DIRECT EFFECT OF THE SYSTEMIC INSECTICIDE IMIDACLOPRID (GAUCHO™) ON YIELD OF GRAIN SORGHUM

REPORT OF PROGRESS 815

Kansas State University
Agricultural Experiment Station
and Cooperative Extension Service

DIRECT EFFECT OF THE SYSTEMIC INSECTICIDE IMIDACLOPRID (GAUCHO™) ON YIELD OF GRAIN SORGHUM[1]

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SUMMARY

A series of tests was conducted at five locations in Kansas during 1996 and 1997 to determine if a yield response results with Gaucho used as a seed treatment on sorghum. Results varied. Gaucho improved yields at Hesston, especially in the June plantings. Some hybrids benefited more than other hybrids. These differences may have been due to chinch bugs that were observed in the plots and were known to be troublesome in the area. Because their numbers were low, other factors may have played a role. At the other locations and in the absence of chinch bugs, Gaucho had less of an influence on yields. At Garden City, where some greenbugs developed, Gaucho provided early-season control, but infestations were too light to influence yields. At Hays, Gaucho treatments appeared to have some influence on the numbers of corn earworms in sorghum heads in one planting, although yield differences were not significant. Overall, this study suggests that yield improvement following use of Gaucho in fields with no observable pest activity may be overrated.

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INTRODUCTION

Gaucho™ is the trade name for imidacloprid, a systemic insecticide commonly used as a seed treatment on sorghum for control of chinch bugs, greenbugs, and other insects. Its ability to control these insects and protect sorghum yield potential is well documented (Sloderbeck et al. 1996; Wilde 1997). However, the effects of Gaucho on sorghum growth, development, and yield in the absence of noticeable insect populations are less well understood. Growers and others using this product have suggested that a positive yield response can occur in the absence of insect attack.

Other systemic insecticides such as disulfoton and carbofuran have been shown to have direct effects on plant growth and crop yields. For example, yields of peanut (Hauser et al. 1977), tobacco (Pless et al. 1971), and sorghum (Thompson and Harvey 1980) were increased in soil treated with disulfoton. Yields of tobacco, corn silage (Pless et al. 1971), corn grain (Apple 1971), rice (Venugopal and Litsinger 1981), and sorghum (Taley et al. 1975) were increased with carbofuran soil treatments. In these instances, the enhanced yield was attributed to a physiological response of the plants to the insecticide. However, other studies indicate no yield response to carbofuran by corn (Rogers and Owens 1974) or to disulfoton or phorate by soybeans (Moody and Bailey 1974).

Because Gaucho is used widely as a seed treatment on sorghum, additional studies were needed to determine its effect on grain production. We compared grain yields of sorghum with and without Gaucho seed treatment in the presence and noticeable absence of economic insect infestations in a series of tests throughout Kansas in 1996 and 1997.

PROCEDURES

Fifteen tests were conducted at five locations representing various soil types and agronomic practices around the state. The locations were the East Central Experiment Field, Ottawa; the KSU Agronomy North Farm, Manhattan; the KSU Agricultural Research Center, Hays; the Harvey County Experiment Field, Hesston; and the Southwest Research-Extension Center, Garden City. At the Hays and Garden City sites, two-row plots 22 ft long were used and arranged in a randomized complete block or split plot design replicated four times. Plots at Ottawa, Manhattan, and Hesston were 30 ft long and arranged in a randomized complete block or split plot design replicated four times. Reduced tillage in combination with herbicides was used to control weeds. Normal fertilization practices were carried out. Soil moisture at planting was adequate for seed germination and emergence.

Single dates of planting were evaluated at Manhattan and Ottawa, KS. Two dates of planting (early and late) were evaluated at Hesston and Hays. The site at Garden City had irrigated and dryland test sites in 1996 and a dryland test in 1997. Tests at all other locations were dryland. At Manhattan, planting dates were May 21, 1996 and May 15, 1997. At Ottawa, sorghum was planted on June 6, 1996 and June 9, 1997. At Hesston, the early dates were April 26, 1996 and April 24, 1997, and the conventional dates were June 19, 1996 and June 27, 1997. At Hays, sorghum was planted on May 17, 1996 and May 20, 1997 and on June 7, 1996 and June 6, 1997. At Garden City in 1996, we established dryland and irrigated tests on June 3 and 4. In 1997, a dryland test was planted on June 6.

Treated and untreated seed of five sorghum hybrids (NC + 271, Cargill 607E, DeKalb DK-56, Mycogen 1552, and Pioneer 8500) were obtained from Gustafson, Inc. for use in the trial. Gaucho™ 480 at a rate of 8 oz. per 100 (4 oz. ai/cwt) had been applied to each treated seed lot. Both lots of seed were treated with commercial rates of Apron (a fungicide) and Concept (a seed

protectant). In 1996 at Hesston, two additional hybrids (Pioneer 8505 and Mycogen 1506) were included, and Pioneer 8500 also was treated with aldicarb (Temik 15 G at 7 lb/a). In 1997, two additional hybrids (Golden Harvest H-403 and Northrup King KS 555Y) with and without Temik applied in-furrow at planting were included in the June plantings for comparison.

Various plant growth parameters were measured to evaluate sorghum response to the insecticide treatments. Emergence dates were recorded when the coleoptile of the first seedlings emerged though the soil surface. Plant stands were recorded at the 2-leaf stage of development. Plant vigor in the seedling stage was assessed at some locations on a scale of 1-5, with 1 being the best and 5 the poorest. Bloom dates were recorded when plants reached the half bloom stage and head counts were made approximately 3 weeks later. Plots were harvested with a modified two-row Gleaner combine, and yields and test weights were determined. Plots were examined at various intervals for the presence of insects. When infestations occurred, the numbers per plant were determined by examining several plants in each plot.

The data were subjected to analysis of variance (SAS Institute 1988). Means were separated utilizing Fisher s protected LSD with a 5% level of significance.

RESULTS

Hesston 1996

This location frequently experiences problems with chinch bugs, and low numbers were observed in the plots.

In the April planting, we observed no consistent effect of Gaucho on early plant populations, plant vigor, or final stands. Also, no interaction occurred between hybrids and Gaucho seed treatment for any trait measured. Lodging ranged from 0 to 7% and had no relationship with treatments. Gaucho was associated with a slight increase in the number of heads/plant and an average yield increase of 7 bu/a. Mycogen 1552 and NC + 271 had the largest and significant yield increases of 10.8 and 12.4 bu/a. Temik significantly increased the yield of Pioneer 8500, whereas Gaucho did not. Gaucho had no effect on sorghum test weight (Table 1).

Hard rainfall 4 days after the June planting caused soil crusting. At 10 days after planting, populations of Gaucho-treated sorghum had an average increase of 6,300 plants/a. Most of this increase was still observed at 20 days after planting. Early plant vigor was slightly greater for Gaucho-treated than for untreated sorghum. Treatment had no effects on maturity, heads/plant, or test weight, and no lodging occurred. However, large yield increases in the range of 15 to 21 bu/a occurred for Gaucho-treated DeKalb DK-56, Mycogen 1552, and NC+ 271. The average yield increase with Gaucho for all hybrids was 11.7 bu/a (Table 2).

Hesston 1997

Chinch bugs were observed in nearby small grains during May and June, as well as in the plots during the early stages of sorghum growth.

