. However, in the current study, another caterpillar pest (sugarcane borer) was present and the treatment seemed to have some impact on their numbers and damage. Although not statistically significant, more than twice as many corn earworm larvae were found in the nontreated corn compared with treated corn 6 days after treatment 2 (6 DAT-2), and corn earworm damage to ear tips at harvest was significantly lower in the Baythroid treated corn. None of the sugarcane borer measurements were statistically significant, but all six factors measured showed numerically higher levels in the nontreated corn. None of the yield factors were different, and aflatoxin levels were very low. Statistically, a higher level of aflatoxin was found in the nontreated corn from the machine harvest (5.9 ppb compared to 3.6 ppb).

MATERIALS/METHODS: The corn study was established on the Keith Orsak Farm in Jackson County on the west side of Highway 172 about 2 miles south of the intersection of Highway 111. The corn hybrid was B&H 9044RR. The experiment was arranged in a randomized complete block design with 3 replications of each of the two treatments. Plots were at least 65 rows wide except for the first nontreated plot (30 rows) which was up-wind from the remainder of the corn. Baythroid XL 1EC (2.8 oz/acre) was applied May 5 (silks first emerging) and again on May 12 by air in a spray volume of 1.0 gpa.

Treatments were assessed by (1) examining 20 ears and plants near the center of each plot on May 18 [6 DAT-2] and again on May 24 [12 DAT-2] for corn earworms, fall armyworms, and evidence of sugarcane borer; (2) harvesting 10 whole plants and another 10 ears from near the center of plots to evaluate ear and plant damage levels from corn earworm (ear tips) and sugarcane borer larvae and damage, yield level of individual ears, and aflatoxin level of the grain; and (3) harvesting a large area with a commercial combine from center rows in plots for yield and an additional measurement for aflatoxin. Grain was adjusted for weight at a standard of 15% moisture.

Plants were processed in the laboratory by examination of stalks for sugarcane borer signs, evaluation of the ears for insect damage, and conduct of aflatoxin test. Aflatoxin levels were determined by using a Vicam testing kit (Afla Test_P).

OBJECTIVES: Baythroid insecticide (a pyrethroid) was applied to field corn to evaluate the impact of the treatment on damage from the corn earworm, fall armyworm, and sugarcane borer. Another objective was measure aflatoxin levels in harvested grain.

RESULTS/DISCUSSION: Several producers have indicted to us that aflatoxin levels in harvested corn could be reduced by application of two precisely timed treatments of a pyrethroid insecticide at very first silk and again one week later. Two field experiments had been conducted in the 1980's in South Texas to measure impact on corn earworm and yield; no effects were found in those studies. The aflatoxin question, however, remained. In the current study, Baythroid was applied at the highest labeled rate as indicated above. No differences were observed in the number of corn earworm or fall armyworm larvae infesting ears at 6 or 12 days after treatment 2 (DAT-2), even though at 6 DAT-2 more than twice as many corn earworm larvae were detected in the nontreated corn ears (Table 1). Additionally, corn ears examined at harvest did have statistically less ear tip damage from caterpillar feeding than the nontreated ears. Although statistically significant differences were not observed in any of six types of sugarcane borer measurements, all infestation and damage measurements were numerically lower in the Baythroid treated corn (Table 2). Two of these data types, centimeters of stalk and ear shank tunneling, had probability levels of 0.0902 and 0.0572, respectively. Shank tunneling could reasonably be expected to affect yield and aflatoxin levels. Corn production was measured in two ways (Table 3). First, a total of twenty ears were harvested from each plot for analysis, and second, center rows in each plot were harvested for yield determination with a commercial combine. No differences were found in either of these measurements, and in fact, machine yields were numerically 7 bu/acre higher in the nontreated corn. No differences were found in aflatoxin levels in the hand harvested corn samples which ranged from 1.64 to 1.57 ppb in Baythroid treated and nontreated plots, respectively. However, there was a significant difference in aflatoxin level in the machine harvest (3.6 ppb and 5.9 ppb in Baythroid treated and nontreated plots, respectively). These levels are so low that they have no meaning in commercial use, but the fact remains, the difference was statistically significant. Other than data trends and a few statistically significant differences, firm conclusions could not be drawn from the study. However, the presence and possible affect of sugarcane borer peaked our interest for future studies.

ACKNOWLEDGMENTS: Thanks are extended to Keith Orsak for providing the study site and paying the aerial application cost. Don White, White's Flying Service is acknowledged for his interest in this work. A special thanks is given to Gary Schwarzlose, Bayer CropScience, for donation of the Baythroid for the large plots.

Table 1. Effect on corn of Baythroid treatments applied at first silk and one week later on corn earworm and fall armyworm numbers and damage, Keith Orsak Farm, Jackson County, TX, 2006.

	Number per 20 ears				
	corn earworm		fall armyworm		Caterpillar ear tip da.
Treatment	6 DAT -2[a]	12 DAT-2	6 DAT-2	12 DAT-2	cm
Baythroid XL 1EC 2.8 oz/acre	4.0 a	18.0 a	0.0 a	1.7 a	54.9 b
Nontreated	9.7 a	17.7 a	0.0 a	1.0 a	67.4 a
LSD (P = 0.05)	NS	NS	NS	NS	5.99
P > F	.1221	.7418	-	.4226	.0122

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

[a] DAT-2 = Days After Treatment 2.

Table 2. Sugarcane borer numbers and infestation levels near harvest in corn treated at silking with Baythroid for caterpillar pests, Keith Orsak Farm, Jackson County, TX, 2006.

		Amount per 10 plants				
Treatment	% damaged plants	larvae	exit holes	# tunnels	cm stalk tunnels	cm shank tunnels
Baythroid XL 1EC 2.8 oz/acre	50.0 a	5.0 a	5.0 a	5.7 a	27.3 a	3.2 a
Nontreated	83.3 a	7.7 a	20.0 a	13.0 a	101.2 a	9.2 a
LSD (P = 0.05)	NS	NS	NS	NS	NS	NS
P > F	.1296	.2697	.0866	.1107	.0902	.0572

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

Table 3. Corn production from plots treated at silking with Baythroid for caterpillar pests, Keith Orsak Farm, Jackson County, TX, 2006.

	% grain moisture		Bushel	Yield	Machine	Aflatoxin (PPB)	
Treatment	hand	machine	weight	grams/ear	bu/acre	hand	machine
Baythroid XL 1EC 2.8 oz/acre	14.6 a	15.8 a	58.7 a	169.1 a	121 a	1.64 a	3.6 b
Nontreated	14.8 a	15.8 a	58.5 a	170.5 a	128 a	1.57 a	5.9 a
LSD (P = 0.05)	NS	NS	NS	NS	NS	NS	1.80
P > F	.6621	.8452	.7418	.0906	.3547	.9331	.0306

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

COMPARISON OF TRANSGENIC CORN HYBRIDS FOR EFFECTIVENESS ON SUGARCANE BORER AND OTHER CATERPILLARS

Jimmy Hays Farm, Victoria County, 2006

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SUMMARY: Bt-transgenic corn hybrids were evaluated for effectiveness on caterpillars, especially the sugarcane borer. Five experimental hybrids from Syngenta Crop Protection and one commercial hybrid each from Croplan Genetics, Garst Seed Company, and B&H Genetics were included in the study. The yellow striped armyworm and fall armyworm infested young plants that were 5-8 inches tall; their numbers were significantly higher in the MIR 604 Bt hybrid (corn rootworm transgenic Bt hybrid) and in the negative isoline. Twelve separate measurements for sugarcane borer indicated very low infestation levels in the transgenic Bt hybrids developed for caterpillar control. Sugarcane borer larval numbers and plant damage factors were significantly greater in the negative isoline and the transgenic corn rootworm hybrid (not designed for caterpillar control). The number of sugarcane borer larvae in MIR 604 was significantly greater by nearly a two fold factor than the number found in the negative isoline. Their numbers averaged 4.0/plant and 2.2/plant in the MIR 604 and negative isoline hybrids, respectively. Generally more entrance/exit holes and centimeters of tunneling were found in internodes below ear attachment level. Tunneling averaged 2.81 centimeters in the MIR 604 and negative isoline hybrids and .01 centimeters in the transgenic Bt hybrids developed for caterpillar control.

All commercial and experimental hybrids developed for caterpillar control exhibited impressive sugarcane borer control. There were no statistical differences between these hybrids with respect to sugarcane borer data.

OBJECTIVES: The field study was conducted to compare sugarcane borer efficacy of transgenic Bt hybrids developed for caterpillar control and to evaluate their effectiveness compared with a non-transgenic hybrid (negative isoline) and a transgenic Bt hybrid developed only for corn rootworm control (MIR 604).

MATERIALS/METHODS: The corn hybrids were evaluated on the Jimmy Hays Farm off FM 1090 about 2 miles east of Highway 87 in Victoria County. The corn was planted late due to delay in arrival of the seed followed by very dry conditions. After adequate rainfall was received, the seed was planted on June 14, 2006 at the rate of 35 seed/22 row feet with a John Deere 7100 MaxEmerge 2-row planter equipped with cone type planter units. The test was arranged in a randomized complete block design with 4 replications. Individual plots were 2 rows wide on 38-inch beds by 22 feet long. Alleys between replications were 3 feet. No other corn was planted within 2100 feet which exceeded the requirements for testing the unregistered hybrids under

Federal Environmental Protection Agency and United States Department of Agriculture rules. Lorsban 4E (32 oz/acre) was applied to the base of stalks with a hand sprayer just before ear formation in the entire test for a heavy chinch bug infestation.

Treatments were assessed by (1) counting the number of total plants on each of the 2-row plots on June 28, (2) counting the number of caterpillars infesting all of the plants on each of the two row plots on June 28, (3) observing the number of plant tops with obvious sugarcane borer damage in all plants in each plot on August 7, (4) examining 10 whole plants from each plot for the number of sugarcane borer larvae (non-emerged pupae were counted as larvae), entrance/exit holes, internal stalk tunnels, ear shank tunnels, and ear tunnels on August 9, and (5) measuring stalk, ear shank, and ear tunneling in 10 plants/plot on August 9. These data were obtained just at the end of the active silking period.

RESULTS/DISCUSSION: There were significant differences in plant stands (Table 1), but the only one that seemed to be of practical importance was the lower stand found in the negative isoline treatment. Plant stands in the negative isoline plots were considerably below the other treatments. The fact that the negative isoline was an old seed lot with less vigor probably accounted for the lower plant stands. Early in the study yellow striped armyworms and fall armyworms were found feeding on 5-8 inch tall plants; their numbers were significantly greater in the MIR 604 and negative isoline hybrids neither which were expected to control caterpillars. The total number of sugarcane borer larvae in stalks, ear shanks, and ears were statistically higher in the MIR 604 hybrid than all other treatments; in turn, the negative isoline hybrid contained significantly more sugarcane borer larvae than all remaining treatments (transgenic Bt hybrids developed for caterpillar control). There were nearly twice as many sugarcane borers in the MIR 604 hybrid compared with the number in the negative isoline hybrid (4.0/stalk verses 2.2/stalk). Again, the negative isoline plots contained fewer plants and may not have been as attractive for sugarcane moth egg laying.

The number of stalk entrance/exit holes and centimeters of stalk tunneling by sugarcane borers is shown in Table 2. The data were separated by infestation above and below the internode to which the ear was attached; the internode just above the ear attachment point was considered in the "below" group. Numerically, there were more entrance holes and tunneling below the ear internode. There were no statistical differences in entrance/exit hole numbers or tunneling in the MIR 604 hybrid and the negative isoline hybrid, but both of these hybrids had significantly more exit holes and tunneling than all the other treatments. There were few entrance/exit holes in the later group of hybrids.

The number of stalk, ear shank, and ear tunnels; and centimeters of tunneling in ear shanks and ears is provided in Table 3. These results were similar to that found for the entrance/exit hole and centimeter tunneling data discussed above. Damage to ear shanks, although significantly greater in the MIR 604 hybrid compared with all other test hybrids, was surprisingly low. Damage to the ears was also relatively low, but again, damage in MIR 604 and the negative isoline was significantly greater than that in the other hybrids.

All test hybrids containing Bt protein for caterpillars were very effective in reducing sugarcane borer damage. In fact, only 3 live sugarcane borer larvae were found in the 240 transgenic Bt (caterpillar protein) plants examined. A total of 247 larvae were found in the 80 non-Bt plants. Note that 3 times more transgenic Bt plants were examined on which these numbers are based.

ACKNOWLEDGMENTS: Syngenta Crop Protection, Inc. is thanked for providing five of the corn hybrids used in the study and for monetary support of the work. Jimmy Hays is thanked for providing the test location for the past two years and for his direct assistance with weed control and crop termination.

Table 1. Plant stand, yellow striped armyworm/fall armyworm infestation, and sugarcane borer larvae in corn hybrid evaluation, Jimmy Hays Farm, Victoria County, TX, 2006.

Hybrid	Plant stand no./10 ft	YSAW/FAW[b] % infested plants	Sugarcane borer % da. tops	Sugarcane borer no./10 plants
MIR 604 (corn rootworm)	15.0 ab	29.9 a	62.5 a	40.0 a
Negative Isoline[a]	10.5 c	28.8 a	51.5 a	21.8 b
Bt 11	14.3 b	0.8 b	0.8 b	0.3 c
MIR 162 + Bt 11	15.3 a	0.0 b	0.0 b	0.3 c
MIR 162 + Bt 11 + MIR 604	14.8 ab	0.0 b	0.0 b	0.0 c
Croplan 818 TS	14.3 b	2.8 b	0.0 b	0.0 c
Garst 8377 YG/RR	15.1 ab	3.0 b	0.0 b	0.0 c
BH 8895RR+	14.3 b	0.0 b	0.8 b	0.3 c
LSD (P = 0.05)	0.93	7.36	14.59	11.72
P > F	.0001	.0001	.0001	.0001

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

[a] Negative Isoline is a non-transgenic hybrid.

[b] YSAW = yellow striped armyworm, FAW = fall armyworm on June 28 (14 DAP).

Table 2. Sugarcane borer damage to corn stalks in corn hybrid evaluation, Jimmy Hays Farm, Victoria County, TX, 2006.

	Number of entrance/exit holes & centimeter stalk tunnels/10 plants					
	Above ear internode		Below ear internode		Total	
Hybrid	entrance/ exit	cm[b] tunnels	entrance/ exit	cm tunnels	entrance/ exit	cm tunnels
MIR 604 (corn rootworm)	67.3 a	193.3 a	60.3 a	139.0 a	127.5 a	332.3 a
Negative Isoline[a]	57.5 a	134.4 b	38.3 a	94.5 a	95.8 a	228.9 a
Bt 11	0.3 b	0.3 c	0.0 b	0.0 b	0.3 b	0.3 b
MIR 162 + Bt 11	0.5 b	1.3 c	0.0 b	0.0 b	0.5 b	1.3 b
MIR 162 + Bt 11 + MIR 604	0.8 b	0.8 c	1.8 b	0.5 b	2.5 b	1.3 b
Croplan 818 TS	1.3 b	0.8 c	1.5 b	2.3 b	2.8 b	3.0 b
Garst 8377 YG/RR	0.0 b	0.0 c	0.0 b	0.0 b	0.0 b	0.0 b
BH 8895RR+	0.0 b	0.0 c	0.8 b	1.3 b	0.8 b	1.3 b
LSD (P = 0.05)	24.09	49.66	30.54	59.51	52.14	103.47
P > F	.0001	.0001	.0018	.0002	.0001	.0001

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

[a] Negative Isoline is a non-transgenic hybrid.

[b] cm = centimeters

Table 3. Number stalk, ear shank, and ear tunnels and centimeters tunneling in shanks and ears by sugarcane borer in corn hybrid evaluation, Jimmy Hays Farm, Victoria County, TX, 2006.

	Number or centimeters tunneling per 10 stalks (shanks & ears)						
	No. stalk tunnels			Ear shank tunnels		Ear	
Hybrid	above ear	below ear	total	cm[b]	number	cm	number
MIR 604 (corn rootworm)	32.8 a	20.0 a	52.8 a	3.3 a	2.0 a	76.8 a	10.4 a
Negative Isoline[a]	23.0 b	13.0 a	36.0 b	0.0 b	0.0 b	26.0 b	6.1 b
Bt 11	0.3 c	0.0 b	0.3 c	0.0 b	0.0 b	0.0 b	0.0 c
MIR 162 + Bt 11	0.5 c	0.0 b	0.5 c	0.0 b	0.0 b	0.0 b	0.0 c
MIR 162 + Bt 11 + MIR 604	0.5 c	0.5 b	1.0 c	0.0 b	0.0 b	0.0 b	0.0 c
Croplan 818 TS	0.8 c	1.0 b	1.8 c	0.0 b	0.0 b	0.0 b	0.0 c
Garst 8377 YG/RR	0.0 c	0.0 b	0.0 c	0.0 b	0.0 b	0.0 b	0.0 c
BH 8895RR+	0.0 c	0.8 b	0.8 c	0.0 b	0.0 b	0.0 b	0.0 c
LSD (P = 0.05)	6.46	7.10	12.81	2.05	1.27	26.91	2.93
P > F	.0001	.0001	.0001	.0361	.0385	.0001	.0001

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

[a] Negative Isoline is a non-transgenic hybrid.

