on Target

Annual review of University of Illinois insect management trials

2010 Report

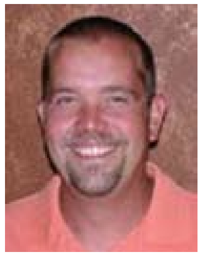
Providing accurate and unbiased evaluations of insect control products and management strategies to assist growers in Illinois.

University of Illinois Extension

College of Agricultural, Consumer and Environmental Sciences
Department of Crop Sciences

Illinois Soybean Association

Since its inception in 1984, the University of Illinois Insect Management and Insecticide Evaluation Program has provided the producers of Illinois complete and informative evaluations of registered insecticides and new chemical and transgenic tools for the management of insect pests in Illinois. It is our intention to provide scientifically sound efficacy data to aid the producers of Illinois in their insect pest management decision making.



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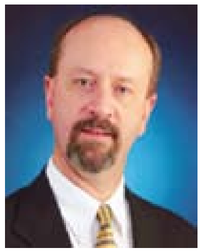

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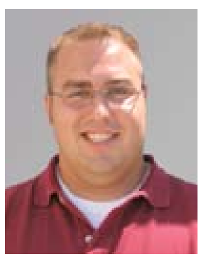

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In Loving Memory

Joshua Ryan Heeren
1983–2010

We dedicate the 2010 edition of our annual summary, *on Target*, in memory of our friend and colleague Josh Heeren. He was tragically killed in a farm accident in the fall of 2010. Josh was a graduate student and member of our research team from 2006–2009. We can attribute many of the successes of the program to Josh's hard work, dedication, and countless contributions. Josh was first and foremost a farmer—he truly loved agriculture. He spent much of his short life pursuing ways to improve the way we utilize the land. He was a great man and a true friend. He will be greatly missed.

"Let us not forget that the cultivation of the earth is the most important labor of man. When tillage begins, other arts will follow. The farmers, therefore, are the founders of civilization."

—Daniel Webster

ACKNOWLEDGMENTS

Trials conducted by the Insect Management and Insecticide Evaluation Program at the University of Illinois are the result of the collaborative efforts of many individuals. We extend our gratitude to all those who worked with and supported us in 2010.

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SOYBEAN

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SECTION 1

Evaluation of products to control corn rootworm larvae (*Diabrotica spp.*) in Illinois, 2010

Nicholas A. Tinsley, Ronald E. Estes, and Michael E. Gray

Location

We established four trials at University of Illinois research and education centers near DeKalb (DeKalb County), Monmouth (Warren County), Perry (Pike County), and Urbana (Champaign County).

Experimental Design and Methods

The experimental design was a randomized complete block with four replications. The plot size for each treatment was 10 ft (four rows) x 40 ft. Five randomly selected root systems were extracted from the first row of each plot on 13 July at Monmouth and Perry, and on 12 and 14 July at Urbana and DeKalb, respectively. Root systems were washed and rated for corn rootworm larval injury using the 0 to 3 node-injury scale developed by Oleson et al. (2005) (Appendix I). Consistency percentages at two different levels (percentage of roots with a node-injury rating less than 1.0, and with a node injury rating less than 0.25) were determined for each product at each location.

Planting, Insecticide Application, and Yield

Trials were planted on 4, 6, 10, and 24 May at Urbana, Perry, DeKalb, and Monmouth, respectively. All trials were planted using a four-row, vacuum style planter constructed by Seed Research Equipment Solutions (SRES). Seeds were planted in 30-inch rows at an approximate depth of 1.75 inches. Granular insecticides were applied through modified Noble metering units or through modified SmartBox metering units mounted to each row. Plastic tubes directed the insecticide granules to either a 5-inch, slope-compensating bander or into the seed furrow. Force 2.1CS was applied at a spray volume of 5 gallons per acre (gal/A) using a CO_2 system. All insecticides were applied in front of the firming wheels on the planter. Active ingredients for all chemical insecticides are listed in Appendix II.

Yields were estimated by harvesting the center two rows of each plot on 13, 28, and 30 September at Perry, Monmouth, and Urbana, respectively, and on 13 October at DeKalb. Weights were converted to bushels per acre (bu/A) at 15.5% moisture. To ensure uniform plant densities across all plots, plant populations in the harvested rows had been thinned at the V6–V8 growth stage to 30,000 plants per acre at all locations.

Agronomic Information

Agronomic information for all four locations is listed in Table 1.1.

Climatic Conditions

Temperature and precipitation data for all four locations are presented in Appendix III.

Statistical Analysis

Data were analyzed using ARM 7 (Agricultural Research Manager), revision 7.5.1 (Copyright© 1982–2009 Gylling Data Management, Inc., Brookings, SD).

Results and Discussion

DeKalb—Mean node-injury ratings and consistency percentages for rootworm injury evaluations on 14 July are reported in Table 1.2. Mean node-injury ratings for the untreated checks (UTCs) ranged from 0.63–2.49, indicating that corn rootworm larval feeding was moderate to severe. DKC61-22 had a surprisingly smaller mean node-injury rating than the other UTCs. Gene-check strips were used to confirm the trait identity of DKC61-22. It is notable that DKC61-22 was treated with clothianidin (Poncho, 0.25 mg of active ingredient per seed) while the other UTCs were treated with thiamethoxam (Cruiser, 0.25 mg of active ingredient per seed). Mean node-injury ratings for the soil-applied insecticides ranged from 0.09–0.27. Both Aztec 4.67G and Force 2.1CS had significantly lower mean node-injury ratings than their UTCs (Pioneer 35F40 and DKC61-22, respectively). Aztec 2.1G had a statistically similar mean node-injury rating as its UTC (DKC61-22). Mean node-injury ratings for the rootworm Bt hybrids ranged from 0.01–0.54 and, in most instances, were significantly smaller than their respective UTCs; this trend excluded YieldGard VT3, which had statistically similar mean node-injury rating as its UTC (DKC61-22). The addition of soil-applied insecticides to rootworm Bt hybrids only resulted in significantly smaller mean node-injury ratings for the Agrisure RW hybrids. The percentages of roots with a node-injury rating < 1.0 ranged from 75–100% for soil-applied insecticides, rootworm Bt hybrids, and soil-applied insecticides combined with rootworm Bt hybrids. Overall, the percentages of roots with a node-injury rating < 1.0 were much smaller for the UTCs and ranged from 0–60%. For most treatments with a rootworm control product, consistency percentages at the 0.25 level were smaller than at the 1.0 level—this trend did not include Force 2.1CS, HxXTRA (Pioneer 35F44 and Pioneer P1162XR), SmartStax (DKC61-21), or the soil-applied insecticides combined with rootworm Bt hybrids.

Mean yields are reported in Table 1.2. Mean yields for the UTCs ranged from 136.7–191.2 bu/A. Mean yields for the soil-applied insecticides ranged from 178.9–204.8 bu/A. Only Aztec 4.67G had a significantly greater mean yield than its UTC (Pioneer 35F40). Mean yields for the rootworm Bt hybrids ranged from 189.6–222.5 bu/A and were significantly greater than their respective UTCs. The addition of soil-applied insecticides to rootworm Bt hybrids never resulted in a significantly greater mean yield.

Monmouth—Mean node-injury ratings and consistency percentages for rootworm injury evaluations on 13 July are reported in Table 1.3. Mean node-injury ratings for the UTCs ranged from 0.00–0.01, indicating that corn rootworm larval feeding was virtually absent. Due to the minimal amount of corn rootworm larval feeding observed for the UTCs, node-injury ratings were not taken for any of the other treatments.

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TABLE 1.1 • **Agronomic information for efficacy trials with products to control corn rootworm larvae, University of Illinois, 2010**

	DeKalb	Monmouth	Perry	Urbana
Planting date	10 May	24 May	6 May	4 May
Root evaluation date	14 July	13 July	13 July	12 July
Harvest date	13 October	28 September	13 September	30 September
Hybrids[1]	DKC61-19 YieldGard VT3 DKC61-21 SmartStax DKC61-22 RR2 Garst 84U96 3000GT Agrisure RW Garst 85W95 GT/CB/LL GH H-8577 3000GT Agrisure RW GH H-8577 GT/CB/LL Mycogen 2D692 SmartStax Mycogen 2K662 HxXTRA Mycogen ST-6808 RR2 Pioneer 35F40 HxI Pioneer 35F44 HxXTRA Pioneer P1162XR HxXTRA	DKC61-19 YieldGard VT3 DKC61-21 SmartStax DKC61-22 RR2 Garst 84U96 3000GT Agrisure RW Garst 85W95 GT/CB/LL GH H-8577 3000GT Agrisure RW GH H-8577 GT/CB/LL Mycogen 2D692 SmartStax Mycogen 2K662 HxXTRA Mycogen ST-6808 RR2 Pioneer 35F40 HxI Pioneer 35F44 HxXTRA Pioneer P1162XR HxXTRA	DKC61-19 YieldGard VT3 DKC61-21 SmartStax DKC61-22 RR2 Garst 84U96 3000GT Agrisure RW Garst 85W95 GT/CB/LL GH H-8577 3000GT Agrisure RW GH H-8577 GT/CB/LL Mycogen 2D692 SmartStax Mycogen 2K662 HxXTRA Mycogen ST-6808 RR2 Pioneer 35F40 HxI Pioneer 35F44 HxXTRA Pioneer P1162XR HxXTRA	DKC61-19 YieldGard VT3 DKC61-21 SmartStax DKC61-22 RR2 Garst 84U96 3000GT Agrisure RW Garst 85W95 GT/CB/LL GH H-8577 3000GT Agrisure RW GH H-8577 GT/CB/LL Mycogen 2D692 SmartStax Mycogen 2K662 HxXTRA Mycogen ST-6808 RR2 Pioneer 35F40 HxI Pioneer 35F44 HxXTRA Pioneer P1162XR HxXTRA
Row spacing	30 inches	30 inches	30 inches	30 inches
Seeding rate	35,000/acre	35,000/acre	35,000/acre	35,000/acre
Previous crop	Trap crop (late-planted corn and pumpkins)	Trap crop (late-planted corn and pumpkins)	Trap crop (late-planted corn and pumpkins)	Trap crop (late-planted corn and pumpkins)
Tillage	Fall—chisel plow Spring—mulch finisher	Fall—chisel plow Spring—field cultivator	Fall—chisel plow Spring—field cultivator	Spring—disk Spring—field cultivator

[1] All soil insecticides were applied to DKC61-22 (the non-rootworm trait isoline of DKC61-19 YieldGard VT3), unless otherwise indicated.

TABLE 1.2 • Evaluation of products to control corn rootworm larvae, DeKalb, University of Illinois, 2010

Product[1]	Rate[2]	Placement[2]	Mean node-injury rating[3,4,5,6] 14 July	% consistency < 1.0[7]	% consistency < 0.25[8]	Mean yield (bu/A)[9,10] 13 Oct
Soil-applied insecticides						
Aztec 2.1G	6.70	Band	0.27 bcd	90	50	195.9 cde
Aztec 4.67G + Pioneer 35F40[12]	3.00	SB furrow[11]	0.16 cd	100	75	178.9 fg
Force 2.1CS	0.46	Band	0.09 d	100	100	204.8 bcd
Rootworm Bt hybrids						
Agrisure RW (Garst 84U96 3000GT[12])	—	—	0.54 b	75	25	195.2 de
Agrisure RW (GH H-8577 3000GT[12])	—	—	0.50 bc	75	50	199.2 b–e
HxXTRA (Pioneer 35F44[12])	—	—	0.04 d	100	100	201.0 b–e
HxXTRA (Pioneer P1162XR[12])	—	—	0.08 d	100	100	189.7 ef
SmartStax (DKC61-21[13])	—	—	0.01 d	100	100	222.5 a
SmartStax (Mycogen 2D692[12])	—	—	0.03 d	100	95	189.6 ef
YieldGard VT3 (DKC61-19[13])	—	—	0.23 bcd	95	70	209.6 abc
Soil-applied insecticides + rootworm Bt hybrids						
Counter 20G + HxXTRA (Pioneer 35F44[12])	4.50	SB furrow[11]	0.02 d	100	100	205.2 bcd
Force 2.1CS + Agrisure RW (Garst 84U96 3000GT[12])	0.46	Band	0.02 d	100	100	204.4 bcd
Force 2.1CS + Agrisure RW (GH H-8577 3000GT[12])	0.46	Band	0.02 d	100	100	212.5 ab
Force 2.1CS + HxXTRA (Pioneer 35F44[12])	0.46	Band	0.00 d	100	100	195.4 de
Force 2.1CS + YieldGard VT3 (DKC61-19[13])	0.46	Band	0.02 d	100	100	210.6 ab
Lorsban 15G + HxXTRA (Mycogen 2K662[12])	8.00	Band	0.02 d	100	100	198.8 b–e
SmartChoice 5G + HxXTRA (Pioneer 35F44[12])	3.50	SB furrow[11]	0.02 d	100	100	203.5 b–e
Untreated checks (UTCs)						
DKC61-22[13]	—	—	0.63 b	60	40	191.2 def
Garst 85W95 GT/CB/LL[12]	—	—	2.17 a	0	0	180.6 fg
GH H-8577 GT/CB/LL[12]	—	—	1.90 a	5	0	170.4 gh
Mycogen ST-6808[12]	—	—	2.13 a	25	10	165.0 h
Pioneer 35F40[12]	—	—	2.49 a	0	0	136.7 i

[1] All soil insecticides were applied to DKC61-22 (the non-rootworm trait isoline of DKC61-19 YieldGard VT3), unless otherwise indicated.
[2] Rates of application for band and furrow placements are ounces (oz) of product per 1,000 ft of row.
[3] Mean node-injury ratings are based on the 0 to 3 node-injury scale (Oleson et al. 2005, Appendix I).
[4] Mean node-injury ratings were derived from five root systems per treatment in each of four replications.
[5] Means followed by the same letter do not differ significantly ($P = 0.05$, Duncan's New Multiple Range Test).
[6] Data were analyzed using a square-root transformation; actual means are shown.
[7] Percentage of roots with a node-injury rating < 1.0.
[8] Percentage of roots with a node-injury rating < 0.25.
[9] Corn was harvested from the center two rows of each plot and converted to bushels per acre (bu/A) at 15.5% moisture.
[10] Means followed by the same letter do not differ significantly ($P = 0.1$, Duncan's New Multiple Range Test).
[11] Seed treated with Cruiser (thiamethoxam), 0.25 milligrams (mg) of active ingredient (a.i.) per seed.
[12] Seed treated with Poncho (clothianidin), 0.25 milligrams (mg) of active ingredient (a.i.) per seed.
[13] Applied with modified SmartBox metering units.

