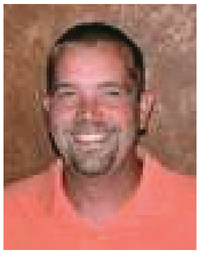
Since its inception in 1984, the University of Illinois Insect Management and Insecticide Evaluation Program has provided the producers of Illinois complete and informative evaluations of registered insecticides and new chemical and transgenic tools for the management of insect pests in Illinois. It 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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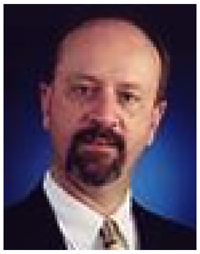

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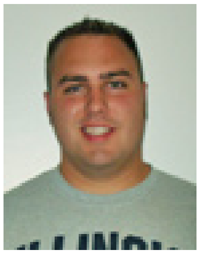

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APPENDICES

SECTION 1

Evaluation of products to control corn rootworm larvae *(Diabrotica spp.)* in Illinois, 2008

Ronald E. Estes, Kevin L. Steffey, Joshua R. Heeren, Nicholas A. Tinsley, 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. 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 16 July at Monmouth and Perry, and on 22 and 29 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). Percentage consistency 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) was determined for each product at each location. Five randomly selected root systems were extracted from a subset of treatments again on 11 August at Dekalb and on 12 August at Monmouth, Perry, and Urbana to assess late-season rootworm injury. Root systems were washed and rated (0 to 3 node-injury scale) for corn rootworm larval injury.

Although all trials were planted with the intention of obtaining yield estimates from all four-row plots, we were unable to resolve issues associated with planting and harvesting problems caused by weather and equipment. The yield estimates we obtained from the four sites correlated very poorly with levels of rootworm injury. For example, the coefficients of determination (R^2) for yields and node injury ratings at the DeKalb and Urbana sites were 0.11 and 0.14, respectively. Consequently, we elected not to publish yield data collected from these trials in 2008.

TABLE 1.1 • Agronomic information for efficacy trials with products to control corn rootworm larvae, University of Illinois, 2008

	DeKalb	Monmouth	Perry	Urbana
Planting date	5 May	23 April	30 April	24 April
Root evaluation dates	29 July 11 August	16 July 12 August	16 July 12 August	22 July 12 August
Hybrids[1]	DKC63-42 VT3 DKC63-46 YGCB/RR2 DKC61-69 VT3 DKC61-72 RR2 Pioneer 34P94 HxXTRA Pioneer 34P89 HxI Pioneer 32T85 HxXTRA Pioneer 32T84 HxI Mycogen 2T789 HxXTRA Mycogen 2T777 RR2	DKC63-42 VT3 DKC63-46 YGCB/RR2 DKC61-69 VT3 DKC61-72 RR2 Pioneer 34P94 HxXTRA Pioneer 34P89 HxI Pioneer 32T85 HxXTRA Pioneer 32T84 HxI Mycogen 2T789 HxXTRA Mycogen 2T777 RR2	DKC63-42 VT3 DKC63-46 YGCB/RR2 DKC61-69 VT3 DKC61-72 RR2 Pioneer 34P94 HxXTRA Pioneer 34P89 HxI Pioneer 32T85 HxXTRA Pioneer 32T84 HxI Mycogen 2T789 HxXTRA Mycogen 2T777 RR2	DKC63-42 VT3 DKC63-46 YGCB/RR2 DKC61-69 VT3 DKC61-72 RR2 Pioneer 34P94 HxXTRA Pioneer 34P89 HxI Pioneer 32T85 HxXTRA Pioneer 32T84 HxI Mycogen 2T789 HxXTRA Mycogen 2T777 RR2
Row spacing	30 inches	30 inches	30 inches	30 inches
Seeding rate	33,000/acre	33,000/acre	33,000/acre	33,000/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—field cultivator	Fall—chisel plow Spring—field cultivator	Fall—chisel plow Spring—field cultivator	Fall—chisel plow Spring—field cultivator

[1] All seed-applied insecticides and soil insecticides were applied to Pioneer 34P89 (the non-rootworm trait isoline of Pioneer 34P94 HxXTRA), unless otherwise indicated.

Planting and Insecticide Application

Trials were planted on 23, 24, and 30 April, and on 5 May at Monmouth, Urbana, Perry, and DeKalb, respectively. All trials were planted using a four-row, Almaco constructed planter with John Deere 7300 row units with Precision Planting finger pick-up style metering units. 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. Liquid insecticides were applied at a spray volume of 5 gal per acre using a CO_2 system. All insecticides were applied in front of the firming wheels on the planter. 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 numbers, are listed in Appendix II.

Agronomic Information

Agronomic information for all four trials 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 7.4.2. (Copyright© 1982–2008 Gylling Data Management, Inc., Brookings, SD).

Results and Discussion

DeKalb—Mean node-injury ratings and consistency percentages for rootworm injury evaluations on 16 July are presented in Table 1.2. Mean node-injury ratings in the untreated checks (UTCs) were 2.88 (DKC61-72), 2.89 (DKC63-46), 3.00 (Mycogen 2T777), 3.00 (Pioneer 32T84), and 3.00 (Pioneer 34P89), indicating corn rootworm larval feeding was extreme in the trial. Mean node-injury ratings for plots treated with Cobalt, Poncho 1250, or EXP 5B seed treatment did not differ significantly from the node-injury ratings for any of the untreated check plots. In addition, node-injury ratings for the following treatments were near or exceeded 1.0: Counter 15G (DKC63-46), Force 2.25CS (0.46 oz), Fortress 5G, Lorsban 15G, HxXTRA (Mycogen 2T789 and Pioneer 34P94), YieldGard VT (DKC61-69 and DKC63-42), and Counter 15G + YieldGard VT (DKC63-42).

The application of Force 2.25CS or Fortress 5G on top of rootworm Bt hybrids significantly reduced the amount of injury caused by corn rootworm larvae to the corresponding Bt hybrid not treated with soil insecticides. The percentages of roots with a node-injury rating <1.0 were 95% or greater in plots treated with Aztec 2.1G (Mycogen 2T77, DKC61-72, and Pioneer 32T84), and EXP 5A + Aztec 2.1G. Additionally, plots of rootworm Bt hybrids that were treated with either Force 2.25CS or Fortress 5G also had 95% or greater consistency.

Percentages of roots with a node-injury rating <0.25 were 95% or greater in only three of the thirty treatments in the trial: Force 2.25CS (0.34 oz) + HxXTRA (Pioneer 34P94), Force

TABLE 1.2 • Evaluation of products to control corn rootworm larvae, DeKalb, University of Illinois, 2008

Product[1]	Rate[2,3]	Placement[2,3]	Mean node-injury rating[4,5,6,7] 16 July	% consistency <1.0[8]	% consistency <0.25[9]
Soil- and seed-applied insecticides					
Aztec 2.1G (Mycogen 2T777[10])	6.7	Band	0.24 hij	95%	50%
Aztec 2.1G (DKC61-72[11])	6.7	Band	0.33 hij	100%	40%
Aztec 2.1G (Pioneer 32T84[11])	6.7	Band	0.33 hij	100%	37%
Aztec 2.1G[11]	6.7	Band	0.79 efg	68%	5%
Cobalt	3	Furrow	2.90 a	0%	0%

Table 1.2 continued on page 6

TABLE 1.2 • continued

Counter 15G (DKC63-46[11])	8	SB furrow[12]	1.46 bcd	32%	5%
EXP 4A + Aztec 2.1G	N/A 6.7	Seed Band	0.58 fgh	80%	5%
EXP 5A + Aztec 2.1G	N/A 6.7	Seed Band	0.49 ghi	95%	15%
EXP 5B	N/A	Seed	2.61 a	5%	0%
EXP 7	N/A	Seed	0.67 fgh	65%	20%
Force 2.25CS	0.46	Band	1.06 c-f	35%	0%
Fortress 5G	4	SB furrow[12]	1.88 b	7%	0%
Lorsban 15G	8	Band	1.55 bc	21%	0%
Poncho 1250	1.25	Seed	2.85 a	0%	0%
Rootworm Bt corn hybrids					
HxXTRA (Mycogen 2T789[10])	—	—	0.97 d-g	53%	21%
HxXTRA (Pioneer 32T85[11])	—	—	0.65 fgh	68%	53%
HxXTRA (Pioneer 34P94[11])	—	—	1.01 d-g	42%	21%
YieldGard VT (DKC61-69[11])	—	—	1.20 cde	35%	10%
YieldGard VT (DKC63-42[11])	—	—	1.17 cde	25%	0%
Soil insecticides + rootworm Bt corn hybrids					
Counter 15G + YieldGard VT (DKC63-42[11])	6	SB furrow[12]	0.94 d-g	40%	15%
Force 2.25CS + HxXTRA (Pioneer 34P94[11])	0.34	Band	0.07 j	100%	95%
Force 2.25CS + HxXTRA (Pioneer 34P94[11])	0.46	Band	0.04 j	100%	100%
Force 2.25CS + YieldGard VT (DKC63-42[11])	0.34	Band	0.05 j	100%	95%
Force 2.25CS + YieldGard VT (DKC63-42[11])	0.46	Band	0.18 ij	95%	75%
Fortress 5G + HxXTRA (Pioneer 34P94[11])	3	SB furrow[12]	0.13 ij	100%	80%
Untreated checks (UTCs)					
DKC61-72[11]	—	—	2.88 a	0%	0%
DKC63-46[11]	—	—	2.89 a	0%	0%
Mycogen 2T777[10]	—	—	3.00 a	0%	0%
Pioneer 32T84[11]	—	—	3.00 a	0%	0%
Pioneer 34P89	—	—	3.00 a	0%	0%

[1] All seed-applied insecticides and soil insecticides were applied to Pioneer 34P89, the near-isoline of Pioneer 34P94, unless otherwise indicated.
[2] Rates of application for band and furrow placements are ounces (oz) of product per 1,000 ft of row.
[3] Rates of application for seed treatments are milligrams (mg) of active ingredient (a.i.) per seed.
[4] Mean node-injury ratings are based on the 0 to 3 node-injury scale (Oleson et al. 2005, Appendix I).
[5] Mean node-injury ratings were derived from five root systems per treatment in each of four replications.
[6] Data were transformed (square root transformation) for analysis; actual means are shown.
[7] Means followed by the same letter do not differ significantly ($P = 0.05$, Duncan's New Multiple Range Test).
[8] Percentage of roots with a node-injury rating <1.0.
[9] Percentage of roots with a node-injury rating <0.25.
[10] Seed treated with Cruiser 250, 0.25 milligrams (mg) of active ingredient (a.i.) per seed.
[11] Seed treated with Poncho 250, 0.25 milligrams (mg) of active ingredient (a.i.) per seed.
[12] Applied with modified SmartBox metering units.

2.25CS (0.46 oz) + HxXTRA (Pioneer 34P94), and Force 2.25CS (0.34 oz) + YieldGard VT (DKC63-42).

Late-season rootworm injury in seven treatments was assessed on 12 August (Table 1.3). Overall, mean node-injury ratings on 12 August increased only minimally from the node-injury ratings on 16 July. With the exception of Poncho 1250, all treatments had significantly lower mean node-injury ratings than the node-injury ratings in the UTCs. Force 2.25CS + YGVT (DKC63-42) was the only treatment with 80% or more consistency at the 1.0 or 0.25 levels.

Monmouth—Mean node-injury ratings and consistency percentages for rootworm injury evaluations on 16 July are presented in Table 1.4. Mean node-injury ratings in the untreated checks (UTCs) were 0.90 (DKC61-72), 1.28 (DKC63-46), 1.81 (Mycogen 2T777), 1.66 (Pioneer 32T84), and 1.76 (Pioneer 34P89), indicating that rootworm larval feeding was relatively moderate. The mean node-injury ratings for Cobalt, EXP 5B, Force 2.25CS (0.46 oz), Fortress 5G, Lorsban 15G, and Poncho 1250 were not significantly different from the mean node-injury ratings of one or more of the UTCs. The mean node-injury ratings for all other treatments were significantly lower than the mean node-injury ratings of the UTCs.

The addition of a soil insecticide to rootworm Bt hybrids did not significantly reduce node-injury ratings or increase percentage consistency when compared with the Bt hybrids not treated with soil insecticides. The percentages of roots with a node-injury rating <1.0 were 95% or greater in all plots except

TABLE 1.3 • Evaluation of products for late-season control of corn rootworm larvae, DeKalb, University of Illinois, 2008

Product[1]	Rate[2,3]	Placement[2,3]	Mean node-injury rating[4,5,6,7] 12 August	% consistency <1.0[8]	% consistency <0.25[9]
Soil- and seed-applied insecticides					
Force 2.25CS	0.46	Band	1.10 bc	45%	0%
Poncho 1250	1.25	Seed	2.64 a	0%	0%
Rootworm Bt corn hybrids					
HxXTRA (Mycogen 2T789[10])	—	—	0.76 c	55%	30%
HxXTRA (Pioneer 32T85[11])	—	—	0.68 c	65%	45%
HxXTRA (Pioneer 34P94[11])	—	—	1.03 bc	45%	10%
YieldGard VT (DKC61-69[11])	—	—	1.53 b	16%	0%
YieldGard VT (DKC63-42[11])	—	—	1.45 b	15%	5%
Soil insecticides + rootworm Bt corn hybrids					
Force 2.25CS + YieldGard VT (DKC63-42[11])	0.46	Band	0.20 d	100%	80%
Untreated checks (UTCs)					
DKC61-72[11]	—	—	2.88 a	0%	0%
DKC63-46[11]	—	—	2.89 a	0%	0%
Mycogen 2T777[10]	—	—	3.00 a	0%	0%
Pioneer 32T84[11]	—	—	3.00 a	0%	0%
Pioneer 34P89	—	—	3.00 a	0%	0%

[1] All seed-applied insecticides and soil insecticides were applied to Pioneer 34P89, the near-isoline of Pioneer 34P94, unless otherwise indicated.
[2] Rates of application for band and furrow placements are ounces (oz) of product per 1,000 ft of row.
[3] Rates of application for seed treatments are milligrams (mg) of active ingredient (a.i.) per seed.
[4] Mean node-injury ratings are based on the 0 to 3 node-injury scale (Oleson et al. 2005, Appendix I).
[5] Mean node-injury ratings were derived from five root systems per treatment in each of four replications.
[6] Data were transformed (square root transformation) for analysis; actual means are shown.
[7] Means followed by the same letter do not differ significantly ($P = 0.05$, Duncan's New Multiple Range Test).
[8] Percentage of roots with a node-injury rating <1.0.
[9] Percentage of roots with a node-injury rating <0.25.
[10] Seed treated with Cruiser 250, 0.25 milligrams (mg) of active ingredient (a.i.) per seed.
[11] Seed treated with Poncho 250, 0.25 milligrams (mg) of active ingredient (a.i.) per seed.