In the April planting, final sorghum stands ranged from 27 to 65 % of the planting rate. Gaucho increased sorghum populations significantly for all hybrids except Mycogen 1552. The average increase across all hybrids was 6,800 plants/a. Sorghum vigor tended to increase slightly with Gaucho, but this effect was not significant for most of the hybrids. Chinch bug numbers averaged 0.7/plant in early August. Gaucho was associated with slight overall reductions in the number of days from planting to half bloom, the number of heads/plant, lodging percentage, and grain moisture. However, these effects were minor and inconsistent among hybrids. On the other hand, yields tended to increase with Gaucho seed treatment. This increase was significant for DeKalb DK-56 and NC+ 271. The average increase across hybrids was 13 bu/a. Gaucho did not affect the test weight of grain from early-planted sorghum (Table 3).

Heavy rain 2 days after the June planting affected sorghum emergence. However, because of warm soil temperatures, sorghum emerged rapidly, and emergence generally was completed at 10 days after planting. Gaucho and Temik significantly increased overall stands by an average of 17%, or approximately 4,500 plants/a. For Mycogen 1552 and NC+ 271, the increase was smaller and not statistically significant. On average, seedling vigor for all hybrids was improved somewhat by insecticides, and this was observed more clearly at 20 days than at 10 days after planting. An average of 1.3 chinch bugs/plant was present in early August. Insecticides slightly decreased the number of days from planting to half-bloom stage for Cargill 607E, DeKalb DK-56, Golden Harvest H-403, and Pioneer 8500 but not the remaining hybrids. Treatments had no effects on the number of heads/plant or on lodging percentage. Yields generally were enhanced by use of Gaucho, but response varied among hybrids. Significant yield increases of 13.7 to 28.0 bu/a occurred among four of the seven hybrids. Test weight of grain from three hybrids increased slightly with insecticide (Table 4).

Of the five hybrids included in both dates of planting during both 1996 and 1997, Gaucho-treated DK-56, Mycogen 1552, and NC+ 271 all produced significantly higher yields in three of the four tests, with increases ranging from 11 to 30 bu/a. Cargill 607E showed a trend toward higher yields with Gaucho, but increases were not significant. This was also true for Pioneer 8500. Greater differences were associated with Gaucho for the June dates of planting. This might be expected, because chinch bugs migrate from maturing wheat into nearby corn or sorghum during June. These small plants in later-planted fields are more vulnerable to damage.

Manhattan 1996

No noticeable insect infestations occurred in these plots, and no significant differences occurred in yields. Gaucho had no effects on days to half bloom, plant height, grain moisture, lodging, or heads per plant (Table 5).

Manhattan 1997

No severe insect infestations occurred. A few greenbugs were observed on sorghum hybrid NC+ 271, but numbers were too low to quantify. However, significant increases in yields were detected in Gaucho-treated Mycogen 1552 and Pioneer 8500, 10.5 and 12.0 bu/a, respectively.

Differences in dates of half bloom, plant height, grain moisture, and lodging were negligible (Table 6).

Ottawa 1996

No pest insects were observed. Gaucho had practically no effects on days to half bloom, plant height, percent grain moisture, lodging, or heads per plant. No significant differences in yield occurred in any of the hybrids, although one hybrid treated with Gaucho had an increase of 12.7 bu/a, which approached significance (Table 7).

Ottawa 1997

No insect problems were noticed. Cargill 607E, DK-56, and Pioneer 8500 reached half bloom 1.5 to 2.0 days earlier when treated with Gaucho than when not treated. Gaucho-treated hybrids tended to be somewhat shorter, and the difference was significant for Cargill 607E, Dekalb DK-56, and Pioneer 8500. DeKalb DK-56 and NC+ 271 treated with Gaucho tillered less and produced fewer heads per plant. Gaucho did not affect the test weight. Grain yield was not affected, except for Pioneer 8500, which had significantly lower yield with Gaucho treatment (Table 8).

Hays 1996

No significant insect populations were observed. No significant differences in yield were detected between any of the Gaucho-treated or untreated hybrids in either the May or June planting. A large amount of variation in these tests may have masked some of the treatment effects (Tables 9 & 10).

Hays 1997

A head infestation of corn earworms developed at light to moderate levels in the early planting followed by a heavy infestation in the late planting. For the May date of planting, differences in plant populations, days to half bloom, plant height, grain moisture, test weight, and heads per plant were minimal. Earworms ranged between 0.0 and 2.5 per head in the May planting. Gaucho did not influence the level of infestation or produce any differences in grain yield. In the June planting, more earworms occurred in some hybrids than others, but differences in both worm counts and yields were not significant in Gaucho-treated and untreated plots (Tables 11 & 12).

Garden City 1996

Light greenbug infestations were present. Greenbugs began to appear in June at about 2 weeks after planting and remained present at low numbers (well below damaging levels) until about September. In the dryland study at 18 days after planting, the Gaucho treatments were almost free of greenbugs, whereas counts on untreated hybrids ranged from about 30 to 50 per plant. Differences were significant on most hybrids and across all hybrids. Counts taken at 70 days after planting (as the effect of Gaucho declined) remained significant across all hybrids in the Gaucho treatments but not great enough to be significant on any particular hybrid. Yields showed no response to Gaucho treatment. In the irrigated study, greenbugs generally averaged less than 250 per plant when counts were taken at 71 days after planting. Gaucho treatments had fewer greenbugs overall. Differences among hybrids varied, with significantly fewer greenbugs on Gaucho-treated Mycogen 1552, Pioneer 8500, and NC+ 270. These responses were similar to those observed for the 18-day counts in the

dryland study. Again, although Gaucho provided significant reductions in greenbug numbers, even late in the season, yields were not affected significantly (Tables 13 & 14).

Garden City 1997

Seed treated with Gaucho was slower to emerge, but final stands were not significantly different. We speculate that the Gaucho-treated seed may have needed additional water to germinate. Low numbers of greenbugs were observed in mid-August at 69 and 76 days after planting, but counts failed to show significant differences in greenbug numbers with the Gaucho treatments. No differences in height, head number, bloom date, test weight, or yield were detected between the Gaucho-treated and untreated hybrids. A slight difference in the grain moisture was detected, but we do not know at this time if this is a common occurrence in Gaucho-treated hybrids (Table 15).

DISCUSSION

Several producers have noticed responses in growth and yield of sorghum treated with Gaucho compared to untreated sorghum. Some have associated these responses with activity of pest insects. We initiated this study to try to document a yield response with Gaucho. In general, no consistent yield increase occurred in the Gaucho-treated sorghum at five locations in Kansas. The exception was at Hesston, where significant increases were noted with some hybrids in both 1996 and 1997.

At Hesston, Gaucho generally improved yield, especially in the June plantings. Some hybrids benefited more than others did. This difference may have been due to chinch bugs. If so, this would be consistent with our experience that sorghum planted in June tends to suffer more damage than sorghum planted earlier under similar conditions. Chinch bugs were known to be in the plots, but the magnitude of seedling stage infestations was not recorded. The low counts observed in August 1997 suggest that numbers were low during May and June. If so, light infestations at the seedling stage may have more adverse effects than we expected. However, we cannot be certain that the benefit provided by Gaucho was entirely due to chinch bugs. Differences in plant stand suggest that wireworms or other seed-attacking organisms also may have played a role.

At Garden City, Gaucho provided good early-season control of greenbug, although numbers were too low to influence yields. At Hays, Gaucho treatments tended to have somewhat lower (though nonsignificant) numbers of corn earworms in sorghum heads in the June 1997 planting. However, no significant differences in yield occurred.