TABLE 1.3 • **Evaluation of products to control corn rootworm larvae, Monmouth, University of Illinois, 2010**

Product[1]	Rate[2]	Placement[2]	Mean node-injury rating[3,4,5,6] 13 July	% consistency < 1.0[7]	% consistency < 0.25[8]	Mean yield (bu/A)[9,10] 28 Sep
Soil-applied insecticides						
Aztec 2.1G	6.70	Band	—	—	—	215.0 c–g
Aztec 4.67G + Pioneer 35F40[12]	3.00	SB furrow[11]	—	—	—	207.4 fgh
Force 2.1CS	0.46	Band	—	—	—	208.0 fgh
Rootworm Bt hybrids						
Agrisure RW (Garst 84U96 3000GT[12])	—	—	—	—	—	225.4 abc
Agrisure RW (GH H-8577 3000GT[12])	—	—	—	—	—	222.8 a–e
HxXTRA (Pioneer 35F44[12])	—	—	—	—	—	208.4 fgh
HxXTRA (Pioneer P1162XR[12])	—	—	—	—	—	207.4 fgh
SmartStax (DKC61-21[13])	—	—	—	—	—	218.1 b–f
SmartStax (Mycogen 2D692[12])	—	—	—	—	—	211.6 d–h
YieldGard VT3 (DKC61-19[13])	—	—	—	—	—	212.4 d–h
Soil-applied insecticides + rootworm Bt hybrids						
Counter 20G[14] + HxXTRA (Pioneer 35F44[12])	4.50	SB furrow[11]	—	—	—	191.6 i
Force 2.1CS + Agrisure RW (Garst 84U96 3000GT[12])	0.46	Band	—	—	—	224.2 a–d
Force 2.1CS + Agrisure RW (GH H-8577 3000GT[12])	0.46	Band	—	—	—	226.6 abc
Force 2.1CS + HxXTRA (Pioneer 35F44[12])	0.46	Band	—	—	—	212.5 d–h
Force 2.1CS + YieldGard VT3 (DKC61-19[13])	0.46	Band	—	—	—	220.2 a–f
Lorsban 15G[14] + HxXTRA (Mycogen 2K662[12])	8.00	Band	—	—	—	212.3 d–h
SmartChoice 5G + HxXTRA (Pioneer 35F44[12])	3.50	SB furrow[11]	—	—	—	204.8 gh
Untreated checks (UTCs)						
DKC61-22[13]	—	—	0.00 a	100	100	230.3 ab
Garst 85W95 GT/CB/LL[12]	—	—	0.00 a	100	100	231.3 a
GH H-8577 GT/CB/LL[12]	—	—	0.01 a	100	100	210.5 e–h
Mycogen ST-6808[12]	—	—	0.00 a	100	100	199.3 hi
Pioneer 35F40[12]	—	—	0.00 a	100	100	207.3 fgh

[1] All soil insecticides were applied to DKC61-22 (the non-rootworm trait isoline of DKC61-19 YieldGard VT3), unless otherwise indicated.
[2] Rates of application for band and furrow placements are ounces (oz) of product per 1,000 ft of row.
[3] Mean node-injury ratings are based on the 0 to 3 node-injury scale (Oleson et al. 2005, Appendix I).
[4] Mean node-injury ratings were derived from five root systems per treatment in each of four replications.
[5] Means followed by the same letter do not differ significantly ($P = 0.05$, Duncan's New Multiple Range Test).
[6] Data were analyzed using a square-root transformation; actual means are shown.
[7] Percentage of roots with a node-injury rating < 1.0.
[8] Percentage of roots with a node-injury rating < 0.25.
[9] Corn was harvested from the center two rows of each plot and converted to bushels per acre (bu/A) at 15.5% moisture.
[10] Means followed by the same letter do not differ significantly ($P = 0.1$, Duncan's New Multiple Range Test).
[11] Applied with modified SmartBox metering units.
[12] Seed treated with Cruiser (thiamethoxam), 0.25 milligrams (mg) of active ingredient (a.i.) per seed.
[13] Seed treated with Poncho (clothianidin), 0.25 milligrams (mg) of active ingredient (a.i.) per seed.
[14] Callisto (mesotrione) herbicide was applied post-emergence, which may have adversely affected the yield for these treatments.

Consistency percentages for the UTCs were never smaller than 100% at both the 0.25 and 1.0 levels.

Mean yields are reported in Table 1.3. Mean yields for the UTCs ranged from 199.3–231.3 bu/A. Mean yields for the soil-applied insecticides ranged from 207.4–215.0 bu/A and were not significantly greater than their respective UTCs. Mean yields for the rootworm Bt hybrids ranged from 207.4–225.4 bu/A and, for the most part, were not statistically different from their respective UTCs; this trend excluded YieldGard VT3, which had a significantly smaller mean yield than its UTC (DKC61-22). The addition of soil-applied insecticides to rootworm Bt hybrids never resulted in a significantly greater mean yield.

Perry—Mean node-injury ratings and consistency percentages for rootworm injury evaluations on 13 July are reported in Table 1.4. Mean node-injury ratings for the UTCs ranged from 0.05–0.26, indicating that corn rootworm larval feeding was minimal. Mean node-injury ratings for the soil-applied insecticides ranged from 0.01–0.02 and were not statistically different from their UTC (DKC61-22). Mean node-injury ratings for the rootworm Bt hybrids ranged from 0.01–0.03. Only Agrisure RW (GH H-8577 3000GT) and the HxXTRA hybrids had mean node-injury ratings that were significantly smaller than their UTCs. The addition of soil-applied insecticides to rootworm Bt hybrids never resulted in significantly smaller mean node-injury ratings. The percentages of roots with a node-injury rating < 1.0 ranged from 90–100% for all treatments, including the UTCs. Consistency percentages at the 0.25 level ranged from 95–100% for treatments with rootworm control products and from 65–95% for the UTCs.

Mean yields are reported in Table 1.4. Mean yields for the UTCs ranged from 156.2–181.3 bu/A. Mean yields for the soil-applied insecticides ranged from 154.4–160.8 bu/A and were not statistically different from their UTC (DKC61-22). Mean yields for the rootworm Bt hybrids ranged from 157.8–198.3 bu/A. Only the Agrisure RW hybrids had mean yields that were significantly greater than their UTCs; however, mean node-injury ratings for these treatments were statistically similar. The addition of soil-applied insecticides to rootworm Bt hybrids only resulted in a significantly greater mean yield for YieldGard VT3 + Counter 20G; however, mean node-injury ratings for these treatments were statistically similar. The statistically similar mean node-injury ratings for the Agrisure RW hybrids and their respective UTCs, as well as for YieldGard VT3 and YieldGard VT3 + Counter 20G, indicate that some factor other than corn rootworm larval feeding contributed to statistical differences in mean yield.

Urbana—Mean node-injury ratings and consistency percentages for rootworm injury evaluations on 12 July are reported in Table 1.5. Mean node-injury ratings for the UTCs ranged from 0.56–2.31, indicating that corn rootworm larval feeding was moderate to severe. Like the trial in DeKalb, DKC61-22 had a surprisingly smaller mean node-injury rating than the other UTCs. Gene-check strips were used to confirm the trait identity of DKC61-22. Mean node-injury ratings for the soil-applied insecticides ranged from 0.02–0.13 and were significantly smaller than their UTC (DKC61-22). Mean node-injury ratings for the rootworm Bt hybrids ranged from 0.00–0.27 and were significantly smaller than their respective UTCs. The addition of soil-applied insecticides to rootworm Bt hybrids only resulted in significantly smaller mean node-injury ratings for the Agrisure RW hybrids. The percentages of roots with a node-injury rating < 1.0 ranged from 87–100% for soil-applied insecticides, rootworm Bt hybrids, and soil-applied insecticides combined with rootworm Bt hybrids. Overall, the percentages of roots with a node-injury rating < 1.0 were much smaller for the UTCs and ranged from 0–80%. The percentage of roots with a node-injury rating < 1.0 for DKC 61-22 (the only UTC treated with clothianidin) was greater (80%) than for the other UTCs (0–21%). For most treatments with a rootworm control product, consistency percentages at the 0.25 level were not different from the 1.0 level—this trend did not include Force 2.1CS, Agrisure RW (Garst 84U96 3000GT and GH H-8577 3000GT), and HxXTRA (Mycogen 2K662 and Pioneer P1162XR).

Mean yields are reported in Table 1.5. Mean yields for the UTCs ranged from 112.9–152.2 bu/A. Mean yields for the soil-applied insecticides ranged from 173.5–177.9 bu/A and were significantly greater than their UTC (DKC61-22). Mean yields for the rootworm Bt hybrids ranged from 172.5–219.6 bu/A and were significantly greater than their respective UTCs. The addition of soil-applied insecticides to rootworm Bt hybrids never resulted in a significantly greater mean yield.

TABLE 1.4 • Evaluation of products to control corn rootworm larvae, Perry, University of Illinois, 2010

Product[1]	Rate[2]	Placement[2]	Mean node-injury rating[3,4,5,6] 13 July	% consistency < 1.0[7]	% consistency < 0.25[8]	Mean yield (bu/A)[9,10] 13 Sep
Soil-applied insecticides						
Aztec 2.1G	6.70	Band	0.02 cd	100	100	160.8 d–h
Aztec 4.67G	3.00	SB furrow[11]	0.01 cd	100	100	158.8 e–h
Force 2.1CS	0.46	Band	0.02 cd	100	100	154.4 h
Rootworm Bt hybrids						
Agrisure RW (Garst 84U96 3000GT[12])	—	—	0.02 cd	100	100	187.8 ab
Agrisure RW (GH H-8577 3000GT[12])	—	—	0.01 cd	100	100	198.3 a
HxXTRA (Pioneer 35F44[12])	—	—	0.03 cd	100	95	170.1 c–h
HxXTRA (Pioneer P1162XR[12])	—	—	0.01 cd	100	100	173.4 b–f
SmartStax (DKC61-21[13])	—	—	0.00 d	100	100	164.6 d–h
SmartStax (Mycogen 2D692[12])	—	—	0.01 d	100	100	157.8 fgh
YieldGard VT3 (DKC61-19[13])	—	—	0.00 d	100	100	164.5 d–h
Soil-applied insecticides + rootworm Bt hybrids						
Counter 20G + YieldGard VT3 (DKC61-19[13])	4.50	SB furrow[11]	0.00 d	100	100	182.6 abc
Force 2.1CS + Agrisure RW (Garst 84U96 3000GT[12])	0.46	Band	0.01 d	100	100	176.9 bcd
Force 2.1CS + Agrisure RW (GH H-8577 3000GT[12])	0.46	Band	0.02 cd	100	100	189.8 ab
Force 2.1CS + HxXTRA (Pioneer 35F44[12])	0.46	Band	0.01 cd	100	100	154.9 h
Force 2.1CS + YieldGard VT3 (DKC61-19[13])	0.46	Band	0.00 d	100	100	154.8 h
Lorsban 15G + HxXTRA (Mycogen 2K662[12])	8.00	Band	0.01 cd	100	100	173.2 b–g
SmartChoice 5G + YieldGard VT3 (DKC61-19[13])	3.50	SB furrow[11]	0.00 d	100	100	175.4 b–e
Untreated checks (UTCs)						
DKC61-22[13]	—	—	0.05 bcd	100	95	162.6 d–h
Garst 85W95 GT/CB/LL[12]	—	—	0.09 bc	100	89	160.4 d–h
GH H-8577 GT/CB/LL[12]	—	—	0.13 b	90	90	181.3 bc
Mycogen ST-6808[12]	—	—	0.11 b	100	80	156.2 gh
Pioneer 35F40[12]	—	—	0.26 a	95	65	163.6 d–h

1 All soil insecticides were applied to DKC61-22 (the non-rootworm trait isoline of DKC61-19 YieldGard VT3), unless otherwise indicated.
2 Rates of application for band and furrow placements are ounces (oz) of product per 1,000 ft of row.
3 Mean node-injury ratings are based on the 0 to 3 node-injury scale (Oleson et al. 2005, Appendix I).
4 Mean node-injury ratings were derived from five root systems per treatment in each of four replications.
5 Means followed by the same letter do not differ significantly (*P* = 0.05, Duncan's New Multiple Range Test).
6 Data were analyzed using a square-root transformation; actual means are shown.
7 Percentage of roots with a node-injury rating < 1.0.
8 Percentage of roots with a node-injury rating < 0.25.
9 Corn was harvested from the center two rows of each plot and converted to bushels per acre (bu/A) at 15.5% moisture.
10 Means followed by the same letter do not differ significantly (*P* = 0.1, Duncan's New Multiple Range Test).
11 Applied with modified SmartBox metering units.
12 Seed treated with Cruiser (thiamethoxam), 0.25 milligrams (mg) of active ingredient (a.i.) per seed.
13 Seed treated with Poncho (clothianidin), 0.25 milligrams (mg) of active ingredient (a.i.) per seed.