CORN

TABLE 1.4 • Evaluation of products to control corn rootworm larvae, Monmouth, University of Illinois, 2008

Product[1]	Rate[2,3]	Placement[2,3]	Mean node-injury rating[4,5,6,7] 16 July	% consistency <1.0[8]	% consistency <0.25[9]
Soil- and seed-applied insecticides					
Aztec 2.1G[10]	6.7	Band	0.14 de	100%	179%
Cobalt	3	Furrow	1.77 a	11%	5%
Counter 15G (DKC63-46[10])	8	SB furrow[12]	0.05 e	100%	95%
EXP 4A + Aztec 2.1G	N/A 6.7	Seed Band	0.26 de	95%	60%
EXP 5A + Aztec 2.1G	N/A 6.7	Seed Band	0.22 de	100%	60%
EXP 5B	N/A	Seed	0.96 bc	55%	10%
EXP 7	N/A	Seed	0.03 e	100%	100%
Force 2.25CS	0.46	Band	0.62 cd	79%	37%
Force 3G (DKC61-72[10])	4	Band	0.13 de	100%	80%
Force 3G (Mycogen 2T777[11])	4	Band	0.09 e	100%	95%
Force 3G (Pioneer 32T84[10])	4	Band	0.20 de	95%	75%
Fortress 5G	4	SB furrow[12]	0.93 bc	67%	22%
Lorsban 15G	8	Band	0.85 bc	60%	25%
Poncho 1250	1.25	Seed	1.21 ab	45%	5%
Rootworm Bt corn hybrids					
HxXTRA (Mycogen 2T789[11])	—	—	0.14 de	100%	85%
HxXTRA (Pioneer 32T85[10])	—	—	0.05 e	100%	100%
HxXTRA (Pioneer 34P94[10])	—	—	0.09 e	100%	95%
YieldGard VT (DKC61-69[10])	—	—	0.03 e	100%	100%
YieldGard VT (DKC63-42[10])	—	—	0.09 e	100%	90%
Soil insecticides + rootworm Bt corn hybrids					
Counter 15G + YieldGard VT (DKC63-42[10])	6	SB furrow[12]	0.02 e	100%	100%
Force 2.25CS + HxXTRA (Pioneer 34P94[10])	0.34	Band	0.03 e	100%	100%
Force 2.25CS + HxXTRA (Pioneer 34P94[10])	0.46	Band	0.08 e	100%	85%
Force 2.25CS + YieldGard VT (DKC63-42[10])	0.34	Band	0.02 e	100%	100%
Force 2.25CS + YieldGard VT (DKC63-42[10])	0.46	Band	0.02 e	100%	100%
Fortress 5G + HxXTRA (Pioneer 34P94[10])	3	SB furrow	0.06 e	100%	95%

Table 1.4 continued on page 9

TABLE 1.4 • continued

Untreated checks (UTCs)					
DKC61-72[10]	—	—	0.90 bc	50%	25%
DKC63-46[10]	—	—	1.28 ab	35%	30%
Mycogen 2T777[11]	—	—	1.81 a	25%	10%
Pioneer 32T84[10]	—	—	1.66 a	20%	10%
Pioneer 34P89	—	—	1.76 a	25%	25%

[1] All seed-applied insecticides and soil insecticides were applied to Pioneer 34P89, the near-isoline of Pioneer 34P94, unless otherwise indicated.
[2] Rates of application for band and furrow placements are ounces (oz) of product per 1,000 ft of row.
[3] Rates of application for seed treatments are milligrams (mg) of active ingredient (a.i.) per seed.
[4] Mean node-injury ratings are based on the 0 to 3 node-injury scale (Oleson et al. 2005, Appendix I).
[5] Mean node-injury ratings were derived from five root systems per treatment in each of four replications.
[6] Data were transformed (square root transformation) for analysis; actual means are shown.
[7] Means followed by the same letter do not differ significantly ($P = 0.05$, Duncan's New Multiple Range Test).
[8] Percentage of roots with a node-injury rating <1.0.
[9] Percentage of roots with a node-injury rating <0.25.
[10] Seed treated with Poncho 250, 0.25 milligrams (mg) of active ingredient (a.i.) per seed.
[11] Seed treated with Cruiser 250, 0.25 milligrams (mg) of active ingredient (a.i.) per seed.
[12] Applied with modified SmartBox metering units.

those treated with Cobalt, EXP 5B, Force 2.25CS, Fortress 5G, Lorsban 15G, and Poncho 1250.

Percentages of roots with a node-injury rating <0.25 were 85% or greater in plots with rootworm Bt hybrids, with or without a soil insecticide. Plots treated with the experimental seed treatment EXP 7 or the soil insecticides Counter 15G on DKC63-46 or Force 3G on Mycogen 2T777 also had consistencies of 95% or greater.

Late-season rootworm injury in seven treatments was assessed on 12 August (Table 1.5). For most treatments, mean node-injury ratings on 12 August increased minimally from the node-injury ratings on 16 July. However, mean node-injury ratings for plots treated with Poncho 1250 increased almost one-half node from 16 July to 12 August, and percentage consistency (<1.0) declined from 45 to 10%.

Perry—Mean node-injury ratings and consistency percentages for rootworm injury evaluations on 16 July are presented in Table 1.6. Mean node-injury ratings in the untreated checks (UTCs) were 0.50 (DKC61-72), 0.88 (DKC63-46), 1.31 (Mycogen 2T777), 0.95 (Pioneer 32T84), and 0.78 (Pioneer 34P89), indicating that rootworm larval densities were low to moderate. The mean node-injury rating for Lorsban 15G was significantly greater than the mean node-injury ratings for four of the five UTCs. Mean node-injury ratings for Cobalt, EXP 5B, and Poncho 1250 were not significantly different from four of the five UTCs. Mean node-injury ratings for rootworm Bt hyrbrids treated with soil insecticides were not significantly different from mean node-injury ratings for rootworm Bt hybrids not treated with soil insecticides.

Percentages of roots with a node-injury rating <1.0 for all rootworm control products were 90% or greater with the exception of Cobalt, EXP 5B, Lorsban 15G, and Poncho 1250. Percentages of roots with a node-injury rating <0.25 were all 100% for rootworm Bt hybrids treated with a soil insecticide. However, with the exception of DKC61-69, the level of protection offered by the rootworm Bt hybrids alone was 95% or higher. Cobalt, EXP 5B, Lorsban 15G, and Poncho 1250 had consistency levels of 35%, 45%, 10% and 35%, respectively.

Late-season rootworm injury in eight treatments was assessed on 12 August (Table 1.7). For most treatments, mean node-injury ratings on 12 August increased minimally from the node-injury ratings on 16 July. Mean node-injury ratings for all rootworm control products were <1.0, and node-injury ratings for all treatments except Poncho 1250 were significantly lower than node-injury ratings for the UTCs. With the exception of Poncho 1250, all treatments had percentage consistencies (<1.0) of 100%. Similar to the first assessment on 16 July, the level of consistency for the Bt rootworm hybrids (with or without a soil insecticide) was 95% or greater, with the exception of DKC61-69.

Urbana—Mean node-injury ratings and consistency percentages for rootworm injury evaluations on 16 July are presented in Table 1.8. Mean node-injury ratings in the

Continued on page 12

TABLE 1.5 • **Evaluation of products for late-season control of corn rootworm larvae, Monmouth, University of Illinois, 2008**

Product[1]	Rate[2,3]	Placement[2,3]	Mean node-injury rating[4,5,6,7] 12 August	% consistency <1.0[8]	% consistency <0.25[9]
Soil- and seed-applied insecticides					
Force 2.25CS	0.46	Band	0.78 bc	68%	16%
Poncho 1250	1.25	Seed	1.83 a	10%	0%
Rootworm Bt corn hybrids					
HxXTRA (Mycogen 2T789[10])	—	—	0.37 cd	90%	50%
HxXTRA (Pioneer 32T85[11])	—	—	0.27 cd	58%	58%
HxXTRA (Pioneer 34P94[11])	—	—	0.14 cd	100%	85%
YieldGard VT (DKC61-69[11])	—	—	0.08 d	100%	90%
YieldGard VT (DKC63-42[11])	—	—	0.07 d	100%	100%
Soil insecticides + rootworm Bt corn hybrids					
Force 2.25CS + YieldGard VT (DKC63-42[11])	0.46	Band	0.05 d	100%	100%
Untreated checks (UTCs)					
DKC61-72[11]	—	—	1.39 ab	37%	26%
DKC63-46[11]	—	—	1.37 ab	45%	15%
Mycogen 2T777[10]	—	—	2.12 a	10%	0%
Pioneer 32T84[11]	—	—	1.75 a	20%	00%
Pioneer 34P89	—	—	1.66 ab	30%	30%

[1] All seed-applied insecticides and soil insecticides were applied to Pioneer 34P89, the near-isoline of Pioneer 34P94, unless otherwise indicated.
[2] Rates of application for band and furrow placements are ounces (oz) of product per 1,000 ft of row.
[3] Rates of application for seed treatments are milligrams (mg) of active ingredient (a.i.) per seed.
[4] Mean node-injury ratings are based on the 0 to 3 node-injury scale (Oleson et al. 2005, Appendix I).
[5] Mean node-injury ratings were derived from five root systems per treatment in each of four replications.
[6] Data were transformed (square root transformation) for analysis; actual means are shown.
[7] Means followed by the same letter do not differ significantly ($P = 0.05$, Duncan's New Multiple Range Test).
[8] Percentage of roots with a node-injury rating <1.0.
[9] Percentage of roots with a node-injury rating <0.25.
[10] Seed treated with Cruiser 250, 0.25 milligrams (mg) of active ingredient (a.i.) per seed.
[11] Seed treated with Poncho 250, 0.25 milligrams (mg) of active ingredient (a.i.) per seed.

TABLE 1.6 • **Evaluation of products to control corn rootworm larvae, Perry, University of Illinois, 2008**

Product[1]	Rate[2,3]	Placement[2,3]	Mean node-injury rating[4,5,6,7] 16 July	% consistency <1.0[8]	% consistency <0.25[9]
Soil- and seed-applied insecticides					
Aztec 2.1G (Mycogen 2T777[10])	6.7	Band	0.14 efg	100%	65%
Aztec 2.1G (DKC61-72[11])	6.7	Band	0.16 efg	95%	85%
Aztec 2.1G (Pioneer 32T84[11])	6.7	Band	0.09 fg	100%	90%
Aztec 2.1G[11]	6.7	Band	0.10 fg	100%	100%

Table 1.6 continued on page 11

TABLE 1.6 • continued

Cobalt	3	Furrow	0.68 cd	70%	35%
EXP 4A + Aztec 2.1G	N/A 6.7	Seed Band	0.13 efg	100%	80%
EXP 5A + Aztec 2.1G	N/A 6.7	Seed Band	0.10 fg	100%	85%
EXP 5B	N/A	Seed	0.55 cde	75%	45%
EXP 7	N/A	Seed	0.04 fg	100%	100%
Force 2.25CS	0.46	Band	0.22 d-g	100%	60%
Lorsban 15G	8	Band	1.52 a	25%	10%
Poncho 1250	1.25	Seed	0.74 c	60%	35%
Rootworm Bt corn hybrids					
HxXTRA (Mycogen 2T789[10])	—	—	0.05 fg	100%	95%
HxXTRA (Pioneer 32T85[11])	—	—	0.02 g	100%	100%
HxXTRA (Pioneer 34P94[11])	—	—	0.09 fg	100%	95%
YieldGard VT (DKC61-69[11])	—	—	0.11 efg	100%	84%
YieldGard VT (DKC63-42[11])	—	—	0.04 g	100%	100%
Soil insecticides + rootworm Bt corn hybrids					
Force 2.25CS + HxXTRA (Pioneer 34P94[11])	0.34	Band	0.01 g	100%	100%
Force 2.25CS + HxXTRA (Pioneer 34P94[11])	0.46	Band	0.01 g	100%	100%
Force 2.25CS + YieldGard VT (DKC63-42[11])	0.34	Band	0.02 g	100%	100%
Force 2.25CS + YieldGard VT (DKC63-42[11])	0.46	Band	0.02 g	100%	100%
Untreated checks (UTCs)					
DKC61-72[11]	—	—	0.50 c-f	75%	50%
DKC63-46[11]	—	—	0.88 bc	50%	35%
Mycogen 2T777[10]	—	—	1.31 ab	35%	20%
Pioneer 32T84[11]	—	—	0.95 bc	55%	20%
Pioneer 34P89	—	—	0.78 c	60%	40%

[1] All seed-applied insecticides and soil insecticides were applied to Pioneer 34P89, the near-isoline of Pioneer 34P94, unless otherwise indicated.
[2] Rates of application for band and furrow placements are ounces (oz) of product per 1,000 ft of row.
[3] Rates of application for seed treatments are milligrams (mg) of active ingredient (a.i.) per seed.
[4] Mean node-injury ratings are based on the 0 to 3 node-injury scale (Oleson et al. 2005, Appendix I).
[5] Mean node-injury ratings were derived from five root systems per treatment in each of four replications.
[6] Data were transformed (square root transformation) for analysis; actual means are shown.
[7] Means followed by the same letter do not differ significantly ($P = 0.05$, Duncan's New Multiple Range Test).
[8] Percentage of roots with a node-injury rating <1.0.
[9] Percentage of roots with a node-injury rating <0.25.
[10] Seed treated with Cruiser 250, 0.25 milligrams (mg) of active ingredient (a.i.) per seed.
[11] Seed treated with Poncho 250, 0.25 milligrams (mg) of active ingredient (a.i.) per seed.