Other possible explanations for enhanced growth or yield with systemic insecticides, other than insect, mite, or nematode control, include: influences on microorganisms of the rhizosphere, nutritional ingredients in the insecticide, and an effect on some enzymes involved with plant metabolism (Pless et al. 1971). Future investigations should consider possible effects of Gaucho on soil nematodes, which have reduced sorghum yields in Georgia (Johnson and Burton 1977). However, nematodes are not known to affect sorghum in Kansas, except possibly in extremely sandy soils. In addition, the 4 oz. ai/cwt. rate probably would not be high enough to control nematodes in sorghum. The yield increase observed was with a few sorghum hybrids, and other genotypes may or may not respond in the same

manner. Thus, the question of hybrid response needs further study. Also, because Gaucho can be used to determine losses caused by insect pests, the possibility should be considered that yield differences are confounded with direct effects of this insecticide on sorghum.

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Table 1. Gaucho effects on stands, vigor, maturity and yield of April-planted grain sorghum. Hesston, KS. 1996.

Hybrid	Insecticide	Days to Half Bloom	Plant Height (cm)	Moisture (%)	Test Wt (lb/bu)	Yield (bu/a)	Heads/ Plant	Lodging (%)	Plant Vigor 15 DAP	Plant Vigor 26	Plant Pop1000's/a) 15 DAP	Plant Pop1000's/a) 26 DAP	Plant Stand (%) 15 DAP	Plant Stand (%) 26 DAP
Cargill 607E	None	76.00	99.06	12.20	57.40	56.40	1.30	5.00	3.60	4.40	29.30	36.10	56.00	69.00
Cargill 607E	Gaucho	75.00	99.06	12.20	58.10	54.80	1.30	4.00	3.50	4.20	28.00	35.40	53.00	68.00
DeKalb DK56	None	85.00	114.30	12.90	58.00	65.40	1.40	1.00	3.40	3.10	24.80	27.90	47.00	53.00
DeKalb DK56	Gaucho	84.00	116.84	13.00	58.10	71.80	1.30	2.00	3.30	3.00	25.30	29.40	48.00	56.00
Mycogen 1552	None	83.00	116.84	13.10	58.70	58.40	1.60	4.00	3.90	3.50	21.90	25.60	42.00	49.00
Mycogen 1552	Gaucho	82.00	116.84	12.80	58.70	69.20	1.90	6.00	4.00	3.30	21.00	23.70	40.00	45.00
Pioneer 8500	None	75.00	109.22	12.40	58.10	59.20	1.40	4.00	2.80	2.80	36.60	38.60	70.00	74.00
Pioneer 8500	Gaucho	74.00	106.68	12.20	58.50	66.00	1.70	3.00	3.00	2.60	32.20	35.60	62.00	68.00
Pioneer 8500	Temik	74.00	109.22	12.30	58.50	70.50	1.40	7.00	2.60	2.40	40.00	41.40	77.00	79.00
NC+ 271	None	82.00	109.22	12.10	57.50	58.10	1.10	1.00	3.10	3.30	33.50	36.40	64.00	70.00
NC+ 271	Gaucho	82.00	109.22	12.20	57.60	70.50	1.20	0.00	2.90	3.20	32.80	36.10	63.00	69.00
Mycogen 1506	None	80.00	114.30	12.80	58.80	66.80	1.60	0.00	3.20	2.60	26.70	28.90	51.00	55.00
Mycogen 1506 (D)	Gaucho	79.00	119.38	12.70	58.80	72.00	1.40	1.00	3.20	2.70	30.30	34.60	58.00	66.00
Mycogen 1506	Temik	79.00	116.84	12.50	58.80	72.50	1.50	0.00	3.10	2.30	29.00	30.90	56.00	59.00
Pioneer 8505	None	75.00	106.68	12.40	58.30	61.50	1.80	3.00	3.60	3.30	23.10	26.40	44.00	50.00
Pioneer 8505 (D)	Gaucho	73.00	109.22	12.30	57.70	66.10	1.30	2.00	2.90	2.40	36.10	39.50	69.00	76.00
LSD 0.05		1.00	2.54	0.28	0.68	9.20	0.18	4.00	0.30	0.30	3.20	3.10	6.00	6.00
Main effect means:														
Hybrid														
Cargill 607E		75.00	99.06	12.20	57.70	55.60	1.30	4.00	3.50	4.30	28.60	35.70	55.00	68.00
Dekalb DK56		84.00	116.84	12.90	58.10	68.60	1.40	1.00	3.30	3.10	25.00	28.60	48.00	55.00
Mycogen 1552		82.00	116.84	12.90	58.70	63.80	1.70	5.00	3.90	3.40	21.50	24.60	41.00	47.00
Pioneer 8500		74.00	106.68	12.30	58.30	62.60	1.50	4.00	2.90	2.70	34.40	37.10	66.00	71.00
NC+ 271		82.00	109.22	12.20	57.50	64.30	1.20	1.00	3.00	3.30	33.10	36.20	63.00	69.00
LSD 0.05		0.70	2.54	0.20	0.60	7.10	0.14	3.00	0.20	0.20	2.50	2.40	5.00	5.00
Insecticide														
None		80.00	109.22	12.50	57.90	59.50	1.40	3.00	3.30	3.40	29.20	32.90	56.00	63.00
Gaucho		79.00	109.22	12.50	58.20	66.50	1.50	3.00	3.30	3.30	27.90	32.00	53.00	61.00
LSD 0.05		0.40	NS	NS	NS	4.50	0.09	NS	NS	NS	NS	NS	NS	NS

DAP = Days after planting
(D) = Different seed lot

Table 2. Gaucho effects on stands, vigor, maturity, and yield of June-planted grain sorghum. Hesston, KS. 1996.