TABLE 1.5 • Evaluation of products to control corn rootworm larvae, Urbana, University of Illinois, 2010

Product[1]	Rate[2]	Placement[2]	Mean node-injury rating[3,4,5,6] 12 July	% consistency < 1.0[7]	% consistency < 0.25[8]	Mean yield (bu/A)[9,10] 30 Sep
Soil-applied insecticides						
Aztec 2.1G	6.70	Band	0.02 f	100	100	176.0 e
Aztec 4.67G	3.00	SB furrow[11]	0.06 ef	100	100	177.9 de
Force 2.1CS	0.46	Band	0.13 ef	100	80	173.5 e
Rootworm Bt hybrids						
Agrisure RW (Garst 84U96 3000GT[12])	—	—	0.27 e	87	67	219.6 a
Agrisure RW (GH H-8577 3000GT[12])	—	—	0.27 e	95	55	201.0 abc
HxXTRA (Mycogen 2K662[12])	—	—	0.09 ef	100	94	172.5 e
HxXTRA (Pioneer 35F44[12])	—	—	0.02 f	100	100	174.3 e
HxXTRA (Pioneer P1162XR[12])	—	—	0.10 ef	100	90	181.7 cde
SmartStax (DKC61-21[13])	—	—	0.00 f	100	100	179.1 de
SmartStax (Mycogen 2D692[12])	—	—	0.02 f	100	100	197.8 bcd
YieldGard VT3 (DKC61-19[13])	—	—	0.01 f	100	100	207.6 ab
Soil-applied insecticides + rootworm Bt hybrids						
Counter 20G + SmartStax (DKC61-21[13])	4.50	SB furrow[11]	0.00 f	100	100	185.6 cde
Force 2.1CS + Agrisure RW (Garst 84U96 3000GT[12])	0.46	Band	0.03 f	100	100	210.1 ab
Force 2.1CS + Agrisure RW (GH H-8577 3000GT[12])	0.46	Band	0.02 f	100	100	201.2 abc
Force 2.1CS + HxXTRA (Pioneer 35F44[12])	0.46	Band	0.02 f	100	100	192.1 b–e
Force 2.1CS + YieldGard VT3 (DKC61-19[13])	0.46	Band	0.00 f	100	100	198.9 a–d
Lorsban 15G + HxXTRA (Mycogen 2K662[12])	8.00	Band	0.02 f	100	100	188.9 b–e
SmartChoice 5G + + SmartStax (DKC61-21[13])	3.50	SB furrow[11]	0.00 f	100	100	184.0 cde
Untreated checks (UTCs)						
DKC61-22[13]	—	—	0.56 d	80	50	152.2 f
Garst 85W95 GT/CB/LL[12]	—	—	1.13 c	21	7	131.1 g
GH H-8577 GT/CB/LL[12]	—	—	1.83 b	13	0	129.8 g
Mycogen ST-6808[12]	—	—	2.31 a	0	0	112.9 g
Pioneer 35F40[12]	—	—	2.09 ab	0	0	128.2 g

[1] All soil insecticides were applied to DKC61-22 (the non-rootworm trait isoline of DKC61-19 YieldGard VT3), unless otherwise indicated.
[2] Rates of application for band and furrow placements are ounces (oz) of product per 1,000 ft of row.
[3] Mean node-injury ratings are based on the 0 to 3 node-injury scale (Oleson et al. 2005, Appendix I).
[4] Mean node-injury ratings were derived from five root systems per treatment in each of four replications.
[5] Means followed by the same letter do not differ significantly ($P = 0.05$, Duncan's New Multiple Range Test).
[6] Data were analyzed using a square-root transformation; actual means are shown.
[7] Percentage of roots with a node-injury rating < 1.0.
[8] Percentage of roots with a node-injury rating < 0.25.
[9] Corn was harvested from the center two rows of each plot and converted to bushels per acre (bu/A) at 15.5% moisture.
[10] Means followed by the same letter do not differ significantly ($P = 0.1$, Duncan's New Multiple Range Test).
[11] Applied with modified SmartBox metering units.
[12] Seed treated with Cruiser (thiamethoxam), 0.25 milligrams (mg) of active ingredient (a.i.) per seed.
[13] Seed treated with Poncho (clothianidin), 0.25 milligrams (mg) of active ingredient (a.i.) per seed.

SECTION 2

Evaluation of soil-applied insecticides plus transgenic rootworm hybrids to control corn rootworm larvae (*Diabrotica spp.*) in Illinois, 2010

Ronald E. Estes, Nicholas A. Tinsley, and Michael E. Gray

Location

We established two trials at University of Illinois research and education centers near DeKalb (DeKalb County) and Urbana (Champaign County).

Experimental Design and Methods

The experimental design was a randomized complete block with four replications. The plot size for each treatment was 10 ft (four rows) x 40 ft. Five randomly selected root systems were extracted from the first row of each plot on 14 and 15 July at DeKalb and Urbana, respectively. Root systems were washed and rated for corn rootworm larval injury using the 0 to 3 node-injury scale developed by Oleson et al. (2005) (Appendix I). Consistency percentages at two different levels (percentage of roots with a node-injury rating less than 1.0, and with a node injury rating less than 0.25) were determined for each product at each location. Percentage of lodged plants (plants leaning at 45° or less from the soil surface) was determined on 16 August at Urbana and on 22 September at DeKalb.

Planting, Insecticide Application, and Yield

Trials were planted on 10 and 28 May at DeKalb and Urbana, respectively. Both trials were planted using a four-row, vacuum style planter constructed by Seed Research Equipment Solutions (SRES). Seeds were planted in 30-inch rows at an approximate depth of 1.75 inches. Aztec 2.1G was applied through modified Noble metering units mounted to each row. Plastic tubes directed the insecticide granules to a 5-inch, slope-compensating bander. Force 2.1CS was applied at a spray volume of 5 gallons per acre (gal/A) using a CO_2 system. Both insecticides were applied in front of the firming wheels on the planter. Active ingredients for all chemical insecticides are listed in Appendix II.

Yields were estimated by harvesting the center two rows of each plot on 6 and 13 October at Urbana and DeKalb, respectively. Weights were converted to bushels per acre (bu/A) at 15.5% moisture. To ensure uniform plant densities across all plots, plant populations in the harvested rows had been thinned at the V6–V8 growth stage to 31,000 and 32,000 plants per acre at DeKalb and Urbana, respectively.

Agronomic Information

Agronomic information for both locations is listed in Table 2.1.

Climatic Conditions

Temperature and precipitation data for both locations are presented in Appendix III.

TABLE 2.1 • Agronomic information for efficacy trials of soil-applied insecticides plus transgenic rootworm hybrids to control corn rootworm larvae, University of Illinois, 2010

	DeKalb	Urbana
Planting date	10 May	28 May
Root evaluation date	14 July	15 July
Lodging evaluation date	22 September	16 August
Harvest date	13 October	6 October
Hybrids	DKC61-19 YieldGard VT3 DKC61-22 RR2	DKC61-19 YieldGard VT3 DKC61-22 RR2
Row spacing	30 inches	30 inches
Seeding rate	35,000/acre	35,000/acre
Previous crop	Trap crop (late-planted corn and pumpkins)	Trap crop (late-planted corn and pumpkins)
Tillage	Fall—chisel plow Spring—mulch finisher	Spring—disk Spring—field cultivator

Statistical Analysis

Data were analyzed using ARM 7 (Agricultural Research Manager), revision 7.5.1 (Copyright© 1982–2009 Gylling Data Management, Inc., Brookings, SD).

Results and Discussion

Mean node-injury ratings, consistency percentages, lodging percentages, and yields are presented in Table 2.2. Although all data are presented in one table, each location has been analyzed independently.

DeKalb—The mean node-injury rating for the untreated check (UTC) was 1.13, indicating that corn rootworm larval feeding was moderate. Mean node-injury ratings for plots containing rootworm Bt hybrids and plots containing soil-applied insecticides combined with rootworm Bt hybrids were not statistically different. All plots that contained some form of protection from larval injury (a rootworm Bt hybrid alone or combined with a soil-applied insecticide) had significantly lower mean node-injury ratings than the UTC. At the 1.0 level, consistency percentages were 95% or greater for all plots that contained some form of protection from larval injury. At the 0.25 level, the percent consistency was 0% in the UTC and 65% in the YieldGard VT3 treatment; when a soil insecticide was added to the YieldGard VT3 hybrid, consistency percentages remained at 95% or greater. Mean lodging percentages were very low and statistically similar for all treatments. Mean yield in the UTC was 180.9 bu/A. Mean yields in all plots that contained some form of protection from larval injury were significantly higher that the UTC, but statistically similar to each other. Mean yields for the treated plots ranged from 204.7–210.1 bu/A. Overall, the addition of

TABLE 2.2 • Evaluation of soil-applied insecticides plus transgenic rootworm hybrids to control corn rootworm larvae, University of Illinois, 2010

Product	Rate[1]	Placement	Mean node-injury rating[2,3,4,5]	% consistency < 1.0[6]	% consistency < 0.25[7]	% lodging[4,8,9]	Mean yield (bu/A)[10,11]
DeKalb							
UTC (DKC61-22[12])	—	—	1.13 a	47	0	0 a	180.9 b
YieldGard VT3 (DKC61-19[12])	—	—	0.24 b	95	65	0 a	204.7 a
YieldGard VT3 (DKC61-19[12]) + Aztec 2.1G	6.7	Band	0.04 b	100	95	0 a	206.5 a
YieldGard VT3 (DKC61-19[12]) + Force 2.1CS	0.9	Band	0.03 b	100	100	2 a	210.1 a
Urbana							
UTC (DKC61-22[12])	—	—	0.01 a	100	100	0 a	194.1 a
YieldGard VT3 (DKC61-19[12])	—	—	0.01 a	100	100	1 a	196.4 a
YieldGard VT3 (DKC61-19[12]) + Aztec 2.1G	6.7	Band	0.00 a	100	100	0 a	208.0 a
YieldGard VT3 (DKC61-19[12]) + Force 2.1CS	0.9	Band	0.01 a	100	100	0 a	195.9 a

[1] Rates of application for soil insecticides are ounces (oz) of product per 1,000 ft of row.
[2] Mean node-injury ratings are based on the 0 to 3 node-injury scale (Oleson et al. 2005, Appendix I).
[3] Mean node-injury ratings were derived from five root systems per treatment in each of four replications.
[4] Means followed by the same letter do not differ significantly (*P* = 0.05, Duncan's New Multiple Range Test).
[5] Mean node-injury ratings were evaluated on 14 and 15 July at DeKalb and Urbana, respectively.
[6] Percentage of roots with a node-injury rating < 1.0.
[7] Percentage of roots with a node-injury rating < 0.25.
[8] Percentage of plants leaning at 45° or less from the soil surface.
[9] Percentage lodging was evaluated on 12 August at Monmouth and Perry, and on 11 and 17 August at Urbana and DeKalb, respectively.
[10] Corn was harvested from the center two rows of each plot and converted to bushels per acre (bu/A) at 15.5% moisture on 6 and 13 October at Urbana and DeKalb, respectively.
[11] Means followed by the same letter do not differ significantly (*P* = 0.1, Duncan's New Multiple Range Test).
[12] Seed treated with Poncho (clothianidin), 0.25 milligrams (mg) of active ingredient (a.i.) per seed.

soil-applied insecticides to plots with rootworm Bt hybrids did not result in significantly higher mean yields.

Urbana—The mean node-injury rating for the all treatments at this location was either 0.00 or 0.01, indicating that corn rootworm larval feeding was minimal. Mean node-injury ratings and lodging percentages were statistically similar for all treatments. Consistency percentages were 100% for all treatments at both the 0.25 and 1.0 levels. None of the treated plots had significantly higher yields than the UTC (194.1 bu/A).

SECTION 3

Evaluation of Force 2.1CS and an experimental soil-applied insecticide to control corn rootworm larvae (*Diabrotica spp.*) in Illinois, 2010

Nicholas A. Tinsley, Ronald E. Estes, and Michael E. Gray

Location

We established one trial at the University of Illinois Agricultural Engineering Farm near Urbana (Champaign County).

Experimental Design and Methods

The experimental design was a randomized complete block with four replications. Plot size for each treatment was 10 ft (four rows) x 30 ft. Six randomly selected root systems were extracted from the first row of each plot on 15 July. Root systems were washed and rated for corn rootworm larval injury using the 0 to 3 node-injury scale developed by Oleson et al. (2005) (Appendix I). Consistency percentages at two different levels (percentage of roots with a node-injury rating less than 1.0, and with a node injury rating less than 0.25) were determined for each product. Percentage of lodged plants (plants leaning at 45° or less from the soil surface) was determined on 16 August.