TABLE 1.7 • **Evaluation of products for late-season control of corn rootworm larvae, Perry, University of Illinois, 2008**

Product[1]	Rate[2,3]	Placement[2,3]	Mean node-injury rating[4,5,6,7] 12 August	% consistency <1.0[8]	% consistency <0.25[9]
Soil- and seed-applied insecticides					
Force 2.25CS	0.46	Band	0.20 cd	100%	72%
Poncho 1250	1.25	Seed	0.75 a-d	70%	35%
Rootworm Bt corn hybrids					
HxXTRA (Mycogen 2T789[10])	—	—	0.09 d	100%	95%
HxXTRA (Pioneer 32T85[11])	—	—	0.07 d	100%	100%
HxXTRA (Pioneer 34P94[11])	—	—	0.07 d	100%	95%
YieldGard VT (DKC61-69[11])	—	—	0.12 cd	100%	80%
YieldGard VT (DKC63-42[11])	—	—	0.07 d	100%	100%
Soil insecticides + rootworm Bt corn hybrids					
Force 2.25CS + YieldGard VT (DKC63-42[11])	0.46	Band	0.05 d	100%	100%
Untreated checks (UTCs)					
DKC61-72[11]	—	—	0.54 bcd	80%	50%
DKC63-46[11]	—	—	0.88 abc	55%	30%
Mycogen 2T777[10]	—	—	1.52 a	50%	20%
Pioneer 32T84[11]	—	—	1.23 ab	30%	10%
Pioneer 34P89	—	—	1.29 ab	50%	40%

[1] All seed-applied insecticides and soil insecticides were applied to Pioneer 34P89, the near-isoline of Pioneer 34P94, unless otherwise indicated.
[2] Rates of application for band and furrow placements are ounces (oz) of product per 1,000 ft of row.
[3] Rates of application for seed treatments are milligrams (mg) of active ingredient (a.i.) per seed.
[4] Mean node-injury ratings are based on the 0 to 3 node-injury scale (Oleson et al. 2005, Appendix I).
[5] Mean node-injury ratings were derived from five root systems per treatment in each of four replications.
[6] Data were transformed (square root transformation) for analysis; actual means are shown.
[7] Means followed by the same letter do not differ significantly ($P = 0.05$, Duncan's New Multiple Range Test).
[8] Percentage of roots with a node-injury rating <1.0.
[9] Percentage of roots with a node-injury rating <0.25.
[10] Seed treated with Cruiser 250, 0.25 milligrams (mg) of active ingredient (a.i.) per seed.
[11] Seed treated with Poncho 250, 0.25 milligrams (mg) of active ingredient (a.i.) per seed.

untreated checks (UTCs) were 1.90 (DKC61-72), 1.60 (DKC63-46), 1.72 (Mycogen 2T777), 1.87 (Pioneer 32T84), and 2.23 (Pioneer 34P89), indicating corn rootworm larval densities were moderate to high. Mean node-injury ratings for all plots treated with an insecticide were significantly lower than the mean node-injury ratings of the UTCs, except plots treated with Cobalt, EXP 5B, or Poncho 1250. Cobalt, EXP 5B, or Poncho 1250 were the only treatments with mean node-injury ratings greater than 1.0. HxXTRA (Pioneer 34P94) treated with soil insecticides (Aztec 4.67G or Force 2.25CS) had significantly lower node-injury ratings than the same rootworm Bt hybrid without a soil insecticide. The mean node-injury rating for YieldGard VT (DKC63-42) without a soil insecticide was not significantly different from the same rootworm Bt hybrid treated with soil insecticides.

Percentages of roots with a node-injury rating <1.0 were 90% or greater in plots treated with Counter 15G, EXP 5A + Aztec 2.1G, Force 3G, YieldGard VT (DKC61-61 and DKC63-42), and all of the rootworm Bt hybrids plus a soil insecticide. Percentages of roots with a node-injury rating <0.25 were 90% or greater only in plots treated with Force 2.25CS plus a rootworm Bt hybrid. Percentages of roots with a node-injury rating <0.25 were equal to or less than 5% for Cobalt, EXP 5B, Lorsban 15G, and Poncho 1250.

Late-season rootworm injury in eight treatments was assessed on 12 August (Table 1.9). Overall, mean node-injury ratings on 12 August were not noticeably different from mean node-injury ratings assessed on 16 July. However, the mean node-injury rating for HxXTRA (Pioneer 34P94) was significantly greater than the mean node-injury ratings for any of the other rootworm Bt hybrids or for Force 2.25CS. Mean node-injury ratings for all treatments, except Poncho 1250, were significantly lower than mean node-injury ratings in the UTCs. Force 2.25CS, YieldGard VT (DKC63-42), and Force 2.25CS + YGVT (DKC63-42) were the only treatments that provided 75% or more consistency at the 1.0 level. Only Force 2.25CS and the combination of Force 2.25CS + YieldGard VT (DKC63-42) provided 75% or more consistency at the 0.25 level.

TABLE 1.8 • Evaluation of products to control corn rootworm larvae, Urbana, University of Illinois, 2008

Product[1]	Rate[2,3]	Placement[2,3]	Mean node-injury rating[4,5,6,7] 16 July	% consistency <1.0[8]	% consistency <0.25[9]
Soil- and seed-applied insecticides					
Aztec 2.1G[10]	6.7	Band	0.65 cd	70%	20%
Aztec 4.67G	3	SB furrow[12]	0.60 cde	70%	30%
Cobalt	3	Furrow	1.80 ab	0%	0%
Counter 15G (DKC63-46[10])	8	SB furrow[12]	0.36 d-g	95%	35%
EXP 4A + Aztec 2.1G	N/A 6.7	Seed Band	0.55 c-f	85%	20%
EXP 5A + Aztec 2.1G	N/A 6.7	Seed Band	0.38 def	100%	35%
EXP 5B	N/A	Seed	1.93 ab	0%	0%
EXP 7	N/A	Seed	0.35 d-g	89%	42%
Force 2.25CS	0.46	Band	0.39 def	89%	32%
Force 3G (DKC61-72[10])	4	Band	0.21 fgh	100%	70%
Force 3G (Mycogen 2T777[11])	4	Band	0.19 fgh	100%	80%
Force 3G (Pioneer 32T84[10])	4	Band	0.33 d-h	95%	60%
Lorsban 15G	8	Band	0.66 cd	80%	5%
Poncho 1250	1.25	Seed	2.07 ab	0%	0%
Rootworm Bt corn hybrids					
HxXTRA (Mycogen 2T789[11])	—	—	0.39 def	80%	50%
HxXTRA (Pioneer 32T85[10])	—	—	0.62 cde	70%	25%
HxXTRA (Pioneer 34P94[10])	—	—	0.84 c	60%	0%
YieldGard VT (DKC61-69[10])	—	—	0.42 def	90%	45%
YieldGard VT (DKC63-42[10])	—	—	0.25 e-h	95%	53%
Soil insecticides + rootworm Bt corn hybrids					
Aztec 4.67G + HxXTRA (Pioneer 34P94[10])	3	SB furrow[12]	0.29 d-h	95%	50%
Counter 15G + YieldGard VT (DKC63-42[10])	6	SB furrow[12]	0.21 fgh	100%	55%
Force 2.25CS + HxXTRA (Pioneer 34P94[10])	0.34	Band	0.05 gh	100%	90%

Table 1.8 continued on page 14

TABLE 1.8 • continued

Force 2.25CS + HxXTRA (Pioneer 34P94[10])	0.46	Band	0.01 h	100%	100%
Force 2.25CS + YieldGard VT (DKC63-42[10])	0.34	Band	0.02 h	100%	100%
Force 2.25CS + YieldGard VT (DKC63-42[10])	0.46	Band	0.01 h	100%	100%
Untreated checks (UTCs)					
DKC61-72[10]	—	—	1.90 ab	0%	0%
DKC63-46[10]	—	—	1.60 b	5%	0%
Mycogen 2T777[11]	—	—	1.72 ab	10%	0%
Pioneer 32T84[10]	—	—	1.87 ab	0%	0%
Pioneer 34P89	—	—	2.23 a	0%	0%

[1] All seed-applied insecticides and soil insecticides were applied to Pioneer 34P89, the near-isoline of Pioneer 34P94, unless otherwise indicated.
[2] Rates of application for band and furrow placements are ounces (oz) of product per 1,000 ft of row.
[3] Rates of application for seed treatments are milligrams (mg) of active ingredient (a.i.) per seed.
[4] Mean node-injury ratings are based on the 0 to 3 node-injury scale (Oleson et al. 2005, Appendix I).
[5] Mean node-injury ratings were derived from five root systems per treatment in each of four replications.
[6] Data were transformed (square root transformation) for analysis; actual means are shown.
[7] Means followed by the same letter do not differ significantly ($P = 0.05$, Duncan's New Multiple Range Test).
[8] Percentage of roots with a node-injury rating <1.0.
[9] Percentage of roots with a node-injury rating <0.25.
[10] Seed treated with Poncho 250, 0.25 milligrams (mg) of active ingredient (a.i.) per seed.
[11] Seed treated with Cruiser 250, 0.25 milligrams (mg) of active ingredient (a.i.) per seed.
[12] Applied with modified SmartBox metering units.

TABLE 1.9 • **Evaluation of products for late-season control of corn rootworm larvae, Urbana, University of Illinois, 2008**

Product[1]	Rate[2,3]	Placement[2,3]	Mean node-injury rating[4,5,6,7] 12 August	% consistency <0.25[8]	% consistency <1.0[9]
Soil- and seed-applied insecticides					
Force 2.25CS	0.46	Band	0.16 ef	100%	75%
Poncho 1250	1.25	Seed	2.18 a	0%	0%
Rootworm Bt corn hybrids					
HxXTRA (Mycogen 2T789[10])	—	—	0.66 cd	65%	20%
HxXTRA (Pioneer 32T85[11])	—	—	0.79 c	50%	10%
HxXTRA (Pioneer 34P94[11])	—	—	1.36 b	13%	0%
YieldGard VT (DKC61-69[11])	—	—	0.55 cd	60%	40%
YieldGard VT (DKC63-42[11])	—	—	0.45 de	75%	45%
Soil insecticides + rootworm Bt corn hybrids					
Force 2.25CS + YieldGard VT (DKC63-42[11])	0.46	Band	0.01 f	100%	100%

Table 1.9 continued on page 15

TABLE 1.9 • continued

Untreated checks (UTCs)					
DKC61-72[11]	—	—	2.17 a	0%	0%
DKC63-46[11]	—	—	1.82 a	0%	0%
Mycogen 2T777[10]	—	—	1.88 a	0%	0%
Pioneer 32T84[11]	—	—	2.29 a	0%	0%
Pioneer 34P89	—	—	2.31 a	0%	0%

[1] All seed-applied insecticides and soil insecticides were applied to Pioneer 34P89, the near-isoline of Pioneer 34P94, unless otherwise indicated.
[2] Rates of application for band and furrow placements are ounces (oz) of product per 1,000 ft of row.
[3] Rates of application for seed treatments are milligrams (mg) of active ingredient (a.i.) per seed.
[4] Mean node-injury ratings are based on the 0 to 3 node-injury scale (Oleson et al. 2005, Appendix I).
[5] Mean node-injury ratings were derived from five root systems per treatment in each of four replications.
[6] Data were transformed (square root transformation) for analysis; actual means are shown.
[7] Means followed by the same letter do not differ significantly ($P = 0.05$, Duncan's New Multiple Range Test).
[8] Percentage of roots with a node-injury rating <1.0.
[9] Percentage of roots with a node-injury rating <0.25.
[10] Seed treated with Cruiser 250, 0.25 milligrams (mg) of active ingredient (a.i.) per seed.
[11] Seed treated with Poncho 250, 0.25 milligrams (mg) of active ingredient (a.i.) per seed.

SECTION 2

Comparison of experimental and commercially available granular insecticides to control corn rootworm larvae *(Diabrotica spp.)* in Illinois, 2008

Ronald E. Estes, Joshua R. Heeren, Nicholas A. Tinsley, Kevin L. Steffey, 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 5 ft (two rows) x 30 ft. Five randomly selected root systems were extracted from the first row of each plot on 22 July. The 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). Percentage of lodged plants (plants leaning at 45° or less from the soil surface) was determined on 22 September.

Planting and Insecticide Application

The trial was planted on 7 May using a four-row, Almaco constructed planter with John Deere 7300 row units with Precision Planting finger pick-up style metering units. All granular insecticides were applied through modified SmartBox metering units mounted to each row of the planter. Plastic tubes directed the insecticide granules to the seed furrow. All insecticides were applied in front of the planter's firming wheels. Cable-mounted tines were attached behind each of the planter row units to improve insecticide incorporation.

Active ingredients for all chemical insecticides, except those with experimental numbers, are listed in Appendix II.

Agronomic Information

Agronomic information is listed in Table 2.1.

Climatic Conditions

Temperature and precipitation data are presented in Appendix III.

Statistical Analysis

Data were analyzed using ARM 7 (Agricultural Research Manager), revision 7.4.2. (Copyright© 1982–2008 Gylling Data Management, Inc., Brookings, SD).

Results and Discussion

The level of rootworm injury to the untreated check (UTC) plots was moderate to high, with a mean node-injury rating of 2.11. All of the granular insecticide treatments provided acceptable protection (node-injury ratings <1.0) against corn rootworm larval damage with node-injury ratings ranging from 0.09 to 0.89, all significantly less than the mean node-injury rating of the UTC. Counter 15G and 20G provided excellent root protection with node-injury ratings of 0.14 and 0.09, respectively, although not statistically different from the mean node-injury ratings for the other granular products in the trial. Percentage lodging values for all plots were assessed on 22 September. Plots treated with Fortress Plus 5G and both Counter 15G and 20G had significantly less lodging than the untreated check plots.

TABLE 2.1 • Agronomic information for efficacy trial of experimental and commercially available insecticides to control corn rootworm larvae, Urbana, University of Illinois, 2008

Planting date	6 May
Root evaluation date	22 July
Row spacing	30 inches
Seeding rate	33,000/acre
Previous crop	Trap crop (late-planted corn and pumpkins)
Tillage	Fall—chisel plow Spring—field cultivator

TABLE 2.2 • **Evaluation of experimental and commercially available insecticides for control of corn rootworm larvae, Urbana, University of Illinois, 2008**

Product[1]	Rate[2]	Placement	Mean node-injury rating[3,4,5] 22 July	% lodging[5,6] 22 Sept
AMV 101G	3.7	Furrow	0.86 b	43 ab
Counter 15G	8.0	Furrow	0.14 b	9 b
Counter 20G	6.0	Furrow	0.09 b	24 b
Fortress 5G	3.7	Furrow	0.89 b	55 ab
Fortress Plus 5G	3.7	Furrow	0.56 b	24 b
UTC[7]	—	—	2.11 a	81 a

[1] All insecticides were applied with modified SmartBox metering units.
[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] Percentage of plants leaning at 45° or less from the soil surface.
[7] UTC = untreated check.