Hybrid	Insecticide	Days to Half Bloom	Plant Height (cm)	Moisture (%)	Test Wt (lb/bu)	Yield (bu/a)	Heads/ Plant	Plant Vigor 10 DAP	Plant Pop (1000's/a) 10 DAP	Plant Pop (1000's/a) 20 DAP	Plant Stand (%) 10 DAP	Plant Stand (%) 20 DAP
Cargill 607E	None	60.00	101.60	14.80	58.80	84.20	1.20	2.70	30.60	33.00	58.00	63.00
Cargill 607E	Gaucho	59.00	104.14	14.80	58.90	91.50	1.30	2.50	35.80	37.30	68.00	71.00
DeKalb DK56	None	68.00	134.62	18.20	57.80	81.20	1.10	2.90	24.60	28.50	47.00	54.00
DeKalb DK56	Gaucho	68.00	132.08	17.90	58.10	96.80	1.10	2.80	32.80	35.80	63.00	68.00
Mycogen 1552	None	63.00	124.46	16.60	59.20	94.80	1.20	2.70	28.20	30.40	54.00	58.00
Mycogen 1552	Gaucho	63.00	127.00	16.70	59.10	110.10	1.30	2.00	32.70	35.40	63.00	68.00
Pioneer 8500	None	59.00	111.76	14.40	60.20	102.80	1.40	2.60	29.80	32.20	57.00	62.00
Pioneer 8500	Gaucho	58.00	109.22	14.10	60.20	106.60	1.30	1.70	39.60	40.00	76.00	77.00
Pioneer 8500	Temik	58.00	109.22	14.30	60.40	98.10	1.30	2.00	38.80	40.60	74.00	78.00
NC+ 271	None	64.00	114.30	16.00	58.30	79.40	1.10	2.60	26.00	27.40	50.00	52.00
NC+ 271	Gaucho	64.00	111.76	15.60	59.00	100.30	1.20	2.70	29.20	32.00	56.00	61.00
Mycogen 1506	None	63.00	129.54	16.50	58.60	82.60	1.40	2.40	21.50	22.70	41.00	43.00
Mycogen 1506 (D)	Gaucho	63.00	127.00	15.40	59.00	107.50	1.20	2.10	36.20	39.30	69.00	75.00
Mycogen 1506	Temik	63.00	129.54	15.70	59.00	116.80	1.30	2.40	32.70	35.20	63.00	67.00
Pioneer 8505	None	57.00	106.68	15.10	59.80	101.70	1.20	2.30	34.30	37.00	66.00	71.00
Pioneer 8505	Gaucho	57.00	109.22	14.30	60.20	109.30	1.30	1.60	41.30	42.10	79.00	81.00
Pioneer 8505 (D)	None	58.00	109.22	15.20	59.60	90.30	1.50	2.80	22.70	25.40	43.00	49.00
Pioneer 8505 (D)	Gaucho	56.00	106.68	14.50	59.90	104.80	1.20	1.60	40.20	42.60	77.00	82.00
LSD 0.05		1.30	5.08	1.10	0.65	10.90	0.13	0.40	4.00	4.20	8.00	8.00
Main effect means:												
Hybrid												
Cargill 607E		59.00	101.60	14.80	58.80	87.80	1.20	2.60	33.20	35.20	63.00	67.00
Dekalb DK56		68.00	132.08	18.00	57.90	89.00	1.10	2.90	28.70	32.10	55.00	61.00
Mycogen 1552		63.00	124.46	16.70	59.20	102.50	1.20	2.40	30.50	32.90	58.00	63.00
Pioneer 8500		58.00	109.22	14.30	60.20	104.70	1.40	2.10	34.70	36.10	66.00	69.00
NC+ 271		64.00	111.76	15.80	58.70	89.90	1.20	2.60	27.60	29.70	53.00	57.00
Pioneer 8505		57.00	109.22	14.70	60.00	105.50	1.20	1.90	37.80	39.50	72.00	76.00
LSD 0.05		0.95	3.05	0.80	0.49	6.30	0.09	0.30	2.20	2.30	4.00	4.00
Insecticide												
None		62.00	114.30	15.80	59.00	90.70	1.20	2.60	28.90	31.40	55.00	60.00
Gaucho		61.00	114.30	15.60	59.20	102.40	1.20	2.20	35.20	37.10	67.00	71.00
LSD 0.05		NS	NS	NS	NS	3.60	NS	0.20	1.30	1.30	2.00	3.00

DAP = Days after planting (D) = Different seed lot

Table 3. Gaucho effects on stands, vigor, maturity, and yield of April-planted grain sorghum. Hesston, KS. 1997.

Hybrid	Insecticide	Days to Half Bloom	Plant Height (cm)	Moisture (%)	Test Wt (lb/bu)	Yield (bu/a)	Heads/ Plant	Lodging (%)	Plant Vigor		Plant Pop (1000's/a)		Plant Stand (%)	
									22 DAP	39 DAP	22 DAP	39 DAP	22 DAP	39 DAP
Cargill 607E	None	85.00	114.30	12.80	58.70	90.40	1.70	1.00	3.60	4.10	21.10	24.90	40.00	47.00
Cargill 607E	Gaucho	85.00	111.76	12.70	58.20	98.40	1.60	0.00	3.60	4.00	28.00	31.50	53.00	59.00
DeKalb DK56	None	93.00	132.08	13.70	60.20	69.30	2.00	3.00	3.40	3.20	10.80	12.40	20.00	23.00
DeKalb DK56	Gaucho	91.00	137.16	13.40	60.30	99.30	1.60	0.00	2.40	2.90	20.10	22.50	38.00	43.00
Mycogen 1552	None	90.00	137.16	13.50	60.00	79.70	2.40	3.00	2.80	3.00	13.30	14.00	25.00	27.00
Mycogen 1552	Gaucho	89.00	137.16	13.60	60.20	86.40	2.60	1.00	2.50	2.90	12.90	14.00	24.00	27.00
Pioneer 8500	None	86.00	129.54	13.00	59.70	121.00	2.10	1.00	1.90	2.00	25.00	28.40	47.00	54.00
Pioneer 8500	Gaucho	84.00	129.54	12.80	59.80	122.00	1.60	0.00	1.90	1.60	38.00	40.40	72.00	76.00
NC+ 271	None	90.00	129.54	13.30	59.50	88.20	2.00	1.00	3.60	3.00	15.30	17.70	29.00	33.00
NC+ 271	Gaucho	90.00	127.00	13.10	59.80	107.90	1.80	1.00	2.80	2.90	20.80	23.10	39.00	44.00
LSD 0.05		1.10	3.56	0.30	0.55	10.30	0.27	1.00	0.85	0.38	3.10	2.50	6.00	5.00
Main effect means:														
Hybrid														
Cargill 607E		85.00	111.76	12.80	58.50	94.40	1.60	1.00	3.60	4.10	24.50	28.20	46.00	53.00
Dekalb DK56		92.00	134.62	13.50	60.30	84.30	1.80	1.00	2.90	3.10	15.50	17.50	29.00	33.00
Mycogen 1552		89.00	137.16	13.50	60.10	83.00	2.50	2.00	2.60	2.90	13.10	14.00	25.00	27.00
Pioneer 8500		85.00	129.54	12.90	59.70	121.50	1.80	1.00	1.90	1.80	31.50	34.40	60.00	65.00
NC+ 271		90.00	127.00	13.20	59.60	98.00	1.90	1.00	3.20	2.90	18.00	20.40	34.00	39.00
LSD 0.05		0.80	2.54	0.20	0.39	7.30	0.19	1.00	0.60	0.27	2.20	1.80	4.00	3.00
Insecticide														
None		89.00	127.00	13.30	59.60	89.70	2.00	2.00	3.00	3.10	17.10	19.50	32.00	37.00
Gaucho		88.00	127.00	13.10	59.70	102.80	1.80	0.00	2.60	2.80	24.00	26.30	45.00	50.00
LSD 0.05		0.50	NS	0.10	NS	4.60	0.12	1.00	0.38	0.17	1.40	1.10	3.00	2.00

DAP = Days after planting

Table 4. Gaucho effects on stands, vigor, maturity, and yield of June-planted grain sorghum. Hesston, KS. 1997.