Planting, Insecticide Application, and Yield

The trial was planted on 27 May using a four-row, Almaco constructed planter with John Deere 7300 row units. Precision cone units were used to plant the seeds. The insecticides were applied in front of the firming wheels on the planter at a spray volume of 5 gallons per acre (gal/A) using a CO_2 system. Cable-mounted tines were attached behind each of the row units to improve insecticide incorporation. Active ingredients for all chemical insecticides, except those with experimental designations, are listed in Appendix II.

Yields were estimated by harvesting the center two rows of each plot on 6 October. Weights were converted to bushels per acre (bu/A) at 15.5% moisture.

Agronomic Information

Agronomic information is listed in Table 3.1.

Climatic Conditions

Temperature and precipitation data are presented in Appendix III.

Statistical Analysis

Data were analyzed using ARM 7 (Agricultural Research Manager), revision 7.5.1 (Copyright© 1982–2009 Gylling Data Management, Inc., Brookings, SD).

Results and Discussion

Mean node-injury ratings, consistency percentages, lodging percentages, and yields are presented in Table 3.2.

The mean node-injury rating for the untreated check (UTC) was 0.01, indicating that corn rootworm larval feeding was minimal. Mean node-injury ratings and lodging percentages were statistically similar for all treatments. Consistency percentages were 100% for all treatments at both the 0.25 and 1.0 levels. No insecticide treatment yielded significantly different from the UTC (185.2 bu/A). The minimal amount of corn rootworm injury observed in this trial was most likely due to an unseasonably large amount of precipitation occurring between larval hatch and establishment and the late planting date.

TABLE 3.1 • Agronomic information for efficacy trial of Force 2.1CS and an experimental soil-applied insecticide to control corn rootworm larvae, University of Illinois, 2010

Planting date	27 May
Root evaluation date	15 July
Lodging evaluation date	16 August
Harvest date	6 October
Hybrid	DKC61-22 RR2
Row spacing	30 inches
Seeding rate	33,000/acre
Previous crop	Trap crop (late-planted corn and pumpkins)
Tillage	Spring—disk Spring—field cultivator

TABLE 3.2 • Evaluation of Force 2.1CS and an experimental soil-applied insecticide to control corn rootworm larvae, University of Illinois, 2010

Product[1]	Rate[2]	Placement	Mean node-injury rating[3,4,5] 15 July	% consistency < 1.0[6]	% consistency < 0.25[7]	% lodging[5,8] 16 Aug	Mean yield (bu/A)[9,10] 6 Oct
Experimental D	0.35	Band	0.02 a	100	100	0 a	179.5 ab
Experimental D	0.46	Band	0.02 a	100	100	0 a	180.0 ab
Force 2.1CS	0.35	Band	0.02 a	100	100	0 a	188.0 a
Force 2.1CS	0.46	Band	0.02 a	100	100	0 a	171.3 b
UTC (DKC61-22[11])	—	—	0.01 a	100	100	1 a	185.2 ab

[1] Both soil insecticides were applied to DKC61-22.
[2] Rates of application for soil insecticides are ounces (oz) of product per 1,000 ft of row.
[3] Mean node-injury ratings are based on the 0 to 3 node-injury scale (Oleson et al. 2005, Appendix I).
[4] Mean node-injury ratings were derived from six root systems per treatment in each of four replications.
[5] Means followed by the same letter do not differ significantly ($P = 0.05$, Duncan's New Multiple Range Test).
[6] Percentage of roots with a node-injury rating < 1.0.
[7] Percentage of roots with a node-injury rating < 0.25.
[8] Percentage of plants leaning at 45° or less from the soil surface.
[9] Means followed by the same letter do not differ significantly ($P = 0.1$, Duncan's New Multiple Range Test).
[10] Corn was harvested from the center two rows of each plot and converted to bushels per acre (bu/A) at 15.5% moisture.
[11] Seed treated with Poncho (clothianidin), 0.25 milligrams (mg) of active ingredient (a.i.) per seed.

SECTION 4

Evaluation of foliar-applied insecticides to control silk-feeding beetles in Illinois, 2010

Nicholas A. Tinsley, Ronald E. Estes, and Michael E. Gray

Location

We established one trial at the University of Illinois Agricultural Engineering Farm near Urbana (Champaign County).

Experimental Design and Methods

The experimental design was a randomized complete block with four replications. Plot size for each treatment was 10 ft (four rows) x 30 ft. Insecticides were applied to designated plots on 5 August. Prior to and after insecticide application, densities of silk-feeding beetles (Japanese beetles, southern corn rootworm beetles, and western corn rootworm beetles) were estimated by counting the total number of beetles on 10 ears in each plot. Densities of silk-feeding beetles after insecticides were applied were assessed on 10, 12, 19, and 26 August (5, 7, 14, and 21 days after treatment [DAT]).

Planting and Insecticide Application

The trial was planted on 27 May using a four-row, Almaco constructed planter with John Deere 7300 row units and Precision Planting finger pick-up style metering units. Insecticides were applied on 5 August with a CO_2 backpack sprayer and a four-row boom. For treatments receiving a spray volume of 15 gallons per acre (gal/A), TeeJet 8001VS spray tips were calibrated. For treatments receiving a spray volume of 1 gal/A, TeeJet 800017 spray tips were calibrated and a TeeJet 126 strainer was used. Active ingredients for all chemical insecticides, except those with experimental designations, are listed in Appendix II.

Agronomic Information

Agronomic information is listed in Table 4.1.

Climatic Conditions

Temperature and precipitation data are presented in Appendix III.

Statistical Analysis

Data were analyzed using ARM 7 (Agricultural Research Manager), revision 7.5.1 (Copyright© 1982–2009 Gylling Data Management, Inc., Brookings, SD).

Results and Discussion

Densities of silk-feeding beetles are presented in Table 4.2. Although some beetles were observed on 5 August, the focus of this discussion will be on the densities of beetles on dates following the application of foliar insecticides.

No Japanese beetles were observed on any sampling date. Southern corn rootworm beetles were only observed on 5 August, prior to the application of insecticides.

Densities of western corn rootworm beetles were very small following the application of foliar insecticides. No significant differences in the number of western corn rootworm beetles were observed on 10 or 26 August (5 and 21 DAT, respectively). On 12 August (7 DAT), plots treated with A18481, Hero, and Warrior II (1 gal/A) had significantly fewer western corn rootworm beetles than the untreated check (UTC); however, the densities were extremely small. On 19 August (14 DAT), plots treated with A18481, Endigo ZC (15 gal/A), and Warrior II (15 gal/A) had significantly fewer western corn rootworm beetles than the UTC. Again, the densities of beetles were exceedingly small. Across all sampling dates, no significant differences were observed between the low (1 gal/A) and high (15 gal/A) spray volumes of either Endigo ZC or Warrior II.

TABLE 4.1 • Agronomic information for efficacy trial of foliar-applied insecticides to control silk-feeding beetles, University of Illinois, 2010

Planting date	27 May
Hybrid	DKC61-22 RR2
Row spacing	30 inches
Seeding rate	33,000/acre
Previous crop	Corn
Tillage	Spring—disk Spring—field cultivator

TABLE 4.2 • **Evaluation of foliar-applied insecticides to control silk-feeding beetles, University of Illinois, 2010**

Product[2]	Rate[3]	Spray volume[4]	Mean no. beetles per ear[1]				
			5 Aug[5] (0 DAT[6])	10 Aug[5] (5 DAT[6])	12 Aug[5] (7 DAT[6])	19 Aug[5] (14 DAT[6])	26 Aug[5] (21 DAT[6])
Japanese beetle							
A18481	4.50	15	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a
Endigo ZC	4.50	15	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a
Endigo ZC	4.50	1	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a
Hero	7.00	15	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a
Warrior II	1.92	15	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a
Warrior II	1.92	1	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a
UTC[7]	—	—	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a
Southern corn rootworm							
A18481	4.50	15	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a
Endigo ZC	4.50	15	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a
Endigo ZC	4.50	1	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a
Hero	7.00	15	0.1 a	0.0 a	0.0 a	0.0 a	0.0 a
Warrior II	1.92	15	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a
Warrior II	1.92	1	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a
UTC[7]	—	—	0.1 a	0.0 a	0.0 a	0.0 a	0.0 a
Western corn rootworm							
A18481	4.50	15	0.3 a	0.0 a	0.0 b	0.0 b	0.0 a
Endigo ZC	4.50	15	0.5 a	0.0 a	0.1 ab	0.0 b	0.0 a
Endigo ZC	4.50	1	0.2 a	0.1 a	0.1 ab	0.1 ab	0.0 a
Hero	7.00	15	0.3 a	0.0 a	0.0 b	0.0 ab	0.0 a
Warrior II	1.92	15	0.3 a	0.0 a	0.1 ab	0.0 b	0.0 a
Warrior II	1.92	1	0.4 a	0.1 a	0.1 b	0.0 ab	0.0 a
UTC[7]	—	—	0.3 a	0.1 a	0.3 a	0.1 a	0.1 a

[1] Means were derived from the numbers of beetles on 10 ears per treatment in each of four replications.
[2] Crop oil concentrate (COC) was added to foliar insecticide applications at a rate of 1% volume per volume of spray solution.
[3] Rates of application for foliar insecticides are ounces of product per acre (oz/A).
[4] Spray volumes for foliar insecticides are gallons per acre (gal/A).
[5] Means followed by the same letter do not differ significantly (*P* = 0.05, Duncan's New Multiple Range Test).
[6] DAT = days after treatment (with foliar insecticides).
[7] UTC = untreated check.

SECTION 5

Evaluation of SmartStax and a soil insecticide to control black cutworm larvae (*Agrotis ipsilon*) in Illinois, 2010

Nicholas A. Tinsley, Ronald E. Estes, and Michael E. Gray

Location

We established one trial at the University of Illinois Agricultural Engineering Farm near Urbana (Champaign County).

Experimental Design and Methods

The experimental design was a randomized complete block with four replications. Plot size for each treatment was 2.5 ft (1 row) x 7 ft. Steel barriers (6 in x 4.5 ft, 5 in tall) were placed around approximately 10 consecutive plants in each plot. Each plant within the barrier was infested with two third-instar black cutworm larvae on 21 September and again on 22 September. The number of plants that were fed upon or cut by the larvae was recorded on 28 September and on 5 and 12 October (7, 14, and 21 days after infestation [DAI]).

Planting and Insecticide Application

The trial was planted on 7 September using a four-row, Almaco constructed planter with John Deere 7300 row units and Precision Planting finger pick-up style metering units. Force 3G was applied through modified Noble metering units mounted to each row. Plastic tubes directed the insecticide granules to a 5-inch, slope-compensating bander. Cable-mounted tines were attached behind each of the row units to improve insecticide incorporation. Active ingredients for all chemical insecticides are listed in Appendix II.

Agronomic Information

Agronomic information is listed in Table 5.1.

Climatic Conditions

Temperature and precipitation data are presented in Appendix III.

Statistical Analysis

Data were analyzed using ARM 7 (Agricultural Research Manager), revision 7.5.1 (Copyright© 1982–2009 Gylling Data Management, Inc., Brookings, SD).

Results and Discussion

The mean percentages of plants cut and plants with feeding injury for dates following infestation with black cutworm larvae are presented in Table 5.2.

Although each plant in the trial was infested with four larvae, the number of plants cut was very small and ranged from 0–5%. For each sampling date, no significant differences in the percentage of plants cut were observed between any of the treatments. On 28 September (7 DAI), the percentage of plants with feeding injury ranged from 22–80% and increased only slightly on subsequent sampling dates. Beginning on 28 September (7 DAI), SmartStax plants had significantly less feeding injury (22%) than both of the untreated checks (UTCs) (80 and 77%) and the Force 3G treatment (76%). This observation continued through subsequent sampling dates. The Force 3G treatment had a statistically similar percentage of plants with feeding injury as the UTCs across all sampling dates.

TABLE 5.1 • Agronomic information for efficacy trial of SmartStax and a soil insecticide to control black cutworm larvae, University of Illinois, 2010

Planting date	7 September
Hybrids	Mycogen 2D692 SmartStax Mycogen ST-6808 RR2
Row spacing	30 inches
Seeding rate	33,000/acre
Previous crop	Corn
Tillage	Spring—disk

TABLE 5.2 • Evaluation of SmartStax and a soil insecticide to control black cutworm larvae, University of Illinois, 2010

Product	Rate[1]	Placement	28 Sep (7 DAI[2])		5 Oct (14 DAI[2])		12 Oct (21 DAI[2])	
			Mean % of plants cut[3]	Mean % of plants with feeding injury[3]	Mean % of plants cut[3]	Mean % of plants with feeding injury[3]	Mean % of plants cut[3]	Mean no. of plants with feeding injury[3]
Force 3G[4]	4.00	Band	0 a	76 a	0 a	80 a	0 a	82 a
SmartStax (Mycogen 2D692[5])	—	—	0 a	22 b	0 a	25 b	0 a	25 b
UTC[6] (Mycogen ST-6808[5])	—	—	2 a	80 a	2 a	86 a	5 a	88 a
UTC[6] (Mycogen ST-6808[5])	—	—	0 a	77 a	0 a	77 a	0 a	77 a

[1] Rates of application for soil insecticides are ounces (oz) of product per 1,000 ft of row.
[2] DAI = days after infestation (with black cutworm larvae).
[3] Means followed by the same letter do not differ significantly (*P* = 0.05, Duncan's New Multiple Range Test).
[4] Force 3G was applied to Mycogen ST-6808.
[5] Seed treated with Cruiser (thiamethoxam), 0.25 milligrams (mg) of active ingredient (a.i.) per seed.
[6] UTC = untreated check.