SECTION 3

Evaluation of Force 2.25CS to control corn rootworm larvae *(Diabrotica spp.)* in Illinois, 2008

Ronald E. Estes, Joshua R. Heeren, Nicholas A. Tinsley, Kevin L. Steffey, 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 40 ft. Five randomly selected root systems were extracted from the first row of each plot on 21 July. The 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). Percentage of lodged plants (plants leaning at 45° or less from the soil surface) was determined on 22 September.

Yields were estimated by harvesting the center two rows of each plot on 20 October. Weights were converted to bushels per acre (bu/A) at 15% moisture. Plant populations in the harvested rows had been thinned to 28,000 plants per acre at the V6–V8 growth stage.

Planting and Insecticide Application

The trial was planted on 25 April using a four-row, Almaco constructed planter with John Deere 7300 row units with Precision Planting finger pick-up style metering units. Granular insecticides were applied through modified Noble metering units mounted to each row of the planter. Plastic tubes directed the insecticide granules to either a 5-inch, slope-compensating bander or into the seed furrow. Capture 2EC and Force 2.25CS were applied at a spray volume of 5 gal per acre using a CO_2 system with TeeJet 8001VS spray tips attached to stainless steel drop tubes. All insecticides were applied in front of the planter's firming wheels. Cable-mounted tines were attached behind each of the planter row units to improve insecticide incorporation.

Active ingredients for all chemical insecticides, except those with experimental numbers, are listed in Appendix II.

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 7.4.2. (Copyright© 1982–2007 Gylling Data Management, Inc., Brookings, SD).

Results and Discussion

The mean node-injury rating, percentage lodging, and yield for each treatment are provided in Table 3.2. The mean node-injury rating in the untreated check (UTC) was 0.96, indicating that corn rootworm larval feeding injury was low to moderate in the trial.

The mean node-injury ratings for all insecticide treatments were significantly lower than the mean node-injury rating for the UTC, with the exception of Force 3G and Capture LFR 1.5EC, both applied in-furrow. Aztec 2.1G (Band), Force 3G (Band), and Force 2.25CS (Band) all provided excellent protection against corn rootworm larval injury, with node-injury ratings that ranged from 0.01 to 0.02. All three of these

TABLE 3.1 • Agronomic information for efficacy trial of Force 2.25CS to control corn rootworm larvae, Urbana, University of Illinois, 2008

Planting date	25 April
Root evaluation date	21 July
Row spacing	30 inches
Seeding rate	33,000/acre
Hybrid	Pioneer 34P89
Previous crop	Trap crop (late-planted corn and pumpkins)
Tillage	Fall—chisel plow Spring—field cultivator

treatments had significantly lower node-injury ratings than Force 3G applied in-furrow. Lodged plants (plants leaning at 45° or less from the soil surface) were found only in plots treated with Capture LFR.

Average yields were relatively low in the trial, ranging from 115 to 137 bushels per acre. Although there was more than a 20 bushel difference between the highest and lowest average yields, the differences in yield for all treatments were not statistically significant.

TABLE 3.2 • Evaluation of Force 2.25CS for control of corn rootworm larvae, Urbana, University of Illinois, 2008

Product	Rate[1,2]	Placement	Mean node-injury rating[3,4,5] 21 July	% lodging[5] 22 Sept	Mean yield (bu/A)[6,7] 20 Oct
Aztec 2.1G	6.7	Band	0.01 c	0 c	137.78 a
Aztec 2.1G	6.7	Furrow	0.39 bc	0 c	116.65 a
Capture LFR 1.5EC	0.075	Band	0.37 bc	25 ab	115.15 a
Capture LFR 1.5EC	0.075	Furrow	0.57 abc	10 bc	119.35 a
Force 3G	4	Band	0.01 c	0 c	135.23 a
Force 3G	4	Furrow	0.68 ab	0 c	137.88 a
Force 2.25CS	0.12	Band	0.02 c	0 c	129.55 a
Force 2.25CS	0.12	Furrow	0.12 bc	0 c	123.58 a
UTC[8]	—	—	0.96 a	0 c	132.70 a

[1] Rates of application for granular insecticides are ounces (oz) of product per 1,000 ft of row.
[2] Rates of application for Capture 2EC and Force 2.25CS are ounces of active ingredient (oz a.i.) 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] Percentage of plants leaning at 45° or less from the soil surface.
[6] Means followed by the same letter do not differ significantly (*P* = 0.05, Duncan's New Multiple Range Test).
[7] Corn was harvested from the center two rows of each plot and converted to bushels per acre (bu/A) at 15% moisture.
[8] UTC = untreated check.

SECTION 4

Comparison of experimental and commercially available transgenic rootworm hybrids and granular insecticides to control corn rootworm larvae *(Diabrotica spp.)* in Illinois, 2008

Ronald E. Estes, Joshua R. Heeren, Nicholas A. Tinsley, Kevin L. Steffey, 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 hybrid was 20 ft (eight rows) x 30 ft. Five randomly selected root systems were extracted from the center two rows of each eight-row plot on 1 and 26 August. The 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).

Planting Information

The trial was planted on 22 May using a four-row, Almaco constructed planter with John Deere 7300 row units. Precision cone units were used to plant the seeds. Granular insecticides were applied through modified Noble metering units mounted to each row of the planter. Plastic tubes directed the insecticide granules to either a 5-inch, slope-compensating bander or into the seed furrow. All insecticides were applied in front of the planter's firming wheels. Cable-mounted tines were attached behind each of the planter row units to improve insecticide incorporation.

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 7.4.2. (Copyright© 1982–2007 Gylling Data Management, Inc., Brookings, SD).

Results and Discussion

The mean node-injury ratings taken on two dates are presented in Table 4.2. The mean node-injury ratings in the non-Bt check were 2.36 and 2.63 on 1 and 26 August, indicating that corn rootworm larval injury was severe.

The mean node-injury ratings for all rootworm control products were significantly lower than the mean node-injury rating for the non-Bt check on both 1 and 26 August. On 1 August, YieldGard VT3 Pro/Herculex RW and YieldGard VT/RR2 + Aztec 2.1G had significantly less corn rootworm larval injury than Herculex XTRA/RR2 and the non-Bt check. On 26 August, SmartStax, YieldGard VT3 Pro/Herculex RW, and YieldGard VT/RR2 + Aztec 2.1G had significantly less corn rootworm larval injury than Herculex XTRA/RR2 and the non-Bt check. The mean node-injury ratings for the non-Bt corn hybrid (Roundup Ready 2) treated with Aztec 2.1G were not significantly different from the mean node-injury ratings for YieldGard VT/RR2 + Aztec 2.1G, YieldGard VT/RR2, YieldGard VT3 Pro/Herculex RW, and SmartStax on either 1 or 26 August. All of the granular insecticides and transgenic hybrids performed well, with node-injury scores not exceeding 0.66 by the second evaluation date.

TABLE 4.1 • Agronomic information for efficacy trial of experimental and commercially available transgenic rootworm hybrids and granular insecticides to control corn rootworm larvae, Urbana, University of Illinois, 2008

Planting date	22 May
Root evaluation dates	1 and 26 August
Row spacing	30 inches
Seeding rate	33,000/acre
Previous crop	Trap crop (late-planted corn and pumpkins)
Tillage	Fall—chisel plow Spring—field cultivator

TABLE 4.2 • **Evaluation of experimental and commercially available transgenic rootworm hybrids and granular insecticides for control of corn rootworm larvae, Urbana, University of Illinois, 2008**

Treatment/transgenic trait	Rate[1]	Placement	Mean node-injury rating[2,3,4] 1 August	Mean node-injury rating[2,3,4] 26 August
Roundup Ready 2 (non-Bt check)	—	—	2.36 a	2.63 a
Roundup Ready 2 + Aztec 2.1G	6.7	Band	0.29 bc	0.25 cd
YieldGard VT/RR2 + Aztec 2.1G	6.7	Band	0.02 c	0.01 d
YieldGard VT/RR2	—	—	0.37 bc	0.48 bc
YieldGard VT3 Pro/Herculex RW[5]	—	—	0.01 c	0.05 d
Herculex XTRA/RR2	—	—	0.54 b	0.66 b
SmartStax	—	—	0.04 bc	0.03 d

[1] Rates of application for granular 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] Treatment combination was evaluated for experimental purposes only and is not commercially available.

SECTION 5

Evaluation of a seed-blend (Pioneer Optimum AcreMax) to control corn rootworm larvae *(Diabrotica spp.)* in Illinois, 2008

Nicholas A. Tinsley, Ronald E. Estes, Joshua R. Heeren, Kevin L. Steffey, 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 20 ft. For treatments that were not seed-blends, five randomly selected root systems were extracted from the first row of each plot on 5 August. For treatments that were seed-blends, one randomly selected, non-rootworm Bt refuge plant and the two plants on either side of the refuge plant (for a total of five plants) were extracted from the first row of each plot on 5 August. The 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).

Yields were estimated by harvesting the center two rows of each plot on 20 October. Weights were converted to bushels per acre (bu/A) at 15% moisture.

Planting and Insecticide Application

The trial was planted on 22 May using a four-row, Almaco constructed planter with John Deere 7300 row units with Precision Planting finger pick-up style metering units. For treatments that were seed-blends, 3 seeds per row of a non-rootworm Bt hybrid (Pioneer 34P89) were planted by hand and marked with stakes. When plants entered the V1–V2 growth stages, refuge plants were thinned to 1 plant per row, resulting in a 2.5% refuge seed-blend.

Active ingredients for all chemical insecticides, except those with experimental numbers, 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 7.3.6. (Copyright© 1982–2007 Gylling Data Management, Inc., Brookings, SD).

Results and Discussion

The mean node-injury rating and yield for each treatment are provided in Table 5.2. The mean node-injury rating for the non-rootworm Bt hybrid was 2.86, indicating that corn rootworm larval feeding injury was heavy in the trial.

The mean node-injury ratings for the two seed-blend treatments and the rootworm Bt hybrid were significantly lower than the non-rootworm Bt hybrid. The two seed-blend treatments and the rootworm Bt hybrid provided a statistically similar level of protection against corn rootworm larval injury, with node-injury ratings that ranged from 0.74 to 0.79. No significant difference in the mean node-injury rating was observed between the seed-blend with EXP1 and the seed-blend with Poncho 1250.

The two seed-blend treatments and the rootworm Bt hybrid had significantly higher yields than the non-rootworm Bt hybrid. The two seed-blend treatments and the rootworm Bt

TABLE 5.1 • Agronomic information for evaluation of a seed-blend (Pioneer Optimum AcreMax) to control corn rootworm larvae, Urbana, University of Illinois, 2008

Planting date	22 May
Root evaluation date	5 August
Row spacing	30 inches
Seeding rate	35,000/acre
Previous crop	Trap crop (late-planted corn and pumpkins)
Tillage	Fall—chisel plow Spring—field cultivator

hybrid had statistically similar yields. There was no significant difference in yield between the two seed-blend treatments, regardless of which seed-applied insecticide was used.

The seed-blend treatments evaluated in this trial provided a similar level of protection against corn rootworm larval injury and associated yield loss as the rootworm Bt hybrid.

TABLE 5.2 • Evaluation of a seed-blend (Pioneer Optimum AcreMax) to control corn rootworm larvae, Urbana, University of Illinois, 2008

Product	Rate[1]	% seed-blend	Mean node-injury rating[2,3,4] 5 Aug	Mean yield (bu/A)[5] 20 Oct
Hx I (Pioneer 34P89)[6]	—	100	2.86 a	83.83 b
+ Cruiser 250	0.25	—		
Hx I (Pioneer 34P89)[6]	—	2.5	0.79 b	138.00 a
+ Cruiser 250	0.25	—		
Hx XTRA (Pioneer 34P94)	—	97.5		
+ EXP 1	N/A	—		
Hx I (Pioneer 34P89)[6]	—	2.5	0.77 b	160.35 a
+ Cruiser 250	0.25	—		
Hx XTRA (Pioneer 34P94)	—	97.5		
+ Poncho 1250	1.25	—		
Hx XTRA (Pioneer 34P94)	—	100	0.74 b	159.33 a
+ Cruiser 250	0.25	—		

[1] Rates of application for seed treatments are milligrams (mg) of active ingredient (a.i.) per seed.
[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; a weighted means adjustment was used to determine the root ratings for the seed-blend treatments.
[4] Means followed by the same letter do not differ significantly (P = 0.05, Duncan's New Multiple Range Test).
[5] Corn was harvested from the center two rows of each plot and converted to bushels per acre (bu/A) at 15% moisture.
[6] Pioneer 34P89 is the near-isoline of Pioneer 34P94.

SECTION 6

Evaluation of transgenic hybrids and insecticidal seed treatments for control of black cutworm larvae *(Agrotis ipsilon)* in Illinois, 2008

Ronald E. Estes, Joshua R. Heeren, Nicholas A. Tinsley, Kevin L. Steffey, and Michael E. Gray

Location

We established one trial on 18 July 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 30 ft. A 10-inch diameter, bottomless, plastic bucket was placed around each of approximately 20 plants in each plot to serve as a barrier to prevent escape of larvae. Two second- to third-instar black cutworms were introduced into each barrier on 30 July when corn plants were in the V2–V3 stage of development. The numbers of plants fed upon or cut by the larvae were recorded on 4, 6, 13, and 20 August (5, 7, 14, and 21 days after infestation, respectively).

Planting Information

The trial was planted on 18 July using a four-row, Almaco constructed planter with John Deere 7300 row units. Precision cone units were used to plant the seeds.

Active ingredients for all chemical insecticides, except those with experimental numbers, are listed in Appendix II.

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 7.4.2. (Copyright© 1982–2008 Gylling Data Management, Inc., Brookings, SD).