[b] cm = centimeters

EFFECTIVENESS OF INSECTICIDES ON STORED CORN WITH RATES SELECTED BASED ON FOUR CENTS PER BUSHEL MAXIMUM COST

Ten Month Preliminary Report

Texas Agricultural Experiment Station, Nueces County, 2006

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SUMMARY: Managers of stored grain along the Texas Gulf Coast state that (1) the cost of treating grain with protectants for insect control at the labeled rates for many of the products is excessive compared to cost of fumigation, and (2) the period for which they need insect protection is about 12 months. In previous studies we obtained more than 19 months of very effective control with protectants, but the cost of the rates for some of the products was relatively high. In the present study the tested rates of single insecticides or mixtures of insecticides were selected based on a maximum cost of $0.04/bushel.

Through 10 months of storage, 4 of 6 insecticide treatments kept pest insect numbers at very low levels. The promising treatments include Actellic, Actellic + Diacon II, Spinosad, and Spinosad + Diacon II. The treatments that exceeded 1 primary insect pest/quart sample included the nontreated corn, Spinosad (dry formulation), and Diacon II. There was evidence that lesser grain borer numbers might increase at a greater rate in the Actellic (alone) treatment just as occurred in an earlier stored corn study. The ineffectiveness of the dry formulation of Spinosad was evident in this study just as occurred in the previous study. By the 5th storage month, pest insect numbers in the nontreated and the less effective insecticide treatments exceeded the economic injury level for both primary and secondary species. Temperature increase was noted in the Spinosad (dry formulation), Diacon II, and nontreated corn moisture content was generally higher in these same treatments.

OBJECTIVES: The experiment was established to determine the effectiveness on stored corn of insecticides for pests based on maximum use rates which cost no more than $0.04/bushel.

MATERIALS/METHODS: Commercially cleaned corn that was in excellent condition was obtained from the Bee County Coop, Tynan, Texas. Corn measured in 50 lb increments was treated on January 24, 2006 in a small cement mixer by applying equivalent to 5 gallons of liquid volume/1000 bushels. Four 50 lb samples of each treatment were placed in 30 gallon plastic drums (200 lb total corn/drum). Drums were covered with 0.5-inch hardware cloth to keep out birds, rodents and other unwanted animals. Following treatment and loading of drums, Phostoxin applied at 1 pellet/30 gallon drum was placed into the center of the grain mass in early February. Drums were then sealed with 6 ml polyethylene sheeting and tape. Drums were sealed for 5 days and then aerated for 5 days. Sampling of drums revealed no live insects after fumigation. Following aeration, 20 adult lesser grain borer and 10 each of rice weevil and red flour beetle specimens were added to each drum. Each treatment was replicated 4 times and drums, arranged in a randomized complete design, were placed on a concrete floor at the Texas Agricultural Experiment Station, Corpus Christi, TX. Insects (natural infestation) from inside and outside the building had access to the experimental grain.

Treatments were assessed each month by (1) measuring the temperature with a 12-inch thermometer placed 11.5 inches deep into the middle of each drum, (2) probing grain at 6 locations/drum with a grain probe to obtain a one quart sample for insect inspection and moisture content, and (3) separating insects from the grain using a Seedburo Equipment Company sieve (8/64 - inch triangle holes). Insects were then counted under a Circline magnifier lamp. At intervals during the test period the corn was weighed and a sample was sent to the Corpus Christi Grain Exchange to determine quality factors.

RESULTS/DISCUSSION: Grain temperatures were not different until the number of insects began to significantly increase in the 5th storage month, and thereafter the differences generally continued to widen as insect numbers increased (Table 1). Higher temperatures occurred in the spinosad (dry formulation), Diacon II (applied alone) and in the nontreated corn. Significant differences were not detected in grain moisture content through 7 months of storage, but by the 8th month, the same three treatments mentioned above generally had a higher moisture content (Table 2). Significant differences did not occur in total insect pest numbers until the 5th storage month at which time the nontreated corn contained more insects than the other treatments (Table 3). Total insect pests in the 5th month numbered 4.5/quart sample of which 1.0/quart sample were rice weevils (Table 4). The economic injury level for the rice weevil is considered to be 1.0/quart sample. Rice weevil numbers per quart sample had increased by the 10th storage month to 18.8 in nontreated, 42.8 in Diacon II, and 36.8 in Spinosad (dry); whereas, an average of 0.4/quart sample were found in the remaining treatments in the 10th month. Significant differences were not found in lesser grain borer numbers in the first 9 months of storage but by month 10, significantly more were found in the Actellic (alone) treatment (Table 5). This occurrence was expected based on previous studies where Actellic had little effect on lesser grain borer. Red flour beetle numbers for each month are shown in Table 6. Red flour beetle numbers began to appear in the nontreated corn by the 5th storage month, and by the 7th month statistical differences were observed. Rusty grain beetle and corn sap beetle numbers remained relatively low throughout the 10-month storage period (Tables 7-8). At least two species of beneficial insect parasites (*Anisopteromalus calandrae* and *Choetospila elegans*) were observed beginning in the 6th storage month (Table 9). *A. calandrae* accounted for greater than 90% of the observed parasitic wasps. Nearly twice as many parasites were found in the Diacon II and nontreated corn compared to the Spinosad dry formulation, and very few were found in remaining treatments. The ineffectiveness of the dry Spinosad formulation treatment in reducing insect pests coupled with fewer parasites compared to the Diacon II (alone) and nontreated corn treatments may account for increased pest numbers in the dry Spinosad treatment. Grade factors (Table 10) show significantly greater insect damage in Spinosad (dry), Diacon II, and nontreated corn. Weight loss was statistically greater in Spinosad (dry), Diacon II and nontreated corn compared to the other treatments after 8, 9, and 10 months (Table 11). The monetary loss averaged 29 cents/bushel in the Spinosad (dry), Diacon II, and nontreated corn after 10 months. The loss in the remaining treatments averaged 4 cents/bushel after 10 months. We expect to see accelerated loss over the next few months in these three treatments.

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Table 1. Temperature levels in stored corn treated with insecticides for insects, Texas Agricultural Experiment Station, Nueces County, TX, 2006.

		Temperature (°F) at month number and month post-treatment										
Treatment	Rate/ 1000 bu	1 Mar	2 Apr	3 May	4 Jun	5 Jul	6 Aug	7 Sep	8 Oct	9 Nov	10 Dec	Avg
Spinosad 0.5% AI	11.2 lb	70.9 a	77.8 a	80.3 a	84.0 a	86.5 bc	90.3 a	87.3 a	88.5 a	78.5 a	73.5 a	81.7 a
Actellic 5E	6.83 oz	71.3 a	78.0 a	80.5 a	83.5 a	85.5 d	88.3 b	85.8 b	83.5 c	74.3 b	67.5 c	79.8 c
Actellic 5E + Diacon II	3.86 oz + 3.50 oz	70.9 a	77.8 a	80.0 a	83.6 a	85.8 cd	88.3 b	86.0 b	83.8 c	75.0 b	67.0 c	79.8 c
Spinosad 0.75 lb	9.6 oz	71.0 a	77.9 a	80.1 a	83.5 a	85.8 cd	88.5 b	86.0 b	83.8 c	74.8 b	67.5 c	79.9 c
Spinosad 0.75 lb + Diacon II	5.43 oz + 3.50 oz	70.9 a	78.1 a	80.1 a	83.9 a	85.5 d	88.5 b	86.0 b	83.8 c	74.5 b	67.3 c	79.9 c
Diacon II	8.07 oz	71.1 a	78.0 a	80.5 a	84.4 a	88.0 a	89.5 a	87.0 a	87.8 a	77.8 a	72.5 ab	81.7 a
Nontreated		70.9 a	77.9 a	80.5 a	84.1 a	86.8 b	89.8 a	86.8 a	86.5 b	77.3 a	71.0 b	81.1 b
LSD (P = 0.05)		NS	NS	NS	NS	0.88	0.95	0.66	1.21	1.47	2.09	0.46
P > F		.7982	.2158	.0905	.0778	.0001	.0009	.0005	.0001	.0001	.0001	.0001

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

Table 2. Moisture levels in stored corn treated with insecticides for insects, Texas Agricultural Experiment Station, Nueces County, TX, 2006.

		Moisture (%) at month number and month post-treatment										
Treatment	Rate/ 1000 bu	1 Mar	2 Apr	3 May	4 Jun	5 Jul	6 Aug	7 Sep	8 Oct	9 Nov	10 Dec	Avg
Spinosad 0.5% AI	11.2 lb	10.7 a	10.9 a	10.9 a	10.8 a	11.5 a	11.1 a	11.3 a	11.8 ab	11.9 a	11.8 a	11.3 b
Actellic 5E	6.83 oz	10.8 a	10.9 a	10.9 a	11.2 a	11.5 a	11.3 a	11.2 a	11.5 bc	11.2 bc	10.8 c	11.1 c
Actellic 5E + Diacon II	3.86 oz + 3.50 oz	10.8 a	11.0 a	10.9 a	11.3 a	11.9 a	11.3 a	11.3 a	11.3 c	11.2 bc	10.4 d	11.1 c
Spinosad 0.75 lb	9.6 oz	11.0 a	10.9 a	10.9 a	11.2 a	11.9 a	11.5 a	11.3 a	11.4 c	11.3 bc	10.7 cd	11.2 bc
Spinosad 0.75 lb + Diacon II	5.43 oz + 3.50 oz	10.8 a	10.9 a	10.9 a	11.3 a	11.2 a	11.4 a	11.3 a	11.5 bc	11.1 c	10.8 c	11.1 c
Diacon II	8.07 oz	11.0 a	11.3 a	11.0 a	11.1 a	11.6 a	11.5 a	11.2 a	12.1 a	11.8 a	11.5 ab	11.4 a
Nontreated		10.9 a	10.9 a	10.9 a	10.9 a	11.6 a	11.5 a	11.3 a	11.9 ab	11.6 ab	11.3 b	11.3 b
LSD (P = 0.05)		NS	NS	NS	NS	NS	NS	NS	0.34	0.46	0.38	0.11
P > F		.7172	.5570	.4590	.1784	.0554	.3161	.5609	.0021	.0108	.0001	.0003

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

Table 3. Total number pest insects in stored corn treated with insecticides for insects, Texas Agricultural Experiment Station, Nueces County, TX, 2006.

		Total insects/quart sample at month number and month post-treatment										
Treatment	Rate/ 1000 bu	1 Mar	2 Apr	3 May	4 Jun	5 Jul	6 Aug	7 Sep	8 Oct	9 Nov	10 Dec	Avg
Spinosad 0.5% AI	11.2 lb	0.0 a	0.0 a	0.5 a	0.5 a	1.3 b	2.3 b	10.8 a	13.3 a	22.8 a	42.8 a	9.40 a
Actellic 5E	6.83 oz	0.0 a	0.0 a	0.0 a	0.0 a	0.3 b	0.5 b	1.3 b	0.5 b	0.5 b	2.5 b	0.55 b
Actellic 5E + Diacon II	3.86 oz + 3.50 oz	0.0 a	0.0 a	0.0 a	0.5 a	0.0 b	0.3 b	0.0 b	0.0 b	0.3 b	0.5 b	0.15 b
Spinosad 0.75 lb	9.6 oz	0.0 a	0.3 a	0.0 a	0.0 a	0.3 b	0.5 b	0.8 b	0.0 b	0.0 b	0.3 b	0.20 b
Spinosad 0.75 lb + Diacon II	5.43 oz + 3.50 oz	0.0 a	0.0 a	0.3 a	0.0 a	0.3 b	0.3 b	0.3 b	0.0 b	0.3 b	0.3 b	0.15 b
Diacon II	8.07 oz	0.3 a	0.5 a	0.3 a	1.0 a	0.8 b	3.3 ab	4.0 b	9.0 a	24.8 a	42.8 a	8.65 a
Nontreated		0.0 a	0.5 a	0.5 a	0.5 a	4.5 a	6.0 a	10.0 a	16.3 a	21.3 a	25.3 a	8.48 a
LSD (P = 0.05)		NS	NS	NS	NS	2.29	3.00	5.61	7.87	9.59	17.56	2.901
P > F		.4552	.2216	.6095	.0852	.0078	.0054	.0013	.0005	.0001	.0001	.0001

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

Table 4. Rice weevils in stored corn treated with insecticides for insects, Texas Agricultural Experiment Station, Nueces County, TX, 2006.

		Rice weevils/quart sample at month number and month post-treatment										
Treatment	Rate/ 1000 bu	1 Mar	2 Apr	3 May	4 Jun	5 Jul	6 Aug	7 Sep	8 Oct	9 Nov	10 Dec	Avg
Spinosad 0.5% AI	11.2 lb	0.0 a	0.0 a	0.0 a	0.5 a	1.3 a	1.5 ab	7.8 a	7.8 a	18.3 a	36.8 a	7.38 a
Actellic 5E	6.83 oz	0.0 a	0.0 a	0.0 a	0.0 b	0.3 a	0.0 b	0.0 b	0.0 b	0.0 b	0.8 c	0.10 b
Actellic 5E + Diacon II	3.86 oz + 3.50 oz	0.0 a	0.0 a	0.0 a	0.0 b	0.0 a	0.0 b	0.0 b	0.0 b	0.3 b	0.3 c	0.05 b
Spinosad 0.75 lb	9.6 oz	0.0 a	0.0 a	0.0 a	0.0 b	0.0 a	0.0 b	0.3 b	0.0 b	0.0 b	0.3 c	0.05 b
Spinosad 0.75 lb + Diacon II	5.43 oz + 3.50 oz	0.0 a	0.0 a	0.0 a	0.0 b	0.0 a	0.0 b	0.3 b	0.0 b	0.0 b	0.0 c	0.03 b
Diacon II	8.07 oz	0.0 a	0.0 a	0.0 a	0.0 b	0.5 a	3.0 a	4.0 ab	9.0 a	24.8 a	42.8 a	8.40 a
Nontreated		0.0 a	0.0 a	0.0 a	0.0 b	1.0 a	2.8 a	8.8 a	11.5 a	17.5 a	18.8 b	6.03 a
LSD (P = 0.05)		NS	NS	NS	0.32	NS	1.57	5.43	5.50	9.63	16.88	2.887
P > F		-	-	-	.0327	.3214	.0007	.0061	.0003	.0001	.0001	.0001

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

Table 5. Lesser grain borers in stored corn treated with insecticides for insects, Texas Agricultural Experiment Station, Nueces County, TX, 2006.

		Lesser grain borers/quart sample at month number and month post-treatment										
Treatment	Rate/ 1000 bu	1 Mar	2 Apr	3 May	4 Jun	5 Jul	6 Aug	7 Sep	8 Oct	9 Nov	10 Dec	Avg
Spinosad 0.5% AI	11.2 lb	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 b	0.00 b
Actellic 5E	6.83 oz	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.3 a	1.3 a	0.5 a	0.5 a	1.5 a	0.40 a
Actellic 5E + Diacon II	3.86 oz + 3.50 oz	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 b	0.00 b
Spinosad 0.75 lb	9.6 oz	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.3 a	0.0 a	0.0 a	0.0 b	0.03 b
Spinosad 0.75 lb + Diacon II	5.43 oz + 3.50 oz	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 b	0.00 b
Diacon II	8.07 oz	0.3 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 b	0.03 b
Nontreated		0.0 a	0.0 a	0.3 a	0.0 a	0.0 a	0.0 a	0.0 a	0.3 a	0.5 a	0.5 b	0.15 b
LSD (P = 0.05)		NS	NS	NS	NS	NS	NS	NS	NS	NS	0.67	0.168
P > F		.4552	-	.4552	-	-	.4552	.4552	.1794	.2816	.0011	.0006

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

Table 6. Red flour beetles in stored corn treated with insecticides for insects, Texas Agricultural Experiment Station, Nueces County, TX, 2006.