SECTION 6

Evaluation of SmartStax to control ear-feeding lepidopteran pests in Illinois, 2010

Nicholas A. Tinsley, Ronald E. Estes, and Michael E. Gray

Location

We established one trial at the University of Illinois Agricultural Engineering Farm near Urbana (Champaign County).

Experimental Design and Methods

The experimental design was a randomized complete block with six replications. Plot size for each treatment was 10 ft (four rows) x 20 ft. Densities of ear-feeding lepidopteran pests (fall armyworms, corn earworms, and European corn borers) were assessed on 7 September (at the R3 growth stage). Densities were estimated by counting the total number of larvae on 10 ears in each plot. The number of kernels consumed was recorded for each ear that was evaluated.

Planting Information

The trial was planted on 2 July using a four-row, vacuum style planter constructed by Seed Research Equipment Solutions (SRES). The planting date was later than normal to attract late-season flights of corn earworm. Seeds were planted in 30-inch rows at an approximate depth of 1.75 inches.

Agronomic Information

Agronomic information is listed in Table 6.1.

Climatic Conditions

Temperature and precipitation data are presented in Appendix III.

Statistical Analysis

Data were analyzed using ARM 7 (Agricultural Research Manager), revision 7.5.1 (Copyright© 1982–2009 Gylling Data Management, Inc., Brookings, SD).

Results and Discussion

Means for the number of fall armyworm larvae, corn earworm larvae, European corn borer larvae, and kernels consumed per ear are reported in Table 6.2.

Densities of ear-feeding lepidopteran pests were small at the time of sampling. No fall armyworm larvae were observed in the trial. The untreated check (UTC) had a statistically similar number of European corn borer larvae per ear as SmartStax, with 0.00 and 0.03 larvae per ear, respectively. The UTC averaged significantly more corn earworm larvae and kernels consumed per ear than SmartStax plants.

TABLE 6.1 • Agronomic information for efficacy trial of SmartStax to control ear-feeding lepidopteran pests, University of Illinois, 2010

Planting date	2 July
Hybrids	Mycogen 2D692 SmartStax Mycogen ST-6808 RR2
Row spacing	30 inches
Seeding rate	35,000/acre
Previous crop	Corn
Tillage	Spring—disk Spring—field cultivator

TABLE 6.2 • Evaluation of SmartStax to control ear-feeding lepidopteran pests, University of Illinois, 2010

Product	Mean no. of FAW[1] larvae per ear[2,3]	Mean no. of CEW[4] larvae per ear[2,3]	Mean no. of ECB[5] larvae per ear[2,3]	Mean no. of kernels consumed per ear[2,3]
SmartStax (Mycogen 2D692[7])	0.00 a	0.05 b	0.00 a	0.18 b
UTC[8] (Mycogen ST-6808[7])	0.00 a	0.77 a	0.03 a	6.68 a

[1] FAW = fall armyworm.
[2] Means were derived from the numbers of larvae on 10 ears per treatment in each of six replications.
[3] Means followed by the same letter do not differ significantly ($P = 0.05$, Duncan's New Multiple Range Test).
[4] CEW = corn earworm.
[5] ECB = European corn borer.
[6] Means were derived from the numbers of kernels consumed on 10 ears per treatment in each of six replications.
[7] Seed treated with Cruiser (thiamethoxam), 0.25 milligrams (mg) of active ingredient (a.i.) per seed.
[8] UTC = untreated check.

SECTION 7

Evaluation of SmartStax to control European corn borer larvae (*Ostrinia nubilalis*) in Illinois, 2010

Nicholas A. Tinsley, Ronald E. Estes, and Michael E. Gray

Location

We established one trial at the University of Illinois Agricultural Engineering Farm near Urbana (Champaign County).

Experimental Design and Methods

The experimental design was a randomized complete block with four replications. The plot size for each treatment was 10 ft (four rows) x 20 ft. A Davis inoculator was used to place approximately 90 neonate European corn borer larvae near the tip of the ear on 10 consecutive plants in row two of each plot on 5 August (at the R1 growth stage). Densities of European corn borer larvae were assessed on 7 September (33 days after infestation [DAI]). Densities were estimated by splitting the stalks of 10 plants in each plot and counting the total number of larvae. The number and total length of any tunnels that were present were recorded for each plant that was evaluated.

Planting Information

The trial was planted on 26 May using a four-row, vacuum style planter constructed by Seed Research Equipment Solutions (SRES). Seeds were planted in 30-inch rows at an approximate depth of 1.75 inches.

Agronomic Information

Agronomic information is listed in Table 7.1.

Climatic Conditions

Temperature and precipitation data are presented in Appendix III.

Statistical Analysis

Data were analyzed using ARM 7 (Agricultural Research Manager), revision 7.5.1 (Copyright© 1982–2009 Gylling Data Management, Inc., Brookings, SD).

Results and Discussion

Means for the number of European corn borer larvae per plant, number of tunnels per plant, and tunnel length per plant are reported in Table 7.2.

No European corn borer larvae or tunnels were observed in any plot with SmartStax plants. The untreated check (UTC) averaged 0.85 European corn borer larvae per plant and 1.58 tunnels per plant. The mean total tunnel length for UTC plants was 7.95 cm.

TABLE 7.1 • Agronomic information for efficacy trial of SmartStax to control European corn borer larvae, University of Illinois, 2010

Planting date	26 May
Hybrids	Mycogen 2D692 SmartStax Mycogen ST-6808 RR2
Row spacing	30 inches
Seeding rate	35,000/acre
Previous crop	Corn
Tillage	Spring—disk Spring—field cultivator

TABLE 7.2 • Evaluation of SmartStax to control European corn borer larvae, University of Illinois, 2010

Product	Mean no. of ECB[1] larvae per plant[2,3]	Mean no. of tunnels[4] per plant[2,3]	Mean tunnel length[5] per plant (cm)[2,3]
SmartStax (Mycogen 2D692[6])	0.00 b	0.00 b	0.00 b
UTC[7] (Mycogen ST-6808[6])	0.85 a	1.58 a	7.95 a

[1] ECB = European corn borer.
[2] Means were derived from the numbers of larvae in 10 plants per treatment in each of four replications.
[3] Means followed by the same letter do not differ significantly ($P = 0.05$, Duncan's New Multiple Range Test).
[4] Means were derived from the numbers of tunnels in 10 plants per treatment in each of four replications.
[5] Means were derived from the total length of tunnels in 10 plants per treatment in each of four replications.
[6] Seed treated with Cruiser (thiamethoxam), 0.25 milligrams (mg) of active ingredient (a.i.) per seed.
[7] UTC = untreated check.

SECTION 8

Evaluation of foliar-applied insecticides to control soybean aphids (*Aphis glycines*) in Illinois, 2010

Nicholas A. Tinsley, Ronald E. Estes, and Michael E. Gray

Location

We established one trial at the Adam Yoeckel Farm near Morrison (Whiteside County). Funding for this experiment was provided by the Illinois Soybean Association.

Experimental Design and Methods

The experimental design was a randomized complete block with four replications. The plot size for each treatment was 10 ft (four rows) x 30 ft. Insecticides were applied to designated plots on 27 August. Prior to and after insecticide application, densities of soybean aphids were estimated by counting the total number of aphids on three plants in each plot. Densities of soybean aphids after insecticides were applied were assessed on 3, 10, and 17 September (7, 14, and 21 days after treatment [DAT]).

Planting, Insecticide Application, and Yield

The trial was planted on 2 June using a 16-row, New Holland SP580 planter. Seeds were planted in 30-inch rows at an approximate depth of 0.75 inches. Insecticides were applied on 27 August with a CO_2 backpack sprayer and a four-row boom. TeeJet TTJ60-1102VP spray tips were calibrated to deliver a volume of 20 gallons per acre (gal/A). Active ingredients for all chemical insecticides, except those with experimental designations, are listed in Appendix II.

Yields were estimated by harvesting the center two rows of each plot on 15 October. Weights were converted to bushels per acre (bu/A) at 13% moisture.

Agronomic Information

Agronomic information is listed in Table 8.1.

Climatic Conditions

Temperature and precipitation data are presented in Appendix III.

Statistical Analysis

Data were analyzed using ARM 7 (Agricultural Research Manager), revision 7.5.1 (Copyright© 1982–2009 Gylling Data Management, Inc., Brookings, SD).

Results and Discussion

Mean densities of soybean aphids and yields are reported in Table 8.2. Densities of soybean aphids were very small across all sampling dates and never exceeded 10 per plant, well below the economic threshold of 250 soybean aphids per plant. No significant differences in numbers of soybean aphids per plant were observed between any treatment on 3 September (7 DAT). While some significant differences were observed on 10 September (14 DAT), no insecticide treatment had a significantly different number of soybean aphids per plant than either of the untreated checks (UTCs). On 17 September (21 DAT), all of the insecticide treatments had significantly smaller numbers of soybean aphids per plant than one of the UTCs.

The range in yields was 55.9 (Belay + NIS) to 62.4 (Hero) bu/A. This difference in yield was statistically different. However, none of the insecticide treatments differed significantly from the UTCs. This was expected due to the very small densities of soybean aphids observed in this experiment.

TABLE 8.1 • Agronomic information for efficacy trial of foliar-applied insecticides to control soybean aphids, Morrison, University of Illinois, 2010

Planting date	2 June
Harvest date	15 October
Variety	Pioneer 92M80
Row spacing	30 inches
Seeding rate	145,000/acre
Previous crop	Corn
Tillage	Spring—Turbo-till vertical tillage

TABLE 8.2 • **Evaluation of foliar-applied insecticides to control soybean aphids, Morrison, University of Illinois, 2010**

Product	Rate[2,3]	Mean no. soybean aphids per plant[1]			Mean yield (bu/A)[6,7]
		3 Sep[4] (7 DAT)[5]	10 Sep[4] (14 DAT)[5]	17 Sep[4] (21 DAT)[5]	15 Oct
Baythroid XL	2.40	3.42 a	4.33 a	0.17 b	58.0 ab
Baythroid XL + Lorsban 4E	2.00 8.00	2.75 a	0.00 b	0.00 b	58.0 ab
Belay + NIS[8]	3.00 0.25	3.50 a	1.83 ab	0.00 b	57.8 ab
Belay + NIS[8]	4.00 0.25	4.42 a	0.00 b	0.67 b	61.0 ab
Belay + NIS[8]	6.00 0.25	3.42 a	2.42 ab	0.00 b	55.9 b
Belay + Brigade 2EC + NIS[8]	3.00 4.00 0.25	0.42 a	0.00 b	0.00 b	57.3 ab
Belay + Lorsban 4E + NIS[8]	3.00 16.0 0.25	0.00 a	0.08 b	0.00 b	56.6 ab
Brigade 2EC + NIS[8]	6.40 0.25	1.75 a	1.92 ab	0.00 b	56.3 ab
Brigadier	4.00	1.00 a	0.00 b	0.00 b	56.6 ab
Declare	1.02	3.75 a	0.08 b	0.08 b	57.8 ab
Declare	1.28	0.17 a	0.00 b	0.00 b	55.9 b
Declare + Nufos 4E	1.02 12.0	0.58 a	0.00 b	0.00 b	59.3 ab
Endigo ZC + NIS[8]	4.50 0.25	1.08 a	2.50 ab	0.00 b	57.3 ab
GF-2595	11.0	1.25 a	1.00 ab	0.00 b	59.1 ab
GF-2595	13.0	0.42 a	0.00 b	0.00 b	56.4 ab
Hero	10.3	2.50 a	0.00 b	0.00 b	62.4 a
Hero	5.00	0.00 a	0.00 b	0.00 b	58.4 ab
Lorsban 4E	16.0	0.75 a	0.00 b	0.00 b	59.9 ab
Mustang Max	2.00	4.25 a	0.33 b	0.50 b	61.6 ab
Warrior	2.56	5.50 a	1.50 ab	0.42 b	59.3 ab
Warrior II	1.28	6.67 a	0.00 b	1.08 b	57.8 ab
Warrior II	1.54	2.50 a	0.00 b	0.00 b	61.0 ab
UTC[9]	—	5.92 a	2.17 ab	3.50 a	60.7 ab
UTC[9]	—	3.92 a	2.00 ab	0.33 b	58.1 ab

[1] Means were derived from the numbers of soybean aphids on three plants per treatment in each of four replications.
[2] Rates of application for foliar insecticides are ounces (oz) of product per acre.
[3] Rates of application for NIS (non-ionic surfactant) are percentage of volume per volume of spray solution (%V/V).
[4] Means followed by the same letter do not differ significantly ($P = 0.05$, Duncan's New Multiple Range Test).
[5] DAT = days after treatment (with foliar insecticides).
[6] Means followed by the same letter do not differ significantly ($P = 0.1$, Duncan's New Multiple Range Test).
[7] Soybeans were harvested from the center two rows of each plot and converted to bushels per acre (bu/A) at 13% moisture.
[8] NIS = non-ionic surfactant.
[9] UTC = untreated check.