Results and Discussion

The mean numbers of plants that were cut or fed upon by black cutworm larvae are presented in Table 6.2. Due to the relatively small numbers of cut plants, there were no significant differences in the amount of cutting caused by black cutworm larvae among any of the treatments. Although the percentages of plants that had been fed upon by black cutworm larvae were fairly large (approximately 51 to 82% over the course of evaluations), no treatment had greater efficacy than any other. Although each plant was exposed to two black cutworm larvae to increase the probability for injury, apparently there was a high level of larval mortality due to environmental conditions or other unknown factors.

TABLE 6.1 • Agronomic information for evaluation of transgenic hybrids and insecticidal seed treatments to control black cutworm larvae, Urbana, University of Illinois, 2008

Planting date	18 July
Row spacing	30 inches
Seeding rate	30,000/acre

TABLE 6.2 • **Evaluation of transgenic hybrids and insecticidal seed treatments to control black cutworm larvae, 18 July planting, Urbana, University of Illinois, 2008**

Product	Rate[1]	4 August, 5 DAI[2]	4 August, 5 DAI[2]	6 August, 7 DAI[2]	6 August, 7 DAI[2]	13 August, 14 DAI[2]	13 August, 14 DAI[2]	20 August, 21 DAI[2]	20 August, 21 DAI[2]
		Mean percentage of cut plants[3]	Mean percentage of plants with feeding injury[3]	Mean percentage of cut plants[3]	Mean percentage of plants with feeding injury[3]	Mean percentage of cut plants[3]	Mean percentage of plants with feeding injury[3]	Mean percentage of cut plants[3]	Mean percentage of plants with feeding injury[3]
Poncho 600 5SC	0.25	0.00 a	70.00 a	0.00 a	71.25 a	3.75 a	73.75 a	6.25 a	73.75a
Cruiser 5FS	0.25	0.00 a	62.99 a	0.00 a	71.25 a	0.00 a	71.25 a	1.09 a	72.50 a
V-10170(1713) 5FS	0.25	1.04 a	56.04 a	2.08 a	61.04 a	5.83 a	64.58 a	5.83 a	67.92 a
V-10170(1729) 5FS	0.25	1.25 a	55.00 a	1.25 a	71.25 a	2.50 a	75.00 a	3.75 a	78.75 a
V-10170(1729) 5FS	0.35	0.00 a	55.71 a	0.00 a	65.82 a	1.09 a	69.24 a	2.34 a	72.99 a
V-10170(1729) 5FS	0.50	0.00 a	62.08 a	0.00 a	65.83 a	0.00 a	70.83 a	0.00 a	74.86 a
HxXtra (Mycogen 2T789) + Cruiser 5FS	— 0.25	0.00 a	51.25 a	0.00 a	61.25 a	0.00 a	65.00 a	0.00 a	66.25 a
UTC[4,5] (Mycogen 2T777) + Cruiser 5FS	— 0.25	0.00 a	62.20 a	0.00 a	68.45 a	1.39 a	73.45 a	1.39 a	77.20 a
UTC[4]	—	0.00 a	70.00 a	0.00 a	76.25 a	3.75 a	81.25 a	5.00 a	82.50 a

[1] Rates of application for seed treatments are milligrams (mg) of active ingredient (a.i.) per seed.
[2] DAI = days after infestation by third-instar black cutworms.
[3] Means followed by the same letter do not differ significantly ($P = 0.05$, Duncan's New Multiple Range Test).
[4] UTC = untreated check.
[5] Mycogen 2T777 is the non-Bt near-isoline of Mycogen 2T789 HxXTRA

SECTION 7

Evaluation of resistant soybean lines to control soybean aphids *(Aphis glycines)* in Illinois, 2008

Nicholas A. Tinsley, Ronald E. Estes, Joshua R. Heeren, Kevin L. Steffey, Michael E. Gray, and Brian W. Diers

Location

We established one trial to evaluate the efficacy of several resistant soybean lines to control soybean aphids. The trial was located at the David and Carol Cook Farm near Morrison (Whiteside County). Funding for this experiment was provided by the Illinois Soybean Association and the North Central Soybean Research Program.

Experimental Design and Methods

The experimental design was a randomized complete block with three replications. The plot size for each treatment was 10 ft (four rows) x 12 ft. Eleven experimental soybean lines and one commercially available soybean variety were selected. Three soybean lines with putative resistance to soybean aphids (LD05-16060, LD05-16529, and LD05-16611) and their respective aphid-susceptible near-isolines (SD01-76R, LD05-16159, and LD05-16621) were provided from the soybean breeding program at the University of Illinois. Other lines with putative resistance to soybean aphids were provided from the soybean breeding programs at Michigan State University (E06901, E06902, E07901, and E07906-2) and South Dakota State University (SD(LD)05R-16137). An aphid-susceptible, commercially-available variety (GR-2332) was provided from Midwest Seed Genetics (Carroll, Iowa).

Densities of soybean aphids were determined by counting the total number of soybean aphids on three plants in each plot. Soybean aphid densities were assessed on 30 July; 6, 14, 20, and 28 August; and 4 September. Two rows of each plot were mechanically harvested on 10 October, and the weights were adjusted to bushels per acre (bu/A) at 13% moisture.

Planting Information

All plots were planted on 20 May using a four-row, Almaco constructed planter with John Deere 7300 row units. Precision cone units were used to plant the seeds.

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 SAS (Statistical Analysis System), version 9.1 (Copyright© 2003 SAS Institute, Cary, NC).

Results and Discussion

Densities of soybean aphids assessed on six dates (30 July through 4 September) are presented in Table 7.2.

Densities of soybean aphids were small (<35 aphids per plant) when sampling began on 30 July (Table 7.2), but they increased noticeably through 28 August when most plots had the highest densities of the evaluation period. The average number of soybean aphids per plant in plots with susceptible cultivars reached 344 on 28 August. This average was well above the currently accepted economic threshold of 250 soybean aphids per plant (Ragsdale et al. 2007). Densities of soybean aphids decreased by 4 September but were still large in plots with susceptible cultivars (Table 7.2). Some soybean lines (SD01-76R, SD(LD)05-16137, E06902, and E07901) were not sampled on 4 September because the plants were beginning to senesce.

When densities of soybean aphids were largest—14 through 28 August—resistant lines from the University of Illinois had significantly fewer soybean aphids per plant than their susceptible isolines, except for LD05-16060 on 28 August

TABLE 7.1 • Agronomic information for efficacy trial of resistant soybean lines to control soybean aphids, Morrison (Whiteside County), University of Illinois, 2008

Planting date	20 May
Row spacing	30 inches
Seeding rate	175,000/acre
Previous crop	Corn
Tillage	Spring—disk
Harvest date	10 October

(Table 7.2). The statistically similar numbers of soybean aphids per plant on LD05-16060 (86.33) and SD01-76R (72.44) on 28 August may have been caused by early senescence of SD01-76R, leading to fewer leaves examined for soybean aphids (Table 7.2). Susceptible isolines were not provided for resistant lines from Michigan State University or South Dakota State University, which had significantly fewer soybean aphids per plant than the susceptible Illinois lines LD05-16519 and LD05-16621 from 14 through 28 August (Table 7.2). A similar trend was observed between resistant lines from Michigan State University and South Dakota State University and the Illinois susceptible line SD01-76R on 14 and 20 August, except for E06902 on 14 August (Table 7.2).

From 6 August through 28 August, the aphid-susceptible, commercially-available cultivar GR-2332 had significantly more soybean aphids per plant than all resistant lines, except for LD05-16529 on 28 August.

Yield data for this experiment are presented in Table 7.2. Yields from soybean aphid-resistant lines from the University of Illinois were not significantly greater than yields from their susceptible isolines (Table 7.2). The aphid-susceptible, commercially-available variety GR-2332 had a significantly higher yield than the soybean aphid-resistant lines from Michigan State University and South Dakota State University, as well as the resistant line LD05-16060 from Illinois (Table 7.2). High densities of soybean aphids after the R5 (beginning seed) growth stage, which is the pattern of infestation we observed, do not consistently have a demonstrated negative effect on soybean yield, leading us to propose that yield differences in this experiment were due primarily to differences in yield potential among lines (Ragsdale et al. 2007). The resistant lines evaluated in this experiment were able to suppress soybean aphid densities below the economic threshold and show potential for future development.

TABLE 7.2 • Evaluation of resistant soybean lines to control soybean aphids, Morrison (Whiteside County), University of Illinois, 2008

Cultivar	Resistant	Mean no. aphids per plant[1,2]						Mean yield (bu/acre)[3] 10 Oct
		30 July	6 Aug	14 Aug	20 Aug	28 Aug	4 Sept	
SD01-76R	No	4.89 bc	7.89 def	40.89 b	151.33 b	72.44 cd	—[4]	42.23 e
LD05-16060	Yes	17.56 bc	3.67 efg	11.22 de	46.10 d	86.33 cd	11.90 cd	49.56 de
LD05-16519	No	27.89 a	17.44 cd	88.00 a	292.67 a	489.11 a	172.80 ab	54.03 bcd
LD05-16529	Yes	8.56 bc	51.44 b	55.33 bc	42.56 cd	148.56 bc	129.00 bc	59.79 abc
LD05-16621	No	16.22 ab	20.89 bc	138.33 a	202.11 ab	521.11 a	380.60 a	64.71 a
LD05-16611	Yes	3.78 c	7.22 de	20.22 cd	73.00 c	112.11 cd	81.00 bc	63.07 ab
SD(LD)05-16137	Yes	0.22 c	0.33 g	3.89 ef	9.22 e	47.22 de	—[4]	51.89 cd
E06901	Yes	0.00 c	0.11 g	1.89 ef	3.00 e	10.22 ef	12.60 cd	26.79 f
E06902	Yes	0.11 c	0.67 fg	37.78 bc	59.67 c	111.67 cd	—[4]	29.64 f
E07901	Yes	2.67 c	2.22 efg	20.11 cd	31.89 cd	89.22 cd	—[4]	30.36 f
E07906-2	Yes	0.00 c	0.00 g	0.11 f	1.78 e	3.11 f	0.30 d	31.75 f
GR-2332	No	34.11 a	67.33 a	138.22 a	341.67 a	291.78 ab	337.00 a	66.97 a

[1] Means were derived from the numbers of soybean aphids on three plants in each plot in each replication. Means followed by the same letter do not differ significantly (P = 0.05, PROC GLM, SAS).
[2] Statistical analyses were conducted using a log transformation; actual means are shown.
[3] Soybeans were harvested from the center two rows of each plot, and weights were converted to bushels per acre (bu/A) at 13% moisture. Means followed by the same letter do not differ significantly (P = 0.05, PROC GLM, SAS).
[4] Densities of soybean aphids could not be assessed because plants were beginning to senesce.

SECTION 8

Evaluation of foliar- and seed-applied insecticides to control soybean aphids *(Aphis glycines)* in Illinois, 2008

Joshua R. Heeren, Ronald E. Estes, Nicholas A. Tinsley, Kevin L. Steffey, and Michael E. Gray

Location

We established one trial at the David and Carol Cook Farm near Morrison (Whiteside 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 30 ft. Insecticides were applied to designated plots on 18 August. At intervals before and after the 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 foliar insecticides were applied were assessed on 25 August (7 days after treatment, DAT), 1 September (14 DAT), and 8 September (21 DAT). Two rows from each plot were mechanically harvested on 10 October, and the weights were adjusted to bushels per acre at 13% moisture.

Planting and Insecticide Application

The trial was planted on 20 May using a four-row, Almaco constructed planter with John Deere 7300 row units. Precision cone units were used to plant the seeds. Insecticides were applied on 18 August with a CO_2 backpack sprayer and a four-row hand boom. TeeJet 80015VS spray tips were calibrated to deliver a volume of 20 gal per acre.

Active ingredients for all chemical insecticides, except those with experimental numbers, are listed in Appendix II.

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 7.4.2. (Copyright© 1982–2008 Gylling Data Management, Inc., Brookings, SD).

Results and Discussion

Densities of soybean aphids throughout the season are presented in Table 8.2. Soybean aphids on three plants in each plot were counted weekly from 18 August to 8 September. Although there were some differences in densities of soybean aphids before foliar insecticides were applied on 18 August, the focus of this discussion will be on densities of soybean aphids on the dates following the foliar applications.

The overall mean for all plots (including those with seed-applied insecticides) was 249.5 soybean aphids per plant (the economic threshold is 250 aphids per plant) prior to treating designated plots with foliar-applied insecticides. On 25 August (7 DAT), there was nearly a 75% overall reduction in densities of soybean aphids in plots treated with foliar-applied insecticides.

Mean densities of soybean aphids ranged from 0.00 to 297.67 aphids per plant on 25 August. Eight of the 17 plots treated with a foliar-applied insecticide had significantly fewer aphids than plots treated with Flonicamid 0.85, V-10226, V-10170, and the untreated check (UTC).

On 1 September, mean densities of soybean aphids ranged from 0.33 to 394.67 aphids per plant. Eight of the 17 plots treated with a foliar-applied insecticide had significantly fewer aphids than plots treated with Flonicamid 0.85, V-10226, and V-10170.

TABLE 8.1 • Agronomic information for the efficacy trial of foliar- and seed-applied insecticides to control soybean aphids, Morrison, University of Illinois, 2008

Planting date	20 May
Row spacing	30 inches
Seeding rate	140,000/acre
Variety	Midwest Seed Genetics GR-2332
Previous crop	Corn
Tillage	Spring—disk

By 8 September, densities of soybean aphids had declined. Mean densities of soybean aphids in the UTC were not significantly different from the densities of soybean aphids in many of the plots treated with foliar-applied insecticides.

Mean yields among treatments in the trial ranged from 59.89 to 69.79 bushels per acre. The mean yields for plots treated with Warrior 1CS and Discipline were significantly larger than the mean yield for plots treated with Flonicamid 0.85. There were no other significant differences in yields among any other treatments.