Treatment	Rate/ 1000 bu	Red flour beetles/quart sample at month number and month post-treatment 1 Mar	2 Apr	3 May	4 Jun	5 Jul	6 Aug	7 Sep	8 Oct	9 Nov	10 Dec	Avg
Spinosad 0.5% AI	11.2 lb	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.5 a	2.0 a	0.8 b	1.5 ab	2.8 a	0.75 b
Actellic 5E	6.83 oz	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.3 a	0.0 c	0.0 b	0.0 c	0.3 b	0.05 b
Actellic 5E + Diacon II	3.86 oz + 3.50 oz	0.0 a	0.0 a	0.0 a	0.3 a	0.0 a	0.0 a	0.0 c	0.0 b	0.0 c	0.3 b	0.05 b
Spinosad 0.75 lb	9.6 oz	0.0 a	0.0 a	0.0 a	0.0 a	0.3 a	0.0 a	0.3 bc	0.0 b	0.0 c	0.0 b	0.05 b
Spinosad 0.75 lb + Diacon II	5.43 oz + 3.50 oz	0.0 a	0.0 a	0.0 a	0.0 a	0.3 a	0.0 a	0.0 c	0.0 b	0.3 bc	0.3 b	0.08 b
Diacon II	8.07 oz	0.0 a	0.0 a	0.0 a	0.3 a	0.0 a	0.0 a	0.0 c	0.0 b	0.0 c	0.0 b	0.03 b
Nontreated		0.0 a	0.0 a	0.0 a	0.3 a	3.3 a	3.0 a	1.3 ab	3.0 a	2.0 a	3.5 a	1.63 a
LSD (P = 0.05)		NS	NS	NS	NS	NS	NS	1.19	1.53	1.45	2.02	0.749
P > F		-	-	-	.6589	.0519	.0522	.0102	.0047	.0317	.0048	.0016

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

Table 7. Rusty grain beetles in stored corn treated with insecticides for insects, Texas Agricultural Experiment Station, Nueces County, TX, 2006.

		Rusty grain beetles/quart sample at month number and month post-treatment										
Treatment	Rate/ 1000 bu	1 Mar	2 Apr	3 May	4 Jun	5 Jul	6 Aug	7 Sep	8 Oct	9 Nov	10 Dec	Avg
Spinosad 0.5% AI	11.2 lb	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.3 a	0.3 a	0.8 a	1.5 a	0.8 a	0.35 a
Actellic 5E	6.83 oz	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.00 a
Actellic 5E + Diacon II	3.86 oz + 3.50 oz	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.00 a
Spinosad 0.75 lb	9.6 oz	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.3 a	0.0 a	0.0 a	0.0 a	0.0 a	0.03 a
Spinosad 0.75 lb + Diacon II	5.43 oz + 3.50 oz	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.00 a
Diacon II	8.07 oz	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.00 a
Nontreated		0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	1.5 a	1.3 a	2.5 a	0.52 a
LSD ($P = 0.05$)		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
$P > F$		-	-	-	-	-	.4552	.4552	.1108	.2357	.1031	.1367

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

Table 8. Corn sap beetles in stored corn treated with insecticides for insects, Texas Agricultural Experiment Station, Nueces County, TX, 2006.

		Corn sap beetles/quart sample at month number and month post-treatment									
Treatment	Rate/ 1000 bu	2 Apr	3 May	4 Jun	5 Jul	6 Aug	7 Sep	8 Oct	9 Nov	10 Dec	Avg
Spinosad 0.5% AI	11.2 lb	0.0 a	0.5 a	0.0 a	0.0 a	0.0 a	0.3 a	0.0 a	0.0 a	0.0 a	0.08 a
Actellic 5E	6.83 oz	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.00 a
Actellic 5E + Diacon II	3.86 oz + 3.50 oz	0.0 a	0.0 a	0.3 a	0.0 a	0.3 a	0.0 a	0.0 a	0.0 a	0.0 a	0.05 a
Spinosad 0.75 lb	9.6 oz	0.3 a	0.0 a	0.0 a	0.0 a	0.3 a	0.0 a	0.0 a	0.0 a	0.0 a	0.05 a
Spinosad 0.75 lb + Diacon II	5.43 oz + 3.50 oz	0.0 a	0.3 a	0.0 a	0.0 a	0.3 a	0.0 a	0.0 a	0.0 a	0.0 a	0.05 a
Diacon II	8.07 oz	0.5 a	0.3 a	0.8 a	0.3 a	0.3 a	0.0 a	0.0 a	0.0 a	0.0 a	0.20 a
Nontreated		0.5 a	0.3 a	0.3 a	0.0 a	0.3 a	0.0 a	0.0 a	0.0 a	0.0 a	0.13 a
LSD (P = 0.05)		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
P > F		.2216	.7788	.2524	.4552	.9014	.4552	-	-	-	.1536

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

Table 9. Insect parasites (*Anisopteromalus calandrae* and *Choetospila elegans*) combined counts in stored corn treated with insecticides, Texas Agricultural Experiment Station, Nueces County, TX, 2006.

		Insect parasites/quart sample at month number and month post-treatment					
Treatment	Rate/ 1000 bu	6 Aug	7 Sep	8 Oct	9 Nov	10 Dec	Total [a] Aug-Dec
Spinosad 0.5% AI	11.2 lb	0.25 a	1.00 bc	1.00 a	1.00 ab	1.00 ab	4.25 b
Actellic 5E	6.83 oz	0.00 a	0.25 c	0.00 a	0.25 b	0.00 b	0.50 c
Actellic 5E + Diacon II	3.86 oz + 3.50 oz	0.00 a	0.00 c	0.25 a	0.00 b	0.25 b	0.50 c
Spinosad 0.75 lb	9.6 oz	0.00 a	0.00 c	0.00 a	0.00 b	0.00 b	0.00 c
Spinosad 0.75 lb + Diacon II	5.43 oz + 3.50 oz	0.00 a	0.00 c	0.00 a	0.25 b	0.00 b	0.25 c
Diacon II	8.07 oz	1.25 a	2.00 ab	1.00 a	1.75 a	1.00 ab	7.00 ab
Nontreated		1.00 a	2.50 a	1.00 a	1.50 a	2.00 a	8.00 a
LSD (P = 0.05)		NS	1.071	NS	1.169	1.012	3.074
P > F		.1780	.0002	.1986	.0188	.0035	.0001

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

[a] Parasites summed over 5 month period (August - December).

Table 10. Corn grade factors for various insecticide treatments after 10 months of storage, Texas Agricultural Experiment Station, Nueces County, Texas. 2006.

Treatment	Rate/ 1000 bu	% damaged kernels Total	% damaged kernels IDK[a]	% BKFM[b]	Bushel weight (lb)
Spinosad 0.5% AI	11.2 lb	13.4 a	12.5 a	1.1 a	55.6 d
Actellic 5E	6.83 oz	1.7 c	1.3 b	1.0 a[c]	57.5 b
Actellic 5E + Diacon II	3.86 oz + 3.50 oz	1.6 c	0.8 b	0.9 b	57.9 a
Spinosad 0.75 lb	9.6 oz	1.6 c	1.1 b	0.9 b	57.8 ab
Spinosad 0.75 lb + Diacon II	5.43 oz + 3.50 oz	1.3 c	0.7 b	0.9 b	57.8 ab
Diacon II	8.07 oz	12.1 ab	11.4 a	1.0 ab	56.0 cd
Nontreated		9.6 b	9.1 a	1.0 ab	56.1 d
LSD (P = 0.05)		3.46	3.43	0.16	0.39
P > F		.0001	.0001	.0253	.0001

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

[a] IDK = Insect Damaged Kernels

[b] BKFM = Broken Kernels and Foreign Material.

[c] Statistically separated but numerical rounding to one decimal did not show the difference.

Table 11. Loss in stored corn treated with insecticides for insects after 10 months of storage, Texas Agricultural Experiment Station, Nueces County, TX, 2006.

Treatment	Rate/ 1000 bu	% weight loss by storage month			Loss ¢/bu by storage month[b]	
		8	9	10	8	10
Spinosad 0.5% AI	11.2 lb	1.2 a	1.6 a	2.5 a	24.0 a	37.3 a
Actellic 5E	6.83 oz	0.1 b	0.1 c	0.6 b	3.0 b	6.3 c
Actellic 5E + Diacon II	3.86 oz + 3.50 oz	0.3 b	0.3 c	0.6 b	3.3 b	3.8 c
Spinosad 0.75 lb	9.6 oz	0.4 b	0.4 bc[a]	0.8 b	1.0 b	1.8 c
Spinosad 0.75 lb + Diacon II	5.43 oz + 3.50 oz	0.4 b	0.4 b	0.8 b	3.5 b	4.3 c
Diacon II	8.07 oz	1.3 a	1.8 a	2.5 a	17.8 a	27.5 ab
Nontreated		1.1 a	1.6 a	2.3 a	17.5 a	22.3 b
LSD (P = 0.05)		0.45	0.35	0.47	13.75	13.10
P > F		.0001	.0001	.0001	.0089	.0001

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

[a] Mean separation based on two decimal places.

[b] Grain based on loan value in Nueces County ($2.23/bushel). Monetary loss was based on grain grades as determined by Corpus Christi Grain Exchange and weight change from initial storage.

A COMPARISON ON SORGHUM OF SYSTEMIC INSECTICIDES APPLIED TO PLANTING SEED OR AS A GRANULAR T-BAND IN-FURROW

Texas Agricultural Experiment Station, Nueces County, 2006

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SUMMARY: Various rates, formulations, and brands of systemic insecticides were compared on sorghum as either seed or granular in-furrow applied materials. Insects encountered at very low numbers included yellow sugarcane aphid, greenbug, corn leaf aphid, and chinch bug. Only in two cases were statistical differences found in the data collected. At 37 days after planting (DAP) yellow sugarcane aphid numbers were significantly greater in the nontreated sorghum. The infestation was not sustained, and by 48 DAP very few yellow sugarcane aphids remained in any treatment. Relatively high numbers of chinch bugs were found at 31 DAP, and all insecticide treatments (except Poncho 200 gram ai/100 kg + Test compound 1) contained statistically fewer chinch bugs compared to nontreated sorghum. Two weeks after the 48 DAP counts were taken the test was abandoned due to exceptional drought conditions; the soil was dry down to more than 3 feet.

OBJECTIVES: The field study was conducted on sorghum to compare effectiveness of various systemic insecticide seed or granular treatments and to evaluate certain insecticide formulations for control of early season insect pests.

MATERIALS/METHODS: The sorghum hybrid Pioneer 84G62 (lot 2103) was planted on March 7, 2006 on the Meaney Annex of the Texas Agricultural Experiment Station at Corpus Christi, TX with a 4-row buster type planter equipped with research cone seed distributors. The seeding rate was 68,780 kernels/acre planted on 38-inch width rows. Granular Counter was applied in a T-band through Gandy electric driven boxes. Soil moisture at planting was marginal for seed germination and emergence in some rows was poor. Soil temperature was 62°F at the 3-inch depth, it was a sandy clay loam (52% sand, 14% silt, and 34% clay), it had 7.8 pH, and contained 1.61% organic matter. Cotton had been grown on the site the previous season. Fertilizer consisted of 125-22-0 + 6.7 lb/acre zinc and Atrazine 4F (1.0 quart/acre) herbicide was applied for weed control. Experimental plots were 4 rows wide by 40 feet long arranged in a randomized complete block design with 4 replications of each treatment.

Treatments were assessed by (1) counting the number of yellow sugarcane aphids, greenbugs, and corn leaf aphids on 20 plants/plot at 31, 37, and 48 DAP, and (2) counting the number of chinch bugs on and in the soil around 20 plants/plot 48 DAP.

RESULTS/DISCUSSION: Exceptional drought conditions (highest level listed by the National Weather Service) prevailed at the test location. Therefore, only limited data was obtained and the test was abandoned before boot stage.

Yellow sugarcane aphid and greenbug numbers were very low in all treatments, but 37 DAP there were statistically more yellow sugarcane aphids in the nontreated sorghum (Table 1). Yellow sugarcane aphids other than in untreated sorghum were only detected on Counter treated plots at 37 DAP and in two of the Poncho treatments at 48 DAP. A few greenbugs were detected in 4 treatments at 48 DAP. Corn leaf aphids and chinch bug numbers are provided in Table 2. Numerically there tended to be a few more corn leaf aphids in nontreated plots, but numbers averaged less than 1/plant. It appeared that excellent results would be obtained on chinch bugs due to the differences observed and the relative high numbers in the nontreated sorghum at 31 DAP. At that time significantly more chinch bugs were found in the nontreated sorghum compared with all other treatments except the Poncho + Test Compound 1. The nontreated sorghum exceeded the established rescue threshold of 40 bugs/100 plants by a substantial amount. Some of the insecticide treatments contained near or slightly above treatment threshold levels. Two weeks later very few chinch bugs remained in the test; this finding cannot be explained.

ACKNOWLEDGMENTS: Rudy Alaniz and Clint Livingston, Demonstration Assistants, are thanked for their help in conduct of this study. Appreciation is expressed to Bayer CropScience for their support.

Table 1. Yellow sugarcane aphid and greenbug on sorghum plants comparing systemic seed and granular applied insecticide, Texas Agricultural Experiment Station, Nueces County, TX, 2006.

Treatment	Product rate g ai/100 kg seed	Number per 10 plants at DAP[e]					
		yellow sugarcane aphid			Greenbug		
		31	37	48	31	37	48
Gaucho 480FS	250	0 a	0 b	0.3 a	0 a	0 a	0.0 a
Poncho 600FS	200	0 a	0 b	0.5 a	0 a	0 a	0.3 a
Poncho 600FS	250	0 a	0 b	0.0 a	0 a	0 a	0.0 a
Poncho 600FS + T1[a]	200	0 a	0 b	0.0 a	0 a	0 a	0.0 a
Poncho 600FS + T2[b]	200	0 a	0 b	0.0 a	0 a	0 a	0.0 a
Cruiser 5FS	200	0 a	0 b	0.0 a	0 a	0 a	0.5 a
Cruiser 5FS + (M+A)[c]	200	0 a	0 b	0.0 a	0 a	0 a	0.5 a
Counter 15G	[d]	0 a	1.8 b	0.5 a	0 a	0 a	0.0 a
Nontreated		0 a	4.3 a	0.3 a	0 a	0 a	0.3 a
LSD (P = 0.05)		NS	2.11	NS	NS	NS	NS
P > F		-	.0033	.6946	-	-	.6946

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

[a] T1 = Test Compound 1

[b] T2 = Test Compound 2

[c] M+A = only treatment in test with Maxim + Apron seed treatment

[d] Granular product rate was 4.0 oz/1000 row feet in a T-band

[e] DAP = Days After Planting

Table 2. Corn leaf aphid and chinch bug on sorghum plants comparing systemic seed and granular applied insecticide, Texas Agricultural Experiment Station, Nueces County, TX, 2006.

		Number per 10 plants at DAP[e]			
		corn leaf aphid			chinch bug
Treatment	Product rate g ai/100 kg seed	31	37	48	31
Gaucho 480FS	250	0.0 a	0.3 a	0 a	7.75 b
Poncho 600FS	200	0.0 a	2.5 a	0 a	4.00 b
Poncho 600FS	250	0.0 a	1.5 a	0 a	8.25 b
Poncho 600FS + T1[a]	200	0.0 a	1.0 a	0 a	9.00 ab
Poncho 600FS + T2[b]	200	0.0 a	2.8 a	0 a	6.75 b
Cruiser 5FS	200	0.0 a	0.8 a	0 a	6.75 b
Cruiser 5FS + (M+A)[c]	200	0.5 a	1.3 a	0 a	7.25 b
Counter 15G	[d]	0.0 a	1.5 a	0 a	4.00 b
Nontreated		7.0 a	2.5 a	0 a	14.0 a
LSD (P = 0.05)		NS	NS	NS	5.645
P > F		.4613	.5783	-	.0490

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

[a] T1 = Test Compound 1
[b] T2 = Test Compound 2
[c] M+A = only treatment in test with Maxim + Apron seed treatment
[d] Granular product rate was 4.0 oz/1000 row feet in a T-band
[e] DAP = Days After Planting

EVALUATION OF SYNGENTA SEED TREATMENTS ON SORGHUM

Texas Agricultural Experiment Station, Nueces County, 2006

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SUMMARY: Exceptional drought conditions occurred which severely limited evaluation of the seed treatments. Only partial plant stands were obtained and the test was abandoned following counts made 25 days after planting (DAP). No yellow sugarcane aphids or greenbugs were detected in any of the plots 25 DAP. Corn leaf aphids were observed, but statistical significance did not occur in the data. Numerically, however, the nontreated sorghum contained much greater numbers of the corn leaf aphid.

OBJECTIVES: The field study was established on sorghum to compare types and rates of experimental systemic insecticide seed treatments for effect on aphids and other early season insect pests.