SECTION 9

Evaluation of resistant soybean lines to control soybean aphids (*Aphis glycines*) in Illinois, 2010

Andrew T. Morehouse, Nicholas A. Tinsley, Ronald E. Estes, Michael E. Gray, and Brian W. Diers

Location

We established one trial at the Adam Yoeckel Farm near Morrison (Whiteside County). Funding for this experiment was provided by the Illinois Soybean Association.

Experimental Design and Methods

The experimental design was a split-plot, randomized complete block with four replications. The plot size for each treatment was 20 ft (eight rows) x 30 ft. One half (four rows) of each plot was treated with a foliar-applied insecticide for yield comparisons. The remaining half was not treated with an insecticide. Six experimental soybean lines were provided from the soybean breeding program at the University of Illinois. The resistant lines LD05-16657a and LD06-16721a contained the *Rag1* resistance gene (their susceptible near-isoline was Dwight). The resistant lines LD08-12441a and LD08-12582a contained the *Rag2* gene (their susceptible near-isoline was LD02-4485).

Densities of soybean aphids were determined by counting the total number of soybean aphids on each of three plants in each subplot. Densities of soybean aphids were assessed on 30 July; 6, 12, 18, and 25 August; and 1, 8, and 15 September.

Planting, Insecticide Application, and Yield

The trial was planted on 2 June using a four-row, vacuum style planter constructed by Seed Research Equipment Solutions (SRES). Seeds were planted in 30-inch rows at an approximate depth of 0.75 inches. Insecticide was applied on 25 August with a CO_2 backpack sprayer and a four-row boom. TeeJet TTJ60-1102VP spray tips were calibrated to deliver a volume of 20 gallons per acre (gal/A). Active ingredients for all chemical insecticides are listed in Appendix II.

Yields were estimated by harvesting the center two rows of each subplot on 16 October. Weights were converted to bushels per acre (bu/A) at 13% moisture.

Agronomic Information

Agronomic information is listed in Table 9.1.

Climatic Conditions

Temperature and precipitation data are presented in Appendix III.

Statistical Analysis

Data were analyzed using ARM 7 (Agricultural Research Manager), revision 7.5.1 (Copyright© 1982–2009 Gylling Data Management, Inc., Brookings, SD).

Results and Discussion

Mean densities of soybean aphids are reported in Table 9.2. Densities remained relatively small throughout the growing season. Densities peaked on 25 August, when the mean number of soybean aphids per plant in susceptible plots reached 25.6 (N = 144). However, this number was well below the current economic threshold of 250 soybean aphids per plant (Ragsdale et al. 2007). Densities decreased after this date until senescence began on 15 September.

When densities of soybean aphids were greatest (25 August), the resistant lines LD06-16657a and LD05-16721a had statistically similar numbers of soybean aphids per plant as their susceptible near-isoline Dwight. This was also observed for the resistant line LD08-12582a and its susceptible near-

TABLE 9.1 • Agronomic information for efficacy trial of resistant soybean lines to control soybean aphids, Morrison, University of Illinois, 2010

Planting date	2 June
Harvest date	16 October
Lines	Dwight LD05-16657a LD06-16721a LD02-4485 LD08-12441a LD08-12582a
Row spacing	30 inches
Seeding rate	140,000/acre
Previous crop	Corn
Tillage	Spring—Turbo-till vertical tillage

isoline LD02-4485. However, the resistant line LD08-12441a had significantly fewer soybean aphids per plant than its susceptible near-isoline LD02-4485. On dates following insecticide application (1, 8, and 15 September), plots with Cobalt had statistically similar numbers of soybean aphids per plant as their untreated counterparts.

Mean yields are reported in Table 9.2. Yields for the resistant lines LD05-16657a and LD06-16721a were not statistically different from their susceptible near-isoline Dwight. Similarly, the yield for the resistant line LD08-12441a was not statistically different from its susceptible near-isoline LD02-4485. However, the resistant line LD08-12582a yielded significantly less than its susceptible near-isoline LD02-4485. Plots treated with Cobalt did not yield statistically different from their untreated counterparts, indicating that differences in yield were unlikely to have been caused by densities of soybean aphids.

TABLE 9.2 • **Evaluation of resistant soybean lines to control soybean aphids, Morrison, University of Illinois, 2010**

Product	Resistant	Rate[1]	Mean no. soybean aphids per plant[2,3]								Mean yield (bu/acre)[4,5]
			30 July	6 Aug	12 Aug	18 Aug	25 Aug	1 Sep	8 Sep	15 Sep	16 Oct
Dwight	No	—	0.17 b	0.17 a	0.08 b	7.17 bc	10.83 bc	16.50 a	8.67 ab	3.33 a	52.7 a–d
LD05-16657a	Yes[6]	—	0.00 b	0.00 a	2.50 b	4.08 bc	4.75 c	3.92 a	3.25 ab	2.17 a	57.1 ab
LD06-16721a	Yes[6]	—	1.17 b	1.42 a	2.58 b	3.50 bc	13.92 abc	9.58 a	10.00 a	4.83 a	48.3 cd
LD02-4485	No	—	2.58 a	2.50 a	4.67 b	24.33 a	33.50 a	12.33 a	4.83 ab	2.67 a	59.0 a
LD08-12441a	Yes[7]	—	0.00 b	0.00 a	1.17 b	3.25 bc	9.17 bc	0.08 a	3.58 ab	0.25 a	53.6 a–d
LD08-12582a	Yes[7]	—	0.00 b	0.17 a	1.42 b	4.42 bc	13.08 abc	3.17 a	1.17 ab	0.00 a	50.9 bcd
Dwight + Cobalt	No	13	1.17 b	0.83 a	3.00 b	12.08 b	26.25 ab	5.17 a	0.33 ab	2.58 a	53.2 a–d
LD05-16657a + Cobalt	Yes[6]	13	0.00 b	0.00 a	0.42 b	4.00 bc	9.83 bc	0.67 a	1.33 ab	0.00 a	55.8 abc
LD06-16721a + Cobalt	Yes[6]	13	0.33 b	0.00 a	1.58 b	6.17 bc	4.75 c	8.00 a	8.58 ab	0.08 a	49.4 bcd
LD02-4485 + Cobalt	No	13	0.92 b	0.25 a	11.42 a	21.25 a	31.67 a	7.58 a	0.50 ab	0.00 a	55.1 abc
LD08-12441a + Cobalt	Yes[7]	13	0.00 b	0.00 a	1.17 b	2.17 c	5.42 bc	0.00 a	0.00 b	0.00 a	47.0 d
LD08-12582a + Cobalt	Yes[7]	13	0.83 b	0.08 a	0.92 b	1.08 c	2.33 c	4.33 a	1.25 ab	0.75 a	49.1 cd

[1] Rates of application for foliar insecticide are ounces (oz) of product per acre.
[2] Means were derived from the numbers of soybean aphids on three plants in each subplot in each of four replications.
[3] Means for the same date and followed by the same letter do not differ significantly (*P* = 0.1, Duncan's New Multiple Range Test).
[4] Soybeans were harvested from the center two rows of each subplot and converted to bushels per acre (bu/A) at 13% moisture.
[5] Means followed by the same letter do not differ significantly (*P* = 0.1, Duncan's New Multiple Range Test).
[6] Resistance was conferred by the *Rag1* gene.
[7] Resistance was conferred by the *Rag2* gene.

APPENDIX I • References Cited

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Ragsdale, D. W., B. P. McCornack, R. C. Venette, B. D. Potter, I. V. MacRae, E. W. Hodgson, M. E. O'Neal, K. D. Johnson, R. J. O'Neil, C. D. DiFonzo, T. E. Hunt, P. A. Glogoza, and E. M. Cullen. 2007. Economic threshold for soybean aphid (Hemiptera: Aphididae). Journal of Economic Entomology 100: 1258–1267.

Node-injury Scale (from Oleson et al. 2005)

0.0 No feeding damage

1.0 One node (circle of roots), or the equivalent of an entire node, pruned back to within approximately 3.8 cm (1.5 in) of the stalk (or soil line if roots originate from above ground nodes)

2.0 Two complete nodes pruned

3.0 Three or more complete nodes pruned (highest rating that can be given)

Damage in between complete nodes pruned is noted as the percentage of the node missing, e.g., 1.50 = 1 ½ nodes pruned.

For a complete explanation of the node-injury scale and a comparison with the Iowa State University 1-to-6 root rating scale (Hills and Peters 1971), visit the "Interactive Node-Injury Scale" Web site, *http://www.ent.iastate.edu/pest/rootworm/nodeinjury/nodeinjury.html*.

APPENDIX II • Common Names of Pesticides

Product name	Common name
Aztec 2.1G	tebupirimphos + cyfluthrin
Aztec 4.67G	tebupirimphos + cyfluthrin
Baythroid XL	beta-cyfluthrin
Belay	clothianidin
Brigade 2EC	bifenthrin
Brigadier	bifenthrin + imidacloprid
Cobalt	chlorpyrifos + gamma-cyhalothrin
Counter 20G	terbufos
Declare	gamma-cyhalothrin
Endigo ZC	lambda-cyhalothrin + thiamethoxam
Force 2.1CS	tefluthrin
Force 3G	tefluthrin
Hero	zeta-cypermethrin + bifenthrin
Lorsban 15G	chlorpyrifos
Lorsban 4E	chlorpyrifos
Mustang Max	zeta-cypermethrin
Nufos 4E	chlorpyrifos
SmartChoice 5G	chlorethoxyfos + bifenthrin
Warrior	lambda-cyhalothrin
Warrior II	lambda-cyhalothrin

APPENDIX III • Temperature and Precipitation

2010 Daily Weather Data for DeKalb, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
April 1	0.00	63
April 2	0.00	67
April 3	0.09	65
April 4	0.15	50
April 5	1.06	59
April 6	0.90	59
April 7	0.23	62
April 8	0.06	43
April 9	0.00	36
April 10	0.00	45
April 11	0.00	58
April 12	0.00	57
April 13	0.01	61
April 14	0.00	60
April 15	0.00	66
April 16	0.00	70
April 17	0.00	51
April 18	0.00	47
April 19	0.00	48
April 20	0.00	48
April 21	0.00	52
April 22	0.00	55
April 23	0.00	53
April 24	0.20	53
April 25	0.74	57
April 26	0.02	52
April 27	0.00	51
April 28	0.00	45
April 29	0.00	51
April 30	T	65
Total	**3.46**	—

M = Missing
T = Trace

2010 Daily Weather Data for DeKalb, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
May 1	0.10	68
May 2	0.11	62
May 3	0.00	59
May 4	0.00	59
May 5	0.00	66
May 6	T	57
May 7	1.02	56
May 8	0.15	49
May 9	0.01	42
May 10	0.00	48
May 11	0.87	51
May 12	0.31	48
May 13	2.41	48
May 14	0.05	59
May 15	0.00	56
May 16	0.00	54
May 17	0.01	58
May 18	0.00	56
May 19	0.00	59
May 20	0.00	63
May 21	0.30	64
May 22	0.02	63
May 23	0.00	67
May 24	0.06	78
May 25	0.00	82
May 26	0.25	77
May 27	0.00	76
May 28	0.00	70
May 29	0.00	72
May 30	0.00	77
May 31	0.00	80
Total	**5.67**	—

M = Missing
T = Trace

2010 Daily Weather Data for DeKalb, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
June 1	0.02	71
June 2	0.45	75
June 3	0.02	67
June 4	T	66
June 5	0.01	70
June 6	0.34	67
June 7	0.12	66
June 8	0.05	66
June 9	0.34	64
June 10	0.00	69
June 11	T	69
June 12	0.00	78
June 13	0.58	71
June 14	0.78	66
June 15	0.00	66
June 16	0.06	67
June 17	0.00	71
June 18	0.45	72
June 19	1.16	75
June 20	0.00	74
June 21	0.00	75
June 22	0.09	75
June 23	0.09	77
June 24	0.56	74
June 25	0.00	73
June 26	0.32	76
June 27	0.00	78
June 28	1.09	75
June 29	0.00	70
June 30	0.00	65
Total	**6.53**	**—**

M = Missing
T = Trace

2010 Daily Weather Data for DeKalb, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
July 1	0.00	65
July 2	0.00	68
July 3	0.00	71
July 4	0.00	74
July 5	0.06	79
July 6	0.01	80
July 7	0.16	80
July 8	0.55	80
July 9	0.00	76
July 10	0.00	75
July 11	0.00	77
July 12	0.80	73
July 13	0.04	72
July 14	0.00	77
July 15	0.00	81
July 16	0.00	75
July 17	0.00	78
July 18	0.00	81
July 19	0.00	78
July 20	T	73
July 21	0.00	76
July 22	T	78
July 23	0.23	80
July 24	4.67	80
July 25	0.14	76
July 26	0.00	71
July 27	0.00	75
July 28	0.00	78
July 29	T	75
July 30	T	73
July 31	0.26	71
Total	**6.92**	**—**