TABLE 8.2 • Evaluation of foliar- and seed-applied insecticides to control soybean aphids, Morrison, University of Illinois, 2008

Product	Rate[2,3]	Mean no. soybean aphids per plant[1]			Mean yield (bu/A)[4,7] 10 October
		25 August[4,5] (7 DAT)[6]	1 September[4,5] (14 DAT)[6]	8 September[4,5] (21 DAT)[6]	
Asana XL + Lorsban 4E	6.4 4	4.67 ef	4.58 d	0.92 c	62.23 ab
Baythroid XL	2.4	70.42 b-f	84.00 a-d	20.67 bc	65.63 ab
Baythroid XL + Lorsban 4E	2 8	6.17 def	0.58 d	11.50 bc	63.30 ab
Cobalt 2.55 EC	13	2.25 ef	3.92 d	3.92 bc	65.34 ab
Cruiser 5FS[8]	50	153.67 a-d	338.17 a-d	117.92 abc	63.53 ab
Dimethoate 4EC	8	34.08 c-f	28.75 bcd	21.42 bc	61.91 ab
Dimethoate 4EC + Nufos 4EC	8 8	10.33 def	6.83 d	6.33 bc	66.51 ab
Discipline	5.12	0.00 f	0.33 d	0.44 c	69.67 a
Flonicamid	2	68.58 a-f	109.75 a-d	49.00 abc	65.33 ab
Flonicamid	0.85	297.67 a	346.17 ab	199.67 abc	59.89 b
Flonicamid	1.4	65.08 a-f	49.08 bcd	25.58 bc	65.27 ab
Flonicamid	1.1	88.75 a-f	25.17 bcd	63.50 abc	66.17 ab
Gaucho 600[8]	62.5	171.25 a-f	183.00 a-d	46.08 abc	61.72 ab
Hero	5	0.75 f	0.50 d	2.92 bc	65.14 ab
Leverage 2.7 + NIS[9]	3.8 0.125	16.17 def	16.50 bcd	11.33 bc	65.65 ab
Lorsban 4E	16	6.50 def	15.33 cd	12.08 bc	64.91 ab
V-10170[8] V-10226[10]	50 3.5	127.50 a-e	181.75 a-d	66.50 bc	62.74 ab
V-10170[8]	50	240.92 ab	394.67 a	123.42 ab	63.28 ab
V-10226[10]	3.5	192.17 abc	329.50 abc	227.83 a	65.45 ab
Warrior 1CS	3.2	64.00 c-f	3.00 d	10.75 bc	69.79 a
UTC[11]		215.83 abc	219.58 a-d	41.25 bc	61.68 ab

[1] Mean densities of soybean aphids were derived from the total number of aphids on three plants per treatment in each of four replications.
[2] Rates of application of foliar-applied insecticides are ounces (oz) of product per acre.
[3] Rates of application of NIS (non-ionic surfactant) are percentage volume of product 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] Data were transformed (log transformation) for analysis; the actual means are shown.
[6] DAT = days after treatment (with foliar-applied insecticides).
[7] Soybeans were harvested from 30 ft of the center two rows of each plot, and weights were converted to bushels per acre (bu/A) at 13% moisture.
[8] Rates of application for these seed treatments are grams (g) of active ingredient (a.i.) per 100 kg of seed.
[9] NIS = non-ionic surfactant.
[10] Rates of application for these seed treatments are ounces (oz) of product per hundredweight (cwt) of seed.
[11] UTC = untreated check.

SECTION 9

Evaluation of foliar-applied insecticides to control insect pests of alfalfa in Illinois, 2008

Joshua R. Heeren, Hannah N. Imlay, Ronald E. Estes, Nicholas A. Tinsley, Kevin L. Steffey, and Michael E. Gray

Location

We established two trials, one located at the David and Carol Cook Farm near Morrison (Whiteside County), and the other located on a University of Illinois Animal Sciences 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 20 ft x 30 ft. Insecticides were applied to designated plots on 26 June in Morrison and on 19 August in Urbana. Densities of potato leafhoppers and other insects were assessed at each location prior to the foliar insecticide application by taking 20 sweeps per plot with a 15-inch diameter sweep net. Densities of potato leafhoppers and other insects after foliar insecticide applications were assessed on 2 July (7 days after treatment, DAT), 10 July (14 DAT), and 17 July (21 DAT) in Morrison and on 26 August (7 DAT), 2 September (14 DAT), and 9 September (21 DAT) in Urbana.

Insecticide Application

Insecticides were applied on 26 June in Morrison and on 19 August in Urbana with a CO_2 backpack sprayer and a 10-ft hand boom. TeeJet 80015VS spray tips were calibrated to deliver a volume of 20 gal per acre.

Active ingredients for all chemical insecticides, except those with experimental numbers, are listed in Appendix II.

Climatic Conditions

Temperature and precipitation data are presented in Appendix III.

Statistical Analysis

Data were analyzed using ARM 7 (Agricultural Research Manager), revision 7.4.2. (Copyright© 1982–2008 Gylling Data Management, Inc., Brookings, SD).

Results and Discussion

Densities of potato leafhoppers, grasshoppers, blister beetles, meadow spittlebugs, and tarnished plant bugs collected from Morrison and Urbana are presented in Tables 9.1–9.4. Although there were some differences in densities of insects across plots before foliar insecticides were applied, the focus of this discussion will be on the densities of insects on the dates following the foliar insecticide applications.

At Morrison, there were no significant differences in densities of grasshoppers among any of the treatments. Differences in densities of potato leafhoppers, blister beetles, meadow spittlebugs, and tarnished plant bugs among treatments were observed only on isolated dates, and there was no apparent trend with the differences. For example, on 2 July (7 DAT), the mean densities of potato leafhoppers and tarnished plant bugs were significantly smaller in plots treated with Mustang Max than in plots treated with GF 2153. However, on 10 July (14 DAT), the Mustang Max-treated plots had significantly more blister beetles than the plots treated with either Lorsban-4E or the low rate of Cobalt 2.55 EC. On 17 July (21 DAT), plots treated with the low rate of Cobalt 2.55 EC had significantly fewer meadow spittlebugs than plots treated with 2153.

At Urbana, there were no grasshoppers, blister beetles, or meadow spittlebugs found in any of the sweep samples taken. There were no significant differences in densities of potato leafhoppers among treatments on any dates, however, there were significant differences in densities of tarnished plant bugs among treatments. On 26 August (7 DAT), plots treated with Mustang Max and Warrior 1CS had significantly fewer tarnished plant bugs than plots treated with Lorsban-4E, the low rate of Cobalt 2.55 EC, and the UTC. However, this trend was reversed, to an extent, by 2 September (14 DAT); the plots treated with Warrior 1CS and Mustang Max had significantly more tarnished plant bugs than the plots treated with Lorsban-4E. On 9 September (21 DAT), the plots treated with the high rate of Cobalt 2.55 EC had significantly fewer tarnished plant bugs than plots treated with the low rate of Cobalt 2.55 EC

TABLE 9.1 • **Evaluation of products to control insect pests of alfalfa, Morrison, University of Illinois, 2008**

Product	Rate[2]	Potato leafhopper[1]				Grasshopper[1]				Blister beetle[1]			
		26 June	2 July (7 DAT)[3]	10 July (14 DAT)[3]	17 July (21 DAT)[3]	26 June	2 July (7 DAT)[3]	10 July (14 DAT)[3]	17 July (21 DAT)[3]	26 June	2 July (7 DAT)[3]	10 July (14 DAT)[3]	17 July (21 DAT)[3]
Cobalt 2.55 EC	7	4.25 a	1.75 ab	4.25 a	16.75 a	0.00 b	0.00 a	0.50 a	0.75 a	0.25 a	0.00 a	0.00 b	0.25 a
Cobalt 2.55 EC	13	1.50 ab	1.75 ab	5.50 a	12.75 a	0.00 b	0.00 a	1.00 a	0.25 a	0.00 a	0.00 a	0.50 ab	0.25 a
GF2153	16	1.00 b	5.75 a	5.25 a	12.50 a	0.00 b	0.00 a	0.25 a	0.75 a	0.00 a	0.00 a	0.25 ab	0.50 a
Lorsban-4E	16	2.00 ab	2.50 ab	0.75 a	12.75 a	0.00 b	0.00 a	0.50 a	1.00 a	0.00 a	0.00 a	0.00 b	0.25 a
Mustang Max	4	3.50 ab	0.00 b	4.75 a	10.25 a	0.00 b	0.00 a	0.50 a	1.25 a	0.00 a	0.25 a	0.75 a	0.00 a
UTC[4]	—	2.50 ab	3.75 ab	2.75 a	19.25 a	1.00 a	0.00 a	0.25 a	0.50 a	0.00 a	0.00 a	0.25 ab	0.25 a

[1] Means were derived from the number of insects per 20 sweeps using a 15-inch diameter sweep net. Means followed by the same letter do not differ significantly (*P*= 0.05, Duncan's New Multiple Range Test).
[2] Rates of application of foliar-applied insecticides are ounces (oz) of product per acre.
[3] DAT = days after treatment (with foliar-applied insecticides).
[4] UTC = untreated check.

TABLE 9.2 • **Evaluation of products to control insect pests of alfalfa, Morrison, University of Illinois, 2008**

Product	Rate[2]	Meadow spittlebug[1]				Tarnished plant bug[1]			
		26 June	2 July (7 DAT)[3]	10 July (14 DAT)[3]	17 July (21 DAT)[3]	26 June	2 July (7 DAT)[3]	10 July (14 DAT)[3]	17 July (21 DAT)[3]
Cobalt 2.55 EC	7	0.00 a	0.00 a	0.50 a	0.00 b	1.50 a	4.00 a	3.00 a	4.00 a
Cobalt 2.55 EC	13	0.75 a	0.00 a	0.00 a	0.25 ab	2.50 a	2.00 ab	2.50 a	3.00 a
GF2153	16	0.00 a	0.75 a	0.25 a	0.75 a	3.25 a	4.25 a	4.00 a	3.50 a
Lorsban-4E	16	0.00 a	0 .25 a	0.50 a	0.25 ab	2.25 a	2.50 ab	4.00 a	4.25 a
Mustang Max	4	0.25 a	0.00 a	0.25 a	0.25 ab	3.00 a	0.75 b	4.00 a	3.50 a
UTC[4]	—	0.75 a	1.50 a	0.50 a	0.25 ab	2.00 a	1.75 ab	1.25 a	3.00 a

[1] Means were derived from the number of insects per 20 sweeps using a 15-inch diameter sweep net. Means followed by the same letter do not differ significantly (*P*= 0.05, Duncan's New Multiple Range Test).
[2] Rates of application of foliar-applied insecticides are ounces (oz) of product per acre.
[3] DAT = days after treatment (with foliar-applied insecticides).
[4] UTC = untreated check.

TABLE 9.3 • Evaluation of products to control insect pests of alfalfa, Urbana, University of Illinois, 2008

Product	Rate[2]	Potato leafhopper[1]				Tarnished plant bug[1]			
		19 August	26 August (7 DAT)[3]	2 September (14 DAT)[3]	9 September (21 DAT)[3]	19 August	26 August (7 DAT)[3]	2 September (14 DAT)[3]	9 September (21 DAT)[3]
Cobalt 2.55 EC	7	0.75 a	0.75 a	3.00 a	1.50 a	0.50 a	7.75 a	10.25 bc	8.50 a
Cobalt 2.55 EC	13	1.25 a	0.50 a	3.75 a	1.50 a	1.25 a	6.25 ab	12.25 bc	1.75 b
GF2153	16	2.25 a	0.50 a	6.00 a	2.75 a	1.25 a	7.25 ab	13.00 bc	5.75 ab
Lorsban-4E	16	2.25 a	1.00 a	5.75 a	0.75 a	1.25 a	8.50 a	8.75 c	5.25 ab
Mustang Max	4	1.25 a	0.00 a	2.50 a	0.75 a	0.50 a	2.50 bc	17.50 ab	5.50 ab
Warrior 1CS	3.2	1.25 a	0.25 a	2.25 a	1.75 a	0.25 a	1.00 c	22.75 a	3.75 ab
UTC[4]	—	1.50 a	0.25 a	4.50 a	1.00 a	1.25 a	8.75 a	12.50 bc	4.00 ab

[1] Means were derived from the number of insects per 20 sweeps using a 15-inch diameter sweep net. Means followed by the same letter do not differ significantly (P= 0.05, Duncan's New Multiple Range Test).
[2] Rates of application of foliar-applied insecticides are ounces (oz) of product per acre.
[3] DAT = days after treatment (with foliar-applied insecticides).
[4] UTC = untreated check

APPENDIX I • References Cited

Hills, T. M., and D. C. Peters. 1971. A method of evaluating postplanting insecticide treatments for control of western corn rootworm larvae. Journal of Economic Entomology 64: 764–765.

Oleson, J. D., Y. L. Park, T. M. Nowatzki, and J. J. Tollefson. 2005. Node-injury scale to evaluate root injury by corn rootworms (Coleoptera: Chrysomelidae). Journal of Economic Entomology 98: 1–8.