Hybrid	Insecticide	Days to Half Bloom	Plant Height (cm)	Moisture (%)	Test Wt (lb/bu)	Yield (bu/a)	Heads/ Plant	Lodging (%)	Plant Vigor		Plant Pop (1000's/a)		Plant Stand (%)	
									10 DAP	20 DAP	10 DAP	20 DAP	10 DAP	20 DAP
Cargill 607E	None	60.00	109.22	15.70	55.70	83.60	1.10	4.00	3.10	2.80	36.80	36.70	85.00	85.00
Cargill 607E	Gaucho	58.00	111.76	15.20	55.50	94.20	1.10	4.00	2.50	1.20	43.10	43.40	100.00	100.00
DeKalb DK56	None	67.00	137.16	16.80	57.80	95.80	1.10	1.00	3.00	3.00	32.80	33.30	76.00	77.00
DeKalb DK56	Gaucho	65.00	142.24	17.10	58.90	123.80	1.00	3.00	1.80	1.50	39.50	39.70	91.00	92.00
Mycogen 1552	None	64.00	134.62	16.40	57.60	89.00	1.40	1.00	3.00	3.10	30.90	31.40	71.00	73.00
Mycogen 1552	Gaucho	63.00	139.70	15.90	58.40	110.30	1.50	0.00	2.50	1.80	32.30	32.50	75.00	75.00
Pioneer 8500	None	60.00	121.92	15.70	58.20	105.70	1.30	0.00	1.80	2.00	38.40	38.40	89.00	89.00
Pioneer 8500	Gaucho	58.00	121.92	15.50	58.60	116.80	1.20	1.00	1.30	1.40	43.00	43.20	99.00	100.00
NC+ 271	None	62.00	116.84	15.50	56.50	90.10	1.20	2.00	3.10	2.90	32.50	32.90	75.00	76.00
NC+ 271	Gaucho	61.00	116.84	15.30	56.80	87.10	1.10	2.00	2.70	1.90	36.10	36.30	84.00	84.00
Golden Harvest H-403	None	59.00	109.22	15.40	56.70	74.50	1.30	0.00	2.60	2.30	31.80	32.10	74.00	74.00
Golden Harvest H-403	Temik	58.00	106.68	15.40	58.10	91.20	1.20	1.00	1.40	1.10	42.50	42.20	98.00	98.00
N. King KS 555Y	None	61.00	114.30	15.40	59.60	79.50	1.20	5.00	3.40	3.30	30.30	30.20	70.00	70.00
N. King KS 555Y	Temik	61.00	114.30	15.00	57.40	93.20	1.10	10.00	2.20	1.90	38.50	38.30	89.00	89.00
LSD 0.05		0.80	3.81	0.60	0.74	11.60	0.18	4.00	0.55	0.65	4.50	4.70	10.50	11.00
Main effect means:														
Hybrid														
Cargill 607E		59.00	109.22	15.50	55.60	88.90	1.10	4.00	2.80	2.00	39.90	40.00	92.00	93.00
Dekalb DK56		66.00	139.70	16.90	58.40	109.80	1.10	2.00	2.40	2.30	36.10	36.50	84.00	84.00
Mycogen 1552		63.00	137.16	16.10	58.00	99.70	1.50	1.00	2.80	2.50	31.60	31.90	73.00	74.00
Pioneer 8500		59.00	121.92	15.60	58.40	111.20	1.30	1.00	1.60	1.70	40.70	40.80	94.00	94.00
NC+ 271		61.00	116.84	15.40	56.60	88.60	1.10	2.00	2.90	2.40	34.30	34.60	79.00	80.00
LSD 0.05		0.60	2.79	0.50	0.48	8.10	0.14	2.00	0.34	0.45	3.30	3.50	7.70	8.20
Insecticide														
None		62.00	124.46	16.00	57.10	92.80	1.20	2.00	2.80	2.80	34.30	34.50	79.00	80.00
Gaucho		61.00	127.00	15.80	57.60	106.40	1.20	2.00	2.10	1.50	38.80	39.00	90.00	90.00
LSD 0.05		0.40	1.78	NS	0.30	5.10	NS	NS	0.21	0.28	2.10	2.20	4.80	5.20

DAP = Days after planting

Table 5. Gaucho effects on stands, maturity, and yield of grain sorghum. Manhattan, KS. 1996.

Hybrid	Insecticide	Days to Half Bloom	Plant Height (cm)	Moisture (%)	Test Wt (lb/bu)	Yield (bu/a)	Heads/ Plant	Lodging (%)	Plant Pop 1000 s/a)
Cargill 607E	None	68.00	115.82	7.25	28.30	117.20	1.18	1.53	(47.88
Cargill 607E	Gaucho	67.75	114.30	7.05	28.93	112.38	1.20	0.00	44.12
DeKalb DK56	None	75.50	156.21	7.60	29.75	160.60	1.13	0.30	44.42
DeKalb DK56	Gaucho	75.50	154.69	7.60	29.63	159.05	1.18	1.03	41.23
Mycogen 1552	None	71.75	155.45	7.53	29.48	134.93	1.30	0.15	44.64
Mycogen 1552	Gaucho	72.50	154.69	7.35	30.10	136.88	1.23	0.38	47.74
Pioneer 8500	None	70.00	132.59	7.28	29.90	128.25	1.25	0.15	45.14
Pioneer 8500	Gaucho	69.75	131.83	7.60	29.50	136.45	1.25	0.00	46.87
NC+ 271	None	70.25	131.83	7.30	29.20	137.68	1.13	0.43	47.81
NC+ 271	Gaucho	70.50	129.54	7.15	29.48	136.88	1.03	0.78	44.63
LSD 0.05		0.98	3.64	0.46	1.00	10.48	0.12	1.19	6.19
Main effect means:									
Hybrid									
Cargill 607E		67.88	115.06	14.30	57.23	114.79	1.19	0.76	46.00
Dekalb DK56		75.50	155.45	15.20	59.38	159.83	1.15	0.66	46.83
Mycogen 1552		72.13	155.07	14.88	59.58	135.90	1.26	0.26	46.19
Pioneer 8500		69.88	132.21	14.88	59.40	132.35	1.25	0.06	46.01
NC+ 271		70.38	130.68	14.45	58.68	137.28	1.08	0.60	46.22
LSD 0.05		0.81	3.35	0.96	1.75	8.57	0.11	0.98	4.36
Insecticide									
None		71.10	138.38	14.78	58.65	135.73	1.20	0.51	45.98
Gaucho		71.20	137.01	14.70	59.05	136.33	1.18	0.44	44.92
LSD 0.05		1.75	10.40	0.63	1.30	10.77	0.08	0.62	2.75

Table 6. Gaucho effects on stands, maturity and yield of grain sorghum. Manhattan, KS. 1997.

Hybrid	Insecticide	Days to Half Bloom	Plant Height (cm)	Moisture (%)	Test Wt (lb/bu)	Yield (bu/a)	Heads/ Plant	Lodging (%)	Plant Pop (1000 s/a)
Cargill 607E	None	68.50	109.73	13.15	56.35	112.25	1.05	0.13	61.21
Cargill 607E	Gaucho	68.00	108.20	13.15	56.05	117.01	1.10	0.43	58.41
DeKalb DK56	None	73.50	132.59	13.45	59.60	137.60	1.10	1.13	50.29
DeKalb DK56	Gaucho	73.00	131.06	13.45	59.80	142.72	1.18	0.83	48.44
Mycogen 1552	None	72.75	130.30	13.25	57.75	103.57	1.38	1.98	35.31
Mycogen 1552	Gaucho	73.00	131.06	13.10	51.75	114.04	1.58	1.33	32.54
Pioneer 8500	None	71.00	121.92	13.80	58.85	127.23	1.15	0.13	59.44
Pioneer 8500	Gaucho	70.25	122.68	14.05	58.00	139.25	1.23	0.50	54.58
NC+ 271	None	72.50	121.16	13.15	54.70	121.47	1.15	0.15	46.95
NC+ 271	Gaucho	73.25	113.54	13.05	57.90	118.85	1.43	0.78	35.96
LSD 0.05		0.72	7.92	0.35	2.27	9.54	0.08	1.00	6.47
Main effect means:									
Hybrid									
Cargill 607E		68.25	108.97	13.15	56.20	114.63	1.08	.	59.81
Dekalb DK56		73.25	131.83	13.45	59.70	140.16	1.14	.	49.36
Mycogen 1552		72.88	130.68	13.18	54.75	108.80	1.48	.	33.93
Pioneer 8500		70.63	122.30	13.93	58.43	133.24	1.19	.	58.51
NC+ 271		72.88	117.35	13.10	56.30	120.16	1.29	.	41.46
LSD 0.05		0.74	1.88	0.12	3.07	8.91	0.12	.	5.11
Insecticide									
None		71.65	123.14	13.36	57.45	120.42	1.17	.	50.64
Gaucho		71.50	121.31	13.36	56.70	126.37	1.30	.	46.59
LSD 0.05		1.33	6.76	0.22	2.44	9.15	0.11	.	7.08

Table 7. Gaucho effects on stand, maturity, and yield of grain sorghum. Ottawa, KS. 1996.