M = Missing
T = Trace

2010 Daily Weather Data for DeKalb, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
August 1	0.02	70
August 2	0.00	74
August 3	1.12	75
August 4	0.54	78
August 5	0.45	75
August 6	0.00	71
August 7	0.00	71
August 8	0.00	75
August 9	0.17	77
August 10	T	80
August 11	0.01	80
August 12	0.00	81
August 13	0.00	81
August 14	0.44	80
August 15	0.00	79
August 16	0.00	71
August 17	0.00	70
August 18	0.09	64
August 19	0.00	71
August 20	0.00	76
August 21	T	79
August 22	0.00	75
August 23	0.00	73
August 24	0.00	72
August 25	0.00	70
August 26	0.00	65
August 27	0.00	66
August 28	0.00	71
August 29	0.00	75
August 30	0.00	80
August 31	0.12	77
Total	**2.96**	—

M = Missing
T = Trace

2010 Daily Weather Data for DeKalb, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
September 1	0.12	80
September 2	T	74
September 3	0.87	70
September 4	T	59
September 5	0.00	58
September 6	0.01	64
September 7	T	71
September 8	0.00	62
September 9	0.00	61
September 10	0.00	59
September 11	0.06	65
September 12	0.01	65
September 13	0.00	69
September 14	0.00	68
September 15	0.00	67
September 16	0.00	67
September 17	T	58
September 18	0.00	64
September 19	0.21	59
September 20	0.10	60
September 21	0.19	70
September 22	0.23	76
September 23	0.01	68
September 24	0.19	76
September 25	T	58
September 26	0.04	52
September 27	0.00	52
September 28	0.00	54
September 29	0.00	60
September 30	0.00	65
Total	**2.04**	—

M = Missing
T = Trace

2010 Daily Weather Data for DeKalb, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
October 1	0.00	58
October 2	0.15	59
October 3	T	46
October 4	0.00	46
October 5	0.00	49
October 6	0.00	53
October 7	0.00	62
October 8	0.00	62
October 9	0.00	64
October 10	0.00	72
October 11	0.00	71
October 12	0.00	67
October 13	T	67
October 14	0.00	52
October 15	0.00	53
October 16	0.00	53
October 17	0.00	56
October 18	0.00	54
October 19	0.00	47
October 20	0.00	46
October 21	T	54
October 22	0.00	44
October 23	0.00	49
October 24	1.03	59
October 25	0.16	60
October 26	0.37	62
October 27	0.03	55
October 28	T	50
October 29	0.00	36
October 30	0.00	39
October 31	0.00	47
Total	**1.74**	—

M = Missing
T = Trace

2010 Daily Weather Data for Monmouth, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
April 1	0.00	65
April 2	0.00	69
April 3	0.00	61
April 4	0.00	52
April 5	1.04	61
April 6	0.00	59
April 7	0.25	65
April 8	0.11	49
April 9	T	41
April 10	0.00	52
April 11	0.00	60
April 12	0.00	60
April 13	0.00	66
April 14	0.00	68
April 15	0.00	68
April 16	0.19	69
April 17	0.00	50
April 18	0.00	50
April 19	0.00	53
April 20	0.00	52
April 21	0.00	56
April 22	T	58
April 23	0.14	60
April 24	0.00	54
April 25	0.00	59
April 26	2.00	52
April 27	0.09	52
April 28	0.00	50
April 29	0.00	56
April 30	0.00	70
Total	**3.82**	**—**

M = Missing
T = Trace

2010 Daily Weather Data for Monmouth, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
May 1	0.00	66
May 2	0.00	59
May 3	0.76	59
May 4	0.00	58
May 5	0.00	65
May 6	0.00	58
May 7	1.65	60
May 8	0.01	51
May 9	0.00	43
May 10	0.00	52
May 11	1.16	53
May 12	0.00	51
May 13	2.69	54
May 14	0.05	58
May 15	0.00	56
May 16	0.00	59
May 17	0.79	56
May 18	0.06	57
May 19	0.00	60
May 20	0.00	65
May 21	1.04	60
May 22	0.53	64
May 23	0.00	72
May 24	0.00	79
May 25	0.00	79
May 26	2.68	76
May 27	0.00	75
May 28	0.00	71
May 29	0.00	70
May 30	0.00	78
May 31	0.00	79
Total	**11.42**	**—**

M = Missing
T = Trace

2010 Daily Weather Data for Monmouth, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
June 1	0.47	72
June 2	3.29	75
June 3	0.11	72
June 4	0.01	71
June 5	0.00	76
June 6	0.00	69
June 7	2.30	69
June 8	0.05	70
June 9	0.50	70
June 10	0.00	72
June 11	0.03	74
June 12	0.00	80
June 13	0.00	75
June 14	1.85	75
June 15	0.03	76
June 16	0.06	69
June 17	0.00	74
June 18	0.03	76
June 19	0.00	78
June 20	0.00	78
June 21	1.28	79
June 22	0.37	74
June 23	0.19	77
June 24	1.00	76
June 25	0.00	74
June 26	0.00	77
June 27	0.00	79
June 28	0.66	75
June 29	0.02	70
June 30	0.00	68
Total	**12.25**	**—**

M = Missing
T = Trace

2010 Daily Weather Data for Monmouth, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
July 1	0.00	68
July 2	0.00	68
July 3	M	69
July 4	M	74
July 5	M	78
July 6	0.61	79
July 7	0.07	78
July 8	0.85	78
July 9	0.00	76
July 10	M	73
July 11	M	75
July 12	0.02	71
July 13	0.20	75
July 14	0.00	76
July 15	0.00	84
July 16	0.02	74
July 17	M	75
July 18	M	80
July 19	0.06	75
July 20	M	70
July 21	0.01	76
July 22	0.00	80
July 23	0.00	82
July 24	0.85	83
July 25	0.00	75
July 26	0.00	76
July 27	0.00	75
July 28	0.00	82
July 29	0.00	77
July 30	0.00	74
July 31	0.00	74
Total	**2.69**	**—**

M = Missing
T = Trace

2010 Daily Weather Data for Monmouth, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
August 1	0.00	76
August 2	0.00	77
August 3	0.12	77
August 4	M	82
August 5	M	74
August 6	0.03	72
August 7	M	70
August 8	M	73
August 9	0.17	79
August 10	0.01	80
August 11	0.25	80
August 12	M	78
August 13	M	80
August 14	M	79
August 15	M	79
August 16	0.80	71
August 17	0.00	74
August 18	0.20	67
August 19	0.00	74
August 20	0.00	80
August 21	M	78
August 22	M	75
August 23	0.42	74
August 24	0.00	72
August 25	0.00	68
August 26	0.00	65
August 27	0.00	68
August 28	0.00	70
August 29	0.00	76
August 30	0.00	79
August 31	0.00	78
Total	**2.00**	—

M = Missing
T = Trace

2010 Daily Weather Data for Monmouth, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
September 1	1.27	76
September 2	0.13	72
September 3	1.12	70
September 4	0.00	60
September 5	0.00	59
September 6	0.00	65
September 7	0.00	72
September 8	0.00	61
September 9	0.00	66
September 10	0.00	66
September 11	0.41	61
September 12	0.00	64
September 13	0.00	68
September 14	0.00	69
September 15	0.00	69
September 16	T	69
September 17	0.00	56
September 18	0.00	63
September 19	M	62
September 20	0.00	63
September 21	0.00	76
September 22	0.50	75
September 23	T	72
September 24	0.22	72
September 25	0.00	59
September 26	0.00	53
September 27	M	51
September 28	0.00	57
September 29	0.00	61
September 30	0.00	64
Total	**3.65**	—

M = Missing
T = Trace

2010 Daily Weather Data for Monmouth, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
October 1	0.00	59
October 2	0.05	60
October 3	0.00	47
October 4	0.00	47
October 5	0.00	51
October 6	0.00	55
October 7	0.00	60
October 8	0.00	61
October 9	0.00	68
October 10	0.00	68
October 11	0.00	68
October 12	0.00	66
October 13	0.02	66
October 14	0.00	51
October 15	0.00	52
October 16	0.00	52
October 17	0.00	60
October 18	0.00	55
October 19	0.00	48
October 20	0.00	50
October 21	0.00	54
October 22	0.00	47
October 23	0.00	52
October 24	0.00	61
October 25	M	58
October 26	0.92	54
October 27	T	49
October 28	0.00	50
October 29	0.00	35
October 30	0.00	40
October 31	0.00	50
Total	**0.99**	—

M = Missing
T = Trace

2010 Daily Weather Data for Morrison, Illinois (Vantage Point Network)

Date	Precipitation (inches)	Mean Temperature (°F)
April 1	0.00	68
April 2	0.27	64
April 3	0.06	54
April 4	0.52	56
April 5	0.11	58
April 6	0.37	64
April 7	0.22	52
April 8	0.02	41
April 9	0.00	46
April 10	0.00	55
April 11	0.00	57
April 12	0.00	62
April 13	0.00	62
April 14	0.00	68
April 15	0.00	70
April 16	0.00	60
April 17	0.00	50
April 18	0.00	49
April 19	0.00	51
April 20	0.00	53
April 21	0.05	57
April 22	0.00	54
April 23	0.14	54
April 24	0.49	58
April 25	0.16	54
April 26	0.00	55
April 27	0.00	50
April 28	0.00	54
April 29	0.00	66
April 30	0.04	70
Total	**2.45**	**—**

M = Missing
T = Trace

2010 Daily Weather Data for Morrison, Illinois (Vantage Point Network)

Date	Precipitation (inches)	Mean Temperature (°F)
May 1	0.05	62
May 2	0.07	61
May 3	0.00	54
May 4	0.00	68
May 5	0.00	63
May 6	0.00	56
May 7	0.91	50
May 8	0.01	45
May 9	0.00	48
May 10	0.05	52
May 11	1.36	50
May 12	0.55	49
May 13	2.44	58
May 14	0.00	56
May 15	0.00	58
May 16	0.00	57
May 17	0.00	57
May 18	0.00	62
May 19	0.00	65
May 20	0.20	61
May 21	0.01	62
May 22	0.00	68
May 23	0.00	80
May 24	0.00	83
May 25	0.05	73
May 26	0.00	75
May 27	0.00	76
May 28	0.00	71
May 29	0.00	72
May 30	0.00	79
May 31	0.07	75
Total	**5.77**	**—**

M = Missing
T = Trace

2010 Daily Weather Data for Morrison, Illinois (Vantage Point Network)

Date	Precipitation (inches)	Mean Temperature (°F)
June 1	0.02	76
June 2	0.73	71
June 3	0.00	67
June 4	0.08	71
June 5	0.27	72
June 6	0.00	66
June 7	0.00	67
June 8	0.47	65
June 9	0.00	67
June 10	0.02	69
June 11	0.00	82
June 12	0.19	75
June 13	0.93	70
June 14	0.06	70
June 15	0.21	69
June 16	0.00	72
June 17	0.00	75
June 18	2.06	72
June 19	0.03	74
June 20	0.03	74
June 21	0.01	76
June 22	0.00	76
June 23	1.66	75
June 24	0.00	71
June 25	0.00	75
June 26	0.56	78
June 27	0.39	78
June 28	0.00	73
June 29	0.00	68
June 30	0.00	66
Total	**7.72**	**—**

M = Missing
T = Trace

2010 Daily Weather Data for Morrison, Illinois (Vantage Point Network)

Date	Precipitation (inches)	Mean Temperature (°F)
July 1	0.00	61
July 2	0.00	71
July 3	0.00	75
July 4	0.00	79
July 5	0.00	79
July 6	0.10	78
July 7	0.13	76
July 8	0.06	77
July 9	0.00	74
July 10	0.00	81
July 11	0.18	73
July 12	0.44	69
July 13	0.01	75
July 14	0.00	73
July 15	0.00	80
July 16	0.00	76
July 17	0.00	75
July 18	0.00	80
July 19	0.01	73
July 20	0.00	76
July 21	0.00	78
July 22	0.00	80
July 23	0.27	78
July 24	1.05	76
July 25	0.00	74
July 26	0.00	73
July 27	0.00	78
July 28	0.05	79
July 29	0.00	73
July 30	0.01	71
July 31	0.07	75
Total	**2.38**	**—**

M = Missing
T = Trace

2010 Daily Weather Data for Morrison, Illinois (Vantage Point Network)

Date	Precipitation (inches)	Mean Temperature (°F)
August 1	0.00	76
August 2	0.17	75
August 3	1.32	78
August 4	1.08	76
August 5	0.01	74
August 6	0.00	71
August 7	0.01	74
August 8	0.42	78
August 9	0.29	78
August 10	0.00	80
August 11	0.02	79
August 12	0.00	81
August 13	0.93	77
August 14	0.41	77
August 15	0.00	75
August 16	0.00	71
August 17	0.18	67
August 18	0.01	70
August 19	0.00	76
August 20	0.11	77
August 21	0.00	76
August 22	0.01	75
August 23	0.00	73
August 24	0.00	70
August 25	0.01	65
August 26	0.00	56
August 27	0.00	68
August 28	0.00	73
August 29	0.00	78
August 30	0.00	76
August 31	0.00	79
Total	**4.98**	**—**