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
Asana XL 0.66EC	esfenvalerate
Aztec 2.1G	tebupiriphos + cyfluthrin
Aztec 4.67G	tebupiriphos + cyfluthrin
Baythroid XL	cyfluthrin
Cobalt 2.55EC	chlorpyrifos + gamma-cyhalothrin
Counter 15G	terbufos
Cruiser 5FS	thiamethoxam
Dimethoate 4EC	dimethoate
Discipline 2EC	bifenthrin
Flonicamid 50WG	flonicamid
Force 3G	tefluthrin
Force 2.25CS	tefluthrin
Fortress 5G	chlorethoxyfos
Gaucho 600	imidacloprid
Hero	bifenthrin + zeta-cypermethrin
Leverage 2.7	imidacloprid + cyfluthrin
Lorsban 15G	chlorpyrifos
Lorsban 4E	chlorpyrifos
Mustang Max	zeta-cypermethrin
Nufos 4E	chlorpyrifos
Poncho 1250	clothianidin
Poncho 250	clothianidin
Warrior 1CS	lambda-cyhalothrin

APPENDIX III • Temperature and Precipitation

2008 Daily Weather Data for DeKalb, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
April 1	0.53	48
April 2	T	35
April 3	0.00	41
April 4	0.31	44
April 5	0.01	46
April 6	0.00	52
April 7	0.00	51
April 8	0.00	41
April 9	1.22	40
April 10	0.10	43
April 11	0.75	48
April 12	0.05	47
April 13	0.06	35
April 14	0.01	35
April 15	0.00	40
April 16	0.00	45
April 17	0.00	58
April 18	0.00	63
April 19	0.32	61
April 20	0.15	55
April 21	0.00	61
April 22	0.00	63
April 23	0.04	63
April 24	0.00	64
April 25	0.23	67
April 26	0.25	56
April 27	T	46
April 28	0.00	46
April 29	0.34	37
April 30	T	39
Total	**4.37**	—

M=Missing
T=Trace

2008 Daily Weather Data for DeKalb, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
May 1	0.00	48
May 2	0.00	62
May 3	0.34	60
May 4	0.05	44
May 5	0.00	53
May 6	0.00	63
May 7	0.04	68
May 8	0.51	58
May 9	0.00	51
May 10	0.00	51
May 11	0.86	53
May 12	0.64	47
May 13	0.00	51
May 14	0.07	59
May 15	0.00	55
May 16	0.00	50
May 17	0.00	61
May 18	0.08	52
May 19	T	50
May 20	0.00	52
May 21	0.00	55
May 22	0.00	56
May 23	0.00	58
May 24	0.00	53
May 25	0.00	60
May 26	1.47	65
May 27	0.01	62
May 28	0.00	46
May 29	0.00	53
May 30	0.14	57
May 31	0.74	70
Total	**4.95**	—

M=Missing
T=Trace

2008 Daily Weather Data for DeKalb, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
June 1	0.00	67
June 2	0.00	68
June 3	0.00	72
June 4	0.50	66
June 5	0.02	70
June 6	0.00	80
June 7	0.00	79
June 8	0.22	79
June 9	0.90	76
June 10	0.14	63
June 11	0.00	69
June 12	0.00	72
June 13	0.35	78
June 14	0.00	64
June 15	0.24	71
June 16	0.15	69
June 17	0.00	60
June 18	0.00	63
June 19	0.00	63
June 20	0.00	68
June 21	0.02	69
June 22	0.02	70
June 23	0.02	67
June 24	0.00	67
June 25	0.03	67
June 26	0.11	73
June 27	0.00	74
June 28	0.04	72
June 29	0.49	71
June 30	0.01	65
Total	**3.26**	—

M=Missing
T=Trace

2008 Daily Weather Data for DeKalb, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
July 1	0.00	68
July 2	0.00	69
July 3	0.05	71
July 4	0.00	62
July 5	0.00	64
July 6	0.00	67
July 7	0.00	73
July 8	1.17	76
July 9	0.00	73
July 10	0.00	72
July 11	1.55	71
July 12	0.86	76
July 13	0.00	70
July 14	0.00	67
July 15	0.00	69
July 16	0.00	77
July 17	0.00	79
July 18	0.00	78
July 19	0.94	76
July 20	0.50	74
July 21	0.02	75
July 22	0.16	73
July 23	0.00	72
July 24	0.00	69
July 25	0.00	68
July 26	0.00	72
July 27	0.00	69
July 28	0.00	69
July 29	0.00	75
July 30	0.51	76
July 31	0.00	76
Total	**5.76**	—

M=Missing
T=Trace

2008 Daily Weather Data for DeKalb, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
August 1	0.04	76
August 2	0.00	73
August 3	0.00	70
August 4	0.00	70
August 5	1.05	77
August 6	0.00	73
August 7	0.00	70
August 8	0.00	67
August 9	0.05	67
August 10	0.00	67
August 11	0.00	63
August 12	0.00	67
August 13	0.00	68
August 14	0.00	66
August 15	0.00	69
August 16	0.00	66
August 17	0.00	66
August 18	0.00	65
August 19	0.00	71
August 20	0.09	73
August 21	0.00	73
August 22	0.55	72
August 23	0.01	76
August 24	0.01	70
August 25	0.00	65
August 26	0.00	66
August 27	0.00	68
August 28	0.00	71
August 29	0.15	71
August 30	0.00	67
August 31	0.00	69
Total	**1.95**	**—**

M=Missing
T=Trace

2008 Daily Weather Data for DeKalb, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
September 1	0.00	70
September 2	0.00	77
September 3	0.00	78
September 4	0.30	63
September 5	1.50	59
September 6	0.00	60
September 7	0.00	61
September 8	0.00	62
September 9	0.70	53
September 10	T	57
September 11	0.00	60
September 12	0.07	63
September 13	3.46	70
September 14	1.73	69
September 15	0.72	60
September 16	0.01	54
September 17	0.00	61
September 18	0.00	69
September 19	0.00	65
September 20	0.00	67
September 21	0.00	68
September 22	0.00	70
September 23	0.00	70
September 24	0.00	72
September 25	0.00	70
September 26	0.00	65
September 27	0.00	67
September 28	0.00	67
September 29	0.00	62
September 30	0.90	55
Total	**9.39**	**—**

M=Missing
T=Trace

2008 Daily Weather Data for DeKalb, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
October 1	0.00	50
October 2	0.00	49
October 3	0.00	50
October 4	0.00	50
October 5	0.00	49
October 6	0.04	54
October 7	0.00	62
October 8	0.63	57
October 9	0.03	56
October 10	0.00	55
October 11	0.00	61
October 12	0.00	61
October 13	0.00	72
October 14	0.01	63
October 15	0.00	60
October 16	0.25	48
October 17	0.00	47
October 18	0.01	45
October 19	0.00	48
October 20	0.00	52
October 21	0.21	47
October 22	0.00	43
October 23	0.00	45
October 24	0.57	46
October 25	0.88	47
October 26	0.05	49
October 27	0.03	43
October 28	0.00	34
October 29	0.00	35
October 30	0.00	40
October 31	0.00	48
Total	**2.71**	**—**

M=Missing
T=Trace

2008 Daily Weather Data for Monmouth, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
April 1	0.15	45
April 2	0.00	35
April 3	0.00	42
April 4	0.14	43
April 5	0.00	44
April 6	0.00	49
April 7	0.00	48
April 8	0.19	43
April 9	1.40	39
April 10	0.27	42
April 11	0.86	51
April 12	0.00	40
April 13	0.01	36
April 14	0.00	37
April 15	0.00	42
April 16	0.00	50
April 17	0.00	62
April 18	T	66
April 19	0.32	55
April 20	0.00	53
April 21	0.00	60
April 22	0.10	67
April 23	0.11	65
April 24	0.00	68
April 25	0.43	63
April 26	0.25	54
April 27	0.00	48
April 28	0.15	45
April 29	0.01	36
April 30	0.00	44
Total	**4.39**	**—**

M=Missing
T=Trace

2008 Daily Weather Data for Monmouth, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
May 1	0.00	57
May 2	0.22	68
May 3	0.04	56
May 4	0.00	47
May 5	0.00	56
May 6	0.00	64
May 7	0.76	69
May 8	0.00	59
May 9	0.00	55
May 10	0.00	53
May 11	2.01	54
May 12	0.00	47
May 13	0.00	56
May 14	0.01	58
May 15	0.00	55
May 16	0.00	47
May 17	0.00	62
May 18	0.00	62
May 19	0.00	55
May 20	0.25	52
May 21	0.00	53
May 22	0.00	57
May 23	0.19	56
May 24	0.34	50
May 25	0.00	59
May 26	0.00	70
May 27	0.14	64
May 28	0.14	49
May 29	0.00	58
May 30	0.00	67
May 31	0.34	69
Total	**4.44**	**—**

M=Missing
T=Trace

2008 Daily Weather Data for Monmouth, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
June 1	0.00	70
June 2	0.00	74
June 3	0.02	75
June 4	2.34	69
June 5	T	74
June 6	0.14	77
June 7	0.00	75
June 8	0.00	81
June 9	0.62	77
June 10	0.22	61
June 11	0.02	70
June 12	0.00	74
June 13	0.00	76
June 14	0.07	70
June 15	0.00	73
June 16	0.00	70
June 17	0.00	62
June 18	0.00	63
June 19	0.00	70
June 20	0.00	70
June 21	0.00	71
June 22	0.00	69
June 23	0.00	70
June 24	0.00	70
June 25	1.03	72
June 26	1.38	73
June 27	0.37	71
June 28	0.00	70
June 29	0.00	66
June 30	0.03	73
Total	**8.19**	**—**

M=Missing
T=Trace

2008 Daily Weather Data for Monmouth, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
July 1	0.00	68
July 2	0.00	72
July 3	0.01	74
July 4	0.00	64
July 5	0.00	65
July 6	0.00	68
July 7	0.03	76
July 8	0.95	78
July 9	T	71
July 10	0.00	74
July 11	0.00	76
July 12	0.00	68
July 13	0.16	68
July 14	0.00	73
July 15	0.00	71
July 16	0.00	75
July 17	0.00	76
July 18	0.00	76
July 19	0.00	78
July 20	0.00	78
July 21	0.00	77
July 22	0.00	74
July 23	0.00	69
July 24	0.00	71
July 25	0.04	64
July 26	0.00	72
July 27	0.00	69
July 28	0.12	74
July 29	0.00	76
July 30	0.59	77
July 31	0.00	74
Total	**1.90**	**—**

M=Missing
T=Trace

2008 Daily Weather Data for Monmouth, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
August 1	0.00	77
August 2	0.00	75
August 3	0.16	72
August 4	0.00	74
August 5	0.87	79
August 6	0.26	74
August 7	0.00	72
August 8	0.00	68
August 9	0.00	70
August 10	0.00	70
August 11	0.00	62
August 12	0.00	67
August 13	0.00	66
August 14	0.00	71
August 15	0.00	68
August 16	0.00	64
August 17	0.00	67
August 18	0.00	69
August 19	0.00	70
August 20	0.00	72
August 21	0.08	75
August 22	0.23	74
August 23	0.00	76
August 24	0.00	70
August 25	0.00	64
August 26	0.00	63
August 27	0.00	64
August 28	0.00	71
August 29	1.22	73
August 30	0.00	66
August 31	0.00	69
Total	**2.82**	—

M=Missing
T=Trace

2008 Daily Weather Data for Monmouth, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
September 1	0.00	74
September 2	0.00	77
September 3	0.03	74
September 4	1.06	61
September 5	1.22	58
September 6	0.00	61
September 7	0.08	61
September 8	0.00	64
September 9	1.09	51
September 10	0.00	57
September 11	T	62
September 12	0.08	66
September 13	4.10	67
September 14	0.94	64
September 15	0.20	58
September 16	0.03	54
September 17	0.00	62
September 18	0.00	69
September 19	0.00	68
September 20	0.00	67
September 21	0.00	67
September 22	0.00	66
September 23	0.00	70
September 24	0.00	71
September 25	0.00	68
September 26	0.00	69
September 27	0.00	65
September 28	0.00	71
September 29	0.64	68
September 30	0.00	59
Total	**9.47**	—

M=Missing
T=Trace

2008 Daily Weather Data for Monmouth, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
October 1	0.00	53
October 2	0.00	49
October 3	0.00	54
October 4	0.00	54
October 5	0.00	55
October 6	0.00	63
October 7	0.00	68
October 8	0.99	51
October 9	0.00	58
October 10	0.00	58
October 11	0.00	62
October 12	0.00	66
October 13	0.00	71
October 14	0.04	61
October 15	T	57
October 16	0.00	44
October 17	0.00	46
October 18	0.00	46
October 19	0.00	47
October 20	0.00	52
October 21	T	46
October 22	0.00	46
October 23	0.00	50
October 24	0.32	45
October 25	0.06	42
October 26	T	47
October 27	0.00	43
October 28	0.00	32
October 29	0.00	35
October 30	0.00	46
October 31	0.00	52
Total	**1.41**	**—**

M=Missing
T=Trace

2008 Daily Weather Data for Perry, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
April 1	0.24	52
April 2	0.00	35
April 3	0.00	43
April 4	0.17	42
April 5	0.00	43
April 6	0.00	49
April 7	0.00	52
April 8	0.00	50
April 9	0.46	43
April 10	0.76	44
April 11	0.45	59
April 12	0.09	42
April 13	0.12	36
April 14	0.00	36
April 15	0.00	38
April 16	0.00	49
April 17	0.00	59
April 18	0.00	62
April 19	0.53	54
April 20	0.00	51
April 21	0.00	55
April 22	0.52	67
April 23	0.12	59
April 24	0.05	65
April 25	0.45	62
April 26	0.26	56
April 27	0.00	49
April 28	0.09	43
April 29	0.05	41
April 30	0.00	45
Total	**4.36**	**—**

M=Missing
T=Trace

2008 Daily Weather Data for Perry, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
May 1	0.00	58
May 2	0.02	66
May 3	0.26	56
May 4	0.03	48
May 5	0.00	58
May 6	0.00	65
May 7	0.06	65
May 8	0.45	62
May 9	0.00	54
May 10	0.00	53
May 11	1.00	58
May 12	0.02	48
May 13	0.07	57
May 14	0.23	59
May 15	0.00	57
May 16	0.08	47
May 17	0.00	63
May 18	0.00	64
May 19	0.00	56
May 20	0.05	61
May 21	0.00	57
May 22	0.00	60
May 23	0.03	55
May 24	0.02	57
May 25	0.04	62
May 26	0.54	72
May 27	0.05	73
May 28	0.00	57
May 29	0.00	59
May 30	0.00	70
May 31	1.16	73
Total	**4.11**	**—**

M=Missing
T=Trace

2008 Daily Weather Data for Perry, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
June 1	0.00	73
June 2	0.00	75
June 3	2.46	74
June 4	0.53	74
June 5	0.00	78
June 6	0.22	78
June 7	0.00	81
June 8	0.00	83
June 9	0.90	78
June 10	0.17	64
June 11	0.00	74
June 12	0.00	77
June 13	0.12	78
June 14	0.18	70
June 15	0.00	75
June 16	0.00	73
June 17	0.00	65
June 18	0.00	67
June 19	0.15	72
June 20	0.00	75
June 21	0.00	75
June 22	T	73
June 23	0.29	67
June 24	0.00	70
June 25	1.08	70
June 26	0.60	76
June 27	0.04	74
June 28	0.87	76
June 29	0.00	74
June 30	0.25	68
Total	**7.86**	—

M=Missing
T=Trace

2008 Daily Weather Data for Perry, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
July 1	0.00	70
July 2	0.00	75
July 3	0.64	75
July 4	0.00	64
July 5	0.00	66
July 6	0.00	70
July 7	0.00	78
July 8	0.28	80
July 9	1.04	77
July 10	0.00	76
July 11	0.00	78
July 12	0.35	81
July 13	0.12	73
July 14	0.00	72
July 15	0.00	78
July 16	0.00	78
July 17	0.00	79
July 18	0.00	76
July 19	0.44	81
July 20	0.02	80
July 21	0.00	85
July 22	0.60	81
July 23	0.00	76
July 24	0.04	72
July 25	0.44	67
July 26	0.02	76
July 27	0.00	74
July 28	1.03	72
July 29	0.00	77
July 30	0.45	78
July 31	0.02	71
Total	**5.49**	—