MATERIALS/METHODS: The sorghum hybrid Pioneer 84G62 (lot 2103) was planted on March 13, 2006 on the Meaney Annex of the Texas Agricultural Experiment Station at Corpus Christi, TX with a 4-row buster type planter equipped with research cone seed distributors. The seeding rate was 68,780 kernels/acre planted on 38-inch width rows. Soil moisture at planting was very marginal for seed germination and emergence in some rows was poor. Soil temperature was 67°F at the 3-inch depth, it was a sandy clay loam (52% sand, 14% silt, and 34% clay), it had 7.8 pH, and contained 1.61% organic matter. Cotton had been grown on the site the previous season. Fertilizer consisted of 125-22-0 + 6.7 lb/acre zinc and Atrazine 4F (1.0 quart/acre) herbicide was applied for weed control. Experimental plots were 4 rows wide by 40 feet long arranged in a randomized complete block design with 4 replications of each treatment.

Treatments were assessed by counting the number of yellow sugarcane aphids, greenbugs, and corn leaf aphids on 20 plants/plot 25 DAP.

RESULTS/DISCUSSION: Sorghum plants were examined 25 DAP for yellow sugarcane aphids, greenbugs, and corn leaf aphids (Table 1). Only corn leaf aphids were found in the experiment and statistically significant differences were not found. Numerically many more corn leaf aphids were found in nontreated sorghum. The experiment was subsequently abandoned.

ACKNOWLEDGMENTS: Rudy Alaniz and Clint Livingston, Demonstration Assistants, are thanked for their help in conduct of this study. Appreciation is expressed to Syngenta Crop Protection, Inc. for their support.

Table 1. Aphids in sorghum with experimental systemic insecticide seed treatments, Texas Agricultural Experiment Station, Nueces County, TX, 2006.

Treatment	Rate grams/100 kg seed	Number per 20 plants (25 DAP)[a]		
		YSA[b]	GB[b]	CLA[b]
A 9765 5FS	200	0.0 a	0.0 a	0.0 a
A 9765 5FS	250	0.0 a	0.0 a	1.5 a
A 9765 5FS	300	0.0 a	0.0 a	1.0 a
Gaucho 600FS	250	0.0 a	0.0 a	0.5 a
STP 1501	200	0 .0a	0.0 a	2.0 a
Nontreated		0.0 a	0.0 a	9.0 a
LSD (P = 0.05)		NS	NS	NS
P > F		-	-	.1785

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

[a] DAP = Days After Planting

[b] YSA = yellow sugarcane aphid, GB = greenbug, CLA = corn leaf aphid

EVALUATION OF INSECTICIDES FOR CONTROL OF INSECTS IN SORGHUM

Gary Underbrink Farm & Texas Agricultural Experiment Station
Kleberg & Nueces Counties, 2006

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SUMMARY: Headworms in sorghum along the Texas Gulf Coast in 2006 consisted of two species, the fall armyworm and corn earworm. Growers noted that the fall armyworm was much more difficult to control with pyrethroid insecticide and that pyrethroids could not be used at the low rates for corn earworm as had been the case in the past. Additionally, many sorghum fields contained damaging numbers of rice stink bug.

These studies demonstrated that the pyrethroid Mustang Max (pyrethroid) was not as effective on fall armyworm as Lannate. Lannate was effective at both 8.0 and 16 ounces/acre on fall armyworm. Corn earworm numbers were too low at both test locations to properly evaluate effectiveness of insecticide types or rates. Mustang Max appeared to be more effective on rice stink bug, at least from the numerical standpoint, compared to Lannate.

OBJECTIVE: The field study was established to evaluate the effectiveness of Mustang Max and Lannate for control of headworms and rice stink bug on sorghum.

MATERIALS/METHODS: Studies were conducted in Kleberg County on the Gary Underbrink Farm (Test 1) and in Nueces County at the Texas Agricultural Experiment Station (Test 2). Experiments were arranged in a randomized complete block design with 4 replications in plots 4 rows wide by 50 feet long.

Treatments were assessed by vigorously shaking 10 sorghum heads into a 2.5 gallon white plastic container and counting the insects contained therein. In the Kleberg County study, 10 whole plants were examined in addition to the heads since fall armyworms were feeding as much on the leaves as in the heads.

Test 1 (Kleberg County) – Treatments were applied on June 8, 2006 to milk stage sorghum with a CO2 pressurized back pack sprayer equipped with 2, 3X hollow cone nozzles/row at a pressure of 40 psi calibrated to deliver 7.7 gpa while traveling at 2 mph. Insect counts were made 3, 8, and 15 days after treatment (DAT).

Test 2 (Nueces County) – Treatments were applied on June 9, 2006 to early soft dough sorghum with a self-propelled Spider Trac sprayer equipped with 2, 4X hollow cone nozzles/row calibrated to deliver 6.72 gpa total volume at a pressure of 40 psi while traveling at 4 mph. Insect counts were made 4, 7, and 16 days after treatment.

RESULTS/DISCUSSION: Results of both studies will be discussed together to help obtain a better overall understanding of the effects of insecticides evaluated on fall armyworm, corn earworm and rice stink bug. More effective control of fall armyworm was obtained with Lannate in both tests compared with Mustang Max (Tables 1 and 4). It is acknowledged that a statistical separation between Mustang Max and Lannate could not be shown in one test (Table 4), but the numerical difference was striking. Even at the high rate of Mustang Max, improved effectiveness was not obtained on the fall armyworm (Table 1).

Corn earworm numbers were not high enough to obtain adequate evaluation (Tables 2 and 5). Local observation indicates that higher rates of the pyrethroids than used in past years are required to obtain adequate control of corn earworm on sorghum heads. For many years rates below those recommended on the label were very effective on corn earworm in sorghum.

Statistically, no differences were observed on the impact of the insecticide types tested on rice stink bug (Tables 3 and 6), but at 8 DAT in Test 1 rice stink bug numbers were statistically higher in the nontreated sorghum. Numerically fewer rice stink bugs were found in Mustang Max treated sorghum.

Currently we believe Lannate to be more effective on fall armyworm in sorghum compared to the pyrethroids. Additionally, it appears that a high labeled rate of a pyrethroid would be a better choice for corn earworm and rice stink bug.

ACKNOWLEDGMENTS: Gary Underbrink is thanked for providing the field location for conduct of the field experiment in Kleberg County. DuPont Crop Protection and FMC Corporation provided the insecticide used in the two experiments.

Table 1. Comparison of insecticides for control of fall armyworm on sorghum, Gary Underbrink Farm, Kleberg County, TX, 2006.

		Fall armyworm/10 plants			
Treatment	Rate oz/acre	3 DAT[a]	8 DAT	15 DAT	Average
Mustang Max 0.8 EC	3.66	7.0 ab	6.8 a	0.3 a	4.7 a
Mustang Max 0.8 EC	2.67	8.5 ab	7.8 a	0.3 a	5.5 a
Lannate 2.4 LV	16.00	1.3 b	4.3 a	0.0 a	1.8 b
Nontreated		14.0 a	5.5 a	0.5 a	6.7 a
LSD (P = 0.05)		7.30	NS	NS	3.35
P > F		.0226	.5001	.7375	.0499

Means in a column followed by the same letter are not significantly different by ANOVA.
[a] DAT = Days After Treatment

Table 2. Comparison of foliar insecticides for control of corn earworm on sorghum, Gary Underbrink Farm, Kleberg County, TX, 2006.

		Corn earworm/10 plants		
Treatment	Rate oz/acre	8 DAT[a]	15 DAT	Average
Mustang Max 0.8 EC	3.66	0.0 a	0.3 a	0.1 a
Mustang Max 0.8 EC	2.67	1.5 a	0.3 a	0.9 a
Lannate 2.4 LV	16.00	0.0 a	0.5 a	0.3 a
Nontreated		0.5 a	0.0 a	0.3 a
LSD (P = 0.05)		NS	NS	NS
P > F		.1681	.5493	.2631

Means in a column followed by the same letter are not significantly different by ANOVA.
[a] DAT = Days After Treatment

Table 3. Comparison of foliar insecticides for control of rice stink bug on sorghum, Gary Underbrink Farm, Kleberg County, TX, 2006.

		Rice stink bug/10 heads			
Treatment	Rate oz/acre	3 DAT[a]	8 DAT	15 DAT	Average
Mustang Max 0.8 EC	3.66	0.3 a	1.5 b	0.8 a	0.8 b
Mustang Max 0.8 EC	2.67	0.5 a	1.0 b	1.3 a	0.9 b
Lannate 2.4 LV	16.00	2.0 a	2.5 b	0.8 a	1.8 b
Nontreated		5.5 a	7.3 a	1.3 a	4.7 a
LSD (P = 0.05)		NS	4.38	NS	2.33
P > F		.2553	.0372	.8346	.0150

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

[a] DAT = Days After Treatment

Table 4. Comparison of foliar insecticides for control of fall armyworm on sorghum, Texas Agricultural Experiment Station, Nueces County, TX, 2006.

		Fall armyworm/10 heads			
Treatment	Rate oz/acre	4 DAT[a]	7 DAT	16 DAT	Average
Mustang Max 0.8 EC	3.66	5.8 b	4.5 a	1.8 a	4.0 b
Lannate 2.4 LV	8.00	1.8 b	1.5 a	2.0 a	1.8 b
Lannate 2.4 LV	16.00	1.3 b	1.8 a	1.8 a	1.6 b
Nontreated		16.0 a	6.8 a	4.3 a	9.0 a
LSD (P = 0.05)		5.89	NS	NS	3.13
P > F		.0010	.0642	.2867	.0015

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

[a] DAT = Days After Treatment

Table 5. Comparison of foliar insecticides for control of corn earworm on sorghum, Texas Agricultural Experiment Station, Nueces County, TX, 2006.

		Corn earworm/10 heads			
Treatment	Rate oz/acre	4 DAT[a]	7 DAT	16 DAT	Average
Mustang Max 0.8 EC	3.66	0.3 a	1.3 a	0.0 a	0.5 a
Lannate 2.4 LV	8.00	0.5 a	0.0 a	0.3 a	0.3 a
Lannate 2.4 LV	16.00	0.3 a	1.3 a	0.0 a	0.5 a
Nontreated		1.5 a	1.5 a	0.0 a	1.0 a
LSD (P = 0.05)		NS	NS	NS	NS
P > F		.3109	.2959	.4363	.4485

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

[a] DAT = Days After Treatment

Table 6. Comparison of foliar insecticides for control of rice stink bug on sorghum, Texas Agricultural Experiment Station, Nueces County, TX, 2006.

		Rice stink bug/10 heads			
Treatment	Rate oz/acre	4 DAT[a]	7 DAT	16 DAT	Average
Mustang Max 0.8 EC	3.66	1.3 a	0.3 a	14.5 a	5.3 a
Lannate 2.4 LV	8.00	5.3 a	3.5 a	11.5 a	6.8 a
Lannate 2.4 LV	16.00	3.3 a	2.0 a	19.5 a	8.2 a
Nontreated		4.8 a	7.0 a	19.5 a	10.4 a
LSD (P = 0.05)		NS	NS	NS	NS
P > F		.1954	.0793	.7588	.5102

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

[a] DAT = Days After Treatment

EVALUATION OF NEW INSECTICIDES FOR CONTROL OF HEADWORMS AND RICE STINK BUG IN SORGHUM

Gary Underbrink Farm, Kleberg County, 2006

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SUMMARY: A field experiment was conducted to evaluate several new insecticides in various formulations and at various rates on two caterpillar pests and rice stink bug beginning at milk-stage development in sorghum. Tracer and Prolex treatments did not significantly reduce fall armyworm numbers at 4 DAT (days after treatment), but their numbers were reduced in novaluron (Diamond), Lorsban, and G 1846 treated sorghum. Corn earworm numbers were relatively low during the test period; significantly fewer corn earworms were counted in all treatments except for the Prolex treatment as measured in the post treatment averages. The biggest surprise was the lower number of stink bugs found in novaluron treated plots, even though the population consisted mostly of adults (this insect growth regulator was not expected to have an effect on adult insects). In general there were too many inconsistencies in the data to formulate firm conclusions.

OBJECTIVES: Insecticides were evaluated to determine their effectiveness for control of headworms (fall armyworm and corn earworm) and rice stink bug on sorghum. Most of the insecticides are relatively new materials for which field information is needed.

MATERIALS/METHODS: Insecticides were applied to sorghum in the milk-stage of development on the Gary Underbrink Farm in Kleberg on June 8, 2006. Treatments were arranged in a randomized complete block design with 4 replications. Plots were 6 rows wide on 36-inch centers by 50 feet long and the center 4 rows of plots received insecticide treatment. Insecticides were applied with a self-propelled Spider Trac machine equipped with 2, 4X hollow cone nozzles/row calibrated to deliver 6.72 gpa total spray volume at 40 psi while traveling at 4 mph.

Treatments were assessed by vigorously shaking the sorghum heads of 10 plants/plot into a white 2.5 gallon plastic bucket and by inspecting 10 whole plants/plot for fall armyworm, corn earworm, and rice stink bug. The counts were made 4, 8, and 15 days after treatment. Insects on the heads and leaves were combined for analysis.

RESULTS/DISCUSSION: At 4 DAT (days after treatment) significantly fewer fall armyworm were present in novaluron, Lorsban, and GF 1846 treated sorghum compared to numbers of the insect present in nontreated sorghum (Table 1). An average of 4, 8, and 15 DAT counts revealed that all treatments with the exception of Prolex contained significantly fewer fall armyworm compared with the nontreated sorghum. Tracer appeared to be slower in reducing fall armyworm than several of the other insecticides. Similar data was collected for corn earworm beginning at 8 DAT (Table 2). Again, Prolex treated sorghum did not contain significantly fewer corn earworm compared with numbers in the nontreated plots. Surprisingly, fewer rice stink bugs were counted in all plots treated with the EC formulation of novaluron as measured 4 DAT (Table 3). Other treatments which were not different in rice stink bug numbers from the nontreated at 4 DAT included the high rate of G 1846 (the lower rate was significantly better than the nontreated), Tracer + Prolex, and novaluron flowable formulation at 5.0 oz/acre. The rice stink bug data does not appear to be strong enough for firm conclusions.

ACKNOWLEDGMENTS: Special thanks are extended to Gary Underbrink for allowing us to conduct the field study in his sorghum. Makhteshim AGAN of North America and Dow companies are acknowledged for supplying insecticide and monetary support for conduct of the study.

Table 1. Impact of insecticide on fall armyworm on sorghum, Gary Underbrink Farm, Kleberg County, TX, 2006.

		Fall armyworm/10 sorghum plants			
Treatment	Rate oz/acre	4 DAT[a]	8 DAT	15 DAT	Average
Novaluron 0.83EC	4.0	3.3 cd	3.5 a	0.0 a	2.3 cd
Novaluron 0.83EC	5.0	4.3 cd	2.0 a	0.0 a	2.1 cd
Novaluron 0.83EC	6.0	4.0 cd	3.0 a	0.0 a	2.3 cd
Novaluron 0.83F	4.0	1.5 d	3.3 a	0.0 a	1.6 d
Novaluron 0.83F	5.0	4.0 cd	3.0 a	0.0 a	2.3 cd
Tracer 4SC	1.0	7.0 abc	1.0 a	0.0 a	2.7 bcd
Prolex 1.25EC	1.5	8.3 ab	2.5 a	0.5 a	3.3 ab
Tracer 4SC + Prolex 1.25EC	1.0 + 1.5	7.0 abc	2.8 a	0.5 a	3.4 bc
Lorsban 4E	24.0	4.8 bcd	3.3 a	0.0 a	2.7 bcd
GF 1846	19.0	4.3 cd	2.5 a	0.0 a	2.3 cd
GF 1846	29.0	5.8 bc	3.5 a	0.0 a	3.1 bc
Nontreated		10.5 a	4.0 a	0.0 a	4.8 a
LSD (P = 0.05)		3.86	NS	NS	1.39
P > F		.0033	.4526	.5658	.0033

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

[a] DAT = Days After Treatment

Table 2. Impact of insecticide on corn earworm on sorghum heads, Gary Underbrink Farm, Kleberg County, TX, 2006.