M = Missing
T = Trace

2010 Daily Weather Data for Morrison, Illinois (Vantage Point Network)

Date	Precipitation (inches)	Mean Temperature (°F)
September 1	0.38	73
September 2	1.31	72
September 3	0.01	62
September 4	0.00	58
September 5	0.00	64
September 6	0.16	72
September 7	0.00	67
September 8	0.00	60
September 9	0.00	60
September 10	0.00	66
September 11	0.03	67
September 12	0.00	69
September 13	0.00	70
September 14	0.00	66
September 15	0.00	68
September 16	0.00	65
September 17	0.00	64
September 18	0.17	63
September 19	0.08	60
September 20	0.02	70
September 21	0.42	74
September 22	0.00	68
September 23	0.00	78
September 24	0.51	64
September 25	0.12	52
September 26	0.02	54
September 27	0.00	53
September 28	0.00	59
September 29	0.00	54
September 30	0.00	50
Total	**3.23**	**—**

M = Missing
T = Trace

2010 Daily Weather Data for Morrison, Illinois (Vantage Point Network)

Date	Precipitation (inches)	Mean Temperature (°F)
October 1	0.00	59
October 2	0.02	50
October 3	0.00	46
October 4	0.00	48
October 5	0.00	52
October 6	0.00	59
October 7	0.00	60
October 8	0.00	62
October 9	0.00	69
October 10	0.00	66
October 11	0.00	66
October 12	0.00	64
October 13	0.00	59
October 14	0.00	54
October 15	0.00	53
October 16	0.00	57
October 17	0.00	54
October 18	0.00	53
October 19	0.00	48
October 20	0.00	57
October 21	0.00	47
October 22	0.00	51
October 23	1.04	60
October 24	0.38	61
October 25	0.00	63
October 26	1.51	56
October 27	0.00	51
October 28	0.00	40
October 29	0.00	39
October 30	0.00	51
October 31	0.00	42
Total	**2.95**	**—**

M = Missing
T = Trace

2010 Daily Weather Data for Perry, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
April 1	0.00	68
April 2	0.00	71
April 3	1.41	62
April 4	0.01	53
April 5	0.15	61
April 6	0.50	65
April 7	0.15	71
April 8	0.04	55
April 9	0.00	44
April 10	0.00	55
April 11	0.00	65
April 12	0.00	61
April 13	0.00	66
April 14	0.00	66
April 15	0.00	68
April 16	0.00	71
April 17	0.00	54
April 18	0.00	50
April 19	0.00	53
April 20	0.00	52
April 21	0.00	54
April 22	0.07	56
April 23	0.37	63
April 24	0.83	64
April 25	1.76	61
April 26	0.06	52
April 27	0.23	54
April 28	0.00	51
April 29	0.00	58
April 30	0.00	69
Total	**5.58**	**—**

M = Missing
T = Trace

2010 Daily Weather Data for Perry, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
May 1	0.26	69
May 2	0.15	60
May 3	0.16	60
May 4	0.00	60
May 5	0.00	65
May 6	0.00	62
May 7	0.00	63
May 8	0.00	62
May 9	0.00	45
May 10	0.00	53
May 11	2.41	57
May 12	0.02	60
May 13	0.40	63
May 14	0.07	61
May 15	0.00	61
May 16	0.05	56
May 17	1.30	57
May 18	0.06	55
May 19	0.00	60
May 20	0.00	61
May 21	0.69	57
May 22	0.07	63
May 23	0.00	74
May 24	0.00	80
May 25	0.00	78
May 26	0.00	78
May 27	0.00	76
May 28	0.00	72
May 29	0.00	71
May 30	0.00	77
May 31	0.00	79
Total	**5.64**	**—**

M = Missing
T = Trace

2010 Daily Weather Data for Perry, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
June 1	0.05	75
June 2	1.06	76
June 3	0.00	72
June 4	0.00	75
June 5	0.29	77
June 6	0.04	73
June 7	0.00	73
June 8	0.00	75
June 9	2.21	76
June 10	0.00	75
June 11	0.00	74
June 12	0.00	76
June 13	0.14	78
June 14	1.30	78
June 15	0.00	78
June 16	0.60	76
June 17	0.00	77
June 18	0.02	77
June 19	2.09	78
June 20	0.09	78
June 21	1.60	81
June 22	0.66	78
June 23	0.20	78
June 24	0.06	78
June 25	0.00	77
June 26	0.00	78
June 27	0.00	84
June 28	1.10	79
June 29	0.00	75
June 30	0.00	73
Total	**11.51**	**—**

M = Missing
T = Trace

2010 Daily Weather Data for Perry, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
July 1	0.00	73
July 2	0.00	72
July 3	0.00	72
July 4	0.00	78
July 5	0.00	77
July 6	0.45	80
July 7	0.17	78
July 8	1.62	79
July 9	0.00	79
July 10	0.01	77
July 11	0.00	78
July 12	0.00	76
July 13	0.00	77
July 14	0.00	81
July 15	0.00	86
July 16	0.00	78
July 17	0.00	79
July 18	0.41	82
July 19	0.00	79
July 20	4.00	79
July 21	0.13	78
July 22	0.00	80
July 23	0.00	83
July 24	0.00	86
July 25	3.90	81
July 26	0.00	77
July 27	0.00	78
July 28	0.00	80
July 29	0.96	79
July 30	0.00	78
July 31	0.19	78
Total	**11.84**	**—**

M = Missing
T = Trace

2010 Daily Weather Data for Perry, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
August 1	0.00	76
August 2	0.00	77
August 3	0.00	77
August 4	0.00	85
August 5	0.00	84
August 6	0.00	80
August 7	0.00	75
August 8	0.00	76
August 9	0.00	83
August 10	0.00	84
August 11	0.04	84
August 12	0.00	83
August 13	0.00	84
August 14	0.00	82
August 15	0.00	81
August 16	0.00	72
August 17	0.00	74
August 18	0.03	74
August 19	0.03	75
August 20	0.00	82
August 21	0.91	80
August 22	0.00	75
August 23	0.00	74
August 24	0.00	73
August 25	0.00	69
August 26	0.00	65
August 27	0.00	66
August 28	0.00	69
August 29	0.00	76
August 30	0.00	79
August 31	0.01	76
Total	**1.02**	—

M = Missing
T = Trace

2010 Daily Weather Data for Perry, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
September 1	0.70	78
September 2	0.02	73
September 3	0.06	70
September 4	M	M
September 5	M	M
September 6	M	M
September 7	0.00	72
September 8	0.00	64
September 9	0.00	66
September 10	0.02	64
September 11	M	M
September 12	0.00	66
September 13	0.00	69
September 14	T	75
September 15	0.00	72
September 16	0.00	71
September 17	0.00	58
September 18	M	M
September 19	M	M
September 20	0.00	70
September 21	0.00	78
September 22	1.39	75
September 23	0.00	71
September 24	0.24	75
September 25	M	M
September 26	M	M
September 27	0.00	51
September 28	0.00	56
September 29	0.00	61
September 30	0.00	65
Total	**2.43**	—

M = Missing
T = Trace

2010 Daily Weather Data for Perry, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
October 1	M	M
October 2	0.10	60
October 3	0.00	50
October 4	0.00	47
October 5	0.00	48
October 6	0.00	53
October 7	M	M
October 8	0.00	58
October 9	0.00	66
October 10	0.00	67
October 11	0.00	69
October 12	0.00	68
October 13	0.00	66
October 14	0.00	53
October 15	0.00	56
October 16	0.00	52
October 17	0.00	62
October 18	0.00	58
October 19	0.01	50
October 20	0.00	50
October 21	0.00	56
October 22	0.01	49
October 23	1.20	60
October 24	0.16	63
October 25	0.01	63
October 26	0.56	63
October 27	0.00	56
October 28	0.01	53
October 29	0.00	38
October 30	0.00	44
October 31	0.00	52
Total	**2.06**	**—**

M = Missing
T = Trace

2010 Daily Weather Data for Urbana, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
April 1	0.00	65
April 2	0.00	66
April 3	0.39	51
April 4	0.27	58
April 5	T	63
April 6	0.02	69
April 7	0.01	59
April 8	0.15	45
April 9	0.00	46
April 10	0.00	56
April 11	0.00	62
April 12	0.00	63
April 13	0.00	66
April 14	0.00	68
April 15	0.00	67
April 16	0.00	61
April 17	0.01	49
April 18	0.00	51
April 19	0.00	50
April 20	0.00	56
April 21	0.00	57
April 22	0.08	58
April 23	0.01	57
April 24	0.19	63
April 25	0.30	56
April 26	0.65	57
April 27	0.00	51
April 28	0.00	49
April 29	0.00	60
April 30	0.00	69
Total	**2.08**	**—**

M = Missing
T = Trace

2010 Daily Weather Data for Urbana, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
May 1	0.12	69
May 2	0.78	63
May 3	0.00	62
May 4	0.04	62
May 5	0.00	68
May 6	0.00	60
May 7	0.00	65
May 8	T	46
May 9	0.00	48
May 10	0.00	53
May 11	0.90	59
May 12	0.19	61
May 13	0.11	70
May 14	0.02	60
May 15	0.00	58
May 16	0.02	58
May 17	0.48	53
May 18	0.33	58
May 19	0.00	62
May 20	0.00	57
May 21	0.31	66
May 22	0.06	69
May 23	0.00	75
May 24	0.00	79
May 25	0.00	77
May 26	0.00	77
May 27	0.02	75
May 28	0.00	72
May 29	0.00	77
May 30	0.00	78
May 31	0.03	76
Total	**3.41**	**—**

M = Missing
T = Trace

2010 Daily Weather Data for Urbana, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
June 1	0.12	74
June 2	0.54	71
June 3	0.00	73
June 4	0.00	74
June 5	0.07	78
June 6	0.51	69
June 7	0.00	68
June 8	T	69
June 9	1.35	74
June 10	0.00	72
June 11	0.00	79
June 12	0.10	79
June 13	0.46	76
June 14	1.01	76
June 15	0.72	77
June 16	0.48	74
June 17	0.00	74
June 18	0.15	79
June 19	1.11	76
June 20	0.00	79
June 21	0.03	81
June 22	1.03	76
June 23	0.26	79
June 24	0.30	75
June 25	0.00	74
June 26	0.00	79
June 27	0.00	80
June 28	0.09	78
June 29	0.00	70
June 30	0.00	68
Total	**8.33**	—

M = Missing
T = Trace

2010 Daily Weather Data for Urbana, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
July 1	0.00	68
July 2	0.00	69
July 3	0.00	72
July 4	0.00	77
July 5	0.10	78
July 6	0.00	79
July 7	0.00	81
July 8	T	80
July 9	0.02	78
July 10	0.00	75
July 11	T	73
July 12	T	77
July 13	0.00	77
July 14	0.37	80
July 15	0.00	82
July 16	0.68	76
July 17	0.00	79
July 18	0.10	76
July 19	0.00	76
July 20	1.17	75
July 21	0.06	78
July 22	0.43	80
July 23	T	84
July 24	0.00	82
July 25	0.76	76
July 26	0.00	76
July 27	0.00	79
July 28	0.00	81
July 29	0.06	78
July 30	0.00	74
July 31	T	76
Total	**3.75**	—

M = Missing
T = Trace

2010 Daily Weather Data for Urbana, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
August 1	0.00	73
August 2	0.00	74
August 3	0.00	82
August 4	0.00	85
August 5	0.29	80
August 6	0.00	74
August 7	0.00	73
August 8	0.00	76
August 9	0.00	81
August 10	0.01	85
August 11	0.11	84
August 12	0.00	84
August 13	0.00	83
August 14	0.27	80
August 15	0.00	79
August 16	0.00	74
August 17	0.00	71
August 18	T	76
August 19	0.00	77
August 20	0.00	80
August 21	0.92	77
August 22	0.00	78
August 23	0.00	75
August 24	0.00	75
August 25	0.00	73
August 26	0.00	69
August 27	0.00	70
August 28	0.00	74
August 29	0.00	81
August 30	0.00	76
August 31	0.04	79
Total	**1.64**	—

M = Missing
T = Trace

2010 Daily Weather Data for Urbana, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
September 1	0.12	75
September 2	0.95	76
September 3	0.79	67
September 4	0.00	62
September 5	0.00	64
September 6	0.00	71
September 7	0.00	69
September 8	0.00	65
September 9	0.00	65
September 10	0.00	64
September 11	0.18	69
September 12	0.00	68
September 13	0.00	72
September 14	0.00	73
September 15	0.00	72
September 16	0.09	66
September 17	0.00	65
September 18	0.00	67
September 19	0.06	69
September 20	0.00	76
September 21	0.00	78
September 22	0.10	72
September 23	0.62	77
September 24	0.07	67
September 25	0.01	59
September 26	0.20	56
September 27	0.01	56
September 28	0.00	60
September 29	0.00	64
September 30	0.00	65
Total	**3.20**	—

M = Missing
T = Trace

2010 Daily Weather Data for Urbana, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
October 1	0.00	61
October 2	0.18	52
October 3	0.03	51
October 4	0.00	49
October 5	0.00	53
October 6	0.00	61
October 7	0.00	66
October 8	0.00	62
October 9	0.00	67
October 10	0.00	68
October 11	0.00	69
October 12	0.00	68
October 13	0.00	57
October 14	0.28	53
October 15	0.00	54
October 16	0.00	56
October 17	0.00	60
October 18	0.00	51
October 19	T	51
October 20	0.00	53
October 21	0.00	49
October 22	0.00	50
October 23	0.00	68
October 24	0.07	67
October 25	0.16	65
October 26	0.38	60
October 27	0.00	57
October 28	0.00	40
October 29	0.00	40
October 30	0.00	48
October 31	0.00	47
Total	**1.10**	**—**

M = Missing
T = Trace