Hybrid	Insecticide	Plant Height (cm)	Moisture (%)	Test Wt (lb/bu)	Yield (bu/a)	Heads/ Plant	Lodging (%)	Plant Pop (1000s/a)
Cargill 607E	None	118.11	8.95	28.15	127.98	1.15	3.60	49.98
Cargill 607E	Gaucho	120.40	8.83	28.53	133.24	1.10	5.30	52.58
DeKalb DK56	None	148.59	9.15	28.75	148.76	1.05	1.08	46.08
DeKalb DK56	Gaucho	151.64	8.98	29.08	148.07	1.13	1.65	47.38
Mycogen 1552	None	147.83	9.08	28.83	123.21	1.25	9.18	42.32
Mycogen 1552	Gaucho	147.07	9.20	28.23	135.89	1.33	7.78	41.89
Pioneer 8500	None	134.87	8.88	29.38	142.10	1.28	2.78	50.70
Pioneer 8500	Gaucho	135.64	9.18	28.63	143.57	1.23	5.88	52.14
NC+ 271	None	137.92	9.05	28.13	137.97	1.18	7.33	48.53
NC+ 271	Gaucho	134.11	9.40	27.55	133.41	1.13	10.55	50.42
LSD 0.05		4.57	0.29	0.84	12.98	0.12	4.04	4.96

Main effect means:

Hybrid							
Cargill 607E	119.25	17.78	56.68	130.61	1.13	4.45	51.28
Dekalb DK56	150.11	18.13	57.83	148.42	1.09	1.36	46.73
Mycogen 1552	147.45	18.28	57.05	129.55	1.29	8.48	42.11
Pioneer 8500	135.26	18.05	58.00	142.83	1.25	4.33	51.42
NC+ 271	136.02	18.45	55.68	135.69	1.15	8.94	49.48
LSD 0.05	3.91	0.51	1.18	10.13	0.10	3.41	3.36
Insecticide							
None	137.47	18.04	57.29	136.00	1.18	4.79	47.52
Gaucho	137.77	18.23	56.80	138.84	1.18	6.23	48.88
LSD 0.05	7.56	0.35	1.04	7.70	0.08	2.74	3.03

Table 8. Gaucho effects on stand, maturity, and yield of grain sorghum. Ottawa, KS. 1997.

Hybrid	Insecticide	Days to Half Bloom	Plant Height (cm)	Moisture (%)	Test Wt (lb/bu)	Yield (bu/a)	Heads/ Plant	Plant Pop (1000's/a)
Cargill 607E	None	58.50	148.59	15.95	58.15	127.88	1.50	35.71
Cargill 607E	Gaucho	57.00	144.78	15.30	58.60	126.51	1.00	35.97
DeKalb DK56	None	66.50	168.91	18.15	57.80	143.95	2.50	33.37
DeKalb DK56	Gaucho	64.50	163.83	17.65	57.05	152.28	1.25	35.71
Mycogen 1552	None	60.50	153.67	17.45	58.25	143.24	2.50	30.77
Mycogen 1552	Gaucho	59.25	150.50	16.90	58.75	146.30	2.25	31.03
Pioneer 8500	None	58.50	148.59	15.30	60.10	151.35	1.50	35.19
Pioneer 8500	Gaucho	56.50	143.51	15.65	58.65	140.11	1.00	35.45
NC+ 271	None	63.25	160.66	16.45	58.45	142.97	1.75	31.29
NC+ 271	Gaucho	62.25	158.12	16.15	58.20	142.61	1.00	31.81
LSD 0.05		1.13	3.80	1.30	1.83	8.87	0.74	3.57

Main effect means:

Hybrid								
Cargill 607E		57.75	.	15.63	58.38	127.88	.	35.84
Dekalb DK56		65.50	.	17.90	57.43	143.95	.	34.54
Mycogen 1552		59.88	.	17.18	58.50	143.24	.	30.90
Pioneer 8500		57.50	.	15.48	59.38	151.35	.	35.32
NC+ 271		62.75	.	16.30	58.33	142.97	.	31.55
LSD 0.05		1.31	.	0.93	1.36	11.30	.	2.40
Insecticide								
None		61.45	.	16.60	58.55	141.88	.	33.27
Gaucho		59.90	.	16.39	58.25	141.56	.	33.99
LSD 0.05		2.10	.	1.05	0.98	6.77	.	1.95

Table 9. Gaucho effects on stand, maturity, and yield of May-planted grain sorghum. Hays, KS 1996.

Hybrid	Insecticide	Days to Half Bloom	Plant Height (cm)	Moisture (%)	Test Wt (lb/bu)	Yield (bu/a)	Heads/ Plant	Plant Pop (1000 s/a)	Plant Pop (1000 s/a) 7 DAP
Cargill 607E	None	81.00	98.75	14.82	56.00	79.88	1.69	37.68	6.86
Cargill 607E	Gaucho	79.25	97.50	14.30	57.83	88.82	1.70	39.86	12.31
DeKalb DK56	None	88.75	126.25	14.79	60.25	111.30	1.53	39.86	18.51
DeKalb DK56	Gaucho	88.50	128.75	14.50	61.05	108.31	1.37	41.49	18.30
Mycogen 1552	None	84.50	116.25	15.20	59.90	85.32	2.62	36.05	20.36
Mycogen 1552	Gaucho	86.00	115.00	14.60	58.33	91.35	2.66	35.39	16.66
Pioneer 8500	None	80.00	98.75	14.27	59.43	83.24	1.91	43.56	31.25
Pioneer 8500	Gaucho	80.75	103.75	13.94	59.58	102.43	2.35	42.47	26.14
NC+ 271	None	88.25	121.25	14.06	59.85	99.64	1.78	36.16	13.94
NC+ 271	Gaucho	87.25	121.25	13.96	59.18	105.21	1.75	39.20	9.15
LSD 0.05		3.35	21.70	1.40	3.00	24.93	0.56	5.00	7.35

Main effect means:

Hybrid								
Cargill 607E	80.13	98.13	14.56	56.91	84.35	1.69	38.77	9.58
Dekalb DK56	88.63	127.50	14.65	60.65	109.80	1.45	40.67	18.40
Mycogen 1552	85.25	115.63	14.90	59.11	88.33	2.64	35.72	18.51
Pioneer 8500	80.38	101.25	14.10	59.50	92.83	2.13	43.02	28.70
NC+ 271	87.75	121.25	14.01	59.21	102.42	1.77	37.72	11.54
LSD 0.05	2.27	14.19	0.94	2.06	17.15	0.38	3.42	5.33
Insecticide								
None	84.50	112.25	14.63	59.09	91.88	1.91	38.66	18.19
Gaucho	84.35	113.25	14.26	59.19	99.22	1.96	39.68	16.51
LSD 0.05	2.73	11.37	0.60	1.48	11.81	0.36	2.62	5.43

DAP = Days after planting

Table 10. Gaucho effects on stand, maturity, and yield of June-planted grain sorghum. Hays, KS. 1996.