		Corn earworm/10 sorghum plants		
Treatment	Rate oz/acre	8 DAT[a]	15 DAT	Average
Novaluron 0.83EC	4.0	0.0 b	0.0 b	0.0 c
Novaluron 0.83EC	5.0	0.0 b	0.0 b	0.0 c
Novaluron 0.83EC	6.0	0.0 b	0.0 b	0.0 c
Novaluron 0.83F	4.0	0.5 ab	0.0 b	0.3 bc
Novaluron 0.83F	5.0	0.0 b	0.0 b	0.0 c
Tracer 4SC	1.0	0.5 ab	0.0 b	0.3 bc
Prolex 1.25EC	1.5	1.0 a	0.5 a	0.8 a
Tracer 4SC + Prolex 1.25EC	1.0 + 1.5	0.0 b	0.0 b	0.0 c
Lorsban 4E	24.0	0.3 b	0.0 b	0.1 c
GF 1846	19.0	0.3 b	0.0 b	0.1 c
GF 1846	29.0	0.0 b	0.0 b	0.0 c
Nontreated		0.5 ab	0.5 a	0.5 ab
LSD (P = 0.05)		0.59	0.32	0.35
P > F		.0228	.0071	.0012

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

[a] DAT = Days After Treatment

Table 3. Impact of insecticide on rice stink bug in sorghum heads, Gary Underbrink Farm, Kleberg County, TX, 2006.

		Rice stink bug/10 sorghum heads			
Treatment	Rate oz/acre	4 DAT[a]	8 DAT	15 DAT	Average
Novaluron 0.83EC	4.0	2.5 bc	4.3 a	1.3 a	2.7 de
Novaluron 0.83EC	5.0	1.5 c	3.0 a	1.8 a	2.1 e
Novaluron 0.83EC	6.0	2.5 bc	5.0 a	2.0 a	3.2 cde
Novaluron 0.83F	4.0	3.8 bc	5.3 a	2.3 a	3.8 abcde
Novaluron 0.83F	5.0	6.0 ab	7.5 a	2.5 a	5.3 abcd
Tracer 4SC	1.0	3.8 bc	5.8 a	4.0 a	4.5 abcde
Prolex 1.25EC	1.5	3.3 bc	4.8 a	2.5 a	3.5 bcde
Tracer 4SC + Prolex 1.25EC	1.0 + 1.5	5.8 ab	9.5 a	4.3 a	6.5 a
Lorsban 4E	24.0	3.5 bc	4.5 a	3.0 a	3.7 bcde
GF 1846	19.0	3.5 bc	3.8 a	1.0 a	2.8 cde
GF 1846	29.0	8.3 a	7.3 a	1.0 a	5.5 abc
Nontreated		9.3 a	7.0 a	2.0 a	6.1 ab
LSD (P = 0.05)		4.21	NS	NS	2.78
P > F		.0148	.2950	.5236	.0362

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

[a] DAT = Days After Treatment

COMPARISON OF VALENT COMPANY COTTON SEED TREATMENTS FOR EFFECT ON THRIPS, APHIDS, AND MITES

Texas Agricultural Experiment Station, Nueces County, 2006

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SUMMARY: Twelve seed treatments representing various types and mixtures of products were compared along with Temik 15G applied into the seed furrow for effects on insect and mite pests. A severe drought prevented long term observations, and the crop was not carried to completion. In addition, pest numbers were low through the early season evaluation period. At the two true leaf stage there appeared to be a numerical trend for increased thrips numbers in nontreated, V-10112 and V-10170 plots; but it did not carry over to evaluations at four true leaves. Aphid and mite numbers were not different at the two true leaf stage, but by the four true leaf stage aphid numbers were numerically higher in the nontreated plots. There were statistical differences in mite numbers. All treatments except for V-10112 had statistically fewer mites than did the nontreated cotton.

OBJECTIVES: Test objectives were to: (1) determine if Orthene seed treatment provided additional benefit for insect control, plant health, and yield; and (2) compare seed treatment combinations to standard products for efficacy.

MATERIALS/METHODS: The experiment was planted March 15, 2006 on the Texas Agricultural Experiment Station Meaney Annex at Corpus Christi. DPL 555 BG/RR variety cotton was planted at a rate of 3.5 seed/foot on rows spaced 38 inches apart with a 4-row buster type planter equipped with research cone seed distributors. Test design was a randomized complete block with 4 replications, and plots were 4 rows wide by 40 feet long. Soil moisture at-planting was marginal, and resulting plant stand was poor. Soil temperature was 71°F at the 3-inch depth, the soil was a sandy clay loam (52% sand, 14% silt, and 34% clay) which had 7.8 pH and an organic matter content of 1.61%. Sorghum had been grown on the site the previous season. Fertilizer applied was 125-22-0 + 6.7 lb/acre zinc. The base herbicide was Treflan 4 lb at 1.0 quart/acre applied on 12/06/05.

Treatments were assessed by (1) assigning a plant damage rating [1 = no damage up to 5 = severe stunting and leaf curling] at the two true-leaf stage of cotton growth on April 11 [27 days after planting] and (2) cutting and placing into 70% ethyl alcohol 10 plants from each plot on April 11 and again on April 18 for later analysis for thrips, aphids, and mites. The 10-plant samples were washed to remove the arthropods, the liquid filtered, and the filter paper examined under a microscope for arthropods.

RESULTS/DISCUSSION: Thrips counts were made on 10 plants/plot at the two and four true leaf stages of plant development (Table 1). Numerically, V-10112, V10170, and nontreated cotton had the highest number of thrips at the two true leaf stage. These numbers were very low with the highest counts at 0.55/plant. By the four true leaf stage thrips were actually lower than found at the two true leaf stage with no apparent numerical trends. Counts were also made at both leaf stages on aphids and spider mites (Table 2). No differences or trends were noted at the two true leaf stage. At the four true leaf stage aphid numbers were distinctly higher in the nontreated cotton, and statistical differences were found in mite numbers. Except for the V-10112 seed treatment, all treatments contained statistically fewer spider mites than did the nontreated cotton. Plant damage ratings were significantly lower in all seed treatments except for V-10170 compared to the nontreated cotton. It was not possible to obtain additional information due to severe drought conditions. Subsequently, the cotton was destroyed.

ACKNOWLEDGMENTS: Valent Corporation is thanked for their support of the study. Rudy Alaniz and Clint Livingston are acknowledged for assisting with all phases of the experiment.

Table 1. Evaluation of Valent Company seed treatments for thrips on cotton, Texas Agricultural Experiment Station, Nueces County, TX 2006.

		Thrips number per 10 plants					
		Two true leaves			Four true leaves		
Treatment	Rate mg ai/seed	nymph	adult	total	nymph	adult	total
Gaucho	.375	0.0 a	1.5 a	1.5 a	2.3 a	1.0 a	3.3 a
V-10112	.400	1.0 a	4.5 a	5.5 a	1.8 a	1.8 a	3.5 a
V-10112 + Orthene	.4 + .4	0.0 a	0.5 a	0.5 a	0.5 a	0.5 a	1.0 a
V-10112 + Orthene	.5 + .4	0.0 a	1.0 a	1.0 a	0.8 a	0.5 a	1.3 a
V-10170	.375	0.0 a	2.0 a	2.0 a	2.3 a	1.0 a	3.3 a
V-10170 + Orthene	.375 + .4	0.0 a	1.5 a	1.5 a	0.5 a	1.8 a	2.3 a
V-10170	.4	1.0 a	2.0 a	3.0 a	2.0 a	1.8 a	3.8 a
V-10170 + Orthene	.4 + .4	0.5 a	2.0 a	2.5 a	0.3 a	1.0 a	1.3 a
V-10170	.500	0.0 a	1.0 a	1.0 a	0.5 a	0.3 a	0.8 a
V-10170 + Orthene	.5 + .4	0.5 a	1.0 a	1.5 a	0.8 a	1.5 a	2.3 a
Temik 15G	[a]	0.0 a	1.5 a	1.5 a	1.3 a	1.5 a	2.8 a
Cruiser	.300	1.0 a	1.5 a	2.5 a	1.5 a	1.5 a	3.0 a
NUP 05071	.375	0.0 a	2.0 a	2.0 a	0.3 a	0.5 a	0.8 a
Nontreated		0.5 a	3.0 a	3.5 a	0.5 a	0.8 a	1.3 a
LSD (P = 0.05)		NS	NS	NS	NS	NS	NS
P > F		.1998	.8069	.6707	.3275	.5492	.1119

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

[a] Temik 15G applied at 4.0 oz/1000 row feet formulated product into the seed furrow.

Table 2. Evaluation of Valent Company seed treatments for aphids and mites on cotton, Texas Agricultural Experiment Station, Nueces County, TX 2006.

Treatment	Rate mg ai/seed	Number per 10 plants: Two true leaves: aphids	Two true leaves: mites	Four true leaves: aphids	Four true leaves: mites	Plant da.[b] rating
Gaucho	.375	2.0 a	0.5 a	4.3 a	2.5 bc	1.0 c
V-10112	.400	0.0 a	2.5 a	1.0 a	3.8 ab	1.0 c
V-10112 + Orthene	.4 + .4	1.5 a	1.5 a	1.3 a	0.8 bc	1.0 c
V-10112 + Orthene	.5 + .4	4.5 a	2.5 a	2.5 a	0.3 c	1.0 c
V-10170	.375	0.5 a	8.0 a	5.0 a	1.5 bc	1.8 ab
V-10170 + Orthene	.375 + .4	1.5 a	0.0 a	2.0 a	0.3 c	1.3 bc
V-10170	.4	1.0 a	1.0 a	2.5 a	0.0 c	1.3 bc
V-10170 + Orthene	.4 + .4	0.5 a	0.0 a	2.8 a	0.3 c	1.0 c
V-10170	.500	2.5 a	0.5 a	6.8 a	0.5 bc	1.0 c
V-10170 + Orthene	.5 + .4	0.0 a	0.0 a	5.8 a	0.3 c	1.5 bc
Temik 15G	[a]	0.0 a	0.0 a	1.8 a	0.5 bc	1.0 c
Cruiser	.300	2.0 a	10.5 a	4.3 a	2.3 bc	1.0 c
NUP 05071	.375	0.5 a	2.0 a	4.3 a	0.5 bc	1.0 c
Nontreated		0.0 a	2.0 a	32.5 a	6.0 a	2.3 a
LSD (P = 0.05)		NS	NS	NS	3.49	0.62
P > F		.6380	.3323	.3040	.0482	.0040

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

[a] Temik 15G applied at 4.0 oz/1000 row feet formulated product into the seed furrow.

[b] Plant damage rating: 1 = no damage up to 5 = severe stunting and leaf curling. Counts were made at the two true leaf stage.

THRIPS AND APHID CONTROL WITH AT-PLANTING SYSTEMIC INSECTICIDES ON COTTON

Texas Agricultural Experiment Station, Nueces County, 2006

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SUMMARY: According to the National Weather Service the winter of 2005 and spring of 2006 along the Lower Gulf Coast was in "exceptional drought." Cotton plant emergence was very erratic; as a result the study was abandoned several weeks after the last set of plants were collected for pest arthropod analysis. Thrips numbers never exceeded 0.35/plant at the two true leaf-stage or 0.85/plant at four true-leaves. Statistical differences in thrips numbers were apparent only for the total thrips (nymphs and adults) at the two true-leaf stage. The number of thrips in the Cruiser and Temik treatments was statistically reduced compared with the nontreated cotton. Likewise, mite numbers were low throughout the study, and only on one date were statistical differences noted. Mites were found in significantly greater numbers in four true-leaf cotton in the Gaucho Grande treatment; reasons for the increased numbers in this one treatment could not be explained. Significant differences were not found in aphid numbers or plant damage ratings.

OBJECTIVES: Seed treatments were evaluated for effect upon early season thrips, aphids, and mites.

MATERIALS/METHODS: The experiment was planted March 16, 2006 on the Texas Agricultural Experiment Station Meaney Annex at Corpus Christi. Phytogen 470 WR variety cotton seed treated at this location was planted with a 4-row buster type planter equipped with research cone seed distributors at a rate of 3.5 seed/foot on rows spaced 38 inches apart. Test design was a randomized complete block with 4 replications, and plots were 4 rows wide by 40 feet long. Soil moisture at-planting was marginal and resulting plant stand was poor. Soil temperature was 70°F at the 3-inch depth, the soil was a sandy clay loam (52% sand, 14% silt, and 34% clay) which had 7.8 pH and an organic matter content of 1.61%. Sorghum had been grown on the site the previous season. Fertilizer applied was 125-22-0 + 6.7 lb/acre zinc. The base herbicide was Treflan 4 lb at 1.0 quart/acre on 12/06/05.

Treatments were assessed by (1) assigning a plant damage rating [1 = no damage up to 5 = severe stunting and leaf curling] at the two true-leaf stage of cotton growth on April 7 [22 days after planting] and (2) cutting and placing into 70% ethyl alcohol 10 plants from each plot on April 7 and again on April 18 for later analysis for thrips, aphids, and mites. The 10-plant samples were washed to remove the arthropods, the liquid filtered, and the filter paper examined under a microscope.

RESULTS/DISCUSSION: Thrips counts from the 10-plant samples from each plot at the two and four true-leaf stages of plant development are provided in Table 1. Thrips numbers were extremely low throughout the study period and only for the total number of thrips in the two-leaf stage were statistical differences found. The only treatment significantly different from the nontreated cotton was Cruiser. No impact would be expected from the low level infestation rate in the study. Aphid numbers were generally low throughout the test period and no statistical differences were detected (Table 2). However, at the four true-leaf stage an average of 170 aphids/10 plants were found in the nontreated cotton; whereas, the remaining treatments averaged only 4.9 aphids/10 plants. Likewise, mite numbers were low and only at the four true-leaf stage were significant differences found in mite numbers. The Gaucho Grande treatment at that stage exhibited statistically greater numbers of mites than all remaining treatments. Reasons for this difference cannot be explained.

ACKNOWLEDGMENTS: Bayer Crop Science is thanked for their support of the study. Rudy Alaniz and Clint Livingston are acknowledged for assisting with all phases of the experiment.

Table 1. Thrips in cotton treated with systemic insecticide applied as a seed or granular in-furrow treatment, Texas Agricultural Experiment Station, Nueces County, TX 2006.

Treatment	Rate mg ai/seed	Thrips number per 10 plants: Two true leaves nymph	adult	total	Four true leaves nymph	adult	total
Gaucho	.375	2.0 a	1.5 a	3.5 a	1.5 a	5.5 a	7.0 a
Gaucho 5FS + Poncho 5FS	.28 + .095	1.3 a	0.5 a	1.8 abc	1.3 a	0.8 a	2.0 a
Cruiser 5FS	.300	0.3 a	0.3 a	0.5 c	1.3 a	5.5 a	6.8 a
Temik 15G	[a]	0.8 a	0.5 a	1.3 bc	3.8 a	4.8 a	8.5 a
Nontreated		1.5 a	1.3 a	2.8 ab	0.5 a	2.0 a	2.5 a
LSD (P = 0.05)		NS	NS	1.95	NS	NS	NS
P > F		.1515	.1877	.0399	.4723	.2088	.1484

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

[a] Temik 15G applied at 4.0 oz/1000 row feet.

Table 2. Aphid and mite numbers in cotton treated with systemic insecticide applied as a seed or granular in-furrow treatment, Texas Agricultural Experiment Station, Nueces County, TX 2006.

Treatment	Rate mg ai/seed	Number per 10 plants: Two true leaves aphids	mites	Four true leaves aphids	mites	Plant da.[b] rating
Gaucho	.375	5.3 a	1.5 a	6.3 a	4.5 a	1.0 a
Gaucho 5FS + Poncho 5FS	.28 + .095	2.0 a	0.0 a	7.5 a	0.5 b	1.0 a
Cruiser 5FS	.300	1.8 a	0.3 a	2.0 a	0.8 b	1.5 a
Temik 15G	[a]	7.0 a	0.8 a	3.8 a	0.0 b	2.0 a
Nontreated		12.0 a	0.8 a	170.0 a	1.0 b	2.3 a
LSD (P = 0.05)		NS	NS	NS	2.97	NS
P > F		.1667	.3413	.0959	.0414	.0504

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

[a] Temik 15G applied at 4.0 oz/1000 row feet.

[b] Plant damage rating: 1 = no damage up to 5 = severe stunting and leaf curling

COTTON FLEAHOPPER CONTROL WITH FOLIAR INSECTICIDES AND EVALUATION OF TREATMENT RATES

Bill and Randy Wright Farm, Nueces County, 2006

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SUMMARY: Five insecticides, some at multiple rates and others by different brand names, were evaluated for their effectiveness in controlling the cotton fleahopper and for their impact on yield. In the study a high percentage of the fleahoppers were nymphs, and the infestation did not reach economic damaging numbers (under normal conditions) until near the end of the cotton plant growth stage susceptible to major yield reduction. All insecticide treatments dramatically reduced fleahopper numbers as measured 3 and 6 days after treatment (DAT). The new insecticide, Diamond, was very effective in the study possibly due to its affect on the large nymph population present at the test site (Diamond is an incect growth regulator which affects insects when they molt). No changes in cotton fiber characteristics could be attributed to the insecticide treatment, nor were there any yield effects. The lack of yield response was attributed to late development of the fleahopper population in cotton and early season fruit removal by fleahopper which turned out to be a beneficial affect. The slightly reduced early fruit load allowed plants to develop a larger root system and plant size, and to subsequently take advantage of maturing bolls under more favorable soil moisture conditions. It was extremely dry early, but key rainfall was received just in time for excellent boll retention. Although significant differences were not found in the yield data, numerical yield was higher in the nontreated cotton for seven of the nine insecticides evaluated. This finding tended to reinforced our field observation that the later fruit development in nontreated cotton was favorable.