M=Missing
T=Trace

2008 Daily Weather Data for Perry, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
August 1	0.00	78
August 2	0.00	77
August 3	0.02	76
August 4	0.00	78
August 5	0.00	87
August 6	0.83	77
August 7	0.00	74
August 8	0.00	71
August 9	M	71
August 10	M	71
August 11	0.00	66
August 12	0.00	69
August 13	0.00	70
August 14	0.00	73
August 15	0.34	73
August 16	0.00	67
August 17	0.00	69
August 18	0.00	69
August 19	0.00	69
August 20	0.00	70
August 21	M	72
August 22	0.15	74
August 23	0.01	76
August 24	0.09	74
August 25	0.00	66
August 26	M	69
August 27	0.00	68
August 28	0.00	72
August 29	1.15	77
August 30	0.00	68
August 31	0.00	69
Total	**2.59**	—

M=Missing
T=Trace

2008 Daily Weather Data for Perry, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
September 1	0.00	74
September 2	0.00	78
September 3	0.32	76
September 4	2.28	63
September 5	2.34	59
September 6	0.00	61
September 7	0.38	M
September 8	0.08	66
September 9	0.28	57
September 10	0.00	57
September 11	T	59
September 12	0.98	66
September 13	0.34	M
September 14	4.42	70
September 15	0.12	61
September 16	0.01	53
September 17	0.00	M
September 18	0.00	66
September 19	0.00	67
September 20	0.00	69
September 21	0.00	M
September 22	0.00	66
September 23	0.00	68
September 24	0.00	70
September 25	0.00	71
September 26	0.00	70
September 27	0.00	66
September 28	0.00	M
September 29	0.59	71
September 30	0.01	58
Total	**12.15**	—

M=Missing
T=Trace

2008 Daily Weather Data for Perry, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
October 1	0.00	55
October 2	0.00	52
October 3	0.00	M
October 4	0.00	60
October 5	0.00	61
October 6	0.00	64
October 7	0.04	M
October 8	0.63	55
October 9	0.00	M
October 10	0.00	59
October 11	0.00	63
October 12	0.00	M
October 13	0.00	73
October 14	T	63
October 15	0.51	58
October 16	0.58	51
October 17	0.00	50
October 18	0.05	48
October 19	0.00	50
October 20	0.00	54
October 21	0.00	51
October 22	0.00	M
October 23	T	52
October 24	0.49	47
October 25	0.13	46
October 26	T	M
October 27	0.00	45
October 28	0.00	35
October 29	0.00	M
October 30	0.00	48
October 31	0.00	56
Total	**2.43**	—

M=Missing
T=Trace

2008 Daily Weather Data for Morrison, Illinois (Midwest Climate Center)

Date	Precipitation (inches)
April 1	0.00
April 2	0.25
April 3	0.00
April 4	0.00
April 5	0.00
April 6	0.08
April 7	T
April 8	0.98
April 9	0.15
April 10	1.00
April 11	0.00
April 12	0.00
April 13	0.00
April 14	0.00
April 15	0.00
April 16	0.00
April 17	0.00
April 18	0.28
April 19	0.00
April 20	0.00
April 21	0.00
April 22	0.75
April 23	0.00
April 24	0.00
April 25	0.20
April 26	0.70
April 27	0.00
April 28	0.05
April 29	0.00
April 30	0.00
Total	**4.44**

M=Missing
T=Trace

2008 Daily Weather Data for Morrison, Illinois (Midwest Climate Center)

Date	Precipitation (inches)
May 1	0.07
May 2	0.42
May 3	T
May 4	0.00
May 5	0.00
May 6	0.22
May 7	0.00
May 8	0.00
May 9	0.00
May 10	1.30
May 11	0.22
May 12	0.00
May 13	0.00
May 14	0.00
May 15	0.00
May 16	0.00
May 17	0.00
May 18	0.00
May 19	0.03
May 20	0.00
May 21	0.00
May 22	0.13
May 23	0.23
May 24	0.00
May 25	2.05
May 26	0.02
May 27	0.00
May 28	0.00
May 29	0.13
May 30	0.45
May 31	0.10
Total	**5.37**

M=Missing
T=Trace

2008 Daily Weather Data for Morrison, Illinois (Midwest Climate Center)

Date	Precipitation (inches)
June 1	0.00
June 2	0.00
June 3	1.21
June 4	0.00
June 5	0.22
June 6	0.04
June 7	0.15
June 8	0.49
June 9	0.29
June 10	0.00
June 11	0.00
June 12	1.42
June 13	0.00
June 14	0.31
June 15	0.00
June 16	0.00
June 17	0.00
June 18	0.00
June 19	0.00
June 20	0.00
June 21	0.00
June 22	0.00
June 23	0.00
June 24	0.27
June 25	0.34
June 26	0.00
June 27	0.02
June 28	0.00
June 29	0.00
June 30	0.00
Total	**4.76**

M=Missing
T=Trace

2008 Daily Weather Data for Morrison, Illinois (Midwest Climate Center)

Date	Precipitation (inches)
July 1	0.00
July 2	0.00
July 3	0.00
July 4	0.00
July 5	0.00
July 6	0.37
July 7	0.92
July 8	0.00
July 9	0.00
July 10	0.37
July 11	0.31
July 12	0.00
July 13	0.00
July 14	0.00
July 15	0.00
July 16	0.00
July 17	T
July 18	0.42
July 19	0.97
July 20	0.12
July 21	0.21
July 22	0.00
July 23	0.00
July 24	0.00
July 25	0.00
July 26	0.00
July 27	0.00
July 28	0.00
July 29	0.00
July 30	0.00
July 31	0.00
Total	**3.69**

M=Missing
T=Trace

2008 Daily Weather Data for Morrison, Illinois (Midwest Climate Center)

Date	Precipitation (inches)
August 1	0.00
August 2	T
August 3	0.00
August 4	0.77
August 5	0.00
August 6	0.00
August 7	0.00
August 8	0.00
August 9	0.37
August 10	0.00
August 11	0.00
August 12	0.00
August 13	0.00
August 14	0.00
August 15	0.00
August 16	0.00
August 17	0.00
August 18	0.00
August 19	0.15
August 20	0.00
August 21	0.18
August 22	0.00
August 23	0.00
August 24	0.00
August 25	0.00
August 26	0.00
August 27	0.00
August 28	0.12
August 29	0.28
August 30	0.00
August 31	0.00
Total	**1.87**

M=Missing
T=Trace

2008 Daily Weather Data for Morrison, Illinois (Midwest Climate Center)

Date	Precipitation (inches)
September 1	0.00
September 2	0.65
September 3	0.51
September 4	1.21
September 5	0.00
September 6	0.00
September 7	0.00
September 8	0.00
September 9	0.00
September 10	0.00
September 11	T
September 12	3.28
September 13	1.03
September 14	0.21
September 15	0.00
September 16	0.00
September 17	0.00
September 18	0.00
September 19	0.00
September 20	0.00
September 21	0.00
September 22	0.00
September 23	0.00
September 24	0.00
September 25	0.00
September 26	0.00
September 27	0.00
September 28	0.41
September 29	0.05
September 30	0.00
Total	**7.35**

M=Missing
T=Trace

2008 Daily Weather Data for Morrison, Illinois (Midwest Climate Center)

Date	Precipitation (inches)
October 1	0.00
October 2	0.00
October 3	0.00
October 4	0.03
October 5	0.10
October 6	0.00
October 7	1.03
October 8	0.00
October 9	0.00
October 10	0.00
October 11	0.00
October 12	0.00
October 13	0.00
October 14	T
October 15	0.28
October 16	0.00
October 17	0.00
October 18	0.00
October 19	0.00
October 20	0.00
October 21	0.00
October 22	0.00
October 23	0.00
October 24	0.78
October 25	0.00
October 26	0.00
October 27	0.00
October 28	0.00
October 29	0.00
October 30	0.00
October 31	0.00
Total	**2.22**

M=Missing
T=Trace

2008 Daily Weather Data for Urbana, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
April 1	0.07	49
April 2	0.00	41
April 3	0.00	46
April 4	0.05	45
April 5	0.00	49
April 6	0.00	53
April 7	0.00	55
April 8	0.00	55
April 9	0.32	52
April 10	0.94	53
April 11	0.44	57
April 12	0.09	43
April 13	0.04	39
April 14	0.00	41
April 15	0.00	47
April 16	0.00	56
April 17	0.00	62
April 18	0.00	64
April 19	0.20	57
April 20	0.00	60
April 21	0.00	63
April 22	0.00	67
April 23	0.00	69
April 24	0.12	71
April 25	0.01	72
April 26	0.37	60
April 27	0.02	50
April 28	0.20	43
April 29	M	M
April 30	0.00	54
Total	**2.87**	—

M=Missing
T=Trace

2008 Daily Weather Data for Urbana, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
May 1	0.00	64
May 2	0.17	68
May 3	0.00	59
May 4	0.00	56
May 5	0.00	64
May 6	0.00	71
May 7	0.19	70
May 8	0.92	58
May 9	0.00	56
May 10	0.00	55
May 11	0.97	57
May 12	0.00	54
May 13	0.00	59
May 14	0.47	61
May 15	0.67	55
May 16	0.26	58
May 17	0.00	67
May 18	0.00	63
May 19	0.45	54
May 20	0.10	54
May 21	0.00	58
May 22	0.00	60
May 23	0.38	53
May 24	0.00	59
May 25	0.00	64
May 26	0.10	72
May 27	0.05	63
May 28	0.00	59
May 29	0.00	64
May 30	1.28	75
May 31	0.07	75
Total	**6.08**	—

M=Missing
T=Trace

2008 Daily Weather Data for Urbana, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
June 1	0.00	75
June 2	0.00	77
June 3	2.60	74
June 4	1.94	76
June 5	0.00	82
June 6	0.05	78
June 7	1.39	80
June 8	0.00	83
June 9	0.00	79
June 10	0.19	71
June 11	0.00	77
June 12	0.00	81
June 13	0.00	82
June 14	0.00	75
June 15	0.06	80
June 16	0.00	73
June 17	0.00	68
June 18	0.00	72
June 19	0.00	73
June 20	0.00	74
June 21	0.11	75
June 22	0.01	74
June 23	0.00	72
June 24	0.00	72
June 25	0.24	78
June 26	0.00	80
June 27	0.10	78
June 28	0.19	78
June 29	0.00	73
June 30	0.00	73
Total	**6.88**	**—**

M=Missing
T=Trace

2008 Daily Weather Data for Urbana, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
July 1	0.00	74
July 2	0.00	78
July 3	0.39	74
July 4	0.60	69
July 5	0.00	69
July 6	0.00	75
July 7	1.19	77
July 8	2.10	79
July 9	0.40	77
July 10	0.00	77
July 11	0.04	78
July 12	2.15	77
July 13	0.02	71
July 14	0.00	75
July 15	0.00	79
July 16	0.00	81
July 17	0.00	81
July 18	0.00	81
July 19	0.12	81
July 20	0.06	81
July 21	0.21	79
July 22	1.02	75
July 23	0.00	71
July 24	0.00	69
July 25	0.00	73
July 26	0.01	80
July 27	0.00	75
July 28	0.04	77
July 29	0.00	79
July 30	0.45	77
July 31	0.00	79
Total	**8.80**	**—**

M=Missing
T=Trace

2008 Daily Weather Data for Urbana, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
August 1	0.00	79
August 2	0.03	77
August 3	0.01	72
August 4	0.00	80
August 5	0.16	80
August 6	0.00	78
August 7	0.00	74
August 8	0.00	71
August 9	0.01	73
August 10	0.01	70
August 11	0.00	67
August 12	0.00	70
August 13	0.00	72
August 14	0.00	72
August 15	0.00	71
August 16	0.00	70
August 17	0.00	72
August 18	0.00	73
August 19	0.00	74
August 20	0.00	76
August 21	0.25	74
August 22	0.11	77
August 23	0.00	80
August 24	0.00	76
August 25	0.00	69
August 26	0.00	68
August 27	0.00	73
August 28	0.04	75
August 29	0.12	78
August 30	0.00	73
August 31	0.00	74
Total	**0.74**	—

M=Missing
T=Trace

2008 Daily Weather Data for Urbana, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
September 1	0.00	78
September 2	0.00	80
September 3	0.35	79
September 4	1.69	68
September 5	0.69	65
September 6	0.00	65
September 7	0.11	66
September 8	0.34	67
September 9	0.00	60
September 10	0.00	62
September 11	0.04	66
September 12	0.76	72
September 13	0.00	80
September 14	4.38	73
September 15	0.02	63
September 16	0.00	61
September 17	0.00	67
September 18	0.00	68
September 19	0.00	68
September 20	0.05	69
September 21	0.01	69
September 22	0.00	71
September 23	0.00	72
September 24	0.00	72
September 25	0.00	72
September 26	0.00	68
September 27	0.00	67
September 28	0.00	70
September 29	0.03	66
September 30	0.00	59
Total	**8.47**	—

M=Missing
T=Trace

2008 Daily Weather Data for Urbana, Illinois (Midwest Climate Center)

Date	Precipitation (inches)	Mean Temperature (°F)
October 1	0.00	55
October 2	0.00	54
October 3	0.00	61
October 4	M	M
October 5	0.00	62
October 6	0.00	66
October 7	0.49	66
October 8	0.74	61
October 9	0.00	63
October 10	0.00	63
October 11	0.00	71
October 12	0.00	74
October 13	0.00	72
October 14	0.00	67
October 15	M	M
October 16	0.01	52
October 17	0.02	50
October 18	0.04	52
October 19	0.00	54
October 20	0.00	55
October 21	0.00	49
October 22	0.00	48
October 23	0.30	50
October 24	0.85	51
October 25	0.02	48
October 26	0.00	52
October 27	0.00	41
October 28	0.00	38
October 29	0.00	44
October 30	0.00	51
October 31	0.00	59
Total	**2.47**	**—**

M=Missing
T=Trace