Hybrid	Insecticide	Days to Half Bloom	Plant Height (cm)	Moisture (%)	Test Wt (lb/bu)	Yield (bu/a)	Heads/ Plant	Plant Pop (1000's/a)
Cargill 607E	None	61.75	110.00	14.34	60.10)	93.24	1.37	39.86
Cargill 607E	Gaucho	62.00	108.75	14.45	60.05	89.49	1.38	41.82
DeKalb DK56	None	72.75	128.75	17.04	60.95	125.30	1.37	35.50
DeKalb DK56	Gaucho	72.50	132.50	16.56	61.13	123.33	1.37	37.35
Mycogen 1552	None	67.00	125.00	15.16	61.65	105.69	1.81	32.67
Mycogen 1552	Gaucho	67.25	125.00	15.05	61.55	104.75	1.57	35.07
Pioneer 8500	None	61.50	120.00	14.23	61.25	94.87	1.53	41.82
Pioneer 8500	Gaucho	61.25	120.00	14.07	60.83	98.83	1.55	41.93
NC+ 271	None	66.50	116.25	14.90	60.93	101.07	1.42	38.44
NC+ 271	Gaucho	65.50	116.25	14.81	60.98	115.77	1.38	40.84
LSD 0.05		1.81	10.63	0.51	0.63	15.85	0.21	3.96

Main effect means:

Hybrid								
Cargill 607E		61.88	109.38	14.39	60.08	91.36	1.38	40.84
Dekalb DK56		72.63	130.63	16.80	61.04	124.31	1.37	36.43
Mycogen 1552		67.13	123.75	15.11	61.60	105.22	1.69	33.87
Pioneer 8500		61.38	120.00	14.15	61.04	96.85	1.54	41.87
NC+ 271		66.00	116.25	14.85	60.95	108.42	1.40	39.64
LSD 0.05		1.21	7.01	0.36	0.43	11.01	0.15	2.78
Insecticide								
None		65.90	119.50	15.13	60.98	104.03	1.50	37.66
Gaucho		65.70	120.50	14.99	60.91	106.43	1.45	39.40
LSD 0.05		2.78	6.31	0.65	0.41	9.94	0.12	2.51

Table 11. Gaucho effects on stand, maturity, and yield of May-planted grain sorghum Hays, KS. 1997.

Hybrid	Insecticide	Days to Half Bloom	Plant Height (cm)	Moisture (%)	Test Wt (lb/bu)	Yield (bu/a)	Heads/ Plant	Plant Pop (1000 s/a)	CEW Pop
Cargill 607E	None	68.25	102.50	13.68	56.20	140.23	1.56	34.76	0.00
Cargill 607E	Gaucho	68.00	107.50	14.35	55.13	145.64	1.62	38.75	0.50
DeKalb DK56	None	77.25	130.00	15.33	58.95	174.96	1.57	32.40	1.50
DeKalb DK56	Gaucho	77.25	123.75	15.75	58.98	165.07	1.46	30.31	1.75
Mycogen 1552	None	72.00	125.00	14.75	57.28	169.42	1.97	30.13	1.50
Mycogen 1552	Gaucho	70.50	125.00	15.08	56.73	166.99	2.24	26.14	2.00
Pioneer 8500	None	68.75	118.75	14.40	60.08	157.12	1.45	43.83	0.50
Pioneer 8500	Gaucho	68.75	111.25	14.38	59.63	153.92	1.77	38.84	0.00
NC+ 271	None	75.25	116.25	14.30	56.70	163.10	1.72	30.31	2.50
NC+ 271	Gaucho	75.75	116.25	14.45	56.88	162.10	1.92	24.78	1.25
LSD 0.05		2.43	5.94	0.44	1.09	11.77	0.22	4.66	1.80

Main effect means:

Hybrid									
Cargill 607E		68.13	105.00	14.01	55.66	142.94	1.59	36.75	0.25
Dekalb DK56		77.25	126.88	15.54	58.96	170.01	1.51	31.35	1.75
Mycogen 1552		71.25	125.00	14.91	57.00	168.20	2.10	28.13	1.75
Pioneer 8500		68.75	115.00	14.39	59.85	155.52	1.61	41.34	0.25
NC+ 271		75.50	116.25	14.38	56.79	162.60	1.82	27.54	1.88
LSD 0.05		0.83	4.94	0.45	0.71	16.49	0.28	5.22	1.23
Insecticide									
None		72.30	118.50	14.49	57.84	160.97	1.65	34.29	1.20
Gaucho		72.05	116.75	14.80	57.47	158.74	1.80	31.76	1.10
LSD 0.05		0.53	3.12	0.28	0.45	10.43	0.17	3.30	0.89

CEW = Corn Earworm

Table 12. Gaucho effects on stand, maturity, and yield of June-planted grain sorghum. Hays, KS. 1997.

Hybrid	Insecticide	Days to Half Bloom	Plant Height (cm)	Moisture (%)	Test Wt (lb/bu)	Yield (bu/a)	Heads/ Plant	Plant Pop (1000's/a)	CEW Pop
Cargill 607E	None	62.00	p 100.00	13.65	58.03	123.83	1.29	40.38	4.25
Cargill 607E	Gaucho	60.00	105.00	13.35	57.65	130.30	1.39	38.39	1.25
DeKalb DK56	None	70.75	131.25	15.85	57.85	122.05	1.34	32.94	5.50
DeKalb DK56	Gaucho	70.25	133.75	14.75	59.40	122.38	1.37	35.21	3.75
Mycogen 1552	None	67.50	126.25	14.68	58.63	121.36	1.70	28.41	6.00
Mycogen 1552	Gaucho	68.00	125.00	14.18	56.65	115.49	2.07	22.60	3.25
Pioneer 8500	None	62.00	111.25	14.20	60.53	136.11	1.51	41.47	2.50
Pioneer 8500	Gaucho	61.50	112.50	14.20	60.35	134.64	1.57	41.56	1.75
NC+ 271	None	69.50	118.75	13.63	58.68	132.80	1.50	32.94	5.50
NC+ 271	Gaucho	66.50	121.25	13.68	58.03	140.20	1.61	30.76	6.50
LSD 0.05		2.53	7.39	0.47	1.00	11.07	0.15	4.46	3.03
Main effect means:									
Hybrid									
Cargill 607E		61.00	102.50	13.50	57.84	127.06	1.34	39.39	2.75
Dekalb DK56		70.50	132.50	15.30	58.63	122.22	1.36	34.08	4.63
Mycogen 1552		67.75	125.63	14.43	57.64	118.42	1.88	25.50	4.63
Pioneer 8500		61.75	111.88	14.20	60.44	135.38	1.54	41.52	2.13
NC+ 271		68.00	120.00	13.65	58.35	136.50	1.56	31.85	6.00
LSD 0.05		1.15	4.60	0.41	1.25	16.59	0.15	4.12	2.26
Insecticide									
None		66.35	117.50	14.40	58.74	127.23	1.47	35.23	4.75
Gaucho		65.25	119.50	14.03	58.42	128.60	1.60	33.71	3.30
LSD 0.05		2.53	7.39	0.47	1.00	11.07	0.15	4.46	1.58

CEW = Corn Earworm

Table 13. Gaucho effects on greenbugs, maturity, and yield of dryland grain sorghum. Garden City, KS. 1996.