OBJECTIVES: The field study was conducted to compare several new insecticide formulations, new insecticide chemistry (insect growth regulator), and application rates for control of fleahopper nymphs and adults.

MATERIALS/METHODS: A field planted in FiberMax 832 variety cotton farmed by Bill and Randy Wright was selected southeast of Robstown, TX, west of the intersection of County Roads 36 and 67 in which to conduct the experiment. The cotton was planted with an 8-row planter March 20, 2006 at a seeding rate of 3/row foot in rows spaced on 38-inch centers. Plant stands in the test site were good, but no rainfall was received for a long period. No insecticide was applied to any of the surrounding cotton for the entire season.

Insecticide treatments were applied on May 23 when the cotton was at the end of the first week of bloom with a self-propelled Spider Trac ground sprayer. Treatments were made to 4-row by 45 foot plots. These plots were matched to rows corresponding to one side of the farmer's 8-row equipment. The treatments were replicated 4 times and arranged in a randomized complete block design. Insecticides were applied using 4X hollow cone nozzles, at 40 psi, in a total spray volume of 6.72 gpa, while traveling at 4 mph. Crop oil concentrate (COC) was added to the spray mix at 1%vv.

Treatments were assessed by (1) counting fleahoppers [nymphs and adult counts separate] on the treatment date [May 23], and 3 and 6 days after treatment, (2) harvesting 45 feet of one row in each plot with a spindle picker and weighing the seed cotton, (3) ginning a sample of the seed cotton from each plot on a 10-saw laboratory machine to determine lint percentage, and (4) submitting lint to the International Textile Center at Lubbock, Texas for fiber analysis.

RESULTS/DISCUSSION: Fleahoppers averaged nearly 32/100 plant terminals on the day that insecticide treatments were applied of which 88.7% were nymphs (Table 1). The population had not exceeded 10/100 plants 7 days prior to the test date. The cotton had reached the bloom stage when fleahopper nymphs began to increase, and by the treatment date it had been in bloom for slightly more than 7 days. By 3 days after treatment (DAT), nymph fleahoppers had been significantly reduced by all insecticides and the situation remained the same for the 6 DAT counts. Adult fleahopper numbers were so low that statistical differences were not observed in their numbers at 3 or 6 DAT (Table 2). However, for the post-treatment averages of the adults, all insecticide treatments had significantly fewer numbers than nontreated cotton. By 6 DAT no fleahoppers (nymphs or adults) were found in the Diamond EC (6.00 oz/acre) and the treatment statistically separated from the Trimax Pro treatment and the nontreated cotton (Table 3). For post-treatment average of fleahopper nymphs + adults all treatments contained significantly fewer than the nontreated cotton, and all numbers in insecticide treatments were well below the economic treatment threshold.

Lint production and fiber characteristics are shown in Table 4. Differences were not observed in micronaire, fiber length, uniformity, or strength. Statistical differences were found in % fiber elongation, but reasons for this occurred could not be determined. A yield response was not obtained due to control of the cotton fleahopper. In fact, on a numerical basis 7 of the 9 insecticide treatments produced less lint cotton than the nontreated, and in those treatments with a numerical positive response, the yields amounted to 1 and 21 lb/acre above the nontreated cotton. It may seem strange, but the lack of yield increase due to fleahopper control was predictable for two reasons. First, fleahoppers did not increase to numbers that normally cause economic damage until the bloom period which is near the stage at which yield limiting effects would not be expected. Second, the additional squares which were shed early in the nontreated cotton due to fleahopper attack allowed plants to devote more energy to vegetative growth and root development. This subsequently is thought to have led have to more fruit being retained later at a time which corresponded best with available soil moisture. The area experienced an “exceptional drought” and did not receive early season rainfall. The plots where more fruit was present due to fleahopper control earlier in the season could not hold that fruit due to the earlier moisture demand.

ACKNOWLEDGMENTS: Bill and Randy Wright are thanked for providing the test location and their continued interest in field experiments of this nature. Companies which provided support of this work included Syngenta and Nufarm.

Table 1. Fleahopper **nymphs** in cotton treated with various insecticides, Bill and Randy Wright Farm, Nueces County, TX, 2006.

Treatment	Rate oz/acre	Number/100 plant terminals			
		Pretreat	3 DAT[a]	6 DAT	Post-treat average
Centric 40WG	1.25	26.3 a	0.0 b	1.3 b	0.6 c
Centric 40WG	2.00	28.8 a	1.3 b	0.0 b	0.6 c
Intruder 70WP	0.60	32.5 a	0.0 b	1.3 b	0.6 c
Intruder 70WP	0.90	30.0 a	0.0 b	1.5 b	0.6 c
Diamond 0.83EC	4.00	27.5 a	1.3 b	5.0 b	3.1 bc
Diamond 0.83EC	6.00	23.8 a	0.0 b	0.0 b	0.0 c
Trimax Pro 4.44SC	1.35	23.8 a	3.8 b	6.3 b	5.0 b
NUP 06023	3.75	35.0 a	0.0 b	2.5 b	1.3 bc
Orthene 97	4.00	25.0 a	0.0 b	1.3 b	0.6 c
Nontreated		28.8 a	32.5 a	38.8 a	35.6 a
LSD (P = 0.05)		11.98	4.04	6.98	4.22
P > F		.6203	.0001	.0001	.0001

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

[a] DAT = Days After Treatment

Table 2. Fleahopper **adults** in cotton treated with various insecticides, Bill and Randy Wright Farm, Nueces County, TX, 2006.

		Number/100 plant terminals			
Treatment	Rate oz/acre	Pretreat	3 DAT[a]	6 DAT	Post treat average
Centric 40WG	1.25	2.5 a	0.0 a	2.5 a	1.3 b
Centric 40WG	2.00	3.8 a	0.0 a	1.3 a	0.6 b
Intruder 70WP	0.60	5.0 a	0.0 a	3.8 a	1.9 b
Intruder 70WP	0.90	5.0 a	0.0 a	2.5 a	1.3 b
Diamond 0.83EC	4.00	6.3 a	1.3 a	1.3 a	1.3 b
Diamond 0.83EC	6.00	2.5 a	3.8 a	0.0 a	1.9 b
Trimax Pro 4.44SC	1.35	1.3 a	0.0 a	3.8 a	1.9 b
NUP 06023	3.75	1.3 a	1.3 a	0.0 a	0.6 b
Orthene 97	4.00	10.0 a	2.5 a	1.3 a	1.9 b
Nontreated		0.0 a	7.5 a	8.8 a	8.1 a
LSD (P = 0.05)		NS	NS	NS	3.63
P > F		.2659	.2021	.0976	.0117

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

[a] DAT = Days After Treatment

Table 3. Fleahopper **(nymphs and adults)** in cotton treated with various insecticides, Bill and Randy Wright Farm, Nueces County, TX, 2006.

Treatment	Rate oz/acre	Number/100 plant terminals			
		Pretreat	3 DAT[a]	6 DAT	Post treat average
Centric 40WG	1.25	28.8 a	0.0 b	3.8 bc	1.9 c
Centric 40WG	2.00	32.5 a	1.3 b	1.3 c	1.3 c
Intruder 70WP	0.60	37.5 a	0.0 b	5.0 bc	2.5 c
Intruder 70WP	0.90	35.0 a	0.0 b	3.8 bc	1.9 c
Diamond 0.83EC	4.00	33.8 a	2.5 b	6.3 bc	4.4 bc
Diamond 0.83EC	6.00	26.3 a	3.8 b	0.0 c	1.9 c
Trimax Pro 4.44SC	1.35	25.0 a	3.8 b	10.0 b	6.9 b
NUP 06023	3.75	36.3 a	1.3 b	2.5 bc	1.9 c
Orthene 97	4.00	35.0 a	2.5 b	2.5 bc	2.5 c
Nontreated		28.8 a	40.0 a	47.5 a	43.8 a
LSD (P = 0.05)		NS	8.42	7.69	4.27
P > F		.5463	.0001	.0001	.0001

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

[a] DAT = Days After Treatment

Table 4. Cotton fiber characteristics and lint production in plots treated with foliar insecticide for fleahopper control, Bill and Randy Wright Farm, Nueces County, TX, 2006.

Treatment	Rate oz/acre	Fiber characteristics Mic	Lgth	UR	Str	% elong	Lint lb/acre
Centric 40WG	1.25	4.3 a	1.14 a	84.4 a	30.0 a	4.8 a	1084 a
Centric 40WG	2.00	4.3 a	1.12 a	83.2 a	31.5 a	4.3 cd	1052 a
Intruder 70WP	0.60	4.3 a	1.11 a	83.2 a	30.0 a	4.4 bcd	888 a
Intruder 70WP	0.90	4.3 a	1.13 a	84.3 a	31.1 a	4.5 bc	1040 a
Diamond 0.83EC	4.00	4.4 a	1.12 a	83.4 a	30.6 a	4.2 d	943 a
Diamond 0.83EC	6.00	4.4 a	1.12 a	83.3 a	31.0 a	4.4 bcd	997 a
Trimax Pro 4.44SC	1.35	4.3 a	1.12 a	83.8 a	31.0 a	4.6 abc	1055 a
NUP 06023	3.75	4.3 a	1.11 a	83.7 a	29.6 a	4.6 abc	1064 a
Orthene 97	4.00	4.3 a	1.11 a	84.1 a	30.5 a	4.4 bcd	1037 a
Nontreated		4.3 a	1.14 a	84.1 a	31.1 a	4.6 ab	1063 a
LSD (P = 0.05)		NS	NS	NS	NS	0.26	NS
P > F		.9930	.4707	.1758	.1169	.0086	.3270

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

[a] DAT = Days After Treatment

COMPARISON OF COTTON VARIETIES AND RETURNS BASED ON SEED COST AND LINT VALUES

Bill and Randy Wright Farm, Nueces County, 2006

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SUMMARY: FM 960 B2, DPL 408 B2, and FM 832 cotton varieties were planted in 48-row plots and replicated three times for comparison of lint yield and value less the difference in seed cost. There was not a statistical difference in yield, total value of the lint per acre, or dollar value of the lint net of the seed cost. The two Fibermax varieties did have significantly higher value lint per pound compared to DPL 408 B2. Numerically, FM 832 returned $10.22 and $56.34 per acre more than the FM 960 B2 and DPL 408 B2 varieties, respectively. Only a low level bollworm infestation occurred at the test site; it was not high enough to affect production.

OBJECTIVES: The higher cost seed of two transgenic cotton varieties (FM 960 B2 and DPL 408 B2) were compared to FM 832 conventional variety farmer-saved seed (brown bag) to determine yield level, lint value per pound, and lint value per acre net of seed cost.

MATERIALS/METHODS: The cotton varieties were planted on the Bill and Randy Wright Farm southeast of Robstown, TX west of the intersection of County Roads 36 and 67 on March 20, 2006. An 8-row International Harvester 92 air planter distributed 3 seed/foot (41,268/acre) on the 38-inch rows in 48-row plots that were nearly 0.5 miles in length. Varieties were replicated 3 times in a randomized complete block design. A good stand was achieved, but little rainfall was received during the first half of the growing season, but a couple of timely later rains allowed plants to produce a crop. No insecticide was applied to the cotton.

Treatments were assessed by (1) harvesting 32 rows of each variety with a burr-extractor type stripper on August 11 and placing seed cotton from each plot in separate modules, (2) pulling seed cotton samples from corners of each module for ginning on a 10-saw laboratory machine for lint percentage and fiber quality [gin turnout and fiber analysis data was used instead], (3) obtaining the weight of each module and using a standard turnout percentage in calculating lint yields, (4) using the fiber characteristics in modules, excluding the first and last bale in each module, to determine lint values, and (5) determining lint values per acre net of seed cost.

RESULTS/DISCUSSION: Statistically significant differences were not found among the varieties in lint production per acre, acre value of the lint, or dollar value of the production less the cost of the seed (Table 1). There was a difference in lint value per pound based on fiber characteristics and grade in that DPL 408 B2 was significantly lower in value compared with the two other test varieties. Numerically, FM 960 B2 returned $10.22 less than FM 832 based on lint value per acre net of seed cost. Other things being equal, a caterpillar infestation most likely would have changed this relationship. Only a low level bollworm infestation occurred in the field which was judged to have no effect on production.

ACKNOWLEDGMENTS: Thanks are extended to Bayer CropScience for providing FM 960 B2 seed and D&PL Seed Company for providing DPL 408 B seed for the study. Bill and Randy Wright are acknowledged for their time and labor in conducting the study. A special thanks is extended to Charles Gully, Custom Harvester, for the extra time he devoted to placing seed cotton from each plot into separate modules.

Table 1. Production of cotton varieties and lint value net of seed cost, Bill & Randy Wright Farm, Nueces County, TX, 2006.

Variety	Yield lb lint/acre	Lint value $ lb	Lint value $ acre	Seed cost $/acre	$ lint value net of seed cost
FM 960 B2	864 a	.5402 a	466.73 a	22.49	444.24 a
DPL 408 B2	846 a	.5018 b	424.52 a	26.40	398.12 a
FM 832	841 a	.5450 a	458.35 a	3.89	454.46 a
LSD (P = 0.05)	NS	.0327	NS		NS
P > F	.8910	.0395	.5127		.3412

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

EFFECT ON SHREDDED COTTON PLANTS OF 2,4-D APPLIED THROUGH TWO TYPES OF NOZZLES WITH AND WITHOUT DRIFT CONTROL AGENT

Texas Agricultural Experiment Station, Nueces County, 2006

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SUMMARY: It is often difficult to destroy cotton stalks in a timely manner to prevent regrowth and fruiting that serve as sites for boll weevil feeding and egg laying. Additionally, where limited tillage is used a more efficient way to destroy cotton plants quickly after harvest is needed. It was found several years ago that 2,4-D (1.0 quart/acre) applied immediately after shredding would prevent regrowth from producing fruiting structures. Some reports indicated that the treatments were sometimes variable in effectiveness and that drift to unwanted areas occurred. Nozzle selection and drift control agents can be used to address the drift problem, but it was not known if use of such tools might reduce the effectiveness of 2,4-D applied to freshly shredded cotton stalks.

In this study no reduction in 2,4-D effectiveness was found due to use of flat fan or air induction nozzle tips with or without the drift control agent InPlace. All 2,4-D treatments were effective in this study in preventing fruit production from regrowth of shredded cotton plants. However, a second application of the 2,4-D was required to destroy seedling plants emerging from sprouting seed left in the field. The second treatment completely destroyed the seedlings and any green plant growth on plants that received the first treatment.

OBJECTIVES: The field experiment was designed to determine the effect of nozzle type and drift control agent used with 2,4-D for prevention of regrowth of shredded cotton stalks.

MATERIALS/METHODS: The herbicide 2,4-D was applied August 17, 2006 to cotton grown on the Texas Agricultural Experiment Station at Corpus Christi, Texas. Treatments were arranged in a randomized complete block design with 4 replications of treatments in plots 4 rows by 40-feet. Cotton plants were in full cutout with less than 10% open bolls and suffering from drought conditions (less than 18-inches tall) when shredded with a rotary shredder. The 2,4-D was applied within 30 minutes following shredding. A Spider Trac sprayer traveling at 5.5 mph was used to apply all 2,4-D treatments. The flat fan nozzle treatment (80003 XR tips) was applied in 12.0 gpa total spray volume, and the air induction nozzle treatment (11003 VS tips) was applied in 13.0 gpa total spray volume. The sprayer was operated at 30 psi, and a non-ionic surfactant at 2.0 quarts/acre was included with all treatments. The drift control agent used was InPlace Drift Retardant (16.0 oz/acre). Within a few days following significant rainfall and germination of seed from crop residue, each treatment was applied a second time (42 DAT).

Treatments were assessed by (1) examining 25 shredded stalks/plot 14, 22, 29, and 42 days after treatment [DAT] to determine the number of plants with green buds or leaves, (2) removing bark from 25 plants/plot 14 and 22 DAT to determine number of plants with green stem tissue, (3) counting the number of fruiting forms (squares) on 10 plants/plot 29 and 42 DAT, and (4) recording pictures of plant growth 29 and 48 DAT.

RESULTS/DISCUSSION: Differences in percentages of budded plants were only observed in counts made 22 DAT, and differences in the percentages of plants with green stem tissue was only found 14 DAT. However, plants treated with 2,4-D, regardless of treatment method, never reached growth stage to support development of fruit. The nontreated cotton contained squares by 29 DAT and large numbers by 42 DAT. Square production in nontreated plots was estimated to be above 93,000 per acre 42 days after test establishment.

Figures 1 and 2 depict plant response to 2,4-D at 29 and 48 DAT. At 29 DAT note the extensive leaf development in the plot where no 2,4-D was used and the corresponding lack of leaf development where it was used (Fig. 1). Figure 2 depicts similar information 48 DAT. The last set of pictures were taken 6 days after a second treatment had been applied primarily for seedlings following germination of seed in the plots. In no cases were any of the herbicide treated plants close to producing squares.

ACKNOWLEDGMENTS: Rudy Alaniz and Clint Livingston, Demonstration Aids, are thanked for their assistance in conducting the study.

Table 1. Effect on shredded cotton plants of 2,4-D applied through two types of nozzles with and without an added drift control agent, Texas Agricultural Experiment Station, Nueces County, TX, 2006.

		Readings at DAT-1[d]							
	Drift control	% budded plants				% green stems		Fruit/10 plants	
Nozzle tip type	agent[c]	14	22	29	42	14	22	29	42
Air induction[a]	No	71 a	71 b	81 a	93 a	94 b	100 a	0.0 a	0 b
Flat fan[b]	No	57 a	70 b	76 a	87 a	94 b	96 a	0.0 a	0 b
Air induction	Yes	68 a	70 b	85 a	76 a	94 b	95 a	0.0 a	0 b
Flat fan	Yes	67 a	64 b	86 a	89 a	90 b	92 a	0.0 a	0 b
Nontreated		90 a	94 a	96 a	92 a	100 a	100 a	0.8 a	34 a
LSD (P = 0.10)		NS	18.96	NS	NS	5.60	NS	NS	2.32
P > F		.104	.039	.163	.298	.089	.146	.102	.0001

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

[a] Air induction tips: 11003VS

[b] Flat fan nozzle tips: 8003XR

[c] Drift control agent: In-Place at 16.0 oz/acre. A non-ionic surfactant was used in all 2,4-D treatments at 2.0 qt/acre.

[d] DAT-1: Days After Treatment 1

(A) (B)

Fig. 1. Visual effect of 2,4-D on shredded cotton plants 29 days after treatment with 2,4-D. (A) treated in foreground with nontreated in background, (B) closeup of 2,4-D treated plants.

(A) (B)

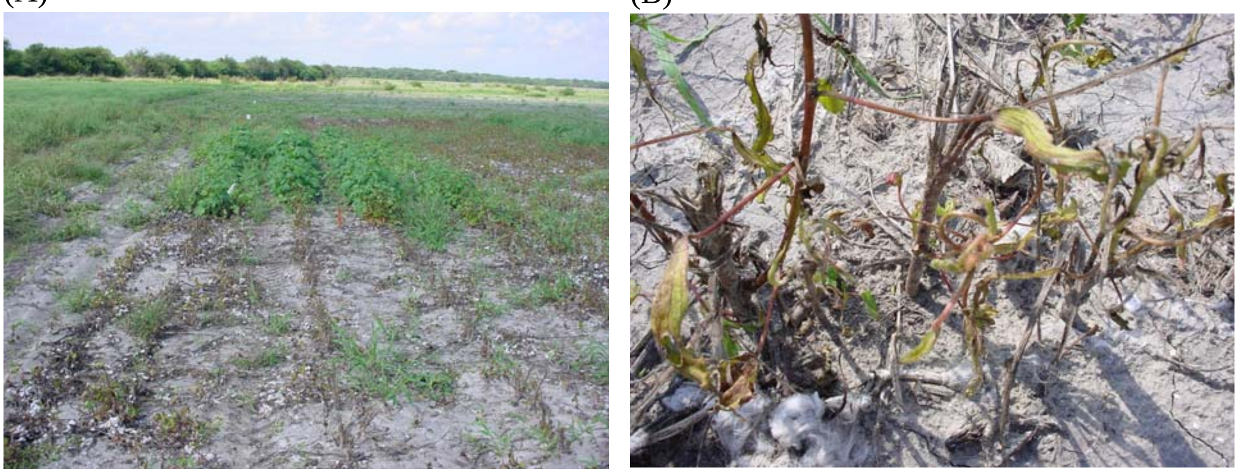

Fig. 2. Visual effect of 2,4-D on shredded cotton plants 48 days after treatment with 2,4-D. (A) treated in foreground with nontreated in background, (B) closeup of 2,4-D treated plants.

BOLL WEEVIL NUMBERS IN PHEROMONE TRAPS IN NUECES AND SAN PATRICIO COUNTIES COMPARING YEARS BEFORE AND DURING THE ERADICATION PROGRAM

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SUMMARY: The year 2006 marked the 9th full season of the boll weevil eradication effort in the South Texas/Wintergarden Boll Weevil Eradication Zone. No boll weevils were captured in 2006 in the Texas Cooperative Extension operated pheromone traps. Progress each year until the 2004 season was evident in our traps, but eradication progress was slowed in that season. Trap catches have steadily declines since 2004. The main area of concern at the end of 2006 was in the Uvalde District.

OBJECTIVE: Pheromone traps were operated to evaluate the impact of boll weevil eradication on relative population levels.

MATERIALS/METHODS: A total of 18 traps were operated at 3 locations from 1988 - 2001. Since 2002 a total of 24 traps have been in place. Traps are deployed as follows: Welder Wildlife Foundation north of Sinton (10 traps), south of Orange Grove and east of Alfred (5 traps) and west of Clarkwood (9 traps). Traps were inspected weekly and pheromone + insecticide strip were changed every other week through 2005. In 2006 traps were inspected every other week. The data used before eradication was collected by Segers et al. during a 6-year period (1977-1982).

RESULTS/DISCUSSION: Early season boll weevil numbers were actually higher in 1998, the first full season of boll weevil eradication (BWE), compared with the pre-eradication trap captures (Table 1). A series of warm winters is believed to have contributed to increased boll weevil activity just before and in the early years of BWE. The BWE program was operated as a "fall" treatment program in the South Texas/Wintergarden zone in 1996 and 1997. During the mid-season of 1999 boll weevils increased to greater numbers than 1998 for the last 5 months of the year. Favorable weather conditions, rainfall that resulted in poor stalk destruction, and relatively high thresholds for treatments all contributed to this increase. In 2000 a more aggressive treatment program was initiated; since that time boll weevil numbers have steadily declined based on the month by month comparison until the 2004 season. In 2004, boll weevil numbers for the season averaged 8.3 times the numbers captured in pheromone traps in 2003. However, a reduction was noted for the 2005 season, and no boll weevils were captured in 2006 in these Texas Cooperative Extension operated traps.

A summary of boll weevil numbers captured in BWE Foundation traps through October each year is provided in Table 2. Decreased numbers of boll weevils were observed by all district offices in 2006 (Table 2). Areas of particular concern continue to include the Uvalde and Kingsville districts. Factors accounting for these problems include (1) migrating boll weevils from the Lower Rio Grande Valley, (2) favorable weather conditions for winter survival and reproduction, (3) fields that were not initially found by Foundation personnel, and (4) logistical problems with program operation. Note that progress was made in all zone districts in 2006. Boll weevils were at the lowest levels of any year since program initiation except for the Uvalde district (Table 2).

ACKNOWLEDGMENTS: Thanks are extended to Rudy Alaniz and Mike Hiller for inspecting traps on certain dates during the year.

Table 1. Boll weevils per pheromone trap per month, Texas Cooperative Extension operated traps.

Month	1977-82 (6 yr avg)[a]	1998	1999	2000	2001	2002	2003	2004	2005	2006
Jan	5.3	0.22	0.22	9.93	0.00	.05	.00	.00	.00	.00
Feb	5.5	0.27	0.00	1.60	0.00	.00	.00	.00	.04	.00
Mar	7.7	3.00	0.33	1.72	0.11	.10	.00	.04	.00	.00
Apr	7.4	30.94	0.00	1.27	0.11	.05	.00	.00	.04	.00
May	2.8	22.00	0.00	0.83	0.17	.05	.00	.00	.00	.00
Jun	4.9	5.10	0.06	0.67	0.00	.00	.00	.00	.00	.00
Jul	188.9	49.50	2.06	11.33	0.35	.00	.00	00	.00	.00
Aug	645.7	48.40	45.00	14.04	0.94	.17	.04	.21	.04	.00
Sep	309.7	2.28	40.90	1.39	0.11	.00	.00	.08	.00	.00
Oct	165.4	1.39	5.72	0.72	0.06	.00	.00	.00	.00	.00
Nov	55.3	0.28	28.30	0.50	0.11	.00	.00	.00	.00	.00
Dec	15.7	0.22	13.67	0.03	0.00	.00	.00	.00	.00	.00
Average	117.9	13.60	11.40	3.67	0.16	.035	.0033	.0275	.010	.00

[a] Traps operated by Segers et al.

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

	Year							
Location	1999	2000	2001	2002	2003	2004	2005	2006
Uvalde	1.92	0.13	0.03	0.034	0.468	3.02	1.149	0.179
Robstown	1.34	1.47	0.06	0.022	0.048	0.14	0.020	0.003
Sinton	1.16	0.84	0.03	0.003	0.004	0.01	0.001	.00001
Kingsville	0.88	1.77	0.45	0.802	0.423	1.96	0.460	.089
Victoria	1.61	1.00	0.34	0.266	0.214	0.11	0.009	.002
Zone total	1.35	1.14	0.16	0.135	0.138	0.66	0.215	.042

BOLLWORM AND TOBACCO BUDWORM PHEROMONE TRAP CATCHES

Texas Agricultural Experiment Station, Nueces County, 2006

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SUMMARY: Pheromone traps for bollworm and tobacco budworm were inspected daily for 31 weeks beginning March 4 extending through October 7 at the Texas Agricultural Experiment Station near Corpus Christi, Texas. The abundance of bollworm far exceeded that of tobacco budworm in 2006; trap catch averaged 15.2 and 0.13 moths/day for bollworm and tobacco budworm, respectively. Trap captures in 2006 were about half the number captured in 2005 (33.1 and 0.27 moths/day). We have observed declining tobacco budworm moth catches for each of the past three years.

The most valuable aspect of pheromone trap operation in the years 2004 - 2006 was for a source of bollworm moths to be tested for susceptibility to pyrethroid insecticide. Increased tolerance to pyrethroid insecticide was observed about the same time that less effectiveness was observed in cotton fields in the region. The observation increased confidence in the decision to switch to other chemistry for control of field populations of the species. Additionally, some tobacco budworm moths were sent to the USDA Laboratory at Stoneville, MS for Cry1Ac protein (Bt) susceptibility testing.

OBJECTIVES: Pheromone traps were operated to measure the relative abundance of moths attracted to the traps, to obtain a supply of bollworm moths for testing susceptibility to pyrethroid insecticide, and to collect tobacco budworm moths for Cry1Ac protein (Bt) testing.

MATERIALS/METHODS: Two Hardstack Moth-ZV 30-inch screen wire cone traps each were deployed and equipped with pheromone for the bollworm and tobacco budworm at the Texas Agricultural Experiment Station, Corpus Christi, Texas. Traps were checked daily from early March through early October, for each of the past 3 years. Pheromone was changed at least once monthly in traps. When enough bollworm moths were captured, they were tested at our location for susceptibility to pyrethroid insecticide.

RESULTS/DISCUSSION: The average daily pheromone trap catch each week for bollworm and tobacco budworm is shown in Fig. 1 and 2. Abundance of bollworm far exceeded that of tobacco budworm. Trap catches in 2006 averaged 15.2 and 0.13 moths/day for bollworm and tobacco budworm respectively. No observable peaks of tobacco budworm were detected. In 2006 peak bollworm moth numbers occurred in weeks 11, 15, 20, and 30. Cotton field infestations reflected the predominance of bollworm compared to tobacco budworm captured in the pheromone traps.

Bollworm moths were used to measure their susceptibility to pyrethroid insecticide. Increased tolerance was observed in these moths at about the same time it became more difficult to obtain a high level control of bollworm in cotton fields. Results of those studies are reported elsewhere.

Tobacco budworm moths were also sent to the USDA Laboratory at Stoneville, MS for susceptibility to Bt Cry1Ac protein. Results of the Cry1Ac testing are reported each year at the Beltwide Cotton Conferences and are published in the proceedings.

ACKNOWLEDGMENTS: Thanks are extended to Rudy Alaniz and Clint Livingston, Demonstration Assistants, for his help in maintaining traps, changing pheromone, counting and testing moths, packaging moths for shipment, and other help with trap operation.

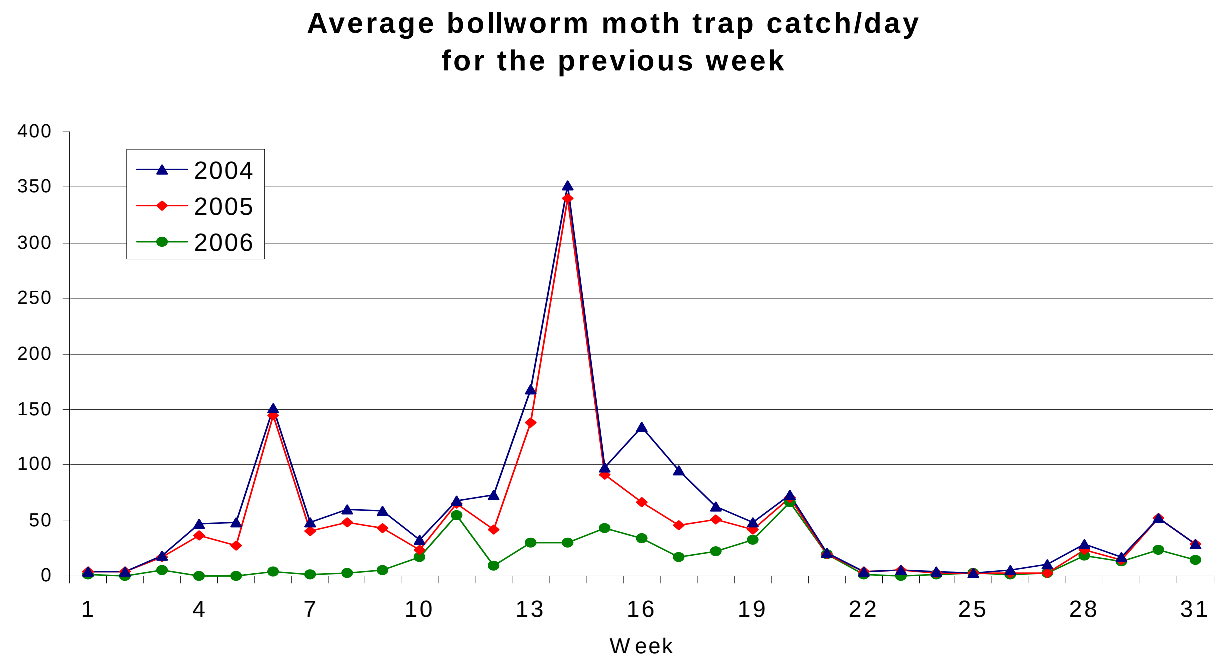

Fig. 1. Bollworm moths captured in pheromone traps, Texas Agricultural Experiment Station, Nueces County, TX. Week 1 = early March and week 31 = early October.