Hybrid	Insecticide	Days to Half Bloom	Plant Height (cm)	Test Wt (lb/bu)	Yield (bu/a)	Avg. # Greenbugs/Plant 18 DAP	70 DAP
Cargill 607E	None	61.75	113.03	54.13	90.90	31.50	120.63
Cargill 607E	Gaucho	61.25	112.40	58.00	90.60	0.13	34.51
DeKalb DK56	None	66.25	121.92	59.63	115.53	5.50	83.50
DeKalb DK56	Gaucho	65.75	121.29	59.90	113.78	0.50	40.00
Mycogen 1552	None	63.25	127.00	59.78	114.15	35.00	95.00
Mycogen 1552	Gaucho	64.00	125.73	60.28	113.18	0.13	22.13
Pioneer 8500	None	60.25	113.67	60.78	116.88	43.50	104.38
Pioneer 8500	Gaucho	60.75	116.21	60.80	116.28	0.25	55.88
NC+ 271	None	66.00	118.10	60.50	119.78	56.00	139.88
NC+ 271	Gaucho	65.75	116.84	60.28	119.58	0.13	51.88
LSD 0.05		4.76	8.68	4.18	20.08	32.29	108.62

Main effect means:

Hybrid						
Cargill 607E	61.50	112.71	56.06	90.75	15.81	77.57
Dekalb DK56	66.00	121.60	59.76	114.65	3.00	61.75
Mycogen 1552	63.63	126.37	60.03	113.66	17.56	58.56
Pioneer 8500	60.50	114.94	60.79	116.58	21.88	80.13
NC+ 271	65.88	117.48	60.39	119.68	28.06	95.88
LSD 0.05	3.11	5.70	2.88	13.08	29.44	80.32

Insecticide						
None	63.50	118.75	58.96	111.45	34.30	108.68
Gaucho	63.50	118.49	59.85	110.68	0.23	40.88
LSD 0.05	2.39	4.71	2.05	10.44	14.90	44.12

DAP = Days after planting

Table 14. Gaucho effects on greenbugs, maturity, and yield of irrigated grain sorghum. Garden City, KS. 1996.

Hybrid	Insecticide	Days to Half Bloom	Plant Height (cm)	Test Wt (lb/bu)	Yield (bu/a)	Avg. # Greenbugs/Plant 71 DAP
Cargill607E	None	63.50	122.56	60.20	101.33	93.25
Cargill 607E	Gaucho	63.75	124.46	60.03	99.95	9.00
DeKalb DK56	None	66.50	128.91	60.68	121.73	128.75
DeKalb DK56	Gaucho	67.00	130.18	60.60	123.68	60.25
Mycogen 1552	None	64.25	138.43	60.80	102.88	236.25
Mycogen 1552	Gaucho	64.50	137.80	60.78	103.05	44.75
Pioneer 8500	None	62.00	120.65	61.08	112.00	216.38
Pioneer 8500	Gaucho	61.75	120.65	61.30	114.55	50.75
NC+ 271	None	67.00	129.54	60.58	115.90	126.63
NC+ 271	Gaucho	67.00	120.65	60.50	113.90	39.38
LSD 0.05		3.49	20.67	0.62	21.14	138.01

Main effect means:

Hybrid						
Cargill 607E		63.63	123.51	60.11	100.64	51.13
Dekalb DK56		66.75	129.54	60.64	122.70	94.50
Mycogen 1552		64.38	138.11	60.79	102.96	140.50
Pioneer 8500		61.88	120.65	61.19	113.28	133.56
NC+ 271		67.00	129.86	60.54	114.91	83.00
LSD 0.05		2.28	13.47	0.41	13.79	113.94
Insecticide						
None		64.65	128.02	60.67	110.76	160.25
Gaucho		64.80	128.65	60.64	111.04	40.83
LSD 0.05		1.87	9.06	0.34	9.90	60.75

DAP = Days after planting

Table 15. Gaucho effects on greenbugs, vigor, maturity, and yield of grain sorghum. Garden City, KS 1997.

Hybrid	Insecticide	Days to Half Bloom	Plant Height (cm)	Moisture (%)	Test Wt (lb/bu)	Yield (bu/a)	Heads/ Plant	Plant Vigor	Plant Pop (1000 s/a)	GB/Plant 69 DAP	GB/Plant 76 DAP
Cargill607E	None	63.50	104.78	15.30	59.10	81.10	1.04	1.25	42.18	71.63	66.88
Cargill 607E	Gaucho	63.50	105.41	14.80	59.40	81.30	1.01	1.25	43.91	8.50	11.13
DeKalb DK56	None	77.25	130.81	17.10	59.10	88.20	1.02	2.50	31.09	15.25	77.75
DeKalb DK56	Gaucho	77.25	129.54	17.10	59.60	91.10	1.00	2.00	35.91	24.63	25.13
Mycogen 1552	None	72.00	130.81	16.20	60.10	85.40	1.16	2.25	31.82	22.88	41.00
Mycogen 1552	Gaucho	72.25	131.45	16.00	59.80	85.30	1.33	2.75	25.09	25.25	53.63
Pioneer 8500	None	67.25	121.29	14.80	60.10	84.70	1.16	1.50	37.27	23.25	99.88
Pioneer 8500	Gaucho	67.75	121.29	14.40	60.20	84.70	1.08	1.50	38.09	51.38	52.75
NC+ 271	None	74.50	118.75	17.30	58.80	86.80	1.06	1.25	36.80	82.50	151.00
NC+ 271	Gaucho	74.75	118.75	17.30	58.90	84.70	1.05	2.00	33.55	52.13	252.38
LSD 0.05		3.61	6.84	0.74	0.45	7.92	0.08	0.58	1.41	57.75	146.93

Main effect means:

Hybrid											
Cargill 607E		63.50	105.09	15.10	59.30	81.20	1.03	1.25	43.05	40.06	39.00
Dekalb DK56		77.25	130.18	17.10	59.30	89.70	1.01	2.25	33.50	19.94	51.44
Mycogen 1552		72.13	131.13	16.10	59.90	85.40	1.23	2.50	28.44	24.06	47.31
Pioneer 8500		67.50	121.29	14.60	60.20	84.70	1.12	1.50	37.68	37.31	76.31
NC+ 271		74.63	118.75	17.30	58.80	85.80	1.06	1.63	35.18	67.31	201.69
LSD 0.05		2.82	5.18	0.42	0.57	13.83	0.09	0.85	3.64	41.87	101.16
Insecticide											
None		70.90	121.29	16.10	59.50	85.20	1.09	1.75	35.84	43.10	87.30
Gaucho		71.10	121.29	15.90	59.60	85.40	1.08	1.90	35.31	32.38	79.00
LSD 0.05		1.79	3.27	0.27	0.36	8.75	0.06	0.54	3.84	27.37	72.96

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