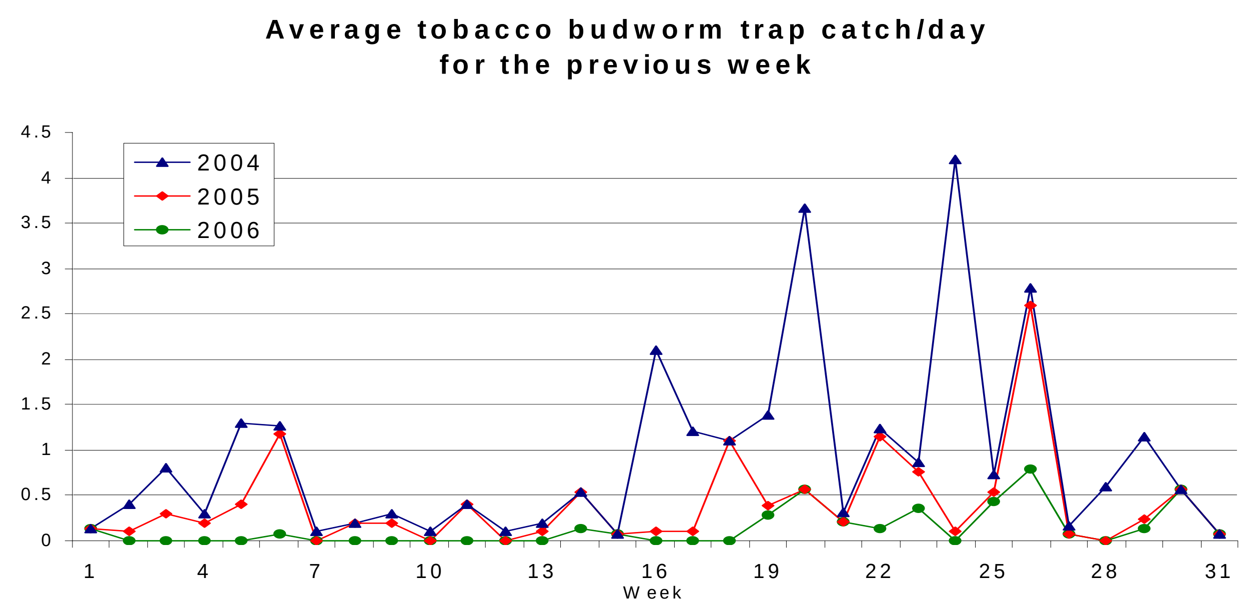

Fig. 2. Tobacco budworm captured in pheromone traps, Texas Agricultural Experiment Station, Nueces County, TX. Week 1 = early March and week 31 = early October.

PROBLEMS WITH MANAGEMENT OF BOLLWORM IN TEXAS COASTAL BEND COTTON FROM 2003 - 2006

Texas Agricultural Experiment Station, Nueces County, 2006

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SUMMARY: The cotton bollworm/corn earworm has been difficult to control with standard rates of pyrethroid insecticide that were effective a few years ago. At certain times during the 2003 - 2005 seasons even the high rates of the pyrethroids failed to provide as effective control as obtained in earlier years. We began to monitor susceptibility of moths to pyrethroid insecticide using the adult vial test (AVT) in 2004. This test was developed by insect toxicologist to monitor changes in susceptibility of insects to various insecticides. In recent years we evaluated moths at 9 different concentrations in the AVT.

During the 2006 cotton growing season, bollworm pyrethroid-resistance levels from May through early June were somewhat similar to those during the same time period in 2004 and 2005. In the later part of the growing season (late June to early/mid July), resistance levels tended to be lower in 2006 compared to the same time period during 2004 and 2005. However, unlike findings for 2004 and 2005, bollworm resistance levels in 2006 did not decline during the months of September and early October (compared to the mid-summer months). In fact, in October 2006, pyrethroid-resistance levels were actually higher than at any time during the summer. We were not successful in capturing additional moths for testing after early October. It is possible that the higher resistance level was an anomaly, but it may be that pyrethroid resistance has gained a foothold in our region, possibly leading to relatively higher levels of resistance in future growing seasons. It may be advisable to consider this information as cotton seed is purchased for the 2007 growing season.

OBJECTIVES: Bollworm moths have been tested each year since 2004 to determine change in susceptibility to the pyrethroid insecticide class. Difficulty controlling the bollworm in cotton points to the importance of conducting such tests.

MATERIALS/METHODS: During each of the crop seasons since 2004, resistance levels have been quantified by conducting the standardized bollworm adult vial test (AVT) using pheromone trap collected moths.

Moths collected early each morning from wire cone Hartstack traps baited with pheromone lures were immediately tested or if there was a few hours delay in placing moths in vials, they were fed a 10% sugarwater solution for about one hour. One moth each was placed into insecticide coated 20 ml glass scintillation vials and held 24 hours for evaluation. For the past two years (2005 and 2006) moths were exposed to cypermethrin concentrations of 0, 0.3, 1.5, 2.5, 3, 5, 10, 30, and 60 micrograms per vial. Vials were placed in a rack and held at room temperature (75-76°F) at a 45° angle with caps loosened. After 24 hours, moths in each vial were inspected and judged to be alive (able to fly), down but not dead, or dead. These data were recorded and sent to the Toxicology Laboratory, Department of Entomology, Texas A&M University, College Station, Texas for further analysis.

In 2006 a total of 2,100 moths were tested (210 moths/exposure level) over the period beginning April 20 through October 4. This number of moths should be adequate in providing an acceptable assessment of their susceptibility status.

RESULTS/DISCUSSION: A significant portion of the bollworm population was found to exhibit elevated levels of tolerance/resistance to pyrethroids in 2006 (Fig. 1). It was evident from the individual test date data that moths were more difficult to kill during June and early July. Similar mortality levels were found in 2004 - 2005. Results from this AVT monitoring program showed that, during the months of June and July, survival levels in test-populations of bollworm moths commonly exceeded 20% at diagnostic cypermethrin dosages of 5 and/or 10 μg per vial. Results from the local AVT monitoring program, coupled with the seasonal timing of difficulty in obtaining adequate control of bollworm with low rates to moderate of pyrethroids, suggests that resistance to pyrethroids by bollworm in Coastal Bend cotton may be aggravated by the spraying of pyrethroids in locally grown grain sorghum. Results from the AVT program during 2004 - 2006 showed that moth survival levels at 5 and/or 10 μg dosages were well below 20% during the early/middle months of cotton growth (i.e., March - May), greater than 20% during middle/late stages of the season (late June and early July), and then receding to < 20% by early September in 2004 - 2005. However, unlike findings for 2004 and 2005, bollworm resistance levels in 2006 did not decline during the months of September and early October (compared to the mid-summer months). In fact, in October 2006, pyrethroid-resistance levels were actually higher than at any time during the summer. We were not successful in capturing additional moths for testing after early October. It is possible that the higher resistance level was an anomaly, but it may be that pyrethroid resistance has gained a foothold in our region, possibly leading to relatively higher levels of resistance in future growing seasons.

Unlike 2004 and 2005 less pyrethroid was used on sorghum since alternate chemistry (methomyl) was chosen for fall armyworm in the sorghum. There was, however, sorghum treated with pyrethroid early in the outbreak since we believed that pyrethroids would provide control of the fall armyworm in sorghum. Additionally, there were some fields where corn earworm was the major headworm species in sorghum and the rice stink bug was present at levels above the economic injury level. We have suspected that the widespread use of pyrethroids in Coastal Bend sorghum has been a key source of selection pressure, inducing increased levels of pyrethroid resistance in bollworm populations destined to move into cotton in the subsequent generation (June - July). Bollworm populations in cotton in 2006 were generally at low levels and may in fact have been at an all time low based on the pheromone trap catches recorded in 2006.

ACKNOWLEDGMENTS: Appreciation is expressed to Dr. Patricia Pietrantonio and to Terry Junek, Department of Entomology, Texas A&M University, College Station, Texas for their support of this project. They provided all the materials necessary to carry out the vial study and processed the data for presentation. Dr. Pietrantonio is the leader for this project for the state of

Texas.

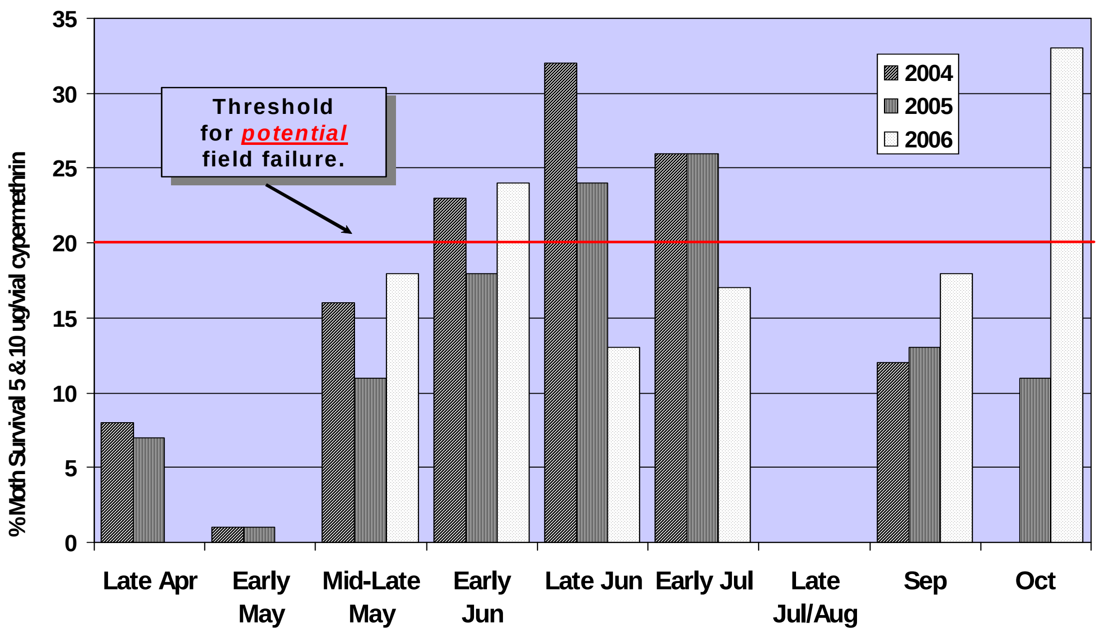

Fig. 1. Bollworm moth survival at 5 and 10 mg/vial cypermethrin in adult vial tests, in the years 2004 - 2006, Texas Agricultural Experiment Station, Nueces County.

EFFECTIVENESS OF INSECTICIDES ON GRASSHOPPERS IN COASTAL BERMUDAGRASS PASTURE

Herbert B.Schumann Farm, Austin County, 2006

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SUMMARY: Several species of grasshoppers have caused damage to hay pastures in Austin County over the past several years; ten grass feeding species were found in this study with about three species making up the bulk of the population. In the present study, grasshopper numbers were judged to be at levels considered to be between severe (15- 28 per square yard) and very severe (28+ per square yard). In outbreak years grasshoppers can be very destructive. Outbreaks are usually preceded by several years of hot, dry summers and warm falls. Dry weather increases nymph and adult survival. Warm falls allow grasshoppers more time to feed and lay eggs. Cool, wet weather slows nymph development, reduces the number of eggs laid, and results in increased disease incidence.

Treatments containing Sevin 4XLR were generally more effective in reducing grasshopper numbers, with the 32.0 oz/acre rate numerically reducing grasshoppers the greatest amount early in the study. A greener color could be seen in this treatment throughout the study. At 7 and 14 days after treatment (DAT), statistical differences were not found among any of the insecticide treatments; all were significantly better than the nontreated. Statistical differences were not found on inspection dates 21, 29, 36, and 42 DAT. At 49 DAT more grasshoppers were present in the 32.0 oz/acre Sevin treatment, probably a response to more food resources. Their numbers, however, were 4-fold below those counted in the nontreated plots 4 DAT.

OBJECTIVES: The objectives of the field study were to (1) compare Dimilin (insect growth regulator), Dimilin + Sevin, and Sevin used alone for effectiveness in controlling grasshoppers, (2) to see if use of Sevin and Dimilin would enhance the length of the control period, and (3) to compare the costs of control.

MATERIALS/METHODS: The grasshopper control study was established on May 25, 2006 on the Herbert Schumann Farm north of Bellville, Texas in Austin County in a field of coastal bermudagrass. The site was a reclaimed peanut field with an acid, sandy soil. It was judged to be excellent habitat for grasshopper egg laying. Insecticide treatments were applied with a Terrigator sprayer equipped with a global positioning system for navigation and a 60-foot 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. The cost to apply the insecticides was $5.00/acre and individual insecticide cost for Sevin 4 XLR was $35.60/gallon and Dimilin 2L was $250.00/gallon. Therefore, costs/acre for chemical and application for the treatments, respectively, were: (1) Dimilin + Sevin – $6.40 + $5.00 = $11.40, (2) Dimilin – $3.91 + $5.00 = $8.91, and (3) Sevin 4 XLR – $8.90 + $5.00 = $13.90/acre.

Treatments were assessed by (1) counting on May 24 (1 day before treatment) the number of grasshoppers in 5 sweeps with a 15-inch net at two locations in each of the 4 plots and after application on May 29; June 1, 8, 15, 23, 30; and July 6,13, (2) collecting grasshoppers before treatment, 21 DAT [days after treatment], and again 49 DAT for growth stage determination [nymph or adult] and species present, and (3) assigning a damage rating [1= very little feeding observed up to 5 = most grass blades eaten and brown color to grass] to each plot 14 DAT [June 8].

RESULTS/DISCUSSION: It has been estimated that 62 grasshoppers per square yard of certain species on about 2.5 acres consume vegetation at the same rate as 2.5 cows. However, it has been demonstrated that comparatively low populations can cause heavy damage if conditions are correct and certain grasshopper species are present. In this study grass response was not quantitatively measured, but a damage rating 14 days after insecticide treatment indicated significant loss in nontreated plots. We estimated that the value of grass production in the Sevin treatment exceeded the cost of control ($13.90/acre). Grass response measurements using cattle exclusion cages are planned for future evaluations.

A 15-inch sweep net was used to determine the relative number of grasshoppers before treatments were applied. The grasshopper population exceeded 45/5 sweeps 24 hours before treatments were applied. At that time approximately 90% were nymphs which is important since Dimilin only affects immature grasshoppers. Eleven species of grasshoppers were found, but one species was not a grass feeder. Three species made up the majority (*Orphulella pelidna, Chortophaga spp.* and *Trachyrhachys kiowa*).

The two treatments containing carbaryl (Sevin) significantly reduced grasshopper numbers 4 DAT compared to Dimilin alone, but by 7 DAT through 14 DAT statistical differences in the insecticide treatments were not found (Table 1). At 14 DAT statistically less grass damage was found in the treatments containing Sevin. Furthermore, we continued to observe a significantly greener color in the 32.0 oz/acre Sevin treatment, an indication of more grass in this treatment. Generally grasshopper numbers at 21, 29, 36, and 42 DAT were numerically greater in the nontreated areas. By 49 DAT it was noticed that more grasshoppers were present in the Sevin (32.0 oz/acre) treatment than the other treatments, and that the numbers in this treatment were not significantly different from the number in nontreated plots. We believe greater numbers of grasshoppers were present in the 32.0 oz/acre Sevin treatment due to the presence of more grass for food. The average of 8 inspection dates showed significantly higher numbers of grasshoppers in the nontreated and significantly fewer in the two treatments where Sevin was included. The Dimilin treatment also averaged fewer grasshoppers compared to the nontreated plots.

Although grass growth response due to grasshopper reduction was not measured, it appeared that enough grass was protected to pay for treatment. The improved grass growth was most noticeable in the 32.0 oz/acre Sevin treatment. Plans have been made to place cattle exclusion panels in the plots in future studies. Chemicals or methods need to be found to reduce treatment costs, sweep net sampling methods must be evaluated to help determine treatment needs, and cultural control methods need to be investigated to help reduce the potential for high numbers of grasshoppers.

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Table 1. Comparison of grasshopper numbers in plots treated with various insecticides, Schumann Farm, Austin County, TX, 2006.

Treatment	Rate oz/acre	$ cost/ acre[a]	Grasshoppers/5 sweeps: 4 DAT[b]	7 DAT	14 DAT	21 DAT	29 DAT	36 DAT	42 DAT	49 DAT	Avg.	Da. rating[c] 14 DAT
Dimilin 2L + Sevin 4XLR	1.0 + 16.0	6.40	0.8 c	0.8 b	7.3 b	6.3 a	6.5 a	4.3 a	4.4 a	4.4 b	4.3 c	1.5 c
Dimilin 2L	2.0	3.91	14.3 b	11.0 b	6.0 b	7.1 a	3.8 a	3.6 a	2.3 a	3.6 b	6.5 b	2.0 b
Sevin 4XLR	32.0	8.90	0.3 c	0.5 b	2.5 b	2.8 a	4.8 a	6.4 a	3.4 a	9.9 a	3.8 c	1.5 c
Nontreated			40.8 a	35.9 a	14.5 a	8.4 a	11.0 a	5.0 a	4.1 a	6.1 ab	15.7 a	3.9 a
LSD (P = 0.05)			13.45	15.78	5.66	4.94	6.04	4.58	3.48	4.13	1.77	.005
P > F			.0002	.0021	.0063	.1306	.0951	.5843	.5389	.0312	.0001	.0001

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

[a] Insecticide cost only; application cost was $5.00/acre.

[b] DAT = Days After Treatment

[c] Damage rating: 1 = very little feeding observed up to 5 = most grass blades eaten and brown color to grass.

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